Cat. No. W457-E1-07

CRT1 Series

CompoNet Slave Units and Repeater Unit

OPERATION MANUAL

OMRON

CRT1 Series CompoNet Slave Units and Repeater Unit

Operation Manual

Revised October 2009

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 Slave Units, and the 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 provide 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 Analog I/O Slave Units.

Section 7 describes the Temperature Input Units.

Section 8 describes the Expansion Units.

Section 9 describes the Bit Slave Units.

Section 10 describes the Repeater Unit.

Section 11 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 12 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.

⚠ 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.

Related Manuals:

Cat. No.	Models	Name	Description
W457 (this manual)	CRT1 Series	CompoNet Slave Units and Repeater Unit Operation Manual	Provides the specifications of CompoNet Slave Units and Repeater Unit.
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.
W342	CS1G/H-CPU□□H CS1G/H-CPU□□-EV1 CS1D-CPU□□H CS1D-CPU□□S CS1W-SCB□□-V1 CS1W-SCU□□-V1 CJ1G/H-CPU□□H CJ1G-CPU□□P CJ1G-CPU□□ CJ1M-CPU□□ CJ1W-SCU□□-V1 CP1H-X□□□□-□ CP1H-XA□□□□-□ CP1H-Y□□□□-□ NSJ□-□□□□(B)-G5D NSJ□-□□□□(B)-M3D	SYSMAC CS/CJ/CP Series SYSMAC One NSJ Series Communications Commands Reference Manual	Describes the communications commands used with CS-series, CJ-series, and CP-series PLCs and NSJ Controllers.
W464	CXONE-AL□□C-EV□/ CXONE-AL□□D-EV□	SYSMAC CS/CJ/CP/NSJ Series CX-Integrator Ver. 2.3 Operation Manual	Describes CX-Integrator operating methods, e.g., for setting up and monitoring networks.

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 Slave Units, and the 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. Be sure this manual is delivered to the persons actually using the CompoNet Slave Units and Repeater Units.

⚠ 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. Also, do not turn ON the power supply while the cover is open. Doing any of these may result in electric shock.

⚠ WARNING Do not input voltages or currents exceeding the rated range to the Unit. Exceeding the rated range may cause Unit failure or fire.

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

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

- When transporting the Unit, use special packing boxes and protect it from being exposed to excessive vibration or impact during transportation.
- Do not drop any Unit or subject any Unit to excessive shock or vibration. Otherwise, Unit failure or malfunction may occur.
- Mount the Units securely using DIN Track, a Mounting Bracket, or screws.
- 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.
- 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.
- When installing the Units, ground to 100 Ω min.
- Wire all connections correctly according to instructions in the manual.
- Always separate Special Flat Cables (Standard and Sheathed) for different CompoNet systems by at least 5 mm to prevent unstable operation due to interference. Do not bundle Special Flat Cables.
- Do not extend connection distances or the number of connected nodes beyond the ranges given in the specifications.
- Do not allow foreign matter to enter the Units when wiring and installing the Units.
- Use the correct wiring materials to wire the Units.
- Use the correct tools to wire the Units.
- Always use the specified communications cables and connectors.
- Confirm the polarity of all terminals before wiring them.
- Make sure that all terminal block screws are tightened to the torque specified in this manuals. Incorrect tightening torque may result in fire, malfunction, or failure.
- Always use the power supply voltage specified in this manual.
- Do not bend cables past their natural bending radius or pull on cables.
- 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.

- 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.
- 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.
- Confirm voltage specifications when wiring communications, the power supply, and I/O crossovers. Incorrect wiring may result in malfunction.
- Do not apply voltages or connect loads to the Output Units in excess of the maximum switching capacity. Excess voltage or loads may result in burning.
- Do not apply voltages to the Input Units in excess of the rated input voltage. Excess voltages may result in 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.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in unexpected operation.
- Check all wiring and switch settings to be sure they are correct.
- 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.
    - Removing or attaching terminal blocks to Slave Units and Expansion Units
    - Removing or attaching the terminal blocks or connectors
    - Replacing components (e.g., relays)
    - Setting the 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 from the user program
- Touch a grounded piece of metal to discharge static electricity from your body before touching any Unit.
- When replacing relays or other parts, be sure to confirm that the ratings of the new part are correct. Not doing so may result in malfunction or burning.
- Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.
- On IP54 Bit Slaves, tighten the cover screws to the specified torque after setting the rotary switches or performing wiring. The specified degree of protection will not be achieved if the screws are not tightened sufficiently.

- 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.

6 Conformance to EC Directives

6-1 Applicable Directives

- EMC Directives
- Low Voltage Directive

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)

Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards.

Applicable standard: EN 61131-2

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. A DC power supply with reinforced insulation or double insulation that can maintain a stable output even if the input is interrupted for 10 ms must be used for communications power, internal power, and I/O power. The OMRON S82J-series Power Supply is recommended. (See note.)

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.
4. Conformance with the EC Directives was confirmed with a system configuration using I/O wiring lengths of less than 30 m.

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

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 CX-Integrator 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 CX-Integrator 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.

Main Features

The functions that can be used depend on the type of Slave Unit. For details, refer to *1-1-3 CompoNet Slave Unit Functions*.

Operation Time Monitor

The Slave Unit can quickly measure the ON/OFF timing of input and output contacts without relying on the ladder program. Contact types (IN - OUT, OUT - IN, IN - IN, OUT - OUT) and trigger patterns (ON → OFF, OFF → ON, ON → ON, OFF → OFF) can be freely combined for measurement. A time can be set in the Slave Unit memory to enable notification of the status when the measured time exceeds the set time.

This data can be set or read by using the CX-Integrator.

Contact Operation Monitor

The number of times each input contact or output contact is turned ON can be counted at a sampling frequency of 50 Hz maximum and stored. A value can also be set in the Slave Unit to enable notification of the status if the number of contact operations reaches the set value.

This data can be set or read by using the CX-Integrator.

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. A value can also be set in the Slave Unit to enable notification of the status if the total time reaches the set value.

These values can be set or read by using the CX-Integrator.

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

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.

Unit Conduction 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 CX-Integrator 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.

This data can be read or written by using the CX-Integrator.

Naming Units

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

This data can be read or written by using the CX-Integrator.

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.

This data can be read or written by using the CX-Integrator.

Network Power Voltage Monitoring

The network power supply voltage (present, maximum, and minimum values) can be stored in the Slave Unit memory. A monitor voltage can also be set in the Slave Unit to enable notification of the status if the voltage drops to the preset value.

These values can be set or read by using the CX-Integrator.

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 checked by using the CX-Integrator.

Communications Error History Monitor

Enables storing the error condition (communication failure details, the communications power supply voltage at the time of failure, and the Unit conduction time) for the most recent 4 communication failures, within the slave unit.

This data can be read by using the CX-Integrator.

Input Filters

The Slave Units read input values multiple times during the set period to eliminate the effect of switch chattering and data omissions caused by noise. An ON delay or OFF delay can also be implemented by using this function.

These settings are made by using the CX-Integrator.

Communications Error Output Setting

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

These settings are made by using the CX-Integrator.

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.

These settings are made by using the CX-Integrator.

Power Short-circuit Detection

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

The status can be checked by using the LED indicators on the Slave Unit or by using the CX-Integrator.

Load Short-circuit Detection

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

The status can be checked by using the LED indicators on the Slave Unit or by using the CX-Integrator.

Removable Terminal Block

The terminal block can be removed.

Expansion Using Expansion Units

One Expansion Unit can be added to a Digital I/O Slave Unit (with 2-tier terminal block and 16 points). This extends the range of possible system configurations by making it possible to expand to a variety of I/O combinations, e.g., 16 inputs and 8 outputs or 24 inputs (16 inputs + 8 inputs).

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.

These settings are made by using the CX-Integrator.

Last Maintenance Date (Maintenance Function)

The date that maintenance was performed can be written in the Slave Unit by using the CX-Integrator.

Cumulated Count

The cumulated count function calculates the integral time for input (or output) analog values and reads the cumulated value. Monitor values can be set in Units. If the cumulated counter value exceeds the set monitor value, the Cumulated Counter Over Flag in general status turns ON.

These values can be set and read by using the CX-Integrator.

Moving Average

An Analog Input Unit or Temperature Input Unit can calculate the moving average of the last eight inputs and use it as the converted data. Smooth input values can be obtained by averaging the inputs if there are rapid fluctuations in the input.

Settings for averaging are made by using the CX-Integrator.

Setting the Number of AD Conversion Points

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.

Rate of Change Calculations

You can find the rate of change during the set data sampling cycle for the input value to an Analog Input Unit or Temperature Input Unit.

The rate of change settings are made by using the CX-Integrator.

Comparator

Input data captured into the Analog Input Slave Unit/Temperature Input Unit or calculation data is compared to alarm settings (Alarm Trip Point High (HH), Warning Trip Point High (H), Warning Trip Point Low (L), and Alarm Trip Point Low (LL)) and the results can be reflected in the "Analog Status Flag" (or "Temperature Data Status Flag"). The Normal Flag (pass signal) turns ON for values that are in set range.

The alarm settings are made by using the CX-Integrator.

Peak/Bottom Hold

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

The peak/bottom hold settings are made by using the CX-Integrator.

Top/Valley Hold

The top/valley hold function holds the top or valley input value to an Analog Input Unit or Temperature Input 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).

The top/valley hold settings are made by using the CX-Integrator.

Disconnected Line Detection

With Analog Input Units, the Disconnected Line Detection Flag for each input can be used in the Master Unit to check whether the analog input lines (for voltage inputs or current inputs) are disconnected for analog inputs that are enabled 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. With Temperature Input Units, disconnections can be detected for each sensor input. The status can be checked at the Master Unit using the Disconnected Line Detection Flag.

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%.

The adjustments can be made by using the CX-Integrator.

Top/Valley Count

With Temperature Input Units, the maximum or minimum number of times the top or valley value is reached can be counted for an application that has fixed cycles of temperature changes. Explicit messages can be used to see if the number of cycles has exceeded a monitoring set value.

The settings are made by using the CX-Integrator.

Temperature Range Total Time Count

With Temperature Input Units, the length of time that the temperature input value is within a user-set temperature range can be measured in seconds. Explicit messages can be used to see if the measured time has exceeded a monitoring set value.

The temperature range total time count settings are made by using the CX-Integrator.

Input Temperature Variation Detection

With Temperature Input Units, the temperature difference between two inputs for inputs 0 to 3 can be detected and compared with a monitoring set value. Explicit messages can be used to see if the temperature difference has exceeded the monitoring set value.

The input temperature variation detection settings are made by using the CX-Integrator.

Input Error Detection Disable Function

With Temperature Input Units, if there is an unused input, detection of input errors (including disconnection) can be disabled.

Input error detection is disabled by using the CX-Integrator.

Other Features

Rotary Switch Setting of Node Addresses

Node addresses can now be set much more easily using rotary switches. (except some models)

Bit-level Distribution (Bit Slaves)

Slave Units are available with 2 inputs, 2 outputs, 4 inputs, 4 outputs, 1 input/1 output, or 2 inputs/2 outputs. These enable bit-level distribution of Slave Units. At the same time, unused Slave Unit I/O can be suppressed.

IP54 Dust-tight, Splash-proof Units (Bit Slaves)

The CRT1B-□D□□SP(-1) Units conform to the IEC IP54 dust-tight, splash-proof degree of protection (see note).

Note For protection against human bodies and solid foreign objects, IP54 requires that dust will not penetrate inside the device to a degree that would affecting operation. For protection against water ingress, water splashing from any direction must have no adverse effect.

Flat Cable Included (Bit Slaves, except Bit Slave Units with Compact Connectors)

Models of Bit Slave Units are available with a Flat Cable included (standard or sheathed). Models with a Flat Cable included, however, do not support a baud rate of 4 Mbps. (Branching is not possible.)

No I/O Power Supply Wiring Required (Bit Slaves)

External I/O (sensors or actuators) connected to Bit Slaves using e-CON connectors, clamp terminals, or compact connectors are supplied power from the CompoNet communications power supply. No separate wiring is required for I/O power supply.

Industry Standard Sensor e-CON Connectors (CRT1-V□D08S(-1)/ CRT1-□D□S(-1)/ CRT1-□D16SH(-1)/ CRT1B-□D02S(-1)/ CRT1B-□D0□SP(-1)/ CRT1-VAD04S/ CRT1-VDA02S)

No special tools are required for connections because industry standard e-CON connectors are used. Electrical cables do not need to be stripped and are simply inserted with pliers. When using e-CON connectors, there is no need to prepare special tools for wiring, and connectors from different makers can be used interchangeably.

Units with MIL Connectors (CRT1-V□D□□ML(-1)/ CRT1-VAD04ML/ CRT1-VDA02ML)

MIL connectors, widely used in the electronic components and semiconductor industries, help reduce wiring requirements.

Units with Clamp Terminal Blocks (CRT1-□D□□SL(-1)/ 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.

1-1-3 CompoNet Slave Unit Functions

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units				
	2-tier Terminal block				
	CRT1-□D08(-1)		CRT1-□D16(-1)		
	Input Units	Output Units	Input Units	Output Units	I/O Units
Operation Time Monitor	Yes				
Contact Operation Monitor	Yes				
Total ON Time Monitor	Yes				
Automatic Baud Rate Detection	Yes				
Unit Conduction 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 I/O Startup	Yes	---	Yes	---	Yes
Power Short-circuit Detection	---				
Unconnected Line Detection	---				
Load Short-circuit Detection	---				
Disconnected Line Detection	---				
Removable Terminal Block Structure	Yes				
Expansion Using Expansion Units	---		Yes		
Scaling	---				
Last Maintenance Date	Yes				
Cumulated Count	---				
Moving Average	---				
Setting the Number of AD Conversion Points	---				
Rate of Change	---				
Comparator	---				
Peak/Bottom Hold	---				
Top/Valley Hold	---				
User Adjustment	---				
Top/Valley Count	---				
Temperature Range Total Time Count	---				
Input Temperature Variation Detection	---				
Input Error Detection Disable Function	---				

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

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units			
	2-tier Terminal block			
	CRT1-ROS08	CRT1-ROS16	CRT1-ROF08	CRT1-ROF16
	Output Units		Output Units	
Operation Time Monitor	Yes		Yes	
Contact Operation Monitor	Yes		Yes	
Total ON Time Monitor	Yes		Yes	
Automatic Baud Rate Detection	Yes		Yes	
Unit Conduction Time Monitor	Yes		Yes	
Naming Units	Yes		Yes	
Naming Connected Devices	Yes		Yes	
Network Power Voltage Monitor	Yes		Yes	
I/O Power Status Monitor	---		---	
Communications Error History Monitor	Yes		Yes	
Input Filter	---		---	
Communications Error Output	Yes		Yes	
Preventing Malfunctions Caused by Inrush Current at I/O Startup	---		---	
Power Short-circuit Detection	---		---	
Unconnected Line Detection	---		---	
Load Short-circuit Detection	---		---	
Disconnected Line Detection	---		---	
Removable Terminal Block Structure	Yes		Yes	
Expansion Using Expansion Units	---	Yes	---	Yes
Scaling	---		---	
Last Maintenance Date	Yes		Yes	
Cumulated Count	---		---	
Moving Average	---		---	
Setting the Number of AD Conversion Points	---		---	
Rate of Change	---		---	
Comparator	---		---	
Peak/Bottom Hold	---		---	
Top/Valley Hold	---		---	
User Adjustment	---		---	
Top/Valley Count	---			
Temperature Range Total Time Count	---			
Input Temperature Variation Detection	---			
Input Error Detection Disable Function	---			

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

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units			
	3-tier Terminal block			
	CRT1-□D08TA(-1) (without Short-circuit and Disconnected Line Detection)		CRT1-□D08TAH(-1) (with Short-circuit and Disconnected Line Detection)	
	Input Units	Output Units	Input Units	Output Units
Operation Time Monitor	Yes			
Contact Operation Monitor	Yes			
Total ON Time Monitor	Yes			
Automatic Baud Rate Detection	Yes			
Unit Conduction 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	---
Communications Error Output	---	Yes	---	Yes
Preventing Malfunctions Caused by Inrush Current at I/O Startup	Yes	---	Yes	---
Power Short-circuit Detection	---		Yes	---
Unconnected Line Detection	---		Yes	---
Load Short-circuit Detection	---		---	Yes
Disconnected Line Detection	---		---	Yes
Removable Terminal Block Structure	Yes			
Expansion Using Expansion Units	---			
Scaling	---			
Last Maintenance Date	Yes			
Cumulated Count	---			
Moving Average	---			
Setting the Number of AD Conversion Points	---			
Rate of Change	---			
Comparator	---			
Peak/Bottom Hold	---			
Top/Valley Hold	---			
User Adjustment	---			
Top/Valley Count	---			
Temperature Range Total Time Count	---			
Input Temperature Variation Detection	---			
Input Error Detection Disable Function	---			

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

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units					
	3-tier Terminal block					
	CRT1-□D16TA(-1) (without Short-circuit and Disconnected Line Detection)			CRT1-□D16TAH(-1) (with Short-circuit and Disconnected Line Detection)		
	Input Units	Output Units	I/O Units	Input Units	Output Units	I/O units
Operation Time Monitor	Yes					
Contact Operation Monitor	Yes					
Total ON Time Monitor	Yes					
Automatic Baud Rate Detection	Yes					
Unit Conduction 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	---	Yes
Communications Error Output	---	Yes	Yes	---	Yes	Yes
Preventing Malfunctions Caused by Inrush Current at I/O Startup	Yes	---	Yes	Yes	---	Yes
Power Short-circuit Detection	---			Yes	---	Yes
Unconnected Line Detection	---			Yes	---	Yes
Load Short-circuit Detection	---			---	Yes	Yes
Disconnected Line Detection	---			---	Yes	Yes
Removable Terminal Block Structure	Yes					
Expansion Using Expansion Units	---					
Scaling	---					
Last Maintenance Date	Yes					
Cumulated Count	---					
Moving Average	---					
Setting the Number of AD Conversion Points	---					
Rate of Change	---					
Comparator	---					
Peak/Bottom Hold	---					
Top/Valley Hold	---					
User Adjustment	---					
Top/Valley Count	---					
Temperature Range Total Time Count	---					
Input Temperature Variation Detection	---					
Input Error Detection Disable Function	---					

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

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units	
	Units with e-CON Connectors	
	CRT1-V□D08S(-1)	
Function	**Input Units**	**Output Units**
Operation Time Monitor	Yes	
Contact Operation Monitor	Yes	
Total ON Time Monitor	Yes	
Automatic Baud Rate Detection	Yes	
Unit Conduction 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	---
Communications Error Output	---	Yes
Preventing Malfunctions Caused by Inrush Current at I/O Startup	Yes	---
Power Short-circuit Detection	---	
Unconnected Line Detection	---	
Load Short-circuit Detection	---	
Disconnected Line Detection	---	
Removable Terminal Block Structure	---	
Expansion Using Expansion Units	---	
Scaling	---	
Last Maintenance Date	Yes	
Cumulated Count	---	
Moving Average	---	
Setting the Number of AD Conversion Points	---	
Rate of Change	---	
Comparator	---	
Peak/Bottom Hold	---	
Top/Valley Hold	---	
User Adjustment	---	
Top/Valley Count	---	
Temperature Range Total Time Count	---	
Input Temperature Variation Detection	---	
Input Error Detection Disable Function	---	

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

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units					
	Units with e-CON Connectors					
	CRT1-□D16S(-1) (without Short-circuit and Disconnected Line Detection)			CRT1-□D16SH(-1) (with Short-circuit and Disconnected Line Detection)		
Function	**Input Units**	**Output Units**	**I/O Units**	**Input Units**	**Output Units**	**I/O units**
Operation Time Monitor	Yes					
Contact Operation Monitor	Yes					
Total ON Time Monitor	Yes					
Automatic Baud Rate Detection	Yes					
Unit Conduction Time Monitor	Yes					
Naming Units	Yes					
Naming Connected Devices	Yes					
Network Power Voltage Monitor	Yes					
I/O Power Status Monitor	---	Yes	Yes	---	Yes	Yes
Communications Error History Monitor	Yes					
Input Filter	Yes	---	Yes	Yes	---	Yes
Communications Error Output	---	Yes	Yes	---	Yes	Yes
Preventing Malfunctions Caused by Inrush Current at I/O Startup	Yes	---	Yes	Yes	---	Yes
Power Short-circuit Detection	---			Yes	---	Yes
Unconnected Line Detection	---			Yes	---	Yes
Load Short-circuit Detection	---			---	Yes	Yes
Disconnected Line Detection	---			---	Yes	Yes
Removable Terminal Block Structure	---					
Expansion Using Expansion Units	---					
Scaling	---					
Last Maintenance Date	Yes					
Cumulated Count	---					
Moving Average	---					
Setting the Number of AD Conversion Points	---					
Rate of Change	---					
Comparator	---					
Peak/Bottom Hold	---					
Top/Valley Hold	---					
User Adjustment	---					
Top/Valley Count	---					
Temperature Range Total Time Count	---					
Input Temperature Variation Detection	---					
Input Error Detection Disable Function	---					

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

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units					
	Units with e-CON Connectors					
	CRT1-□D32S(-1) (without Short-circuit and Disconnected Line Detection)			CRT1-□D32SH(-1) (with Short-circuit and Disconnected Line Detection)		
	Input Units	Output Units	I/O Units	Input Units	Output Units	I/O units
Operation Time Monitor	Yes					
Contact Operation Monitor	Yes					
Total ON Time Monitor	Yes					
Automatic Baud Rate Detection	Yes					
Unit Conduction Time Monitor	Yes					
Naming Units	Yes					
Naming Connected Devices	Yes					
Network Power Voltage Monitor	Yes					
I/O Power Status Monitor	---	Yes	Yes	---	Yes	Yes
Communications Error History Monitor	Yes					
Input Filter	Yes	---	Yes	Yes	---	Yes
Communications Error Output	---	Yes	Yes	---	Yes	Yes
Preventing Malfunctions Caused by Inrush Current at I/O Startup	Yes	---	Yes	Yes	---	Yes
Power Short-circuit Detection	---			Yes	---	Yes
Unconnected Line Detection	---			Yes	---	Yes
Load Short-circuit Detection	---			---	Yes	Yes
Disconnected Line Detection	---			---	Yes	Yes
Removable Terminal Block Structure	---					
Expansion Using Expansion Units	---					
Scaling	---					
Last Maintenance Date	Yes					
Cumulated Count	---					
Moving Average	---					
Setting the Number of AD Conversion Points	---					
Rate of Change	---					
Comparator	---					
Peak/Bottom Hold	---					
Top/Valley Hold	---					
User Adjustment	---					
Top/Valley Count	---					
Temperature Range Total Time Count	---					
Input Temperature Variation Detection	---					
Input Error Detection Disable Function	---					

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

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units				
	Units with MIL Connectors				
	CRT1-V□D16ML(-1)		CRT1-V□D32ML(-1)		
	Input Units	Output Units	Input Units	Output Units	I/O Units
Operation Time Monitor	Yes				
Contact Operation Monitor	Yes				
Total ON Time Monitor	Yes				
Automatic Baud Rate Detection	Yes				
Unit Conduction 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 I/O Startup	Yes	---	Yes	---	Yes
Power Short-circuit Detection	---				
Unconnected Line Detection	---				
Load Short-circuit Detection	---				
Disconnected Line Detection	---				
Removable Terminal Block Structure	---				
Expansion Using Expansion Units	---				
Scaling	---				
Last Maintenance Date	Yes				
Cumulated Count	---				
Moving Average	---				
Setting the Number of AD Conversion Points	---				
Rate of Change	---				
Comparator	---				
Peak/Bottom Hold	---				
Top/Valley Hold	---				
User Adjustment	---				
Top/Valley Count	---				
Temperature Range Total Time Count	---				
Input Temperature Variation Detection	---				
Input Error Detection Disable Function	---				

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

Yes: Supported, ---: Not supported

Unit / Function	Digital I/O Slave Units				
	Units with Screw-less Clamp Terminals				
	CRT1-□D08SL(-1)		CRT1-□D16SL(-1)		
	Input Units	Output Units	Input Units	Output Units	I/O Units
Operation Time Monitor	Yes				
Contact Operation Monitor	Yes				
Total ON Time Monitor	Yes				
Automatic Baud Rate Detection	Yes				
Unit Conduction 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 I/O Startup	Yes	---	Yes	---	Yes
Power Short-circuit Detection	---				
Unconnected Line Detection	---				
Load Short-circuit Detection	---				
Disconnected Line Detection	---				
Removable Terminal Block Structure	Yes				
Expansion Using Expansion Units	---				
Scaling	---				
Last Maintenance Date	Yes				
Cumulated Count	---				
Moving Average	---				
Setting the Number of AD Conversion Points	---				
Rate of Change	---				
Comparator	---				
Peak/Bottom Hold	---				
Top/Valley Hold	---				
User Adjustment	---				
Top/Valley Count	---				
Temperature Range Total Time Count	---				
Input Temperature Variation Detection	---				
Input Error Detection Disable Function	---				

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

Yes: Supported, ---: Not supported

Function \ Unit	Analog I/O Slave Units					
	Units with 2-tier Terminal block		Units with e-CON Connectors		Units with MIL Connectors	
	CRT1-AD04 CRT1-DA02		CRT1-VAD04S CRT1-VDA02S		CRT1-VAD04ML CRT1-VDA02ML	
	Input Units	Output Units	Input Units	Output Units	Input Units	Output Units
Operation Time Monitor	---					
Contact Operation Monitor	---					
Total ON Time Monitor	---					
Automatic Baud Rate Detection	Yes					
Unit Conduction Time Monitor	Yes					
Naming Units	Yes					
Naming Connected Devices	Yes					
Network Power Voltage Monitor	Yes					
I/O Power Status Monitor	---					
Communications Error History Monitor	Yes					
Input Filter	---					
Communications Error Output	---	Yes	---	Yes	---	Yes
Preventing Malfunctions Caused by Inrush Current at I/O Startup	---					
Power Short-circuit Detection	---					
Unconnected Line Detection	---					
Load Short-circuit Detection	---					
Disconnected Line Detection	Yes	---	Yes	---	Yes	---
Removable Terminal Block Structure	Yes					
Expansion Using Expansion Units	---					
Scaling	Yes					
Last Maintenance Date	Yes					
Cumulated Count	Yes					
Moving Average	Yes	---	Yes	---	Yes	---
Setting the Number of AD Conversion Points	Yes	---	Yes	---	Yes	---
Rate of Change	Yes	---	Yes	---	Yes	---
Comparator	Yes	---	Yes	---	Yes	---
Peak/Bottom Hold	Yes	---	Yes	---	Yes	---
Top/Valley Hold	Yes	---	Yes	---	Yes	---
User Adjustment	Yes					
Top/Valley Count	---					
Temperature Range Total Time Count	---					
Input Temperature Variation Detection	---					
Input Error Detection Disable Function	---					

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

Yes: Supported, ---: Not supported

Unit / Function	Temperature Input Units
	CRT1-TS04T CRT1-TS04P
	Input Units
Operation Time Monitor	---
Contact Operation Monitor	---
Total ON Time Monitor	---
Automatic Baud Rate Detection	Yes
Unit Conduction Time Monitor	Yes
Naming Units	Yes
Naming Connected Devices	Yes
Network Power Voltage Monitor	Yes
I/O Power Status Monitor	---
Communications Error History Monitor	Yes
Input Filter	---
Communications Error Output	---
Preventing Malfunctions Caused by Inrush Current at I/O Startup	---
Power Short-circuit Detection	---
Unconnected Line Detection	---
Load Short-circuit Detection	---
Disconnected Line Detection	Yes
Removable Terminal Block Structure	Yes
Expansion Using Expansion Units	---
Scaling	Yes
Last Maintenance Date	Yes
Cumulated Count	Yes
Moving Average	Yes
Setting the Number of AD Conversion Points	---
Rate of Change	Yes
Comparator	Yes
Peak/Bottom Hold	Yes
Top/Valley Hold	Yes
User Adjustment	Yes
Top/Valley Count	Yes
Temperature Range Total Time Count	Yes
Input Temperature Variation Detection	Yes
Input Error Detection Disable Function	Yes

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

Yes: Supported, ---: Not supported

Function \ Unit	Bit Slave Units					Bit Slaves with Compact Connectors						Repeater Unit
	CRT1B-□D02S(-1)		CRT1B-□D0□SP(-1) CRT1B-MD04SLP(-1)			CRT1B-□D02JS(-1)			CRT1B-□D04JS(-1)			CRS1-RPT01
	Input Units	Output Units	Input Units	Output Units	I/O units	Input Units	Output Units	I/O units	Input Units	Output Units	I/O units	
Operation Time Monitor	Yes					---			---			---
Contact Operation Monitor	Yes					---			---			---
Total ON Time Monitor	Yes					---			---			---
Automatic Baud Rate Detection	Yes					Yes			Yes			Yes
Unit Conduction Time Monitor	Yes					---			---			Yes
Naming Units	Yes					---			---			Yes
Naming Connected Devices	Yes					---			---			---
Network Power Voltage Monitor	Yes					---			---			Yes
I/O Power Status Monitor	---					---			---			---
Communications Error History Monitor	Yes					---			---			Yes
Input Filter	Yes	---	Yes	---	Yes	Yes	---	Yes	Yes	---	Yes	---
Communications Error Output	---	Yes	---	Yes	Yes	---	Yes	Yes	---	Yes	Yes	---
Preventing Malfunctions Caused by Inrush Current at I/O Startup	Yes	---	Yes	---	Yes	---			---			---
Power Short-circuit Detection	Yes	---	Yes	---	Yes	---			---			---
Unconnected Line Detection	---					---			---			---
Load Short-circuit Detection	---	Yes	---	Yes	Yes	---			---			---
Disconnected Line Detection	---					---			---			---
Removable Terminal Block Structure	---					---			---			---
Expansion Using Expansion Units	---					---			---			---
Scaling	---					---			---			---
Last Maintenance Date	Yes					---			---			Yes
Cumulated Count	---					---			---			---
Moving Average	---					---			---			---
Setting the Number of AD Conversion Points	---					---			---			---
Rate of Change	---					---			---			---
Comparator	---					---			---			---
Peak/Bottom Hold	---					---			---			---
Top/Valley Hold	---					---			---			---
User Adjustment	---					---			---			---
Top/Valley Count	---					---			---			---
Temperature Range Total Time Count	---					---			---			---
Input Temperature Variation Detection	---					---			---			---
Input Error Detection Disable Function	---					---			---			---

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

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

Analog I/O Slave Units: Slave Units with analog I/O

Temperature Input Units: Slave Units with temperature inputs

Expansion Units: Units that can be used to expand the number of I/O points for Digital I/O Slave Units (with 2-tier terminal blocks and 16 points).

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 : Bit Slave Units are Slave Units with 2 points or 4 points of digital I/O. They come with a Standard or Sheathed Flat Cable included.

Bit Slaves with Compact Connectors: Bit Slave Units with Compact Connectors are Slave Units with 2 points or 4 points of digital I/O. They have built-in compact connectors for the I/O interface that support connections with communications cables using internal hook communications connectors.

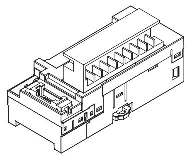
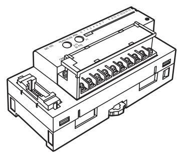
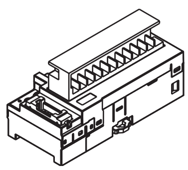
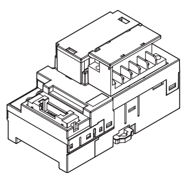
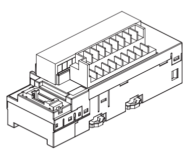
Repeater Units

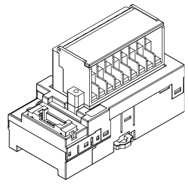
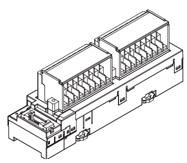
Units that can be used to expand the network by extending trunk lines or branching.

1-2-1 Word Slave Units

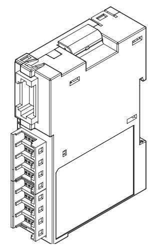
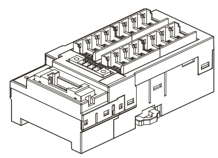
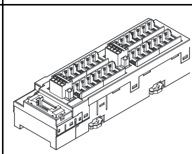
Digital I/O Slave Units

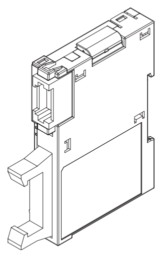
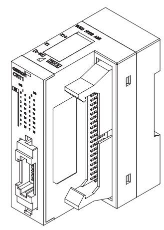
Terminal Block with Screws

Type	Appearance	I/O capacity	Model	Features
Digital I/O Slave Units with 2-tier Terminal Block		8 inputs (NPN)	CRT1-ID08	• Terminal blocks can be attached/ removed from the Unit. • Expansion Units cannot be added.
		8 inputs (PNP)	CRT1-ID08-1	
		8 outputs (NPN)	CRT1-OD08	
		8 outputs (PNP)	CRT1-OD08-1	
		16 inputs (NPN)	CRT1-ID16	• Terminal blocks can be attached/ removed from the Unit. • Expansion Units can be added.
		16 inputs (PNP)	CRT1-ID16-1	
		16 outputs (NPN)	CRT1-OD16	
		16 outputs (PNP)	CRT1-OD16-1	
		8 inputs/8 outputs (NPN)	CRT1-MD16	• Terminal blocks can be attached/ removed from the Unit. • Expansion Units cannot be added.
		8 inputs/8 outputs (PNP)	CRT1-MD16-1	
		8 outputs (relay outputs)	CRT1-ROS08	
		8 outputs (SSR outputs)	CRT1-ROF08	
		16 outputs (relay outputs)	CRT1-ROS16	• Terminal blocks can be attached/ removed from the Unit. • Expansion Units can be added.
		16 outputs (SSR outputs)	CRT1-ROF16	

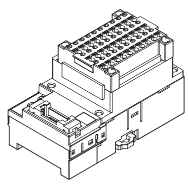
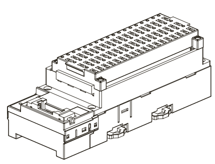
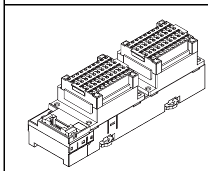
Type		Appearance	I/O capacity	Model	Features
Digital I/O Slave Units with 3-tier Terminal Block	Without Short-circuit and Disconnected Line Detection		8 inputs (NPN)	CRT1-ID08TA	• Terminal blocks can be attached/removed from the Unit. • Expansion Units cannot be added.
			8 inputs (PNP)	CRT1-ID08TA-1	
			8 outputs (NPN)	CRT1-OD08TA	
			8 outputs (PNP)	CRT1-OD08TA-1	
	With Short-circuit and Disconnected Line Detection		8 inputs (NPN)	CRT1-ID08TAH	
			8 inputs (PNP)	CRT1-ID08TAH-1	
			8 outputs (NPN)	CRT1-OD08TAH	
			8 outputs (PNP)	CRT1-OD08TAH-1	
	Without Short-circuit and Disconnected Line Detection		16 inputs (NPN)	CRT1-ID16TA	
			16 inputs (PNP)	CRT1-ID16TA-1	
			16 outputs (NPN)	CRT1-OD16TA	
			16 outputs (PNP)	CRT1-OD16TA-1	
			8 inputs/8 outputs (NPN)	CRT1-MD16TA	
			8 inputs/8 outputs (PNP)	CRT1-MD16TA-1	
	With Short-circuit and Disconnected Line Detection		16 inputs (NPN)	CRT1-ID16TAH	
			16 inputs (PNP)	CRT1-ID16TAH-1	
			16 outputs (NPN)	CRT1-OD16TAH	
			16 outputs (PNP)	CRT1-OD16TAH-1	
			8 inputs/8 outputs (NPN)	CRT1-MD16TAH	
			8 inputs/8 outputs (PNP)	CRT1-MD16TAH-1	

Units with Connectors

Type		Appearance	I/O capacity	Model	Features
Digital I/O Slave Units with e-CON Connectors	Without Short-circuit and Disconnected Line Detection		8 inputs (NPN)	CRT1-VID08S	• Equipped with e-CON connectors. • Expansion Units cannot be added.
			8 inputs (PNP)	CRT1-VID08S-1	
			8 outputs (NPN)	CRT1-VOD08S	
			8 outputs (PNP)	CRT1-VOD08S-1	
			16 inputs (NPN)	CRT1-ID16S	
			16 inputs (PNP)	CRT1-ID16S-1	
			16 outputs (NPN)	CRT1-OD16S	
			16 outputs (PNP)	CRT1-OD16S-1	
			8 inputs and 8 outputs (NPN)	CRT1-MD16S	
			8 inputs and 8 outputs (PNP)	CRT1-MD16S-1	
	With Short-circuit and Disconnected Line Detection		16 inputs (NPN)	CRT1-ID16SH	
			16 inputs (PNP)	CRT1-ID16SH-1	
			16 outputs (NPN)	CRT1-OD16SH	
			16 outputs (PNP)	CRT1-OD16SH-1	
			8 inputs and 8 outputs (NPN)	CRT1-MD16SH	
			8 inputs and 8 outputs (PNP)	CRT1-MD16SH-1	
	Without Short-circuit and Disconnected Line Detection		32 inputs (NPN)	CRT1-ID32S	
			32 inputs (PNP)	CRT1-ID32S-1	
			32 outputs (NPN)	CRT1-OD32S	
			32 outputs (PNP)	CRT1-OD32S-1	
			16 inputs and 16 outputs (NPN)	CRT1-MD32S	
			16 inputs and 16 outputs (PNP)	CRT1-MD32S-1	
	With Short-circuit and Disconnected Line Detection		32 inputs (NPN)	CRT1-ID32SH	
			32 inputs (PNP)	CRT1-ID32SH-1	
			32 outputs (NPN)	CRT1-OD32SH	
			32 outputs (PNP)	CRT1-OD32SH-1	
			16 inputs and 16 outputs (NPN)	CRT1-MD32H	
			16 inputs and 16 outputs (PNP)	CRT1-MD32H-1	

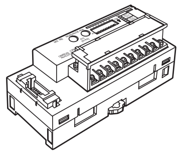
Type	Appearance	I/O capacity	Model	Features
Digital I/O Slave Units with MIL Connectors		16 inputs (NPN)	CRT1-VID16ML	• Equipped with MIL connectors. • Expansion Units cannot be added.
		16 inputs (PNP)	CRT1-VID16ML-1	
		16 outputs (NPN)	CRT1-VOD16ML	
		16 outputs (PNP)	CRT1-VOD16ML-1	
		32 inputs (NPN)	CRT1-VID32ML	
		32 inputs (PNP)	CRT1-VID32ML-1	
		32 outputs (NPN)	CRT1-VOD32ML	
		32 outputs (PNP)	CRT1-VOD32ML-1	
		16 inputs/16 outputs (NPN)	CRT1-VMD32ML	
		16 inputs/16 outputs (PNP)	CRT1-VMD32ML-1	

Units with Clamp Terminal Blocks

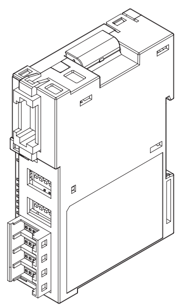
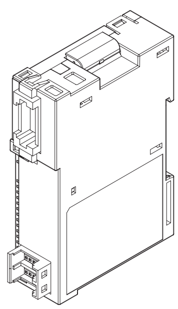
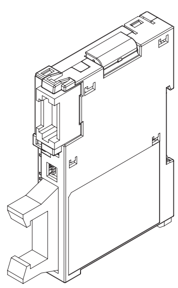
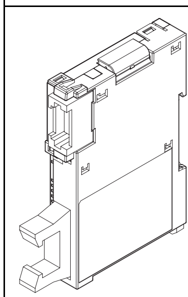
Type	Appearance	I/O capacity	Model	Features
Digital I/O Slave Units with Screw-less Clamp Terminal Blocks		8 inputs (NPN)	CRT1-ID08SL	• Equipped with screw-less clamp terminals. • Expansion Units cannot be added.
		8 inputs (PNP)	CRT1-ID08SL-1	
		8 outputs (NPN)	CRT1-OD08SL	
		8 outputs (PNP)	CRT1-OD08SL-1	
		16 inputs (NPN)	CRT1-ID16SL	
		16 inputs (PNP)	CRT1-ID16SL-1	
		16 outputs (NPN)	CRT1-OD16SL	
		16 outputs (PNP)	CRT1-OD16SL-1	
		8 inputs/8 outputs (NPN)	CRT1-MD16SL	
		8 inputs/8 outputs (PNP)	CRT1-MD16SL-1	

Analog I/O Slave Units

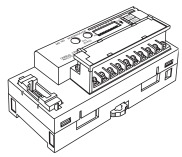
Terminal Block with Screws

Type	Appearance	I/O capacity	Model	Features
Analog I/O Slave Units with 2-tier Terminal Block		4 inputs	CRT1-AD04	I/O range: 0 to 5 V, 1 to 5 V, 0 to 10 V, –10 to 10 V, 0 to 20 mA, 4 to 20 mA
		2 outputs	CRT1-DA02	

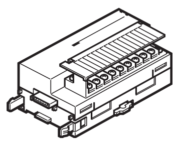
Units with Connectors

Type	Appearance	I/O capacity	Model	Features
Analog I/O Slave Units with e-CON Connectors		4 inputs	CRT1-VAD04S	I/O range: 0 to 5 V, 1 to 5 V, 0 to 10 V, –10 to 10 V, 0 to 20 mA, 4 to 20 mA
		2 outputs	CRT1-VDA02S	
Analog I/O Slave Units with MIL Connectors		4 inputs	CRT1-VAD04ML	
		2 outputs	CRT1-VDA02ML	

Temperature Input Units

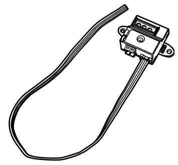
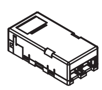
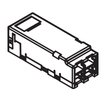
Type	Appearance	I/O capacity	Model	Features
Temperature Input Units with 2-tier Terminal Block		4 inputs	CRT1-TS04T	Thermocouple input (Switchable between R, S, K, J, T, E, B, N, L, U, W, and PL2.)
			CRT1-TS04P	Platinum resistance thermometer input (PT100 only)

Expansion Units

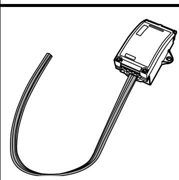
Type	Appearance	I/O capacity	Model	Features
Expansion Units with 2-tier Terminal Block		8 inputs (NPN)	XWT-ID08	• Expansion Units are used to add points to Digital. I/O Slave Units with 2-tier terminal blocks and 16 points. • One Expansion Unit can be added to one Slave Unit.
		8 inputs (PNP)	XWT-ID08-1	
		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	

1-2-2 Bit Slave Units

Slaves with Connectors

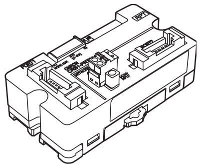
Type	Appearance	I/O capacity	Model	Features
Bit Slave Units with e-CON Connectors		2 inputs (NPN)	CRT1B-ID02S	• Standard Flat Cable connected as standard feature.
		2 inputs (PNP)	CRT1B-ID02S-1	
		2 outputs (NPN)	CRT1B-OD02S	
		2 outputs (PNP)	CRT1B-OD02S-1	
		2 inputs (NPN)	CRT1B-ID02SP	• Sheathed Flat Cable connected as standard feature. • IP54 dust-tight and splash-proof
		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	
Bit Slave Units with Compact Connectors		2 inputs (NPN)	CRT1B-ID02JS	• Compact, space-saving design • Internal hook communications connectors • Network power supply • Multidrop connections are supported for DCN4 Flat Cable I (sold separately).
		2 inputs (PNP)	CRT1B-ID02JS-1	
		2 outputs (NPN)	CRT1B-OD02JS	
		2 outputs (PNP)	CRT1B-OD02JS-1	
		1 input/1output (NPN)	CRT1B-MD02JS	
		1 input/1output (PNP)	CRT1B-MD02JS-1	
		4 inputs (NPN)	CRT1B-ID04JS	
		4 inputs (PNP)	CRT1B-ID04JS-1	
		4 outputs (NPN)	CRT1B-OD04JS	
		4 outputs (PNP)	CRT1B-OD04JS-1	
		2 inputs/2 outputs (NPN)	CRT1B-MD04JS	
		2 inputs/2 outputs (PNP)	CRT1B-MD04JS-1	

Slaves with Clamp Terminal Blocks

Type	Appearance	I/O capacity	Model	Features
Bit Slave Units with Screw-less Clamp Terminal Blocks		2 inputs/2 outputs (NPN)	CRT1B-MD04SLP	• Sheathed Flat Cable connected as standard feature. • IP54 dust-tight and splash-proof
		2 inputs/2 outputs (PNP)	CRT1B-MD04SLP-1	

Note Bit Slave Unit models with a Standard or Sheathed Flat Cable included do not support a baud rate of 4 Mbps. (Branching is not possible.)

1-2-3 Repeater Units

Appearance	Specification	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 Slave Unit Installation and Connection

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 connection method	Internal power	External power
Digital I/O Slave Units	With 2-tier Terminal Block	CRT1-ID08(-1)	DIN Track	Terminal block with M3 screws	Supplied along with communications power	An external I/O power supply is required for connected devices.
		CRT1-OD08(-1)				
		CRT1-ID16(-1)				
		CRT1-OD16(-1)				
		CRT1-MD16(-1)				
		CRT1-ROS08				
		CRT1-ROF08				
		CRT1-ROS16				
		CRT1-ROF16				
	With 3-tier Terminal Block	CRT1-ID08TA(-1)				
		CRT1-OD08TA(-1)				
		CRT1-ID08TAH(-1)				
		CRT1-OD08TAH(-1)				
		CRT1-ID16TA(-1)				
		CRT1-OD16TA(-1)				
		CRT1-MD16TA(-1)				
		CRT1-ID16TAH(-1)				
		CRT1-OD16TAH(-1)				
		CRT1-MD16TAH(-1)				

Name		Model	Slave Unit installation	I/O connection method	Internal power	External power
Digital I/O Slave Units	With e-CON Connectors	CRT1-VID08S(-1)	DIN Track or Mounting Bracket	e-CON connectors	Supplied along with communications power	Shared with communications power supply. (See note.)
		CRT1-VOD08S(-1)				I/O power must be supplied externally for connected devices.
		CRT1-ID16S(-1)	DIN Track			Shared with communications power supply. (See note.)
		CRT1-OD16S(-1)				I/O power must be supplied externally for connected devices.
		CRT1-MD16S(-1)				Shared with communications power supply only for inputs. (See note.)
		CRT1-ID16SH(-1)				Shared with communications power supply. (See note.)
		CRT1-OD16SH(-1)				I/O power must be supplied externally for connected devices.
		CRT1-MD16SH(-1)				Shared with communications power supply only for inputs. (See note.)
		CRT1-ID32S(-1)				Shared with communications power supply. (See note.)
		CRT1-OD32S(-1)				I/O power must be supplied externally for connected devices.
		CRT1-MD32S(-1)				Shared with communications power supply only for inputs. (See note.)
		CRT1-ID32SH(-1)				Shared with communications power supply. (See note.)
		CRT1-OD32SH(-1)				I/O power must be supplied externally for connected devices.
		CRT1-MD32SH(-1)				Shared with communications power supply only for inputs. (See note.)

Name			Model	Slave Unit installation	I/O connection method	Internal power	External power
Digital I/O Slave Units	With MIL Connectors		CRT1-VID16ML(-1)	DIN Track or Mounting Bracket	MIL connectors	Supplied along with communications power	I/O power must be supplied externally for connected devices.
			CRT1-VOD16ML(-1)				
			CRT1-VID32ML(-1)				
			CRT1-VOD32ML(-1)				
			CRT1-VMD32ML(-1)				
	With Screw-less Clamp Terminal Blocks		CRT1-ID08SL(-1)	DIN Track	Screw-less clamp terminal block		
			CRT1-OD08SL(-1)				
			CRT1-ID16SL(-1)				
			CRT1-OD16SL(-1)				
			CRT1-MD16SL(-1)				
Analog I/O Slave Units	With 2-tier Terminal Block		CRT1-AD04		Terminal block with M3 screws		---
			CRT1-DA02				
	With e-CON Connectors		CRT1-VAD04S	DIN Track or Mounting Bracket	e-CON connectors		
			CRT1-VDA02S				
	With MIL Connectors		CRT1-VAD04ML		MIL connectors		
			CRT1-VDA02ML				
Temperature Input Units			CRT1-TS04T	DIN Track	Terminal block with M3 screws		
			CRT1-TS04P				
Digital I/O Slave Units Expansion Units			XWT-ID08(-1)				Refer to the following section.
			XWT-OD08(-1)				
			XWT-ID16(-1)				
			XWT-OD16(-1)				
Bit Slave Units	With e-CON Connectors		CRT1B-ID02S(-1)	M4 screw installation	e-CON connectors		Supplied along with communications power (See note.)
			CRT1B-OD02S(-1)				
		IP54	CRT1B-ID02SP(-1)				
			CRT1B-OD02SP(-1)				
			CRT1B-ID04SP(-1)				
	With Screw-less Clamp Terminal Blocks	IP54	CRT1B-MD04SLP(-1)		Screw-less clamp terminal block		
	With Compact Connectors		CRT1B-ID02JS(-1)	M4 screen mounting using CRT1B-ATT03 Mounting Bracket	Compact connectors		
			CRT1B-OD02JS(-1)				
			CRT1B-ID04JS(-1)				
			CRT1B-OD04JS(-1)				
			CRT1B-MD02JS(-1)				
			CRT1B-MD04JS(-1)				
Repeater Units			CRS1-RPT01	DIN Track or M4 screw installation	---		Communications power for the downstream line must be supplied from the communications power supply connector.

Note For Bit Slave Units, the external I/O (sensor and actuator) power 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.

Supplying I/O Power to Expansion Units

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

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

Devices for Connection to CompoNet Communications

Refer to the following for information on cables and connectors for connection to CompoNet communications.

- *2-3-1 Cables That Can Be Used*
- *3-3 Preparing Flat Connectors*
- *3-4 Connecting Cables and Terminating Resistor*

SECTION 2
Wiring Configurations

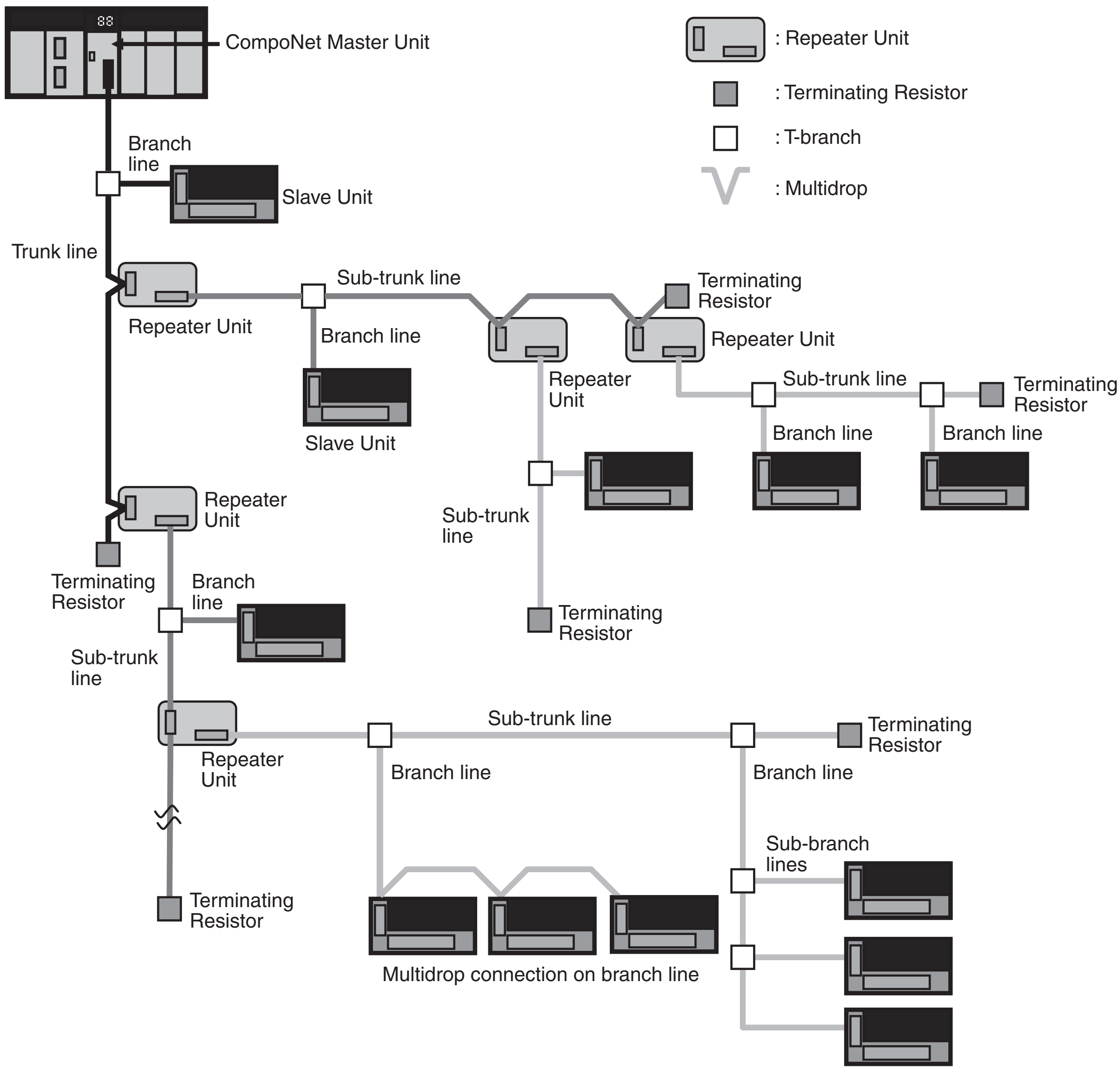
This section describes the configurations of CompoNet Networks.

2-1 CompoNet Networks

2-1-1 Overall System Configuration and Elements

A CompoNet Network is a remote I/O system that consists of the following elements.

System Configuration Example



Communications Cables

CompoNet Networks use round cable I, round cable II, Flat Cable I (DCA4-4F10 Standard Flat Cable), and Flat Cable II (DCA5-4F10 Sheathed Flat Cable) for Communications Cables.

Master Unit

The Master Unit manages the CompoNet Network and transfers I/O data between the PLC and the Slave Units.

There is only one Master Unit per network. The Master Unit must be connected to the trunk line.

Slave Units

Some Slave Units receive output data from the Master Unit across the CompoNet Network and output it. Other Slave Units send data that has been input across the network to the Master Unit. There are two types of Slave Unit according to the I/O capacity of the Slave Unit.

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

Repeater Unit

Using Repeater Units enables expanding network connections as follows:

- Extending the Communications Cable
- Increasing the number of nodes (Units)
- Creating long-distance T-branches from the trunk line and sub-trunk lines (See note.)
- Converting between different types of cable (round cable I, round cable II, Flat Cable I, and Flat Cable II)

A sub-trunk line downstream from a Repeater Unit can be connected with the same communications specifications (i.e., distances and number of Slave Units) as the trunk line.

Up to 64 Repeater Units can be connected per network (i.e., per Master Unit). When Repeater Units are connected in series from the Master Unit, up to two layers can be created.

Note The physical layer is not connected across a Repeater Unit. The connection is thus different from a branch connection, which branches the same physical layer.

Terminating Resistors

With a CompoNet Network, the Master Unit is located at one end of the trunk line and a Terminating Resistor is connected to the other end of the trunk line. If Repeater Units are used, each Repeater Unit is treated like a Master Unit, i.e., Terminating Resistor is connected to the most remote end of the sub-trunk line downstream from the Repeater Unit.

Note A Terminating Resistor reduces signal bouncing to stabilize communications and must always be connected to the most remote end of the network lines below the Master Unit and each Repeater Unit. Always connect a Terminating Resistor to ensure the quality of the transmission path.

Trunk Lines and Branch Lines

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

- Trunk line: The transmission path between the Master Unit and the Terminating Resistor.
- Sub-trunk line: The transmission path between the Repeater Unit and the Terminating Resistor (when a Repeater Unit is used)
- Branch line: The transmission path created using a T-branch from the trunk line or sub-trunk line.
- Sub-branch line: The transmission path created using a T-branch from a branch line. (T-branching is not possible from sub-branch lines.)

Note Due to differences in functionality, the same type of cable must be used between the trunk line and a branch line, a sub-trunk line and a branch line, and a branch line and a sub-branch line. Different types of cable can be used between the trunk line and a sub-trunk line.

Branches

There are two ways to create branch lines.

1) T-branch Connections

- T-branch connections using Flat Connectors (when Flat Cable I or Flat Cable II is used)
- T-branch connections using commercially available relay terminals (when round cable I or round cable II is used)

2) Multidrop Connections

- Multidrop connections using Flat Connectors and Multidrop Connectors (when Flat Cable I or Flat Cable II is used)
- Multidrop connections using Open Type Connectors (when round cable I or round cable II is used)

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

Communications Power Supply

This is the power supply for communications and internal operations for each Unit.

A commercially available 24-VDC power supply is used for communications and internal operations in each Unit.

One communications power supply can be connected for a trunk line or a sub-trunk line. Communications power is supplied to the trunk line from the Master Unit and to a sub-trunk line from the Repeater Unit.

One power supply cannot be used to supply communications power to more than one line (i.e., to the trunk line and sub-trunk line or to two sub-trunk lines).

I/O Power Supply

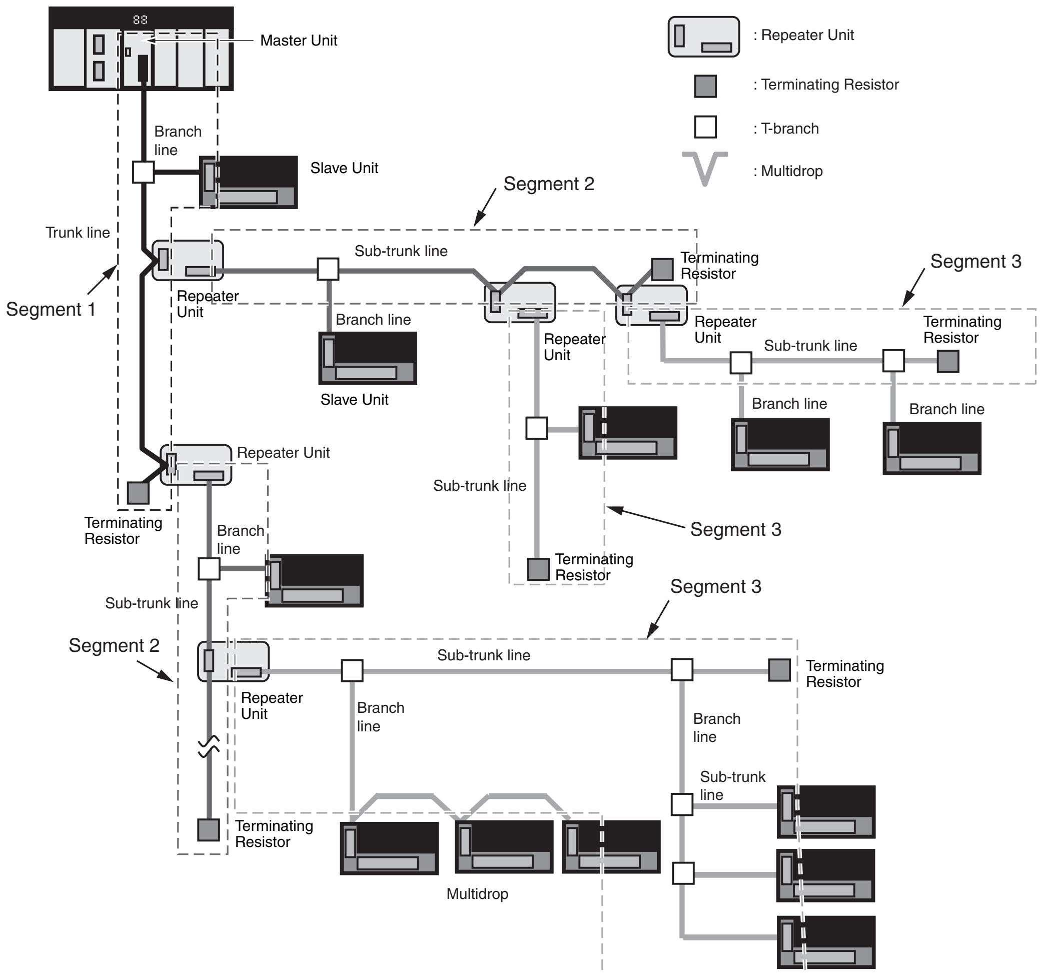
A commercially available 24-VDC power supply is used to power the I/O operations of the external I/O device connected to a Unit. It is connected to the I/O power supply terminal of the Unit.

2-1-2 Segments

Segment Layers

When Repeater Units are used, the CompoNet Network is divided into segments by the Repeater Units. Each segment is connected to the network, but is isolated electrically. Three layers of these isolated segments can be configured, called segments 1, 2, and 3, counted in order from the Master Unit. Repeater Units can be used to add a maximum of two extra segment layers. Therefore, up to two extra segment layers can be created from the Master Unit using Repeater Units. Accordingly, you can expand the length of one trunk line and one branch line to up to 1,500 m (500 m × 3, 93.75 kbps).

Including Repeater Units connected using multidrop connections, a maximum of 64 Repeater Units can be connected in a single network (i.e., to a single Master Unit).



Number of Units Per Segment

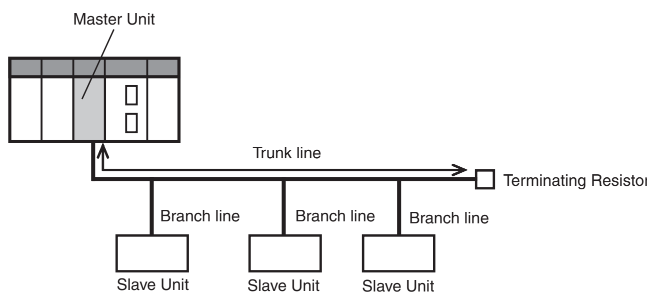
A maximum of 32 Slave Units and Repeater Units can be connected in one segment.

2-2 Wiring Formations

There are two possible wiring formations for a CompoNet Network.

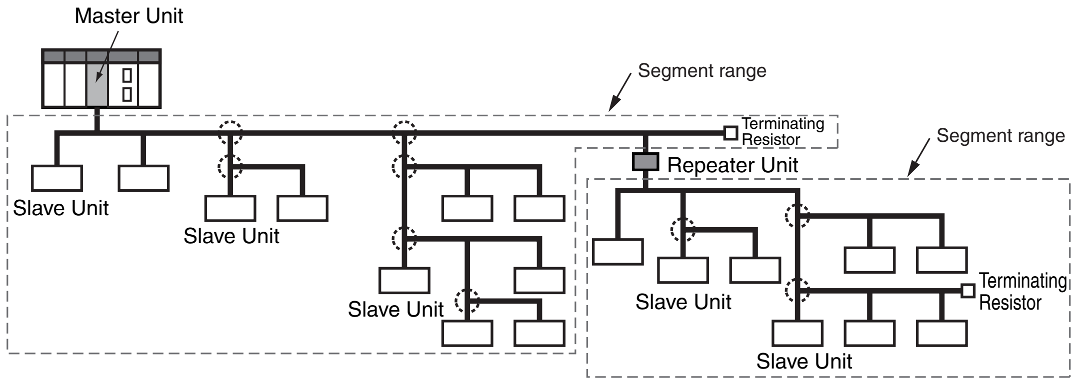
Trunk Line-Branch Line Formation

With this wiring formation, the trunk line is differentiated from branch lines and there are restrictions on the number of branches and the number of connections.



Unrestricted Wiring Formation

With this wiring formation, there is no distinction between the trunk line and branch lines. Wiring can be performed without restrictions as long as the total cable length per segment is no longer than 200 m. There is also no limit in the number of branches.



Relation between Baud Rate and Communications Cable

The Cables that can be used and the required baud rates are automatically determined by whether a trunk line-branch line formation or an unrestricted wiring formation is used.

Cable type	Baud rate			
	4 Mbps	**3 Mbps**	**1.5 Mbps**	**93.75 kbps**
Round cable I	Trunk line - branch line wiring formation (See note 1.)	Trunk line - branch line wiring formation	Trunk line - branch line wiring formation	Trunk line - branch line wiring formation
Round cable II				Unrestricted wiring formations
Flat Cable I				
Flat Cable II	--- (See note 2.)			

Note

(1) If a baud rate of 4 Mbps is used, branching is not possible from the trunk line. (Only multidrop connections are possible.)

(2) If a baud rate of 4 Mbps is used, branching and multidrop connections are not possible from the trunk line. (There are no Multidrop Connectors for Flat Cable II.)

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

Item	Wiring formation	
	Trunk line-branch line formation	**Unrestricted wiring formation**
Master Unit location	End of network	Anywhere in network (not necessarily at the end)
Maximum number of Slave Units connected to any one branch line	1 or 3 depending on the cable type and baud rate	No restrictions
Terminating Resistor location	On the opposite ends of the trunk line and all sub-trunk lines from the Master Unit and each Repeater Unit	On the most remote ends from the Master Unit and each Repeater Unit

2-3 Communications Cable

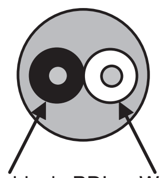
2-3-1 Cables That Can Be Used

The following four types of cable can be used in a CompoNet network.

Round cable I

Check with the manufacturer for applicable CompoNet products.

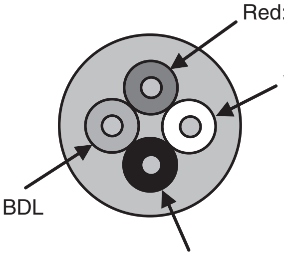
Use commercially available VCTF cable with two 0.75-mm^2 conductors (JIS C3306) that meet CompoNet specifications.



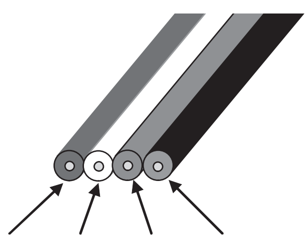
Round cable II

Check with the manufacturer for applicable CompoNet products.

Use commercially available VCTF cable with four 0.75-mm^2 conductors (JIS C3306) that meet CompoNet specifications.



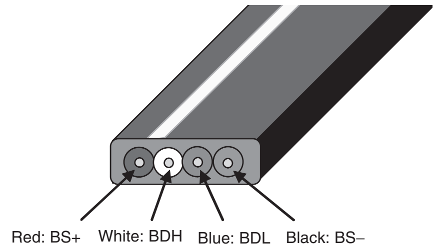
Flat Cable I (DCA4-4F10 Standard Flat Cable)



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

CompoNet-compatible products other than DCA4-4F10 can be used. Confirm applicability with the manufacturer.

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



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

CompoNet-compatible products other than DCA5-4F10 can be used. Confirm applicability with the manufacturer.

Note

(3) The characteristics of each conductor in Flat Cable I and Flat Cable II have been adjusted to the application. Check the line insulator colors and use each line only for the application given in the above table.

(4) For information on applicable CompoNet products and manufacturers, refer to the ODVA home page.
http://www.odva.org/

2-3-2 Criteria for Selecting Cables

Selecting Cable Types

Select the cable type using the following items as conditions.

<table>
<tr><th colspan="3" rowspan="2">Item</th><th colspan="4">Cable type</th></tr>
<tr><th>Round cable I</th><th>Round cable II</th><th>Flat Cable I</th><th>Flat Cable II</th></tr>
<tr><td colspan="3">Application</td><td>• When using commercially available cable is desirable.
• To provide communications power separately.</td><td>• When using commercially available cable is desirable.
• To supply communications power to all Slave Units with the communications cable.</td><td>• To supply communications power to all Slave Units with the communications cable.</td><td>• To supply communications power to all Slave Units with the communications cable.
• Applications in environments that required IP54 compliance (drip-proof, splash-proof).</td></tr>
<tr><td rowspan="4">Slave Unit connections</td><td colspan="2">Word Slave Units</td><td colspan="3">Supported.</td><td>Supported. (See note 2.)</td></tr>
<tr><td rowspan="2">Bit Slave Units (communications section Flat Cable standard connection)</td><td></td><td rowspan="2">Not supported. (See note 1.)</td><td rowspan="2">Not supported. (See note 1.)</td><td>Supported.</td><td>Not supported.</td></tr>
<tr><td>IP54 Bit Slave Units</td><td>Not supported.</td><td>Supported.</td></tr>
<tr><td colspan="2">Bit Slave Unit (communications section connector)</td><td colspan="3">Supported.</td><td>Supported. (See note 2.)</td></tr>
</table>

Item	Cable type			
	Round cable I	Round cable II	Flat Cable I	Flat Cable II
Wiring method for communications power supply	Wired separately from the Communications Cable.	Supplied via Communications Cable. (Power is supplied from the Master Unit and Repeater Units.)		
Master Unit location	End of trunk line	Baud rate other than 93.75 kbps: End of trunk line 93.75 kbps: Anywhere in network		

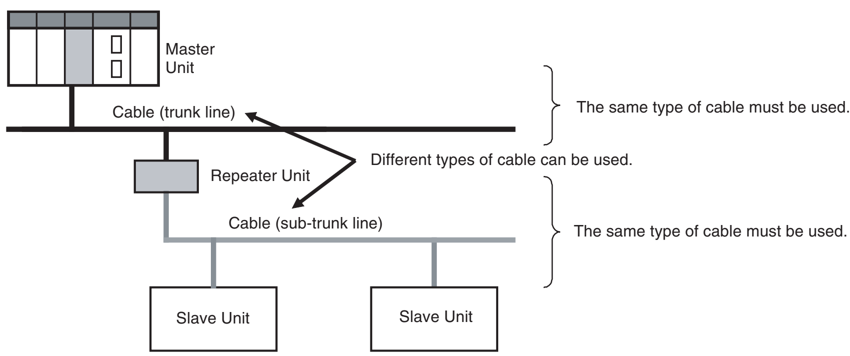
Note (1) Bit Slave that come with a flat cable already connected cannot be connected if the preconnected cable is removed.

(2) If a baud rate of 4 Mbps is used, branching and multidrop connections are not possible from the trunk line. (There are no Multidrop Connectors for Flat Cable II.)

Using Different Cable Types

The same type of cable must be used for all lines downstream from the Master 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).

When Repeater Units are used, however, different cables can be used for the trunk line and sub-trunk lines, and for sub-trunk lines and sub-trunk lines, above and below a Repeater Unit.



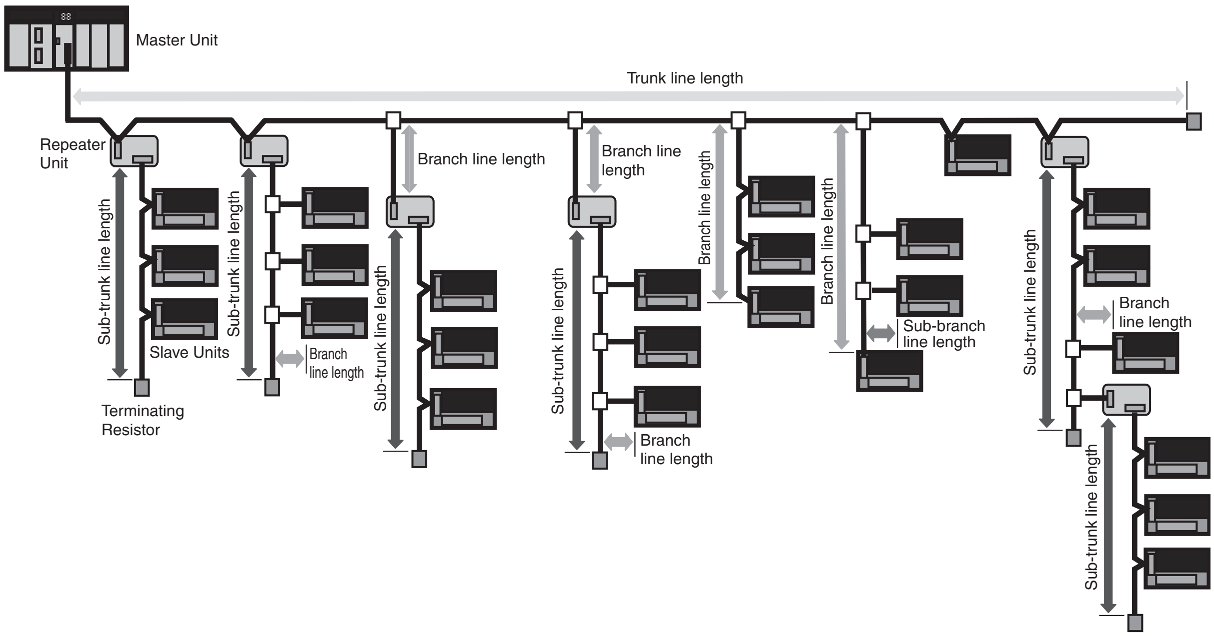
Note Round cable I, round cable II, Flat Cable I (Standard) and Flat Cable II (Sheathed) are treated as different types of cable.

Restrictions in Distance between Cables of Multiple CompoNet Systems

When using more than one CompoNet System with Flat Cable I or II, operation may be unstable due to interference. To prevent this, the Flat Cables for the different CompoNet Systems must be separated from each other by at least 5 mm.

2-3-3 Maximum Distance and Number of Connected Units for Types of Communications Cables

The maximum cable lengths for each segment are shown below, along with the maximum number of Slave Units that can be connected. Do not exceed these limits.



Baud Rate of 4 Mbps (No Branching, See note.)

Item	Round cable I/II	Flat Cable I
Length per trunk line or sub-trunk line	30 m (90 m)	30 m (90 m)
Branch line length	Lines cannot be branched from the trunk line. (Only multidrop connections are possible from the trunk line or sub-trunk lines.)	
Total branch line length		
Restrictions on branch line locations		
Number of Slave Units (including Repeater Units)	32	32

Note Bit Slave Units come with Flat Cable and cannot be connected. Also, there is no applicable connector for multidrop connections for Flat Cable II, and therefore multidrop connection cannot be made.

Baud Rate of 3 Mbps

Item	Round cable I/II	Flat Cable I/II
Length per trunk line or sub-trunk line	30 m (90 m)	30 m (90 m)
Branch line length	0.5 m	0.5 m
Total branch line length	8 m	8 m
Restrictions on branch line locations	3/m	3/m
Number of Units per branch (See note 1.)	1	1
Maximum sub-branch line length	Not supported.	Not supported.
Total sub-branch line length	Not supported.	Not supported.
Number of Slave Units (including Repeater Units)	32	32

Baud Rate of 1.5 Mbps

Item	Round cable I		Round cable II Flat Cable I/II
	Without branching	With branching	
Length per trunk line or sub-trunk line	100 m (300m)	30 m (90m)	30 m (90 m)
Branch line length	Not supported. (See note 2.)	2.5 m	2.5 m
Total branch line length	Not supported. (See note 2.)	25 m	25 m
Restrictions on branch line locations	---	3/m	3/m
Number of Units per branch (See note 1.)		3	3
Maximum sub-branch line length		Not supported.	0.1 m (See note 3.)
Total sub-branch line length		Not supported.	2 m (See note 3.)
Number of Slave Units (including Repeater Units)	32	32	32

Note
(1) The number of Units per branch is the maximum number of Slave Units or Repeater Units that can be connected to one branch using multidrop or T-branch connections (sub-branch lines).
(2) Lines cannot be branched from the trunk line. (Only multidrop connections are possible from the trunk line or sub-trunk lines.)
(3) Sub-branch lines can be branched from branch lines.

Baud Rate of 93.75 kbps

Item	Round cable I	Round cable II Flat Cable I/II
Length per trunk line or sub-trunk line	500 m	Unrestricted wiring is enabled for a total length of 200 m.
Branch line length	6 m	
Total branch line length	120 m	
Restrictions on branch line locations	3/m	
Number of Units per branch (See note.)	1	
Maximum sub-branch line length	---	
Total sub-branch line length	---	
Number of Slave Units (including Repeater Units)	32	32

Note The number of Units per branch is the maximum number of Slave Units or Repeater Units that can be connected to one branch using multidrop or T-branch connections (sub-branch lines).

2-4 Communications Cable Wiring Examples

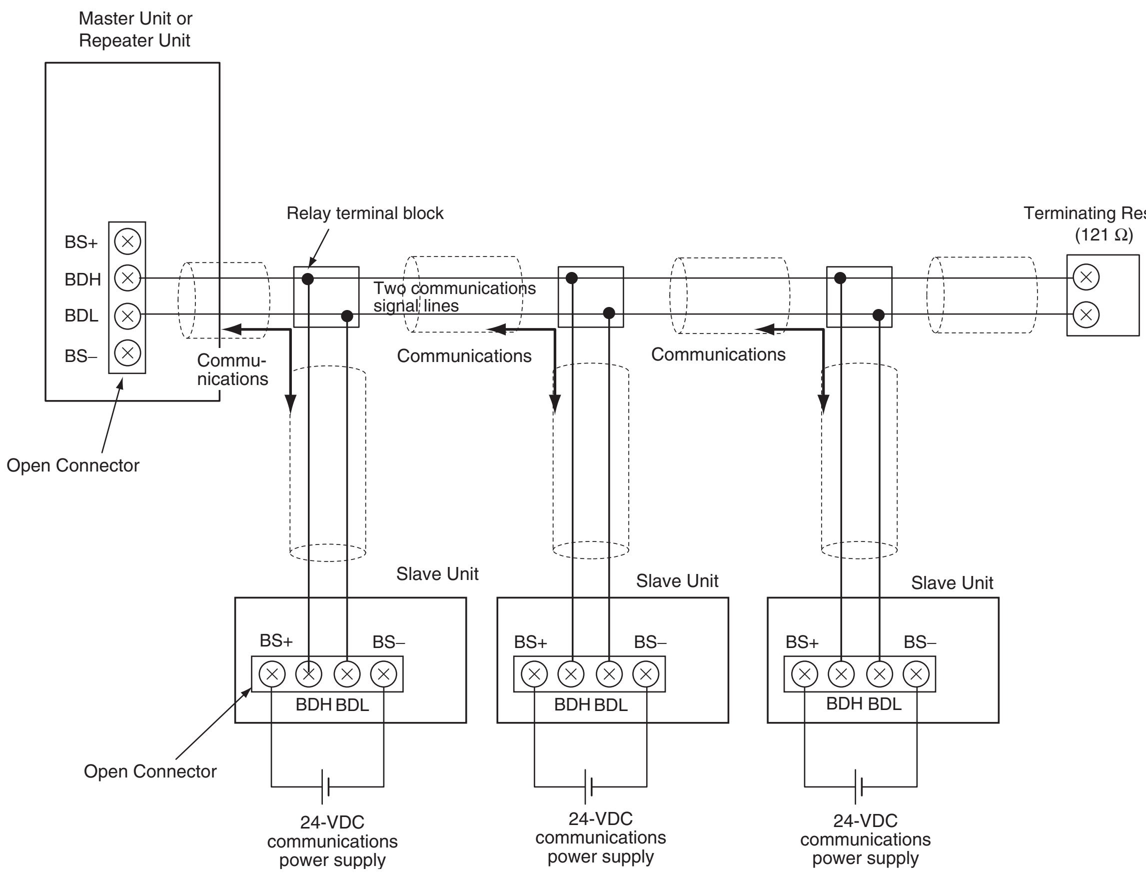
The following wiring is required in a CompoNet Network.

- Two communications signal lines (communications data): BDH (communications data high) and BDL (communications data low)
- Two communications power supply lines (power for communications and internal Slave Unit circuits): BS+ (communications power supply plus side) and BS– (communications power supply minus side)

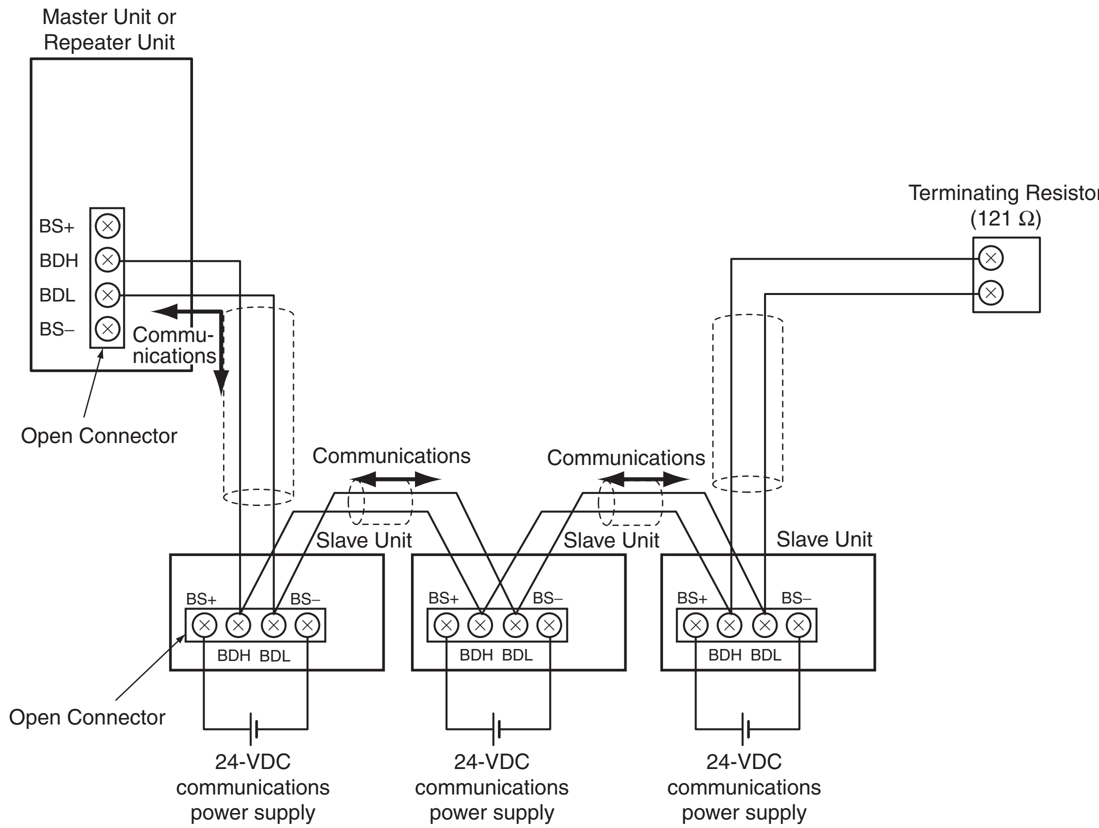
The wiring method depends on the type of cable that is used.

2-4-1 Round Cable I

- Connect the two communications signal lines in parallel between the Master Unit or Repeater Unit and multiple Slave Units.
- Use Open Type Connectors (DCN4-TB4, for connecting Units) to connect Communications Cables to Master Units, Repeater Units, and Slave Units.
- To supply the communications power (24 VDC), connect the two communications power supply lines to each Slave Unit separately from the Communications Cables.
- Power is not supplied to the Master Unit or Repeater Units.
- A Terminating Resistor (DRS1-T) must be connected at the end of the network.

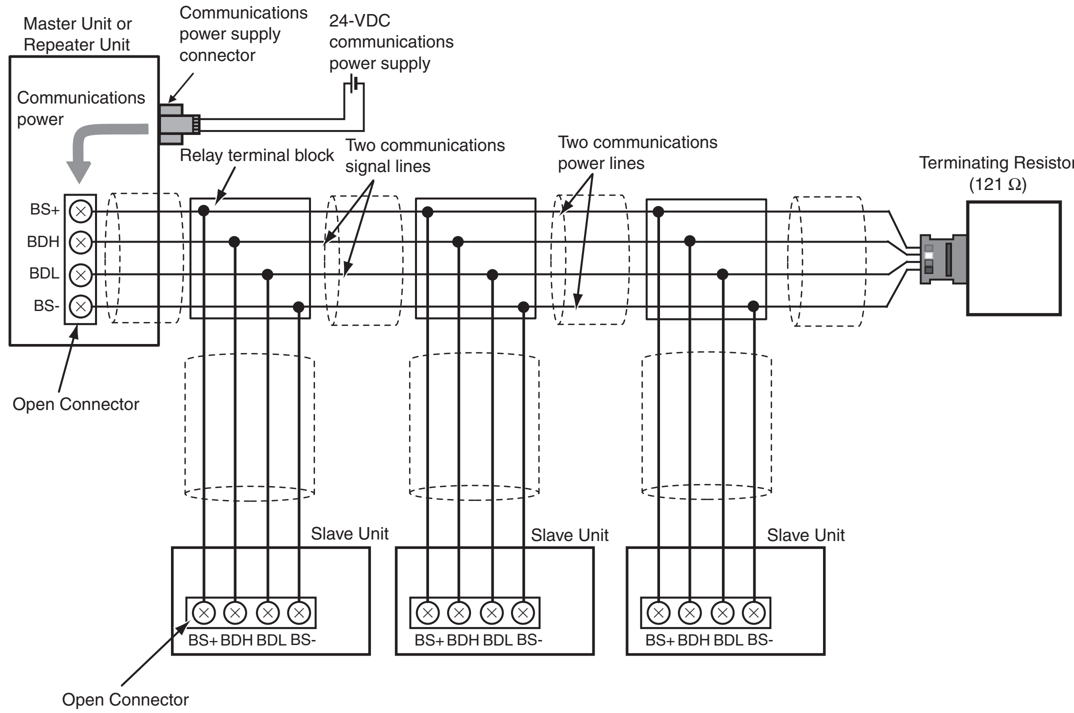


Slave Units can also be connected in parallel using multidrop connections.

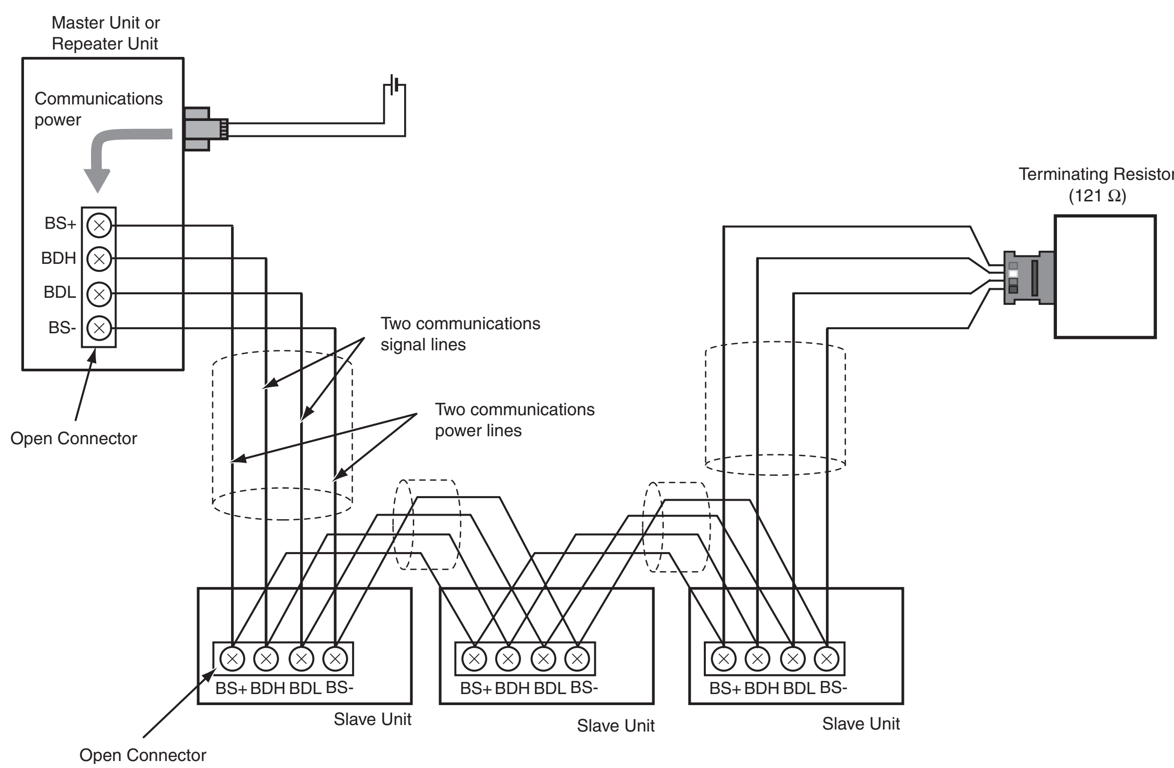


2-4-2 Round Cable II

- Connect the two communications signal lines and two communications power lines in parallel between the Master Unit or Repeater Unit and multiple Slave Units.
- Use Open Type Connectors (DCN4-TB4, for connecting Units) to connect Communications Cables to Master Units, Repeater Units, and Slave Units.
- Connect the communications power supply (24 VDC) to the communications power supply connector for the Master Unit or Repeater Unit.
- Connect DCN4-TM4 Terminating Resistors and DCN4-TR4 Flat Connector Sockets at the ends of the network.

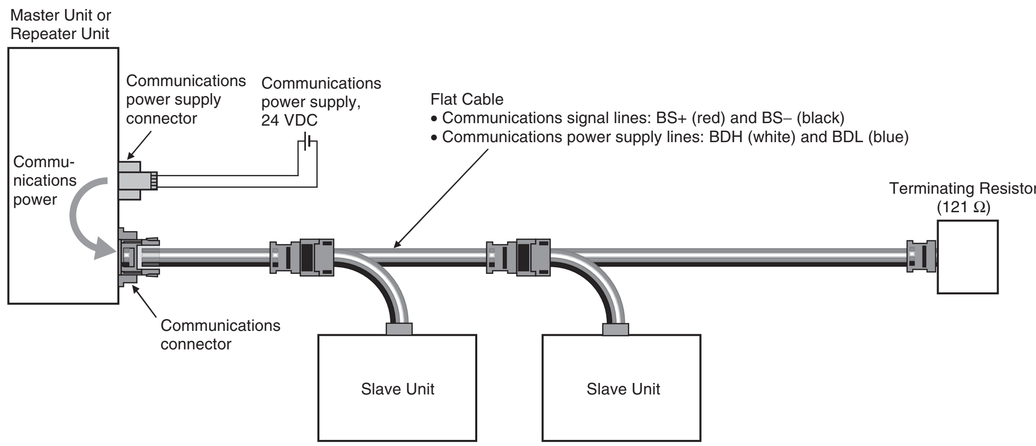


Slave Units can also be connected in parallel using multidrop connections.

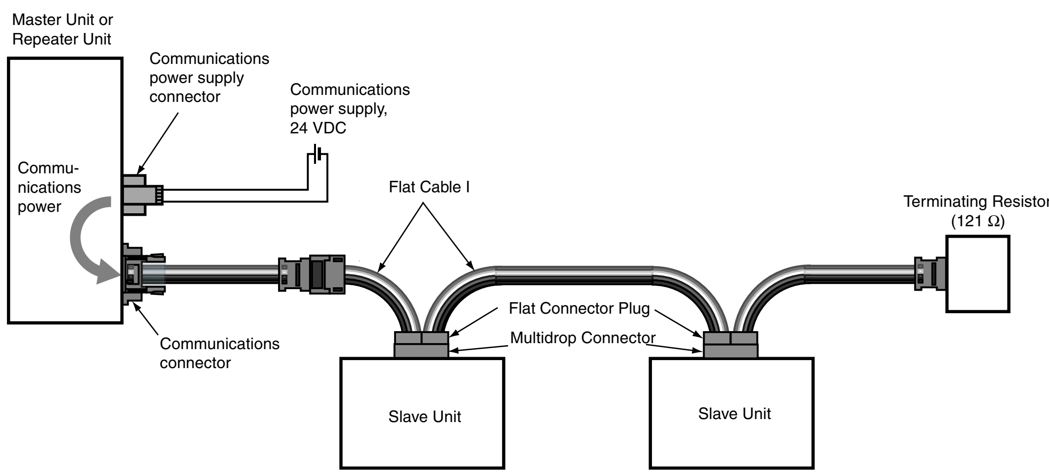


2-4-3 Flat Cable I/II

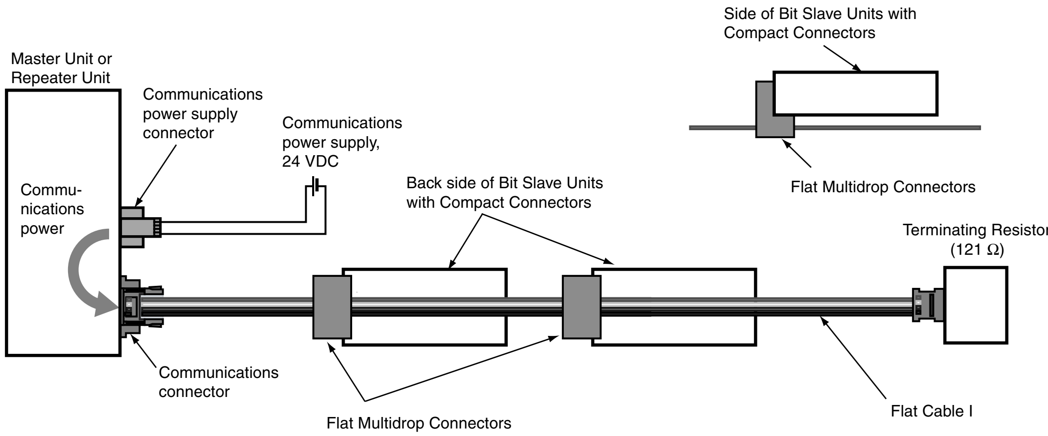
- The two communications signal lines and the two communications power supply lines are connected to the Master Unit, Repeater Units, and Slave Units using Flat Cable.
- Connect the communications power supply (24 VDC) to the communications power supply connector for the Master Unit or Repeater Unit.
- A Terminating Resistor (DCN4-TM4 or DCN5-TM4) must be connected at the end of the network.



Slave Units can also be connected in parallel by using multidrop connections. A DCN4-MD4 Multidrop Connector is required for this. (Only Flat Cable I can be used.)



DCN4-MR4 Flat Multidrop Connectors are used for multidrop connections for Bit Slave Units with Compact Connectors. (Only Flat Cable I can be used.)



SECTION 3
Installation and Wiring

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

3-1 Installing Slave Units

3-1-1 Installation Method

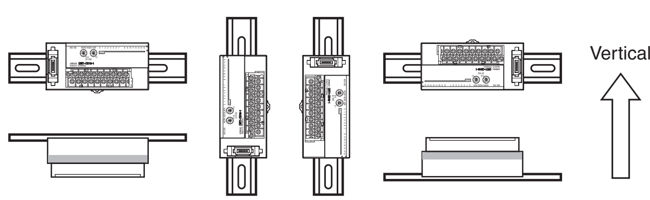
The installation method for Slave Units and Repeater Units depends on the model.

Name		Model	Installation method
Digital I/O Slave Units	With 2-tier Terminal Block	CRT1-ID08(-1)	DIN Track
		CRT1-OD08(-1)	
		CRT1-ID16(-1)	
		CRT1-OD16(-1)	
		CRT1-MD16(-1)	
		CRT1-ROS08	
		CRT1-ROF08	
		CRT1-ROS16	
		CRT1-ROF16	
	With 3-tier Terminal Block	CRT1-ID08TA(-1)	
		CRT1-OD08TA(-1)	
		CRT1-ID08TAH(-1)	
		CRT1-OD08TAH(-1)	
		CRT1-ID16TA(-1)	
		CRT1-OD16TA(-1)	
		CRT1-MD16TA(-1)	
		CRT1-ID16TAH(-1)	
		CRT1-OD16TAH(-1)	
		CRT1-MD16TAH(-1)	
	With e-CON Connectors	CRT1-VID08S(-1)	DIN Track or Mounting Bracket
		CRT1-VOD08S(-1)	
		CRT1-ID16S(-1)	DIN Track
		CRT1-OD16S(-1)	
		CRT1-MD16S(-1)	
		CRT1-ID16SH(-1)	
		CRT1-OD16SH(-1)	
		CRT1-MD16SH(-1)	
		CRT1-ID32S(-1)	
		CRT1-OD32S(-1)	
		CRT1-MD32S(-1)	
		CRT1-ID32SH(-1)	
		CRT1-OD32SH(-1)	
		CRT1-MD32SH(-1)	
	With MIL Connectors	CRT1-VID16ML(-1)	DIN Track or Mounting Bracket
		CRT1-VOD16ML(-1)	
		CRT1-VID32ML(-1)	
		CRT1-VOD32ML(-1)	
		CRT1-VMD32ML(-1)	
	With Screw-less Clamp Terminal Blocks	CRT1-ID08SL(-1)	DIN Track
		CRT1-OD08SL(-1)	
		CRT1-ID16SL(-1)	
		CRT1-OD16SL(-1)	
		CRT1-MD16SL(-1)	

Name			Model	Installation method
Analog I/O Slave Units	With 2-tier Terminal Block		CRT1-AD04	DIN Track
			CRT1-DA02	
	With e-CON Connectors		CRT1-VAD04S	DIN Track or Mounting Bracket
			CRT1-VDA02S	
	With MIL Connectors		CRT1-VAD04ML	
			CRT1-VDA02ML	
Temperature Input Units			CRT1-TS04T	DIN Track
			CRT1-TS04P	
Expansion Units			XWT-ID08(-1)	
			XWT-OD08(-1)	
			XWT-ID16(-1)	
			XWT-OD16(-1)	
Bit Slave Units	With e-CON Connectors		CRT1B-ID02S(-1)	Screw installation (M4)
			CRT1B-OD02S(-1)	
		IP54	CRT1B-ID02SP(-1)	
			CRT1B-OD02SP(-1)	
			CRT1B-ID04SP(-1)	
	With Screw-less Clamp Terminal Blocks	IP54	CRT1B-MD04SLP(-1)	
	Bit Slave Units with Compact Connectors		CRT1B-ID02JS(-1)	M4 screw mounting using CRT1B-ATT03 Mounting Bracket
			CRT1B-OD02JS(-1)	
			CRT1B-ID04JS(-1)	
			CRT1B-OD04JS(-1)	
			CRT1B-MD02JS(-1)	
			CRT1B-MD04JS(-1)	
Repeater Unit			CRS1-RPT01	DIN Track or screw installation (M4)

3-1-2 Installation Orientation

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



3-1-3 Mounting to a DIN Track

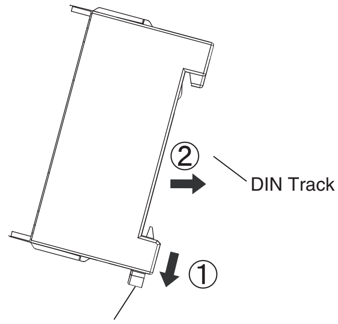
Materials Required for Installation

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

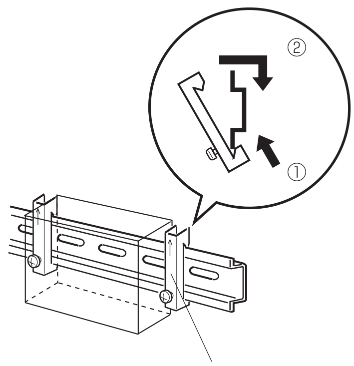
Installation Orientation

1,2,3...

1. Hook the slot on the back of the Unit into the top of the DIN Track. Pull down the DIN Track mounting pin and insert the Unit.



2. Hook the bottom of the End Plate on the DIN Track first, and then the top. Attach an End Plate on each side of the Unit, and tighten the screws to secure them. Check to make sure that the Unit is firmly secured.



3-1-4 Mounting with a Mounting Bracket

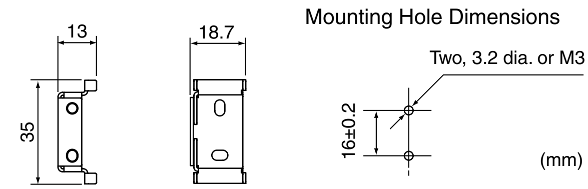
Slave Units with e-CON connectors (CRT1-V□D08S(-1)/CRT1-VAD04S/ CRT1-VDA02S) or MIL connectors (CRT1-V□D□□ML(-1)/CRT1-VAD04ML/ CRT1-VDA02ML) can be panel-mounted or wall-mounted, either vertically or horizontally, using special Mounting Brackets.

Required Brackets

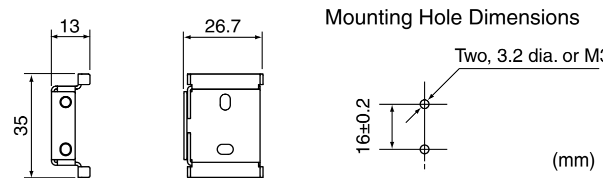
Name	Model	Applicable Slave Unit
Mounting Bracket	CRT1-ATT01	Units with MIL Connectors CRT1-V□D16ML(-1) CRT1-VAD04ML CRT1-VDA02ML
	CRT1-ATT02	Units with e-CON Connectors CRT1-V□D08S(-1) CRT1-VAD04S CRT1-VDA02S
	SRT2-ATT02	Units with MIL Connectors CRT1-V□D32ML(-1)

Dimensions

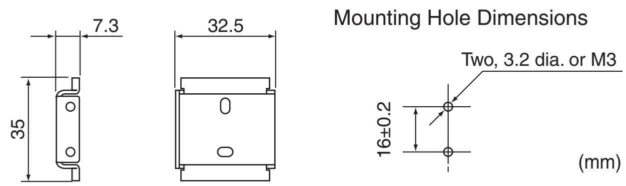
CRT1-ATT01



CRT1-ATT02



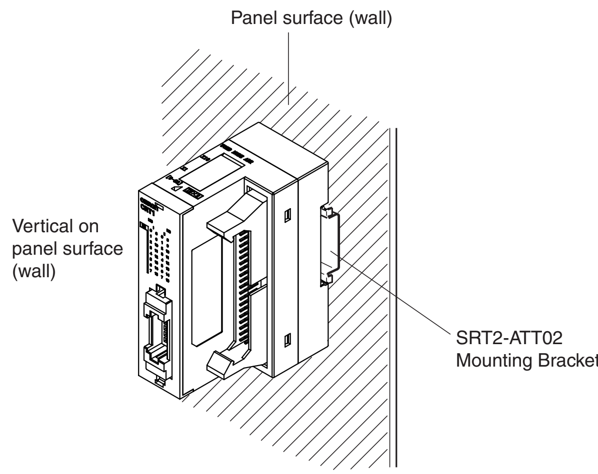
SRT2-ATT02



Vertical Mounting

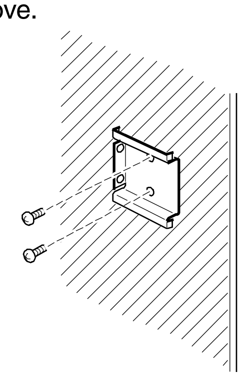
Use a Mounting Bracket to vertically mount a Slave Unit to a panel or a wall.

Example: Mounting a CRT1-V□D32ML Slave Unit with MIL Connectors



Mounting Procedure

1. Attach the Mounting Bracket to the panel surface (or wall) with two Phillips screws, as shown in the following diagram. For mounting hole dimensions, refer to *Dimensions* above.

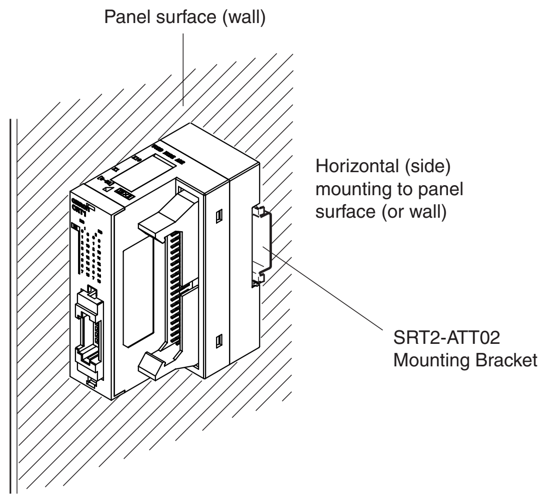


2. Mount the Slave Unit to the Mounting Bracket. The Mounting Bracket is the same shape as a DIN Track, so use the same method as when mounting to a DIN Track.

Horizontal Mounting

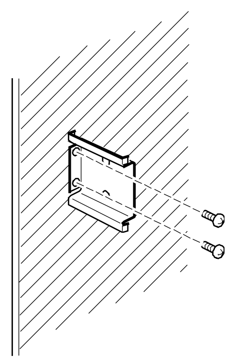
Use a Mounting Bracket to horizontally mount (side mount) a Slave Unit to a panel or a wall.

Example: Mounting a CRT1-V□D32ML Slave Unit with MIL Connectors



Mounting Procedure

1. Attach the Mounting Bracket to the panel surface (or wall) with two Phillips screws, as shown in the following diagram. For mounting hole dimensions, refer to *Dimensions* above.



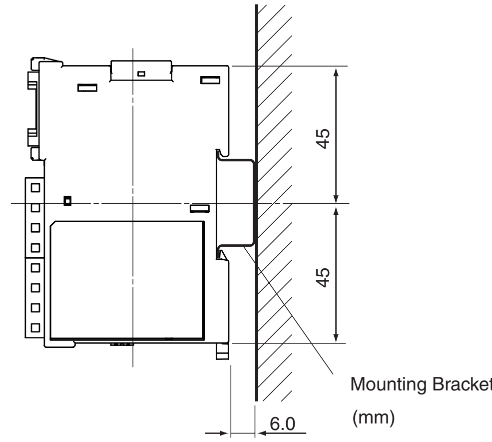
2. Mount the Slave Unit to the Mounting Bracket. The Mounting Bracket is the same shape as a DIN Track, so use the same method as when mounting to a DIN Track.

Mounting Dimensions

Vertical Mounting to a Wall

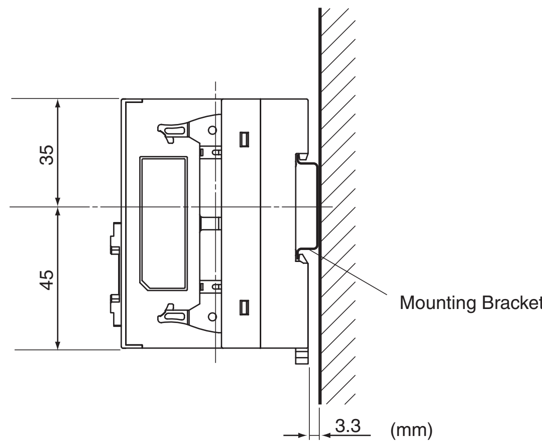
- Units with e-CON Connectors (CRT1-V□D08S(-1)/CRT1-VAD04S/CRT1-VDA02S)

- Units with MIL Connectors (CRT1-V□D□□ML(-1)/CRT1-VAD04ML/CRT1-VDA02ML)



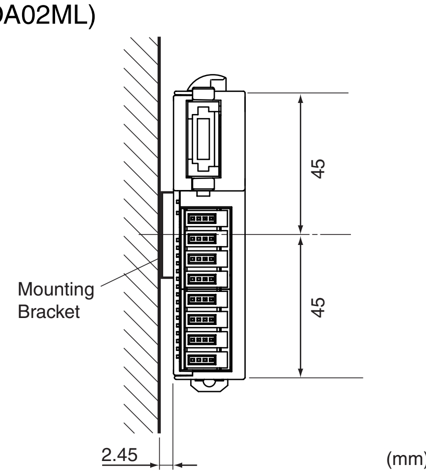
(The Unit shown in the diagram is the CRT1-V□D08S(-1).)

- Units with MIL Connectors (CRT1-V□D32ML(-1))



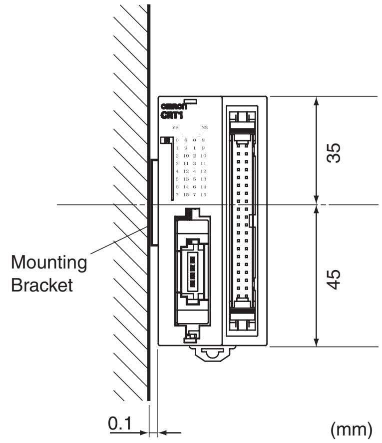
Horizontal Mounting to a Wall

- Units with e-CON Connectors (CRT1-V□D08S(-1)/CRT1-VAD04S/CRT1-VDA02S)
- Units with MIL Connectors (CRT1-V□D□□ML(-1)/CRT1-VAD04ML/CRT1-VDA02ML)



(The Unit shown in the diagram is the CRT1-V□D08S(-1).)

• Units with MIL Connectors (CRT1-V□D32ML(-1))

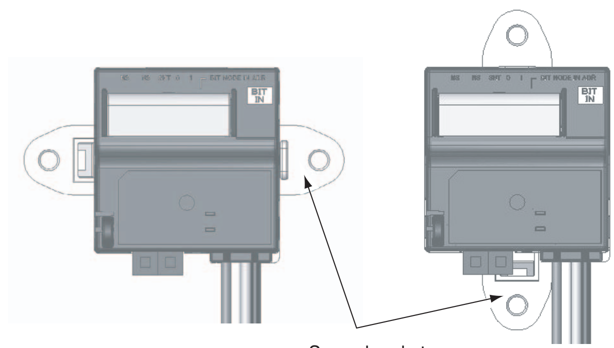


3-1-5 Mounting with Screws

Refer to the dimensions for the particular Unit and prepare the mounting holes in the panel. Tighten the M4 screws to a torque of 0.9 N·m, and check to be sure that the Unit is securely mounted.

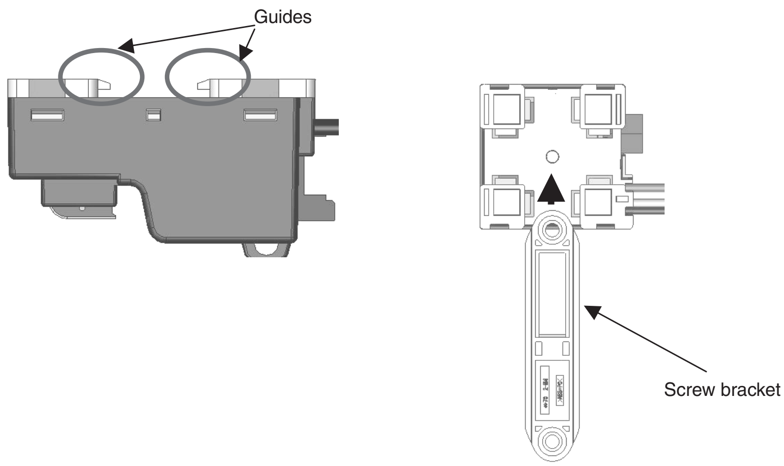
Mounting Bit Slave Units Using Screw Brackets

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

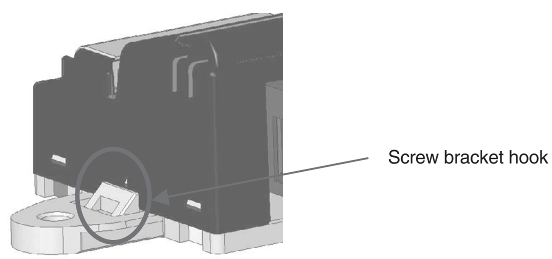


Use the following procedure to mount the screw bracket.

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



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



3-1-6 Screw Mounting with a Mounting Bracket

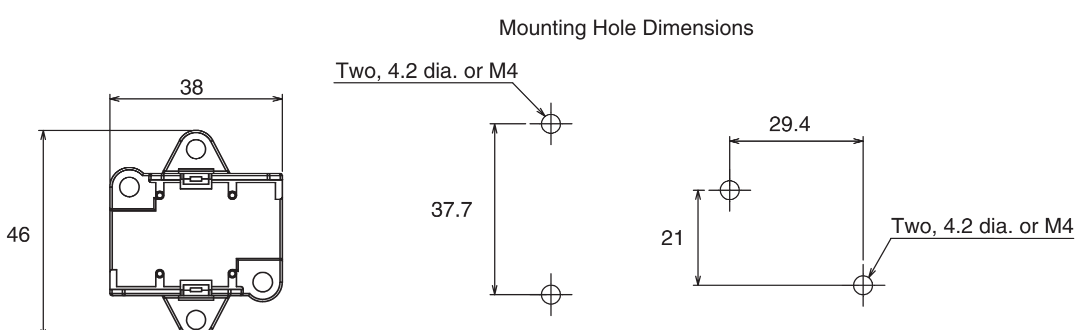
Slave Units with Compact Connectors (CRT1B-□D02JS(-1) or CRT1B-□D04JS(-1)) can be mounted using special Mounting Brackets.

Required Brackets

Name	Model	Applicable Slave Unit
Mounting Bracket	CRT1-ATT03	Bit Slaves with Compact Connectors CRT1B-□D02JS(-1) CRT1B-□D04JS(-1)

Dimensions

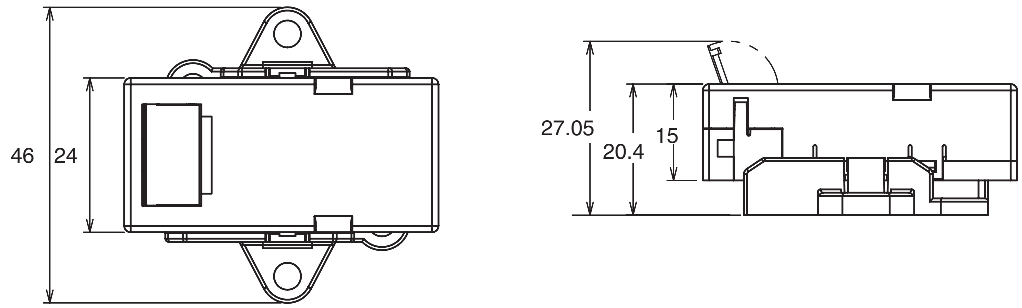
■ CRT1-ATT03



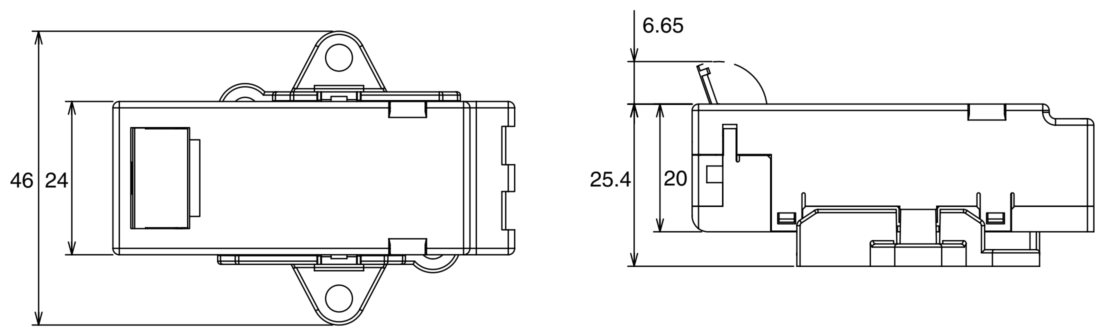
Perform mounting using either of the two sets of holes.

Mounting Dimensions

■ **CRT1B-□D02JS(-1)**

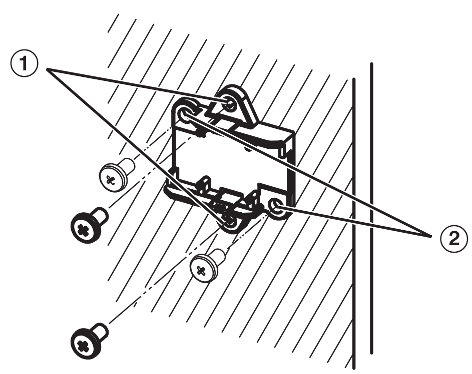


■ **CRT1B-□D04JS(-1)**

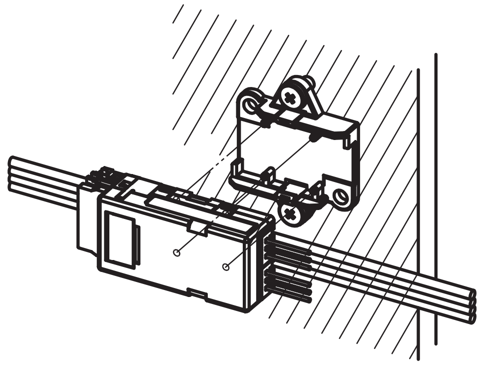


Mounting Procedure

1,2,3... 1. Mount the Unit using two M4 screws in the mounting holes ① or the mounting holes ②. Tighten the screws to the following torque.
   - Tightening torque: 0.9 N·m



2. As shown in the following figure, press in on the Unit until the internal hooks of the Mounting Bracket make a clicking sound. After mounting the Unit, be sure to check that the Bit Slave Unit with Compact Connectors is correctly mounted to the Mounting Bracket.

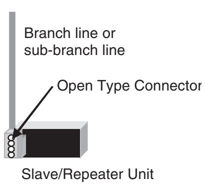
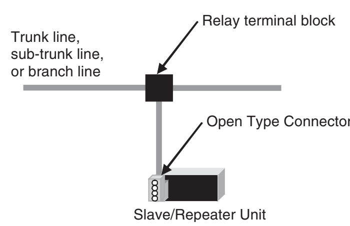
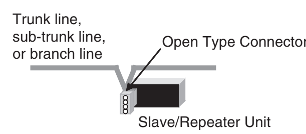


3-2 Connecting Cables

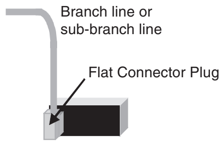
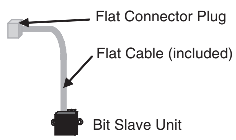
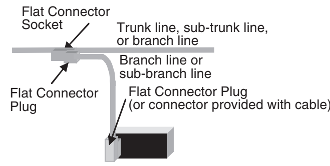
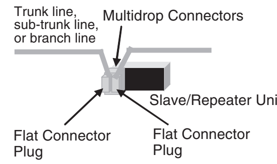
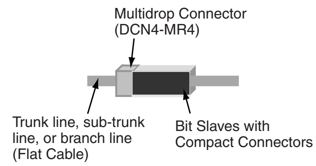
In a CompoNet Network, Units can be connected and cables can be branched and extended by using Communications Cable and mounting connectors to Units. The methods for connecting Communications Cables and Units and for branching depend on the cable type and branching formation used.

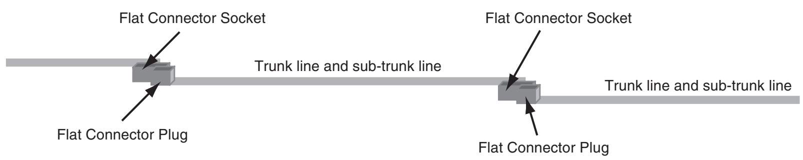
The differences are shown in the following table.

3-2-1 Round Cable I/II

Slave Unit/Repeater Unit connections	Cable branches	
	T-branch connections	Multidrop connections
Open Type Connector  **Note** Bits Slave Units with a Flat Cable included cannot use Open Type Connectors.	Commercially available relay terminal block  	Open Type Connector 

3-2-2 Flat Cable I/II

<table>
<tr><th rowspan="2">Slave Unit/Repeater Unit connections</th><th colspan="2">Cable branches</th></tr>
<tr><th>T-branch connections</th><th>Multidrop connections</th></tr>
<tr>
<td>Flat Connector Plug
• Word Slave Units, Bit Slave Units with a communications connector, or Repeater Units

• Bit Slave Unit with Flat Cable Included

Note Bit Slave Units are available with a Flat Cable included as a standard feature.</td>
<td>Flat Connector Socket + Flat Connector Plug
</td>
<td>Multidrop Connector

Bit Slaves with Compact Connectors

Note If a Sheathed Flat Cable II is used, multidrop connections using multidrop connectors cannot be used.</td>
</tr>
</table>

<table>
<tr><th>Cable Extension</th></tr>
<tr><td>Flat Connector Socket + Flat Connector Plug
</td></tr>
</table>

3-3 Preparing Flat Connectors

To connect a Terminating Resistor to round cable II, to connect Flat Cable I or II to Units and to branch or extend the wiring, Flat Connectors must be prepared and attached to the cables.

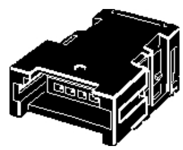
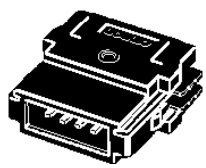
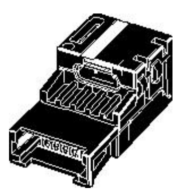
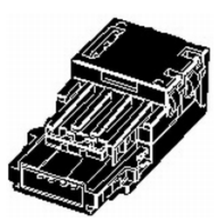
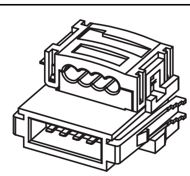
Note

(1) Flat Connectors cannot be reused once they have been attached. Perform the procedure with care.

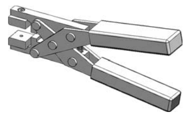
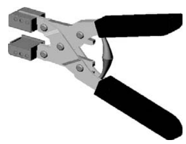
(2) Always hold on to the Flat Connector when connecting or disconnecting it.

(3) When connecting a Flat Connector, press it all the way in and then pull on it to be sure it is locked into place.

Connectors Used

Name	Appearance	Model	Application
Flat Connector I Socket		DCN4-TR4	Used as a set with the DCN4-BR4 Flat Connector Plug in the following applications: • Extending the trunk line or sub-trunk lines. • T-branching branch lines from the trunk line or sub-trunk lines. • T-branching sub-branch lines from a branch line. Used independently when connecting a DCN4-TM4 Terminating Resistor to the end of the trunk line or a sub-trunk line.
Flat Connector I Plug		DCN4-BR4	Used as a set with the DCN4-TR4 Flat Connector Socket in the following applications: • Extending the trunk line or sub-trunk lines. • T-branching branch lines from the trunk line or sub-trunk lines. • T-branching sub-branch lines from a branch line. Used independently in the following applications: • Connecting Communications Cable to a Unit. • Connecting Communications Cable to a DCN4-MD4 Multidrop Connector (when a multidrop connection is used).
Flat Connector II Socket		DCN5-TR4	Used as a set with the DCN5-BR4 Flat Connector Plug in the following applications: • Extending the trunk line or sub-trunk lines. • T-branching branch lines from the trunk line or sub-trunk lines. • T-branching sub-branch lines from a branch line. Used independently when connecting a DCN5-TM4 Terminating Resistor to the end of the trunk line or a sub-trunk line.
Flat Connector II Plug		DCN5-BR4	Used as a set with the DCN5-TR4 Flat Connector Socket in the following applications: • Extending the trunk line or sub-trunk lines • T-branching branch lines from the trunk line or sub-trunk lines • T-branching sub-branch lines from a branch line Used independently to connect Communications Cable to a Unit.
Flat Multidrop Connector Plug		DCN4-MR4	Used independently in the following application: • Connecting Communications Cable to a Unit in a multidrop connection This connector can be used with the following Units: Bit Slave Units with Compact Connectors (CRT1B-□D0□JS(-1))

Tools Required

Name	Appearance	Model	Application
Pliers		DWT-A01	Crimping tool for DCN4-TR4 Flat Connector Socket, DCN4-BR4 Flat Connector Plug, or DCN4-MR4 Flat Multidrop Connector Plug.
Pliers		DWT-A02	Crimping tool for DCN5-TR4 Flat Connector Socket or DCN5-BR4 Flat Connector Plug

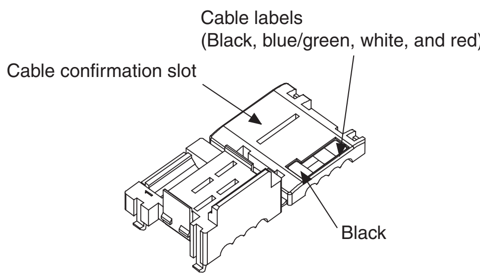
3-3-1 Round Cable II

This procedure is only required to connect a Terminating Resistor.

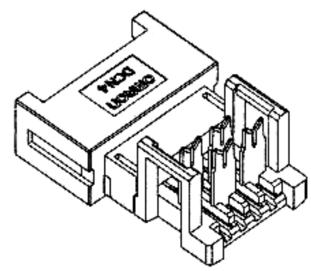
Preparing DCN4-TR4 Flat Connector Sockets

Component Names

Cover

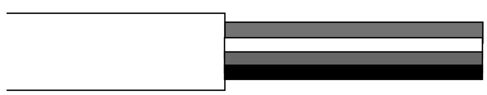


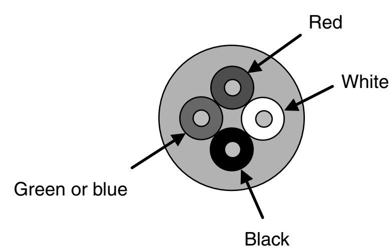
Housing



■ Preparing the Cable

Cut the cable perpendicular to the length, and strip the sheath as shown in the following diagram.

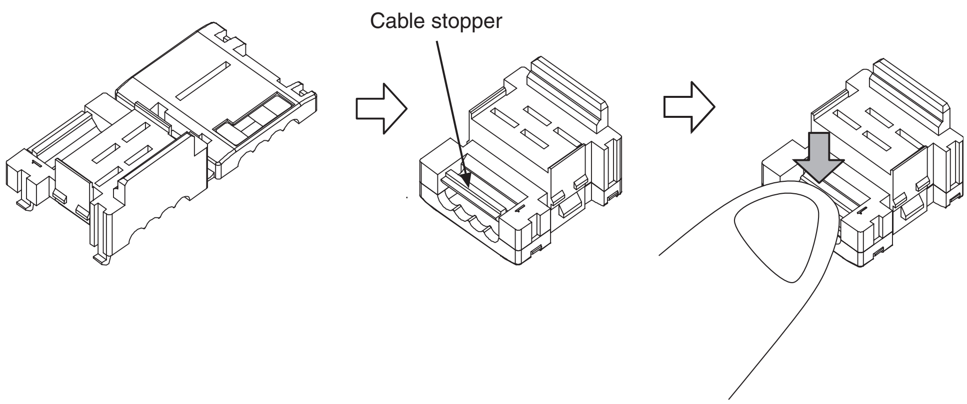




■ Setting the Cable Stopper

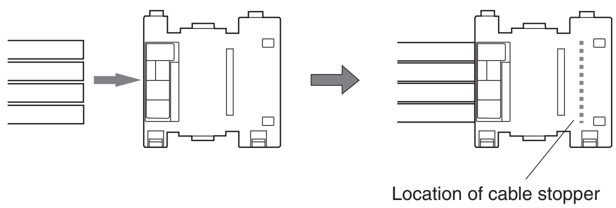
Set the Cable Stopper.

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



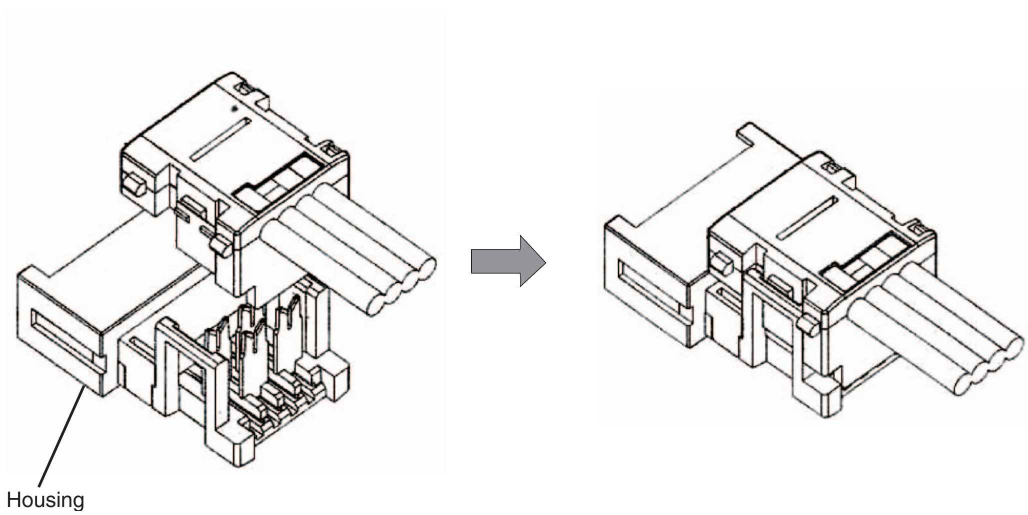
■ Attaching the Cable

Confirm that the cable colors match the cable labels, and then insert the cable end all the way to the back of the cover in which the cable stopper has already been set.



■ Attaching the Housing

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

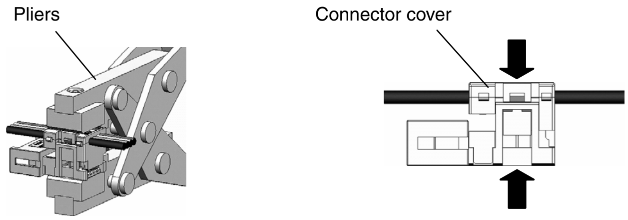


Note The housing cannot be removed from the cover once it has been attached. The connector may be damaged if the housing is forcefully removed.

■ Pressure-welding the Connector

The connector is pressure-welded using the DWT-A01 Pliers.

1,2,3... 1. As shown below, align the center (see arrows) of the connector cover with the center of the pressure-welding block on the Pliers.

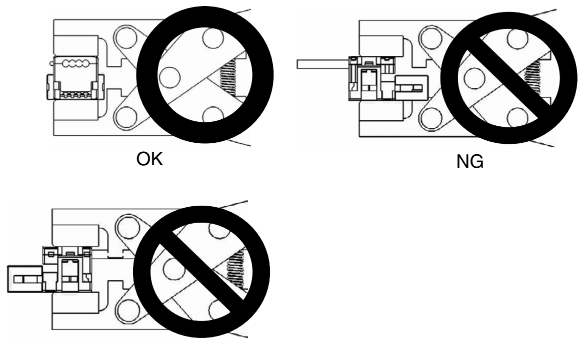


2. Squeeze firmly on the Pliers until the lock on the connector clicks into place.

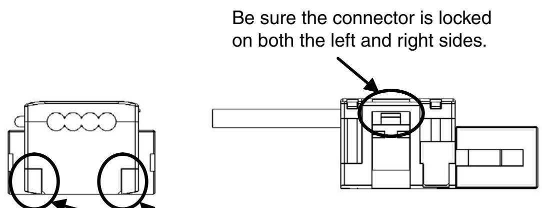
Note (1) Do not pressure-weld the connector cover at the edges.

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

(3) Set the connector in the correct orientation.



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

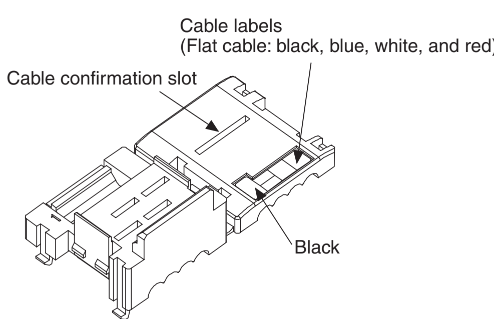


3-3-2 Flat Cable I

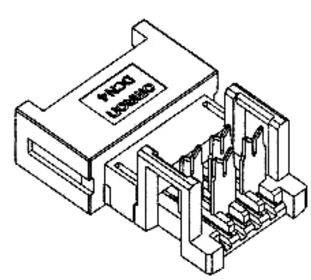
Preparing DCN4-TR4 Flat Connector Sockets

Component Names

Cover



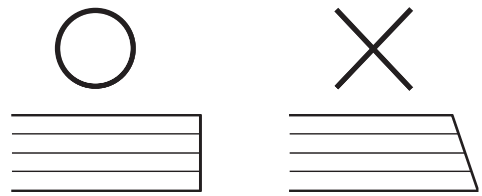
Housing



■ Cutting the Cable (when Extending Cable or Connecting a Terminating Resistor)

Cut the cable perpendicular to the length.

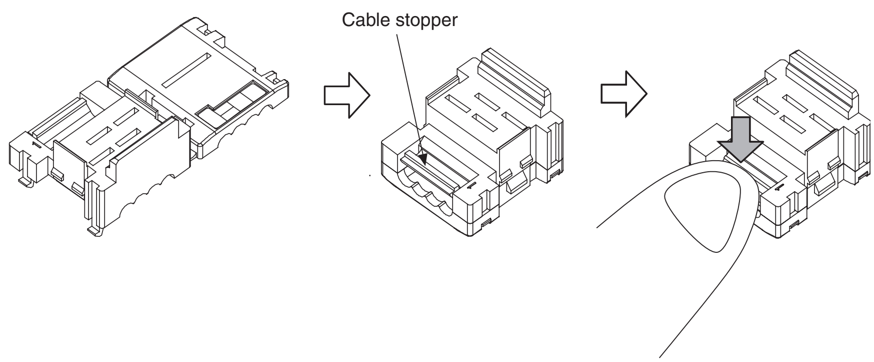
To prevent short-circuits, cut the cable with a sharp blade, such as wire cutters, and be sure that there are no whiskers on the wires.



■ Setting the Cable Stopper (when Extending Cable or Connecting a Terminating Resistor)

A stopper must be set in advance when extending a line or connecting a Terminating Resistor.

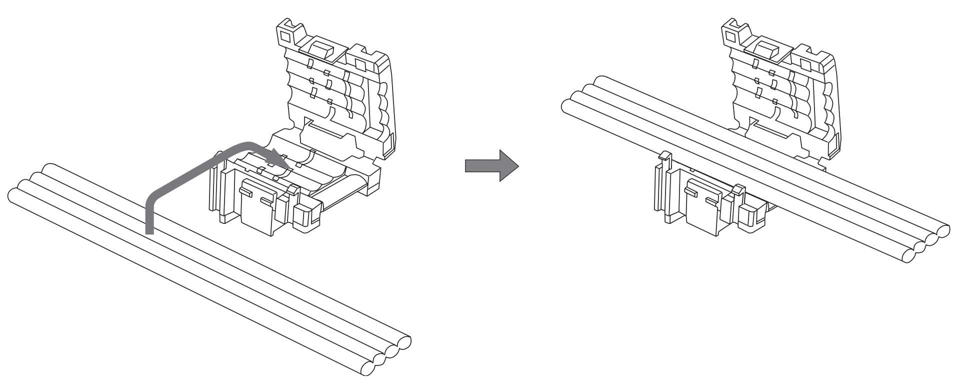
Close the cover, secure the hooks, and then press down on the cable stopper until it clicks into place.



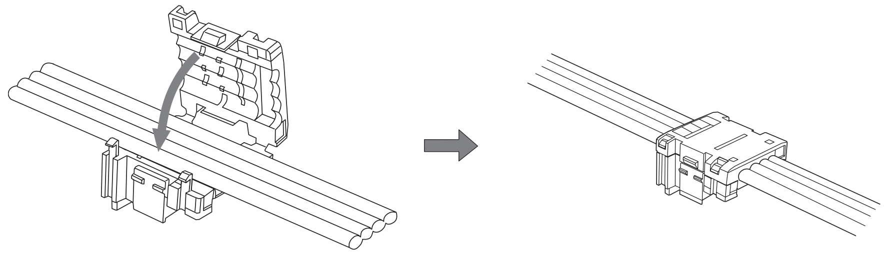
■ Attaching the Cable

■ T-branch Connections

1,2,3... 1. Align the cable labels and cable colors and insert the cable into the cover.

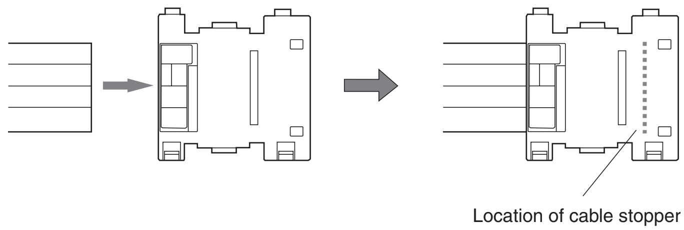


2. Hold the cable and secure it with the hooks.



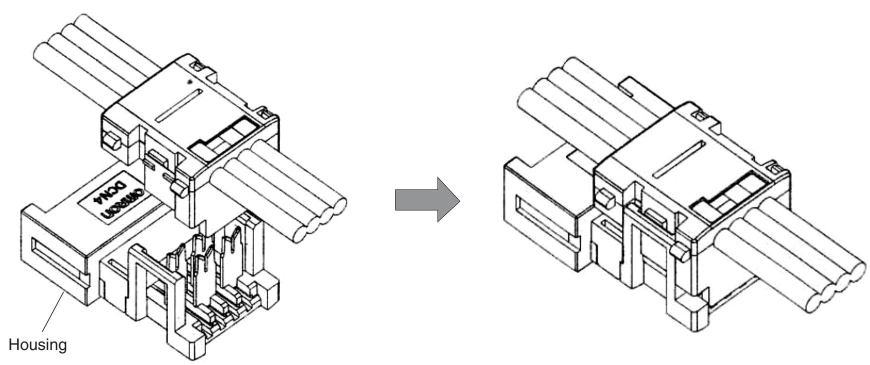
■ Line Extensions and Terminating Resistors

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



■ Attaching the Housing

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

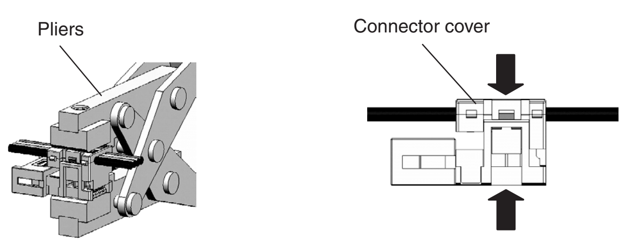


Note The housing cannot be removed from the cover once it has been attached. The connector may be damaged if the housing is forcefully removed.

■ Pressure-welding the Connector

The connector is pressure-welded using the DWT-A01 Pliers.

1,2,3... 1. As shown below, align the center (see arrows) of the connector cover with the center of the pressure-welding block on the Pliers.

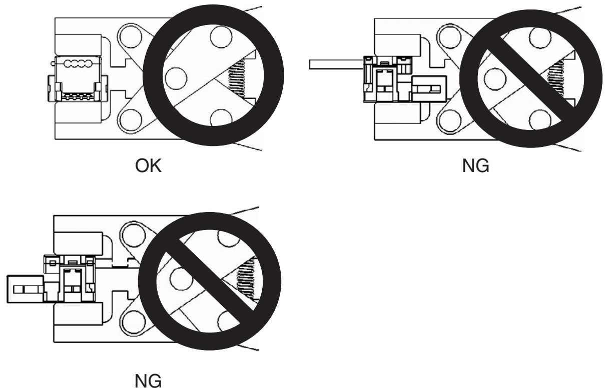


2. Squeeze firmly on the Pliers until the lock on the connector clicks into place.

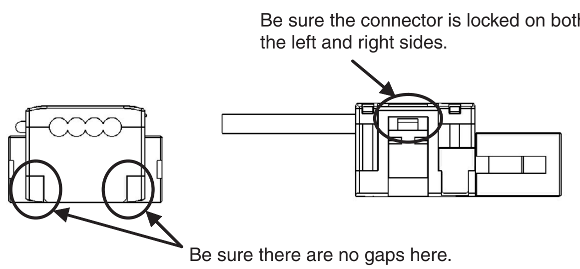
Note (1) Do not pressure-weld the connector cover at the edges.

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

(3) Set the connector in the correct orientation.

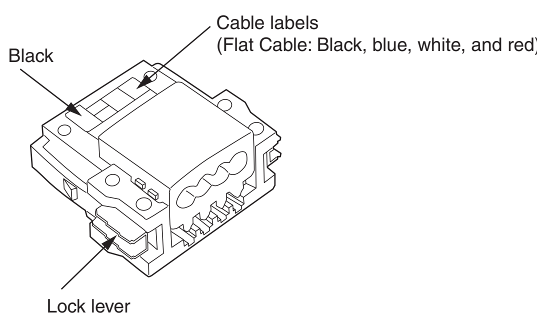


3. After attaching the cable, confirm that it is properly pressure-welded as shown below.



Processing and Mounting Procedure for DCN4-BR4 Flat Connector Plug

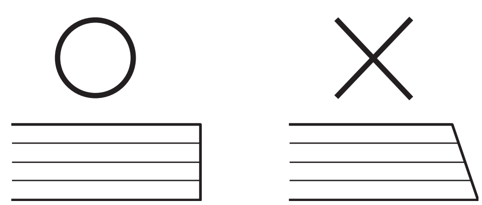
Flat Connector Plug Component Names



■ Cutting the Cable

Cut the cable perpendicular to the length.

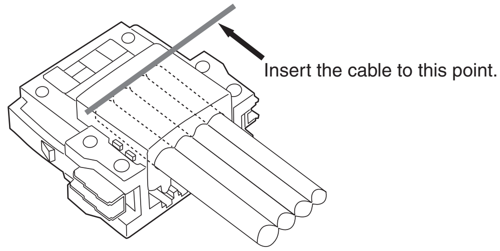
To prevent short-circuits, cut the cable with a sharp blade, such as wire cutters, and be sure that there are no whiskers on the wires.



■ Attaching the Cable

Align the cable labels and cable colors and insert the cable.

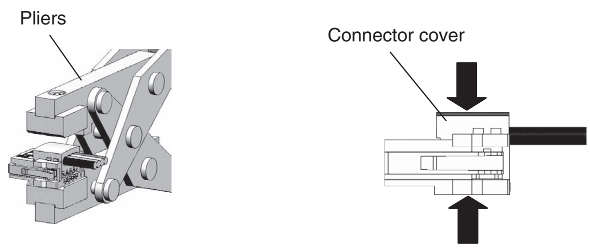
Confirm that the cable is inserted all the way to the back. (The cover is semi-transparent.)



■ Crimping the Connector

Crimp the connector using the DWT-A01 Pliers.

1,2,3... 1. As shown in the following figure, align the center (see arrows) of the connector cover with the center of the crimping block on the Pliers.

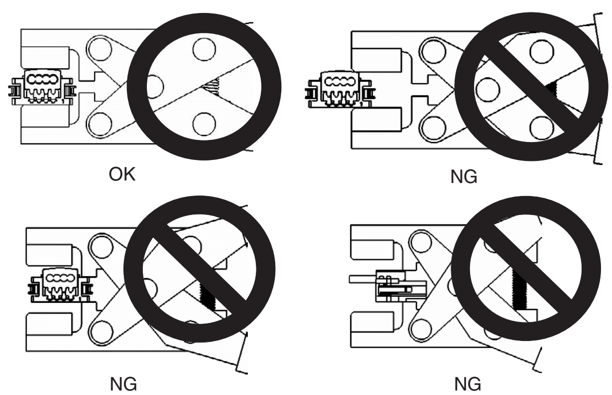


2. Squeeze firmly on the Pliers until the lock on the connector clicks into place.

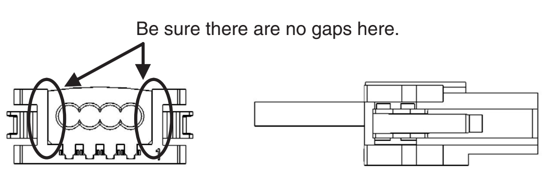
Note (1) Do not pressure-weld the connector cover at the edges.

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

(3) Set the connector in the correct orientation.

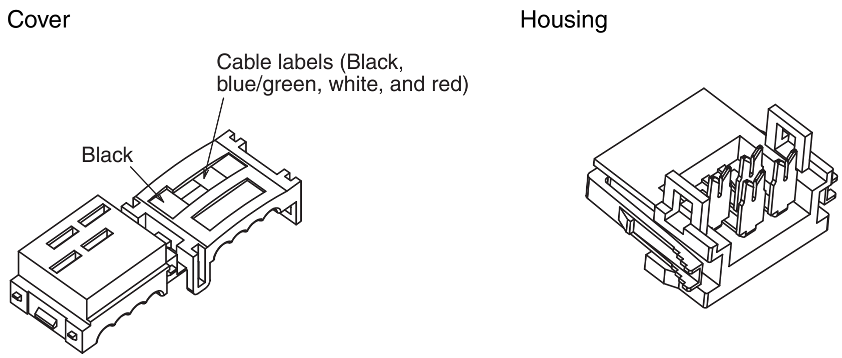


3. After attaching the cable, confirm that it is properly pressure-welded as shown below.



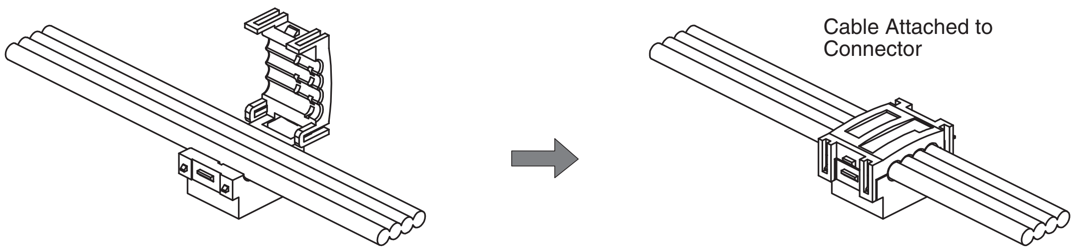
Preparing and Connecting DCN4-MR4 Multidrop Connectors

Componet Names



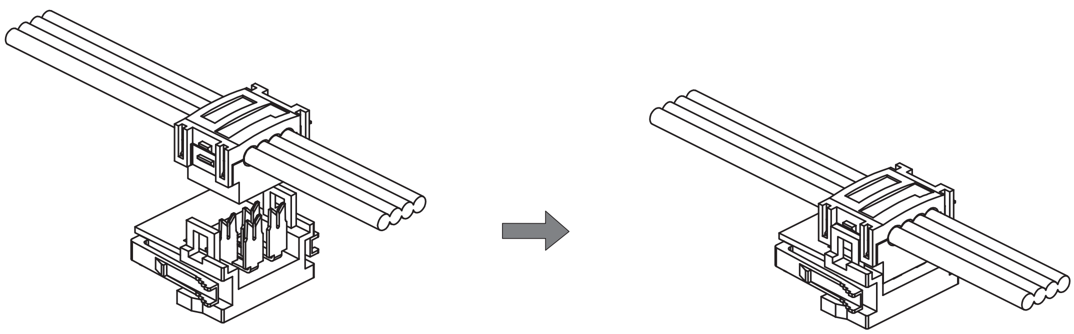
■ Wiring Procedure

1,2,3...
1. Align the line colors of the cable with the cable labels, and place the cable on the Connector.
2. Close the cover until the hooks lock in place.



■ Attaching the Housing

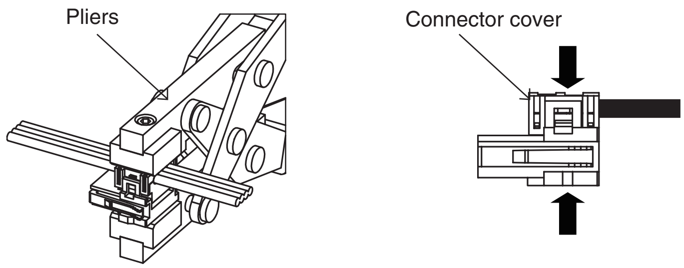
1,2,3...
1. Confirm the colors again, and temporarily secure the housing to the cover.



■ Pressure-welding the Connector

Use the DWT-A01 Pliers to pressure-weld Connector.

1,2,3...
1. As shown in the following figure, set the connector cover so that the center of it (indicated by the arrows) is in the center of the pressure-welding block of the Pliers.
2. Squeeze the Pliers firmly until you hear the connector lock into place.

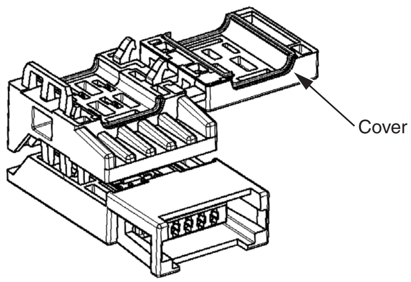


Note After pressure-welding the cable, confirm that it has been pressure-welded correctly. The tabs on the cover of the Housing must be completely locked.

3-3-3 Flat Cable II

Preparing DCN5-TR4 Flat Connector Sockets

Component Names



■ Cutting the Cable

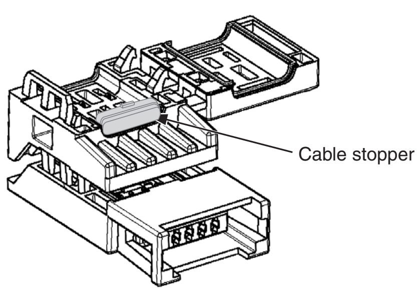
Cut the cable perpendicular to the length.

To prevent short-circuits, cut the cable with a sharp blade, such as wire cutters, and be sure that there are no whiskers on the wires.

■ Setting the Cable Stopper (when Extending Cable or Connecting a Terminating Resistor)

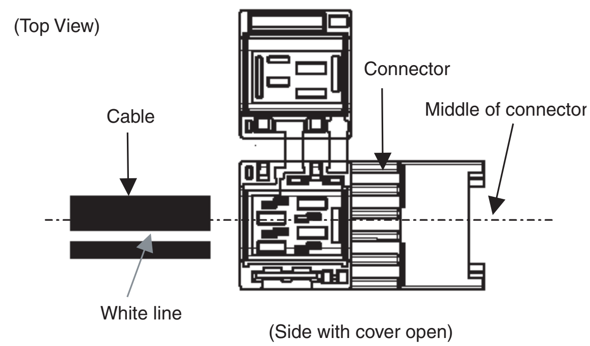
A stopper must be set in advance when extending a line or connecting a Terminating Resistor.

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

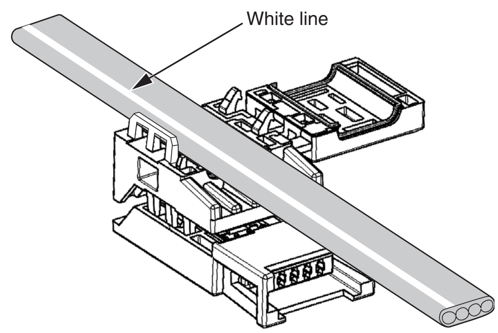


■ Attaching the Cable

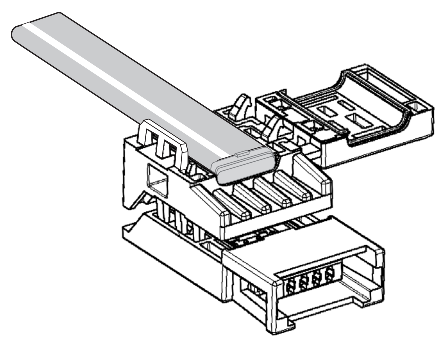
1,2,3... 1. As shown in the diagram below, place the cable so that the white line is in the direction of the side with the open cover, with the white line on the cable facing upward.



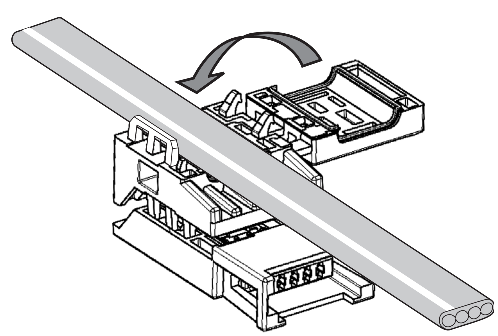
T-branch Connections



Line Extensions and Terminating Resistor Connections



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



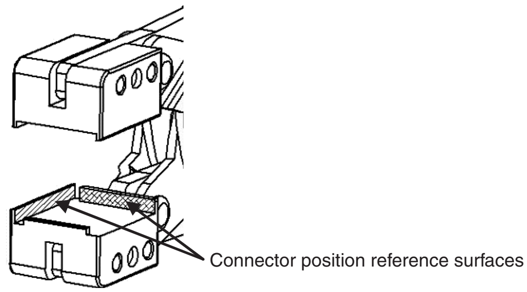
Note When extending the cable or connecting it to a Terminating Resistor, make sure that the end of the cable is inserted all the way to the cable stopper so that it will not be pulled out.

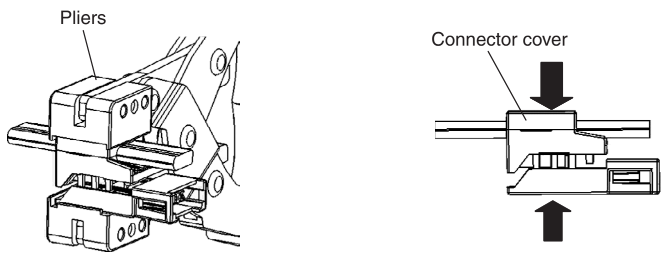
■ Pressure-welding the Connector

Use the DWT-A02 Pliers to pressure-weld the connector.

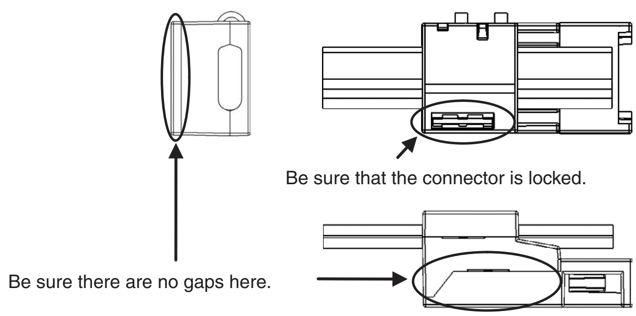
1,2,3...
1. Set the connector on the pressure-welding block of the crimping tool.

   As shown below, align the center (see arrows) of the connector cover with the center of the pressure-welding block on the Pliers.



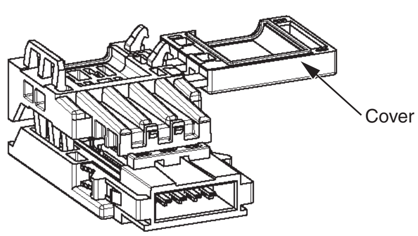


2. Squeeze firmly on the Pliers until the lock on the connector clicks into place.
3. After attaching the cable, confirm that it is properly pressure-welded as shown below.



Preparing DCN5-BR4 Flat Connector Plugs

Component Names



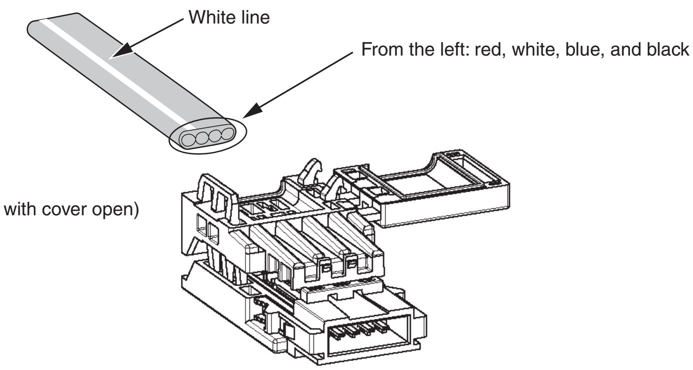
■ Cutting the Cable

Cut the cable perpendicular to the length.

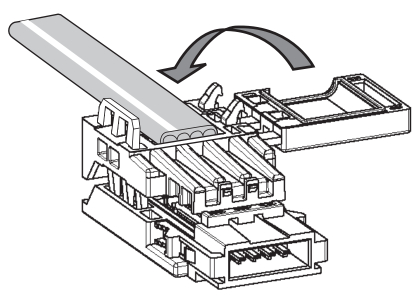
To prevent short-circuits, cut the cable with a sharp blade, such as wire cutters, and be sure that there are no whiskers on the wires.

■ Attaching the Cable

1,2,3... 1. As shown in the diagram below, place the cable so that the white line is in the direction of the side with the open cover, with the white line on the cable facing upward.



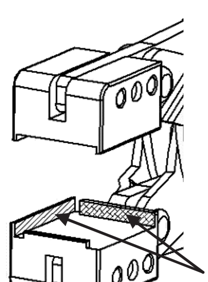
2. Hold the cable so that it does not move and close the cover.

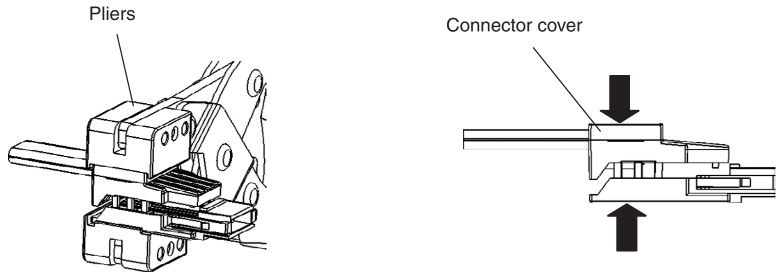


■ Pressure-welding the Connector

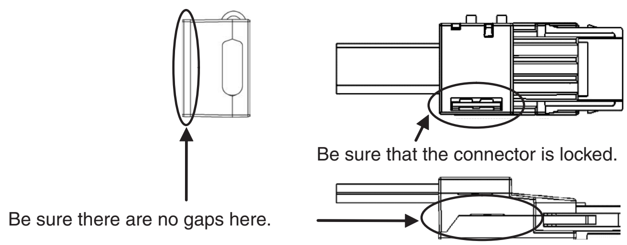
Use the DWT-A02 Pliers to pressure-weld the connector.

1,2,3... 1. As shown below, align the center (see arrows) of the connector cover with the center of the pressure-welding block on the Pliers.





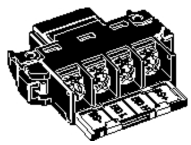
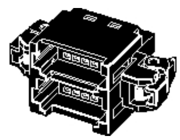
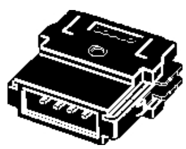
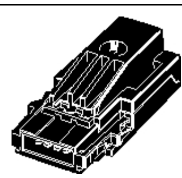
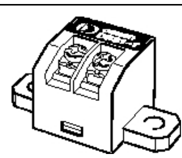
2. Squeeze firmly on the Pliers until the lock on the connector clicks into place.
3. After attaching the cable, confirm that it is properly pressure-welded as shown below.



3-4 Connecting Cables and Terminating Resistor

This section describes how to connect Flat Cable I/II or round cable I/II to Slave Units, Repeater Units, and Terminating Resistors, and how to extend or branch the cables.

Peripheral Devices Used

Name	Appearance	Model	Application
Open Type Connector (for connecting Units)		DCN4-TB4	Converts the Unit's communications connector into a screw terminal block to enable connecting round cable I or round cable II to a Slave Unit or Repeater Unit.
Relay terminal block	---	Commercially available	Used for T-branching round cable I or round cable II.
Multidrop Connector		DCN4-MD4	Used to connect Slave Units or Repeater Units to trunk lines, sub-trunk lines, or branch lines by using multidrop connections.
Terminating Resistor		DCN4-TM4	This is a Connector-type Terminating Resistor for Flat Cable I and round cable II. It is connected to a DCN4-TR4 Flat Connector Socket at the end of a trunk line or sub-trunk line.
Terminating Resistor		DCN5-TM4	This is a Connector-type Terminating Resistor for Flat Cable II. It is connected to a DCN5-TR4 Flat Connector Socket at the end of a trunk line or sub-trunk line.
Terminating Resistor		DRS1-T	This is a Terminal Block-type Terminating Resistor for round cable I. It is connected to the end of a trunk line or sub-trunk line round cable I.

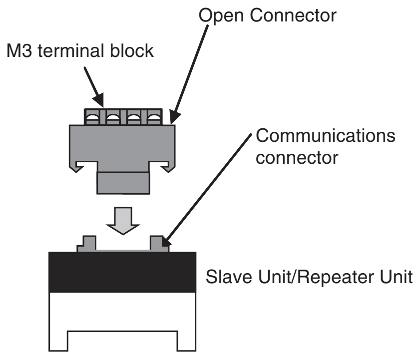
Terminating Resistor Specifications

Type	Connector		Terminal block
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
Accuracy	1% max.	1% max.	---
Capacity between power supply lines	0.01 μF	0.01 μF	---

3-4-1 Connecting Communications Cable to Slave Units and Repeater Units

Connecting Round Cable I/II

The DCN4-TB4 Open Type Connector is used to convert the communications connector on the Slave Unit or Repeater Unit to a terminal block (M3) for connecting the cable wires.

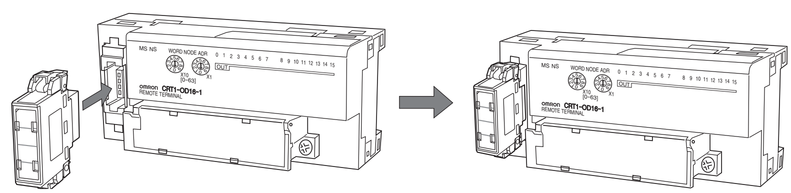


Installation Method

1,2,3...

1. Attach the Open Type Connector to the communications connector of the Slave Unit or Repeater Unit.

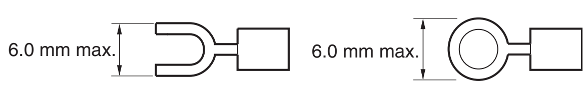
   Orient the Open Type Connector so that the side with the open terminals is facing to the left and press in the Open Type Connector until it clicks into place.

   Note To remove the Open Type Connector once it has been attached, firmly press in on the latches on both sides and pull out the Open Type Connector.

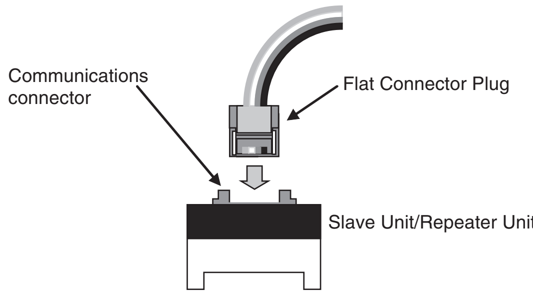
2. Open the terminal cover of the Open Type Connector and connect the cable wires to BDH (communications data high) and BDL (communications data low) in the terminal block. For round cable II, connect the cable wires to BS+ (communications power supply plus) and BS- (communications power supply minus).

Note Before connecting the cable wires to the terminal block, first attach the M3 crimp terminals shown below to the wires.



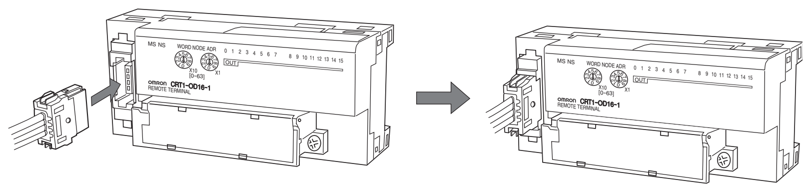
Connecting Flat Cable I

A DCN4-BR4 Flat Connector Plug attached to a Communications Cable is connected to the communications connector of a Slave Unit or Repeater Unit.



Installation Method

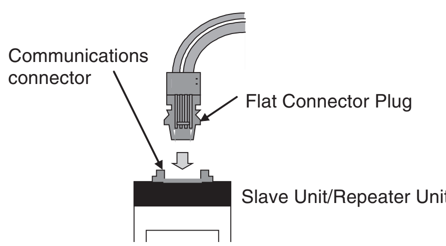
Be sure the face of the Connector on which line colors are indicated (red, white, black, and blue) is facing to the left and press in the Connector until it clicks into place.



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

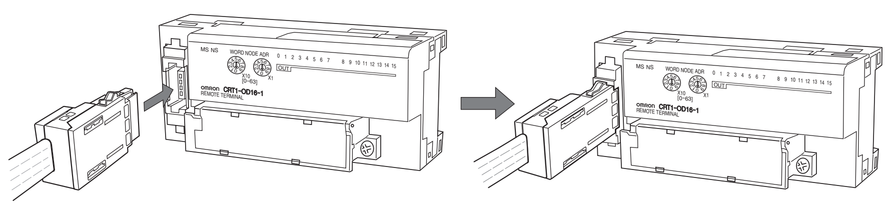
Connecting Flat Cable II

A DCN5-BR4 Flat Connector Plug attached to a Communications Cable is connected to the communications connector of a Slave Unit or Repeater Unit.



Installation Method

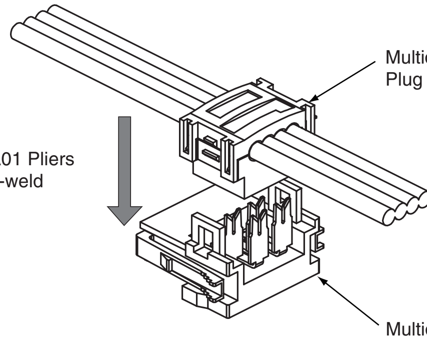
Orient the Connector so that the white line on the cable is facing to the left and press in the Connector until it clicks into place.



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

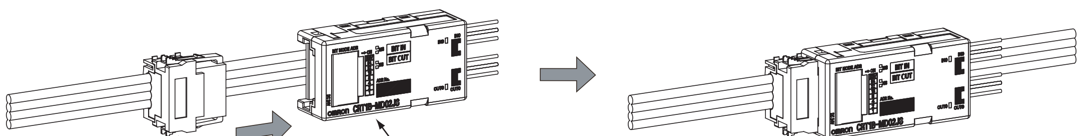
Connecting Flat Cable I for Bit Slave Units with Compact Connectors

Connect a DCN4-MR4 Flat Multidrop Connector to a Flat Cable I cable. For details, refer to *Preparing and Connecting DCN4-MR4 Multidrop Connectors* on page 67.



■ **Mounting Method**

Align the Multidrop Connector Plug with the communications connector on the Bit Slave Unit with a Compact Connector and press it in until it clicks into place.



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

Flat Cable II

Flat Cable II cannot be used for multidrop connections.

3-4-2 Branching Communications Cables

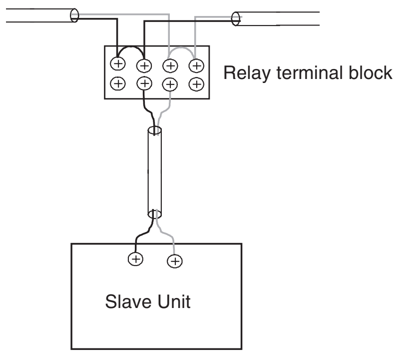
There are two methods that can be used to branch the trunk line, sub-trunk lines, and branch lines: T-branches and multidrop connections.

T-branches

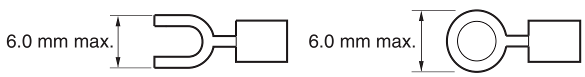
Using Round Cable I/II

Connect the cable wires by using a commercially available relay terminal block.

Example: Round cable I

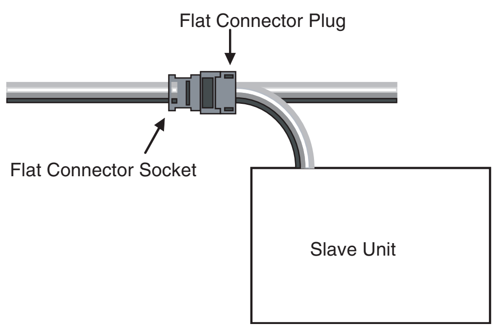


Note Before connecting the cable wires to the terminal block, first attach the M3 crimp terminals shown below to the wires.



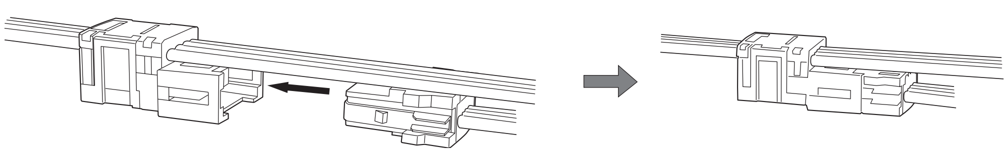
Using Flat Cable I

Attach a DCN4-BR4 Flat Connector Plug to the DCN4-TR4 Flat Connector Socket connected to Communications Cable.



■ Installation Method

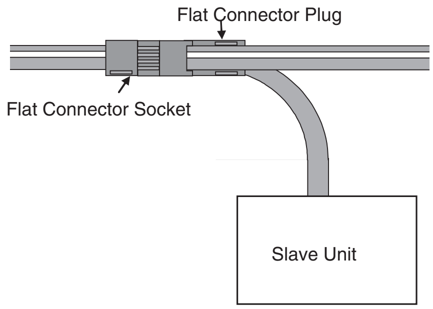
Be sure the surface of the Flat Connector Plug on which line colors are indicated (red, white, black, and blue) is facing downward and press in the Connector until it clicks into place.



