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Cat. No. Z148-E1-05

V670 Series

Electromagnetic Inductive RFID System

USER'S MANUAL

OMRON

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Introduction

We sincerely appreciate your purchase of the V670 series of the Electromagnetic Induction Type RFID System. The V670 series is fully supported by our cutting-edge technology and vast expertise. This user's manual provides vital information on its operational functions and product performances, and includes full instructions for use.

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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 product 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.

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

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Meaning of Signal Words

The following signal words are used in this instruction manual.

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

Meaning of Alert Symbols

The following alert symbols are used in this instruction manual.

	Indicates the possibility of electric shock under specific conditions.

Alert Statement in this user's Manual

The following alert statements apply to the products in this instruction manual. Each alert statement also appears at the locations needed in the manual to attract your attention.

CAUTION

When you plug or unplug the connector into the programming console when the power supply turns on, take care not to touch the controller wire. Otherwise, you may get an electric shock.



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Precautions for safe use.

For the safety, be sure to follow the instructions below:

1. Do not operate this device in any flammable, explosive or corrosive gas environment.
2. Do not disassemble, repair nor remodel this device.
3. Tighten the base lock screws and terminal block screws completely.
4. Be sure to use wiring crimp terminal of a specified size.
5. If any cable has a locking mechanism, be sure to check that it has been locked before using it.
6. The DC power supply must meet the following items:
   (1) Such DC power supply must be used for the V670 Series only and must not be connected to any other devices nor apparatuses.
   (2) Voltage of such DC power supply must be within the specified rating (24 VDC+10%-10%).
7. Be sure to follow any other warnings, cautions and notices mentioned in this manual.
8. In the event that the system gives out a foul smell, is heated abnormally in the main body portion, emits smoke, or exhibits any other abnormal condition, immediately stop using the system and turn off the power.
9. Dispose of this product as industrial waste.

Precautions for correct use.

Please observe the following precautions to prevent failure to operate, malfunctions, or undesirable effects on product performance.

♦ System Construction

- In consequence of diversification of small-size antennas/tags, the ID controller has been upgraded to Model V670-CD1D-V1. Be sure to combine Model V670-H51 or Model V670-H51Q antenna with Model V670-CD1D-V1 controller. Combination of this antenna with Model V670-CD1D controller might result in unstable communication.

♦ Installation Site

Install the product at a location where:

- It is not exposed to corrosive gases, dust, metal chips, or salt.
- The working temperature is within the range stipulated in the specifications.
- There are no sudden variations in temperature (no condensation).
- The relative humidity is within the range stipulated in the specifications.
- No vibration or shock exceeding the values stipulated in the specifications is transmitted directly to the body of the product.
- It is not subject to splashing water, oil, or chemical substances.

♦ Installation

- This device uses the frequency band 13.56 MHz to communicate with a tag. This frequency band 13.56 MHz is used also as the ISM band (one of frequencies assigned to medical or industrial heater;). So, such heater may affect the communication with a tag or may damage the tag, if the heater is located near this device. If you must use this device near such heater, we would like you to check the influence in advance.
- To minimize general influence of noise, follow the instructions below:
  (1) Ground any metallic material located around this device according to Class D (Class III).
  (2) Wire this device keeping away from high voltage and heavy current.
- Connectors are not waterproof. Avoid using the product in a humid environment.
- Do not use any chemical that may affect the materials of the product.

♦ Cleaning

- Do not use any thinner. Resin material and case paint are dissolved by thinner.

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Standard Conformity

1. FCC Rules (Federal Communications Commission)

This Product complies with Part 15 Subpart C of the FCC Rules.
FCC ID: E4E6CYCIDV6700206

FCC NOTICE

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.

FCC WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Properly shielded ground cables and connectors must be used for connection to host computer and/or peripherals in order to meet FCC emission limits.
Ferrite cores (TDK Type ZCAT2032-0930 or its equivalent) must be attached to the cables connecting the power supply and ground to suppress RF interference.

2. EC Declaration of Conformity

Hereby, OMRON Corporation declares that this RFID System, Antenna V670-H11, V670-H51, V670-H51Q and Controller V670-CD1D-V1. Controller are in compliance with essential requirements and other relevant provisions of Directive 1995/5/EC, and satisfy tests for the appropriate requirements of the following relevant standards.

Radio: EN 300 330-2 V1.1.1 (06-2001) EN 300 300-1 V1.3.1 (06-2001)
EMC: EN 301 489-3 V1.4.1 (08-2002) EN 301 489-1 V1.4.1 (08-2002)
Safety: EN 61010-1: 2001 (2nd Edition)

Countries of intended use:
Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Romania, Spain, Sweden, Switzerland, United Kingdom

CE

3. Wireless Standards for China

V670-CD1D-V1/V670-H11
ID: 2006DJ0992
V670-CD1D-V1/V670-H51
ID: 2006DJ0990

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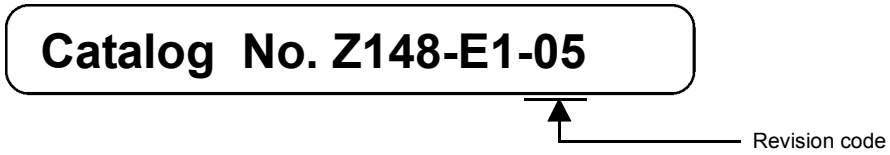
English	Hereby, Omron, declares that the RFID System, Antenna V670-H11 Series, V670-H51 Series, V670-H51Q Series, and Controller V670-CD1D Series are in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish	Omron vakuuttaa täten että RFID Säännös, Antenni V670-H11 Series, V670-H51 Series, V670-H51Q Series, jar Kontrollida V670-CD1D Series tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Dutch	Hierbij verklaart Omron dat het toestel de RFID Systeem, Antenne V670-H11 ´Serie, V670-H51 ´Serie, V670-H51Q ´Serie, en Controleur V670-CD1D ´Serie in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijh 1999/5/EG.
French	Par la présente Omron déclare que la RFID Système, Antenne V670-H11 Série, V670-H51 Série, V670-H51Q Série, et Contrôler V670-CD1D Série sont conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Swedish	Härmed intygar Omron att den RFID System, Antenn V670-H11 Serie, V670-H51 Serie, V670-H51Q Serie, och Kontrollant V670-CD1D Serie stär l överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Danish	Undertegnede Omron erklærer herved, at følgende den RFID System, Antenne V670-H11 Serie, V670-H51 Serie, V670-H51Q Serie, og Kontrollør V670-CD1D Serie overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
German	Hiermit erklärt Omron, die RFID System, Antenne V670-H11 Serie, V670-H51 Serie, V670-H51Q Serie, und Kontrolleur V670-CD1D Serie in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet. (BMWi)
Greek	ΜΕ ΤΗΝ ΡΑΡΟΥΣΑ Omron ΔΗΛΟΝΕΙ RFID ΌΥΌΘΗΜΑ, ΚΕΡΑΙΑ V670-H11 ΌΕΙΡΑ, V670-H51Q ΌΕΙΡΑ, ΚΑΙ ΚΟΥΡΟΛΗΡΥ V670-CD1D ΌΕΙΡΑ SYMMOPF ONETAI PPOS TIS OYSIODEIS APAITHSEIS KAI TIS LOIPES SXETIKES DIATAXEIS THS ODHGIAS 1999/5/EK.
Italian	Con la presente Omron dichiara che la RFID Sistema, Antena V670-H11Serie, V670-H51 Serie, V670-H51Q Serie, e Controlleur V670-CD1D Serie sono conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Spanish	Por medio de la presente Omron declara que el RFID Sistema, Antena V670-H11 Serie, V670-H51 Serie, V670-H51Q Serie, y Controlador V670-CD1D Serie esta conforme a los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Portuguese	Omron declara que a RFID Sistema, Antena V670-H11 Série, V670-H51 Série, V670-H51Q Série, e Controlador V670-CD1D Série ser conforme com os tequisitos essenciais e outras disposições da Directiva 1999/5/CE.
Romanian	Prin prezenta, Omron declară că acest V670-H11, V670-H51, V670-H51Q, V670-CD1D este conform cu cerinţele principale çi cu celelalte prevederi relevanate ale Directivei 1999/5/EC.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Properly shielded ground cables and connectors must be used for connection to host computer and/or peripherals in order to meet the FCC emission limits.
Ferrite cores (TDK Type ZCAT2032-0930 or its equivalent) must be attached to the cables connecting the power supply and ground to suppress RF interference.

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Manual Revision History

A manual revision history code is added to the end of catalog number shown at the left lower part of front cover and back cover



Revision Code	Date of Revision	Reason of Revision / Revised Page
--	October 2000	First Edition
-02	May 2003	New models have been added.
-03	March 2005	Prefix (Standard Conformity): Last line in FCC WARNING description changed and sentence added after table. Warranty and Limitations of Liability page updated. Romania added to list of countries of intended use.
-04	January 2006	Pages 1-1, 2-1, 2-5, 2-6, 3-7, 3-10, 3-11, and appendix-2: Mark removed from V670-CD1D-V1 graphic. Page 2-3: Insulation resistance changed to "20 MΩ or more (at 100 VDC mega)." Page 2-3: Withstand voltage changed to "Leakage current 20 mA or less at 1,000 VAC (for 1 minute)."
05	September 2006	Prefix (Standard Conformity): List of Chinese wireless standards added. Page 2-3: Impact changed to "15 m/s^2." Page 2-7: Leakage current under withstand voltage changed to "20 mA or less." Page 2-7: "Teflon" changed to "fluororesin" in table, total cable length added, and note 2 changed from Teflon explanation to cable extension description. Page 2-8: Graphics for V670-H11 changed. Page 2-13: Graphics for V670-A4□ changed.

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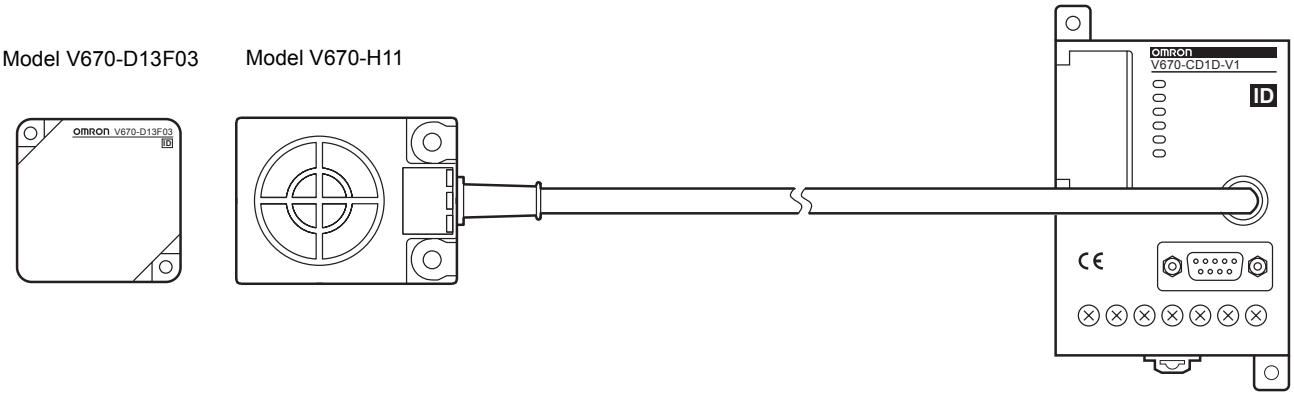
Chapter 1 Features and System Configuration

1-1 Features

The V670 Series is the electromagnetic inductive. RFID system which has achieved fast, long-life and high-performance communication. This ID system is the most suitable for process control of high-speed line and traffic control of moving object in a plant and an application that information must be updated frequently in a process.

Model V670-CD1D-V1

Model V670-D13F03 Model V670-H11



♦ ID Controller (referred to as “Controller”)

- **Model V670-CD1D-V1**
  Model V670-CD1D-V1 connects to a personal computer (referred to as "PC") and/or programmable controller (PLC) and controls the RFID system.
  Model V670-CD1D-V1 has a general-purpose I/O terminal and a function to judge and process independently (Self-Execution mode) and, therefore, a very fast system can be configured for simple process only without any host device.

♦ Antenna (referred to as “Antenna”)

- **Model V670-H11**
  Model V670-H11 is a waterproof antenna (standard antenna) with dimensions of 4 × 5.3 cm. Model V670-H11 can achieve the communication range of 20 mm in combination with model V670-D13F03. Model V670-H11 has a very fast communication performance and can transfer 12 bytes of data in approximately 5 ms.

- **Model V670-H51**
  Model V670-H51 is a cylindrically-shaped waterproof antenna. Model V670-H51 can achieve a communication range of 5.0 mm when combined with Model V670-D13F01 or V670-D13F01H tag. Model V670-H51 has a communication performance as high as that of Model V670-H11.

- **Model V670-H51Q**
  Model V670-H51Q is a cylindrically-shaped antenna. Housed in a Teflon (tetrafluoroethylene) casing, Model V670-H51Q is highly resistant to chemicals. Model V670-H51Q can achieve a communication range of 4.5 mm when combined with Model V670-D13F01 or V670-D13F01H tag. Model V670-H51Q has a communication performance as high as that of Model V670-H11.

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♦ ID tag (referred to as “Tag”)

- **Model V670-D13F03**
  Model V670-D13F03 is a waterproof tag which has 128 bytes of memory capacity with dimensions of 40 × 40 mm. Model V670-D13F03 uses high-performance nonvolatile memory called Ferroelectric RAM (FeRAM) as internal memory. So, memory life is semi-permanent. (The memory can be accessed one billion times.)

- **Model V670-D13F01**
  Model V670-D13F01 is a rectangular tag with dimensions of 8 mm × 16 mm. Model V670-D13F01 is highly resistant to chemicals since it is housed in a PPS casing filled with chemical-resistant epoxy resin. Model V670-D13F01 has the same memory capacity and characteristics as those of Model V670-D13F03.

- **Model V670-D13F01H**
  Model V670-D13F01H is a tag provided with screw holes to assure the same performance and construction as those of Model V670-D13F01, and is easy to install.

- **Model V670-A81**
  Model V670-A81 is an attachment specially designed for Model V670-D13F01H. When combined with Model V670-A81, Model V670-D13F01H retains its original communication range even when fitted to a steel structure. Made of PPS, Model V670-A81 is highly resistant to chemicals.

♦ Easy to use

By connecting the programming console model C200H-PRO27 (unbundled, referred to as "ProCon") to the Controller via the special cable model V700-P10 (unbundled), the system operation status and error log information can be read. This is useful for system start-up and maintenance at a working site.

Ferroelectric RAM (FeRAM)
Ferroelectric RAM is one of nonvolatile RAMs and data can be written into and read from it faster than conventional memory (such as EEPROM and flash ROM). Data can be written into the ferroelectric RAM semi-permanently.
While any conventional RAM cannot hold data if nothing is written into it for a specified period (approximately 10 years), the ferroelectric RAM can hold data if anything is written into or read from it. So, the characteristic of ferroelectric RAM is very excellent in data-holding performance.

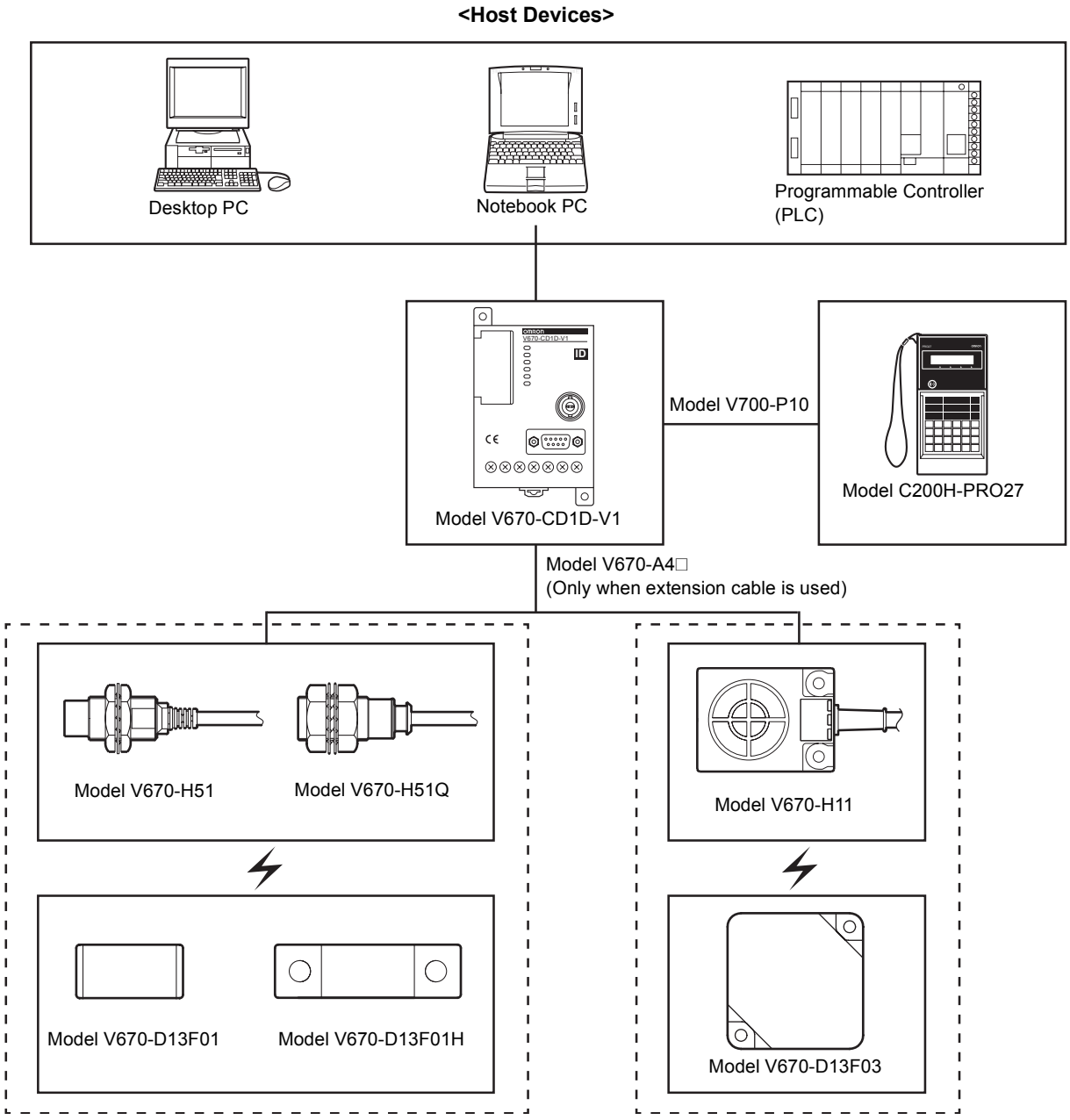
Precaution for Correct use

In consequence of diversification of small-size antennas/tags, the ID controller has been upgraded to Model V670-CD1D-V1. Be sure to combine Model V670-H51 or Model V670-H51Q antenna with Model V670-CD1D-V1 controller. Combination of this antenna with Model V670-CD1D controller might result in unstable communication.

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1-2 System Configuration

- **Example of Model V670-CD1D-V1 system configuration**
  Model V670-CD1D-V1 contains a serial interface based on RS-232C and can connect easily to a general-purpose PC and programmable controller (PLC). Model V670-CD1D-V1 has a command execution mode and self-execution mode as an operation mode and controls the communication to a tag according to the instructions from a host device (in the command execution mode) or the registered conditions (in the self-execution mode).