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

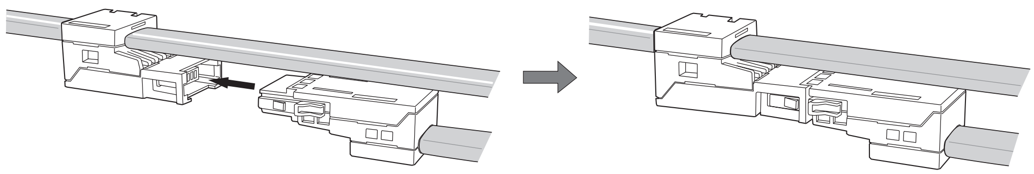
Using Flat Cable II

Attach a DCN5-BR4 Flat Connector Plug to the DCN5-TR4 Flat Connector Socket connected to Communications Cable.



■ **Installation Method**

Place the Flat Connector Plug so that the white line on the cable is facing downward and press in the Connector until it clicks into place.



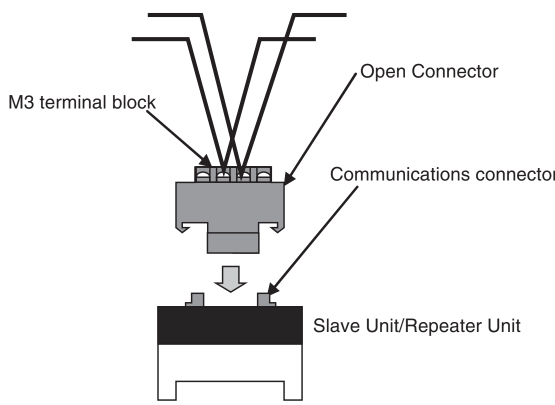
Note To remove a Connector once it has been attached, press in firmly on the latches on both sides of the front of the Connector and pull it out.

Multidrop Connections

Using Round Cable I/II

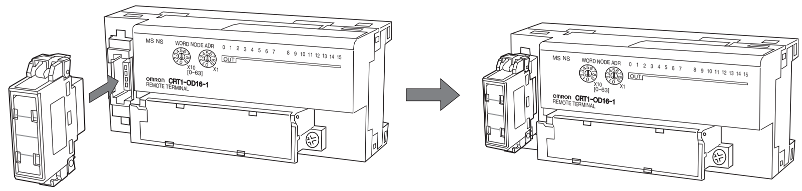
The DCN4-TB4 Open Type Connector is used to convert the communications connector on the Slave Unit or Repeater Unit to a terminal block (M3) for connecting the cable wires.

Example: Round cable I



■ Connection Method

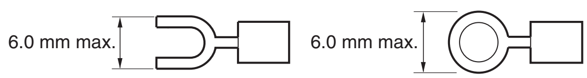
1,2,3... 1. Orient the Open Type Connector so that surface with the open terminals is facing to the left and press in the Open Type Connector until it clicks into place.



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

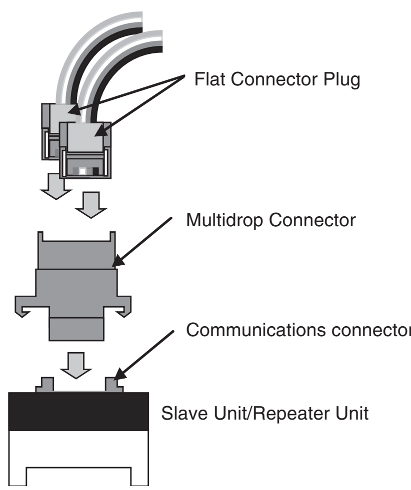
2. Open the terminal cover of the Open Type Connector and connect the cable wires to BDH (communications data high) and BDL (communications data low) in the terminal block. For round cable II, connect the cable wires to BS+ (communications power supply plus) and BS- (communications power supply minus).

Note Before connecting the cable wires to the terminal block, first attach the M3 crimp terminals shown below to the wires.



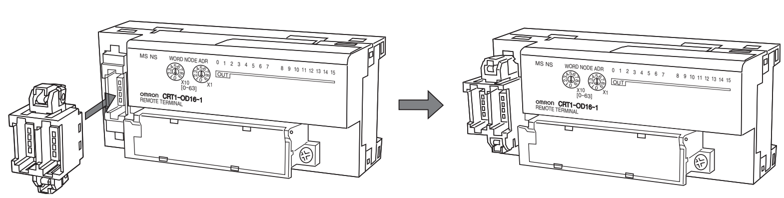
Using Flat Cable I

Attach a DCN4-MD4 Multidrop Connector to the communications connector of the Slave Unit or Repeater Unit, and then attach two DCN4-BR4 Flat Connector Plugs that are already connected to Communications Cables.

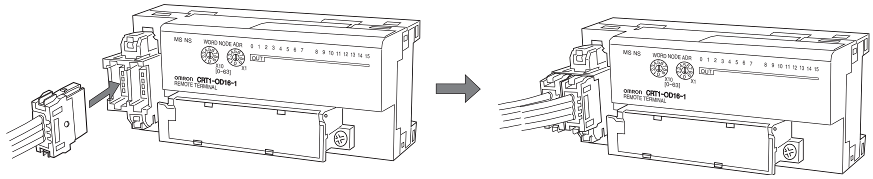


■ Installation Method

1,2,3... 1. Place the Multidrop Connector so that the surface with the printed number is facing to the left and press in the Connector until it clicks into place.



2. Be sure the surfaces of the two Flat Connector Plugs on which line colors are indicated (red, white, black, and blue) are facing to the left and press in the Connectors until they click into place.

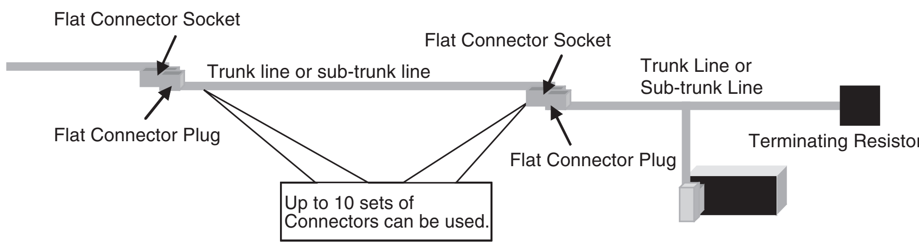


Note To remove a Connector once it has been attached, press in on the latches on both sides of the Connector and pull it out.

Using Flat Cable II Branching is not possible using multidrop connections.

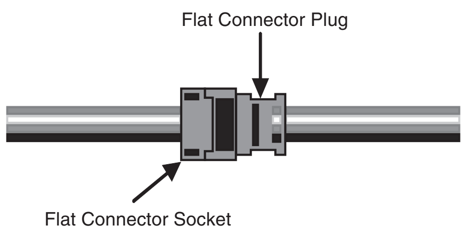
3-4-3 Extending Communications Cables

The cable length for the trunk line, sub-trunk lines, branch lines, and sub-branch lines can be extended by up to 10 levels by using Flat Connectors. The maximum extendable length, however, is the maximum trunk line length. (Refer to *2-3-3 Maximum Distance and Number of Connected Units for Types of Communications Cables*.)

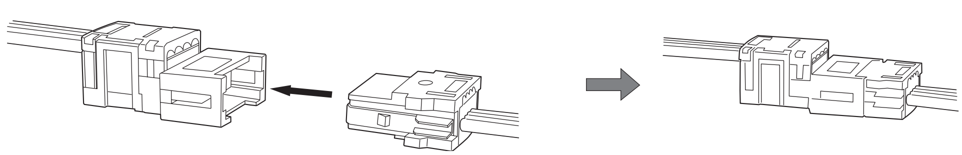


Flat Cable I

Attach a DCN4-BR4 Flat Connector Plug to a DCN4-TR4 Flat Connector Socket connected to Communications Cable.



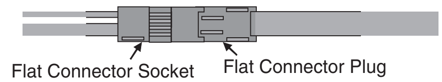
Installation Method Be sure the surface of the Flat Connector Plug on which line colors are indicated (red, white, black, and blue) is facing downward and press in the Connector until it clicks into place.



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

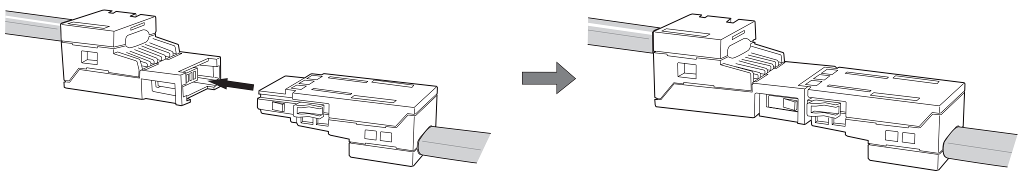
Flat Cable II

Attach a DCN5-BR4 Flat Connector Plug to a DCN5-TR4 Flat Connector Socket connected to Communications Cable.



Installation Method

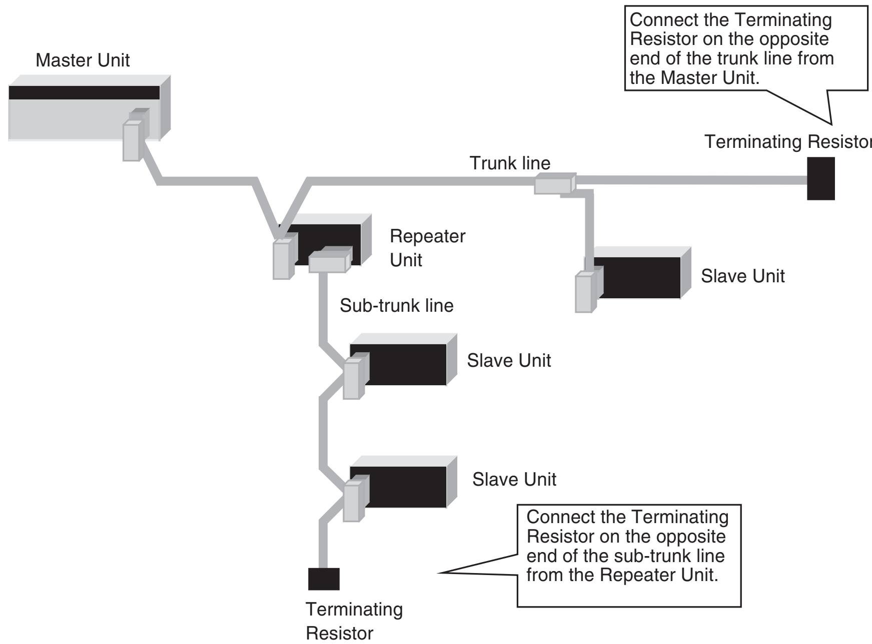
Orient the Flat Connector Plug so that the white line on the cable is facing downward and press in the Connector until it clicks into place.



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

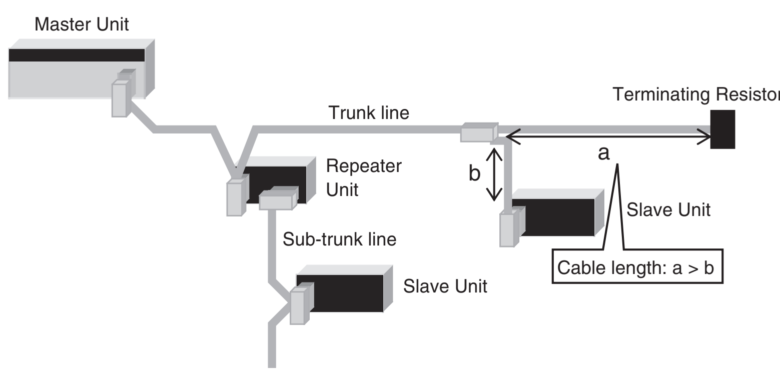
3-4-4 Connection Locations for Terminating Resistor

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



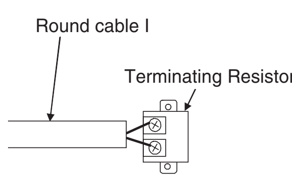
Note (1) Do not connect the Terminating Resistor at the same end of the cable as the Master Unit or Repeater Unit.

(2) When the cable is branched at the locations shown in the figure below, connect the Terminating Resistor at the end of the line so that the length of a is greater than b.



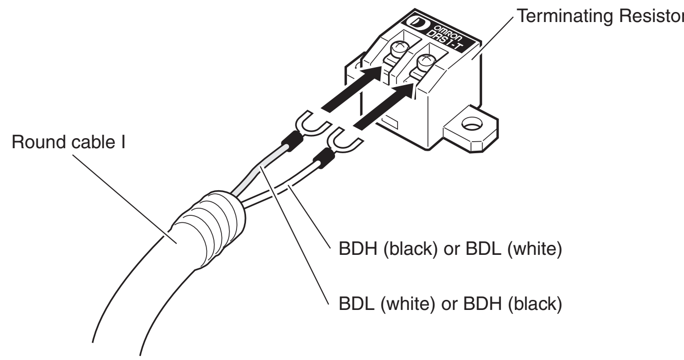
Round Cable I

Connect the cable wires to a DRS1-T Terminating Resistor.

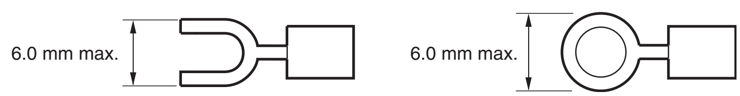


Connection Method

Connect the cable wires to the Terminating Resistor and tighten the screws. The Terminating Resistor has no polarity, so either wire can be connected to either terminal regardless of the color.

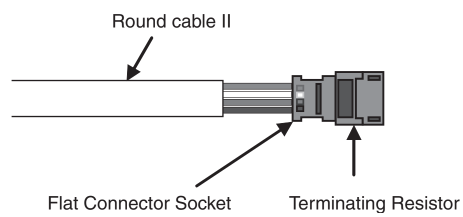


Note Before connecting the cable wires to the Terminating Resistor, first attach the M3 crimp terminals shown below to the wires.



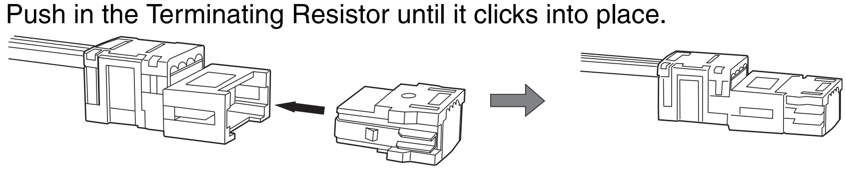
Round Cable II

Attach a DCN4-TM4 Terminating Resistor to the DCN4-TR4 Flat Connector Socket connected to the cable.



Connection Method

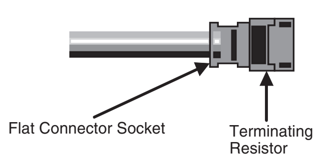
Push in the Terminating Resistor until it clicks into place.



Note To remove a Terminating Resistor once it has been connected, press in on the latches on both sides and pull it out.

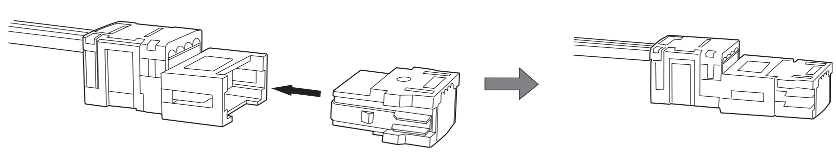
Flat Cable I

Attach a DCN5-TM4 Terminating Resistor to the DCN5-TR4 Flat Connector Socket connected to Communications Cable.



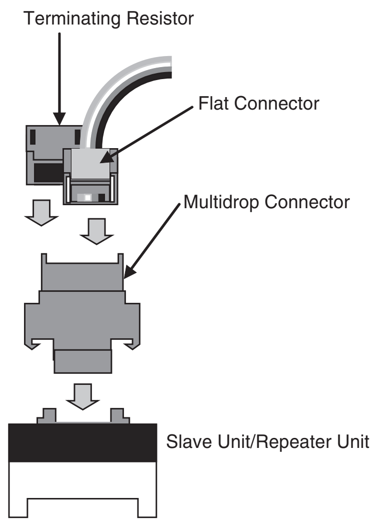
Installation Method

Push in the Terminating Resistor until it clicks into place.



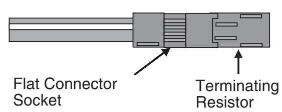
Note To remove a Terminating Resistor once it has been connected, press in on the latches on both sides and pull it out.

When using a multidrop connection for branching a Slave Unit or Repeater Unit, the Terminating Resistor can be directly connected to the Multidrop Connector that is connected to the Unit. (This is only possible when Flat Cable I is used.)



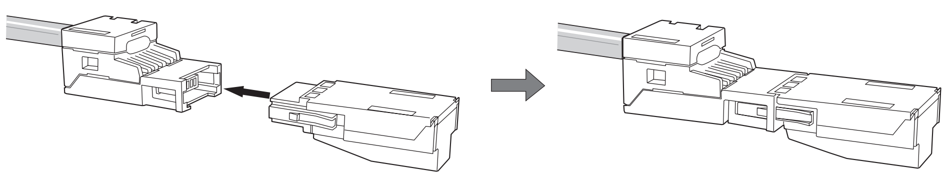
Flat Cable II

Attach a DCN5-TM4 Terminating Resistor to the DCN5-TR4 Flat Connector Socket connected to Communications Cable.



Installation Method

Push in the Terminating Resistor until it clicks into place.



Note To remove a Terminating Resistor once it has been connected, press in on the latches on both sides and pull it out.

3-5 Power Supply Wiring

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

- Communications power supply: Used for communications with individual Units and for internal circuit operations of Units.
- I/O power supply: Used for I/O operations for Units with external I/O.

The method for supplying communications power and I/O power depends on the types of cable and Slave Unit that are used. The differences are shown in the following table.

Slave Unit classification according to power supply method	Cable type	Communications power supply	I/O power supply
Multi-power supply	Round cable I	Supplied to Units individually.	Supplied to individual Units separately from the communications power supply.
	Round cable II Flat Cable I/II	Supplied through the Communications Cable by supplying power to the Master Unit.	
Network power supply	Round cable I	Cannot be used.	
	Round cable II Flat Cable I/II	The communications power supply and the I/O power supply are provided together through Communications Cable.	

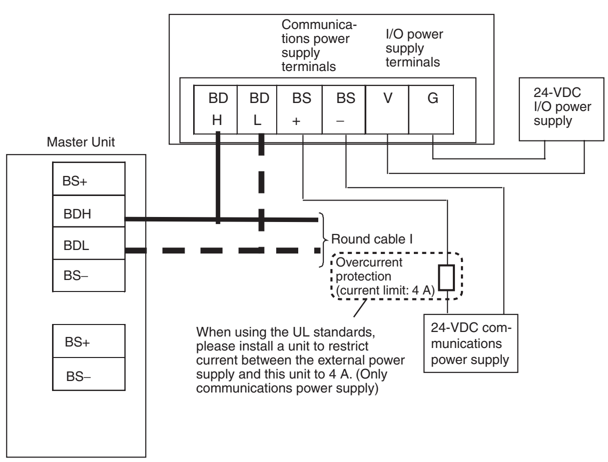
Multi-power Supply Slave Units

Using Round Cable I

- Communications Power Supply

  Supply power to the power supply terminals of the communications connectors of individual Units (or to the PORT1 connector for Repeater Units).
- I/O Power Supply

  Supply I/O power to the I/O power supply terminals of individual Units, separately from the communications power supply. To prevent noise, be sure to use separate power supplies for I/O and communications.



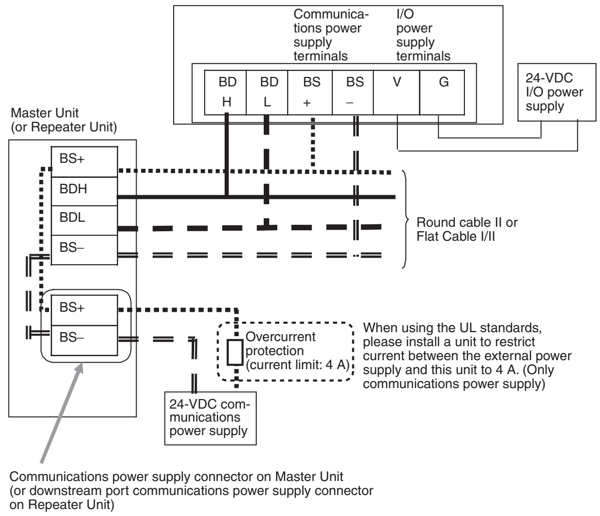
Using Round Cable II or Flat Cable I/II

- Communications Power Supply

  Supply communications power to the Master Unit's communications power supply connector (or to the downstream port communications power supply connectors on Repeater Units).

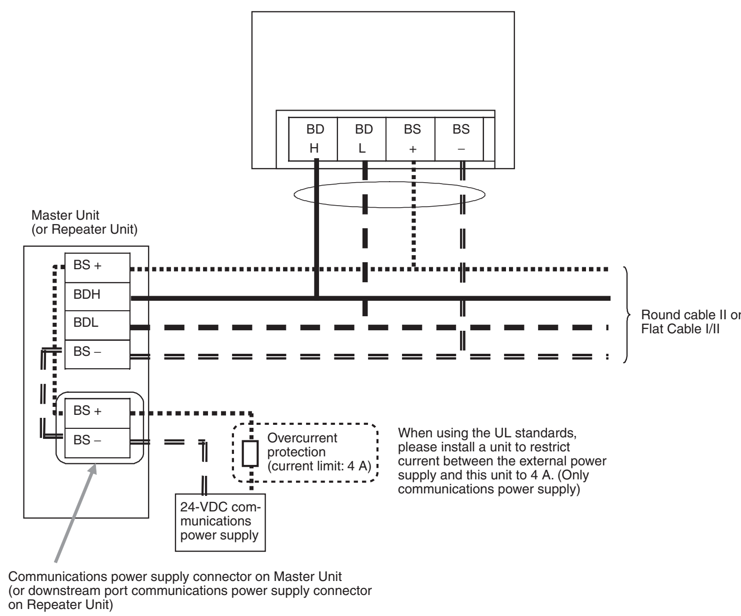
- I/O Power Supply

  Supply I/O power to the I/O power supply terminals of individual Units, separately from the communications power supply.



Network Power Supply Slave Units

These Units use the same set of power supply terminals for both communications and I/O power, so there is no need to provide separate power supplies. (Bit Slave Units are sold with a Flat Cable already attached.) The common communications and I/O power supply is provided to the Master Unit's communications power supply connector (or to the downstream port communications power supply connectors on Repeater Units).



3-5-1 Power Supply Specifications

Use a communications power supply that meets the following specifications.

Item	Specification
Output voltage	24 VDC ±10%
Output ripple	600 mVp-p

Item	Specification
Output current	Use a power supply that equals or 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 current consumption of their external I/O
Insulation	Between output and AC power and between output and chassis ground

An OMRON S82-series Power Supply for the communications power supply for CompoNet Slave Units is recommended.

Note (1) For network power supply Slave Units, the external I/O power supply 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)

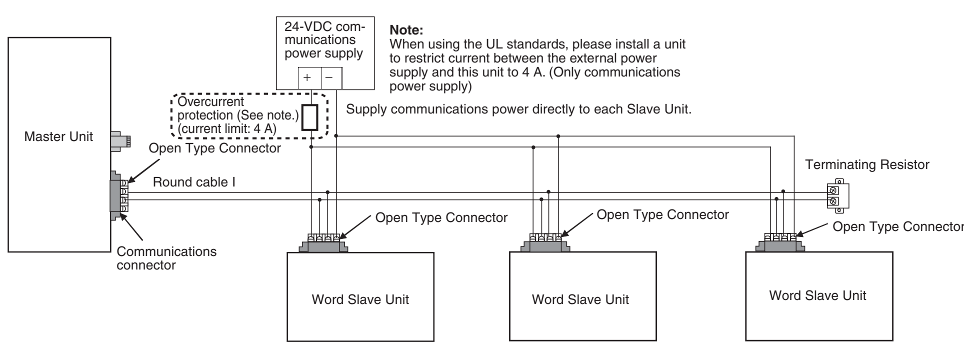
(2) Use a power supply with sufficient capacity considering the inrush current at startup.

For details on current consumption for each Unit, refer to *Appendix C Current Consumption Summary*.

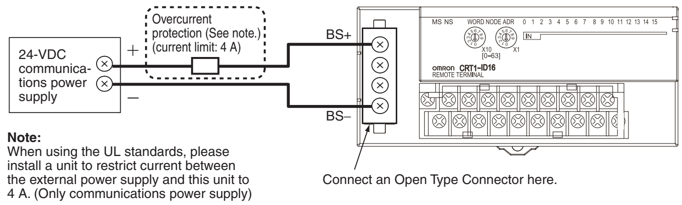
3-5-2 Connection Locations for Communications Power Supplies

Round Cable I

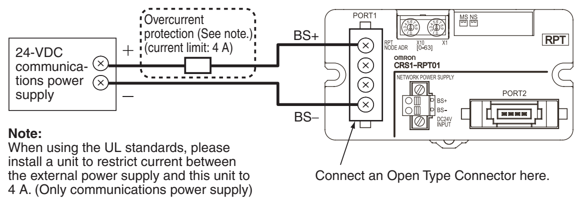
A 24-VDC power supply is connected individually to each Slave Unit. Power does not need to be supplied to the Master Unit.



Before connecting the power supply, first connect a DCN4-TB4 Open Type Connector to the communications connector to convert it to a screw terminal block.

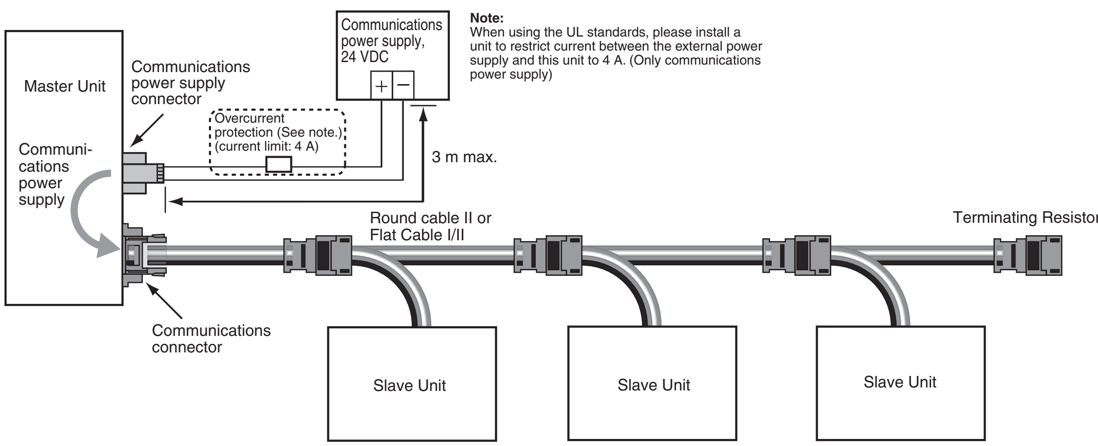


When using a Repeater Unit, supply power through the BS+ and BS– terminals of the Repeater Unit's PORT1 connector.

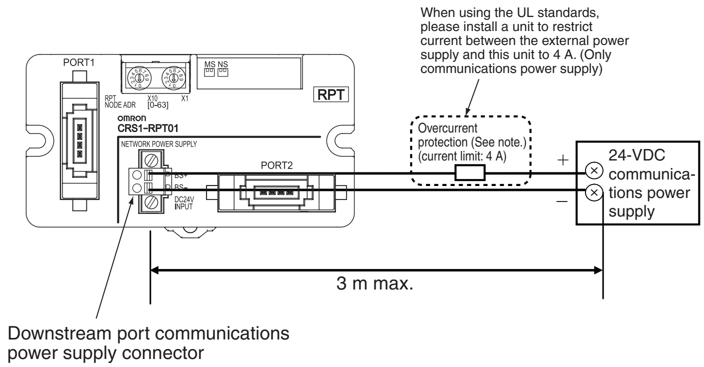


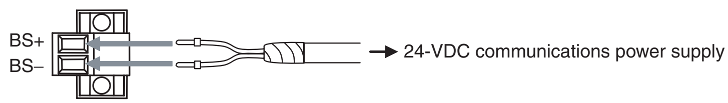
Round Cable II or Flat Cable I/II

Connect a 24-VDC power supply to the Master Unit's communications power supply connector (BS+ and BS–). This provides communications power to each Slave Unit and Repeater Unit connected by round cable II or Flat Cable I/II. Connect only one communications power supply for the trunk line. The cable between the communications power supply and the communications power supply connector must be no longer than 3 m.



When Repeater Units are used, communications power to sub-trunk lines is supplied by the downstream port communications power supply connectors (BS+ and BS–) of the Repeater Units. The cable between the communications power supply and the communications power supply connector must be no longer than 3 m.





Recommended Ferrules The following ferrules are recommended for the communications power supply cable.

Product number	Applicable power cable size	Crimping tool	Manufacturer
AI0,5-10 WH	0.5 mm (AWG20)	CRIMPFOX UD6 (Product No. 1204436) or CRIMPTFOX ZA3 series	Phoenix Contact
H0.5/16 orange	0.5 mm (AWG20)	Crimper PZ1.5 (Product No. 900599)	Weidmuller

The following screwdriver is recommended for use when removing ferrules.

Product number	Manufacturer
XW4Z-00C	OMRON

3-5-3 Connecting the I/O Power Supply

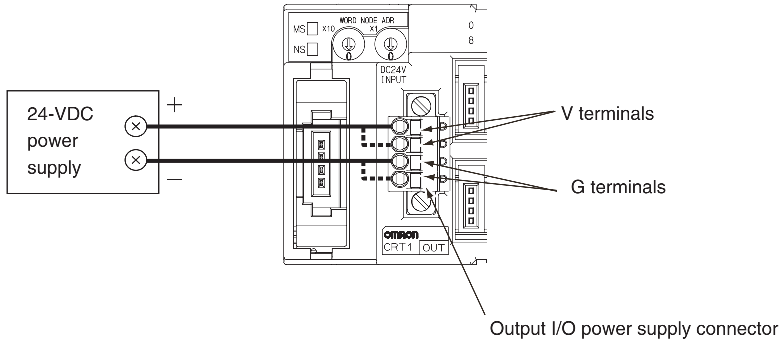
Provide a 24-VDC I/O power supply to the I/O terminals of all Slave Units (multi-power supply models). For details on connections, refer to *3-6 Connecting External I/O for Slave Units*.

Connection to output I/O power supply connector (only for digital I/O slave unit (e-CON connector type))

Output Units and I/O Units with e-CON connectors have output I/O power supply connectors for supplying I/O power to external devices. A 24-VDC power supply is provided using the following method.

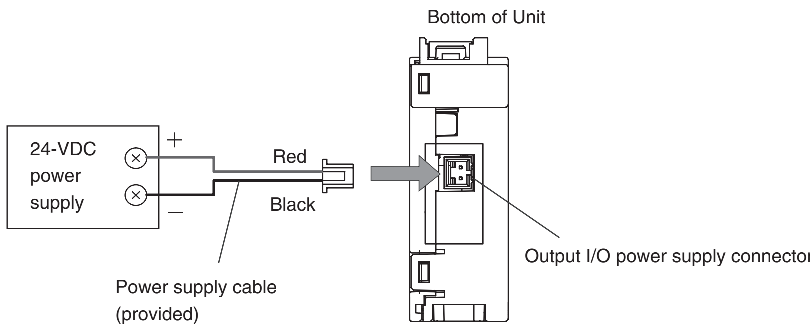
Units with e-CON Connectors (CRT1-OD□□S(-1), MD□□S(-1), OD□□SH(-1), and MD□□SH(-1))

Connect the 24-VDC power supply line to the V terminal and G terminal of the output I/O power supply connector.



Units with e-CON Connectors (CRT1-VOD08S(-1))

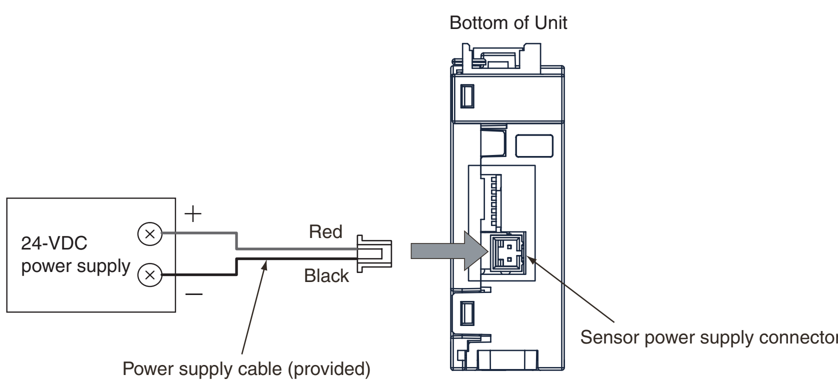
Peel back the coating on the included power supply cable and connect it to the 24-VDC power supply, then attach the power supply cable connector to the output I/O power supply connector on the bottom of the unit.



Connection to the connector for the sensor power supply connector (for CRT1-VAD04S only)

E-CON connector type Analog Input Slave Units (CRT1-VAD04S) are equipped with a sensor power supply connector for supplying of power to the connected sensor.

Peel back the coating on the included power supply cable and connect the wires to the 24-VDC power supply, then attach the power supply cable connector to the sensor power supply connector on the bottom of the unit.



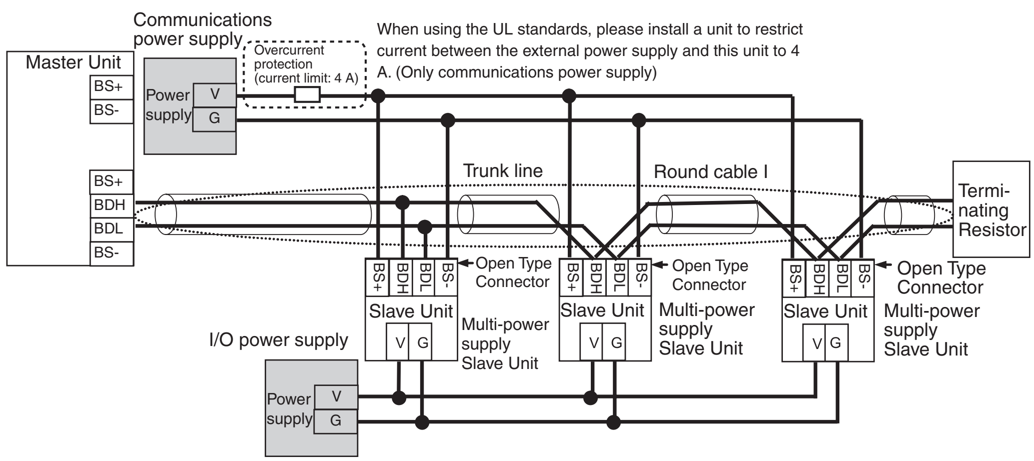
3-5-4 Connecting the Communications and I/O Power Supplies

Round Cable I

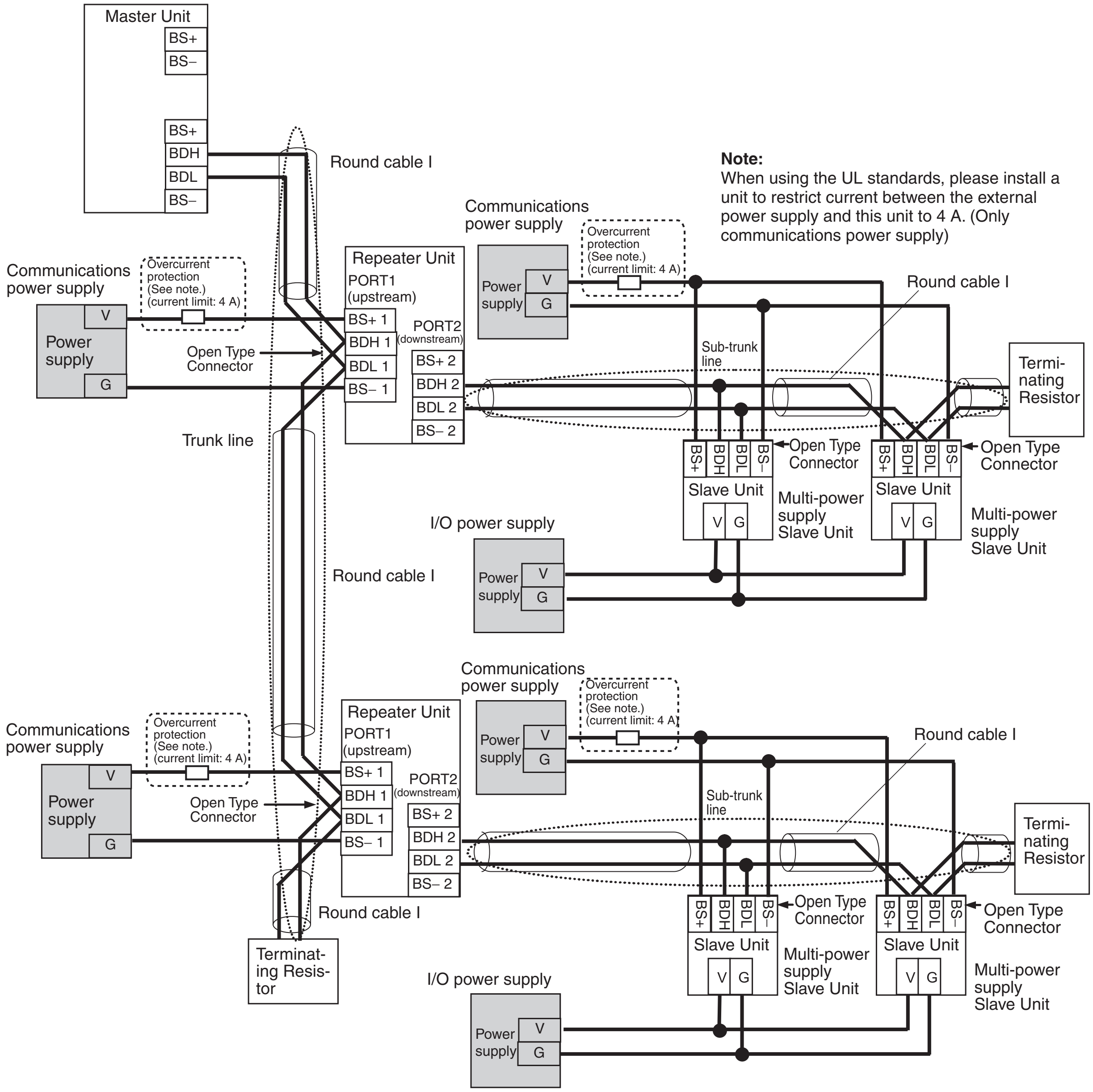
When round cable I is used, the communications power cannot be supplied through the communications cable. The communications power must be supplied to each Slave Unit and Repeater Unit through separate lines. For Slave Units that require power for I/O (i.e., multi-power supply Slave Units), the I/O power must also be supplied separately.

There is no need to provide an external communications power supply for the Master Unit.

Not Using a Repeater Unit



Using Repeater Units



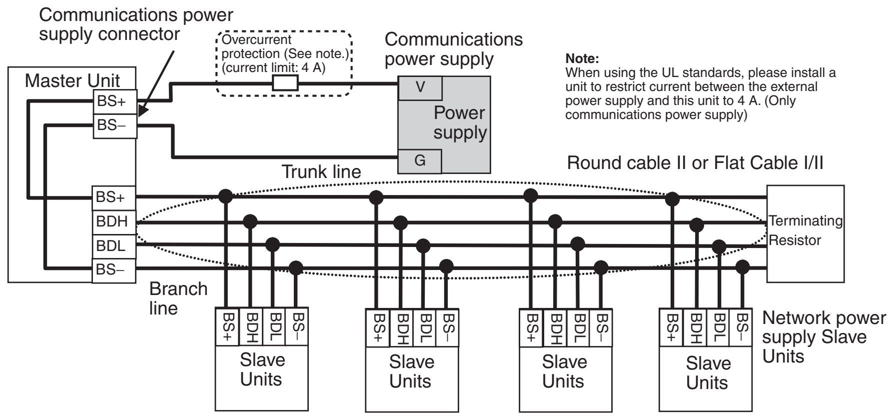
Note The I/O power supply to multi-power supply Slave Units may be a source of noise depending on the connected devices. Even when supplying the communications power supply together to all Slave Units, use a separate I/O power supply so that noise does not affect the network.

Using Round Cable II or Flat Cable I/II

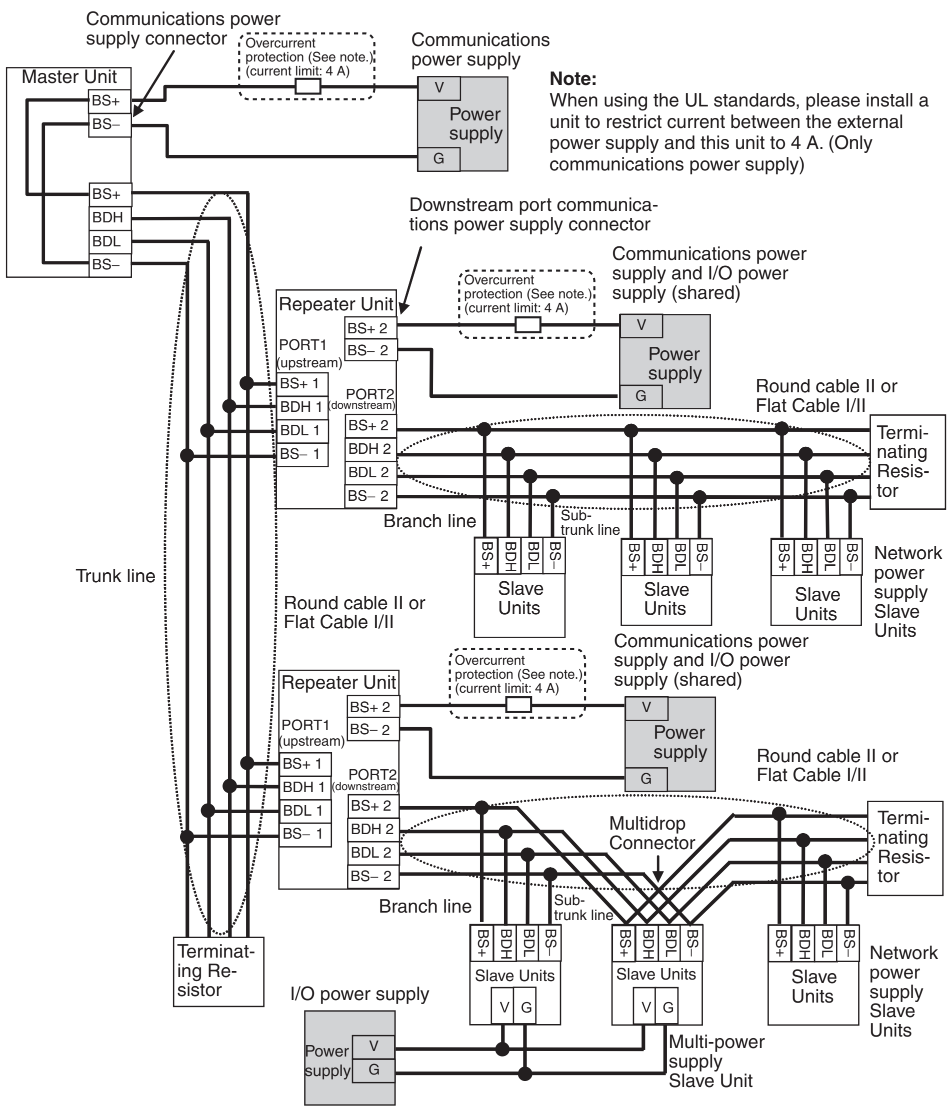
When round cable II or Flat Cable I/II is used, the Slave Unit communications power is supplied through the Flat Cable I/II. There is no special wiring required to provide the communications power supply to individual Slave Units. The same communications power supply is shared for the entire trunk line or sub-trunk line.

For Slave Units requiring an I/O power supply (i.e., multi-power supply Slave Units), however, I/O power must be supplied separately.

Not Using Repeater Unit



Using Repeater Units



Note (1) 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 communications may not be possible.

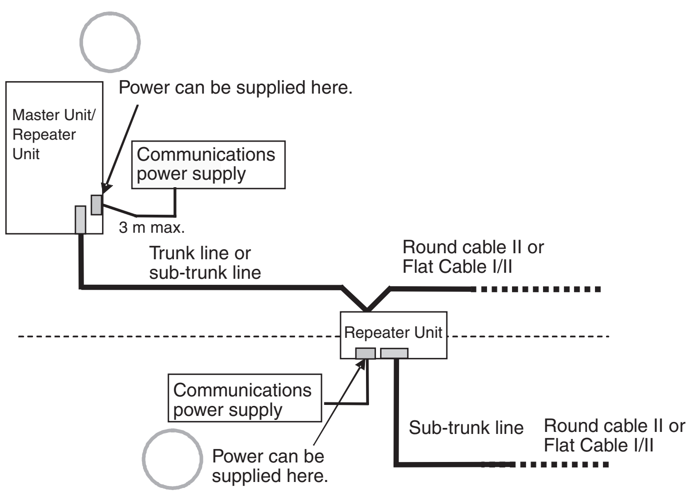
(2) Do not supply communications power to the trunk line and a sub-trunk line or to two sub-trunk lines from the same power supply. Also do not supply communications power to two or more CompoNet systems from the same power supply. The quality of communications will decrease and normal remote I/O communications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

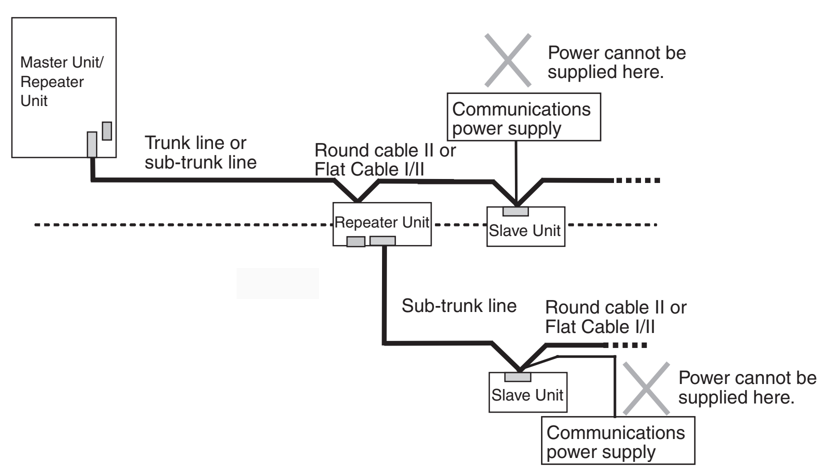
(3) The I/O power supply to multi-power supply Slave Units may be a source of noise depending on the connected devices. Even when supplying the communications power supply together to all Slave Units, use a separate I/O power supply so that noise does not affect the network.

Restrictions

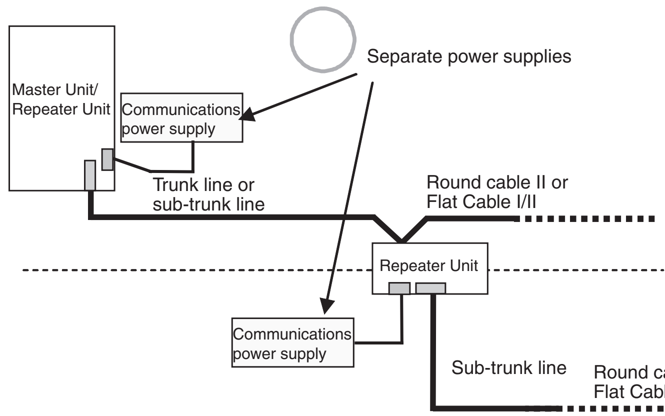
The following restrictions apply when supplying communications power through Round Cable II or Flat Cable I/II.

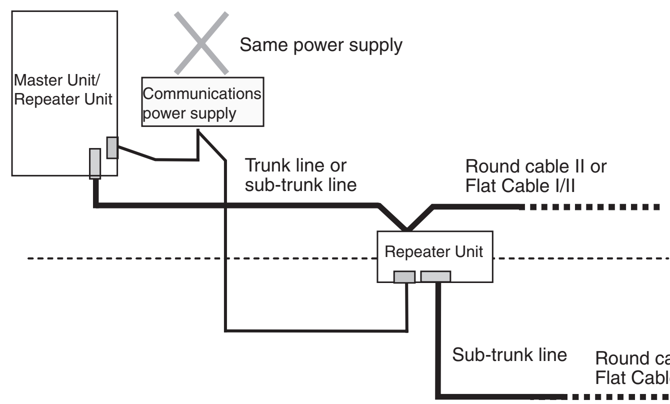
- The communications power supply can be connected at only one location for the trunk line and one location each for the sub-trunk lines.
- Communications power to the trunk line can be supplied only through the communications power supply connector on the Master Unit. Communications power to a sub-trunk 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 Master Unit 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).

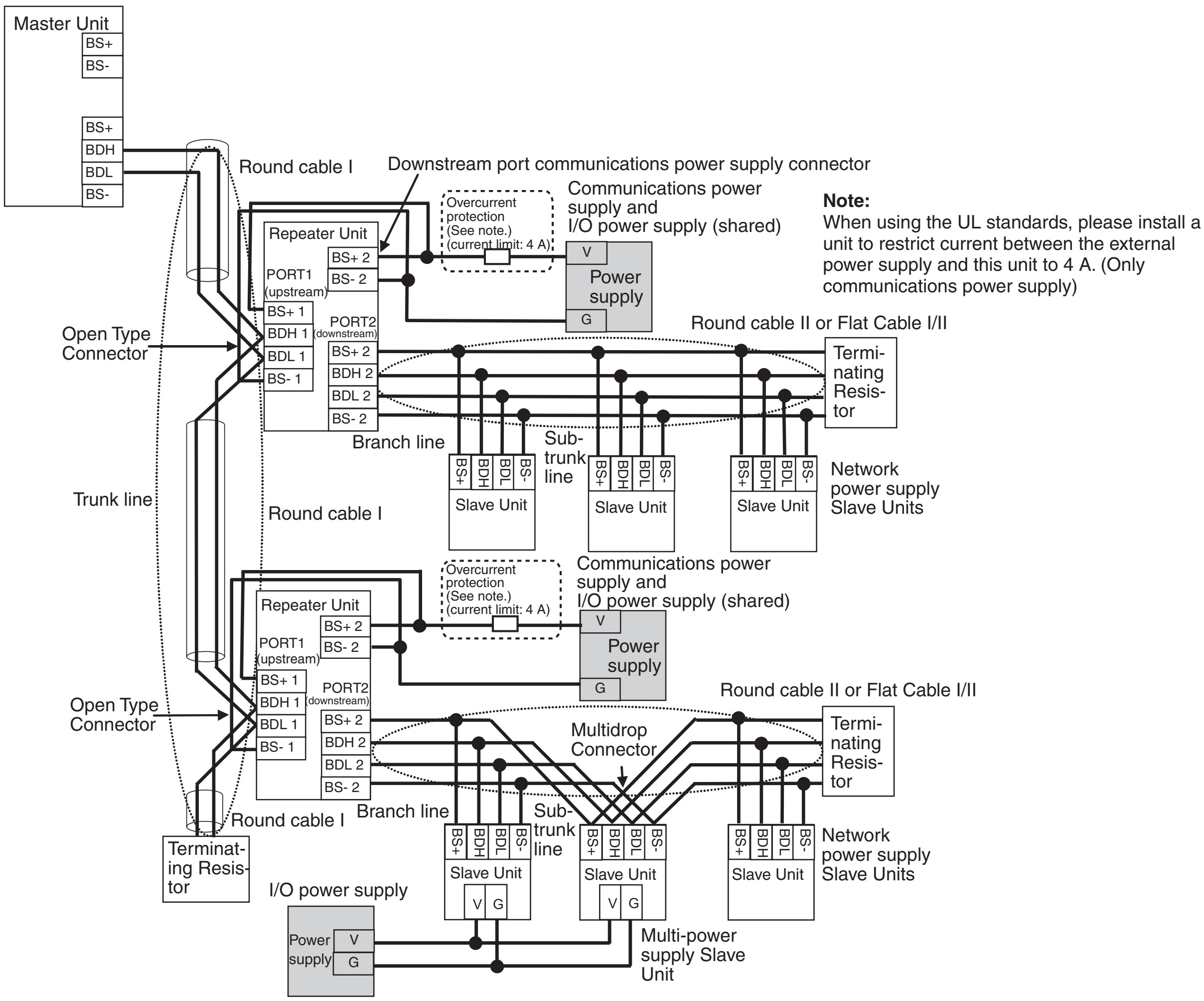




Transmission quality will not be maintained and communications errors may occur if this restriction is not observed.

Using Round Cable I and Round Cable II or Flat Cable I/II Together

One or more Repeater Units can be used in a CompoNet Network to use both round cable I and round cable II, or round cable I and Flat Cable I/II under the same Master Unit.



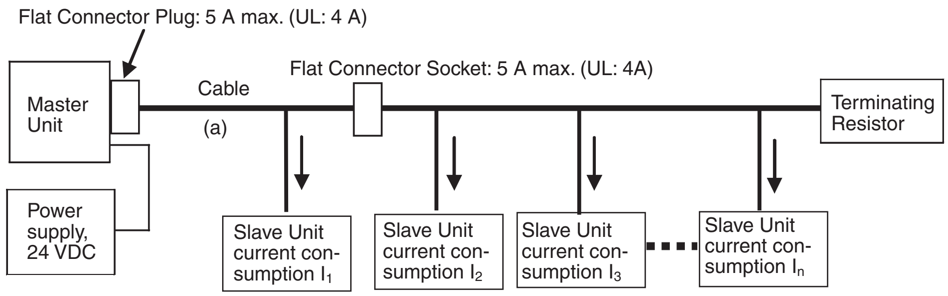
Note The I/O power supply to multi-power supply Slave Units may be a source of noise depending on the connected devices. Even when supplying the communications power supply together to all Slave Units, use a separate I/O power supply so that noise does not affect the network.

3-5-5 Precautions when Supplying Communications Power

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. Exceeding the allowable current may result in heating or burnout of the cables or connectors.



The allowable currents for cables and connectors are given below.

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, Flat Connector Sockets, and Flat Connector Plugs. Do not allow the current flow where these connectors are used to exceed the allowable current.

Name	Model	Allowable current
Communications power supply connectors on CS/CJ-Master Units	CS1W-CRM21	5 A (UL: 4 A)
	CJ1W-CRM21	
Communications power supply connector on Repeater Unit	CRS1-RPT01	
Flat Connector Sockets	DCN4-TR4	
	DCN5-TR4	
Flat Connector Plugs	DCN4-BR4	
	DCN5-BR4	
Multidrop Connector	DCN4-MD4	
Flat Multidrop Connector Plug	DCN4-MR4	

Voltage Drop

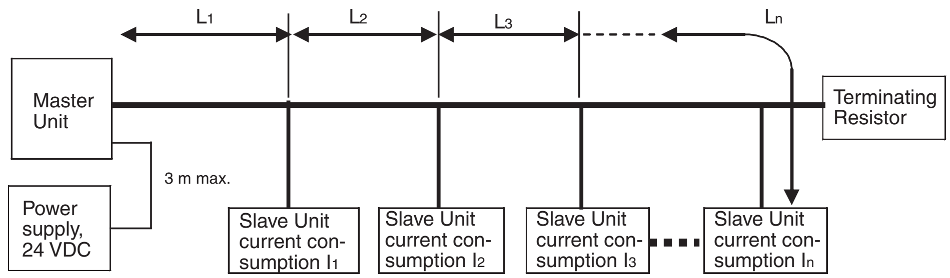
Cable Voltage Drop

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) $\times$ Cable conductor resistance (Ω/m) $\times$ Cable length (m) $\times$ 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 formula:

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

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

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

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

Therefore the length that the cable can be extended is as follows:

$$L\ (m) \leq 200 \div (I_1 + I_2 + I_3 + \ldots + I_n) \ldots \text{For Flat Cable}$$

3-5-6 Precautions when Providing 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.

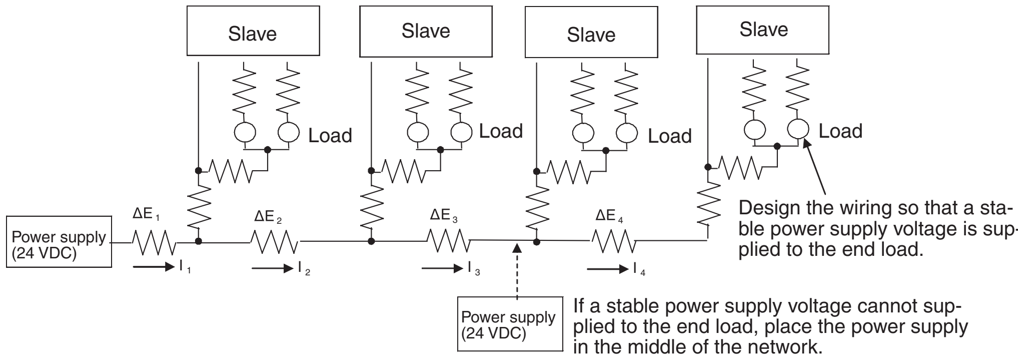
Supplying I/O Power from One Source

When supplying I/O power to the entire system from one source, the power consumed by each device and all 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.

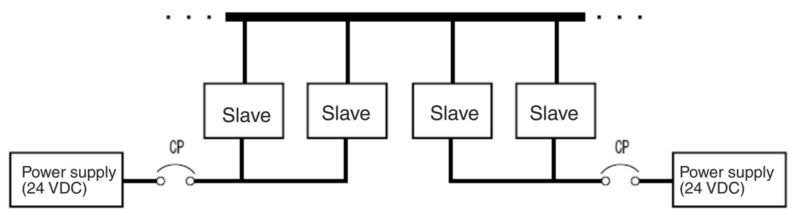
The following measures can be considered to keep the voltage drop within the allowable range when supplying power from one power supply.

- Increase the thickness of the power supply cables.
- Increase the output voltage of the power supply.
- Shorten 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.



3-5-7 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.

3-6 Connecting External I/O for Slave Units

This section describes how to connect external devices, such as sensors, to the I/O terminals of Slave Units. The connection method varies depending on the type of Slave Unit that is used. The following table shows the differences in external I/O connection methods according to the Slave Unit.

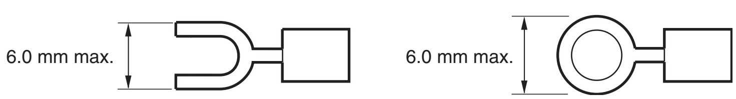
Name		Model	I/O connection method
Digital I/O Slave Units	With 2-tier Terminal Block	CRT1-ID08(-1)	Screw terminal block (M3)
		CRT1-OD08(-1)	
		CRT1-ID16(-1)	
		CRT1-OD16(-1)	
		CRT1-MD16(-1)	
		CRT1-ROS08	
		CRT1-ROF08	
		CRT1-ROS16	
		CRT1-ROF16	
	With 3-tier Terminal Block	CRT1-ID08TA(-1)	
		CRT1-OD08TA(-1)	
		CRT1-ID08TAH(-1)	
		CRT1-OD08TAH(-1)	
		CRT1-ID16TA(-1)	
		CRT1-OD16TA(-1)	
		CRT1-MD16TA(-1)	
		CRT1-ID16TAH(-1)	
		CRT1-OD16TAH(-1)	
		CRT1-MD16TAH(-1)	
	With e-CON Connectors	CRT1-VID08S(-1)	e-CON connector
		CRT1-VOD08S(-1)	
		CRT1-ID16S(-1)	
		CRT1-OD16S(-1)	
		CRT1-MD16S(-1)	
		CRT1-ID16SH(-1)	
		CRT1-OD16SH(-1)	
		CRT1-MD16SH(-1)	
		CRT1-ID32S(-1)	
		CRT1-OD32S(-1)	
		CRT1-MD32S(-1)	
		CRT1-ID32SH(-1)	
		CRT1-OD32SH(-1)	
		CRT1-MD32SH(-1)	
	With MIL Connectors	CRT1-VID16ML(-1)	MIL connector
		CRT1-VOD16ML(-1)	
		CRT1-VID32ML(-1)	
		CRT1-VID32ML(-1)	
		CRT1-VMD32ML(-1)	
	With Screw-less Clamp Terminal Blocks	CRT1-ID08SL(-1)	Screw-less clamp terminal block
		CRT1-OD08SL(-1)	
		CRT1-ID16SL(-1)	
		CRT1-OD16SL(-1)	
		CRT1-MD16SL(-1)	

Name			Model	I/O connection method
Analog I/O Slave Units	With 2-tier Terminal Block		CRT1-AD04	Screw terminal block (M3)
			CRT1-DA02	
	With e-CON Connectors		CRT1-VAD04S	e-CON connector
			CRT1-VDA02S	
	With MIL Connectors		CRT1-VAD04ML	MIL connector
			CRT1-VDA02ML	
Temperature Input Units			CRT1-TS04T	Screw terminal block (M3)
			CRT1-TS04P	
Expansion Units			XWT-ID08(-1)	
			XWT-OD08(-1)	
			XWT-ID16(-1)	
			XWT-OD16(-1)	
Bit Slaves	With e-CON Connectors		CRT1B-ID02S(-1)	e-CON connector
			CRT1B-OD02S(-1)	
		IP54	CRT1B-ID02SP(-1)	
			CRT1B-OD02SP(-1)	
			CRT1B-ID04SP(-1)	
	With Screw-less Clamp Terminal Blocks	IP54	CRT1B-MD04SLP(-1)	Screw-less clamp terminal block
	Bit Slave Units with Compact Connectors		CRT1B-ID02JS(-1)	XA-series Connector from J.S.T. Mfg
			CRT1B-OD02JS(-1)	
			CRT1B-MD02JS(-1)	
			CRT1B-ID04JS(-1)	
			CRT1B-OD04JS(-1)	
			CRT1B-MD04JS(-1)	

3-6-1 Connecting to a Screw Terminal Block

For Slave Units with screw terminal blocks, attach the following M3 crimp terminals to signal lines and then connect them to the terminal block.

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



Note Mounting and Removing Terminal Blocks
When attaching a terminal block to a Slave Unit with two or three terminal blocks, tighten the mounting screws alternately a little at a time. When removing a terminal block, loosen the mounting screws alternately a little at a time. If you tighten or loosen only one of the screws all the way without tightening or loosening the other screw, the terminal block will warp, possibly causing it to crack.

The following Slave Units have one or two terminal blocks.

Name		Model
Digital I/O Slave Units	Models with 2 terminal blocks	CRT1-ID08(-1) CRT1-OD08(-1) CRT1-ID16(-1) CRT1-OD16(-1) CRT1-MD16(-1) CRT1-ROS08 CRT1-ROF08 CRT1-ROS16 CRT1-ROF16
	Models with 3 terminal blocks	CRT1-ID08TA(-1) CRT1-OD08TA CRT1-ID08TAH(-1) CRT1-OD08TAH(-1) CRT1-ID16TA(-1) CRT1-OD16TA(-1) CRT1-MD16TA(-1) CRT1-ID16TAH(-1) CRT1-OD16TAH(-1) CRT1-MD16TAH(-1)
Analog I/O Slave Units	Models with 2 terminal blocks	CRT1-AD04 CRT1-DA02
Temperature Input Units	---	CRT1-TS04T CRT1-TS04P
Expansion Units	---	XWT-ID08(-1) XWT-OD08(-1) XWT-ID16(-1) XWT-OD16(-1)

3-6-2 Connecting to e-CON Connector Terminals

For Slave Units with e-CON connector terminals, a special cable connector must be attached to an external device cable. Follow the procedure below to attach the connector to the cable.

■ Checking the Cable Connector and Cable Wire Size

The wire size and sheath diameter of applicable cables depend on the type of cable connector. Use the following table to check that the cable connector and external device cable wire size and sheath diameter are compatible.

Tyco Electronics Connectors

Model	Housing color	Applicable wire range	
3-1473562-4	Orange	sheath outer diameter: 0.9 to 1.0 mm	Cross-sectional area: 0.08 to 0.5 mm^2
1-1473562-4	Red	sheath outer diameter: 0.9 to 1.0 mm	
1473562-4	Yellow	sheath outer diameter: 1.0 to 1.15 mm	
2-1473562-4	Blue	sheath outer diameter: 1.15 to 1.35 mm	
4-1473562-4	Green	sheath outer diameter: 1.35 to 1.60 mm	

Sumitomo 3M Connectors

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

Model	Housing color	Applicable wire range
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

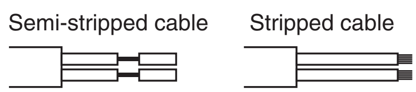
OMRON Connectors

Model	Specification	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.

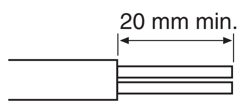
■ Preparing External Device Cables

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.

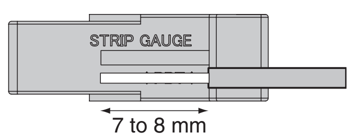


When the cables are prepared this way, a cable connector cannot be attached, so first cut the end and remove the cable sheath as shown in the following diagram. (Do not strip the sheaths of the core wires.)



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 Cable Wires into the Cable Connector

Insert the cable wires of the external device into the cable connector, and connect each wire so that the terminal number on the connector cover matches the wire color as shown in the following table.

- For Digital I/O Slave Unit

Terminal number	Using CRT1-VID08S, CRT1-ID16S(H), CRT1-MD16S(H), CRT1-ID32S(H), CRT1-MD32S(H), CRT1B-ID02S, CRT1B-ID02SP, CRT1B-ID04SP		Using CRT1-VID08S-1, CRT1-ID16S(H)-1, CRT1-MD16S(H)-1, CRT1-ID32S(H)-1, CRT1-MD32S(H)-1, CRT1B-ID02S-1, CRT1B-ID02SP-1, CRT1B-ID04SLP-1	
	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	---	---	---	---

Terminal number	Using CRT1-VID08S, CRT1-ID16S(H), CRT1-MD16S(H), CRT1-ID32S(H), CRT1-MD32S(H), CRT1B-ID02S, CRT1B-ID02SP, CRT1B-ID04SP		Using CRT1-VID08S-1, CRT1-ID16S(H)-1, CRT1-MD16S(H)-1, CRT1-ID32S(H)-1, CRT1-MD32S(H)-1, CRT1B-ID02S-1, CRT1B-ID02SP-1, CRT1B-ID04SLP-1	
	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)
3	Blue (black)	Blue (black)	Blue (black)	---
4	Black (white)	Brown (white)	Black (white)	Blue (black)

Note 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.

- For Analog I/O Slave Unit

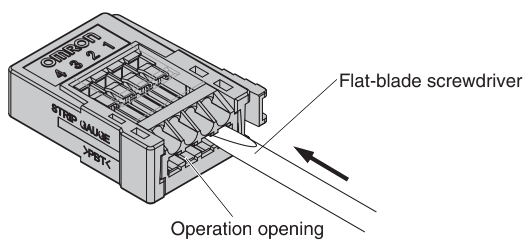
The wire colors differ by external devices. Please see the catalog or manual for the specific external device.

Using Tyco Electronics or Sumitomo 3M Connectors

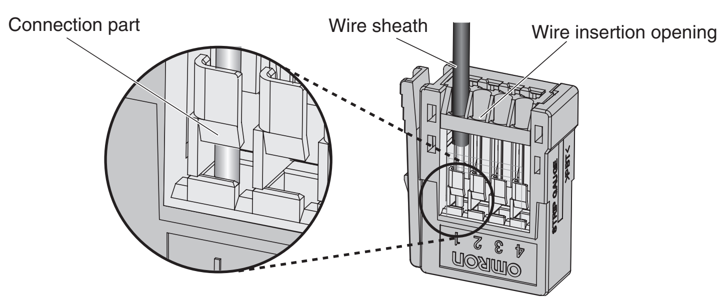
1,2,3...
1. Confirm that the terminal number matches the wire color, and insert each wire all the way into the opening on the cable connector cover.
2. Use a tool, such as a pliers, to push the cover straight in so that it is parallel with the body.

Using OMRON Connectors

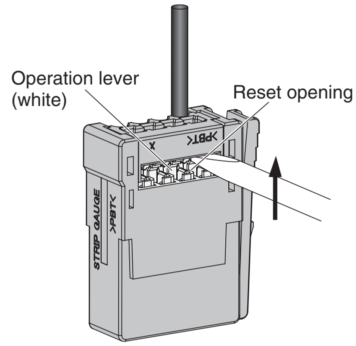
1,2,3...
1. Use a flat-blade screwdriver to push the operation lever inside the connector's operation opening until it locks, as shown in the following diagram.



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

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.

3-6-3 Connecting to MIL Connector Terminals

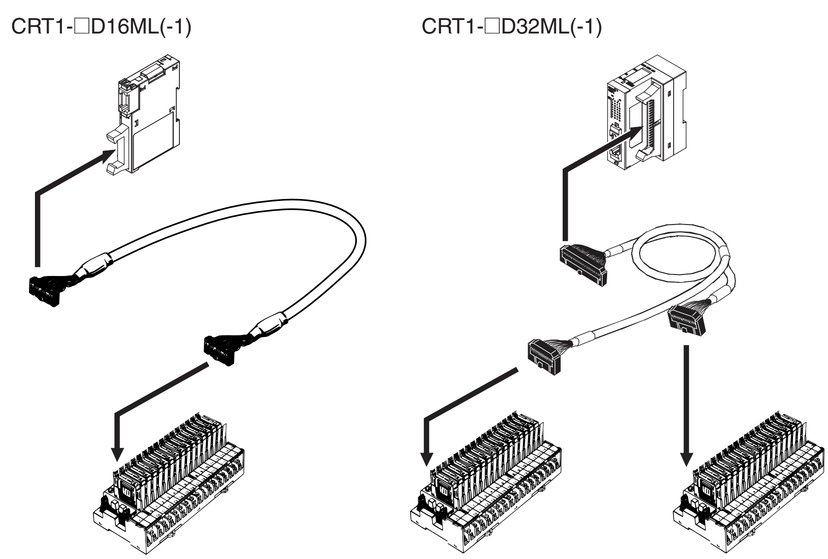
Use any of the following methods to connect to a MIL connector.

- Use an OMRON MIL Cable.
- Pressure-weld a Flat Cable to a MIL Socket.
- Pressure-weld a loose-wire cable to a MIL connector.

Using OMRON MIL Cable

- Connecting Relay Terminals

  The MIL Cables for connecting OMRON Relay Terminals are shown in the following table. Select the appropriate Cable depending on the combination of Remote I/O Terminals and Relay Terminals that are used.



Slave model	MIL Cable model	Connected Relay Terminal	Remarks
CRT1-VID16ML	G79-I□C	G7TC-ID16 G7TC-IA16	---
CRT1-VOD16ML	G79-O□C	G7TC-OC16/OC08 G7OD-SOC16/VSOC16 G7OD-FOM16/VFOM16 G7OA-ZOC16-3 G7OD-SOC08 G7OR-SOC08	---
CRT1-VOD16ML-1	G79-I□C	G7TC-OC16-1	---
	G79-O□C	G7OD-SOC16-1 G7OD-FOM16-1 G7OA-ZOC16-4	
CRT1-VID32ML	G79-I50-25-D1 (50 cm) G79-I75-50-D1 (75 cm)	G7TC-ID16 G7TC-IA16	---
CRT1-VOD32ML	G79-O50-25-D1 (50 cm) G79-O75-50-D1 (75 cm)	G7TC-OC16/OC08 G7OD-SOC16/VSOC16 G7OD-FOM16/VFOM16 G7OA-ZOC16-3 G7OD-SOC08 G7OR-SOC08	---
CRT1-VOD32ML-1	G79-O50-25-D1 (50 cm) G79-O75-50-D1 (75 cm)	G7OD-SOC16-1 G7OD-FOM16-1 G7OA-ZOC16-4	---
	G79-I50-25-D1 (50 cm) G79-I75-50-D1 (75 cm)	G7TC-OC16-1	
CRT1-VMD32ML	G79-M50-25-D1 (50 cm) G79-M75-50-D1 (75 cm)	Inputs: G7TC-ID16 G7TC-IA16 Outputs: G7TC-OC16/ OC08 G7OD-SOC16/ VSOC16 G7OD-FOM16 VFOM16 G7OA-ZOC16-3 G7OD-SOC08 G7OR-SOC08	Inputs and outputs are distinguished by color. Input tube color: Red Output tube color: Yellow
CRT1-VMD32ML-1	G79-M50-25-D2 (50 cm) G79-M75-50-D2 (75 cm)	Inputs: G7OA-ZIM16-5 G7OD-SOC16-1 G7OD-FOM16-1 G7OA-ZOC16-4	Inputs and outputs are distinguished by color. Input tube color: Red Output tube color: Yellow

Connecting to a Connector-Terminal Block Conversion Unit

The following Connector-Terminal Block Conversion Units are available.

For details, refer to the *SYSMAC Selection Guide* (Cat. No. X066).

Type	Series
Slim	XW2D
Through-type	XW2B
With common terminal	XW2C

Type	Series
Three-tier with common terminal	XW2E
Screw-less clamp terminals	XW2F
e-CON connector	XW2N

■ Connecting Loose Wires to Devices

The following table shows the Cables available when the Slave Unit has a MIL connector and the other device has loose wires. Use these Cables as needed.

Slave model	MIL Cable model		Remarks
CRT1-V□D16ML	20 pins	G79-A200C (2 m) G79-A500C (5 m)	Loose wire size: AWG24 Loose wires are cut.
		G79-Y100C (1 m) G79-Y150C (1.5 m) G79-Y200C (2 m) G79-Y300C (3 m) G79-Y500C (5 m)	Forked terminals are attached to the loose wires. Forked terminal: 161071-M2 (Nippon Terminal)
CRT1-V□D32ML	40 pins	G79-A200C-D1 (2 m) G79-A500C-D1 (5 m)	Loose wire size: AWG28 Loose wires are cut.
		G79-Y100C-D1 (1 m) G79-Y200C-D1 (2 m) G79-Y500C-D1 (5 m)	Forked terminals are attached to the loose wires. Forked terminal: 161071-M2 (Nippon Terminal)
CRT1-VDA02ML	10 pins		Indicated cable is not available
CRT1-VAD04ML	16 pins		

The following table shows the MIL connector pin numbers, loose wire colors, dot markings, and dot colors.

20 Pins (G79-A□□□C)

Pin No.	Wire color	Dots	Dot color	Pin No.	Wire color	Dots	Dot color
20	Light brown	■	Black	10	Light brown	■■	Black
19			Red	9			Red
18	Yellow		Black	8	Yellow		Black
17			Red	7			Red
16	Light green		Black	6	Light green		Black
15			Red	5			Red
14	Gray		Black	4	Gray		Black
13			Red	3			Red
12	White		Black	2	White		Black
11			Red	1			Red

20 Pins (G79-Y□□□C)

Pin No.	Wire color	Dots	Dot color	Pin No.	Wire color	Dots	Dot color
1	Light brown	■	Black	11	Light brown	■■	Black
2			Red	12			Red
3	Yellow		Black	13	Yellow		Black
4			Red	14			Red
5	Light green		Black	15	Light green		Black
6			Red	16			Red
7	Gray		Black	17	Gray		Black
8			Red	18			Red
9	White		Black	19	White		Black
10			Red	20			Red

40 Pins

Pin No.	Wire color	Dots	Dot color	Pin No.	Wire color	Dots	Dot color
1	Light brown	■	Black	21	Light brown	■■■	Black
2			Red	22			Red
3	Yellow		Black	23	Yellow		Black
4			Red	24			Red
5	Light green		Black	25	Light green		Black
6			Red	26			Red
7	Gray		Black	27	Gray		Black
8			Red	28			Red
9	White		Black	29	White		Black
10			Red	30			Red
11	Light brown	■■	Black	31	Light brown	■■■■	Black
12			Red	32			Red
13	Yellow		Black	33	Yellow		Black
14			Red	34			Red
15	Light green		Black	35	Light green		Black
16			Red	36			Red
17	Gray		Black	37	Gray		Black
18			Red	38			Red
19	White		Black	39	White		Black
20			Red	40			Red

Pressure-welding a Flat Cable to a MIL Socket

To make your own connecting cable by pressure-welding the flat cable to the MIL socket, use the components shown in the table below and follow the directions.

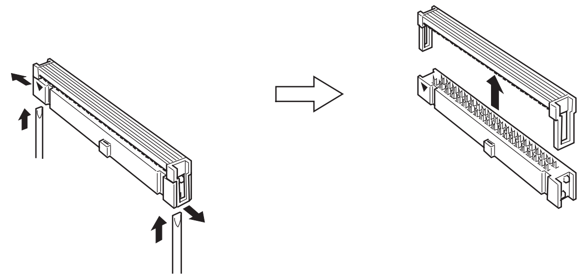
- Required Components

Number of connector pins	Model	
10 pins	No polarity guide	XG4M-1031-T
	Uses polarity guide	XG4M-1030-T
16 pins	XG4M-1630-T	
20 pins	XG4M-2030-T	
40 pins	XG4M-4030-T	

- Procedure

1,2,3...

1. Using a fine flat-bladed screwdriver, open the hooks at both ends of the MIL Socket and separate the contact side and the cover side. There are two latches at each end of the Socket (i.e., the contact side, and altogether four laches). Release the bottom laches on both sides at the same time, and then release the upper two. Do not attempt to release two latches on one side without releasing the latches on the other side.

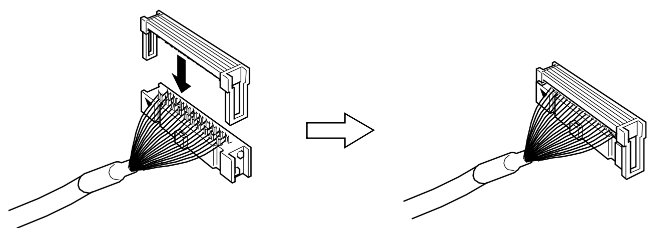


2. Insert the Flat Cable between the separated Socket sides, line it up with the contacts, align the contact side with the cover side, and lock them in place. Use an object such as a vise to firmly press them together until they mesh with the latches.

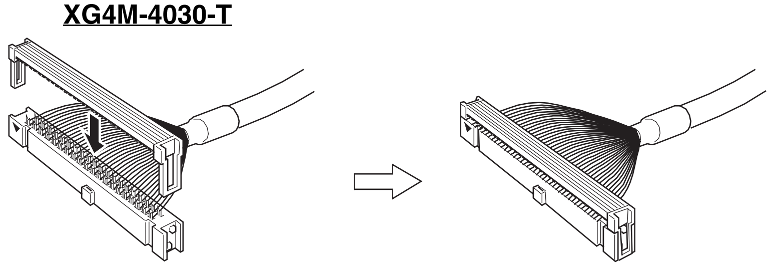
   Applicable wires for pressure-welding: 1.27-mm pitch Flat Cable (7-strand)

   - UL2651 (Standard cable)
   - UL20012 (Folding cable)
   - UL20028 (Color-coded cable)

XG4M-1031-T/1030-T/1630-T/2030-T

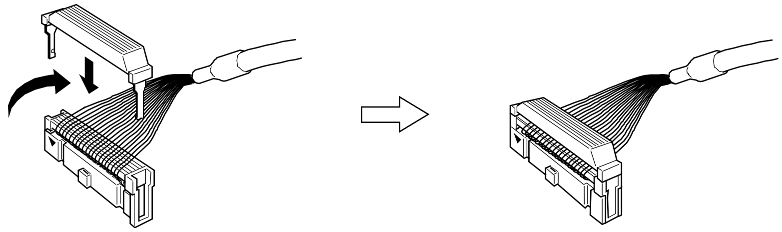


XG4M-4030-T

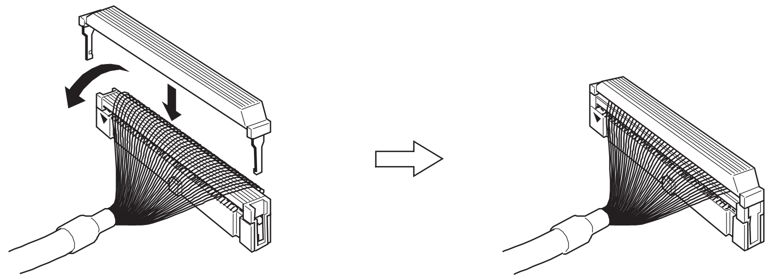


3. Bend back the cable as required, insert a Strain Relief, and lock the cable in place.

XG4M-1031-T/1030-T/1630-T/2030-T



XG4M-4030-T



Pressure-welding a Loose-wire Cable to a MIL Connector.

To prepare a connecting cable by pressure-welding a loose-wire cable to a MIL connector, assemble the connector from the components shown in the following table.

10-pin Cable

Component		Wire size: AWG24	Wire size: AWG28 to AWG26
Socket	No polarity guide	XG5M-1031-N	XG5M-1034-N
	Uses polarity guide	XG5M-1032-N	XG5M-1035-N
Semi-cover (See note.)		XG5S-0501	

16-pin Cable

Component	Wire size: AWG24	Wire size: AWG28 to AWG26
Socket	XG5M-1632-N	XG5M-1635-N
Semi-cover (See note.)	XG5S-0801	

20-pin Cable

Component	Wire size: AWG24	Wire size: AWG28 to AWG26
Socket	XG5M-2032-N	XG5M-2035-N
Semi-cover (See note.)	XG5S-1001	
Hood Cover	XG5S-2012	

40-pin Cable

Component	Wire size: AWG24	Wire size: AWG28 to AWG26
Socket	XG5M-4032-N	XG5M-4035-N
Semi-cover (See note.)	XG5S-2001	
Hood Cover	XG5S-4022	

Note Two Semi-covers are required per connector.

For details on individual components, refer to the *Connectors Group Catalog* (Cat. No. G015).

Note When using a DCN4-MD4 Multidrop Connector to branch a Communications Cable, bind together the loose wires where the cable comes out of the Hood Cover. Wire the Communications Cable and loose-wire cable so that they do not interfere with each other.

3-6-4 Connecting to Screw-less Clamp Terminal Blocks

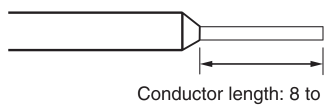
For Slave Units with screw-less clamp terminal blocks, the terminal blocks can be easily wired by inserting pin terminals. Follow the procedure below to connect the external device cable to a screw-less clamp terminal block.

■ Applicable Pin Terminals

When wiring an external device cable to a screw-less clamp terminal block, special pin terminals must be placed on the cable wires. The applicable pin terminals are listed in the following table.

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

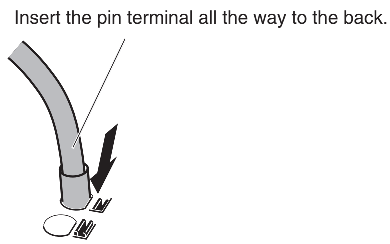
The pin terminal conductor should be about 8 to 10 mm in length.



■ Wiring to the Screw-less Clamp Terminal Block

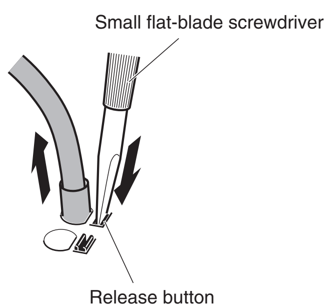
Inserting Pin Terminals

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



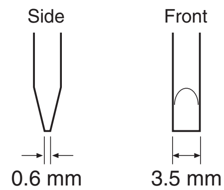
Removing Pin Terminals

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.



The following screwdriver is recommended for removing pin terminals.

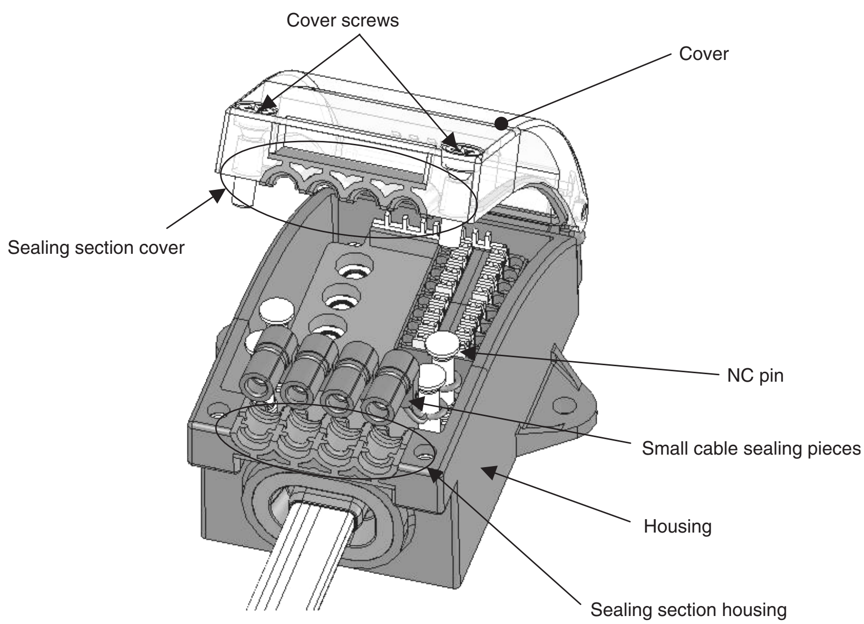
Model	Manufacturer
SD0.6 × 3.5 × 100 Flat-blade Screwdriver	Weidmuller Co. Ltd.



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

3-6-5 Connecting External I/O to IP54 Bit Slave Units

Components



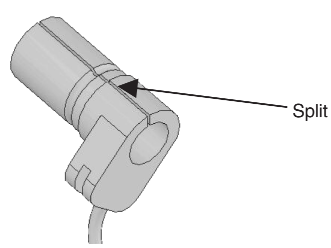
External I/O is connected to e-CON connector terminals or screw-less clamp terminals inside the housing. Connected external I/O cables are passed through the sealing.

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.

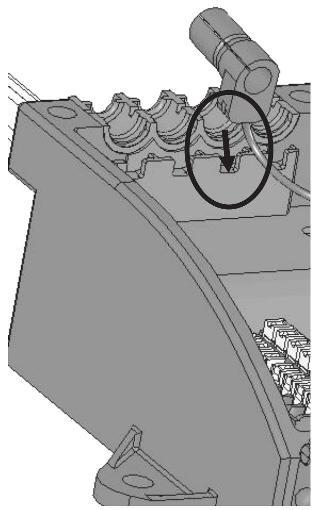
Applicable Cables

The range of outer diameters of cables that can be connected is 2.2 to 6.3 mm. When the diameter is within the range of 2.2 to less than 3.6 mm, then the sealing section for small-diameter cables must be attached.



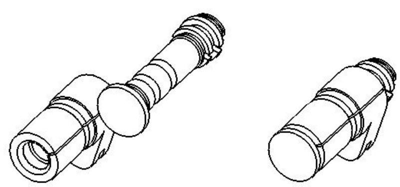
Installation Method

1,2,3...
1. Expand the split in the sealing piece and insert the cable.
2. 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, close the cover and tighten the cover screws.

The tightening torque is 0.8 to 1.0 N·m.

3-6-6 Connecting to Compact Connectors

The compact connectors use XA-series Connectors from JST Mfg. Co., Ltd. Special cable connectors must be attached for cables connecting to external devices if a Slave Unit with Compact Connectors is used.

XA-series Connectors from J.S.T. Mfg.

Name	Applicable cable range			Model	Crimping Tool
	mm^2	AWG#	Wire sheath external diameter		
Contacts	0.08 to 0.33	28 to 22	1.2 to 1.9	SXA-001T-P0.6	YC692 or YC692R
	0.22 to 0.5	24 to 20	1.5 to 1.9	SXA-01T-P0.6	YRS701 to YC701R

Name	Model
Housing	XAP-03V-1

Note (1) Automated Crimp Tools are also available. For details, contact the manufacturer.

(2) For information on the processing procedure, refer to the instruction manual included with the tool or contact the manufacturer (JST Mfg. Co., Ltd.).

SECTION 4
Basic Specifications of Slave Units

This section provides the basic specifications of the Slave Units.

4-1 Basic Specifications of Slave Units

This section gives the specifications that are the same for all Slave Units. For specifications that vary with the Slave Unit, refer to the section for each Slave Unit.

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 Mbps, 3 Mbps, 1.5 Mbps, 93.75 kbps
Modulation	Base-band
Coding	Manchester code
Error control	Manchester code rules, CRC
Communications media	The following media can be used. • Round cable I • Round cable II • Flat Cable I • Flat Cable II **Note** Round cable I, round cable II, Flat Cable I, and Flat Cable II are all different types of cable. To use more than one type of cable at a time, Repeater Units must be used to separate them on trunk lines and 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 inputs 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 per segment	32 nodes (including Repeater Units)
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 or Repeater Units.
Connection forms	Round cable II or Flat Cable I/II at baud rate of 93.75 kbps: 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, 2 kV (power line).
Vibration resistance	10 to 60 Hz with double-amplitude of 0.7 mm, 60 to 150 Hz and 50 m/s^2 in X, Y, and Z directions for 80 min each
Shock resistance	150 m/s^2 (3 times each in 6 directions on 3 axes)
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)
Terminal block screw tightening torque (See note.)	M3 wiring screws: 0.5 N·m M3 mounting screws: 0.5 N·m
Installation	Mounting with 35-mm DIN Track, M4 screws, or Mounting Brackets (depending on model)

Note Applicable only to Slaves to which screw terminal blocks are mounted.

Some of the specifications are different for the CRT1-ROS08/ROS16 (with relay outputs) and the CRT1-ROF08/ROF16 (with SSR outputs). For details, refer to *5-3-8 Sixteen-point Output Units (2-tier Terminal Block with Relay Outputs)* and *5-3-9 Sixteen-point Output Units (2-tier Terminal Block with SSR Outputs)*.

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).

NS (Network 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 switch settings. An EEPROM checksum error has occurred.
	Not lit.	Power OFF/Startup	The power supply is OFF, the Unit is being reset, or the Unit is being initialized.

Name	Indicator status	Node/communications status	Meaning
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 address is set out of range. 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/Baud rate not yet detected.	The power supply is OFF or the baud rate has not been detected.

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

SECTION 5
Digital I/O Slave Units

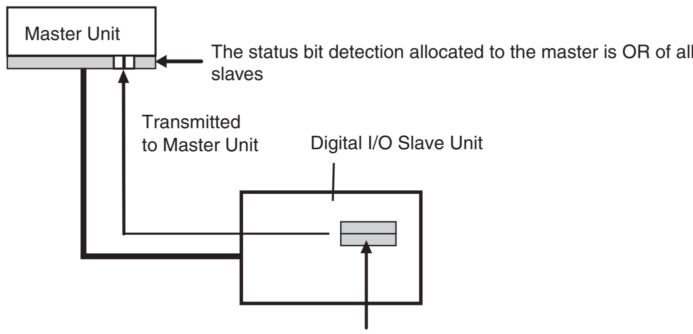
This section describes the Digital I/O Slave Units.

5-1 Status Areas

A Digital I/O Slave Unit has two internal 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.

When any of the bits in the status area of the slaves connected to the Master Unit turns ON, the corresponding bit (bit 12 is for warning status area notices and bit 13 is for alarm area notices) of the status flag in the Master Unit turns ON.

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



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 Conduction 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	---

Bit	Content	Description
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 Digital I/O Slave Unit and Expansion Unit if an Expansion Unit is not connected.
13	Reserved	---
14	Reserved	---
15	Reserved	---

5-2 Allocating I/O Data

Input and output areas in I/O memory in the Master Unit are allocated to the I/O data of Word Slave Units in a CompoNet Network. Node address areas are allocated in order of node addresses for Slave Units of the same type. In a CompoNet Network, Units are allocated node address areas of the size required for each Unit, based on the node address set for the Unit.

5-2-1 Data Allocation for Word Slave Units

Word Slave Units are allocated node address areas in units of 16 points (one word).

- Units with 8 inputs or outputs are allocated one word (the node address set for the Unit).
- Units with 16 inputs or outputs are allocated one word (the node address set for the Unit).
- Units with 16 I/O points (8 inputs and 8 outputs) are allocated two words (the node address set for the Unit). The data is allocated to the lower bytes of the words, and the upper bytes remain unused.

- Units with 32 inputs or outputs are allocated two words per node (node address m and m+1 for the Input Area or Output Area).
- Units with 32 I/O points (16 inputs and 16 outputs) are allocated two words per node (node address m for the Input Area, and node address m for the Output Area).

Eight-point Input Unit

Input Area

Not used.								7	6	5	4	3	2	1	0

Eight-point Output Unit

Output Area

Not used.								7	6	5	4	3	2	1	0

Sixteen-point Input Unit

Input Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Sixteen-point Output Unit

Output Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Sixteen-point I/O Unit

Output Area

Not used.								7	6	5	4	3	2	1	0

Input Area

Not used.								7	6	5	4	3	2	1	0

Thirty-two-point Input Unit

Input Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Thirty-two-point Output Unit

Output Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Thirty-two-point I/O Unit

Output Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

5-2-2 Data Allocation for Word Slave Units with Expansion Units

When an Expansion Unit is used, memory is allocated in the same way as it would be allocated to a Word Slave Unit that includes the input and output data of the Expansion Unit.

Sixteen-point Input Unit + Sixteen-point Expansion Input Unit

Two node address areas are allocated: Node address m in the Input Area and node address m+1 in the Input Area.

Input Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Sixteen-point Input Unit + Eight-point Expansion Input Unit

Two node address areas are allocated: Node address m in the Input Area and node address m+1 in the Input Area.

Input Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Not used.								23	22	21	20	19	18	17	16

Sixteen-point Input Unit + Sixteen-point Expansion Output Unit

Two node address areas are allocated: Node address m in the Input Area and node address m in the Output Area.

Output Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Sixteen-point Input Unit + Eight-point Expansion Output Unit

Two node address areas are allocated: Node address m in the Input Area and node address m in the Output Area.

Output Area

Not Used.								7	6	5	4	3	2	1	0

Input Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Sixteen-point Output Unit + Sixteen-point Expansion Output Unit

Two node address areas are allocated: Node address m in the Output Area and node address m+1 in the Output Area.

Output Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Sixteen-point Output Unit + Eight-point Expansion Output Unit

Two node address areas are allocated: Node address m in the Output Area and node address m+1 in the Output Area.

Output Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Not Used.								23	22	21	20	19	18	17	16

Sixteen-point Output Unit + Sixteen-point Expansion Input Unit

Two node address areas are allocated: Node address m in the Output Area and node address m in the Input Area.

Output Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Sixteen-point Output Unit + Eight-point Expansion Input Unit

Two node address areas are allocated: Node address m in the Output Area and node address m in the Input Area.

Output Area

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Area

Not Used.								7	6	5	4	3	2	1	0

5-3 Units with Screw Terminal Blocks

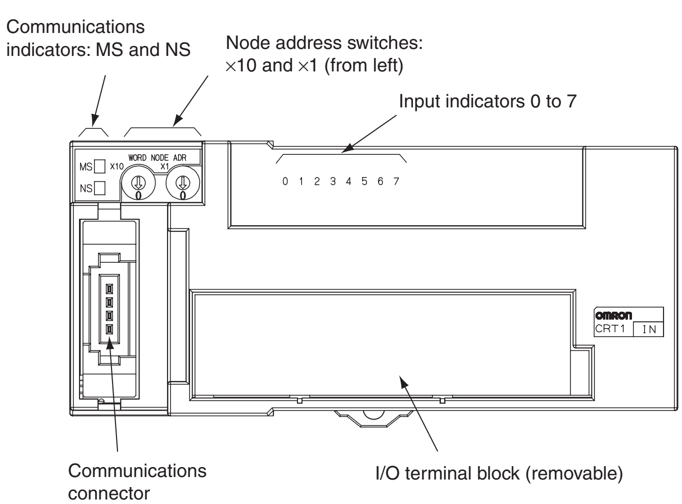
5-3-1 Eight-point Input Units (2-tier Terminal Block) CRT1-ID08/CRT1-ID08-1

Input Section Specifications

Item	Specification	
Model	CRT1-ID08	CRT1-ID08-1
I/O capacity	8 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	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	8 inputs/common	
Isolation method	Photocoupler	
Input indicator	LED (yellow)	
Installation	DIN Track	
Power supply type	Multi-power supply	
Communications power supply current consumption	30 mA max. for 24-VDC power supply voltage 50 mA max. for 14-VDC power supply voltage	
Weight	160 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-ID08 and CRT1-ID08-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

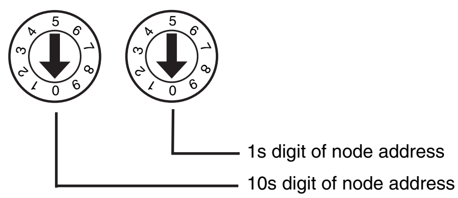
The meanings of the input indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

Setting the Node Address

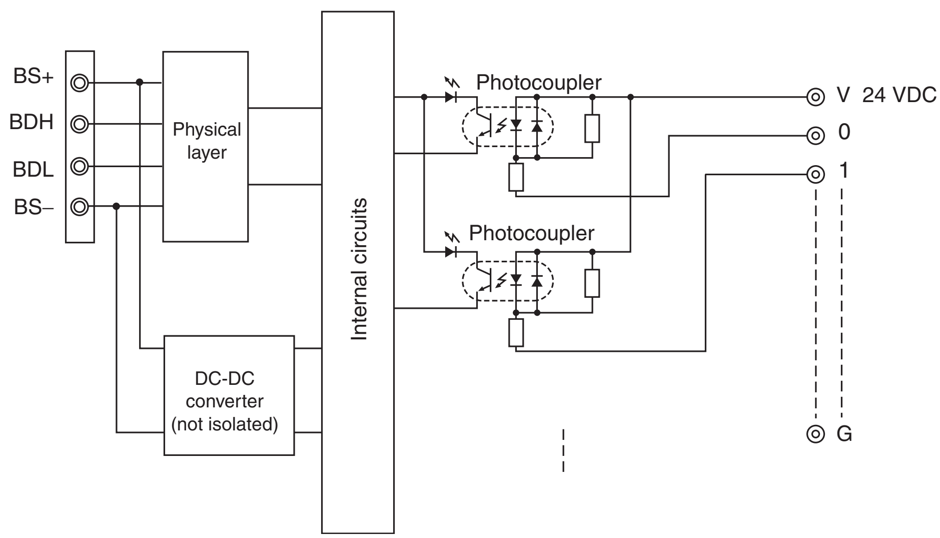
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

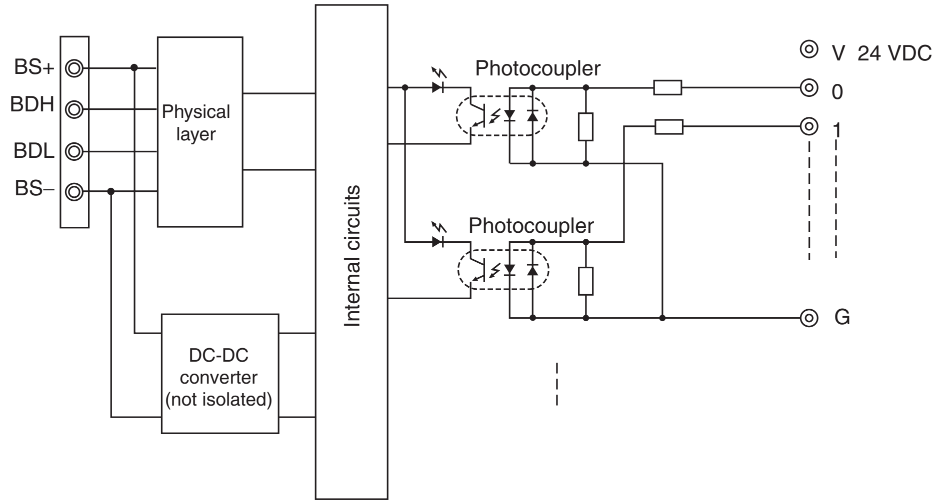


Internal Circuits

CRT1-ID08 (NPN)

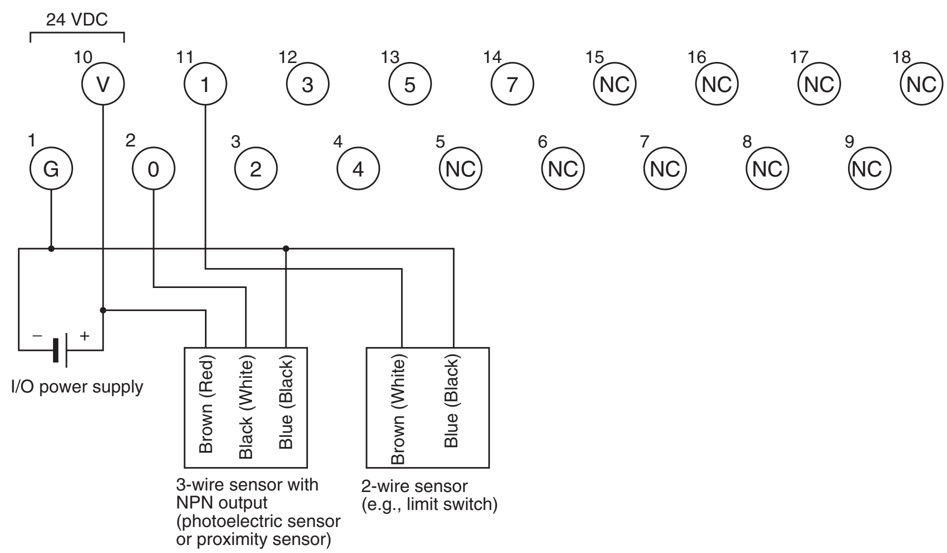


CRT1-ID08-1 (PNP)

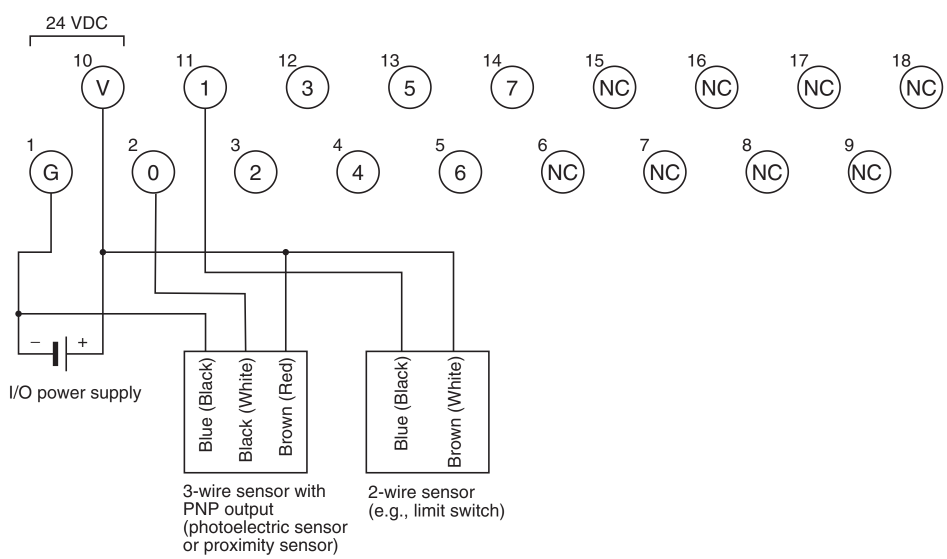


Wiring

CRT1-ID08 (NPN)



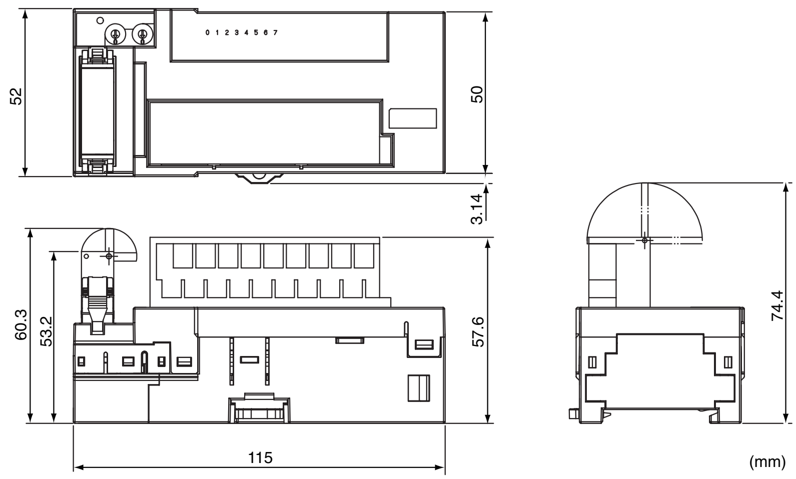
CRT1-ID08-1 (PNP)



Note 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.

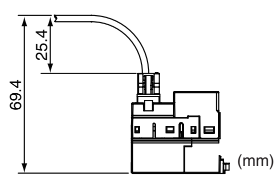
Dimensions (Same for CRT1-ID08 and CRT1-ID08-1)

When a DCN4-TB4 Open Type Connector Is Mounted

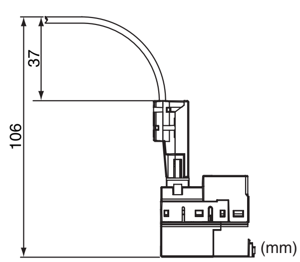


Communications Connector Dimensions Including the Connector and Cable

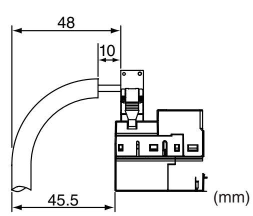
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



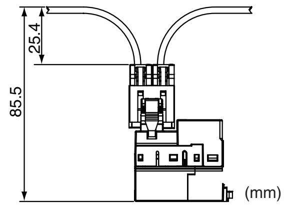
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ **When a DCN4-MD4 Multidrop Connector Is Mounted**



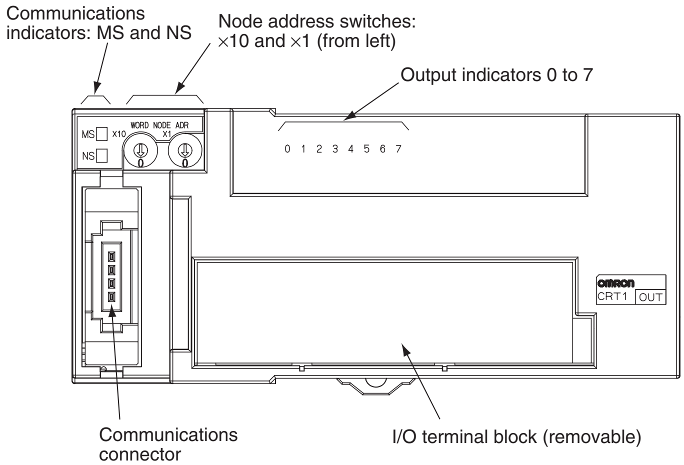
5-3-2 Eight-point Output Units (2-tier Terminal Block) CRT1-OD08/CRT1-OD08-1

Output Section Specifications

Item	Specification	
Model	CRT1-OD08	CRT1-OD08-1
I/O capacity	8 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.5 A/output, 2 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	8 outputs/common	
Isolation method	Photocoupler	
Output indicators	LED (yellow)	
Installation	DIN Track	
Power supply type	Multi-power supply	
Communications power supply current consumption	35 mA max. for 24-VDC power supply voltage 55 mA max. for 14-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	
Weight	160 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-OD08 and CRT1-OD08-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

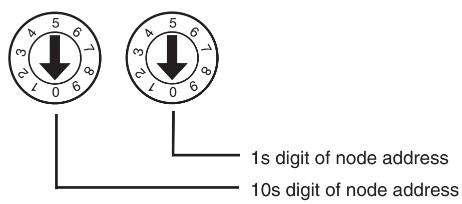
The meanings of the output indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

Setting the Node Address

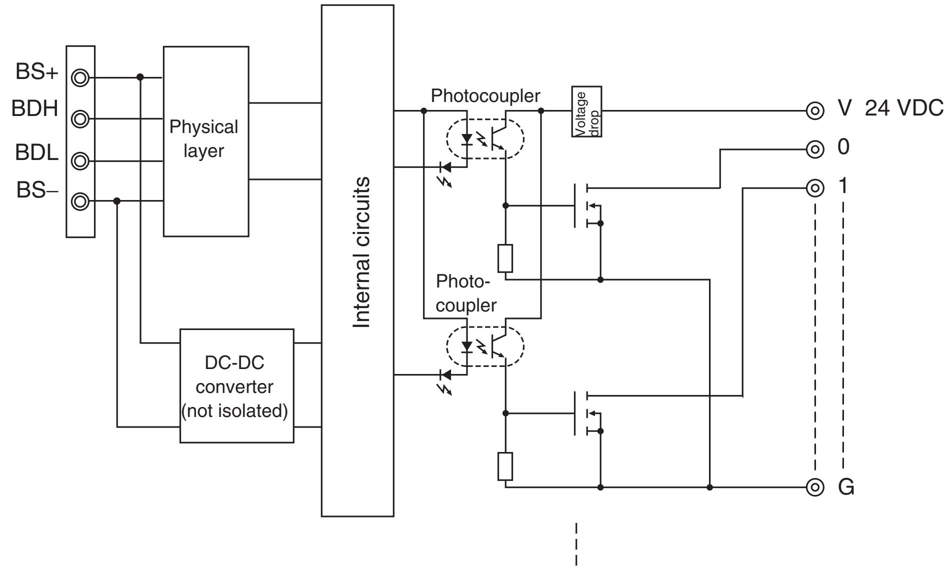
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

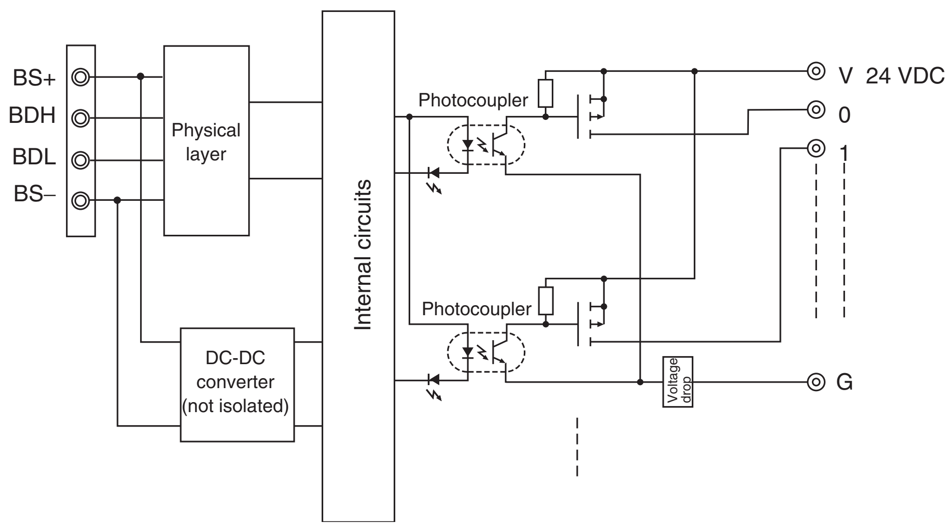


Internal Circuits

CRT1-OD08 (NPN)

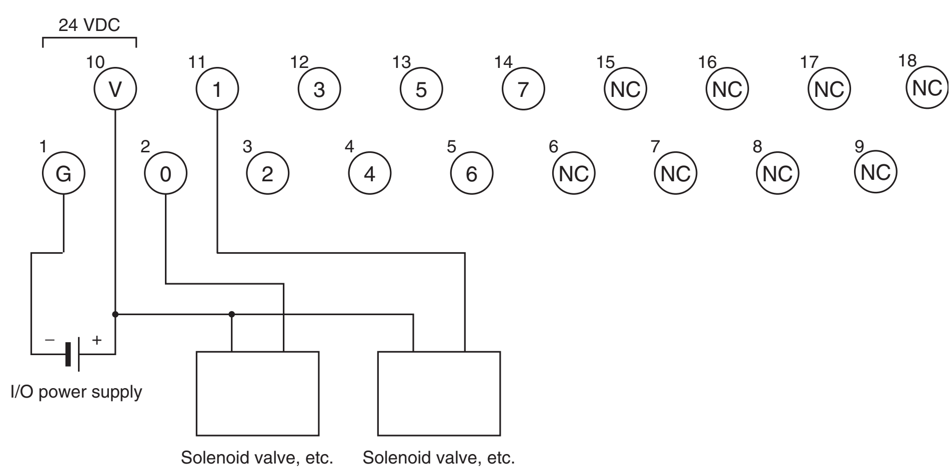


CRT1-OD08-1 (PNP)

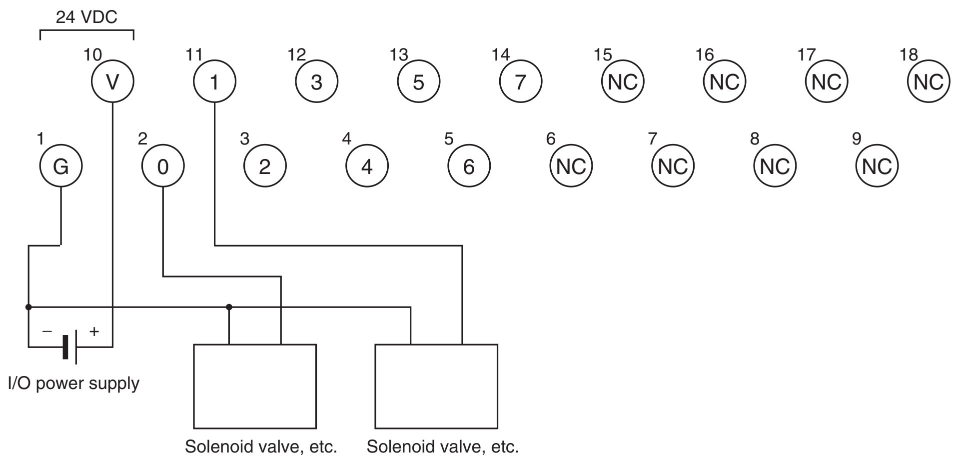


Wiring

CRT1-OD08 (NPN)



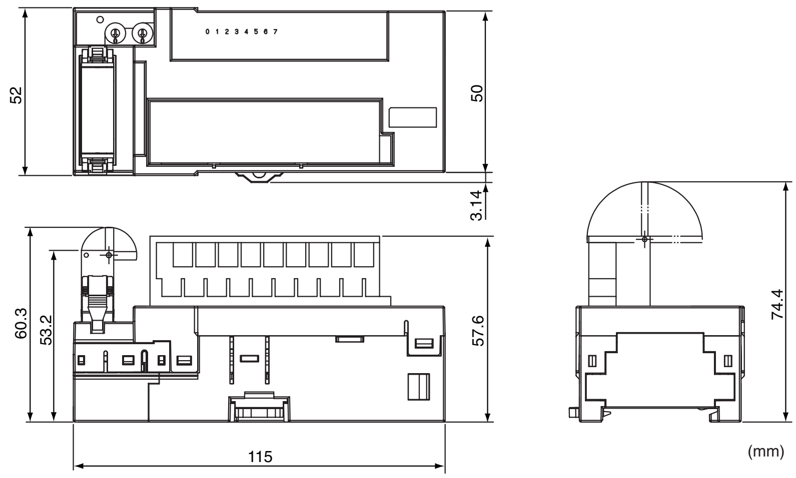
CRT1-OD08-1 (PNP)



Note When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

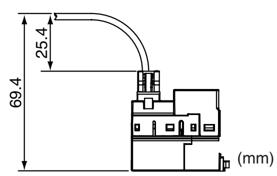
Dimensions (Same for CRT1-OD08 and CRT1-OD08-1)

When a DCN4-TB4 Open Type Connector Is Mounted

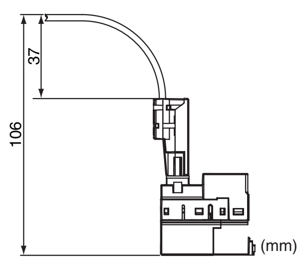


Communications Cable Dimensions when Connector and Cable Are Connected

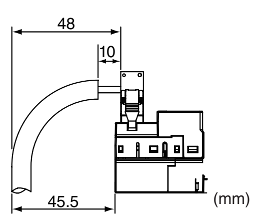
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



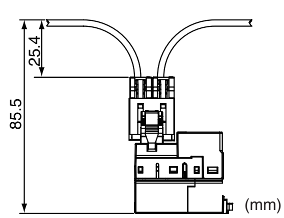
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



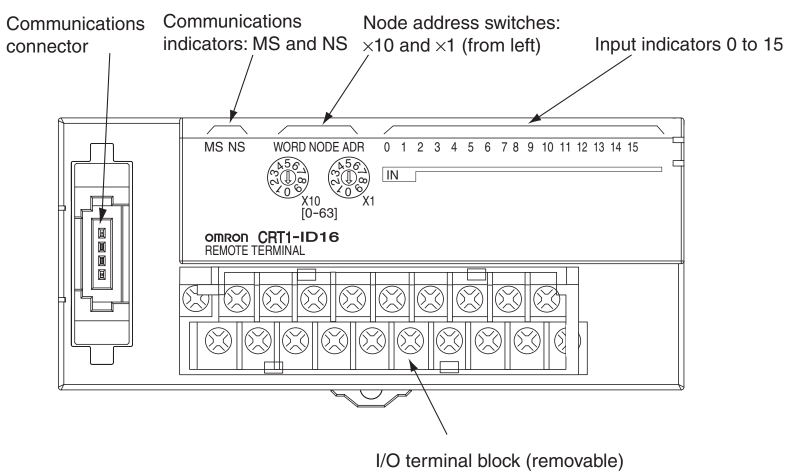
5-3-3 Sixteen-point Input Units (2-tier Terminal Block) CRT1-ID16/CRT1-ID16-1

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 min./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	55 mA max. for 24-VDC power supply voltage 85 mA max. for 14-VDC power supply voltage	
Weight	141 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-ID16 and CRT1-ID16-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

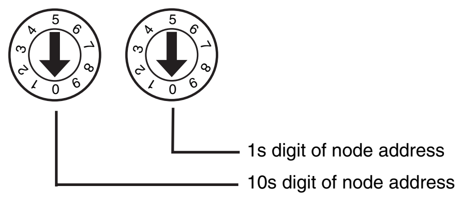
The meanings of the input indicators are given in the following table.

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

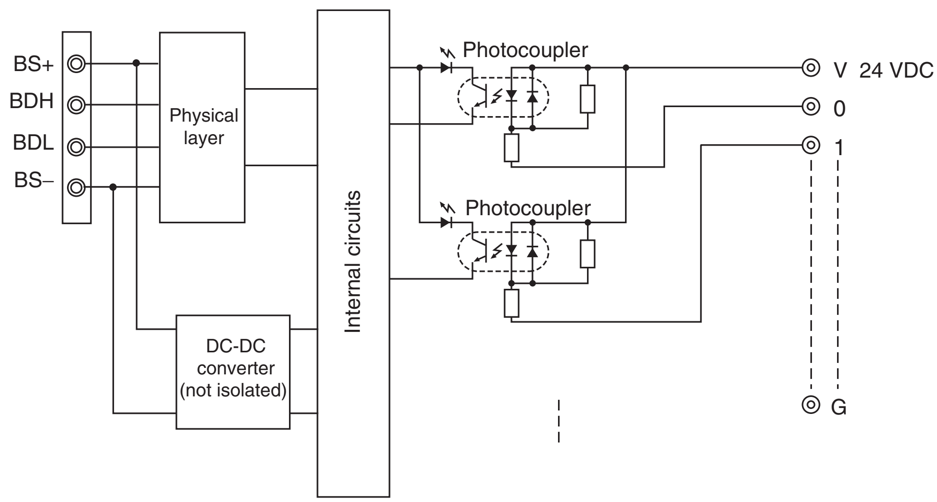
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

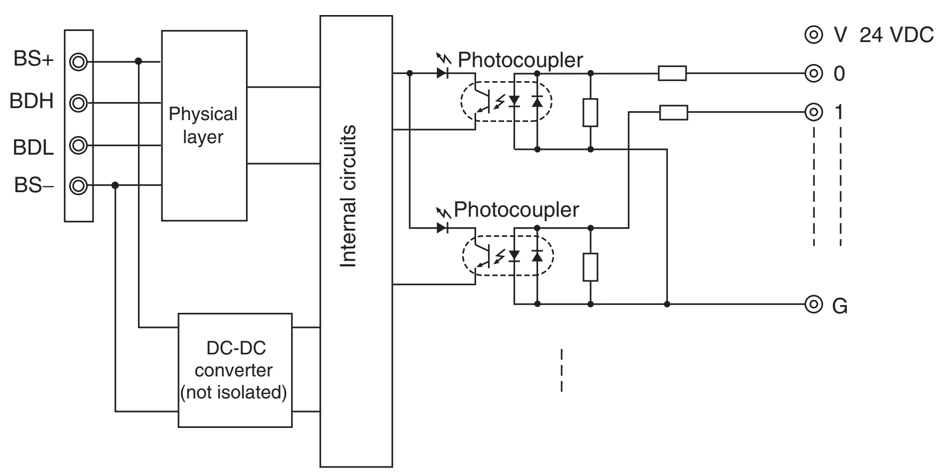


Internal Circuits

CRT1-ID16 (NPN)

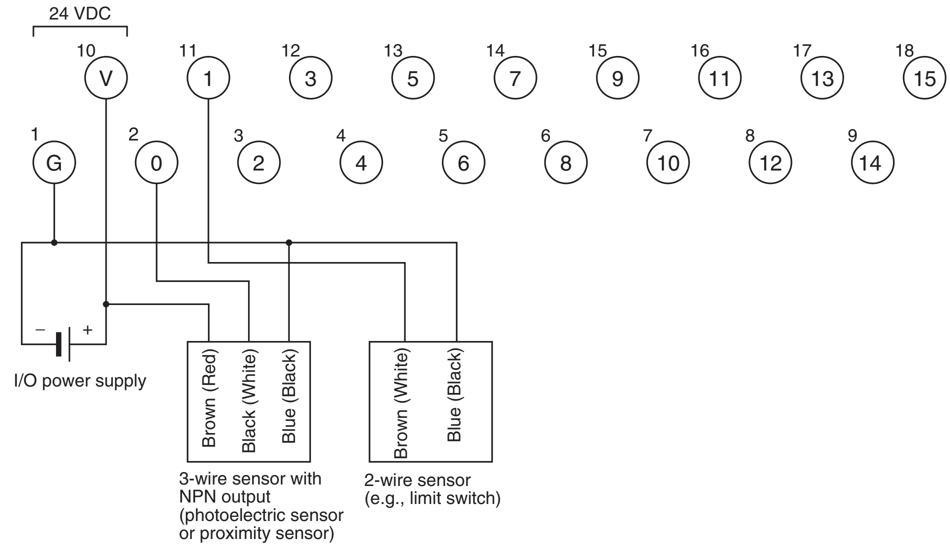


CRT1-ID16-1 (PNP)

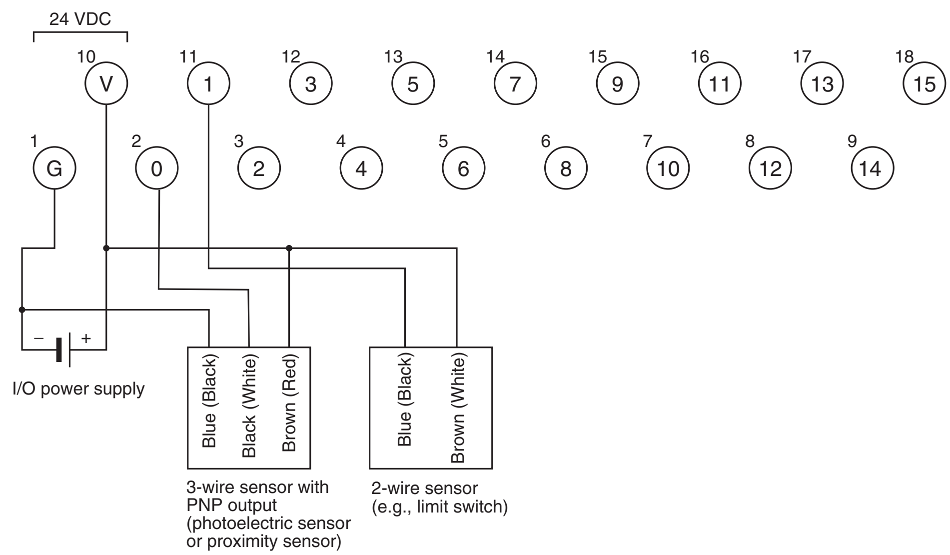


Wiring

CRT1-ID16 (NPN)



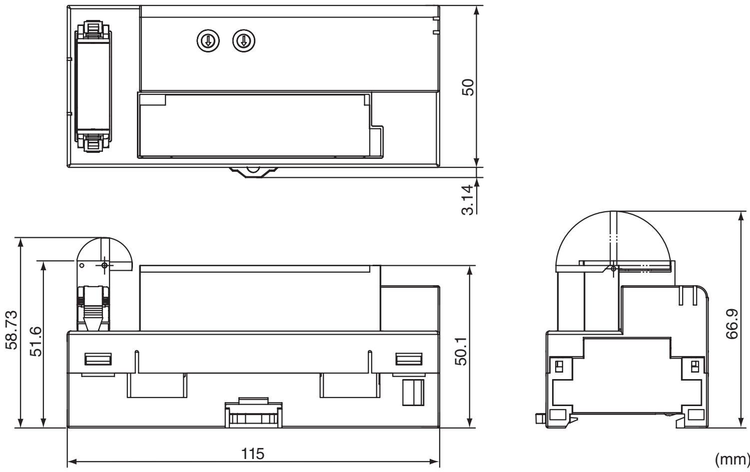
CRT1-ID16-1 (PNP)



Note 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.

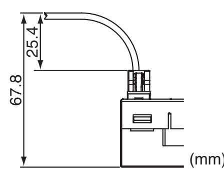
Dimensions (Same for CRT1-ID16 and CRT1-ID16-1)

When a DCN4-TB4 Open Type Connector Is Mounted

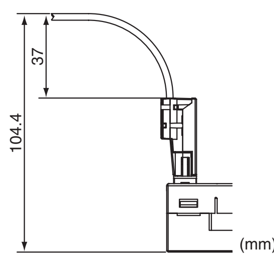


Communications Connector Dimensions Including the Connector and Cable

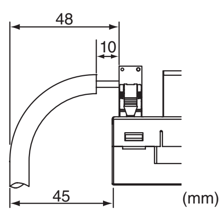
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



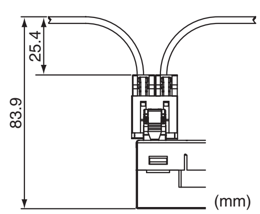
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



5-3-4 Sixteen-point Output Units (2-tier Terminal Block with Transistor Outputs)

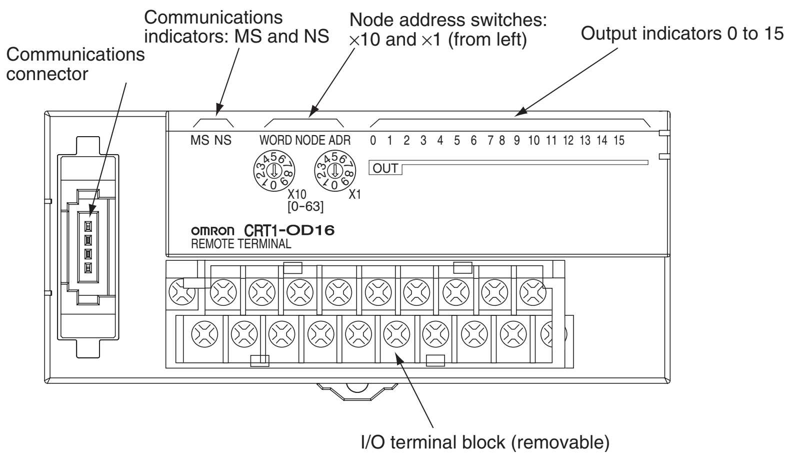
CRT1-OD16/CRT1-OD16-1

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	55 mA max. for 24-VDC power supply voltage 85 mA max. for 14-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	
Weight	141 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-OD16 and CRT1-OD16-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

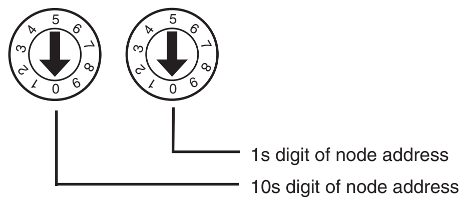
The meanings of the output indicators are given in the following table.

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

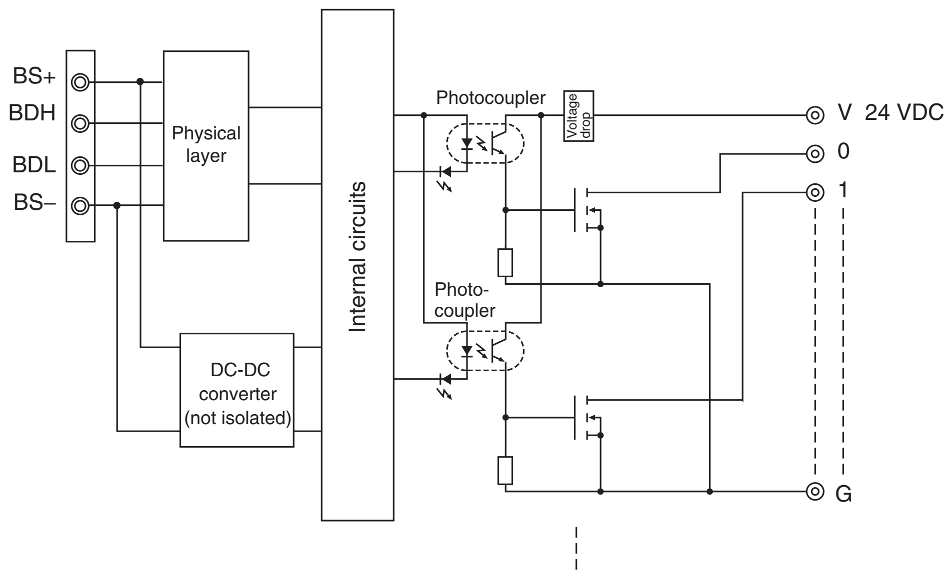
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

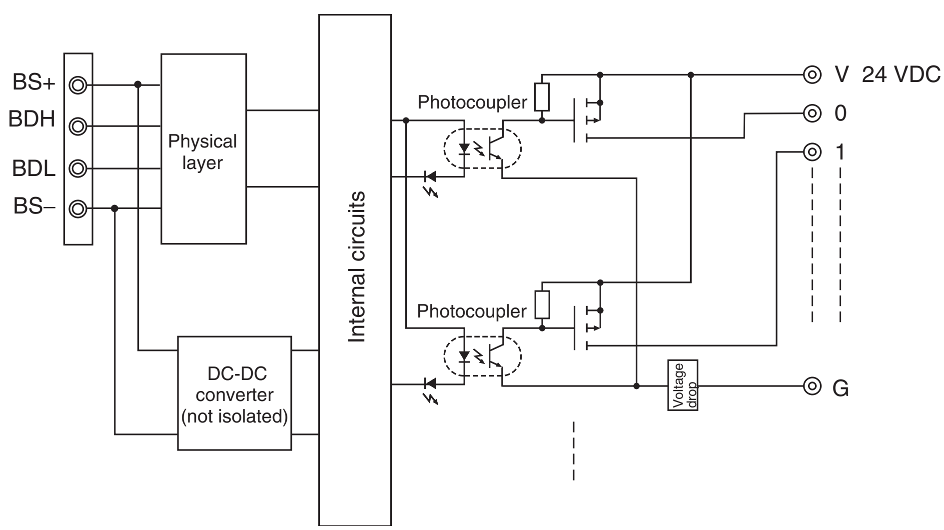


Internal Circuits

CRT1-OD16 (NPN)

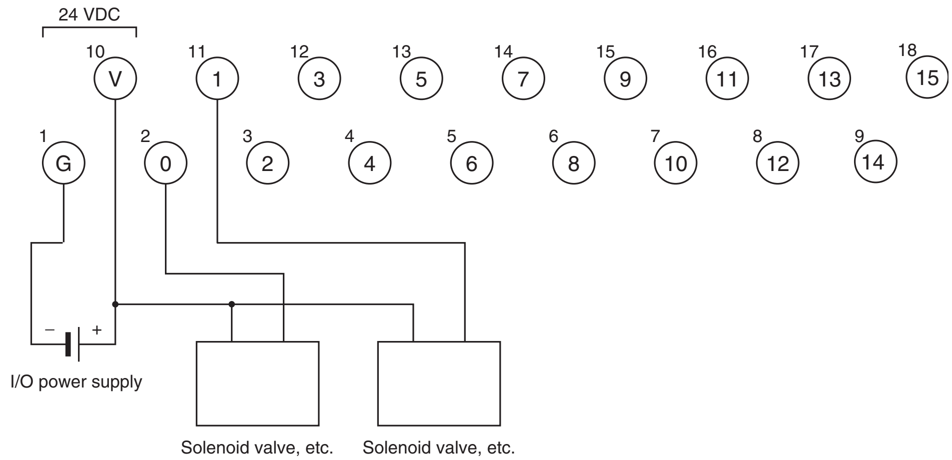


CRT1-OD16-1 (PNP)

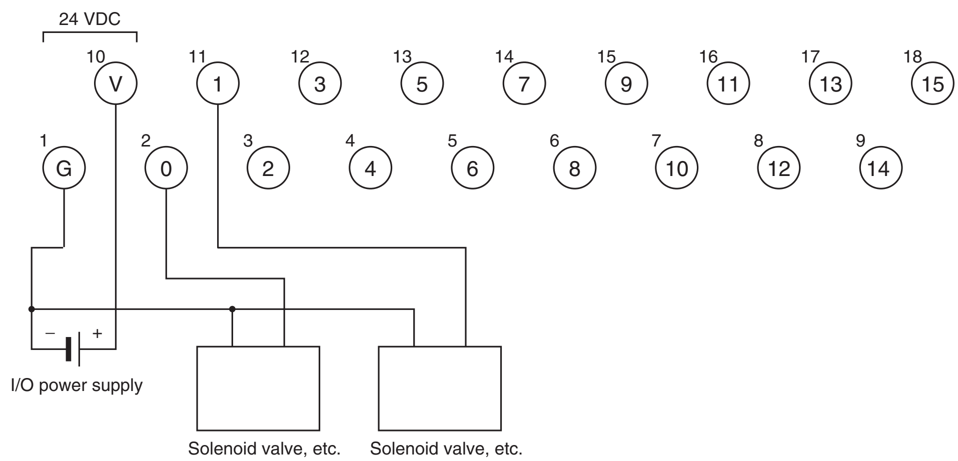


Wiring

CRT1-OD16 (NPN)



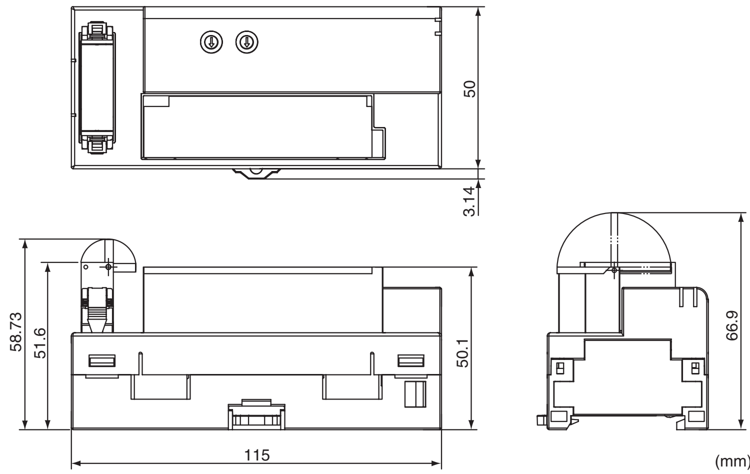
CRT1-OD16-1 (PNP)



Note When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

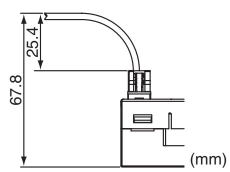
Dimensions (Same for CRT1-OD16 and CRT1-OD16-1)

When a DCN4-TB4 Open Type Connector Is Mounted

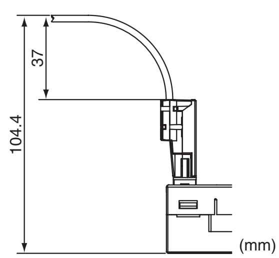


Communications Cable Dimensions when Connector and Cable Are Connected

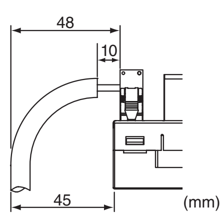
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



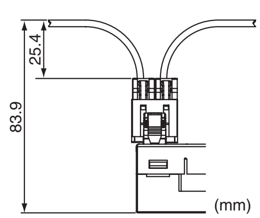
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



5-3-5 Eight-point Input and Eight-point Output Units (2-tier Terminal Block)

CRT1-MD16/CRT1-MD16-1

Common Specifications

Item	Specification	
Model	CRT1-MD16	CRT1-MD16-1
Installation	DIN Track	
Communications power supply current consumption	35 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage	
Weight	170 g max.	

Input Section Specifications

Item	Specification	
Model	CRT1-MD16	CRT1-MD16-1
I/O capacity	8 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	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	8 inputs/common	
Isolation method	Photocoupler	
Input indicator	LED (yellow)	
Power supply type	Multi-power supply	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

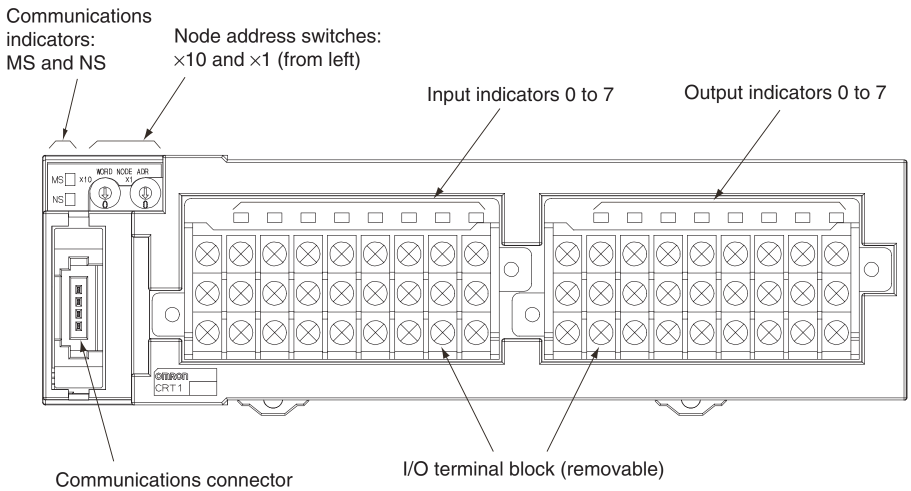
Output Section Specifications

Item	Specification	
Model	CRT1-MD16	CRT1-MD16-1
I/O capacity	8 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.5 A/output, 2A/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	8 outputs/common	
Isolation method	Photocoupler	
Output indicators	LED (yellow)	

Item	Specification
Power supply type	Multi-power supply
Output handling for communications errors	Select either hold or clear from CX-Integrator.

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-MD16/CRT1-MD16-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

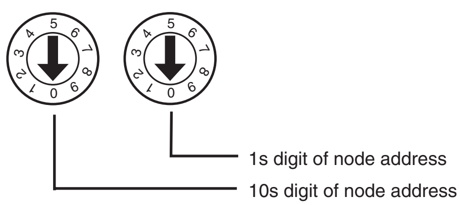
The meanings of the I/O indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7 (inputs) 0 to 7 (outputs)	Lit yellow.	Input or output ON	The input or output is ON.
	Not lit.	Input or output OFF	The input or output is OFF.

Setting the Node Address

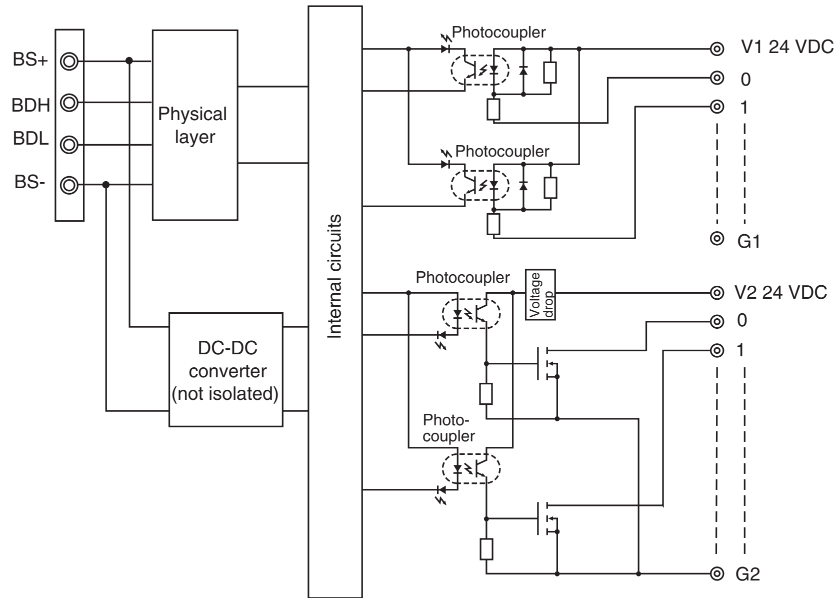
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

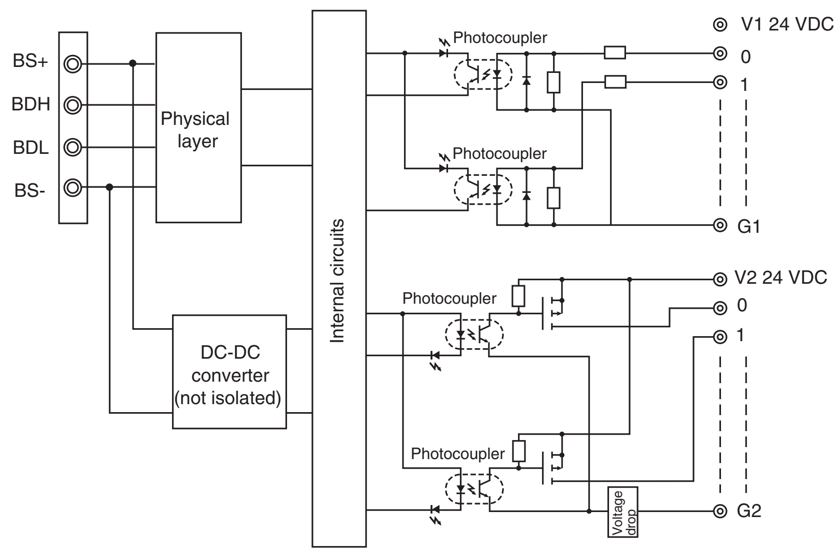


Internal Circuits

CRT1-MD16 (NPN)

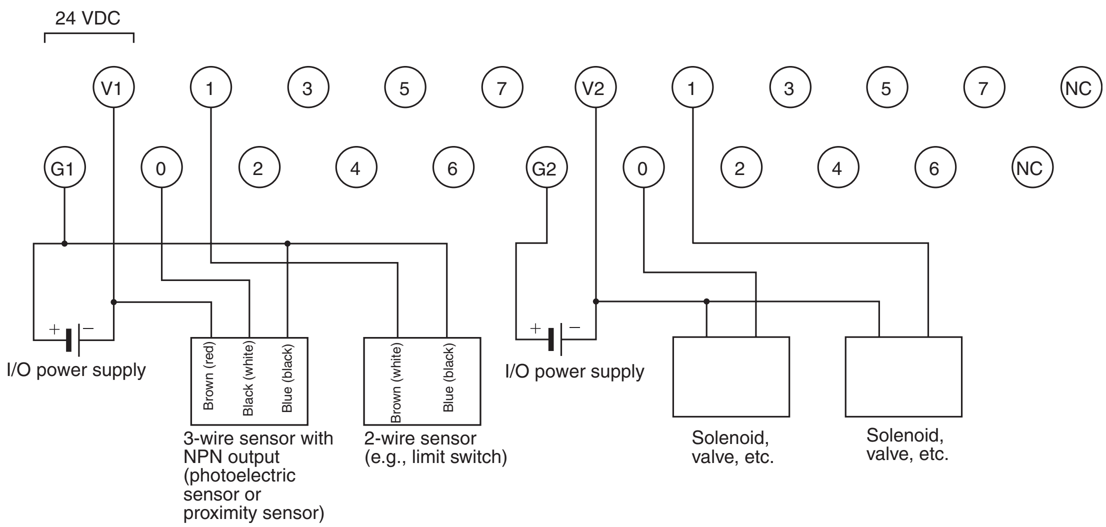


CRT1-MD16-1 (PNP)

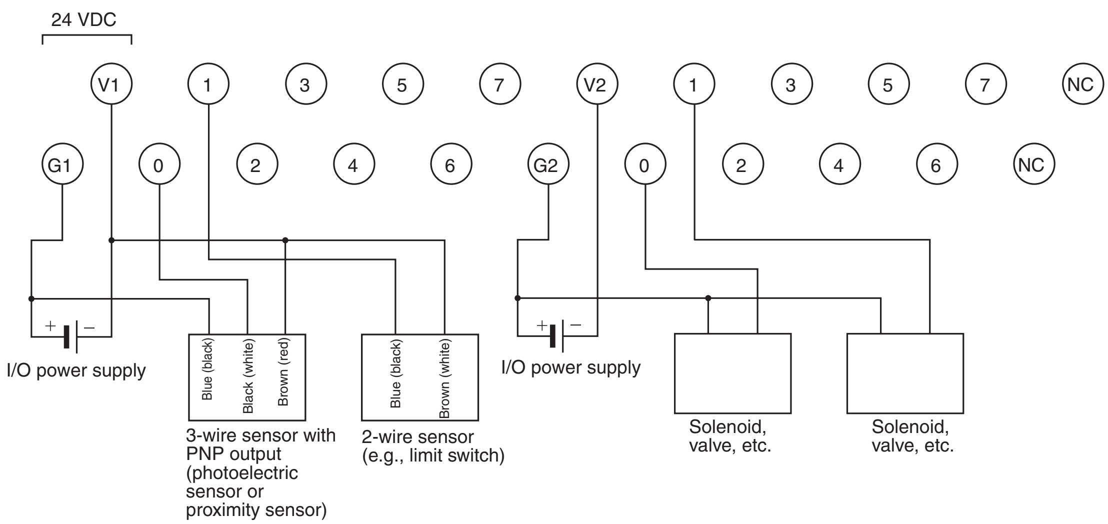


Wiring

CRT1-MD16 (NPN)



CRT1-MD16-1 (PNP)



Note

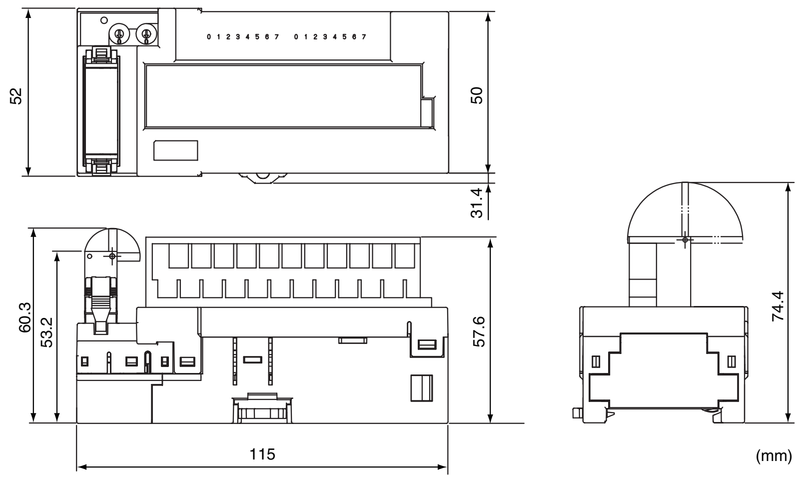
(1) The V1 and V2 terminals as well as the G1 and G2 terminals of the I/O power supply are not connected internally. Supply power separately for V1-G1 and V2-G2.

(2) When using an inductive load, such as a solenoid valve, either use a built-in diode to absorb the counterelectromotive force or install an external diode.

(3) Wire colors have been changed according to the revised JIS standards for photoelectric and proximity sensors. The previous colors are shown in parentheses.

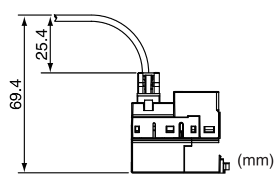
Dimensions (Same for CRT1-MD16/CRT1-MD16-1)

When a DCN4-TB4 Open Type Connector Is Mounted

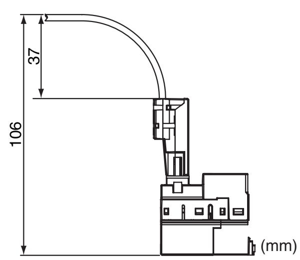


Communications Cable Dimensions when Connector and Cable Are Connected

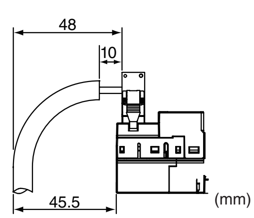
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



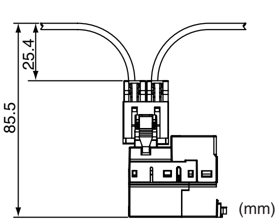
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



5-3-6 Eight-point Output Units (2-tier Terminal Block with Relay Outputs)

CRT1-ROS08

Common Specifications

Item	Specification
Communications power supply voltage	14 to 26.4 VDC
Noise immunity	Conforms to IEC 61000-4-4, 2 kV (power line).
Vibration resistance	10 to 55 Hz with double-amplitude of 0.7 mm
Shock resistance	100 m/s^2 (3 times in 6 directions on 3 axes)
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)
Terminal block screws tightening torque	M3 wiring screws: 0.5 N·m M3 mounting screws: 0.5 N·m

Relay Output Section Specifications (per Output)

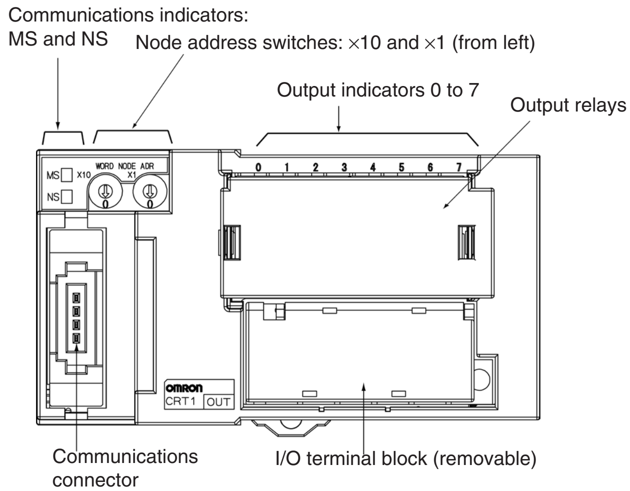
Item	Specification
Model	CRT1-ROS08
I/O capacity	8 outputs
Mounted Relays	DRTA-NY5W-K (5 VDC)
Rated load	Resistive load 250 VAC, 2 A, common: 8 A 30 VDC, 2 A, common: 8 A
Rated ON current	3 A
Maximum contact voltage	250 VAC, 125 VDC
Maximum contact current	3 A
Maximum switching capacity	750 VA AC, 90 W DC
Minimum applicable load (reference value)	5 VDC, 1 mA
Mechanical service life	20,000,000 operations min.
Electrical service life	100,000 operations min.
Installation method	DIN Track
Communications power supply current consumption	95 mA max. for 24-VDC power supply voltage 150 mA max. for 14-VDC power supply voltage
Output hold for communications errors	Select either hold or clear from CX-Integrator.
Weight	170 g max.

Note (1) With a current of between 2 and 3 A (8 to 10 A per common), either ensure that the number of points per common that simultaneously turn ON does not exceed 4 or ensure that the temperature does not exceed 45°C. There are no restrictions if the current does not exceed 2 A (8 A per common).

(2) The rated current is the value for assuring normal operation, and not for assuring durability of the relays. The relay service life depends greatly on factors such as the operating temperature, the type of load, and switching

conditions. The actual equipment must be checked under actual operating conditions.

Component Names and Functions



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

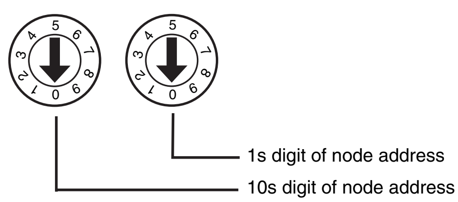
The meanings of the output indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

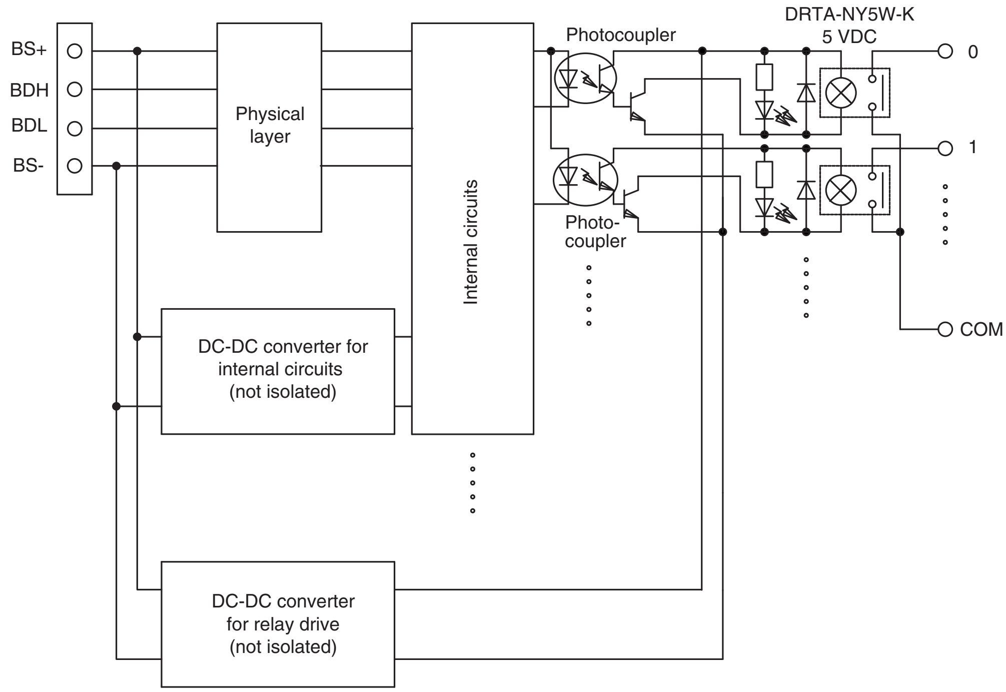
Setting the Node Address

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.)

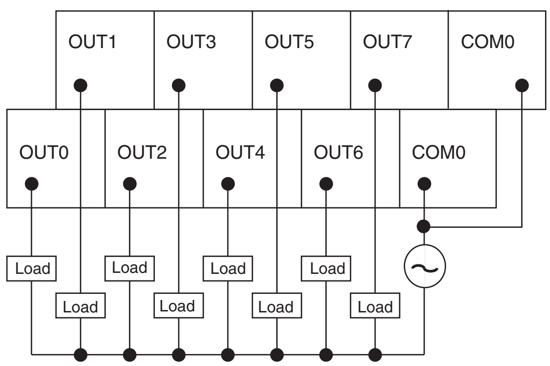
The setting on the rotary switches is read when power is turned ON.



Internal Circuits

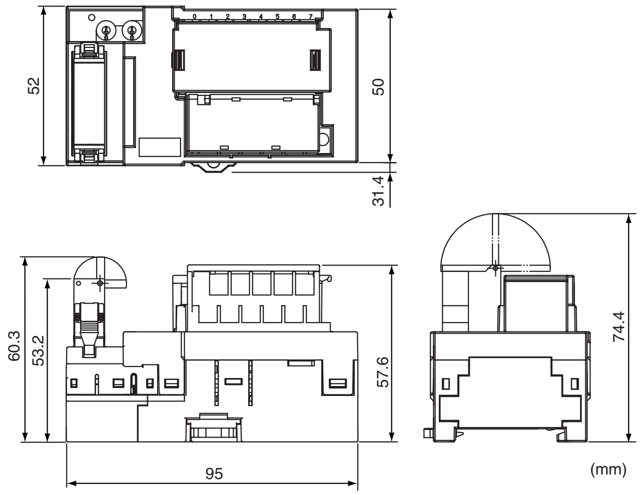


Wiring



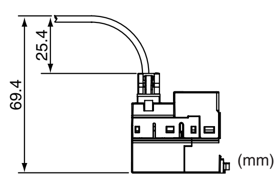
Dimensions

When a DCN4-TB4 Open Type Connector Is Mounted

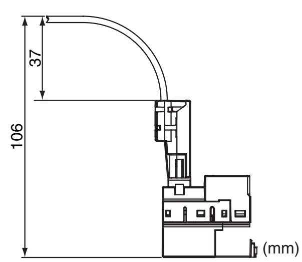


Communications Cable Dimensions when Connector and Cable Are Connected

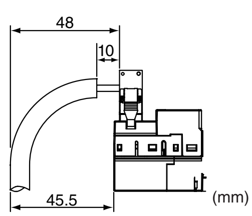
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



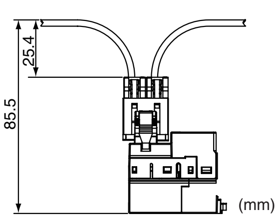
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted

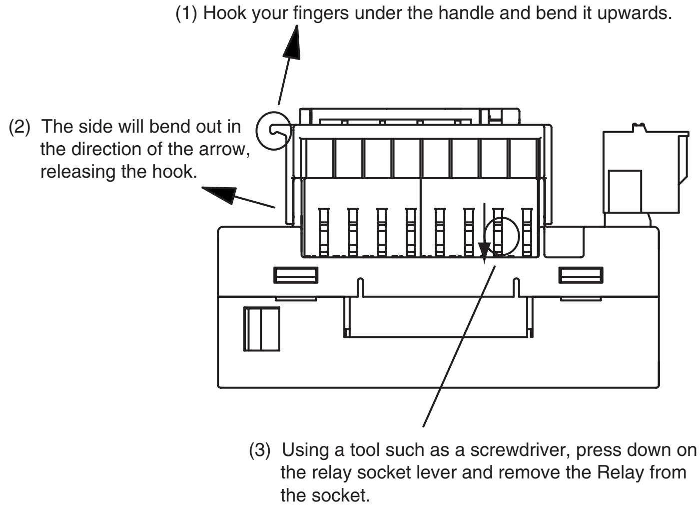


■ When a DCN4-MD4 Multidrop Connector Is Mounted



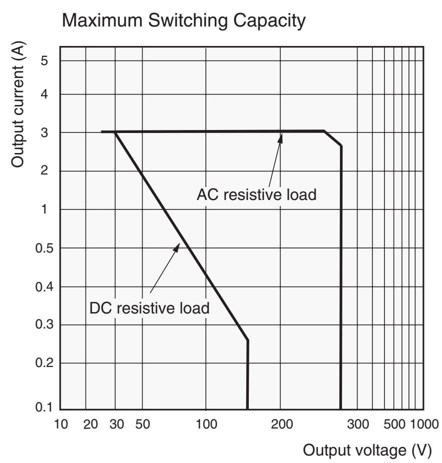
Replacing Relays

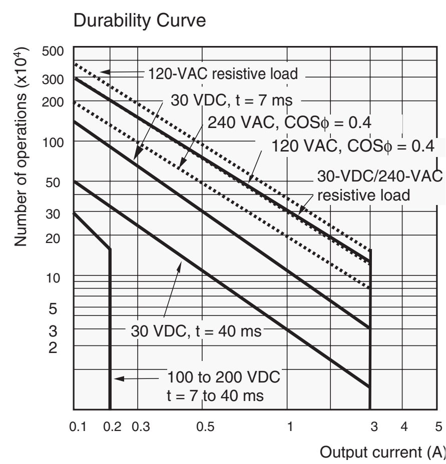
To replace output relays, first remove the cover using the following procedure.



Reference Data

The following reference data shows actual measured data from sampling in a production line. There is some variation in relay characteristics, so use this data for reference only.





5-3-7 Eight-point Output Units (2-tier Terminal Block with SSR Outputs) CRT1-ROF08

Common Specifications

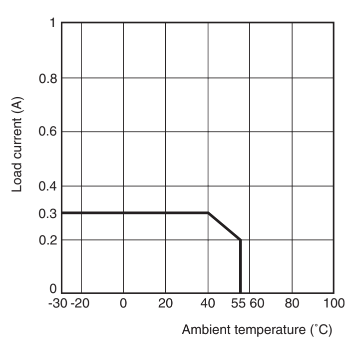
Item	Specification
Communications power supply voltage	14 to 26.4 VDC
Noise immunity	Conforms to IEC 61000-4-4, 2 kV (power line).
Vibration resistance	10 to 60 Hz with double-amplitude of 0.7 mm, 60 to 150 Hz and 50 m/s^2 in X, Y, and Z directions for 80 min each
Shock resistance	150 m/s^2 (3 times in 6 directions on 3 axes)
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)
Terminal block screws tightening torque	M3 wiring screws: 0.5 N·m M3 mounting screws: 0.5 N·m

SSR Output Section Specifications (per Output)

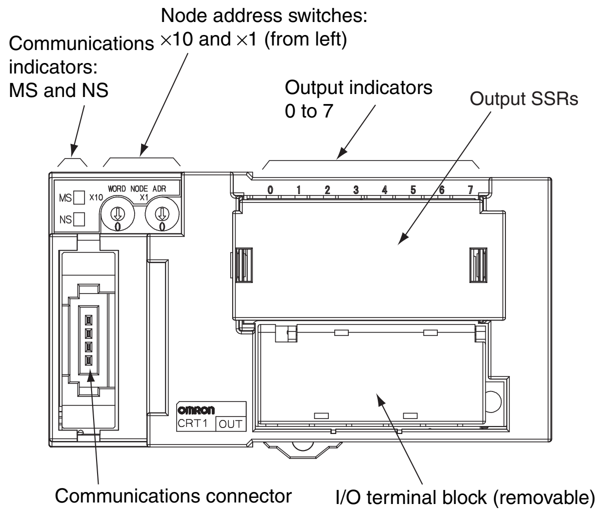
Item	Specification
Model	CRT1-ROF08
I/O capacity	8 outputs
Load voltage	24 to 265 VAC
Load current	0.3 A (See note.)
Inrush current resistivity	50 A (60 Hz)
Installation method	DIN Track
Communications power supply current consumption	60 mA max. for 24-VDC power supply voltage 90 mA max. for 14-VDC power supply voltage
Output hold for communications errors	Select either hold or clear from CX-Integrator.
Weight	160 g max.

Note The SSRs cannot be replaced.

Load Current Vs. Ambient Temperature Characteristics



Component Names and Functions



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

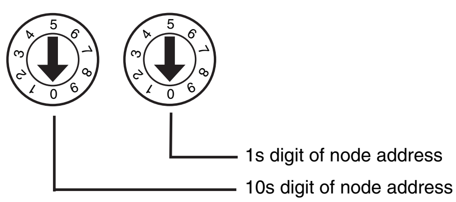
The meanings of the output indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

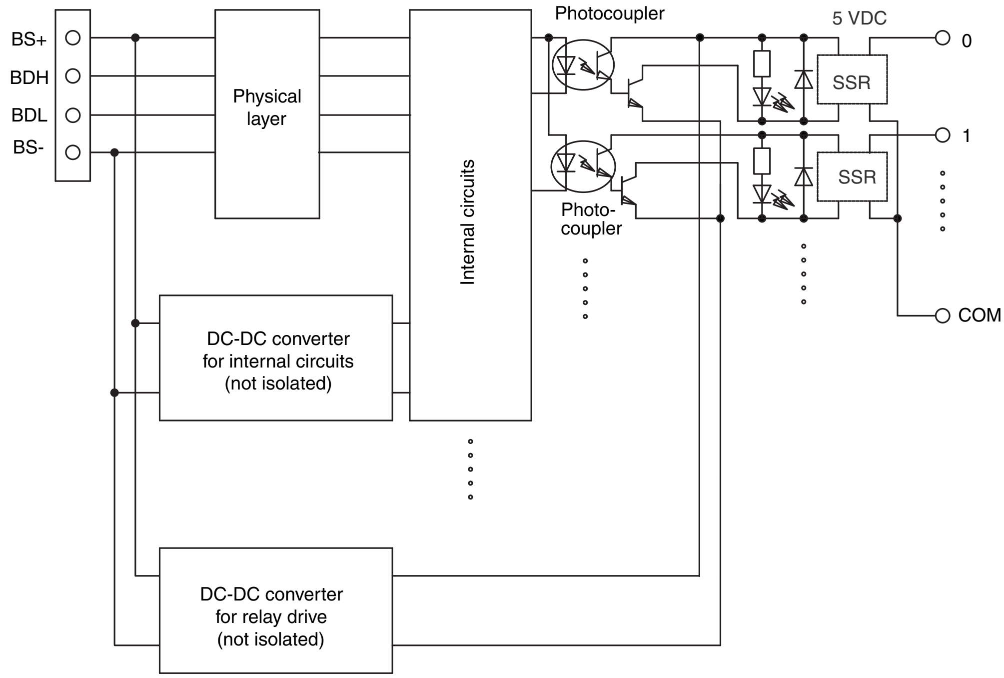
Setting the Node Address

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.)

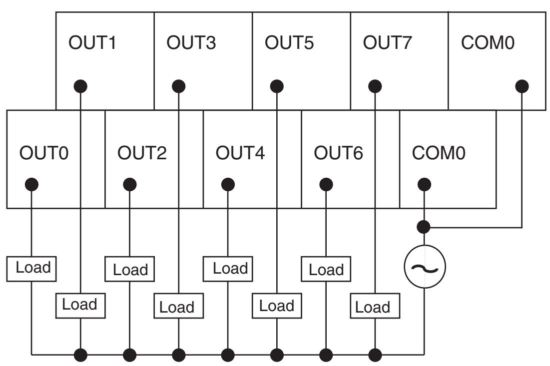
The setting on the rotary switches is read when power is turned ON.