Precaution for Correct use
In consequence of diversification of small-size antennas/tags, the ID controller has been upgraded to Model V670-CD1D-V1. Be sure to combine Model V670-H51 or Model V670-H51Q antenna with Model V670-CD1D-V1 controller. Combination of this antenna with Model V670-CD1D controller might result in unstable communication.

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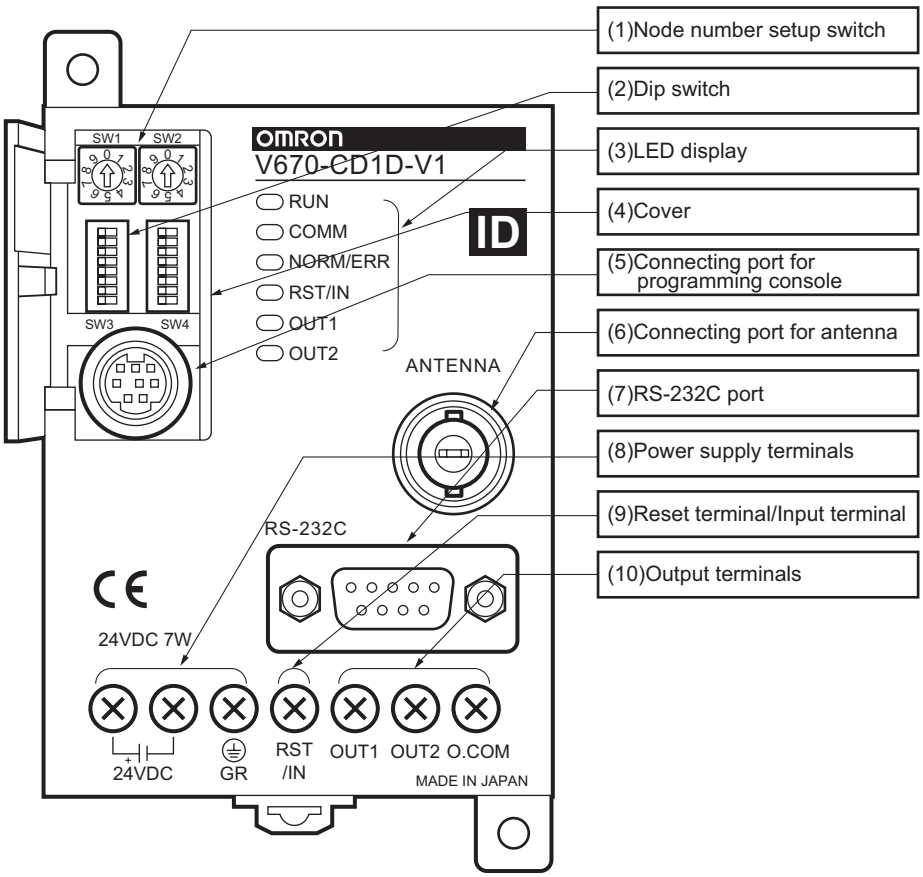
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Chapter 2 Specifications and Performance

2-1 Controller

2-1-1 Component Names and Functions

- **Model V670-CD1D-V1**



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No.	Name		Function	Description
(1)	Note number setup switch		Sets a controller node number.	Used to identify the controllers when a maximum of 31 controllers are connected to one host computer.
(2)	Dip switch		Sets every mode.	Sets an input function, operation mode, protocol, communication conditions, etc.
(3)	LED display		An operation status is shown on this LED displayed.	
	RUN	Green	Shows the RUN status.	Turns on when an operation is normal.
	COMM	Green	Shows an operation status.	Turns on during the communication to a tag.
	NORM/ERR	Green	Shows the end of communication.	Turns on once and turns off when the communication has ended correctly.
		Red	Shows an error.	Turns on once and turns off when the communication has ended due to an error. Turns on when a system error occurs.
	RST/IN	Green	Shows an input status.	Turns on when the RST/IN input signal turns ON.
	OUT1	Green	Shows an output status.	Turns on when the OUT1 output signal turns ON.
	OUT2	Green	Shows an output status.	Turns on when the OUT2 output signal turns ON.
(4)	Cover		Cover common to (1), (2) and (5).	Open as necessary.
(5)	Connecting port for programming console		Used to connect a programming console.	Our programming console type C200H-PRO27 (unbundled) can connect to this port through the connecting cable model V700-P10 (unbundled). When you operate the programming console, use the key sheet that comes with the V700-P10.
(6)	Connecting port for antenna		Used to connect an antenna.	One antenna can connect to this port. To extend the cable, use model V670-A4□(unbundled).
(7)	RS-232C port		Used to connect a host device.	Based on the RS-232C, a general-purpose programmable controller (PLC) and PC can connect to this port.
(8)	Power supply terminal		Terminal for power supply.	
	24 VDC+		Supplies the power.	Connects the "+" side of 24 VDC power supply.
	24 VDC-			Connects 0 V.
	GR			Ground Class D (Class III).
(9)	Input terminal		Terminal for input.	
	RST/IN		Supplies a reset signal or trigger signal.	When external reset input and external trigger input are used, they connects to this terminal together with 24 VDC- in pairs. Function can be selected with a dip switch.
(10)	Output terminal		Terminal for output.	
	OUT1		Output signal 1	When external output is used, it connects to this terminal together with O.COM in pairs.
	OUT2		Output signal 2	
	O.COM		Output common	

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2-1-2 General Specifications

Item	Specifications
Model	V670-CD1D-V1
Power supply voltage (Power consumption)	24 VDC±10% (7 W or less)
Ambient operating temperature	0 to +55°C (no icing)
Ambient operating humidity	35 to 85%RH (no condensation)
Ambient storage temperature	-20 to +75°C (no icing)
Ambient storage humidity	35 to 85%RH (no condensation)
Insulation resistance	20 MΩ or more (at 100 VDC mega) (1) to (6). (1) Between a group of the power supply terminals and the grounding terminal. (2) Between a group of the power supply terminals and a group of the output terminals. (3) Between a group of the power supply terminals and the case. (4) Between a group of the output terminals and the grounding terminal. (5) Between a group of the output terminals and the case. (6) Between the grounding terminal and the case.
Withstand voltage	Leakage current 20 mA or less at 1,000 VAC (for 1 minute). Impressed to (1) to (6) above.
Protective structure	Contains a panel.
Vibration resistance	10 to 150 Hz, double amplitude 0.2 mm, acceleration 15 m/s^2. Performing sweep 10 times for 8 minutes in an upward, downward, leftward, rightward, forward and backward directions.
Impact	Giving impact of 15 m/s^2 3 times each in upward, downward, leftward, rightward, forward and backward directions, i.e., 18 times in total.
Ground	According to Class D (conventional Class III)
Material	PC/ASA resin
Weight	Approximately 270 g
Installation	DIN or M4 screws

2-1-3 Performance Specifications

Item	Specifications
Communication function	Single/Repeat/Input mode access function. Write protect function/Memory check function Self-Execution Function
Maintenance function	Error reading function
Diagnosis function	CPU error, host communication error, satellite communication error.
I/O function	Input contact: 1 (RST/IN) Output contact: 2 (OUT1 and OUT2)

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2-1-4 Communication Specifications

Item	Specifications
Base specification	RS-232C
Communication method	EIA/TIA-232-E
Transmission rate	9600 bps, 19200 bps, 38400 bps, 115200 bps *
Synchronization method	Start-stop synchronization (Stop bit 1 or 2) *
Transmission code	ASCII7 unit or JIS8 unit *
Error control	Vertical parity (even, odd, nil)*. Horizontal parity is used as FCS.
Line length	A maximum of 15 m.
Suitable connector	D-SUB 9-pin, male Model XM2A-0901 (plug) and model XM2S-0911 (hood), which come with our controller.
Recommendable cable	CO-MA-VV-SB 5Px28AWG (Hitachi Cable)

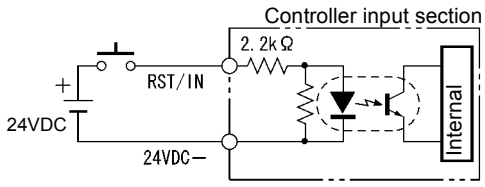
* This can be set by a dip switch of the controller. For how to set, refer to Chapter 3.

2-1-5 I/O Specifications

- **Input Specifications (RST/IN)**

Item	Specifications
Input voltage	24 VDC ±10% (including ripple)
Input impedance	2.2 kΩ
Input current	10 mA TYP (24 VDC)
ON voltage	19 to 24 V
OFF voltage	5 V or less
Input response time	40 μs or less

Circuit Structure

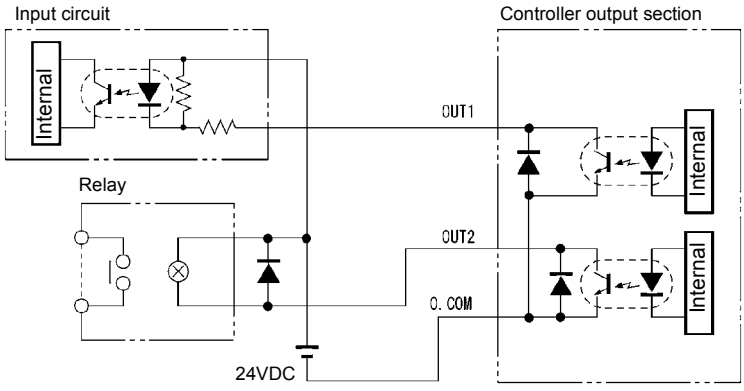


- **Output Specifications (OUT1/OUT2)**

The output is the open collector specification.