Internal Circuits

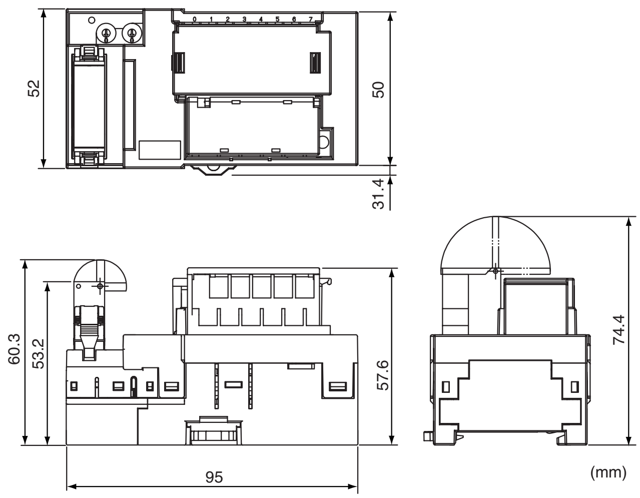


Wiring



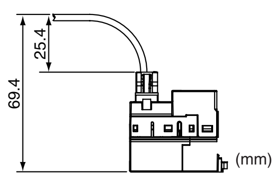
Dimensions

When a DCN4-TB4 Open Type Connector Is Mounted

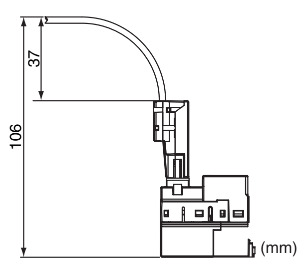


Communications Cable Dimensions when Connector and Cable Are Connected

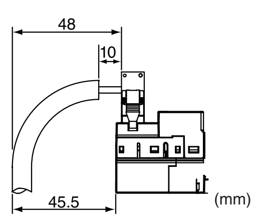
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



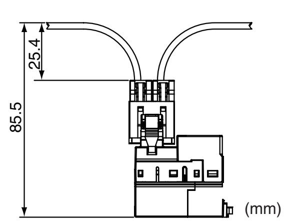
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



5-3-8 Sixteen-point Output Units (2-tier Terminal Block with Relay Outputs)

CRT1-ROS16

Common Specifications

Item	Specification
Communications power supply voltage	14 to 26.4 VDC
Noise immunity	Conforms to IEC 61000-4-4, 2 kV (power line).
Vibration resistance	10 to 55 Hz with double-amplitude of 0.7 mm
Shock resistance	100 m/s^2 (3 times in 6 directions on 3 axes)
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)
Terminal block screws tightening torque	M3 wiring screws: 0.5 N·m M3 mounting screws: 0.5 N·m

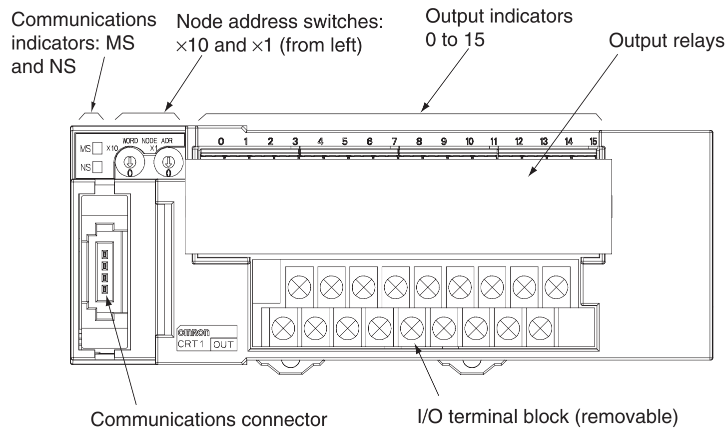
Relay Output Section Specifications (per Output)

Item	Specification
Model	CRT1-ROS16
I/O capacity	16 outputs
Mounted Relays	DRTA-NY5W-K (5 VDC)
Rated load	Resistive load 250 VAC, 2 A, common: 8 A 30 VDC, 2 A, common: 8 A
Rated ON current	3 A
Maximum contact voltage	250 VAC, 125 VDC
Maximum contact current	3 A
Maximum switching capacity	750 VA AC, 90 W DC
Minimum applicable load (reference value)	5 VDC, 1 mA
Mechanical service life	20,000,000 operations min.
Electrical service life	100,000 operations min.
Installation method	DIN Track
Communications power supply current consumption	155 mA max. for 24-VDC power supply voltage 255 mA max. for 14-VDC power supply voltage
Output hold for communications errors	Select either hold or clear from CX-Integrator.
Weight	260 g max.

Note (1) With a current of between 2 and 3 A (8 to 10 A per common), either ensure that the number of points per common that simultaneously turn ON does not exceed 4 or ensure that the temperature does not exceed 45°C. There are no restrictions if the current does not exceed 2 A (8 A per common).

(2) The rated current is the value for assuring normal operation, and not for assuring durability of the relays. The relay service life depends greatly on factors such as the operating temperature, the type of load, and switching conditions. The actual equipment must be checked under actual operating conditions.

Component Names and Functions



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

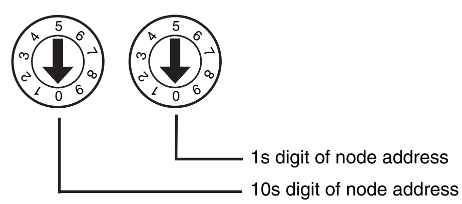
The meanings of the output indicators are given in the following table.

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.

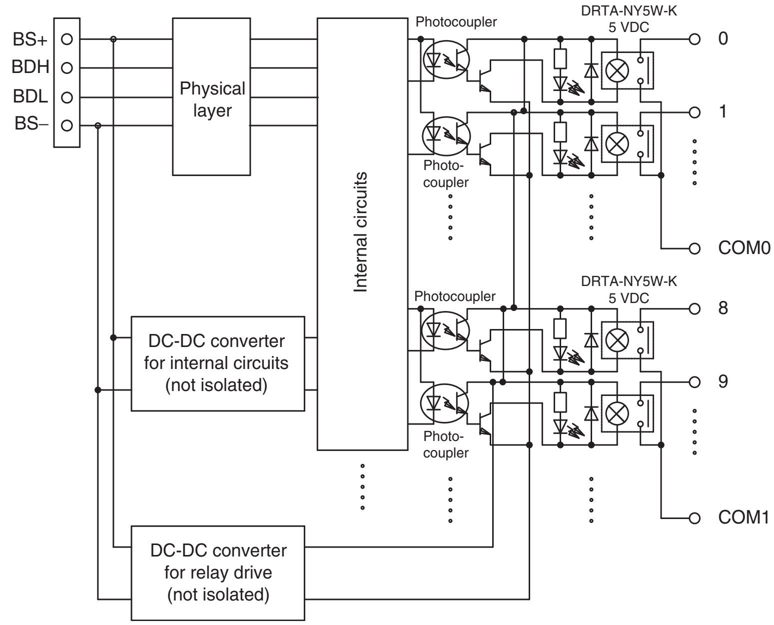
Setting the Node Address

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.)

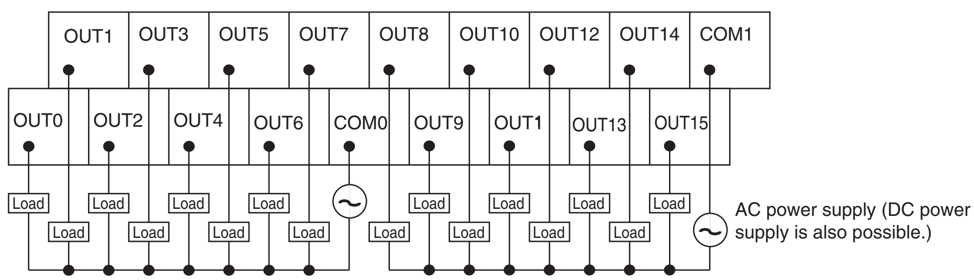
The setting on the rotary switches is read when power is turned ON.



Internal Circuits

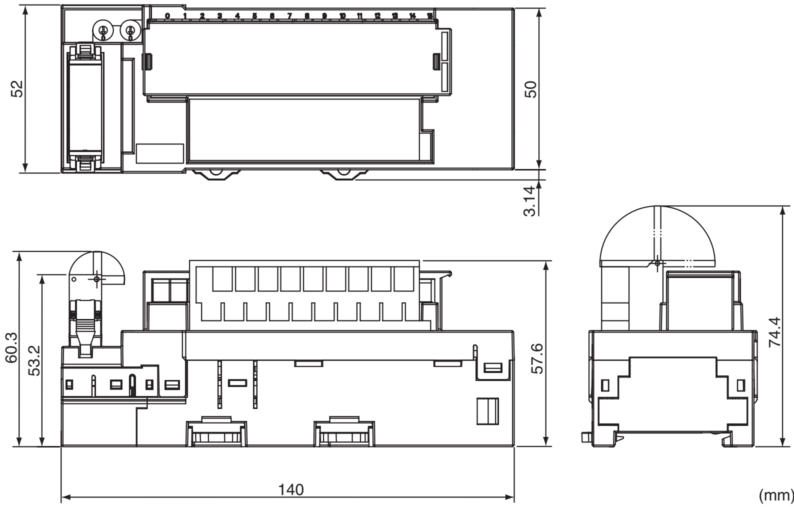


Wiring



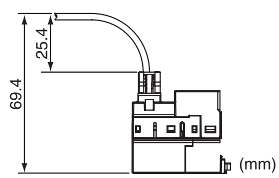
Dimensions

When a DCN4-TB4 Open Type Connector Is Mounted

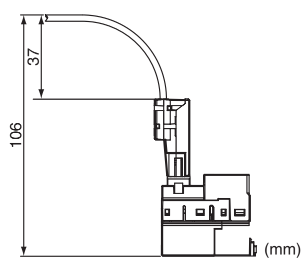


Communications Cable Dimensions when Connector and Cable Are Connected

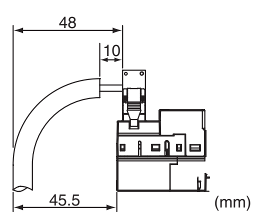
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



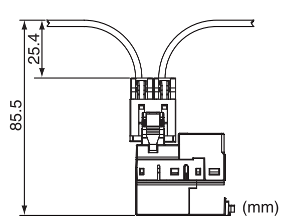
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted

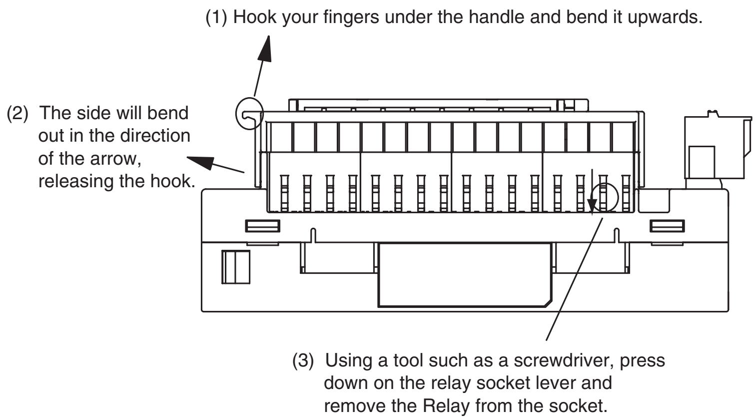


■ When a DCN4-MD4 Multidrop Connector Is Mounted



Replacing Relays

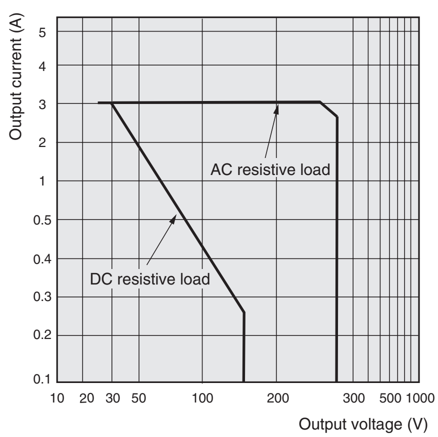
To replace output relays, first remove the cover using the following procedure.



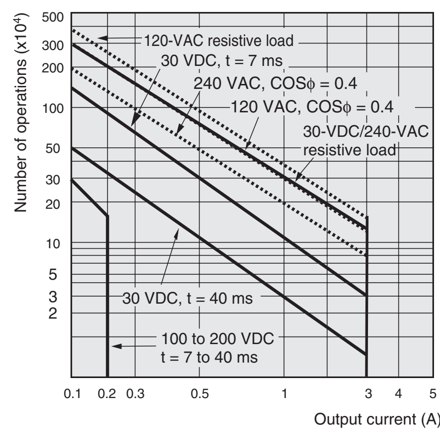
Reference Data

The following reference data shows actual measured data from sampling in a production line. There is some variation in relay characteristics, so use this data for reference only.

Maximum Switching Capacity



Durability Curve



5-3-9 Sixteen-point Output Units (2-tier Terminal Block with SSR Outputs)

CRT1-ROF16

Common Specifications

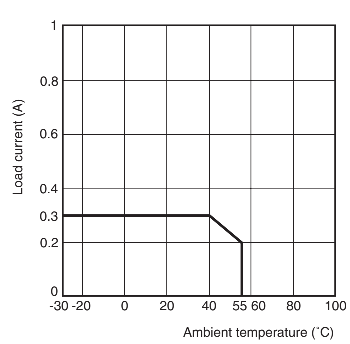
Item	Specification
Communications power supply voltage	14 to 26.4 VDC
Noise immunity	Conforms to IEC 61000-4-4, 2 kV (power line).
Vibration resistance	10 to 60 Hz with double-amplitude of 0.7 mm, 60 to 150 Hz and 50 m/s^2 in X, Y, and Z directions for 80 min each
Shock resistance	150 m/s^2 (3 times in 6 directions on 3 axes)
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)
Terminal block screws tightening torque	M3 wiring screws: 0.5 N·m M3 mounting screws: 0.5 N·m

SSR Output Section Specifications (per Output)

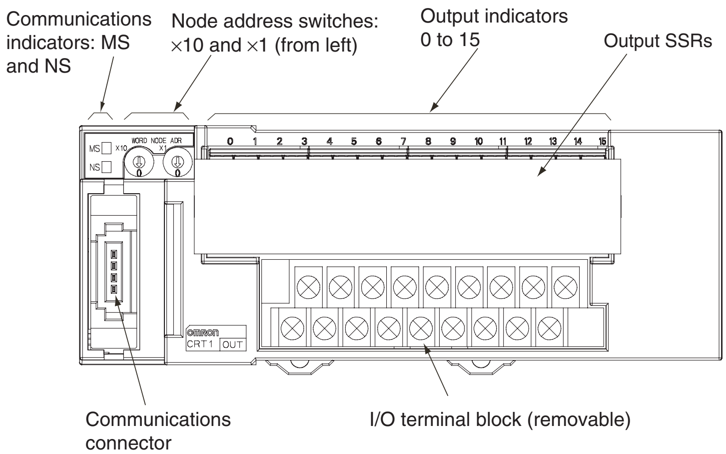
Item	Specification
Model	CRT1-ROF16
I/O capacity	16 outputs
Load voltage	24 to 265 VAC
Load current	0.3 A (See note.)
Inrush current resistivity	50 A (60 Hz)
Installation method	DIN Track
Communications power supply current consumption	85 mA max. for 24-VDC power supply voltage 130 mA max. for 14-VDC power supply voltage
Output hold for communications errors	Select either hold or clear from CX-Integrator.
Weight	250 g max.

Note The SSRs cannot be replaced.

Load Current Vs. Ambient Temperature Characteristics



Component Names and Functions



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

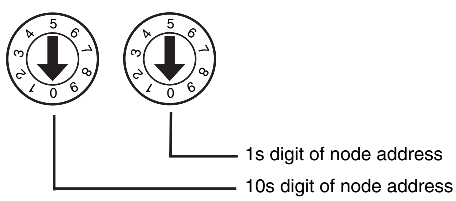
The meanings of the output indicators are given in the following table.

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.

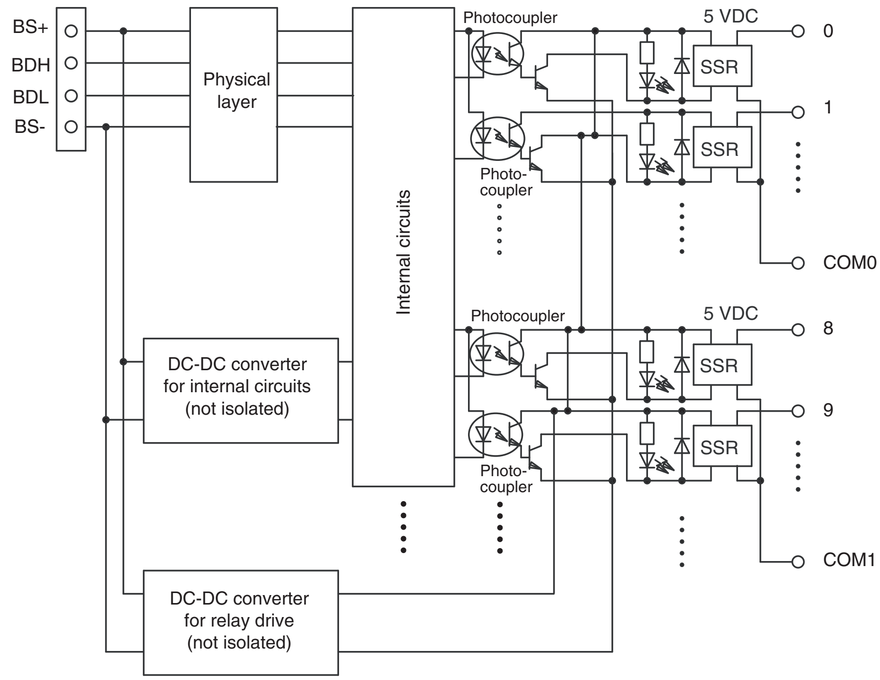
Setting the Node Address

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.)

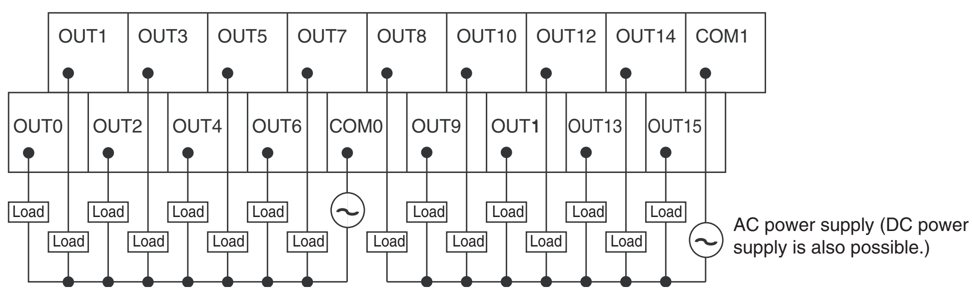
The setting on the rotary switches is read when power is turned ON.



Internal Circuits

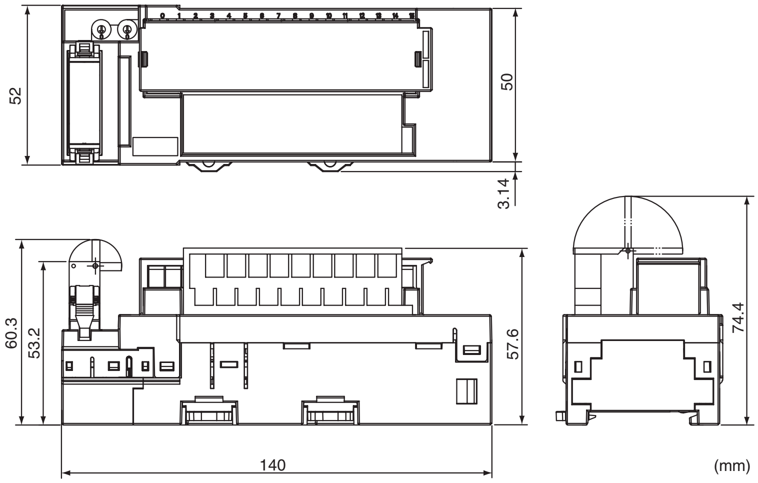


Wiring



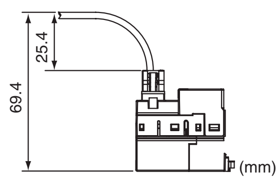
Dimensions

When a DCN4-TB4 Open Type Connector Is Mounted

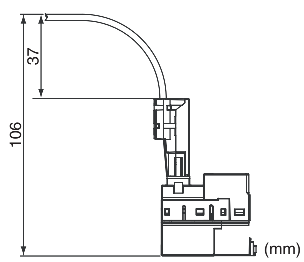


Communications Cable Dimensions when Connector and Cable Are Connected

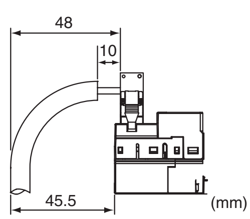
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



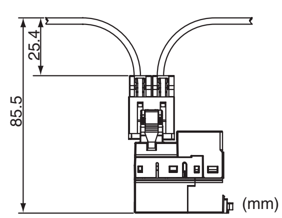
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



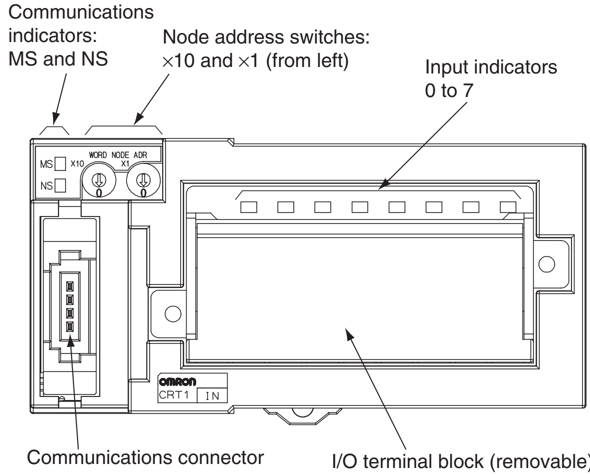
5-3-10 Eight-point Input Units (3-tier Terminal Block) CRT1-ID08TA/CRT1-ID08TA-1/CRT1-ID08TAH/CRT1-ID08TAH-1

Input Section Specifications

Item	Specification			
Model	CRT1-ID08TA	CRT1-ID08TA-1	CRT1-ID08TAH-1	CRT1-ID08TAH-1
I/O capacity	8 inputs			
Internal I/O common	NPN	PNP	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)	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	1.0 mA max.			
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./input			
ON delay	1.5 ms max.			
OFF delay	1.5 ms max.			
Power supply short-circuit detection	---		Operates at 50 mA/point min.	
Disconnection detection	---		Operates at 0.3 mA/point max.	
Number of circuits per common	8 inputs/common			
Isolation method	Photocoupler			
Input indicator	LED (yellow)			
Installation	DIN Track			
Power supply type	Multi-power supply			
Current supplied to input devices	100 mA/points		50 mA/point	
Communications power supply current consumption	30 mA max. for 24-VDC power supply voltage 50 mA max. for 14-VDC power supply voltage		35 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	5 mA max. for 24-VDC power supply voltage		25 mA max. for 24-VDC power supply voltage	
Weight	190 g max.		200 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-ID08TA(-1)/CRT1-ID08TAH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the input indicators are given in the following table.

The detected status is also shown below for Slave Unit with detection functions.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

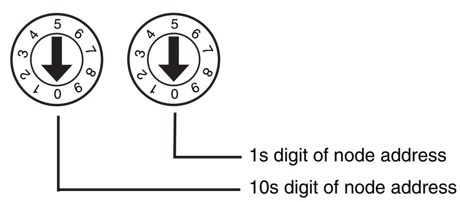
CRT1-ID08TAH(-1) Only

Name	LED status	I/O status	Meaning
0 to 7	Lit red.	Short-circuit detection	The power supply is short-circuited.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

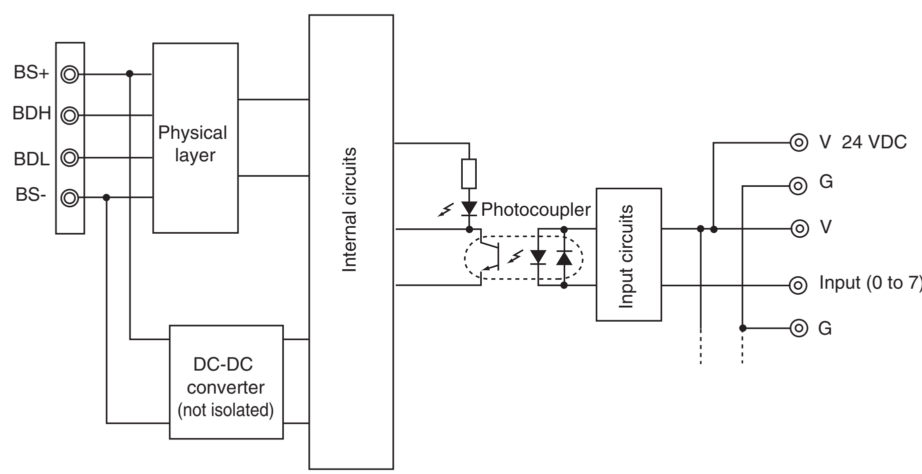
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

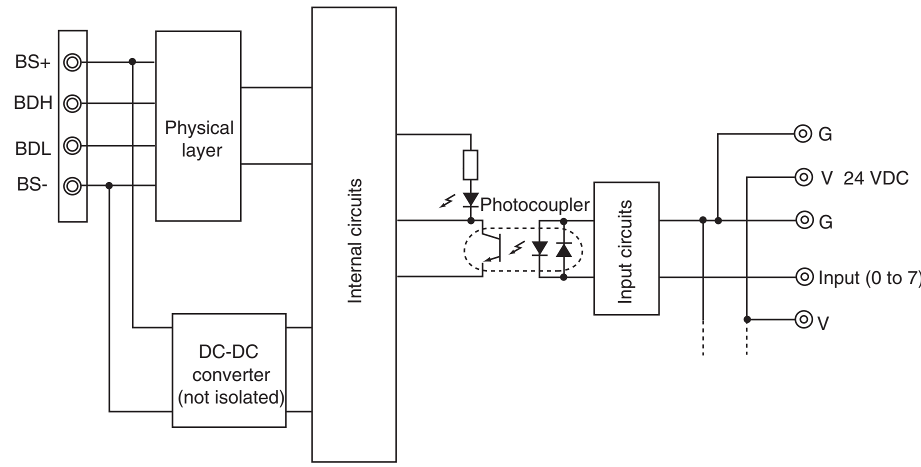


Internal Circuits

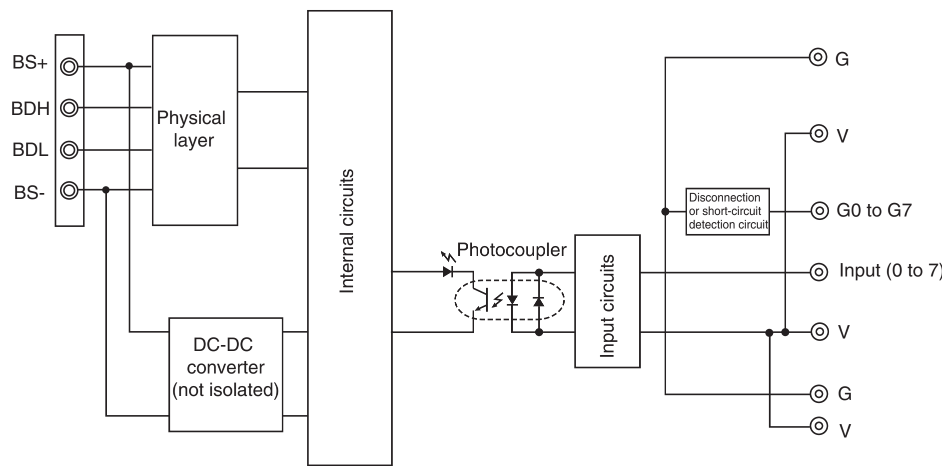
CRT1-ID08TA (NPN)



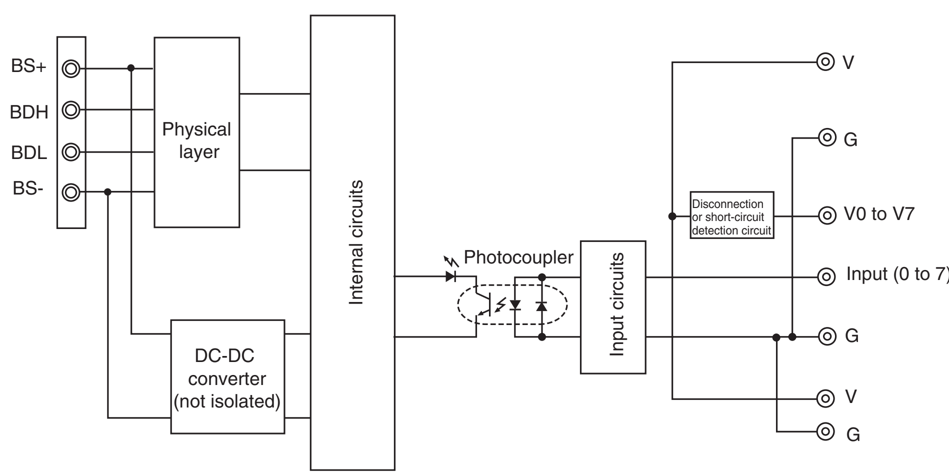
CRT1-ID08TA-1 (PNP)



CRT1-ID08TAH (NPN)

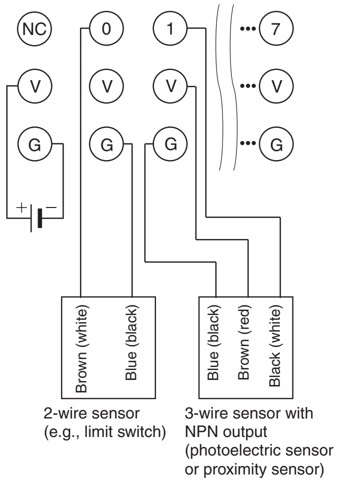


CRT1-ID08TAH-1 (PNP)

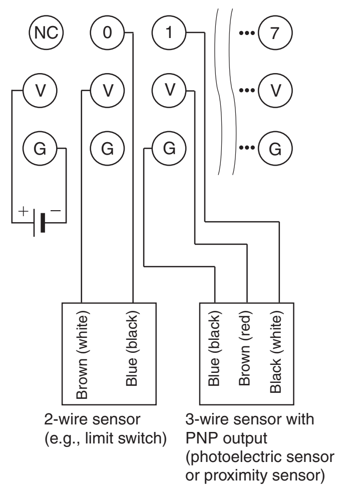


Wiring

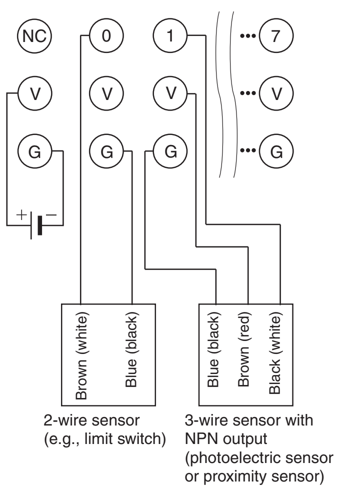
CRT1-ID08TA (NPN)



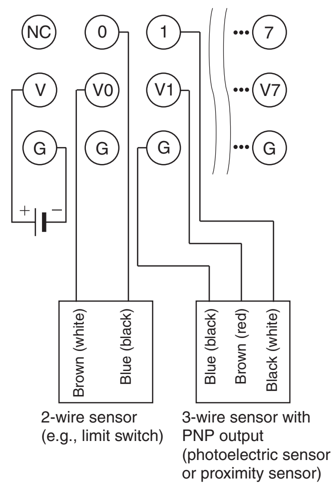
CRT1-ID08TA-1 (PNP)



CRT1-ID08TAH (NPN)



CRT1-ID08TAH-1 (PNP)



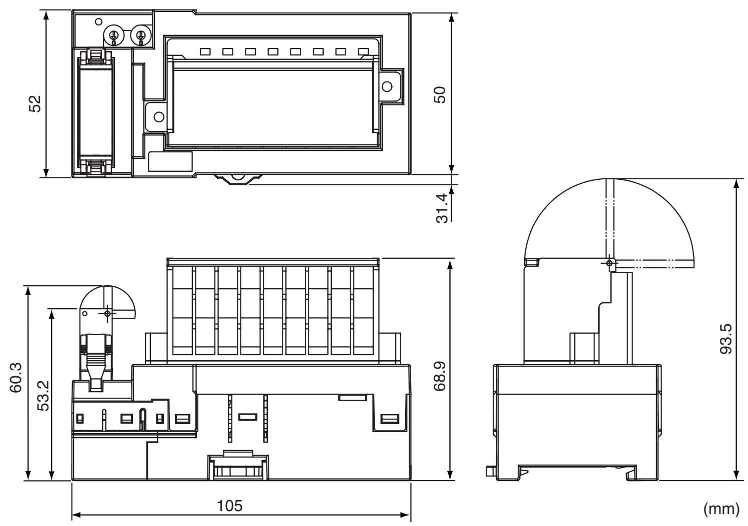
Note

(1) Do not wire NC terminals.

(2) Wire colors have been changed according to the revised JIS standards for photoelectric and proximity sensors. The previous colors are shown in parentheses.

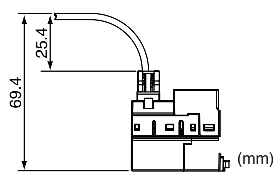
Dimensions (Same for CRT1-ID08TA(-1)/CRT1-ID08TAH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

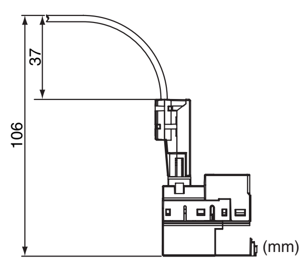


Communications Cable Dimensions when Connector and Cable Are Connected

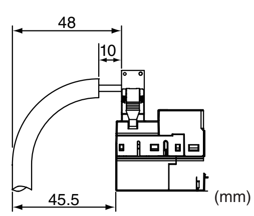
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



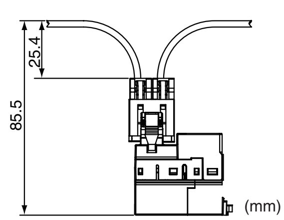
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



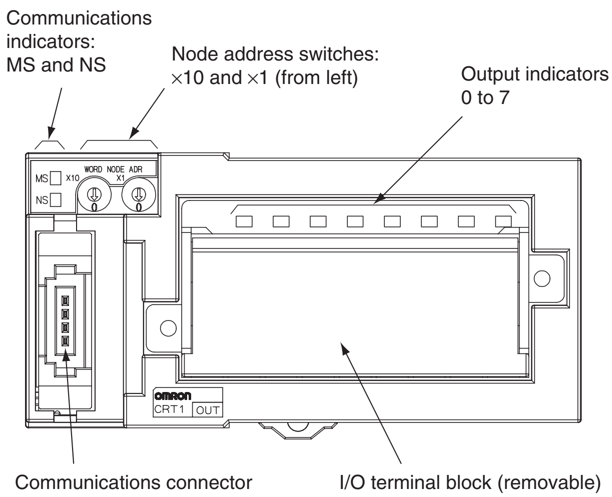
5-3-11 Eight-point Output Units (3-tier Terminal Block) CRT1-OD08TA/CRT1-OD08TA-1/CRT1-OD08TAH/CRT1-OD08TAH-1

Output Section Specifications

Item	Specification			
Model	CRT1-OD08TA	CRT1-OD08TA-1	CRT1-OD08TAH	CRT1-OD08TAH-1
I/O capacity	8 outputs			
Internal I/O common	NPN	PNP	NPN	PNP
Rated output current	0.5 A/output, 2 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)	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.			
Load short-circuit detection	---		Supported.	
Disconnection detection	---		Operates at 3 mA/point max. (Does not operate at over 3 mA.)	
Number of circuits per common	8 outputs/common			
Isolation method	Photocoupler			
Output indicators	LED (yellow)			
Installation	DIN Track			
Power supply type	Multi-power supply			
Current supplied to output devices	100 mA/point			
Communications power supply current consumption	35 mA max. for 24-VDC power supply voltage 55 mA max. for 14-VDC power supply voltage			
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage		15 mA max. for 24-VDC power supply voltage	35 mA max. for 24-VDC power supply voltage
Output handling for communications errors	Select either hold or clear from CX-Integrator.			
Weight	190 g max.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-OD08TA(-1)/CRT1-OD08TAH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output indicators are given in the following table.

The detected status is also shown below for Slave Unit with detection functions.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

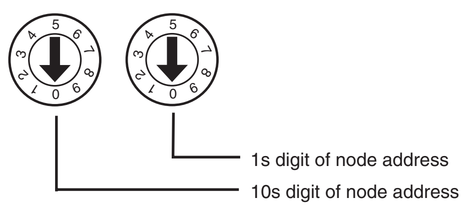
CRT1-OD08TAH(-1) Only

Name	LED status	I/O status	Meaning
0 to 7	Lit red.	Short-circuit detection	A load short-circuit occurred.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

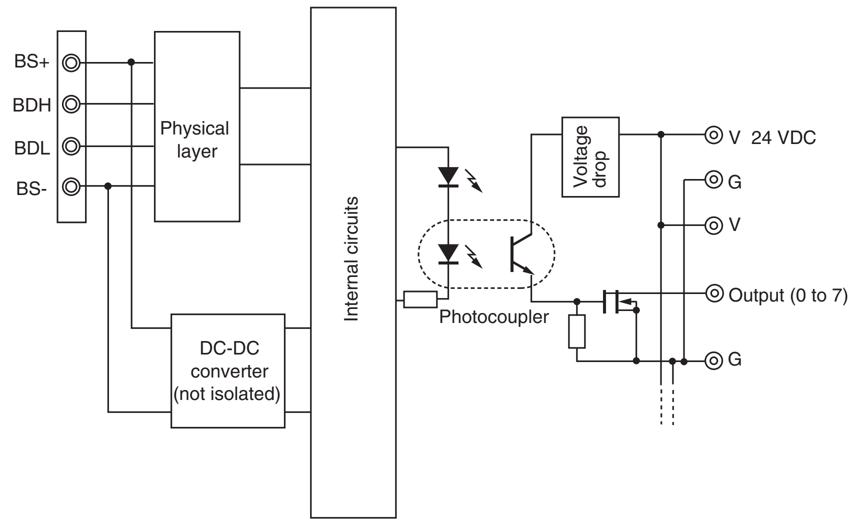
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

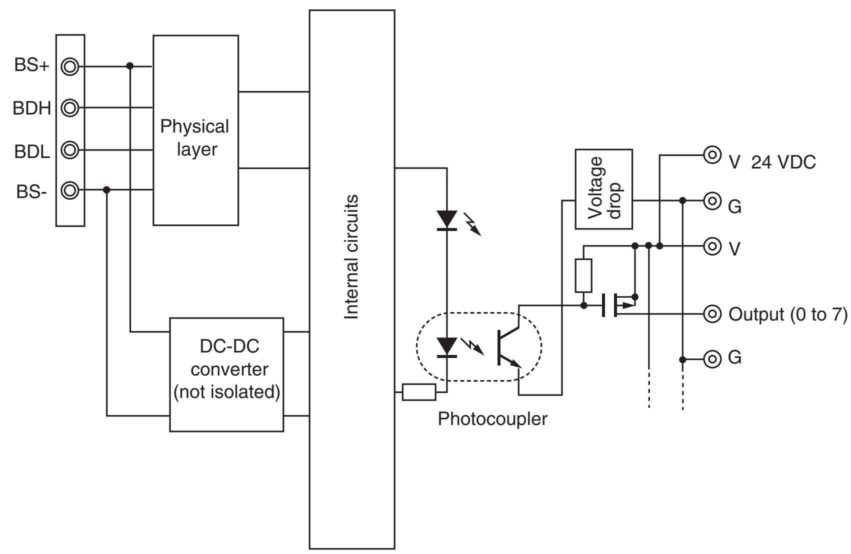


Internal Circuits

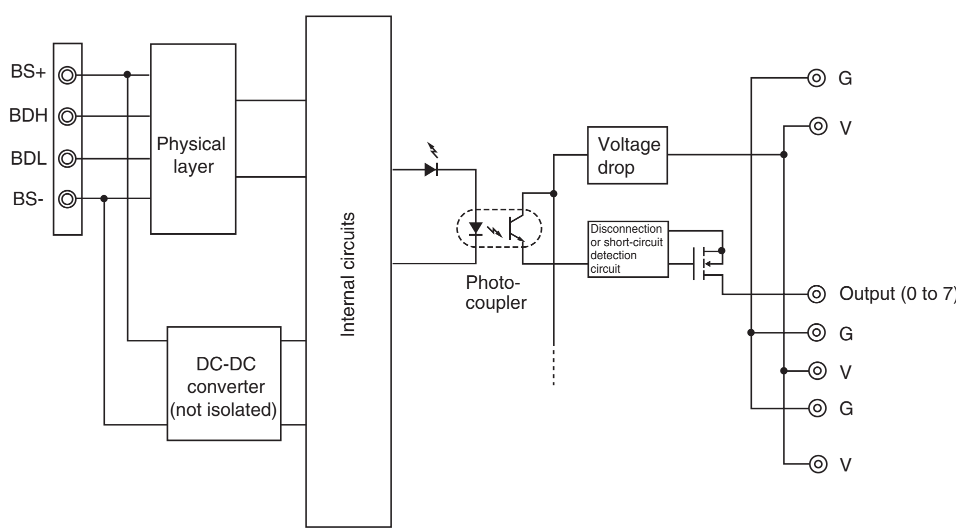
CRT1-OD08TA (NPN)



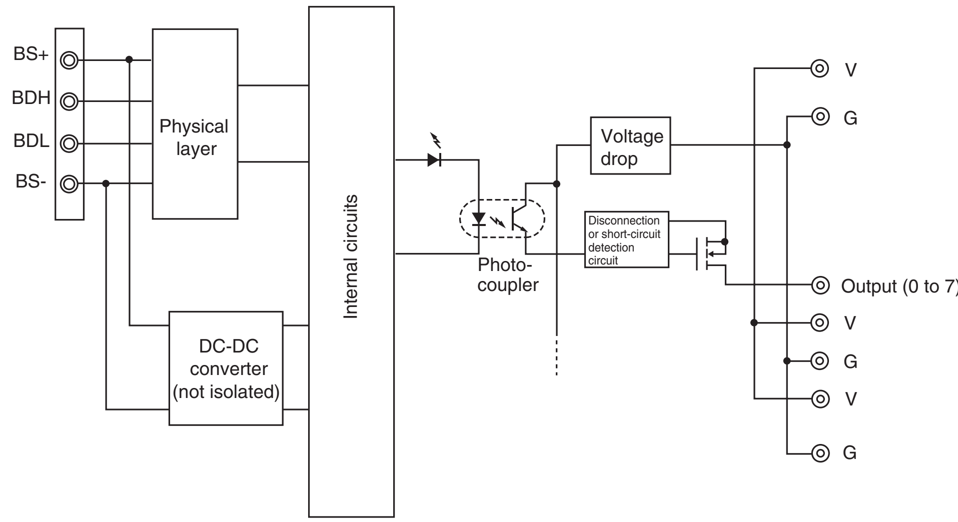
CRT1-OD08TA-1 (PNP)



CRT1-OD08TAH (NPN)

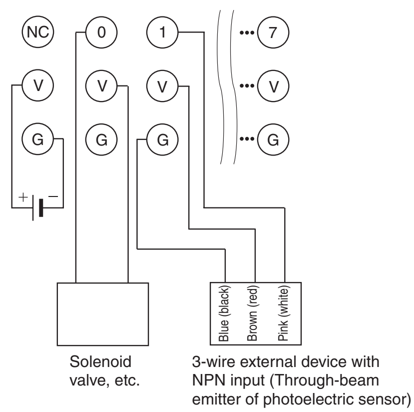


CRT1-OD08TAH-1 (PNP)

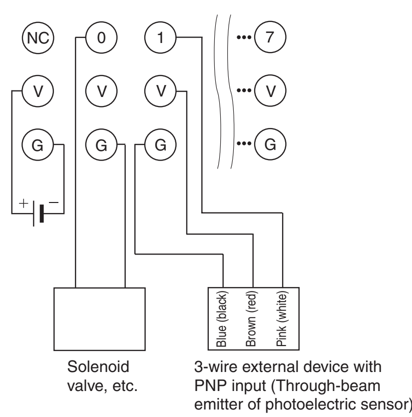


Wiring

CRT1-OD08TA/ CRT1-OD08TAH (NPN)



CRT1-OD08TA-1/ CRT1-OD08TAH-1 (PNP)



Note

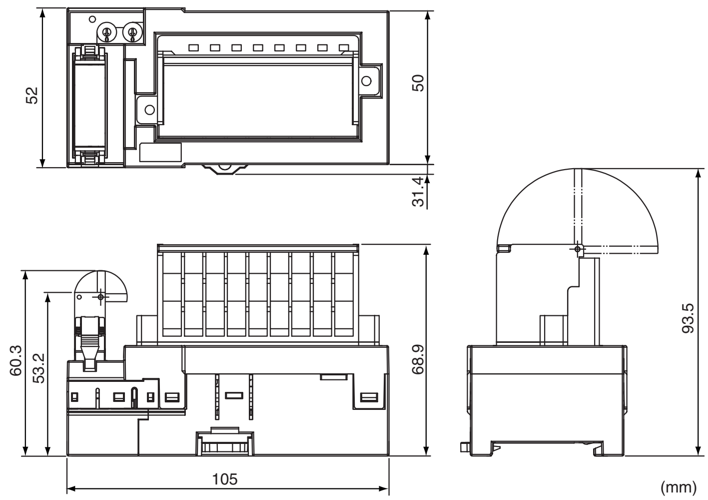
(1) When using an inductive load, such as a solenoid valve, either use a built-in diode to absorb the counterelectromotive force or install an external diode.

(2) Use a maximum current of 500 mA for each V and G terminal accept for the I/O power supply terminals.

(3) Do not wire NC terminals.

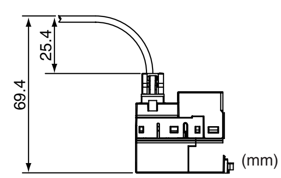
Dimensions (Same for CRT1-OD08TA(-1)/CRT1-OD08TAH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

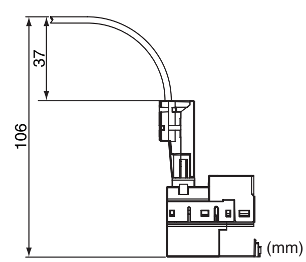


Communications Cable Dimensions when Connector and Cable Are Connected

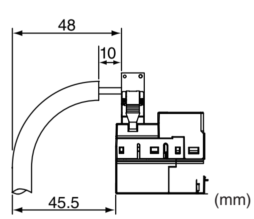
■ **When a DCN4-BR4 Flat Connector I Plug Is Mounted**



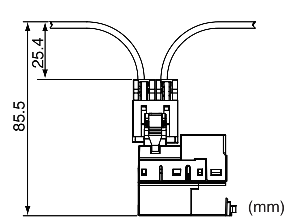
■ **When a DCN5-BR4 Flat Connector II Plug Is Mounted**



■ **When a DCN4-TB4 Open Type Connector Is Mounted**



■ **When a DCN4-MD4 Multidrop Connector Is Mounted**



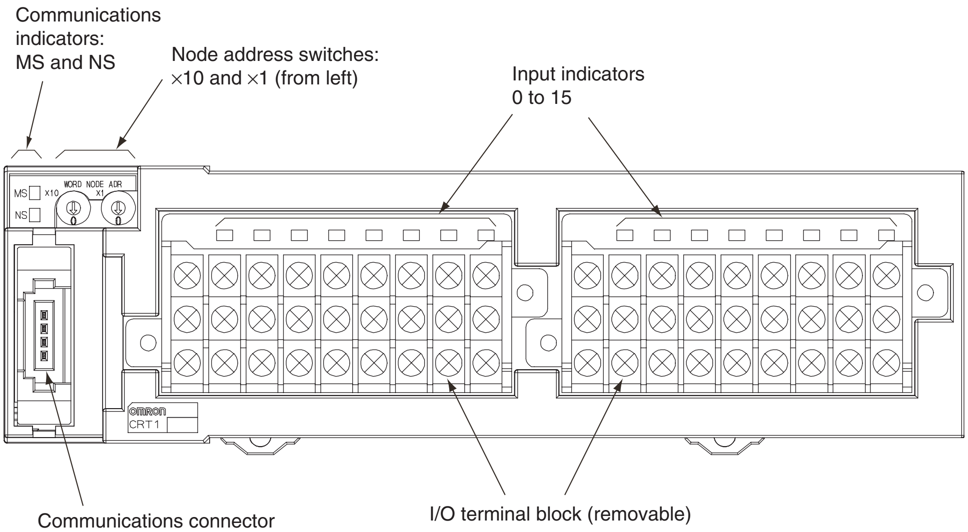
5-3-12 Sixteen-point Input Units (3-tier Terminal Block) CRT1-ID16TA/CRT1-ID16TA-1/CRT1-ID16TAH/CRT1-ID16TAH-1

Input Section Specifications

Item	Specification			
Model	CRT1-ID16TA	CRT1-ID16TA-1	CRT1-ID16TAH	CRT1-ID16TAH-1
I/O capacity	16 inputs			
Internal I/O common	NPN	PNP	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)	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	1.0 mA max.			
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./input			
ON delay	1.5 ms max.			
OFF delay	1.5 ms max.			
Power supply short-circuit detection	---		Operates at 50 mA/point min.	
Disconnection detection	---		Operates at 0.3 mA/point max.	
Number of circuits per common	8 inputs/common			
Isolation method	Photocoupler			
Input indicator	LED (yellow)			
Installation	DIN Track			
Power supply type	Multi-power supply			
Current supplied to input devices	100 mA/points		50 mA/points	
Communications power supply current consumption	40 mA max. for 24-VDC power supply voltage 55 mA max. for 14-VDC power supply voltage		40 mA max. for 24-VDC power supply voltage 70 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	5 mA max. for 24-VDC power supply voltage		25 mA max. for 24-VDC power supply voltage	
Weight	330 g max.		340 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-ID16TA(-1)/CRT1-ID16TAH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the input indicators are given in the following table.
The detection status is also shown below for Slave Units with detection functions.

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.

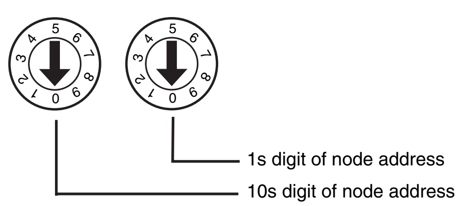
CRT1-ID16TAH(-1) Only

Name	LED status	I/O status	Meaning
0 to 15	Lit red.	Short-circuit detection	The power supply is short-circuited.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

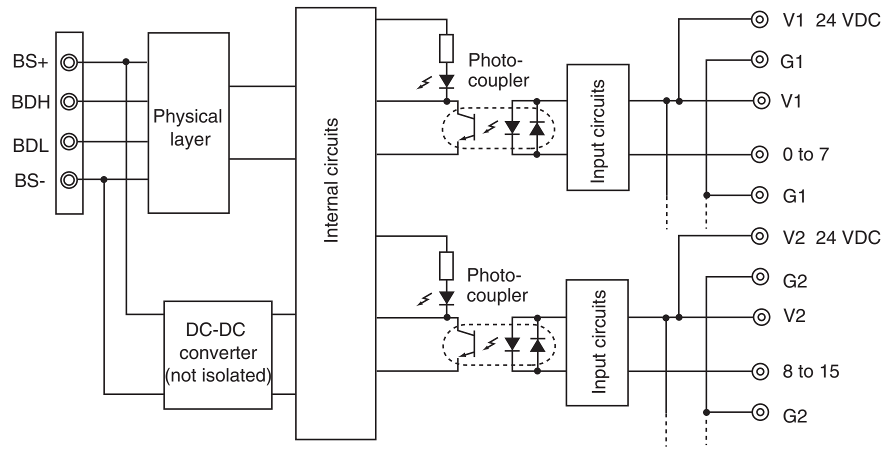
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

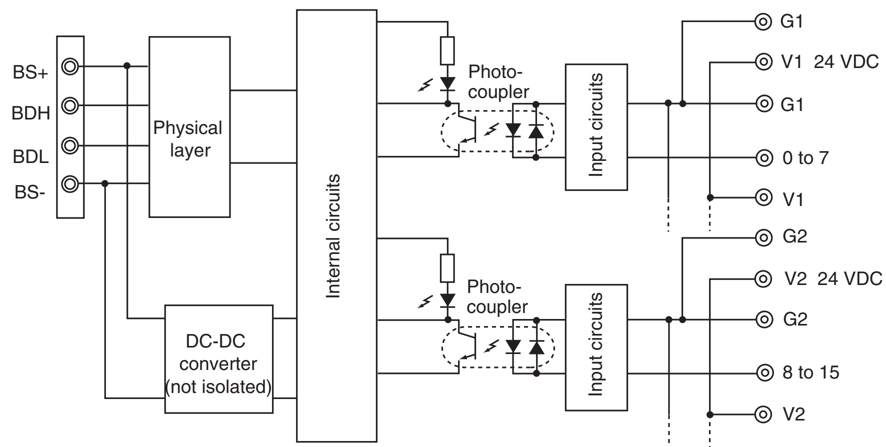


Internal Circuits

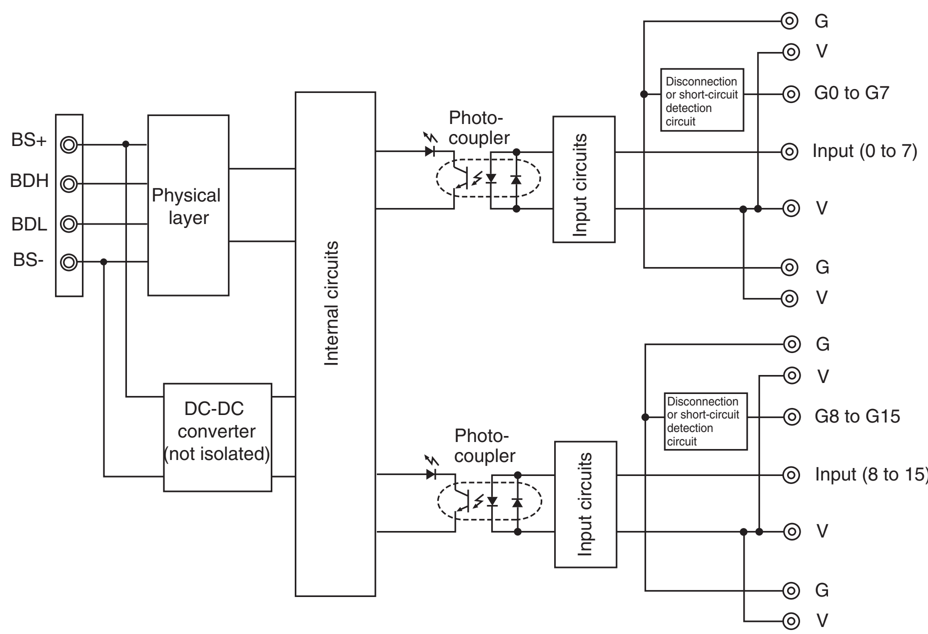
CRT1-ID16TA (NPN)



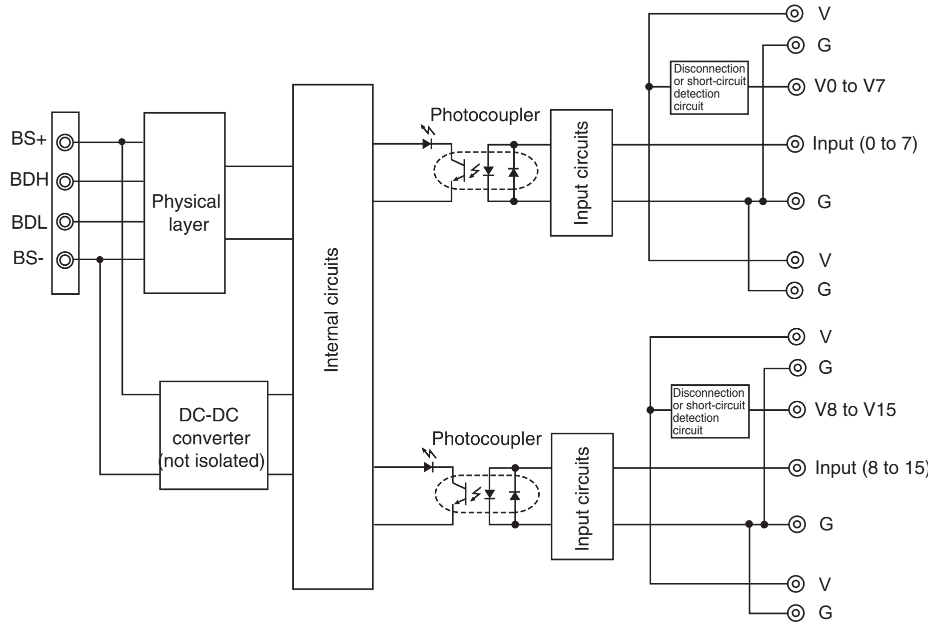
CRT1-ID16TA-1 (PNP)



CRT1-ID16TAH (NPN)

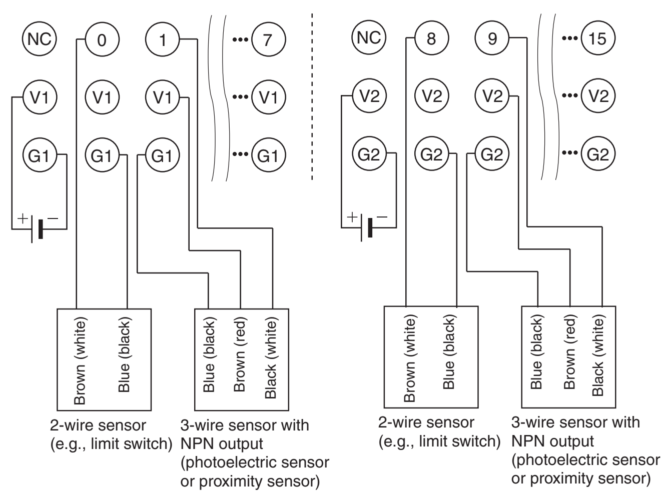


CRT1-ID16TAH-1 (PNP)

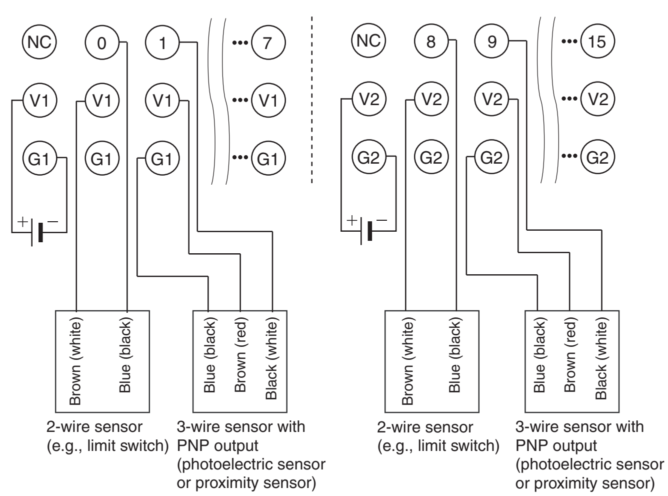


Wiring

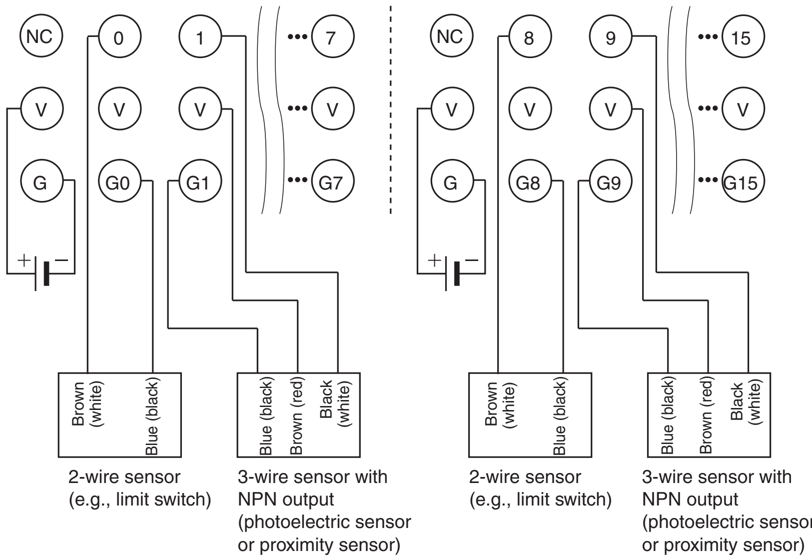
CRT1-ID16TA (NPN)



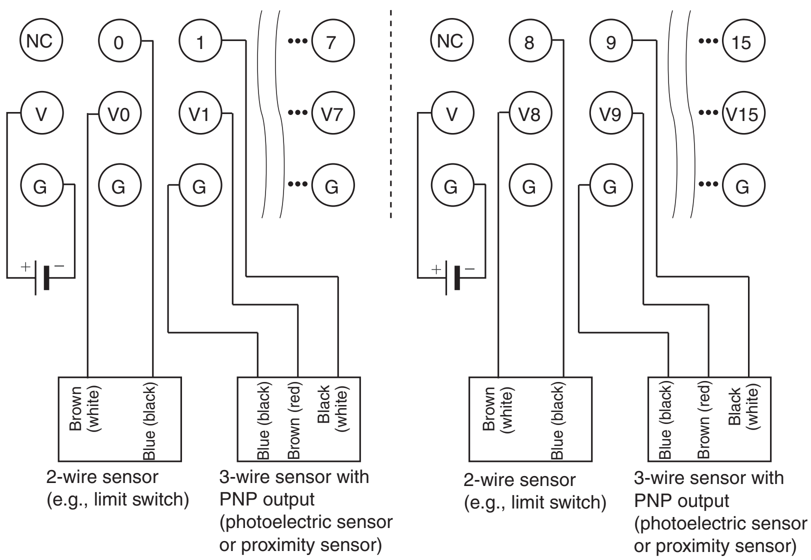
CRT1-ID16TA-1 (PNP)



CRT1-ID16TAH (NPN)



CRT1-ID16TAH-1 (PNP)



Note

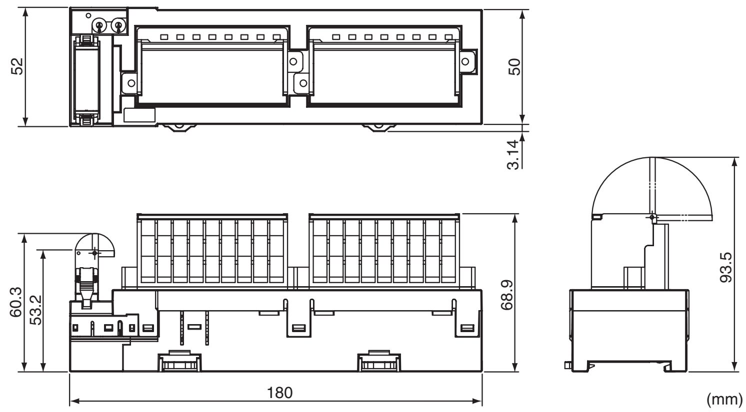
(1) The V terminals on the left and right for the I/O power supply, and the G terminals on the left and right for the I/O power supply are not connected internally. Supply power separately for V-G terminals on the left side and the right side.

(2) Do not wire NC terminals.

(3) Wire colors have been changed according to the revised JIS standards for photoelectric and proximity sensors. The previous colors are shown in parentheses.

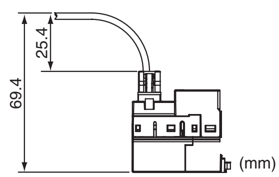
Dimensions (Same for CRT1-ID16TA(-1)/CRT1-ID16TAH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

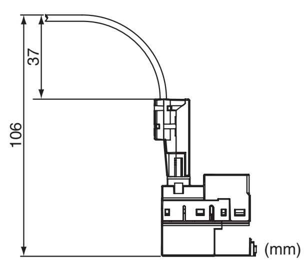


Communications Cable Dimensions when Connector and Cable Are Connected

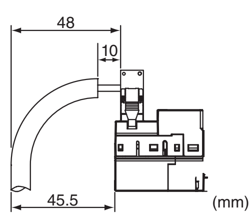
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



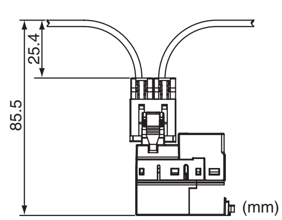
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



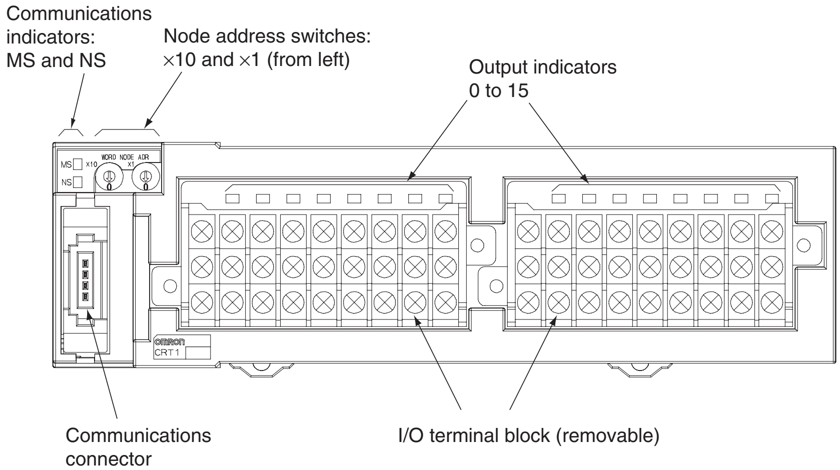
5-3-13 Sixteen-point Output Units (3-tier Terminal Block) CRT1-OD16TA/CRT1-OD16TA-1/CRT1-OD16TAH/CRT1-OD16TAH-1

Output Section Specifications

Item	Specification			
Model	CRT1-OD16TA	CRT1-OD16TA-1	CRT1-OD16TAH	CRT1-OD16TAH-1
I/O capacity	16 outputs			
Internal I/O common	NPN	PNP	NPN	PNP
Rated output current	0.5 A/output, 2 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)	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	8 outputs/common			
Load short-circuit detection	---		Supported.	
Disconnection detection	---		Operates at 3 mA/point max. (Does not operate at over 3 mA.)	
Isolation method	Photocoupler			
Output indicators	LED (yellow)			
Installation	DIN Track			
Power supply type	Multi-power supply			
Current supplied to output devices	100 mA/points			
Communications power supply current consumption	45 mA max. for 24-VDC power supply voltage 65 mA max. for 14-VDC power supply voltage		40 mA max. for 24-VDC power supply voltage 70 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage		15 mA max. for 24-VDC power supply voltage	35 mA max. for 24-VDC power supply voltage
Output handling for communications errors	Select either hold or clear from CX-Integrator.			
Weight	330 g max.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-OD16TA(-1)/CRT1-OD16TAH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output indicators are given in the following table.

The detection status is also shown below for Slave Units with detection functions.

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.

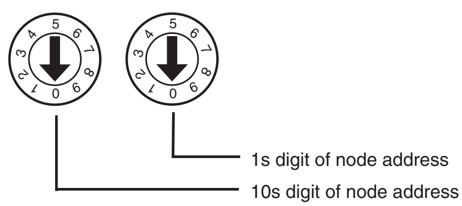
CRT1-OD16TAH(-1) Only

Name	LED status	I/O status	Meaning
0 to 15	Lit red.	Short-circuit detection	A load short-circuit occurred.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

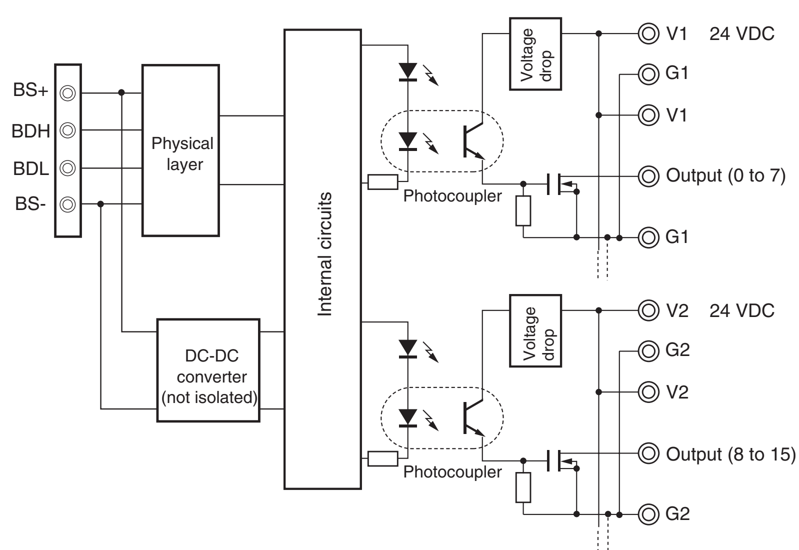
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

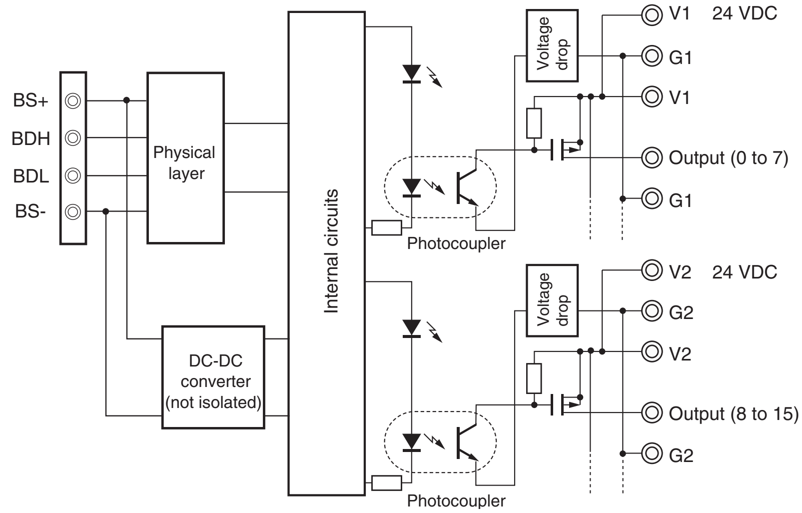


Internal Circuits

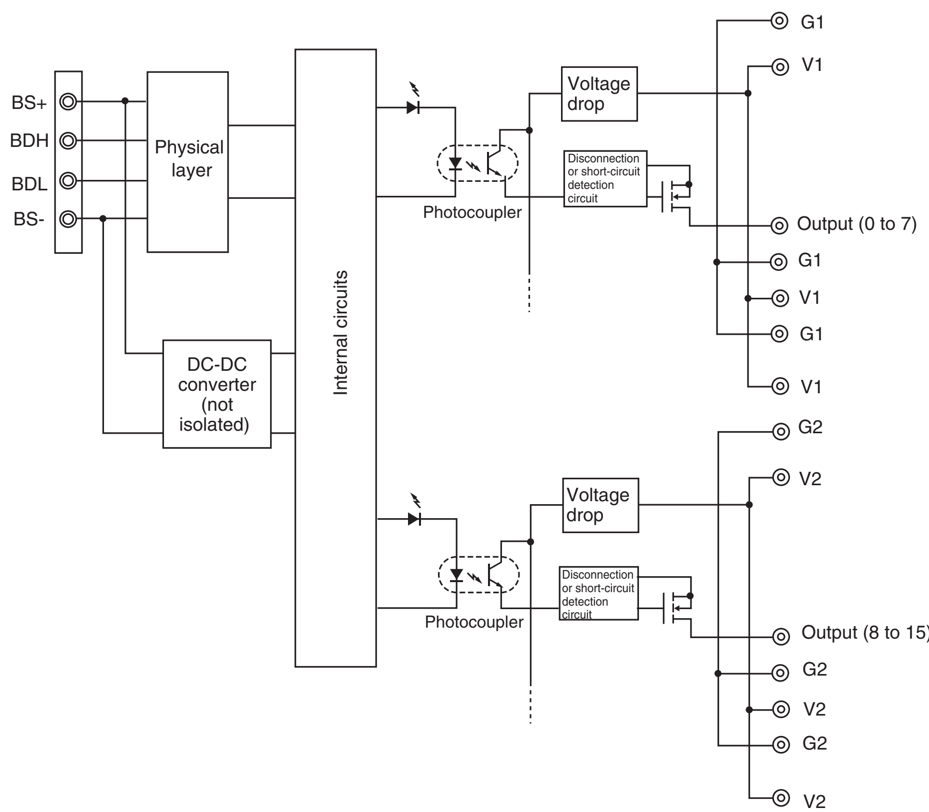
CRT1-OD16TA (NPN)



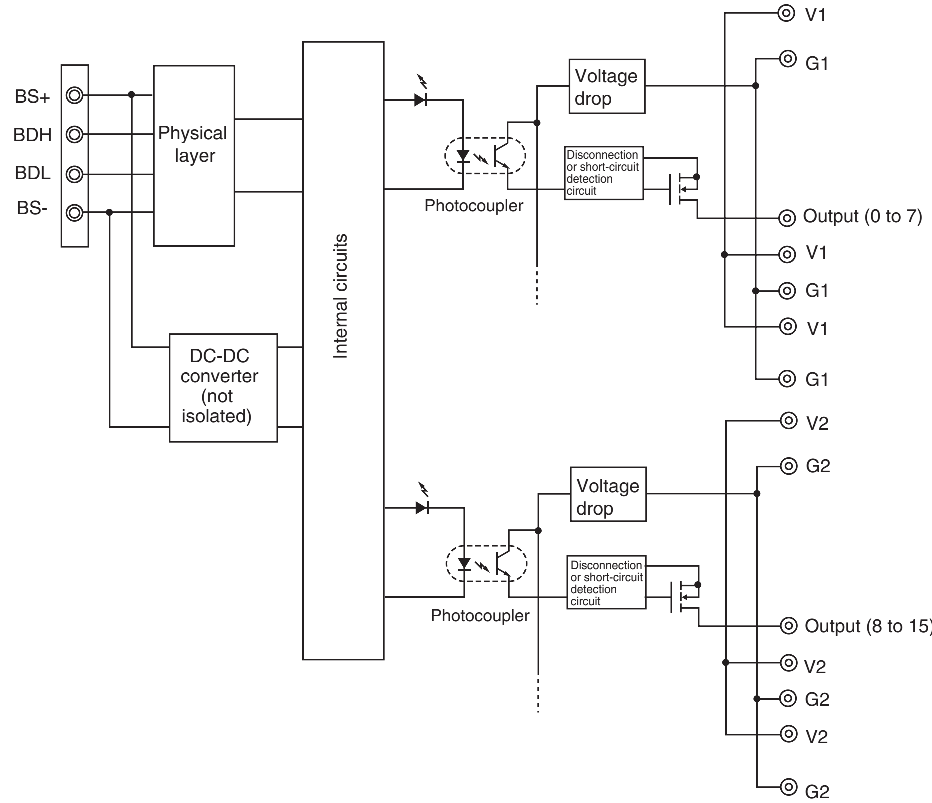
CRT1-OD16TA-1 (PNP)



CRT1-OD16TAH (NPN)

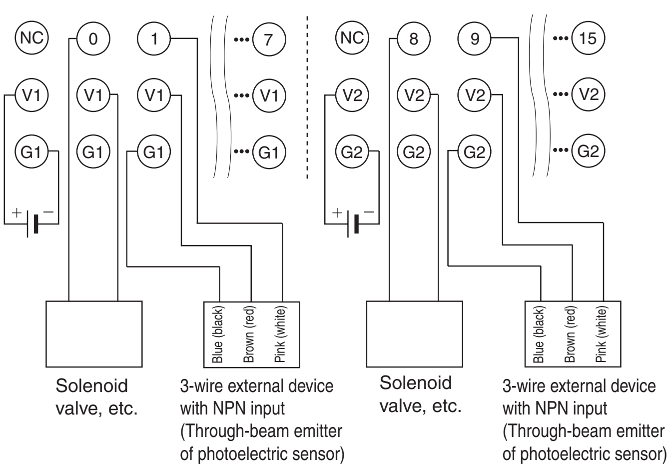


CRT1-OD16TAH-1 (PNP)

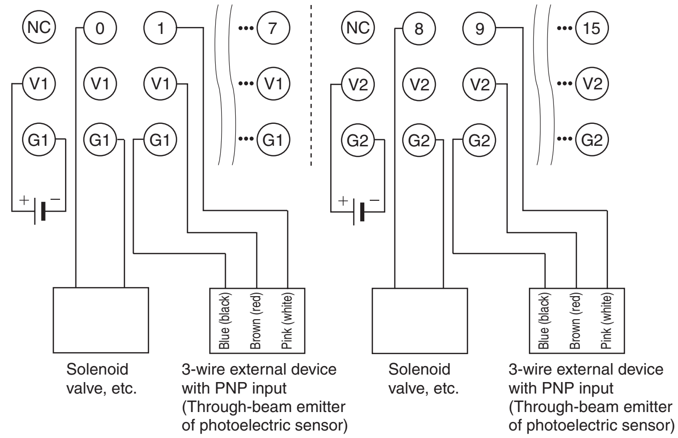


Wiring

CRT1-OD16TA/ CRT1-OD16TAH (NPN)



**CRT1-OD16TA-1/
CRT1-OD16TAH-1 (PNP)**



Note

(1) The V1 and V2 terminals as well as the G1 and G2 terminals of the I/O power supply are not connected internally. Supply power separately for V1-G1 and V2-G2.

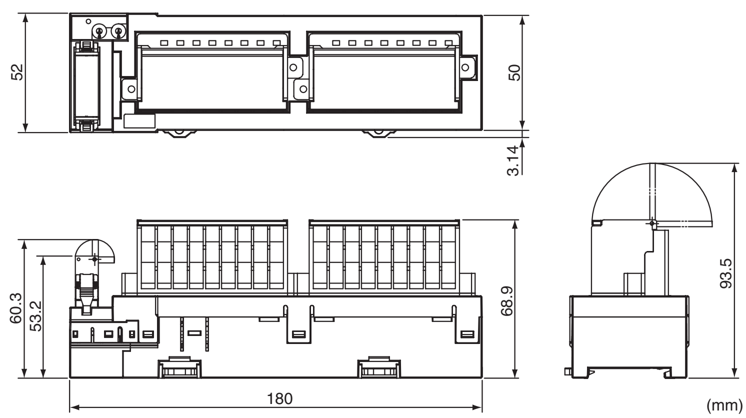
(2) Use a maximum current of 500 mA for each V1, V2, G1, and G2 terminal aside from the I/O power supply terminals.

(3) When using an inductive load, such as a solenoid valve, either use a built-in diode to absorb the counterelectromotive force or install an external diode.

(4) Do not wire NC terminals.

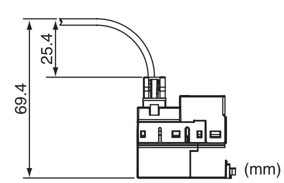
Dimensions (Same for CRT1-OD16TA(-1)/CRT1-OD16TAH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

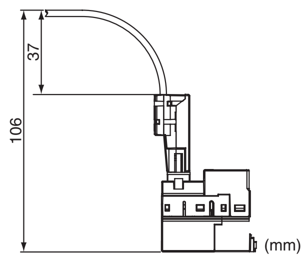


Communications Cable Dimensions when Connector and Cable Are Connected

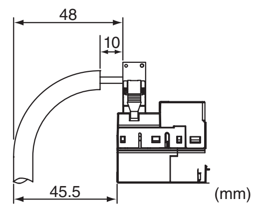
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



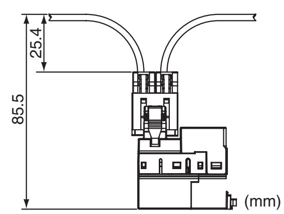
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



5-3-14 Eight-point Input and Eight-point Output Units (3-tier Terminal Block)

CRT1-MD16TA/CRT1-MD16TA-1/CRT1-MD16TAH/CRT1-MD16TAH-1

Common Specifications

Item	Specification			
Model	CRT1-MD16TA	CRT1-MD16TA-1	CRT1-MD16TAH	CRT1-MD16TAH-1
Installation	DIN Track			
Communications power supply current consumption	40 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage		40 mA max. for 24-VDC power supply voltage 70 mA max. for 14-VDC power supply voltage	
Weight	330 g max.		340 g max.	

Input Section Specifications

Item	Specification			
Model	CRT1-MD16TA	CRT1-MD16TA-1	CRT1-MD16TAH	CRT1-MD16TAH-1
I/O capacity	8 inputs			
Internal I/O common	NPN	PNP	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)	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	1.0 mA max.			
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./input			
ON delay	1.5 ms max.			
OFF delay	1.5 ms max.			
Power supply short-circuit detection	---		Operates at 50 mA/point min.	
Disconnection detection	---		Operates at 0.3 mA/point max.	
Number of circuits per common	8 inputs/common			
Isolation method	Photocoupler			
Input indicator	LED (yellow)			
Power supply type	Multi-power supply			
Current supplied to input devices	100 mA/points		50 mA/points	
I/O power supply current consumption	5 mA max. for 24-VDC power supply voltage		25 mA max. for 24-VDC power supply voltage	

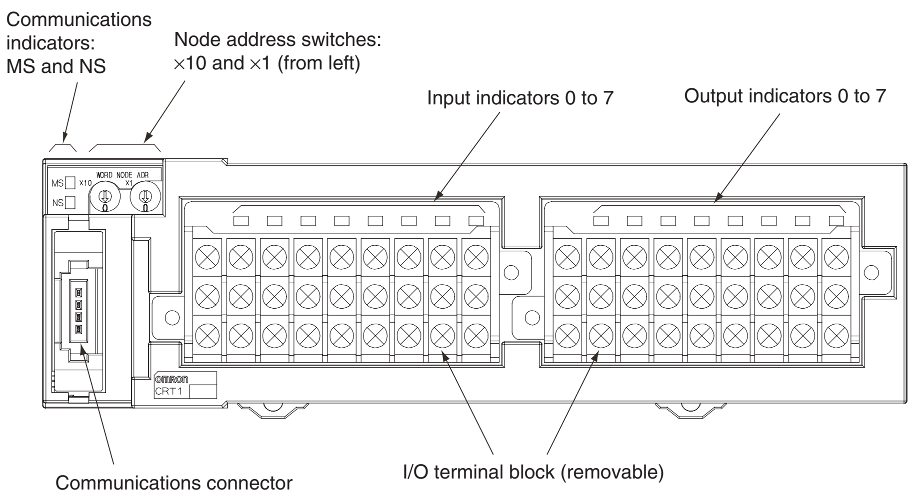
Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Output Section Specifications

Item	Specification			
Model	CRT1-MD16TA	CRT1-MD16TA-1	CRT1-MD16TAH	CRT1-MD16TAH-1
I/O capacity	8 outputs			
Internal I/O common	NPN	PNP	NPN	PNP
Rated output current	0.5 A/output, 2 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)	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.			
Load short-circuit detection	---		Supported.	
Disconnection detection	---		Operates at 3 mA/point max. (Does not operate at over 3 mA.)	
Number of circuits per common	8 outputs/common			
Isolation method	Photocoupler			
Output indicators	LED (yellow)			
Power supply type	Multi-power supply			
Current supplied to output devices	100 mA/points			
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage			35 mA max. for 24-VDC power supply voltage
Output handling for communications errors	Select either hold or clear from CX-Integrator.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-MD16TA(-1)/CRT1-MD16TAH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

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

The detection status is also shown below for Slave Units with detection functions.

Name	LED status	I/O status	Meaning
0 to 7 (inputs) 0 to 7 (outputs)	Lit yellow.	Input or output ON	The input or output is ON.
	Not lit.	Input or output OFF	The input or output is OFF.

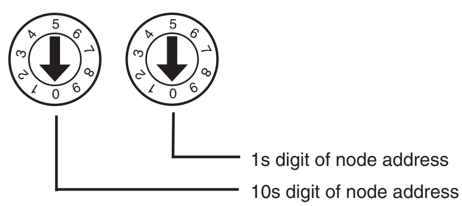
CRT1-MD16TAH(-1) Only

Name	LED status	I/O status	Meaning
0 to 7 (inputs)	Lit red.	Short-circuit detection	The power supply is short-circuited.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.
0 to 7 (outputs)	Lit red.	Short-circuit detection	A load short-circuit occurred.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

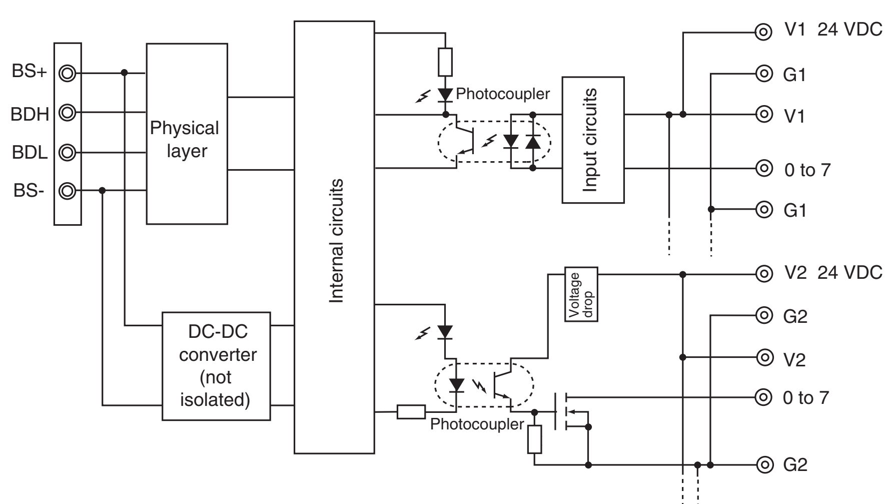
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

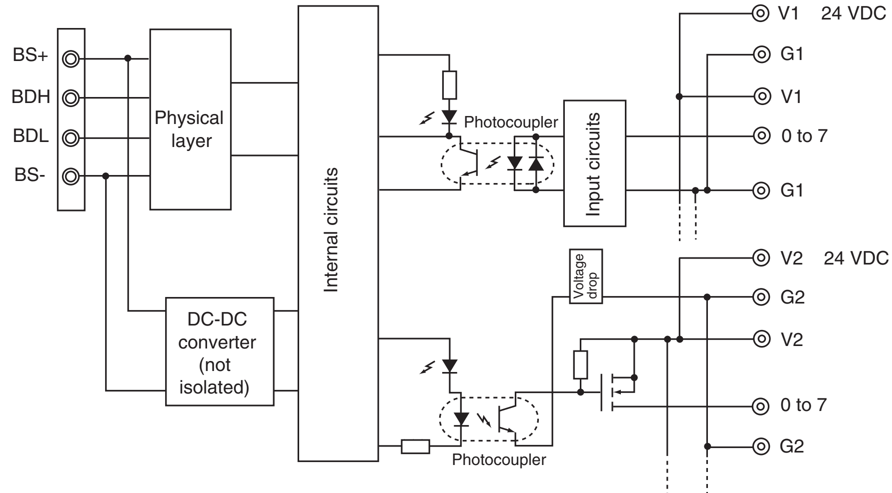


Internal Circuits

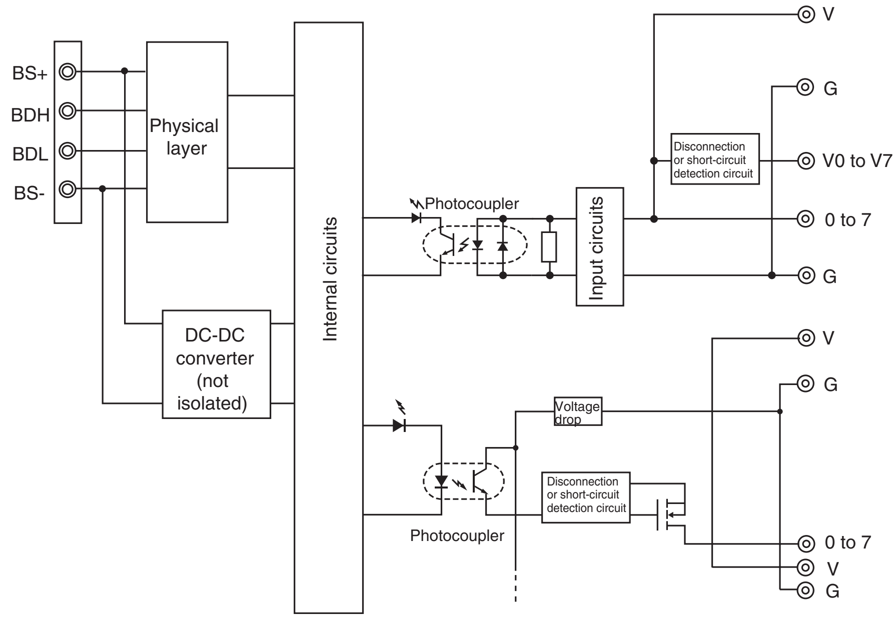
CRT1-MD16TA (NPN)



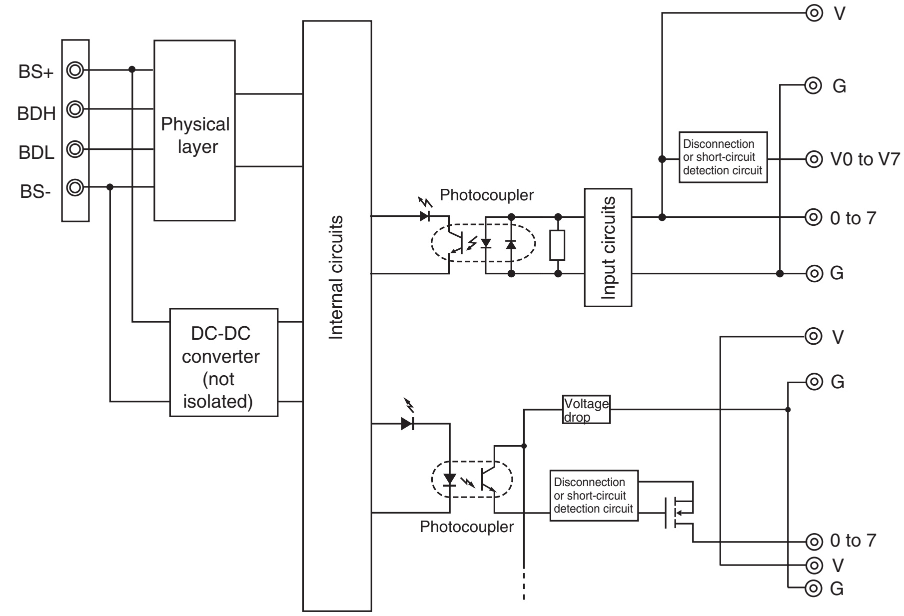
CRT1-MD16TA-1 (PNP)



CRT1-MD16TAH (NPN)

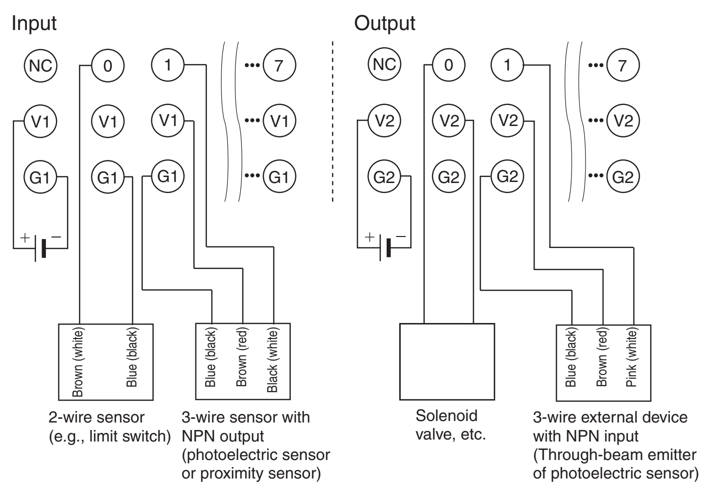


CRT1-MD16TAH-1 (PNP)

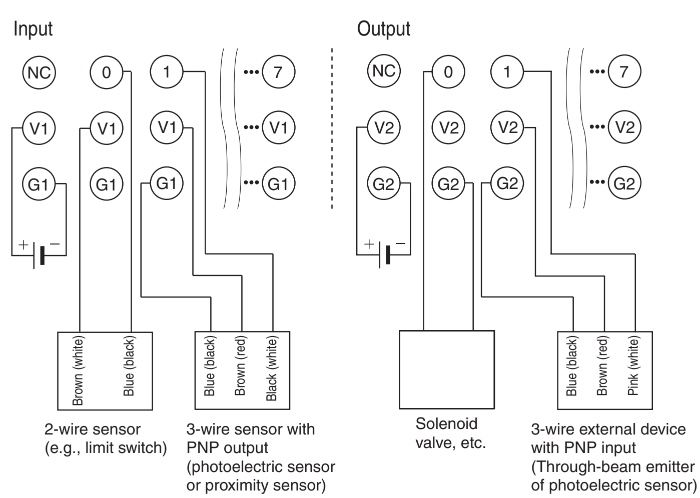


Wiring

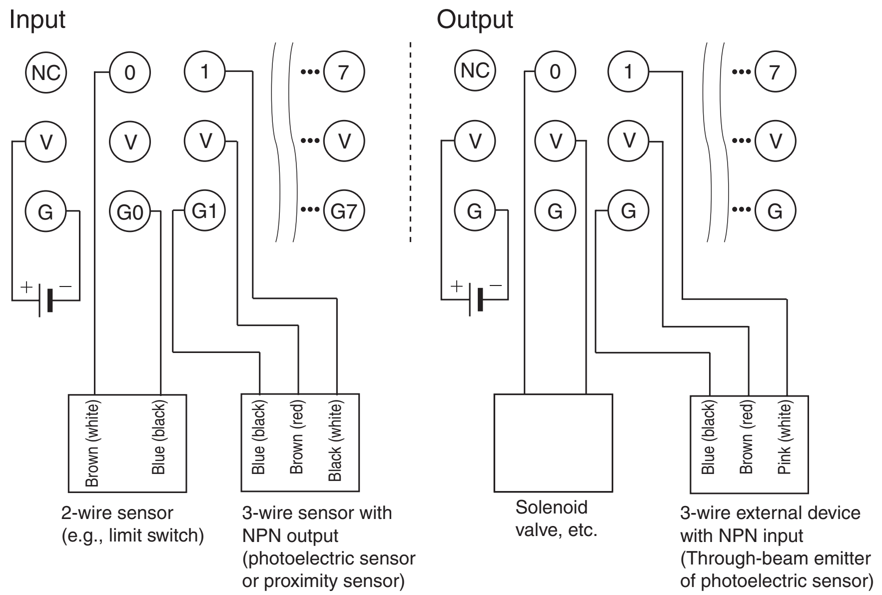
CRT1-MD16TA (NPN)



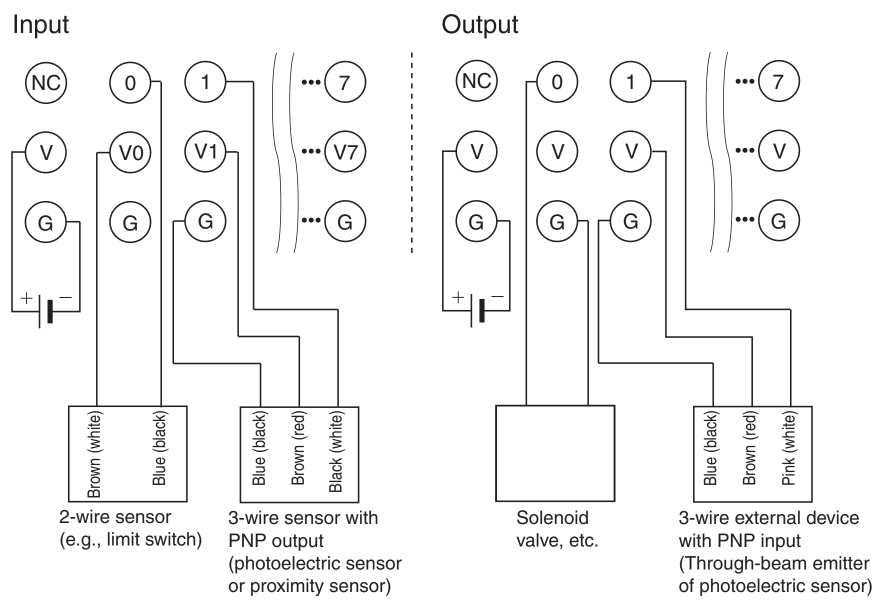
CRT1-MD16TA-1 (PNP)



CRT1-MD16TAH (NPN)



CRT1-MD16TAH-1 (PNP)



Note

(1) The V1 and V2 terminals as well as the G1 and G2 terminals of the I/O power supply are not connected internally. Supply power separately for V1-G1 and V2-G2.

(2) Use a maximum current of 500 mA for each V1, V2, G1, and G2 terminal aside from the I/O power supply terminals on the output side.

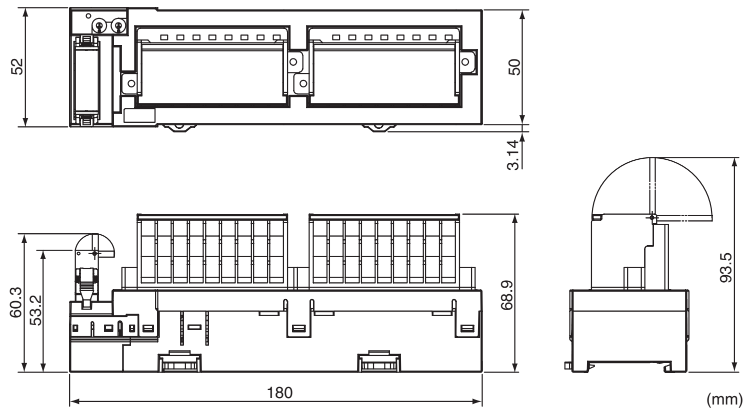
(3) When using an inductive load, such as a solenoid valve, either use a built-in diode to absorb the counterelectromotive force or install an external diode.

(4) Do not wire NC terminals.

(5) Wire colors have been changed according to the revised JIS standards for photoelectric and proximity sensors. The previous colors are shown in parentheses.

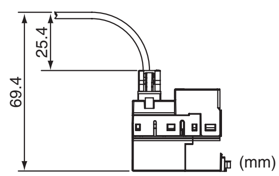
Dimensions (Same for CRT1-MD16TA(-1)/CRT1-MD16TAH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

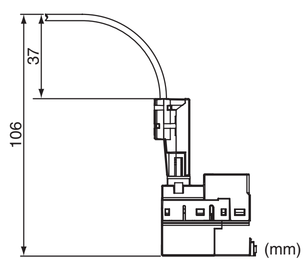


Communications Cable Dimensions when Connector and Cable Are Connected

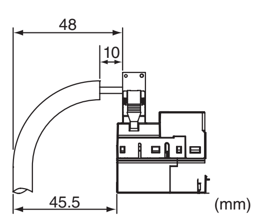
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



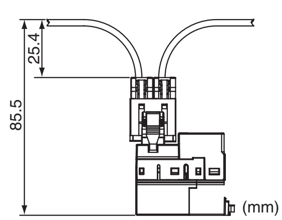
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



5-4 Units with Connectors

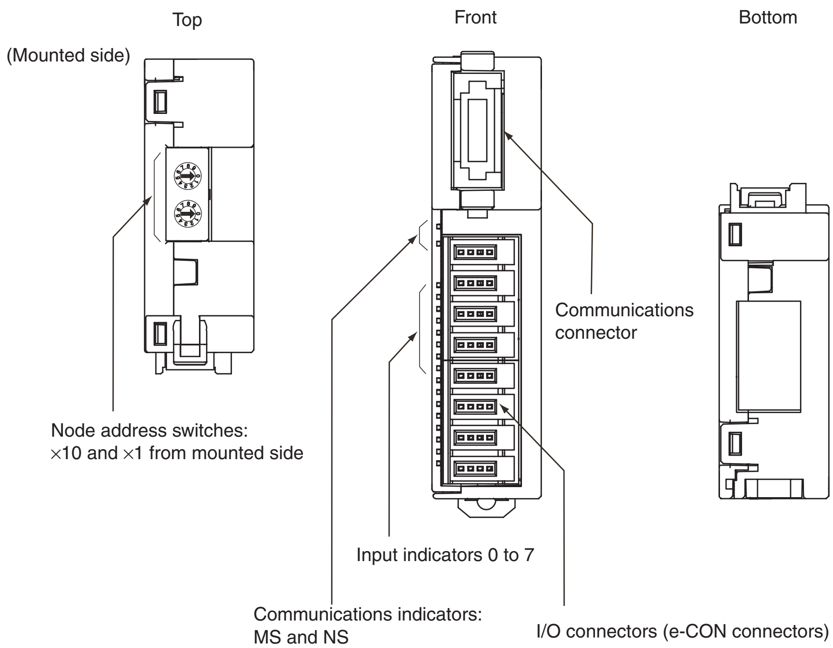
5-4-1 Eight-point Input Units (e-CON Connectors) CRT1-VID08S/CRT1-VID08S-1

Input Section Specifications

Item	Specification	
Model	CRT1-VID08S	CRT1-VID08S-1
I/O capacity	8 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	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 11 VDC: 3.0 mA min./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	8 inputs/common	
Isolation method	Photocoupler	
Input indicator	LED (yellow)	
Installation	DIN Track or Mounting Bracket	
Power supply type	Network power supply	
Power short-circuit protection	Operates at 50 mA/point min.	
Current supplied to input devices	50 mA/input	
Communications power supply current consumption	35 mA max. for 24-VDC power supply voltage 50 mA max. for 14-VDC power supply voltage	
Weight	80 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-VID08S and CRT1-VID08S-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

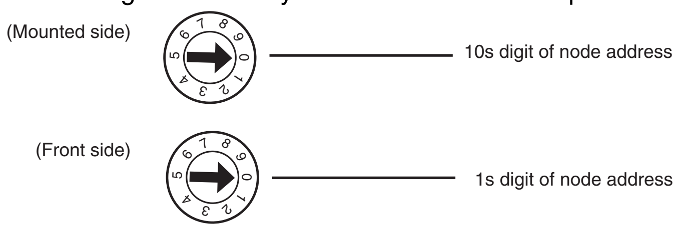
The meanings of the input indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

Setting the Node Address

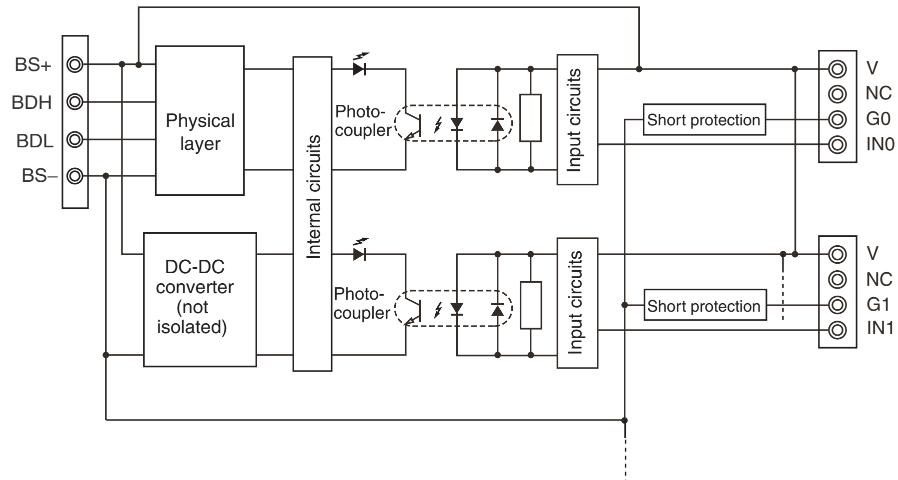
The node address is set as a decimal number with the 10s digit set on the mounting-side rotary switch and the 1s digit set on the front-side rotary switch. (The maximum node address is 63.)

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

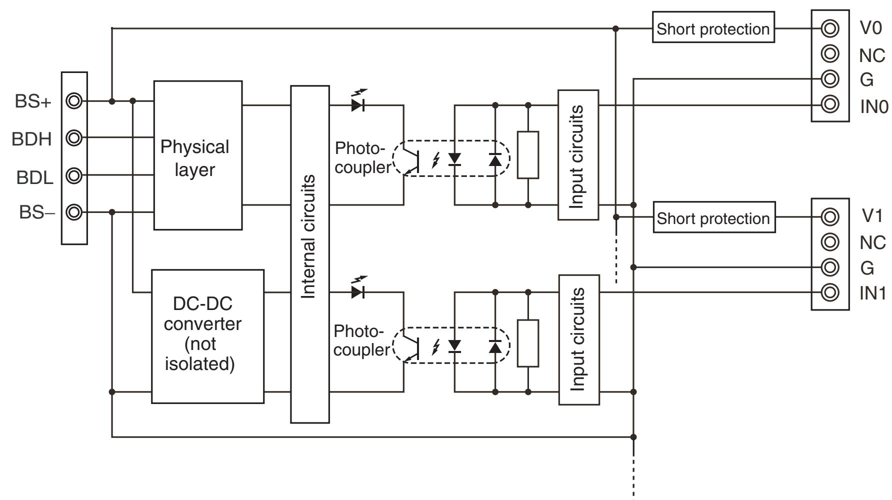


Internal Circuits

CRT1-VID08S (NPN)

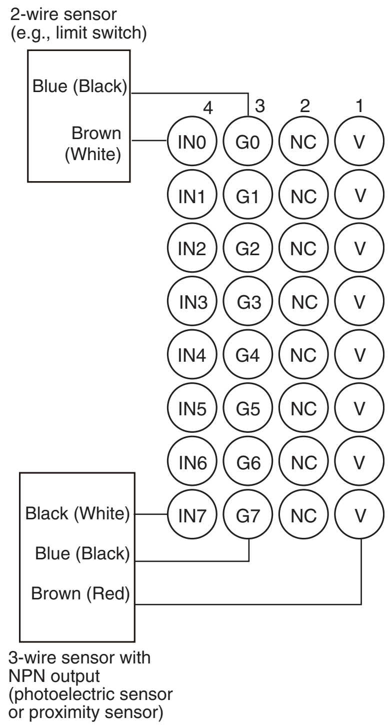


CRT1-VID08S-1 (PNP)

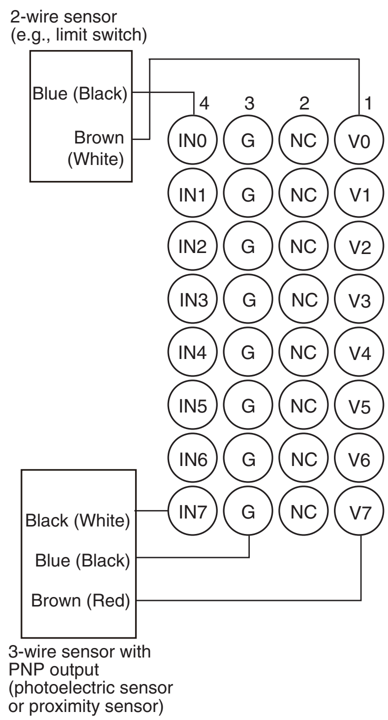


Wiring

CRT1-VID08S (NPN)



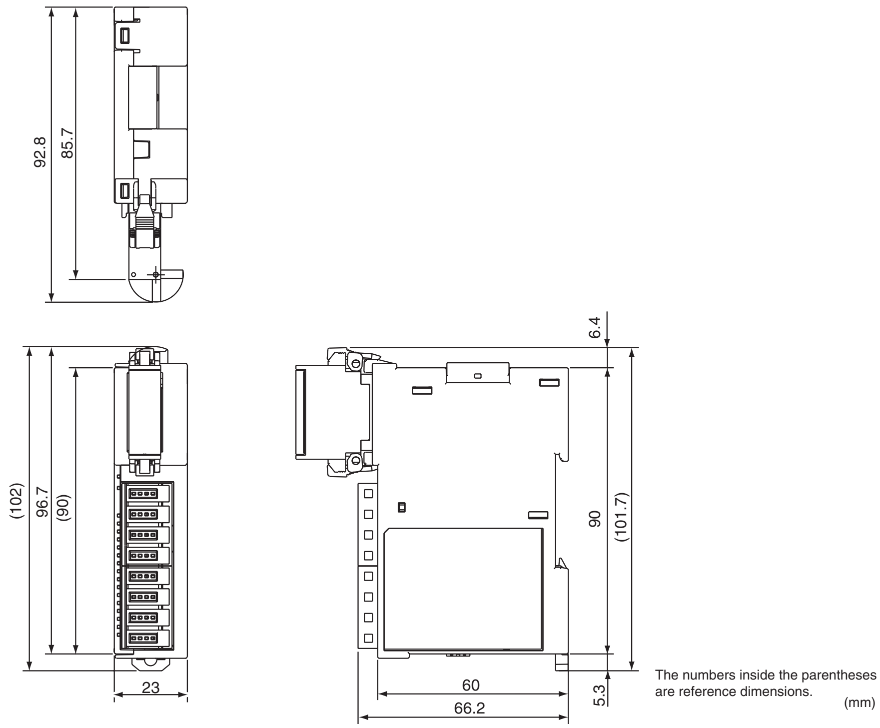
CRT1-VID08S-1 (PNP)



Note 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.

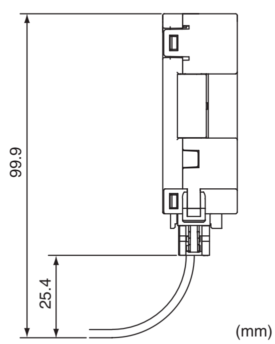
Dimensions (Same for CRT1-VID08S and CRT1-VID08S-1)

When a DCN4-TB4 Open Type Connector Is Mounted

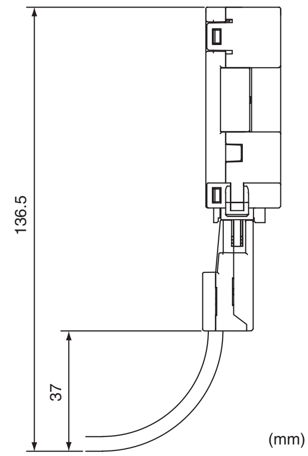


Communications Connector Dimensions Including the Connector and Cable

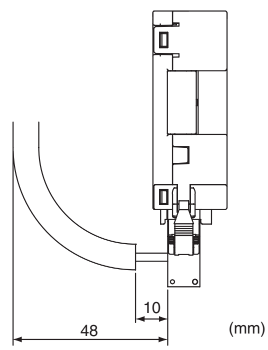
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



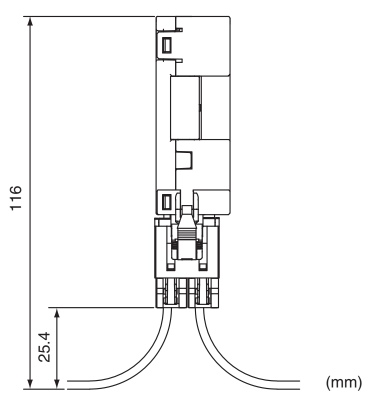
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



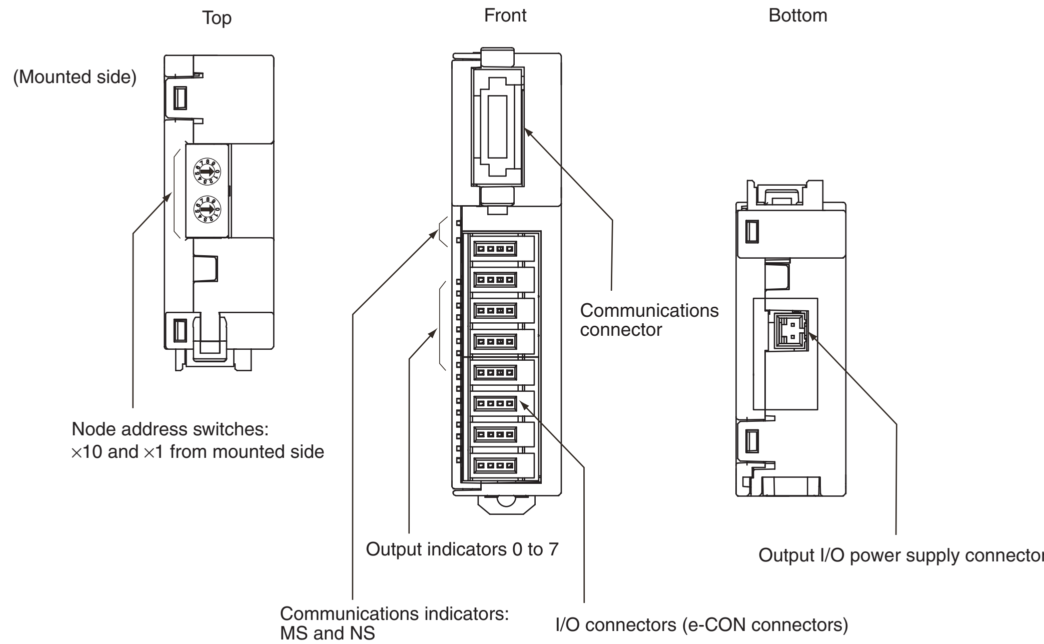
5-4-2 Eight-point Output Units (e-CON Connectors) CRT1-VOD08S/CRT1-VOD08S-1

Output Section Specifications

Item	Specification	
Model	CRT1-VOD08S	CRT1-VOD08S-1
I/O capacity	8 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.3 A/output, 2 A/common	
Residual voltage	1.2 V max. (0.3 A DC, between each output terminal and the G terminal)	1.2 V max. (0.3 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	8 outputs/common	
Isolation method	Photocoupler	
Output indicators	LED (yellow)	
Installation	DIN Track or Mounting Bracket	
Power supply type	Multi-power supply	
Current supplied to output devices	100 mA/output	
Communications power supply current consumption	40 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	
Weight	80 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-VOD08S and CRT1-VOD08S-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

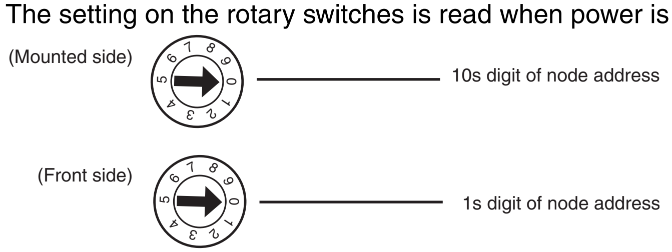
The meanings of the output indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

Setting the Node Address

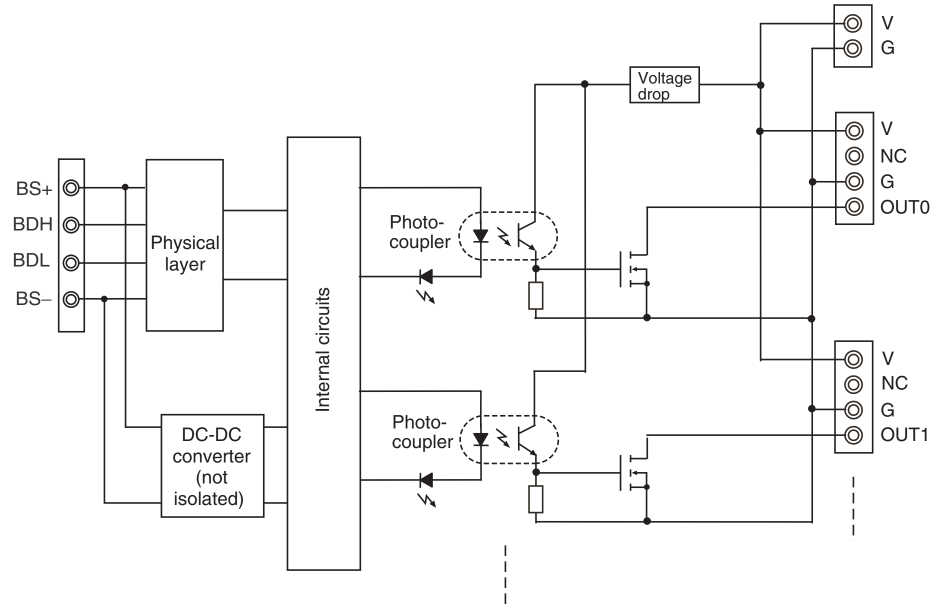
The node address is set as a decimal number with the 10s digit set on the mounting-side rotary switch and the 1s digit set on the front-side rotary switch. (The maximum node address is 63.)

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

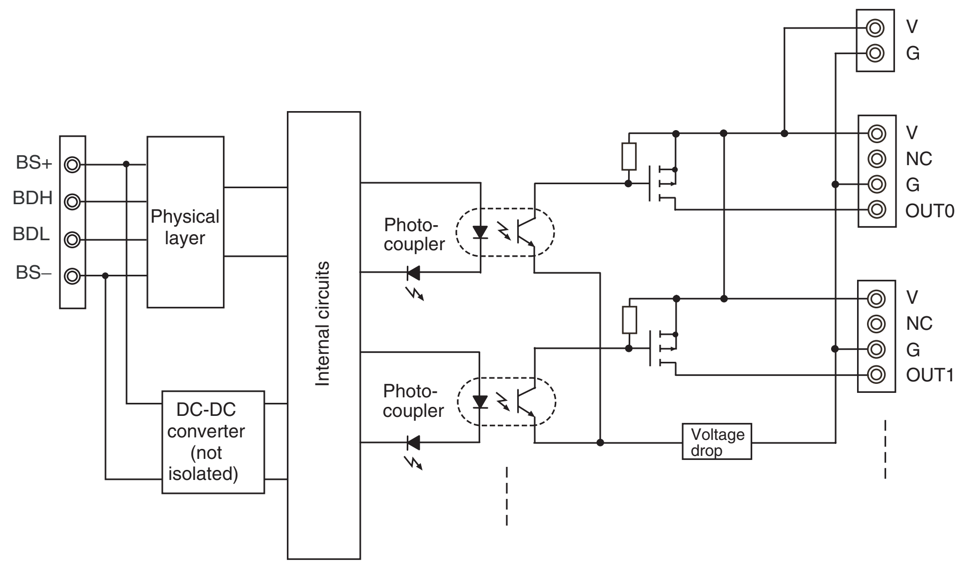


Internal Circuits

CRT1-VOD08S (NPN)

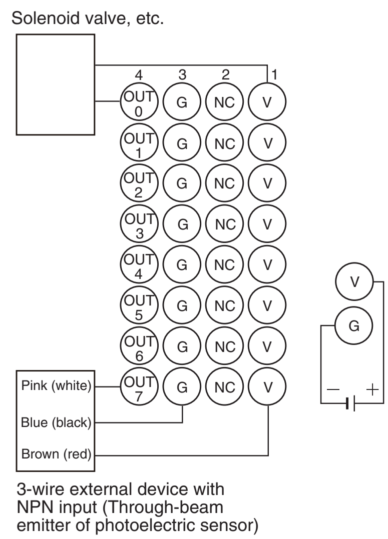


CRT1-VOD08S-1 (PNP)

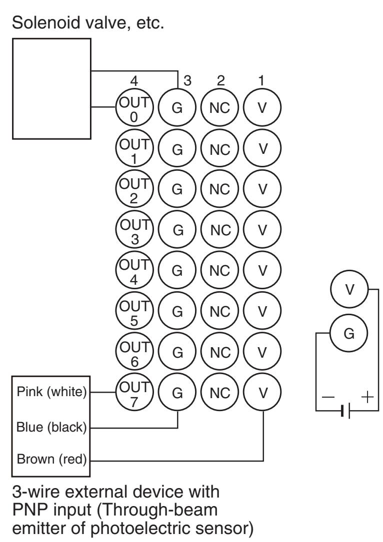


Wiring

CRT1-VOD08S (NPN)



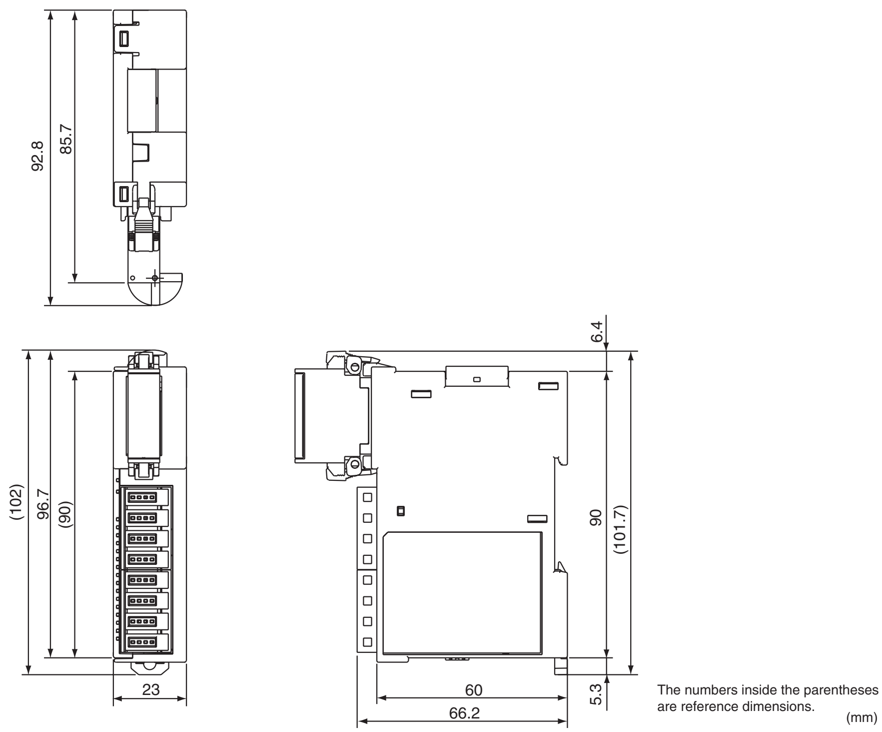
CRT1-VOD08S-1 (PNP)



Note When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

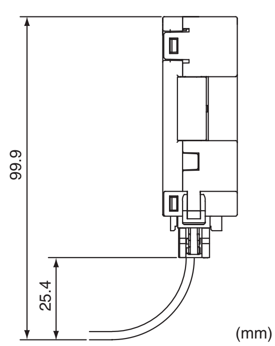
Dimensions (Same for CRT1-VOD08S and CRT1-VOD08S-1)

When a DCN4-TB4 Open Type Connector Is Mounted

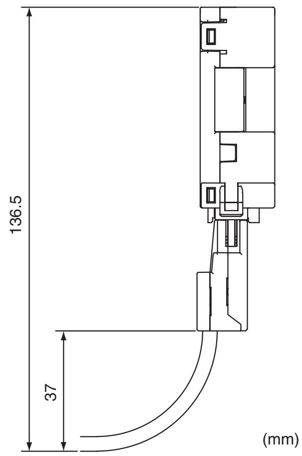


Communications Connector Dimensions Including the Connector and Cable

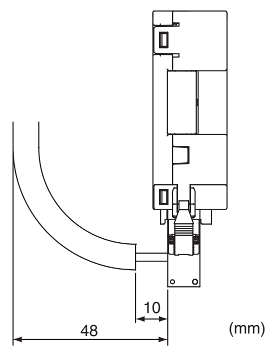
■ **When a DCN4-BR4 Flat Connector I Plug Is Mounted**



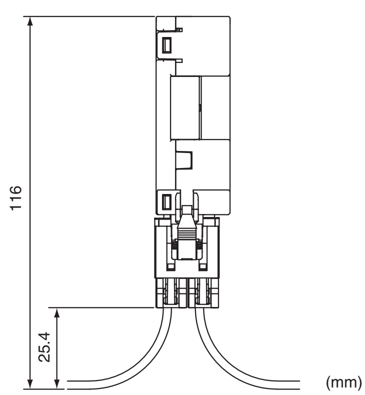
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



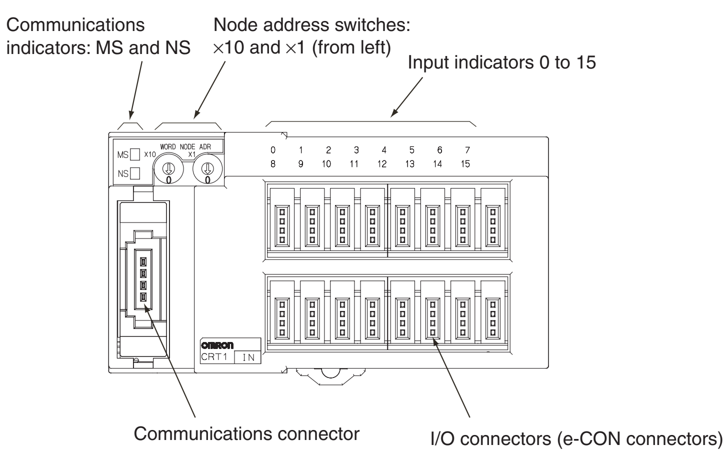
5-4-3 Sixteen-point Input Units (e-CON Connectors) CRT1-ID16S/CRT1-ID16S-1/CRT1-ID16SH/CRT1-ID16SH-1

Input Section Specifications

Item	Specification			
Model	CRT1-ID16S	CRT1-ID16S-1	CRT1-ID16SH	CRT1-ID16SH-1
I/O capacity	16 inputs			
Internal I/O common	NPN	PNP	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)	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 current	1 mA max.			
Input current	At 24 VDC: 6.0 mA max./input At 11 VDC: 3.0 mA min./input			
ON delay	1.5 ms max.			
OFF delay	1.5 ms max.			
Power supply short-circuit detection	---		Operates at 50 mA/point min.	
Disconnection detection	---		Operates at 0.3 mA/point max.	
Number of circuits per common	16 inputs/common			
Isolation method	Photocoupler			
Input indicator	LED (yellow)			
Installation	DIN Track			
Power supply type	Network power supply			
Power short-circuit protection	Operates at 50 mA/point min.			
Current supplied to input devices	50 mA/input			
Communications power supply current consumption	110 mA max. for 24-VDC power supply voltage 125 mA max. for 14-VDC power supply voltage		125 mA max. for 24-VDC power supply voltage 145 mA max. for 14-VDC power supply voltage	
Weight	110 g max.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-ID16S(-1) and CRT1-ID16SH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the input indicators are given in the following table.

The detection status is also shown below for Slave Units with detection functions.

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.

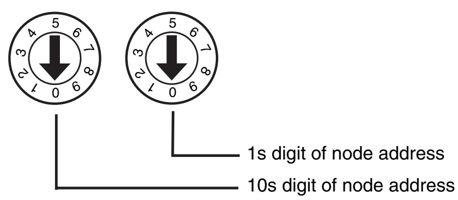
CRT1-ID16SH(-1) Only

Name	LED status	I/O status	Meaning
0 to 15	Lit red.	Short-circuit detection	The power supply is short-circuited.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

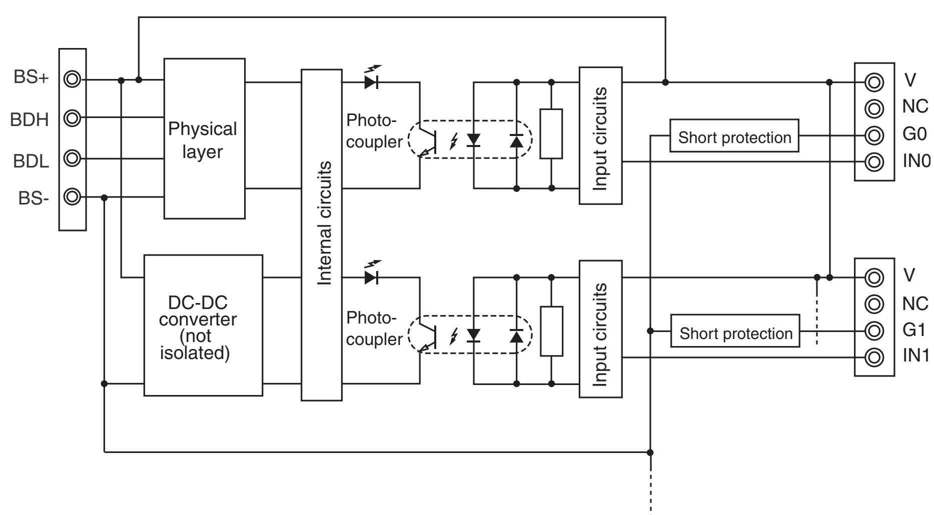
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

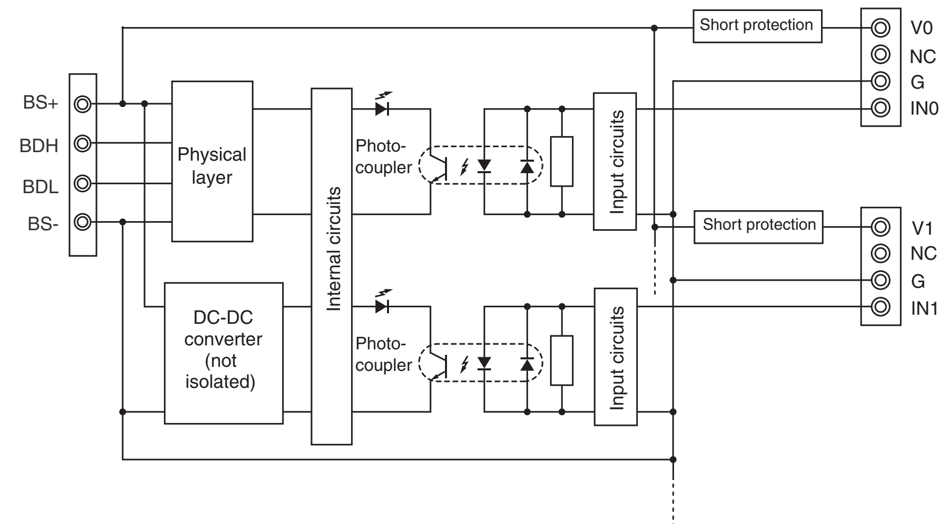


Internal Circuits

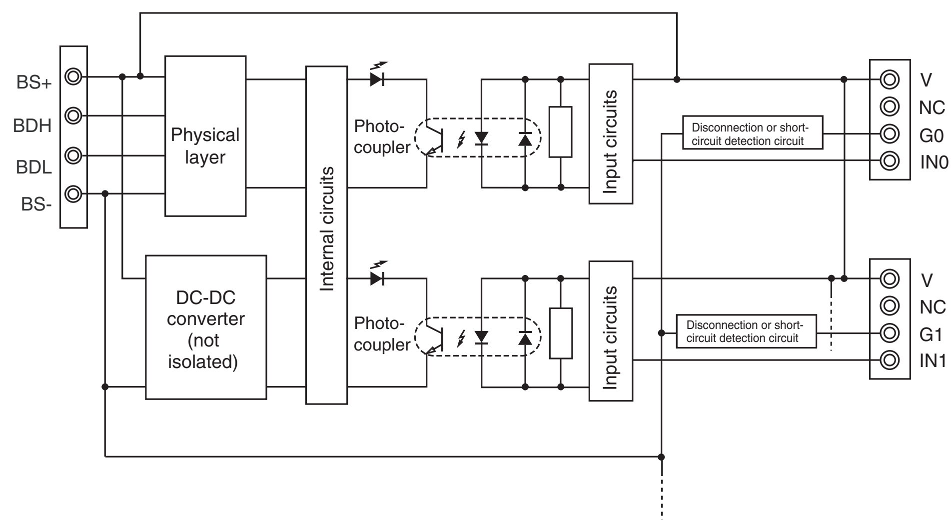
CRT1-ID16S (NPN)



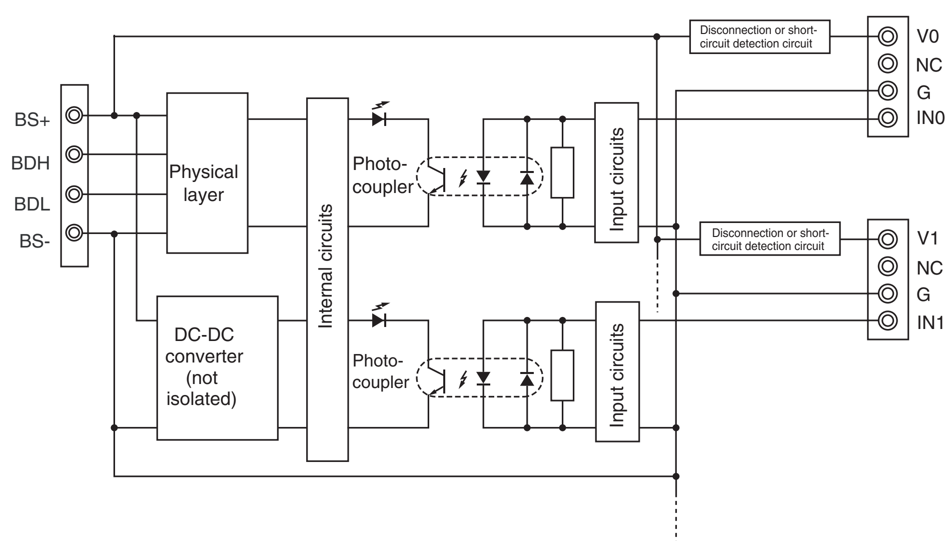
CRT1-ID16S-1 (PNP)



CRT1-ID16SH (NPN)

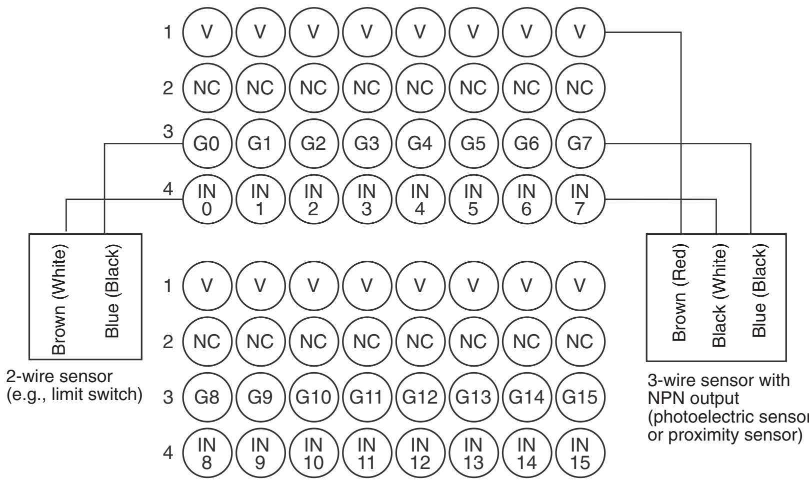


CRT1-ID16SH-1 (PNP)

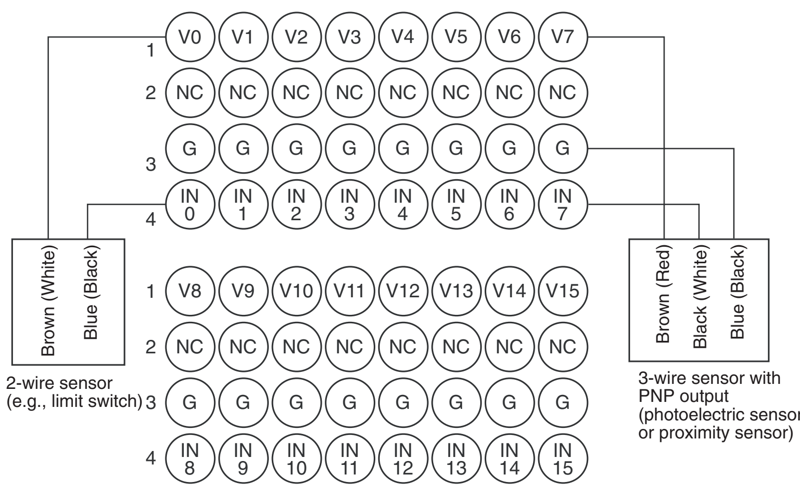


Wiring

CRT1-ID16S/
CRT1-ID16SH (NPN)



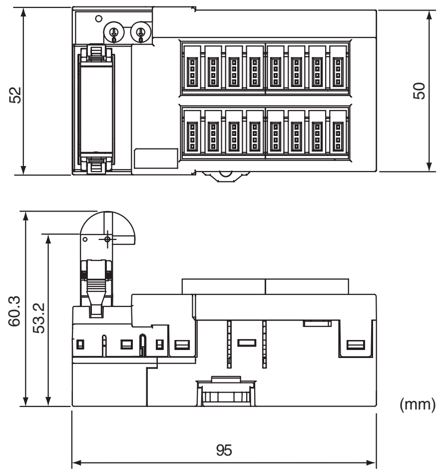
CRT1-ID16S-1/
CRT1-ID16SH-1 (PNP)



Note 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.

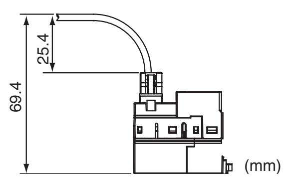
Dimensions (Same for CRT1-ID16S(-1) and CRT1-ID16SH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

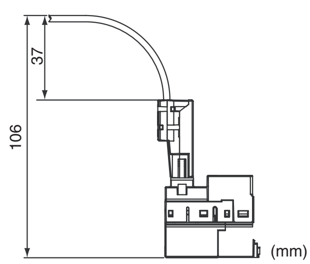


Communications Connector Dimensions Including the Connector and Cable

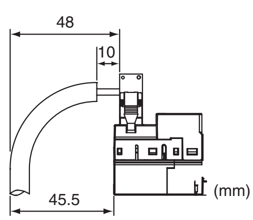
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



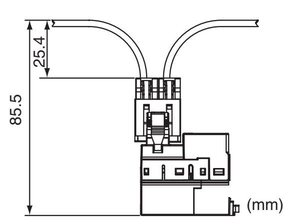
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



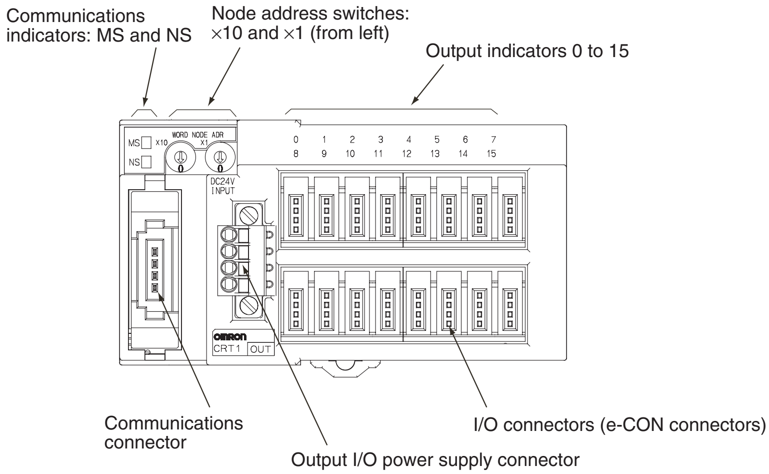
5-4-4 Sixteen-point Output Units (e-CON Connectors) CRT1-OD16S/CRT1-OD16S-1/CRT1-OD16SH/CRT1-OD16SH-1

Output Section Specifications

Item	Specification			
Model	CRT1-OD16S	CRT1-OD16S-1	CRT1-OD16SH	CRT1-OD16SH-1
I/O capacity	16 outputs			
Internal I/O common	NPN	PNP	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)	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.			
Load short-circuit detection	---		Supported.	
Disconnection detection	---		Operates at 3 mA/point max. (Does not operate at over 3 mA.)	
Number of circuits per common	16 outputs/common			
Isolation method	Photocoupler			
Output indicators	LED (yellow)			
Installation	DIN Track			
Power supply type	Multi-power supply			
Current supplied to output devices	100 mA/output			
Communications power supply current consumption	40 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage		40 mA max. for 24-VDC power supply voltage 65 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	20 mA max. for 24-VDC power supply voltage		15 mA max. for 24-VDC power supply voltage	60 mA max. for 24-VDC power supply voltage
Output handling for communications errors	Select either hold or clear from CX-Integrator.			
Weight	110 g max.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-OD16S(-1) and CRT1-OD16SH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output indicators are given in the following table.

The detection status is also shown below for Slave Units with detection functions.

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.

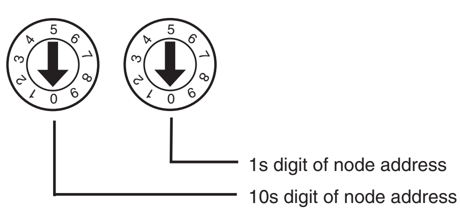
CRT1-OD16SH(-1) Only

Name	LED status	I/O status	Meaning
0 to 15	Lit red.	Short-circuit detection	A load short-circuit occurred.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

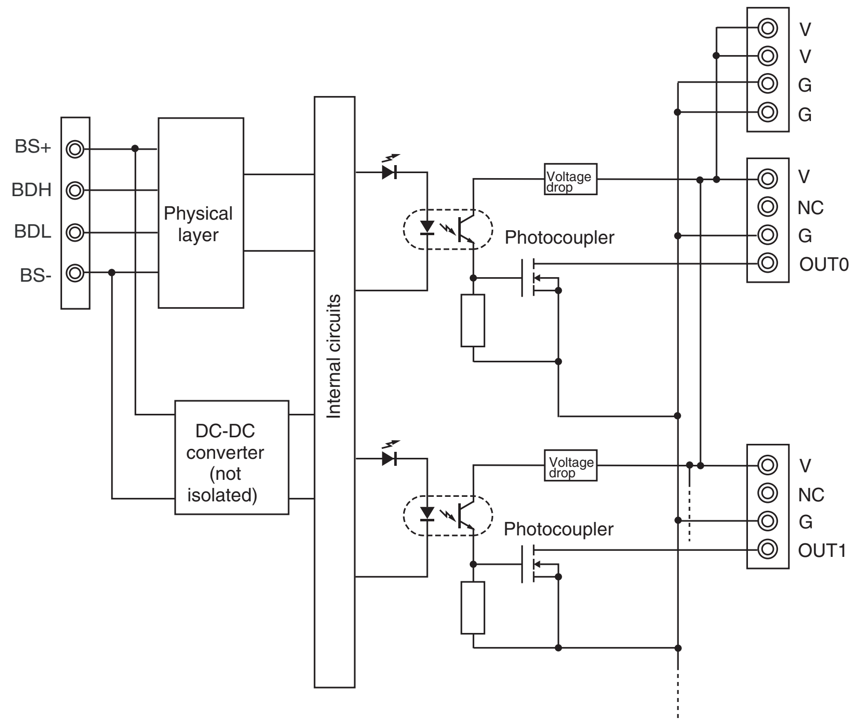
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

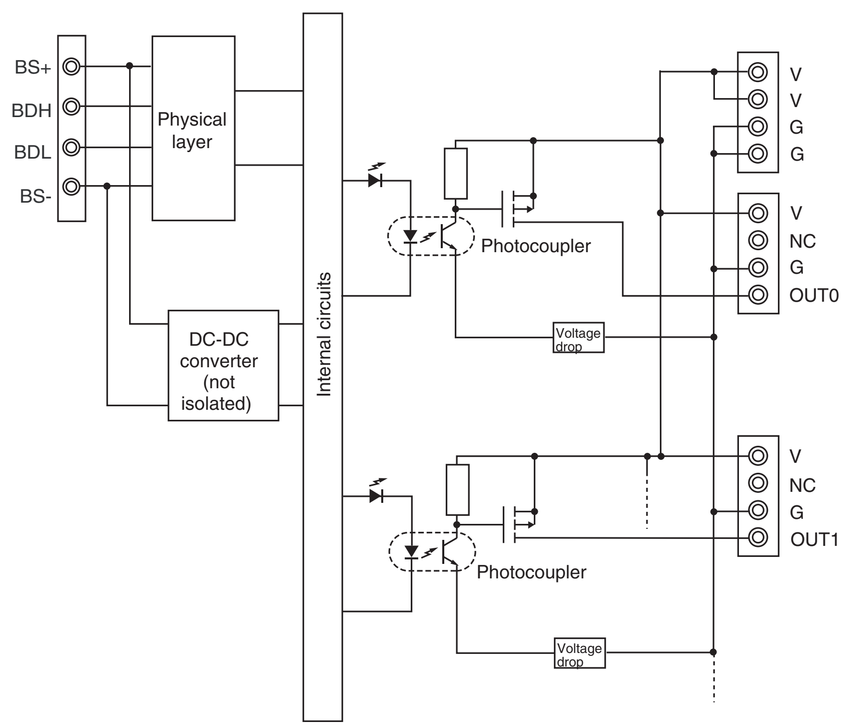


Internal Circuits

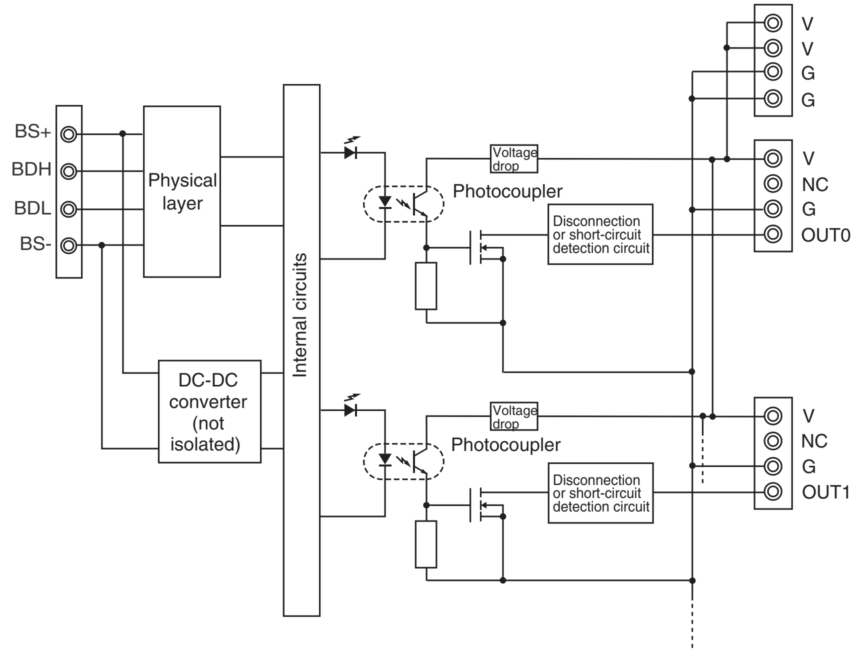
CRT1-OD16S (NPN)



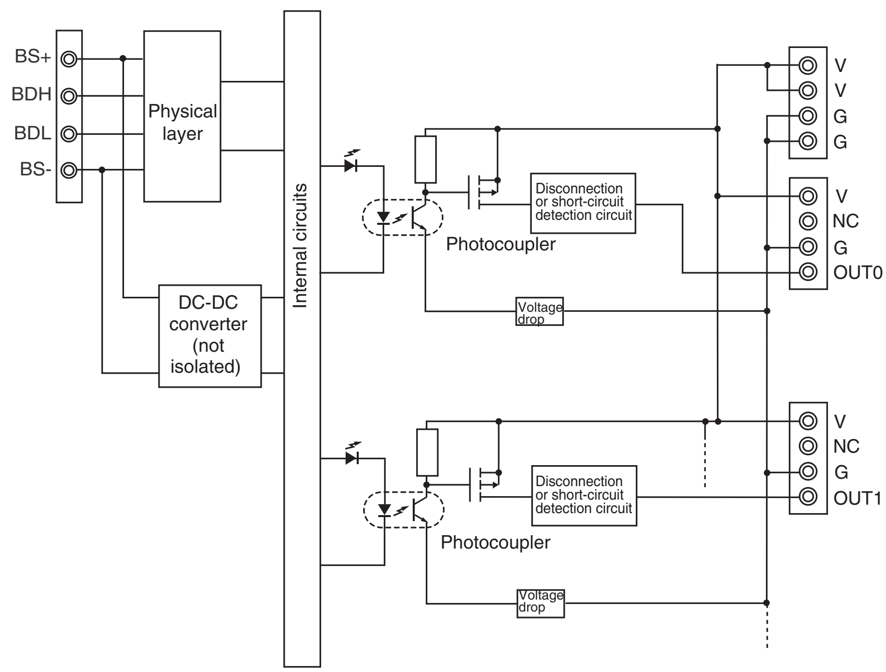
CRT1-OD16S-1 (PNP)



CRT1-OD16SH (NPN)

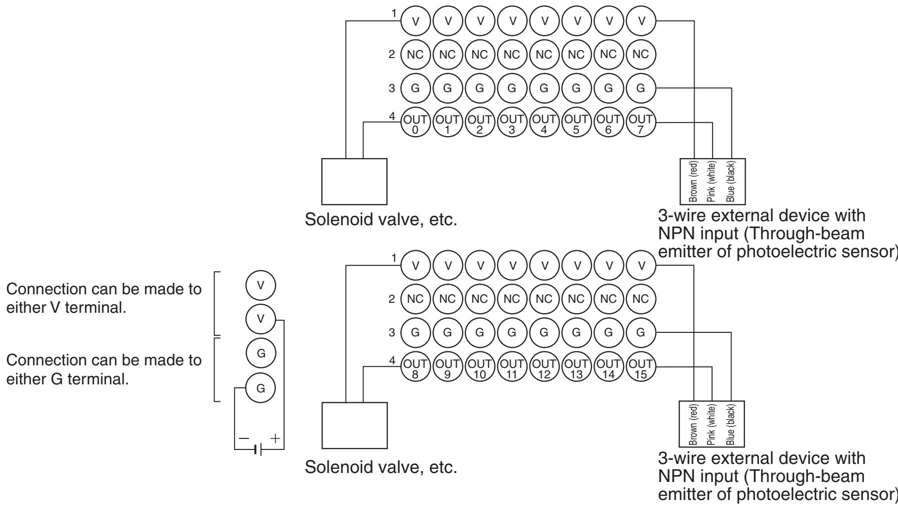


CRT1-OD16SH-1 (PNP)

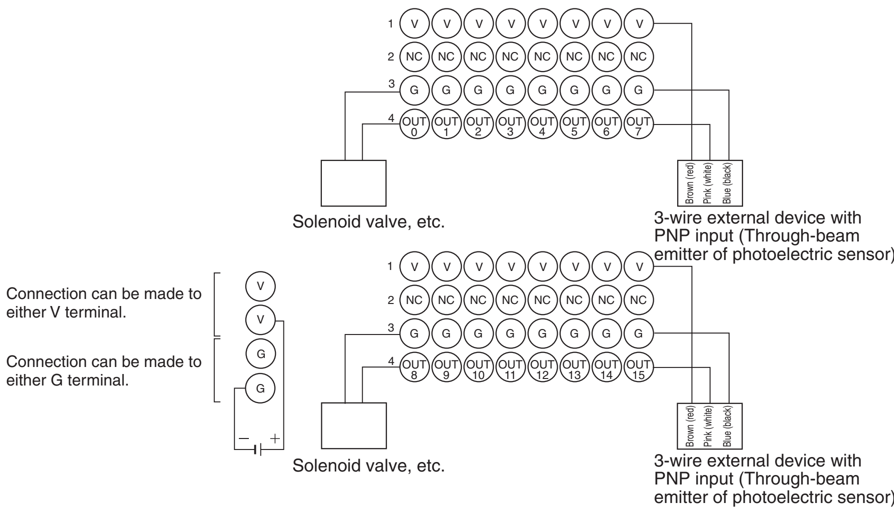


Wiring

CRT1-OD16S/
CRT1-OD16SH (NPN)



CRT1-OD16S-1/
CRT1-OD16SH-1 (PNP)

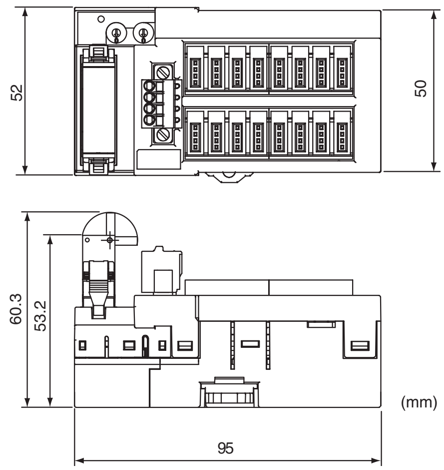


Note (1) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

(2) Two V terminals and two G terminals are provided for use as I/O power supply terminals. One set of terminals is used for the power supply for the Unit, and the other set is used for the supply power to the next Unit. Use a maximum current of 4 A per terminal.

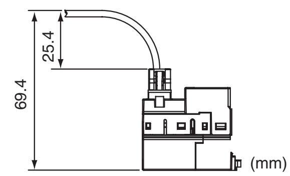
Dimensions (Same for CRT1-OD16S(-1) and CRT1-OD16SH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

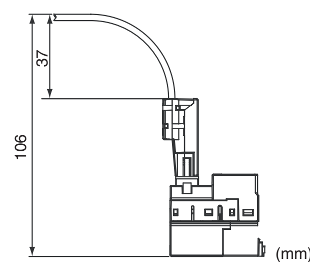


Communications Connector Dimensions Including the Connector and Cable

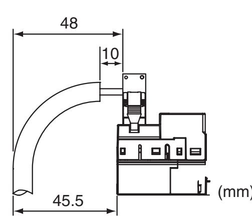
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



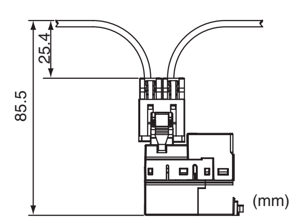
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



5-4-5 Eight-point Input and Eight-point Output Units (e-CON Connectors)

CRT1-MD16S/CRT1-MD16S-1/CRT1-MD16SH/CRT1-MD16SH-1

Common Specifications

Item	Specification			
Model	CRT1-MD16S	CRT1-MD16S-1	CRT1-MD16SH	CRT1-MD16SH-1
Installation	DIN Track			
Communications power supply current consumption	75 mA max. for 24-VDC power supply voltage 95 mA max. for 14-VDC power supply voltage		60 mA max. for 24-VDC power supply voltage 90 mA max. for 14-VDC power supply voltage	
Weight	120 g max.			

Input Section Specifications

Item	Specification			
Model	CRT1-MD16S	CRT1-MD16S-1	CRT1-MD16SH	CRT1-MD16SH-1
I/O capacity	8 inputs			
Internal I/O common	NPN	PNP	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)	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 current	1.0 mA max.			
Input current	At 24 VDC: 6.0 mA max./input At 11 VDC: 3.0 mA min./input			
ON delay	1.5 ms max.			
OFF delay	1.5 ms max.			
Power supply short-circuit detection	---		Operates at 50 mA/point min.	
Disconnection detection	---		Operates at 0.3 mA/point max.	
Number of circuits per common	8 inputs/common			
Isolation method	Photocoupler			
Input indicator	LED (yellow)			
Power supply type	Network power supply			
Power short-circuit protection	Operates at 50 mA/point min.			
Current supplied to input devices	50 mA/input			

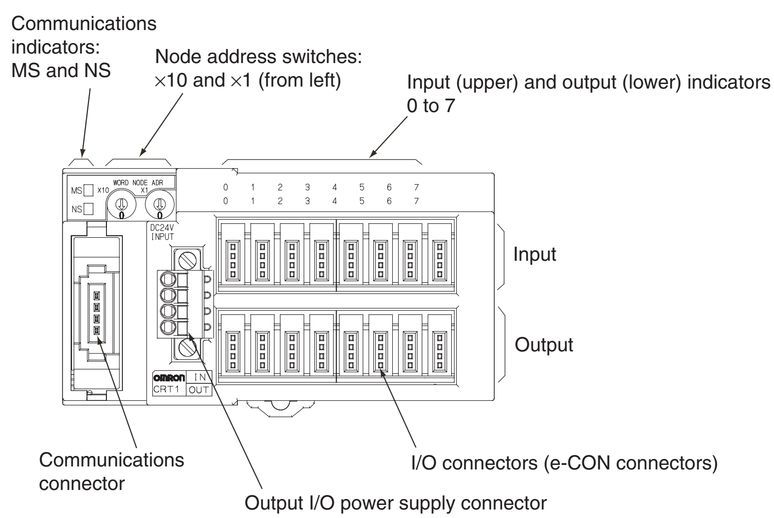
Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Output Section Specifications

Item	Specification			
Model	CRT1-MD16S	CRT1-MD16S-1	CRT1-MD16SH	CRT1-MD16SH-1
I/O capacity	8 outputs			
Internal I/O common	NPN	PNP	NPN	PNP
Rated output current	0.5 A/output, 2 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)	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.			
Load short-circuit detection	---		Supported.	
Disconnection detection	---		Operates at 3 mA/point max. (Does not operate at over 3 mA.)	
Number of circuits per common	8 outputs/common			
Isolation method	Photocoupler			
Output indicators	LED (yellow)			
Power supply type	Multi-power supply			
Current supplied to output devices	100 mA/output			
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage			35 mA max. for 24-VDC power supply voltage
Output handling for communications errors	Select either hold or clear from CX-Integrator.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-MD16S(-1)/CRT1-MD16SH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

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

The detection status is also shown below for Slave Units with detection functions.

Name	LED status	I/O status	Meaning
0 to 7 (inputs) 0 to 7 (outputs)	Lit yellow.	Input or output ON	The input or output is ON.
	Not lit.	Input or output OFF	The input or output is OFF.

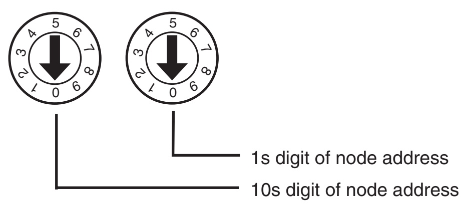
CRT1-MD16SH(-1) Only

Name	LED status	I/O status	Meaning
0 to 7 (inputs)	Lit red.	Short-circuit detection	The power supply is short-circuited.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.
0 to 7 (outputs)	Lit red.	Short-circuit detection	A load short-circuit occurred.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

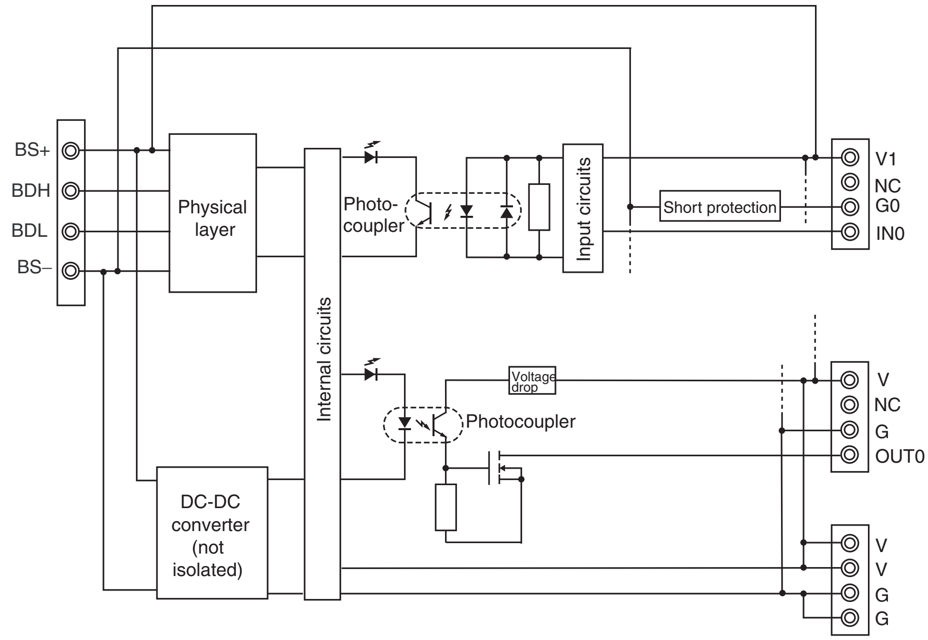
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

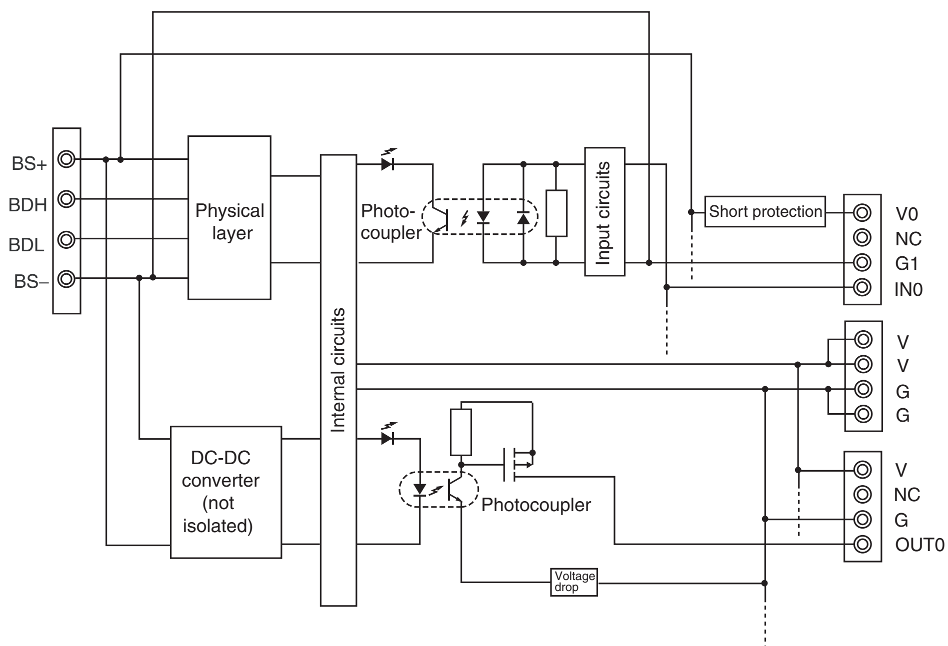


Internal Circuits

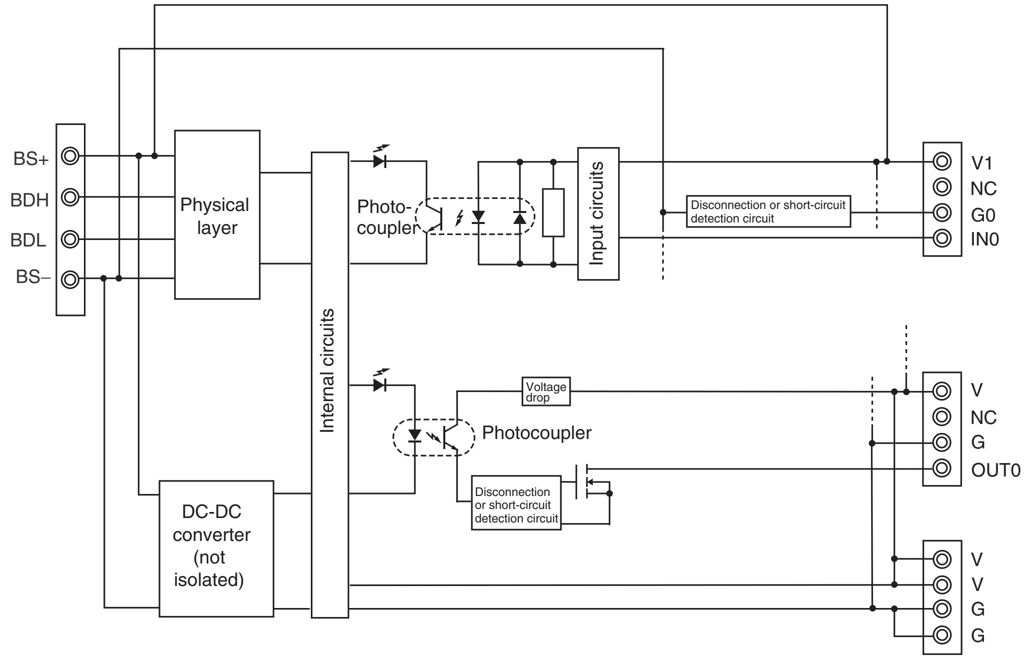
CRT1-MD16S (NPN)



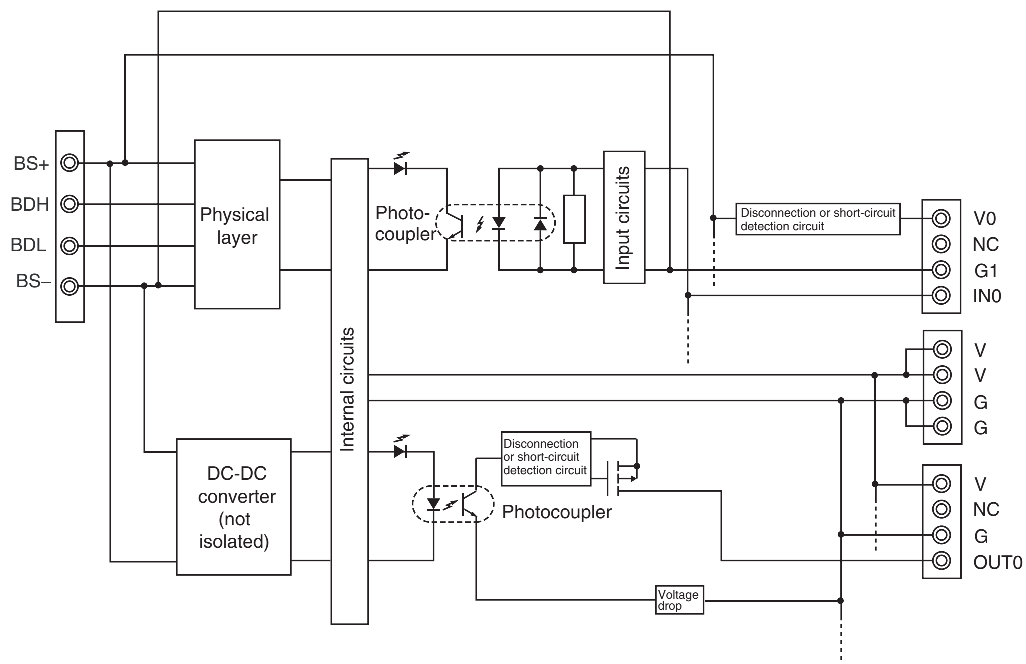
CRT1-MD16S-1 (PNP)



CRT1-MD16SH (NPN)

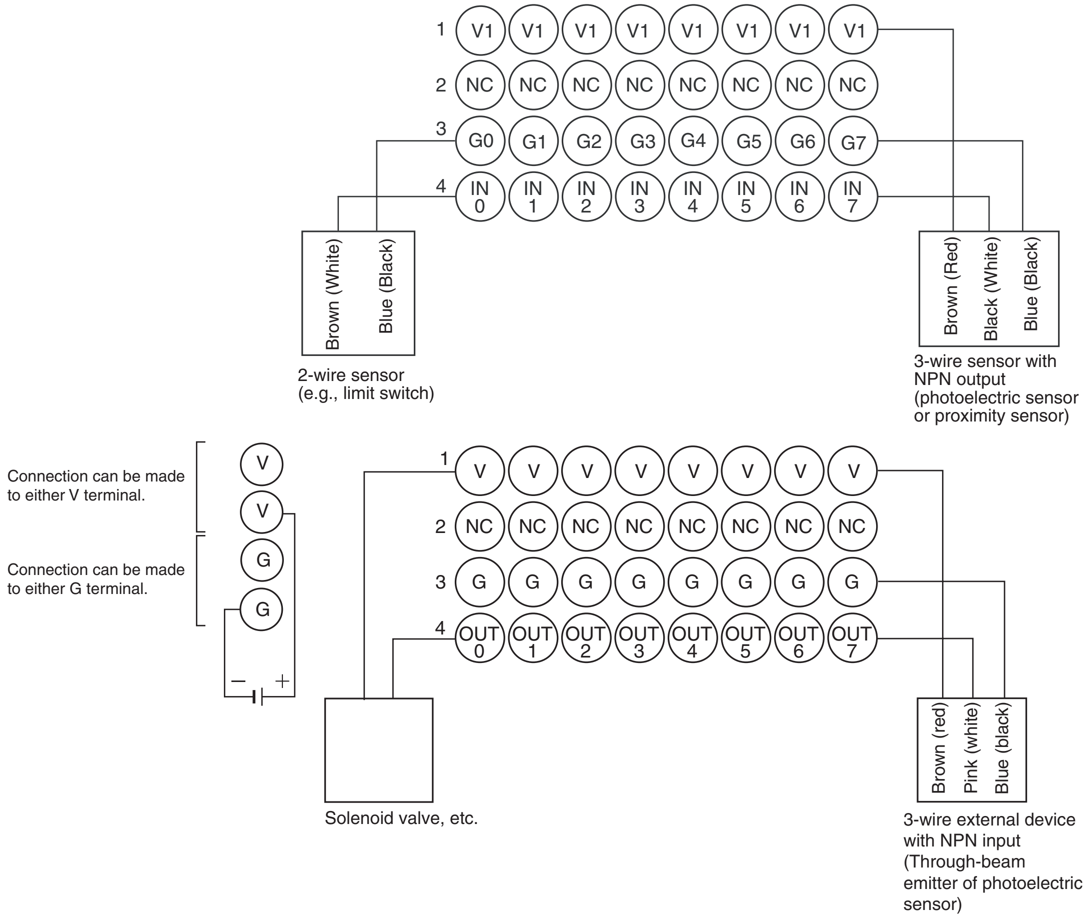


CRT1-MD16SH-1 (PNP)

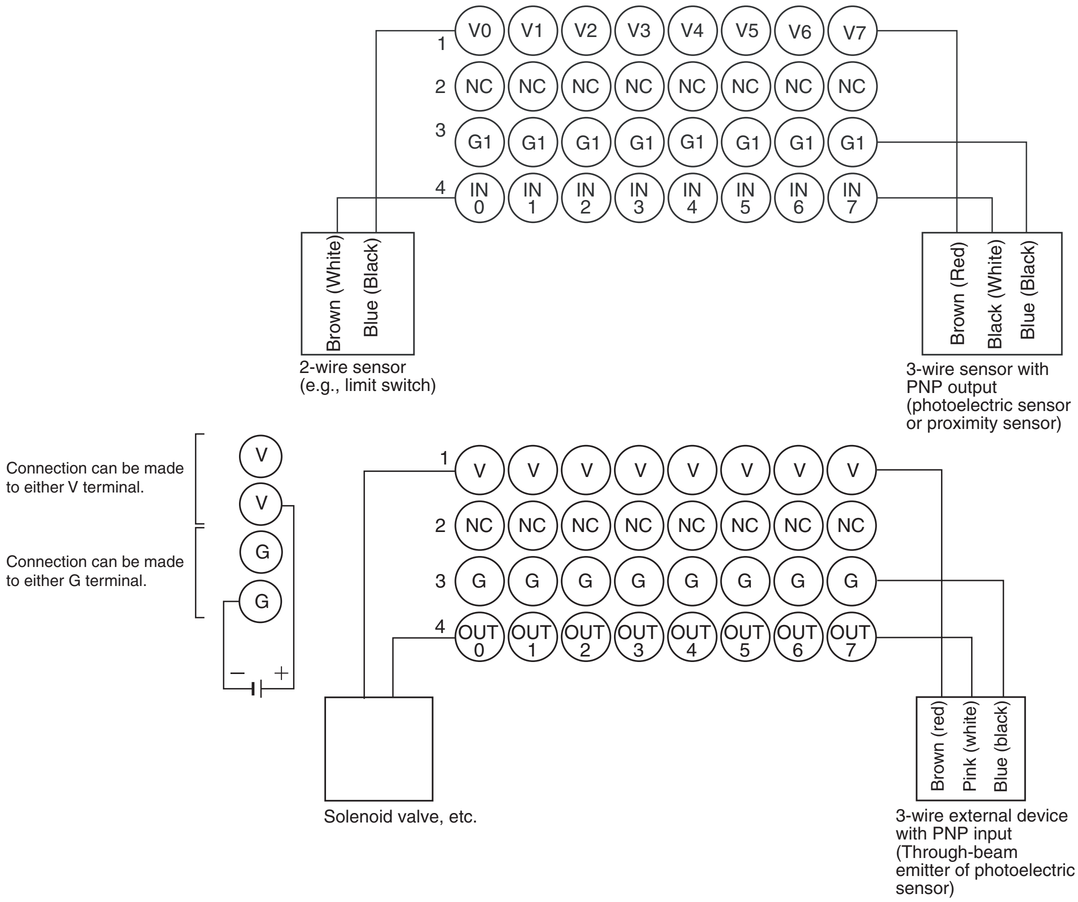


Wiring

CRT1-MD16S
CRT1-MD16SH (NPN)



CRT1-MD16S-1/
CRT1-MD16SH-1 (PNP)



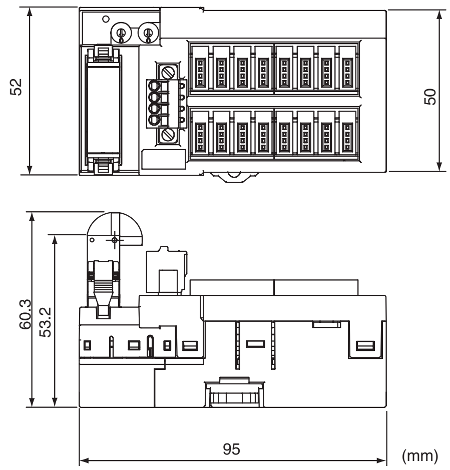
Note (1) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

(2) Two V terminals and two G terminals are provided for use as I/O power supply terminals. One set of terminals is used for the power supply for the Unit, and the other set is used for the supply power to the next Unit. Use a maximum current of 4 A per terminal.