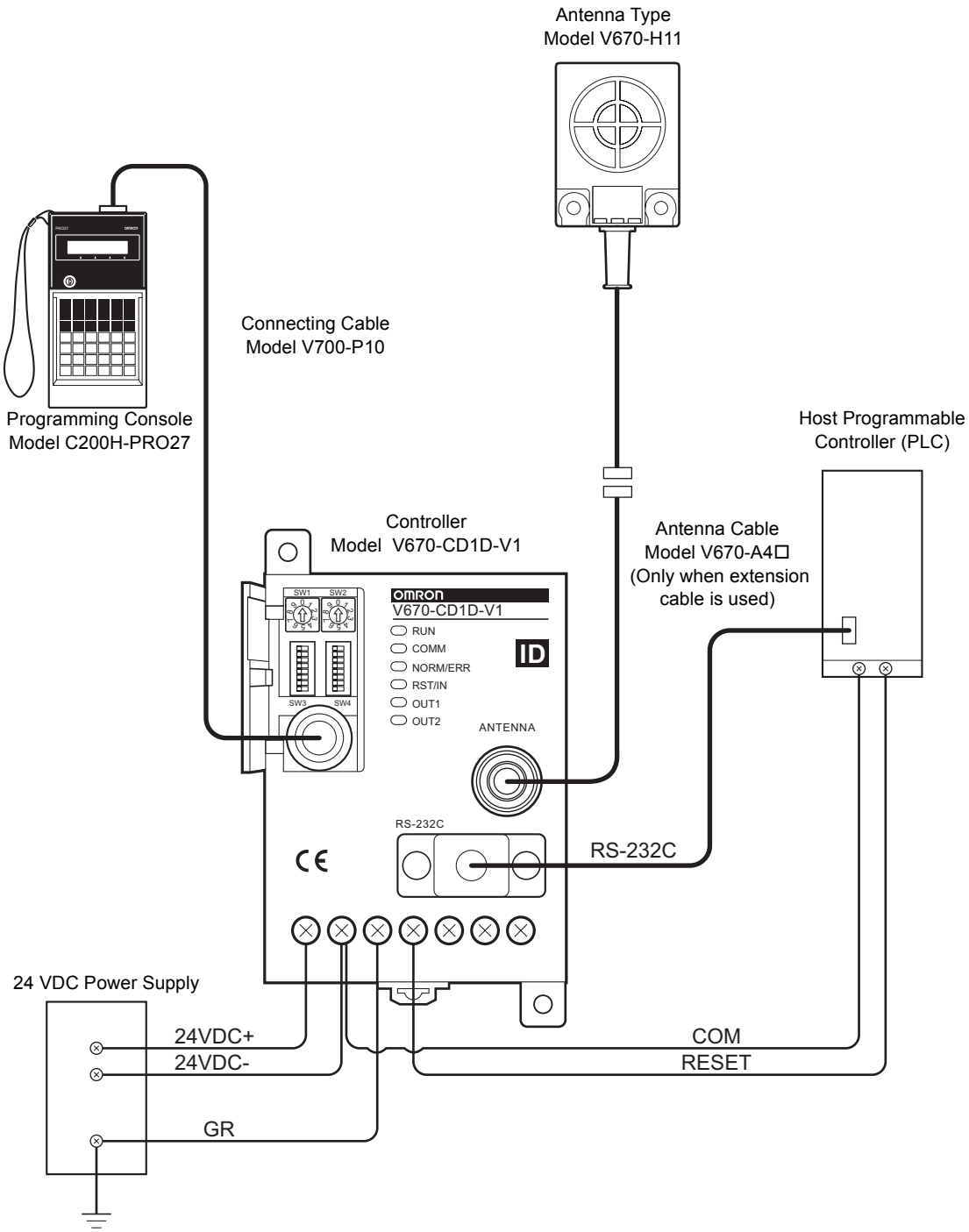
Item	Specifications
Maximum open/close ability	24 V ±10% 100 mA
Leakage current	1 μA or less
Residual voltage	1.0 V or less

Circuit Structure



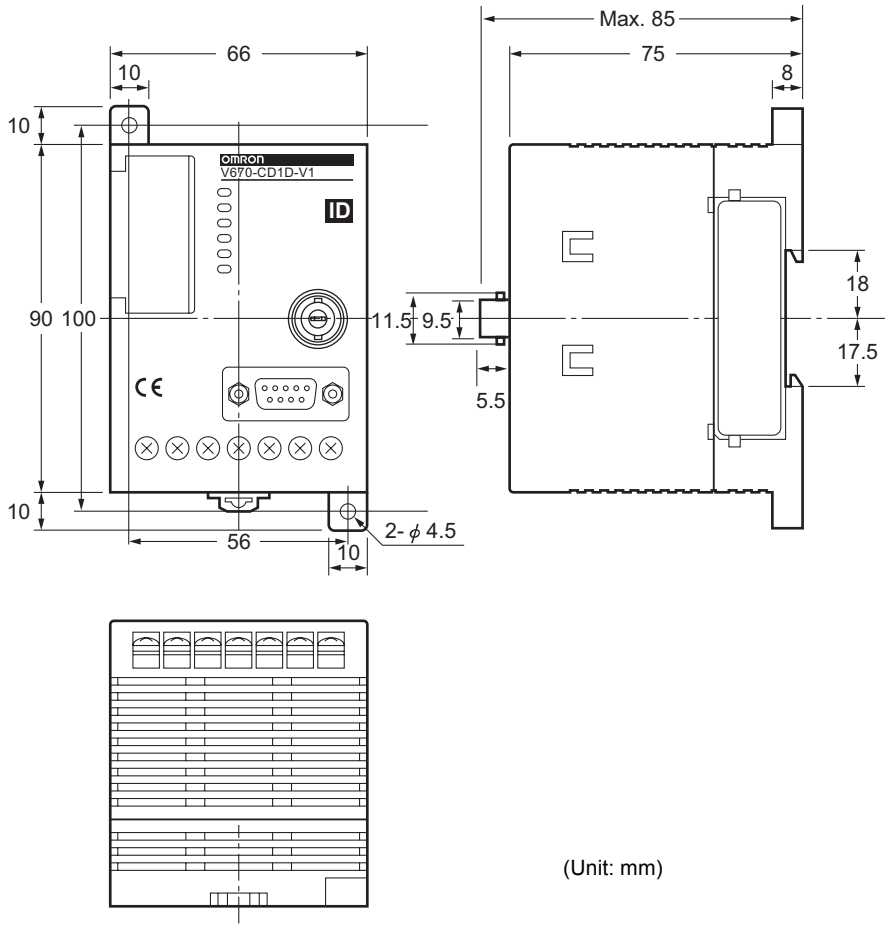
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2-1-6 Example of Wiring



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2-1-7 Outside Dimension



(Unit: mm)

Case material	PC/ASA resin

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2-2 Antenna

2-2-1 Specifications

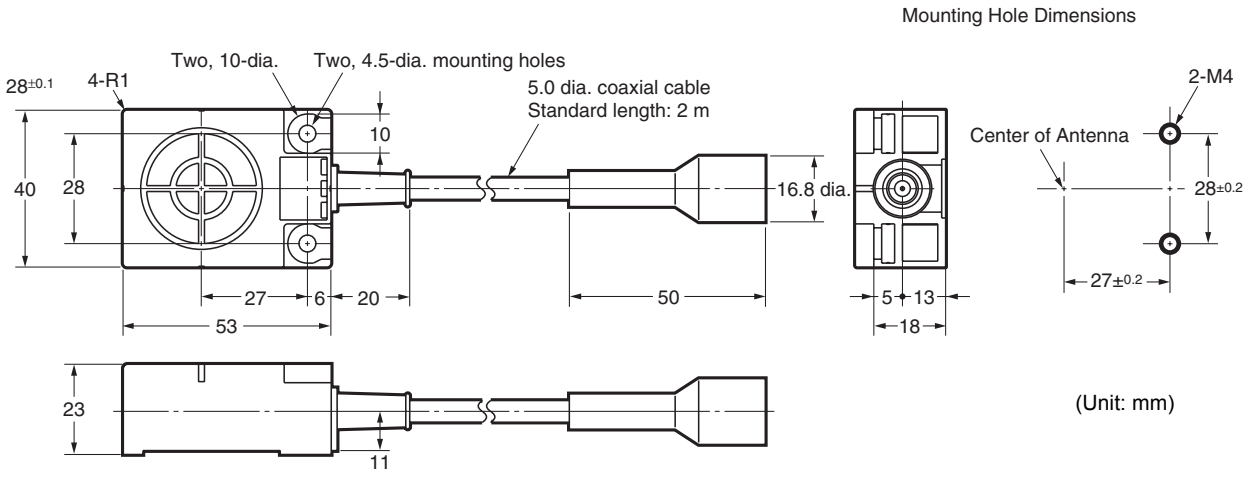
Item	Specifications		
Model	V670-H11	V670-H51	V670-H51Q
Oscillating frequency	13.56 MHz		
Ambient operating temperature	-10 to +70°C		
Ambient operating humidity	35 to 85%RH	35 to 95%RH	
Ambient storage temperature	-25 to +85°C	-25 to +75°C	
Ambient storage humidity	35 to 85%RH	35 to 95%RH	
Insulation resistance	20 MΩ or more (at 1,000 VDC mega). Impressed between a group of terminals and a case.		
Withstand voltage	1,000 VAC (for 1 minute). Impressed between a group of terminals and a case. Leakage current 20 mA or less.		
Protective structure	IP67 (IEC60529 Standard) *1		IP67 (IEC60529 Standard) *1 IP67g (for communication side only, JEM Standard)
Vibration resistance	10 to 150 Hz, double amplitude 0.7 mm, acceleration 50 m/s^2. Performing sweep 10 times for 8 minutes in an upward, downward, leftward, rightward, forward and backward directions.	10 to 500 Hz, double amplitude 1.5 mm, acceleration 100 m/s^2. Performing sweep 10 times for 11 minutes in an upward, downward, leftward, rightward, forward and backward directions.	
Impact	Giving impact of 150 m/s^2 3 times each in upward, downward, leftward, rightward, forward and backward directions, i.e., 18 times in total.	Giving impact of 300 m/s^2 3 times each in upward, downward, leftward, rightward, forward and backward directions, i.e., 18 times in total.	
Material	ABS/epoxy filler (Cable section material is PVC.)	PBT/brass/filled with epoxy resin	Fluororesin/filled with epoxy resin
Cable length	2 m (total length: 30 m*2)		
Weight	Approximately 160 g	Approximately 140 g	Approximately 130 g

*1: Connectors are not waterproof.
*2: Extending the cable length reduces the communication distance. The communication distance also varies depending on the type of extension cable. For details, refer to the section with communication distance specifications.