(3) 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.

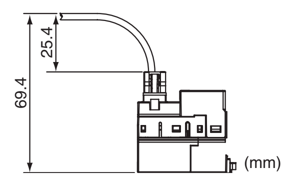
Dimensions (Same for CRT1-MD16S(-1)/CRT1-MD16SH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

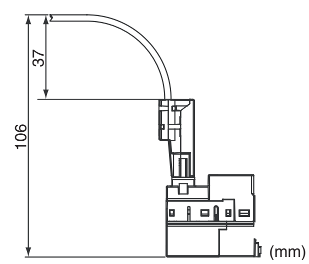


Communications Cable Dimensions when Connector and Cable Are Connected

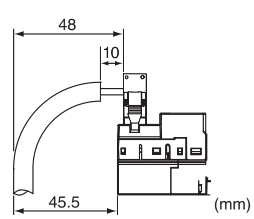
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



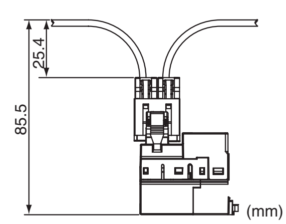
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



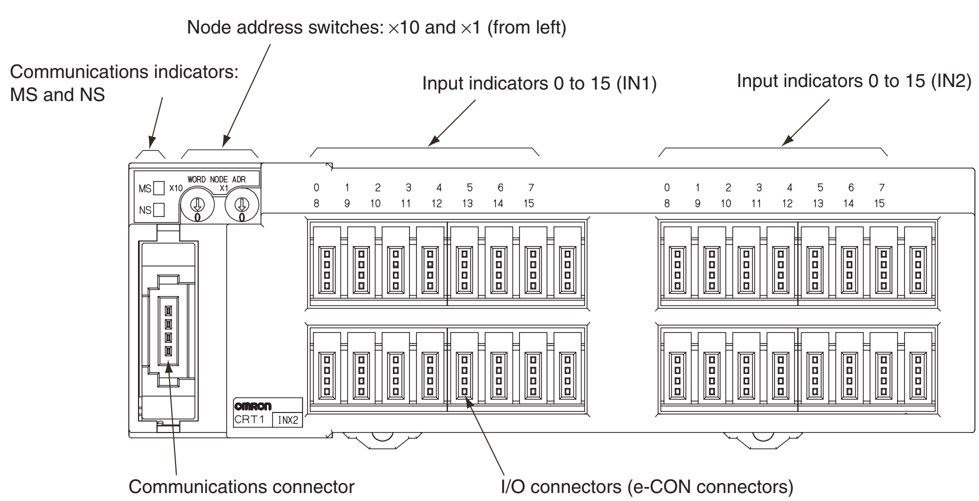
5-4-6 Thirty-two-point Input Units (e-CON Connectors) CRT1-ID32S/CRT1-ID32S-1/CRT1-ID32SH/CRT1-ID32SH-1

Input Section Specifications

Item	Specification			
Model	CRT1-ID32S	CRT1-ID32S-1	CRT1-ID32SH	CRT1-ID32SH-1
I/O capacity	32 inputs			
Internal I/O common	NPN	PNP	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)	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 current	1.0 mA max.			
Input current	At 24 VDC: 6.0 mA max./input At 11 VDC: 3.0 mA min./input			
ON delay	1.5 ms max.			
OFF delay	1.5 ms max.			
Power supply short-circuit detection	---		Operates at 50 mA/point min.	
Disconnection detection	---		Operates at 0.3 mA/point max.	
Number of circuits per common	32 inputs/common			
Isolation method	Photocoupler			
Input indicator	LED (yellow)			
Installation	DIN Track			
Power supply type	Network power supply			
Power short-circuit protection	Operates at 50 mA/point min.			
Current supplied to input devices	50 mA/input			
Communications power supply current consumption	195 mA max. for 24-VDC power supply voltage 200 mA max. for 14-VDC power supply voltage		210 mA max. for 24-VDC power supply voltage 235 mA max. for 14-VDC power supply voltage	
Weight	180 g max.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-ID32S(-1) and CRT1-ID32SH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the input indicators are given in the following table.

The detection status is also shown below for Slave Units with detection functions.

Name	LED status	I/O status	Meaning
0 to 15 (IN1) 0 to 15 (IN2)	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

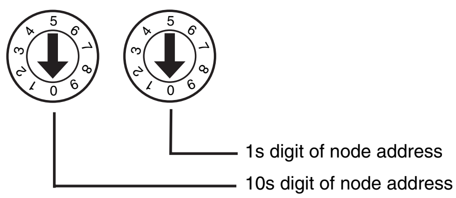
CRT1-ID32SH(-1) Only

Name	LED status	I/O status	Meaning
0 to 15 (IN1) 0 to 15 (IN2)	Lit red.	Short-circuit detection	The power supply is short-circuited.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

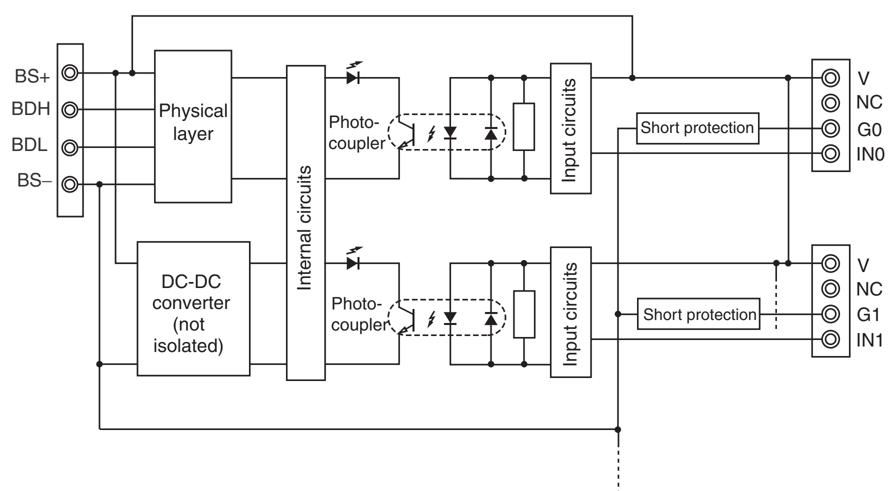
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

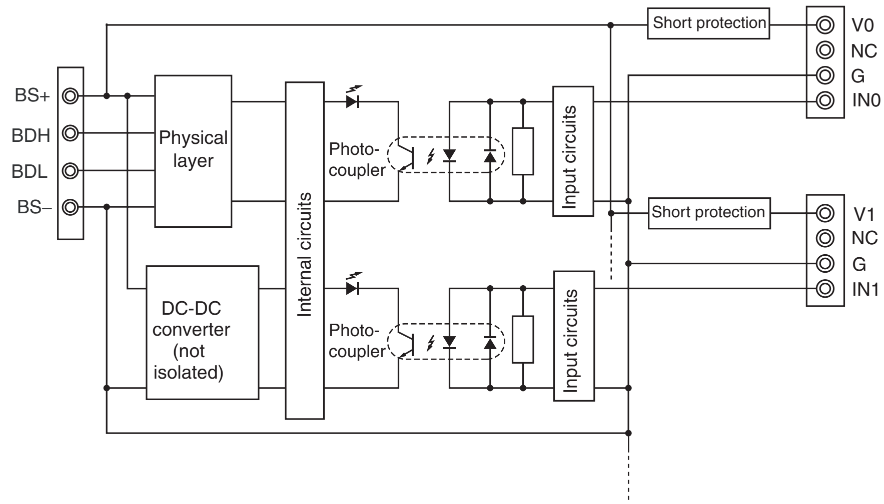


Internal Circuits

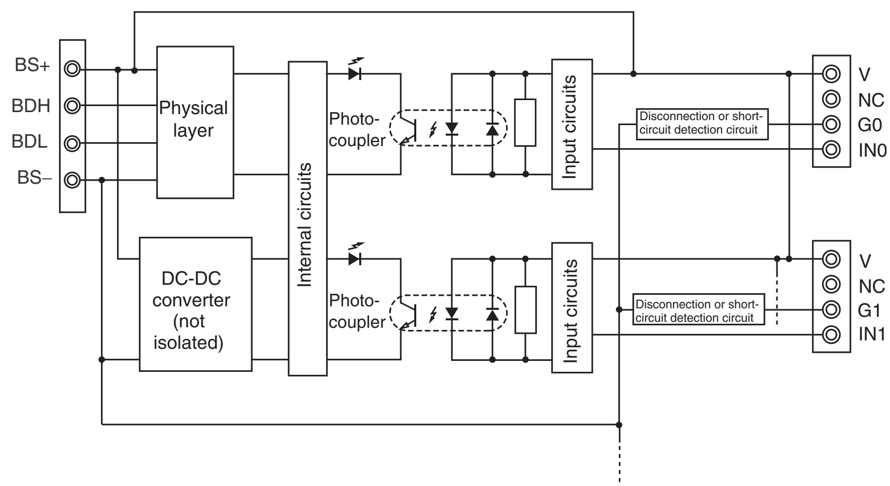
CRT1-ID32S (NPN)



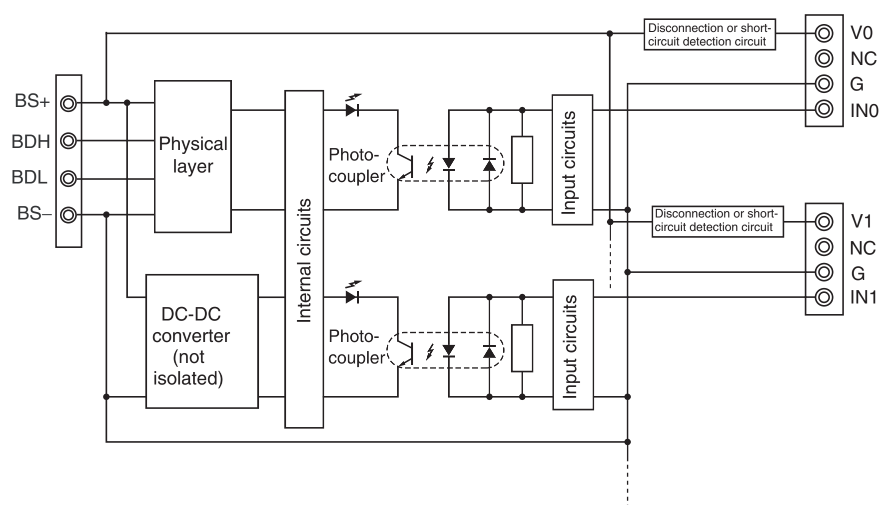
CRT1-ID32S-1 (PNP)



CRT1-ID32SH (NPN)

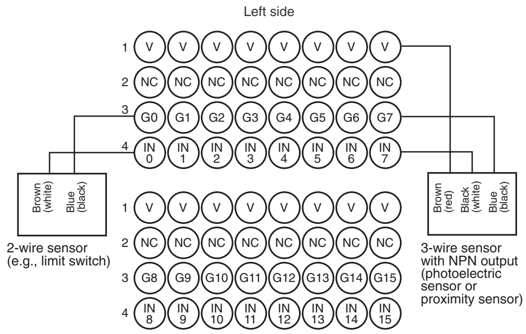


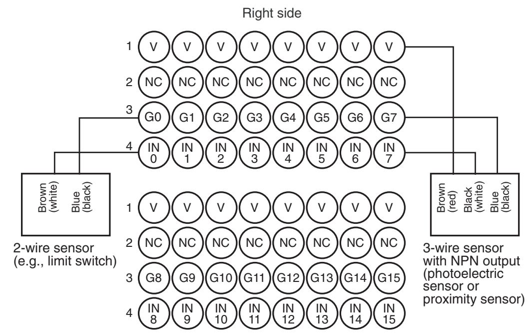
CRT1-ID32SH-1 (PNP)



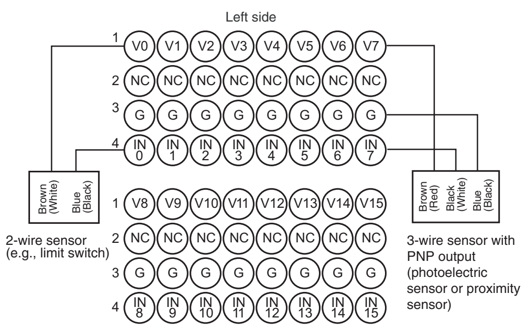
Wiring

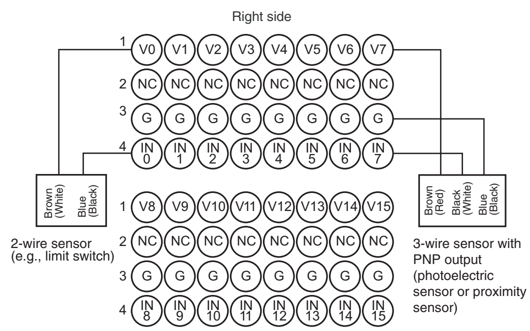
CRT1-ID32S/
CRT1-ID32SH (NPN)





CRT1-ID32S-1/
CRT1-ID32SH-1 (PNP)

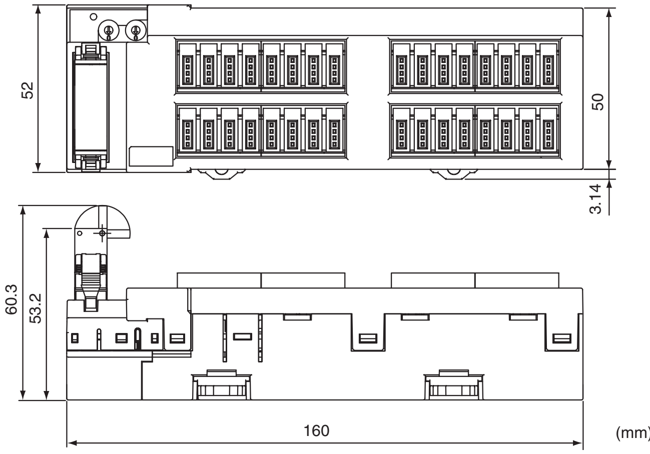




Note Wire colors have been changed according to revisions in the JIS standards for photoelectric and proximity sensors. The colors in parentheses are the wire colors prior to the revisions.

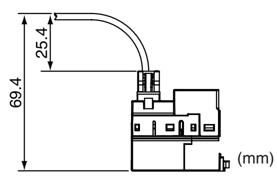
Dimensions (Same for CRT1-ID32S(-1) and CRT1-ID32SH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

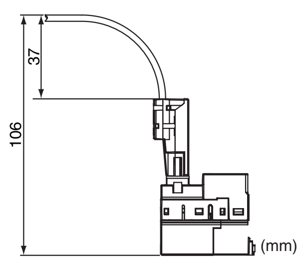


Communications Connector Dimensions Including the Connector and Cable

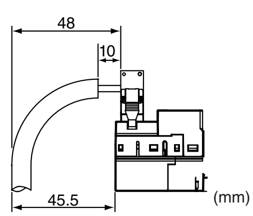
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



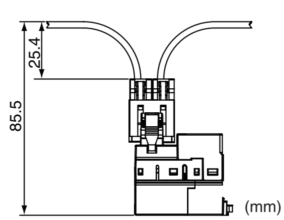
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



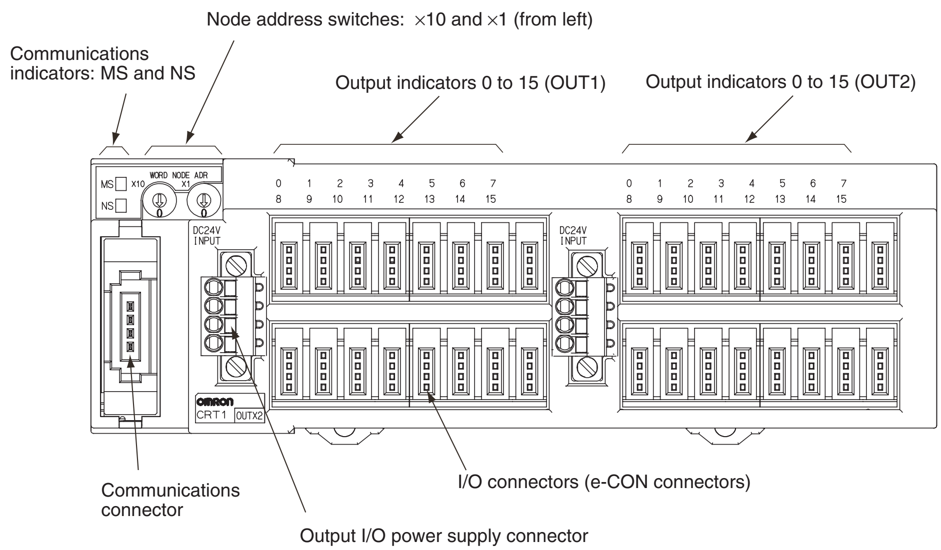
5-4-7 Thirty-two-point Output Units (e-CON Connectors) CRT1-OD32S/CRT1-OD32S-1/CRT1-OD32SH/CRT1-OD32SH-1

Output Section Specifications

Item	Specification			
Model	CRT1-OD32S	CRT1-OD32S-1	CRT1-OD32SH	CRT1-OD32SH-1
I/O capacity	32 outputs			
Internal I/O common	NPN	PNP	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)	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.			
Load short-circuit detection	---		Supported.	
Disconnection detection	---		Operates at 3 mA/point max. (Does not operate at over 3 mA.)	
Number of circuits per common	16 outputs/common			
Isolation method	Photocoupler			
Output indicators	LED (yellow)			
Installation	DIN Track			
Power supply type	Multi-power supply			
Current supplied to output devices	100 mA/output			
Communications power supply current consumption	50 mA max. for 24-VDC power supply voltage 80 mA max. for 14-VDC power supply voltage		50 mA max. for 24-VDC power supply voltage 90 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage			60 mA max. for 24-VDC power supply voltage
Output handling for communications errors	Select either hold or clear from CX-Integrator.			
Weight	170 g max.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-OD32S(-1) and CRT1-OD32SH(-1))



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output indicators are given in the following table.

The detection status is also shown below for Slave Units with detection functions.

Name	LED status	I/O status	Meaning
0 to 15 (OUT1) 0 to 15 (OUT2)	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

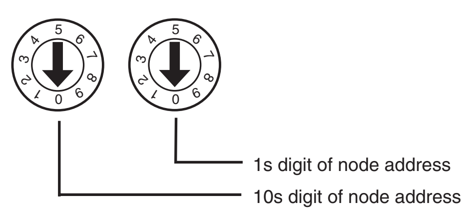
CRT1-OD32SH(-1) Only

Name	LED status	I/O status	Meaning
0 to 15 (OUT1) 0 to 15 (OUT2)	Lit red.	Short-circuit detection	A load short-circuit occurred.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

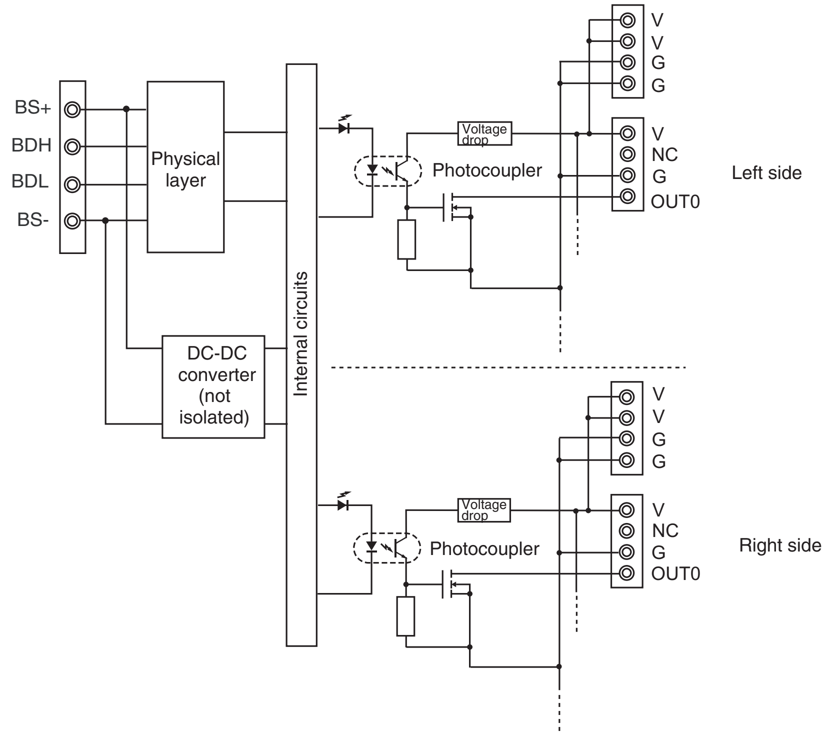
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

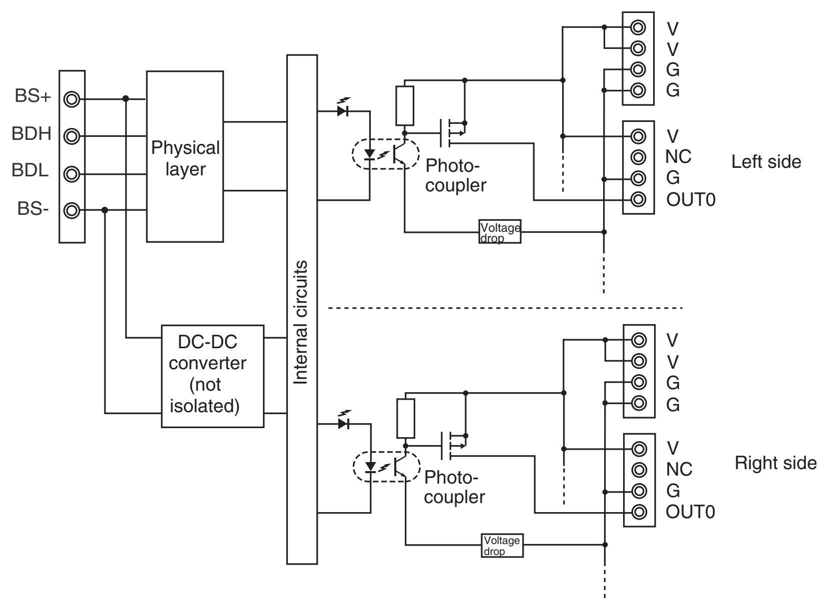


Internal Circuits

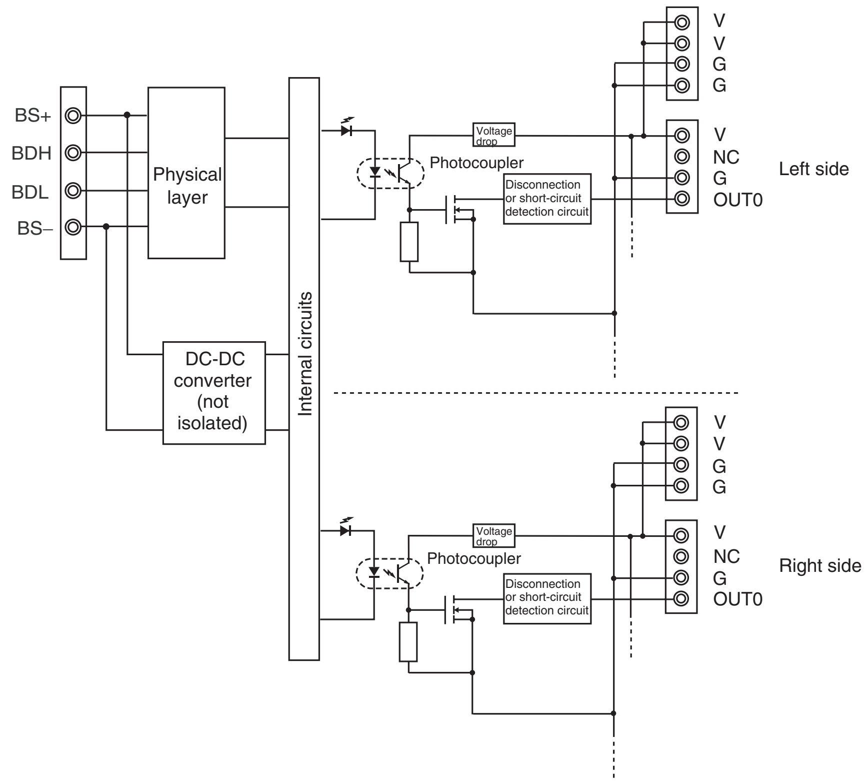
CRT1-OD32S (NPN)



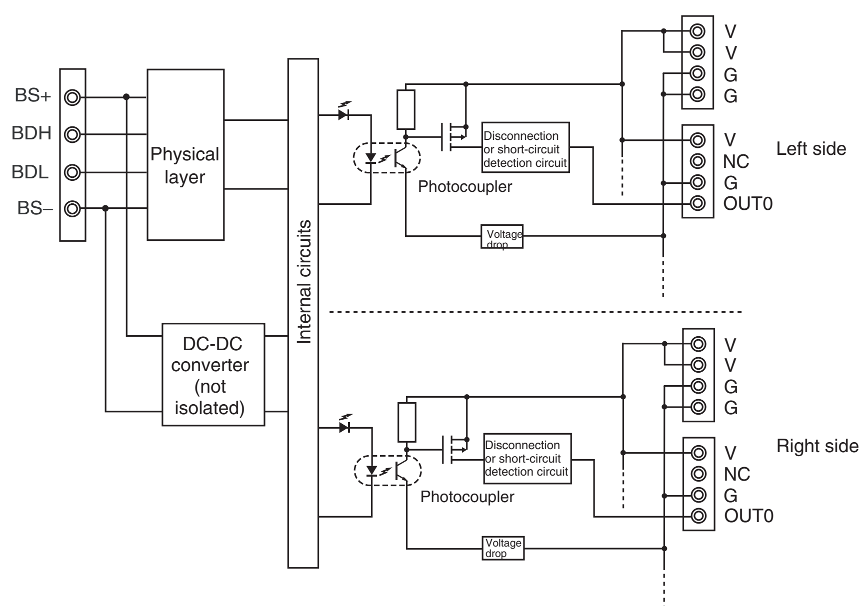
CRT1-OD32S-1 (PNP)



CRT1-OD32SH (NPN)

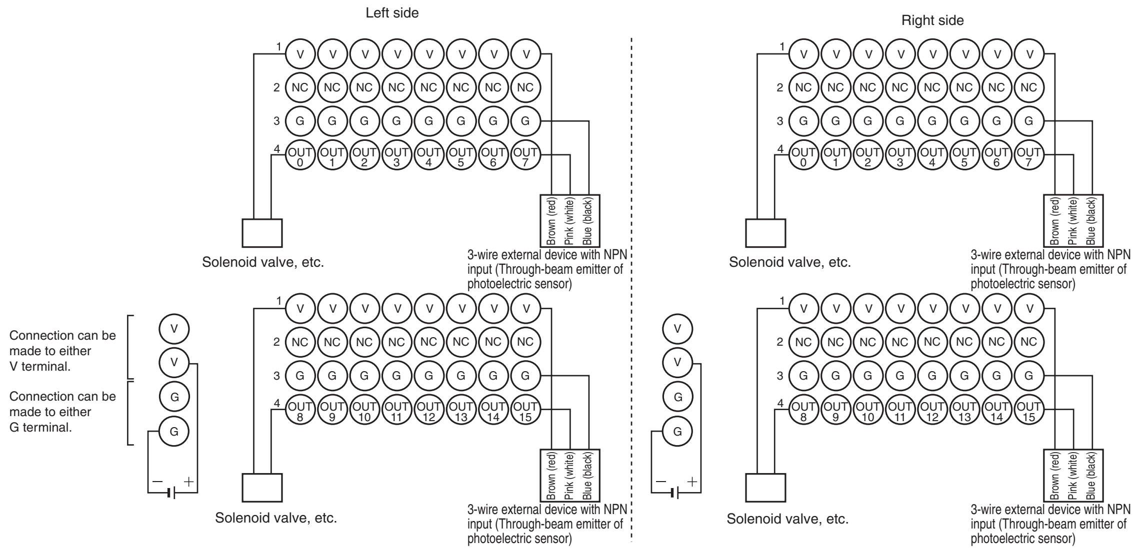


CRT1-OD32SH-1 (PNP)

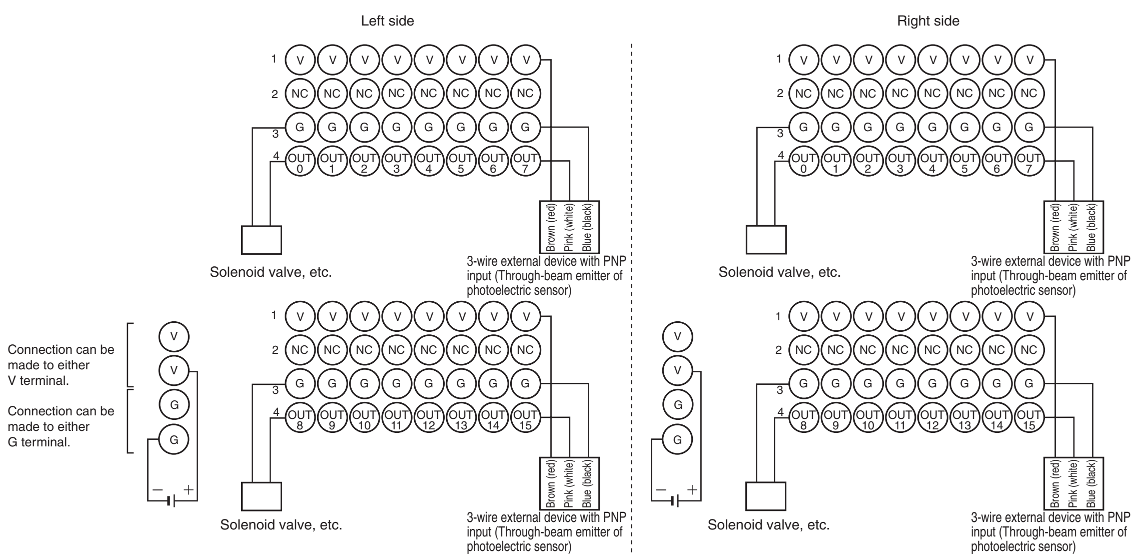


Wiring

CRT1-OD32S/ CRT1-OD32SH (NPN)



CRT1-OD32S-1/ CRT1-OD32SH-1 (PNP)

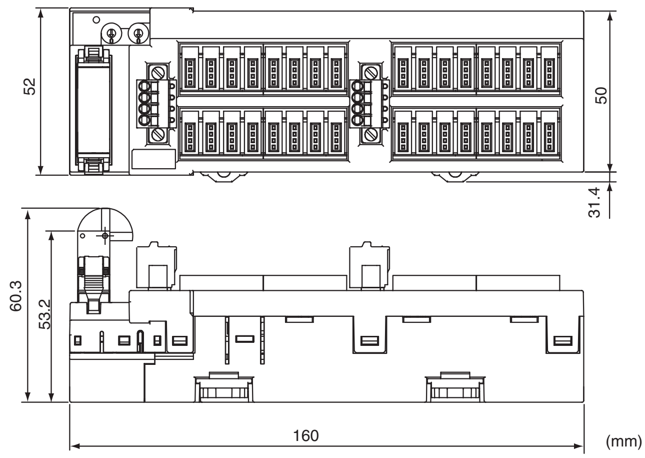


Note (1) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

(2) Two V terminals and two G terminals are provided for use as I/O power supply terminals. One set of terminals is used for the power supply for the Unit, and the other set is used for the supply power to the next Unit. Use a maximum current of 4 A per terminal.

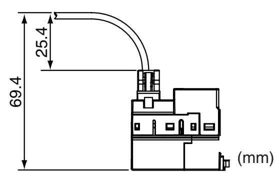
Dimensions (Same for CRT1-OD32S(-1) and CRT1-OD32SH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

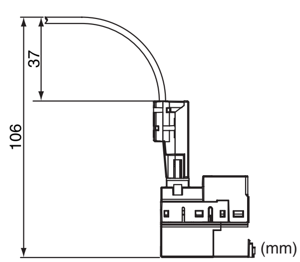


Communications Connector Dimensions Including the Connector and Cable

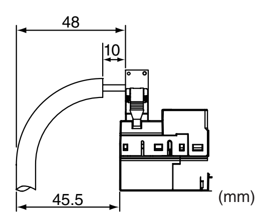
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



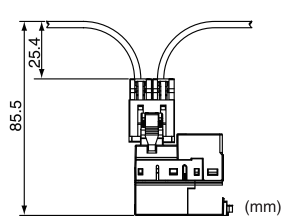
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



5-4-8 Sixteen-point Input and Sixteen-point Output Units (e-CON Connectors)

CRT1-MD32S/CRT1-MD32S-1/CRT1-MD32SH/CRT1-MD32SH-1

Common Specifications

Item	Specification			
Model	CRT1-MD32S	CRT1-MD32S-1	CRT1-MD32SH	CRT1-MD32SH-1
Installation	DIN Track			
Communications power supply current consumption	45 mA max. for 24-VDC power supply voltage 70 mA max. for 14-VDC power supply voltage		60 mA max. for 24-VDC power supply voltage 100 mA max. for 14-VDC power supply voltage	
Weight	180 g max.			

Input Section Specifications

Item	Specification			
Model	CRT1-MD32S	CRT1-MD32S-1	CRT1-MD32SH	CRT1-MD32SH-1
I/O capacity	16 inputs			
Internal I/O common	NPN	PNP	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)	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 current	1.0 mA max.			
Input current	At 24 VDC: 6.0 mA max./input At 11 VDC: 3.0 mA min./input			
ON delay	1.5 ms max.			
OFF delay	1.5 ms max.			
Power supply short-circuit detection	---		Operates at 50 mA/point min.	
Disconnection detection	---		Operates at 0.3 mA/point max.	
Number of circuits per common	16 inputs/common			
Isolation method	Photocoupler			
Input indicator	LED (yellow)			
Power supply type	Network power supply			
Power short-circuit protection	Operates at 50 mA/point min.			
Current supplied to input devices	50 mA/input			

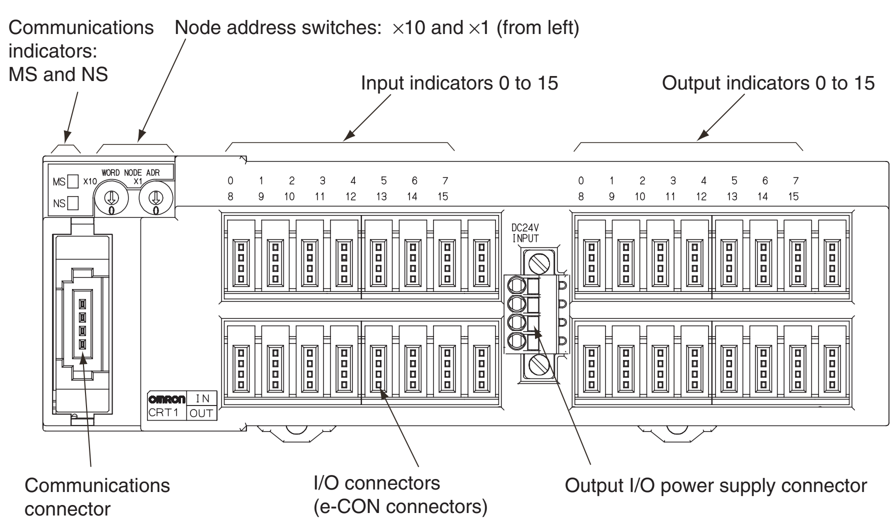
Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Output Section Specifications

Item	Specification			
Model	CRT1-MD32S	CRT1-MD32S-1	CRT1-MD32SH	CRT1-MD32SH-1
I/O capacity	16 outputs			
Internal I/O common	NPN	PNP	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)	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.			
Load short-circuit detection	---		Supported.	
Disconnection detection	---		Operates at 3 mA/point max. (Does not operate at over 3 mA.)	
Number of circuits per common	16 outputs/common			
Isolation method	Photocoupler			
Output indicators	LED (yellow)			
Power supply type	Multi-power supply			
Current supplied to output devices	100 mA/output			
I/O power supply current consumption	20 mA max. for 24-VDC power supply voltage		15 mA max. for 24-VDC power supply voltage	60 mA max. for 24-VDC power supply voltage
Output handling for communications errors	Select either hold or clear from CX-Integrator.			

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-MD32S(-1)/CRT1-MD32SH(-1))



Indicator Section

Communications Indicators Refer to *4-1-3 Communications Indicators*.

I/O Indicators

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

The detection status is also shown below for Slave Units with detection functions.

Name	LED status	I/O status	Meaning
0 to 15 (inputs) 0 to 15 (outputs)	Lit yellow.	Input or output ON	The input or output is ON.
	Not lit.	Input or output OFF	The input or output is OFF.

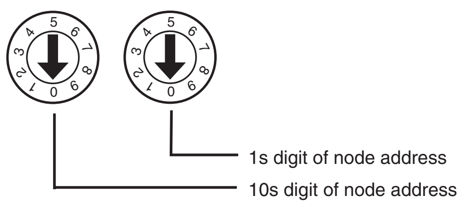
CRT1-MD32SH(-1) Only

Name	LED status	I/O status	Meaning
0 to 15 (inputs)	Lit red.	Short-circuit detection	The power supply is short-circuited.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.
0 to 15 (outputs)	Lit red.	Short-circuit detection	A load short-circuit occurred.
	Flashing red.	Disconnection detection	A line is not connected.
	Not lit.	Normal status	The Unit is operating normally.

Setting the Node Address

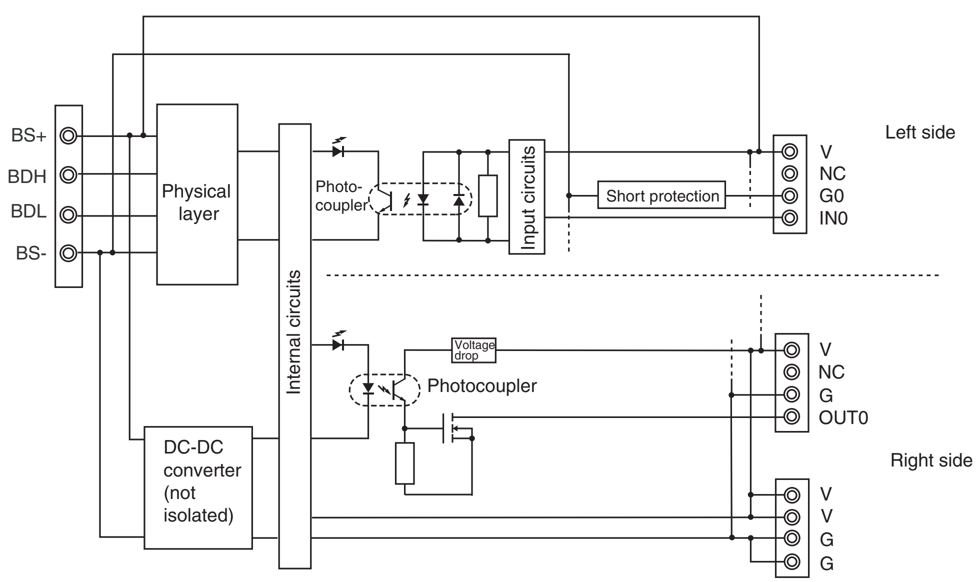
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

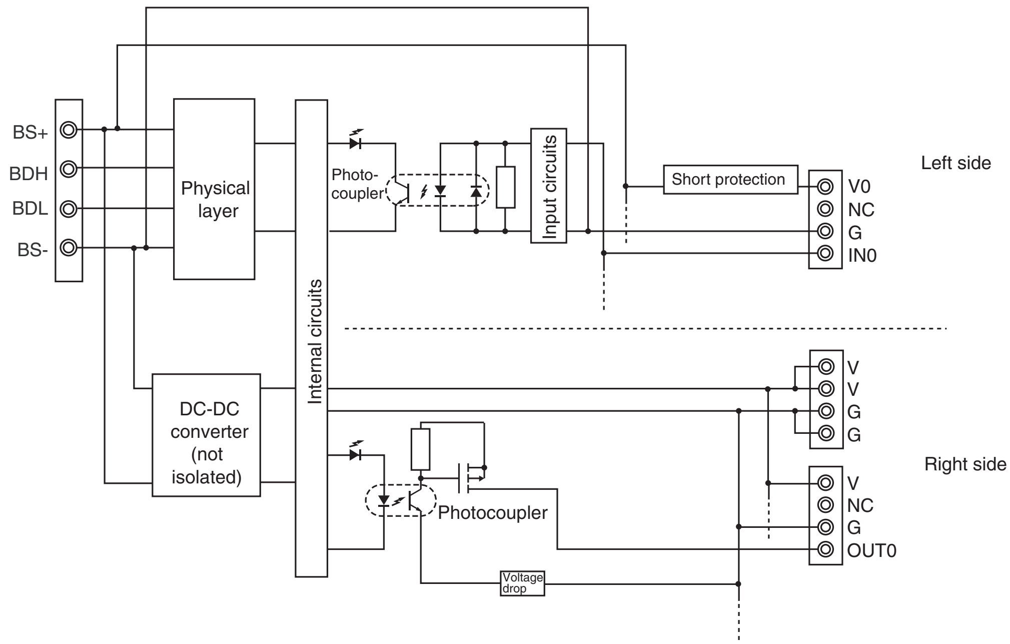


Internal Circuits

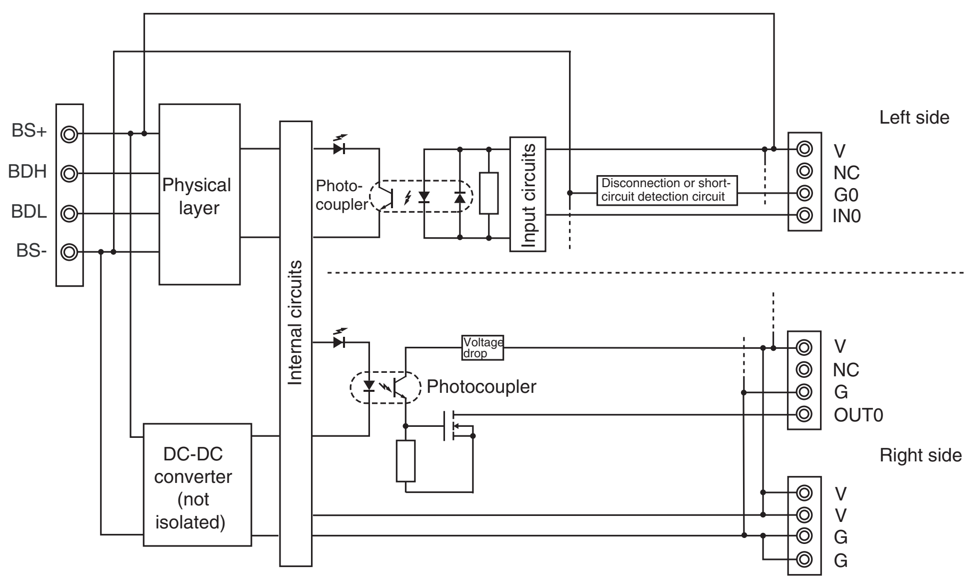
CRT1-MD32S (NPN)



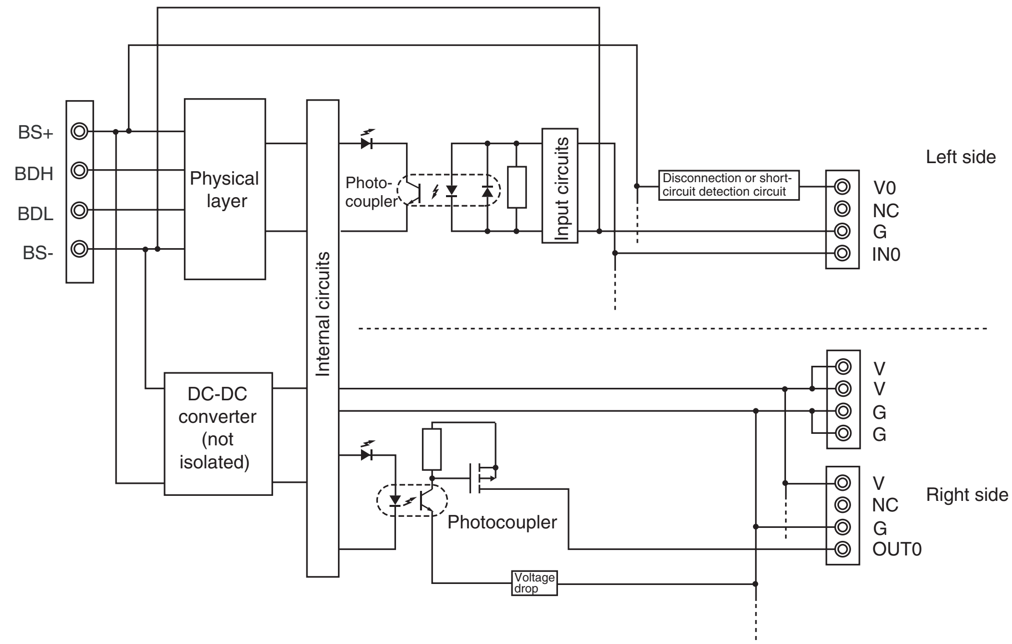
CRT1-MD32S-1 (PNP)



CRT1-MD32SH (NPN)

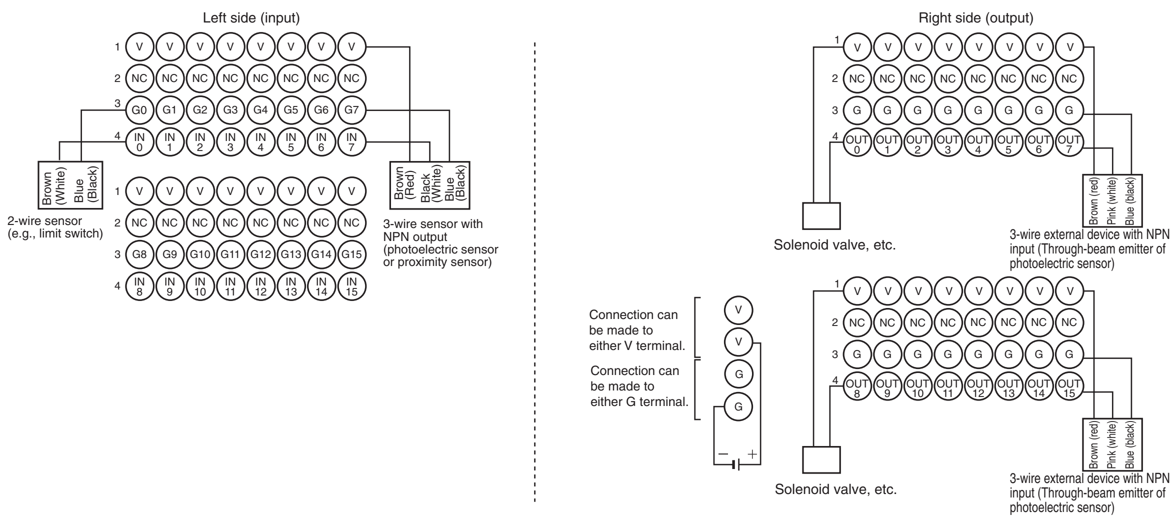


CRT1-MD32SH-1 (PNP)

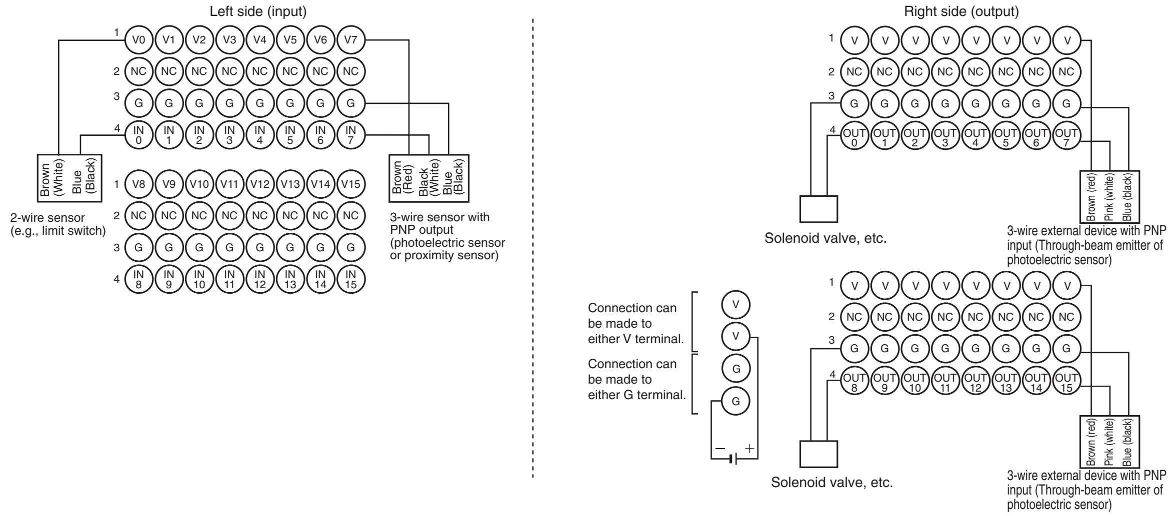


Wiring

CRT1-MD32S
CRT1-MD32SH (NPN)



CRT1-MD32S-1/ CRT1-MD32SH-1 (PNP)



Note

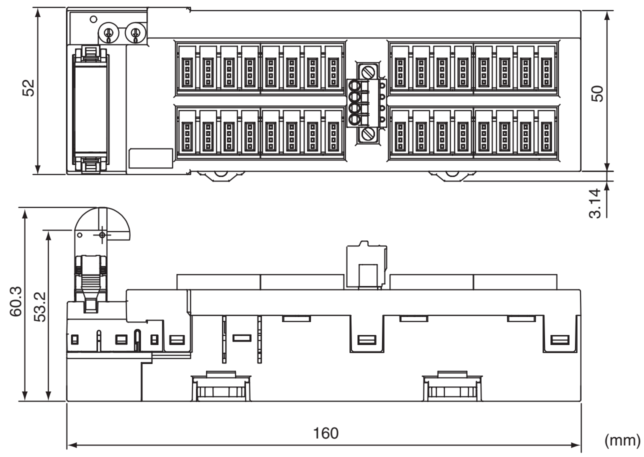
(1) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

(2) Two V terminals and two G terminals are provided for use as I/O power supply terminals. One set of terminals is used for the power supply for the Unit, and the other set is used for the supply power to the next Unit. Use a maximum current of 4 A per terminal.

(3) 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.

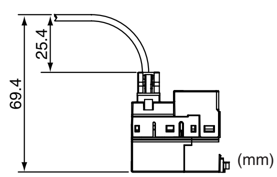
Dimensions (Same for CRT1-MD32S(-1)/CRT1-MD32SH(-1))

When a DCN4-TB4 Open Type Connector Is Mounted

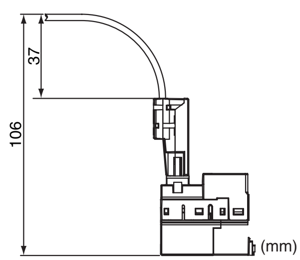


Communications Cable Dimensions when Connector and Cable Are Connected

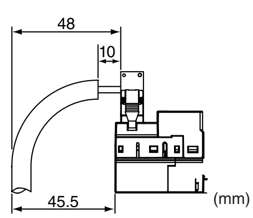
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



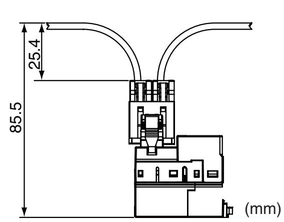
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



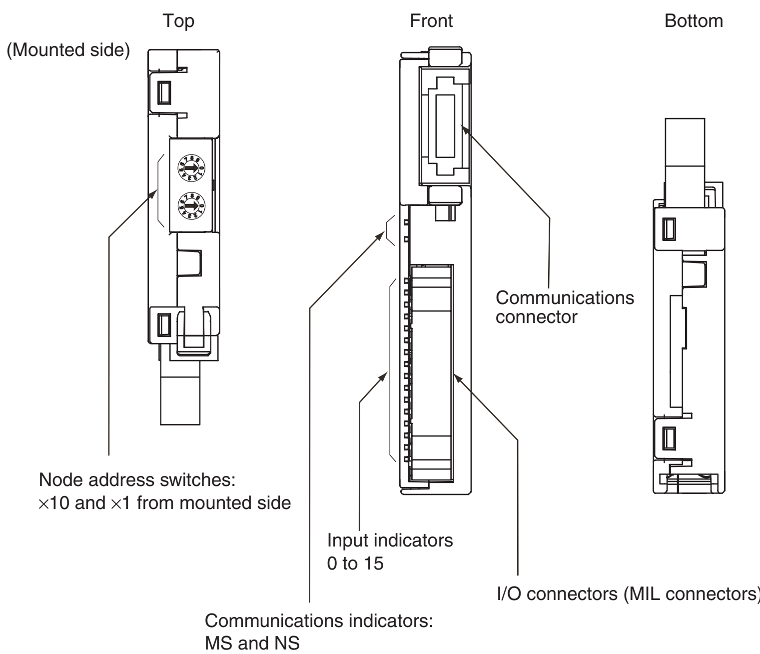
5-4-9 Sixteen-point Input Units (MIL Connectors) CRT1-VID16ML/CRT1-VID16ML-1

Input Section Specifications

Item	Specification	
Model	CRT1-VID16ML	CRT1-VID16ML-1
I/O capacity	16 inputs	
Internal I/O common	NPN	PNP
ON voltage	17 VDC min. (between each input terminal and the V terminal)	17 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	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./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 or Mounting Bracket	
Power supply type	Multi-power supply	
Communications power supply current consumption	40 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	5 mA max. for 24-VDC power supply voltage	
Weight	80 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-VID16ML and CRT1-VID16ML-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

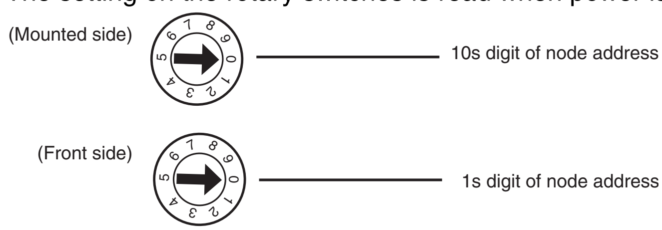
The meanings of the input indicators are given in the following table.

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

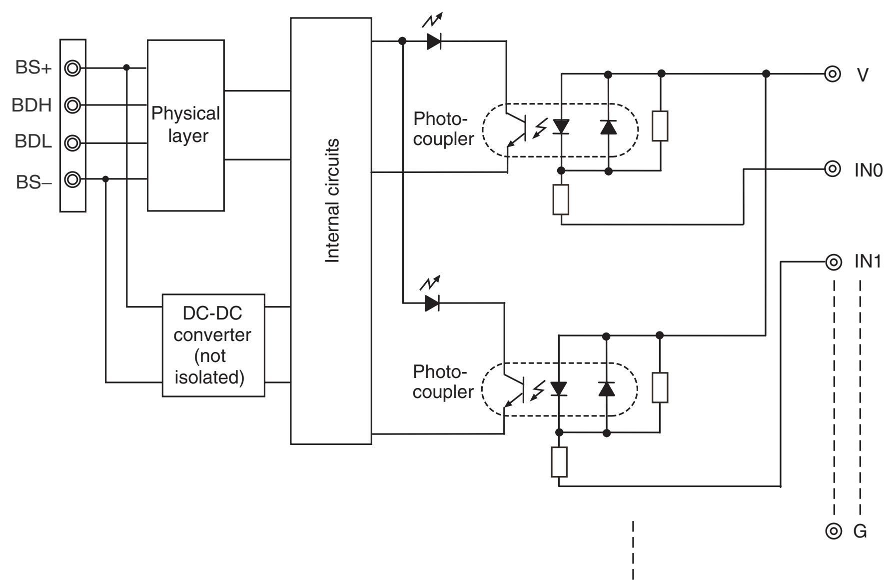
The node address is set as a decimal number with the 10s digit set on the mounting-side rotary switch and the 1s digit set on the front-side rotary switch. (The maximum node address is 63.)

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

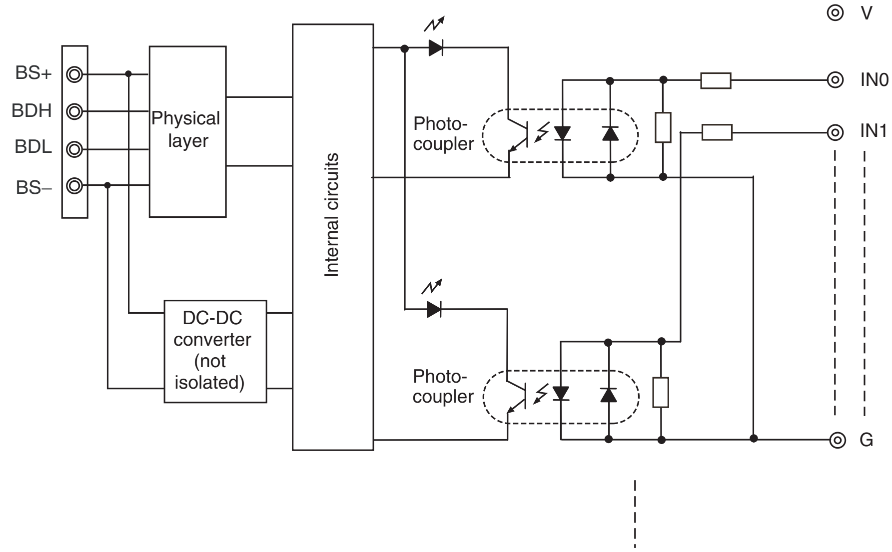


Internal Circuits

CRT1-VID16ML (NPN)

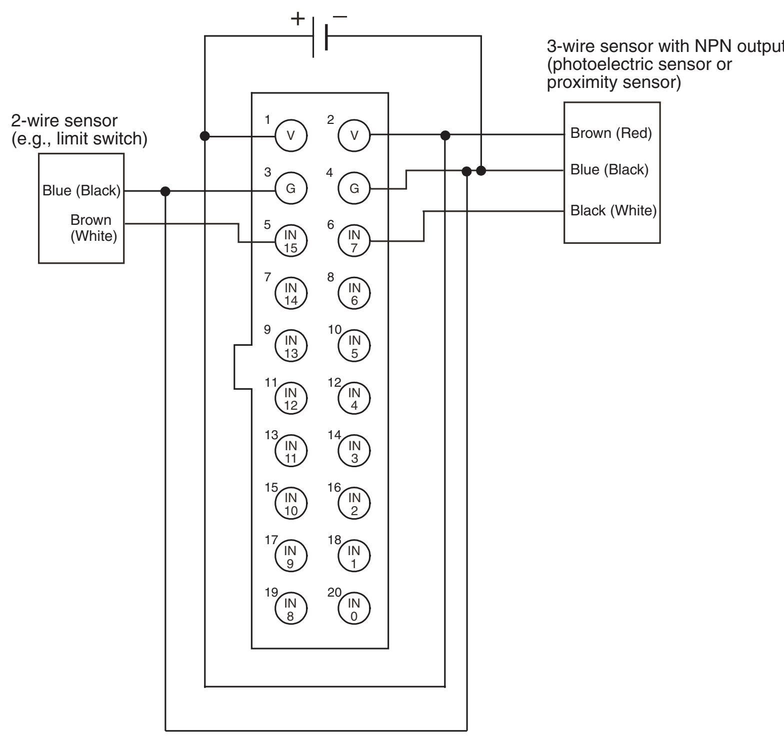


CRT1-VID16ML-1 (PNP)

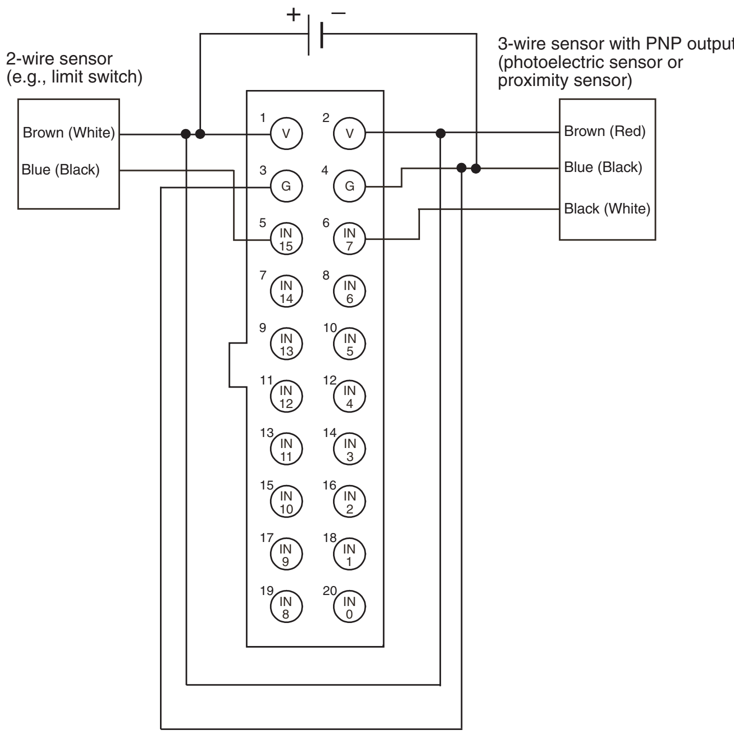


Wiring

CRT1-VID16ML (NPN)



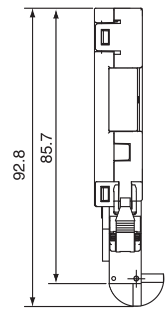
CRT1-VID16ML-1 (PNP)

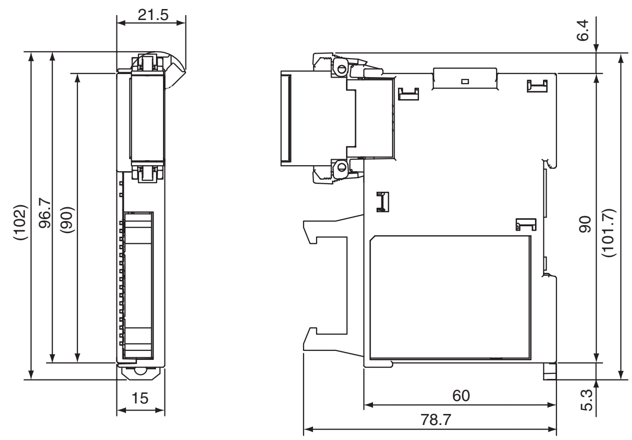


Note The two V terminals as well as the two G terminals are internally connected.

Dimensions (Same for CRT1-VID16ML and CRT1-VID16ML-1)

When a DCN4-TB4 Open Type Connector Is Mounted

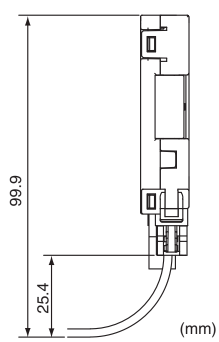




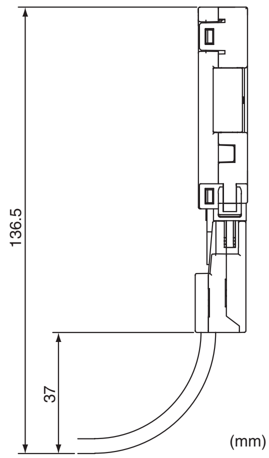
Figures in parentheses are reference dimensions.
(mm)

Communications Connector Dimensions Including the Connector and Cable

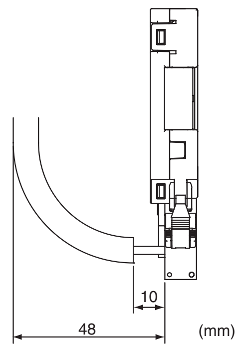
■ **When a DCN4-BR4 Flat Connector I Plug Is Mounted**



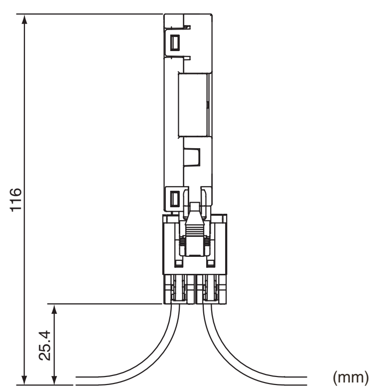
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



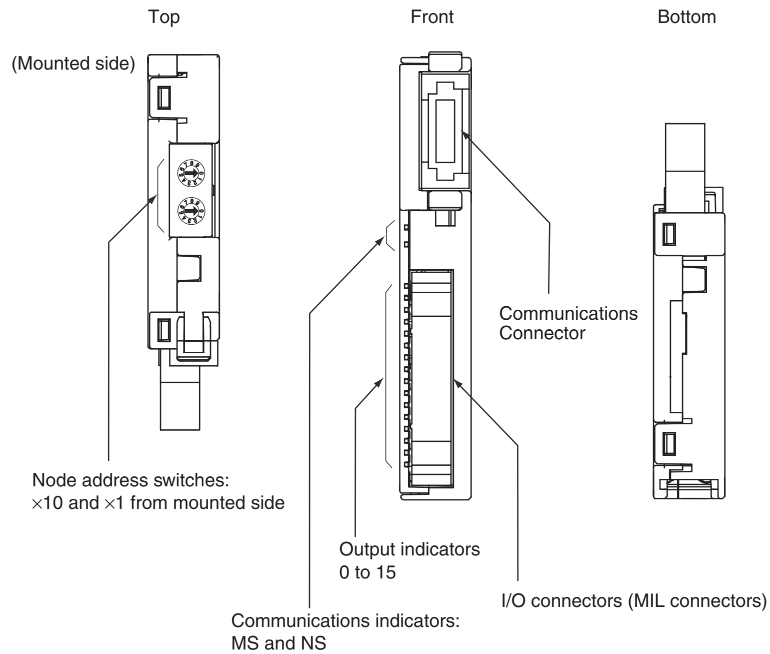
5-4-10 Sixteen-point Output Units (MIL Connectors) CRT1-VOD16ML/CRT1-VOD16ML-1

Output Section Specifications

Item	Specification	
Model	CRT1-VOD16ML	CRT1-VOD16ML-1
I/O capacity	16 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.3 A/output, 2 A/common (See note.)	
Residual voltage	1.2 V max. (0.3 A DC, between each output terminal and the G terminal)	1.2 V max. (0.3 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 or Mounting Bracket	
Power supply type	Multi-power supply	
Communications power supply current consumption	45 mA max. for 24-VDC power supply voltage 65 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	
Weight	70 g max.	

Note Do not use a total external load current of more than 2 A, and do not use more than 1 A per V terminal or G terminal.
Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-VOD16ML and CRT1-VOD16ML-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

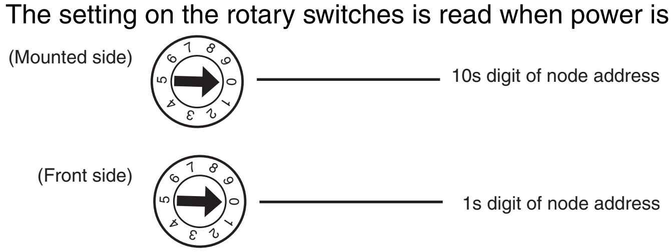
The meanings of the output indicators are given in the following table.

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

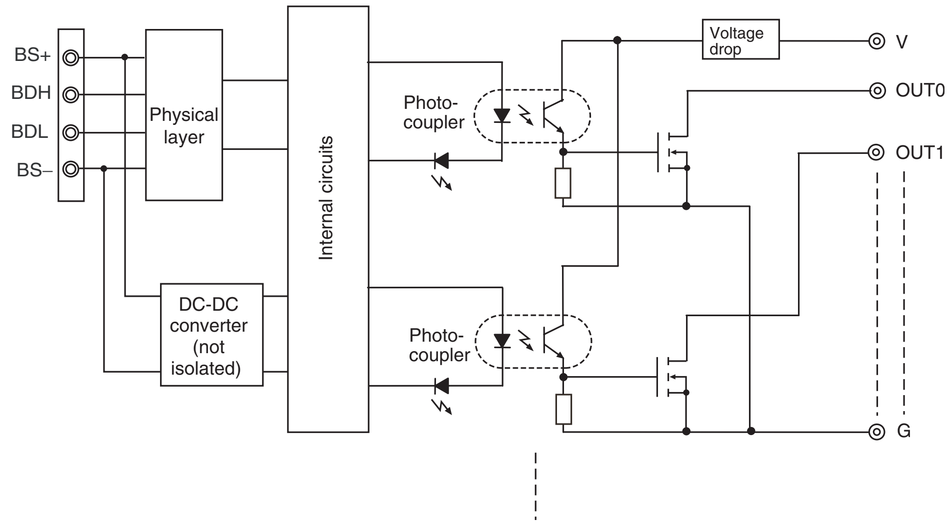
The node address is set as a decimal number with the 10s digit set on the mounting-side rotary switch and the 1s digit set on the front-side rotary switch. (The maximum node address is 63.)

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

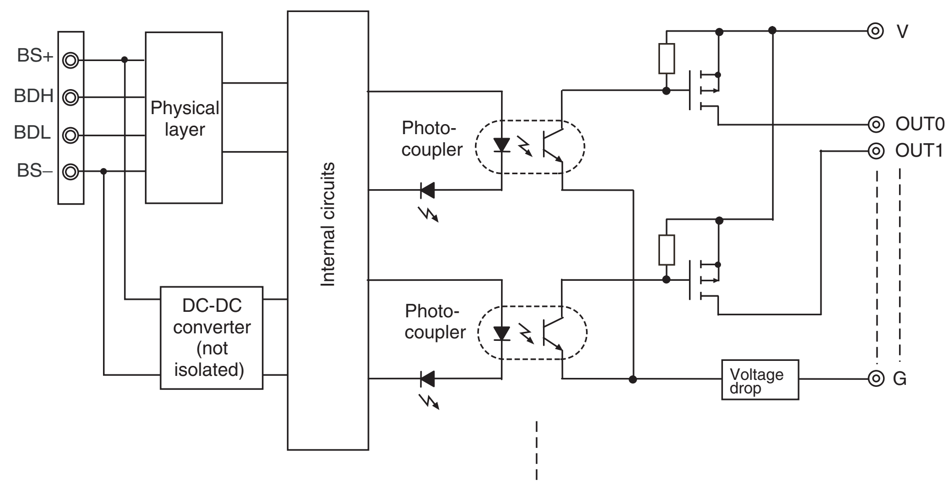


Internal Circuits

CRT1-VOD16ML (NPN)

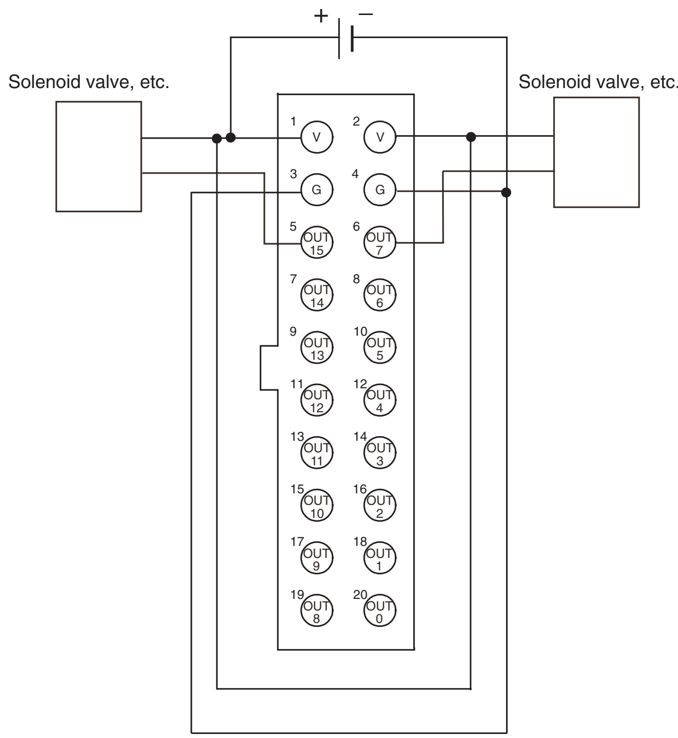


CRT1-VOD16ML-1 (PNP)

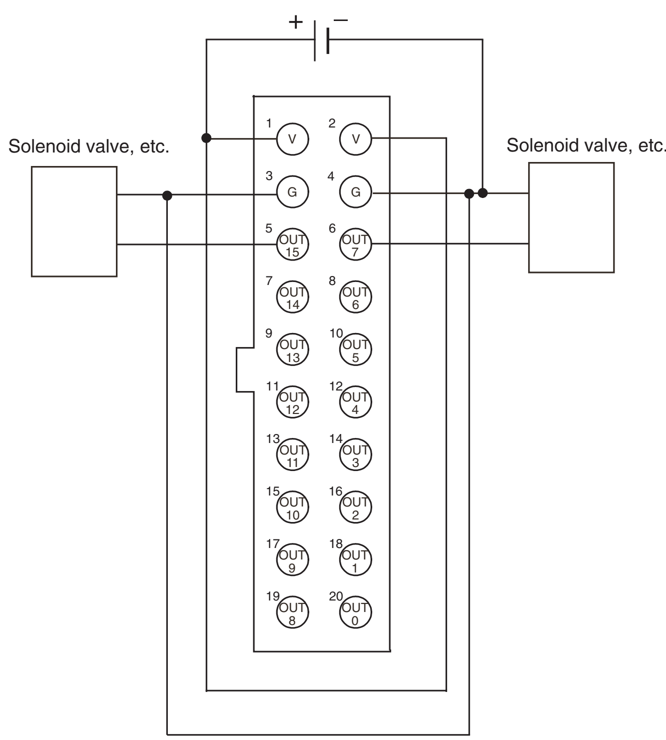


Wiring

CRT1-VOD16ML (NPN)



CRT1-VOD16ML-1 (PNP)

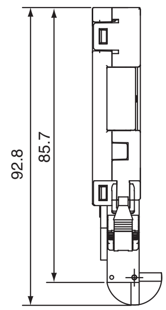


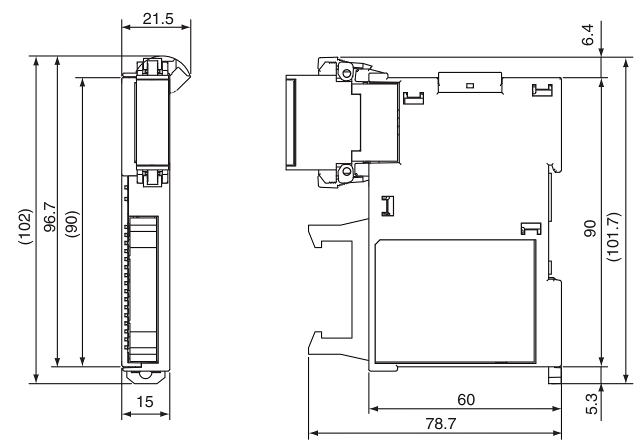
Note (1) The two V terminals as well as the two G terminals are internally connected. If the power exceeds 1 A per terminal, or if the total external load current exceeds 2 A, then provide the output power supply externally rather than from the terminals.

(2) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

Dimensions (Same for CRT1-VOD16ML and CRT1-VOD16ML-1)

When a DCN4-TB4 Open Type Connector Is Mounted

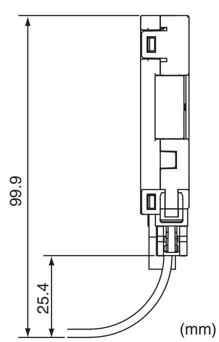




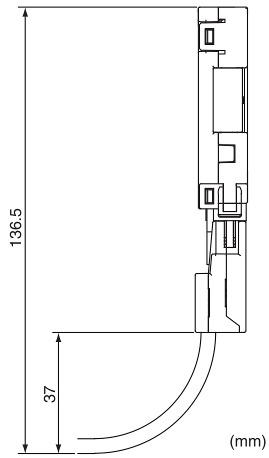
Figures in parentheses are reference dimensions.
(mm)

Communications Connector Dimensions Including the Connector and Cable

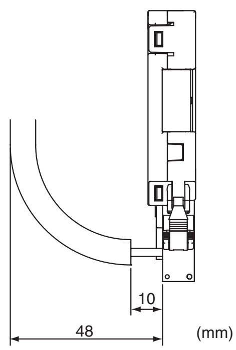
■ **When a DCN4-BR4 Flat Connector I Plug Is Mounted**



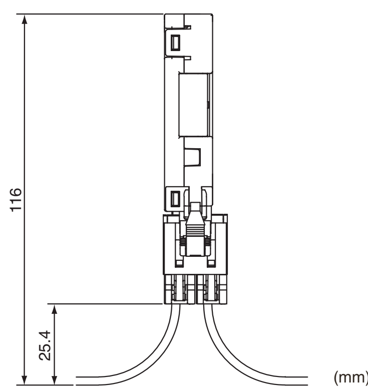
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



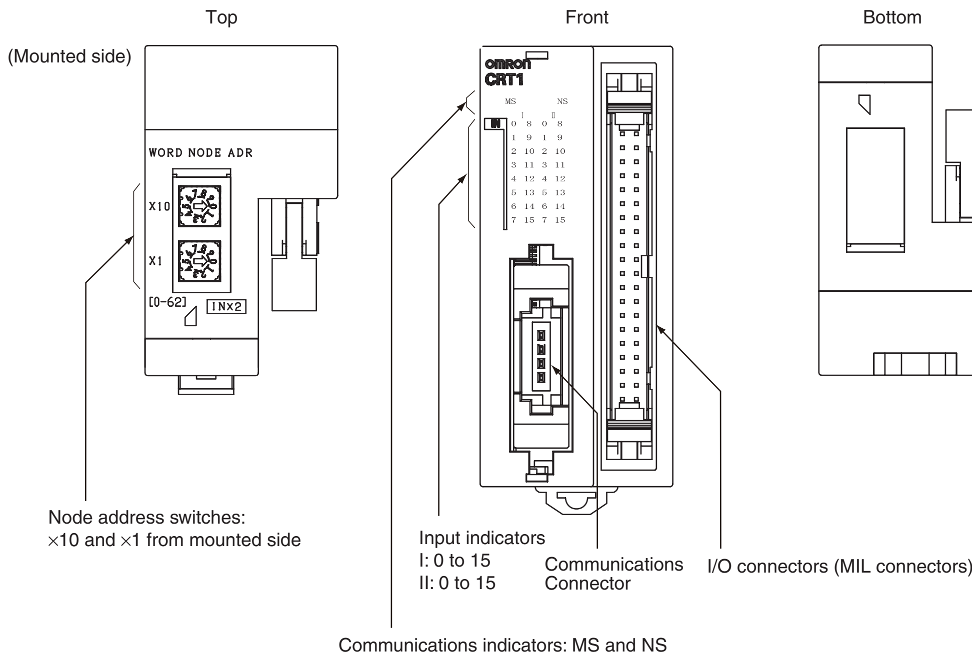
5-4-11 Thirty-two-point Input Units (MIL Connectors) CRT1-VID32ML/CRT1-VID32ML-1

Input Section Specifications

Item	Specification	
Model	CRT1-VID32ML	CRT1-VID32ML-1
I/O capacity	32 inputs	
Internal I/O common	NPN	PNP
ON voltage	17 VDC min. (between each input terminal and the V terminal)	17 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	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	32 inputs/common	
Number of simultaneous inputs	32 max. (See note.)	
Isolation method	Photocoupler	
Input indicator	LED (yellow)	
Installation	DIN Track or Mounting Bracket	
Power supply type	Multi-power supply	
Communications power supply current consumption	40 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	2 mA max. for 24-VDC power supply voltage	
Weight	120 g max.	

Note When Slave Units are mounted facing upwards, and 32 inputs may all turn ON, leave the specified distance between Units according to the ambient temperature. (Refer to the *Dimensions*.)
Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-VID32ML and CRT1-VID32ML-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the input indicators are given in the following table.

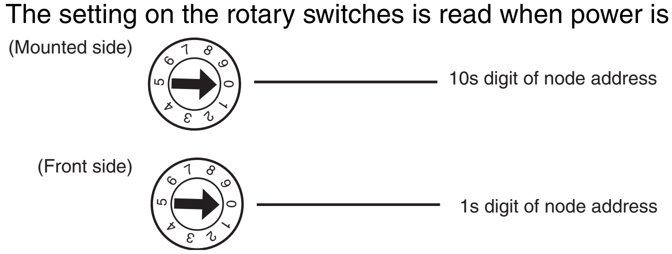
Name	LED status	I/O status	Meaning
I 0 to I 15 (word m)	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.
II 0 to II 15 (word m+1)	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

Note Word m: The first word allocated to the Slave Unit

Setting the Node Address

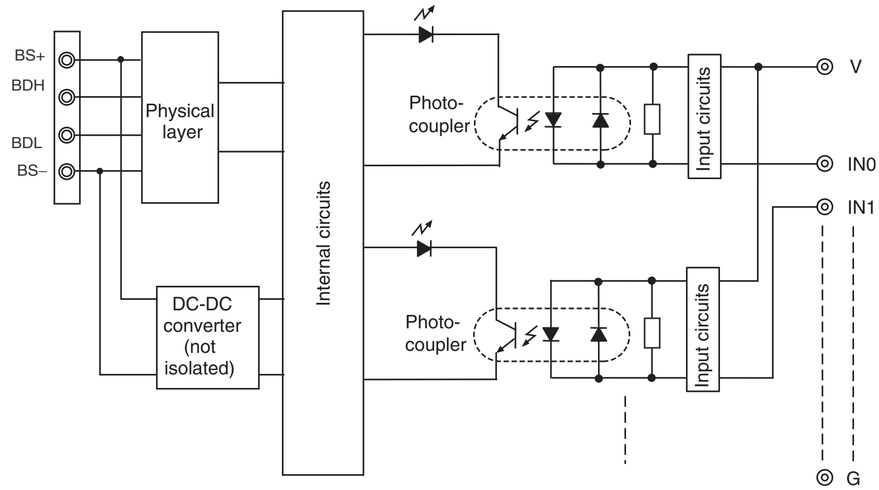
The node address is set as a decimal number with the 10s digit set on the mounting-side rotary switch and the 1s digit set on the front-side rotary switch. (The maximum node address is 62.)

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

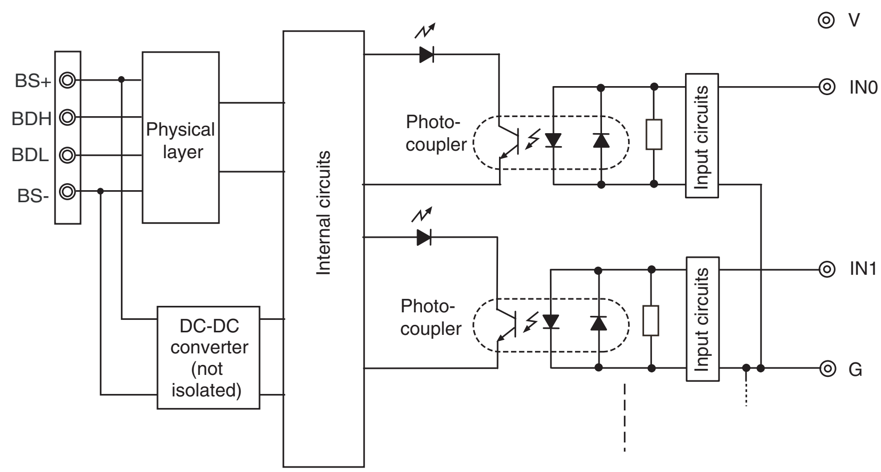


Internal Circuits

CRT1-VID32ML (NPN)

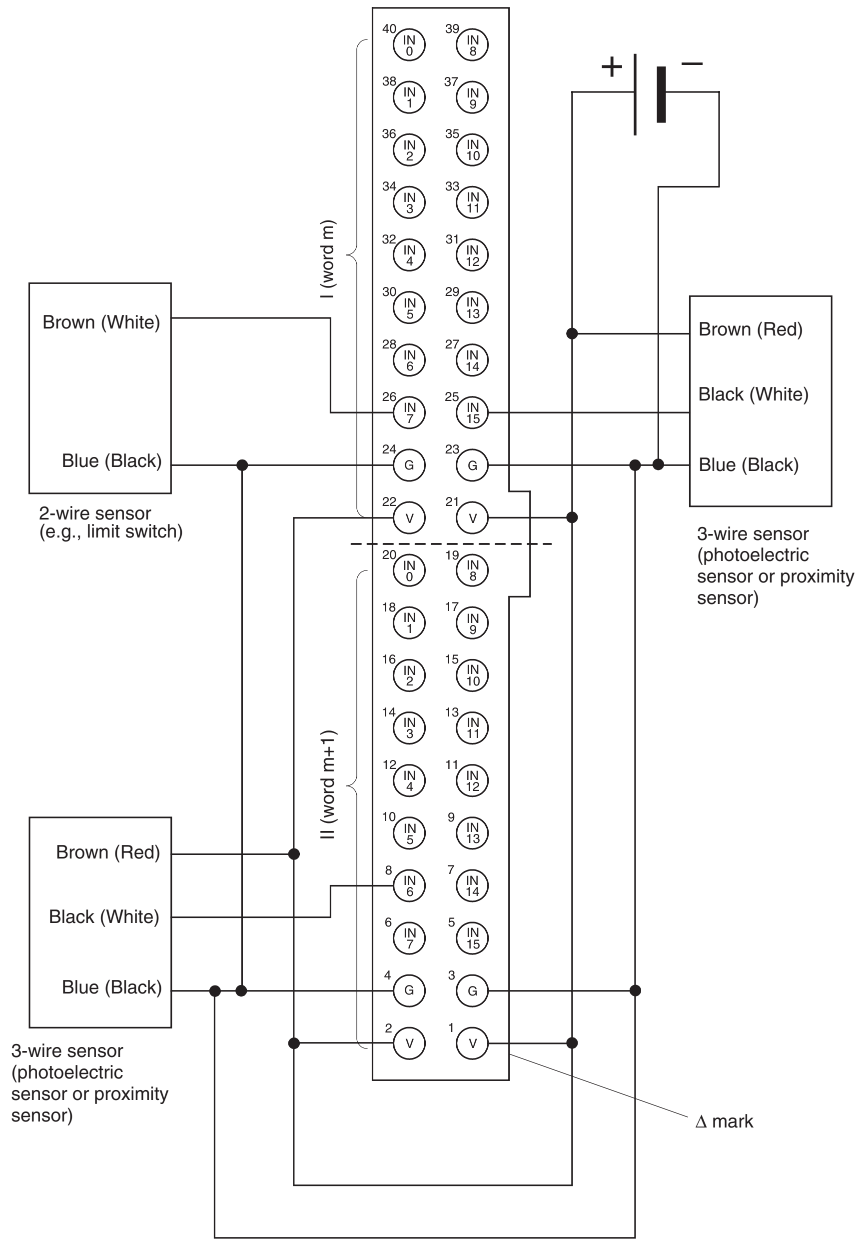


CRT1-VID32ML-1 (PNP)

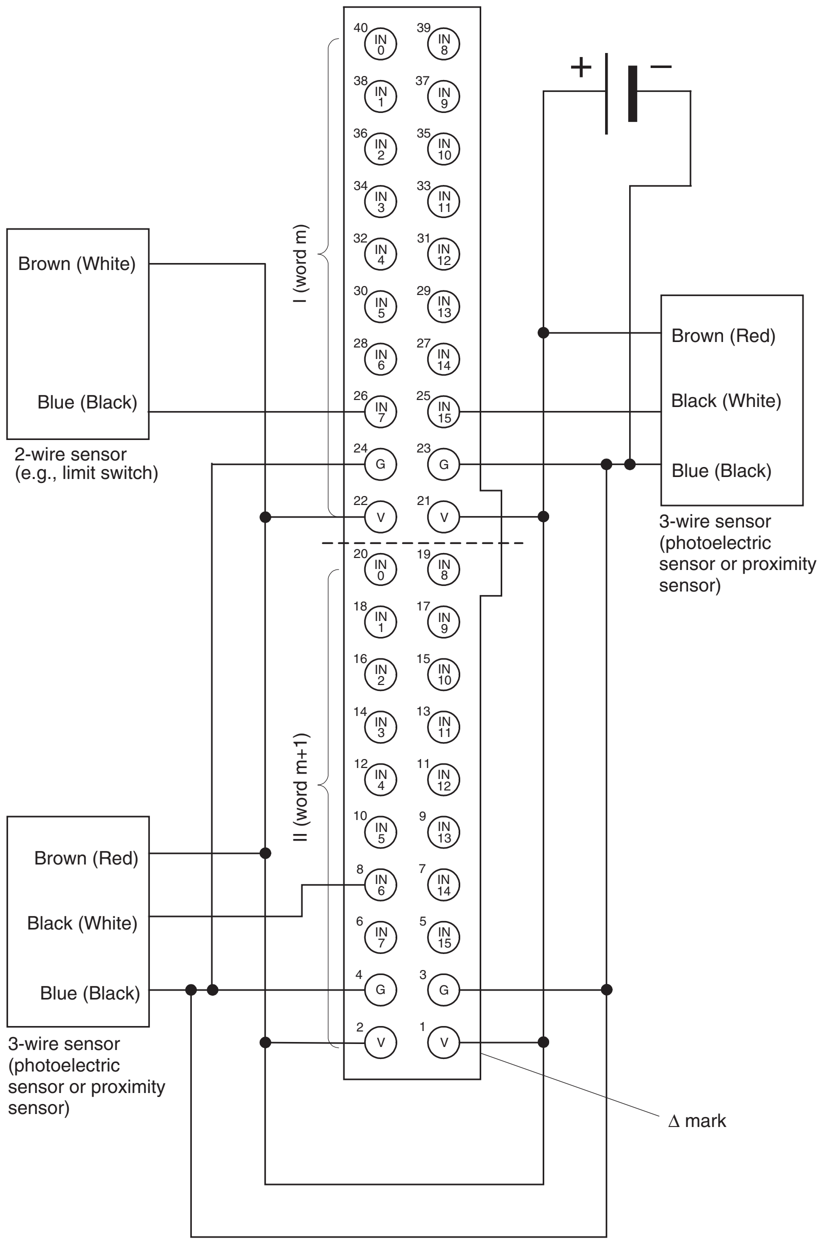


Wiring

CRT1-VID32ML (NPN)



CRT1-VID32ML-1 (PNP)



Note All V terminals as well as all G terminals are internally connected.

I/O Allocation

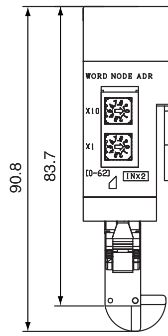
The following diagram shows the correspondence between MIL connector pin numbers and allocated words and bits when the first word for a Slave Unit allocated in the Master Unit is m.

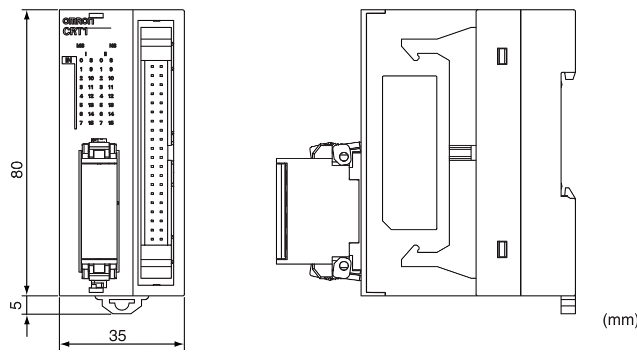
Input Area

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit
Word m	I 15	I 14	I 13	I 12	I 11	I 10	I 9	I 8	I 7	I 6	I 5	I 4	I 3	I 2	I 1	I 0	··· 16 inputs
Word m+1	II 15	II 14	II 13	II 12	II 11	II 10	II 9	II 8	II 7	II 6	II 5	II 4	II 3	II 2	II 1	II 0	··· 16 inputs

Dimensions (Same for CRT1-VID32ML and CRT1-VID32ML-1)

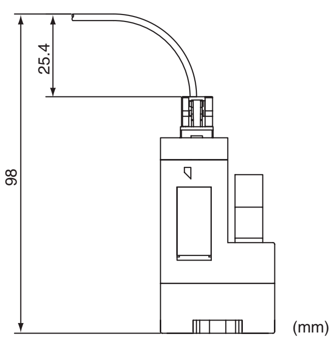
When a DCN4-TB4 Open Type Connector Is Mounted



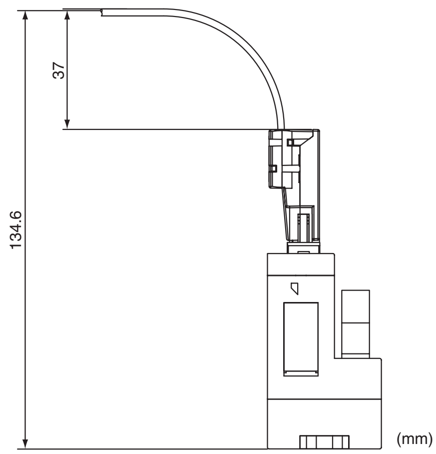


Communications Connector Dimensions Including the Connector and Cable

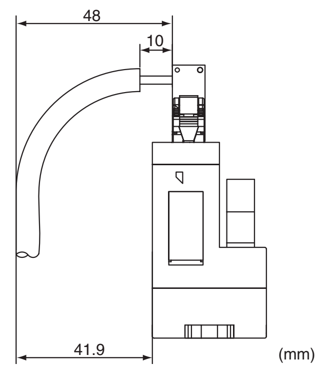
■ **When a DCN4-BR4 Flat Connector I Plug Is Mounted**



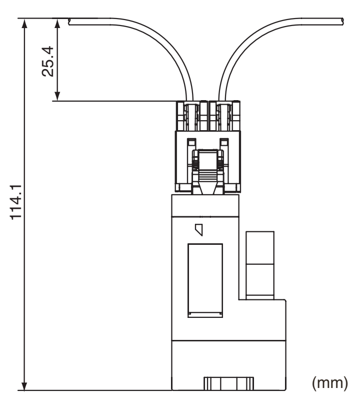
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



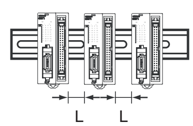
Note The following ambient operating temperature restrictions apply when multiple 32-point Slave Units with MIL Connectors are mounted in parallel.

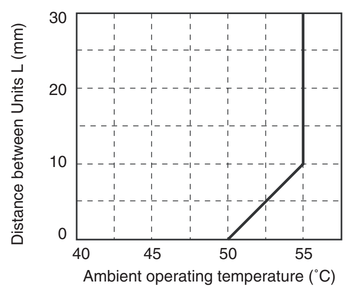
When Units Are Not Mounted Facing Upwards:

Units can be densely mounted (32 points can turn ON simultaneously at an ambient operating temperature of 55°C).

When Units Are Mounted Facing Upwards:

If 32 points may be turned ON simultaneously, the distance between the Units must be restricted depending on the ambient operating temperature, as shown in the following graph. For example, when the ambient operating temperature is 55°C, a space of at least 10 mm is required between Units.





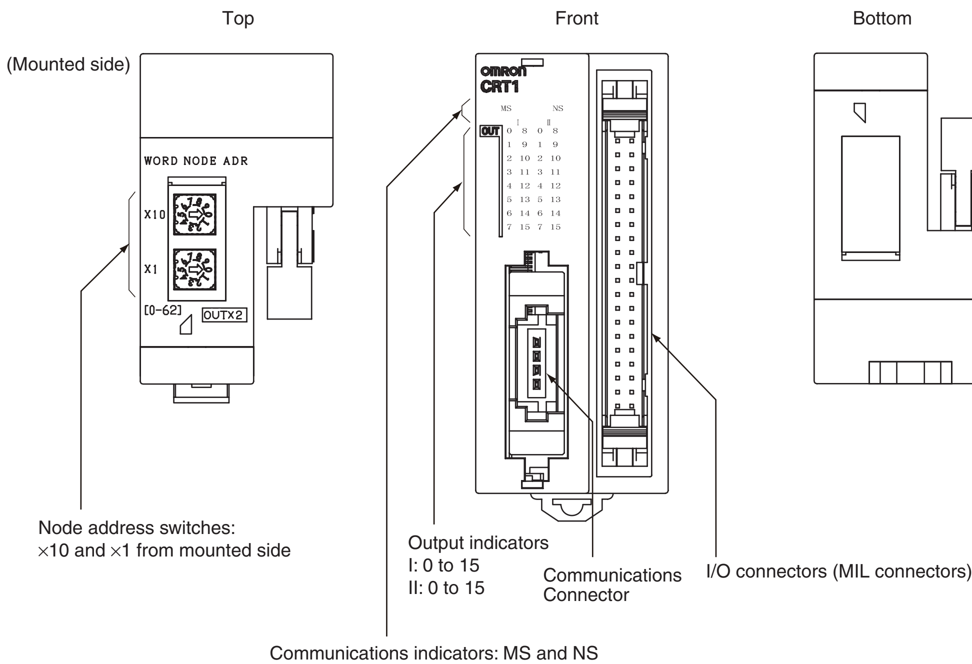
5-4-12 Thirty-two-point Output Units (MIL Connectors) CRT1-VOD32ML/CRT1-VOD32ML-1

Output Section Specifications

Item	Specification	
Model	CRT1-VOD32ML	CRT1-VOD32ML-1
I/O capacity	32 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.3 A/output, 4 A/common (See note.)	
Residual voltage	1.2 V max. (0.3 A DC, between each output terminal and the G terminal)	1.2 V max. (0.3 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	32 outputs/common	
Isolation method	Photocoupler	
Output indicators	LED (yellow)	
Installation	DIN Track or Mounting Bracket	
Power supply type	Multi-power supply	
Communications power supply current consumption	50 mA max. for 24-VDC power supply voltage 80 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	6.5 mA max. for 24-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	
Weight	100 g max.	

Note Do not use a total external load current of more than 4 A, and do not use more than 1 A per V terminal or G terminal.
Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-VOD32ML and CRT1-VOD32ML-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output indicators are given in the following table.

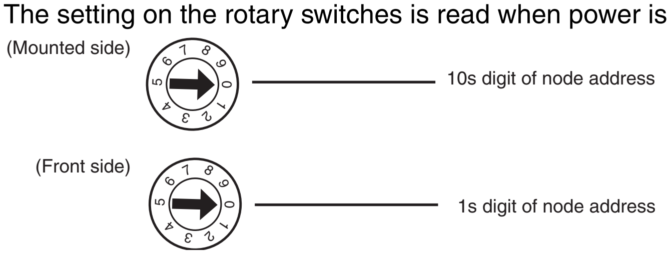
Name	LED status	I/O status	Meaning
I 0 to I 15 (word m)	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.
II 0 to II 15 (word m+1)	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

Note Word m: The first word allocated to the Slave Unit

Setting the Node Address

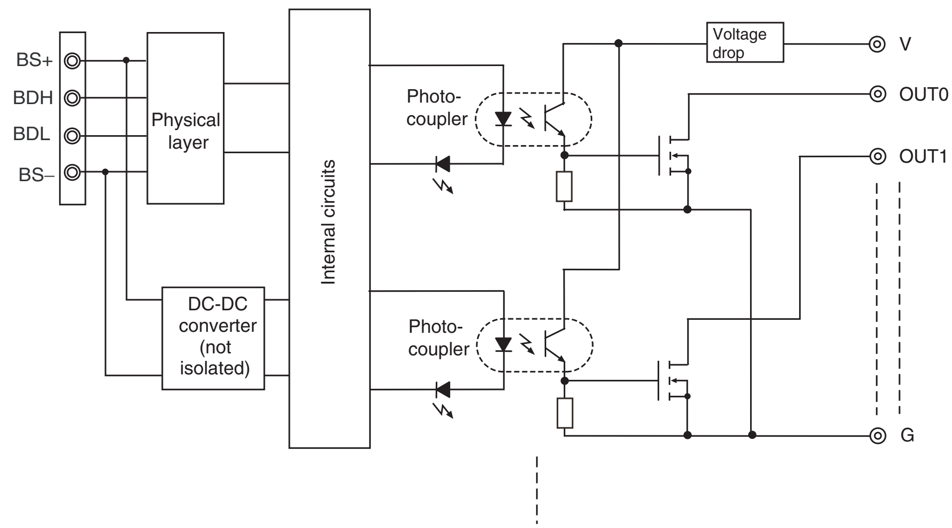
The node address is set as a decimal number with the 10s digit set on the mounting-side rotary switch and the 1s digit set on the front-side rotary switch. (The maximum node address is 62.)

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

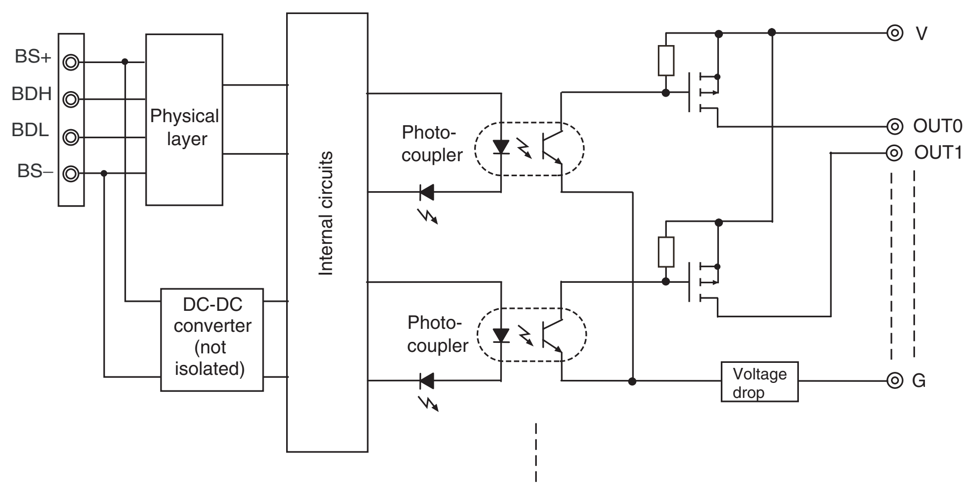


Internal Circuits

CRT1-VOD32ML (NPN)

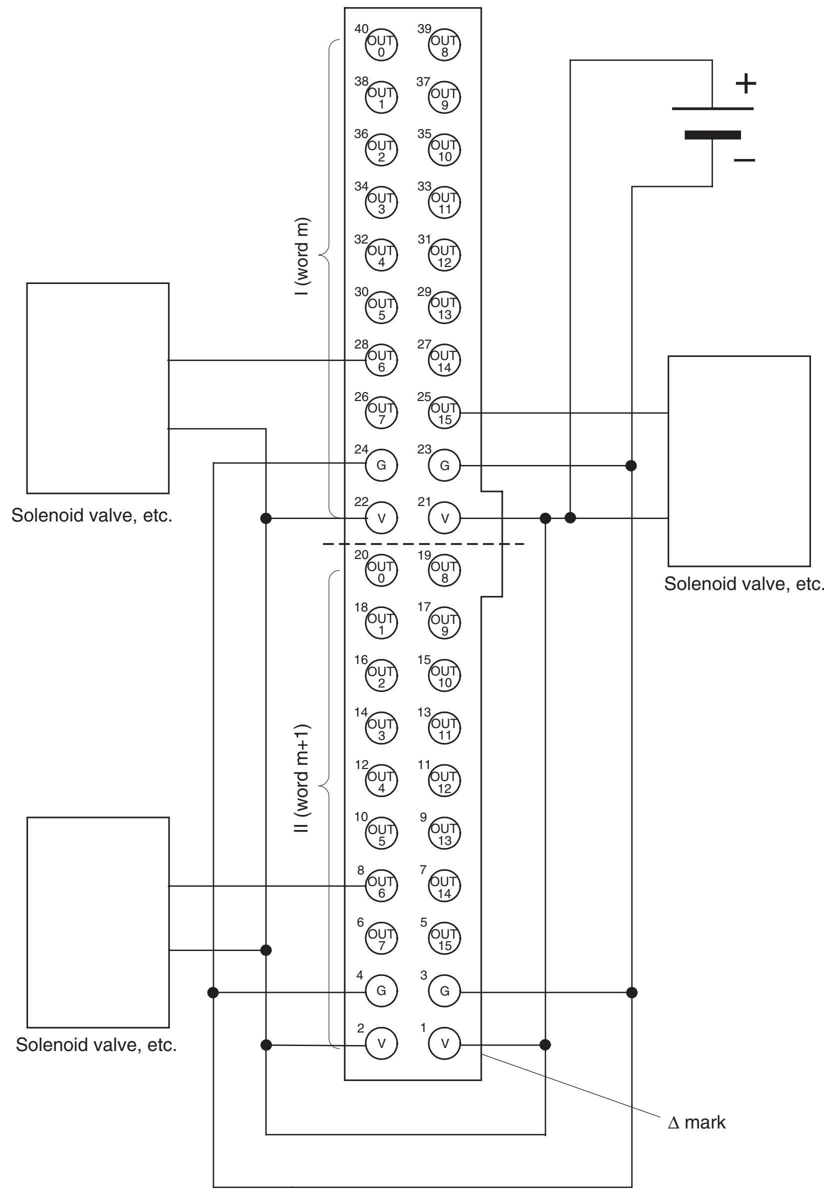


CRT1-VOD32ML-1 (PNP)

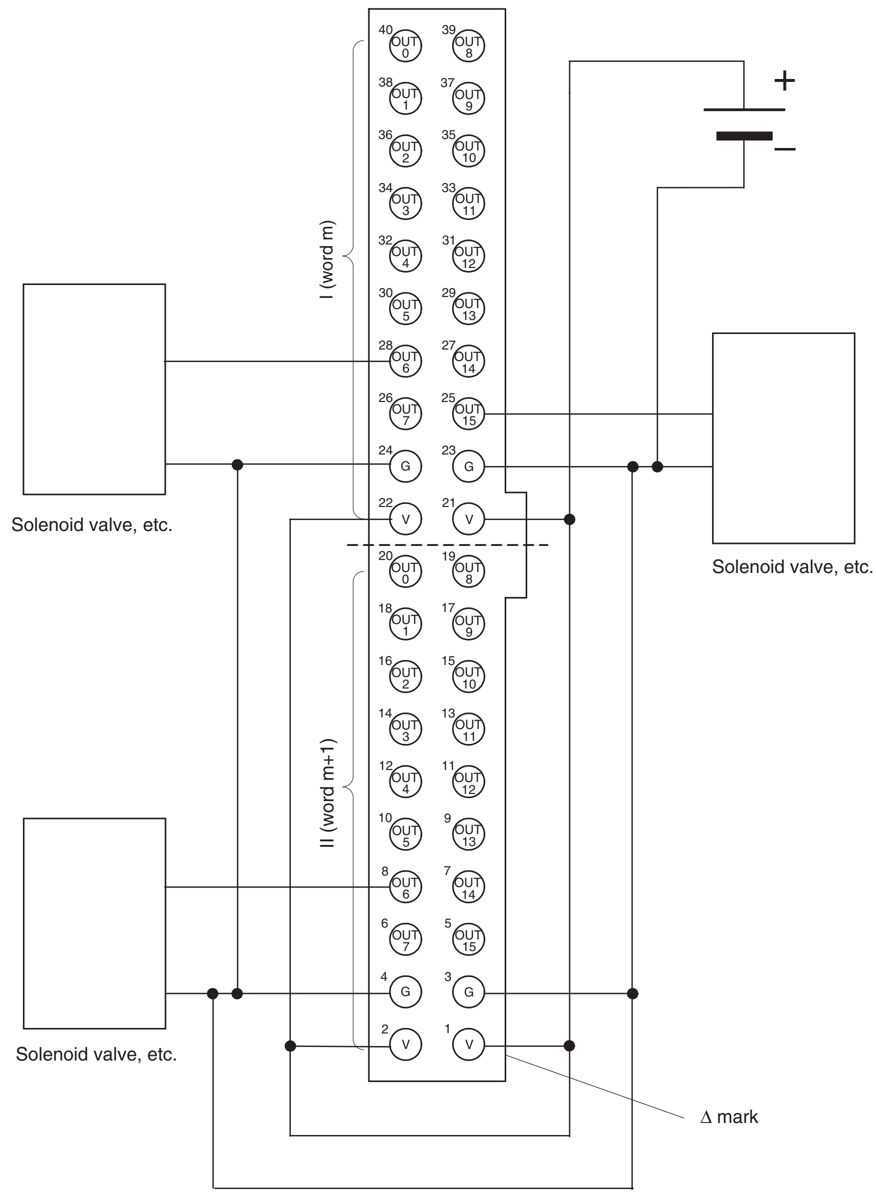


Wiring

CRT1-VOD32ML (NPN)



CRT1-VOD32ML-1 (PNP)



Note (1) All V terminals as well as all G terminals are internally connected. If the power exceeds 1 A per terminal, or if the total external load current exceeds 4 A, then provide the output power supply externally rather than from the terminals.

(2) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

I/O Allocation

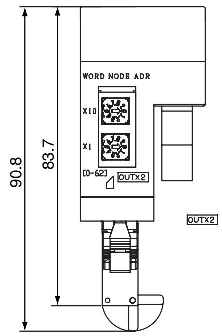
The following diagram shows the correspondence between MIL connector pin numbers and allocated words and bits when the first word for a Slave Unit allocated in the Master Unit is n.

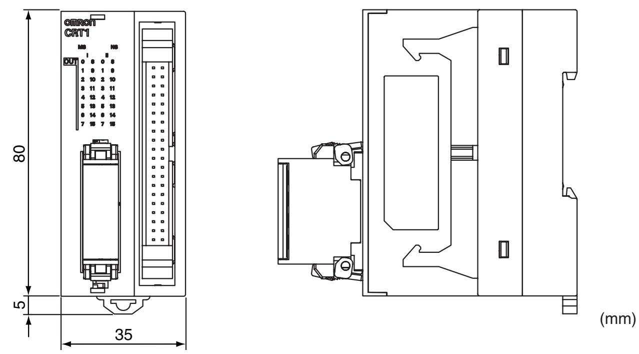
Output Area

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Word n	I 15	I 14	I 13	I 12	I 11	I 10	I 9	I 8	I 7	I 6	I 5	I 4	I 3	I 2	I 1	I 0	··· 16 outputs
Word n+1	II 15	II 14	II 13	II 12	II 11	II 10	II 9	II 8	II 7	II 6	II 5	II 4	II 3	II 2	II 1	II 0	··· 16 outputs

Dimensions (Same for CRT1-VOD32ML and CRT1-VOD32ML-1)

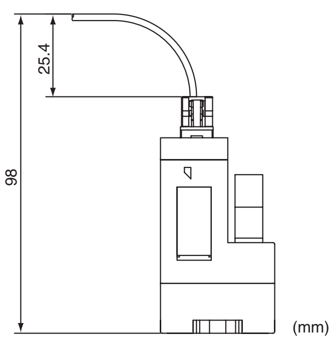
When a DCN4-TB4 Open Type Connector Is Mounted



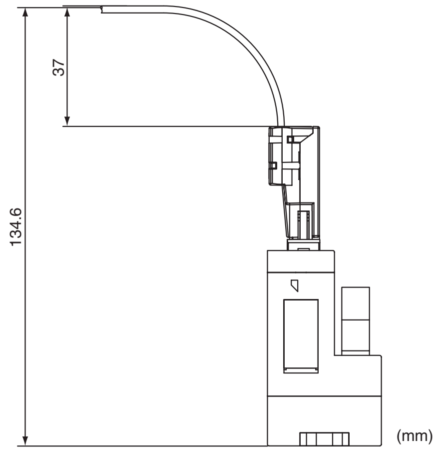


Communications Connector Dimensions Including the Connector and Cable

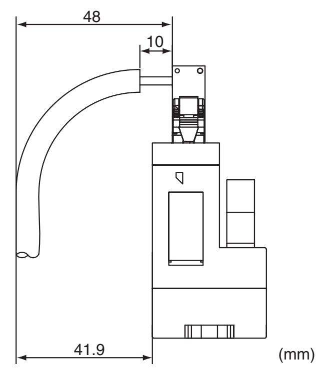
■ **When a DCN4-BR4 Flat Connector I Plug Is Mounted**



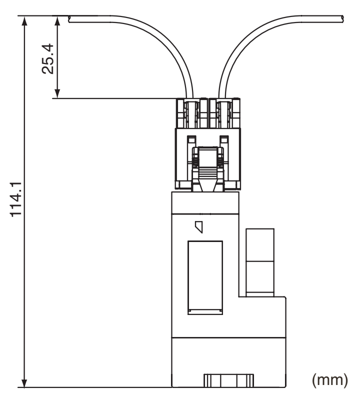
■ **When a DCN5-BR4 Flat Connector II Plug Is Mounted**



■ **When a DCN4-TB4 Open Type Connector Is Mounted**



■ **When a DCN4-MD4 Multidrop Connector Is Mounted**



5-4-13 Sixteen-point Input and Sixteen-point Output Units (MIL Connectors)

CRT1-VMD32ML/CRT1-VMD32ML-1

Common Specifications

Item	Specification	
Model	CRT1-VMD32ML	CRT1-VMD32ML-1
Installation	DIN Track or Mounting Bracket	
Communications power supply current consumption	45 mA max. for 24-VDC power supply voltage 70 mA max. for 14-VDC power supply voltage	
Weight	110 g max.	

Input Section Specifications

Item	Specification	
Model	CRT1-VMD32ML	CRT1-VMD32ML-1
I/O capacity	16 inputs	
Internal I/O common	NPN	PNP
ON voltage	17 VDC min. (between each input terminal and the V terminal)	17 VDC min. (between each input terminal and the G terminal)
OFF voltage	5 VDC min. (between each input terminal and the V terminal)	5 VDC min. (between each input terminal and the G terminal)
OFF current	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	16 inputs/common	
Number of simultaneous inputs	16 max.	
Isolation method	Photocoupler	
Input indicator	LED (yellow)	
Power supply type	Multi-power supply	
I/O power supply current consumption	2 mA max.	

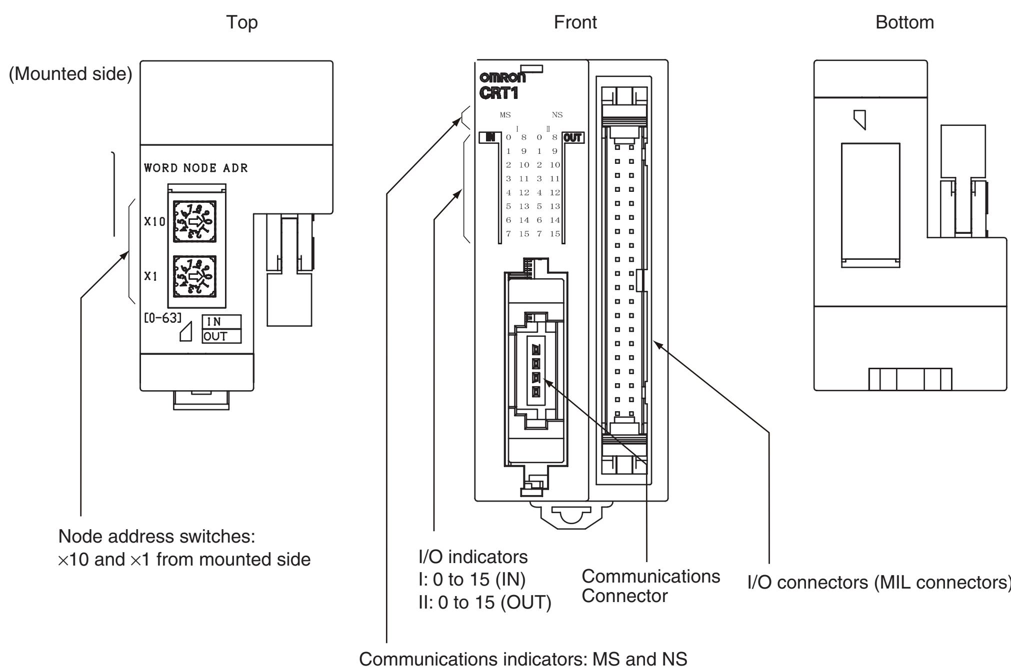
Note When Slave Units are mounted facing upwards, and 16 inputs may all turn ON, leave the specified distance between Units according to the ambient temperature. (Refer to the *Dimensions*.)
Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Output Section Specifications]

Item	Specification	
Model	CRT1-VMD32ML	CRT1-VMD32ML-1
I/O capacity	16 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.3 A/output, 2 A/common (See note.)	
Residual voltage	1.2 V max. (0.3 A DC, between each output terminal and the G terminal)	1.2 V max. (0.3 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)	
Power supply type	Multi-power supply	
I/O power supply current consumption	6.5 mA max. for 24-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	

Note Do not use a total external load current of more than 2 A, and do not use more than 1 A per V terminal or G terminal.
Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-VMD32ML and CRT1-VMD32ML-1)



Indicator Section

Communications Indicators Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output indicators are given in the following table.

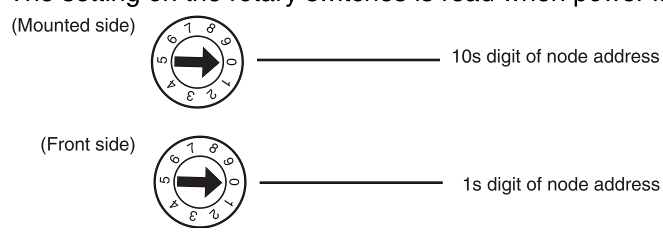
Name	LED status	I/O status	Meaning
I 0 to I 15 (word m)	Lit yellow.	Input or output ON	The input or output is ON.
	Not lit.	Input or output OFF	The input or output is OFF.
II 0 to II 15 (word n)	Lit yellow.	Input or output ON	The input or output is ON.
	Not lit.	Input or output OFF	The input or output is OFF.

Note Word m: Word allocated for Input Area of Slave Unit
Word n: Word allocated for Output Area of Slave Unit

Setting the Node Address

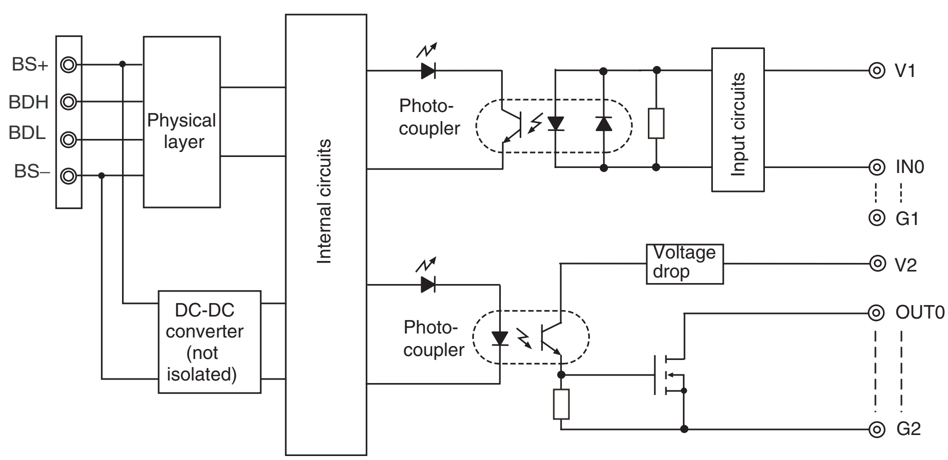
The node address is set as a decimal number with the 10s digit set on the mounting-side rotary switch and the 1s digit set on the front-side rotary switch. (The maximum node address is 63.)

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

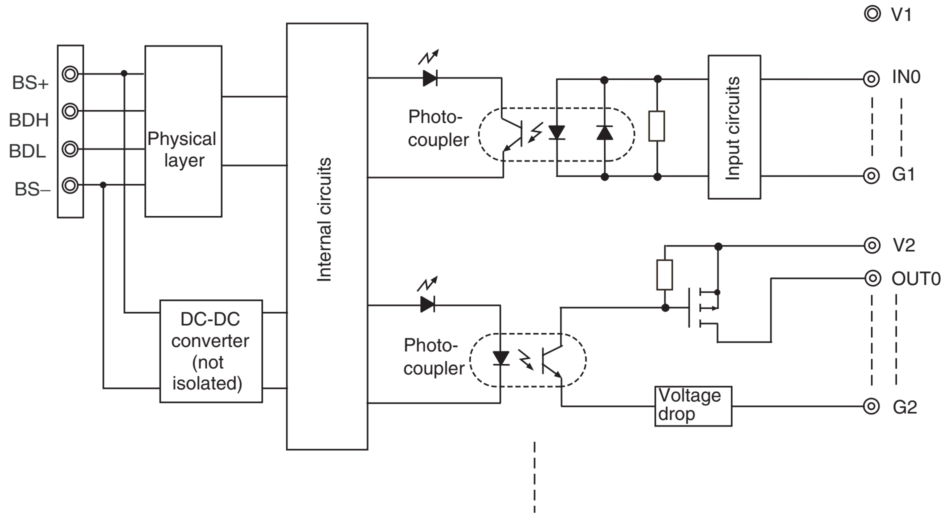


Internal Circuits

CRT1-VMD32ML (NPN)

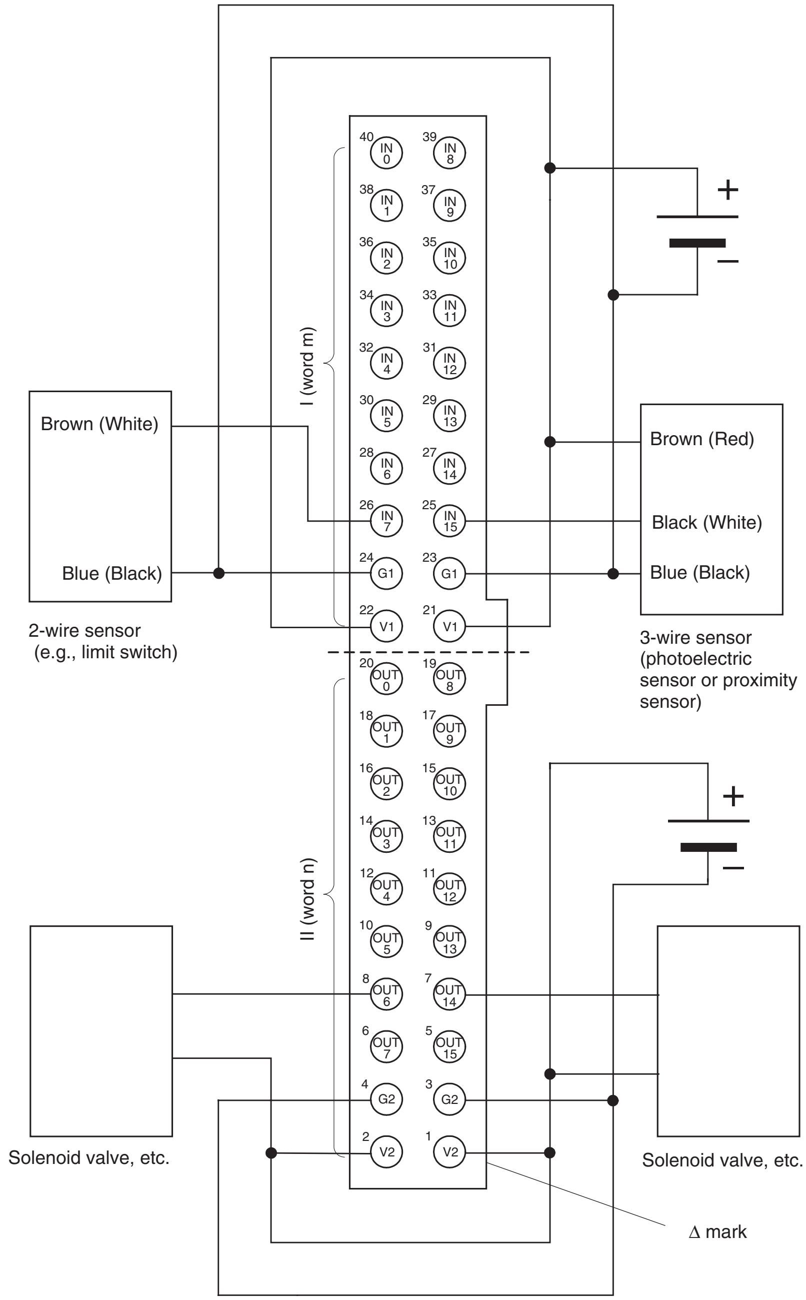


CRT1-VMD32ML-1 (PNP)

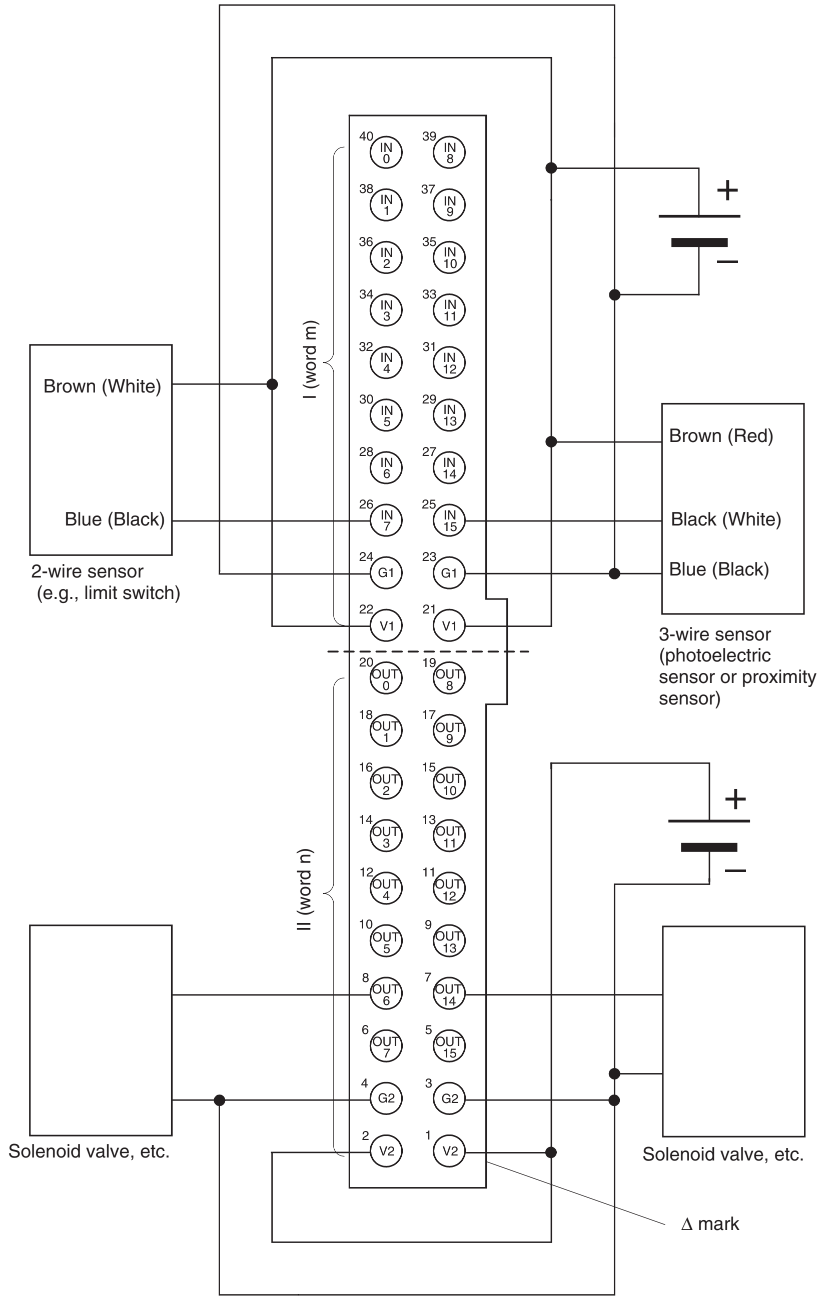


Wiring

CRT1-VMD32ML (NPN)



CRT1-VMD32ML-1 (PNP)



Note

(1) V1 terminals are internally connected, as are V2, G1, and G2 terminals. (V1 and V2 terminals are not internally connected, and G1 and G2 terminals are not internally connected.) If the power exceeds 1 A per terminal or if the total external load current exceeds 2 A, then provide the output power supply from an external source rather than from the terminals.

(2) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

I/O Allocation

The following diagram shows the correspondence between MIL connector pin numbers and allocated words and bits when the first input word for a Slave Unit allocated in the Master Unit is m, and the first output word is n.

Input Area

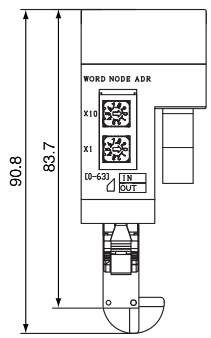
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit
Word m	I 15	I 14	I 13	I 12	I 11	I 10	I 9	I 8	I 7	I 6	I 5	I 4	I 3	I 2	I 1	I 0	··· 16 inputs

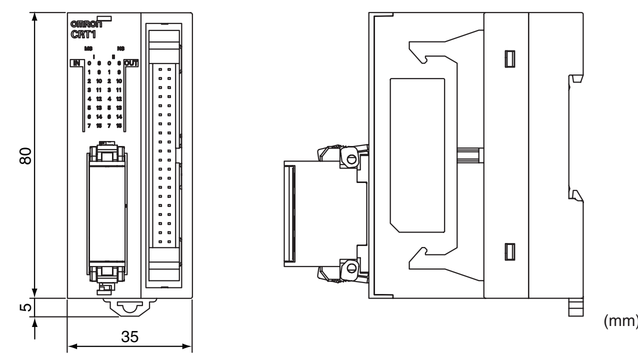
Output Area

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit
Word n	II 15	II 14	II 13	II 12	II 11	II 10	II 9	II 8	II 7	II 6	II 5	II 4	II 3	II 2	II 1	II 0	··· 16 outputs

Dimensions (Same for CRT1-VMD32ML and CRT1-VMD32ML-1)

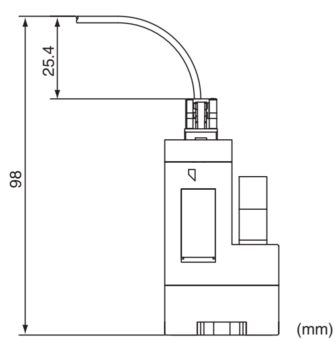
When a DCN4-TB4 Open Type Connector Is Mounted



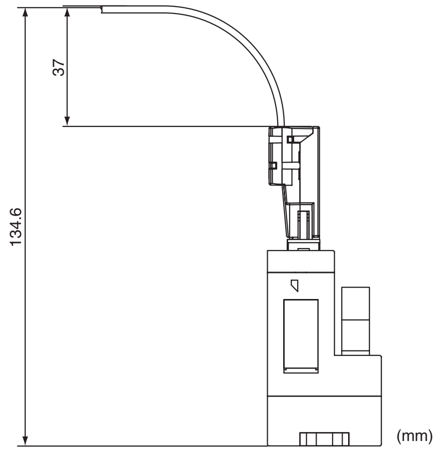


Communications Connector Dimensions Including the Connector and Cable

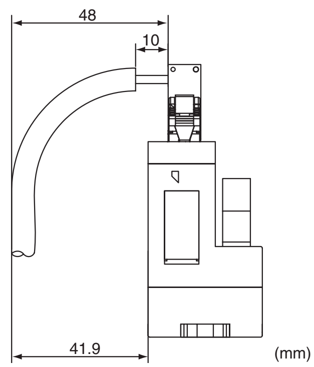
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



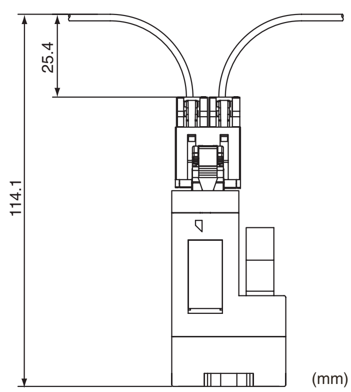
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



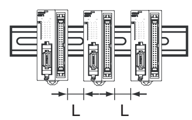
Note The following ambient operating temperature restrictions apply when multiple 32-point Slave Units with MIL Connectors are mounted in parallel.

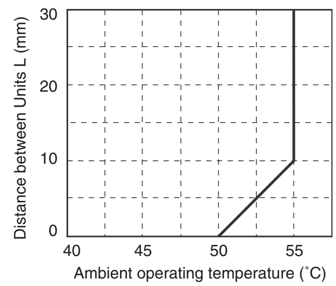
When Units Are Not Mounted Facing Upwards:

Units can be densely mounted (16 points can turn ON simultaneously at an ambient operating temperature of 55°C).

When Units Are Mounted Facing Upwards:

If 16 points may be turned ON simultaneously, the distance between the Units must be restricted depending on the ambient operating temperature, as shown in the following graph. For example, when the ambient operating temperature is 55°C, a space of at least 10 mm is required between Units.





5-5 Units with Clamp Terminal Blocks

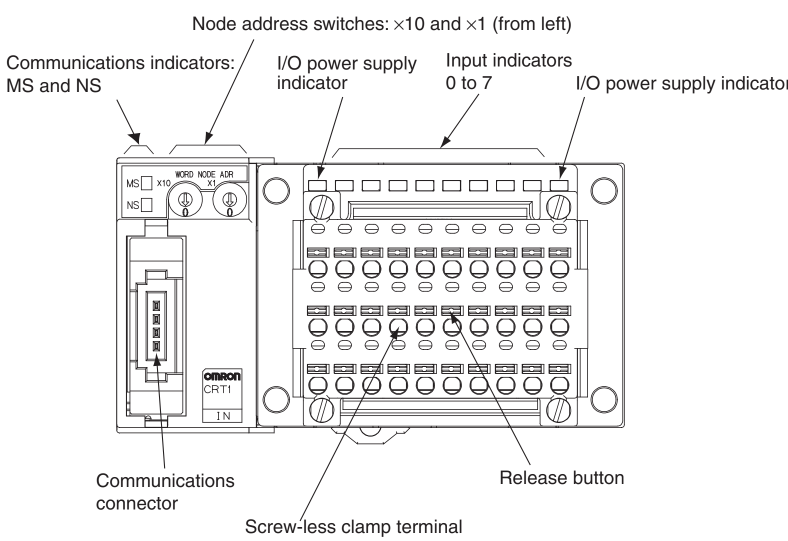
5-5-1 Eight-point Input Units (With Screw-less Clamps) CRT1-ID08SL/CRT1-ID08SL-1

Input Section Specifications

Item	Specification	
Model	CRT1-ID08SL	CRT1-ID08SL-1
I/O capacity	8 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 min./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	8 inputs/common	
Isolation method	Photocoupler	
Input indicator	LED (yellow)	
Installation	DIN Track	
Power supply type	Multi-power supply	
Current supplied to input devices	100 mA/input	
Communications power supply current consumption	30 mA max. for 24-VDC power supply voltage 50 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage	
Weight	170 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-ID08SL and CRT1-ID08SL-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the input indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

I/O Power Supply Indicators

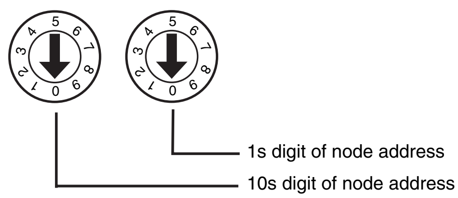
The meanings of the I/O power supply indicators are given in the following table.

Name	LED status	I/O status	Meaning
I/O	Lit green.	I/O power supply ON	The I/O power supply is ON.
	Not lit.	I/O power supply OFF	The I/O power supply is OFF.

Setting the Node Address

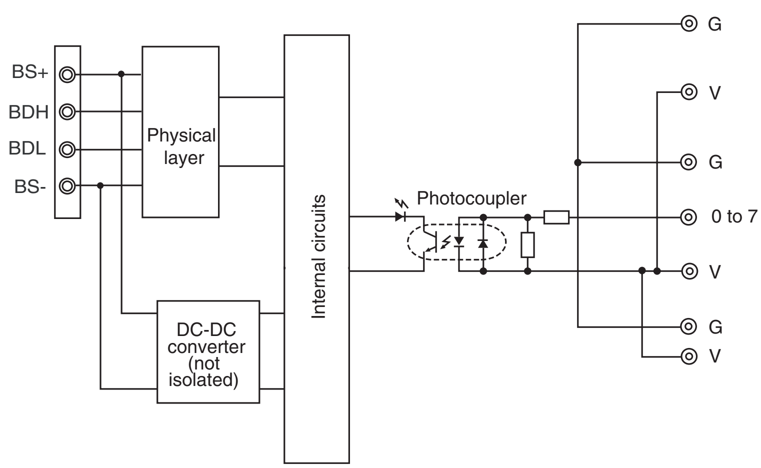
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

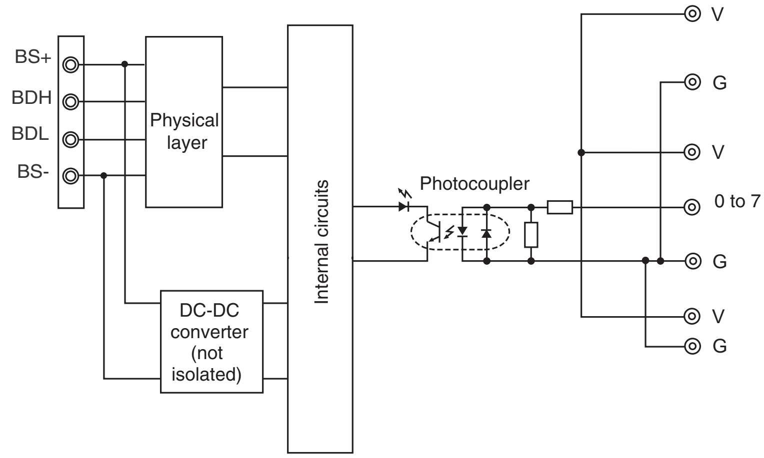


Internal Circuits

CRT1-ID08SL (NPN)

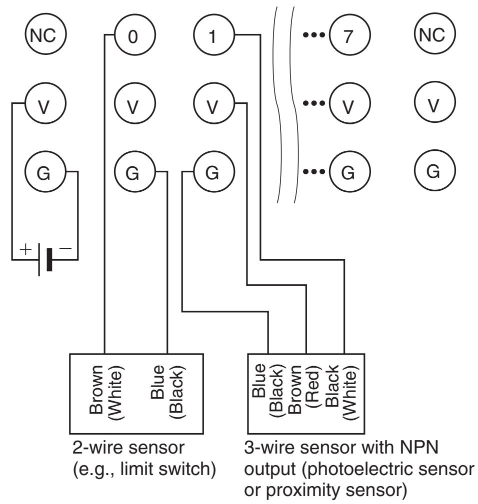


CRT1-ID08SL-1 (PNP)

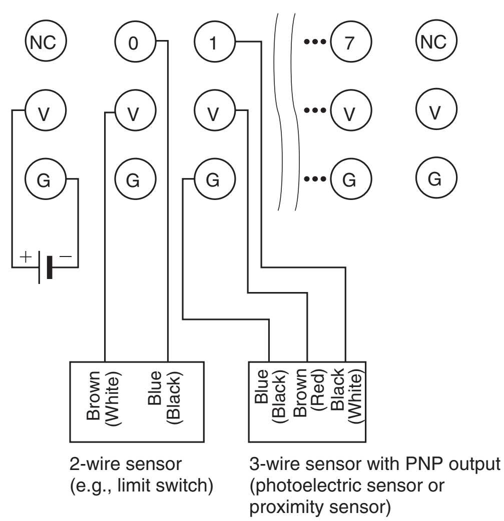


Wiring

CRT1-ID08SL (NPN)



CRT1-ID08SL-1 (PNP)



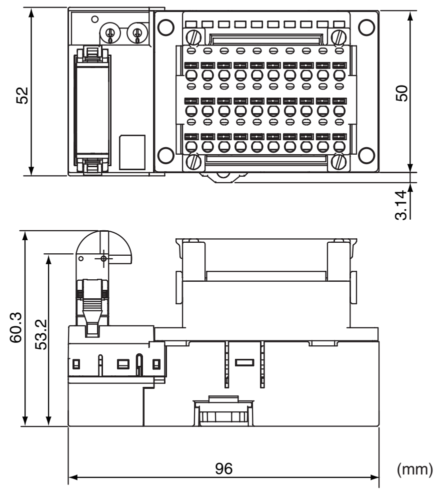
Note

(1) Do not wire NC terminals.

(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.

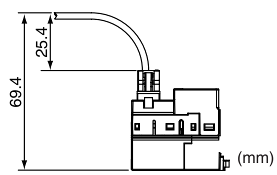
Dimensions (Same for CRT1-ID08SL and CRT1-ID08SL-1)

When a DCN4-TB4 Open Type Connector Is Mounted

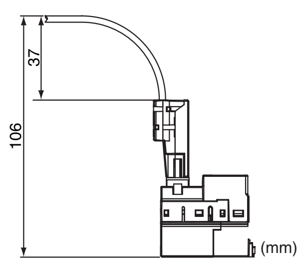


Communications Connector Dimensions Including the Connector and Cable

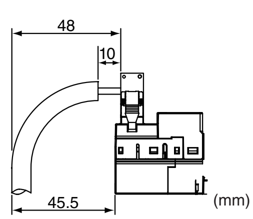
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



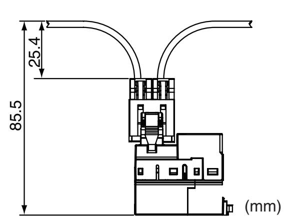
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



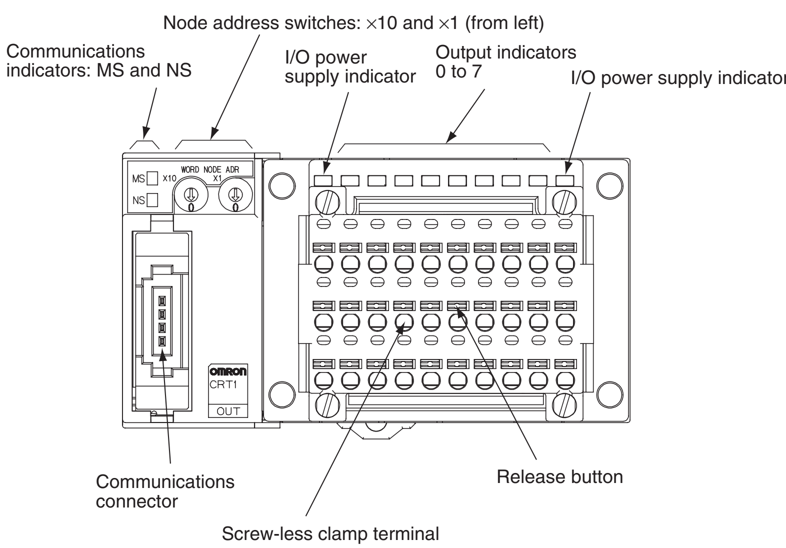
5-5-2 Eight-point Output Units (With Screw-less Clamps) CRT1-OD08SL/CRT1-OD08SL-1

Output Section Specifications

Item	Specification	
Model	CRT1-OD08SL	CRT1-OD08SL-1
I/O capacity	8 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.5 A/output, 2 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	8 outputs/common	
Isolation method	Photocoupler	
Output indicators	LED (yellow)	
Installation	DIN Track	
Power supply type	Multi-power supply	
Current supplied to output devices	100 mA/output	
Communications power supply current consumption	35 mA max. for 24-VDC power supply voltage 55 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	25 mA max. for 24-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	
Weight	170 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-OD08SL and CRT1-OD08SL-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

I/O Power Supply Indicators

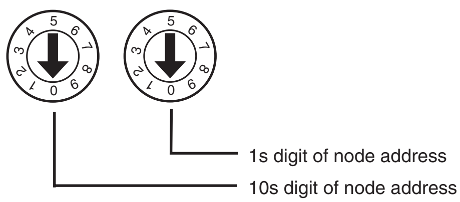
The meanings of the I/O power supply indicators are given in the following table.

Name	LED status	I/O status	Meaning
I/O	Lit green.	I/O power supply ON	The I/O power supply is ON.
	Not lit.	I/O power supply OFF	The I/O power supply is OFF.

Setting the Node Address

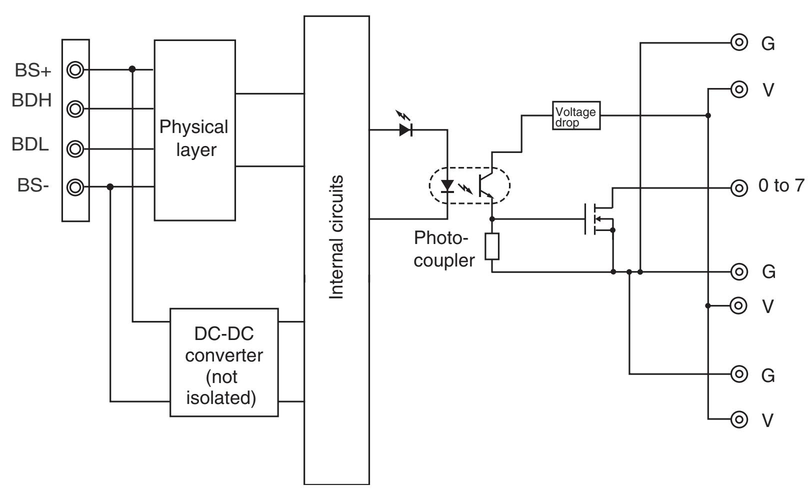
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

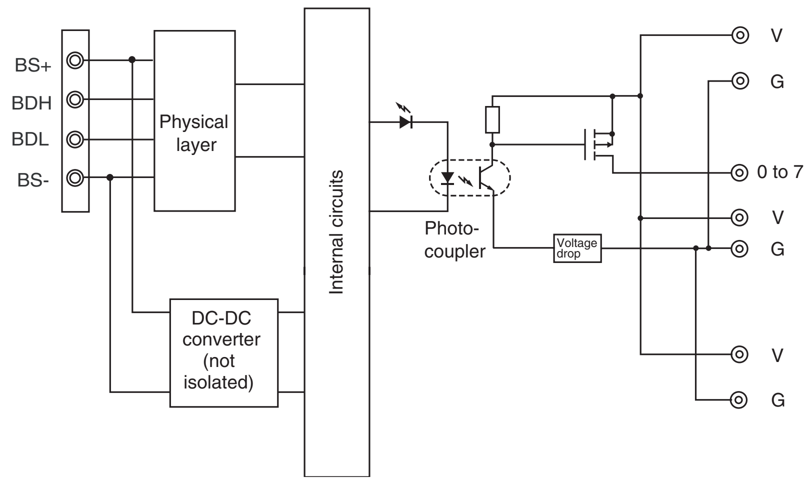


Internal Circuits

CRT1-OD08SL (NPN)

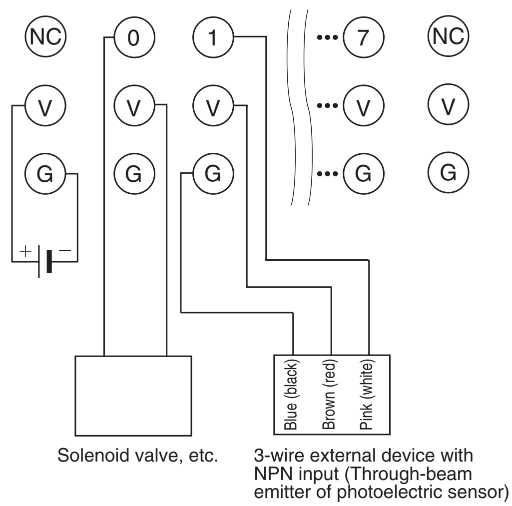


CRT1-OD08SL-1 (PNP)

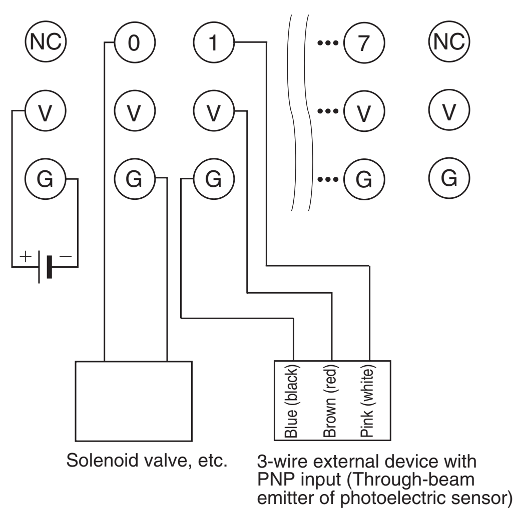


Wiring

CRT1-OD08SL (NPN)



CRT1-OD08SL-1 (PNP)

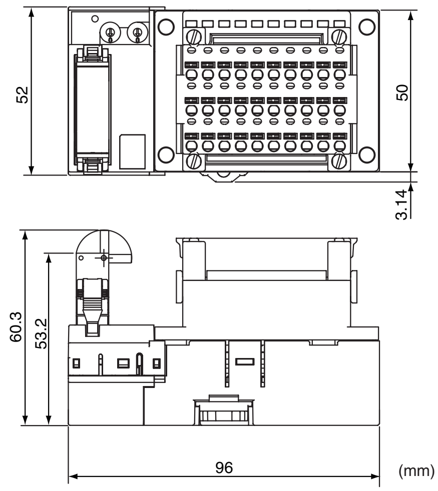


Note (1) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

(2) Do not wire NC terminals.

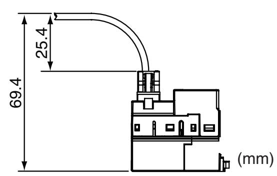
Dimensions (Same for CRT1-OD08SL and CRT1-OD08SL-1)

When a DCN4-TB4 Open Type Connector Is Mounted

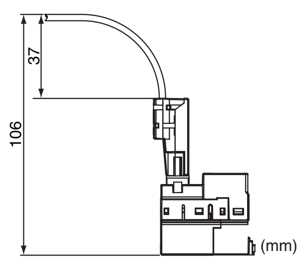


Communications Cable Dimensions when Connector and Cable Are Connected

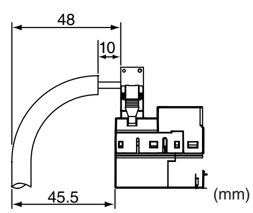
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



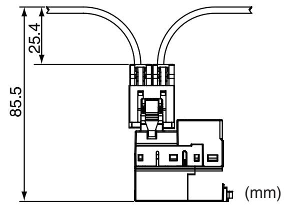
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ **When a DCN4-MD4 Multidrop Connector Is Mounted**



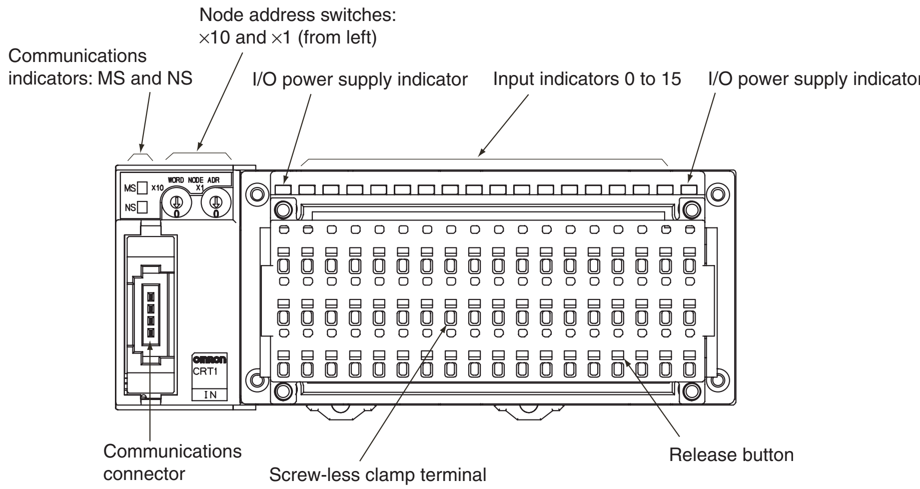
5-5-3 Sixteen-point Input Units (With Screw-less Clamps) CRT1-ID16SL/CRT1-ID16SL-1

Input Section Specifications

Item	Specification	
Model	CRT1-ID16SL	CRT1-ID16SL-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	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./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	
Current supplied to input devices	100 mA/input	
Communications power supply current consumption	35 mA max. for 24-VDC power supply voltage 55 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage	
Weight	250 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-ID16SL and CRT1-ID16SL-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the input 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.

I/O Power Supply Indicators

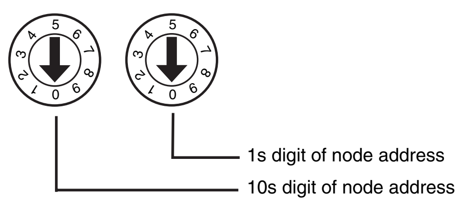
The meanings of the I/O power supply indicators are given in the following table.

Name	LED status	I/O status	Meaning
I/O	Lit green.	I/O power supply ON	The I/O power supply is ON.
	Not lit.	I/O power supply OFF	The I/O power supply is OFF.

Setting the Node Address

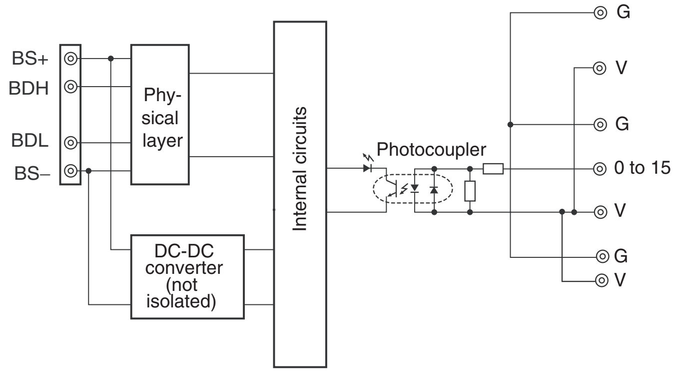
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

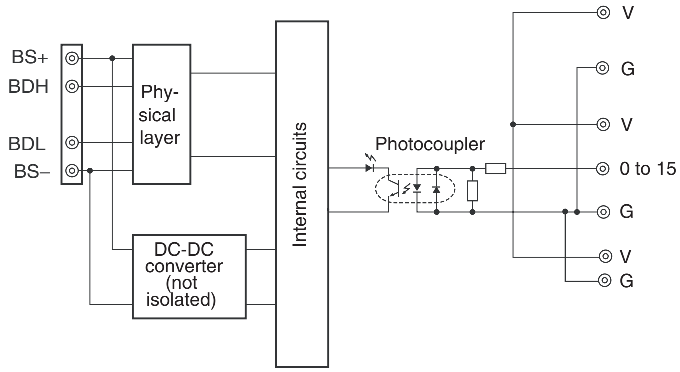


Internal Circuits

CRT1-ID16SL (NPN)

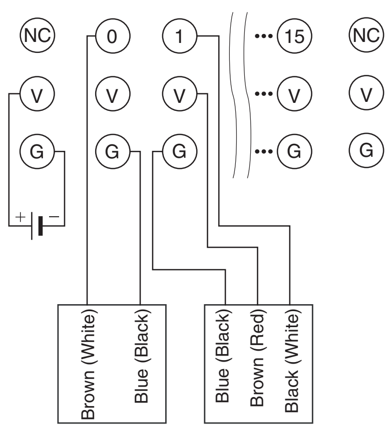


CRT1-ID16SL-1 (PNP)

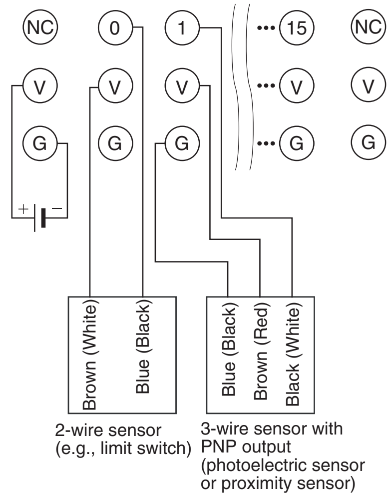


Wiring

CRT1-ID16SL (NPN)



CRT1-ID16SL-1 (PNP)

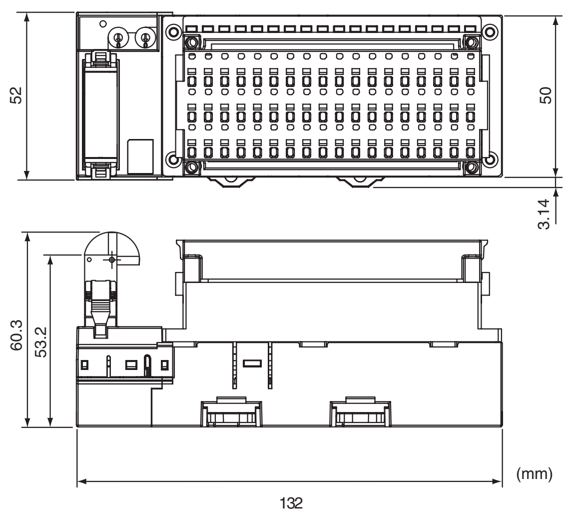


Note (1) Do not wire NC terminals.

(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.

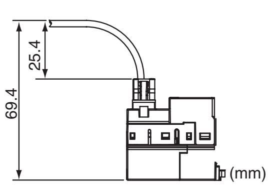
Dimensions (Same for CRT1-ID16SL and CRT1-ID16SL-1)

When a DCN4-TB4 Open Type Connector Is Mounted

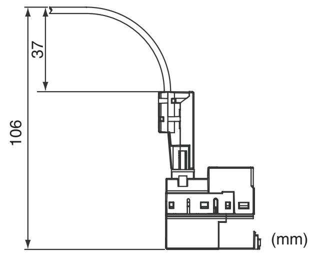


Communications Connector Dimensions Including the Connector and Cable

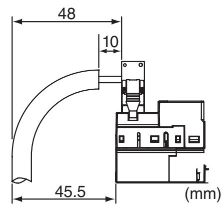
■ **When a DCN4-BR4 Flat Connector I Plug Is Mounted**



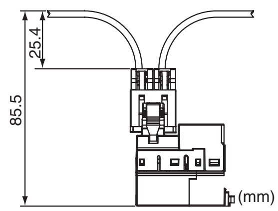
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



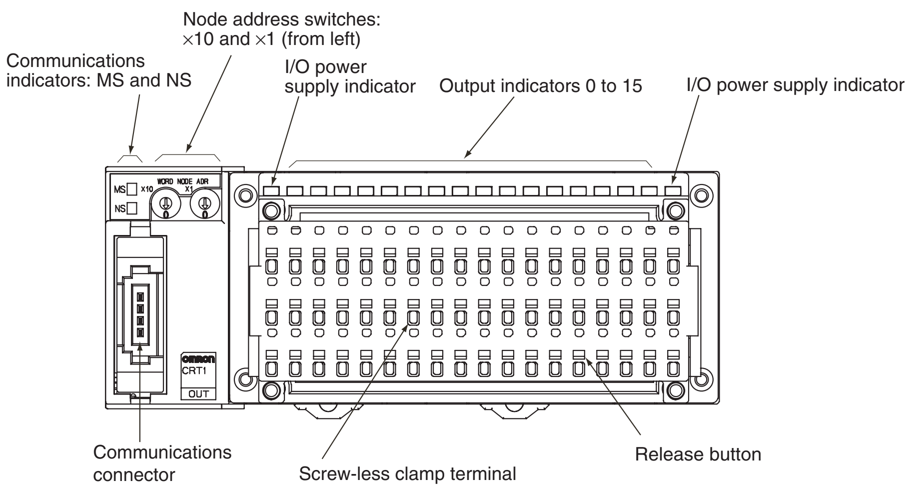
5-5-4 Sixteen-point Output Units (With Screw-less Clamps) CRT1-OD16SL/CRT1-OD16SL-1

Output Section Specifications

Item	Specification	
Model	CRT1-OD16SL	CRT1-OD16SL-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	
Current supplied to output devices	100 mA/output	
Communications power supply current consumption	35 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage	
I/O power supply current consumption	30 mA max. for 24-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	
Weight	250 g max.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-OD16SL and CRT1-OD16SL-1)



Indicator Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output 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.

I/O Power Supply Indicators

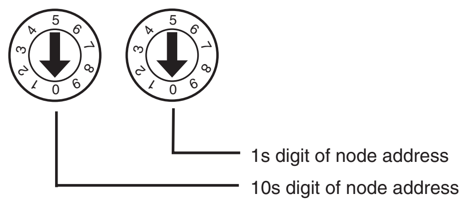
The meanings of the I/O power supply indicators are given in the following table.

Name	LED status	I/O status	Meaning
I/O	Lit green.	I/O power supply ON	The I/O power supply is ON.
	Not lit.	I/O power supply OFF	The I/O power supply is OFF.

Setting the Node Address

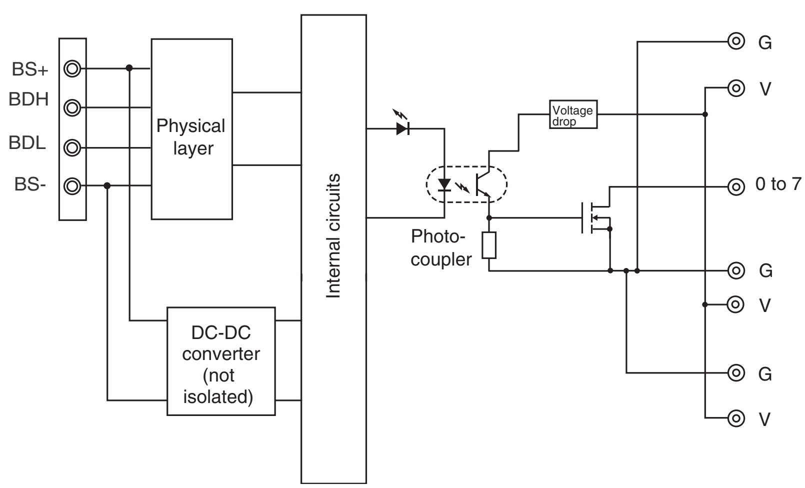
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

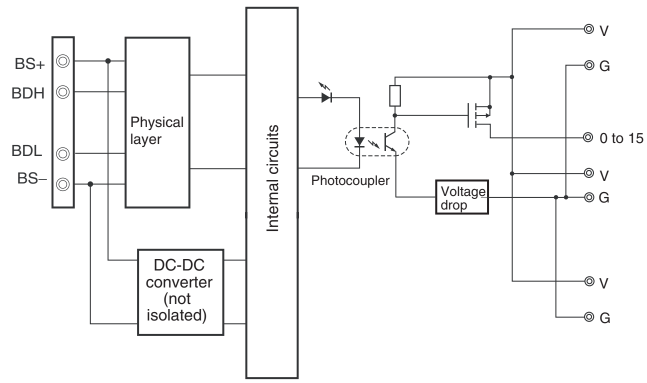


Internal Circuits

CRT1-OD16SL (NPN)

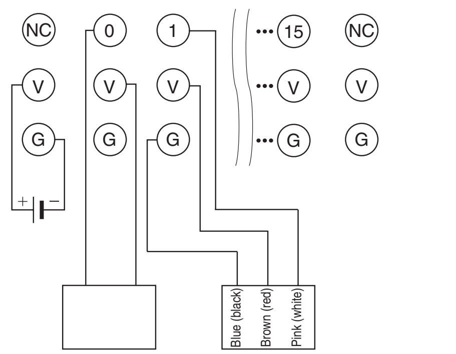


CRT1-OD16SL-1 (PNP)

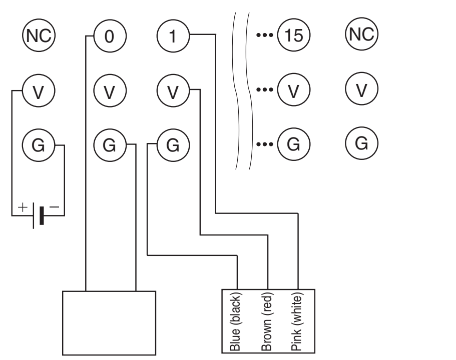


Wiring

CRT1-OD16SL (NPN)



CRT1-OD16SL-1 (PNP)

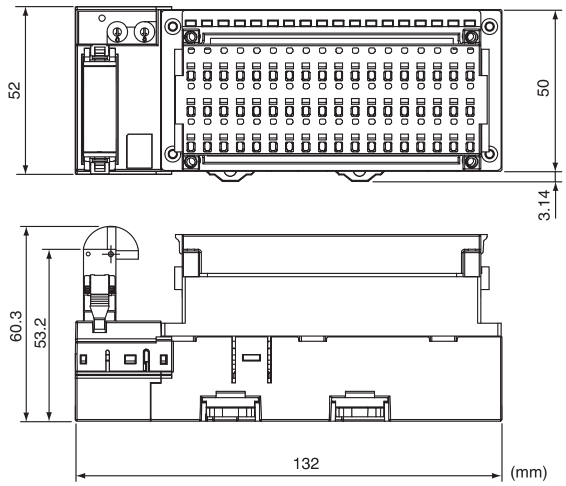


Note (1) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

(2) Do not wire NC terminals.