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2-2-2 Outside Dimension

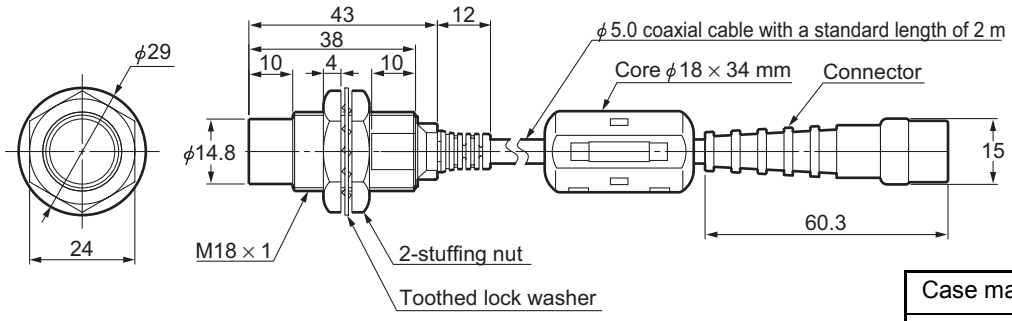
- **Model V670-H11**



(Unit: mm)

Case material	ABS resin
Filler resin	Epoxy resin
Cable	PVC

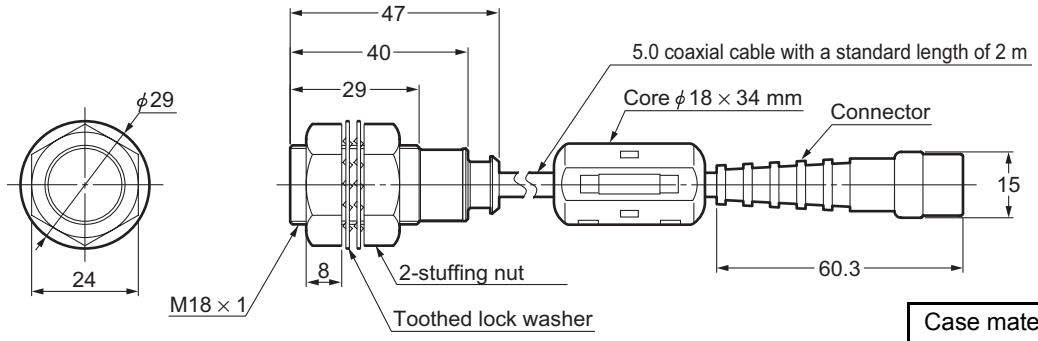
- **Model V670-H51**



(Unit: mm)

Case material	Brass/PBT
Filler resin	Epoxy resin
Cable	PVC

- **Model V670-H51Q**



(Unit: mm)

Case material	Teflon
Filler resin	Epoxy resin
Cable	PVC

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2-3 Tag

2-3-1 Specifications

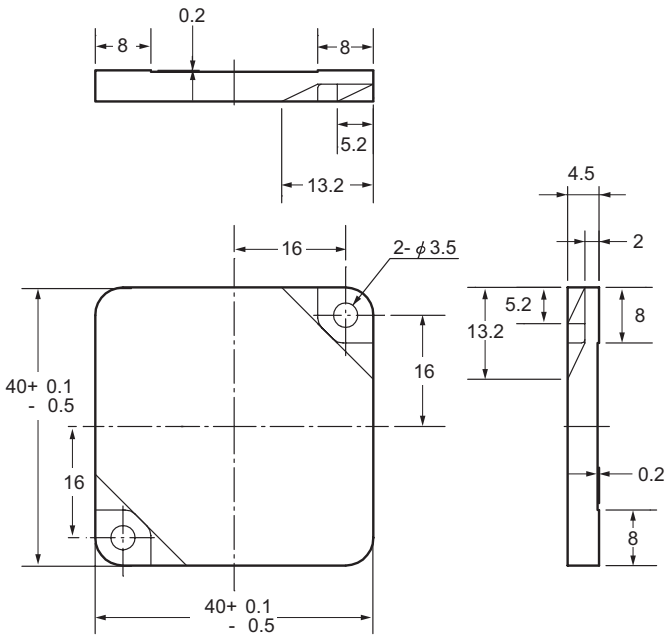
Item	Specifications		
Model	V670-D13F01	V670-D13F01H	V670-D13F03
Memory capacity	128 bytes		
Type of memory	FeRAM (Ferroelectric RAM)		
Memory life	Number of accesses*: One billion		
Data-holding period	10 years after accessing (read or write).		
Ambient operating temperature	-10 to +70°C		
Ambient storage temperature	-10 to +70°C		
Ambient operating humidity	35 to 95%RH		35 to 85%RH
Protective structure	IP67 (IEC60529 Standard)		
Vibration	10 to 2000 Hz, double amplitude 1.5 mm, acceleration 150 m/s^2. Performing sweep 10 times for 15 minutes in an upward, downward, leftward, rightward, forward and backward directions.		
Impact	Giving impact of 500m/s^2 3 times each in upward, downward, leftward, rightward, forward and backward directions, i.e., 18 times in total.		
Material	PPS/epoxy filler resin		ABS/epoxy filler resin
Weight	Approximately 1 g	Approximately 1 g	Approximately 6 g

* Number of accesses is the total number of read/write communication times.

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2-3-2 Outside Dimension

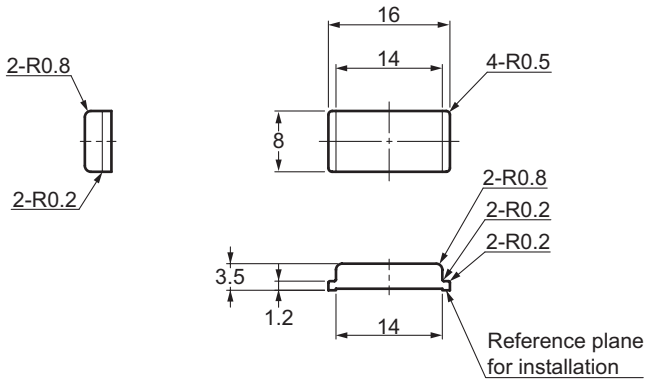
- **Model V670-D13F03**



Case material	ABS resin
Filler resin	Epoxy resin

(Unit: mm)

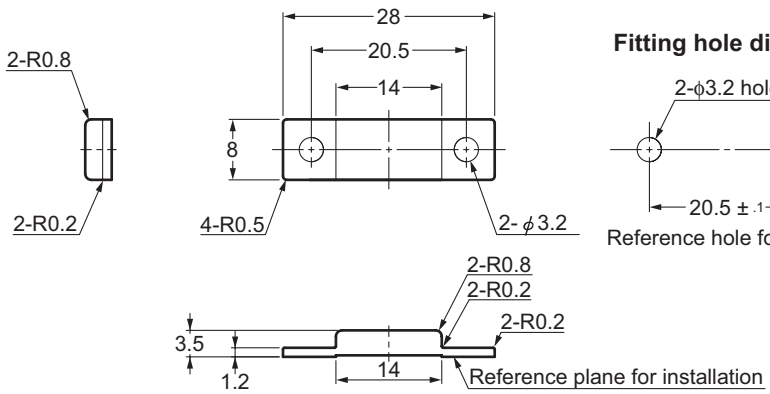
- **Model V670-D13F01**



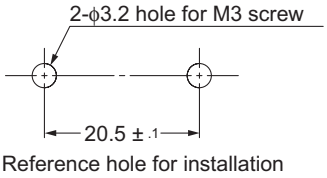
Case material	PPS resin
Filler resin	Epoxy resin

(Unit: mm)

- **Model V670-D13F01H**



Fitting hole dimension



Case material	PPS resin
Filler resin	Epoxy resin

(Unit: mm)

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2-3-3 Memory Map

There are a user area and ID code in memory in a tag. Memory capacity of user area is 128 bytes. You can write 1 byte of data into one address. Memory area is divided into 4 bytes of pages and every page has its own address like 0000h to 0003h, 0004h to 0007, etc.

♦ Memory Map

<table>
<tr><th rowspan="2">Page</th><th rowspan="2">User Address</th><th colspan="2">User Area</th></tr>
<tr><td>When a protect function is not used</td><td>When a protect function is used</td></tr>
<tr><td rowspan="4">1</td><td>$0000</td><td rowspan="8">User Area</td><td rowspan="4">Specified address in a protect area</td></tr>
<tr><td>$0001</td></tr>
<tr><td>$0002</td></tr>
<tr><td>$0003</td></tr>
<tr><td rowspan="4">.
.
.
.</td><td>$0004</td><td rowspan="4">User Area</td></tr>
<tr><td>.
.
.
.</td></tr>
<tr><td>$007F</td></tr>
</table>

* When a protect function is used, the addresses 0000h to 0003h are used as protect address information and cannot be used as a user area. For details, refer to "4-6 Write Protection Function".

♦ ID Code

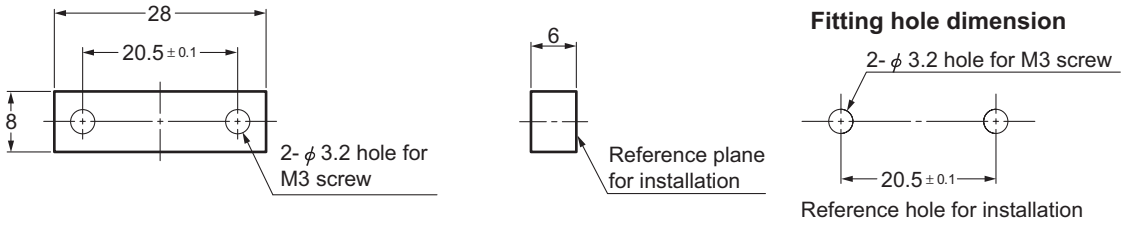
This is a 4-byte area where tag identification number (inherent tag number) is written. The ID code is written at shipment from a factory and it cannot be modified. The ID code can be read by an ID read command.

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2-3-4 Attachment (Model V670-A81) for Model V670-D13F01H Tag

When a tag is attached to a metal structure, the metal will reduce the communication range of the tag. Model V670-A81 is an attachment specially designed for Model V670-D13F01H Tag. When combined with this attachment, Model V670-D13F01H tag retains its original communication range even when installed on a metal structure.
Tag to be combined: Model V670-D13F01H

♦ Outside Dimension



Material	PPS resin

♦ How to install

Place the attachment on the reference plane of the tag and adjust its position until the fitting holes align with each other. Then secure both parts with M3 screws.
Screw tightening torque: 5 N • m

♦ For general applications

Conform to the tag specifications.

♦ Influence of back metal

Use of this attachment increases the distance between the tag and metal surface to 6 mm. Before use, refer to Chapter 9-4, "Influence of Back Metal of Tag."

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2-4 Cable

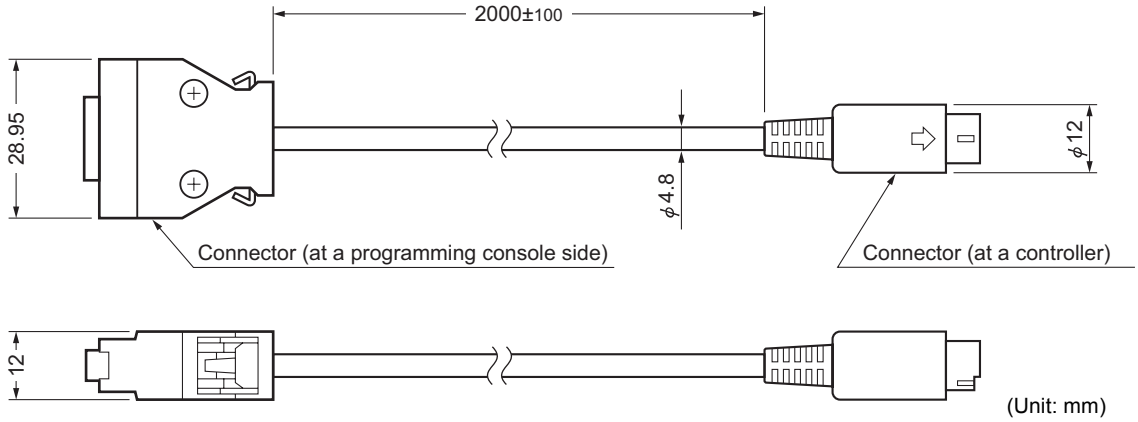
2-4-1 Specifications

Item \ Model	Model V700-P10	Model V670-A4☐
Insulation resistance	50 MΩ or more between a terminal and sheathing (at 250 VDC mega).	20 MΩ or more between a terminal and sheathing (at 1000 VDC mega).
Withstand voltage	250 VAC, 1 minute.	1000 VAC, 1 minute.
Maximum operating temperature	70°C	70°C
Remarks	Connector without waterproof specification.	Connector without waterproof specification.

2-4-2 Outside Dimension

- **Model V700-P10 (Programming console connecting cable)**

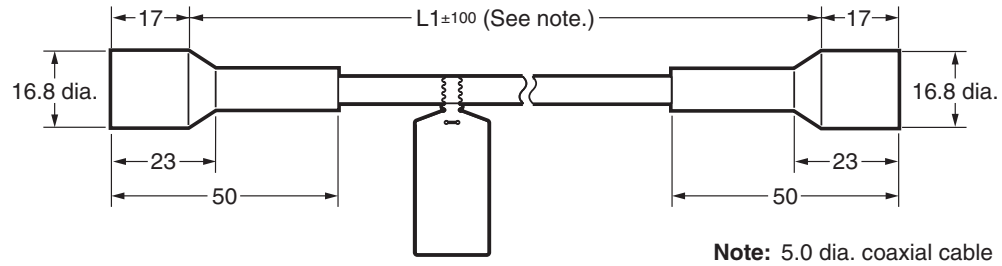
Item	Model V700-P10
Length	Approximately 2 m
Weight	Approximately 110 g



(Unit: mm)

- **Model V670-A4☐ (Antenna extension cable)**

Item \ Model	Model V670-A40	Model V670-A41	Model V670-A42	**Model V670-A43**
Length	Approximately 3 m	Approximately 10 m	Approximately 18 m	Approximately 28 m
Weight	Approximately 140 g	Approximately 410 g	Approximately 710 g	Approximately 1100 g
L1	3000 mm	10000 mm	18000 mm	28000 mm



Note: 5.0 dia. coaxial cable
Standard length: 10 m

(Unit: mm)

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2-5 Communication Range Specifications

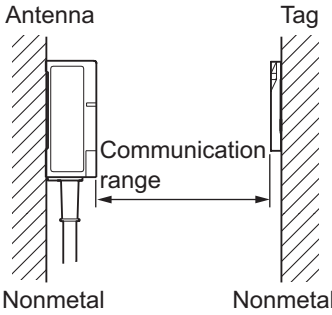
Communication range varies depending on the installation conditions and environment conditions. Check the conditions mentioned in this manual carefully.

♦ Maximum communication range

Antenna / Controller	ID Tag	Communication Range
Model V670-H11 + Model V670-CD1D-V1	Model V670-D13F03	5 to 23 mm (Area width 20 mm or more if the range between a tag and antenna is 5 to 20 mm.)
Model V670-H51 + Model V670-CD1D-V1	Model V670-D13F01 / Model V670-D13F01H	0.5 to 5.0 mm
Model V670-H51Q + Model V670-CD1D-V1	Model V670-D13F01 / Model V670-D13F01H	0.5 to 4.5 mm

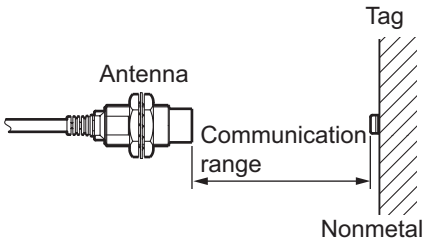
Measurement conditions:

- **Combination of Model V670-H11 with Model V670-D13F03**



*Antenna extension cable (Model V670-A4☐: not used)

- **Combination of Model V670-H51/H51Q with Model V670-D13F01/D13F01H**



*Antenna extension cable (Model V670-A4☐: not used)

♦ Use of extension cable (Model V670-A4☐)

Use of an extension cable will reduce the communication range.

Extension cable	Communication range		
	Model V670-H11	Model V670-H51	Model V670-H51Q
Model V670-A40 (3 m)	5.0 to 21.5 mm	0.5 to 5.0 mm	0.5 to 4.5 mm
Model V670-A41 (10 m)	5.0 to 21.0 mm	0.5 to 5.0 mm	0.5 to 4.5 mm
Model V670-A42 (18 m)	5.0 to 20.5 mm	0.5 to 4.0 mm	0.5 to 3.5 mm
Model V670-A43 (28 m)	5.0 to 20.0 mm	0.5 to 4.0 mm	0.5 to 3.5 mm

* For extension cable connection procedure, refer to the descriptions on pages 3-9 and the instruction manual packaged together with the extension cable.

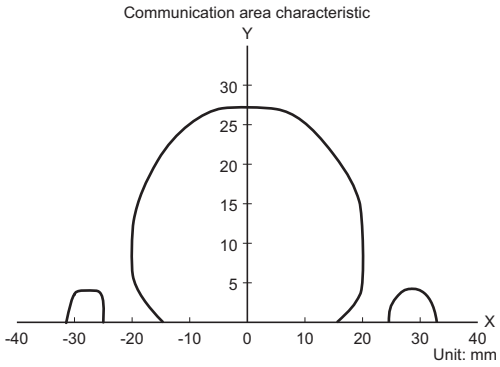
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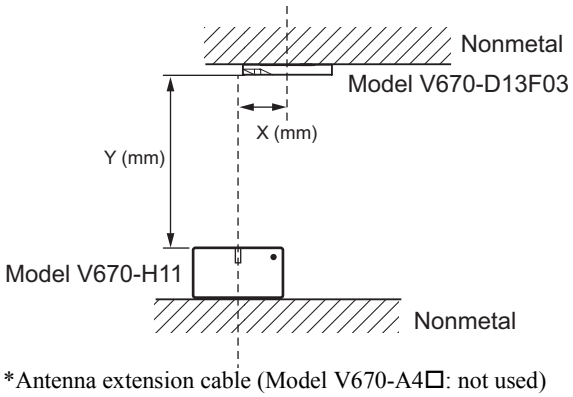
2-5-1 Communication Area (Reference)

♦ Combination of Model V670-H11 with Model V670-D13F03

The communication area varies depending on the installation conditions and grounding environment.

The operation area formed on a plane, which is on an antenna center line and vertical to the antenna, is shown below.