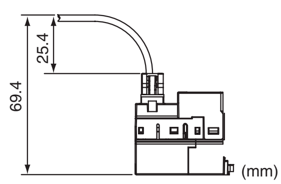
Dimensions (Same for CRT1-OD16SL and CRT1-OD16SL-1)

When a DCN4-TB4 Open Type Connector Is Mounted

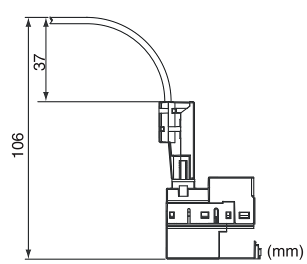


Communications Cable Dimensions when Connector and Cable Are Connected

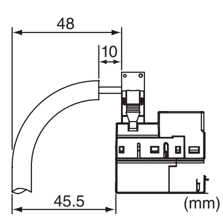
■ **When a DCN4-BR4 Flat Connector I Plug Is Mounted**



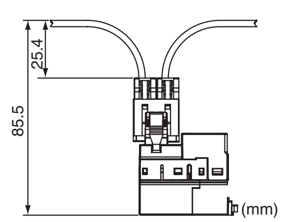
■ **When a DCN5-BR4 Flat Connector II Plug Is Mounted**



■ **When a DCN4-TB4 Open Type Connector Is Mounted**



■ **When a DCN4-MD4 Multidrop Connector Is Mounted**



5-5-5 Eight-point Input and Eight-point Output Units (With Screw-less Clamps)

CRT1-MD16SL/CRT1-MD16SL-1

Common Specifications

Item	Specification	
Model	CRT1-MD16SL	CRT1-MD16SL-1
Installation	DIN Track	
Communications power supply current consumption	35 mA max. for 24-VDC power supply voltage 60 mA max. for 14-VDC power supply voltage	
Weight	290 g max.	

Input Section Specifications

Item	Specification	
Model	CRT1-MD16SL	CRT1-MD16SL-1
I/O capacity	8 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 min. (between each input terminal and the V terminal)	5 VDC min. (between each input terminal and the G terminal)
OFF current	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 11 VDC: 3.0 mA min./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	8 inputs/common	
Isolation method	Photocoupler	
Input indicator	LED (yellow)	
Power supply type	Multi-power supply	
Current supplied to input devices	100 mA/input	
I/O power supply current consumption	15 mA max. for 24-VDC power supply voltage	

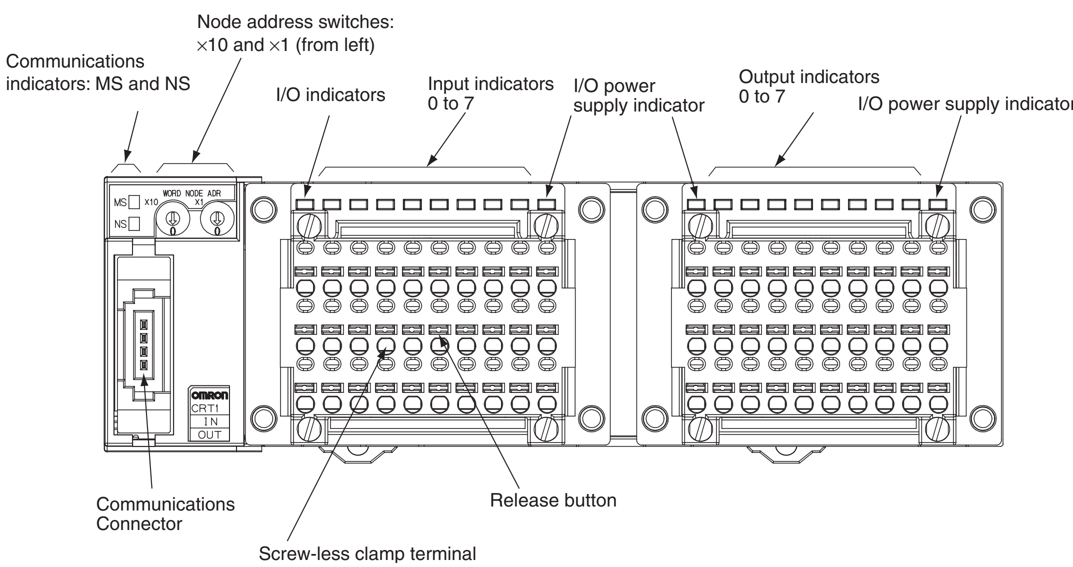
Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Output Section Specifications

Item	Specification	
Model	CRT1-MD16SL	CRT1-MD16SL-1
I/O capacity	8 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.5 A/output, 2 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	8 outputs/common	
Isolation method	Photocoupler	
Output indicators	LED (yellow)	
Power supply type	Multi-power supply	
Current supplied to output devices	100 mA/output	
I/O power supply current consumption	25 mA max. for 24-VDC power supply voltage	
Output handling for communications errors	Select either hold or clear from CX-Integrator.	

Note Please see "*Appendix E: I/O Power Supply Current*" regarding the I/O power supply current supplied to the V and G terminals.

Component Names and Functions (Same for CRT1-MD16SL and CRT1-MD16SL-1)



Indicator Section

Communications Indicators Refer to *4-1-3 Communications Indicators*.

I/O Indicators

The meanings of the output indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7 (inputs) 0 to 7 (outputs)	Lit yellow.	Input or output ON	The input or output is ON.
	Not lit.	Input or output OFF	The input or output is OFF.

I/O Power Supply Indicators

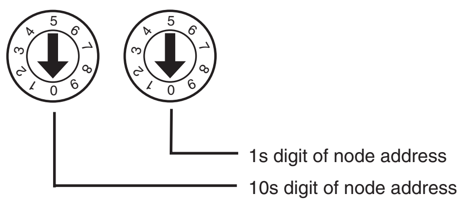
The meanings of the I/O power supply indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 7 (inputs) 0 to 7 (outputs)	Lit green.	I/O power supply ON	The I/O power supply is ON.
	Not lit.	I/O power supply OFF	The I/O power supply is OFF.

Setting the Node Address

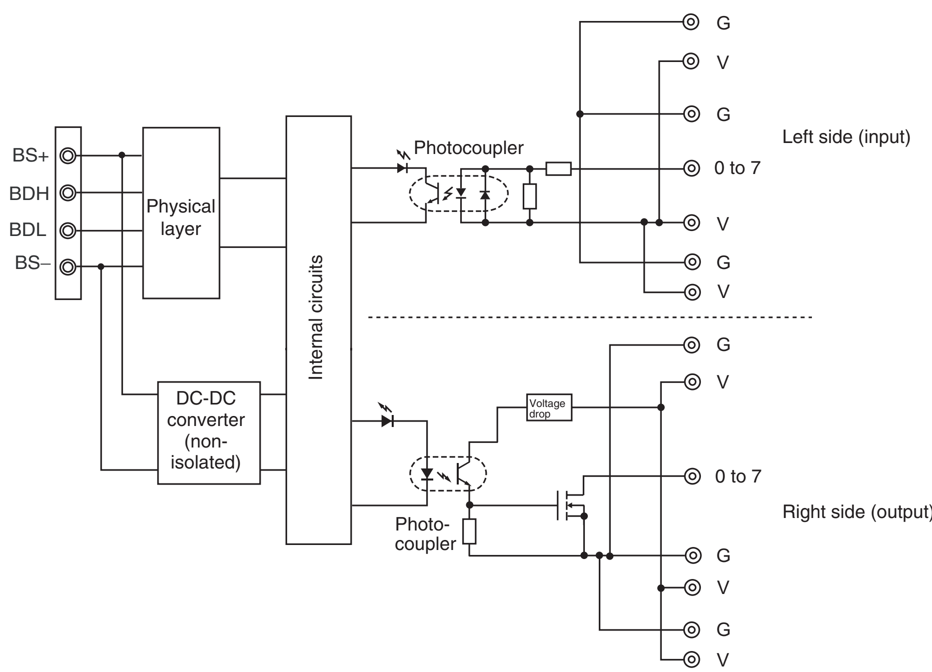
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

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

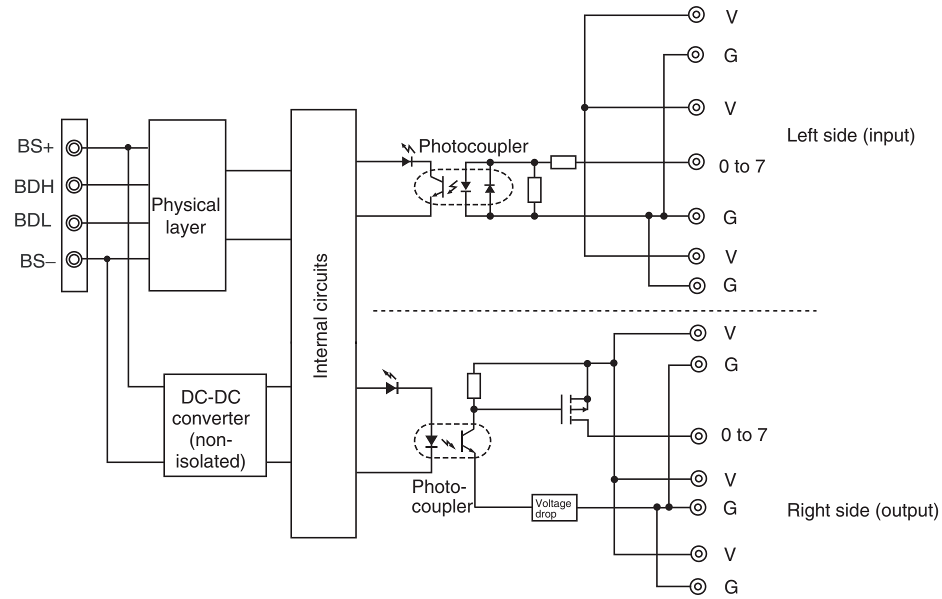


Internal Circuits

CRT1-MD16SL (NPN)

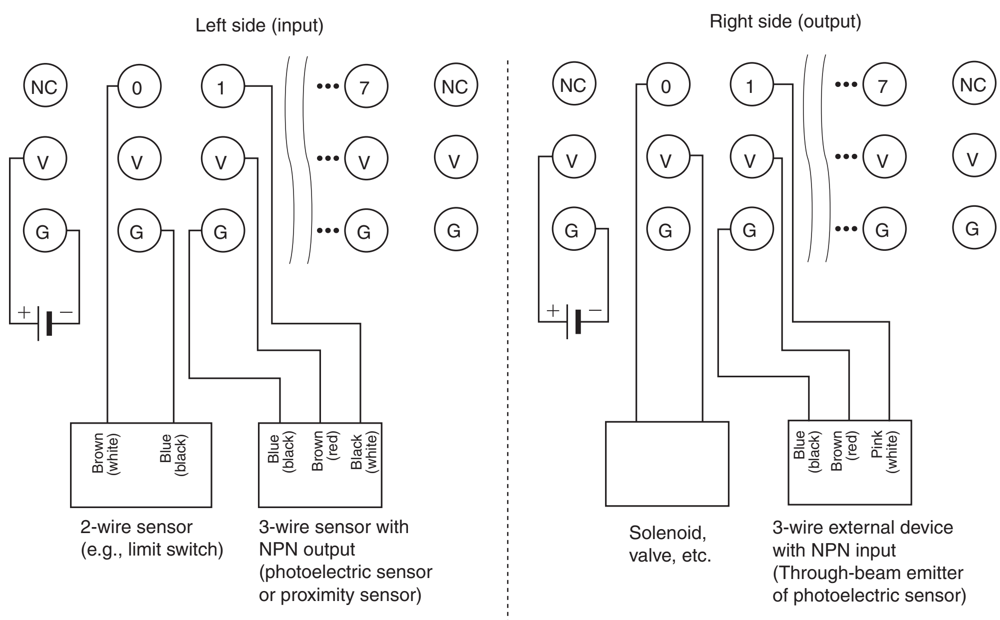


CRT1-MD16SL-1 (PNP)

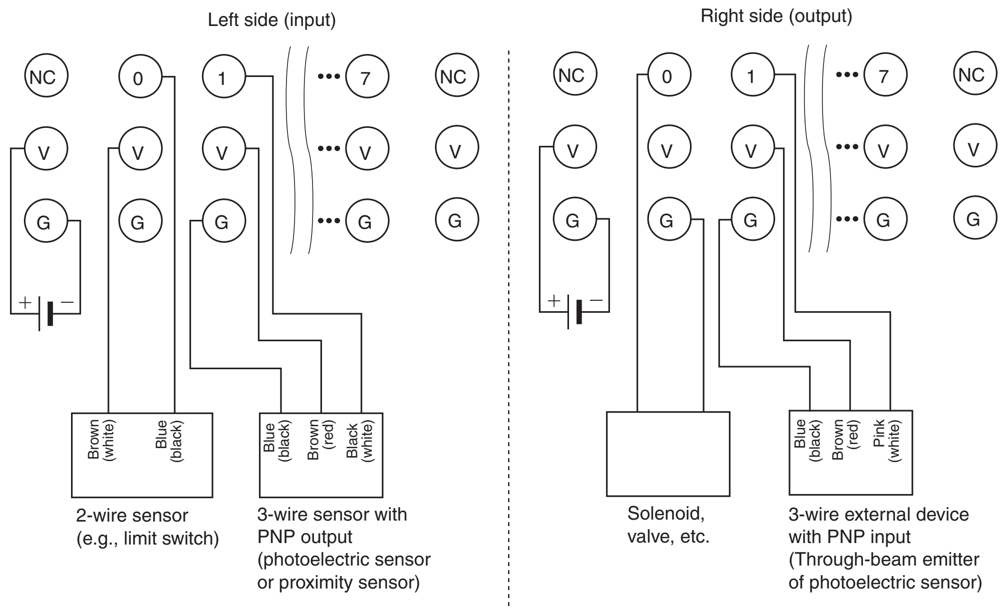


Wiring

CRT1-MD16SL (NPN)



CRT1-MD16SL-1 (PNP)



Note

(1) The V terminals on the left and right for the I/O power supply, as well as the G terminals on the left and right for the I/O power supply are not connected internally. Supply power separately for V-G terminals on the left side and the right side.

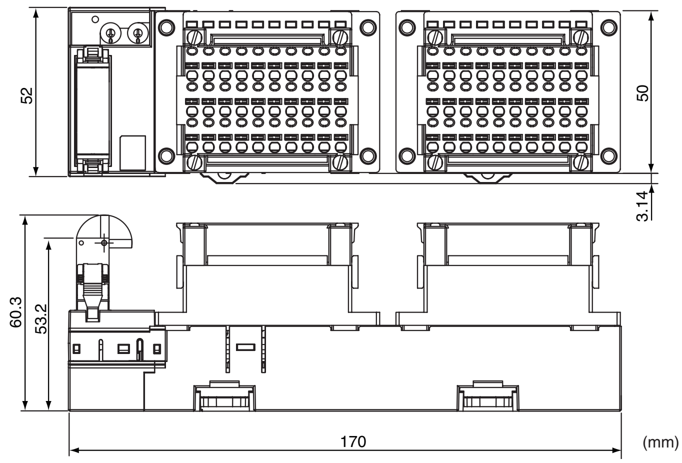
(2) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

(3) Do not wire NC terminals.

(4) 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.

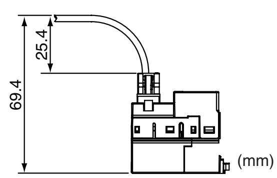
Dimensions (Same for CRT1-MD16SL and CRT1-MD16SL-1)

When a DCN4-TB4 Open Type Connector Is Mounted

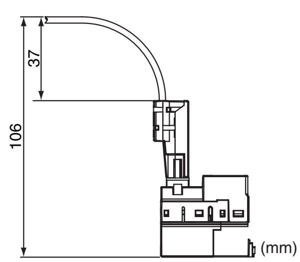


Communications Cable Dimensions when Connector and Cable Are Connected

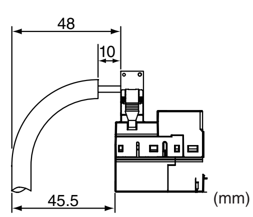
■ When a DCN4-BR4 Flat Connector I Plug Is Mounted



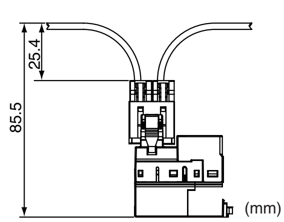
■ When a DCN5-BR4 Flat Connector II Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



SECTION 6
Analog I/O Slave Units

This section describes the Analog I/O Slave Units.

6-1 Analog I/O Slave Units

6-1-1 Analog I/O Slave Units

In the Analog I/O Slave Unit, various functions such as a scaling function and a peak/bottom hold function can be used in addition to AD/DA conversion of the analog I/O data.

Furthermore, various types of calculations for analog input values that previously had to be processed using a high level PLC ladder program can be processed in the Analog Input Slave Unit.

In addition, the data calculated using these functions can be selected as "analog data", combined with status information such as "Analog Status Flag", and allocated to I/O.

Allocating and monitoring of this status information, setting up Analog Unit specific functions, and data monitoring can easily be performed using CX-Integrator.

6-1-2 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 *11-4 Analog I/O Slave Unit (input) Functions* and *11-5 Analog I/O Slave Unit (output) Functions* for details on functions and setting methods.

Analog Input Slave Unit

Function	Details	Default
Setting of number of AD conversion points	Reducing the number of input conversion points increases the speed of the conversion cycle.	4
Moving average function	Averages the most recent 8 values of the analog input value. This provides a smooth input value for an input that oscillates.	Disabled
Scaling	Performs scaling. The analog input value can be converted into industrial units that can be utilized by the user, reducing the calculation load on the ladder program of the master PLC. Scaling also supports an offset function for compensating for mounting errors in sensors and other devices.	Disabled 0 to 6,000
Peak/bottom hold	Holds the maximum value and minimum value of the analog input value.	Disabled
Top/valley hold	This holds the "tops of the mountains" and "bottoms of the valleys" of the analog input values.	Disabled
Rate of change	This calculates the rate of change of the analog input values for each set sampling cycle.	Disabled
Comparator	Analog input values or data after calculation (peak value, bottom value, top value, valley value, rate of change) are compared to 4 types of set values: Alarm Trip Point High (HH), Warning Trip Point High (H), Warning Trip Point Low (L), and Alarm Trip Point Low (LL) and the results are notified using the Analog Status Flag.	Disabled
Disconnected line detection	Detects disconnections of analog inputs. (Valid only for the input ranges 4 to 20 mA and 1 to 5 V)	Enabled
User adjustment	"Shift" generated from measurement error due to hardware can be adjusted to an arbitrary input value.	Disabled

Function	Details	Default
Cumulated count	Provides time integration of the analog input values.	Disabled
Last maintenance date function	Stores the date for the last time maintenance was performed inside the unit.	Differs for each model

Analog Output Slave Units

Function	Details	Default
Scaling	Performs scaling. The analog output value can be converted into industrial units that can be utilized by the user reducing the calculation load on the ladder program in the Master Unit.	Disabled 0 to 6,000
User adjustment	"Shift" generated from measurement error due to hardware can be adjusted to an arbitrary output value.	Disabled
Cumulative counter	This provides time integration of the analog output values.	Disabled
Communications error output setting	Sets the value output when a communications error occurs for each output.	Hold
Last maintenance date function	Stores the date for the last maintenance was performed inside the unit.	Differs for each model

6-2 Summary of the Analog Input Slave Units

Analog Input Slave Units convert (AD conversion) analog input signals such as 1 to 5 V and 4 to 20 mA to digital data (binary values) and stores them in the Master Unit.

A summary of the Analog Input Slave Unit is described below.

6-2-1 Input Range and Conversion Data

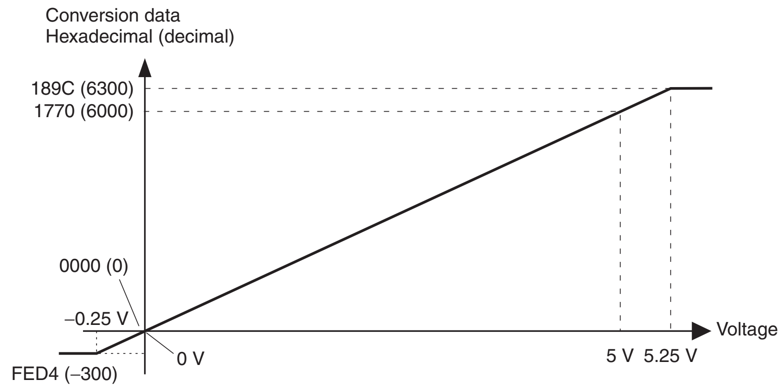
Input analog signals are converted to digital data in the following manner using a set input range.

If the input data exceeds the data range for which conversion is possible, the conversion data saturates at the upper or low limit.

Input Range and Conversion Data

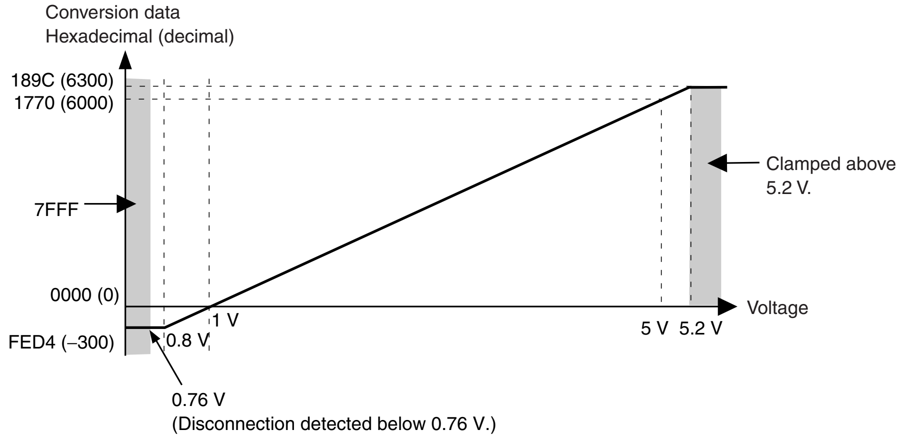
■ Input Range: 0 to 5 V

Voltage of 0 to 5V is converted to data from 0000 to 1770 Hex (0 to 6000). The input data range for which conversion is possible is –0.25 to +5.25 V and here the output data is FED4 to 189C Hex (–300 to +6300). When input data is a negative voltage, it is expressed as the two's complement (hexadecimal) and the output data for a disconnected line is the same as for an input of 0 V (0000 Hex).



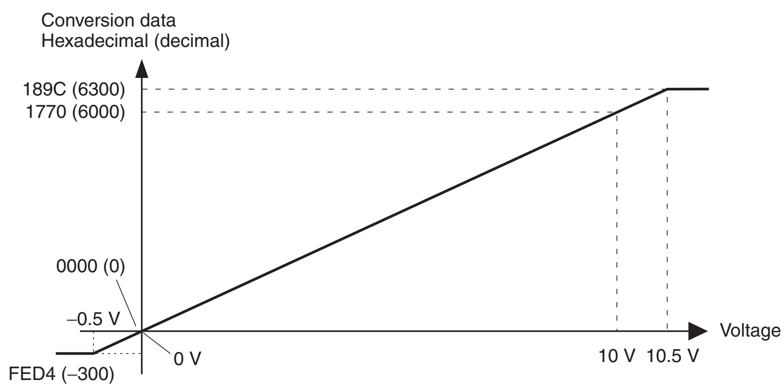
■ Input Range:1 to 5 V

Voltage of 1 to 5V is converted to data from 0000 to 1770 Hex (0 to 6000). The input data range for which conversion is possible is 0.8 to 5.2 V and here the output data is FED4 to 189C Hex (–300 to +6300). If the input value falls below the input range such as for a disconnected line (input voltage is less than 0.76 V), a disconnected line detection function activates and data is set to 7FFF Hex.



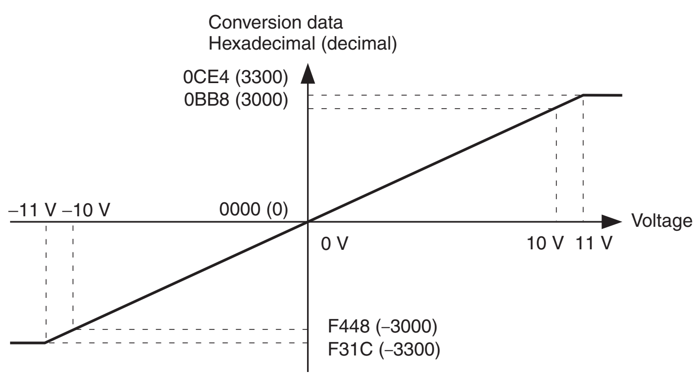
■ Input Range: 0 to 10 V

Voltage of 0 to 10V is converted to data from 0000 to 1770 Hex (0 to 6000). The input data range for which conversion is possible is –0.5 to +10.5 V and here the output data is FED4 to 189C Hex (–300 to +6300). When input data is a negative voltage, it is expressed as the two's complement (hexadecimal) and the output data for a disconnected line is the same as for an input of 0 V (0000 Hex).



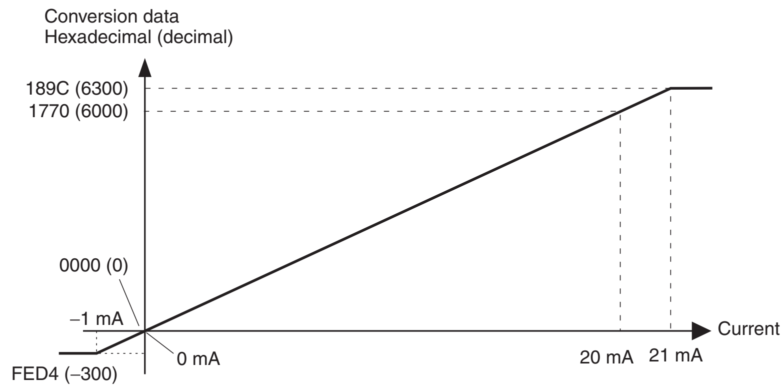
■ Input Range: –10 to 10 V

Voltage of –10 to +10 V is converted to data from F448 to 0BB8 Hex (–3000 to +3000). The input data range for which conversion is possible is –11 to +11 V and here the output data is F31C to 0CE4 Hex (–3300 to +3300). When input data is a negative voltage, it is expressed as the two's complement (hexadecimal) and the output data for a disconnected line is the same as for an input of 0 V (0000 Hex).



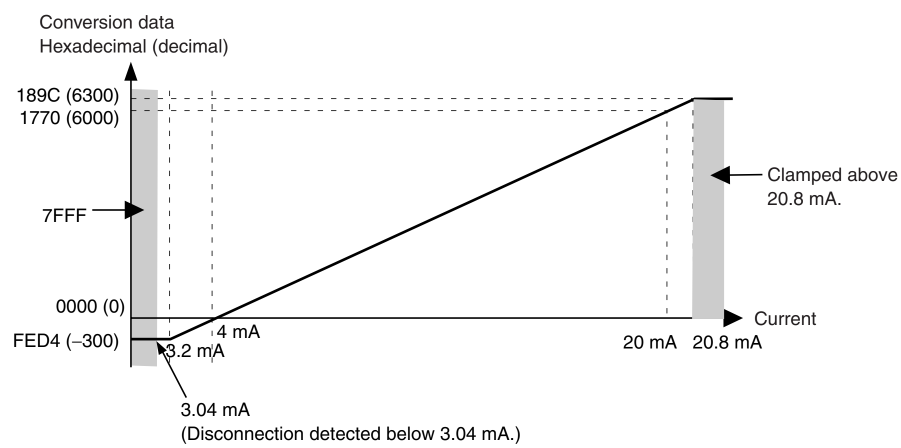
■ Input Range: 0 to 20 mA

Current of 0 to 20 mA is converted to data from 0000 to 1770 Hex (0 to 6000). The input data range for which conversion is possible is –1 to +21 mA and here the output data is FED4 to 189C Hex (–300 to +6300). When input data is a negative voltage, it is expressed as the two's complement (hexadecimal) and the output data for a disconnected line is the same as for an input of 0 mA (0000 Hex).



■ Input Range: 4 to 20 mA

Current of 4 to 20 mA is converted to data from 0000 to 1770 Hex (0 to 6000). The input data range for which conversion is possible is 3.2 to 20.8 mA and here the output data is FED4 to 189C Hex (–300 to +6300). If the input value falls below the input range such as for a disconnected line (input current is less than 3.04 mA), a disconnected line detection function activates and data is set to 7FFF Hex.



Input Range Settings

Setting of input range is performed using Analog Input Slave Unit DIP switches, CX-Integrator, or Explicit message.

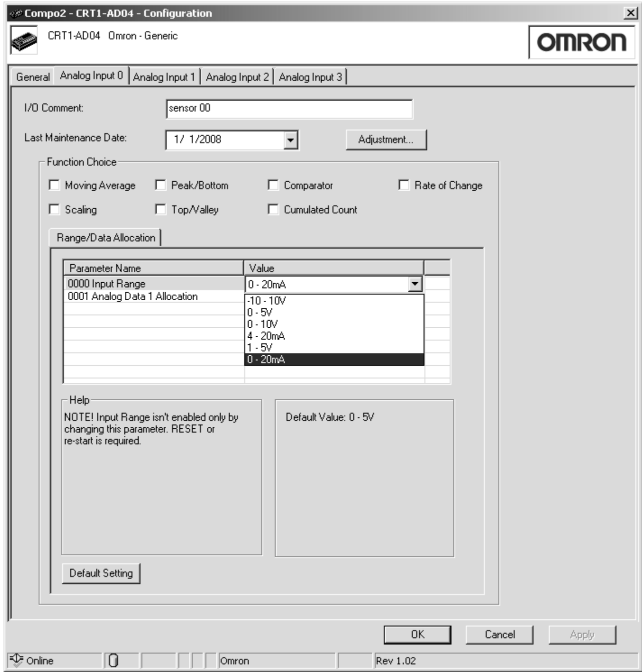
The method for setting the input range using CX-Integrator is described below.

Please see "*11-1 CX-Integrator*" on page 481 regarding details for CX-Integrator.

1,2,3...

1. Turn ON the power to the CompoNet Slave Unit.
2. Double-click the icon of the Slave to be set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)

3. Select the tab of the channel for which you would like to change the range and select any input range from the pull-down list of "Input Range".



4. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

AD Conversion Data for Negative Numbers

If the AD conversion data is a negative number, it is expressed as the two's complement. The NEG instruction (two’s complement conversion) can be used to obtain the absolute value of the two’s complement.

6-2-2 Calculation and Selection Processing of Input Data

Input Data Calculation

The following types of calculations can be performed in the unit for external analog input values.

- Scaling to desired industry unit
- Moving average processing

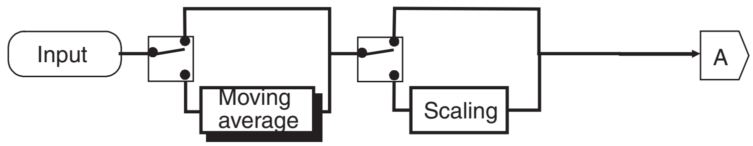
After processing, the data can be allocated to the Master Unit I/O.

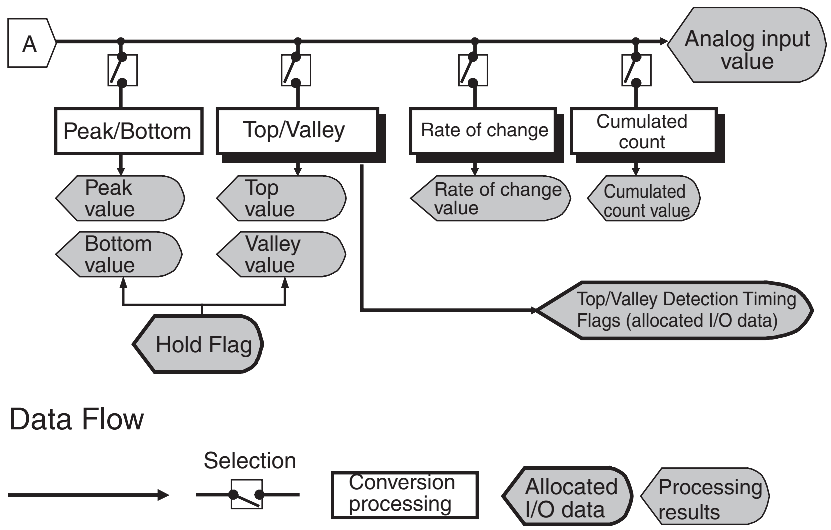
In addition, the following types of calculations can be performed for analog values for which the processing described above was performed.

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

The values after these calculations are called "Peak Value", "Bottom Value", "Top Value", "Valley Value", "Rate of Change", and "Cumulated Count Value".

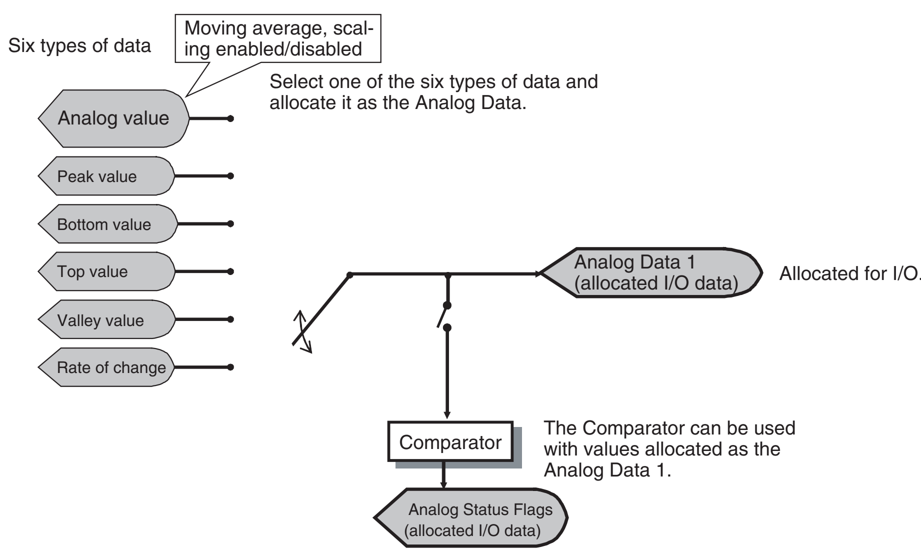
The flow of data calculation is as shown in the flow chart below.





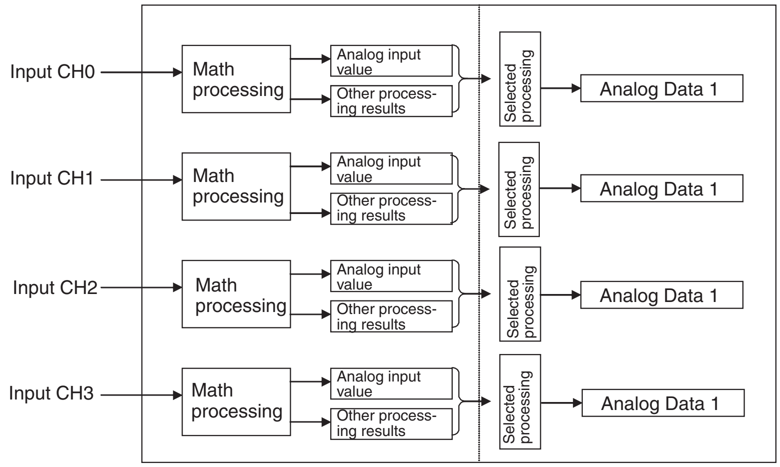
Selection of Allocation Data

After performing each calculation, 6 types of data "Raw Value", "Peak Value", "Bottom Value", "Top Value", "Valley Value", and "Rate of Change" can be selected for allocation to I/O. The selected data becomes "Analog Data 1" and can be allocated independently or with a status flag to the Master Unit. The selection process is performed by either CX-Integrator or Explicit message. In addition, comparison calculation of "Analog Data 1" with 4 types of alarm settings (Alarm Trip Point High (HH), Warning Trip Point High (H), Warning Trip Point Low (L), Alarm Trip Point Low (LL)) can be performed. (Comparator function)



Note In default, "Raw Value" is to be allocated to I/O.

Furthermore, "Analog Data 1" can be selected separately for each input as described below.



6-2-3 I/O Data Type and Allocation

I/O Data

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.

Data allocation is performed by CX-Integrator.

Input Data

I/O data	Details
Analog Data 1 (4 input words (8 bytes))	• Used to monitor analog data. • One type of data from the 4-word analog value, peak value, bottom value, top value, valley value, and rate of change is selected and allocated. (The default is allocation of the analog value.) **Note** The comparator function can be used with regards to the value allocated to analog data 1.
Top/Valley Detection Timing Flags (1 input word (2 bytes))	Top/Valley Detection Timing Flags are allocated in one word. The flag is allocated together with the top or valley value in order to identify the timing for the Master Unit to capture the top or valley hold value.
Analog Status Flags (2 input words (4 bytes))	Each of the bits for the Comparator Result Flag, Top/Valley Detection Timing Flag, Disconnected Line Detection Flag are allocated. 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 Flag Allocated simultaneously with top value and valley value and used for data capture timing. • Disconnected Line Detection Flag Disconnected line can be detected even if analog value is not allocated.
Analog Data + Top/Valley Detection Timing Flags (5 input words (10 bytes))	From the start, the Top/Valley Detection Timing Flag (1 word (2 bytes)) is allocated to the end of analog data 1 (4 words (8 bytes)).

Output Data

I/O data	Details
Hold Flags (1 output word (2 bytes))	This is used in conjunction with each type of hold function (peak, bottom, top, valley) and is used to control execution timing of the hold function on the Master Unit side.

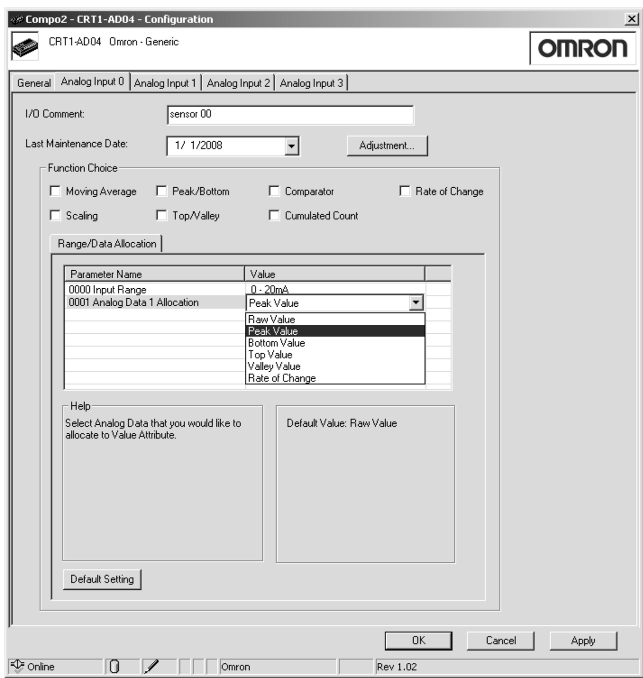
Analog Data Selection Method

The data type to be allocated as "Analog Data 1" can be selected from a maximum of 6 types of data using various types of calculations, which are "Raw Value", "Peak Value", "Bottom Value", "Top Value", "Valley Value", and "Rate of Change". These values can be selected alone or in combination with the Status Flags.

Setting Using the CX-Integrator

1,2,3...

1. Turn ON the power to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the tab of the channel to select the analog data you want and select the type of allocation data from the "Analog Data 1 Allocation" pull-down list.



4. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

Allocating I/O Data

Select allocation data using one of the following methods and perform remote I/O communications.

1. Only allocate analog value (default I/O data)
2. Select I/O data (pattern) for allocation (fixed I/O data combination)

■ If only allocating analog value (default I/O data)

If the Analog Input Slave Unit is used with default settings, only analog value is selected as I/O data and 4 words (8 bytes) worth of data is allocated to the IN area of the Master Unit as shown below.

	15 0
First word + 0CH	Analog input value for Input CH0
First word + 1CH	Analog input value for Input CH1
First word + 2CH	Analog input value for Input CH2
First word + 3CH	Analog input value for Input CH3

■ If I/O data (pattern) is selected for allocation (fixed I/O data combination)

"Analog data 1" is combined with data such as status flag and allocated as I/O using set combinations as described below.

Data that can be integrated can be selected using CX-Integrator.

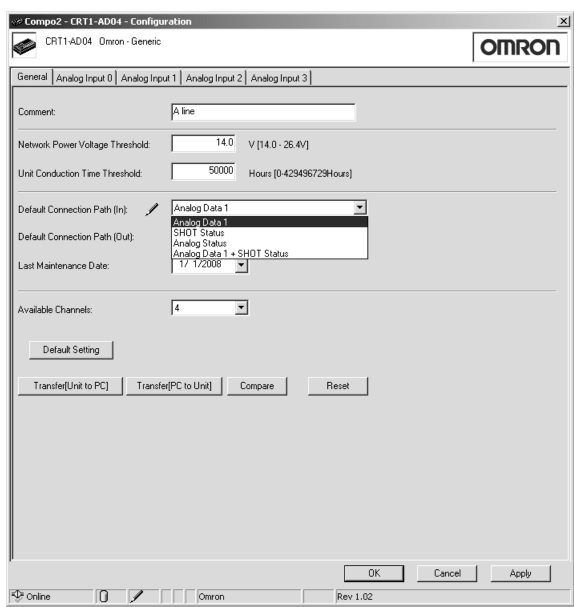
(Example) Case of allocating "Analog Data 1" + "Top/Valley Detection Timing Flag" to the Master Unit

	15 8	7 0
First word + 0CH	Analog Data 1 for Input CH0	
First word + 1CH	Analog Data 1 for Input CH1	
First word + 2CH	Analog Data 1 for Input CH2	
First word + 3CH	Analog Data 1 for Input CH3	
First word + 4CH	Top Detection Timing Flag	Valley Detection Timing Flag

Method of selection using the CX-Integrator

1,2,3...

1. Turn ON the power to the CompoNet Slave Unit.
2. Double-click the icon of the Analog Input Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the "General" tab and select I/O data (pattern) from the "Default Connection Path (In)" pull-down list. The following example shows the case for allocation of "Analog Data 1".



4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.

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

I/O Data

Analog Data 1

Analog Data is used to monitor analog values. One item from "Raw Value", "Peak Value", "Bottom Value", "Top Value", "Valley Value", and "Rate of Change" can be selected for allocation. (The default is allocating of "Raw Value".)

Note The comparator function can be used with regards to the value allocated to "Analog Data 1".

The data format for allocation to the Master Unit is described below.

The data is allocated in a two's complement form. (4 words (8 bytes))

	15 ... 0
First word + 0CH	**Analog Data 1 for Input CH0**
First word + 1CH	**Analog Data 1 for Input CH1**
First word + 2CH	**Analog Data 1 for Input CH2**
First word + 3CH	**Analog Data 1 for Input CH3**

Top/Valley Detection Timing Flags

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 (1 word (2 bytes)).

15 ... 8	7 ... 0
+1	**+0**

	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	**Lower byte**
+1	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	**Upper byte**

The meaning for each bit is as described below.

Byte	Abbreviation	Name	Details
+0	V_STx	Valley Detection Timing Flag	Becomes 1 (ON) at the timing when a valley is detected by the top/valley hold function and becomes 0 (OFF) after passing of one-shot time.
+1	T_STx	Top Detection Timing Flag	Becomes 1 (ON) at the timing when a top is detected by the top/valley hold function and becomes 0 (OFF) after passing of one-shot time.

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 (2 words (4 bytes)).

15 8	7 0
+1	+0
+3	+2

	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 CH0	Lower byte
+1	BW1	T_ST1	V_ST1	HH1	H1	PS1	L1	LL1	Input CH1	Upper byte
+2	BW2	T_ST2	V_ST2	HH2	H2	PS2	L2	LL2	Input CH2	Lower byte
+3	BW3	T_ST3	V_ST3	HH3	H3	PS3	L3	LL3	Input CH3	Upper byte

The meaning for each bit is as described below.

Bit	Abbreviation	Name		Details
0	LLx	Comparator Result Flag	Low Low Limit Alarm Flag	Turns ON when the value of data allocated in Analog Data 1 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 1 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 1 exceeds the High Limit alarm setting.
4	HHx		High High Limit Alarm Flag	Turns ON when the value of data allocated in Analog Data 1 exceeds the High High Limit alarm setting.
5	V_STx	Top/Valley Detection Timing Flags	Valley Detection Timing Flag	Turns ON at the timing when a valley is detected by the top/valley hold function and becomes 0 (OFF) after passing of one-shot time.
6	T_STx		Top Detection Timing Flag	Turns ON at the timing when a top is detected by the top/valley hold function and becomes 0 (OFF) after passing of one-shot time.
7	BWx	Disconnected Line Detection Flag		Turns ON when a disconnection is detected.

Analog Data 1 + Top/Valley Detection Timing Flags

This data pattern consists of Analog Data 1 followed by the Top/Valley Detection Timing Flags and is allocated in the Master Unit using the following data format (5 words (10 bytes)).

15 8	7 0
+1	+0
+3	+2
+5	+4
+7	+6
+9	+8

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
+0	Analog Data 1 for Input CH0								Lower byte
+1									Upper byte
+2	Analog Data 1 for Input CH1								Lower byte
+3									Upper byte
+4	Analog Data 1 for Input CH2								Lower byte
+5									Upper byte
+6	Analog Data 1 for Input CH3								Lower byte
+7									Upper byte
+8	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0	Lower byte
+9	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	Upper byte

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 (1 word (2 bytes)).

15 … 8	7 … 0
+1	+0

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

The meaning for each bit is as described below.

Bit	Abbreviation	Name	Details
0	HD0	Hold Flag for Input CH0	The hold function is performed for Analog Input CH0 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 CH1	The hold function is performed for Analog Input CH1 while this flag is ON. The hold function stops and the last value is held when the flag goes OFF.
2	HD2	Hold Flag for Input CH2	The hold function is performed for Analog Input CH2 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 CH3	The hold function is performed for Analog Input CH3 while this flag is ON. The hold function stops and the last value is held when the flag goes OFF.

Note After a Hold Flag is turned ON at the Master Unit, there is a transmission time delay for notification of this to the unit.

6-3 Summary of the Analog Output Slave Units

The Analog Output Slave Unit converts (DA conversion) digital data (binary values) stored in the Master Unit into analog signals of 1 to 5 V or 4 to 20 mA and outputs this.
A summary of the Analog Output Slave Unit is described below.

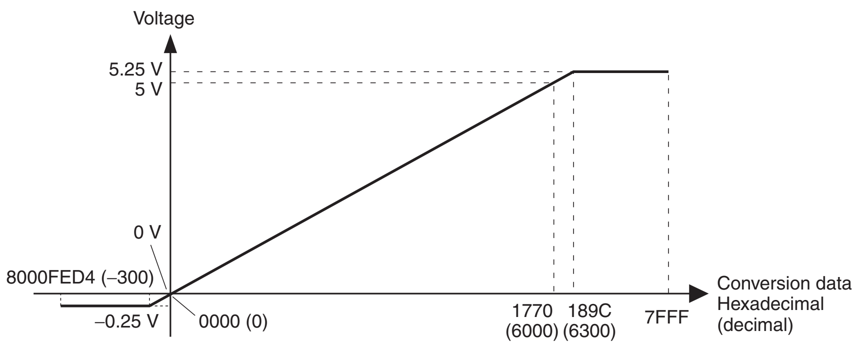
6-3-1 Output Range and Conversion Data

Digital data that is output is converted to analog data using a set output range as shown below.
If the output data exceeds the data range for which conversion is possible, the conversion data saturates at the upper or low limit.

Output Range and Conversion Data

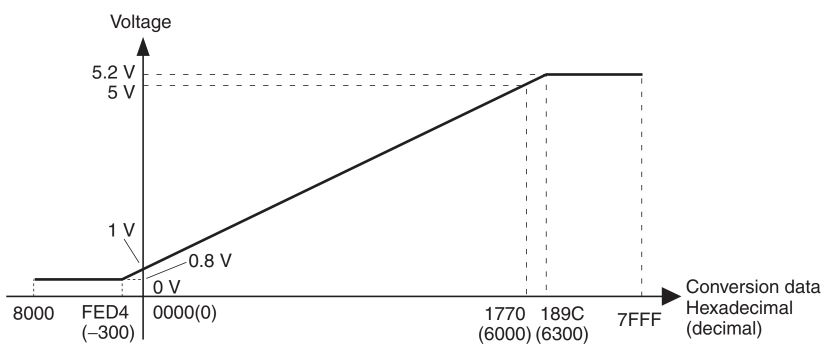
■ Output Range: 0 to 5 V

Data of 0000 to 1770 Hex (0 to 6000) is converted to voltage from 0 to 5 V and output. The output data range for which conversion is possible is from FED4 to 189C Hex (–300 to +6300) and for this case the output data becomes from -0.25 to +5.25 V.



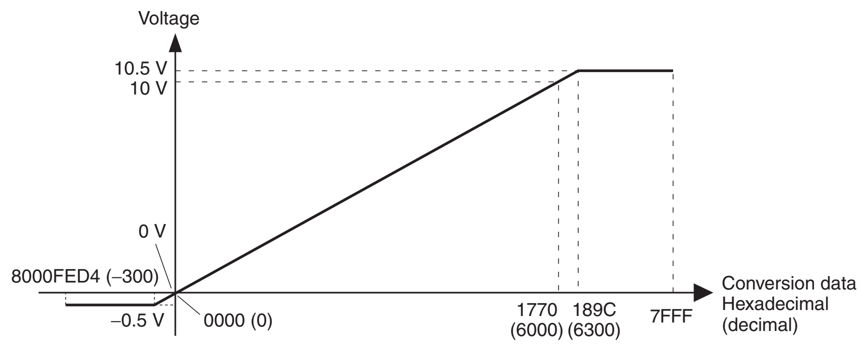
■ Output Range: 1 to 5 V

Data of 0000 to 1770 Hex (0 to 6000) is converted to voltage from 1 to 5 V and output. The output data range for which conversion is possible is from FED4 to 189C Hex (–300 to +6300) and for this case the output data becomes from 0.8 to 5.2 V.



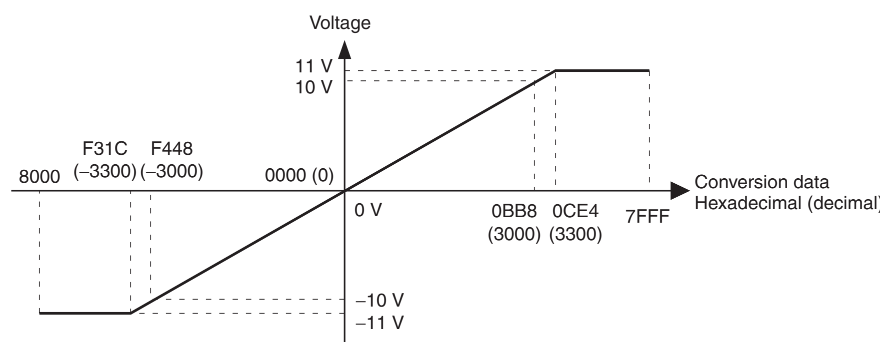
■ Output Range: 0 to 10 V

Data of 0000 to 1770 Hex (0 to 6000) is converted to voltage from 0 to 10 V and output. The output data range for which conversion is possible is from FED4 to 189C Hex (–300 to +6300) and for this case the output data becomes from –0.5 to +10.5 V.



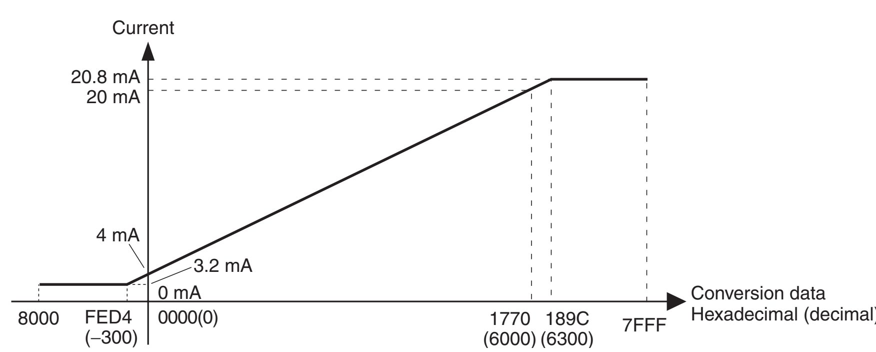
■ Output Range: –10 to 10 V

Data of F448 to 0BB8 Hex (–3000 to +3000) is converted to voltage from –10 to +10 V and output. The output data range for which conversion is possible is from F31C to 0CE4 Hex (–3300 to +3300) and for this case the output data becomes from –11 to +11 V. Negative voltages are specified as two's complements (16 bits).



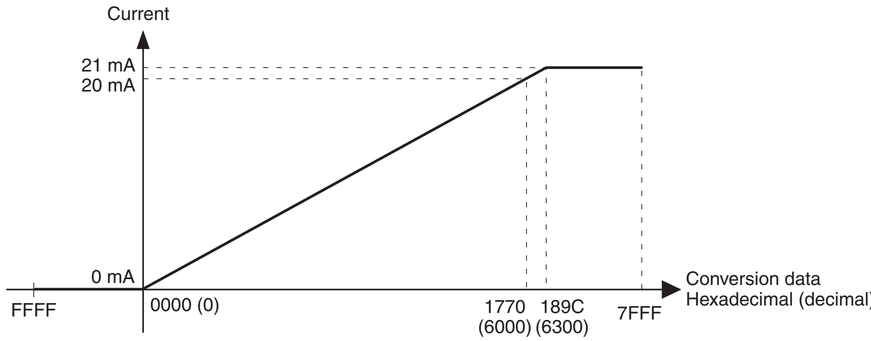
■ Output Range: 4 to 20 mA

Data of 0000 to 1770 Hex (0 to 6000) is converted to current from 4 to 20 mA and output. The output data range for which conversion is possible is from FED4 to 189C Hex (–300 to +6300) and for this case the output data becomes from 3.2 to 20.8 mA.



■ **Output Range: 0 to 20 mA**

Data of 0000 to 1770 Hex (0 to 6000) is converted to current from 0 to 20 mA and output. The output data range for which conversion is possible is from 0000 to 189C Hex (0 to 6300) and for this case the output data becomes from 0 to 21 mA.



Output Range Settings

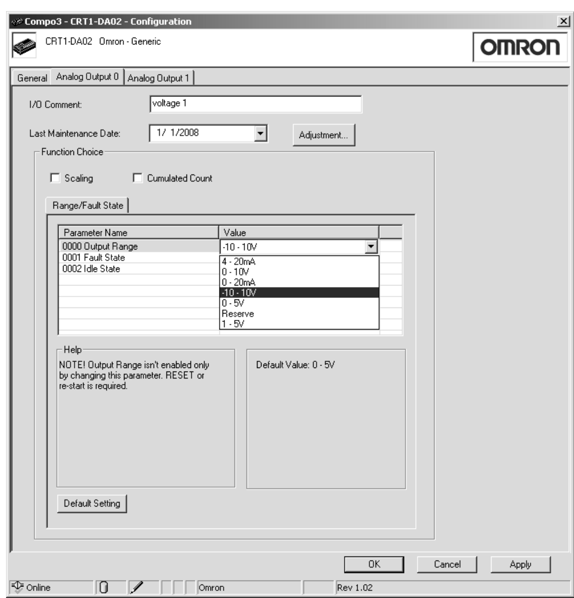
Setting of output range is performed using Analog Output Slave Unit DIP switches, CX-Integrator, or Explicit message.

The method for setting the output range using CX-Integrator is described below.

Please see "*11-1 CX-Integrator*" on page 481 regarding details for CX-Integrator.

1,2,3...

1. Turn ON the power to the CompoNet Slave Unit.
2. Double-click the icon of the Analog Output Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the tab for the channel for which you would like to change the range and select any output range from the pull-down list of "Output Range".



4. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

DA Conversion Data

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

	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
First word + 0CH	Output CH0 DA conversion data
First word + 1CH	Output CH1 DA conversion data

Please indicate the two's complement as the DA conversion data for outputting of a negative voltage.
Using the NEG (two's complement conversion) is convenient for obtaining the two's complement from the absolute value.

6-3-2 I/O Data Type and Allocation

I/O Data

Analog Output Slave Units support one type of output data.

Data I/O allocation is performed by CX-Integrator.

Output Data

Data Type	Details
Output data (2 output words (4 bytes))	Used to allocate two words of analog output data.

Use the CX-Integrator to allocate I/O.

I/O Data Allocated in the Master Unit

The Analog Output Slave Unit has the output data allocated by default. No setting is required. Two words (4 bytes) of output data is allocated. The data is output as two’s complements.

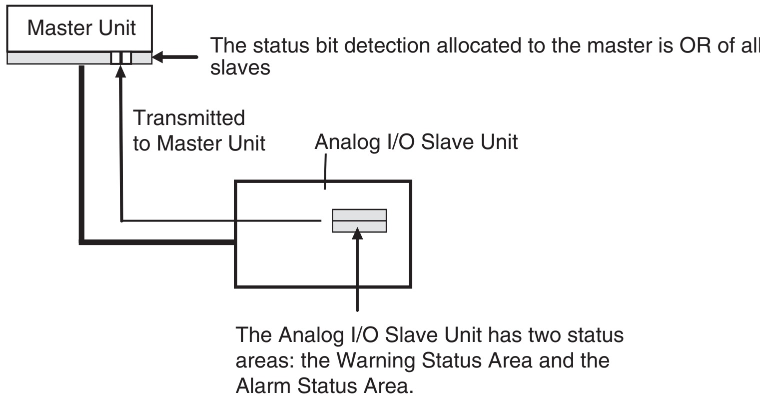
	15 8 7 0
First word + 0CH	**Analog output value for Output CH0**
First word + 1CH	**Analog output value for Output CH1**

6-4 Status Areas

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

When any of the bits in the status area of the slaves connected to the Master Unit turns ON, the corresponding bit (bit 12 is for warning status area notices and bit 13 is for alarm area notices) of the status flag in the Master Unit turns ON.

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



6-4-1 Analog Input Slave Unit Status Area

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 (Below the monitor value)	Turns ON if the network power supply voltage is reduced below the set monitor value.
3	Unit Maintenance Flag OFF: Normal ON: Error (Higher than the monitor value)	Turns ON when the cumulative total unit conduction time exceeds the set monitor value.
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Analog Range Exceeded Flag OFF: Within range (Less than the set monitor value) ON: Out-of-range (More than the set monitor value)	Turns ON in the case that the analog data exceeds the displayable range or if it exceeds the set monitor value set by the comparator function.
9	Cumulated Counter Exceeded Flag OFF: Within range (Less than the set monitor value) ON: Out-of-range (More than the set monitor value)	Turns ON if the cumulated counter 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 when 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 when 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	---

6-4-2 Analog Output Slave Unit Status Area

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 (Below the monitor value)	Turns ON if the network power supply voltage is reduced below the set monitor value.
3	Unit Maintenance Flag OFF: Normal ON: Error (Higher than the monitor value)	Turns ON when the cumulative total unit conduction time exceeds the set monitor value.
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 (Less than the set monitor value) ON: Out-of-range (More than the set monitor value)	Turns ON if the cumulated counter value exceeds the set monitor value.

Bit	Content	Description
10	Reserved	---
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	---

6-5 Analog Data Monitor

The present value, monitor of set values, and maintenance information of analog data can be confirmed using the CX-Integrator [Monitor] screen.

Right-clicking on the Analog I/O Slave Unit icon on the Network Configuration Window when the CX-Integrator is on-line, and selecting "Monitor" enables displaying of the [Monitor] screen.

Maintenance information is displayed in the status check box at the bottom of the screen and if the check box is ON, it shows that an error has occurred. Please see "*11-1 CX-Integrator*" on page 481 regarding details for CX-Integrator.

Monitor Window

General Tab Page

Item		Description
Monitor Display	Comment	Displays the text set by the Naming Unit function.
	Last Maintenance Date	Displays the last maintenance date that was set.
	Present Unit Conduction Time	Displays the total time that the Unit has been ON (cumulative power ON time).
	Present Network Power Voltage	Displays the present network power supply voltage.
	Network Power Voltage (Peak)	Displays the maximum and minimum network power supply voltages up to the present time.
	Network Power Voltage (Bottom)	
Status Check Boxes	Unit Maintenance	Selected if the total Unit conduction time has exceed the monitor value set by the Unit Conduction Time Monitor Function.
	Network Power Voltage Drop	Selected if the network power supply voltage has fallen below the monitor value set by the Network Power Voltage Monitor Function.
	Cumulated Counter Over	Selected if any of the input's cumulated time counter values has exceeded the monitor value set by the Temperature Integration Function.
	Unit error	Turns ON when an error occurs in one of the units.

Item		Description
Buttons	Clear Button	Click this button to clear the displayed values.
	Update Button	Click this button to update the Maintenance information.
	Save Maintenance Counter Button	Click this button to save the Maintenance Counter Value in the Unit. The previous value is retained when the power supply is turned OFF and ON again.

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

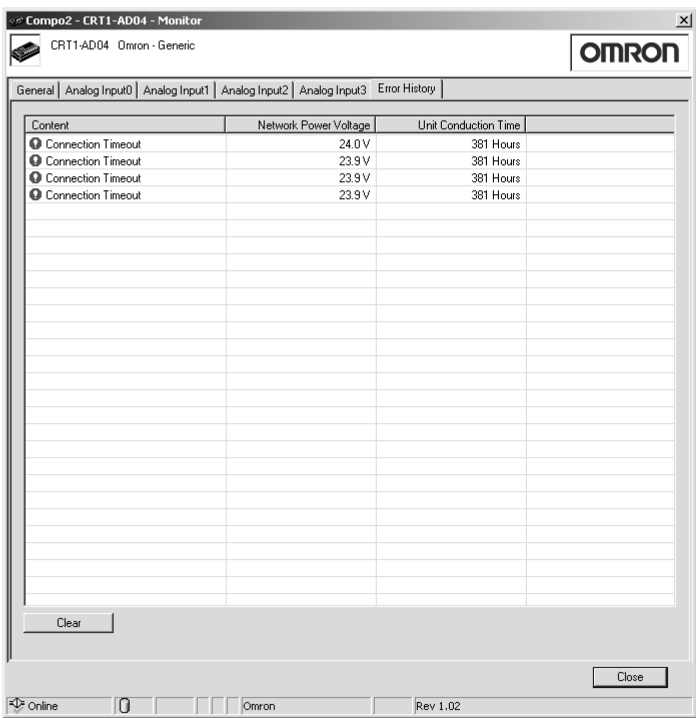
"Analog Input"/"Analog Output" tab

Item			Description
Analog Input	Monitor Display	Input Range	Displays the input range setting.
		I/O Comment	Displays the text set by the Naming Connected Device function.
		Last Mainte-nance Date	Displays the last maintenance date that was set.
		Present Value	Displays the present analog value.
		Peak Value	Displays the peak value, bottom value, top value, and valley value for the analog data being held in the unit.
		Bottom Value	
		Top Value	
		Valley Value	
		Rate of Change	Displays the rate of change in comparison to the previous sampling cycle.
		Cumulated Counter	Displays the total time calculated by the cumu-lated count.
		Max Value	Displays the maximum value and minimum value of the analog data being held in the unit.
		Min Value	
	Status check boxes	Over Range	Turns ON if the analog data exceeds the upper limit of the displayable range.
		High Alarm Over	Turns ON if the analog data exceeds the set monitor value set by the comparator function.
		High Warning Over	
		Low Warning Over	
		Low Alarm Over	
		Under Range	Turns ON if the analog data is below the lower limit of the displayable range.
		Broken Wire	Turns ON when there is a disconnected line. (However, only for the cases when the input range is the 1 to 5 V range or the 4 to 20 mA range)
		Threshold Cumu-lated Counter Over	Turns ON when the time integrated values increases above the monitor value set by the cumulated count function.
		Cumulated Counter Overflow	Selected when there is an overflow in the cumu-lated count value.
		Cumulated Counter Under-flow	Selected when there is an underflow in the cumu-lated count value.
	Buttons	Clear Buttons	Clear the displayed values

Item			Description
Analog Output	Monitor Display	Output Range	Displays the output range setting.
		I/O Comment	Displays the text set by the Naming Connected Device function.
		Last Maintenance Date	Displays the last maintenance date that was set.
		Present Value	Displays the present network power supply voltage.
		Cumulated Counter	Displays the total time calculated by the cumulated count.
	Status check boxes	Threshold Cumulated Counter Over	Turns ON when the time integrated values increases above the monitor value set by the cumulated count function.
		Cumulated Counter Overflow	Selected when there is an overflow in the cumulated count value.
		Cumulated Counter Underflow	Selected when there is an underflow in the cumulated count value.
	Buttons	Clear Buttons	Clear the displayed values

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

Error History Tab Page



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.
Clear Button	Clears the error history.

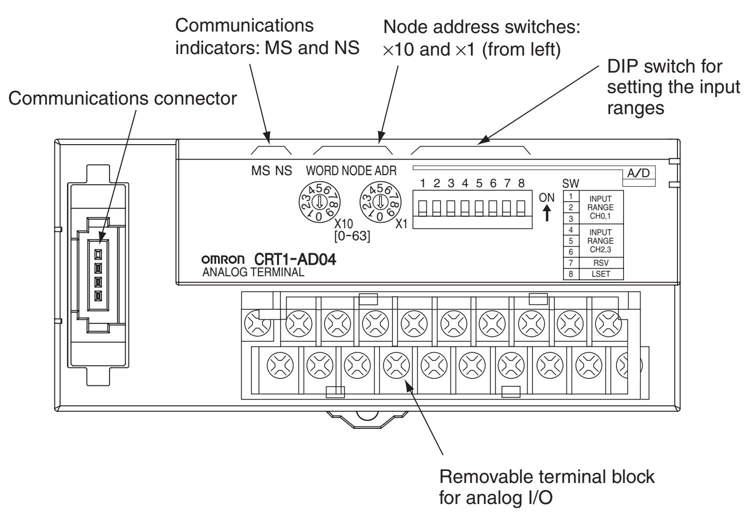
6-6 Units with Screw Terminal Blocks

6-6-1 Four-point Analog Input Slave Unit (with 2-tier Terminal Block) CRT1-AD04

General Specifications

Item		Specification	
		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 MΩ min.	Approx. 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
Conversion cycle		1 ms / 1 point	
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		110 mA max. for 24-VDC power supply 175 mA max. for 14-VDC power supply	
Weight		153 g	

Component Names and Functions



Indicator Section

Communications Indicators

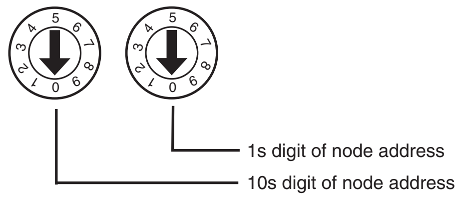
Refer to *4-1-3 Communications Indicators*.

Switch Settings

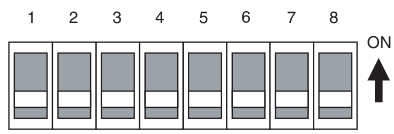
Setting the Node Address

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. (The maximum node address is 63.)

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



Setting the Input Ranges



Pin No.	Setting	Specification
1	Input CH0/CH1 range settings (common)	Default setting: All pins OFF See the next table
2		
3		
4	Input CH2/CH3 range settings (common)	Default setting: All pins OFF See the next table
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 CX-Integrator. 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.

■ **Input CH0/CH1 range (common)**

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

■ **Input CH2/CH3 range (common)**

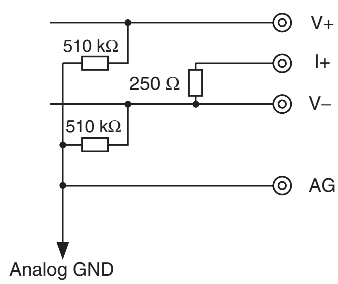
Input range	Pin 4	Pin 5	Pin 6
0 to 5 V	OFF	OFF	OFF
1 to 5 V	ON	OFF	OFF
0 to 10 V	OFF	ON	OFF
–10 to 10 V	ON	ON	OFF
4 to 20 mA	OFF	OFF	ON
0 to 20 mA	ON	OFF	ON

Note

(1) When the DIP switch is used to set the input ranges (pin 8 ON), the input signal ranges must always be the same for Inputs CH0 and CH1 and for Inputs CH2 and CH3. If it is necessary to set separate input signal ranges for Inputs 0 to 3, use the CX-Integrator rather than the DIP switch to make the settings.

(2) Do not set the DIP switches or pins other than as specified in the table above.

Internal Circuits

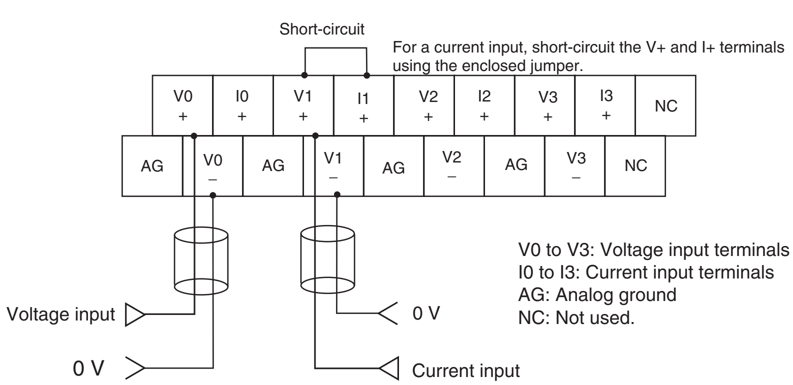


Terminal Arrangements

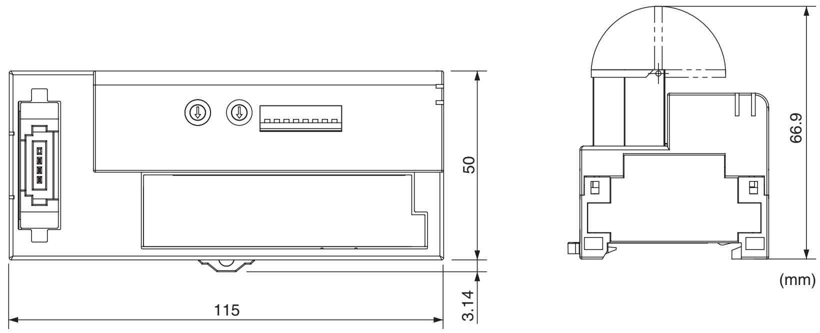
Communications Connector

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

Analog I/O Terminal Block



Dimensions



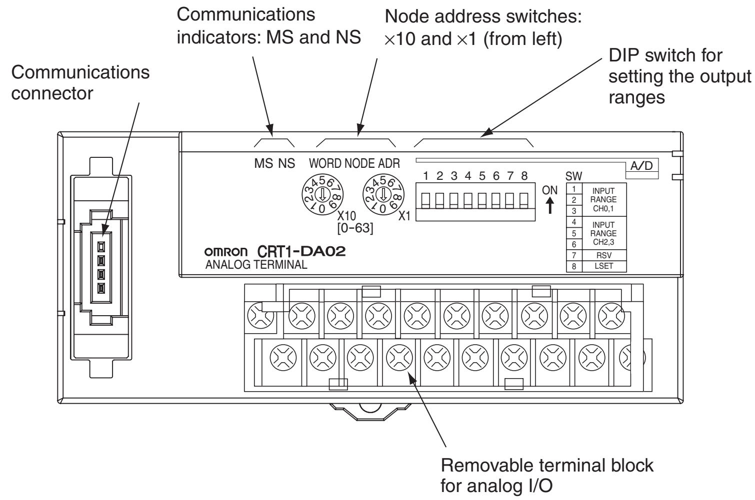
6-6-2 Two-point Analog Input Slave Unit (with 2-tier Terminal Block) CRT1-DA02

General Specifications

Item		Specification	
		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.)
Conversion cycle		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		125 mA max. for 24-VDC power supply 205 mA max. for 14-VDC power supply	
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



Indicator Section

Communications Indicators

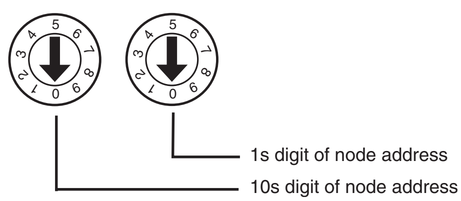
Refer to *4-1-3 Communications Indicators*.

Switch Settings

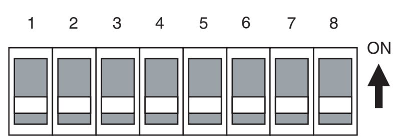
Setting the Node Address

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. (The maximum node address is 63.)

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	Specification
1	Range settings for output CH0	Default setting: All pins OFF See the next table
2		
3		
4	Range settings for output CH1	Default setting: All pins OFF See the next table
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 CompoNet 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.

■ **Range for output CH0**

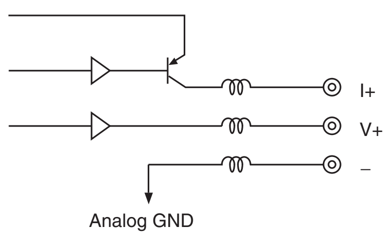
Output range	Pin 1	Pin 2	Pin 3
0 to 5 V	OFF	OFF	OFF
1 to 5 V	ON	OFF	OFF
0 to 10 V	OFF	ON	OFF
–10 to 10 V	ON	ON	OFF
4 to 20 mA	OFF	OFF	ON
0 to 20 mA	ON	OFF	ON

■ **Range for output CH1**

Output 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 the DIP switches or pins other than as specified in the table above.

Internal Circuits



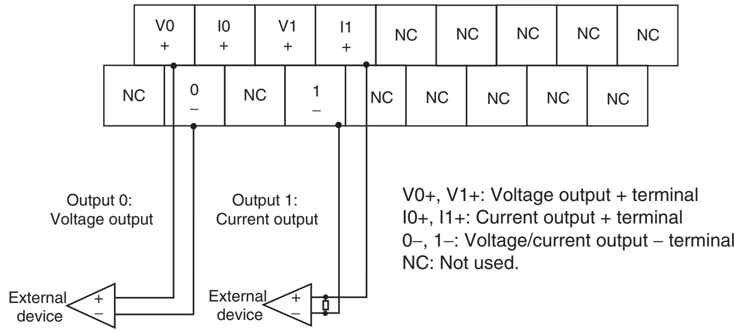
The negative terminals for output CH0 and output CH1 are connected internally.

Wiring

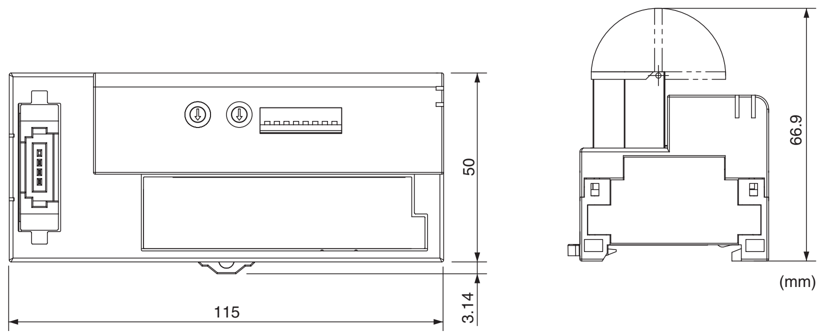
Communications Connector

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

Analog I/O Terminal Block



Dimensions



6-7 Units with Connectors

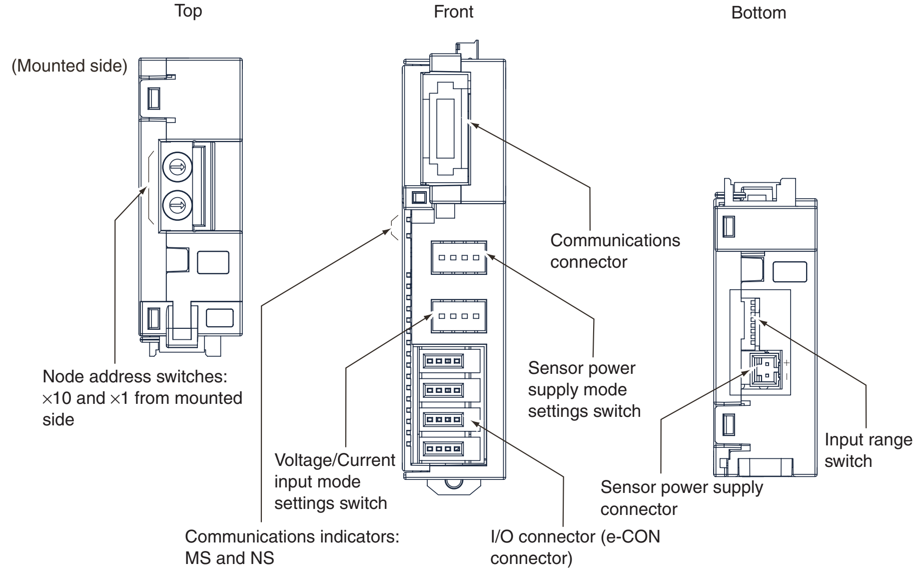
6-7-1 Four-point Analog Input Slave Unit (with e-CON Connectors) CRT1-VAD04S

General Specifications

Item		Specification	
		Voltage input	Current input
Model		CRT1-VAD04S	
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 MΩ min.	Approx. 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
Conversion cycle		1 ms/ 1 point	
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 mount or mount for Mounting Bracket	
Power supply type		Multi-power supply	
Communications power current consumption		75 mA max. for 24-VDC power supply 115 mA max. for 14-VDC power supply	
Sensor power supply current (See note.)		Less than 200 mA (for each CH)	
Weight		85 g max.	

Note In order to provide power to the sensor through the I/O connector, a 24-VDC power supply must be connected to the sensor power supply connector.

Component Names and Functions



Indicator Section

Communications Indicators

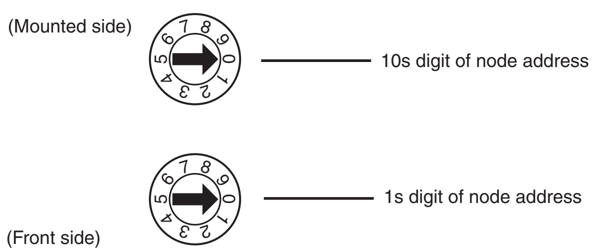
Refer to *4-1-3 Communications Indicators*.

Switch

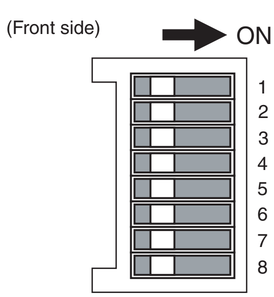
Setting the Node Address

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.)

Rotary switch settings are read when power is turned ON.



Input range switch



Pin No.	Setting	Specification
1	Input CH0/CH1 range settings (common)	See the next table Default setting: All pins OFF
2		
3		

Pin No.	Setting	Specification
4	Input CH2/CH3 range settings (common)	See the next table 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 CX-Integrator. 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 power is turned ON.

■ Input CH0/CH1 range (common)

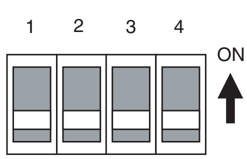
Input range	Pin 1	Pin 2	Pin 3
0 to 5 V	OFF	OFF	OFF
1 to 5 V	ON	OFF	OFF
0 to 10 V	OFF	ON	OFF
–10 to 10 V	ON	ON	OFF
4 to 20 mA	OFF	OFF	ON
0 to 20 mA	ON	OFF	ON

■ Input CH2/CH3 range (common)

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

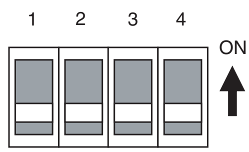
Note
(1) When the DIP switch is used to set the input ranges (pin 8 ON), the input signal ranges must always be the same for Inputs CH0 and CH1 and for Inputs CH2 and CH3. If it is necessary to set separate input signal ranges for Inputs CH0 to CH3, use the CX-Integrator rather than the DIP switch to make the settings.
(2) Do not set the DIP switches or pins other than as specified in the table above.

Sensor Power Supply Mode Settings Switch



Pin No.	Setting	Specification
1	Input CH0 sensor power supply mode toggle	OFF: Power supply for 2-wire or 4-wire sensor ON: Power supply for 3-wire sensor (Default setting is OFF)
2	Input CH1 sensor power supply mode toggle	
3	Input CH2 sensor power supply mode toggle	
4	Input CH3 sensor power supply mode toggle	

Voltage/Current Input Mode Settings Switch



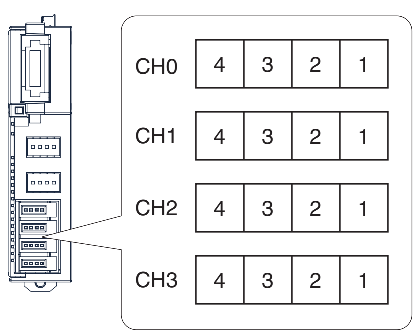
Pin No.	Setting	Specification
1	Input CH0 voltage/current input mode toggle	OFF: Voltage input ON: Current input (Default setting is OFF)
2	Input CH1 voltage/current input mode toggle	
3	Input CH2 voltage/current input mode toggle	
4	Input CH3 voltage/current input mode toggle	

Terminal Arrangements

Communications Connector

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

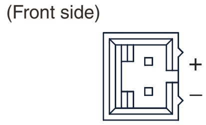
I/O Connector



Pin No.	Signal name
1	24VDC (Sensor power supply+)
2	n – (Voltage/current input–)
3	0V (Sensor power supply–)
4	n + (Voltage/current input+)

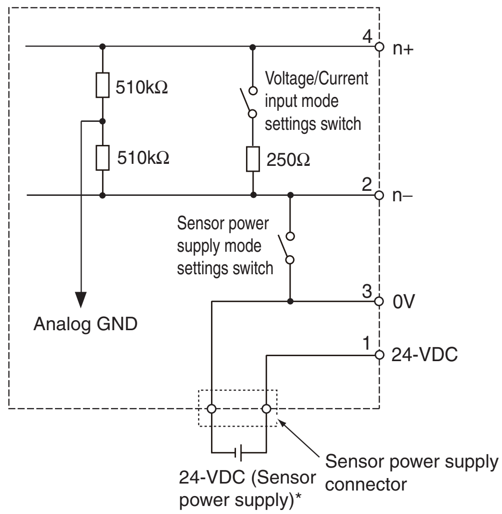
Note N: 0 to 3

Sensor Power Supply Connector



Pin code	Signal name
+	24VDC
–	0V

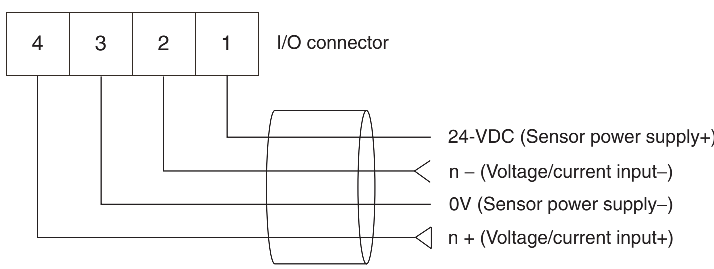
Internal Circuits



*Supplied from external

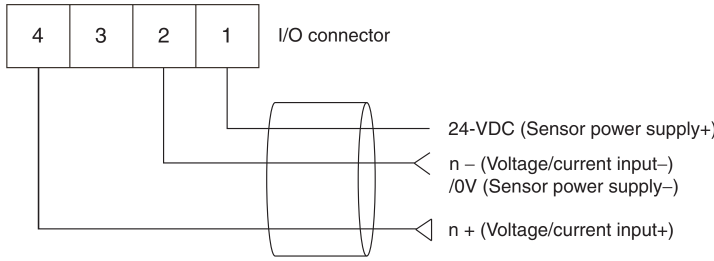
Wiring and Switch Settings

4-wire sensor



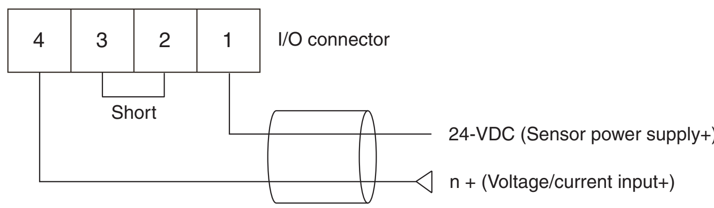
Input type	Sensor power supply mode settings switch	Voltage/Current input mode settings switch
Voltage input	OFF (Power supply for 2-wire or 4-wire sensor)	OFF (Voltage input)
Current input	ON (Power supply for 2-wire or 4-wire sensor)	ON (Current input)

3-wire sensor

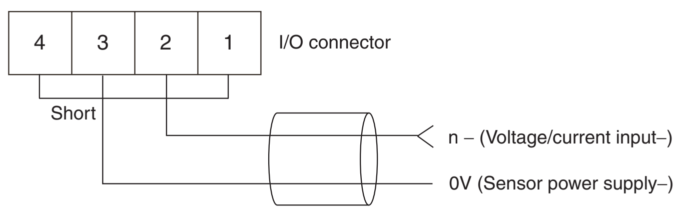


Input type	Sensor power supply mode settings switch	Voltage/Current input mode settings switch
Voltage input	OFF (Power supply for 3-wire sensor)	OFF (Voltage input)
Current input	ON (Power supply for 3-wire sensor)	ON (Current input)

2-wire sensor



Or

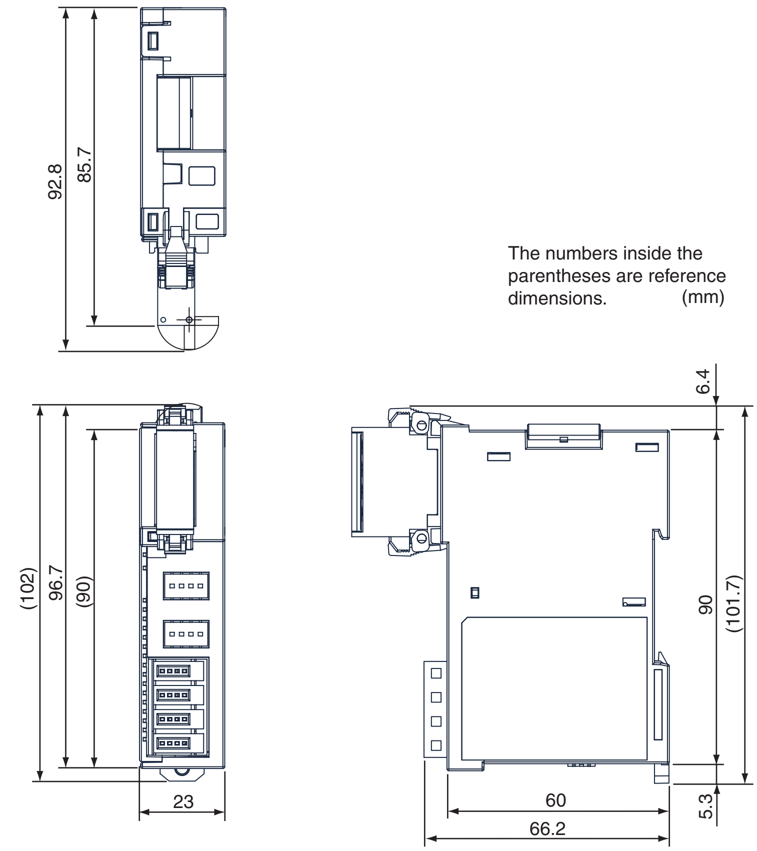


Note Wiring is different depending on the connected sensor.

Input type	Sensor power supply mode settings switch	Voltage/Current input mode settings switch
Current input	OFF (Power supply for 2-wire or 4-wire sensor)	ON (Current input)

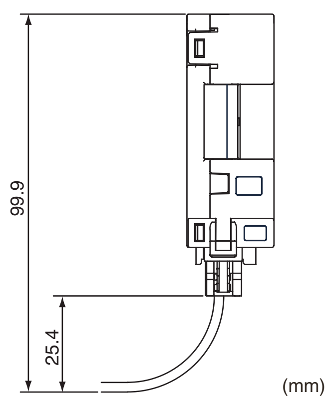
Dimensions

When a DCN4-TB4 Open Type Connector Is Mounted

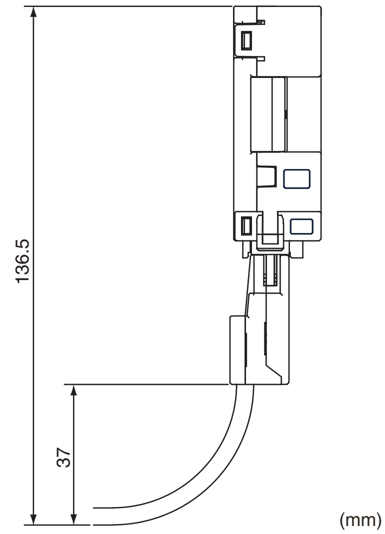


Communications Connector Dimensions Including the Connector and Cable

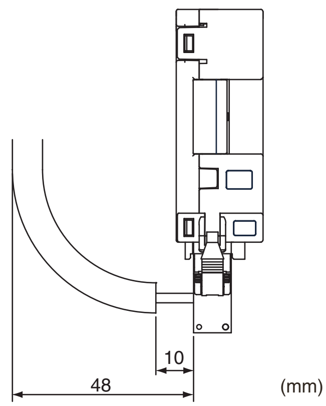
■ When a DCN4-BR4 Flat Connector Plug Is Mounted



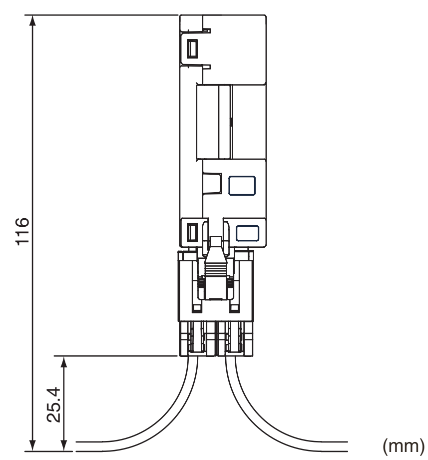
■ **When a DCN5-BR4 Flat Connector Plug Is Mounted**



■ **When a DCN4-TB4 Open Type Connector Is Mounted**



■ **When a DCN4-MD4 Multidrop Connector Is Mounted**



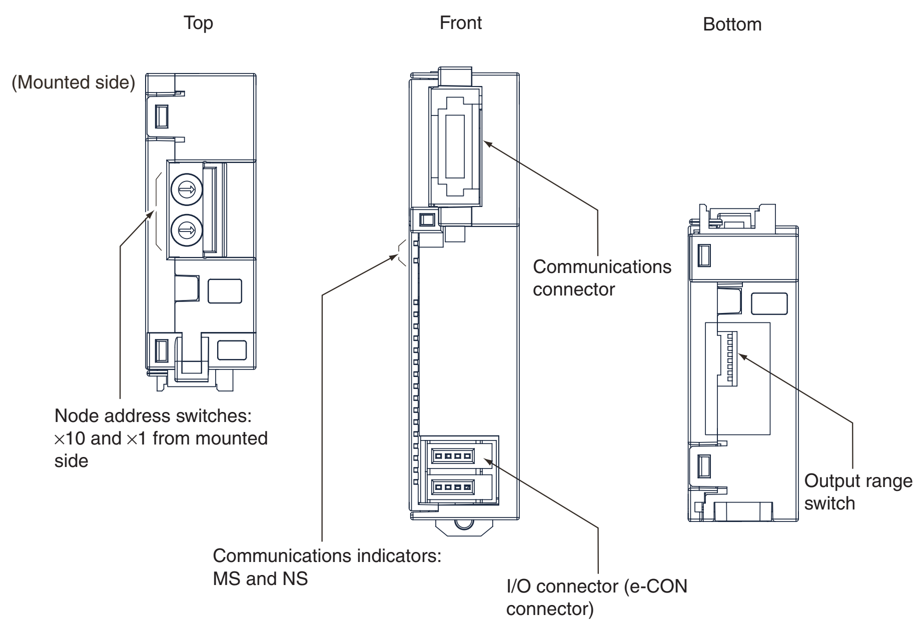
6-7-2 Two-point Analog Output Slave Unit (with e-CON Connectors) CRT1-VDA02S

General Specifications

Item		Specification	
		Voltage Output	Current Output
Model		CRT1-VDA02S	
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.)
Conversion cycle		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 mount or mount for Mounting Bracket	
Power supply type		Multi-power supply	
Communications power current consumption		105 mA max. for 24-VDC power supply 170 mA max. for 14-VDC power supply	
Weight		85 g max.	

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

Component Names and Functions



Indicator Section

Communications Indicators

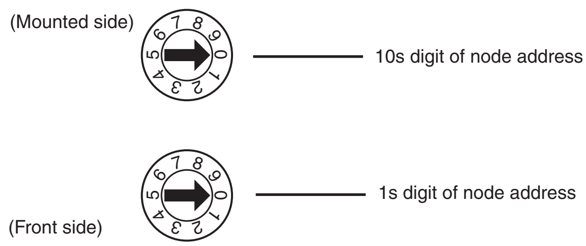
Refer to *4-1-3 Communications Indicators*.

Switch

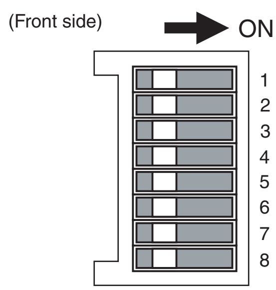
Setting the Node Address

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.)

Rotary switch settings are read when power is turned ON.



Output range switch



Pin No.	Setting	Specification
1	Range settings for output CH0	See the next table Default setting: All pins OFF
2		
3		
4	Range settings for output CH1	See the next table 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 CX-Integrator. 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 power is turned ON.

■ **Range for output CH0**

Output 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

■ **During current output of output 1**

Output 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

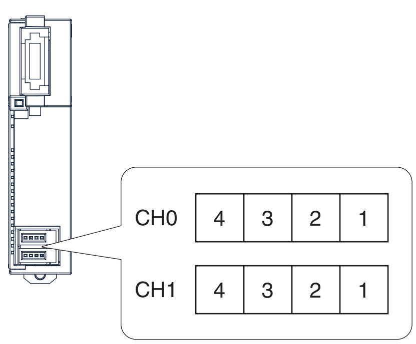
Note Do not set the DIP switches or pins other than as specified in the table above.

Terminal Arrangements

Communications Connector

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

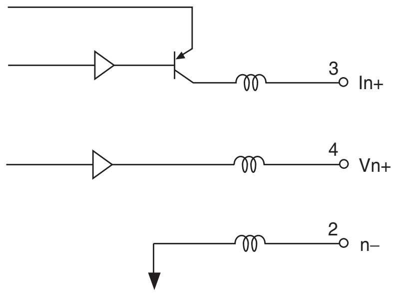
I/O Connector



Pin No.	Signal name
1	N.C.
2	n – (Voltage/current output–)
3	In + (Current output+)
4	Vn + (Voltage output+)

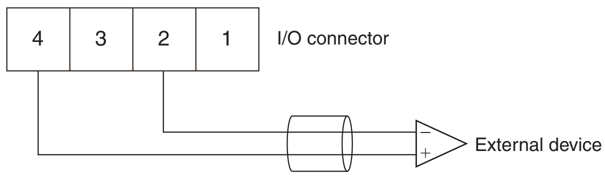
n: 0 or 1

Internal Circuits

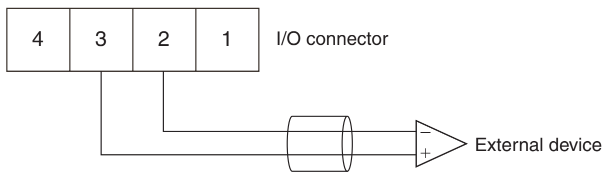


Wiring

Wiring for Voltage Output

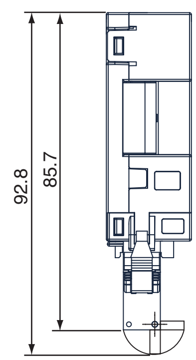


Wiring for Current Output

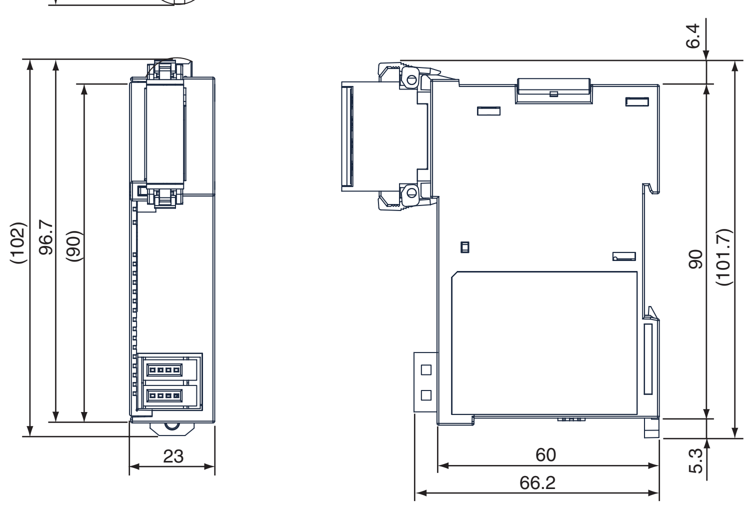


Dimensions

When a DCN4-TB4 Open Type Connector Is Mounted

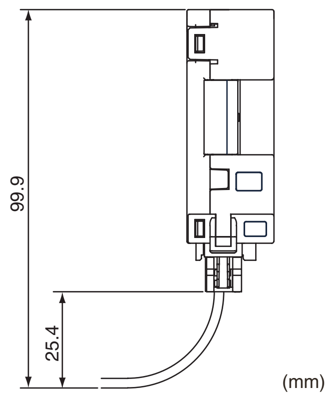


The numbers inside the parentheses are reference dimensions. (mm)

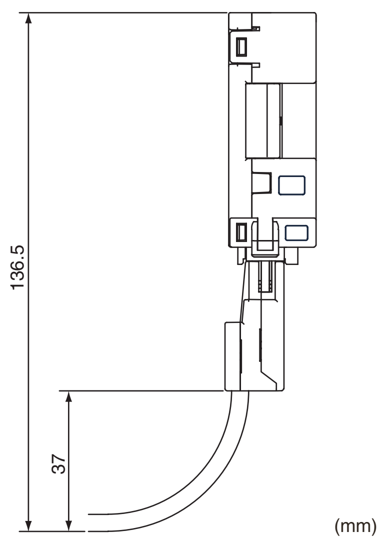


Communications Connector Dimensions Including the Connector and Cable

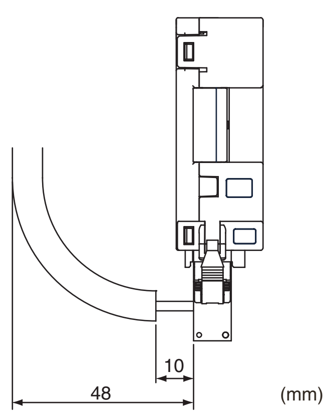
■ When a DCN4-BR4 Flat Connector Plug Is Mounted



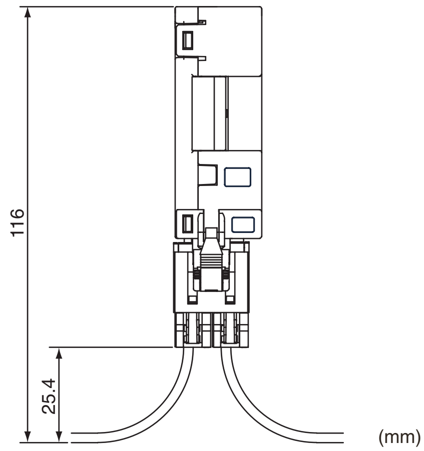
■ When a DCN5-BR4 Flat Connector Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ **When a DCN4-MD4 Multidrop Connector Is Mounted**

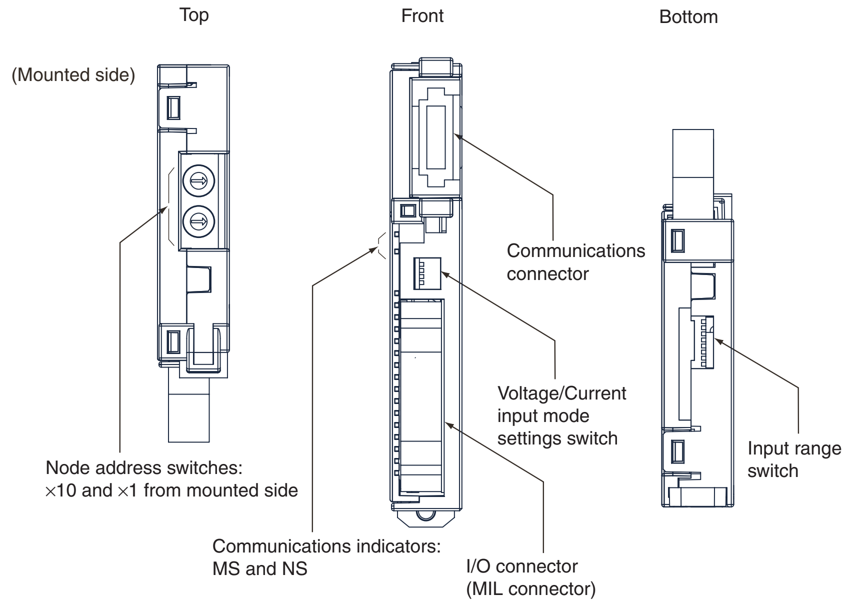


6-7-3 Four-point Analog Input Slave Unit (with MIL Connectors) CRT1-VAD04ML

General Specifications

Item		Specification	
		Voltage input	Current input
Model		CRT1-VAD04ML	
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 MΩ min.	Approx. 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
Conversion cycle		1 ms/ 1 point	
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 mount or mount for Mounting Bracket	
Power supply type		Multi-power supply	
Communications power current consumption		75 mA max. for 24-VDC power supply 115 mA max. for 14-VDC power supply	
Weight		70 g max.	

Component Names and Functions



Indicator Section

Communications Indicators

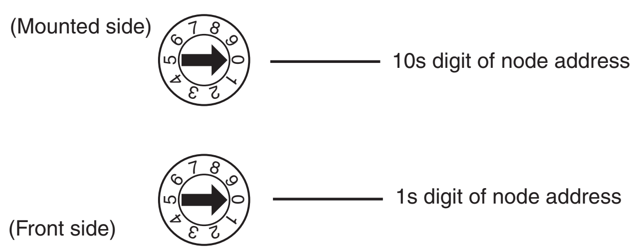
Refer to *4-1-3 Communications Indicators*.

Switch

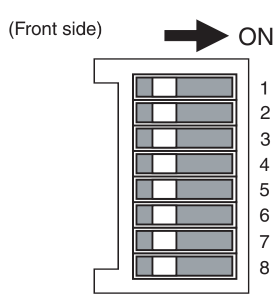
Setting the Node Address

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.)

Rotary switch settings are read when power is turned ON.



Input range switch



Pin No.	Setting	Specification
1	Input CH0/CH1 range settings (common)	See the next table Default setting: All pins OFF
2		
3		

Pin No.	Setting	Specification
4	Input CH2/CH3 range settings (common)	See the next table 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 CX-Integrator. 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 power is turned ON.

■ Input CH0/CH1 range (common)

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

■ Input CH2/CH3 range (common)

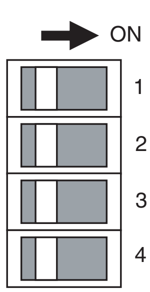
Input range	Pin 4	Pin 5	Pin 6
0 to 5 V	OFF	OFF	OFF
1 to 5 V	ON	OFF	OFF
0 to 10 V	OFF	ON	OFF
–10 to 10 V	ON	ON	OFF
4 to 20 mA	OFF	OFF	ON
0 to 20 mA	ON	OFF	ON

Note

(1) When the DIP switch is used to set the input ranges (pin 8 ON), the input signal ranges must always be the same for Inputs CH0 and CH1 and for Inputs CH2 and CH3. If it is necessary to set separate input signal ranges for Inputs CH0 to CH3, use the CX-Integrator rather than the DIP switch to make the settings.

(2) Do not set the DIP switches or pins other than as specified in the table above.

Voltage/Current Input Mode Settings Switch



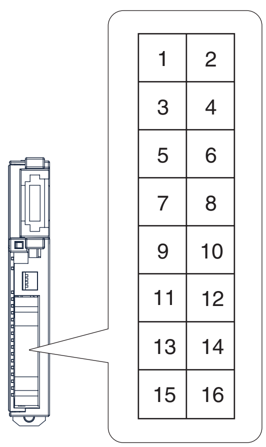
Pin No.	Setting	Specification
1	Input CH0 voltage/current input mode toggle	OFF: Voltage input ON: Current input (Default setting is OFF)
2	Input CH1 voltage/current input mode toggle	
3	Input CH2 voltage/current input mode toggle	
4	Input CH3 voltage/current input mode toggle	

Terminal Arrangements

Communications Connector

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

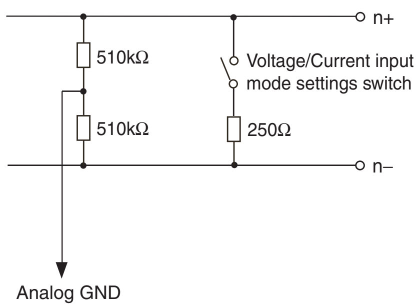
I/O Connector



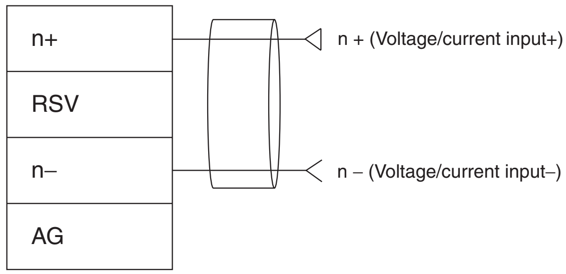
Pin No.	Signal name	Pin No.	Signal name
1	0 + (Voltage/current input+)	2	1 + (Voltage/current input+)
3	RSV	4	RSV
5	0 – (Voltage/current input–)	6	1 – (Voltage/current input–)
7	AG (Analog GND)	8	AG (Analog GND)
9	2 + (Voltage/current input+)	10	3 + (Voltage/current input+)
11	RSV	12	RSV
13	2 – (Voltage/current input–)	14	3 – (Voltage/current input–)
15	AG (Analog GND)	16	AG (Analog GND)

Note Do not connect anything to the RSV terminal.

Internal Circuits



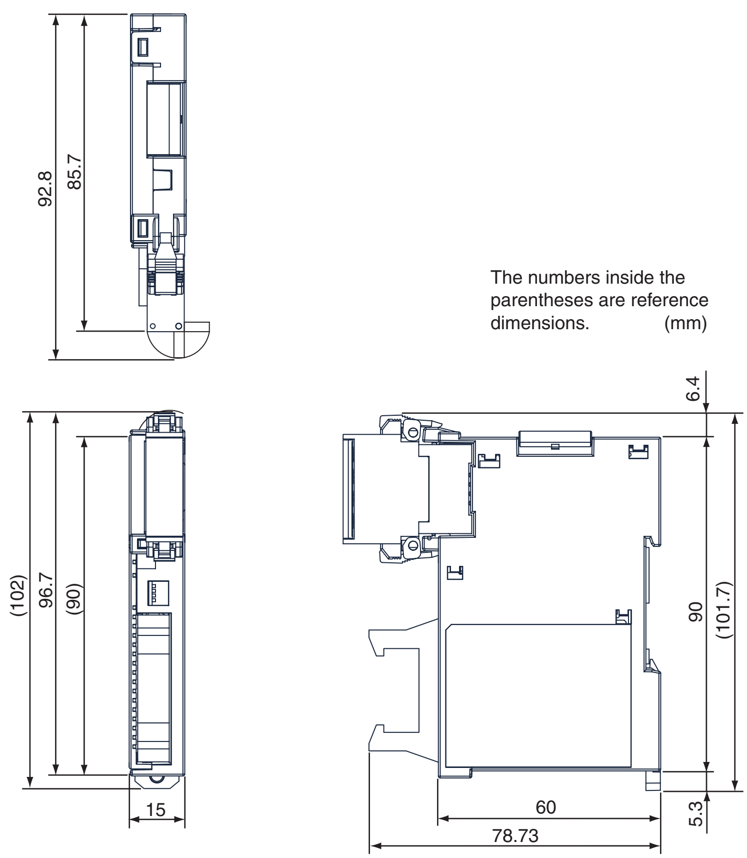
Wiring and Switch Settings



Input type	Voltage/Current input mode settings switch
Voltage input	OFF (Voltage input)
Current input	ON (Current input)

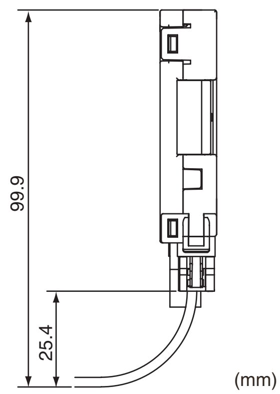
Dimensions

When a DCN4-TB4 Open Type Connector Is Mounted

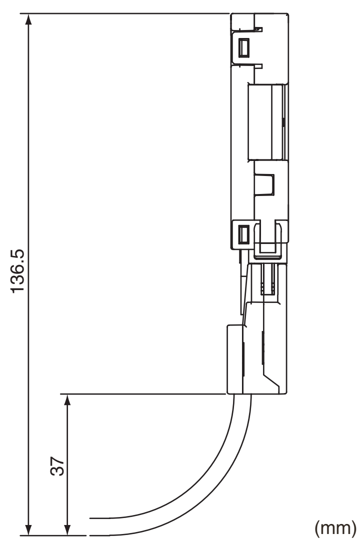


Communications Connector Dimensions Including the Connector and Cable

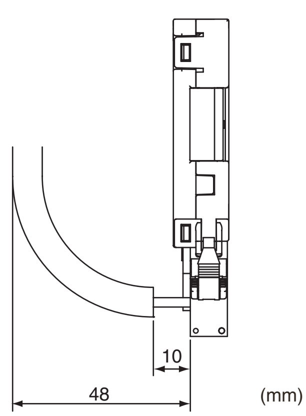
■ When a DCN4-BR4 Flat Connector Plug Is Mounted



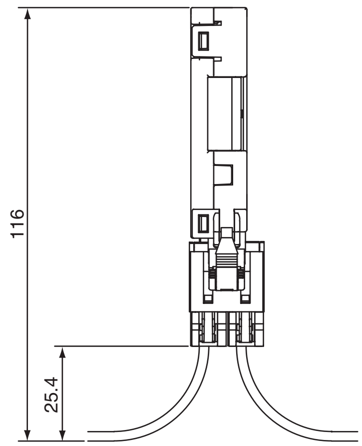
■ When a DCN5-BR4 Flat Connector Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ **When a DCN4-MD4 Multidrop Connector Is Mounted**



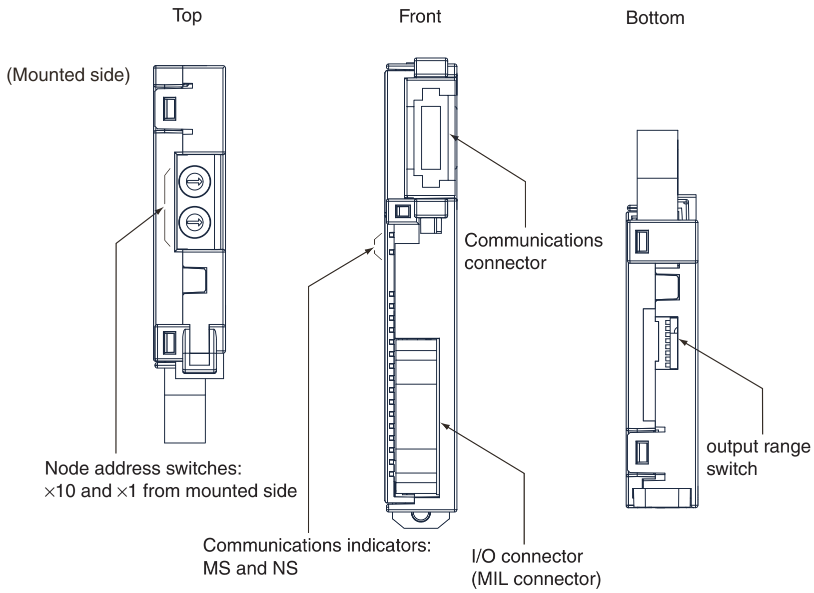
6-7-4 Two-point Analog Output Slave Unit (with MIL Connectors) CRT1-VDA02ML

General Specifications

Item		Specification	
		Voltage Output	Current Output
Model		CRT1-VDA02ML	
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.)
Conversion cycle		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 mount or mount for Mounting Bracket	
Power supply type		Multi-power supply	
Communications power current consumption		105 mA max. for 24-VDC power supply 170 mA max. for 14-VDC power supply	
Weight		75 g max.	

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

Component Names and Functions



Indicator Section

Communications Indicators

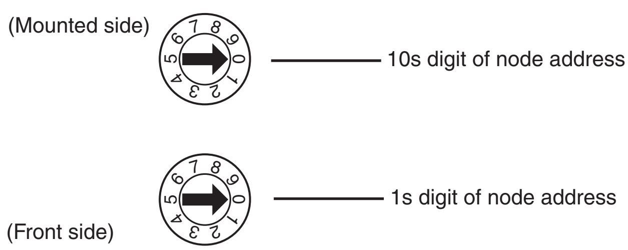
Refer to *4-1-3 Communications Indicators*.

Switch

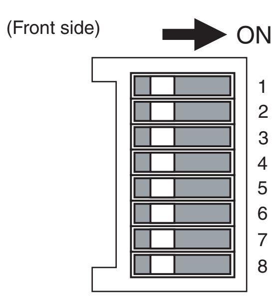
Setting the Node Address

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.)

Rotary switch settings are read when power is turned ON.



Output range switch



Pin No.	Setting	Specification
1	Range settings for output CH0	See the next table Default setting: All pins OFF
2		
3		

Pin No.	Setting	Specification
4	Range settings for output CH1	See the next table 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 CX-Integrator. 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 power is turned ON.

■ **Range for output CH0**

Output 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

■ **Range for output CH1**

Output 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

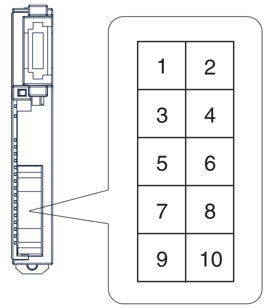
Note Do not set the DIP switches or pins other than as specified in the table above.

Terminal Arrangements

Communications Connector

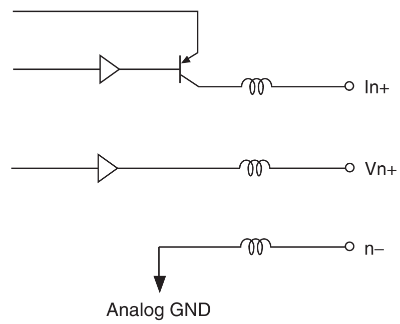
BS+	Communications power supply +
BDH	Communications data high
BDL	Communications data low
BS–	Communications power supply –

I/O Connector



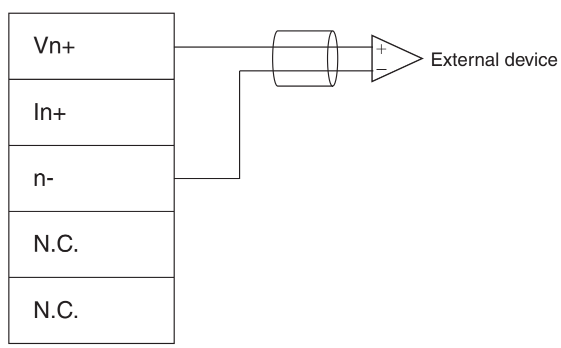
Pin No.	Signal name	Pin No.	Signal name
1	V0 + (Voltage output+)	2	V1 + (Voltage output+)
3	I0 + (Current output+)	4	I1 + (Current output+)
5	0 – (Voltage/current output–)	6	1 – (Voltage/current output–)
7	N.C.	8	N.C.
9	N.C.	10	N.C.

Internal Circuits

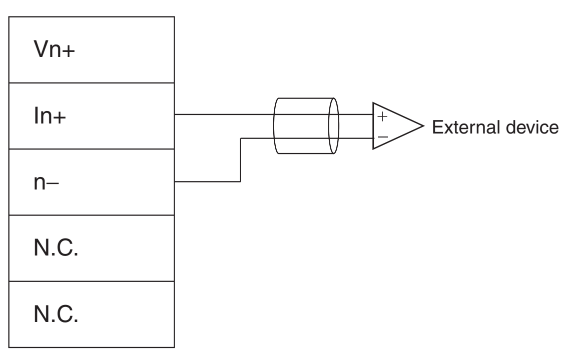


Wiring

Wiring for Voltage Output

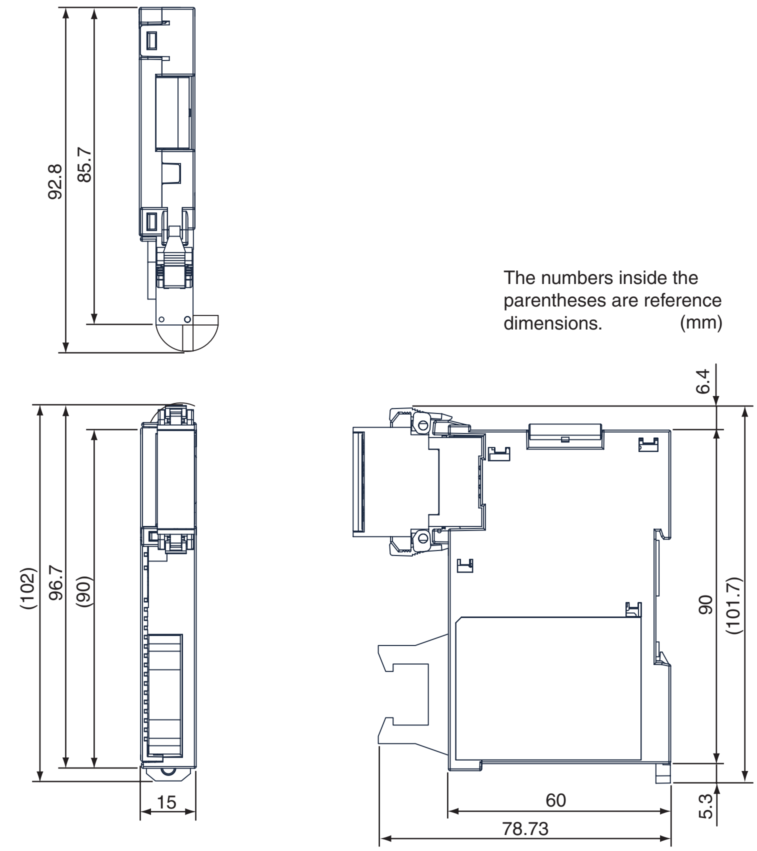


Wiring for Current Output



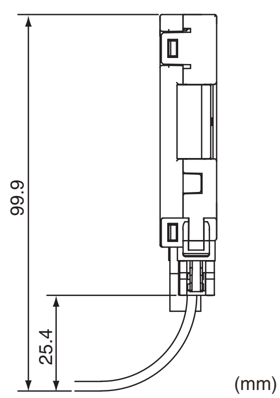
Dimensions

When a DCN4-TB4 Open Type Connector Is Mounted

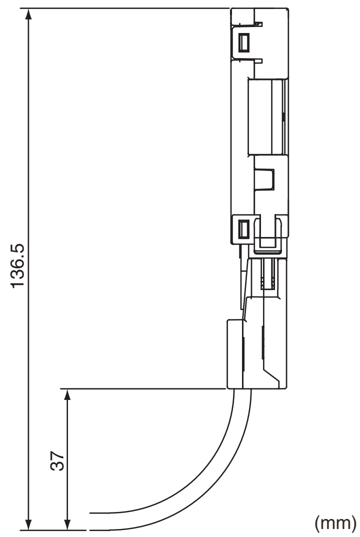


Communications Connector Dimensions Including the Connector and Cable

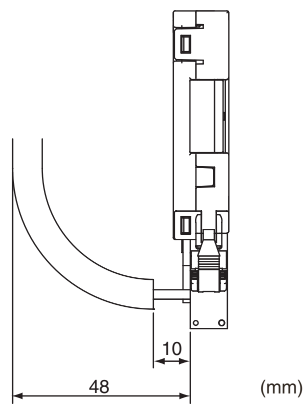
■ When a DCN4-BR4 Flat Connector Plug Is Mounted



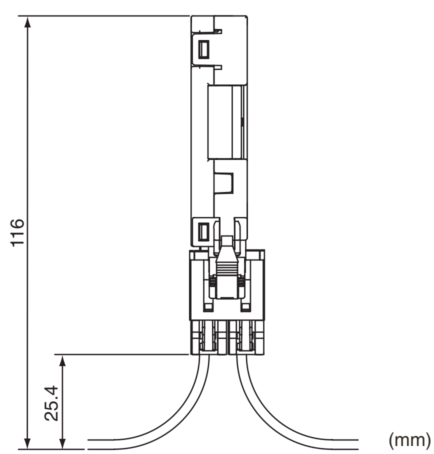
■ When a DCN5-BR4 Flat Connector Plug Is Mounted



■ When a DCN4-TB4 Open Type Connector Is Mounted



■ When a DCN4-MD4 Multidrop Connector Is Mounted



SECTION 7
Temperature Input Units

This section describes the Temperature Input Units.

7-1 Temperature Input Units

7-1-1 Temperature Input Units

A Temperature Input Unit supports a variety of functions, such as scaling and peak/bottom hold functions. They can internally perform math operations on temperature input values, which previously required ladder programming at a host PLC.

Temperature data can be obtained from math operations and allocated as I/O in combination with Temperature Status Flags or other status information. The CX-Integrator can be used to easily allocate and monitor status information, set Temperature Input Unit functions, and monitor data.

7-1-2 List of Data Processing Functions

The following tables list the data processing functions that can be used with Temperature Input Units. Refer to *11-6 Temperature Input Unit Functions* for details on functions and setting methods.

Function		Details	Default
Moving average		Calculates the average of the past eight temperature input values, and produces a stable input value even when the input value is unsteady.	Moving average disabled.
Scaling		Performs scaling. Scaling allows conversion of temperature input values into values using the industry unit required by the user. It reduces the number of operations requiring ladder programming in the master PLC Unit. Scaling also supports an offset function for compensating for mounting errors in sensors and other devices.	Disabled 0 to 28,000
Peak/bottom hold		Holds the maximum and minimum temperature input values.	Disabled
Top/valley hold		Holds the top and valley temperature input values.	Disabled
Rate of change		Calculates the rate of change for temperature input values for each sampling period.	Disabled
Comparator		Temperature input value or data after calculation (peak value, bottom value, top value, valley value, rate of change) are compared to 4 types of set values: Alarm Trip Point High (HH), Warning Trip Point High (H), Warning Trip Point Low (L), and Alarm Trip Point Low (LL) and the results are provided using the Temperature Data Status Flag.	Disabled
Input Error Detection Disable Function		Can be used to disable detection of input errors (including disconnection). This function is used when there are unused inputs.	Disabled
Off-wire detection		Detects disconnections of analog inputs.	Enabled
User adjustment		Can be used to adjust the input value when an offset occurs due to hardware errors.	Disabled
Last maintenance date		Records the date of the last maintenance in the Unit.	2008/10/1
Input temperature variation detection function		Makes a relative comparison of two inputs and detects a temperature difference between two inputs.	Disabled
Replacement monitoring functions	Temperature integration function	Compiles the total heat exposure of a device or sensor by multiplying the temperature and measurement time.	Disabled
	Top/Valley count function	Counts the number of heating cycles handled by a device or application that has fixed cycles of temperature changes.	Disabled
	Temperature Range Count	Measures how long the system is at a user-set temperature or within a user-set temperature range.	Disabled

Note Data will be undefined if default values are set using the CX-Integrator or other Support Software.

7-1-3 Temperature Input Unit Display Modes

Temperature Input Units have two Display Modes: normal and 1/100 display.

Normal Display Mode (Default Setting)

The input temperature data is converted to 4-digit hexadecimal digital data and transmitted to the Master Unit. If the conversion data is negative, the negative value is expressed as the two's complement.

Four words are allocated in the Master Unit for the four inputs, as shown in the following diagram. If the data for the input type contains a digit below the decimal place, the value sent to the master will be 10 times the actual value. (The decimal point is omitted.)

	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
First word + 0CH	Input CH0 Temperature conversion data
First word + 1CH	Input CH1 Temperature conversion data
First word + 2CH	Input CH2 Temperature conversion data
First word + 3CH	Input CH3 Temperature conversion data

- Example 1: R type thermocouple at 1,000°C
  1,000 converted to hexadecimal → 03E8 hex
- Example 2: U type thermocouple at 350.0°C
  $350 \times 10 = 3{,}500$ converted to hexadecimal → 0DAC hex

1/100 Display Mode

The input temperature data for all input types is transmitted to the Master as data with precision to 0.01 digits. The temperature data is multiplied by 100 and converted to 8-digit hexadecimal digital data (four long values).

If the conversion data is negative, the negative value is expressed as the two’s complement.

Eight words are allocated in the Master Unit for the four inputs, as shown in the following diagram.

	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
First word + 0CH	Input CH0 Temperature conversion data (rightmost)
First word + 1CH	Input CH0 Temperature conversion data (leftmost)
First word + 2CH	Input CH1 Temperature conversion data (rightmost)
First word + 3CH	Input CH1 Temperature conversion data (leftmost)
First word + 4CH	Input CH2 Temperature conversion data (rightmost)
First word + 5CH	Input CH2 Temperature conversion data (leftmost)
First word + 6CH	Input CH3 Temperature conversion data (rightmost)
First word + 7CH	Input CH3 Temperature conversion data (leftmost)

- Example 1: 850.00°C

  850 × 100 = 85,000 converted to hexadecimal → 0001 4C08 hex

  Rightmost data = 4C08 hex; Leftmost data = 0001 hex
- Example 2: –200.00°C

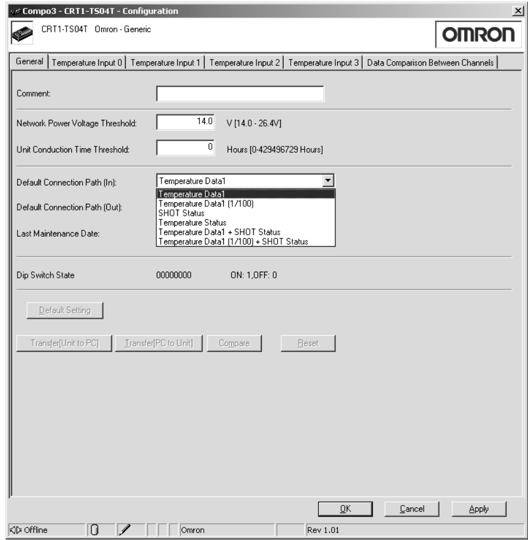
  –200 × 100 = –20,000 converted to hexadecimal → FFFF B1E0 hex

  Rightmost data = B1E0 hex; Leftmost data = FFFF hex

Setting the 1/100 Display Mode

1,2,3...

1. Turn ON power supply to the Temperature Input Unit.
2. With the CX-Integrator, double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit*** to open the Configuration Window.
3. Click the **General** Tab and select *Temperature Data1 (1/100)* in the *Default Connection Path (In)* Field.



4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

Note

1. The 1/100 Display Mode must be enabled by setting the connection path with the CX-Integrator.
   If the Normal Display Mode is selected for the I/O data from the CX-Integrator, the temperature data will change to 0.
2. In 1/100 Display Mode, the temperature data will be converted to two decimal places even though the actual resolution is not 0.01°C (or °F). Consequently, the display for temperatures in 0.1 °C/°F or 0.01 °C/°F ranges may jump back and forth between values. Treat any values displayed in Normal Display Mode beyond the specified input resolution as reference data.

7-2 Overview of Temperature Input Units

7-2-1 Math Operations and Processing Input Data

Performing Math Operations on Input Data

The following math operations can be performed on external temperature input values.

- Scaling to user-specified industrial units
- Moving average processing

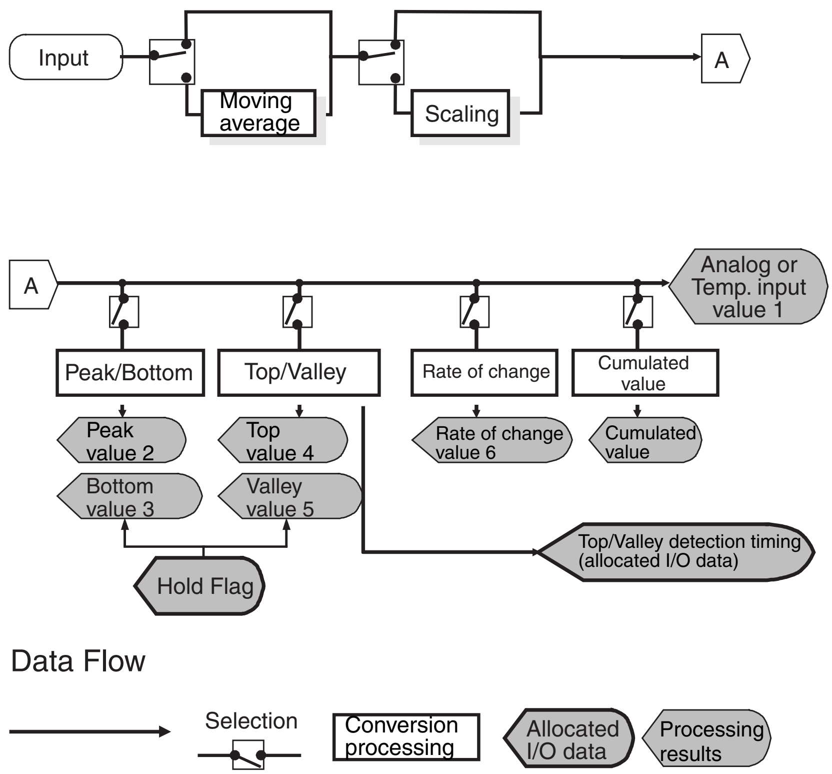
Processed data can be allocated as I/O in the Master Unit.

The following math operations can be performed on temperature input values that have undergone the above processing.

- Peak/hold operation
- Top/valley operation
- Rate of change calculations
- Cumulative operation

The values after processing are called peak value, bottom value, top value, valley value, rate of change, and cumulated value.

Math operations are performed according to the following flowchart.



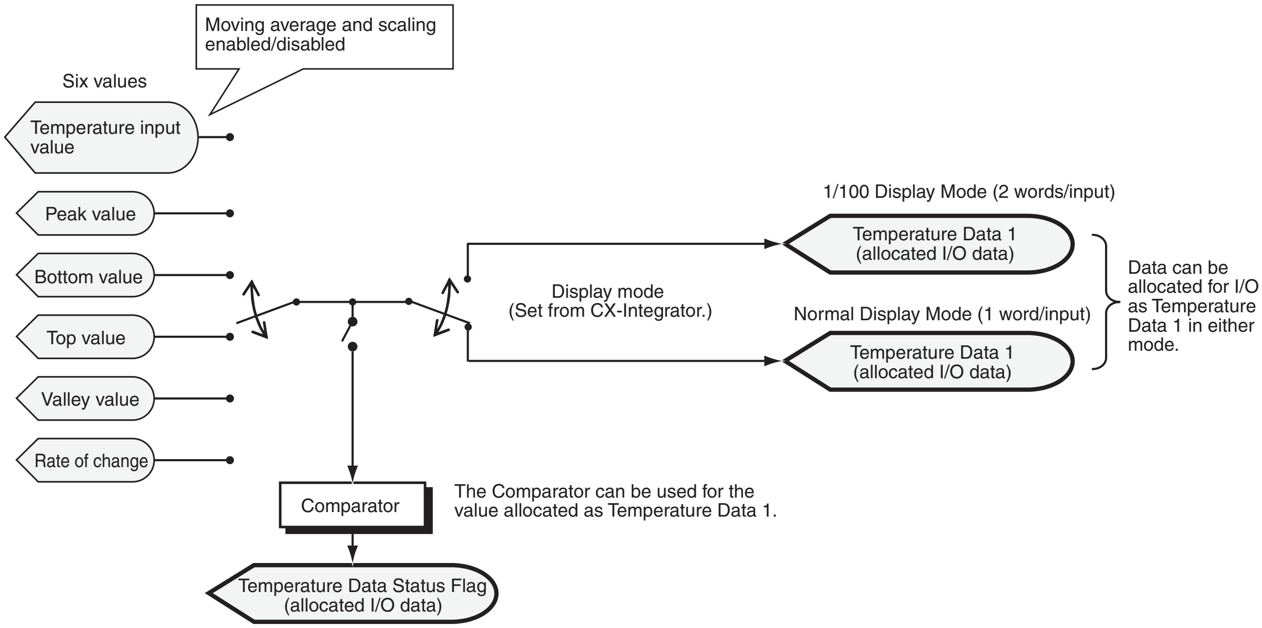
Selecting Allocation Data

After performing math operations, select the data to be allocated to I/O in the Master Unit from the following six values: temperature input value, peak value, bottom value, top value, valley value, and rate of change. The selected data will be Temperature Data 1, and can be allocated in the Master Unit alone or in combination with Status Flags. The data is selected using the CX-Integrator or explicit messages.

Comparison with four alarm set values, HH, H, L, and LL can be performed for Temperature Data 1. This is called the comparator function.

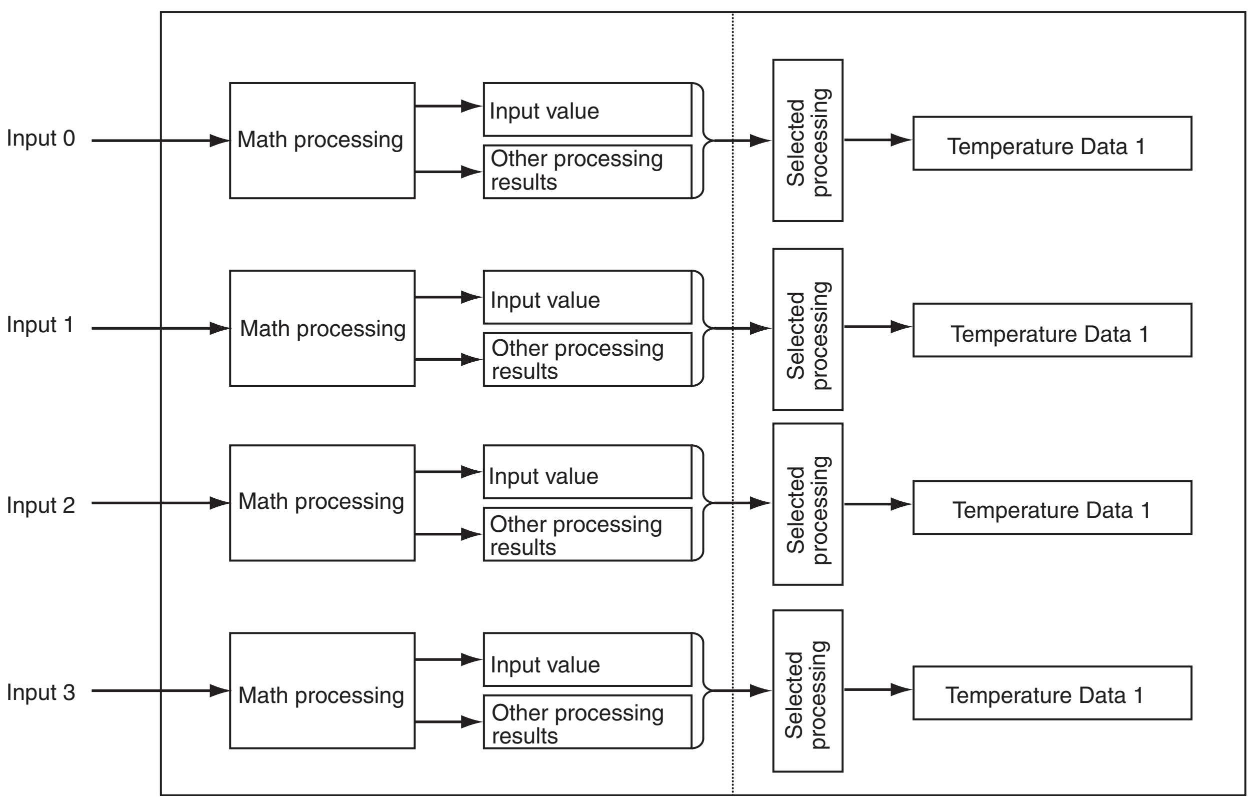
Flow of Data in Temperature Input Units

In a Temperature Input Unit, it is possible to switch the display mode of the data selected from the six values. The Display Mode can be the Normal Display Mode or the 1/100 Display Mode. The data can be allocated in either mode for Temperature Data 1.



Note By default, the temperature input value will be allocated as I/O.

Temperature Data 1 can be set separately for each input, as shown in the following diagram.



7-2-2 I/O Data Type and Allocation

A Temperature Input Unit support the following four types of input data and one type of output data. Required data can be allocated to I/O and used. Data is allocated using the CX-Integrator.

Input Data

Input data	Description
Temperature Data 1 Normal Display: 4 input words (8 bytes) 1/100 Display: 8 input words (16 bytes)	• Allocated to monitor temperature data. • Select one of the following values: temperature input value, peak value, bottom value, top value, valley value, or rate of change. (The temperature input value is allocated by default.) **Note** The comparator function can be used with the value allocated as Temperature Data 1.
Top/Valley Detection Timing Flags (1 input word (2 bytes))	Top/Valley Detection Timing Flags are allocated to one input word. These flags are allocated together with the top/valley value and used to time the reading of value held as the top or valley value.
Temperature Data Status Flag (2 input words (4 bytes))	These words contain 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 even if temperature input value is not allocated. • Top/Valley Detection Timing Flags: These flags are allocated together with the top/valley value and used to time the reading of value held as the top or valley value. • Off-wire Detection Flags: Disconnections can be detected even when the temperature input value is not allocated.
Temperature Data 1 + Top/Valley Detection Timing Flags Normal Display: 5 input words (10 bytes) 1/100 Display: 9 input words (18 bytes)	These words contain Temperature Data 1 followed by the Top/Valley Detection Timing Flags.

Output Data

Output data	Description
Hold Flags 1 output word (2 bytes)	These flags are used with the hold functions (peak, bottom, top, and valley) to control the execution timing of hold functions from the Master Unit.

Note Data can be allocated using other data combinations if an OMRON CS/CJ-series Master Unit is used. The settings are made in the Master Unit.

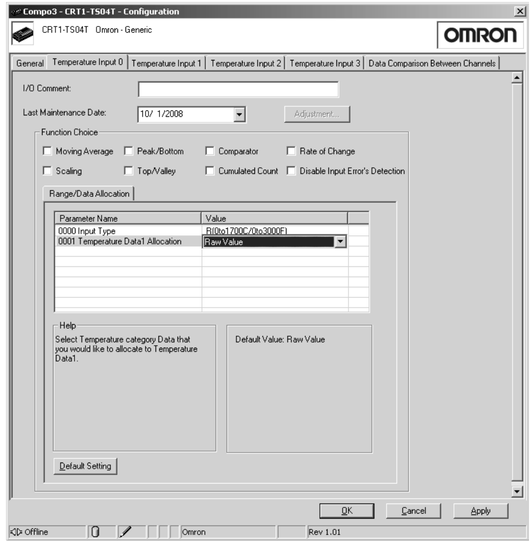
Selecting Temperature Data

The data can be selected from six calculated values to allocate as Temperature Data 1. Select one of the following: temperature input value, peak value, bottom value, top value, valley value, or rate of change. The selected data is allocated in the Master Unit alone or in combination with Status Flags.

Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the table for the input where the temperature data is to be selected and select the data to allocated in the *Allocate Temperature Data 1* Field.



4. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

Selecting I/O Data for Allocation

Use one of the following methods to select data for allocation and then perform remote I/O communications.

1,2,3...

1. Allocating only the temperature input values (default I/O data)
2. Allocating selected I/O data patterns (fixed I/O data combinations)

■ Allocating Only the Temperature Input Values

When using the Temperature Input Unit's default settings, only the temperature input values are selected as 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
First word + 0CH	**Temperature Input Value for Input CH0**
First word + 1CH	**Temperature Input Value for Input CH1**
First word + 2CH	**Temperature Input Value for Input CH2**
First word + 3CH	**Temperature Input Value for Input CH3**

If the 1/100 Display Mode is set for the temperature input value with the CX-Integrator, eight words (sixteen bytes) will be allocated in the Master's Input Area, as shown in the following diagram.

	15 0
First word + 0CH	**Temperature Input Value for Input CH0, Lower Word**
First word + 1CH	**Temperature Input Value for Input CH0, Upper Word**
First word + 2CH	**Temperature Input Value for Input CH1, Lower Word**
First word + 3CH	**Temperature Input Value for Input CH1, Upper Word**
First word + 4CH	**Temperature Input Value for Input CH2, Lower Word**
First word + 5CH	**Temperature Input Value for Input CH2, Upper Word**
First word + 6CH	**Temperature Input Value for Input CH3, Lower Word**
First word + 7CH	**Temperature Input Value for Input CH3, Upper Word**

■ Allocating Selected I/O Data Patterns

Data such as Status Flags can be allocated together with Temperature Data 1 as I/O in the following combinations. The data to be combined can be selected from the CX-Integrator.

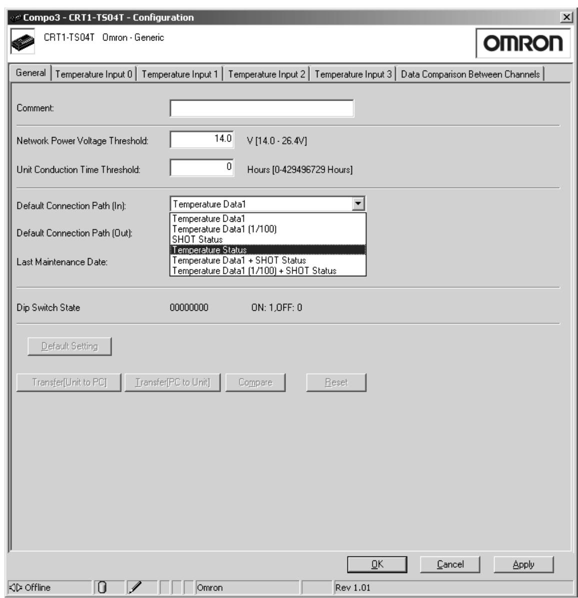
Example: Allocating Temperature Data 1 + Top/Valley Detection Timing Flags in the Master Unit using normal display.

	15 8	7 0
First word + 0CH	**Temperature Data 1 for Input CH0**	
First word + 1CH	**Temperature Data 1 for Input CH1**	
First word + 2CH	**Temperature Data 1 for Input CH2**	
First word + 3CH	**Temperature Data 1 for Input CH3**	
First word + 4CH	**Top Detection Timing Flag**	**Valley Detection Timing Flag**

■ Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the **General** Tab and select an I/O data pattern in the *Default Connection Path (In)* Field. The following example shows selecting the temperature data and status flags.



4. Click the **Transfer [PC to Unit]** Button to download the data and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

I/O Data

Temperature Data 1

Temperature Data 1 is used to monitor the temperature input value. The temperature input value is allocated as the default setting, but any of the following data can be allocated: temperature input value, peak value, bottom value, top value, valley value, or rate of change.

Note The comparator function can be used for the data allocated as Temperature Data 1.

The following tables show the data format used for allocating data in the Master Unit.

Data is allocated as two's complements.

Normal Display (4 Words (8 Bytes))

	15 0
First word + 0CH	Temperature Data 1 for Input CH0
First word + 1CH	Temperature Data 1 for Input CH1
First word + 2CH	Temperature Data 1 for Input CH2
First word + 3CH	Temperature Data 1 for Input CH3

1/100 Display Mode (8 Words (16 Bytes))

	15 0
First word + 0CH	Temperature Data 1 for Input CH0, Lower Word
First word + 1CH	Temperature Data 1 for Input CH0, Upper Word
First word + 2CH	Temperature Data 1 for Input CH1, Lower Word
First word + 3CH	Temperature Data 1 for Input CH1, Upper Word
First word + 4CH	Temperature Data 1 for Input CH2, Lower Word
First word + 5CH	Temperature Data 1 for Input CH2, Upper Word
First word + 6CH	Temperature Data 1 for Input CH3, Lower Word
First word + 7CH	Temperature Data 1 for Input CH3, Upper Word

Top/Valley Detection Timing Flags

These flags turn ON for the one-shot time when a top or valley is detected for the top/valley hold function. These flags are allocated when detecting the time to read the values held as the top or valley values at the Master Unit. The following data format is used when these flags are allocated in the Master Unit (1 word (2 bytes)).

15 8	7 0
+1	+0

	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	Lower byte
+1	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	Upper byte

Each bit is described in the following table.

Byte	Abbreviation	Name	Description
+0	V_STx	Valley Detection Timing Flag	Turns ON when a valley is detected by the top/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/valley 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 *11-6-4 Top/Valley Hold*.

Temperature Data Status Flag

The Temperature Status Flags include the Comparator Result Flag, the Top/Valley Detection Timing Flags, and the Disconnected Line Detection Flags. These flags are allocated for detection and monitoring. The data format used for each byte when these flags are allocated in the Master Unit is shown below (2 words (4 bytes)).

15 8	7 0
+1	**+0**
+3	**+2**

	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 CH0	Lower byte
+1	BW1	T_ST1	V_ST1	HH1	H1	PS1	L1	LL1	Input CH1	Upper byte
+2	BW2	T_ST2	V_ST2	HH2	H2	PS2	L2	LL2	Input CH2	Lower byte
+3	BW3	T_ST3	V_ST3	HH3	H3	PS3	L3	LL3	Input CH3	Upper byte

Each bit is described in the following table.

Bit	Abbrevi-ation	Name		Description
0	LLx	Compara-tor result	Low Low Limit Alarm Flag	Turns ON when the value of data allocated in Temperature Data 1 drops below the Low Low Limit alarm setting.
1	Lx		Low Limit Alarm Flag	Turns ON when the value of data allocated in Temperature Data 1 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 Temperature Data 1 exceeds the High Limit alarm setting.
4	HHx		High High Limit Alarm Flag	Turns ON when the value of data allocated in Temperature Data 1 exceeds the High High Limit alarm setting.
5	V_STx	Top/Val-ley Detec-tion Timing Flag	Valley Detec-tion Timing Flag	Turns ON when a valley is detected by the top/valley hold function and then turns OFF after the one-shot time has elapsed.
6	T_STx		Top Detection-Timing Flag	Turns ON when a top is detected by the top/valley hold function and then turns OFF after the one-shot time has elapsed.
7	BWx	Off-wire Detection Flag		Turns ON when a disconnection is detected.

Temperature Data 1 + Top/ Valley Detection Timing Flags

This data pattern consists of Temperature Data 1 followed by the Top/Valley Detection Timing Flags. It is allocated in the Master Unit using the following data format.

Normal Display (5 Words (10 Bytes))

15 8	7 0
+1	+0
+3	+2
+5	+4
+7	+6
+9	+8

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
+0	Temperature Data 1 for Input CH0								Lower byte
+1									Upper byte
+2	Temperature Data 1 for Input CH1								Lower byte
+3									Upper byte
+4	Temperature Data 1 for Input CH2								Lower byte
+5									Upper byte
+6	Temperature Data 1 for Input CH3								Lower byte
+7									Upper byte
+8	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0	Lower byte
+9	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	Upper byte

1/100 Display Mode (9 Words (18 Bytes))

15 8	7 0
+1	+0
+3	+2
+5	+4
+7	+6
+9	+8
+11	+10
+13	+12
+15	+14
+17	+16

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
+0	Temperature Data 1 for Input CH0, Lower Word								Lower byte
+1									Upper byte
+2	Temperature Data 1 for Input CH0, Upper Word								Lower byte
+3									Upper byte
+4	Temperature Data 1 for Input CH1, Lower Word								Lower byte
+5									Upper byte
+6	Temperature Data 1 for Input CH1, Upper Word								Lower byte
+7									Upper byte
+8	Temperature Data 1 for Input CH2, Lower Word								Lower byte
+9									Upper byte
+10	Temperature Data 1 for Input CH2, Upper Word								Lower byte
+11									Upper byte
+12	Temperature Data 1 for Input CH3, Lower Word								Lower byte
+13									Upper byte
+14	Temperature Data 1 for Input CH3, Upper Word								Lower byte
+15									Upper byte
+16	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0	Lower byte
+17	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	Upper byte

Hold Flags (Output)

The Hold Flags are used with the peak/bottom hold and top/valley hold functions. They are used to control the hold execution timing from the Master Unit. They are allocated in the Master Unit using the following data format (1 word (2 bytes)).

15 ... 8	7 ... 0
+1	+0

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

Each bit is described in the following table.

Bit	Abbreviation	Name	Description
0	HD0	Hold Flag for Input 0	The hold function is performed for Temperature 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 Temperature Input 1 while this flag is ON. The hold function stops and the last value is held when the flag goes OFF.
2	HD2	Hold Flag for Input 2	The hold function is performed for Temperature 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 Temperature Input 3 while this flag is ON. The hold function stops and the last value is held when the flag goes OFF.

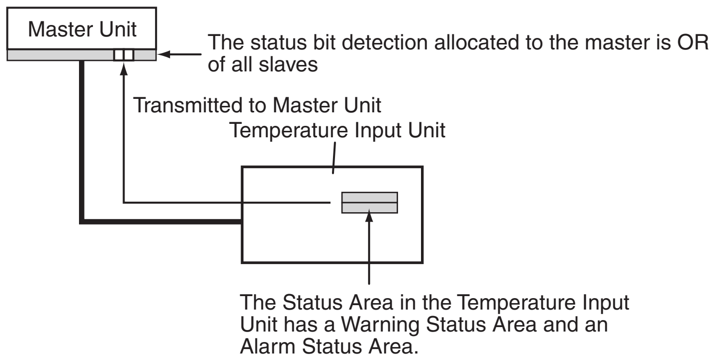
Note A transmission delay may occur between when the Master Unit's power is turned ON and the status of the Hold Flag is transferred to the Temperature Input Unit.

7-3 Status Areas

A Temperature Input Unit has two status areas. The flags are turned ON and OFF based on the threshold values set by the user for each function in that Unit.

When any of the bits in the status area of the slaves connected to the Master Unit turns ON, the corresponding bit (bit 12 is for warning status area notices and bit 13 is for alarm area notices) of the status flag in the Master Unit turns ON.

The Temperature Input Unit's status area information can be read by using the CX-Integrator or explicit messages.



Warning Status Area

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

Bit	Content	Description
0	Reserved.	Cannot be used.
1	Reserved.	Cannot be used.
2	Network Power Voltage Drop Flag OFF: Normal ON: Error (Voltage dropped below threshold.)	Turns ON when the Network Power Voltage drops below the voltage set as the threshold for monitoring.
3	Unit Maintenance Flag OFF: Normal ON: Error (Threshold exceeded.)	Turns ON when the Total Unit Conduction Time exceeds the value set as the threshold for monitoring.
4	Reserved.	Cannot be used.
5	Reserved.	Cannot be used.
6	Reserved.	Cannot be used.
7	Reserved.	Cannot be used.
8	Temperature Input Warning Flag OFF: Within range (below set monitor value) ON: Out-of-range (equal to or above set monitor value)	Turns ON when the temperature data exceeds the displayable range or the monitor value set for the comparator function.
9	Cumulative Counter Exceeded Flag OFF: Within range (below set monitor value) ON: Out-of-range (equal to or above set monitor value)	Turns ON when the cumulative value exceeds the set monitor value.
10	Input Temperature Variation Detection Threshold Exceeded Flag OFF: Within range (below set monitor value) ON: Out-of-range (equal to or above set monitor value)	Turns ON when the difference between input temperatures exceed the set monitor value.
11	Set Temperature Range Total Time Exceeded Flag OFF: Within range (below set monitor value) ON: Out-of-range (equal to or above set monitor value)	Turns ON when time in the set temperature range exceeds the set monitor value.

Bit	Content	Description
12	Number of Top/Valley Exceeded Set Value Flag OFF: Within range (below set monitor value) ON: Out-of-range (equal to or above set monitor value)	Turns ON when the number of tops or valleys exceeds the set monitor value.
13	Reserved.	Cannot be used.
14	Reserved.	Cannot be used.
15	Reserved.	Cannot be used.

Alarm Status Area

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

Bit	Content	Description
0	Reserved.	Cannot be used.
1	EEPROM Data Error Flag OFF: Normal ON: Error	Turns ON when there is an error with data in the EEPROM.
2	Reserved.	Cannot be used.
3	Reserved.	Cannot be used.
4	Reserved.	Cannot be used.
5	Reserved.	Cannot be used.
6	Reserved.	Cannot be used.
7	Reserved.	Cannot be used.
8	Disconnected Line Detection Flag OFF: Normal or input error detection is disabled ON: Disconnected line detected or cold junction compensator error occurred	Turns ON when the line is disconnected or when there is a Cold Junction Compensator Error.
9	Cold Junction Compensator Off-wire Flag (CRT1-TS04T only) OFF: Normal ON: Disconnected line detected	Turns ON when the cold junction compensator is disconnected.
10	Reserved.	Cannot be used.
11	Reserved.	Cannot be used.
12	Reserved.	Cannot be used.
13	Reserved.	Cannot be used.
14	Reserved.	Cannot be used.
15	Reserved.	Cannot be used.

7-4 Monitoring Temperature Data

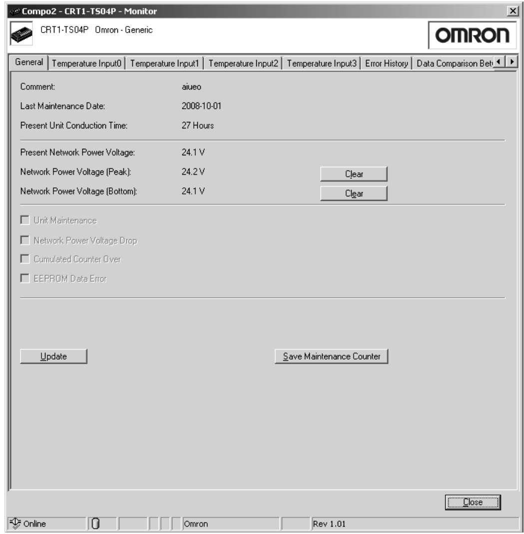
The Monitor Window of the CX-Integrators can be used to monitor the set values and current status of temperature data, and to check Unit maintenance information.

With the CX-Integrator connected online, right-click a Temperature Input Unit icon in the Network Configuration Window and select ***Monitor*** from the pop-up menu to display the Monitor Window. The check boxes (flags) shown in the following table will be selected if the corresponding error had occurred.

Refer to *11-1 CX-Integrator* on page 481 for details on the CX-Integrator.

Monitor Window

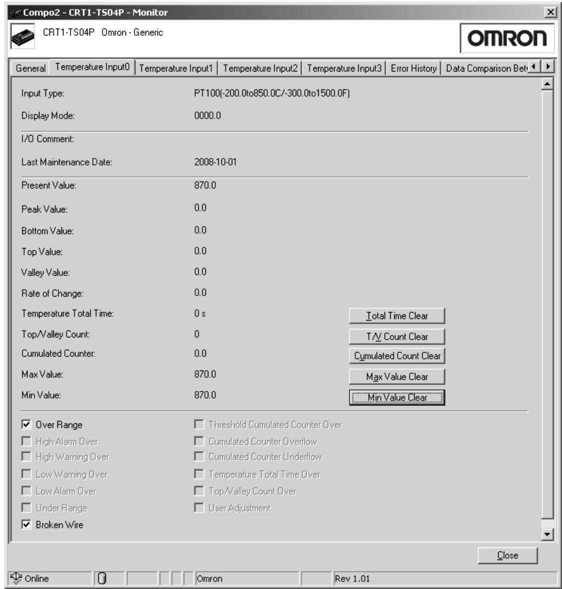
General Tab Page



Item		Description
Monitor Display	Comment	Displays the text set as the Unit comment.
	Last Maintenance Date	Displays the last maintenance date that was set.
	Present Unit Conduction Time	Displays the total time that the Unit has been ON (cumulative power ON time).
	Present Network Power Voltage	Displays the present network power supply voltage.
	Network Power Voltage (Peak)	Displays the maximum and minimum network power supply voltages up to the present time.
	Network Power Voltage (Bottom)	
Status Check Boxes	Unit Maintenance	Selected if the total Unit conduction time has exceed the monitor value set by the Unit Conduction Time Monitor Function.
	Network Power Voltage Drop	Selected if the network power supply voltage has fallen below the monitor value set by the Network Power Voltage Monitor Function.
	Cumulated Counter Over	Selected if any of the input's cumulative time counter values has exceeded the monitor value set by the Temperature Integration Function.
	EEPROM Data Error	Selected if a Unit Error has occurred in the Unit memory.
	Temperature Resistance Sensor Disconnected	Selected if a Temperature Resistance Sensor Disconnection error has occurred.
Buttons	Clear Button	Click this button to clear the displayed values.
	Update Button	Click this button to update the Maintenance information.
	Save Maintenance Counter Button	Click this button to save the Maintenance Counter Value in the Unit. The previous value is retained when the power supply is turned OFF and ON again.

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

Temperature Input Tab Page

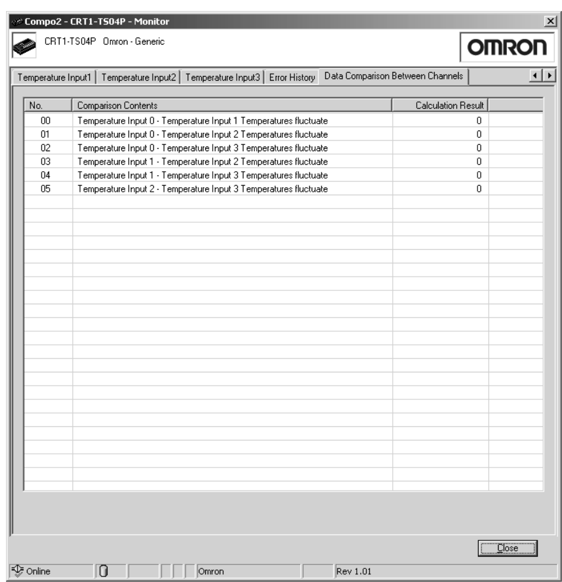


Item		Description
Monitor Display	Input Type	Displays the present input sensor type.
	Display Mode	Indicates the number of digits displayed. 0000: No decimal point 0000.0: One digit below the decimal point 0000.0: Two digits below the decimal point
	I/O Comment	Displays the text set as the connected device comment.
	Last Mainte-nance Date	Displays the last maintenance date that was set.
	Present Value	Displays the present temperature input value.
	Peak Value	Display the peak value, bottom value, top value, and valley value of the temperature data retained by the Unit.
	Bottom Value	
	Top Value	
	Valley Value	
	Rate of Change	Displays the rate of change in comparison to the previous sampling cycle.
	Temperature Total Time	Displays the total time the temperature has been within the set temperature range.
	Top/Valley Count	Displays the count measured by the Top/Valley Count Function.
	Cumulative Counter	Displays the total time calculated by the cumula-tive counter.
	Max Value	Displays the maximum and minimum values of the temperature data retained in the Unit.
	Min Value	

Item		Description
Status check boxes	Over Range	Selected when the temperature data is above the displayable range.
	High Alarm Over	Selected when the temperature data exceeds the monitor value set for the comparator function.
	High Warning Over	
	Low Warning Over	
	Low Alarm Over	
	Under Range	Selected when the temperature data is below the displayable range.
	Broken Wire	Selected when there is a disconnected wire.
	Threshold Cumulated Counter Over	Selected when the cumulated time exceeds the monitor value set for the Cumulative Temperature Function.
	Cumulative Counter Overflow	Selected when there is an overflow in the cumulative counter value.
	Cumulative Counter Underflow	Selected when there is an underflow in the cumulative counter value.
	Temperature Total Time Over	Selected when the present value in the set temperature range exceeds the monitor value.
	Top/Valley Count Over	Selected when the top or valley count exceeds the monitor value.
	User Adjustment	Selected when the user-set adjustment function is operating.
Buttons	Clear Buttons	Clear the displayed values

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

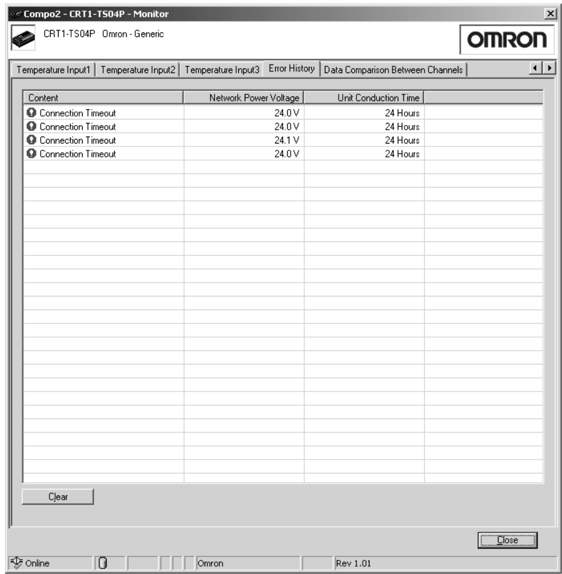
Data Comparison between Channels Tab Page



Item	Description
Comparison Contents	Displays the inputs used in the error calculation.
Calculation Result	Displays the calculation results.

Note If either of the comparison inputs is disconnected, the results will be 0.00

Error History Tab Page



Item	Description
Content	Displays the contents of the communications errors that 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.
Clear Button	Clears the error history.

7-5 Temperature Input Units

7-5-1 Temperature Input Units

Specifications

Item	Specifications	
Model	CRT1-TS04T	CRT1-TS04P
Input type	Switchable between R, S, K, J, T, E, B, N, L, U, W, and PL2 When set with CX-Integrator: Input types can be set individually for each input. Wen set with DIP switch: The same input type setting applies to all 4 inputs.	Switchable between PT100 (–200 to 850°C) and PT100 (–200 to 200°C) When set with CX-Integrator: Input types can be set individually for each input. Wen set with DIP switch: The same input type setting applies to all 4 inputs.

<table>
<tr><th>Item</th><th colspan="2">Specifications</th></tr>
<tr><td>Indicator accuracy</td><td>(±0.3% of indication value or ±1°C, whichever is larger) ±1 digit max. (See note.)

Indicator Accuracy in Exceptional Cases
<table>
<tr><th>Input type and temperature range</th><th>Input accuracy</th></tr>
<tr><td>K, T, and N below –100°C</td><td>±2°C ±1 digit max.</td></tr>
<tr><td>U and L</td><td>±2°C ±1 digit max.</td></tr>
<tr><td>R and S below 200°C</td><td>±3°C ±1 digit max.</td></tr>
<tr><td>B below 400°C</td><td>Not specified.</td></tr>
<tr><td>W</td><td>±0.3% of indication value or ±3°C (whichever is larger) ±1 digit max.</td></tr>
<tr><td>PL2</td><td>±0.3% of indication value or ±2°C (whichever is larger) ±1 digit max.</td></tr>
</table></td><td>–200 to 850°C input range:
(±0.3% of indication value or ±0.8°C, whichever is larger) ±1 digit max.
–200 to 200°C input range:
(±0.3% of indication value or ±0.5°C, whichever is larger) ±1 digit max.</td></tr>
<tr><td>Conversion cycle</td><td colspan="2">250 ms/4 points</td></tr>
<tr><td>Temperature conversion data</td><td colspan="2">Binary data (4-digit hexadecimal when Normal Display Mode is selected or 8-digit hexadecimal when 1/100 Display Mode is selected.)</td></tr>
<tr><td>Isolation method</td><td colspan="2">Between input and communication lines: Photocoupler isolation
Between temperature input signals: Photocoupler isolation</td></tr>
<tr><td>Mounting method</td><td colspan="2">35-mm DIN track mounting (See note.)</td></tr>
<tr><td>Communications power supply current</td><td>75 mA max. at 24 VDC
110 mA max. at 14 VDC</td><td>75 mA max. at 24 VDC
110 mA max. at 14 VDC</td></tr>
<tr><td>Weight</td><td>148 g max.</td><td>147 g max.</td></tr>
</table>

Note There are specifications that apply to the mounting direction and input accuracy. Refer to the next page for details.

Effects of Mounting Direction on Accuracy

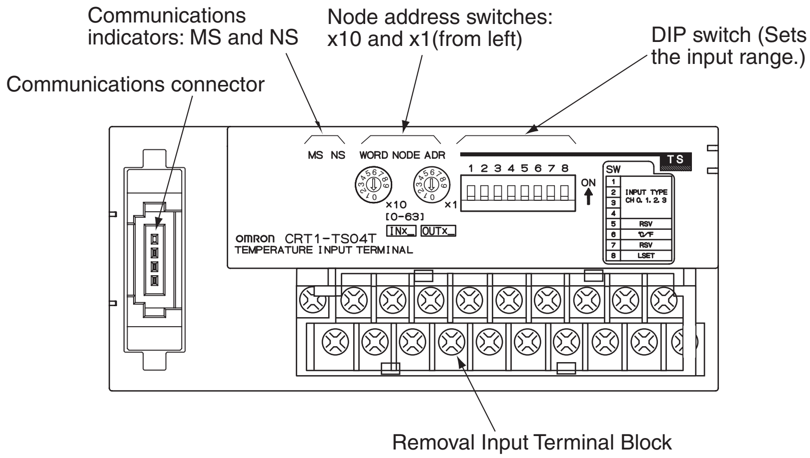
A cold junction compensator is included in the Terminal Block of the CRT1-TS04T. The input accuracy depends on the mounting direction if only the Unit is replaced.

<table>
<tr><th>Mounting direction</th><th>Input accuracy</th></tr>
<tr><td>Mounted normally</td><td>As specified in the Performance Specifications.</td></tr>
<tr><td>Mounted in any direction other than the above</td><td>±0.3% of indication value or ±2°C (whichever is larger) ±1 digit max.

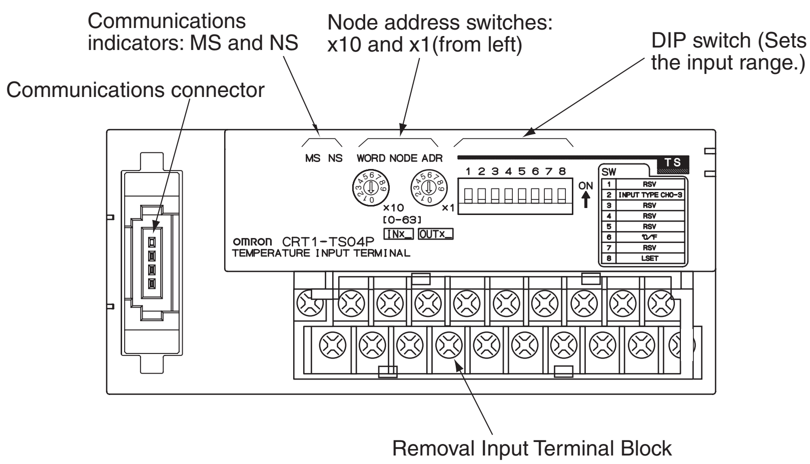
Indicator Accuracy in Exceptional Cases
<table>
<tr><th>Input type and temperature range</th><th>Input accuracy</th></tr>
<tr><td>K, T, and N below –100°C</td><td>±3°C ±1 digit max.</td></tr>
<tr><td>U and L</td><td>±3°C ±1 digit max.</td></tr>
<tr><td>R and S below 200°C</td><td>±4°C ±1 digit max.</td></tr>
<tr><td>B below 400°C</td><td>Not specified.</td></tr>
<tr><td>W</td><td>±0.3% of indication value or ±4°C (whichever is larger) ±1 digit max.</td></tr>
<tr><td>PL2</td><td>±0.3% of indication value or ±3°C (whichever is larger)</td></tr>
</table></td></tr>
</table>

Names and Functions of Parts

CRT1-TS04T



CRT1-TS04P



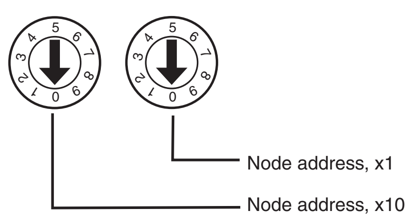
Display Section

Communications Indicators Refer to *4-1-3 Communications Indicators*.

Node Address Settings

The node address of the Temperature Input Unit is set as a decimal value using the left rotary switch for the ten's digit and the right rotary switch for the one's digit. (Up to 63 nodes can be set.)

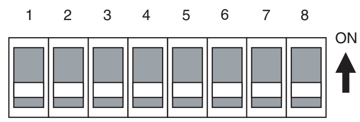
Note The rotary switch settings are read when the power is turned ON.



Setting the Input Type

Setting with the DIP Switch

The input type can be set using the DIP switch or the CX-Integrator.



Set each pin according to the following table.