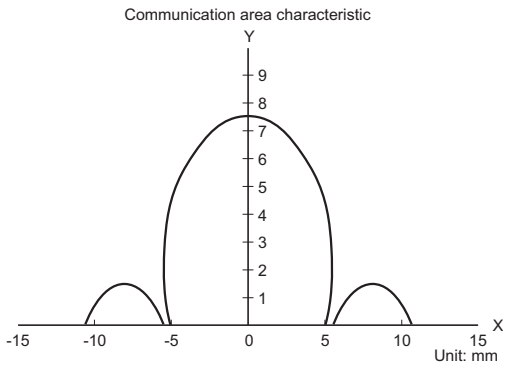
*Antenna extension cable (Model V670-A4☐: not used)

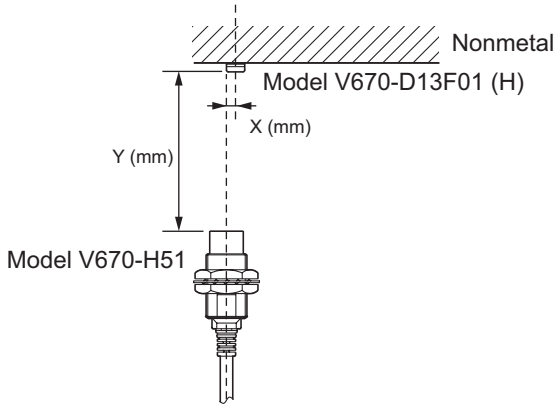
♦ Combination of Model V670-H51 with Model V670-D13F01/ D13F01H

The communication area varies depending on the installation conditions and grounding environment.

The operation area formed on a plane, which is on an antenna center line and vertical to the antenna, is shown below.

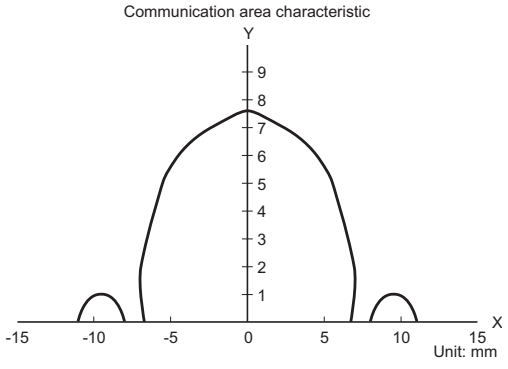
- **When tag is attached perpendicular to the passing direction (X-direction) (typical example)**

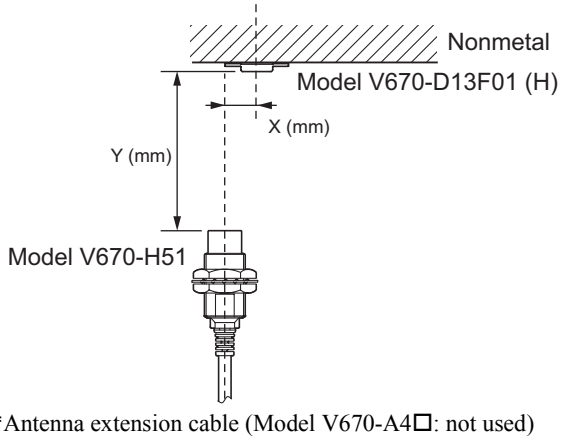




*Antenna extension cable (Model V670-A4☐: not used)

- **When tag is attached horizontally in relation to the passing direction (X-direction) (typical example)**





*Antenna extension cable (Model V670-A4☐: not used)

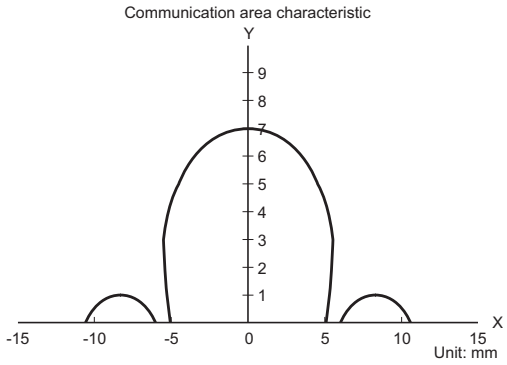
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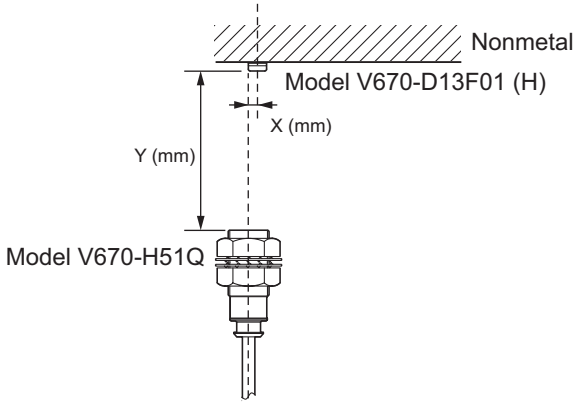
♦ Combination of Model V670-H51Q with Model V670-D13F01/ D13F01H

The communication area varies depending on the installation conditions and grounding environment.

The operation area formed on a plane, which is on an antenna center line and vertical to the antenna, is shown below.

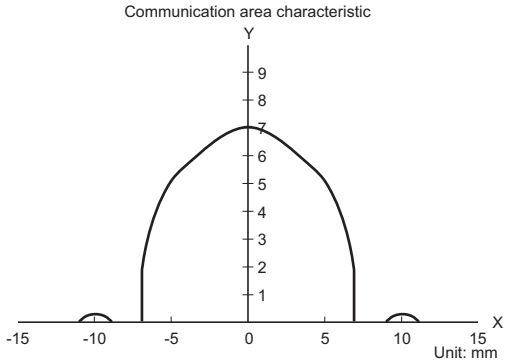
- **When tag is attached perpendicular to the passing direction (X-direction) (typical example)**

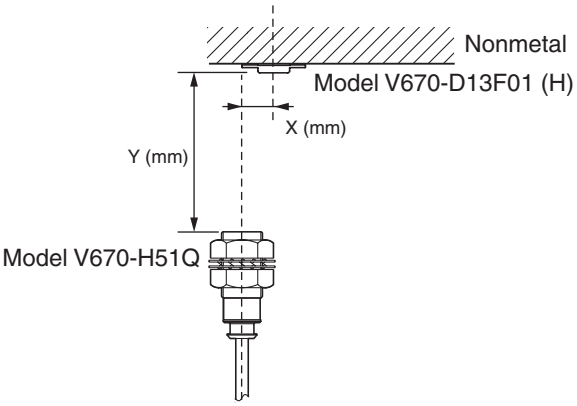




*Antenna extension cable (Model V670-A4☐: not used)

- **When tag is attached horizontally in relation to the passing direction (X-direction) (typical example)**



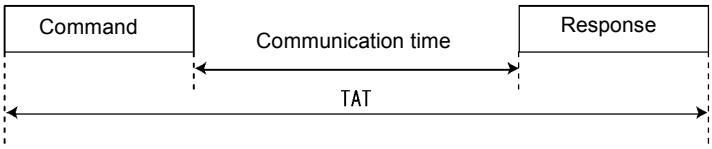


*Antenna extension cable (Model V670-A4☐: not used)

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2-5-2 Operation Time (Reference)

There are TAT (Turn Around Time) and communication time in the operation time.

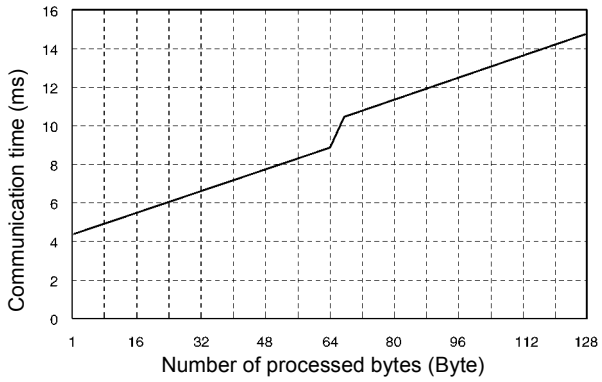


TAT means the total processing time required to operate V670 from the viewpoint of a host device. The communication time means a time required for the communication between an antenna and tag, excluding host communication.

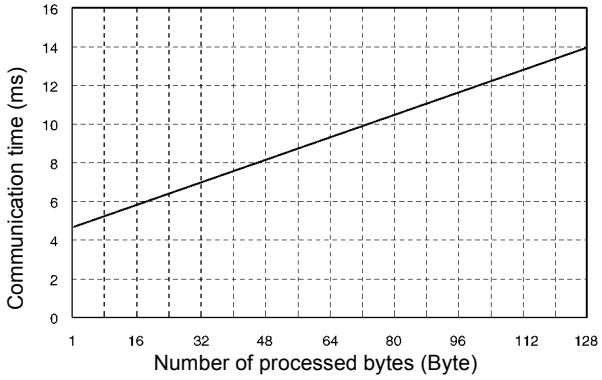
♦ Communication time

Time required for the communication between an antenna and ID tag. The time varies depending on data amount to be read and written. The communication time can be calculated from the charts and formulas below.

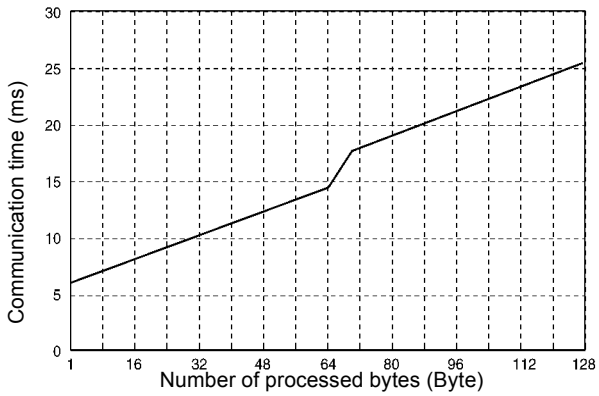
- **Read**



- **Write**



- **Write (with verification)**



Command	Bytes	Communication time (ms)
Read	1 to 64 bytes 65 to 128 bytes	0.07 x N + 4.22 0.07 x N + 5.64
ID Read	4 bytes	1.59
Write	1 to 128 bytes	0.07 x N + 4.72
Write (with verification)	1 to 64 bytes 65 to 128 bytes	0.14 x N + 6.45 0.14 x N + 7.79

N: Number of bytes to be processed

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In the communication with a tag, any data is read and written at every 4 bytes. Therefore, to minimize the communication time, specify the address and the number of bytes suitably so that the address for writing can be a multiple of 4.
Example: If 4 bytes of data is written from the address 0001h, change the address to 0000h.
If you cannot change as stated above due to the structure of change system, add the following time to the communication time.