Pin No.	Setting	Specifications
SW1	Sets the input type (input range)	Refer to the following table. Default setting: All pins OFF
SW2		
SW3		
SW4		
SW5	Always OFF	Always set this pin to OFF. Malfunctions may occur if it is set to ON.
SW6	Selects °C or °F display.	OFF: °C conversion ON: °F conversion Default setting: OFF
SW7	Always OFF	Always set this pin to OFF. Malfunctions may occur if it is set to ON.
SW8	Selects the input type setting method.	OFF: Set with CX-Integrator. ON: Set with DIP switch. **Note** When the input type is set with the DIP switch, all inputs are set to the same input type. To set different input types, use the CX-Integrator to make the settings.

CRT1-TS04T

SW1	SW2	SW3	SW4	Input type
OFF	OFF	OFF	OFF	R
ON	OFF	OFF	OFF	S
OFF	ON	OFF	OFF	K (–200 to 1300°C)
ON	ON	OFF	OFF	K (0.0 to 500.0°C)
OFF	OFF	ON	OFF	J (–100 to 850°C)
ON	OFF	ON	OFF	J (0.0 to 400.0°C)
OFF	ON	ON	OFF	T
ON	ON	ON	OFF	E
OFF	OFF	OFF	ON	L (–100 to 850°C)
ON	OFF	OFF	ON	L (0.0 to 400.0°C)
OFF	ON	OFF	ON	U
ON	ON	OFF	ON	N
OFF	OFF	ON	ON	W
ON	OFF	ON	ON	B
OFF	ON	ON	ON	PL2
ON	ON	ON	ON	Not used.

Note If the settings are incorrect, the MS Indicator will flash red and the Unit will not operate. In this case, make the settings again and reset the power supply.

CRT1-TS04P

SW1	SW2	SW3	SW4	Input type
Always OFF	OFF	Always OFF.		PT100 (–200 to 850°C)
	ON			PT100 (–200 to 200°C)

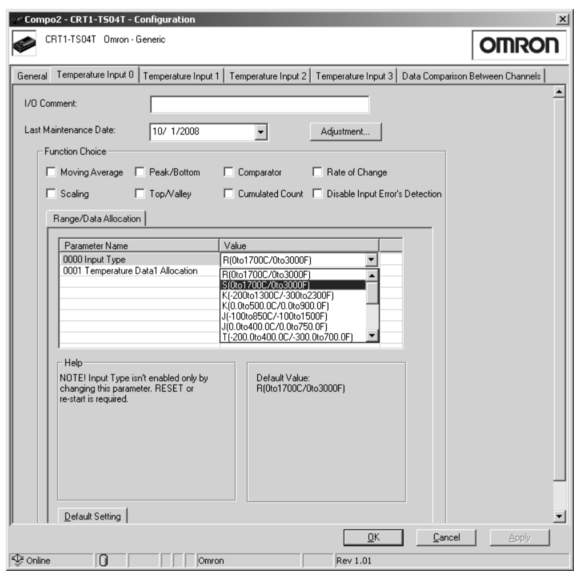
Note If the settings are incorrect, the MS Indicator will flash red and the Unit will not operate. In this case, make the settings again and reset the power supply.

Note
1. Always set pin 5 and pin 7 to OFF (default).
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.
4. °C/°F display settings cannot be set individually for each input.

Setting Using the CX-Integrator

Input types can be set for each temperature input using the CX-Integrator. Use the following procedure.

1,2,3...
1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where the input type is to be set and select an input type in the *Input Type* Field.



4. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

Temperature Ranges by Input Type

The following tables show the temperature ranges for each input type.

CRT1-TS04T

Input type	Temperature range (°C)	Temperature range (°F)
R	0 to 1,700	0 to 3,000
S	0 to 1,700	0 to 3,000
K (–200 to 1300°C)	–200 to 1,300	–300 to 2,300

Input type	Temperature range (°C)	Temperature range (°F)
K (0.0 to 500.0°C)	0.0 to 500.0	0.0 to 900.0
J (–100 to 850°C)	–100 to 850	–100 to 1,500
J (0.0 to 400.0°C)	0.0 to 400.0	0.0 to 750.0
T	–200.0 to 400.0	–300.0 to 700.0
E	0 to 600	0 to 1,100
L (–100 to 850°C)	–100 to 850	–100 to 1,500
L (0.0 to 400°C)	0.0 to 400.0	0.0 to 750.0
U	–200.0 to 400.0	–300.0 to 700.0
N	–200 to 1,300	–300 to 2,300
W	0 to 2,300	0 to 4,100
B	100 to 1,800	300 to 3,200
PL2	0 to 1,300	0 to 2,300

CRT1-TS04P

Input type	Temperature range (°C)	Temperature range (°F)
PT100 (–200 to 850°C)	–200.0 to 850.0	–300.0 to 1,500.0
PT100 (–200 to 200°C)	–200.0 to 200.0	–300.0 to 380.0

Note The temperature ranges listed above are the ranges in which the input accuracy is within the specified range.

Convertible Temperature Ranges

The convertible data range depends on the selected input type, as shown in the following tables.

CRT1-TS04T Data Ranges

Input type	°C	Display	°F	Display
R	–20 to 1,720	FFEC to 06B8	–20 o 3,020	FFEC to 0BCC
S	–20 to 1,720	FFEC to 06B8	–20 to 3,020	FFEC to 0BCC
K (–200 to 1,300°C)	–220 to 1,320	FF24 to 0528	–320 to 2,3200	FEC0 to 0910
K (0.0 to 500.0°C)	–20.0 to 520.0	FF38 to 1450	–20.0 to 920.0	FF38 to 23F0
J (–100 to 850°C)	–120 to 870	FF88 to 0366	–120 to 1,520	FF88 to 05F0
J (0.0 to 400.0°C)	–20.0 to 420.0	FF38 to 1068	–20.0 to 770.0	FF38 to 1E14
T	–220.0 to 420.0	F768 to 1068	–320.0 to 720.0	F380 to 1C20
E	–20 to 620	FFEC to 026C	–20 to 1,120	FFEC to 0460
L (–100 to 850°C)	–120 to 870	FF88 to 0366	–120 to 1,520	FF88 to 05F0
L (0.0 to 400.0°C)	–20.0 to 420.0	FF38 to 1068	–20.0 to 770.0	FF38 to 1E14
U	–220.0 to 420.0	F768 to 1068	–320.0 to 720.0	F380 to 1C20
N	–220 to 1,320	FF24 to 0528	–320 to 2,320	FEC0 to 0910
W	–20 to 2,320	FFEC to 0910	–20 to 4,120	FFEC to 1018
B	80 to 1,820	0050 to 071C	280 to 3,220	0118 to 0C94
PL2	–20 to 1,320	FFEC to 0528	–20 to 2,320	FFEC to 0910

Note 1. The display data will be clamped at the minimum value when the value is below the minimum display value but higher than the value at which an off-wire condition is detected.

2. When an off-wire condition is detected, the display data will be 7FFF. (In 1/100 Display Mode, the display data will be 7FFF FFFF.)

CRT1-TS04P Data Ranges

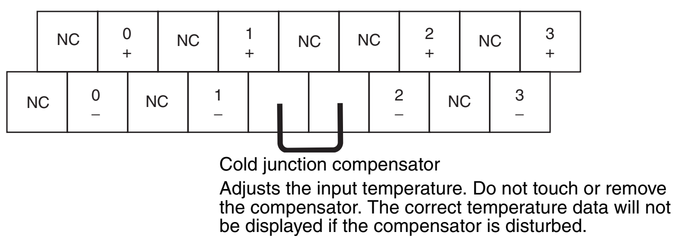
Input type	°C	Display	°F	Display
PT100 (–200 to 850°C)	–220.0 to 870.0	F768 to 21FC	–320.0 to 1,520.0	F380 to 3B60
PT100 (–200 to 200°C)	–220.0 to 220.0	F768 to 0898	–320.0 to 400.0	F380 o 0FA0

Note

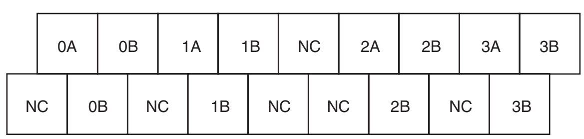
1. If the Unit is subjected to sudden temperature changes, moisture may condense in the Unit and cause incorrect indications. If there is condensation, remove the Unit from service and keep it at a steady temperature for about 1 hour before using it again.
2. If the input temperature exceeds the convertible range, the temperature data will be clamped at the minimum or maximum value.
   If the temperature exceeds the convertible range by a certain value, an off-wire condition (broken or disconnected input wire) will be detected and the temperature data will be set to 7FFF Hex. If the input temperature returns to the convertible range, the off-wire detection function will be reset automatically and normal conversion data will be stored.

Terminal Arrangement

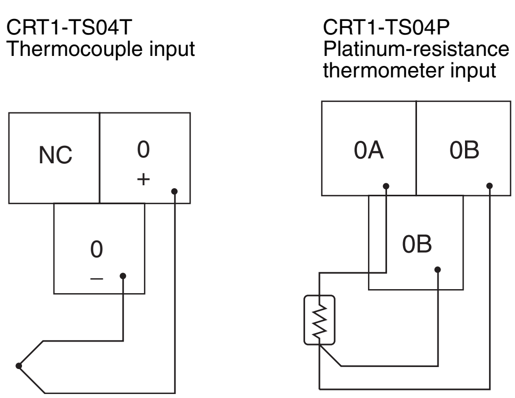
CRT1-TS04T



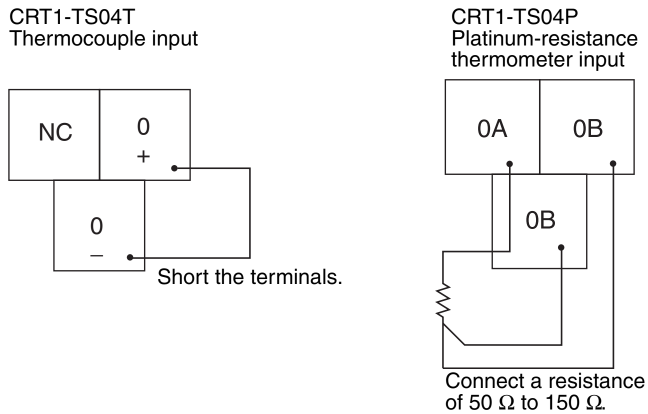
CRT1-TS04P



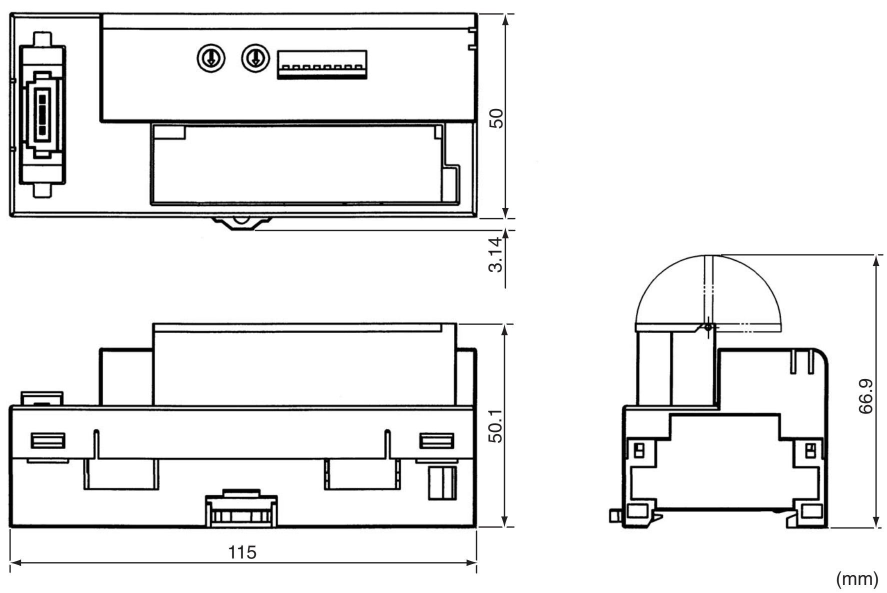
Wiring



Note If there are inputs that are not connected because they are not being used, an off-wire condition may be detected. To prevent an off-wire detection, wire the unused input terminals as shown in the following diagram. Alternatively, set the Input Error Detection Disable Function from the CX-Integrator.



Dimensions (Same for CRT1-TS04T and CRT1-TS04P)



SECTION 8
Expansion Units

This section describes the Expansion Units.

8-1 Expansion Units

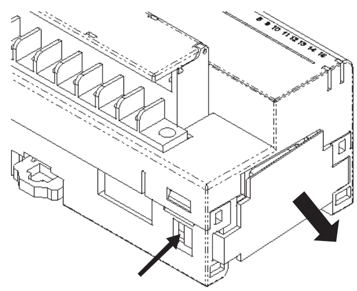
One Expansion Unit can be combined with one Digital I/O Slave Unit (CRT1-ID16(-1), CRT1-OD16(-1), CRT1-ROS16, or CRT1-ROF16). The following Expansion Units are available. They can be combined in various ways for flexible I/O capacity expansion.

Model	I/O points	Input capacity	Output capacity
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

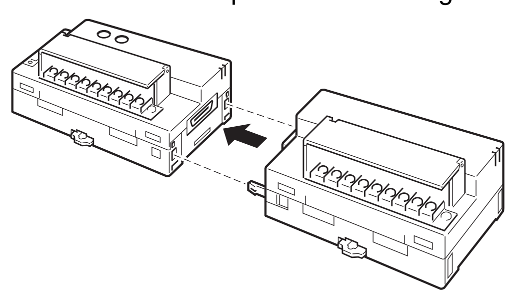
Installing Expansion Units

1,2,3...

1. Remove the cover from the right side of the Digital I/O Slave Unit.



2. Align the connector on the Expansion Unit with the connector on the Digital I/O Slave Unit and press the Units together.



3. Press the Expansion Unit and Digital I/O Slave Unit together until they click into place with the connectors properly mated.

I/O Power Supply

If an Expansion Input Unit is connected to a Digital Input Slave Unit, then I/O power must be supplied only to the Digital I/O Slave Unit. If any other combination of Units is used, I/O power must be supplied to both the Digital I/O Slave Unit and Expansion Unit. This includes connecting an Expansion Input Unit to a Digital Output Slave Unit, an Expansion Output Unit to a Digital Input Slave Unit, or an Expansion Output Unit to a Digital Output Slave 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
Digital Input Slave Unit with Expansion Input Unit Example: CRT1-ID16 + XWT-ID16	Not required. (The Expansion Unit uses the same I/O power supply as the Digital I/O Slave Unit.)
Digital Input Slave Unit with Expansion Output Unit Example: CRT1-ID16 + XWT-OD16	Required (I/O power must be supplied to both Units.)
Digital Output Slave Unit with Expansion Input Unit Example: CRT1-OD16 + XWT-ID16	Required (I/O power must be supplied to both Units.)
Digital Output Slave Unit with Expansion Output Unit Example: CRT1-OD16 + XWT-OD16	Required (I/O power must be supplied to both Units.)

Note Do not connect Expansion Units while the power supply is ON.

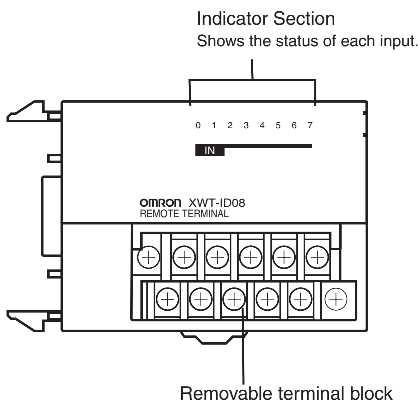
8-2 Expansion Unit Specifications

8-2-1 Eight-point 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	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./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)



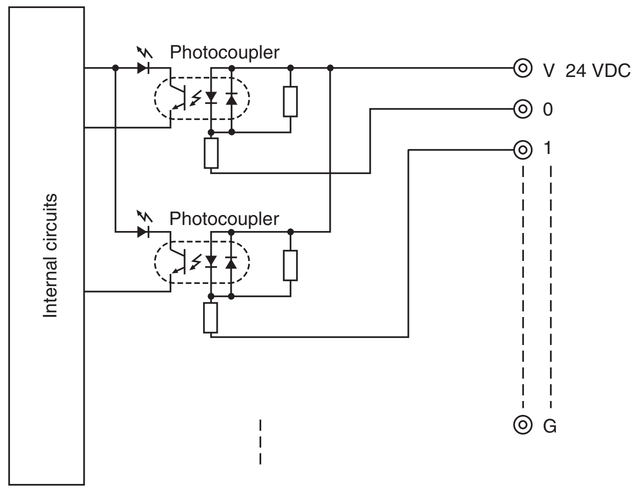
Operation Indicators

The meanings of the input indicators are given in the following table.

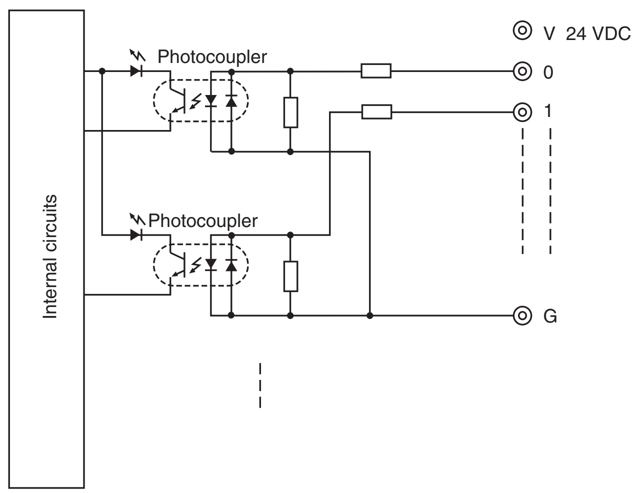
Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

Internal Circuits

XWT-ID08 (NPN)

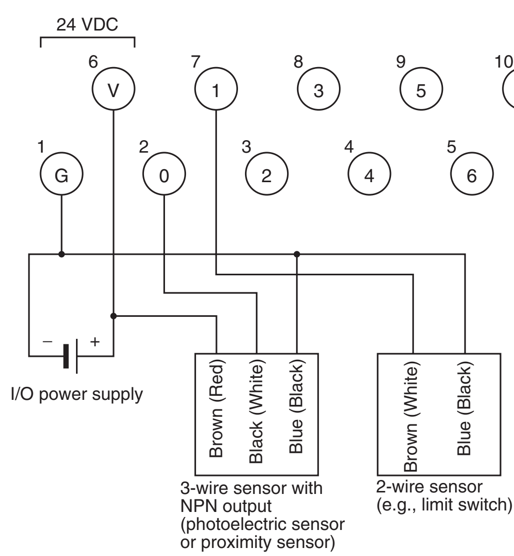


XWT-ID08-1 (PNP)

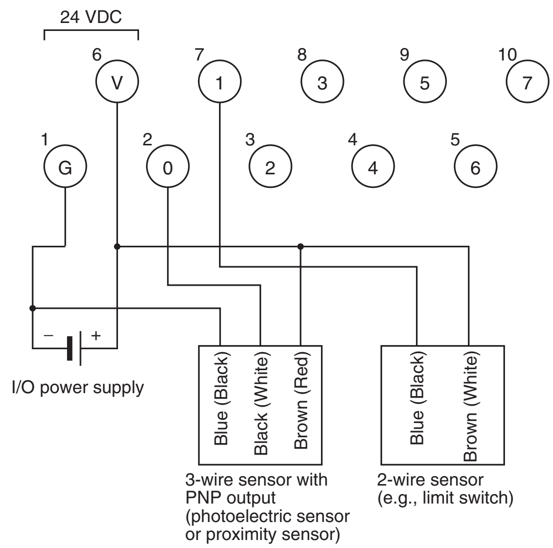


Wiring

XWT-ID08 (NPN)

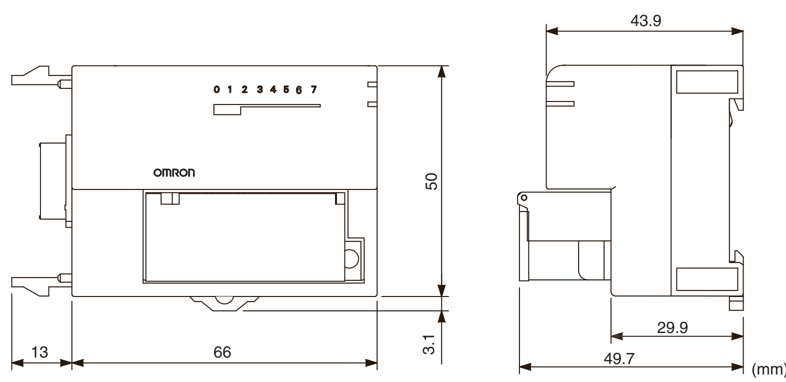


XWT-ID08-1 (PNP)



Note 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.

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

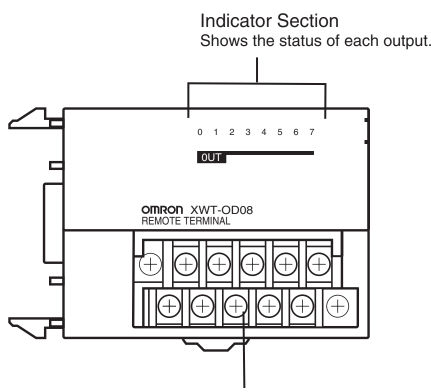


8-2-2 Eight-point Output Units XWT-OD08/XWT-OD08-1

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)



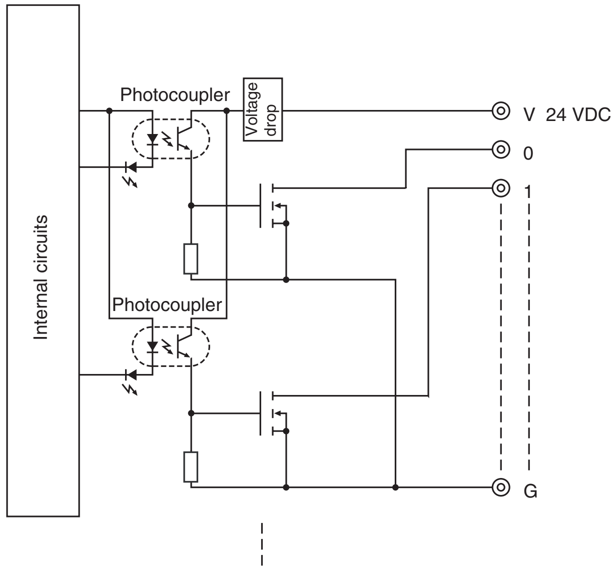
Operation Indicators

The meanings of the output indicators are given in the following table.

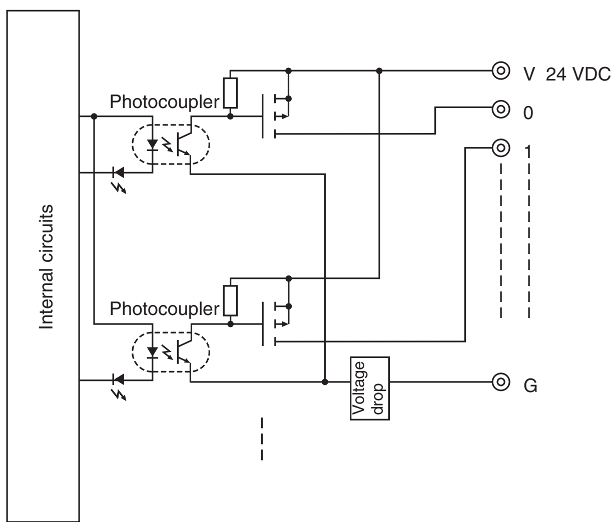
Name	LED status	I/O status	Meaning
0 to 7	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

Internal Circuits

XWT-OD08 (NPN)

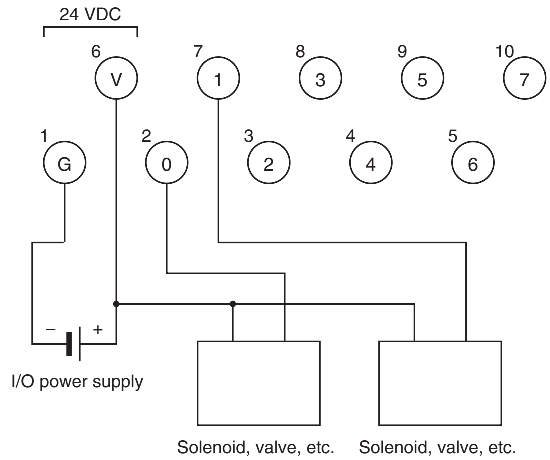


XWT-OD08-1 (PNP)

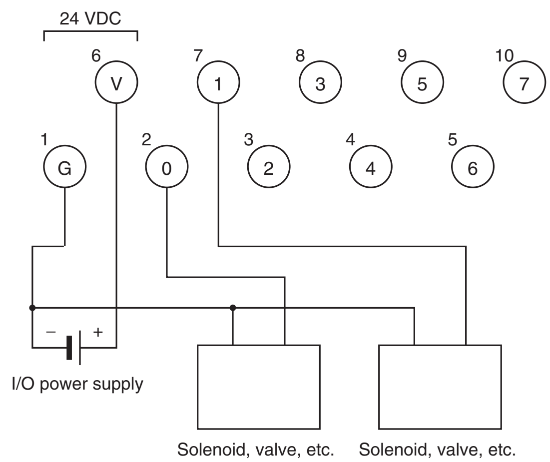


Wiring

XWT-OD08 (NPN)

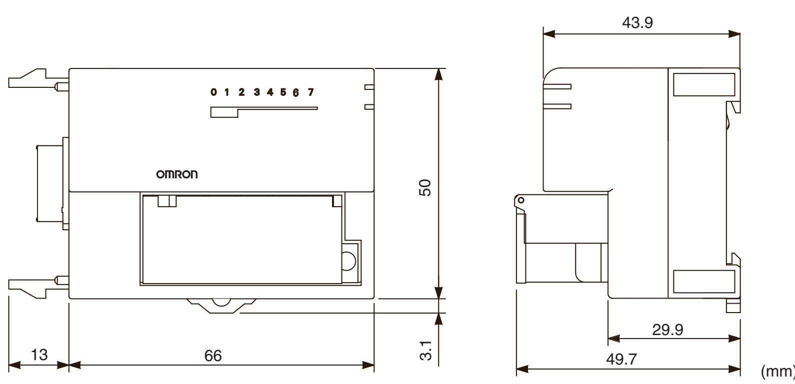


XWT-OD08-1 (PNP)



Note When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

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

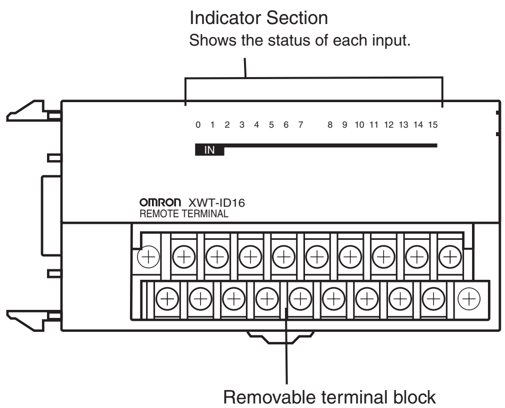


8-2-3 Sixteen-point Input Units XWT-ID16/XWT-ID16-1

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	1.0 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA min./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)



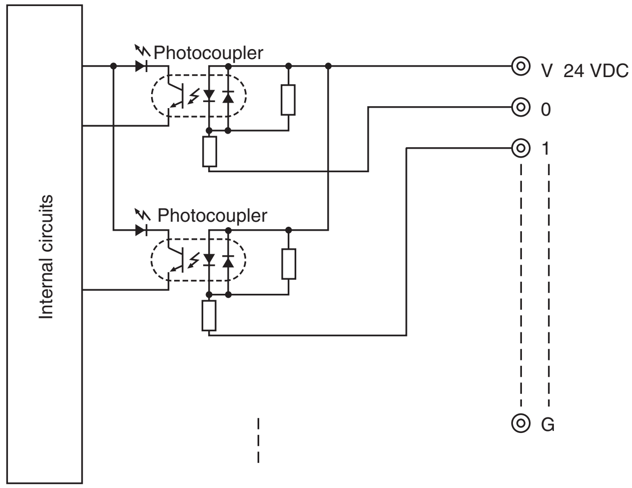
Operation Indicators

The meanings of the input indicators are given in the following table.

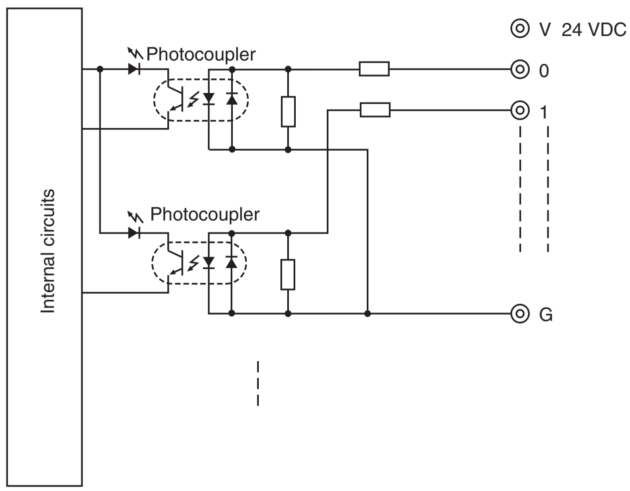
Name	LED status	I/O status	Meaning
0 to 15	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

Internal Circuits

XWT-ID16 (NPN)

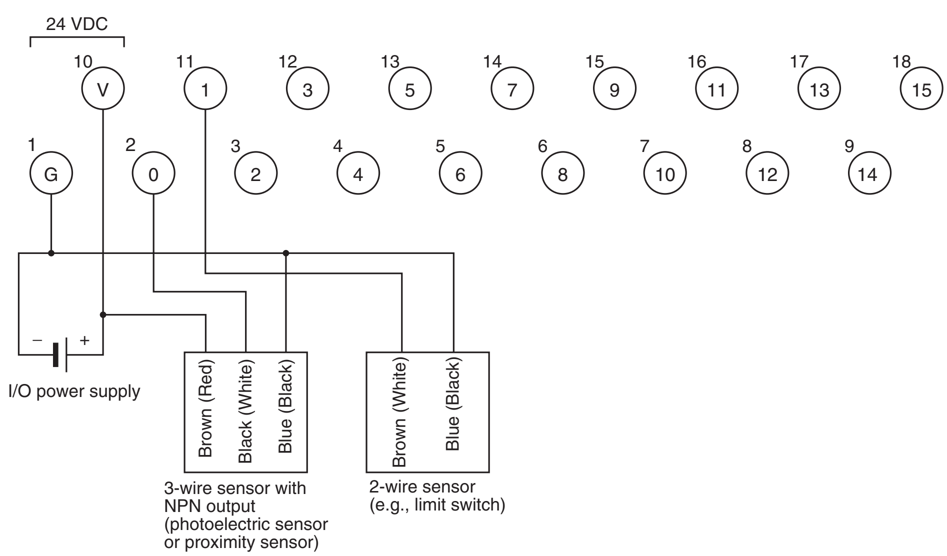


XWT-ID16-1 (PNP)

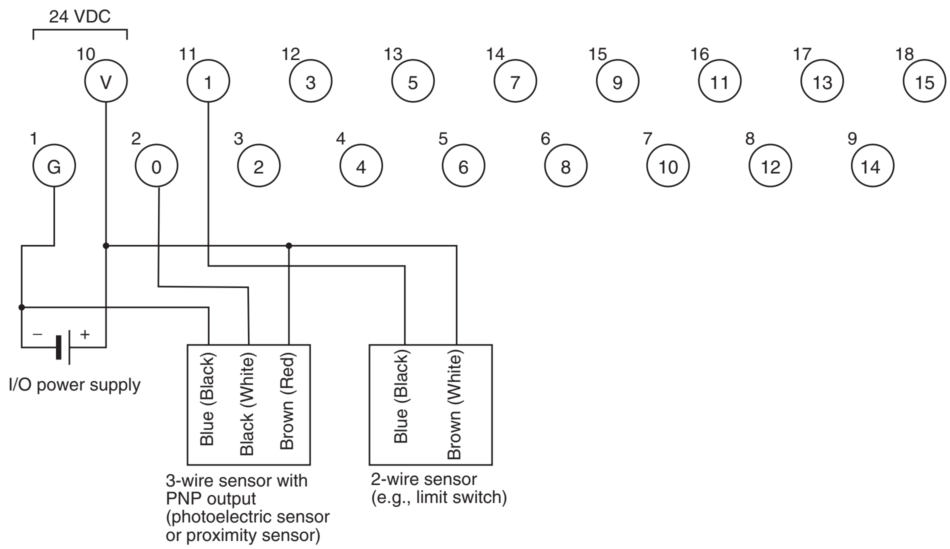


Wiring

XWT-ID16 (NPN)

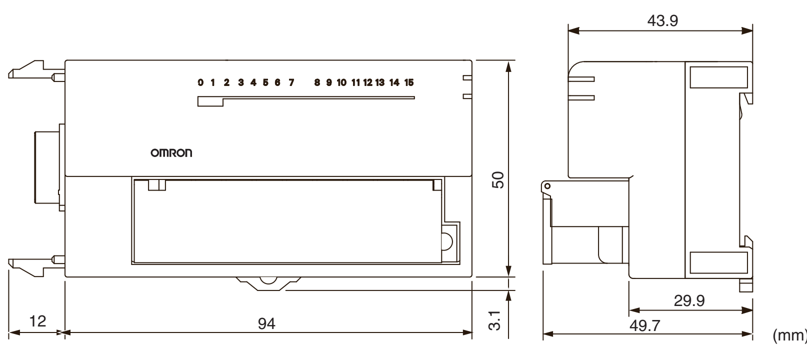


XWT-ID16-1 (PNP)



Note 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.

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

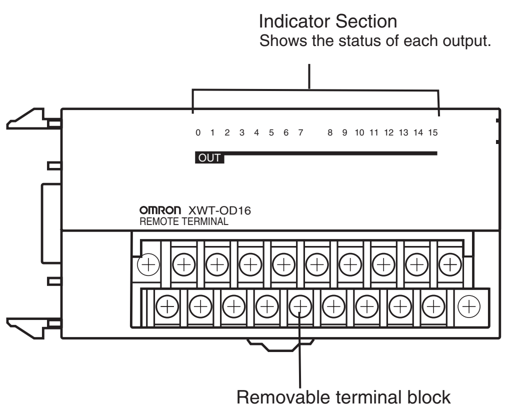


8-2-4 Sixteen-point Output Units XWT-OD16/XWT-OD16-1

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)



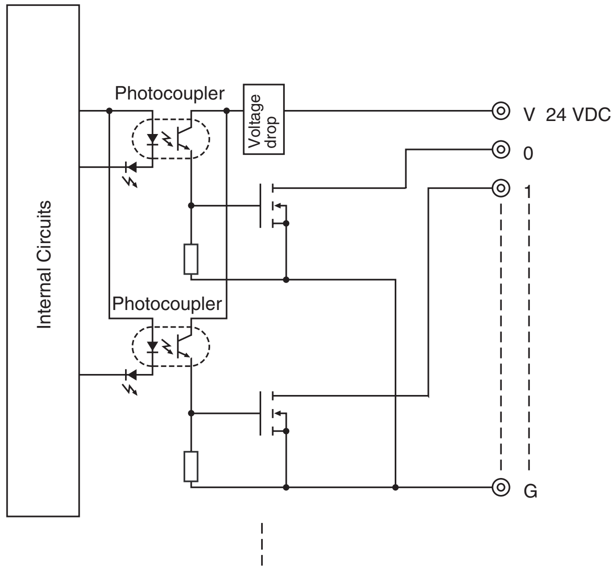
Operation Indicators

The meanings of the output indicators are given in the following table.

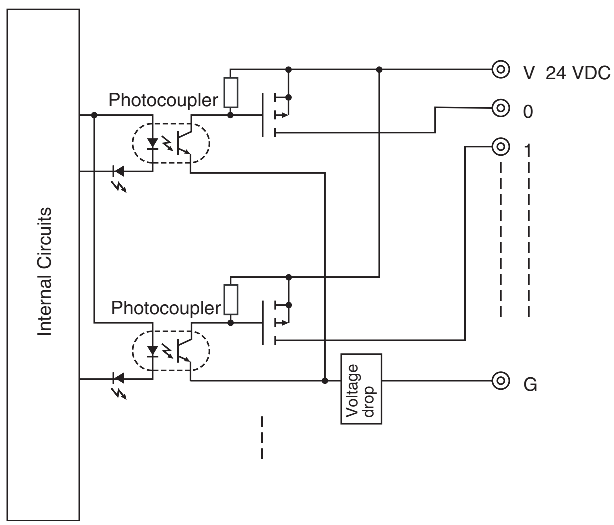
Name	LED status	I/O status	Meaning
0 to 15	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

Internal Circuits

XWT-OD16 (NPN)

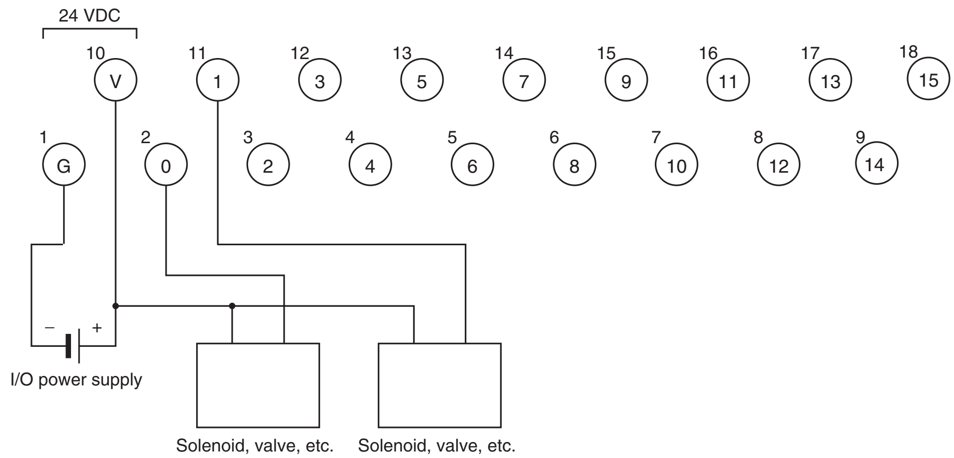


XWT-OD16-1 (PNP)

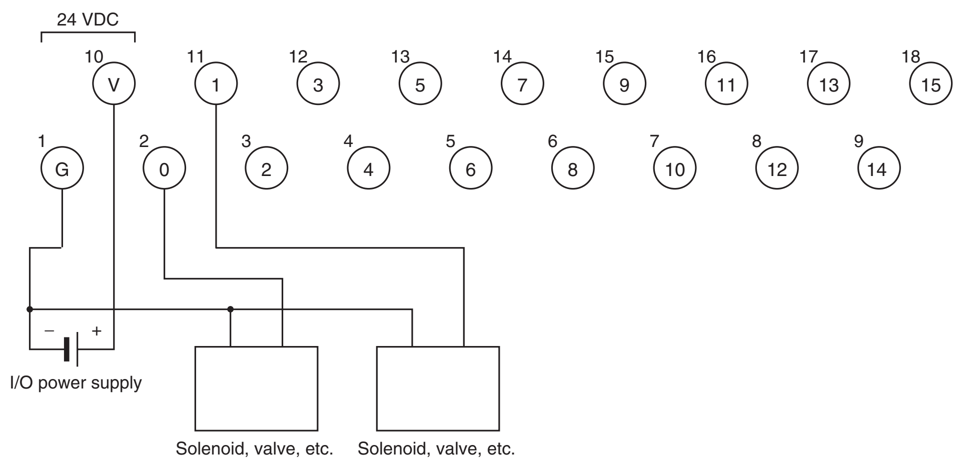


Wiring

XWT-OD16 (NPN)

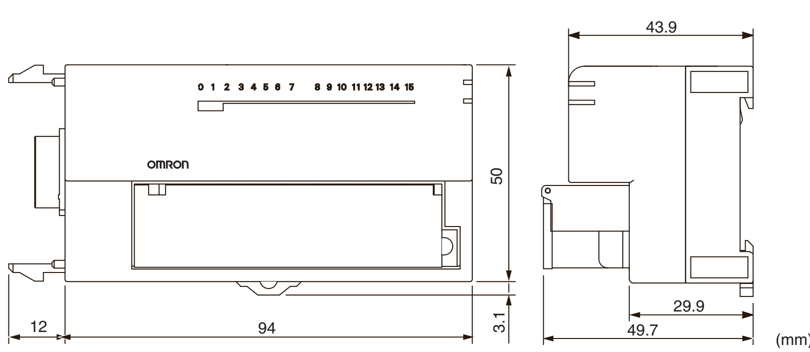


XWT-OD16-1 (PNP)



Note When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

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



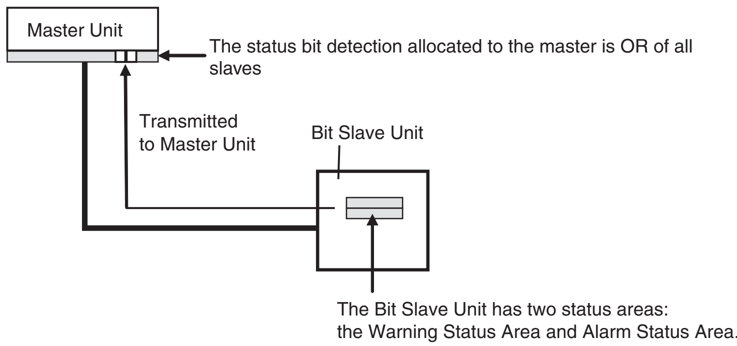
SECTION 9
Bit Slave Units

This section describes the Bit Slave Units.

9-1 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. When any of the bits in the status area of the slaves connected to the Master Unit turns ON, the corresponding bit (bit 12 is for warning status area notices and bit 13 is for alarm area notices) of the status flag in the Master Unit turns ON.

The Bit Slave Unit's status area information can be read by using the CX-Integrator or explicit messages.



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 Conduction 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	---

Note For Bit Slave Units with Compact Connectors, all bits are 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	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	Load Short-circuit Detection Flag OFF: Normal ON: Short-circuit	Turns ON when there is a short in the load connection, including wiring mistakes and connected device failure.
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

Note Bit Slave Units with Compact Connectors support only the EEPROM Data Error Flag.

9-2 Allocating I/O Data

Bit Slave Units are allocated node address areas in units of two points (two bits).

- Input Units and Output Units

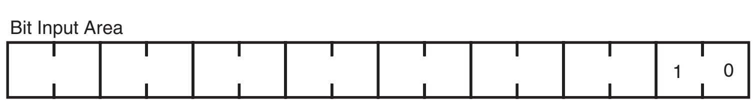
  Units with two points are allocated two bits (the node address set for the Unit).

  Units with four points are allocated four bits (the node address set for the Unit and the next node address area).

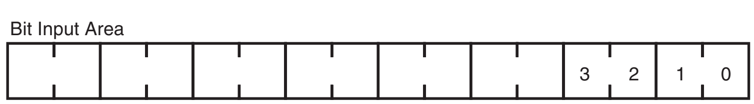
- I/O Units

  Units are allocated four bits (the input and output node address areas).

Two-point Input Units

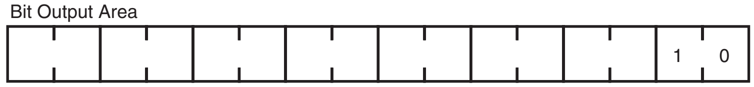


Four-point Input Units



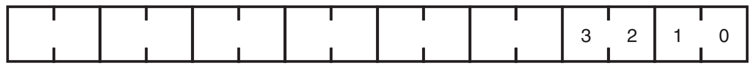
Two-point Output Units

Bit Output Area



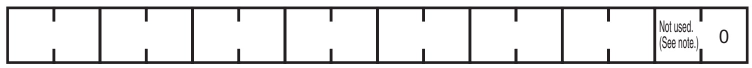
Four-point Output Units

Bit Output Area

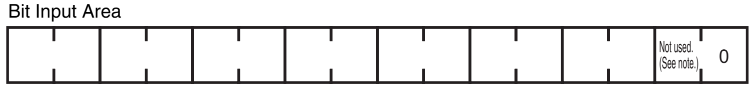


Two-point I/O Units

Bit Output Area



Bit Input Area

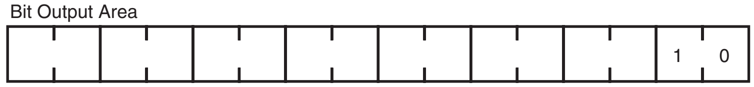


Note Upper bits indicated "not used" for two-point Output Units are unused bits. Treat unused bits as follows:

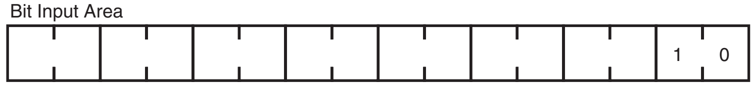
- Unused bits in bit output area: Use 0.
- Unused bits in bit input area: 0 is input.

Four-point I/O Units

Bit Output Area



Bit Input Area



Bit Slave Units are allocated node address areas in order without leaving any bits unused in the middle. For example, eight, two-point Slave Units are allocated one word. Likewise, four, two-point Slave Units and two, four-point Slave Units are also allocated one word.

9-3 Bit Slave Units with e-CON Connectors

9-3-1 Two-point Input Units CRT1B-ID02S/CRT1B-ID02S-1

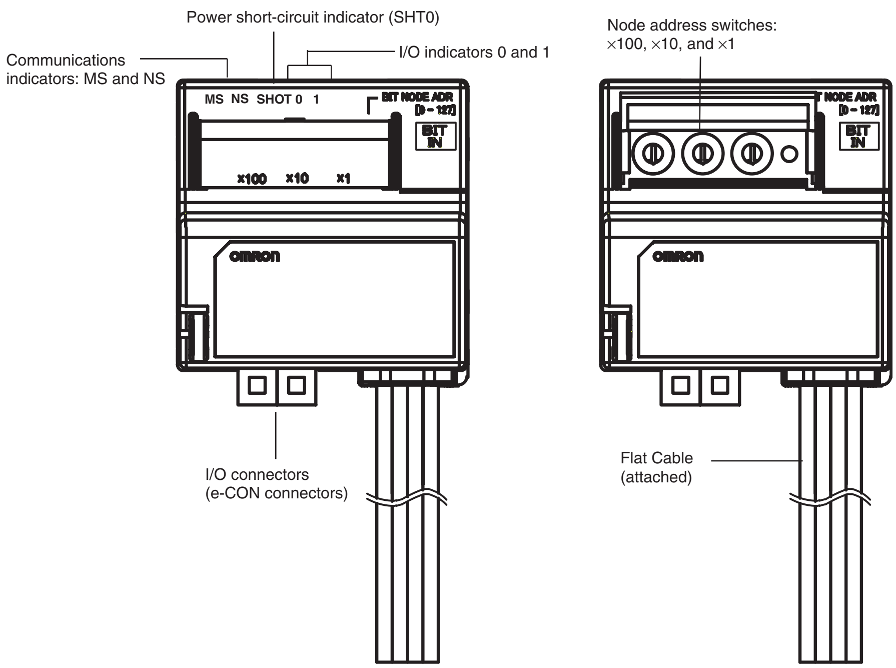
Input Section Specifications

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	1.0 mA max.	
Input current	3.0 mA min./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	
Power short-circuit detection	Supported.	
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.)	65 mA max. for 24-VDC power supply voltage 80 mA max. for 14-VDC power supply voltage	45 mA max. for 24-VDC power supply voltage 65 mA max. for 14-VDC power supply voltage
Input device supply current	80 mA/2 points	
Weight	70 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 (Same for CRT1B-ID02S and CRT1B-ID02S-1)



Display Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

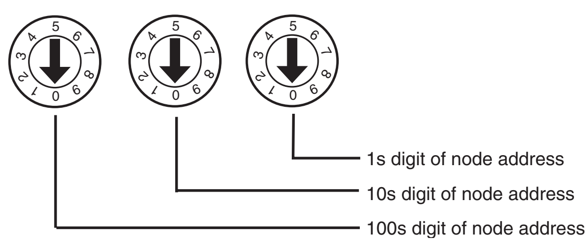
The meanings of the input and status indicators are given in the following table.

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.	Power short-circuit	The power supply is short-circuited.

Setting the Node Address

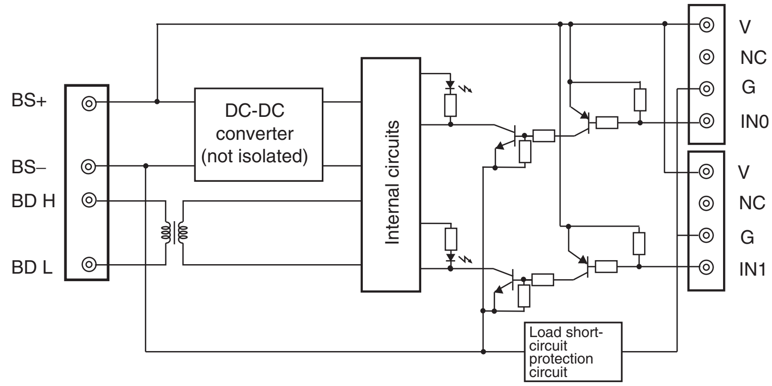
The node address is set as a decimal number between 0 and 127 with the 100s digit set on the left rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the right rotary switch.

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

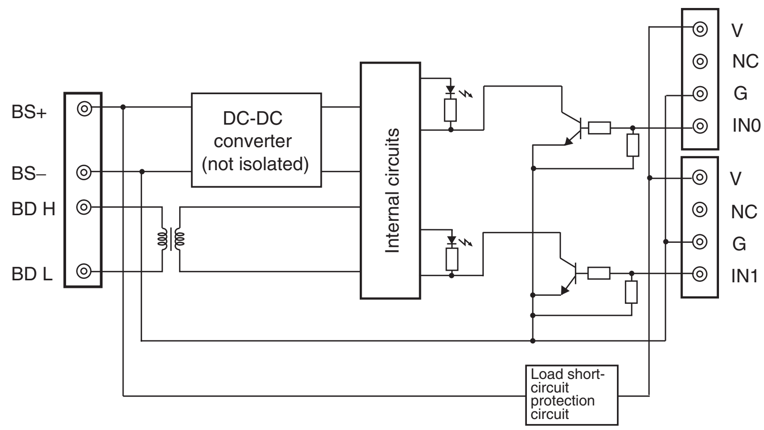


Internal Circuits

CRT1B-ID02S (NPN)



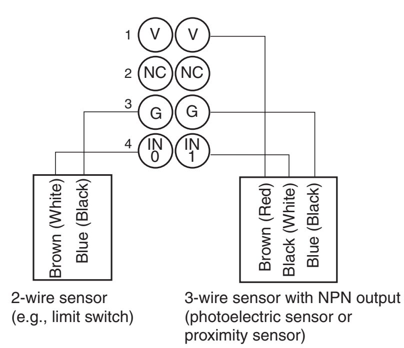
CRT1B-ID02S-1 (PNP)



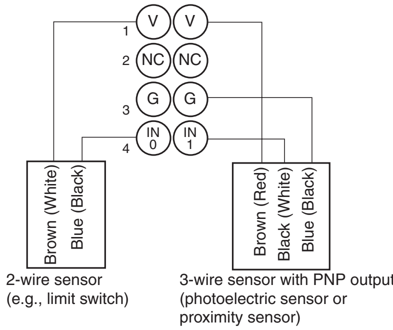
Wiring

The I/O connector section uses e-CON connectors. Pin arrangements and signals are shown below.

CRT1B-ID02S (NPN)

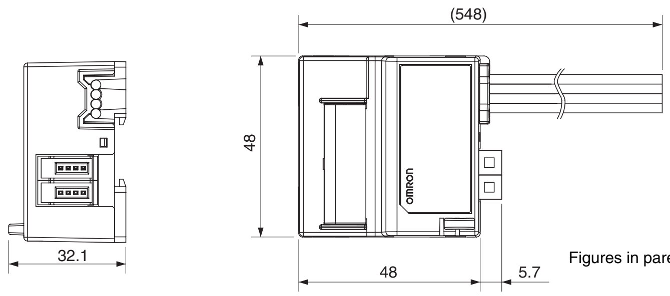


CRT1B-ID02S-1 (PNP)



Note 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.

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



Figures in parentheses are reference dimensions.
(mm)

9-3-2 Two-point Output Units CRT1B-OD02S/CRT1B-OD02S-1

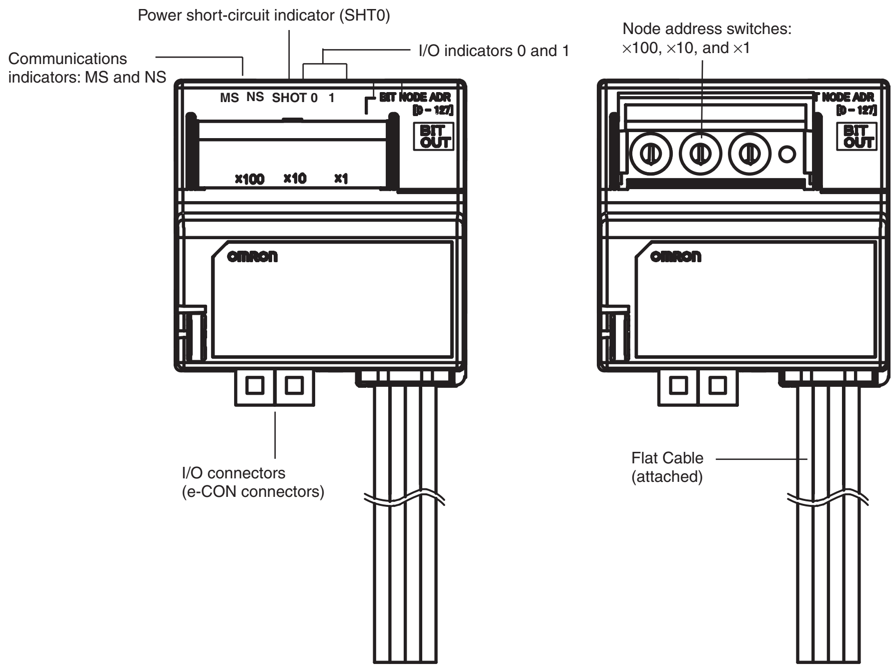
Output Section Specifications

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 BS–)	1.2 V max. (0.2 A DC, between each output terminal and BS+)
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	
Load short-circuit detection	Supported.	
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.)	55 mA max. for 24-VDC power supply voltage 75 mA max. for 14-VDC power supply voltage	55 mA max. for 24-VDC power supply voltage 70 mA max. for 14-VDC power supply voltage
Weight	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 (Same for CRT1B-OD20S and CRT1B-OD20S-1)



Display Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

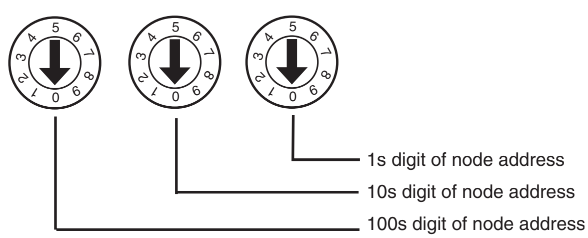
The meanings of the output and status indicators are given in the following table.

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

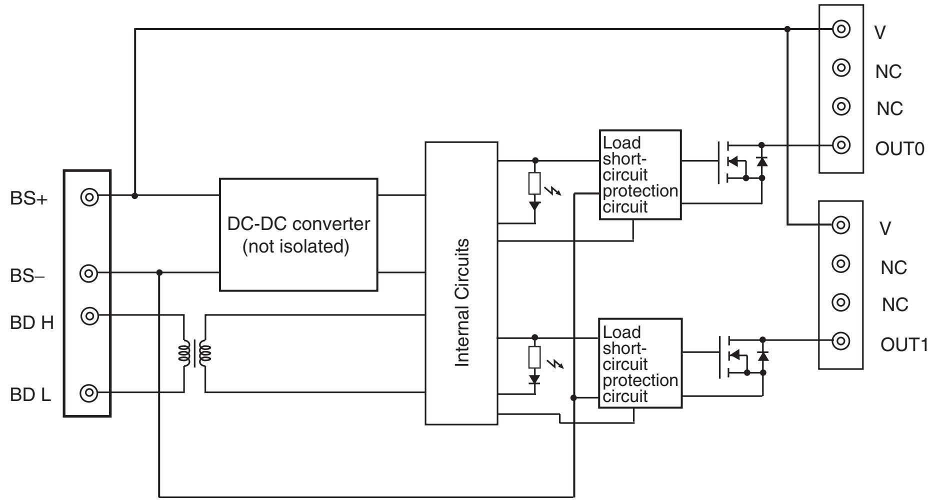
The node address is set as a decimal number between 0 and 127 with the 100s digit set on the left rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the right rotary switch.

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

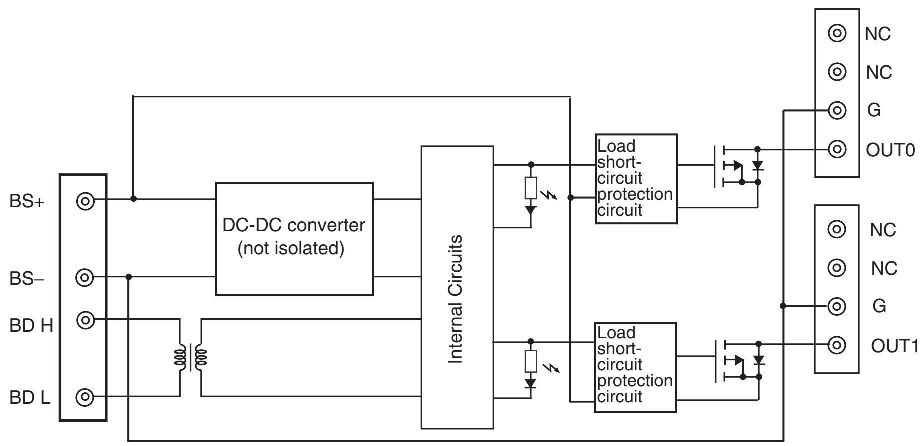


Internal Circuits

CRT1B-OD02S (NPN)



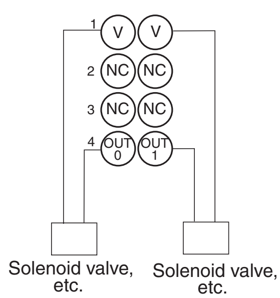
CRT1B-OD02S-1 (PNP)



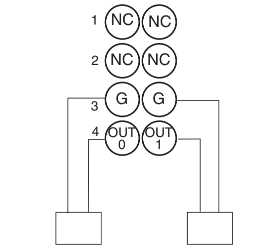
Wiring

The I/O connector section uses e-CON connectors. Pin arrangements and signals are shown below.

CRT1B-OD02S (NPN)

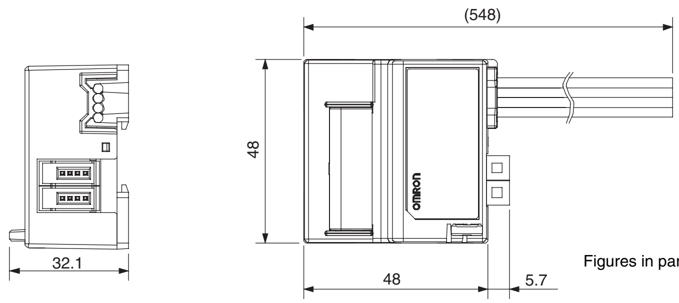


CRT1B-OD02S-1 (PNP)



Note When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

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



Figures in parentheses are reference dimensions.
(mm)

9-3-3 Two-point Input Units (IP54) CRT1B-ID02SP/CRT1B-ID02SP-1

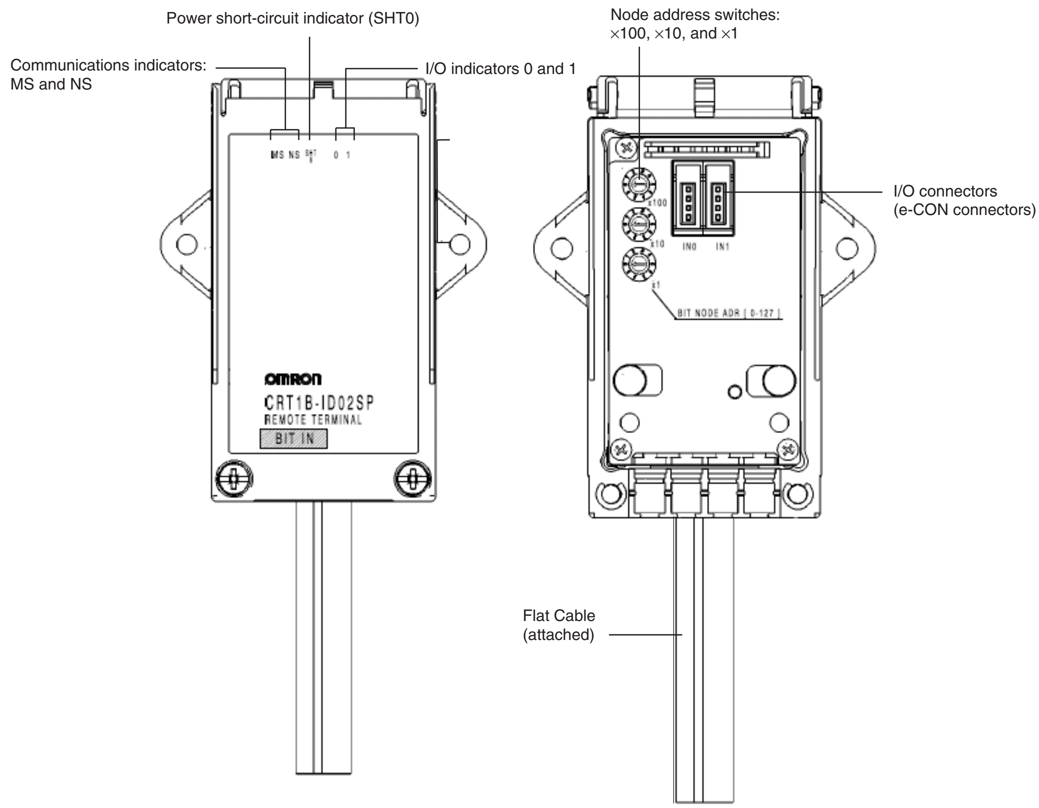
Input Section Specifications

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	1.0 mA max.	
Input current	3.0 mA min./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	
Power short-circuit detection	Supported.	
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.)	65 mA max. for 24-VDC power supply voltage 80 mA max. for 14-VDC power supply voltage	
Input device supply current	80 mA/2 points	
Weight	184 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 (Same for CRT1B-ID02SP and CRT1B-ID02SP-1)



Display Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

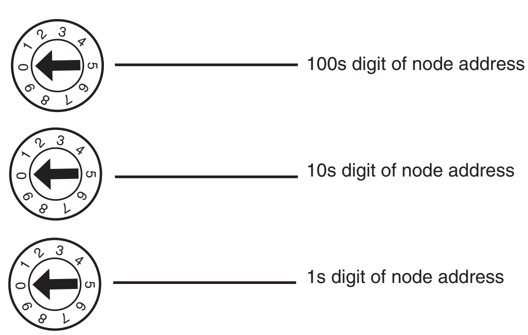
The meanings of the input and status indicators are given in the following table.

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.	Power short-circuit	The power supply is short-circuited.

Setting the Node Address

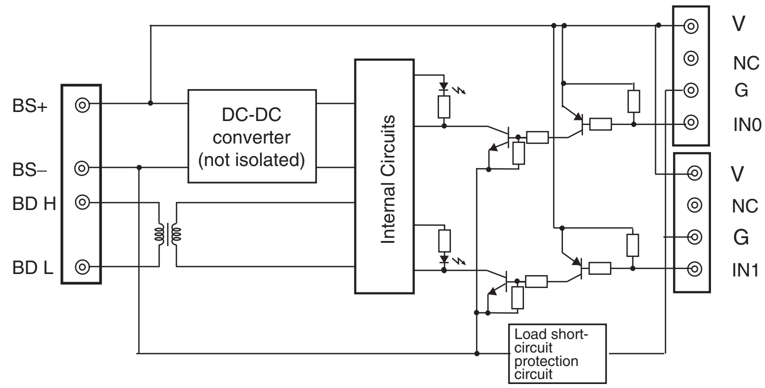
The node address is set as a decimal number between 0 and 127 with the 100s digit set on the top rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the bottom rotary switch.

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

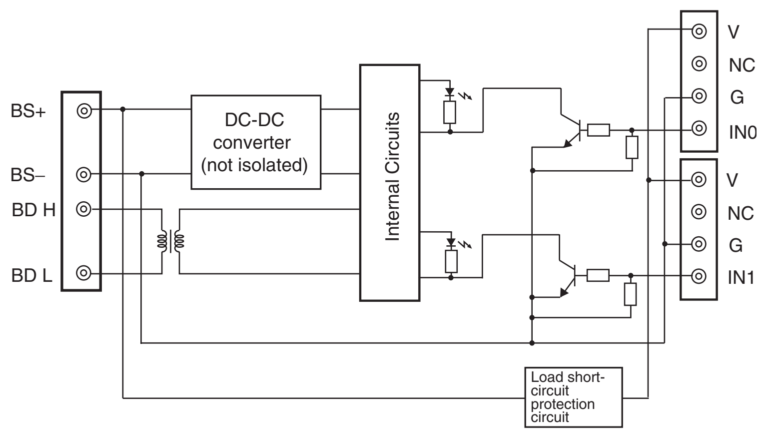


Internal Circuits

CRT1B-ID02SP (NPN)



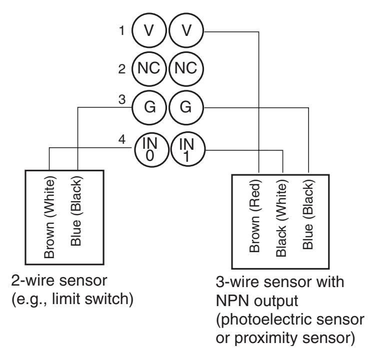
CRT1B-ID02SP-1 (PNP)



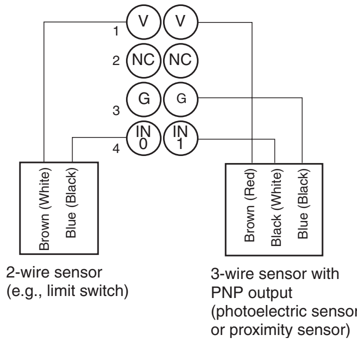
Wiring

The I/O connector section uses e-CON connectors. Pin arrangements and signals are shown below.

CRT1B-ID02SP (NPN)

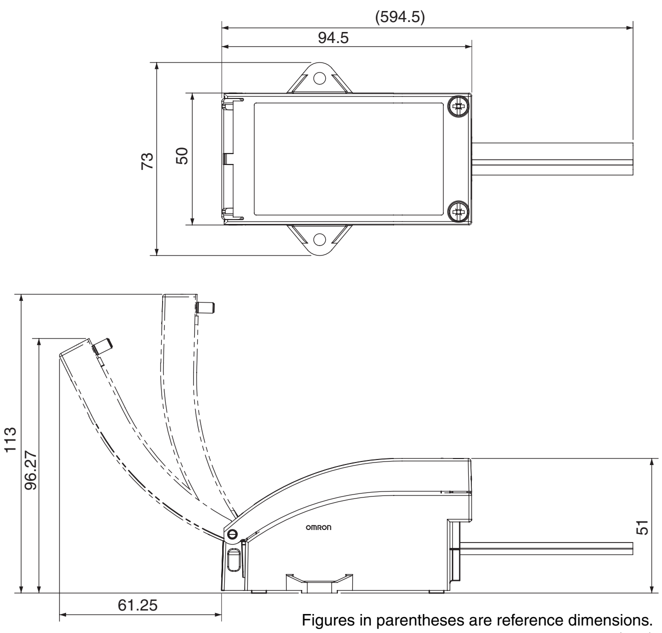


CRT1B-ID02SP-1 (PNP)



Note 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.

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



Figures in parentheses are reference dimensions.
(mm)

9-3-4 Two-point Output Units (IP54) CRT1B-OD02SP/CRT1B-OD02SP-1

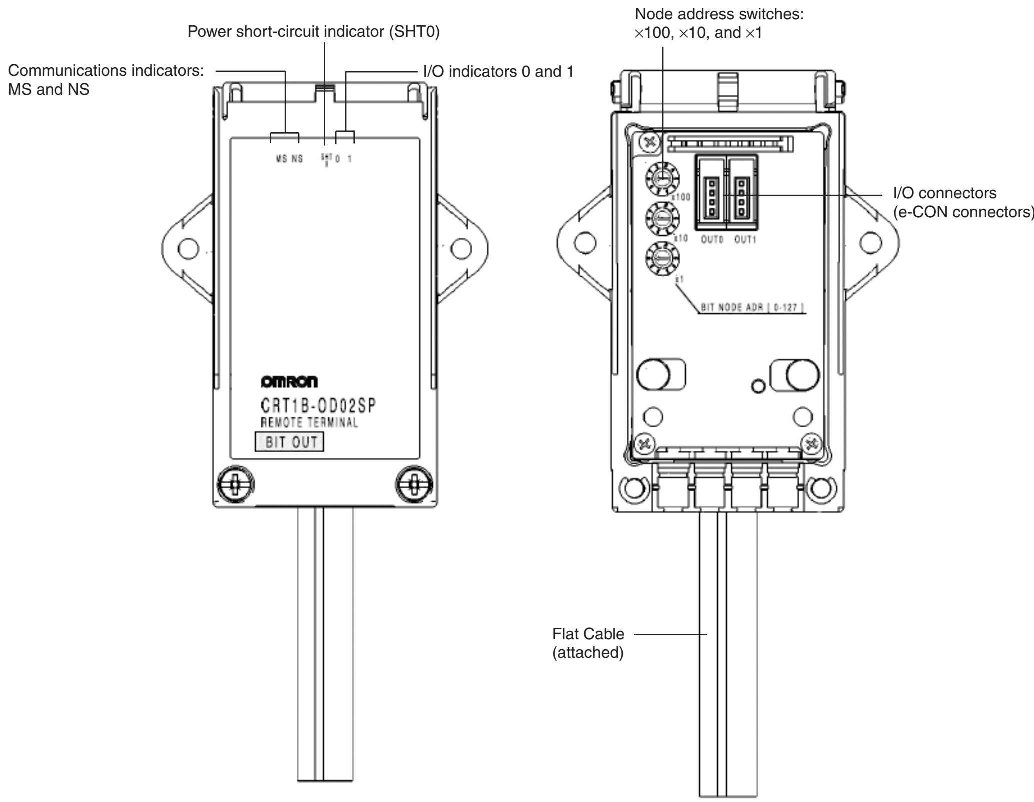
Output Section Specifications

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 BS−)	1.2 V max. (0.2 A DC, between each output terminal and BS+)
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	
Load power short-circuit detection	Supported.	
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.)	50 mA max. for 24-VDC power supply voltage 75 mA max. for 14-VDC power supply voltage	
Weight	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 (Same for CRT1B-OD02SP and CRT1B-OD02SP-1)



Display Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

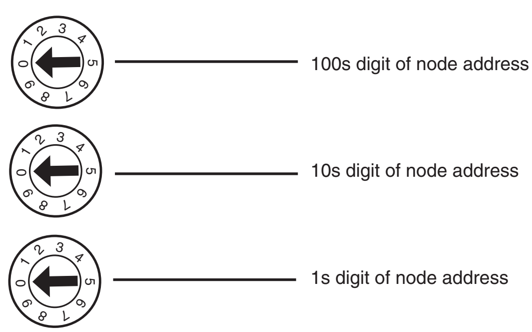
The meanings of the output and status indicators are given in the following table.

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 short-circuit detection	The load is short-circuited.

Setting the Node Address

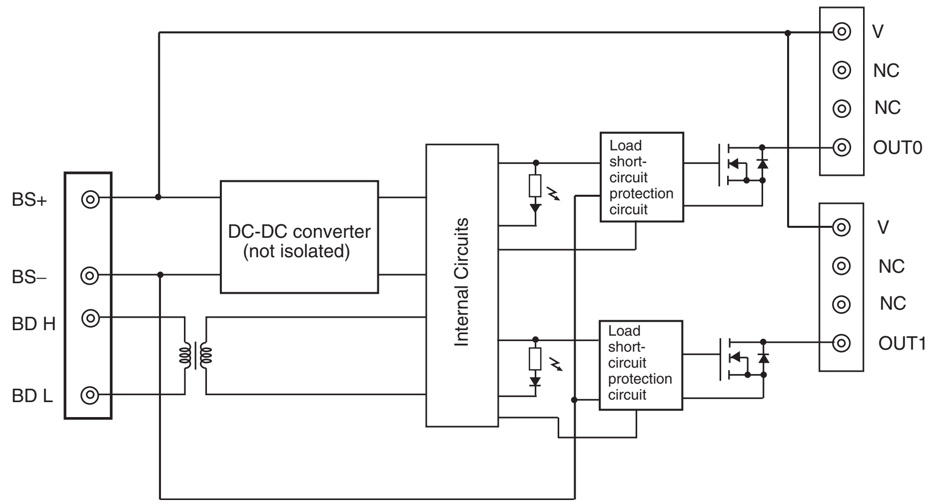
The node address is set as a decimal number between 0 and 127 with the 100s digit set on the top rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the bottom rotary switch.

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

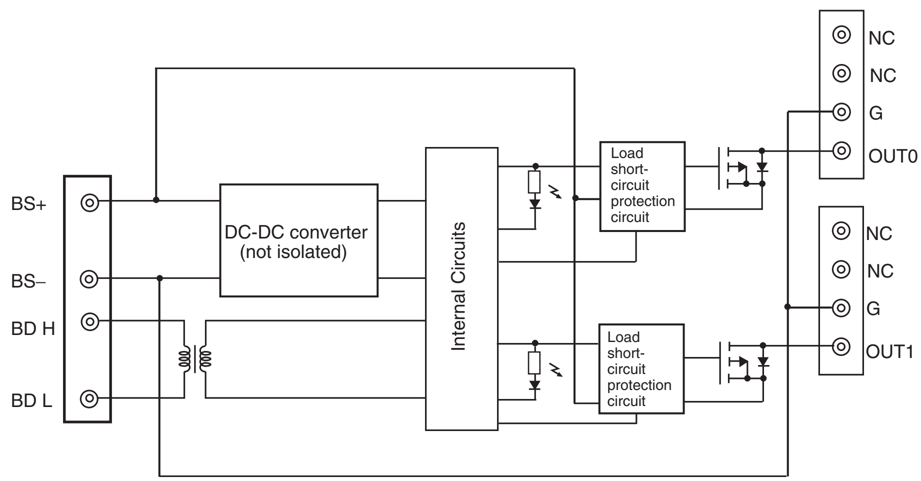


Internal Circuits

CRT1B-OD02SP (NPN)



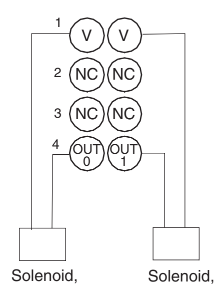
CRT1B-OD02SP-1 (PNP)



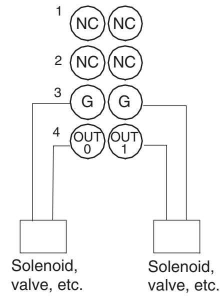
Wiring

The I/O connector section uses e-CON connectors. Pin arrangements and signals are shown below.

CRT1B-OD02SP (NPN)

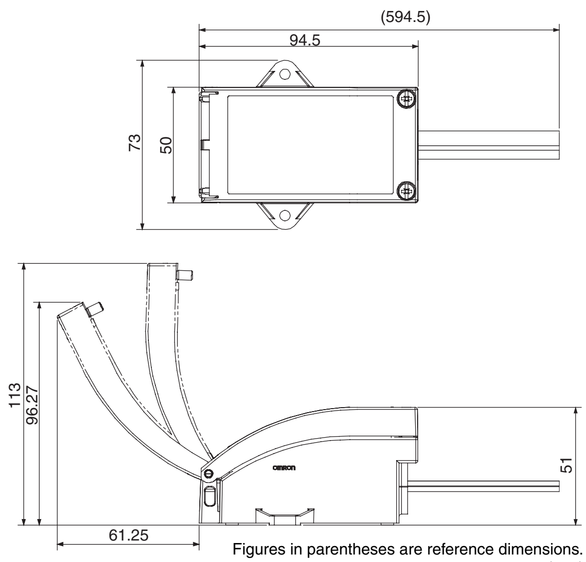


CRT1B-OD02SP-1 (PNP)



Note When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

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



Figures in parentheses are reference dimensions.
(mm)

9-3-5 Four-point Input Units (IP54) CRT1B-ID04SP/CRT1B-ID04SP-1

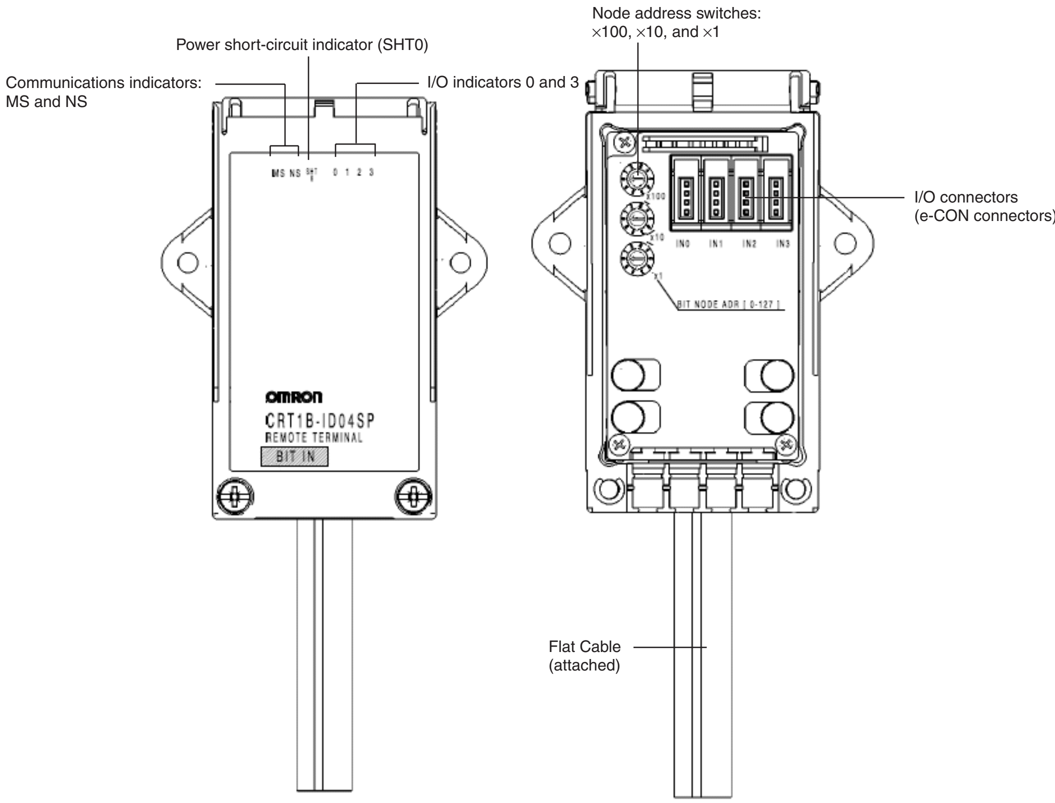
Input Section Specifications

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	1.0 mA max.	
Input current	3.0 mA min./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	
Power short-circuit detection	Supported.	
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.)	85 mA max. for 24-VDC power supply voltage 90 mA max. for 14-VDC power supply voltage	
Input device supply current	80 mA/2 points	
Weight	188 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 (Same for CRT1B-ID04SP/CRT1B-ID04SP-1)



Display Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

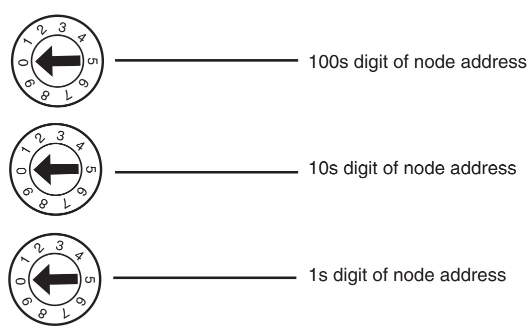
The meanings of the input and status indicators are given in the following table.

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.	Power short-circuit	The power supply is short-circuited.

Setting the Node Address

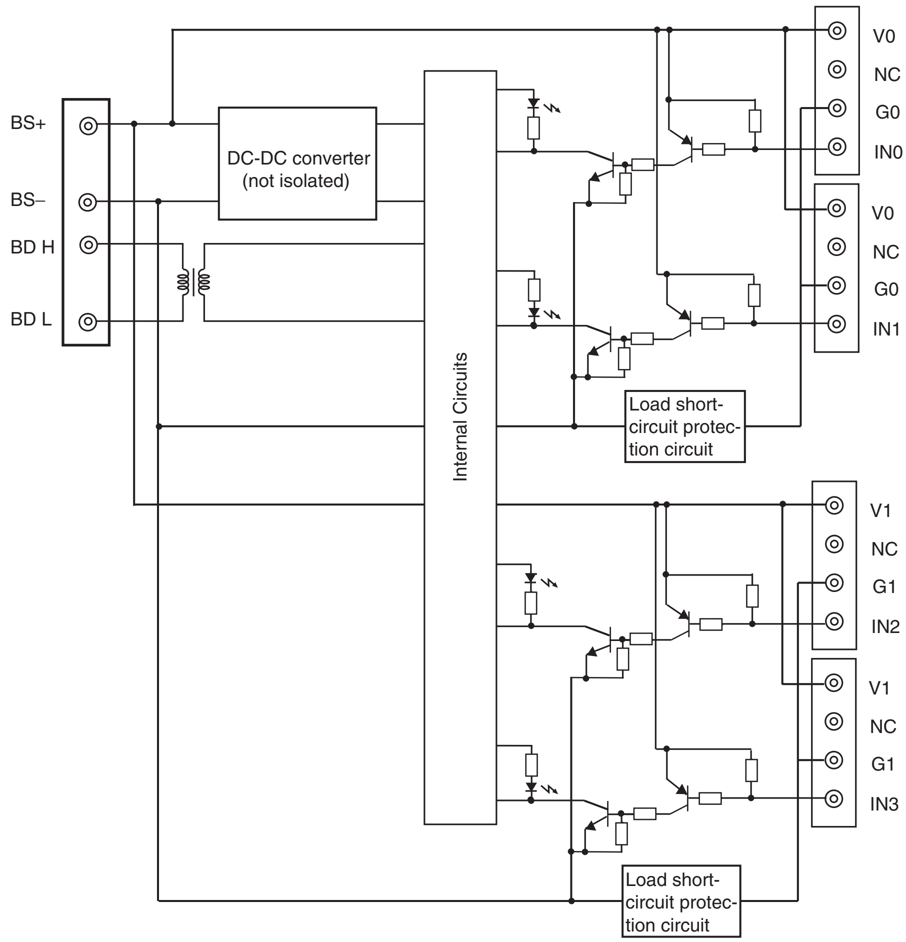
The node address is set as a decimal number between 0 and 127 with the 100s digit set on the top rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the bottom rotary switch.

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

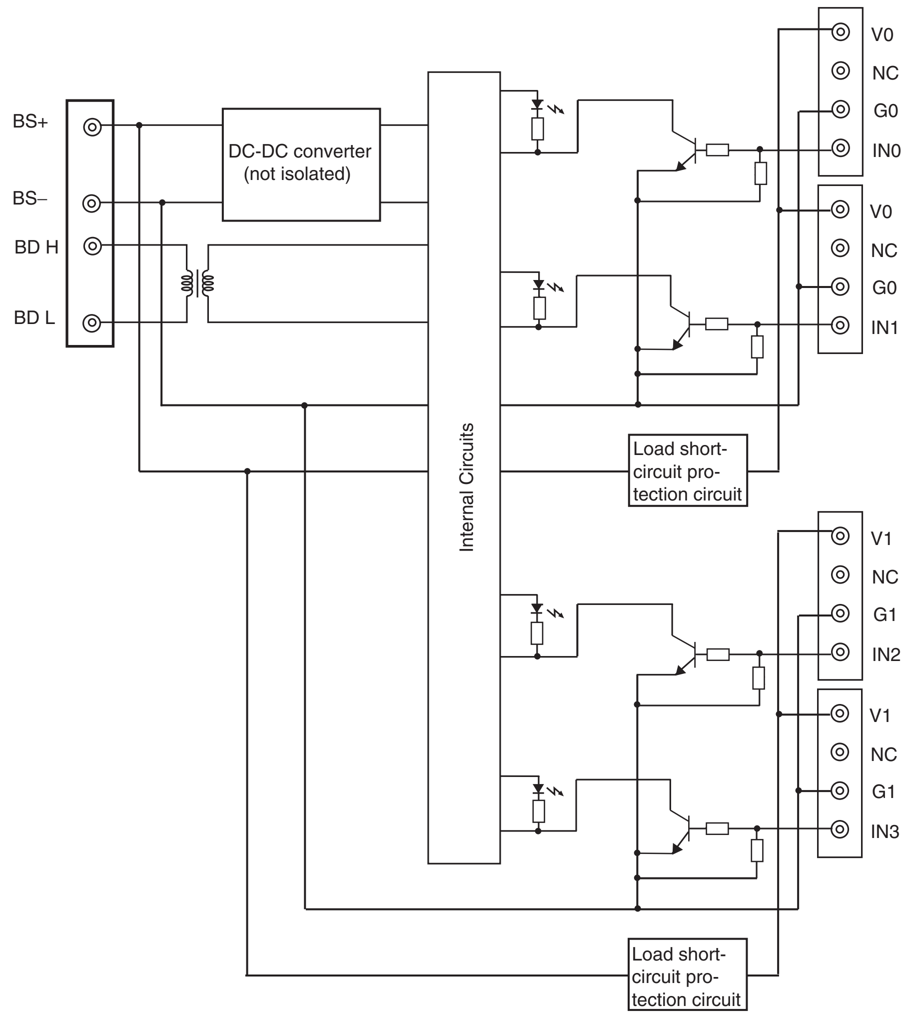


Internal Circuits

CRT1B-ID04SP (NPN)



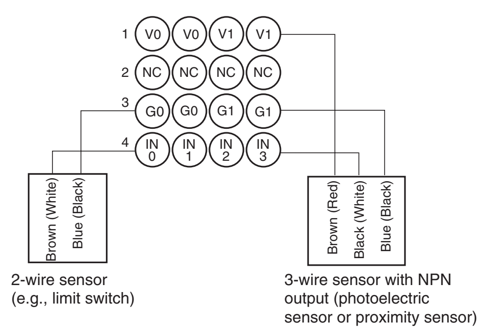
CRT1B-ID04SP-1 (PNP)



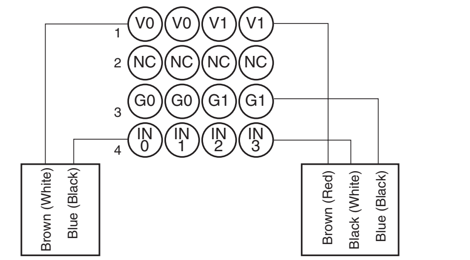
Wiring

The I/O connector section uses e-CON connectors. Pin arrangements and signals are shown below.

CRT1B-ID04SP (NPN)

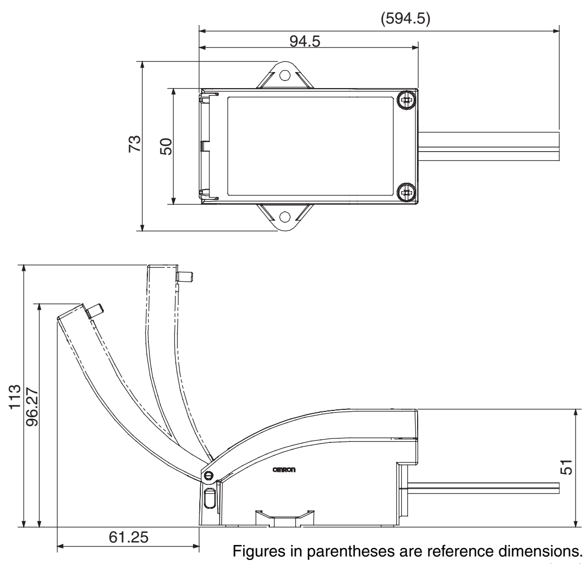


CRT1B-ID04SP-1 (PNP)



Note 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.

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



Figures in parentheses are reference dimensions.
(mm)

9-4 Clamp Terminal Blocks

9-4-1 Two-point Input/Two-point Output Units (IP54) CRT1B-MD04SLP/CRT1B-MD04SLP-1

Input Section Specifications

Item	Specification	
Model	CRT1B-MD04SLP	CRT1B-MD04SLP-1
I/O capacity	2 inputs	
Internal I/O common line	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 min./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	
Power short-circuit detection	Supported.	
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. for 24-VDC power supply voltage 90 mA max. for 14-VDC power supply voltage	75 mA max. for 24-VDC power supply voltage 85 mA max. for 14-VDC power supply voltage
Input device supply current	80 mA/2 points	
Weight	191 g max.	191 g max.

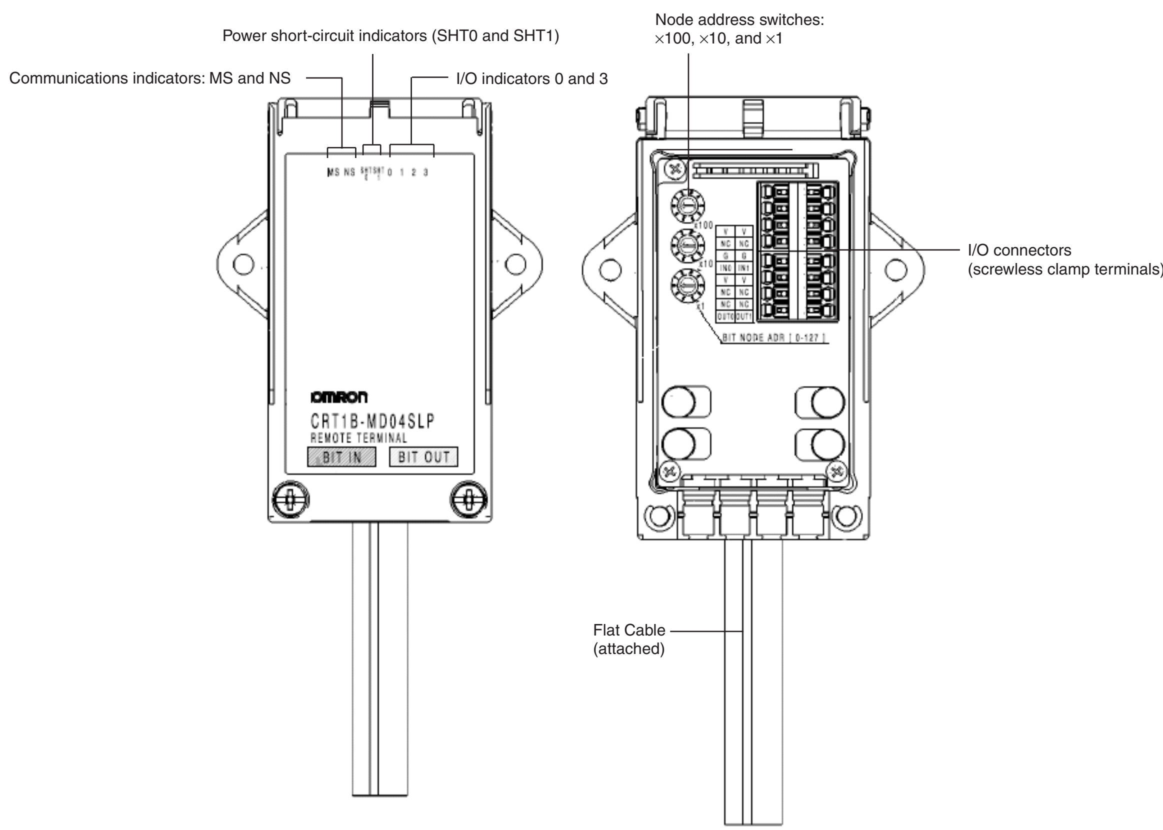
Note The current consumption is for Bit Slave Unit communications current when all inputs and outputs are OFF, i.e., it does not include input device current consumption or output load current consumption. The communications power supply is also used for the I/O power supply for sensors and actuators. 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 × number of sensors used) + (actual load current x number of actuators used)

Output Section Specifications

Item	Specification	
Model	CRT1B-MD04SLP	CRT1B-MD04SLP-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 BS–)	1.2 V max. (0.2 A DC, between each output terminal and BS+)
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	
Load power short-circuit detection	Supported.	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	

Component Names and Functions (Same for CRT1B-MD04SLP/CRT1B-MD04SLP-1)



Display Section

Communications Indicators

Refer to *4-1-3 Communications Indicators*.

I/O Indicators

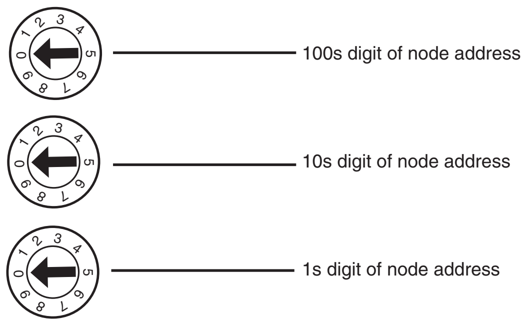
The meanings of the I/O and status indicators are given in the following table.

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.	Power short-circuit detected	The power supply is short-circuited.
SHT1	Lit red.	Load short-circuit detected	The load is short-circuited.

Setting the Node Address

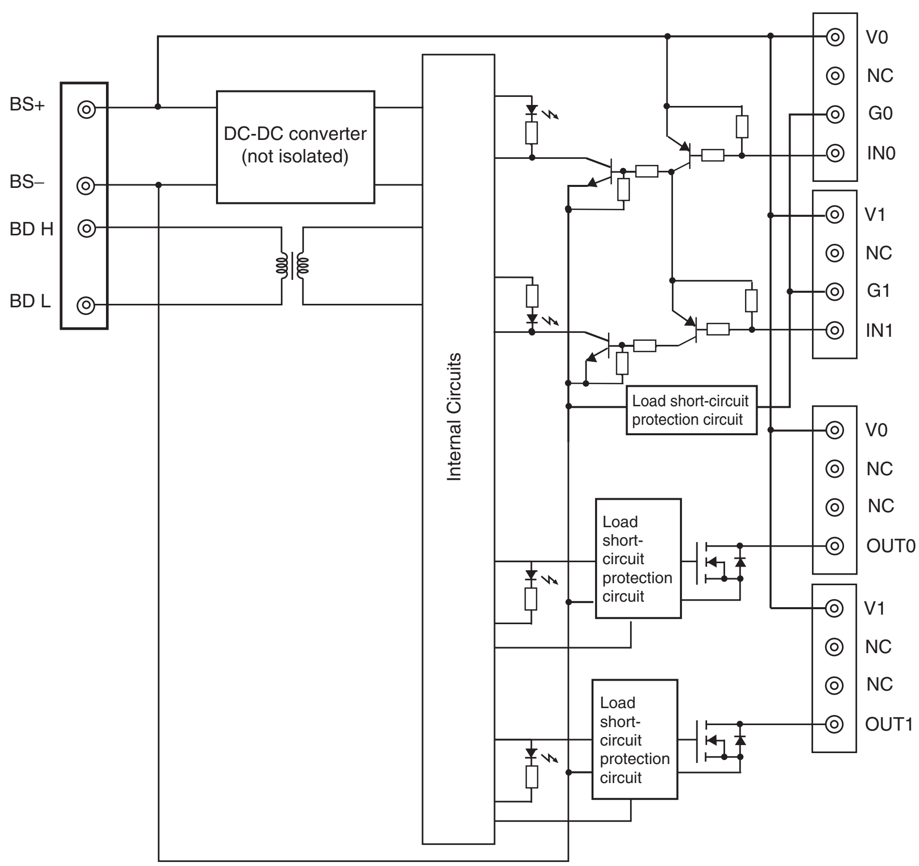
The node address is set as a decimal number between 0 and 127 with the 100s digit set on the top rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the bottom rotary switch.

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

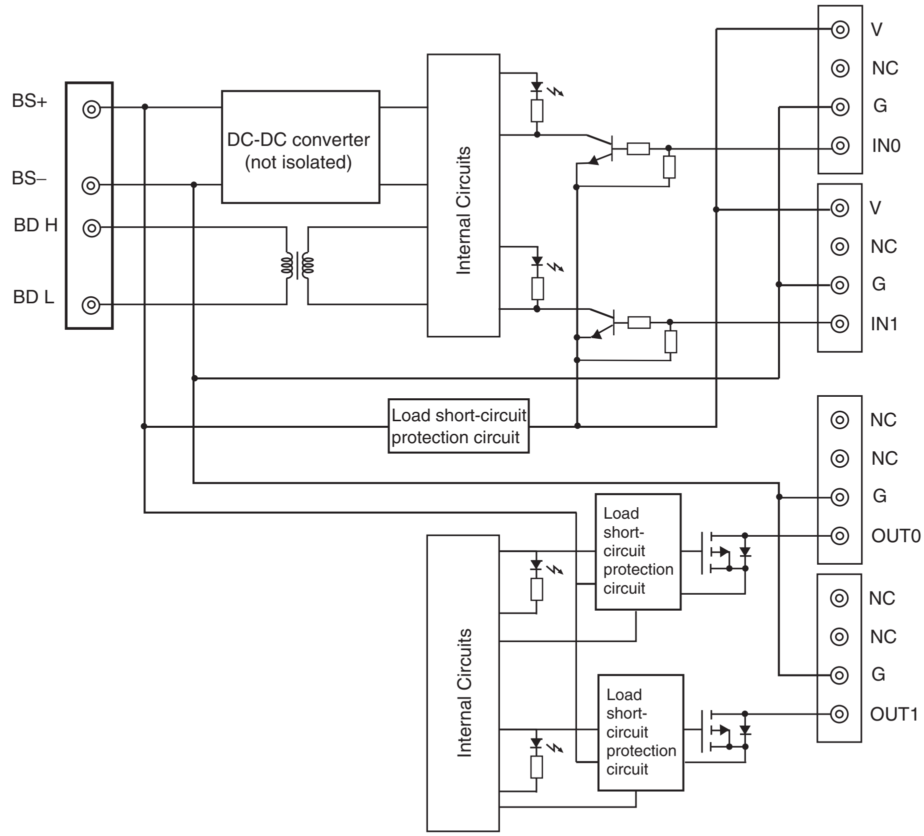


Internal Circuits

CRT1B-MD04SLP (NPN)



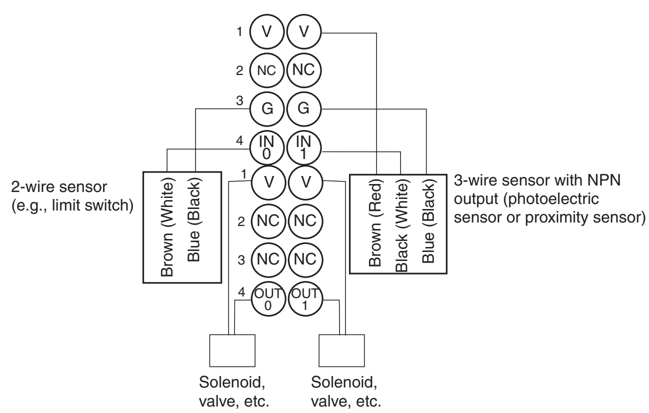
CRT1B-MD04SLP-1 (PNP)



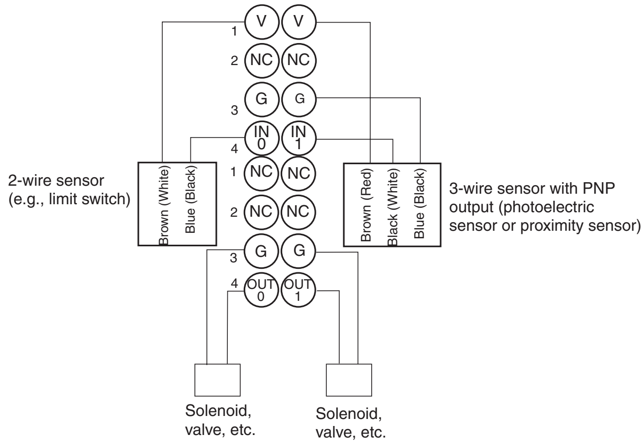
Wiring

The I/O connector section uses a screw-less clamp terminal block. Pin arrangements and signals are shown below.

CRT1B-MD04SLP (NPN)



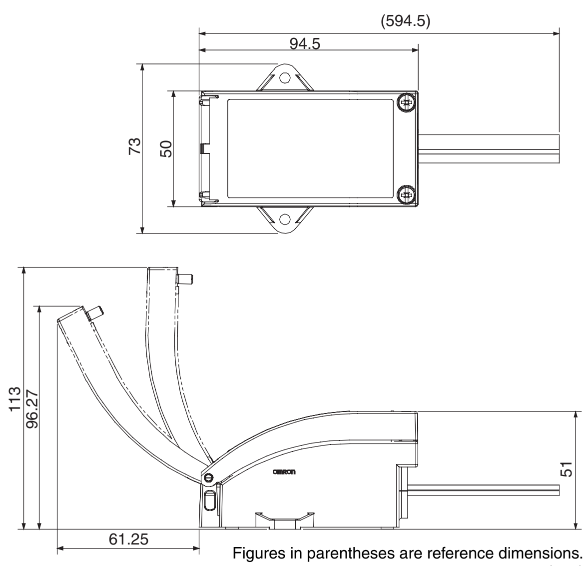
CRT1B-MD04SLP-1 (PNP)



Note (1) When using an inductive load (such as a solenoid valve), either use a built-in diode for absorbing the counterelectromotive force or install an external diode.

(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.

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



Figures in parentheses are reference dimensions.
(mm)

9-5 Bit Slave Units with Compact Connectors

9-5-1 Bit Slaves with Compact Connectors

Connecting to Communications Cables

The following communications connectors can be connected to Bit Slave Units with Compact Connectors.

Applicable Communications Connectors

Name	Model	Hook	Applicable communications cable
Open Type Connector (for Unit connection)	HCN-TB4LMZG+ (Honda Tsushin Kogyo Co., Ltd.)	Internal	Round Cable I and Round Cable II
Flat Connector Plug	DCN4-BR4	Internal	Flat Cable I
	DCN5-BR4	Internal	Flat Cable II
Multidrop Connector Plug for Flat Cable I	DCN4-MR4	Internal	Flat Cable I

The DCN4-TB4 Open Type Connector and DCN4-MD4 Multidrop Connector cannot be used with Bit Slaves with Compact Connectors. For information on how to process and attach the communications connectors, refer to *3-3 Preparing Flat Connectors*.

Applicable Functions

Bit Slave Units with Compact Connectors do not include functionality to collect data to help shorten startup and recovery time for control systems and maintenance systems.

For details, refer to *1-1-3 CompoNet Slave Unit Functions* on page 7.

Checking the Communications Power Supply Voltage

Bit Slave Units with Compact Connectors do not support a network power supply voltage monitor. Use either of the following methods to check the voltage if a Flat Cable is connected.

- Connect a Flat Connector Socket connected to a cable to a Flat Connector Plug or Flat Cable I Multidrop Connector Plug at the location where a Bit Slave Unit with Compact Connectors is to be connected, secure the extended cable with the terminal block so as not to cause a short circuit, and measure the voltage using a voltmeter.
- Use a tester or voltmeter to measure between the V and G terminals of the I/O connector.

Note (1) Be careful to not cause a short-circuit when performing the measurement. The system or Unit may be damaged if a short-circuit is created.

(2) Always turn OFF the output from the Output Unit before measuring between the V and G terminals of the I/O connector. The Unit may be damaged if a short-circuit is made with a signal pin for which the output is ON when the measurement is performed.

Continuous Short- circuit Protection Circuit

This prevents the network power supply from continuously remaining short-circuited if a short-circuit occurs in I/O wiring. This protection circuit may become damaged when a short-circuit occurs, and cause the Unit to not operate correctly.

9-5-2 Two-point Input Unit CRT1B-ID02JS/CRT1B-ID02JS-1

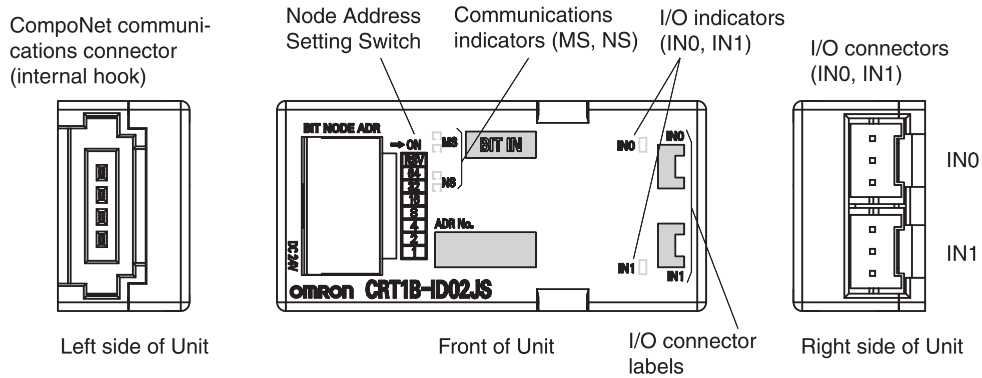
Input Section Specifications

Item	Specification	
Model	CRT1B-ID02JS	CRT1B-ID02JS-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	---	---
OFF current	1.0 mA max.	
Input current	3.0 mA min./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	
Power short-circuit detection	Not supported.	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	M4 screw mounting using CRT1B-ATT03 Mounting Bracket	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	25 mA max. for 24-VDC power supply voltage 30 mA max. for 14-VDC power supply voltage	
Input device supply current	50 mA/point (G terminal)	50 mA/point (V terminal)
Weight	16 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 (Same for CRT1B-ID02JS and CRT1B-ID02JS-1)



Display Section

Communications indicators

Refer to *4-1-3 Communications Indicators*.

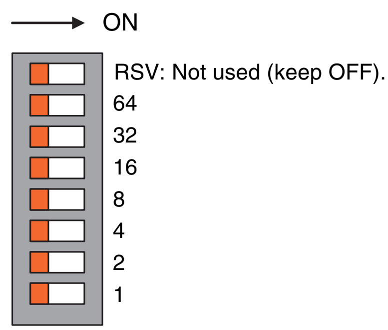
I/O indicators

The indicators show the status of the inputs.

Name	LED status	Status	Meaning
IN0, IN1	Lit yellow.	Input ON	The input is ON.
	Not lit	Input OFF	The input is OFF.

Setting the Node Address

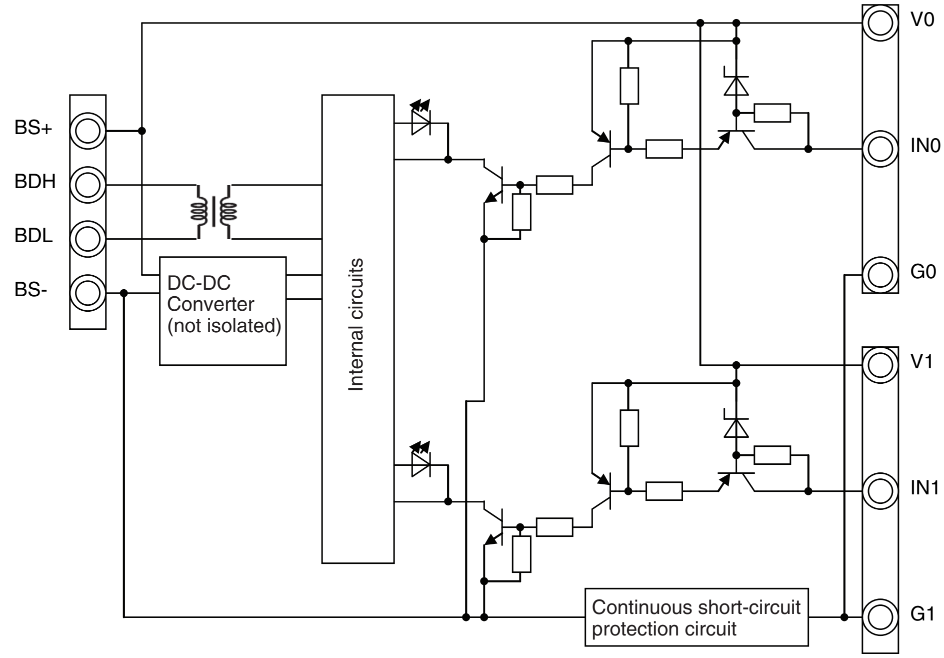
Using the node address switch, set the node address to a 7-bit binary value between 00000000 and 1111111 (0 to 127 decimal). Communications will not be performed if the node address is set out of range. The factory setting is 0000000.



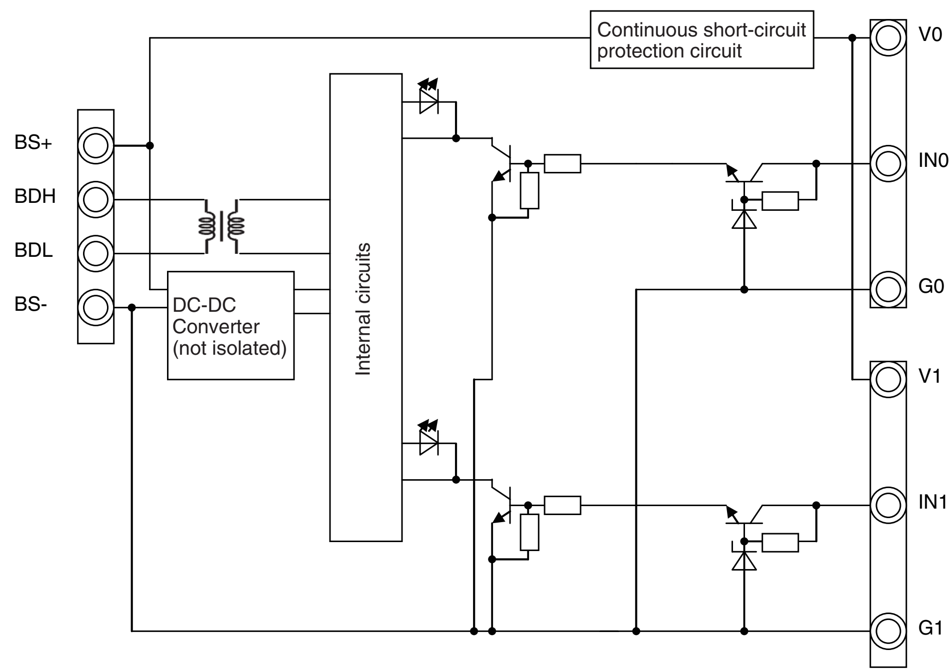
Refer to *Appendix F Node Address Settings for Bit Slave Units with Compact Connectors* for the relation between decimal node addresses and switch settings.

Internal circuits

CRT1B-ID02JS (NPN)



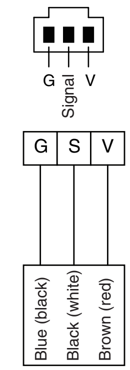
CRT1B-ID02JS-1 (PNP)



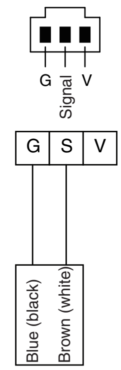
Wiring

The I/O connector section uses compact connectors. Pin arrangements and signals are shown below.

CRT1B-ID02JS (NPN)

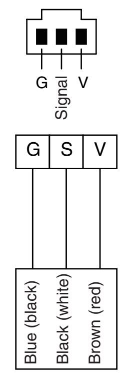


3-wire sensor with NPN output (photoelectric sensor or proximity sensor)

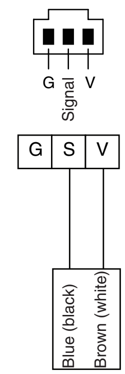


2-wire sensor (e.g., limit switch)

CRT1B-ID02JS-1 (PNP)



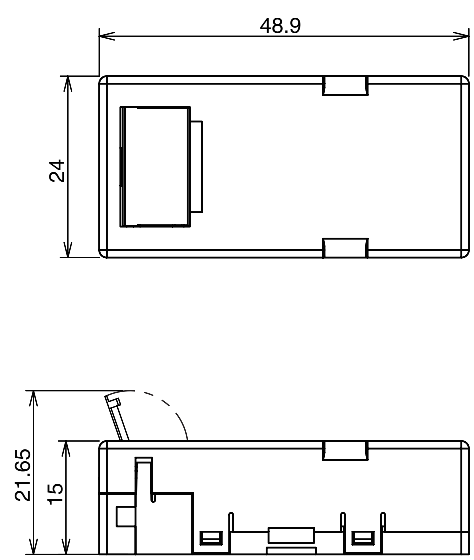
3-wire sensor with PNP output (photoelectric sensor or proximity sensor)



2-wire sensor (e.g., limit switch)

Note 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.

Dimensions (Same for CRT1B-ID02JS and CRT1B-ID02JS-1)



(mm)

9-5-3 Two-point Output Units CRT1B-OD02JS/CRT1B-OD02JS-1

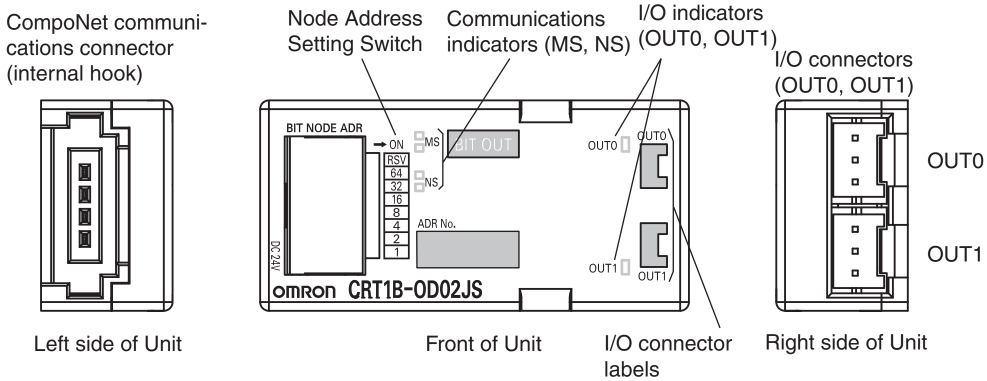
Output Section Specifications

Item	Specification	
Model	CRT1B-OD02JS	CRT1B-OD02JS-1
I/O capacity	2 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.1 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. (0.1 A DC, between each output terminal and G terminal)	1.2 V max. (0.1 A DC, between each output terminal and 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	
Load short-circuit detection	Not supported.	
Isolation method	No isolation	
Output indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	M4 screw mounting using CRT1B-ATT03 Mounting Bracket	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	25 mA max. for 24-VDC power supply voltage 30 mA max. for 14-VDC power supply voltage	
Output device supply current	30 mA/point (G terminal)	30 mA/point (V terminal)
Weight	16 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 (Same for CRT1B-OD02JS and CRT1B-OD02JS-1)



Display Section

Communications indicators

Refer to *4-1-3 Communications Indicators*.

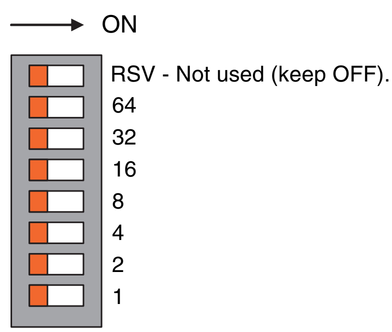
I/O indicators

The indicators show the status of the outputs.

Name	LED status	Status	Meaning
OUT0, OUT1	Lit yellow.	Output ON	The output is ON.
	Not lit	Output OFF	The output is OFF.

Setting the Node Address

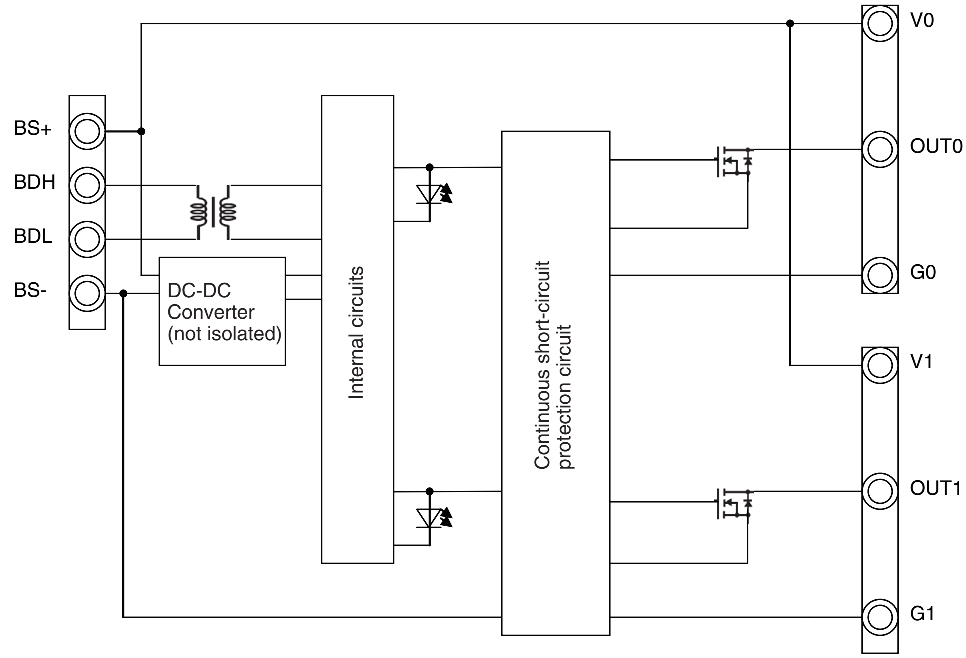
Using the node address switch, set the node address to a 7-bit binary value between 00000000 and 1111111 (0 to 127 decimal). Communications will not be performed if the node address is set out of range. The factory setting is 0000000.



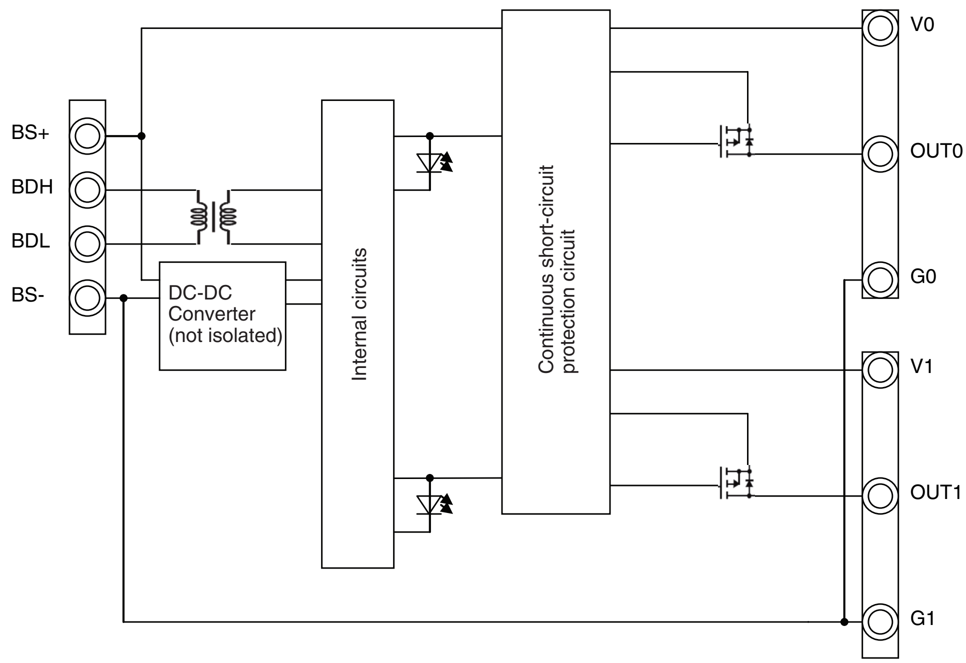
Refer to *Appendix F Node Address Settings for Bit Slave Units with Compact Connectors* for the relation between decimal node addresses and switch settings.

Internal circuits

CRT1B-OD02JS (NPN)



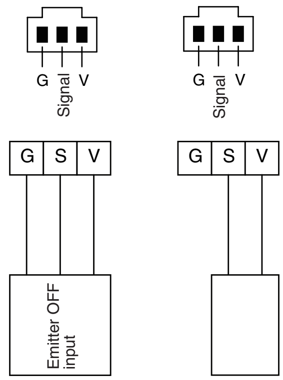
CRT1B-OD02JS-1 (PNP)



Wiring

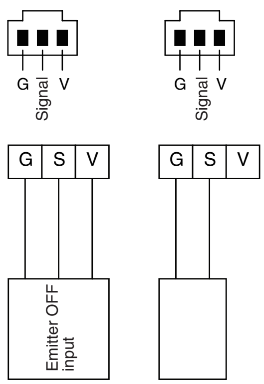
The I/O connector section uses compact connectors. Pin arrangements and signals are shown below.

CRT1B-OD02JS (NPN)



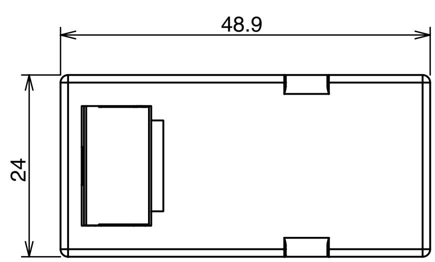
Photoelectric sensor, emitter, etc.　　Solenoid, valve, etc.

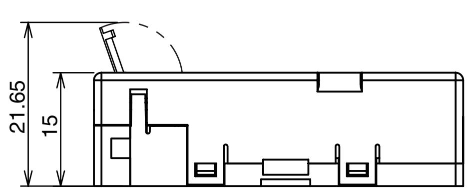
CRT1B-OD02JS-1 (PNP)



Photoelectric sensor, emitter, etc.　　Solenoid, valve, etc.

Dimensions (Same for CRT1B-OD02JS and CRT1B-OD02JS-1)





(mm)

9-5-4 Four-point Input Unit CRT1B-ID04JS/CRT1B-ID04JS-1

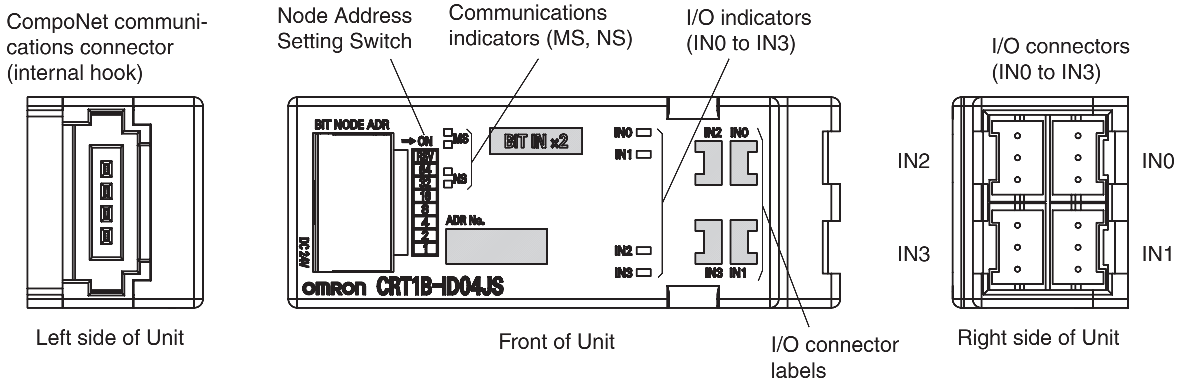
Input Section Specifications

Item	Specification	
Model	CRT1B-ID04JS	CRT1B-ID04JS-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	---	---
OFF current	1.0 mA max.	
Input current	3.0 mA min./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	
Power short-circuit detection	Not supported.	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	M4 screw mounting using CRT1B-ATT03 Mounting Bracket	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	35 mA max. for 24-VDC power supply voltage 40 mA max. for 14-VDC power supply voltage	
Input device supply current	50 mA/point (G terminal)	50 mA/point (V terminal)
Weight	21 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 (Same for CRT1B-ID04JS and CRT1B-ID04JS-1)



Display Section

Communications indicators

Refer to *4-1-3 Communications Indicators*.

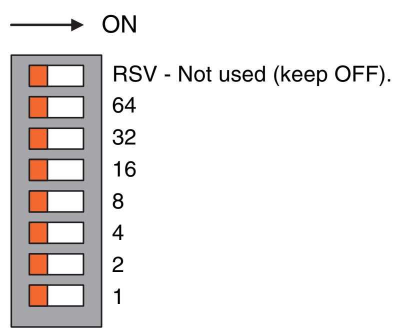
I/O indicators

The indicators show the status of the inputs.

Name	LED status	Status	Meaning
IN0 to IN3	Lit yellow.	Input ON	The input is ON.
	Not lit	Input OFF	The input is OFF.

Setting the Node Address

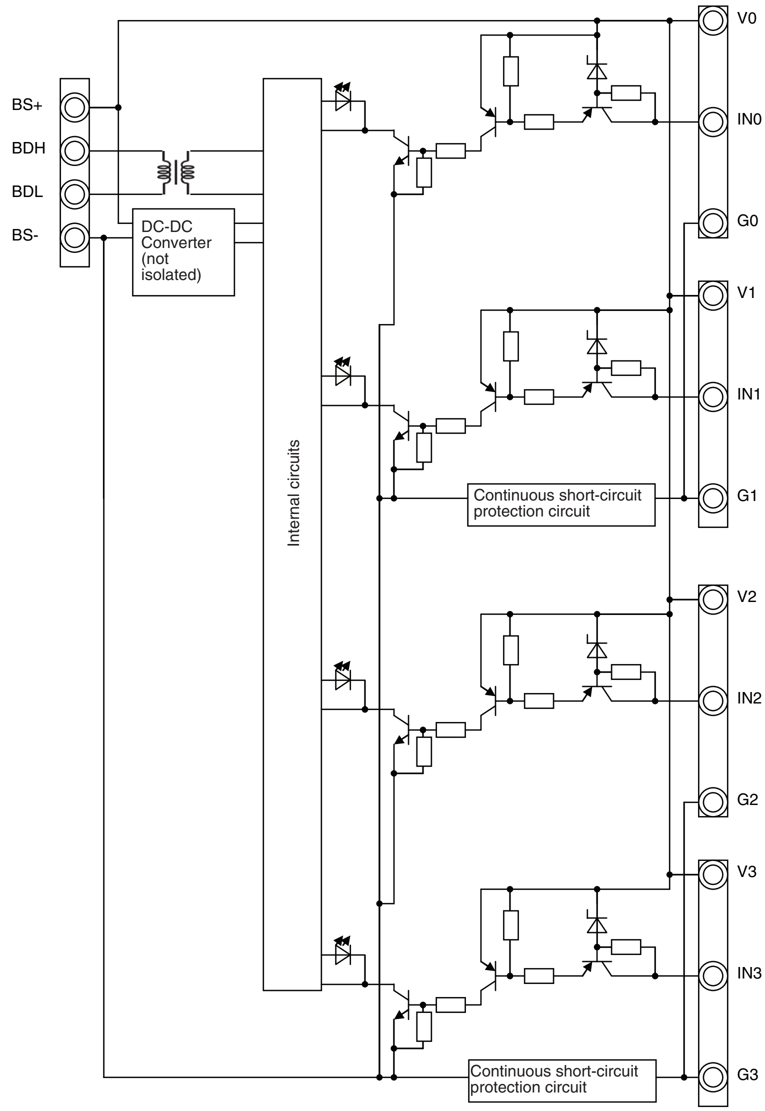
Using the node address switch, set the node address to a 7-bit binary value between 00000000 and 1111110 (0 to 126 decimal). Communications will not be performed if the node address is set out of range. The factory setting is 0000000.



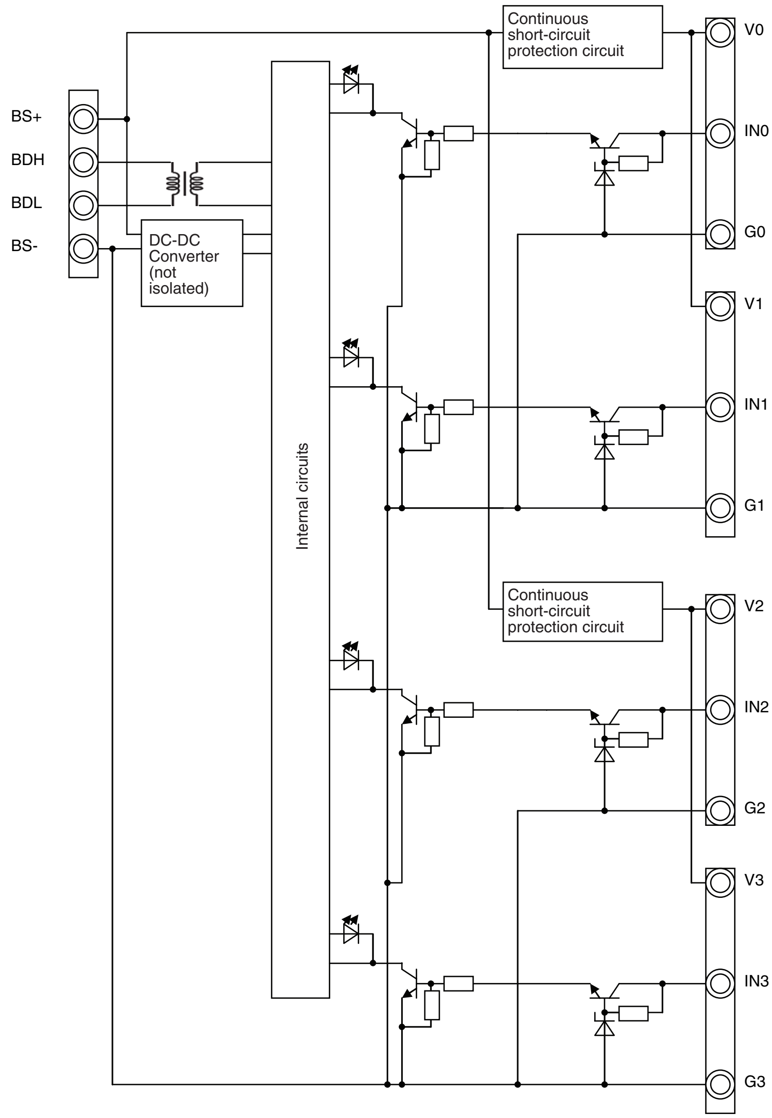
Refer to *Appendix F Node Address Settings for Bit Slave Units with Compact Connectors* for the relation between decimal node addresses and switch settings.

Internal circuits

CRT1B-ID04JS (NPN)



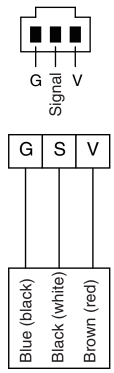
CRT1B-ID04JS-1 (PNP)



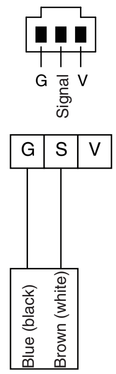
Wiring

The I/O connector section uses compact connectors. Pin arrangements and signals are shown below.

CRT1B-ID04JS (NPN)

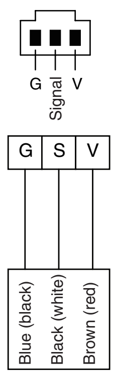


3-wire sensor with NPN output (photoelectric sensor or proximity sensor)

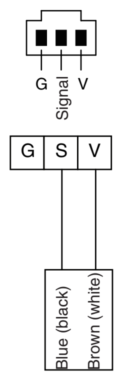


2-wire sensor (e.g., limit switch)

CRT1B-ID04JS-1 (PNP)



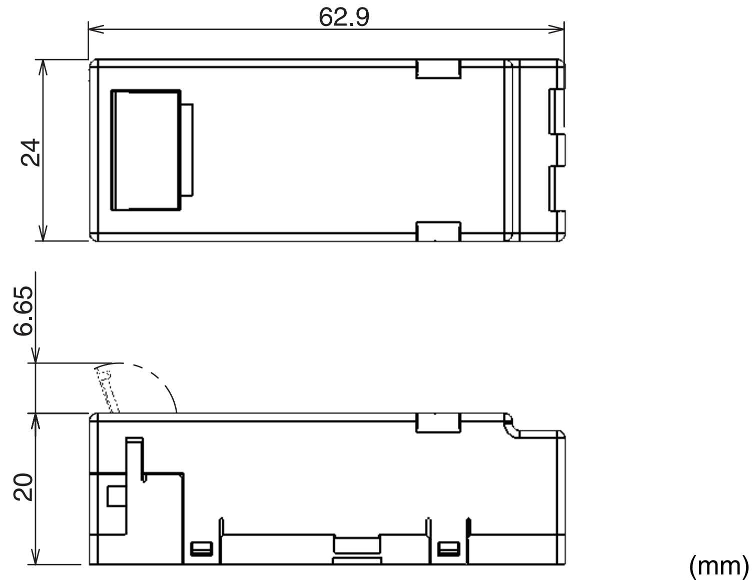
3-wire sensor with PNP output (photoelectric sensor or proximity sensor)



2-wire sensor (e.g., limit switch)

Note 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.

Dimensions (Same for CRT1B-ID04JS and CRT1B-ID04JS-1)



9-5-5 Four-point Output Units CRT1B-OD04JS/CRT1B-OD04JS-1

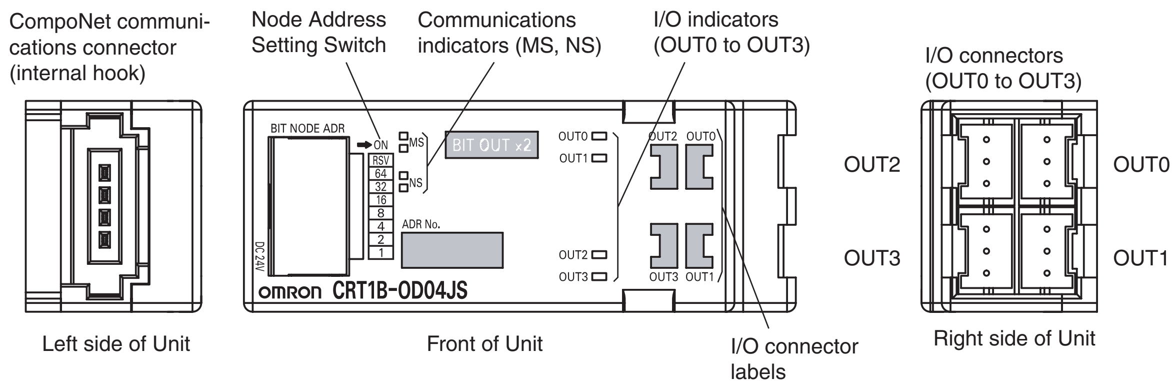
Output Section Specifications

Item	Specification	
Model	CRT1B-OD04JS	CRT1B-OD04JS-1
I/O capacity	4 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.1 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. (0.1 A DC, between each output terminal and G terminal)	1.2 V max. (0.1 A DC, between each output terminal and 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	4 outputs/common	
Load short-circuit detection	Not supported.	
Isolation method	No isolation	
Output indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	M4 screw mounting using CRT1B-ATT03 Mounting Bracket	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	30 mA max. for 24-VDC power supply voltage 35 mA max. for 14-VDC power supply voltage	
Output device supply current	30 mA/point (G terminal)	30 mA/point (V terminal)
Weight	21 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 (Same for CRT1B-OD04JS and CRT1B-OD04JS-1)



Display Section

Communications indicators

Refer to *4-1-3 Communications Indicators*.

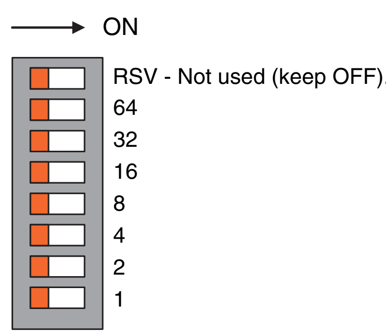
I/O indicators

The indicators show the status of the inputs.

Name	LED status	Status	Meaning
OUT0 to OUT3	Lit yellow.	Input ON	The input is ON.
	Not lit	Input OFF	The input is OFF.

Setting the Node Address

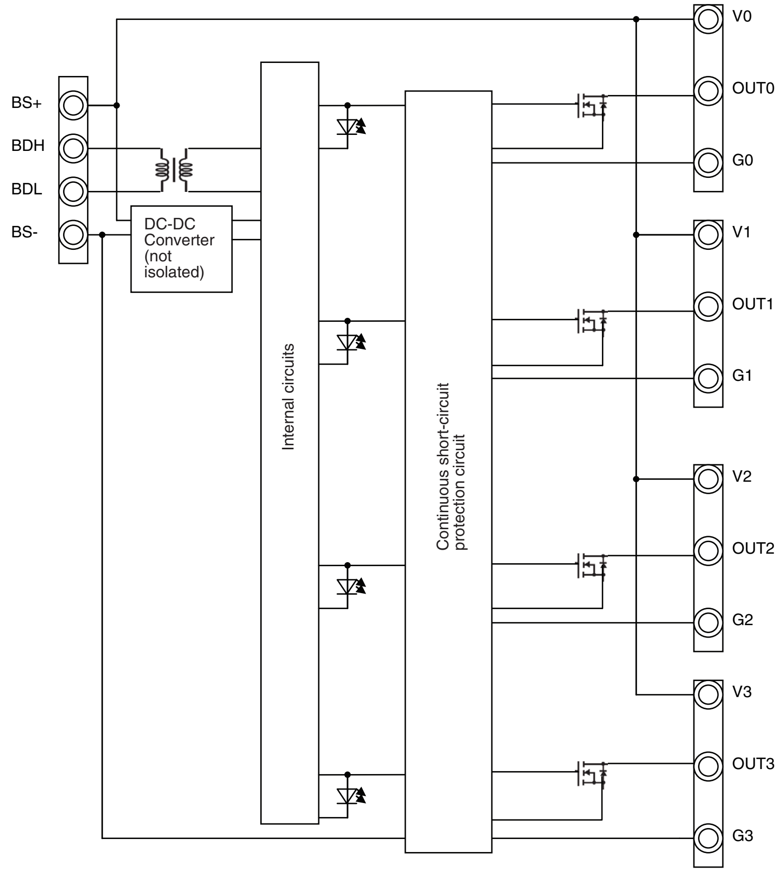
Using the node address switch, set the node address to a 7-bit binary value between 00000000 and 1111110 (0 to 126 decimal). Communications will not be performed if the node address is set out of range. The factory setting is 0000000.



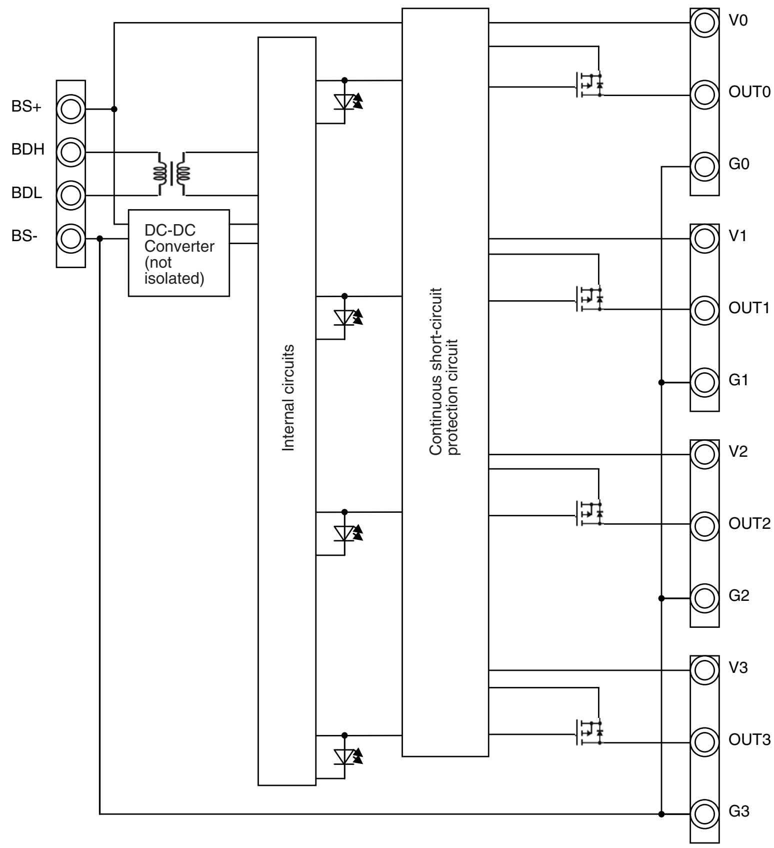
Refer to *Appendix F Node Address Settings for Bit Slave Units with Compact Connectors* for the relation between decimal node addresses and switch settings.

Internal circuits

CRT1B-OD04JS (NPN)



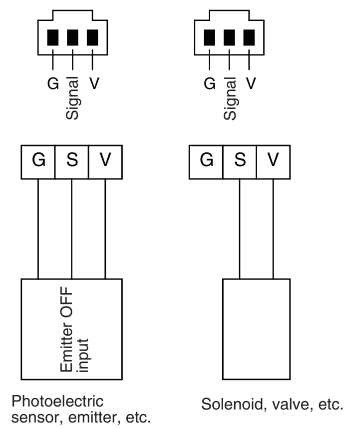
CRT1B-OD04JS-1 (PNP)



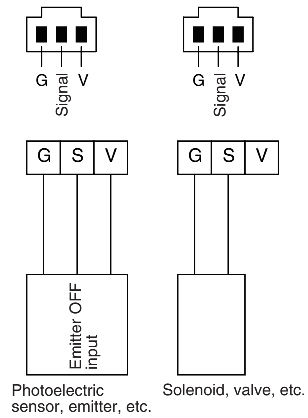
Wiring

The I/O connector section uses compact connectors. Pin arrangements and signals are shown below.

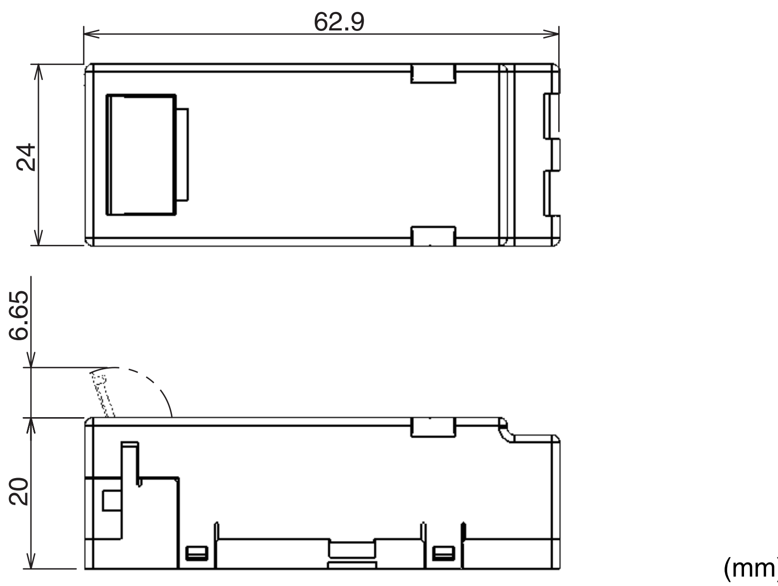
CRT1B-OD04JS (NPN)



CRT1B-OD04JS-1 (PNP)



Dimensions (Same for CRT1B-OD04JS and CRT1B-OD04JS-1)



9-5-6 One-point Input/One-point Output Unit CRT1B-MD02JS/CRT1B-MD02JS-1

Input Section Specifications

Item	Specification	
Model	CRT1B-MD02JS	CRT1B-MD02JS-1
I/O capacity	1 input	
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	---	---
OFF current	1.0 mA max.	
Input current	3.0 mA min./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	1 input/common	
Power short-circuit detection	Not supported.	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	M4 screw mounting using CRT1B-ATT03 Mounting Bracket	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	25 mA max. for 24-VDC power supply voltage 30 mA max. for 14-VDC power supply voltage	
Input device supply current	50 mA/point (G terminal)	50 mA/point (V terminal)
Weight	16 g max.	

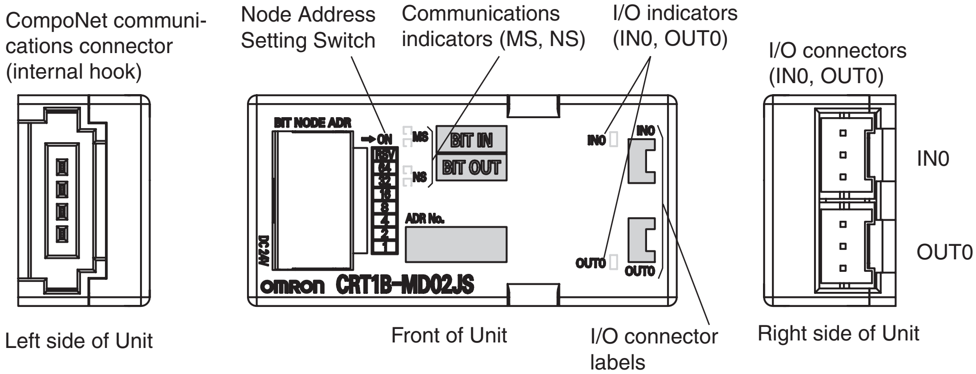
Note The current consumption is for Bit Slave Unit communications current when all inputs are OFF, i.e., it does not include input device current consumption. The communications power supply is also used for the I/O power supply for sensors. Be sure to consider the sensor current consumption and the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

Output Section Specifications

Item	Specification	
Model	CRT1B-MD02JS	CRT1B-MD02JS-1
I/O capacity	1 output	
Internal I/O common	NPN	PNP
Rated output current	0.1 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. (DC, 0.1 A, between each output terminal and G terminal)	1.2 V max. (DC, 0.1 A, between each output terminal and 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	1 output/common	
Load short-circuit detection	Not supported.	
Isolation method	No isolation	
Output indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	M4 screw mounting using CRT1B-ATT03 Mounting Bracket	
Power supply type	Network power supply	
Output device supply current	30 mA/point (G terminal)	30 mA/point (V terminal)

Component Names and Functions (Same for CRT1B-MD02JS and CRT1B-MD02JS-1)



Display Section

Communications indicators

Refer to *4-1-3 Communications Indicators*.

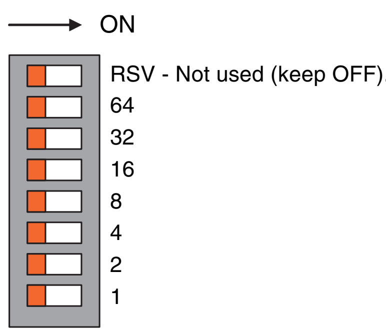
I/O indicators

The indicators show the status of the input and output.

Name	LED status	Status	Meaning
IN0, OUT0	Lit yellow.	I/O ON	The I/O is ON.
	Not lit	I/O OFF	The I/O is OFF.

Setting the Node Address

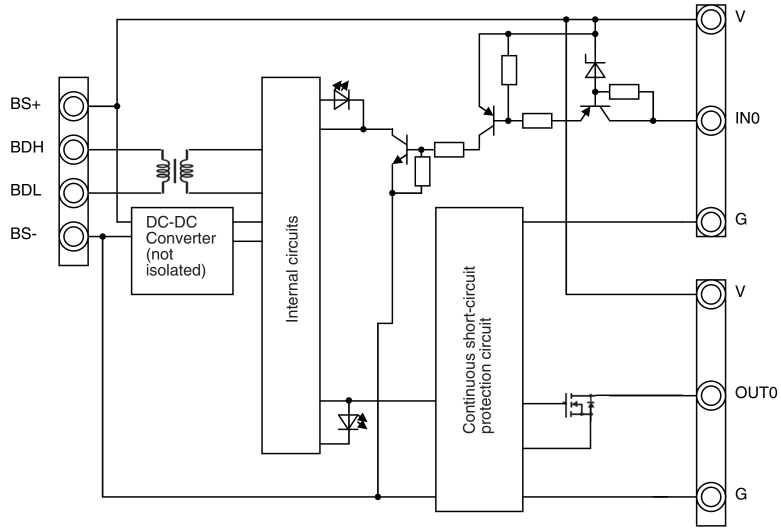
Using the node address switch, set the node address to a 7-bit binary value between 00000000 and 1111111 (0 to 127 decimal). Communications will not be performed if the node address is set out of range. The factory setting is 0000000.



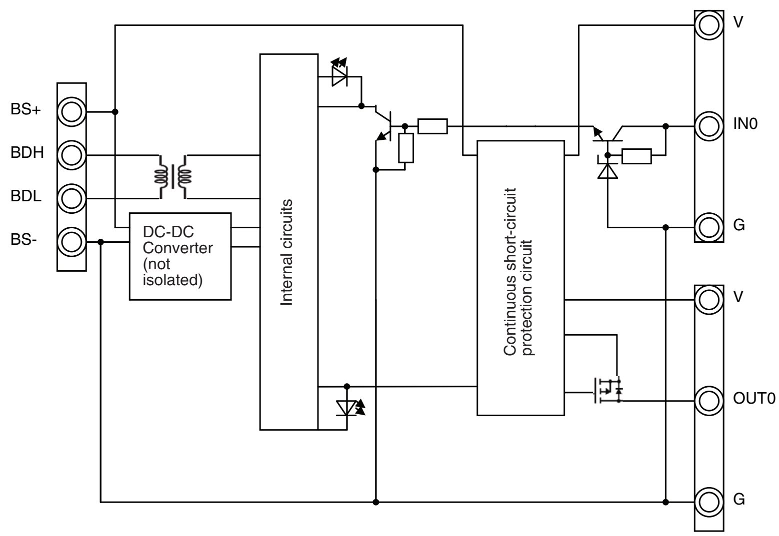
Refer to *Appendix F Node Address Settings for Bit Slave Units with Compact Connectors* for the relation between decimal node addresses and switch settings.

Internal circuits

CRT1B-MD02JS (NPN)



CRT1B-MD02JS-1 (PNP)

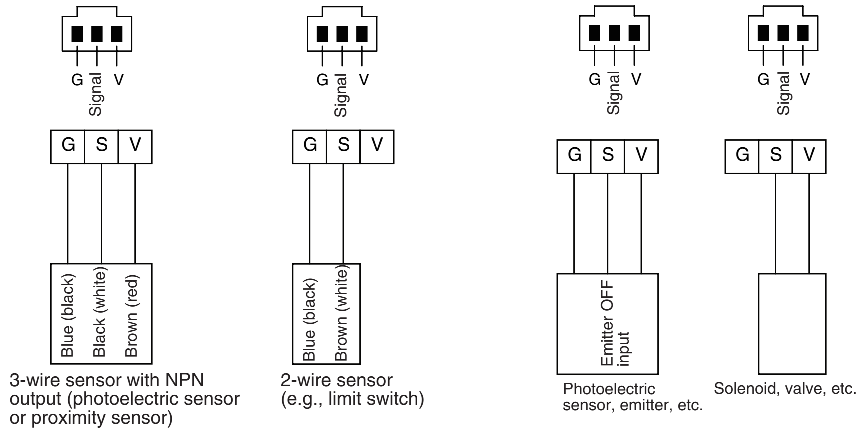


Wiring

The I/O connector section uses compact connectors. Pin arrangements and signals are shown below.

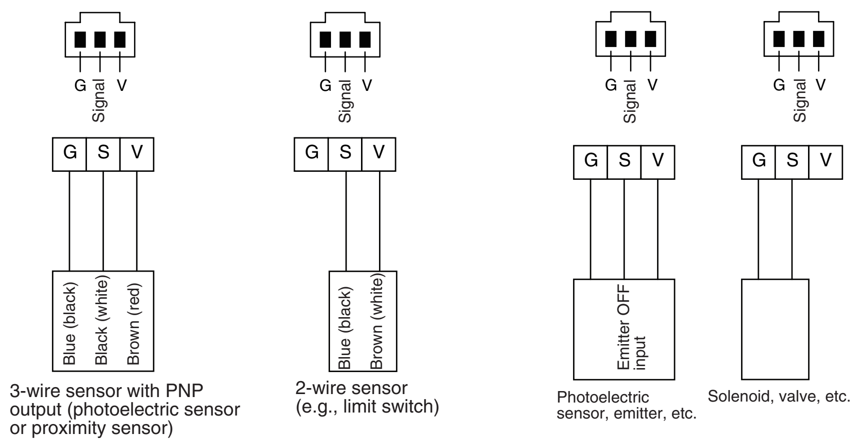
CRT1B-MD02JS (NPN)

Input Connectors Output Connectors



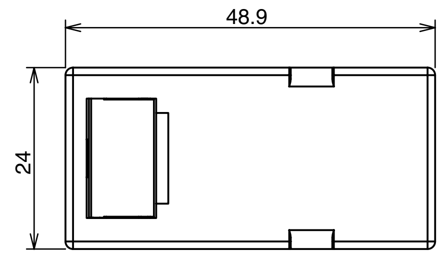
CRT1B-MD02JS-1 (PNP)

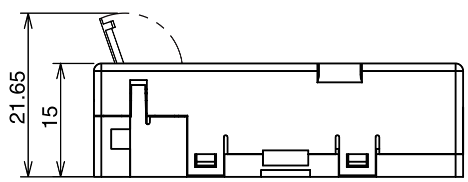
Input Connectors Output Connectors



Note 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.

Dimensions (CRT1B-MD02JS and CRT1B-MD02JS-1)





(mm)

9-5-7 Two-point Input/Two-point Output Unit CRT1B-MD04JS/CRT1B-MD04JS-1

Input Section Specifications

Item	Specification	
Model	CRT1B-MD04JS	CRT1B-MD04JS-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	---	---
OFF current	1.0 mA max.	
Input current	3.0 mA min./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	
Power short-circuit detection	Not supported.	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	M4 screw mounting using CRT1B-ATT03 Mounting Bracket	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	35 mA max. for 24-VDC power supply voltage 40 mA max. for 14-VDC power supply voltage	
Input device supply current	50 mA/point (G terminal)	50 mA/point (V terminal)
Weight	21 g max.	

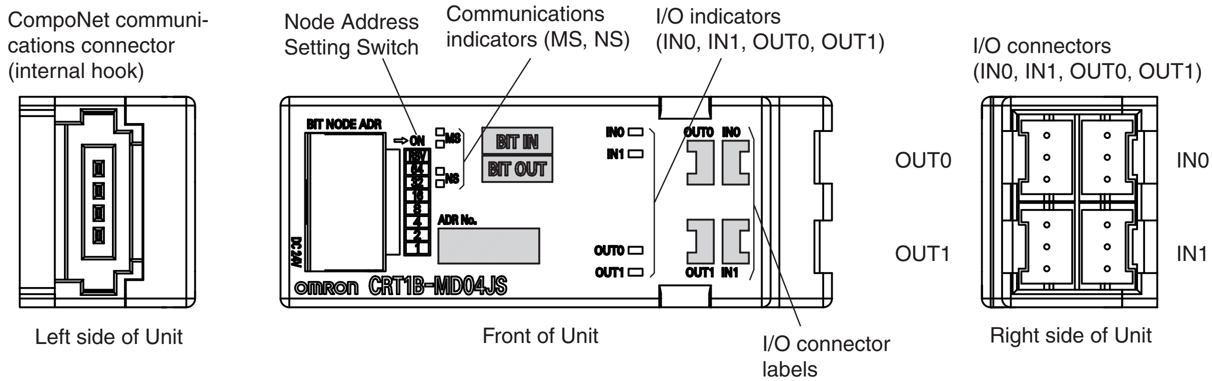
Note The current consumption is for Bit Slave Unit communications current when all inputs are OFF, i.e., it does not include input device current consumption. The communications power supply is also used for the I/O power supply for sensors. Be sure to consider the sensor current consumption and the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

Output Section Specifications

Item	Specification	
Model	CRT1B-MD04JS	CRT1B-MD04JS-1
I/O capacity	2 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.1 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. (DC, 0.1 A, between each output terminal and G terminal)	1.2 V max. (DC, 0.1 A, between each output terminal and 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	
Load short-circuit detection	Not supported.	
Isolation method	No isolation	
Output indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	M4 screw mounting using CRT1B-ATT03 Mounting Bracket	
Power supply type	Network power supply	
Output device supply current	30 mA/point (G terminal)	30 mA/point (V terminal)

Component Names and Functions (Same for CRT1B-MD04JS and CRT1B-MD04JS-1)



Display Section

Communications indicators

Refer to *4-1-3 Communications Indicators*.

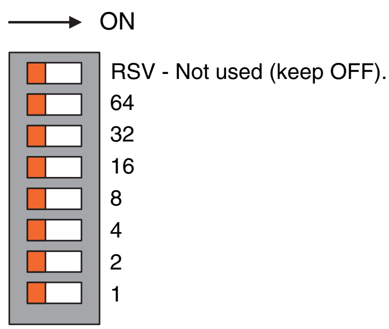
I/O indicators

The indicators show the status of the inputs.

Name	LED status	Status	Meaning
IN0, IN1, OUT0, OUT1	Lit yellow.	Input ON	The input is ON.
	Not lit	Input OFF	The input is OFF.

Setting the Node Address

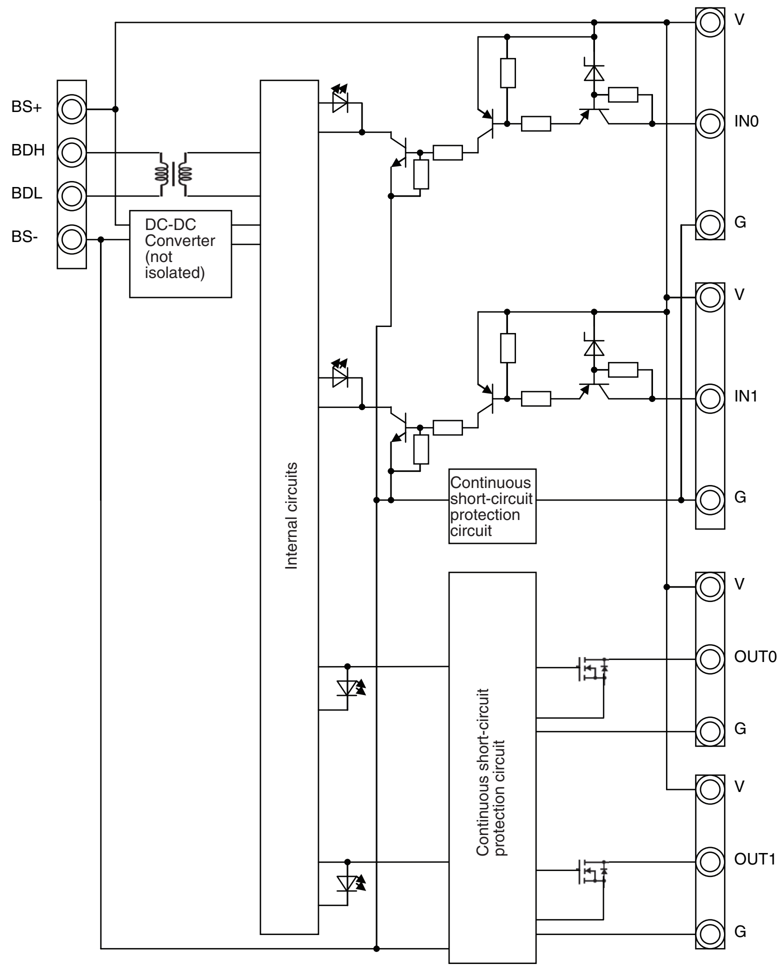
Using the node address switch, set the node address to a 7-bit binary value between 00000000 and 1111111 (0 to 127 decimal). Communications will not be performed if the node address is set out of range. The factory setting is 0000000.



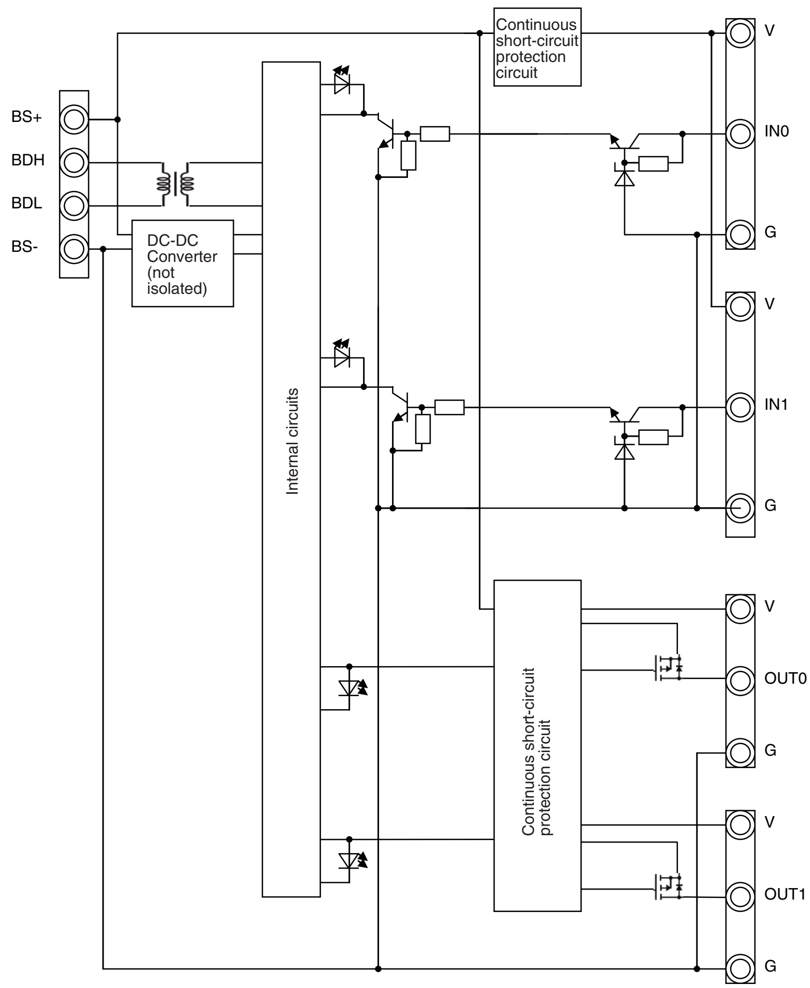
Refer to *Appendix F Node Address Settings for Bit Slave Units with Compact Connectors* for the relation between decimal node addresses and switch settings.

Internal circuits

CRT1B-MD04JS (NPN)



CRT1B-MD04JS-1 (PNP)



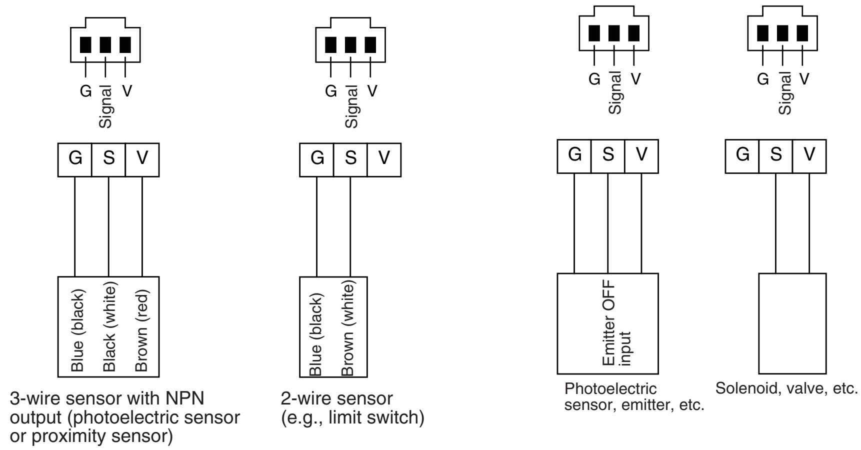
Wiring

The I/O connector section uses compact connectors. Pin arrangements and signals are shown below.

CRT1B-MD04JS (NPN)

Input Connectors

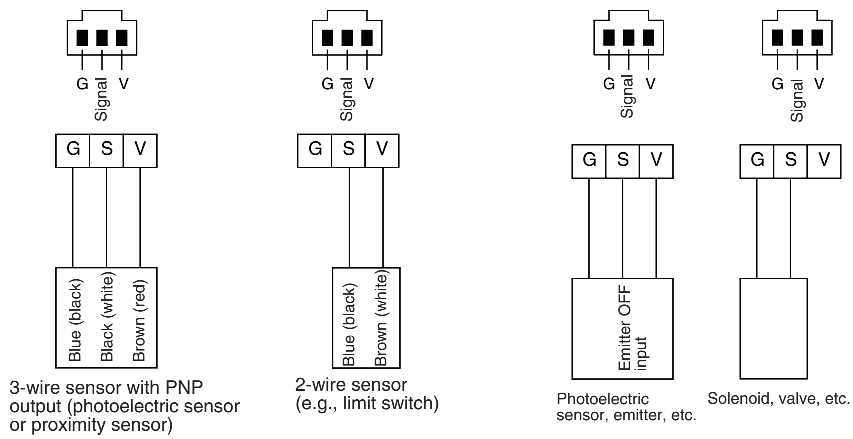
Output Connectors



CRT1B-MD04JS-1 (PNP)

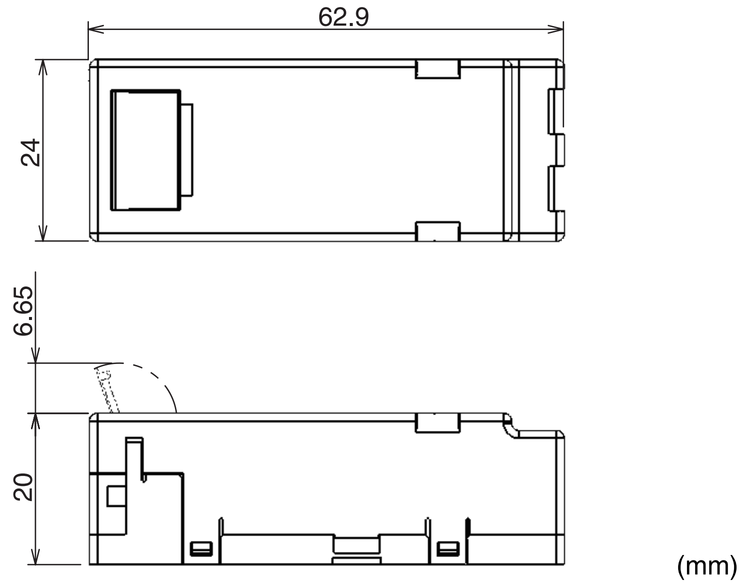
Input Connectors

Output Connectors



Note 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.

Dimensions (Same for CRT1B-MD04JS and CRT1B-MD04JS-1)



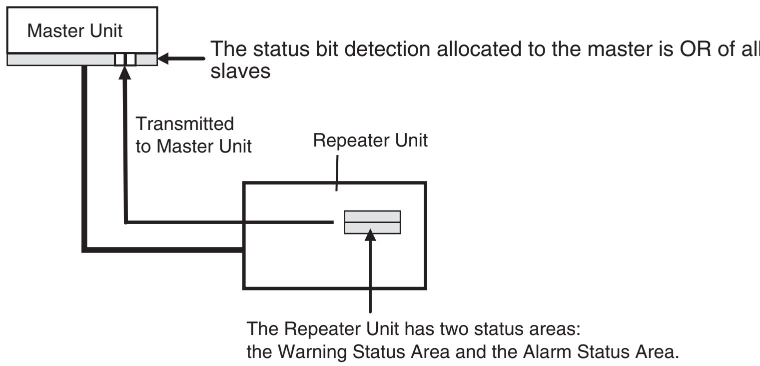
SECTION 10
Repeater Units

This section describes the Repeater Unit.

10-1 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. When any of the bits in the status area of the slaves connected to the Master Unit turns ON, the corresponding bit (bit 12 is for warning status area notices and bit 13 is for alarm area notices) of the status flag in the Master Unit turns ON.

The Repeater Unit's status area information can be read by using the CX-Integrator or explicit messages.



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 Conduction 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 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	Reserved	---
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

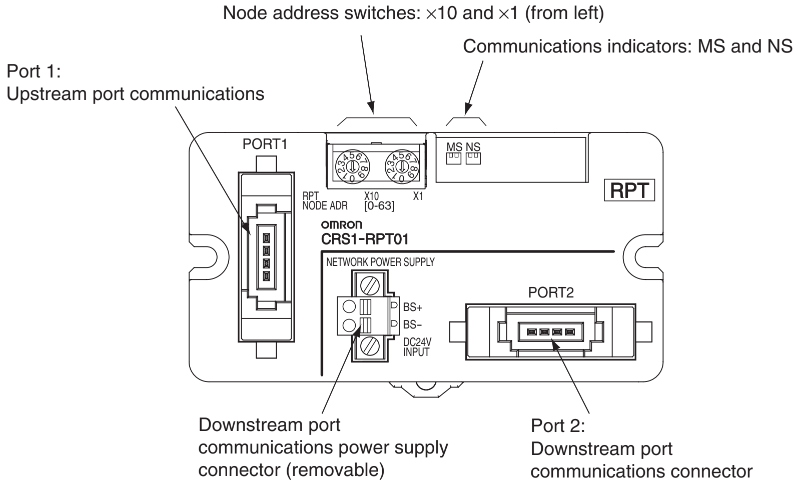
10-2 Repeater Unit

10-2-1 Repeater Unit CRT1-RPT01

Specifications

Item	Specification
Model	CRS1-RPT01
Communications ports	Upstream port (port 1): Trunk 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 from 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 connector (PORT1).
Communications power supply connector allowable current capacity	5 A max. (UL: 4 A)
Noise immunity	Conforms to IEC 61000-4-4, 2 kV (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	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



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).

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

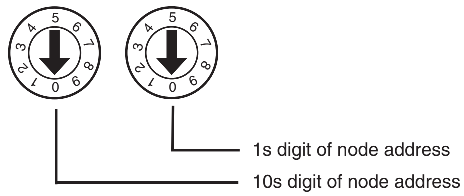
Name	Indicator status	Status	Meaning
MS	Lit green.	Normal status	The Unit is operating normally.
	Flashing green.	---	---
	Lit red.	Fatal error	A hardware error has occurred in the Unit. The watchdog timer has timed-out.
	Flashing red.	Non-fatal error	There is an error in the settings. An EEPROM checksum error has occurred.
	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 address is set out of range or 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/Baud rate not yet detected.	The power supply is OFF or the baud rate has not been detected.

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.)

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



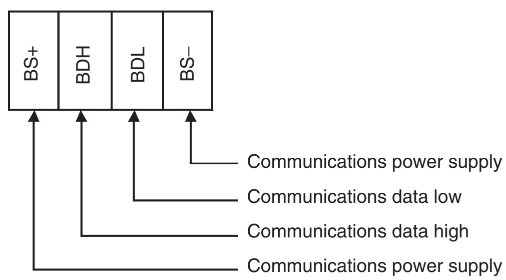
Terminal Arrangement

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)



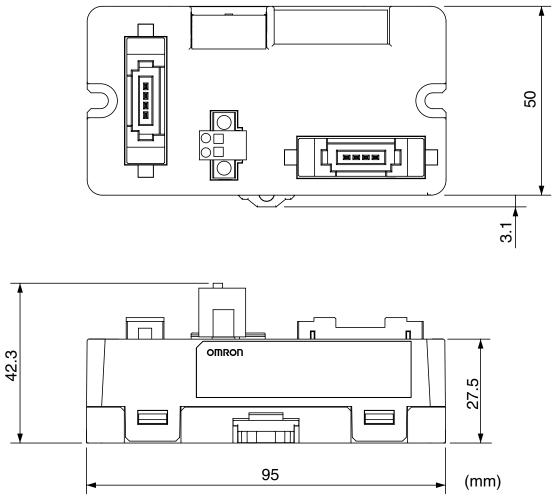
Downstream Port Communications Power Supply Connector

This connector supplies communications power to Slave Units and Repeater Units connected to the downstream communications connector (port 2).

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 11
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.

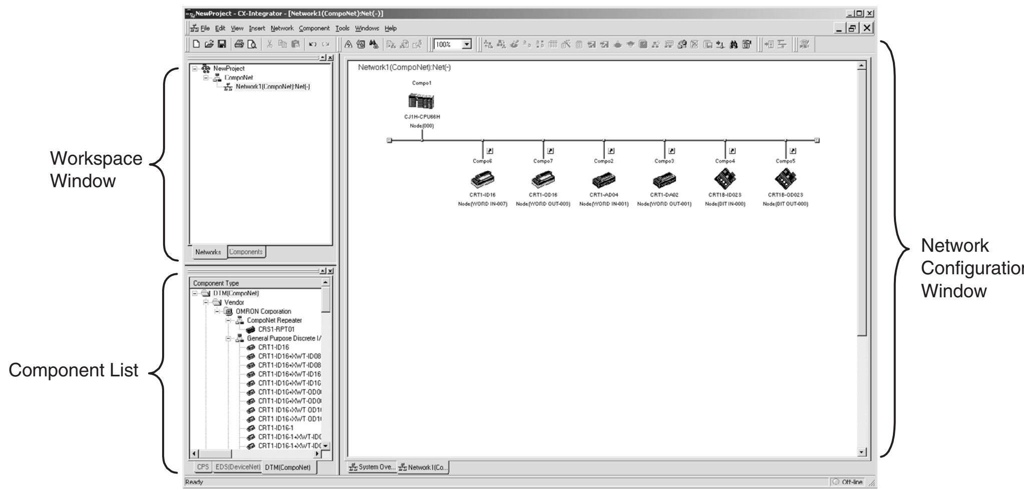
11-1 CX-Integrator

There are two main network display windows in the CX-Integrator: the Online Window and the Offline Window.

11-1-1 Offline Window

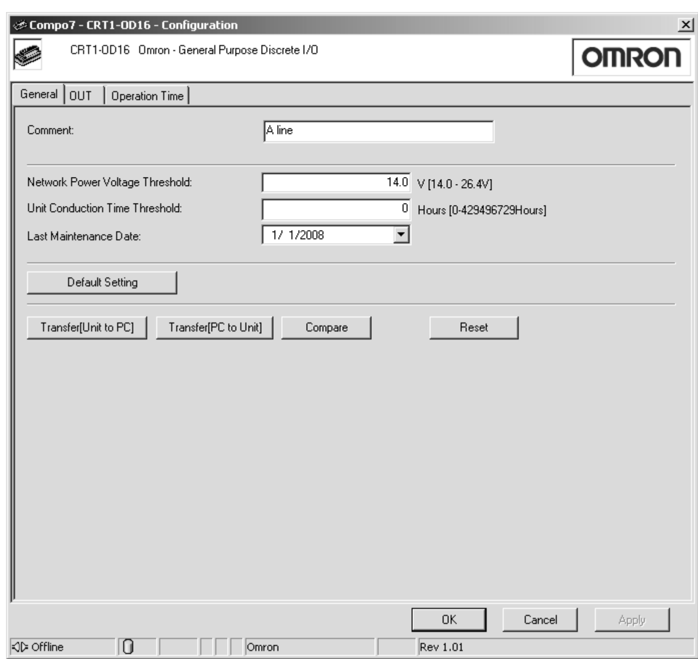
The Offline Window has a white background and is displayed when the CX-Integrator is started. Normally, parameters and other settings are made in this window. The devices parameters for any Slave Unit can be set or edited simply by double-clicking on the Slave Unit in the Offline Window. Refer to *11-2 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.

Offline Window



Configuration Window

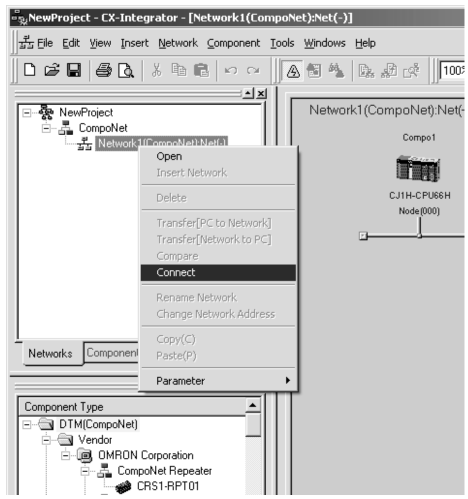
The Configuration Window is used to set and edit functions. To display the Configuration Window, double-click the icon for Slave Unit or right-click the icon and select ***Parameters - Edit*** from the pop-up menu.



11-1-2 Online Window

The Online Window is used to monitor information for CompoNet Slave Units. Use the following procedure to switch from offline to online.

1. Click the  icon in the menu, or select ***Network - Work Online*** from the menu. The background color of the Network Configuration Window will change to gray.
2. Right-click the network name in the Workspace Window, and select ***Connect*** from the pop-up menu.

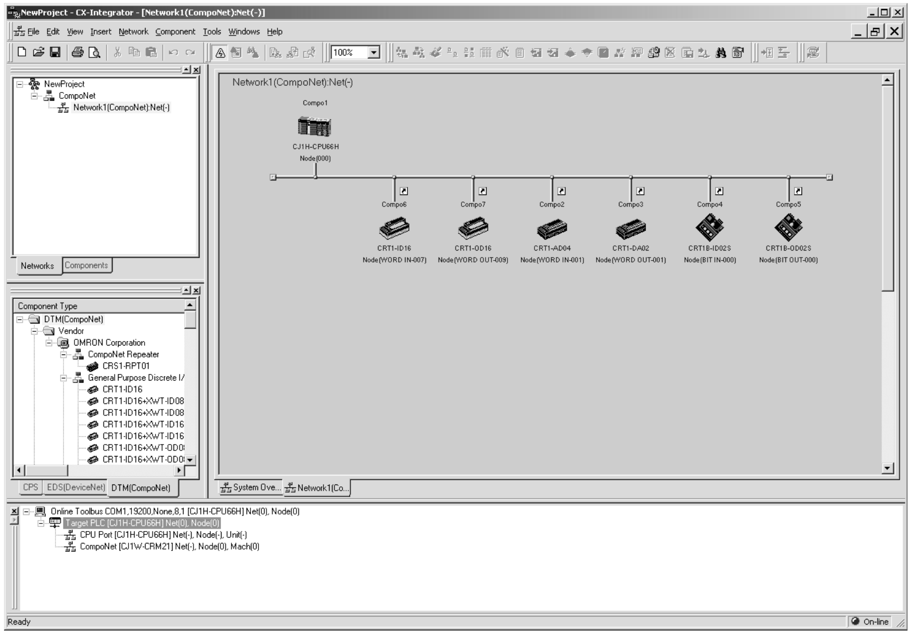


Toggles to on-line status.

While connected online, information on the CompoNet Slave Units is displayed in the Monitor Window. Open this window to monitor the CompoNet Slave Units.

Note The Monitor 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 **Update** Button in the Monitor Window to read the data from the network.

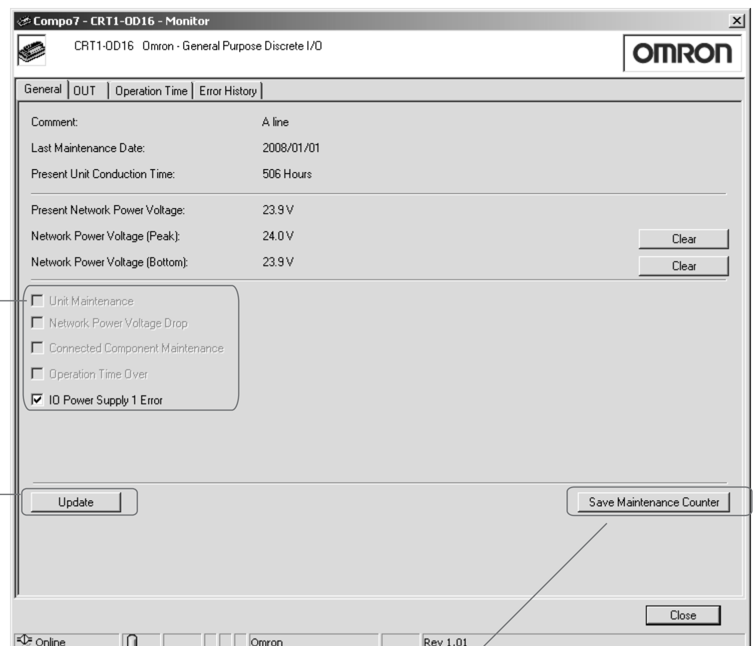
Online Window



Online Connection Information Window

Monitor Window

To display the Monitor Window for a CompoNet Slave Unit, right-click the icon for that Slave Unit and select ***Monitor*** from the pop-up window.



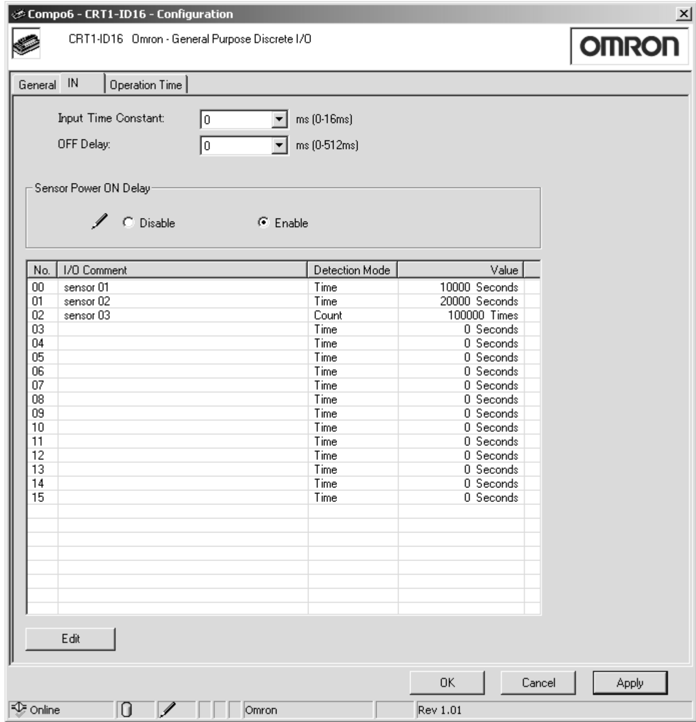
Maintenance information: Displays the generated maintenance information.

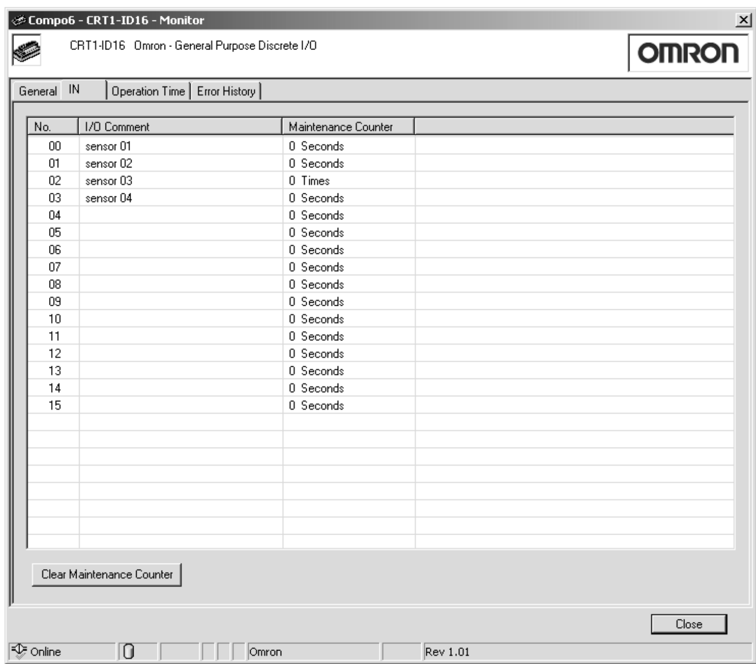
Update Button: Refreshes the current Slave Unit maintenance information.

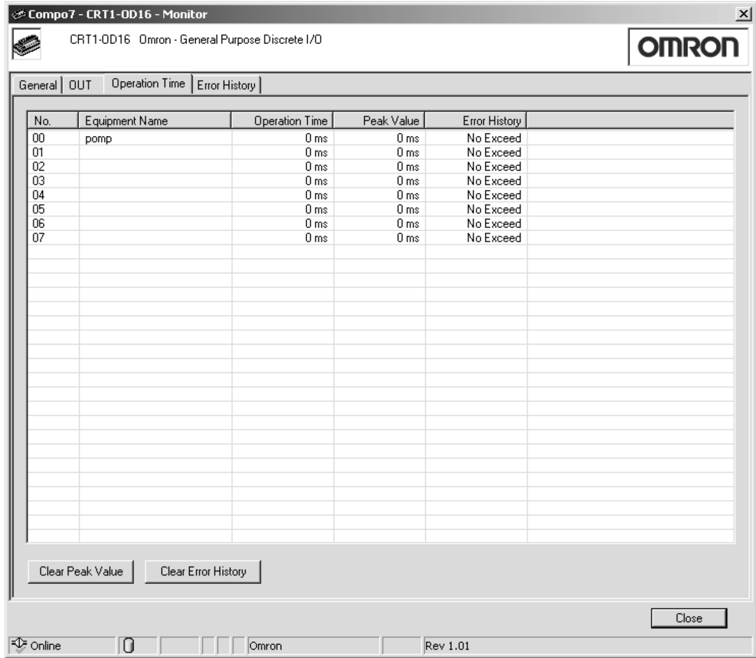
Save Maintenance Counter Button: The maintenance counter value can be saved to the flash memory in the Slave Unit.

■ OUT, IN, and Operation Time Tab Pages

More detailed maintenance information can be found on the OUT, IN, and Operation Time Tab Pages.


Compo6 - CRT1-ID16 - Configuration
CRT1-ID16 Omron - General Purpose Discrete I/O
OMRON
General
IN
Operation Time
Input Time Constant:
0
ms (0-16ms)
OFF Delay:
0
ms (0-512ms)
Sensor Power ON Delay
Disable
Enable
No. | I/O Comment | Detection Mode | Value
00 sensor 01 Time 10000 Seconds
01 sensor 02 Time 20000 Seconds
02 sensor 03 Count 100000 Times
03 Time 0 Seconds
04 Time 0 Seconds
05 Time 0 Seconds
06 Time 0 Seconds
07 Time 0 Seconds
08 Time 0 Seconds
09 Time 0 Seconds
10 Time 0 Seconds
11 Time 0 Seconds
12 Time 0 Seconds
13 Time 0 Seconds
14 Time 0 Seconds
15 Time 0 Seconds
Edit
OK
Cancel
Apply
Online
Omron
Rev 1.01


Compo6 - CRT1-ID16 - Monitor
CRT1-ID16 Omron - General Purpose Discrete I/O
OMRON
General
IN
Operation Time
Error History
No. | I/O Comment | Maintenance Counter
00 sensor 01 0 Seconds
01 sensor 02 0 Seconds
02 sensor 03 0 Times
03 sensor 04 0 Seconds
04 0 Seconds
05 0 Seconds
06 0 Seconds
07 0 Seconds
08 0 Seconds
09 0 Seconds
10 0 Seconds
11 0 Seconds
12 0 Seconds
13 0 Seconds
14 0 Seconds
15 0 Seconds
Clear Maintenance Counter
Close
Online
Omron
Rev 1.01


Compo7 - CRT1-OD16 - Monitor
CRT1-OD16 Omron - General Purpose Discrete I/O
OMRON
General
OUT
Operation Time
Error History
No.
Equipment Name
Operation Time
Peak Value
Error History
00 pomp 0 ms 0 ms No Exceed
01 0 ms 0 ms No Exceed
02 0 ms 0 ms No Exceed
03 0 ms 0 ms No Exceed
04 0 ms 0 ms No Exceed
05 0 ms 0 ms No Exceed
06 0 ms 0 ms No Exceed
07 0 ms 0 ms No Exceed
Clear Peak Value
Clear Error History
Close
Online
Omron
Rev 1.01

11-2 Functions Common to All Slave Units

This section describes the functions common to all CompoNet Slave Units and the procedures for using these functions.

The functions described in *11-2-1 Automatic Baud Rate Detection* and *11-2-2 Hold/Clear Outputs* are supported by Bit Slave Units with Compact Connectors.

11-2-1 Automatic Baud Rate Detection

Description

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.

11-2-2 Hold/Clear Outputs

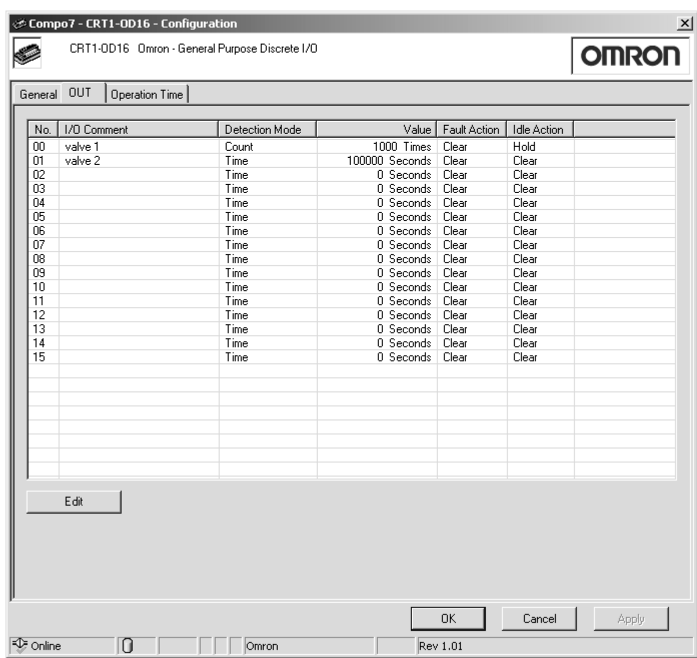
Description

Output Units can be set to hold or clear outputs when an error occurs.

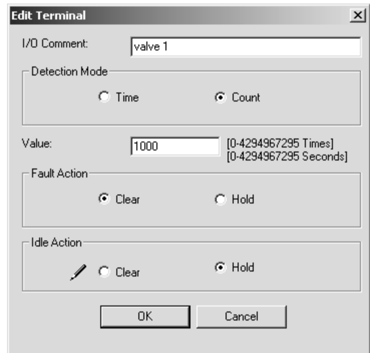
Procedure Using CX-Integrator

1,2,3...

1. Turn ON the power to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **OUT** Tab.



4. Double-click *I/O Comment* for the terminal to be set. The Edit Terminal Window will be displayed. Select either to clear or hold outputs when a communications error (*Fault Action*) and idle state (*Idle Action*) occurs, and then click the **OK** Button.



Fault Action

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.

A communications error occurs when communications with the Master Unit are interrupted.

Idle Action

Clear	Clears all output data from the Master Unit to 0 when idle action occurs.
Hold	Holds all output data from the Master Unit at its current status when idle action occurs.

Idle action is the status that results when an idle output specification is received from the Master Unit. An idle output is specified when a CPU Unit monitoring error occurs in a CS/CJ-series Master Unit.

5. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

11-2-3 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 CX-Integrator, 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 CX-Integrator or using explicit messages.

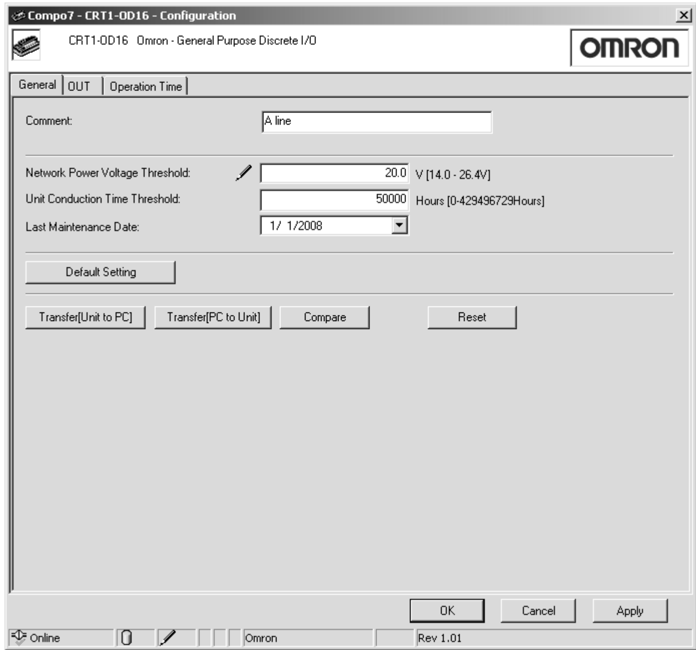
Note
(1) The minimum communications power voltage for the CompoNet network itself is 14 V, so if the network power voltage drops below 14 V, it may not be possible to read a measurement value using the CX-Integrator.
(2) The maximum and minimum values of the network power voltage are cleared when the network power is turned OFF.

Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)

3. Click the **General** Tab. Enter the desired value in the *Network Power Voltage Threshold* Field. (The default is 14 V.)



4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

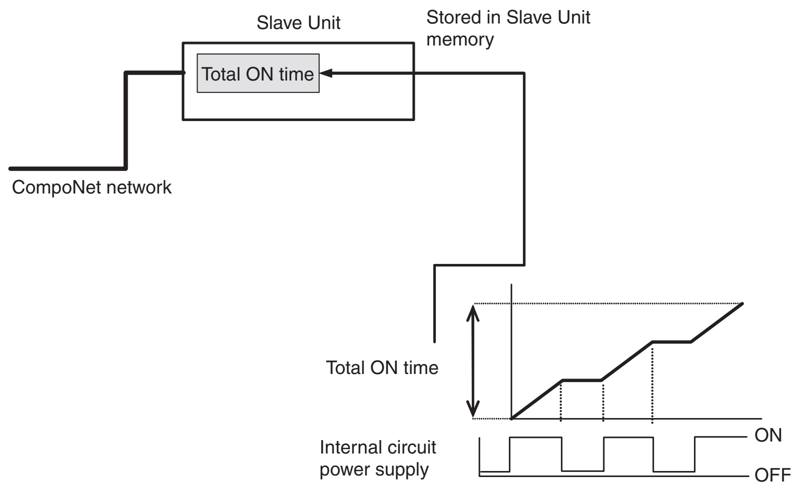
11-2-4 Unit Conduction Time Monitor

Description

The cumulative time that power is ON (i.e., the Total ON Time) to the Slave Unit's internal circuits can be stored in the Slave Unit memory. (This data can be read using the CX-Integrator or using explicit messages.)

The monitor value is stored in the Slave Unit memory so once the total ON 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 CX-Integrator or using explicit messages.

- Measurement time: 0 to 429,496,729.5 h
  (Stored data: 0000 0000 to FFFF FFFF hex)
- Measurement unit: 0.1 h
- Storage unit: 0.2 h

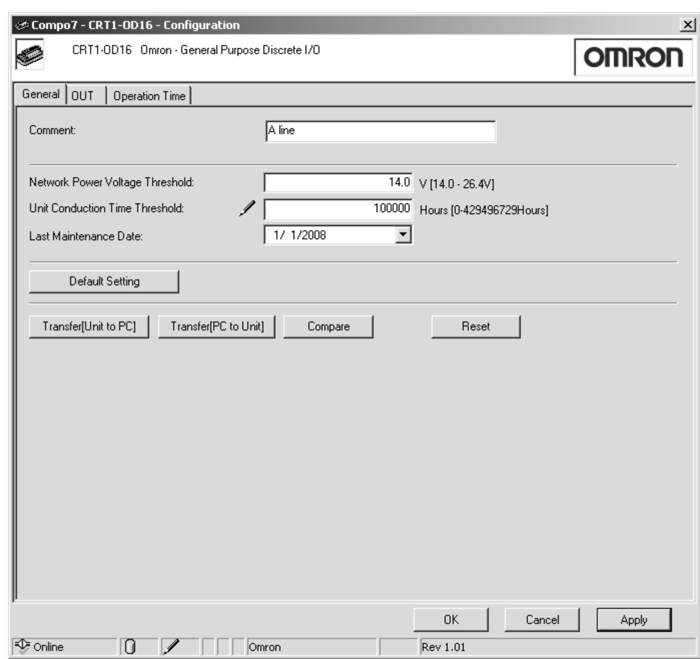


Note The Unit Conduction Time Monitor Function adds up the time the CompoNet Slave Unit network power supply is ON. The time when the power is OFF is not included.

Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **General** Tab. Enter the desired value in the *Unit Conduction Time Threshold* Field.

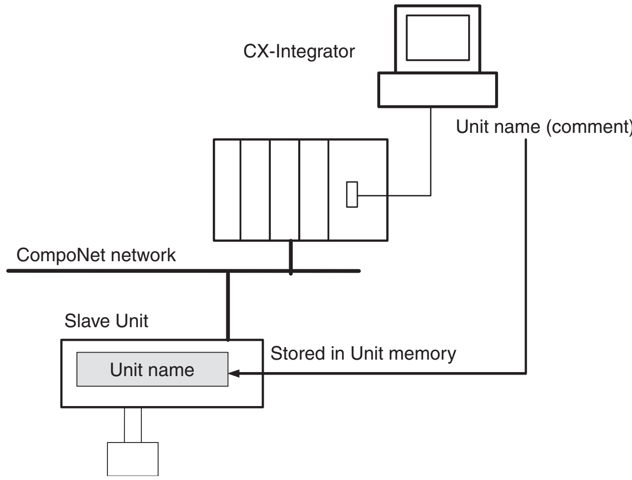


4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-2-5 Naming Units

Description

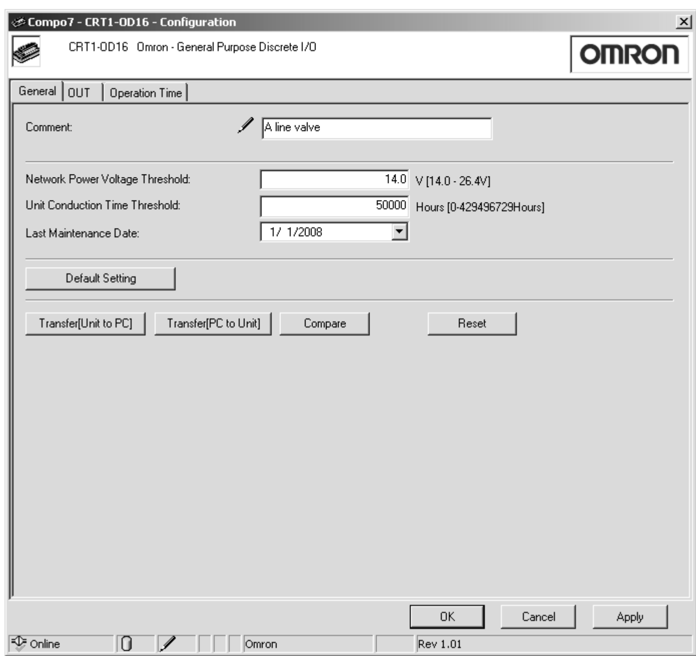
The user can set any name for each Unit (with up to 32 characters) as a comment. The name is stored in the Slave Unit memory. The CX-Integrator or explicit messages can be used to read/write the name (i.e., the comment).



Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **General** Tab. Enter the desired value in the *Comment* Field.

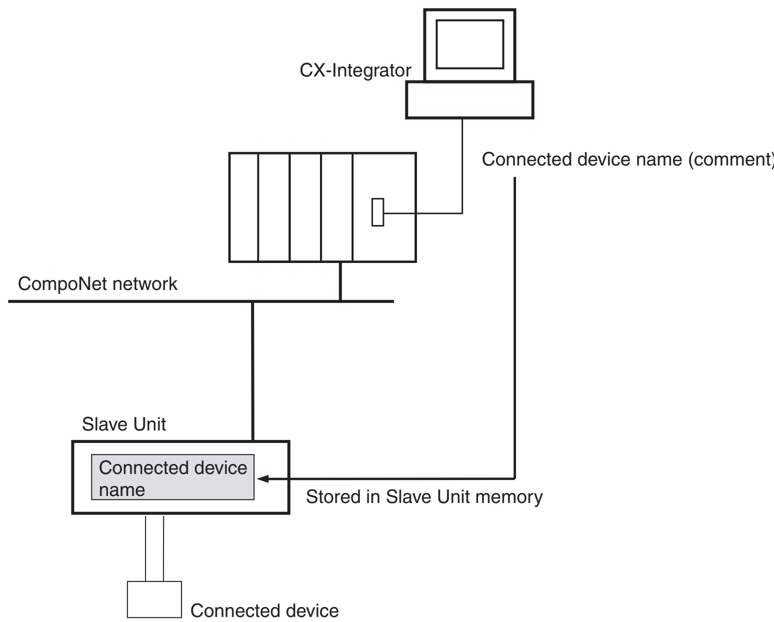


4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-2-6 Naming Connected Devices

Description

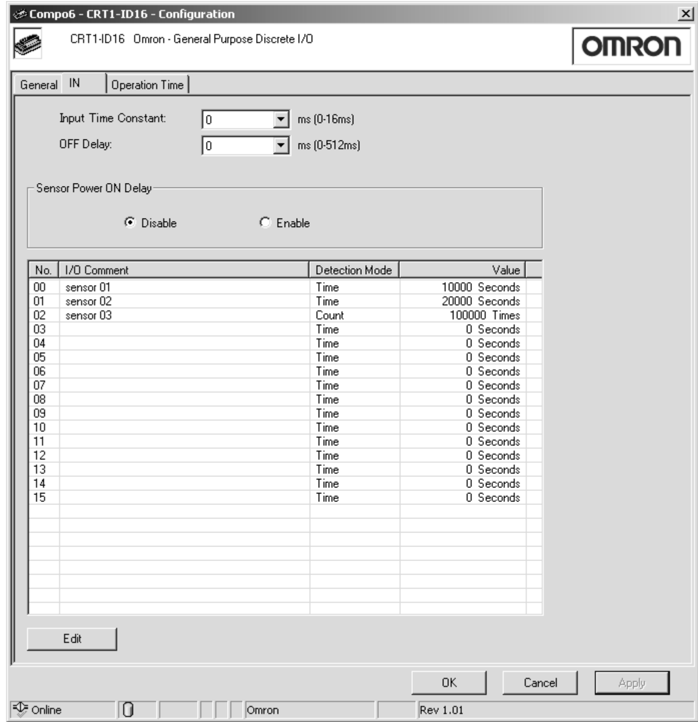
The user can set any name for each I/O contact in the Unit (with up to 32 characters). These names are stored in the Slave Unit memory. Connected devices can be checked for each I/O contact, which is useful for remote maintenance and other applications where, for example, devices with errors need to be identified. The CX-Integrator or explicit messages can be used to read/write the name (i.e., comment).



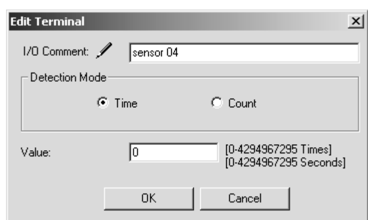
Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **IN** or **OUT** Tab.



4. Double-click in the *I/O Comment* Column of the device for which a comment is to be added. The Edit Terminal Window will be displayed. Enter the desired name in the *I/O Comment* Field and click the **OK** Button.



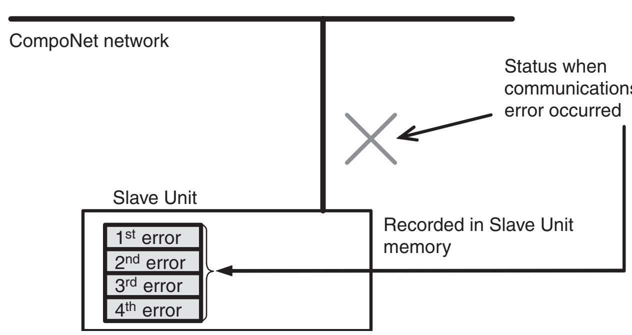
5. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

11-2-7 Communications Error History Monitor

Description

Enables storing the error (communication failure details, the communications power supply voltage at the time of failure, and the Unit conduction time) for the most recent 4 communication failures within the slave unit.

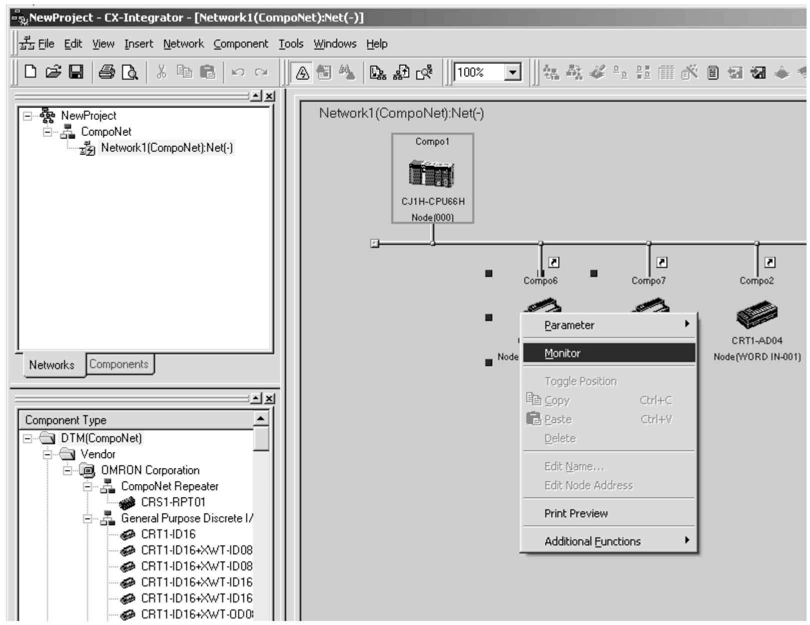
The communications error history can be read using the CX-Integrator.



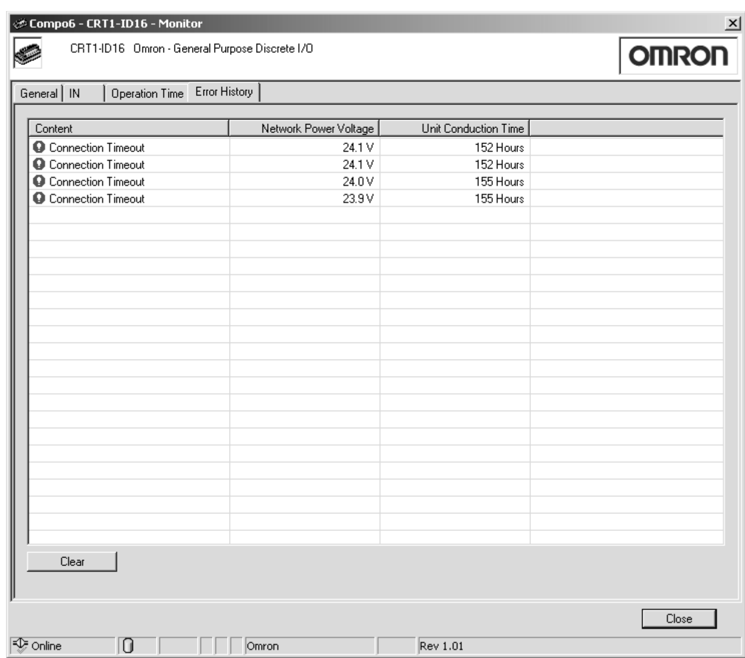
Checking Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Switch to the Online Window, and then right-click the icon for the desired CompoNet Slave Unit in the Network Configuration Window and select ***Monitor*** from the pop-up menu.



3. Click the **Error History** Tab in the Monitor Window. The communications error history showing the previous four errors will be displayed, as shown below. To reset the entire error history, click the **Clear** Button.



4. Click the **Close** Button and exit the window.

11-2-8 Last Maintenance Date

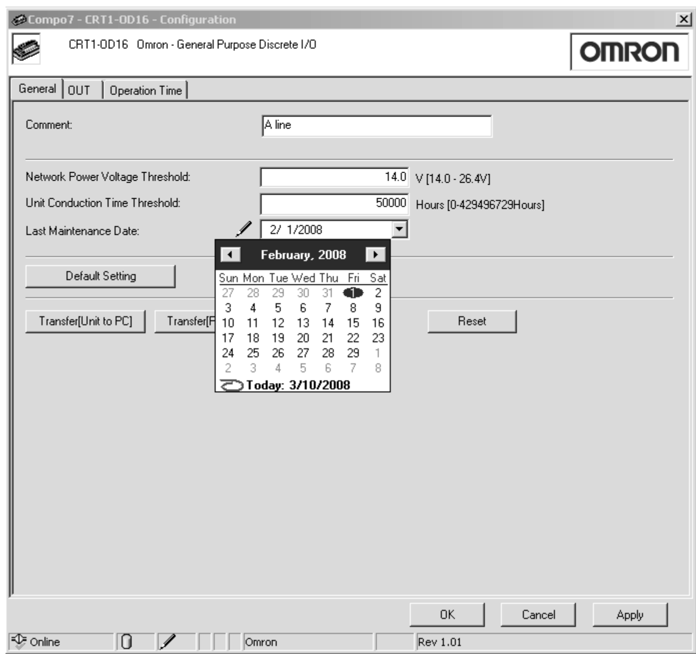
Description

This function can be used to write the date for the last date maintenance was performed in the Slave Unit memory. This makes it easier to decide when the next maintenance should be performed. This maintenance date can be written using the CX-Integrator.

Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **General** Tab and select a date from the *Last Maintenance Date* Field. (To enter the current date, select ***Today*** from the bottom of the pull-down menu.)



4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-3 Functions of Digital I/O Slave Units

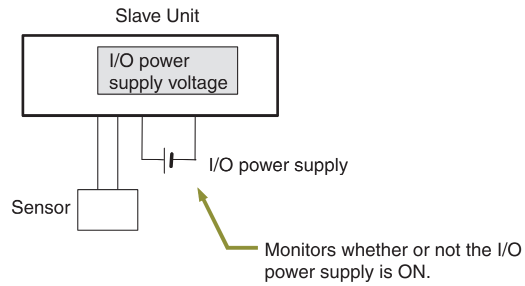
Bit Slave Units support the I/O filter described in *11-3-2 Input Filter (Input Units Only)*.

11-3-1 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 CX-Integrator or using explicit messages.

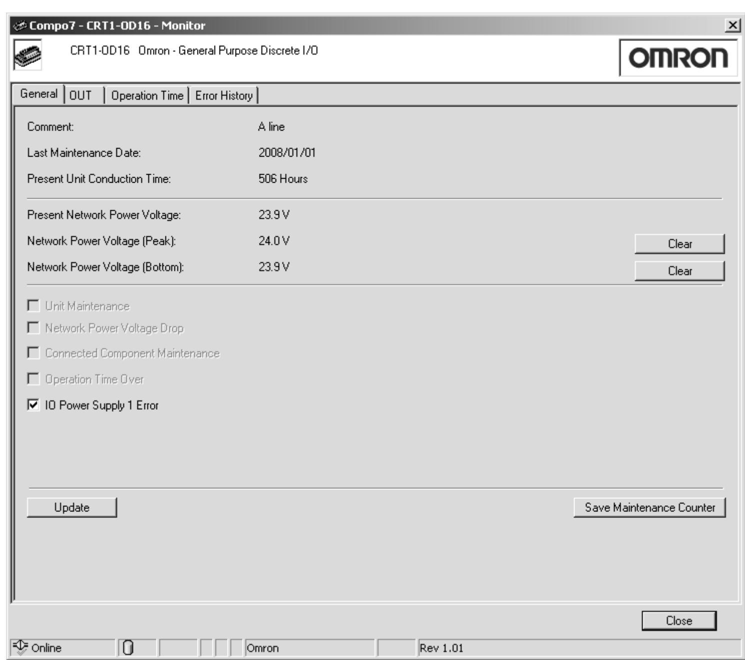


Note A detection voltage cannot be set for the I/O power supply.

Checking Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Switch to the Online Window, and then right-click the icon for the desired CompoNet Slave Unit in the Network Configuration Window and select ***Monitor*** from the pop-up menu. If IO Power Supply 1 Error is selected in the Monitor Window, it means that the I/O power is not ON.



3. Click the **Close** Button and exit the window.

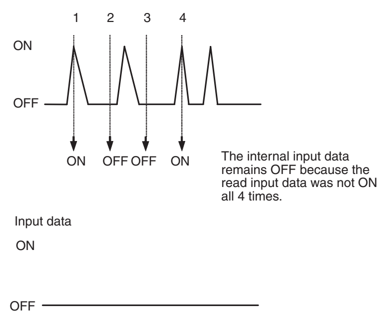
11-3-2 Input Filter (Input Units Only)

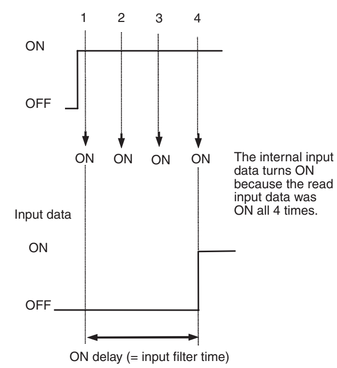
Description

An input value is read more than once during a set time interval. 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.

Input Time Constant

When the input data turns ON, the input data is read 4 times at a set time (1/4 of the time setting). The internal input data turns ON only when all four values are ON. The ON timing is delayed by the value of the input time constant. The same function is supported when the input data turns OFF.



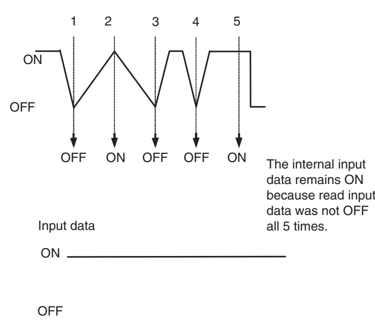


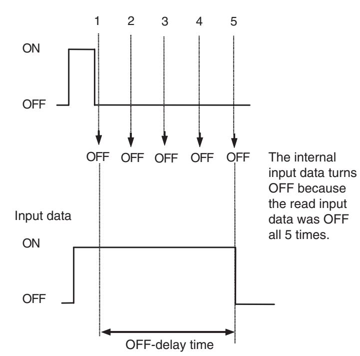
OFF Response Time

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). 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.)

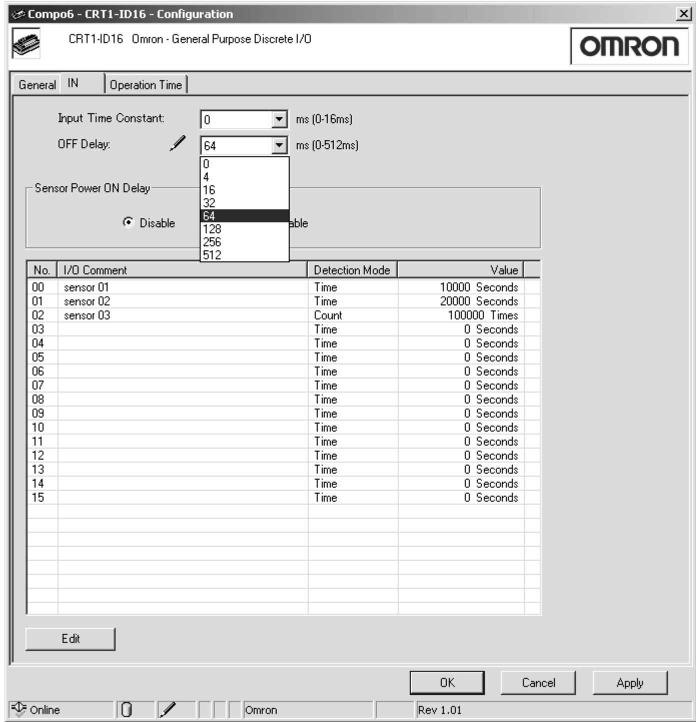




Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **IN** Tab. Select the *Input Time Constant* and *OFF Delay* from the pull-down lists.



4. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-3-3 Error Prevention for Surge Current at Startup (Input Units Only)

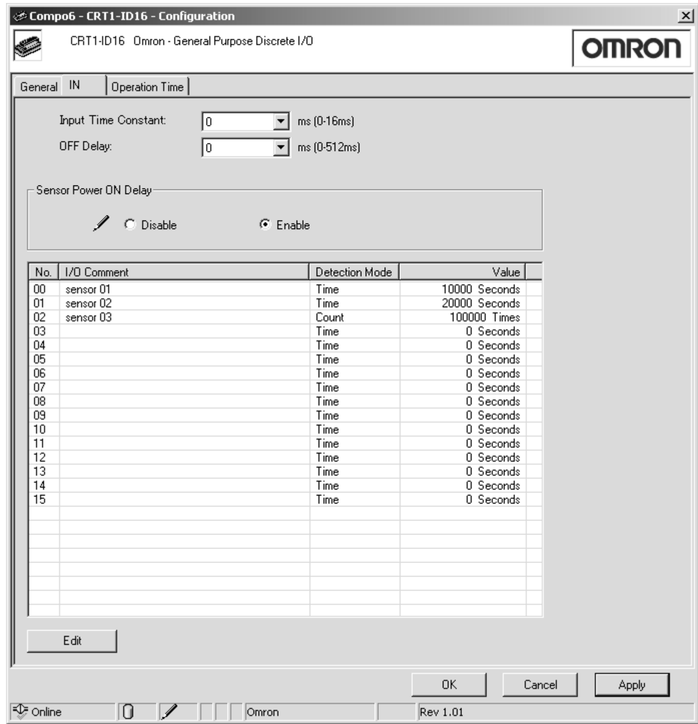
Description

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. This function is enabled or disabled by the CX-Integrator or by explicit messages.

Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **IN** Tab, and select Enable for the *Sensor Power ON Delay*.



4. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

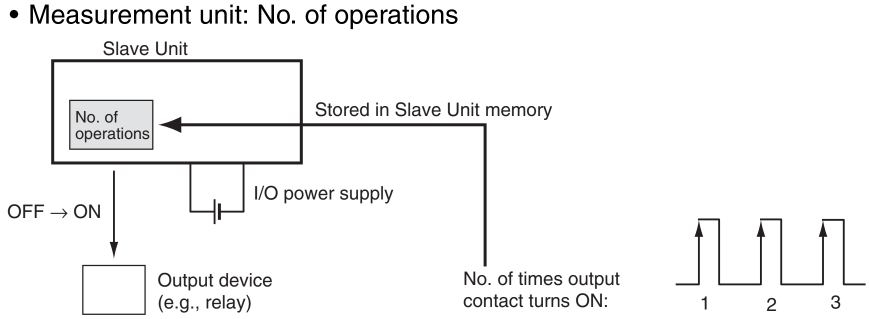
11-3-4 Contact Operation Monitor

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 CX-Integrator or using explicit messages.)

A monitor value can 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 CX-Integrator 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



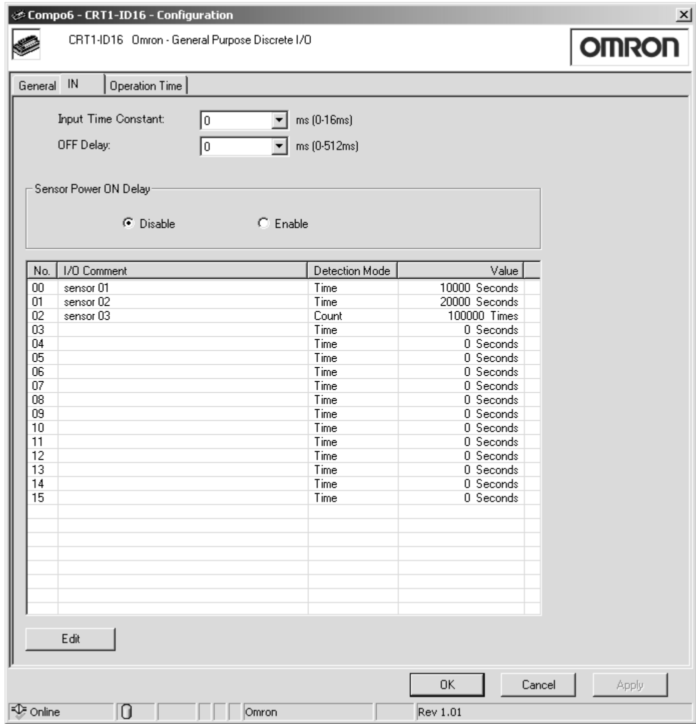
Note (1) The contact operation monitor and the total ON time monitor cannot be used for the same contact at the same time. Select only one of these functions under the *Detection Mode*.

(2) This function does not operate if the I/O power is not turned ON.

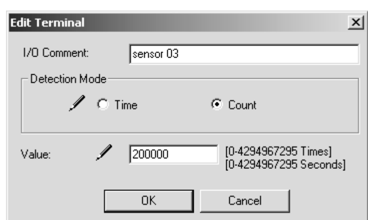
Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **IN** Tab.



4. Double-click the *I/O Comment* column for the terminal to be set. The Edit Terminal Window will be displayed. Select *Count* for the Detection Mode, enter the monitor value, and then click the **OK** Button.



5. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the OK Button and exit the window.

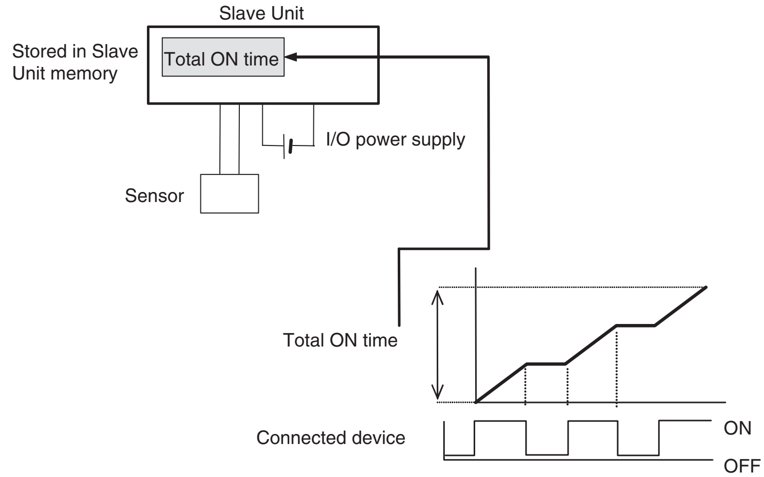
11-3-5 Total ON Time Monitor

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 CX-Integrator or using explicit messages.)

A monitor value can 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 CX-Integrator 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 be used for the same contact at the same time. Select only one of these functions under the *Detection 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.

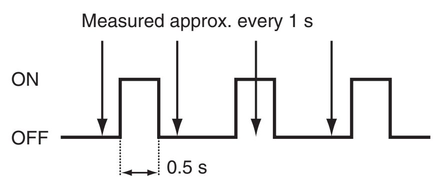


Figure A

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.

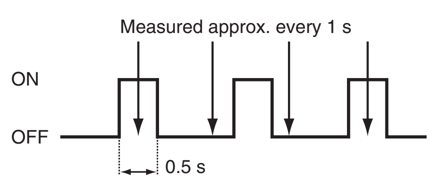


Figure B

■ 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.

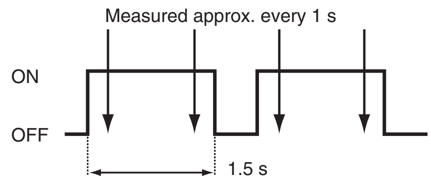
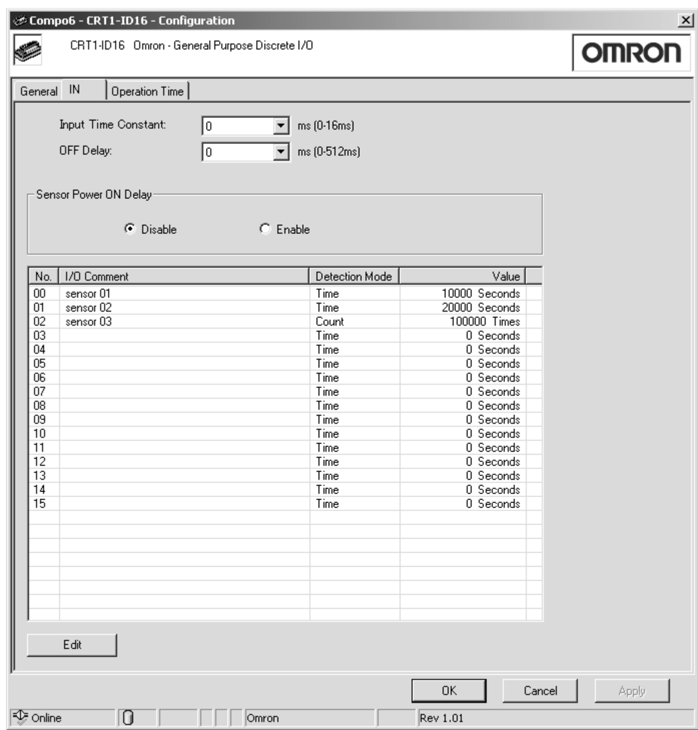


Figure C

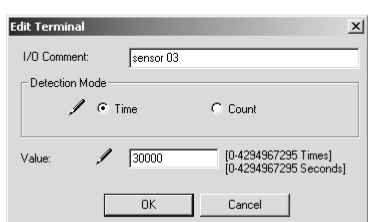
Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **IN** Tab.



4. Double-click the *I/O Comment* column for the terminal to be set. The Edit Terminal Window will be displayed. Select *Time* for the Detection Mode, enter the monitor value in the *Value* Field, and then click the **OK** Button.



5. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the OK Button and exit the window.

11-3-6 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 CX-Integrator or using explicit messages.)

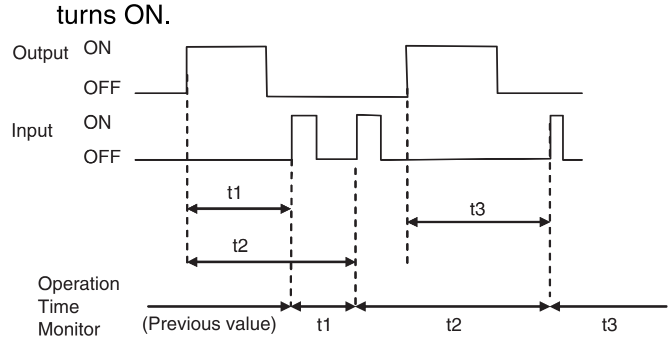
The operation time of various combinations of contacts can be monitored in the Slave Unit (e.g., input-output, output-input, input-input, and output-output).

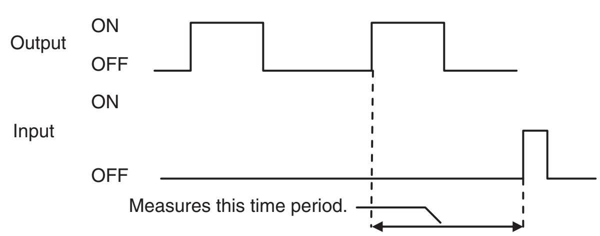
In addition, the trigger edge pattern can be set to ON→OFF, ON→ON, OFF→OFF, or OFF→ON. Any input number and output number combination can also be set. (The number of contact points that can be set depends on the Unit.)

This function allows high-precision measurement of the operation time without being affected by the communications cycle. A monitor value can 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 CX-Integrator or using explicit messages.

- The operation time is stored after the time lag from when the output turns ON until when the input turns ON is measured. The operation time continues to be measured internally until the next output turns ON. The measurement value is refreshed if the input turns ON again before the next 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 output turns ON till when the input turns ON.





Note

(1) If the same contact is used for the start and end of measurement and the same trigger edge pattern is used for both, the measured time will always be 0 ms.

(2) If monitor settings are changed while this function is being used, the accuracy of subsequent monitoring operations cannot be guaranteed. Cor-

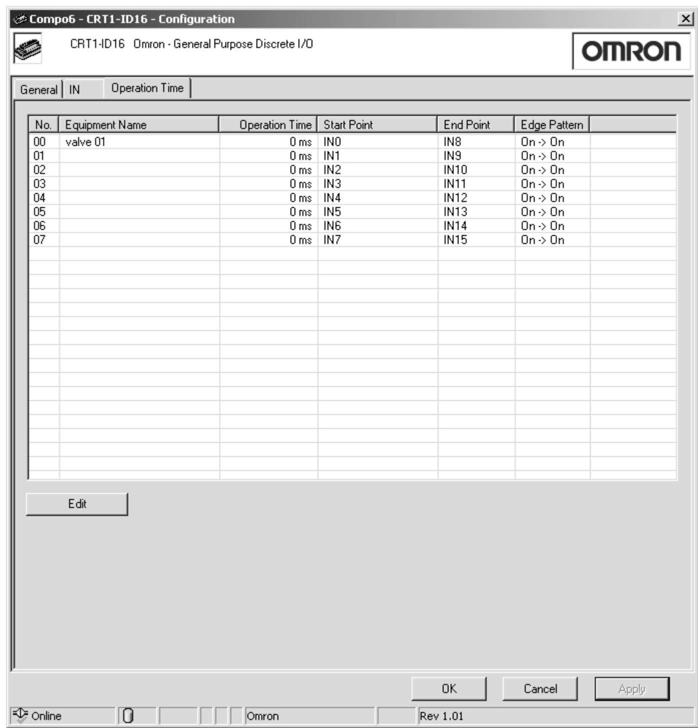
rect monitoring operations will begin again from the point of the next start trigger.

(3) If the measurement start trigger is input and the monitoring set value expires, the flag in the internal Unit Status Area turns ON even if the measurement end trigger has not been input. The Unit's operation time monitor value will retain the previous measurement value until the measurement end trigger is input.

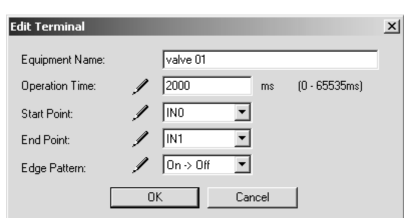
Settings Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **Operation Time** Tab.



4. Double-click the Equipment Name to be monitored. The Edit Terminal Window will be displayed. Enter the set 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 and click the **OK** Button.



5. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

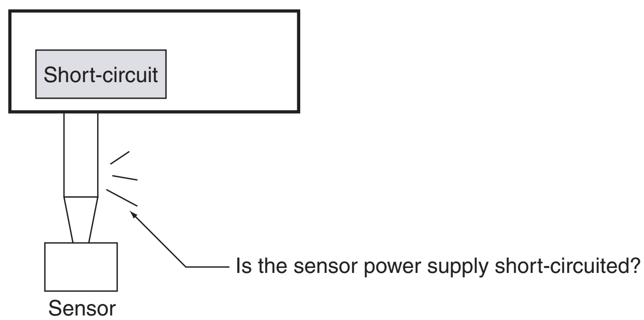
11-3-7 Power Supply Short-circuit Detection (Inputs)

Description

This function monitors the current in the sensor power supply section and detects a power supply short-circuit if the current per input contact exceeds a rated value. Power supply short-circuit detection functions in two different ways depending on Unit specifications. For some Units, the I/O power supply is turned OFF to the entire Unit if a short-circuit is detected for even one input. For other Units, the I/O power is turned OFF individually for each input.

For information on load short-circuit detection, refer to the power short-circuit protection and input device power supply specifications for the applicable Unit.

An indicator on the Slave Unit can be used to see if a power supply short-circuit has been detected. Also, if a short-circuit has been detected, an internal status bit will turn ON in the Slave Unit to inform the Master Unit. The current status can be read using the CX-Integrator or an explicit message. Once the cause of the short-circuit has been removed, operation will recover automatically and power will be output to the connector where the short-circuit was detected.



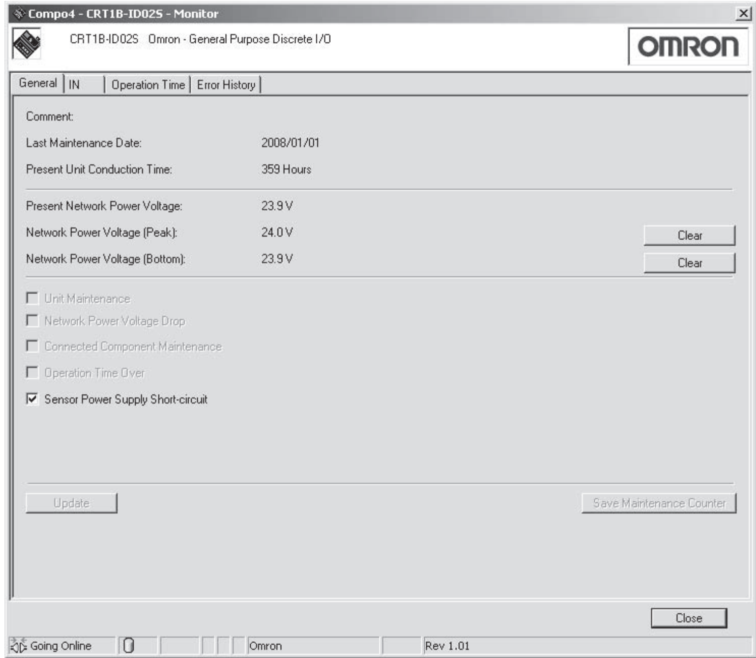
Note Use a power supply device with a rating of 100 W or higher as the communications power supply for network power supply. A short-circuit is detected if a current that exceeds a specified value flows in the sensor power supply output of the Unit. Also, the communications power supply may temporarily turn OFF when a short circuit occurs. Operation will automatically be restored once the cause of the short circuit has been removed, but implement an external circuit so that the system operates safely while the outputs are turned OFF. Use the following formula as a guide for Sensor communications power supply capacity.

- Total network current = Total Unit current consumption + Total Sensor current consumption
- Communications power supply capacity used ≥ (Total network current + (Short-circuit detection current)) × (CompoNet network voltage used)

Monitoring Status with the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Go online, right-click the icon of the applicable CompoNet Slave Unit in the Network Configuration Window, and select ***Monitor***.
3. Make sure that the *Sensor Power Supply Short-circuit* Check Box is selected.



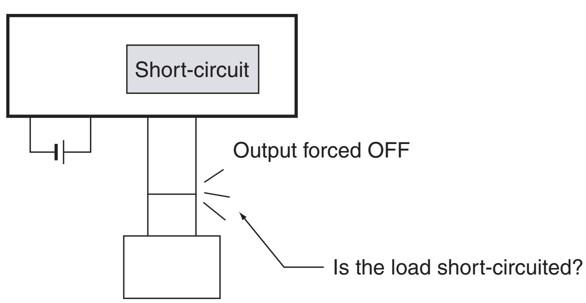
4. Click the **Close** Button. The window will close.

11-3-8 Load Short-circuit Detection (Outputs)

Description

This function monitors the load current in the output section and detects a load short-circuit if the current per contact (or common) exceeds a rated value. If a load short-circuited is detected, the outputs are turned OFF to prevent damage to the Unit output circuits. Load short-circuit detection functions in two different ways depending on Unit specifications. For some Units, the outputs are turned OFF for the entire Unit if a short-circuit is detected for even one output. For other Units, the outputs are turned OFF individually. For information on load short-circuit detection, refer to the rated output current and internal circuits in the specifications for the applicable Unit.

An indicator on the Slave Unit can be used to see if a load short-circuit has been detected. Also, if a short-circuit has been detected, an internal status bit will turn ON in the Slave Unit to inform the Master Unit. The current status can be read using the CX-Integrator or an explicit message. Once the cause of the short-circuit has been removed, operation will recover automatically and power will be output to the connector where the short-circuit was detected.

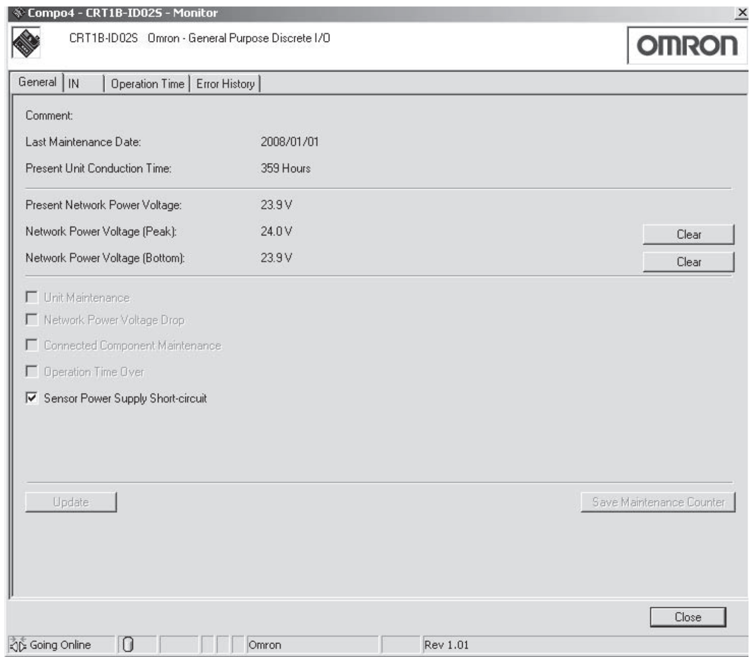


Note An OMRON S82J-series Power Supply device is recommended for the I/O power supply. Load short-circuits may not be detected if a power supply with vertical-drop overcurrent protection characteristics is used. If a power supply device with vertical-drop overcurrent protection characteristics is used, use one with a rating of 100 W min.

Monitoring Status with the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Go online, right-click the icon of the applicable CompoNet Slave Unit in the Network Configuration Window, and select ***Monitor***.
3. Make sure that the *External Load Short-circuit Protection* Check Box is selected.



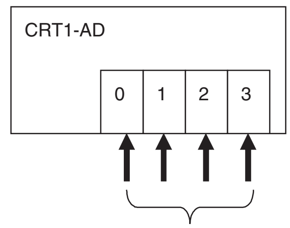
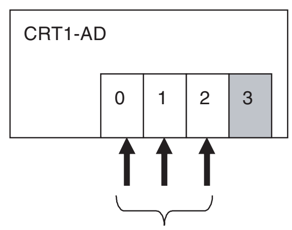
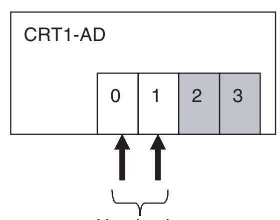
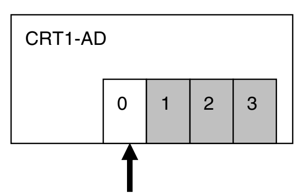
4. Click the **Close** Button. The window will close.

11-4 Analog I/O Slave Unit (input) Functions

11-4-1 AD Conversion Point Setting (only Input Unit)

Description

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.

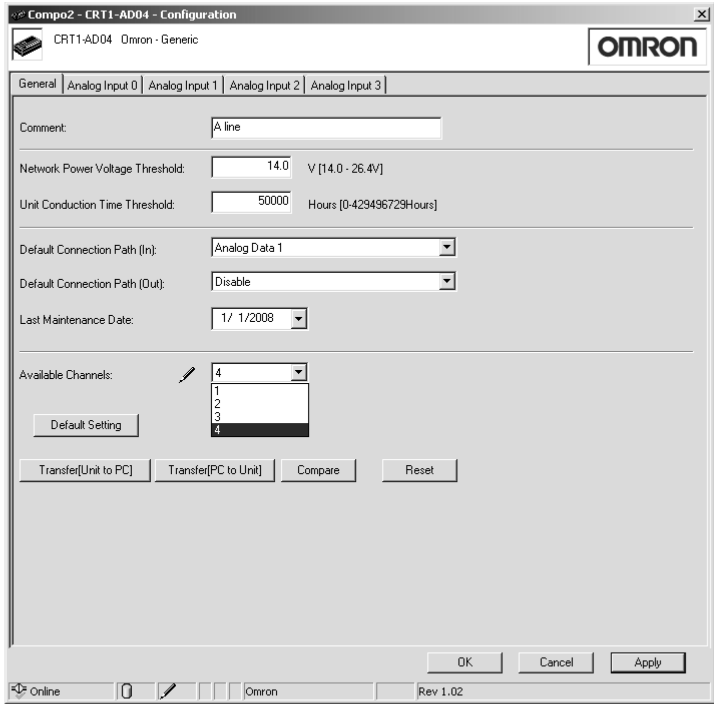
Conversion points	Details
4 points (default)	Converts Input CH0, CH1, CH2, and CH3. 
3 points	Converts Input CH0, CH1, and CH2. 
2 points	Converts Input CH0 and CH1. 
1 point	Converts Input CH0 only. 

Setting Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)

3. Click the **General** Tab and select the number of conversion points from the inputs listed on the pull-down menu under the *Available Channels* Field.

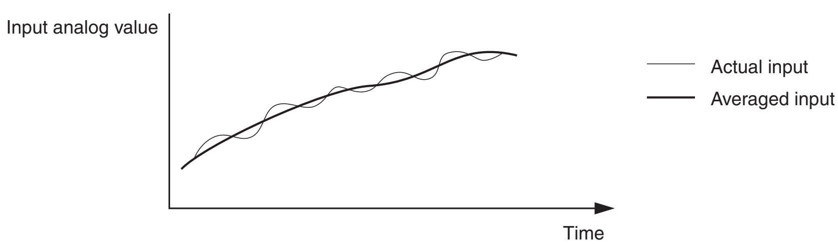


4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-4-2 Moving Average Processing

Description

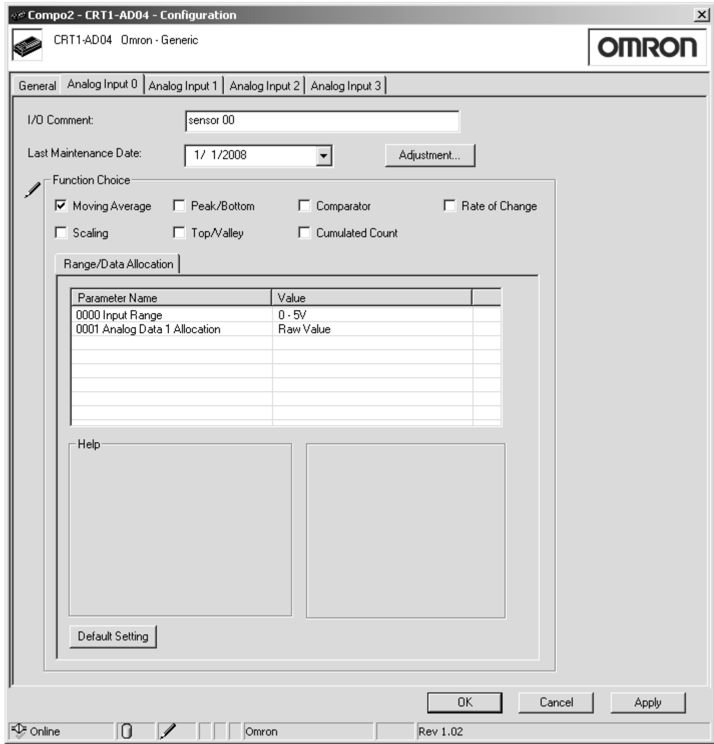
This function calculates the average value (moving average) of the previous eight inputs, and uses the resulting value as conversion data. When the input value fluctuates frequently, as shown in the following diagram, averaging can be used to produce a stable input value.



Setting Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the Tab Page for the input where moving average processing is to be performed, and select ***Moving Average*** under the *Function Choice* heading



4. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-4-3 Scaling

Description

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

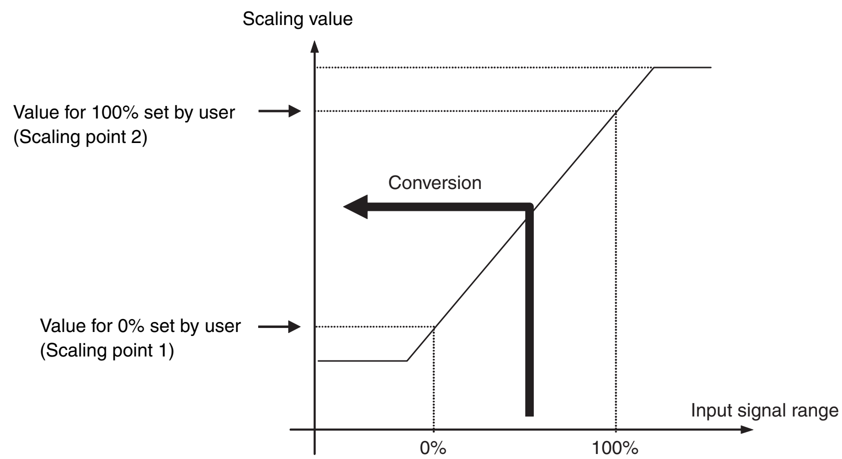
Analog input values (count values) are converted to the original voltage and current values. The units used are mV or µA. When default scaling is selected, scaling is performed according to the range used, as shown in the following table.

Input range	0 to 5 V	0 to 10 V	1 to 5 V	–10 to 10 V (CRT1-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
Discon-nected 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 CX-Integrator.

Input range	0 to 5 V	0 to 10 V	1 to 5 V	–10 to 10 V (CRT1-AD04 only)	0 to 20 mA	4 to 20 mA
100%	Set using CX-Integrator (–28,000 to 28,000)					
0%	Set using CX-Integrator (–28,000 to 28,000)					
Discon-nected line	0000 hex	0000 hex	7FFF hex	0000 hex	0000 hex	7FFF hex

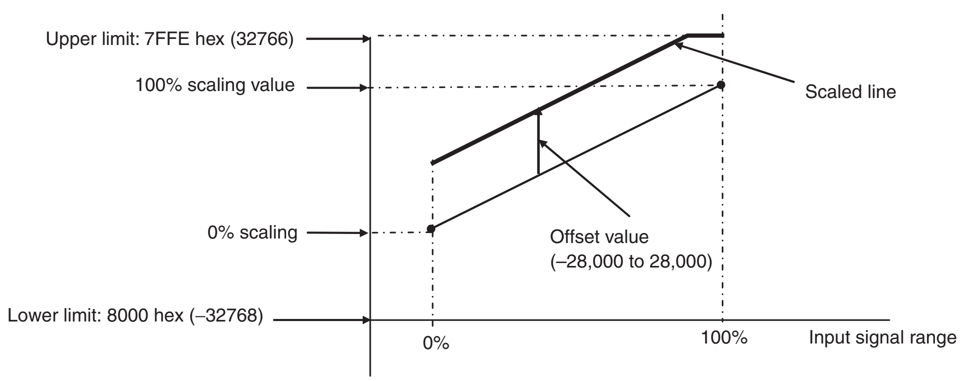


Note Reverse scaling, where the 0% scaling value is higher than the 100% scaling value, is also supported.

Offset Compensation

Scaling the analog input values of linear sensors to distances produces mounting error in the sensor. Offset compensation compensates for the 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.

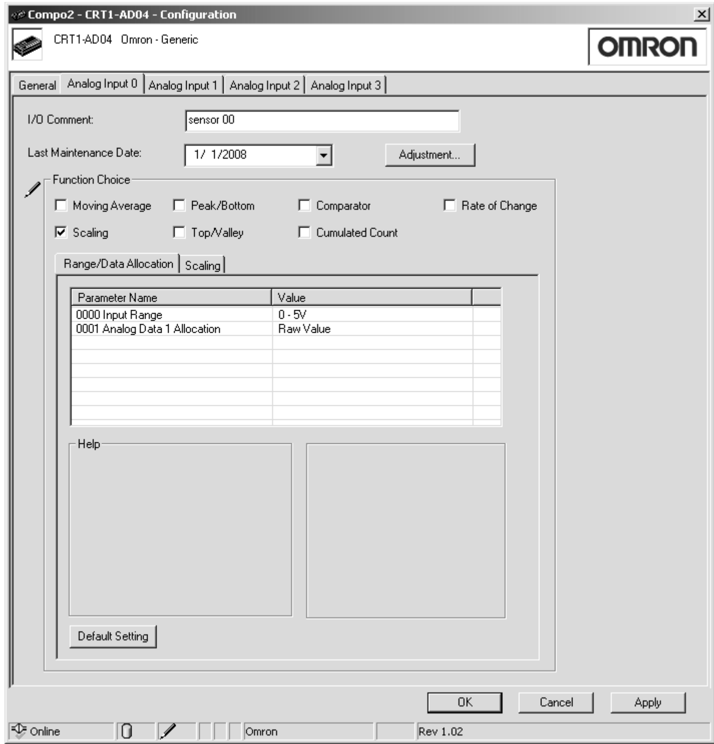
Note The offset value can be set even when using default scaling.



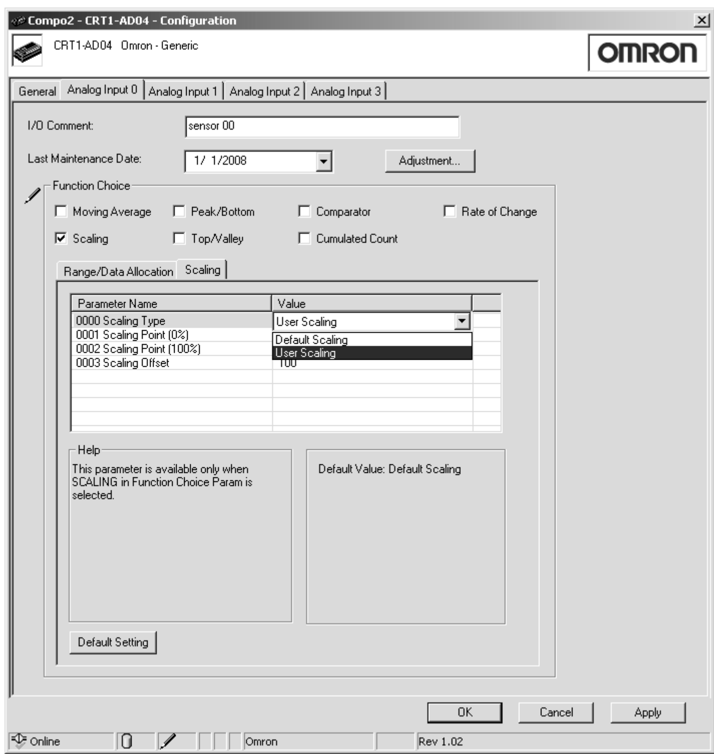
Setting Using the CX-Integrator

1,2,3... 1. Turn ON the power supply to the CompoNet Slave Unit.

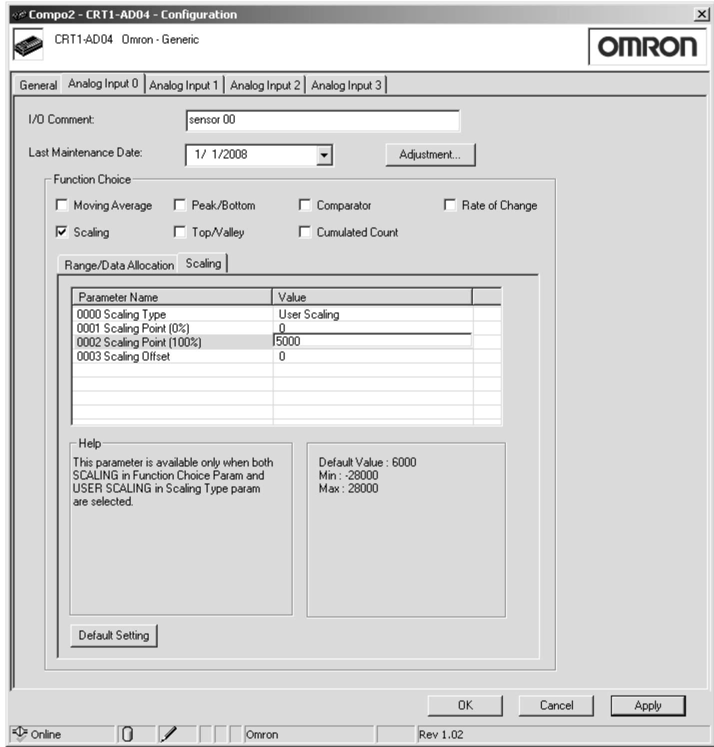
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the Tab Page for the input where scaling is to be performed, and select ***Scaling*** under the *Function Choice* heading.



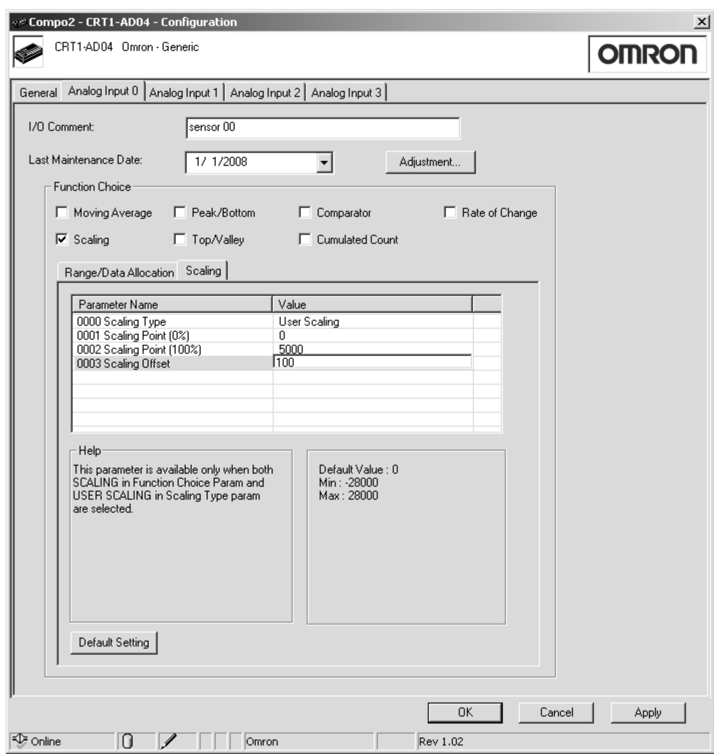
4. Click the **Scaling** Tab, and select either ***Default Scaling*** or ***User Scaling***.



5. When User Scaling is selected, set the 0% value in the *Scaling Point (0%)* Field, and set the 100% value in the *Scaling Point (100%)* Field.



6. For offset compensation, set the offset value in the *Scaling Offset* Field. Either *Default Scaling* or *User Scaling* can be set in the *Scaling Type* Field.



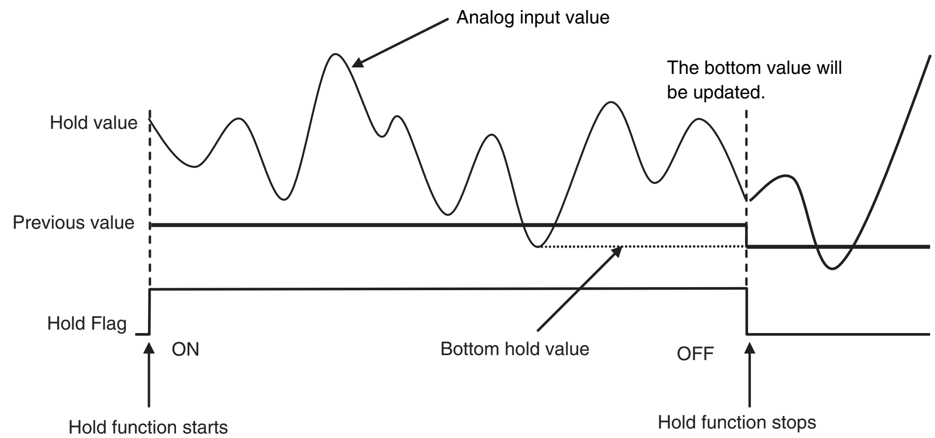
7. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
8. Click the **OK** Button and exit the window.

11-4-4 Peak/Bottom Hold

Description

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

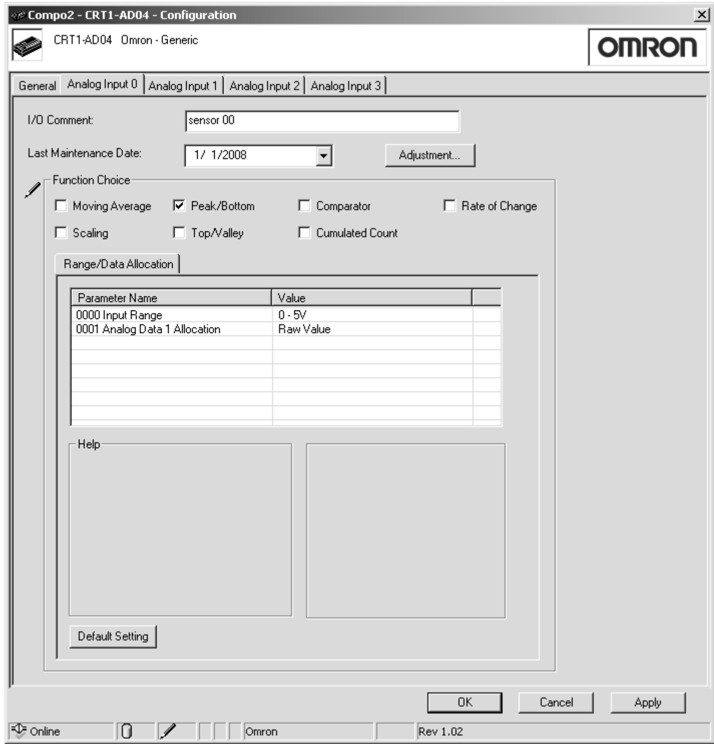


Note A delay in network transmission time will occur from the time the Hold Flag turns ON (or OFF) in the Master Unit's ladder program until notification of the flag's status is actually sent to the Slave. Therefore, even when the Hold Flag is ON, the first analog data transmitted to the Master Unit after 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, and enables only the peak/bottom hold values after a fixed time lag.

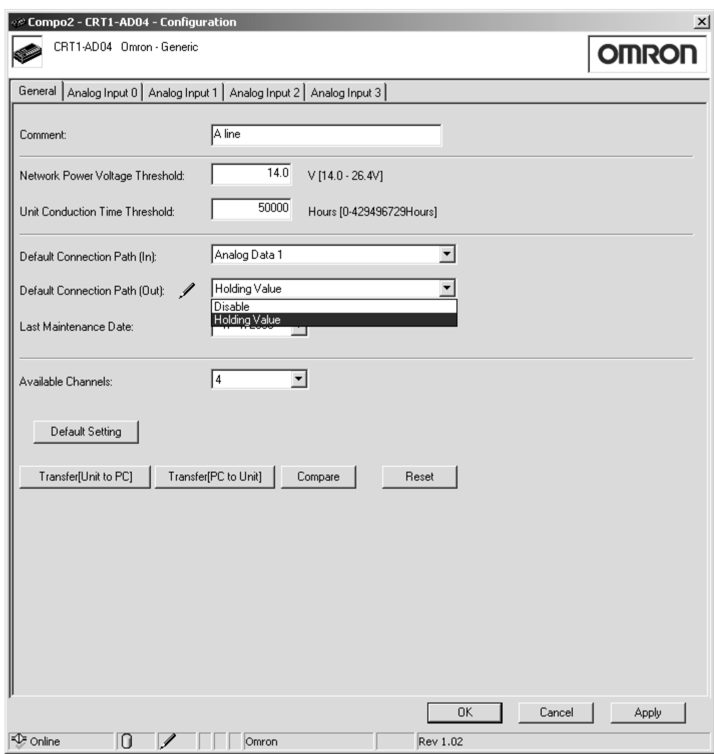
Setting Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the Tab Page for the input where Peak/Bottom is to be set, and select ***Peak/Bottom*** under the *Function Choice* heading.



4. 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 *Default Connection Path (Out)* Field.



5. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

11-4-5 Top/Valley Hold

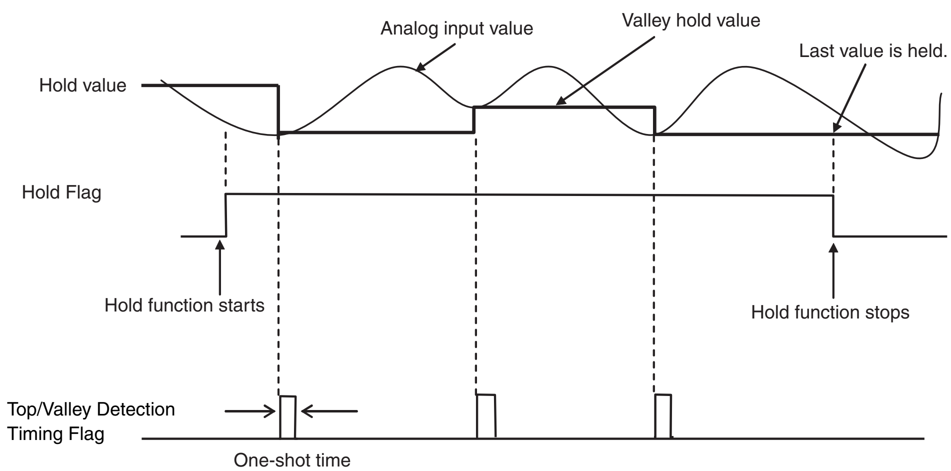
Description

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.)

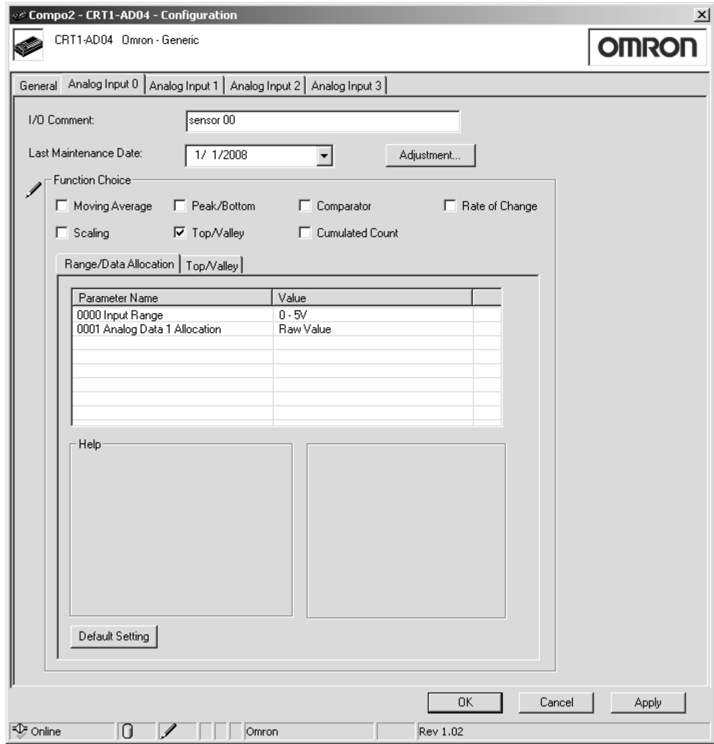
■ Example of Valley Hold



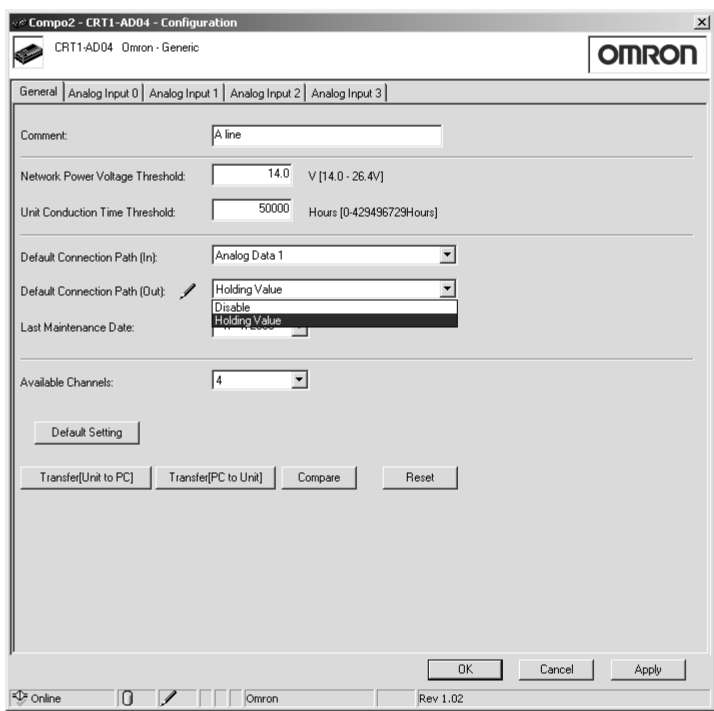
Note
1. A delay in network transmission time will occur from the time the Hold Flag turns ON (or OFF) in the Master Unit's ladder program until notification of the flag's status is actually sent to the Slave. Therefore, even after the Hold Flag is ON, the first analog data transmitted to the Master Unit after 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, and enables only the top/valley hold values after a fixed time lag.
2. The time that the Top/Valley Detection Timing Flags are ON can be adjusted by setting the one-shot time. Use the CX-Integrator to set the one-shot time (the setting range is 1 to 65,535 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 CX-Integrator

1,2,3...
1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the Tab Page for the input where top/valley hold is to be set, and select ***Top/Valley*** under the *Function Choice* heading.



4. 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.

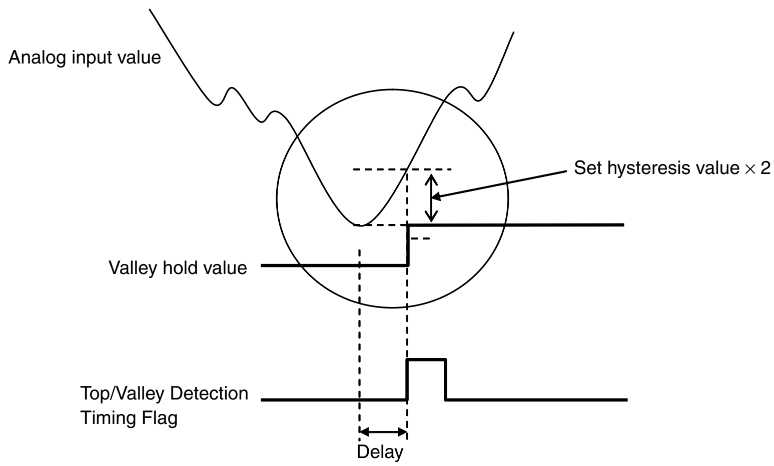


5. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

Hysteresis Setting

The hysteresis value can be set using the CX-Integrator 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.

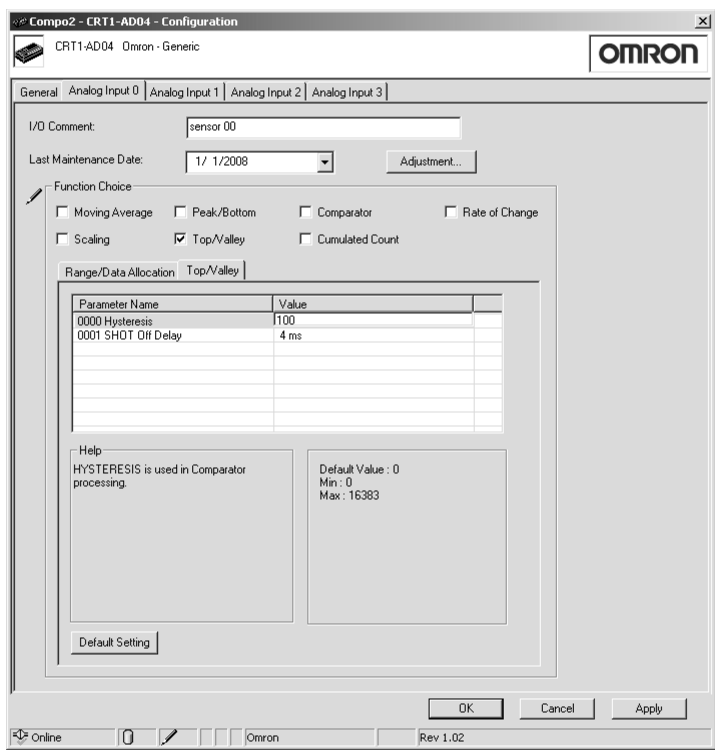
Timing for Setting Data



Setting Hysteresis Using the CX-Integrator

1,2,3...

1. Input the value for hysteresis in the *Hysteresis* Field in the **Top/Valley** Tab under the *Function Choice* heading.



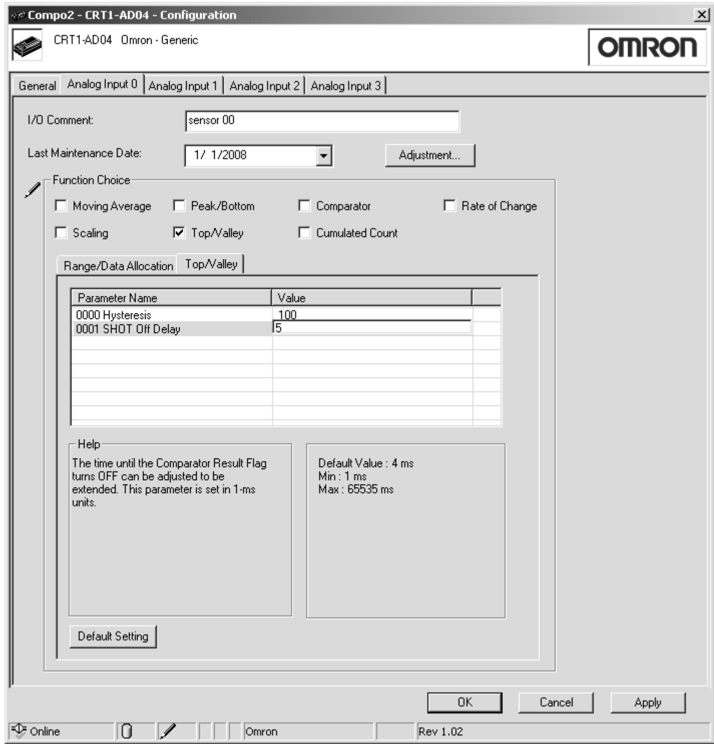
2. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button.
3. Click the **OK** Button and exit the window.

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

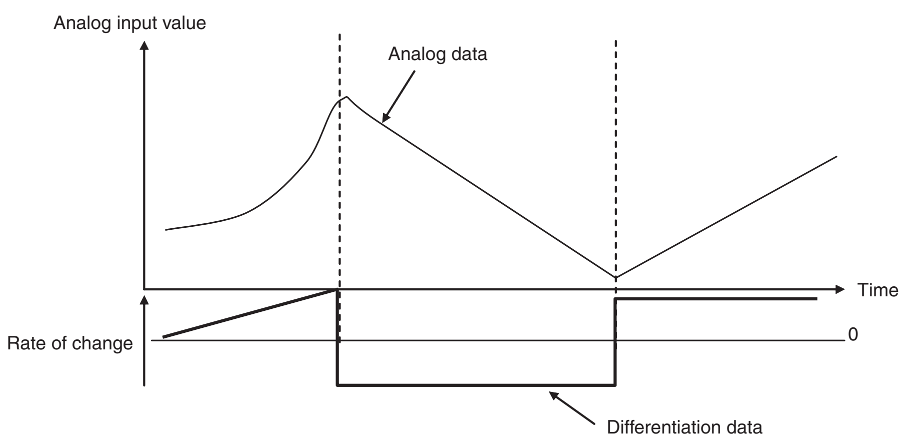


2. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button.
3. Click the **OK** Button and exit the window.

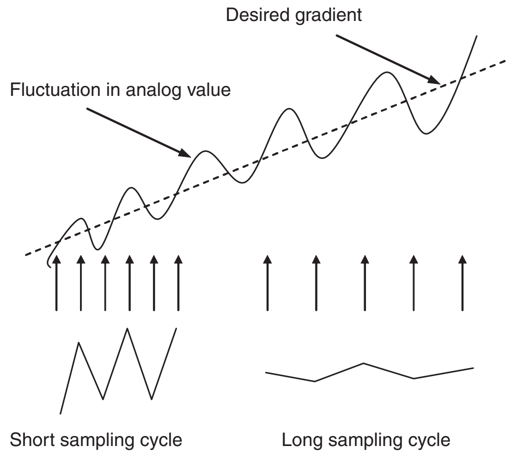
11-4-6 Rate of Change Calculation

Description

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 is 10 to 65,530 ms (in units of 10 ms).



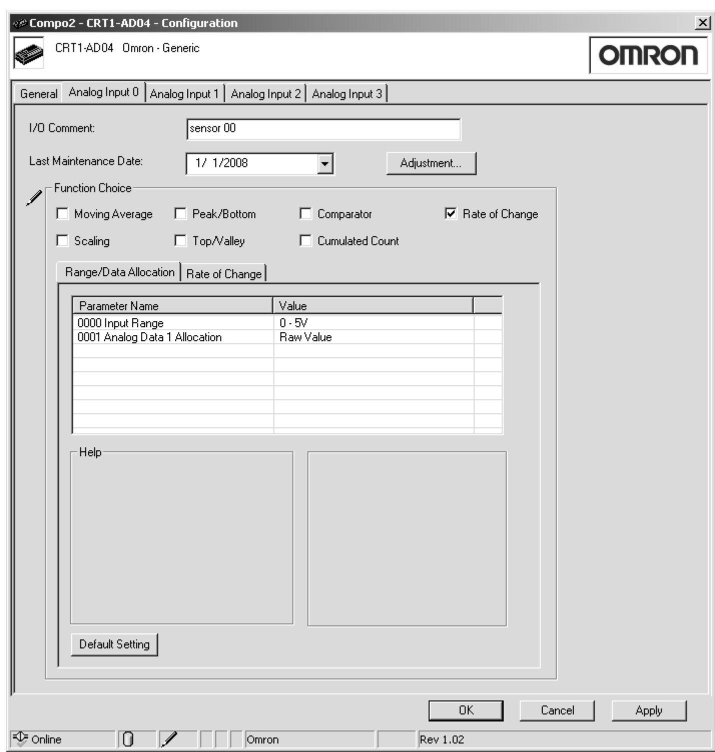
Note If the sampling cycle is set to a small value, the rate of change will be sensitive to small changes. If the analog data is subject to minute fluctuations, and the sampling cycle is shorter than the cycle of fluctuation, the fluctuation will be regarded as the rate of change. To prevent this occurring,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



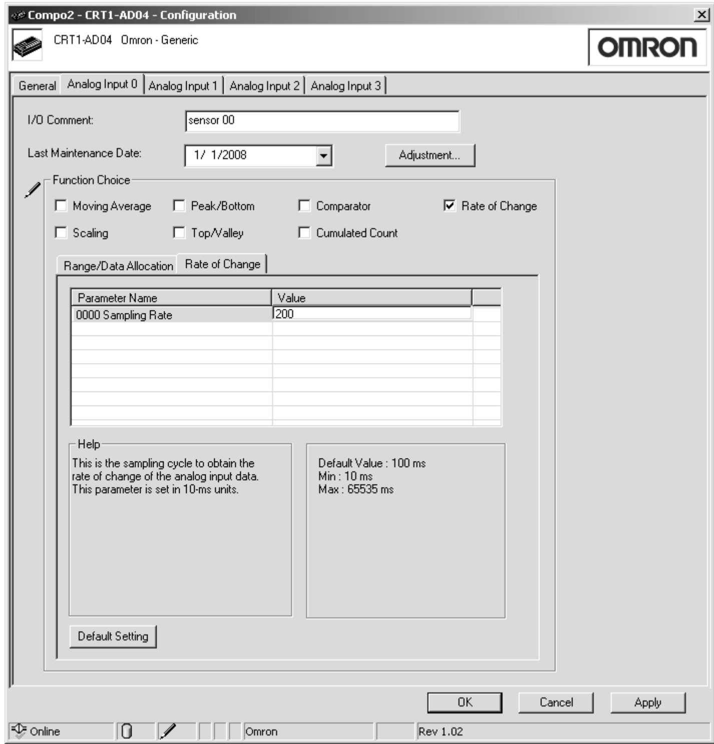
Setting Using the CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. 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.



4. Click the **Rate of Change** Tab and input the desired value for the sampling cycle in the *Sampling Rate* Field.



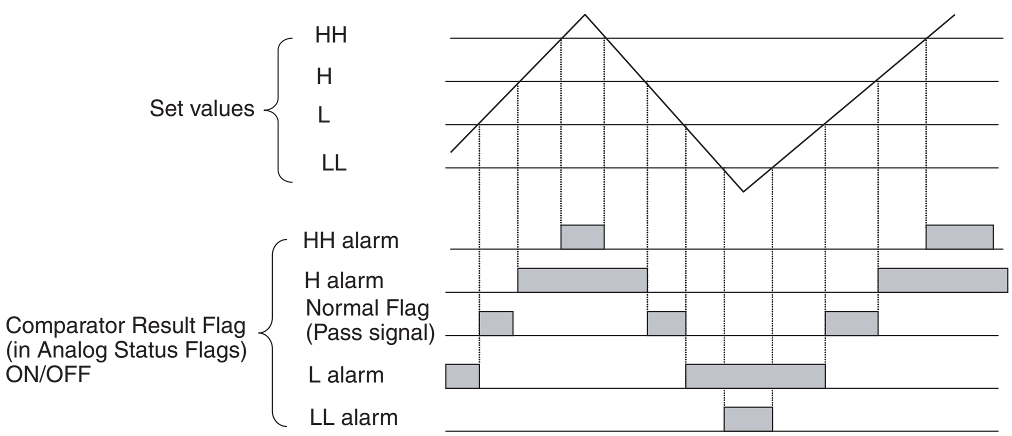
5. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

11-4-7 Comparator

Description

Four values can be set in the Slave Unit, and compared with the Analog Data values.

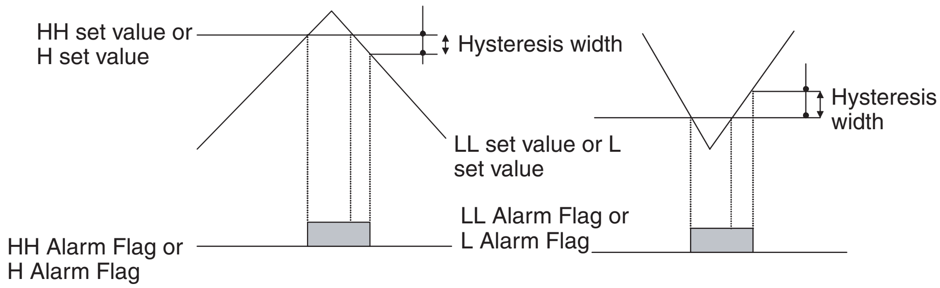
The four set values are the Alarm Trip Point High (HH), the Warning Trip Point High (H), the Warning Trip Point Low (L), and the Alarm Trip Point Low (LL). When the analog data value exceeds the set value, the Comparator Result Flag in the area for Analog Status Flags turns ON. If an alarm does not occur, the Normal Flag (pass signal) turns ON.



Note When the analog input value changes earlier 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.

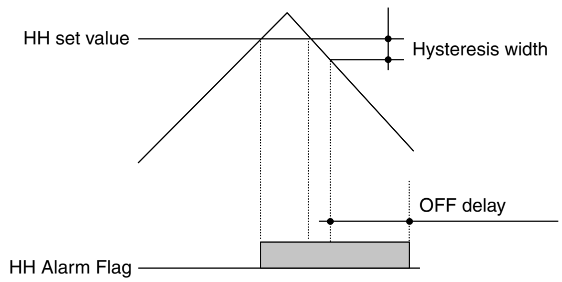
Setting Hysteresis

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 and OFF, set the hysteresis to stabilize the flag operation.



OFF Delay

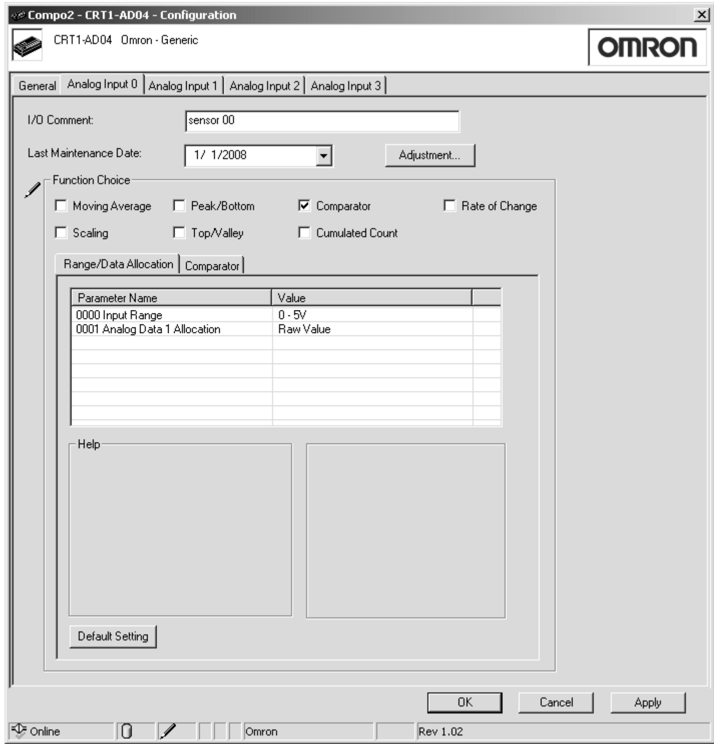
The time until the Comparator Result Flag turns OFF can be extended. For example, even if the Flag is ON momentarily, the OFF delay can be set so that the Master Unit can receive notification of the Flag's status.



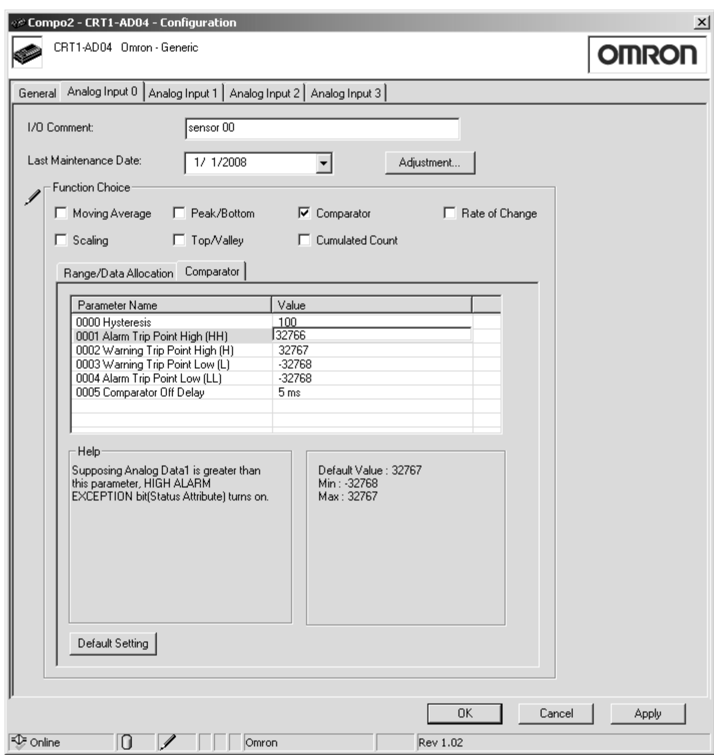
Setting Using the CX-Integrator

1,2,3...

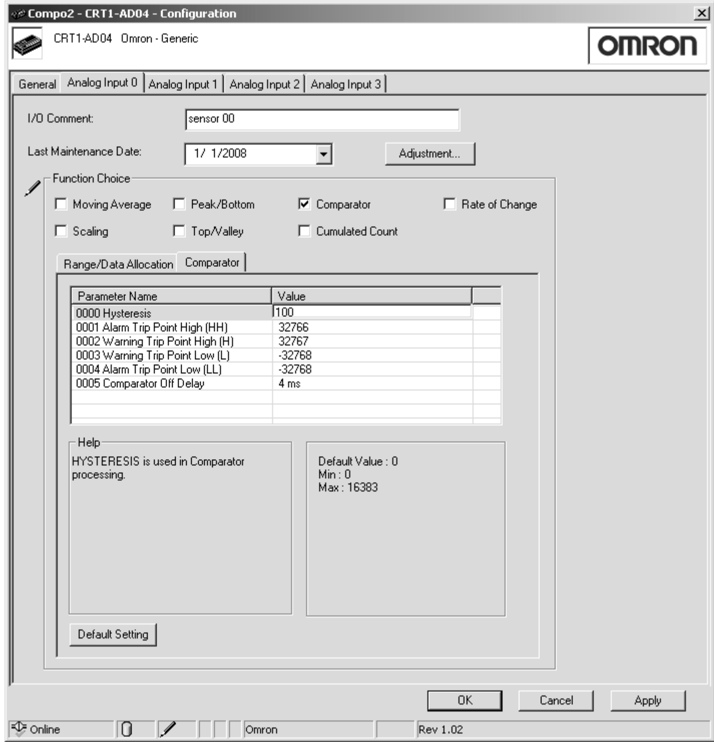
1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the Tab Page for the input where the comparator function is to be set, and select ***Comparator*** under the *Function Choice* heading.



4. Click the **Comparator** Tab and set the four trip points. The example here shows the setting for *Alarm Trip Point High (HH)*.

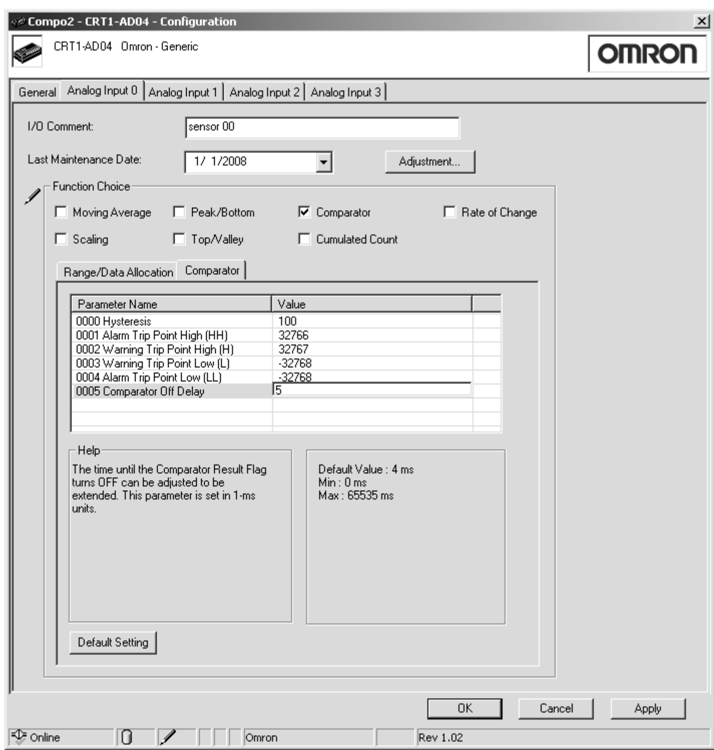


5. To set the hysteresis value, input the desired value in the *Hysteresis* Field.



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

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



7. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.

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

11-4-8 Disconnected Line Detection

Description

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.

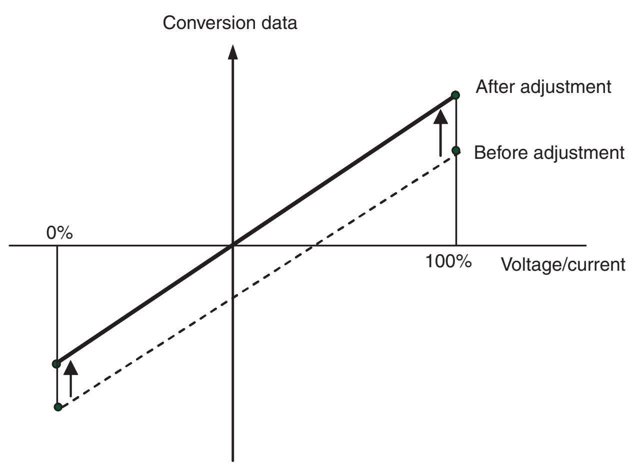
When Disconnected Line Detection is enabled, the value of AD conversion data is set to 7FFF hex. When the input returns to a value within the range that can be converted, the Disconnected Line Detection function will automatically be turned OFF, and normal data conversion will occur.

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, a disconnected line is detected when the input voltage is below 0.76 V (less than 6%). With the 4 to 20 mA input range, a disconnected line is detected when the input current is below 3.04 mA.

11-4-9 User Adjustment

Description

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.

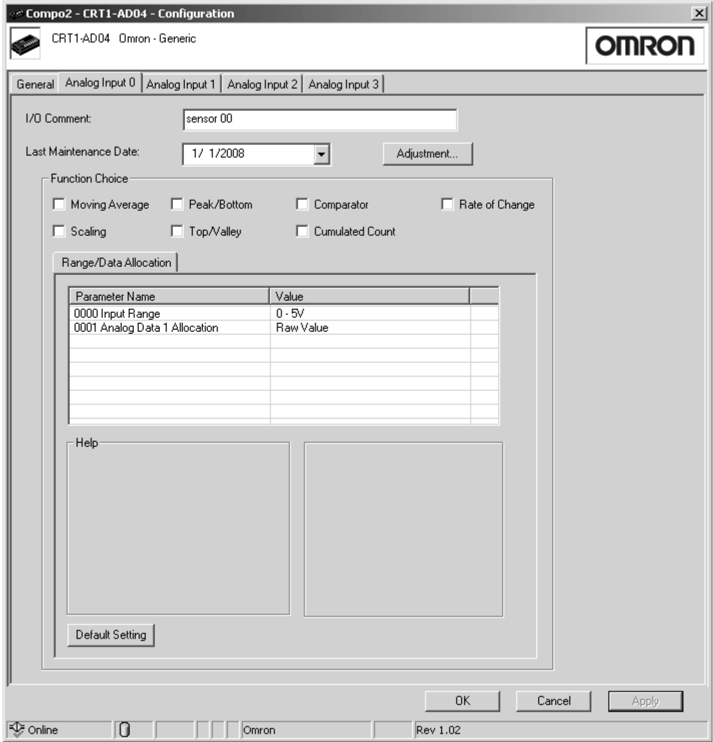
Input range	Low Limit	High Limit
0 to 5 V	–0.25 to 0.25 V	4.75 to 5.25 V
1 to 5 V	0.8 to 1.2 V	4.8 to 5.2 V
0 to 10 V	–0.5 to 0.5 V	9.5 to 10.5 V
–10 to 10 V	–11 to –9.0 V	9.0 to 11 V
4 to 20 mA	3.2 to 4.8 mA	19.2 to 20.8 mA
0 to 20 mA	–1.0 to 1.0 mA	19 to 21 mA

Setting Using the CX-Integrator

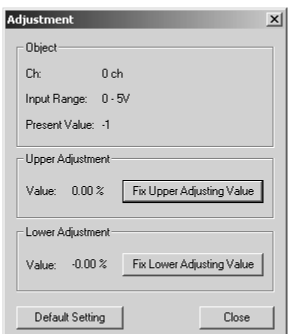
1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)

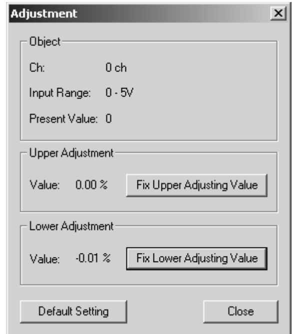
3. Select the Tab Page for the input to be adjusted, and click the **Adjustment** Button. (At this time, set the input range.)



4. Input the voltage (or current) transmitted from the connected device to the Unit's input terminal that is equivalent to the 100% value.
5. Click the **Fix Upper Adjusting Value** Button in the Adjustment Window, and input the adjusted value.



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



To return the set value to the default setting, click the **Default Setting** Button.

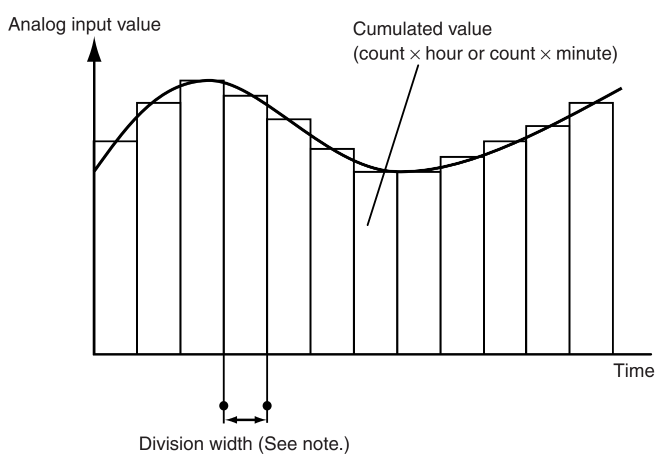
8. Click the **Close** Button to close the Adjustment Window.
9. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
10. Click the **OK** Button and exit the window.

11-4-10 Cumulated Count

Description

The cumulated count 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 CX-Integrator in units of 0.1 hour or minute.

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



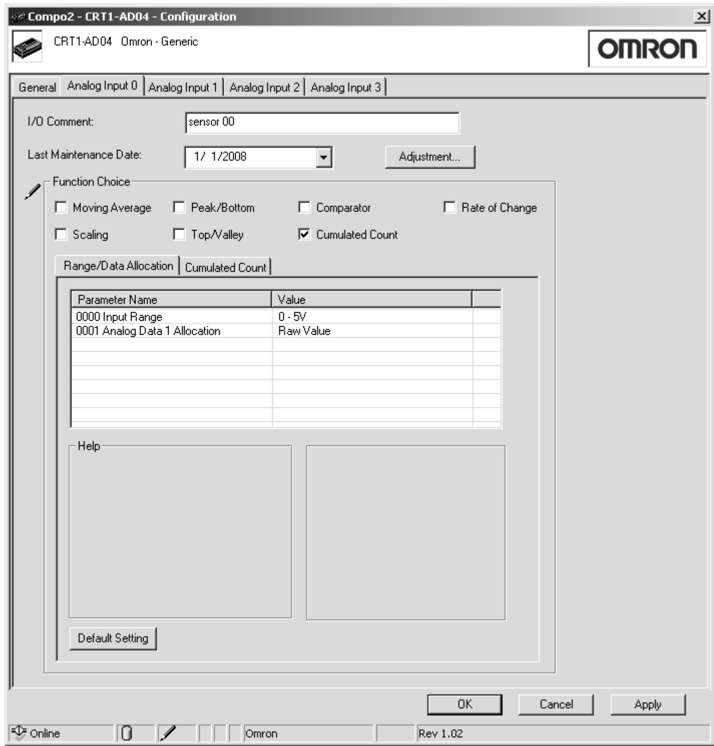
Note The following table shows the divisions for the cumulated counter.

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

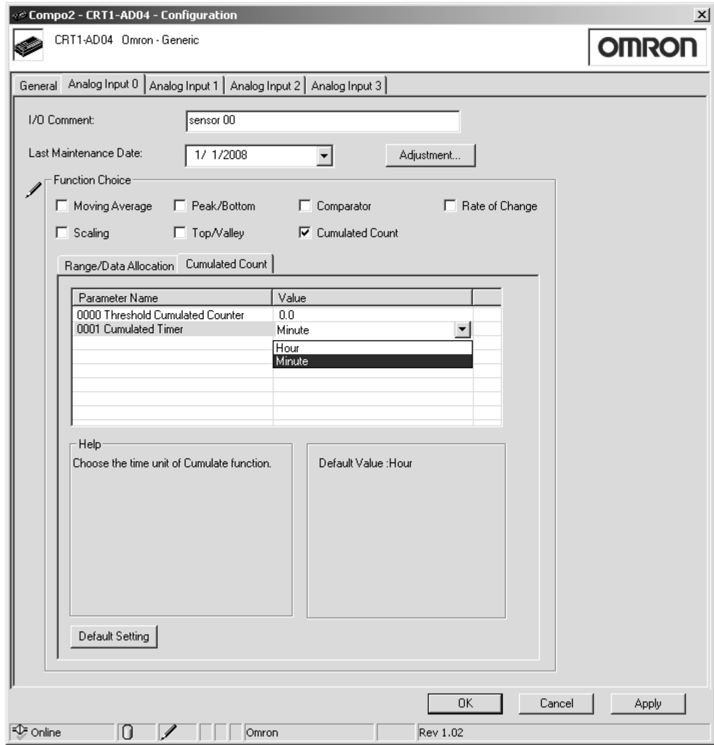
Setting Using the CX-Integrator

1,2,3...

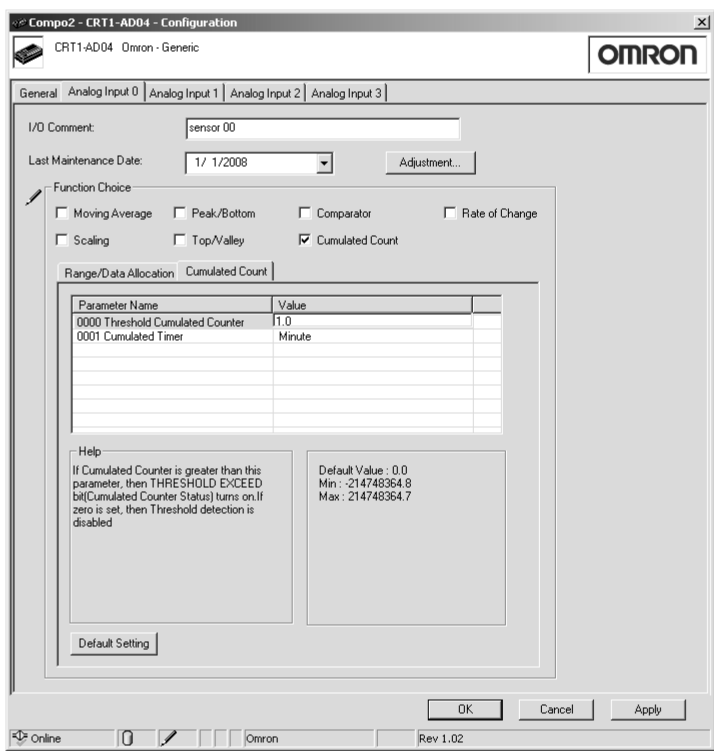
1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the Tab Page for the input where the cumulated counter is to be set, and select ***Cumulated Count*** under the *Function Choice* heading.



4. 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.



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



6. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

11-4-11 Last Maintenance Date

Description

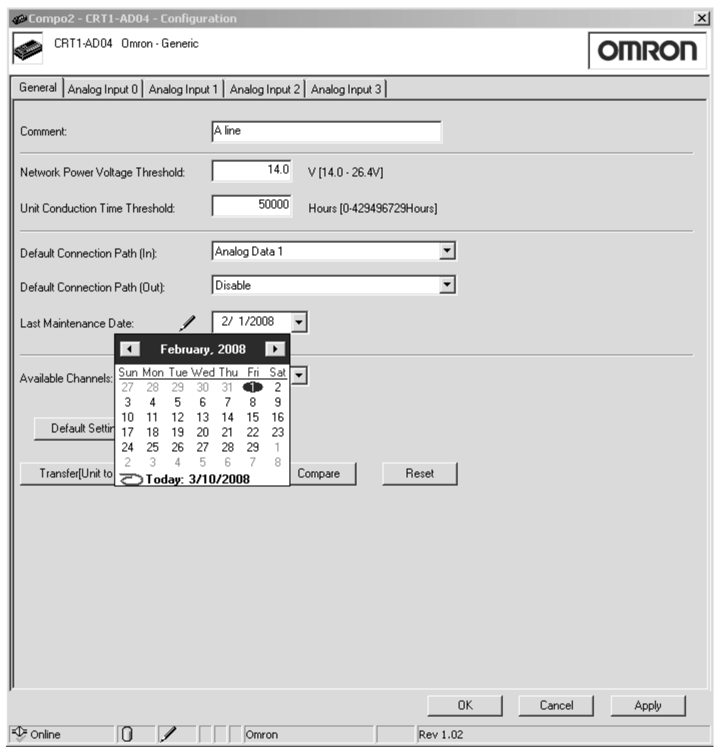
Writes the maintenance date to the unit, individually to units and connected devices. It enables the user to easily determine the next maintenance date. The date can be set using the CX-Integrator.

Setting Using the CX-Integrator

■ Setting the Last Maintenance Date of the Unit

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the **General** Tab and select a date from the *Last Maintenance Date* Field. (To enter the current date, select ***Today*** from the bottom of the pull-down menu.)

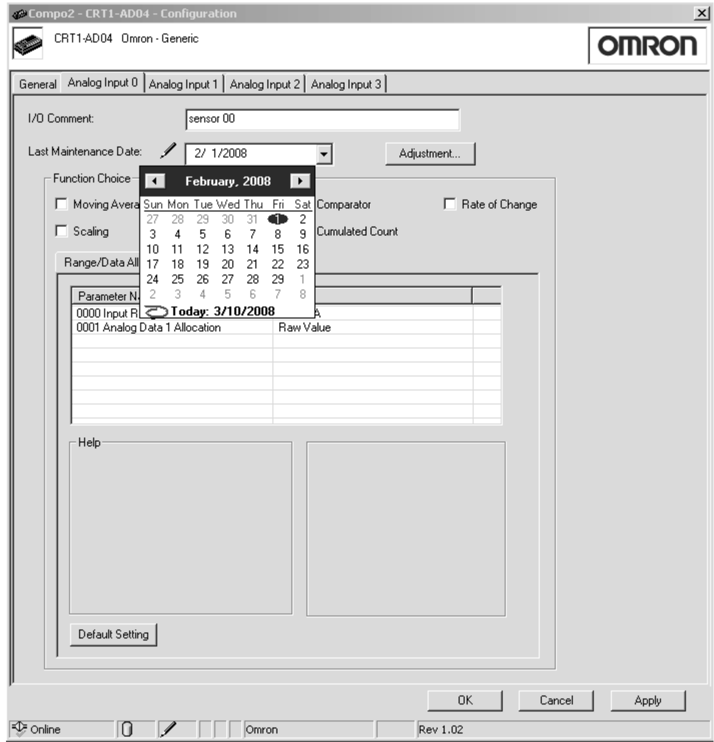


4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

■ Setting the Last Maintenance Date of the Connected Device

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Click the Tab Page for the input that is connected to a 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.)



4. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-5 Analog I/O Slave Unit (output) Functions

11-5-1 Scaling

Description

In default setting, the output values are scaled to a count between 0 to 6,000 and converted to analog values in the output signal range. The scaling function allows user-specified scaling (or industry-specific units) for output signal ranges. The function 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

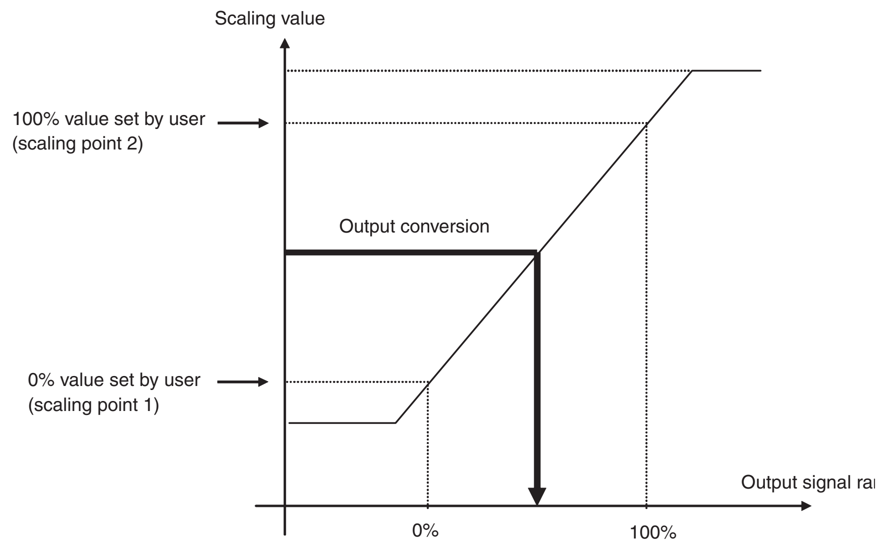
Default scaling converts analog output values into voltage or current values. The units used are mV or µA. When default scaling is selected, scaling is performed according to the output range, as shown in the following table.

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
Discon-nected 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 CX-Integrator.

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 CX-Integrator (–28,000 to 28,000)					
0%	Set using CX-Integrator (–28,000 to 28,000)					
Discon-nected line	---	---	7FFF hex	---	---	7FFF hex

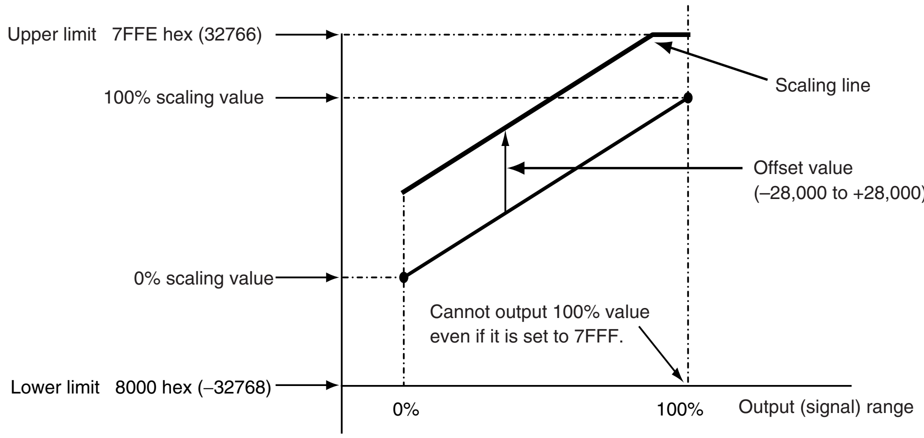


Note Reverse scaling, where the 0% scaling value is higher than the 100% scaling value, is also supported.

Offset Compensation

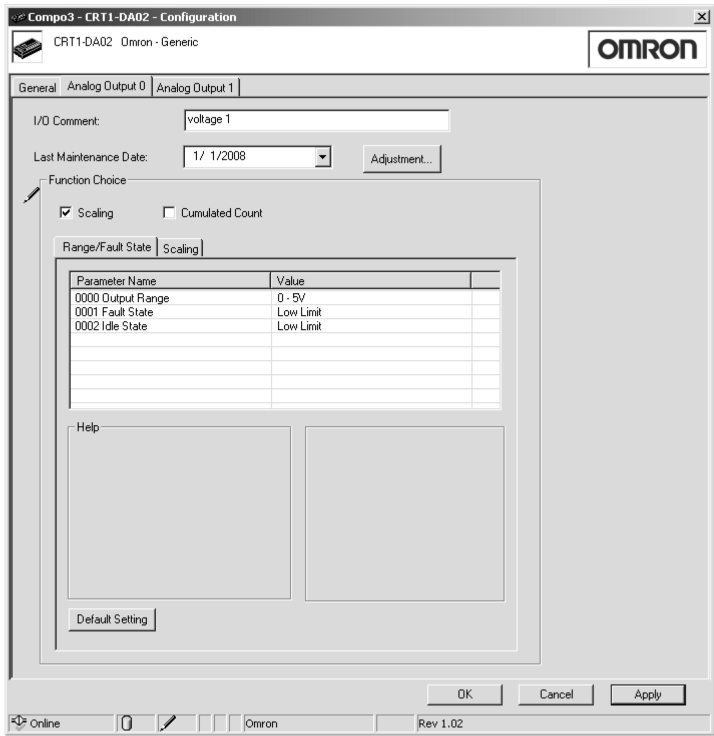
Offset compensation is used to compensate for error that occurs during scaling. The offset amount is added to the scaled line before processing, as shown in the following diagram. The offset (error) value can be input between –28,000 and 28,000, but if underflow or overflow occurs in the scaled line, 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.

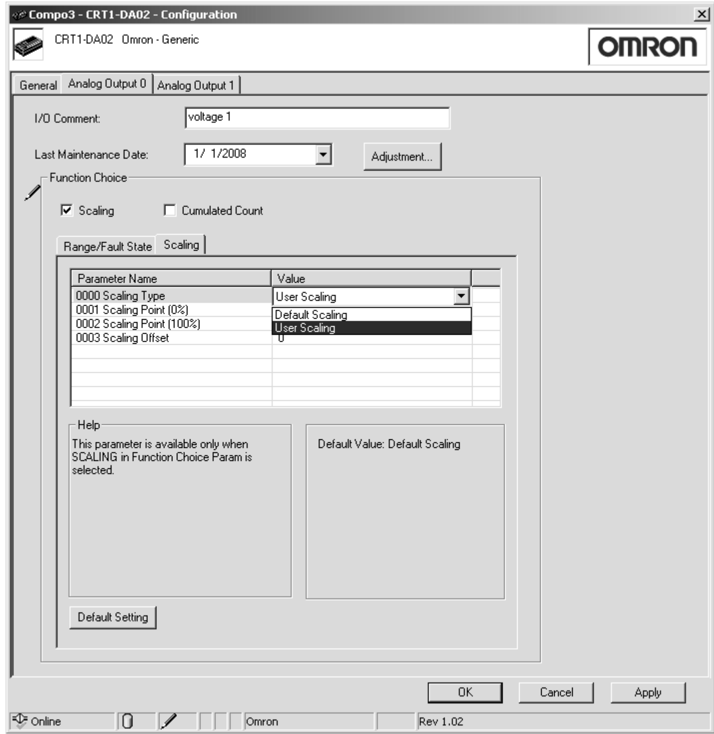


Setting Using the CX-Integrator

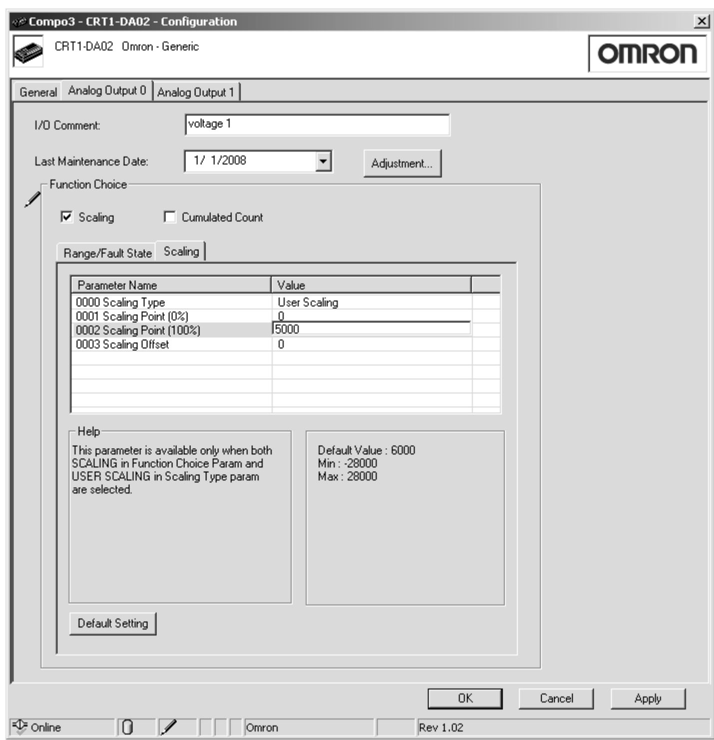
1,2,3...
1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the Tab Page for the output where scaling is to be performed, and select ***Scaling*** under the *Function Choice* heading.



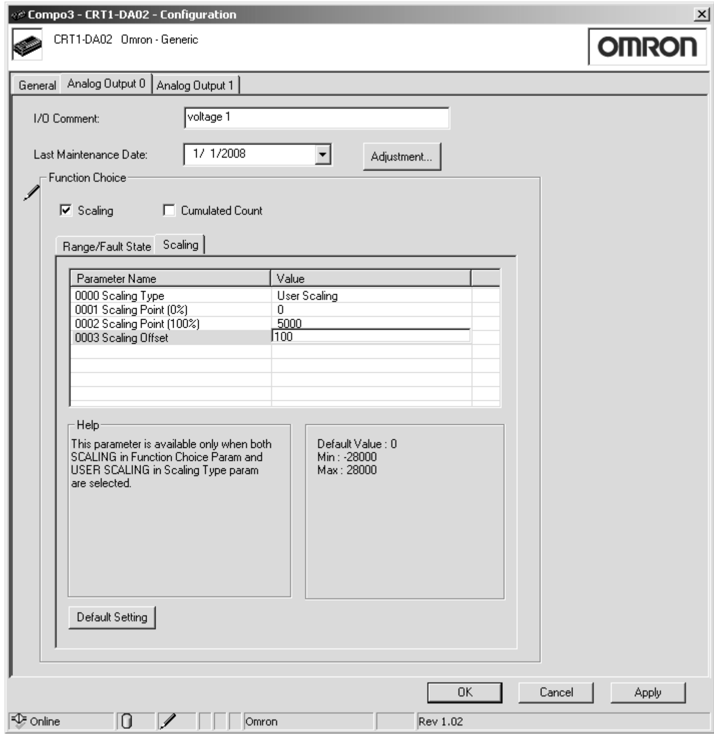
4. To select the scaling type, click the **Scaling** Tab, and select either ***Default Scaling*** or ***User Scaling***.



5. When user scaling is selected, set the 0% value in the *Scaling Point (0%)* Field, and set the 100% value in the *Scaling Point (100%)* Field.



6. 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.

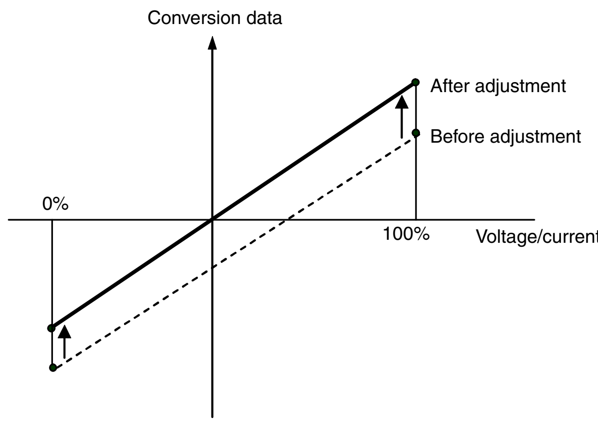


7. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
8. Click the **OK** Button and exit the window.

11-5-2 User Adjustment

Description

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.

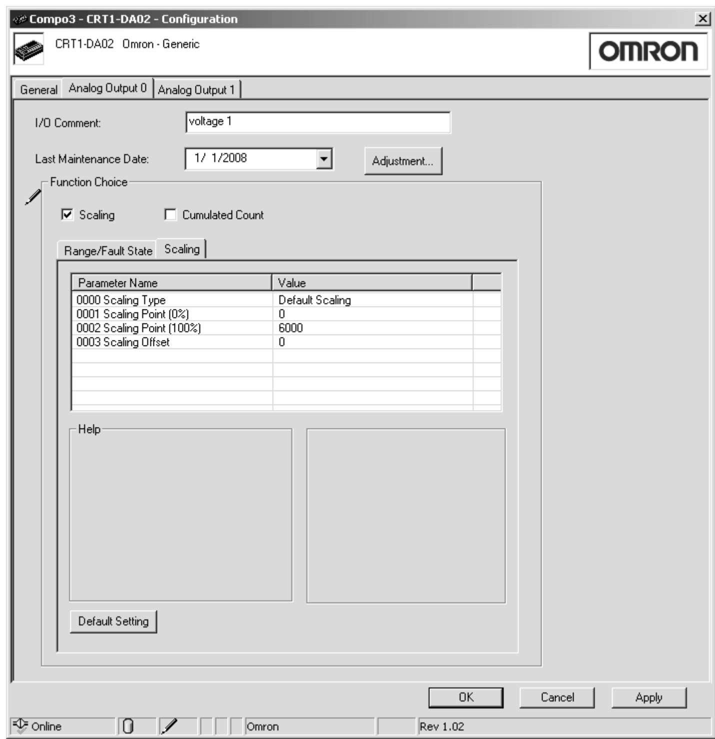
Output range	Low Limit	High Limit
0 to 5 V	–0.25 to 0.25 V	4.75 to 5.25 V
1 to 5 V	0.8 to 1.2 V	4.8 to 5.2 V
0 to 10 V	–0.5 to 0.5 V	9.5 to 10.5 V

Output range	Low Limit	High Limit
–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 CX-Integrator

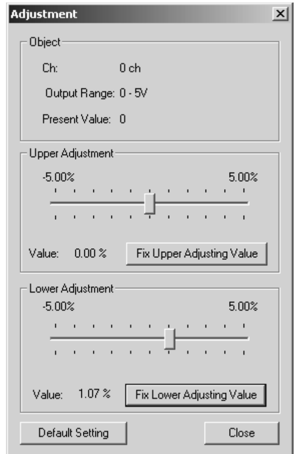
1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the Tab Page for the output to be adjusted, and click the **Adjustment** Button. (At this time, set the output range.)



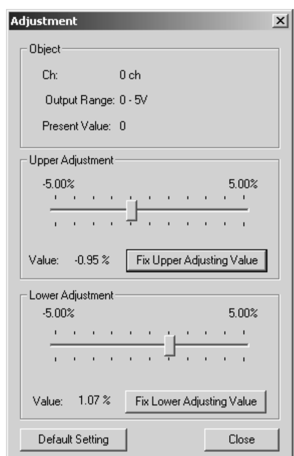
Adjusting the Low Limit

4. Output the value from the Master Unit that is equivalent to 0%. Always perform adjustment with the 0% value.
5. Adjust the analog value that is output from the terminal using the Lower Adjustment 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.



Adjusting the High Limit

6. 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 adjustment can be performed using a lower value.
7. Adjust the analog value that is output from the terminal using the High Adjustment 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.



To return to the default settings, click the **Default Setting** Button.

8. Click the **Close** Button to close the Adjustment Window.
9. Return to the General Tab Page, click the **Transfer [PC to Unit**] Button to download the data, and then click the **Reset** Button to reset the Unit.
10. Click the **OK** Button and exit the window.

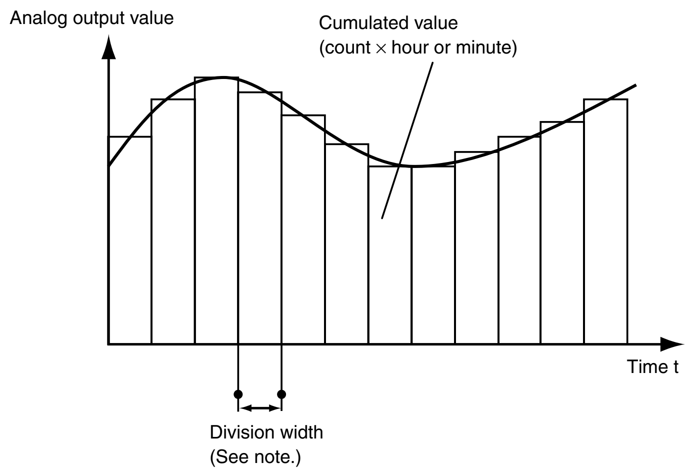
Note In Analog Output Slave Units, always adjust the Low Limit first. If the Low Limit is adjusted without adjusting the High Limit 100%, dislocation may occur.

11-5-3 Cumulated Count

Description

The cumulated count 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 CX-Integrator in units of 0.1 hours or minutes.

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

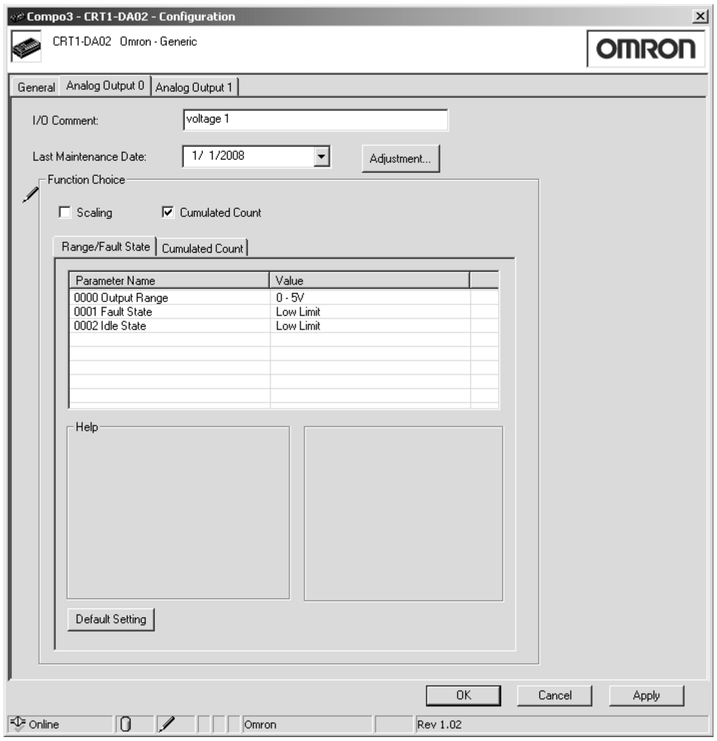


Note The following table shows the divisions for the cumulated counter.

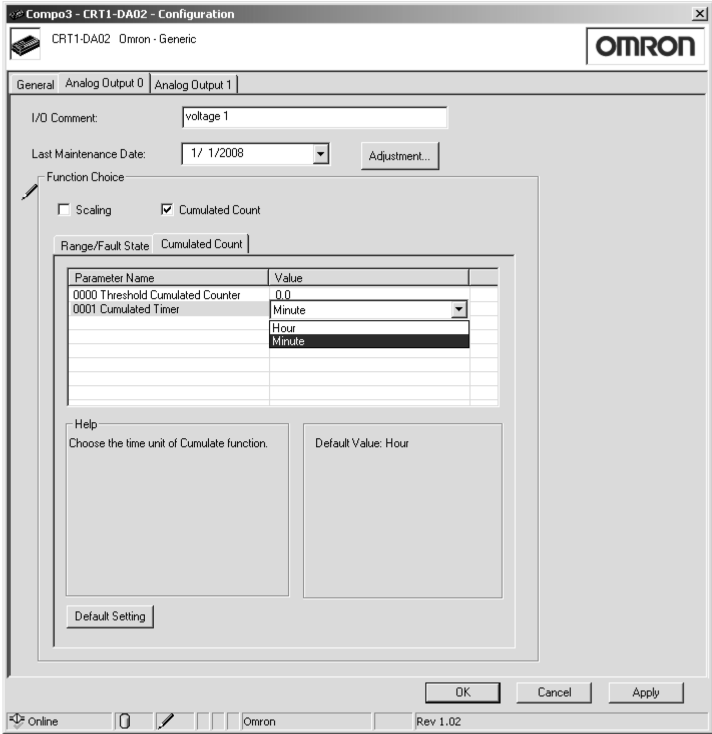
Unit	Divisions
Hour	3.6 s (1/1,000 hour)
Minute	60 ms (1/1,000 minute)

Setting Using the CX-Integrator

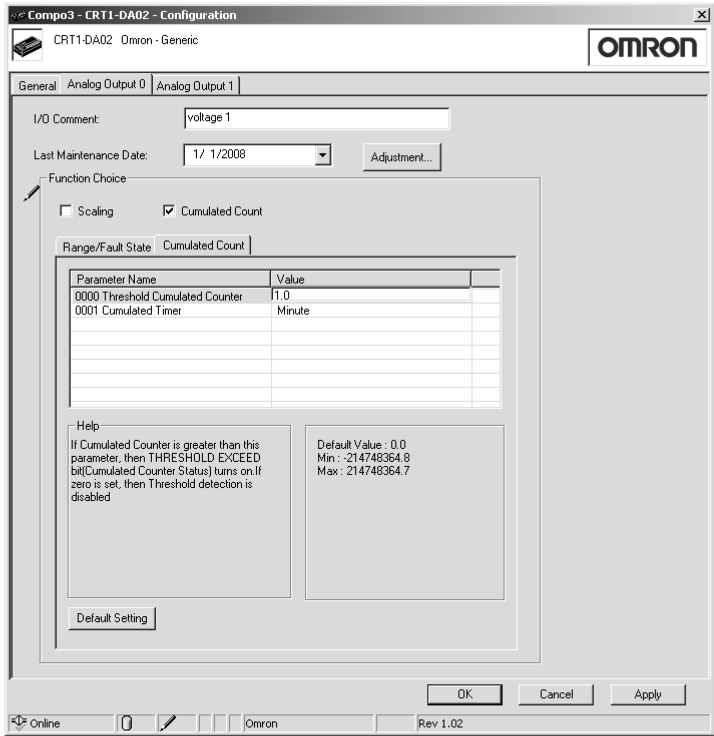
1,2,3...
1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select the tab page for the output where the cumulated counter is to be set, and select the *Cumulated Count* Check Box under the *Function Choice* heading.



4. To set the counter unit, click the **Cumulated Count** Tab and select ***Hour*** or ***Minute*** from the pull-down menu in the *Cumulated Time* Field.



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



6. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

11-5-4 Setting Output Value for Errors

Description

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 CX-Integrator.

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

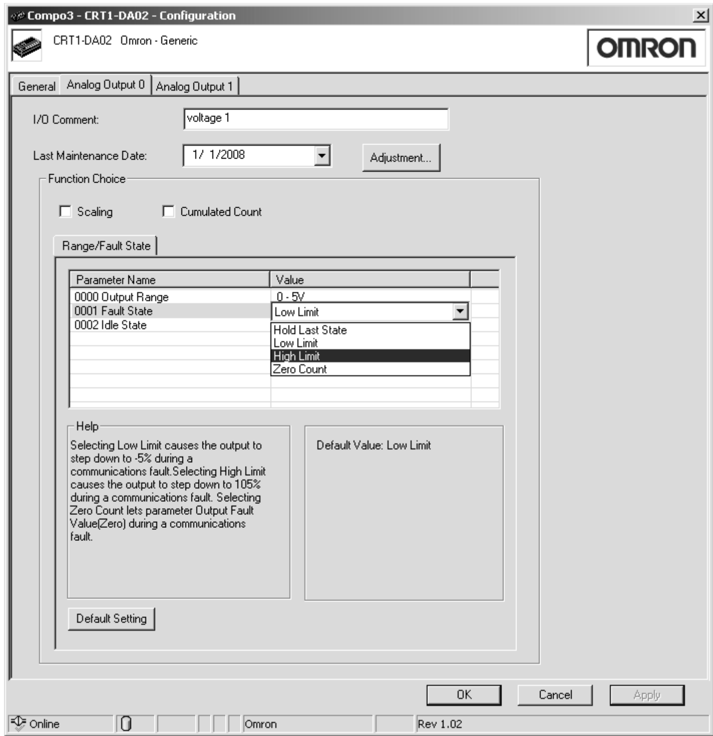
Output range	Low limit	High limit	Hold last state
0 to 5 V	–0.25 V	5.25 V	Holds value.
1 to 5 V	0.8 V	5.2 V	Holds value.
0 to 10 V	–0.5 V	10.5 V	Holds value.
–10 to 10 V	–11 V	11 V	Holds value.
4 to 20 mA	3.2 mA	20.8 mA	Holds value.
0 to 20 mA	0 mA	21 mA	Holds value.

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 CX-Integrator

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Configuration Window. (Alternatively, right-click the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. 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.



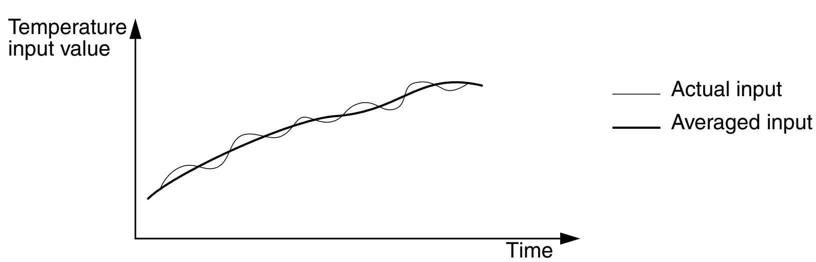
4. Return to the General Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-6 Temperature Input Unit Functions

11-6-1 Moving Average Processing

Description

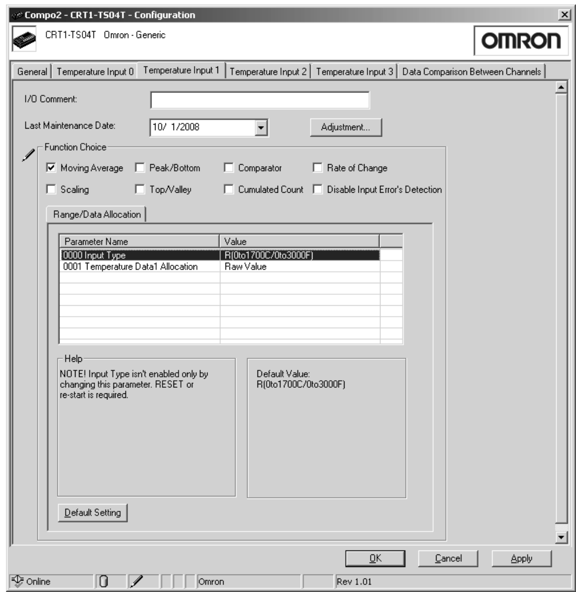
This function calculates the moving average of the previous eight input values, and uses the resulting value as the converted data. When the input value fluctuates frequently, the moving average can be used to produce a stable input value, as shown in the following diagram.



Setting Using CX-Integrator

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where moving average processing is to be performed, and select the *Moving Average* Check Box in the *Function Choice* Area.



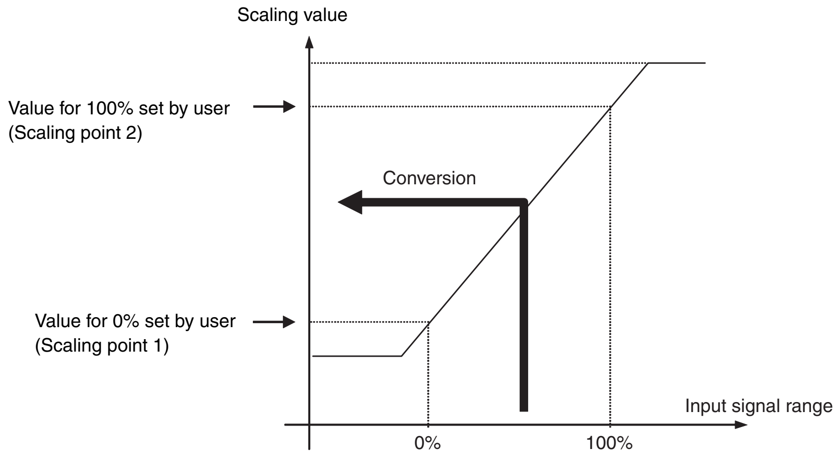
4. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-6-2 Scaling

Description

Scaling can be used to convert the temperature input values (measured values) to display values at the scale required by the user. Scaling also eliminates the need for ladder programming in the Master Unit to perform these basic math operations.

To scale the temperature input values to the scale required by the user, use the CX-Integrator to set the conversion values (–28,000 to 28,000) for two points in the scale (the 100% value and 0% value).

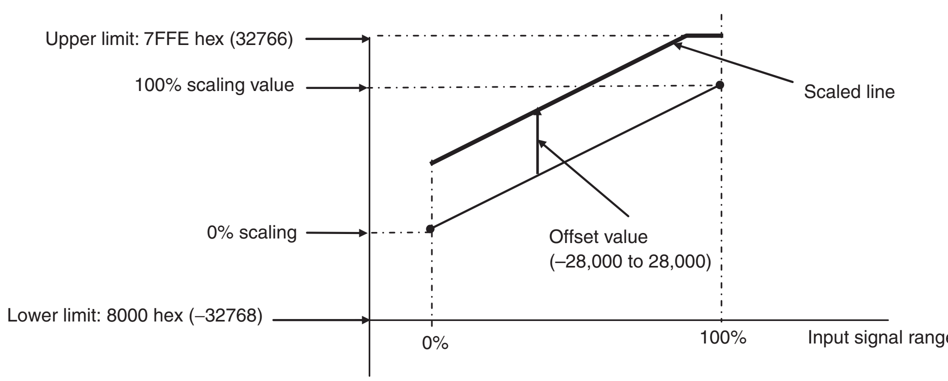


Note
1. The default values are 0 and 28,000.
2. Reverse scaling, where the 0% scaling value is higher than the 100% scaling value, is also supported.

Offset Compensation

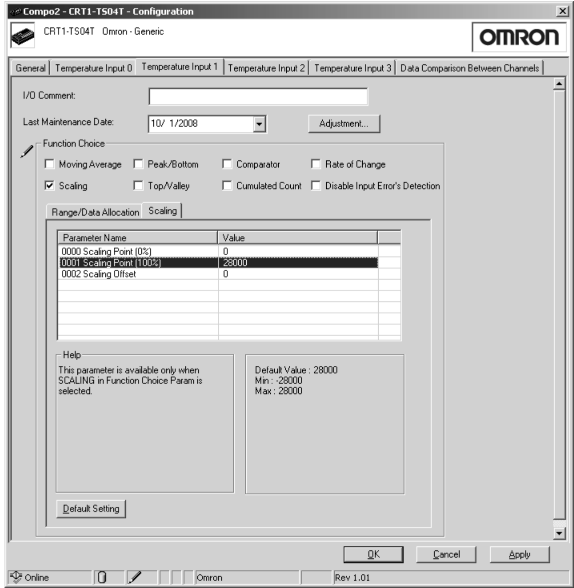
The scaling function is equipped with offset compensation, which can compensate for any error that occurs during scaling. The offset amount is added to the scaled line as shown in the following diagram. The offset value can be input between –28,000 to 28,000. Make sure that underflow or overflow does not occur. The High Limit is 7FFE hex and the Low Limit is 8000 hex. (The High Limit is 7FFFFFFE Hex and the Low Limit is 80000000 Hex for 1/100 Display Mode.)

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

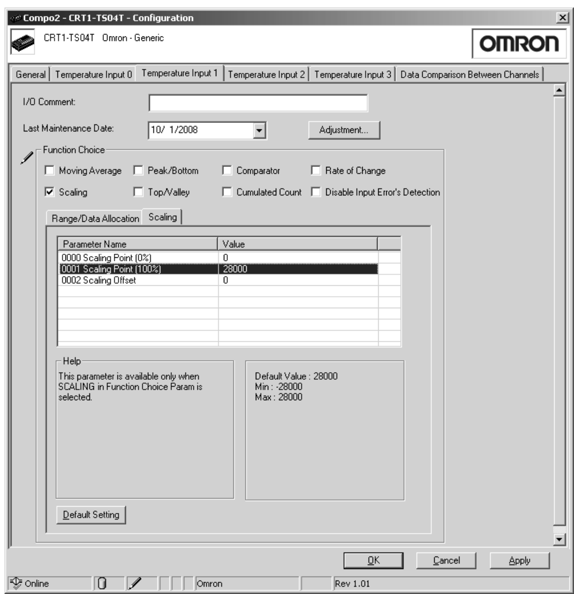


Setting Using CX-Integrator

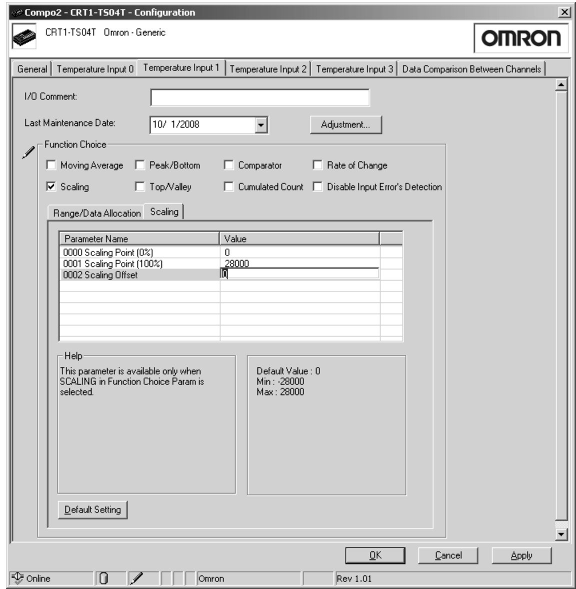
1,2,3...
1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where scaling is to be performed, and select the *Scaling* Check Box in the *Function Choice* Area.



4. Set 0% value in the *Scaling Point (0%)* Field, and set the 100% value in the *Scaling Point (100%)* Field.



5. To offset the scaled values, set the offset value in the *Scaling Offset* Field.



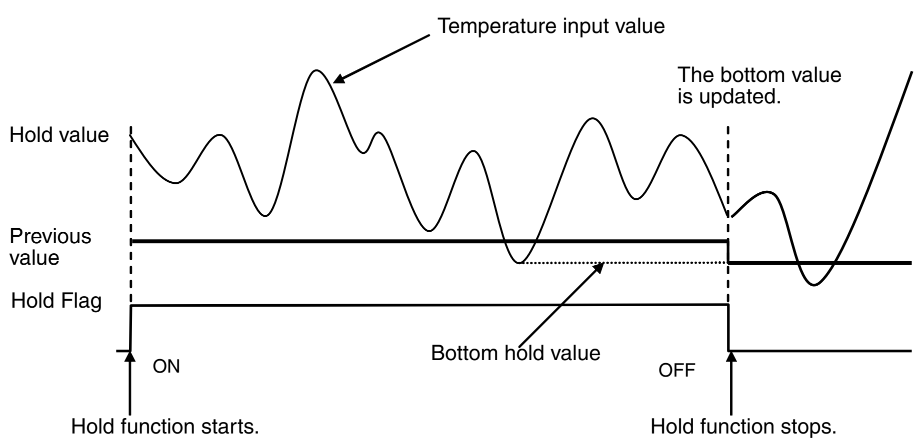
6. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

11-6-3 Peak/Bottom Hold

Description

Peak/bottom hold is used to hold the maximum (peak) value or minimum (bottom) value of the temperature input value. When the Hold Flag allocated in the Output 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 temperature data 1. (Refer to details on the comparator function.)

Example of Bottom Hold

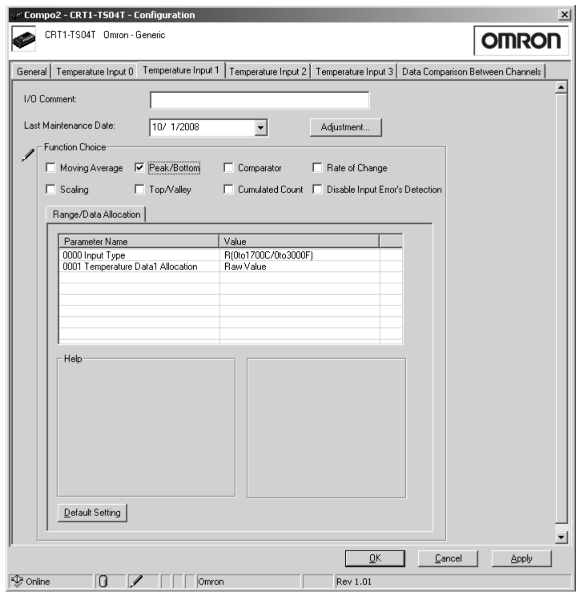


Note A delay in network transmission time will occur from the time the Hold Flag turns ON (or OFF) in the Master Unit's ladder program until notification of the flag's status is actually sent to the Slave. Therefore, even when the Hold Flag is ON, the first temperature data transmitted to the Master 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.

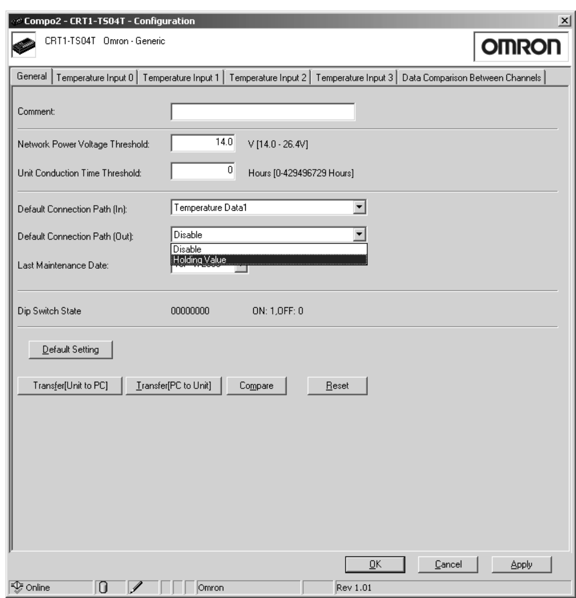
Setting Using CX-Integrator

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where peak/bottom hold is to be set, and select the *Peak/Bottom* Check Box in the *Function Choice* Area.



4. To allocate the Hold Flag (output) in the default connection path, click the **General** Tab Page and select ***Holding Value*** in the *Default Connection Path (Out)* Field.



5. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.

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

11-6-4 Top/Valley Hold

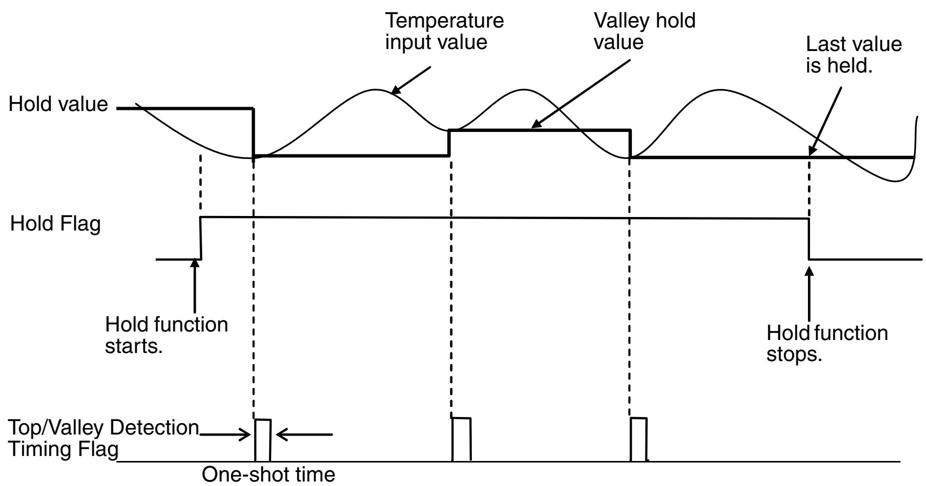
Description

The top/valley hold function is used to hold the top and valley values of the temperature input value.

Temperature 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 Temperature Data 1. (Refer to details on the comparator function.)

Example of Valley Hold



Note

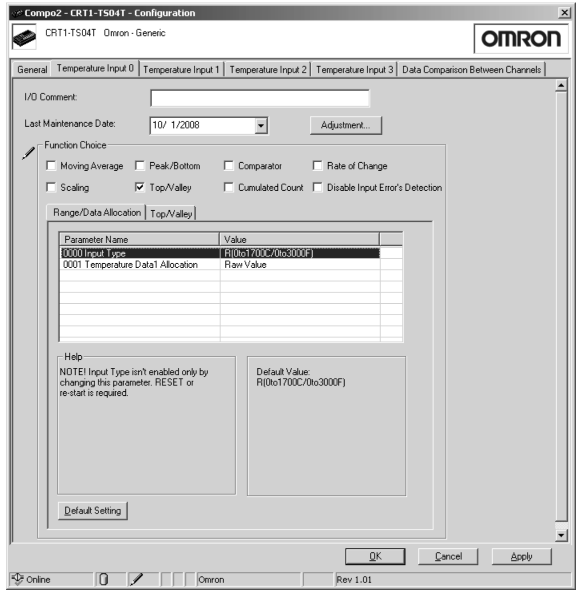
1. A delay in network transmission time will occur from the time the Hold Flag turns ON (or OFF) in the Master Unit's ladder program until notification of the flag's status is actually sent to the Slave. Therefore, even when the Hold Flag is ON, the first temperature data transmitted to the Master Unit 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 CX-Integrator to set the one-shot time (the setting range is 1 to 65,535 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 CX-Integrator

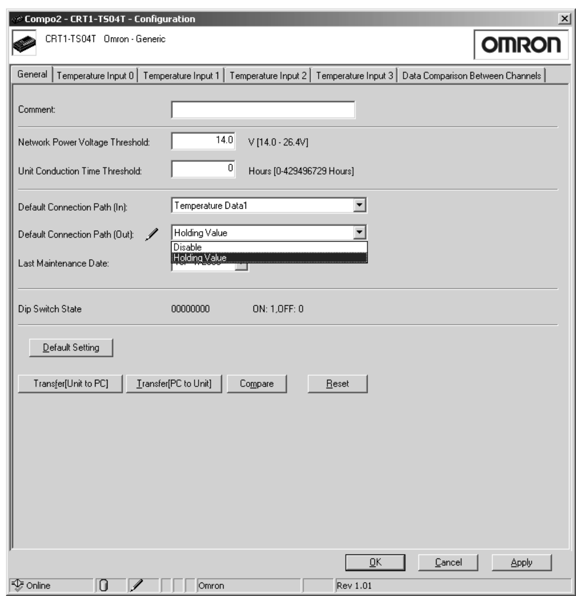
1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.

3. Click the tab for the input where top/valley hold is to be set, and select the *Top/Valley* Check Box in the *Function Choice* Area.



4. To allocate the Hold Flag (output) in the default connection path, click the **General** Tab Page and select *Holding Value* in the *Default Connection Path (Out)* Field.

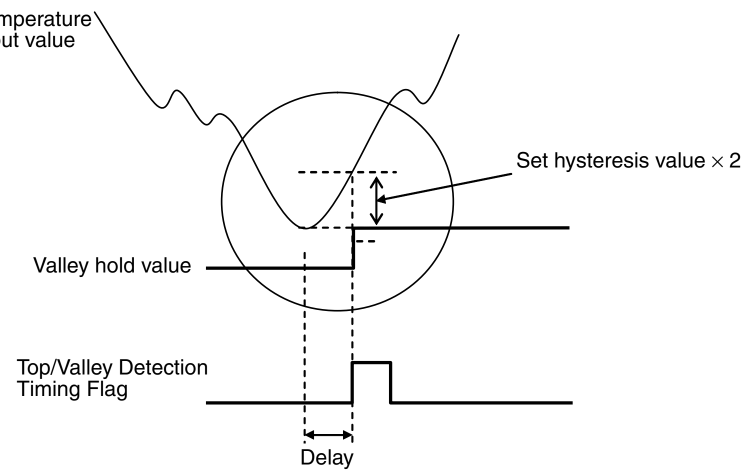


5. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

Hysteresis Setting

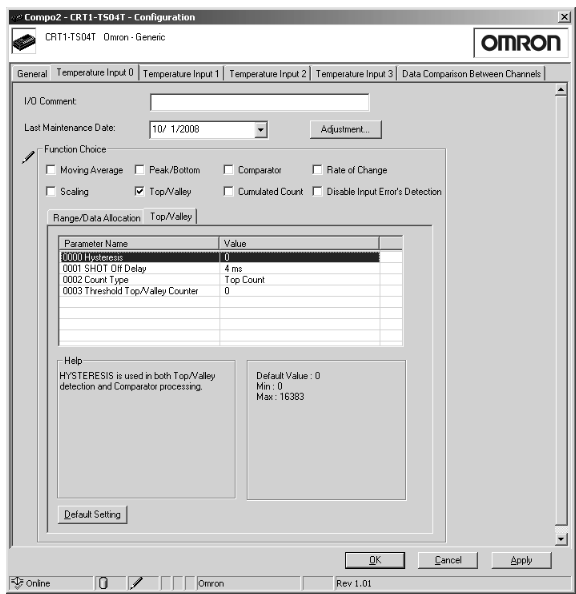
The hysteresis value can be set using the CX-Integrator to prevent detection of top or valley values that occur due to minor fluctuations in the temperature input value. This will cause the start of data holding to be delayed after the actual top or valley value occurs, as shown in the following diagram.

Timing for Setting Data



Setting the Hysteresis Using CX-Integrator

1,2,3... 1. Click the **Top/Valley** Tab and input the hysteresis in the *Hysteresis* Field.

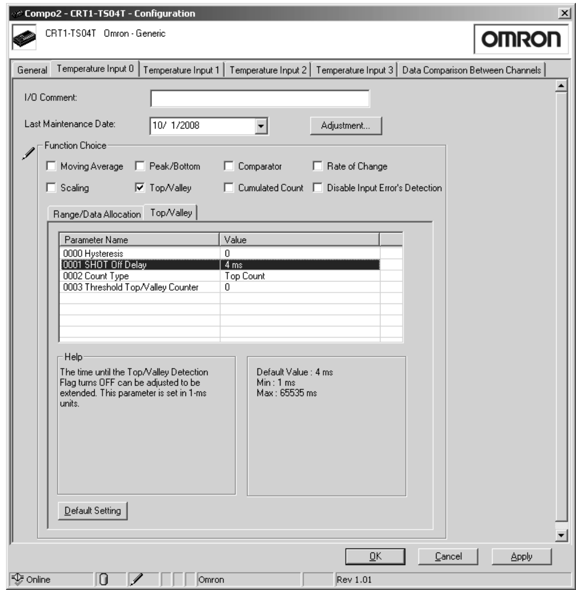


2. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
3. Click the **OK** Button and exit the window.

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

Setting the One-shot Time

1,2,3... 1. Select the **Top/Valley** Tab Page and input the desired value in the *Shot Off Delay* Field.



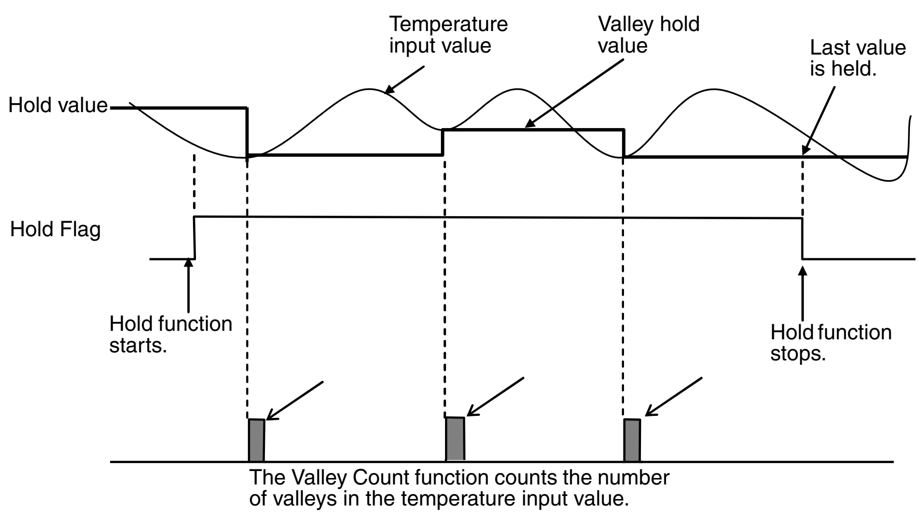
2. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
3. Click the **OK** Button and exit the window.

11-6-5 Top/Valley Counter

Description

The top/value count function counts the number of temperature tops or valleys in devices or applications that have repetitive constant temperature rises (or drops). A monitor value can be set for the counter to indicate when maintenance is required for the Unit or sensor. The status can be read in the Monitor Window or via an explicit message to know when the monitor value has been exceeded.

Valley Counter Operation

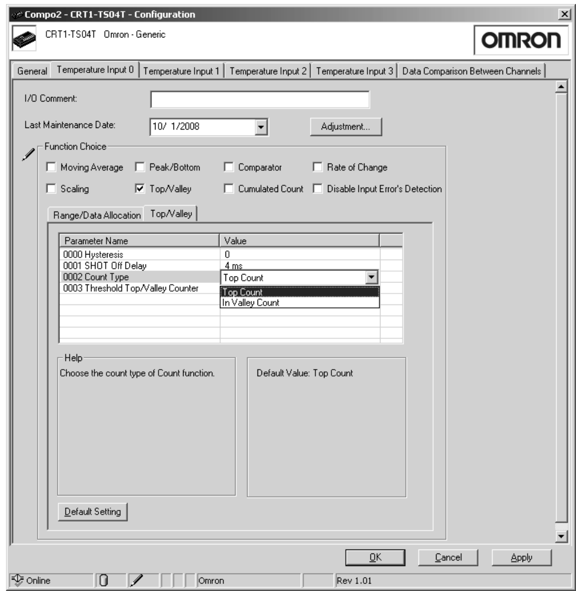


Setting Using CX-Integrator

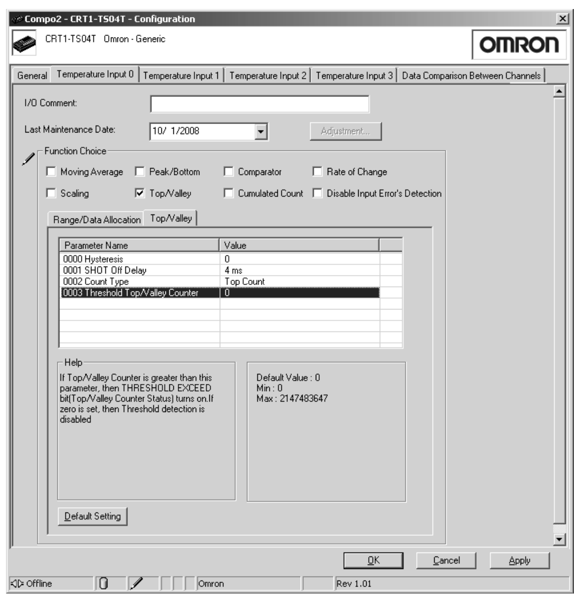
1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.

3. Click the tab for the input where top/valley count is to be used, and select the *Top/Valley* Check Box in the *Function Choice* Area.
4. Select the **Top/Valley** Tab Page and select ***Top Count*** or ***Valley Count*** in the Count Type Field.



5. Set the monitor value for the top/valley counter.

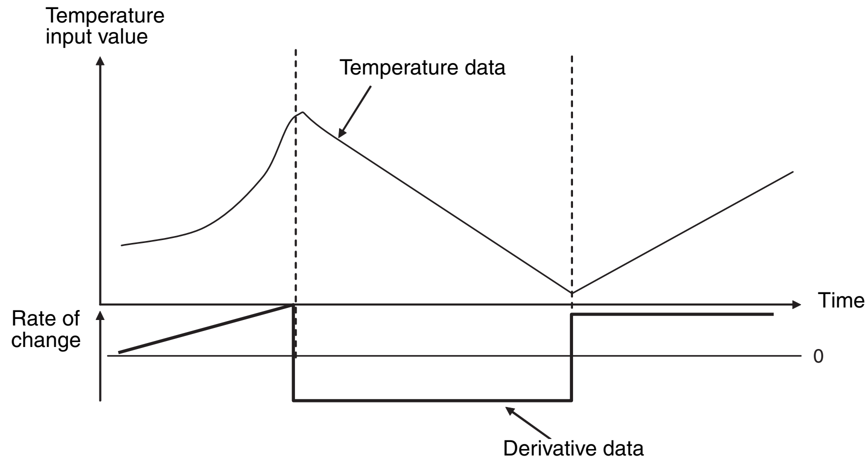


6. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

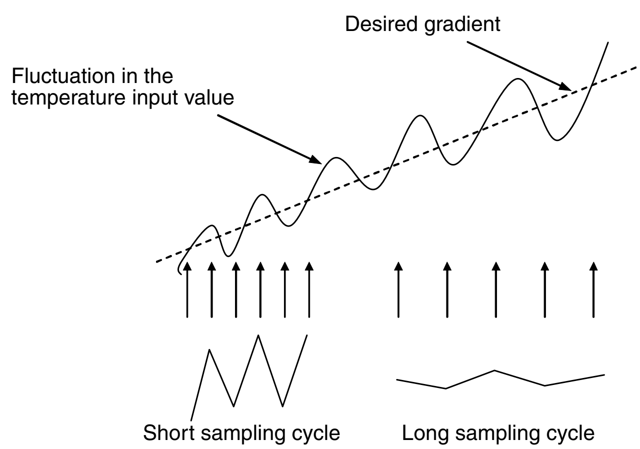
11-6-6 Rate of Change Calculation

Description

The rate of change can be obtained for each sampling cycle set for the temperature input data. This function calculates the difference between the current sampling cycle the previous cycle. The sampling cycle can be set to between 250 ms and 65,500 ms in 250-ms increments. The default setting for the sampling cycle is 250 ms.



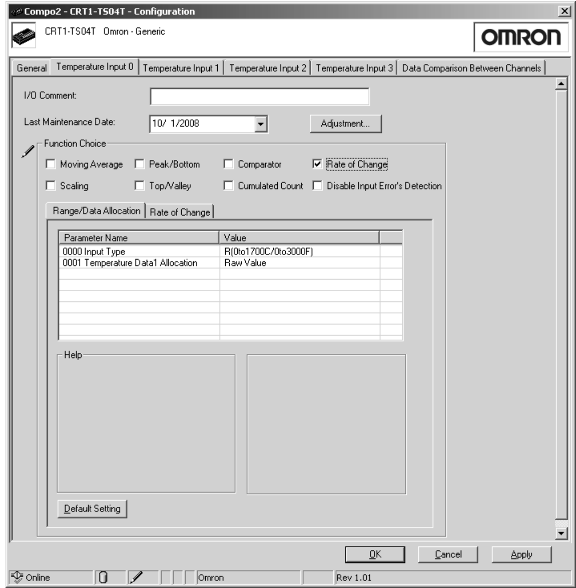
Note If the sampling cycle is set to a small value, the rate of change will be sensitive to small changes. If the temperature data is subject to minute fluctuations, and the sampling cycle is shorter than the cycle of fluctuation, the fluctuation will be regarded as the rate of change. To prevent this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



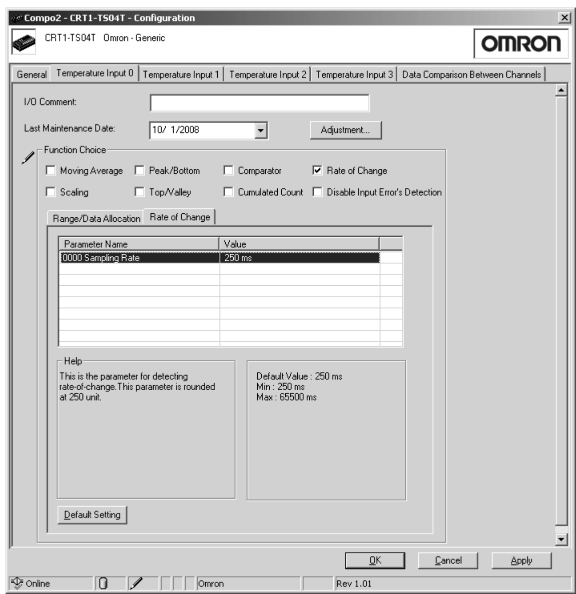
Setting Using CX-Integrator

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where rate of change is to be calculated, and select the *Rate of Change* Check Box in the *Function Choice* Area.



4. Click the **Rate of Change** Tab and input the desired value for the sampling cycle.



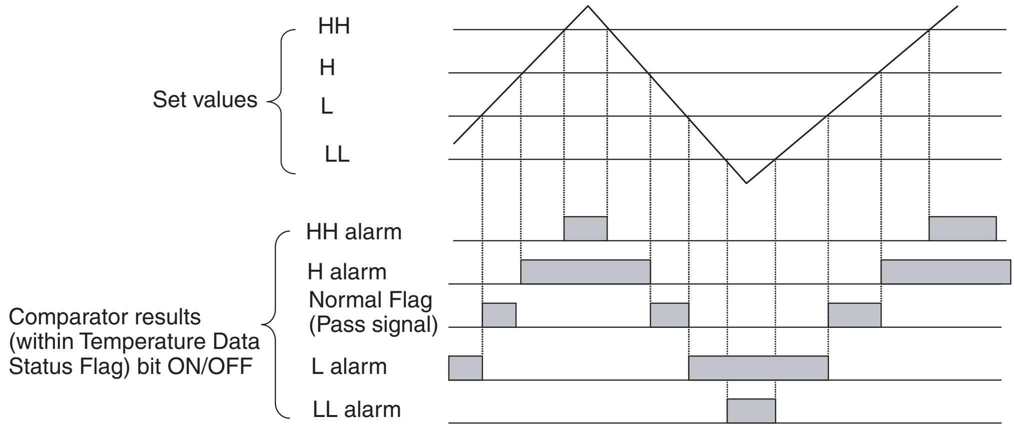
5. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

11-6-7 Comparator

Description

When the High High Limit, High Limit, Low Low Limit, and Low Limit are set in the Unit, a status flag will be turned ON when a value exceeds the set range. The four set values are High High Limit (HH), High Limit (H), Low Low Limit (LL), and Low Limit (L). The values are compared with those in Temperature Data 1. (The comparator function cannot be used with Temperature Data 2.) The setting range is –415,000 to 415,000.

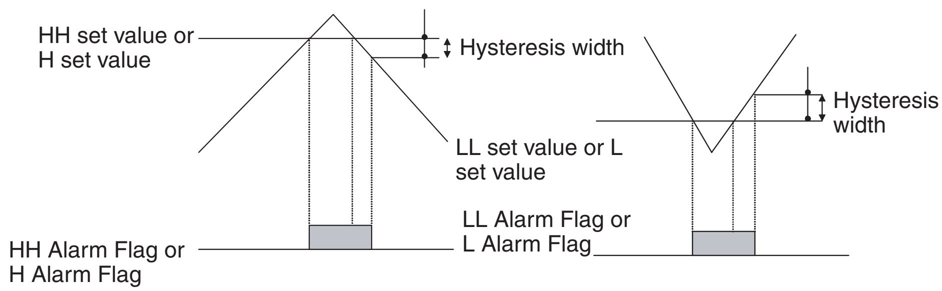
In each case where settings are exceeded, the comparator results bit in the "Temperature Data Status Flag" is turned ON. If a warning is not set, a Normal Flag (Pass signal) is turned ON.



Note When the temperature input value changes faster than the conversion cycle, the status may go from a Low Limit alarm directly to a High Limit alarm without having the Normal Flag (pass signal) go ON in between. Write ladder programs to allow for this.

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 temperature input value fluctuates around the threshold and the flag repeatedly turns ON or OFF, set hysteresis to stabilize the flag operation. The setting range is 0 to 16,383.



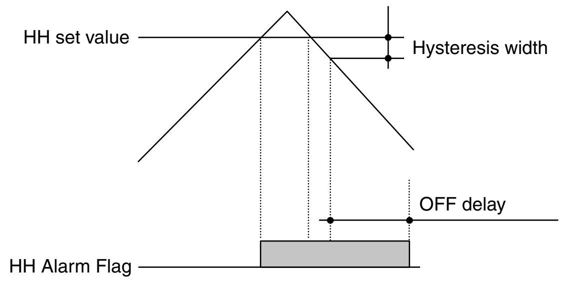
Note When setting the hysteresis value, allow for the decimal point position or the 1/100 Display Mode for each input. Always correct the hysteresis value after changing the display mode or replacing the input with one that has a different decimal point position.

Examples for an Hysteresis of 10°C:

- R thermocouple (normal display) setting: 0010 decimal
- T thermocouple (normal display) setting: 0100 decimal
- Setting for any input with 1/100 display: 1000 decimal

OFF Delay

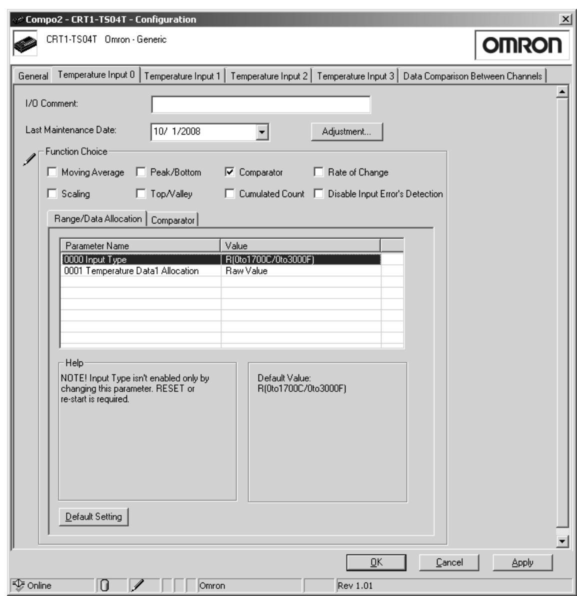
The time until the Comparator Result Flag turns OFF can be extended. For example, even if the Flag is ON momentarily, the OFF delay can be set so that the Master Unit can receive notification of the Flag's status.



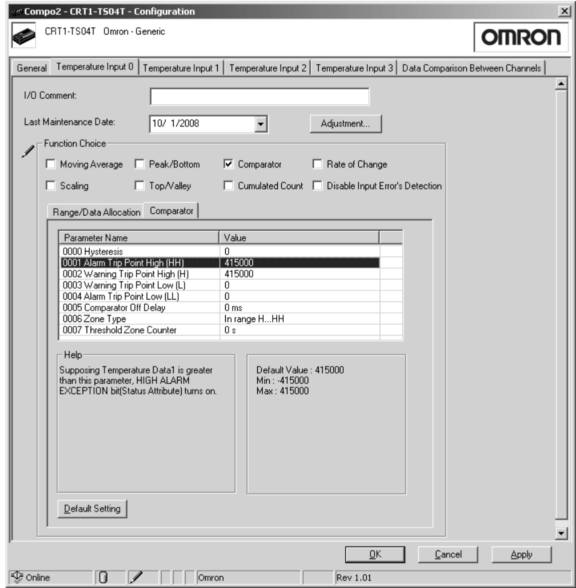
Setting Using CX-Integrator

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where comparator function is to be set, and select the *Comparator* Check Box in the *Function Choice* Area.



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



Note When setting the alarm value, allow for the decimal point position or the 1/100 Display Mode for each input. Always correct the alarm value after changing the display mode or replacing the input with one that has a different decimal point position.

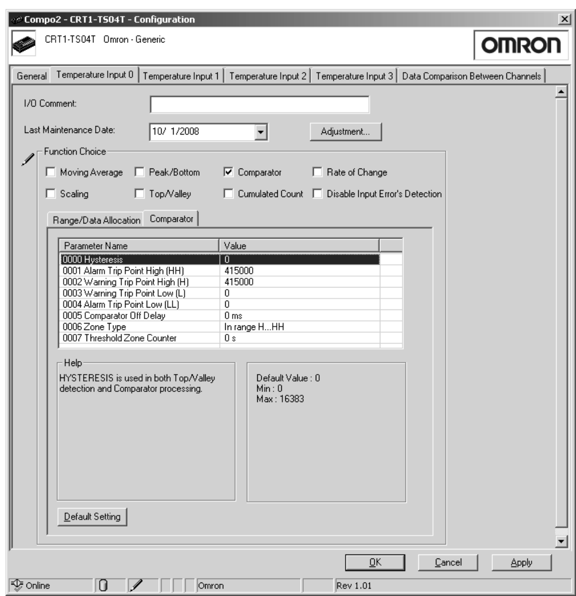
Example: Alarm value setting for 250°

R thermocouple (normal display) setting: 00250 decimal

T thermocouple (normal display) setting: 02500 decimal

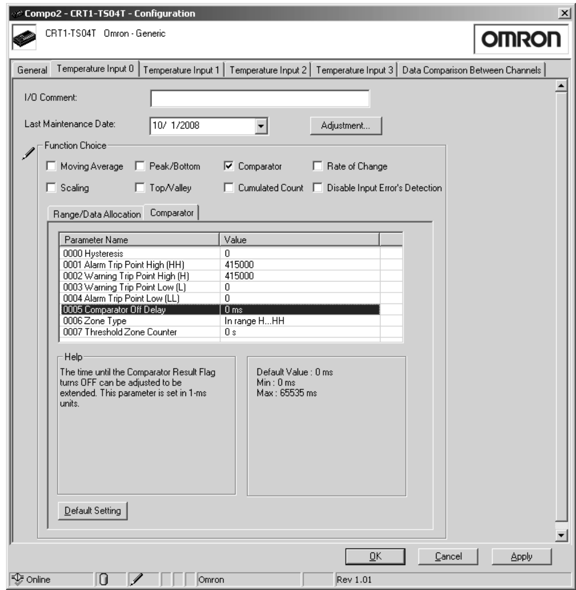
Setting for any input with 1/100 display: 25000 decimal

5. 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.

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



7. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
8. Click the **OK** Button and exit the window.

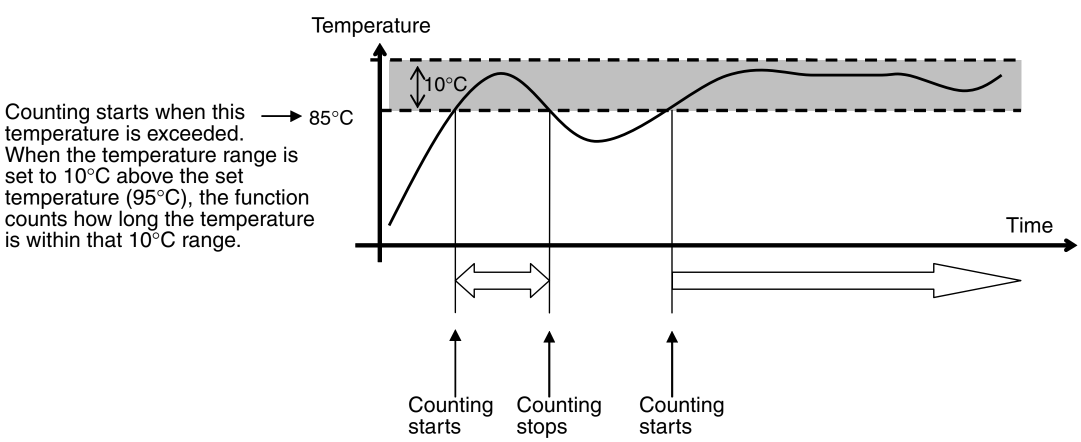
11-6-8 Temperature Range Count

Description

This function times (in 1-second units) how long the temperature input value is within a user-set temperature range. The range count (zone count) can indicate when preventative maintenance is required for devices or applications that deteriorate at a fixed rate within the user-set temperature range.

Select the temperature range settings on the **Comparator** Tab Page. The temperature range boundaries are defined by the High High Limit (HH), High Limit (H), Low Low Limit (LL), or Low Limit (L). If the time within the set temperature range exceeds the monitor value, it indicates that a threshold value has been exceeded. The status can be read in the Monitor Window or via an explicit message to know when a threshold has been exceeded.

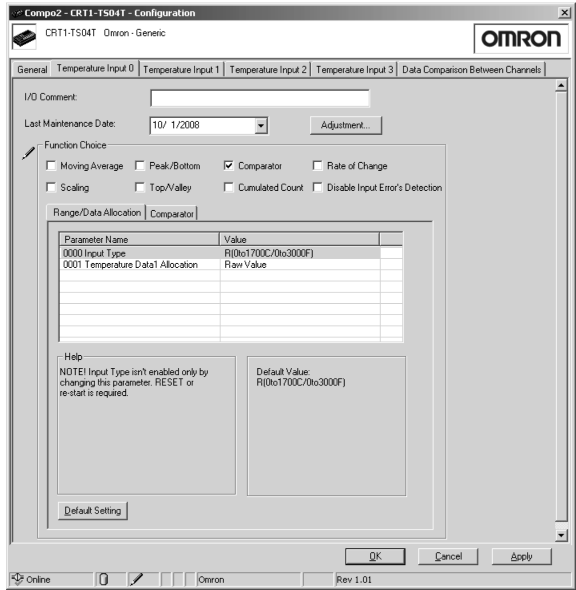
The Over Threshold status can be read in the Maintenance Information Window or via an explicit message.



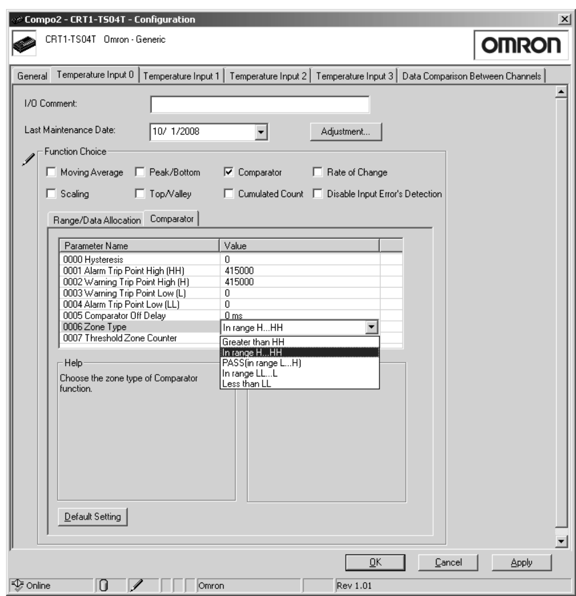
Setting Using CX-Integrator

1,2,3... 1. Turn ON the power supply to the Temperature Input Unit.

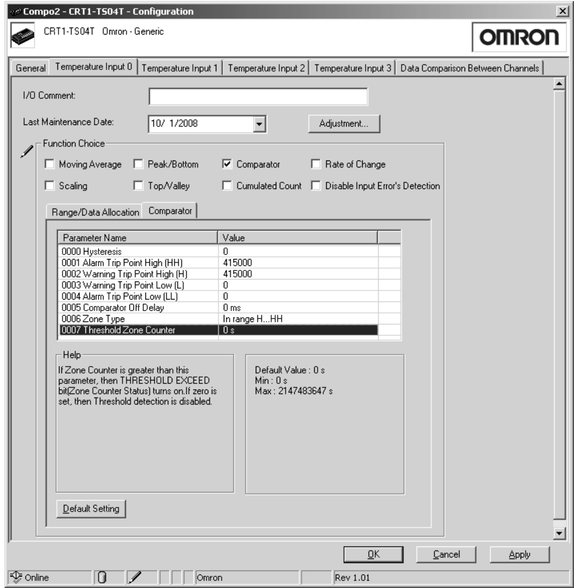
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where time is to be measured, and select the ***Comparator*** Check Box in the *Function Choice* Area.



4. Click the **Comparator** Tab and select the desired type of temperature range in the *Zone Type* Field.



5. Set the monitor value in the *Monitoring Zone Counter* Field to indicate when the temperature has been in the temperature range longer than the set value.



6. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

11-6-9 Data Comparison between Channels

Description

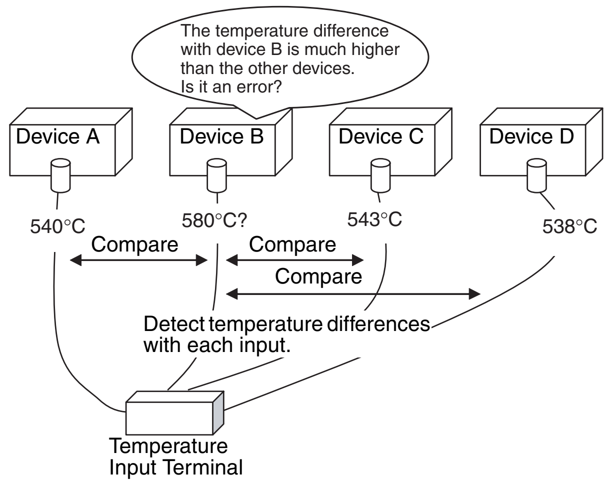
This function can be used to compare the temperature values between of two inputs (inputs 0 to 3) and monitor the relative temperature difference. A monitor value can be set to detect an excessive temperature difference for preventative maintenance in devices in which the temperature difference may cause or indicate a problem. The comparison result can be checked in the Monitor Window on the *Data Comparison between Channels* Tab Page.

The comparison result and status can be read in the Monitor Window or via an explicit message.

Note

1. The comparison operation can be performed only on the data set as Temperature Data 1.
2. When the peak value or bottom value is selected as the temperature data for Temperature Data 1, that processed value will be used in the comparison operation and not the actual temperature input value.

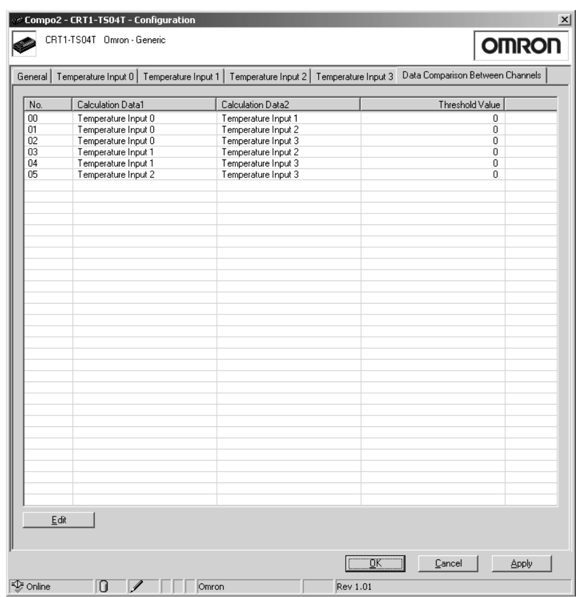
3. The comparison result will be read to a precision of 0.01, regardless of the setting.



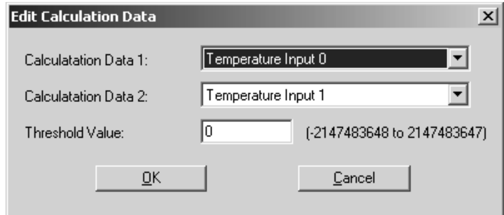
Setting Using CX-Integrator

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the **Data Comparison Between Channels** Tab.



4. Double-click the **Calculation Data1** or **Calculation Data2** cell to open the Edit Calculation Data Window.
5. Select the two temperature inputs to be compared in the *Calculation Data1* and *Calculation Data2* Fields. Set a monitor value in the Monitor Value Field. Always set the threshold value to two decimal places. For example, when setting 10°C, input 1000 for 10.00°C.



6. Click the **OK** Button. The Edit Calculation Data Window will close.
7. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
8. Click the **OK** Button and exit the window.

11-6-10 Input Error Detection Disable Function

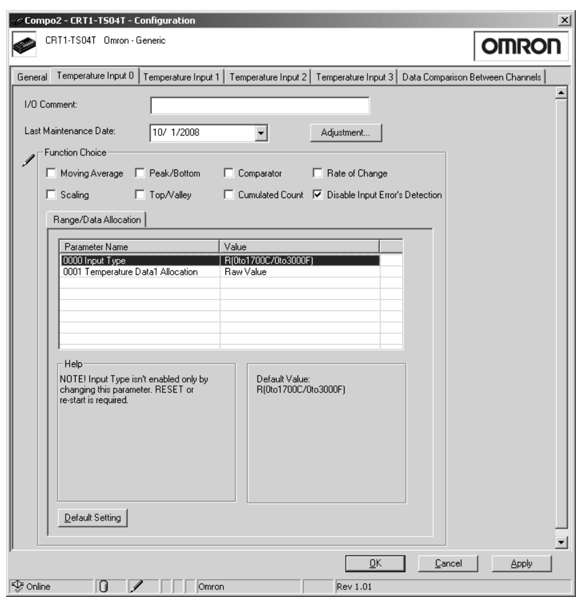
Description

If there are inputs that are not being used, input error detection (including off-wire detection) can be disabled. If this function is used, the Temperature Input Warning Flag and Off-wire Detection Flags will be OFF regardless of the connection status of the input sensor or temperature range.

When this function is enabled, the temperature data is set to 7FFF hex (7FFF FFFFF when 1/100 Display Mode is being used).

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where the input error detection disable function is to be set, and select the *Disable Input Error's Detection* Check Box in the *Function Choice* Area.



4. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

Note Use this function only if there are unused inputs. If this function is used while a sensor is connected, it will not detect input errors (including disconnections).

11-6-11 Off-wire Detection

Description

If the input sensor is disconnected, the Disconnected Line Detection Flag for each channel is turned ON.
The Disconnected Line Detection Flag is included in "Temperature Data Status Flag".

When an off-wire condition is detected, the value of AD conversion data is set to 7FFF hex (7FFF FFFF when 1/100 Display Mode is being used). When the input returns to a value within the range that can be converted, the Off-wire Detection function will automatically be turned OFF, and normal data conversion will resume.

11-6-12 Last Maintenance Date

Description

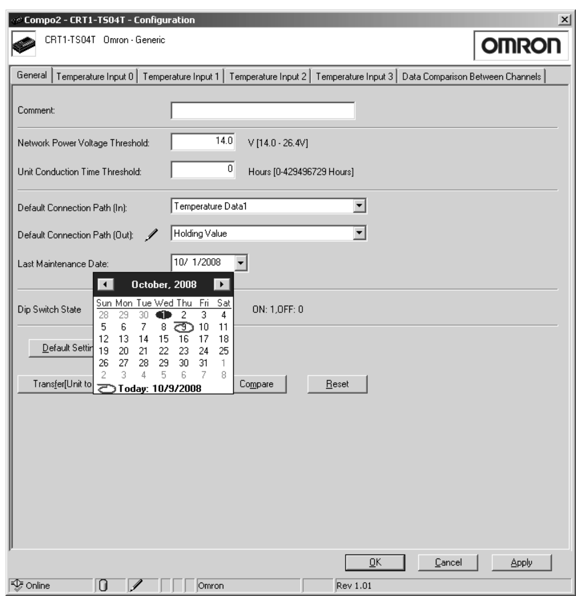
The last maintenance date can be set within the Unit for the Unit and for each of the connected devices. This enables the user to easily determine the next maintenance date. The date can be set using the CX-Integrator.

Setting Using CX-Integrator

■ Setting the last maintenance date in the Unit

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the **General** Tab, and select a date in the *Last Maintenance Date* Field. (To enter the current date, select ***Today*** from the bottom of the pull-down menu.)



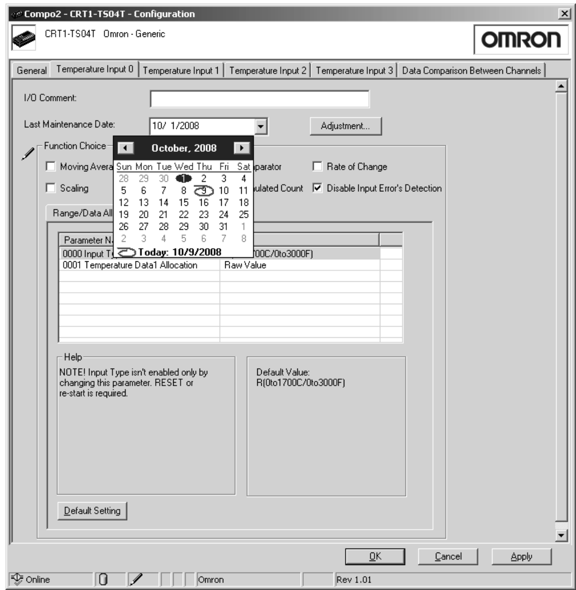
4. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

■ Setting the Last Maintenance Date for a Connected Device

1,2,3...

1. Turn ON the power supply to the Temperature Input Unit.

2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input to which the device to be set is connected, and select a date in the *Last Maintenance Date* Field. (To enter the current date, select ***Today*** from the bottom of the pull-down menu.)



4. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

11-6-13 Cumulated Counter

Description

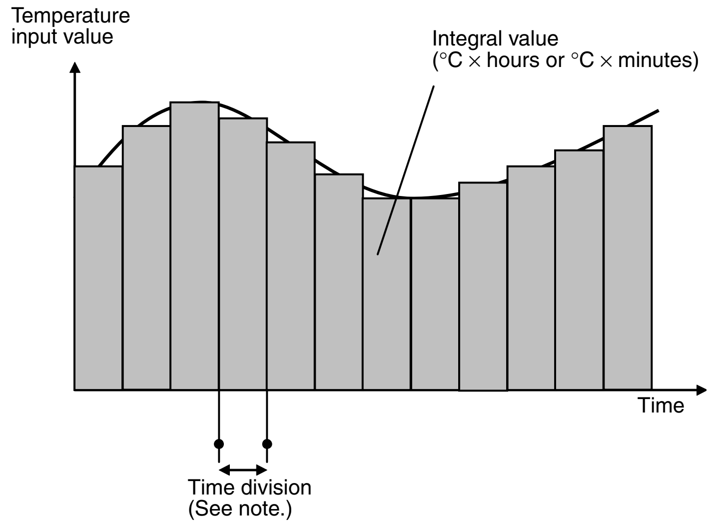
The cumulated counter integrates the temperature input value over time to determine the amount of heat endured by a sensor or device. The cumulated value can be calculated in hours (°C × hours or °F × hours) or minutes (°C × minutes or °F × minutes).

For example, when the units are set to hours, a cumulated value of 100 hours indicates a temperature value equivalent to 100°C continuing for one hour. The value stored in the four-byte area (two words) is the integral value for 300 time divisions. The data is displayed according to the set conditions. (See notes 1 and 2.)

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

Note

1. When °F units are selected, the integration is performed on the °F values.
2. Even if the 1/100 display mode is selected, the integration is performed on the original (×100) temperature values.
3. The meaning of the integral value depends on the decimal point position for the temperature input value.



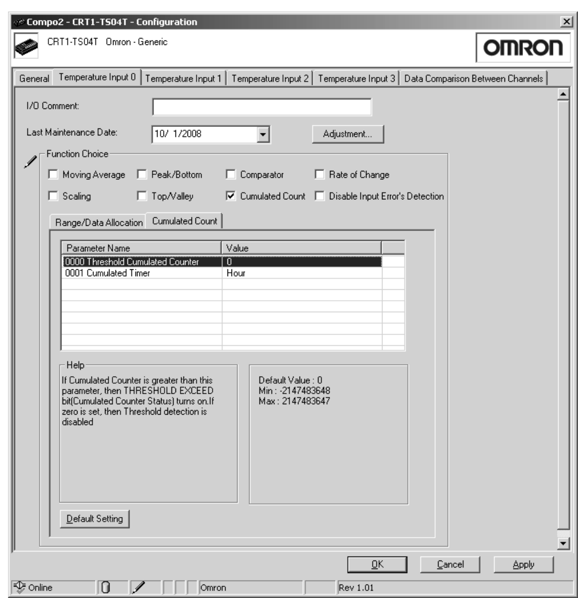
Note The following table shows the time divisions and number of measurements.

Units	Time division	Number of measurements
Hours	12 seconds	300
Minutes	200 ms	300

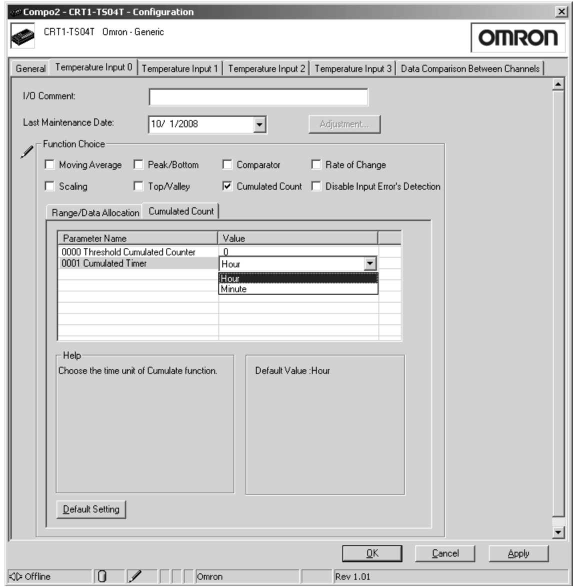
Setting Using CX-Integrator

1,2,3...

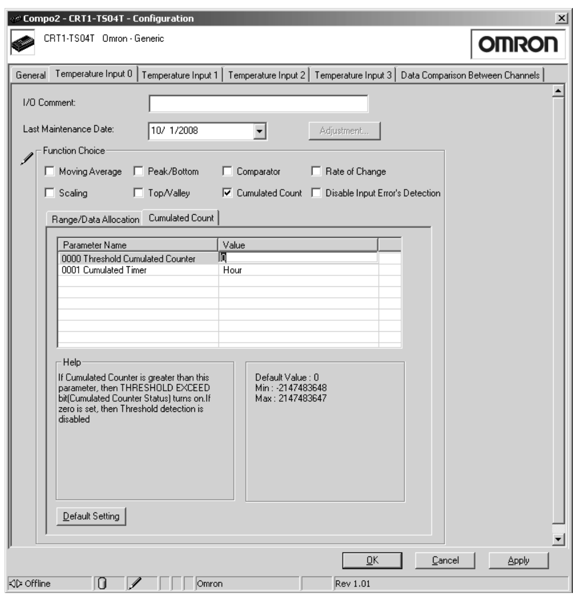
1. Turn ON the power supply to the Temperature Input Unit.
2. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameter - Edit***. The Configuration Window will be displayed.
3. Click the tab for the input where the cumulated counter is to be set, and select the *Cumulated Count* Check Box in the *Function Choice* Area.



4. To set the counter unit, click the **Cumulated Count** Tab and select ***Hour*** or ***Minute*** in the *Cumulated Timer* Field.



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



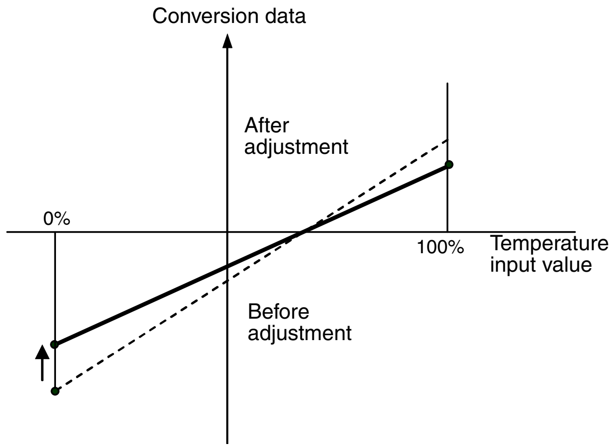
Note When the *Threshold Cumulated Counter* is set to 0, the cumulated value will not be monitored.

6. Return to the **General** Tab Page, click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

11-6-14 User Adjustment

Description

This function can be used to compensate for offsets in the input value caused by factors such as the characteristics and connection methods of the input sensor.



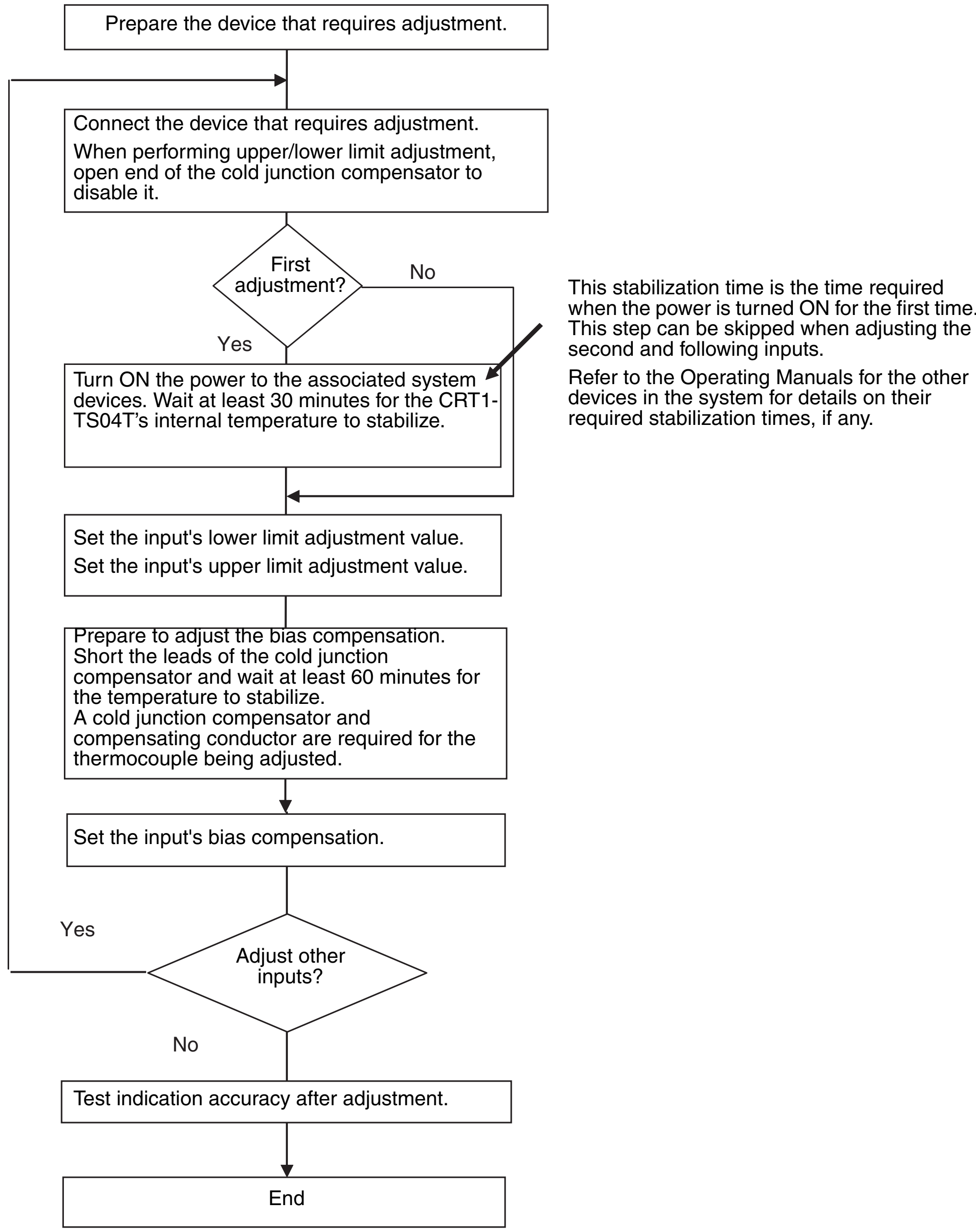
Note

1. Temperature Input Units are properly adjusted at the factory before shipment, so it is normally unnecessary to make adjustments. Use the User Adjustment function only when absolutely necessary. OMRON is not responsible for the results of user adjustments. If a mistake is made in the adjustments, the adjustment data can be cleared to return to the factory default settings.
2. The Temperature Input Unit continues the temperature conversion operations even after user adjustments have been made. It is possible for temperature data values to change suddenly from previous values after the user adjustments are made, so always consider the effects on the operating environment before applying user adjustments.

Adjustment Procedure for the CRT1-TS04T

Adjustment Procedure

Use the following procedure to adjust the Temperature Input Units. Follow the flowchart closely for proper adjustment.



Note The only sensors that can be adjusted are ones that operate while the power supply is ON. When adjusting for sensors that are not presently in use, change the input type setting, toggle the power supply or reset the Unit from the CX-Integrator, and perform the adjustment procedure from the beginning of the flowchart.

Connecting the Devices Required for Adjustment

The following paragraphs explain how to connect the devices that must be connected to the CRT1-TS04T for user adjustment. Wire the following devices properly when adjusting the CRT1-TS04T.

■ Reference Voltage/Current Generator and Precision Digital Multimeter

Used to make adjustments at the upper limit and lower limit.

Prepare devices that can generate accurate 0 mV, 20 mV, and 50 mV voltages. Use a precision digital multimeter that can measure the output voltage and indicate when the voltage/current generator is not producing an accurate voltage output.

■ Cold Junction Compensator (such as a ZERO-CON 0°C Bath) and Compensating Conductors

Used to adjust the bias compensation value.

The cold junction compensator (the ZERO-CON 0°C bath is used in following examples) is a device that maintains an accurate 0°C (32°F) temperature for thermocouple sensors. Use a cold junction compensator compatible with the sensor being adjusted.

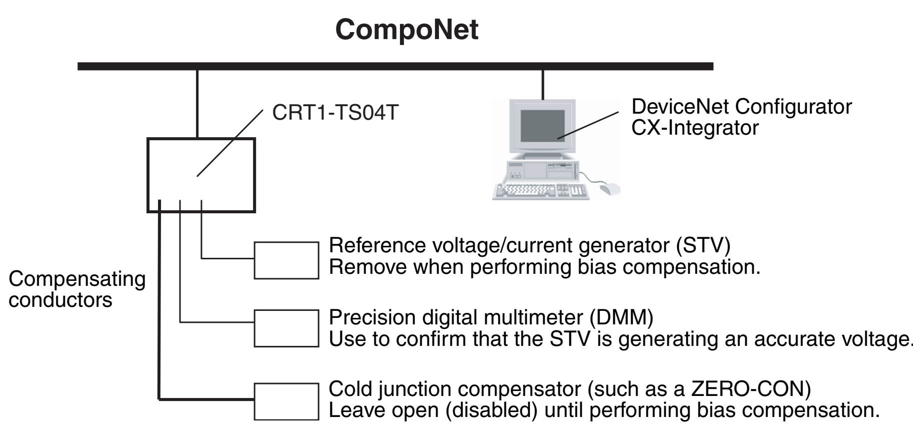
Note When using an R, S, E, B, or W type thermocouple, a K type can be substituted. Set the ZERO-CON to 0°C (32°F).

■ CX-Integrator

Actual adjustments are made from the CX-Integrator windows.

Adjustment Device Connection Diagram

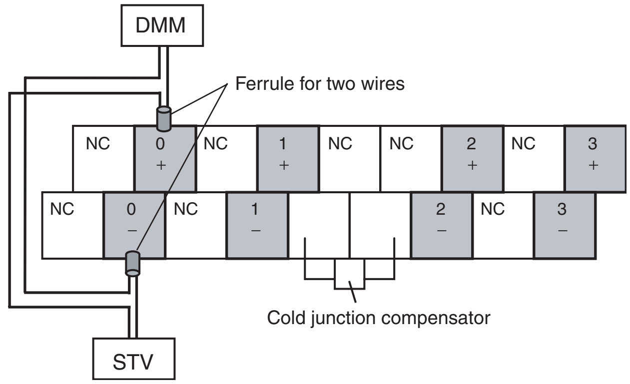
Connect the reference voltage/current generator (STV), precision digital multimeter (DMM), and ZERO-CON to the input terminals. Connect to the corresponding input terminals when adjusting inputs 0 to 3.



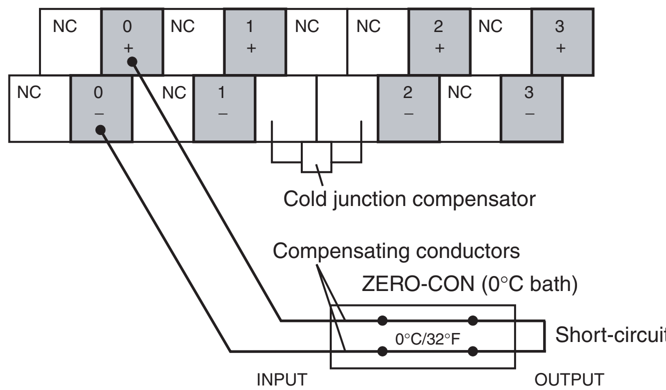
Note The personal computer (CX-Integrator) is connected through CompoNet in the above diagram. If a CS1W-CRM21 or CJ1W-CRM21 Master Unit is being used, the Temperature Input Unit can be adjusted by connecting the CX-Integrator through the Master Unit using a peripheral bus connection.

Input Terminal Connections

Wiring for Adjusting the Upper and Lower Limits



Lead wires for adjusting bias



Checking the Wiring and Making Adjustments

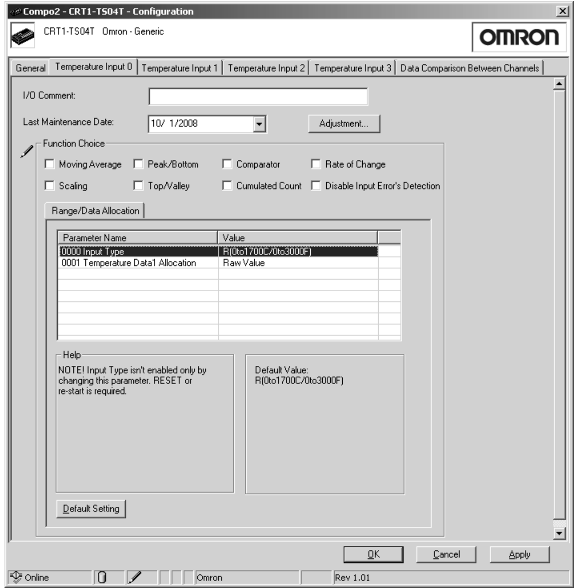
Adjusting the Upper and Lower Limit Values

1,2,3...

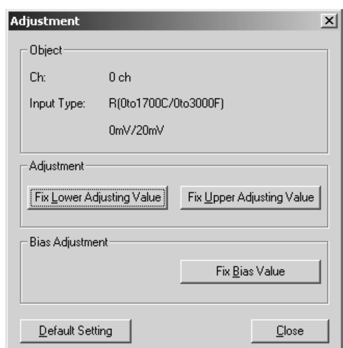
1. Set the wiring for adjusting the upper and lower limits. If connecting the precision digital multimeter (DMM), use a ferrule for two wires.
2. Check the sensor and input type being used.

Note When using an R, S, B, E, or W sensor, use a compensating conductor for a K thermocouple. In addition, when using an R, S, or B sensor, set the input type to K (0.0 to 500.0°C). When using an E or W sensor, set the input type to K (–200 to 1,300°C).

3. Connect the CX-Integrator to the CompoNet network and go online.
4. Upload settings to the CX-Integrator.
5. Turn ON the power supplies of all Units, including the Temperature Input Unit to be adjusted. Wait approximately 30 minutes for the Temperature Input Unit's internal temperature to stabilize.
6. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameters - Edit***. The Configuration Window will be displayed.
7. Click the tab for the input that will be adjusted and click the **Adjustment** Button.



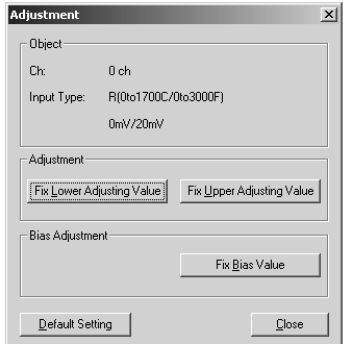
8. Adjust the lower limit value. Input 0 mV from the reference voltage/current generator (STV) to the Temperature Input Unit's input terminals. Wait at least 1 minute for the input to stabilize.
9. Click the **Fix lower adjusting Value** Button in the Adjustment Window to write the adjustment value.



10. Adjust the upper limit value. Input the upper limit voltage from the reference voltage/current generator to the input terminals of the input to be adjusted. Refer to the following table for the appropriate voltage. Wait at least 1 minute for the input to stabilize.

Type	Input voltage
K (–200 to 1300°C)	50 mV
K (0.0 to 500.0°C)	20 mV
J (–100 to 850°C)	50 mV
J (0.0 to 400.0°C)	20 mV
T	20 mV
L (–100 to 850°C)	50 mV
L (0.0 to 400.0°C)	20 mV
U	20 mV
N	50 mV
PL2	50 mV

11. Click the **Fix upper adjusting Value** Button and write the adjustment value.



Checking That the Adjustment Is Effective

1,2,3...

1. Right-click the Unit icon to be adjusted and select ***Monitor***. The Monitor Window will be displayed.
2. Click the tab for the temperature input that was adjusted. If the *User Adjustment* Check Box is selected, the Unit is operating with user-set adjustment values.

Note

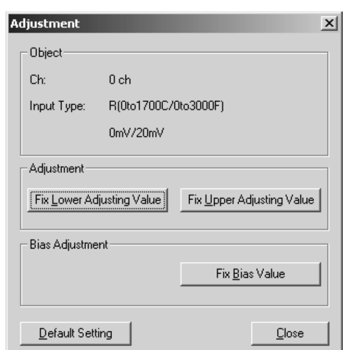
(1) When checking whether the user adjustment values have been set correctly, refresh the data by clicking the **Update** Button in the Monitor Window's **General** Tab Page or uploading the settings again. For details on the Monitor Window, refer to *7-4 Monitoring Temperature Data*.

(2) If the correct reference voltage was not input, the adjustment values may not be accepted.

Adjusting the Bias Compensation Value

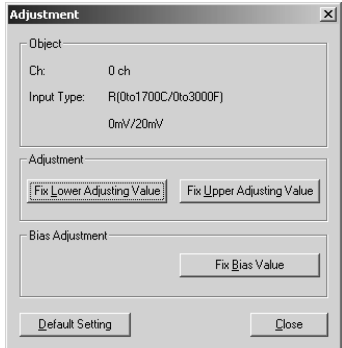
1,2,3...

1. Disconnect the wiring for adjusting the upper and lower limits and change to wiring for bias compensation.
2. After completing the wiring, wait at least 20 minutes with the temperature data in a stable state, and click the **Fix Bias Value** Button in the Bias Adjustment Window. The bias compensation value will be written in the Unit.



Resetting Adjustments

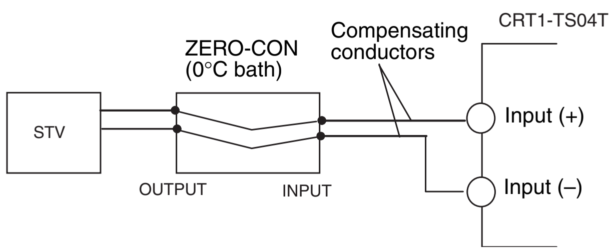
If it is necessary to reset the upper limit adjustment value, lower limit adjustment value, and bias compensation value to the factory defaults, click the **Default Setting** Button. The settings will be returned to the factory settings. The upper/lower limit adjustment values and bias compensation value are all initialized at the same time.



Note

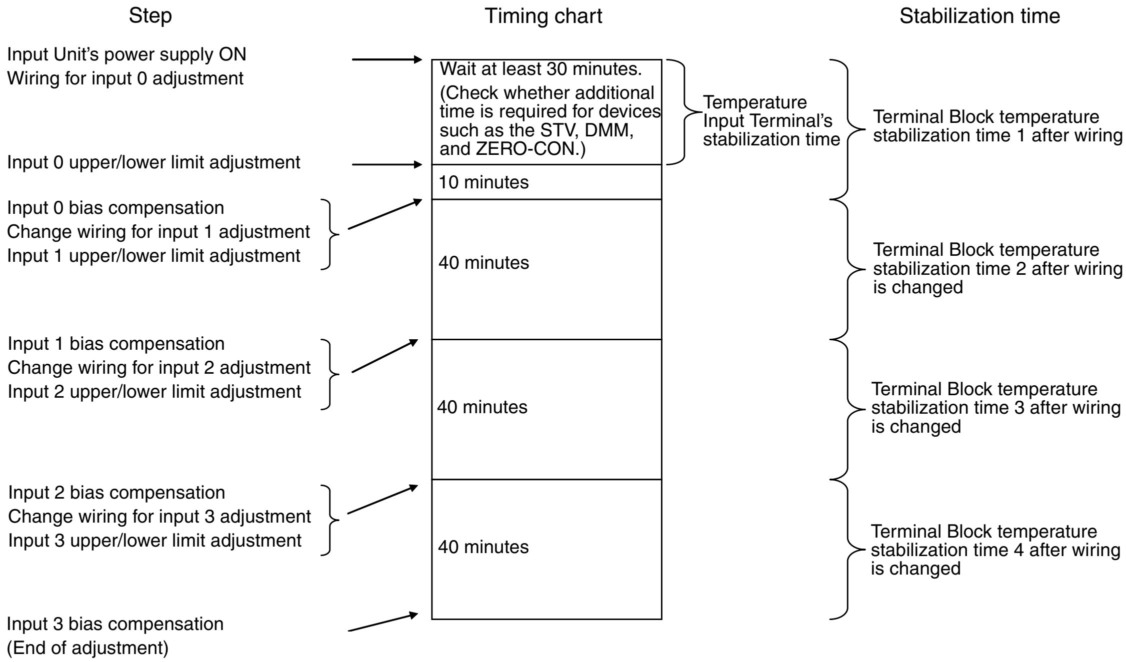
1. The bias compensation value may not be accepted if there is a large temperature difference between the Terminal Block and ZERO-CON (0°C bath). If this problem occurs, correct the adjustment system by using a ZERO-CON compatible with the sensor being adjusted or other means.
2. Always test the indication accuracy after making user adjustments to verify that the adjustments are correct. Test the indication accuracy at three points: the lower limit value, an intermediate value, and the upper limit value.
   - Connect the external devices as shown in the following diagram.
   - After verifying that the ZERO-CON is set to 0°C, set the STV's output voltage to produce a voltage equivalent to the test voltage.

   Note Always use the compensating conductors (the same kind that will be used with the sensor being adjusted) to connect the ZERO-CON to the CRT2-TS04T's input terminals.



Stabilization Times required in Each Step

The following diagram shows the stabilization times (waiting times) required when adjusting all 4 inputs.



Note

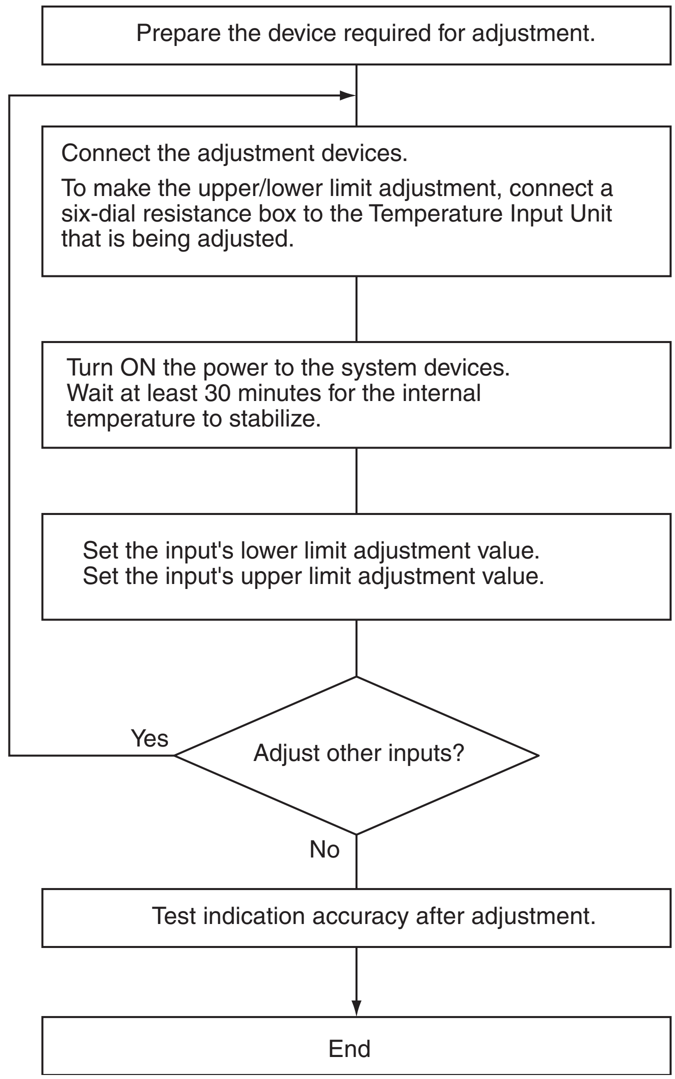
(1) The terminal block temperature stabilization time does not affect the upper/lower limit adjustment after changing the wiring for input 1, so the adjustment can be performed immediately if 30 minutes have passed since the Temperature Input Unit's power was turned ON.

(2) To perform the adjustment procedure properly, always allow sufficient time for the temperature to stabilize. Also allow sufficient time for devices such as the STV, DMM, and ZERO-CON to stabilize. Refer to each device's operating manual for details.

Adjustment Procedure for the CRT1-TS04P

Adjustment Procedure

Use the following procedure to adjust the Temperature Input Unit. Follow the flowchart closely for proper adjustment.



Note Only sensors that operate while the power supply is ON can be adjusted. When adjusting sensors that are not presently in use, change the input type setting, reset the power or CX-Integrator, and then perform the adjustment procedure from the beginning of the flowchart.

Connecting the Devices Required for Adjustment

The following paragraphs explain how to connect the devices that must be connected to the Temperature Input Unit for user adjustment. Wire the following devices properly when making adjustments.

Six-dial Resistance Box and Precision Digital Multimeter

These devices are used to make adjustments at the upper limit and lower limit. Prepare devices that can provide accurate resistance values.

Use a precision digital multimeter that can measure the resistance values and indicate when the six-dial resistance box is not producing an accurate resistance.

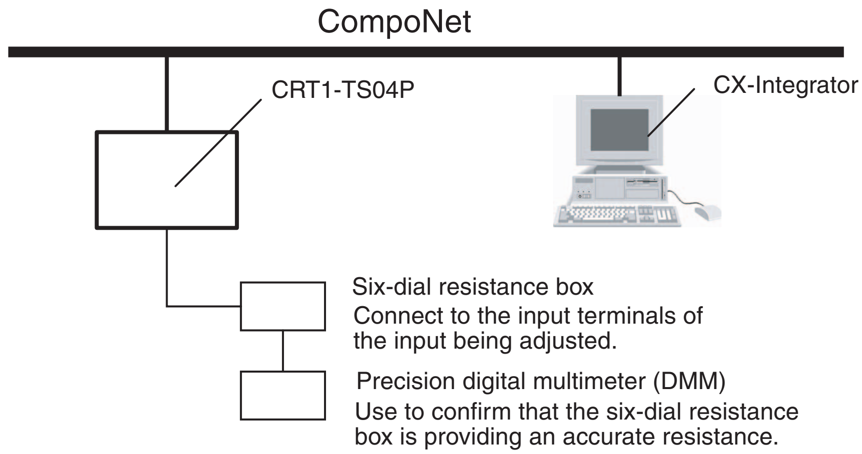
CX-Integrator

Actual adjustments are made from the CX-Integrator.

Adjustment Device Connection Diagram

Connect the six-dial resistance box to the input terminals.

Connect them to the input terminals for the required input from input 0 to 3.

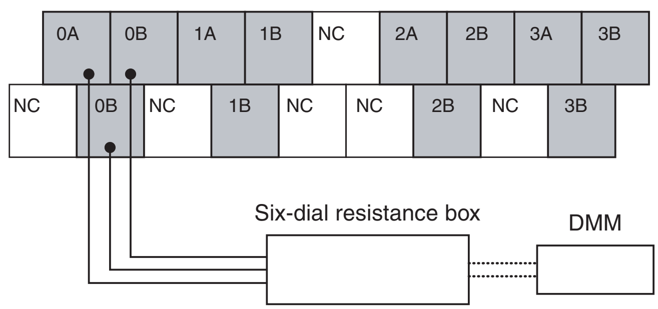


Note

(1) When connecting the six-dial resistance box, use a cable with the same gauge as the one that will be used for operation.

(2) The personal computer (CX-Integrator) is connected through CompoNet in the above diagram. If a CS1W-CRM21 or CJ1W-CRM21 Master Unit is being used, it can be connected through the Master Unit using a peripheral bus connection to adjust the Temperature Input Unit.

Input Terminal Connections

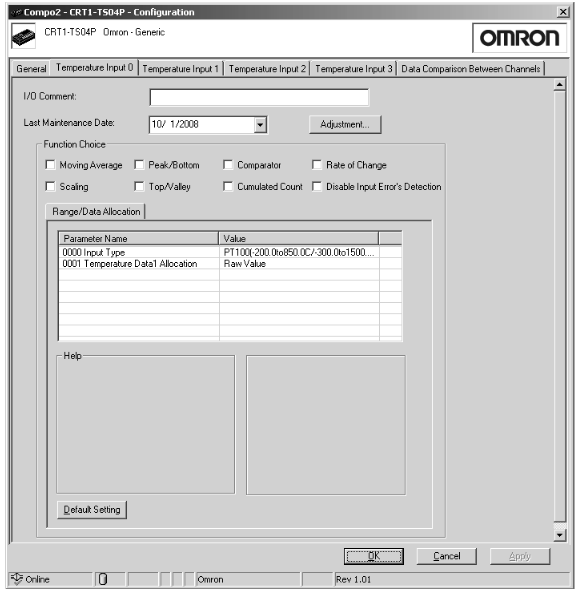


Checking the Wiring and Making Adjustments

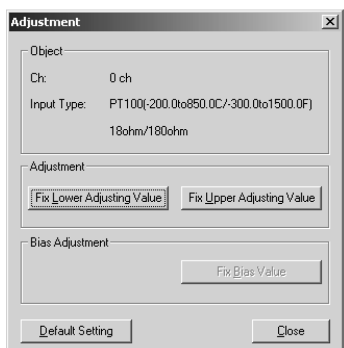
__Adjusting the Upper and Lower Limit Values__

1,2,3...

1. Set the resistance value on the six-dial resistance box equivalent to the test value and properly wire the box to the input of the Temperature Input Unit that is being adjusted.
2. If the correct resistance cannot be obtained, properly wire the digital multimeter to the six-dial resistance box and measure the resistance.
3. Connect the CX-Integrator to the CompoNet network and go online.
4. Upload settings to the CX-Integrator.
5. Turn ON the power supplies of all Units, including the Temperature Input Unit to be adjusted. Wait approximately 30 minutes for the Temperature Input Unit's internal temperature to stabilize.
6. Double-click the icon of the Temperature Input Unit to be set in the Network Configuration Window or right-click the icon and select ***Parameters - Edit***. The Configuration Window will be displayed.
7. Click the tab for the input that will be adjusted and click the **Adjustment** Button.



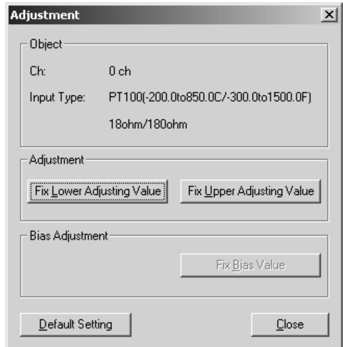
8. Adjust the lower limit value. Input 18 Ω from the six-dial resistance box to the Temperature Input Unit's input terminals. Wait at least 1 minute for the input to stabilize.
9. Click the **Fix Lower Adjusting Value** Button in the Adjustment Window to write the adjustment value.



10. Adjust the upper limit value. Input the resistance from the six-dial resistance box. Refer to the following table for the appropriate resistance to input. Wait at least 1 minute for the input to stabilize.

Type	Input resistance for upper limit adjustment
PT100 (–200 to 850°C)	390 Ω
PT100 (–200 to 200°C)	180 Ω

11. Click the **Fix Upper Adjusting Value** Button to write the adjustment value.



Checking That the Adjustment Is Effective

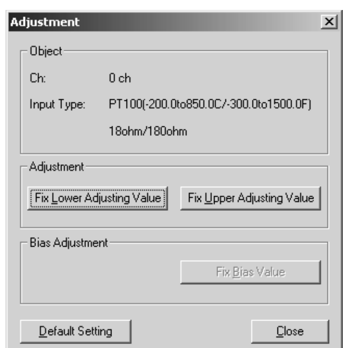
1,2,3...

1. Right-click the Unit icon to be adjusted and select ***Monitor***. The Monitor Window will be displayed.
2. Click the tab for the temperature input that was adjusted. If the *User Adjustment* Check Box is selected, the Unit is operating with user-set adjustment values.

Note When checking whether the user adjustment values have been set correctly, refresh the data by clicking the **Update** Button in the Monitor Window's **General** Tab Page or uploading the settings again. For details on the Monitor Window, refer to *7-4 Monitoring Temperature Data*.

Resetting Adjustments

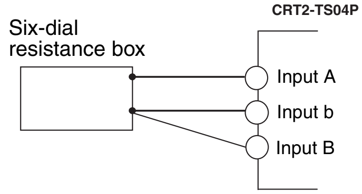
If it is necessary to reset the upper limit adjustment value, and lower limit adjustment value to the factory defaults, click the **Default Setting** Button. The settings will be returned to the factory settings.



Note Always test the indication accuracy after making user adjustments to verify that the adjustments are correct. Test the indication accuracy at three points: the lower limit value, an intermediate value, and the upper limit value.

- Connect the external devices as shown in the following diagram.
- Wait at least 30 minutes after the Temperature Input Terminal’s power is turned ON and set the resistance value on the six-dial resistance box equivalent to the test value.

Note If the power supply is not turned OFF after making an adjustment, it is not necessary to wait 30 minutes before continuing testing.



SECTION 12
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.

12-1 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.
	EEPROM checksum error	EEPROM data error	Use the CX-Integrator to restore the default data.
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 set within the allowable range and that it is used only once. Check the Repeater Unit configuration and then restart the Slave Units. If the node address and Repeater Unit configuration are correct, check the following items, and then restart the Slave Units. • Are the baud rates 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 a Terminating Resistor on each end of the trunk line? • Is there too much noise?
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 a Terminating Resistor on each end of the trunk line? Is there too much noise?
NS Flashing red NS Lit red	Configuration error	A node address has been set out of range.	Make sure that the node address is set within the specified range, and then restart the Slave Unit.

12-2 Troubleshooting

12-2-1 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 EEPROM memory data. Double-click the icon for the Slave Unit in the CX-Integrator. The Configuration 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.	Check the following items, and then restart the Slave Unit with the error. • The node address has been set out of range or duplicated, or a Repeater Unit configuration error has occurred. Check all node addresses and check the Repeater Unit configuration and change the settings if required. • Make sure that the I/O words allocated to the Slave Unit are not used by any other Slave Unit. If the same words are being used by more than one Slave Unit, change the node address. • 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 a Terminating Resistor (121 Ω) is connected to each end of the network's trunk line. If the correct Terminating Resistors are not set, connect a Terminating Resistor of 121 Ω. • Check that all Slave Units are set correctly. • Check that the communications cable is wired correctly. • Check that the power supply cable and power supply are wired correctly and that the settings are correct. • Check connector 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, take necessary measures against the noise to protect 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.
NS indicator remains lit green and status does not change.	Check the following items and take corrective measures based on the Master Unit indicator display. • 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. • Re-register the registration table. • 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.

12-2-2 Troubleshooting by Slave Unit Type

Model	Problem	Cause	Possible correction
All Slave Units	The MS and NS indicators do not light green.	Refer to *4-1-3 Communications Indicators.*	---
	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 is 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 within the 14 to 26.4-V range.
	Cannot set the name of a connected device or Unit.	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 ones immediately after the power was turned OFF. Word Slave Units: Unit Conduction Time and Maintenance Counter	The Maintenance Counter value is stored in internal EEPROM memory every 12 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 CX-Integrator 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 CX-Integrator.
	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.
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 lights 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	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 turns ON and OFF.	The Operation Time Flag is refreshed every measurement cycle, after the operation time is compared with the monitor value. The Operation Time Flag turns ON for one cycle and turns OFF, if the operation time drops below the monitor value at refreshing. There is another flag that holds the contents of monitor value exceeded flags.	---
Slave Units with outputs	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.
Slave Units with inputs	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.

Model	Problem	Cause	Possible correction
Slave Units with Power Short-circuit Detection Function	The short-circuit detection status does not turn OFF after a power 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.
Slave Units with Unconnected Line Detection Function	The Unconnected Line Detection Status Flag turned ON for an unused input.	Unconnected line detection is enabled for an unused input.	Disable unconnected line detection for that input.
	The Unconnected Line Detection Status Flag turned ON even though the sensor power supply was connected.	Current consumption is low. (Output current: 3 mA max.)	Disable unconnected line detection for that input (so that the unconnected line detection function does not operate.)
	The short-circuit detection status does not turn OFF after a unconnected line 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.
Slave Units with Load Short-circuit Detection Function	The short-circuit detection status does not turn OFF after a 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.
Slaves with Disconnected Line Detection	The Disconnected Line Detection Status Flag turned ON for an unused output.	Disconnected line detection is enabled for an unused output.	Disable disconnected line detection for that output.
	The Disconnected Line Detection Status Flag turned ON even though the external load was connected.	Current consumption is low. (Output current: 3 mA max.)	Disable disconnected line detection for that output (so that the disconnected line detection function does not operate.)
	The short-circuit detection status does not turn OFF after a 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.
Output Slave Units with Continuous Short-circuit Protection Circuit	Communications are operating correctly, and the correct area is ON, but the output and the output indicator are not ON.	The output current exceeds the rated output current, continuous short-circuit protection operates, and the outputs are turned OFF. Once operation is performed, all outputs remain OFF until the power supply is reset.	Remove the cause of the error and restart the communications power supply once operation has been recovered.

Model	Problem	Cause	Possible correction
Analog I/O Slave Units and Temperature Input 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 unconditionally if the monitor value is set to 0. The following conditions apply to Temperature Input Units only. • The input's decimal point position for a Temperature Input Unit was in the wrong place when the monitor value was set.	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.) Check the decimal point position and enter 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 CX-Integrator is used to reset the Unit.	• Cycle the power or reset the CX-Integrator.

Model	Problem	Cause	Possible correction
Analog I/O Slave Units and Temperature Input 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. The following conditions apply to Temperature Input Units only. • The setting for the 1/100 Display Mode/Normal Display Mode is incorrect. • The sensor's decimal point position was read incorrectly. The following conditions apply to the CRT1-TS04T only. • The Unit is mounted vertically or face-down. • The Unit was replaced, but the terminal block was not changed. (The accuracy may be reduced if the components are not replaced as a set.)	• 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. The following conditions apply to Temperature Input Units only. • In Normal Display Mode, the display value is multiplied by x1 or x10, depending on the input type setting. • In 1/100 Display Mode, the display value is multiplied by x100, regardless of the input type setting. Check the settings and input type again. • Check the Unit's mounting direction.
	Cannot set using external switches.	• SW8 is turned OFF (default).	• Turn ON SW 8.
	The user adjustment and bias compensation settings are not accepted for the CRT1-TS04T.	• Attempted to calibrate with inputs outside the setting range.	• Calibrate again with the correct input voltage (current). • Change the adjustment system if necessary.
	The Top/Valley Detection Timing Flag will not go ON.	The hysteresis setting is too high.	Adjust the hysteresis setting.
	The Top/Valley Count Over Flag will not go ON (Temperature Input Units only).	The hysteresis setting is 0.	
	The Top/Valley Detection Timing Flags go ON too frequently.	The hysteresis setting is too low.	
	The top/valley count is unexpectedly high for a Temperature Input Unit.		

Model	Problem	Cause	Possible correction
Analog I/O Slave Units (Inputs)	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 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)	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.
Temperature Input Units	The 1/100 Display Mode has been set, but the display reads 0.	The allocated word is the one word in the normal display area.	Either change the default connection path to the 1/100 display area or select a connection path in the Master Unit for the 1/100 display area.
	The temperature range counter is not counting even though the temperature value is set as the count condition.	The comparator function is not effective.	Enable the comparator. (The power must be turned OFF and then ON again.)
	The Top/Valley Count Over Flag will not go ON.	• The top/valley hold function is not enabled. • The hysteresis setting is too high. • The hysteresis setting is 0.	• Enable the top/valley hold function. (The power must be turned OFF and then ON again.) • Adjust the hysteresis setting.
	The comparator does not operate as expected even though the function and hysteresis value have been set.	• The temperature display setting has been switched (°C to °F or vice versa). • The decimal point position was read incorrectly.	Check the decimal point position and °C/°F display for the input type and display mode. If these settings have been changed during operation, check the comparator and hysteresis settings and correct if necessary.

12-3 Device Maintenance

This section describes routine device maintenance, in particular cleaning methods, inspection methods, and how to replace Units.

12-3-1 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 adhesive tape are left on the Unit for a long period. 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.

12-3-2 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 that are used 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

12-3-3 Handling when Replacing Units

Networks are constructed from a Master Unit and Slave Units. If a Unit is malfunctioning, the entire network will be affected. The malfunctioning Unit must 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 Units

Heed the following precautions when replacing nodes after a periodic inspection has revealed a problem.

Check that the new Unit does not 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 Unit Replacement

After replacing a Unit, make the switch and other settings the same as before the Unit 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.

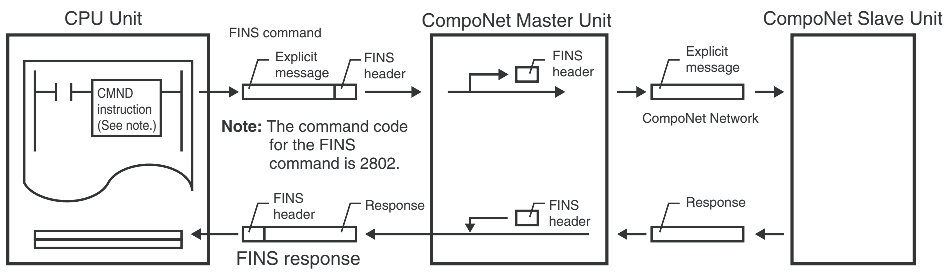
The CompoNet Slave Units process the commands sent from the Master Unit and then return responses.

Sending Explicit Messages by FINS Commands

FINS commands are used to send CompoNet explicit messages from a CS/CJ-series CompoNet Master Unit. For details on FINS commands, refer to the *SYSMAC CS/CJ/CP-series and SYSMAC One NSJ-series Communications Commands Reference Manual* (Cat. No. W342).

Message Flow

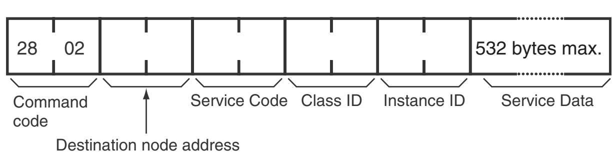
FINS commands are sent by using the CX-Programmer's CMND instruction. When a FINS command is sent from the CPU Unit to the CompoNet Master Unit, the CompoNet Master Unit converts the FINS command to a CompoNet explicit message and sends it to a CompoNet Slave Unit. The response from the Slave Unit is then converted by the Master Unit from a CompoNet explicit message to a FINS response and sent back to the CPU Unit.



FINS Format

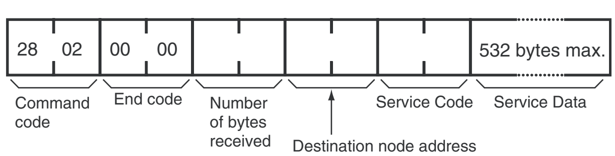
The FINS command code of 2802 hex is used to send CompoNet explicit messages.

Command Format

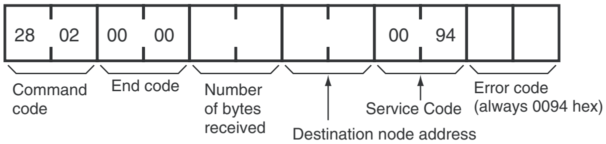


Response Format

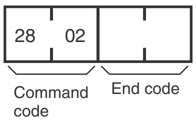
• When a Normal Response Is Returned for a CompoNet Explicit Message



• When an Error Response Is Returned for a CompoNet Explicit Message (CompoNet Explicit Message Communications Error)



- When a CompoNet Explicit Message Transmission Failure or Timeout Occurs (FINS Communications Error)



Description of Parameters

Destination Node Address (Command)

Specifies the Slave Unit destination node address for the explicit message.

Word, input or mixed	Word, output	Bits, input or mixed	Bits, output	Repeater
10xx hex	20xx hex	30xx hex	50xx hex	70 xx hex

The Slave Unit's node address (hex) is entered in xx.

Service Code (Command, Response)

In a command this parameter specifies the service code defined by the CompoNet Network. For details, refer to the following table. In a normal response, a value is returned with the leftmost bit turned ON for the service code specified by the command. In an error response, 0094 hex is returned to indicate an error.

Service Codes

Service	Read	Write	Reset	Save
Command	0E hex	10 hex	05 hex	16 hex
Normal response	8E hex	90 hex	85 hex	96 hex

Class ID (Response)

Specifies the class ID for the explicit message.

Instance ID (Command)

Specifies the instance ID for the explicit message.

Service Data (Command, Response)

In a command, the data defined for the service code is specified for this parameter. In a response, the reception data defined for the service code is returned.

Number of Bytes Received (Response)

The number of bytes received in the data from the destination node address onwards is returned.

Destination Node Address (Response)

The node address of the remote Slave Unit (the source of the response) is returned.

Error Code (Response)

The error code defined by the CompoNet Network is returned. 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.

Response code	Error name	Cause
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.

End Code

The FINS communications end code is returned. For details, refer to the *SYSMAC CS/CJ/CP-series and SYSMAC One NSJ-series Communications Commands Reference Manual* (Cat. No. W342).

Explicit Messages Common to Slave Units

Refer to *1-1-3 CompoNet Slave Unit Functions* for information on which functions are supported by the various Slave Units.

Setting and Monitoring the Unit Conduction Time

Explicit message	Read/ write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service 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		Service 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

Note For information on individual bits in the status areas of a Slave Unit, refer to the *Status Areas* section for the Slave Unit.

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		Service data
						Attribute ID	Data	
Terminal Mainte-nance Infor-mation 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: Con-tact opera-tion 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: opera-tions) 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: opera-tions) 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 sta-tus 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		Service data
						Attribute ID	Data	
Terminal Mainte-nance Infor-mation Monitor Mode	Read	Reads the monitor mode for maintenance infor-mation 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: Con-tact opera-tion counter mode
	Write	Writes the monitor mode for maintenance infor-mation 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: opera-tion) 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: opera-tion) 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 sta-tus 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		Service data
						Attribute ID	Data	
Operation Time Monitor Status Read	Read	Reads the monitor status 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	66 hex	---	1 byte 00 hex: Threshold not passed 01 hex: Threshold passed
Operation Time Monitor Setting	Read	Reads the setting 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	67 hex	---	2 bytes (See note.)
	Write	Writes the setting for the time (unit: ms) from the start point trigger until the end point trigger specified by the Instance ID (No. 1 to 8).	10 hex	97 hex	01 to 08 hex	67 hex	---	2 bytes (See note.)
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	Reset	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	---	---

Note Refer to the note on page 613.

Setting Hold/Clear for Communications Errors for Outputs

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service 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).

Monitoring Power Short-circuit Detection (Slave Units with Input Short-circuit and Disconnected Line Detection)

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Power Short-circuit Detection	Read	Reads the sensor power supply short-circuit status for the input (No. 1 to 32) specified by the Instance ID.	0E hex	08 hex	01 to 20 hex	69 hex	---	1 byte 00 hex: Normal 01 hex: Short-circuit
Power Short-circuit Status for all Slave Units Read at Once	Read	Reads the sensor power supply short-circuit status for all Slave Units.	0E hex	1D hex	01 hex	67 hex	---	1 byte, 2 bytes, or 4 bytes 00 hex: Normal Other than 00 hex: Sensor power supply short-circuit for applicable terminal (Inputs 0 to 31: Bits 0 to 31) (See note.)

Note The response data size is 1 byte for 8 inputs, 2 bytes for 16 inputs, or 4 bytes for 32 inputs.

Monitoring and Setting Unconnected Line Detection (Slave Units with Input Short-circuit and Disconnected Line Detection)

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Uncon-nected Line Detection Setting	Read	Reads the unconnected line detection setting for the input (No. 1 to 32) specified by the Instance ID	0E hex	08 hex	01 to 20 hex	6B hex	---	1 byte 00 hex: Dis-abled (Not used.) 01 hex: Enabled (Used.)
	Write	Writes the unconnected line detection setting for the input (No. 1 to 32) specified by the Instance ID.	10 hex	08 hex	01 to 20 hex	6B hex	1 byte 00 hex: Disabled (Not used.) 01 hex: Enabled (Used.)	---
Uncon-nected Line Status	Read	Reads the connection/ unconnected status for the input (No. 1 to 32) specified by the Instance ID.	0E hex	08 hex	01 to 20 hex	6A hex	---	1 byte 00 hex: Con-nected (or detection not set). 01 hex: Uncon-nected.
Uncon-nected Line Status for all Slave Units Read at Once	Read	Reads the connection/ unconnected status for all Slave Units.	0E hex	1D hex	01 hex	68 hex	---	1 byte, 2 bytes, or 4 bytes 00 hex: Normal Other than 00 hex: Applicable input con-nector is not connected. (Inputs 0 to 31: Bits 0 to 31) (See note.)

Note The response data size is 1 byte for 8 inputs, 2 bytes for 16 inputs, or 4 bytes for 32 inputs.

Monitoring Load Short-circuit Detection (Slave Units with Output Short-circuit and Disconnected Line Detection)

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Load Short-circuit Detection Status	Read	Reads the load short-circuit status for the output (No. 1 to 32) specified by the Instance ID.	0E hex	09 hex	01 to 20 hex	69 hex	---	1 byte 00 hex: Normal 01 hex: Short-circuit
Load Short-circuit Status for all Slave Units Read at Once	Read	Reads the load short-circuit status for all Slave Units.	0E hex	1E hex	01 hex	64 hex	---	1 byte, 2 bytes, or 4 bytes 00 hex: Normal Other than 00 hex: Load short-circuit at applicable terminal. (Outputs 0 to 31: Bits 0 to 31) (See note.)

Note The response data size is 1 byte for 8 outputs, 2 bytes for 16 outputs, or 4 bytes for 32 outputs.

Monitoring and Setting Load Unconnected Line Detection (Slave Units with Output Short-circuit and Disconnected Line Detection)

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Load Uncon-nected Line Detection Setting	Read	Reads the load uncon-nected line detection setting for the output (No. 1 to 32) specified by the Instance ID.	0E hex	09 hex	01 to 20 hex	6B hex	---	1 byte 00 hex: Dis-abled (Not used.) 01 hex: Enabled (Used.)
	Write	Writes the load uncon-nected line detection setting for the output (No. 1 to 32) specified by the Instance ID.	10 hex	09 hex	01 to 20 hex	6B hex	1 byte 00 hex: Disabled (Not used.) 01 hex: Enabled (Used.)	---
Load Uncon-nected Line Detection Status	Read	Reads the load uncon-nected line detection setting for the output (No. 1 to 32) specified by the Instance ID.	0E hex	09 hex	01 to 20 hex	6A hex	---	1 byte 00 hex: Nor-mal 01 hex: Line disconnec-tion
Load Line Disconnec-tion Status for all Slave Units Read at Once	Read	Reads the load line dis-connection status for all output Slave Units.	0E hex	1E hex	01 hex	68 hex	---	1 byte, 2 bytes, or 4 bytes 00 hex: Normal Other than 00 hex: Load line disconnec-tion at appli-cable terminal. (Inputs 0 to 31: Bits 0 to 31) (See note.)

Note The response data size is 1 byte for 8 outputs, 2 bytes for 16 outputs, or 4 bytes for 32 outputs.

Writing Maintenance Information

Explicit message	Read/ write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Mainte-nance 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		Service 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	Not used.	

•Depending on the Unit size, not all bits are used.

• A value of 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 6 bytes and has the following format.

Offset (byte)	Up to 32 inputs	Up to 16 inputs	Up to 32 inputs	Inputs and outputs
+00	4			
+01	No. of data items (UNIT)			
+02	IN Area, terminals 0 to 7	Not used.	OUT Area, terminals 0 to 7	IN Area, terminals 0 to 7
+03	IN Area, terminals 8 to 15		OUT Area, terminals 8 to 15	IN Area, terminals 8 to 15
+04	IN Area, terminals 16 to 23	OUT Area, terminals 0 to 7	OUT Area, terminals 16 to 23	OUT Area, terminals 0 to 7
+05	IN Area, terminals 24 to 31	OUT Area, terminals 8 to 15	OUT Area, terminals 24 to 31	OUT Area, terminals 8 to 15

•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		Service 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 Units

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service 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
Analog Data 2 Value	Read	Reads the value for Analog Data 2.	0E hex	0A hex	01 to 04 hex	65 hex	---	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		Service 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 Set-ting	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 Set-ting	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 Set-ting	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 Compensa-tion after Scaling	Write/ Read	Compensates for scal-ing 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 Detec-tion 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		Service 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 Units

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service 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		Service 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	---

Explicit Messages for Temperature Input Units

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Display Format Read (Normal or 1/100)	Read	Reads the display format. Normal display: 0 1/100 display: 1	0E hex	31 hex	00 hex	64 hex	---	1 byte
Temperature 1 Read for Normal Display	Read	Reads the value of temperature data 1.	0E hex	31 hex	01 to 04 hex	A5 hex	---	2 bytes
Temperature 1 Read for 1/100 Display	Read	Reads the value of temperature data 1.	0E hex	31 hex	01 to 04 hex	06 hex	---	4 bytes
Input Type Set	Write/ Read	Sets the input type. R=0, S=1, K1=2, K2=3, J1=4, J2=5, T=6, E=7, L1=8, L2=9, U=A, N=B, W=C, B=D, PL2=E, PT=F, PT2=11	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	A2 hex	1 byte	1 byte
User Adjustment Check	Read	Checks to see if user adjustment has been performed for the temperature conversion constant. User adjustment: 1 Default setting: 0	0E hex	31 hex	01 to 04 hex	84 hex	---	1 byte
Display Unit Read	Read	Reads the display unit. °C: 1200, °F: 1201	0E hex	31 hex	01 to 04 hex	04 hex	---	2 bytes

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Reading of the Temperature Data Status Flag	Read	Reads the status of the Temperature Data Status Flag. LL = 0; L = 1; Pass signal = 2; H = 3; HH = 4; Valley shot = 5; Top shot = 6; Off-wire detection = 7	0E hex	31 hex	01 to 04 hex	66 hex	---	1 byte
Temperature Data 1 Allocation Selection	Write/ Read	Selects the data allocated to Temperature Data 1. Temperature 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	31 hex	01 to 04 hex	68 hex	1 byte	1 byte
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 Input error detection disable: 7	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	6E hex	2 bytes	2 bytes
Scaling Point 1 Setting	Write/ Read	Sets an temperature value as the 0% value for user scaling.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	70 hex	2 bytes	2 bytes
Scaling Point 2 Setting	Write/ Read	Sets an temperature value as the 100% value for user scaling.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	71 hex	2 bytes	2 bytes
Offset Compensation	Write/ Read	Compensates for scaling errors with an offset value.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	72 hex	2 bytes	2 bytes
Maximum Value Read	Read/ Reset	Reads the maximum value after power is turned ON.	Read: 0E hex Reset: 35 hex	31 hex	01 to 04 hex	73 hex	---	4 bytes
Minimum Value Read	Read/ Reset	Reads the minimum value after power is turned ON.	Read: 0E hex Reset: 35 hex	31 hex	01 to 04 hex	74 hex	---	4 bytes

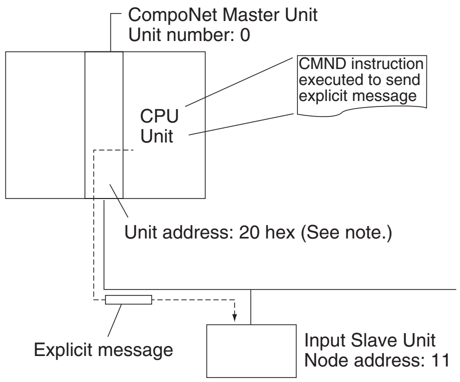
Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Peak Value Read	Read	The peak value is held and read if the hold function is being executed.	0E hex	31 hex	01 to 04 hex	75 hex	---	4 bytes
Bottom Value Read	Read	The bottom value is held and read if the hold function is being executed.	0E hex	31 hex	01 to 04 hex	76 hex	---	4 bytes
Top Value Read	Read	The top value is held and read if the hold function is being executed.	0E hex	31 hex	01 to 04 hex	77 hex	---	4 bytes
Top Detection Timing Flag Read	Read	Reads the timing for detecting top values.	0E hex	31 hex	01 to 04 hex	78 hex	---	1 byte
Valley Value Read	Read	The valley value is held and read if the hold function is being executed.	0E hex	31 hex	01 to 04 hex	79 hex	---	4 bytes
Valley Detection Timing Flag Read	Read	Reads the timing for detecting valley values.	0E hex	31 hex	01 to 04 hex	7A hex	---	1 byte
HH Value Setting	Write/ Read	Sets the HH value.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	11 hex	4 bytes (–415000 to 415000)	4 bytes (–415000 to 415000)
LL Value Setting	Write/ Read	Sets the LL value.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	12 hex	4 bytes (–415000 to 415000)	4 bytes (–415000 to 415000)
H Value Setting	Write/ Read	Sets the H value.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	15 hex	4 bytes (–415000 to 415000)	4 bytes (–415000 to 415000)
L Value Setting	Write/ Read	Sets the L value.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	16 hex	4 bytes (–415000 to 415000)	4 bytes (–415000 to 415000)
Scaled Temperature Input Value Read	Read	Reads temperature input values for which have only been scaled.	0E hex	31 hex	01 to 04 hex	8D hex	---	4 bytes
Rate of Change Value Read	Read	Reads the rate of change for each sampling cycle.	0E hex	31 hex	01 to 04 hex	8E hex	---	4 bytes
Reads the rate of change for each sampling cycle.	Write/ Read	Sets the sampling cycle for obtaining the rate of change based on the previous value. Set in multiples of 250 ms. (Default: 250 ms)	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	90 hex	2 bytes (250 to 65500)	2 bytes (250 to 65500)

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Cumulated Value Read	Read/ Reset	Reads the cumulated temperature input value.	Read: 0E hex Reset: 35 hex	31 hex	01 to 04 hex	91 hex	---	4 bytes (–214748364.8 to 214748364.7)
Cumulative Counter Flag Read	Read	Reads the cumulative count status in the Cumulative Counter Monitor Flag in the general status area. 0: Counter overflow 1: Counter underflow 7: Set value overflow	0E hex	31 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	31 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	31 hex	01 to 04 hex	94 hex	1 byte	1 byte
Decimal Position Read	Read	Reads the position of the decimal point. 0000 = 0 0000.0 = 1 0000.00 = 2	0E hex	31 hex	01 to 04 hex	A3 hex	---	1 byte
Top/Valley Count Read	Read/ Reset	Reads the number of tops or valleys that have been counted.	Read: 0E hex Reset: 35 hex	31 hex	01 to 04 hex	A9 hex	---	4 bytes
Top/Valley Count Threshold Status Read	Read	Reads whether the top/ valley count has exceeded the threshold value. 0: Counter overflow 7: Set value overflow	0E hex	31 hex	01 to 04 hex	AA hex	---	1 byte
Top/Valley Counting Selection	Write/ Read	Selects counting either tops or valleys. Count tops = 0 Count valleys = 1	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	AB hex	1 byte	1 byte
Top/Valley Count Threshold Set	Write/ Read	Sets the threshold value to compare with the top/ valley count.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	AC hex	4 bytes	4 bytes
Time in Temperature Range Read	Read/ Reset	Reads (in seconds) the time the system has been in a user-set temperature range.	Read: 0E hex Reset: 35 hex	31 hex	01 to 04 hex	AD hex	4 bytes	4 bytes

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		Service data
						Attribute ID	Data	
Threshold Status for Time in Temperature Range Read	Read	Compares the time the system has been in a user-set temperature range with a threshold value. 0: Counter overflow 7: Set value overflow	0E hex	31 hex	01 to 04 hex	AE hex	---	1 byte
Range for Time in Temperature Range Set	Write/ Read	Sets the range for timing the time in the set temperature range. Above HH = 0, Between HH and H = 1, Pass = 2, Between L and LL = 3, Below LL = 4	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	AF hex	1 byte	1 byte
Threshold for Comparison with Time in Temperature Range Set/Read	Write/ Read	Sets (in seconds) the threshold value that is compared to the time in the user-set temperature range.	Write: 10 hex Read: 0E hex	31 hex	01 to 04 hex	B0 hex	4 bytes	4 bytes
Input Temperature Variation Detection Read	Read	Reads the result of input temperature variation detection.	0E hex	69 hex	01 to 06 hex	67 hex	---	4 bytes
Variation Detection Threshold Compare	Read	Compares the input temperature variation detection result with a threshold value and outputs the result. 0: Counter overflow 1: Counter underflow 6: Invalid data 7: Set value overflow	0E hex	69 hex	01 to 06 hex	68 hex	---	1 byte
Input Temperature Variation Detection Threshold Set	Write/ Read	Sets the threshold for comparison with the detection result of temperature difference between inputs.	Write: 10 hex Read: 0E hex	69 hex	01 to 06 hex	6E hex	4 bytes	4 bytes

Example of Using Explicit Messages

Example of Sending an Explicit Message with the CMND Instruction



Note: The CompoNet Master Unit (or Special I/O Unit) unit address is the unit number + 20 hex.

Operation

The unit maintenance PV (class ID: 95 hex, instance ID: 01 hex, attribute ID: 71 hex) is read from the Slave Unit.

The command data is read by 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.

Command Details

[CMND S D C]

Contents of S

Address	Contents (hex)	Meaning
D01000	28 02	Command code
D01001	10 0B	Destination node address (Input Slave Unit: node address 11)
D01002	00 0E	Service code: 0E hex
D01003	00 95	Class ID: 0095 hex
D01004	00 01	Instance ID: 0001 hex
D01005	71 00	Attribute ID: 71 hex (The rightmost 00 hex is not read because the number of bytes of command data is set to 11 bytes.)

D: First Response Storage Word

Contents of C

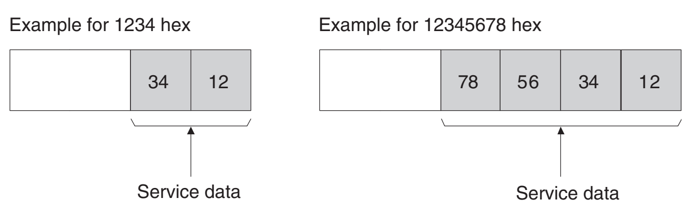
Address	Contents (hex)	Meaning
D00000	00 0B	Number of bytes of command data: 11 bytes
D00001	00 0E	Number of bytes of response data: 14 bytes
D00002	00 00	Destination Master Unit network address: 0
D00003	00 20	Destination Master Unit node address: 0 Destination Master Unit unit address: 20 hex
D00004	00 00	Response required Communications port number: 0 Number of retries: 0
D00005	00 64	Response monitoring time

Response

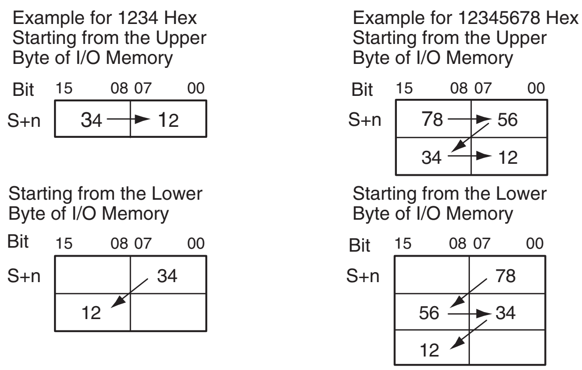
Contents of D

Address	Contents (hex)	Meaning
D02000	28 02	---
D02001	00 00	---
D02002	00 08	---
D02003	10 0B	Destination node address: 11 (0B hex)
D02004	00 8E	Normal completion: 8E hex
D02005	2F 07	The Unit maintenance PV (0000072F hex) is stored in order from leftmost to rightmost. (See note.)
D02006	00 00	---

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:



(2) 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.

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-ID08	---	07 hex	1557	CRT1-ID08
CRT1-ID08-1		07 hex	1558	CRT1-ID08-1
CRT1-OD08		07 hex	1559	CRT1-OD08
CRT1-OD08-1		07 hex	1560	CRT1-OD08-1
CRT1-ID16	None	07 hex	1327	CRT1-ID16
	XWT-ID08	07 hex	1328	CRT1-ID16
	XWT-ID16	07 hex	1329	CRT1-ID16
	XWT-OD08	07 hex	1330	CRT1-ID16
	XWT-OD16	07 hex	1331	CRT1-ID16
	XWT-ID08-1	07 hex	1332	CRT1-ID16
	XWT-ID16-1	07 hex	1333	CRT1-ID16
	XWT-OD08-1	07 hex	1334	CRT1-ID16
	XWT-OD16-1	07 hex	1335	CRT1-ID16
CRT1-ID16-1	None	07 hex	1345	CRT1-ID16-1
	XWT-ID08	07 hex	1346	CRT1-ID16-1
	XWT-ID16	07 hex	1347	CRT1-ID16-1
	XWT-OD08	07 hex	1348	CRT1-ID16-1
	XWT-OD16	07 hex	1349	CRT1-ID16-1
	XWT-ID08-1	07 hex	1350	CRT1-ID16-1
	XWT-ID16-1	07 hex	1351	CRT1-ID16-1
	XWT-OD08-1	07 hex	1352	CRT1-ID16-1
	XWT-OD16-1	07 hex	1353	CRT1-ID16-1

Model		Device type	Product code	Product name
Basic Unit	Expansion Unit			
CRT1-OD16	None	07 hex	1336	CRT1-OD16
	XWT-ID08	07 hex	1337	CRT1-OD16
	XWT-ID16	07 hex	1338	CRT1-OD16
	XWT-OD08	07 hex	1339	CRT1-OD16
	XWT-OD16	07 hex	1340	CRT1-OD16
	XWT-ID08-1	07 hex	1341	CRT1-OD16
	XWT-ID16-1	07 hex	1342	CRT1-OD16
	XWT-OD08-1	07 hex	1343	CRT1-OD16
	XWT-OD16-1	07 hex	1344	CRT1-OD16
CRT1-OD16-1	None	07 hex	1354	CRT1-OD16-1
	XWT-ID08	07 hex	1355	CRT1-OD16-1
	XWT-ID16	07 hex	1356	CRT1-OD16-1
	XWT-OD08	07 hex	1357	CRT1-OD16-1
	XWT-OD16	07 hex	1358	CRT1-OD16-1
	XWT-ID08-1	07 hex	1359	CRT1-OD16-1
	XWT-ID16-1	07 hex	1360	CRT1-OD16-1
	XWT-OD08-1	07 hex	1361	CRT1-OD16-1
	XWT-OD16-1	07 hex	1362	CRT1-OD16-1
CRT1-MD16	---	07 hex	1561	CRT1-MD16
CRT1-MD16-1		07 hex	1562	CRT1-MD16-1
CRT1-ROS08		07 hex	1593	CRT1-ROS08
CRT1-ROF08		07 hex	1594	CRT1-ROF08
CRT1-ROS16	None	07 hex	1511	CRT1-ROS16
	XWT-ID08	07 hex	1512	
	XWT-ID16	07 hex	1513	
	XWT-OD08	07 hex	1514	
	XWT-OD16	07 hex	1515	
	XWT-ID08-1	07 hex	1516	
	XWT-ID16-1	07 hex	1517	
	XWT-OD08-1	07 hex	1518	
	XWT-OD16-1	07 hex	1519	
CRT1-ROF16	None	07 hex	1520	CRT1-ROF16
	XWT-ID08	07 hex	1521	
	XWT-ID16	07 hex	1522	
	XWT-OD08	07 hex	1523	
	XWT-OD16	07 hex	1524	
	XWT-ID08-1	07 hex	1525	
	XWT-ID16-1	07 hex	1526	
	XWT-OD08-1	07 hex	1527	
	XWT-OD16-1	07 hex	1528	
CRT1-ID08TA	---	07 hex	1563	CRT1-ID08TA
CRT1-ID08TA-1		07 hex	1564	CRT1-ID08TA-1
CRT1-OD08TA		07 hex	1565	CRT1-OD08TA
CRT1-OD08TA-1		07 hex	1566	CRT1-OD08TA-1
CRT1-ID08TAH		07 hex	1567	CRT1-OD08TAH
CRT1-ID08TAH-1		07 hex	1568	CRT1-OD08TAH-1
CRT1-OD08TAH		07 hex	1569	CRT1-OD08TAH
CRT1-OD08TAH-1		07 hex	1570	CRT1-OD08TAH-1

Model		Device type	Product code	Product name
Basic Unit	Expansion Unit			
CRT1-ID16TA	---	07 hex	1529	CRT1-ID16TA
CRT1-ID16TA-1		07 hex	1530	CRT1-ID16TA-1
CRT1-OD16TA		07 hex	1531	CRT1-OD16TA
CRT1-OD16TA-1		07 hex	1532	CRT1-OD16TA-1
CRT1-MD16TA		07 hex	1533	CRT1-MD16TA
CRT1-MD16TA-1		07 hex	1534	CRT1-MD16TA-1
CRT1-ID16TAH		07 hex	1595	CRT1-ID16TAH
CRT1-ID16TAH-1		07 hex	1596	CRT1-ID16TAH-1
CRT1-OD16TAH		07 hex	1597	CRT1-OD16TAH
CRT1-OD16TAH-1		07 hex	1598	CRT1-OD16TAH-1
CRT1-MD16TAH		07 hex	1571	CRT1-MD16TAH
CRT1-MD16TAH-1		07 hex	1572	CRT1-MD16TAH-1
CRT1-VID08S		07 hex	1710	CRT1-VID08S
CRT1-VID08S-1		07 hex	1711	CRT1-VID08S-1
CRT1-VOD08S		07 hex	1712	CRT1-VOD08S
CRT1-VOD08S-1		07 hex	1713	CRT1-VOD08S-1
CRT1-ID16S		07 hex	1535	CRT1-ID16S
DRT1-ID16S-1		07 hex	1536	DRT1-ID16S-1
CRT1-OD16S		07 hex	1537	CRT1-OD16S
CRT1-OD16S-1		07 hex	1538	CRT1-OD16S-1
CRT1-MD16S		07 hex	1539	CRT1-MD16S
CRT1-MD16S-1		07 hex	1540	CRT1-MD16S-1
CRT1-ID16SH		07 hex	1599	CRT1-ID16SH
CRT1-ID16SH-1		07 hex	1600	CRT1-ID16SH-1
CRT1-OD16SH		07 hex	1601	CRT1-OD16SH
CRT1-OD16SH-1		07 hex	1602	CRT1-OD16SH-1
CRT1-MD16SH		07 hex	1579	CRT1-MD16SH
CRT1-MD16SH-1		07 hex	1580	CRT1-MD16SH-1
CRT1-ID32S		07 hex	1573	CRT1-ID32S
CRT1-ID32S-1		07 hex	1574	CRT1-ID32S-1
CRT1-OD32S		07 hex	1575	CRT1-OD32S
CRT1-OD32S-1		07 hex	1576	CRT1-OD32S-1
CRT1-MD32S		07 hex	1577	CRT1-MD32S
CRT1-MD32-S		07 hex	1578	CRT1-MD32-S
CRT1-ID32SH		07 hex	1581	CRT1-ID32SH
CRT1-ID32SH-1		07 hex	1582	CRT1-ID32SH-1
CRT1-OD32SH		07 hex	1583	CRT1-OD32SH
CRT1-OD32SH-1		07 hex	1584	CRT1-OD32SH-1
CRT1-MD32SH		07 hex	1585	CRT1-MD32SH
CRT1-MD32SH-1		07 hex	1586	CRT1-MD32SH-1
CRT1-VID16ML		07 hex	1706	CRT1-VID16ML
CRT1-VID16ML-1		07 hex	1707	CRT1-VID16ML-1
CRT1-VOD16ML		07 hex	1708	CRT1-VOD16ML
CRT1-VOD16ML-1		07 hex	1709	CRT1-VOD16ML-1
CRT1-VID32ML		07 hex	1700	CRT1-VID32ML
CRT1-VID32ML-1		07 hex	1701	CRT1-VID32ML-1
CRT1-VOD32ML		07 hex	1702	CRT1-VOD32ML
CRT1-VOD32ML-1		07 hex	1703	CRT1-VOD32ML-1

Model		Device type	Product code	Product name
Basic Unit	Expansion Unit			
CRT1-VMD32ML	---	07 hex	1704	CRT1-VMD32ML
CRT1-VMD32ML-1		07 hex	1705	CRT1-VMD32ML-1
CRT1-ID08SL		07 hex	1587	CRT1-ID08SL
CRT1-ID08SL-1		07 hex	1588	CRT1-ID08SL-1
CRT1-OD08SL		07 hex	1589	CRT1-OD08SL
CRT1-OD08SL-1		07 hex	1590	CRT1-OD08SL-1
CRT1-ID16SL		07 hex	1541	CRT1-ID16SL
CRT1-ID16SL-1		07 hex	1542	CRT1-ID16SL-1
CRT1-OD16SL		07 hex	1543	CRT1-OD16SL
CRT1-OD16SL-1		07 hex	1544	CRT1-OD16SL-1
CRT1-MD16SL		07 hex	1591	CRT1-MD16SL
CRT1-MD16SL-1		07 hex	1592	CRT1-MD16SL-1
CRT1B-ID02S		07 hex	1364	CRT1B-ID02S
CRT1B-ID02S-1		07 hex	1365	CRT1B-ID02S-1
CRT1B-OD02S		07 hex	1366	CRT1B-OD02S
CRT1B-OD02S-1		07 hex	1367	CRT1B-OD02S-1
CRT1B-ID02SP		07 hex	1368	CRT1B-ID02SP
CRT1B-ID02SP-1		07 hex	1369	CRT1B-ID02SP-1
CRT1B-OD02SP		07 hex	1370	CRT1B-OD02SP
CRT1B-OD02SP-1		07 hex	1371	CRT1B-OD02SP-1
CRT1B-ID04SP		07 hex	1372	CRT1B-ID04SP
CRT1B-ID04SP-1		07 hex	1373	CRT1B-ID04SP-1
CRT1B-MD04SLP		07 hex	1374	CRT1B-MD04SLP
CRT1B-MD04SLP-1		07 hex	1375	CRT1B-MD04SLP-1
CRT1B-ID02JS		07 hex	1727	CRT1B-ID02JS
CRT1B-ID02JS-1		07 hex	1728	CRT1B-ID02JS-1
CRT1B-OD02JS		07 hex	1725	CRT1B-OD02JS
CRT1B-OD02JS-1		07 hex	1726	CRT1B-OD02JS-1
CRT1B-MD02JS		07 hex	1729	CRT1B-MD02JS
CRT1B-MD02JS-1		07 hex	1730	CRT1B-MD02JS-1
CRT1B-ID04JS		07 hex	1733	CRT1B-ID04JS
CRT1B-ID04JS-1		07 hex	1734	CRT1B-ID04JS-1
CRT1B-OD04JS		07 hex	1731	CRT1B-OD04JS
CRT1B-OD04JS-1		07 hex	1732	CRT1B-OD04JS-1
CRT1B-MD04JS		07 hex	1735	CRT1B-MD04JS
CRT1B-MD04JS-1		07 hex	1736	CRT1B-MD04JS-1
CRT1-AD04		00 hex	65	CRT1-AD04
CRT1-DA02		00 hex	66	CRT1-DA02
CRT1-VAD04S		00 Hex	1715	CRT1-VAD04S
CRT1-VDA02S		00 Hex	1717	CRT1-VDA02S
CRT1-VAD04ML		00 Hex	1714	CRT1-VAD04ML
CRT1-VDA02ML		00 Hex	1716	CRT1-VDA02ML
CRT1-TS04T		00 hex	1631	CRT1-TS04T
CRT1-TS04P		00 hex	1632	CRT1-TS04P
CRS1-RPT01		26 hex	1363	CRT1-RPT01

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 CompoNet 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) CRT1B-ID02JS(-1) CRT1B-MD02JS(-1) CRT1B-MD04JS(-1)
Assembly instance 3 4 inputs	Input	---	---	---	---	3	2	1	0	CRT1B-ID04SP(-1) CRT1B-ID04JS(-1)
Assembly instance 4 8 inputs	Input	7	6	5	4	3	2	1	0	CRT1-ID08(-1) CRT1-OD16(-1) + XWT-ID08(-1) CRT1-MD16(-1) CRT1-ROS16 + XWT-ID08(-1) CRT1-ROF16 + XWT-ID08(-1) CRT1-ID08TA(-1) CRT1-ID08TAH(-1) CRT1-MD16TA(-1) CRT1-MD16TAH(-1) CRT1-VID08S(-1) CRT1-MD16S(-1) CRT1-MD16SH(-1) CRT1-ID08SL(-1) CRT1-MD16SL(-1)
Assembly instance 5 16 inputs	Input	7 15	6 14	5 13	4 12	3 11	2 10	1 9	0 8	CRT1-ID16(-1) CRT1-ID16(-1) + XWT-OD08(-1) CRT1-ID16(-1) + XWT-OD16(-1) CRT1-OD16(-1) + XWT-ID16(-1) CRT1-ROS16 + XWT-ID16(-1) CRT1-ROF16 + XWT-ID16(-1) CRT1-ID16TA(-1) CRT1-ID16TAH(-1) CRT1-ID16S(-1) CRT1-ID16SH(-1) CRT1-MD32S(-1) CRT1-MD32SH(-1) CRT1-VID16ML(-1) CRT1-VMD32ML(-1) CRT1-ID16SL(-1)
Assembly instance 6 32 inputs	Input	7 15 23 31	6 14 22 30	5 13 21 29	4 12 20 28	3 11 19 27	2 10 18 26	1 9 17 25	0 8 16 24	CRT1-ID16(-1) + XWT-ID16(-1) CRT1-ID32S(-1) CRT1-ID32SH(-1) CRT1-VID32ML(-1)
Assembly instance 7 24 inputs	Input	7 15 23	6 14 22	5 13 21	4 12 20	3 11 19	2 10 18	1 9 17	0 8 16	CRT1-ID16(-1) + XWT-ID08(-1)

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) CRT1B-ID02JS(-1) CRT1B-MD02JS(-1) CRT1B-MD04JS(-1)
Assembly instance 33 4 outputs	Output	---	---	---	---	3	2	1	0	CRT1B-OD04JS(-1)
Assembly instance 34 8 outputs	Output	7	6	5	4	3	2	1	0	CRT1-OD08(-1) CRT1-ID16(-1) + XWT-OD08(-1) CRT1-MD16(-1) CRT1-ROS08 CRT1-ROF08 CRT1-OD08TA(-1) CRT1-OD08TAH(-1) CRT1-MA16TA(-1) CRT1-MD16TAH(-1) CRT1-VOD08S(-1) CRT1-MD16S(-1) CRT1-MD16SH(-1) CRT1-OD08SL(-1) CRT1-MD16SL(-1)
Assembly instance 35 16 outputs	Output	7 15	6 14	5 13	4 12	3 11	2 10	1 9	0 8	CRT1-ID16(-1) + XWT-OD16(-1) CRT1-OD16(-1) CRT1-OD16(-1) + XWT-ID08(-1) CRT1-OD16(-1) + XWT-ID16(-1) CRT1-ROS16 CRT1-ROS16 + XWT-ID08(-1) CRT1-ROS16 + XWT-ID16(-1) CRT1-ROF16 CRT1-ROF16 + XWT-ID08(-1) CRT1-ROF16 + XWT-ID16(-1) CRT1-OD16TA(-1) CRT1-OD16TAH(-1) CRT1-OD16S(-1) CRT1-OD16SH(-1) CRT1-MD32S(-1) CRT1-MD32SH(-1) CRT1-VOD16ML(-1) CRT1-VMD32ML(-1) CRT1-OD16SL(-1)
Assembly instance 36 32 outputs	Output	7 15 23 31	6 14 22 30	5 13 21 29	4 12 20 28	3 11 19 27	2 10 18 26	1 9 17 25	0 8 16 24	CRT1-OD16(-1) + XWT-OD16(-1) CRT1-ROS16 + XWT-OD16(-1) CRT1-ROF16 + XWT-OD16(-1) CRT1-OD32S(-1) CRT1-OD32SH(-1) CRT1-VOD32ML(-1)

Instance number	Type	Bit allocation								Supported model
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	CRT1-ROS16 + XWT-OD08(-1)
		23	22	21	20	19	18	17	16	CRT1-ROF16 + XWT-OD08(-1)

Analog Input Slave Units

Instance number	Byte	Bit allocation								Supported model
Instance 104 Analog Data (input)	+0	Input 0, Analog Data 1								CRT1-AD04 CRT1-VAD04S CRT1-VAD04ML
	+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	+0	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0	CRT1-AD04 CRT1-VAD04S CRT1-VAD04ML
	+1	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	
Instance 134 Analog Status Flags	+0	BW0	T_ST0	V_ST0	HH0	H0	PS0	L0	LL0	CRT1-AD04 CRT1-VAD04S CRT1-VAD04ML
	+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	
Instance 174 Analog Data 1 + Top/Valley Detection Timing Flags	+0	Input 0, Analog Data 1								CRT1-AD04 CRT1-VAD04S CRT1-VAD04ML
	+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-DA02 CRT1-VDA02S CRT1-VDA02ML
Instance 192 Analog output data	+0	Input 0, Analog Data								CRT1-DA02 CRT1-VDA02S CRT1-VDA02ML
	+1									
	+2	Input 1, Analog Data								
	+3									

Temperature Input Terminals (Inputs)

Instance number	Byte	Bit allocation								Supported model
Instance 104 Temperature data 1, normal display	+0	Ch0 Temperature Data 1								CRT1-TS04T CRT1-TS04P
	+1									
	+2	Ch1 Temperature Data 1								
	+3									
	+4	Ch2 Temperature Data 1								
	+5									
	+6	Ch3 Temperature Data 1								
	+7									
Instance 108 Temperature data 1, 1/100 display)	+0	Ch0 Temperature Data 1								CRT1-TS04T CRT1-TS04P
	+1									
	+2									
	+3									
	+4	Ch1 Temperature Data 1								
	+5									
	+6									
	+7									
	+8	Ch2 Temperature Data 1								
	+9									
	+10									
	+11									
	+12	Ch3 Temperature Data 1								
	+13									
	+14									
	+15									
Instance 122 Top/Valley Detection Timing Flags	+0	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0	CRT1-TS04T CRT1-TS04P
	+1	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	
Instance 134 Temperature Data Status Flag	+0	BW0	T_ST0	V_ST0	HH0	H0	PS0	L0	LL0	CRT1-TS04T CRT1-TS04P
	+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	
Instance 174 Temperature data 1, normal display + Top/valley detection timing flag	+0	Ch0 Temperature Data 1								CRT1-TS04T CRT1-TS04P
	+1									
	+2	Ch1 Temperature Data 1								
	+3									
	+4	Ch2 Temperature Data 1								
	+5									
	+6	Ch3 Temperature 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	

Instance number	Byte	Bit allocation								Supported model
Instance 178 Temperature data 1, 1/100 display + Top/valley detection timing flag	+0	Ch0 Temperature Data 1								CRT1-TS04T CRT1-TS04P
	+1									
	+2									
	+3									
	+4	Ch1 Temperature Data 1								
	+5									
	+6									
	+7									
	+8	Ch2 Temperature Data 1								
	+9									
	+10									
	+11									
	+12	Ch3 Temperature Data 1								
	+13									
	+14									
	+15									
	+16	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0	
	+17	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	

Temperature Input Terminals (Output)

Instance number	Byte	Bit allocation								Supported model
Instance 190 Hold flag	+0	---	---	---	---	HD3	HD1	HD1	HD0	CRT1-TS04T CRT1-TS04P

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	2				
	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							
CRT1B-ID02S (-1)		Input Data	0001	0006	20_04_24_ 02_30_03	---	0000	---
CRT1B-OD02S (-1)		Output Data	---	0000	---	0001	0006	20_04_24_ 02_30_03
CRT1B-ID02SP (-1)		Input Data	0001	0006	20_04_24_ 02_30_03	---	0000	---
CRT1B-OD02SP (-1)		Output Data	---	0000	---	0001	0006	20_04_24_ 02_30_03
CRT1B-ID04SP (-1)		Input Data	0001	0006	20_04_24_ 03_30_03	---	0000	---
CRT1B-MD04SLP (-1)		Input Data	0001	0006	20_04_24_ 02_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_ 02_30_03
CRT1B-ID02JS(-1)		Input Data	0001	0006	20_04_24_ 02_30_03	---	0000	---
CRT1B-ID04JS(-1)		Input Data	0001	0006	20_04_24_ 03_30_03	---	0000	---
CRT1B-OD02JS(-1)		Output Data	---	0000	---	0001	0006	20_04_24_ 20_30_03
CRT1B-OD04JS(-1)		Output Data	---	0000	---	0001	0006	20_04_24_ 21_30_03
CRT1B-MD02JS(-1)		Input Data	0001	0006	20_04_24_ 02_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_ 20_30_03
CRT1B-MD04JS(-1)		Input Data	0001	0006	20_04_24_ 02_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_ 20_30_03
CRT1-ID08(-1)		Input Data	0001	0006	20_04_24_ 04_30_03	---	0000	---
CRT1-OD08(-1)		Output Data	---	0000	---	0001	0006	20_04_24_ 22_30_03
CRT1-ID16 (-1)	NA	Input Data	0002	0006	20_04_24_ 05_30_03	---	0000	---
	XWT-ID08 (-1)	Input Data	0003	0006	20_04_24_ 07_30_03	---	0000	---
	XWT-ID16 (-1)	Input Data	0004	0006	20_04_24_ 06_30_03	---	0000	---
	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
	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

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-OD16 (-1)	NA	Output Data	---	0000	---	0002	0006	20_04_24_23_30_03
	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	---
	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	---
	XWT-OD08 (-1)	Output Data	---	0000	---	0003	0006	20_04_24_25_30_03
	XWT-OD16 (-1)	Output Data	---	0000	---	0004	0006	20_04_24_24_30_03
CRT1-MD16(-1)		Input Data	0001	0006	20_04_24_04_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_22_30_03
CRT1-ROS08		Output Data	---	0000	---	0001	0006	20_04_24_22_30_03
CRT1-ROF08		Output Data	---	0000	---	0001	0006	20_04_24_22_30_03
CRT1-ROS16	NA	Output Data	---	0000	---	0002	0006	20_04_24_23_30_03
	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	---
	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	---
	XWT-OD08 (-1)	Output Data	---	0000	---	0003	0006	20_04_24_25_30_03
	XWT-OD16 (-1)	Output Data	---	0000	---	0004	0006	20_04_24_24_30_03
CRT1-ROF16	NA	Output Data	---	0000	---	0002	0006	20_04_24_23_30_03
	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	---
	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	---
	XWT-OD08 (-1)	Output Data	---	0000	---	0003	0006	20_04_24_25_30_03
	XWT-OD16 (-1)	Output Data	---	0000	---	0004	0006	20_04_24_24_30_03
CRT1-ID08TA(-1)		Input Data	0001	0006	20_04_24_04_30_03	---	0000	---
CRT1-OD08TA(-1)		Output Data	---	0000	---	0001	0006	20_04_24_22_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-ID08TAH(-1)		Input Data	0001	0006	20_04_24_ 04_30_03	---	0000	---
CRT1-OD08TAH(-1)		Output Data	---	0000	---	0001	0006	20_04_24_ 22_30_03
CRT1-ID16TA(-1)		Input Data	0002	0006	20_04_24_ 05_30_03	---	0000	---
CRT1-OD16TA(-1)		Output Data	---	0000	---	0002	0006	20_04_24_ 23_30_03
CRT1-MD16TA(-1)		Input Data	0001	0006	20_04_24_ 04_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_ 22_30_03
CRT1-ID16TAH(-1)		Input Data	0002	0006	20_04_24_ 05_30_03	---	0000	---
CRT1-OD16TAH(-1)		Output Data	---	0000	---	0002	0006	20_04_24_ 23_30_03
CRT1-MD16TAH(-1)		Input Data	0001	0006	20_04_24_ 04_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_ 22_30_03
CRT1-VID08S		Input Data	0001	0006	20_04_24_ 04_30_03	---	0000	----
CRT1-VOD08S		Output Data	---	0000	---	0001	0006	20_04_24_ 22_30_03
CRT1-ID16S(-1)		Input Data	0002	0006	20_04_24_ 05_30_03	---	0000	---
CRT1-OD16S(-1)		Output Data	---	0000	---	0002	0006	20_04_24_ 23_30_03
CRT1-MD16S(-1)		Input Data	0001	0006	20_04_24_ 04_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_ 22_30_03
CRT1-ID16SH(-1)		Input Data	0002	0006	20_04_24_ 05_30_03	---	0000	---
CRT1-OD16SH(-1)		Output Data	---	0000	---	0002	0006	20_04_24_ 23_30_03
CRT1-MD16SH(-1)		Input Data	0001	0006	20_04_24_ 04_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_ 22_30_03
CRT1-ID32S(-1)		Input Data	0002	0006	20_04_24_ 06_30_03	---	0000	---
CRT1-OD32S(-1)		Output Data	---	0000	---	0002	0006	20_04_24_ 24_30_03
CRT1-MD32S(-1)		Input Data	0002	0006	20_04_24_ 05_30_03	---	0000	---
		Output Data	---	0000	---	0002	0006	20_04_24_ 23_30_03
CRT1-ID32SH(-1)		Input Data	0004	0006	20_04_24_ 06_30_03	---	0000	---
CRT1-OD32SH(-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-MD32SH(-1)		Input Data	0002	0006	20_04_24_05_30_03	---	0000	---
		Output Data	---	0000	---	0002	0006	20_04_24_23_30_03
CRT1-VID16ML(-1)		Input Data	0002	0006	20_04_24_05_30_03	---	0000	---
CRT1-VOD16ML(-1)		Output Data	---	0000	---	0002	0006	20_04_24_23_30_03
CRT1-VID32ML(-1)		Input Data	0004	0006	20_04_24_06_30_03	---	0000	---
CRT1-VOD32ML(-1)		Output Data	---	0000	---	0004	0006	20_04_24_24_30_03
CRT1-VMD32ML(-1)		Input Data	0002	0006	20_04_24_05_30_03	---	0000	---
		Output Data	---	0000	---	0002	0006	20_04_24_23_30_03
CRT1-ID08SL(-1)		Input Data	0001	0006	20_04_24_04_30_03	---	0000	---
CRT1-OD08SL(-1)		Output Data	---	0000	---	0001	0006	20_04_24_22_30_03
CRT1-ID16SL(-1)		Input Data	0002	0006	20_04_24_05_30_03	---	0000	---
CRT1-OD16SL(-1)		Output Data	---	0000	---	0002	0006	20_04_24_23_30_03
CRT1-MD16SL(-1)		Input Data	0001	0006	20_04_24_04_30_03	---	0000	---
		Output Data	---	0000	---	0001	0006	20_04_24_22_30_03
CRT1-AD04 CRT1-VAD04S CRT1-VAD04ML		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	0000	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

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-DA02 CRT1-VDA02S CRT1-VDA02ML		Generic Status	0001	0006	20_04_24_ 79_30_03	---	---	---
		Analog Data	---	---	---	0004	0006	20_04_24_ C0_30_03
CRT1-TS04T CRT1-TS04P		Tempera-ture Data 1 (Normal)	0008	0006	20_04_24_ 68_30_03	0000	0000	---
		Tempera-ture Data 1 (1/100 dis-play)	0010	0006	20_04_24_ 6C_30_03	0000	0000	---
		Top and Valley shot	0002	0006	20_04_24_ 7A_30_03	0000	0000	---
		Tempera-ture Status	0004	0006	20_04_24_ 86_30_03	0000	0000	---
		Tempera-ture data 1 (Normal) + Top and val-ley shot	000A	0006	20_04_24_ AE_30_03	0000	0000	---
		Tempera-ture data 1 (1/100 dis-play) + Top and valley shot	0012	0006	20_04_24_ B2_30_03	0000	0000	---
		Hold control	0000	0000	---	0001	0006	20_04_24_ BE_30_03

Appendix C
Current Consumption Summary

Digital I/O Slave Units

Model	Communications current consumption
CRT1-ID08	30 mA max. (for 24 V) 50 mA max. (for 14 V)
CRT1-ID08-1	30 mA max. (for 24 V) 50 mA max. (for 14 V)
CRT1-OD08	35 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-OD08-1	35 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-ID16	55 mA max. (for 24 V) 85 mA max. (for 14 V)
CRT1-ID16-1	55 mA max. (for 24 V) 85 mA max. (for 14 V)
CRT1-OD16	55 mA max. (for 24 V) 85 mA max. (for 14 V)
CRT1-OD16-1	55 mA max. (for 24 V) 85 mA max. (for 14 V)
CRT1-MD16	35 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-MD16-1	35 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-ROS08	95 mA max. (for 24 V) 150 mA max. (for 14 V)
CRT1-ROF08	60 mA max. (for 24 V) 90 mA max. (for 14 V)
CRT1-ROS16	155 mA max. (for 24 V) 255 mA max. (for 14 V)
CRT1-ROF16	85 mA max. (for 24 V) 130 mA max. (for 14 V)
CRT1-ID08TA	30 mA max. (for 24 V) 50 mA max. (for 14 V)
CRT1-ID08TA-1	30 mA max. (for 24 V) 50 mA max. (for 14 V)
CRT1-OD08TA	35 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-OD08TA-1	35 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-ID08TAH	35 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-ID08TAH-1	35 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-OD08TAH	35 mA max. (for 24 V) 55 mA max. (for 14 V)

Model	Communications current consumption
CRT1-OD08TAH-1	35 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-ID16TA	40 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-ID16TA-1	37 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-OD16TA	45 mA max. (for 24 V) 65 mA max. (for 14 V)
CRT1-OD16TA-1	45 mA max. (for 24 V) 65 mA max. (for 14 V)
CRT1-MD16TA	40 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-MD16TA-1	40 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-ID16TAH	40 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-ID16TAH-1	40 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-OD16TAH	40 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-OD16TAH-1	40 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-MD16TAH	40 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-MD16TAH-1	40 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-VID08S	35 mA max. (for 24 V) 50 mA max. (for 14 V)
CRT1-VID08S-1	35 mA max. (for 24 V) 50 mA max. (for 14 V)
CRT1-VOD08S	40 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-VOD08S-1	40 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-ID16S	110 mA max. (for 24 V) 125 mA max. (for 14 V)
CRT1-ID16S-1	110 mA max. (for 24 V) 120 mA max. (for 14 V)
CRT1-OD16S	38 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-OD16S-1	39 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-MD16S	75 mA max. (for 24 V) 95 mA max. (for 14 V)
CRT1-MD16S-1	75 mA max. (for 24 V) 95 mA max. (for 14 V)
CRT1-ID16SH	125 mA max. (for 24 V) 145 mA max. (for 14 V)

Model	Communications current consumption
CRT1-ID16SH-1	125 mA max. (for 24 V) 145 mA max. (for 14 V)
CRT1-OD16SH	40 mA max. (for 24 V) 65 mA max. (for 14 V)
CRT1-OD16SH-1	40 mA max. (for 24 V) 65 mA max. (for 14 V)
CRT1-MD16SH	60 mA max. (for 24 V) 90 mA max. (for 14 V)
CRT1-MD16SH-1	60 mA max. (for 24 V) 90 mA max. (for 14 V)
CRT1-ID32S	195 mA max. (for 24 V) 200 mA max. (for 14 V)
CRT1-ID32S-1	195 mA max. (for 24 V) 200 mA max. (for 14 V)
CRT1-OD32S	50 mA max. (for 24 V) 80 mA max. (for 14 V)
CRT1-OD32S-1	50 mA max. (for 24 V) 80 mA max. (for 14 V)
CRT1-MD32S	45 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-MD32S-1	45 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-ID32SH	210 mA max. (for 24 V) 235 mA max. (for 14 V)
CRT1-ID32SH-1	210 mA max. (for 24 V) 235 mA max. (for 14 V)
CRT1-OD32SH	50 mA max. (for 24 V) 90 mA max. (for 14 V)
CRT1-OD32SH-1	50 mA max. (for 24 V) 90 mA max. (for 14 V)
CRT1-MD32SH	60 mA max. (for 24 V) 100 mA max. (for 14 V)
CRT1-MD32SH-1	60 mA max. (for 24 V) 100 mA max. (for 14 V)
CRT1-VID16ML	40 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-VID16ML-1	40 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-VOD16ML	45 mA max. (for 24 V) 65 mA max. (for 14 V)
CRT1-VOD16ML-1	45 mA max. (for 24 V) 65 mA max. (for 14 V)
CRT1-VID32ML	40 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-VID32ML-1	40 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-VOD32ML	50 mA max. (for 24 V) 80 mA max. (for 14 V)

Model	Communications current consumption
CRT1-VOD32ML-1	50 mA max. (for 24 V) 80 mA max. (for 14 V)
CRT1-VMD32ML	45 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-VMD32ML-1	45 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1-ID08SL	30 mA max. (for 24 V) 50 mA max. (for 14 V)
CRT1-ID08SL-1	30 mA max. (for 24 V) 50 mA max. (for 14 V)
CRT1-OD08SL	35 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-OD08SL-1	35 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-ID16SL	34 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-ID16SL-1	34 mA max. (for 24 V) 55 mA max. (for 14 V)
CRT1-OD16SL	37 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-OD16SL-1	37 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-MD16SL	35 mA max. (for 24 V) 60 mA max. (for 14 V)
CRT1-MD16SL-1	35 mA max. (for 24 V) 60 mA max. (for 14 V)
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 the case of combining CRT1-ID16 + XWT-OD16 is 55 + 10 = 65 mA for a communications power supply voltage of 24 VDC and 85 + 10 = 95 mA for a communications power supply voltage of 14 VDC.

Analog I/O Slave Units

Model	Communications current consumption
CRT1-AD04	110 mA max. (for 24 V) 175 mA max. (for 14 V)
CRT1-DA02	125 mA max. (for 24 V) 205 mA max. (for 14 V)
CRT1-VAD04S	75 mA max. (for 24 V) 115 mA max. (for 14 V)

Model	Communications current consumption
CRT1-VDA02S	105 mA max. (for 24 V) 170 mA max. (for 14 V)
CRT1-VAD04ML	75 mA max. (for 24 V) 115 mA max. (for 14 V)
CRT1-VDA02ML	105 mA max. (for 24 V) 170 mA max. (for 14 V)

Temperature Input Units

Model	Communications current consumption
CRT1-TS04T	75 mA max. (for 24 V) 110 mA max. (for 14 V)
CRT1-TS04P	75 mA max. (for 24 V) 110 mA max. (for 14 V)

Bit Slave Units

Model	Communications current consumption
CRT1B-ID02S	65 mA max. (for 24 V) 80 mA max. (for 14 V)
CRT1B-ID02S-1	45 mA max. (for 24 V) 65 mA max. (for 14 V)
CRT1B-OD02S	55 mA max. (for 24 V) 75 mA max. (for 14 V)
CRT1B-OD02S-1	55 mA max. (for 24 V) 70 mA max. (for 14 V)
CRT1B-ID02SP	65 mA max. (for 24 V) 80 mA max. (for 14 V)
CRT1B-ID02SP-1	65 mA max. (for 24 V) 80 mA max. (for 14 V)
CRT1B-OD02SP	50 mA max. (for 24 V) 75 mA max. (for 14 V)
CRT1B-OD02SP-1	50 mA max. (for 24 V) 75 mA max. (for 14 V)
CRT1B-ID04SP	85 mA max. (for 24 V) 90 mA max. (for 14 V)
CRT1B-ID04SP-1	85 mA max. (for 24 V) 90 mA max. (for 14 V)
CRT1B-MD04SLP	80 mA max. (for 24 V) 90 mA max. (for 14 V)
CRT1B-MD04SLP-1	75 mA max. (for 24 V) 85 mA max. (for 14 V)

Bit Slaves with Compact Connectors

Model	Communications current consumption
CRT1B-ID02JS	25 mA max. (for 24 V) 30 mA max. (for 14 V)
CRT1B-ID02JS-1	25 mA max. (for 24 V) 30 mA max. (for 14 V)
CRT1B-OD02JS	25 mA max. (for 24 V) 30 mA max. (for 14 V)
CRT1B-OD02JS-1	25 mA max. (for 24 V) 30 mA max. (for 14 V)
CRT1B-ID04JS	35 mA max. (for 24 V) 40 mA max. (for 14 V)
CRT1B-ID04JS-1	35 mA max. (for 24 V) 40 mA max. (for 14 V)
CRT1B-OD04JS	30 mA max. (for 24 V) 35 mA max. (for 14 V)
CRT1B-OD04JS-1	30 mA max. (for 24 V) 35 mA max. (for 14 V)
CRT1B-MD02JS	25 mA max. (for 24 V) 30 mA max. (for 14 V)
CRT1B-MD02JS-1	25 mA max. (for 24 V) 30 mA max. (for 14 V)
CRT1B-MD04JS	35 mA max. (for 24 V) 40 mA max. (for 14 V)
CRT1B-MD04JS-1	35 mA max. (for 24 V) 40 mA max. (for 14 V)

Repeater Unit

Model	Communications current consumption
CRS1-RPT01	95 mA max.

Appendix D
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

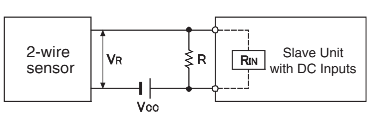
R_{IN}: Input impedance of a Slave Unit with DC Inputs

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]

Appendix E
I/O Power Supply Current

The I/O power supply current to be supplied to the V and G terminals of each Digital I/O Slave Unit is provided by the following equation.

The points to which I/O power must be supplied are divided into small blocks. The I/O power supply currents supplied to these points are calculated in block units.

For example, in a CRT1-ID16TA Slave Unit, the points are divided into two blocks. One includes 8 points on the left: Inputs 0 to 7. The other contains 8 points on the right: Inputs 8 to 15. Currents are calculated for each block.

Input Unit

The I/O power supply current supplied to V and G terminals = input current (for number of points used) + current supplied to input devices (for number of points used) * + I/O power supply current consumption

* This value does not apply to 2-tier terminal block type slaves.
Calculate using I/O power supply current supplied to V and G terminals = input current (for number of points used) + I/O power supply current consumption.

Output Unit

The I/O power supply current supplied to V and G terminals = rated output current (for number of points used) * + current supplied to input devices (for number of points used) + I/O power supply current consumption

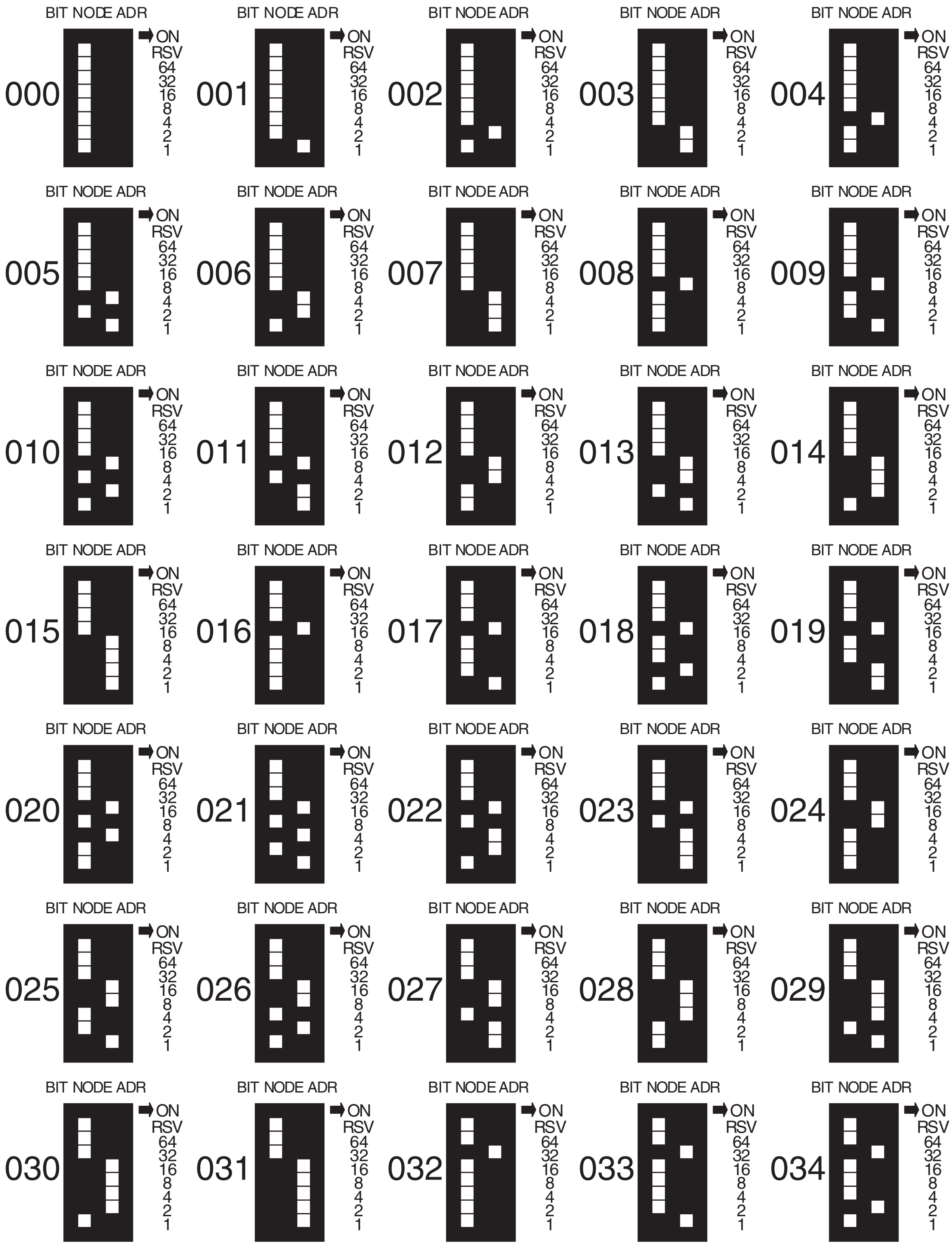
* Compare with the restricted value for common and apply whichever value is the smallest.

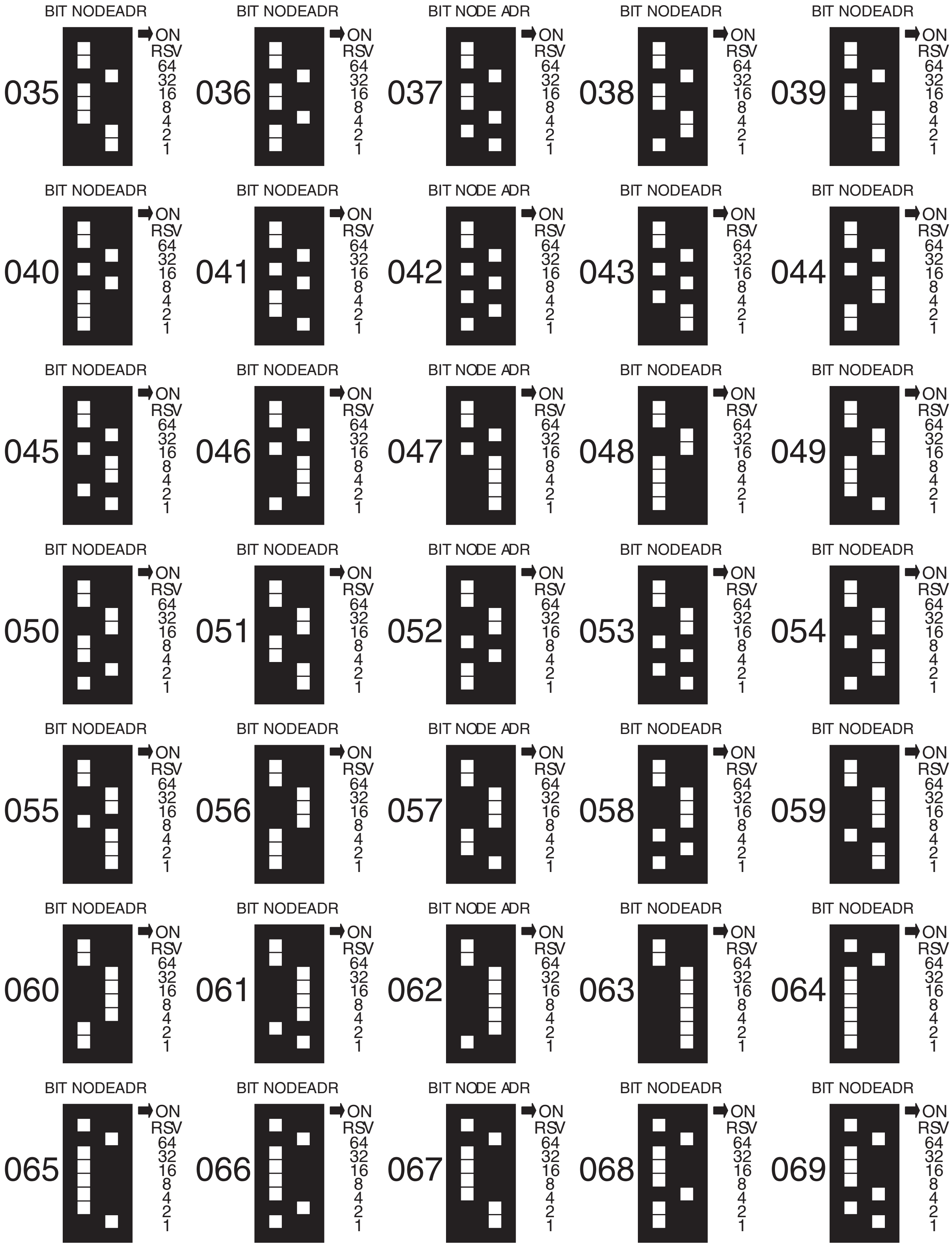
(Example)

Case of having seven 30-mA sensors connected to the CRT1-ID08TA

I/O power supply current supplied to V and G terminals = (6 mA x 7 points) + (30 mA x 7 points) + 5 mA = 257 mA

Appendix F
Node Address Settings for Bit Slave Units with Compact Connectors

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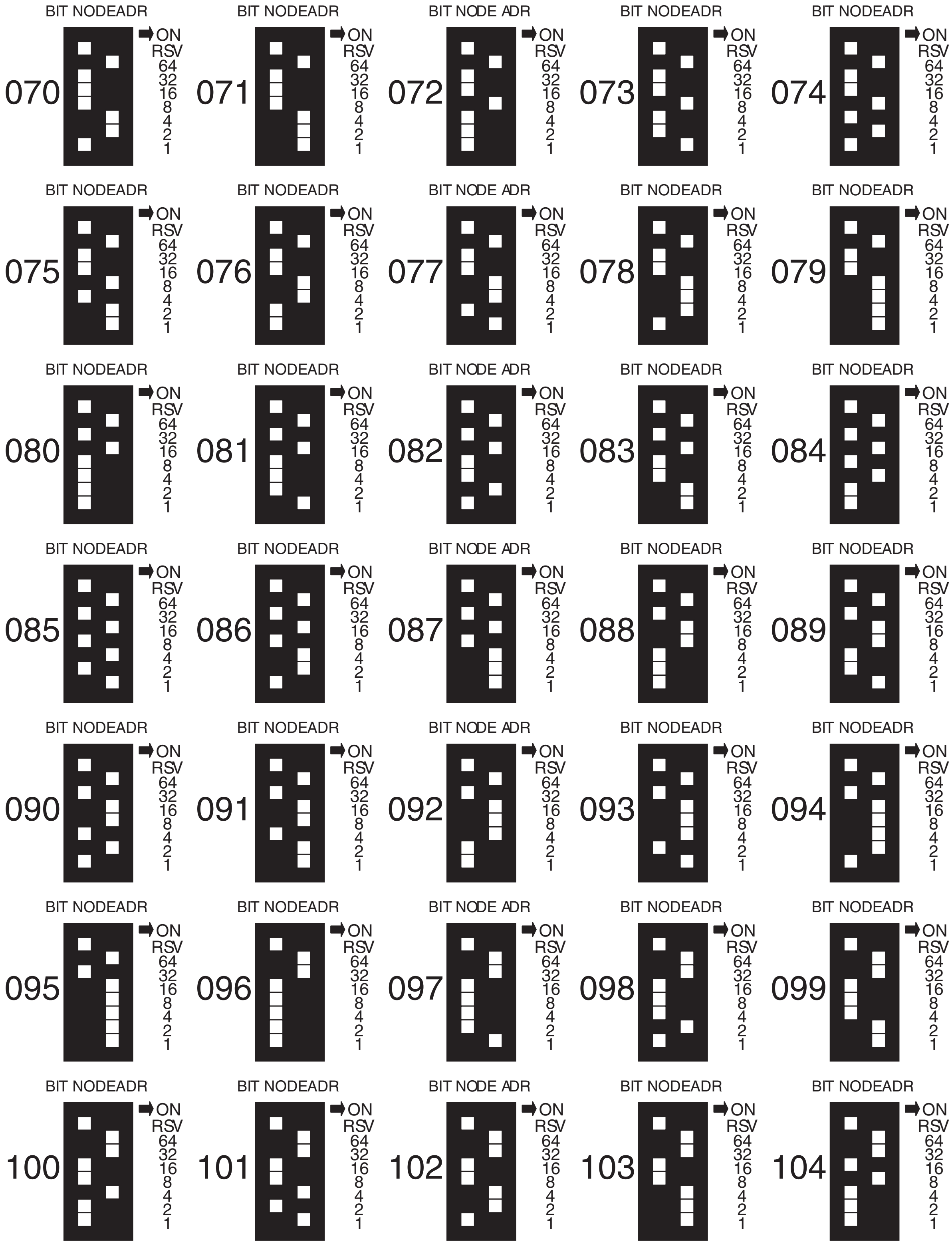
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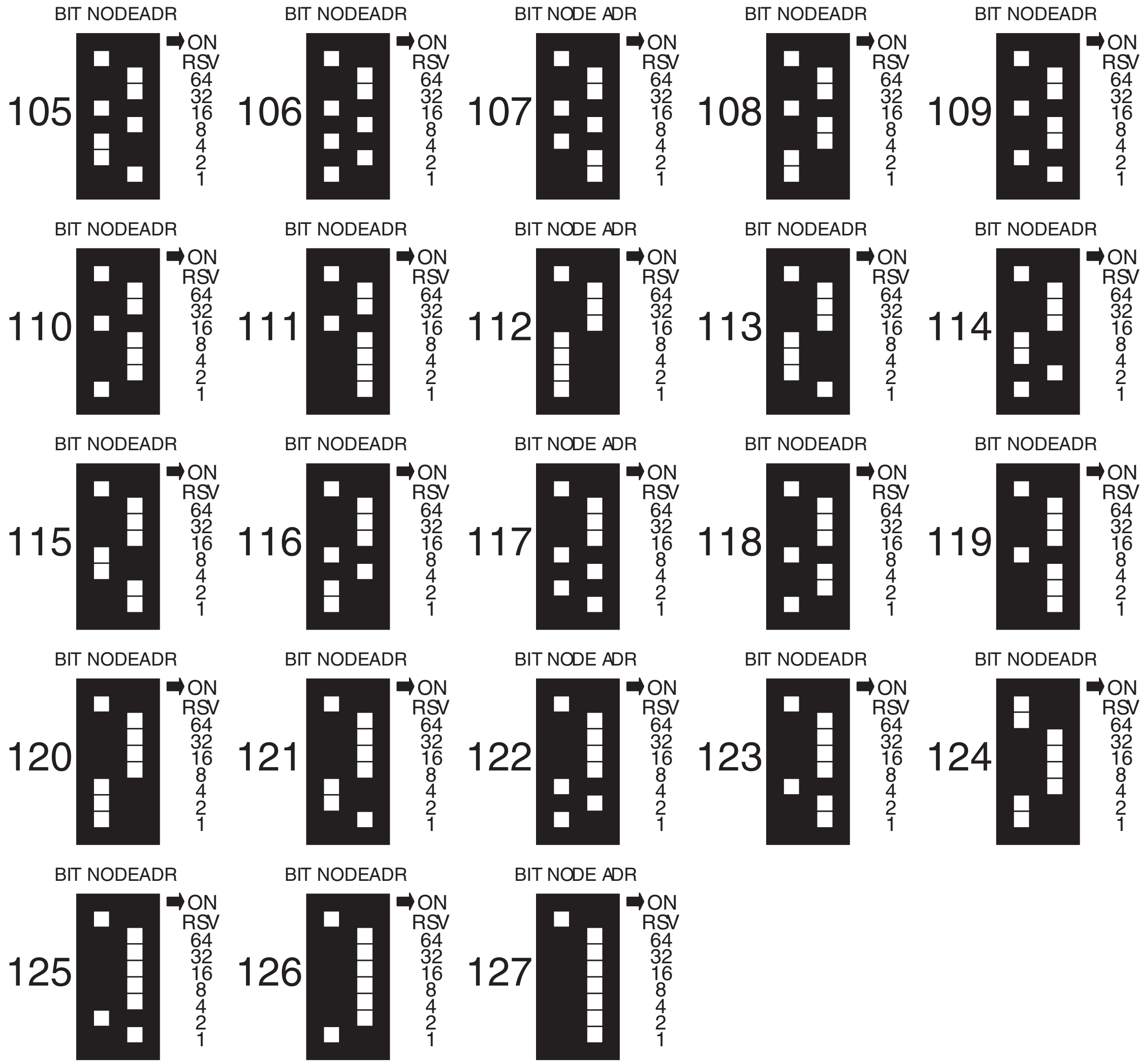
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Revision History

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

Cat. No. W457-E1-07

Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	September 2006	Original production
02	July 2007	Additions to include Digital I/O Slave Units (16-point Input Unit with 3-tier terminal block, 16-point Output Unit with 3-tier terminal block, 8-point Input/8-point Output Unit with 3-tier terminal block, and 16-point Output Unit with relay outputs). Connector names were also changed globally.
03	October 2007	Information was added on the following. Digital I/O Slave Units: 16-input Units (Connector Model and Clamp Model), 16-output Unit (2-tier Terminal Block Model with SSR Outputs, Connector Model, and Clamp Model) 8-input and 8-output Units (Connector Model)
04	May 2008	Added information on the following Digital I/O Slaves 8-point Input Units (with 2-tier terminal block, with 3-tier terminal block, with e-CON connector, or with screwless clamp terminals), 8-point Output Units (with 2-tier terminal block, with 2-tier terminal block and relay outputs, with 2-tier terminal block and SSR outputs, with 3-tier terminal block, with e-CON connector, or with screwless clamp terminals), 8-point Input/8-point Output Units (with 2-tier terminal block, with 3-tier terminal block and detection function, with e-CON connector and detection function, or with screwless clamp terminals), 16-point Input Units (with 3-tier terminal block and detection function, with e-CON connector and detection function, or with MIL connector), 16-point Output Units (with 3-tier terminal block and detection function, with e-CON connector and detection function, or with MIL connector), 32-point Input Units (with e-CON connector or with MIL connector), 32-point Output Unit (with e-CON connector or with MIL connector), and 16-point Input/16-point Output Units (with e-CON connectors or with MIL connector).
05	October 2008	Added information on Temperature Input Units (4 inputs).
06	December 2008	Revised through addition of Analog I/O Slave Unit [4 point input unit (e-CON connector type/MIL connector type)/2 point output unit (e-CON connector type/MIL connector type)]
07	October 2009	Added information on Bit Slave Units with Compact Connectors (2-point Input Unit, 2-point Output Unit, 4-point Input Unit, 4-point Output Unit, 2-point I/O Unit, and 4-point I/O Unit). Added information on multidrop connectors for Flat Cable I.

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Authorized Distributor:

Printed in Japan
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Cat. No. W457-E1-07