When a protect function is used	+2.9 ms
When a start address is not a multiple of 4	+2.9 ms
When an end address (start address + the number of addresses) is not a multiple of 4	+2.9 ms

♦ TAT

Time from the start of command transmission by a host device to the end of receiving of response to the host device. It can be calculated from the communication time and the number of characters of command/response. The formula is as follows:

TAT = command transfer time + communication time + response transmission time

$$\text{Transmission time} = \frac{\text{Bits per character (bit)}}{\text{Baud rate (bps)}} \times \text{number of characters (second)}$$

* The number of bits per character and baud rate vary depending on the communication conditions (baud rate, data length, parity and stop bit).

Assuming that the number of characters of command is A, the number of characters of response is B, the baud rate is 9600 bps, data length is 7 bits, parity is even and stop bit is 2 bits, the following formula can be obtained:

$$\text{TAT} = \frac{11 \times (A + B)}{9600} + \text{communication time (second)}$$

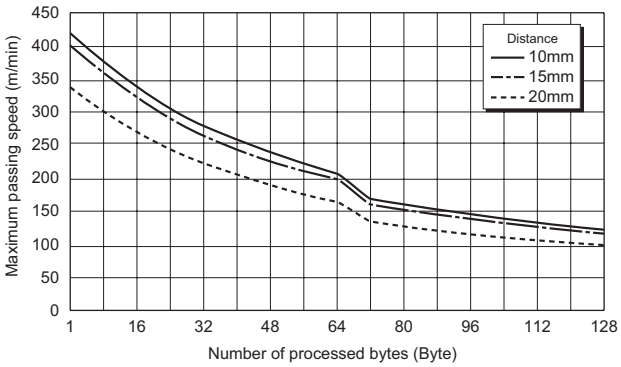
Correct Usage
The formula above calculates the time when processing (transmission of command) starts if the ID tag is within an area of communication with an antenna. The time varies depending on a communication mode and ID tag status.

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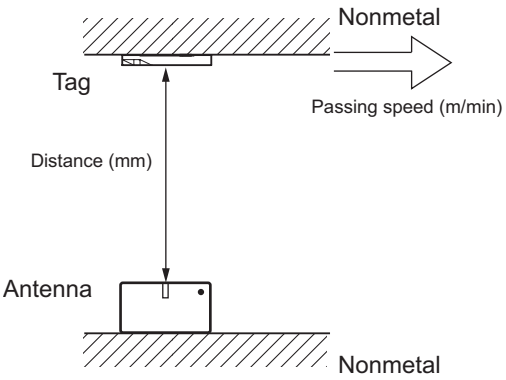
2-5-3 Traffic and Passing Speed (Reference)

♦ Combination of Model V670-H11 with Model V670-D13F03

- **Read**

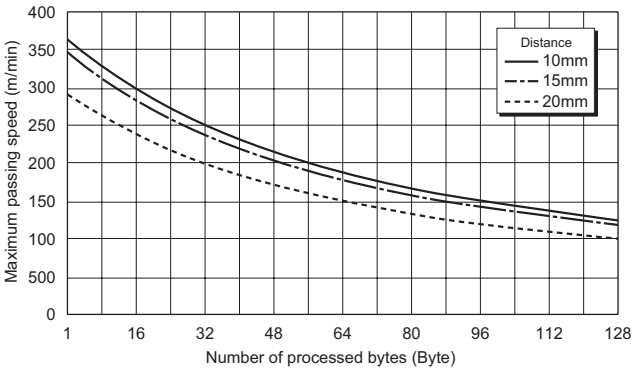


Measurement Conditions:

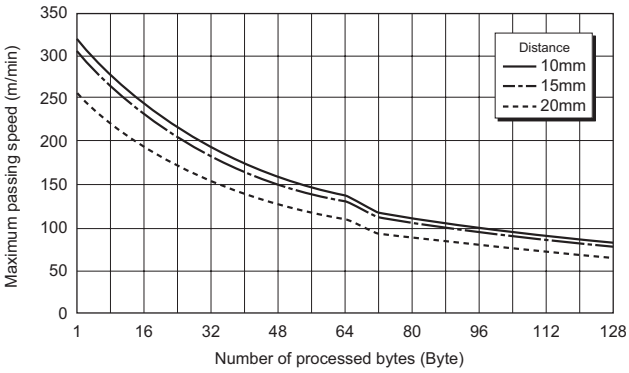


*Antenna extension cable (Model V670-A4☐: not used)

- **Write (without verification)**



- **Write (with verification)**



* Passing speed varies depending on the distance Y (between tag and antenna), axial displacement, etc. Refer to the data on communication area to use the product over its widest communication range.
* Graphs are for reference only. Prior to practical application, carry out the evaluation test of the product.
* Graphs do not include communication error correction.

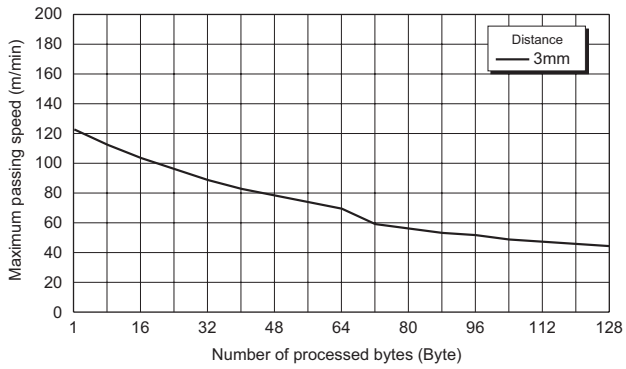
- **ID Read**

Distance	Passing speed
10 mm	750 m/min
15 mm	710 m/min
20 mm	600 m/min

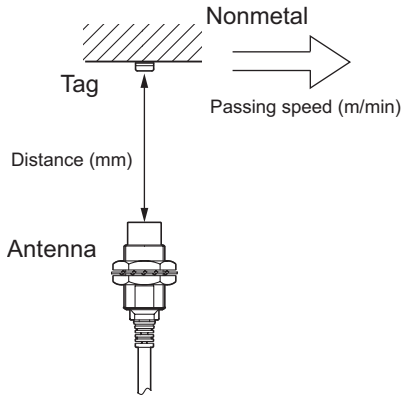
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♦ Combination of Model V670-H51/H51Q with Model V670-D13F01/D13F01H

- **Vertical**
- **Read**

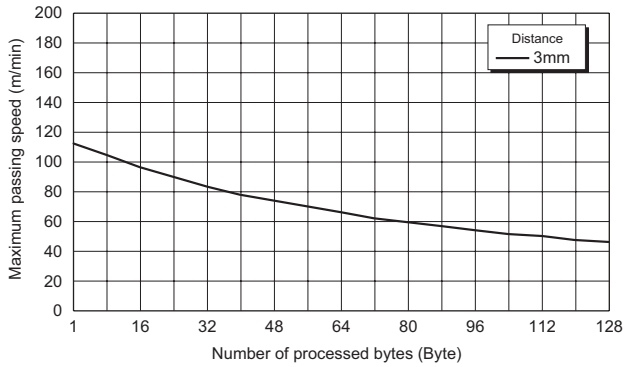


Measurement Conditions:

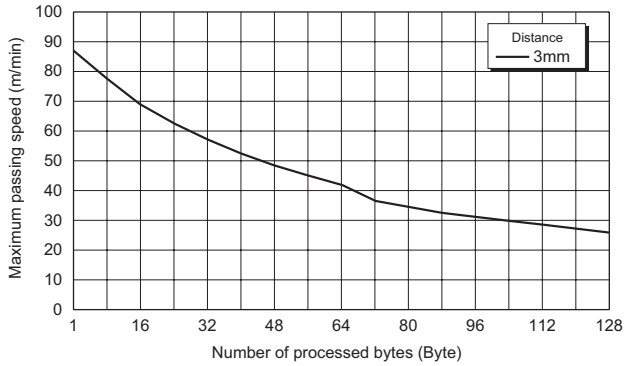


*Antenna extension cable (Model V670-A4☐: not used)

- **Write (without verification)**



- **Write (with verification)**



* Passing speed varies depending on the distance Y (between tag and antenna), axial displacement, etc. Refer to the data on communication area to use the product over its widest communication range.
* Graphs are for reference only. Prior to practical application, carry out the evaluation test of the product.
* Graphs do not include communication error correction.

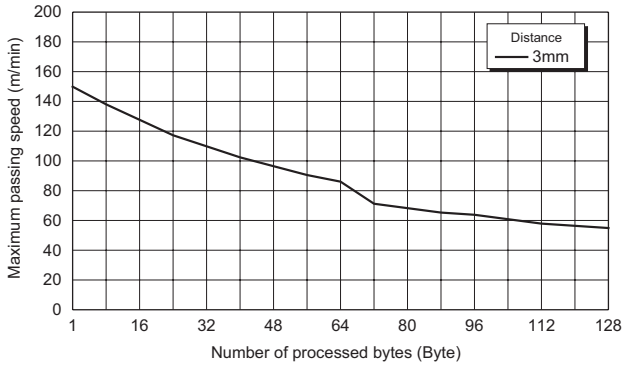
- **ID Read**

Distance	Passing speed
3 mm	225 m/min

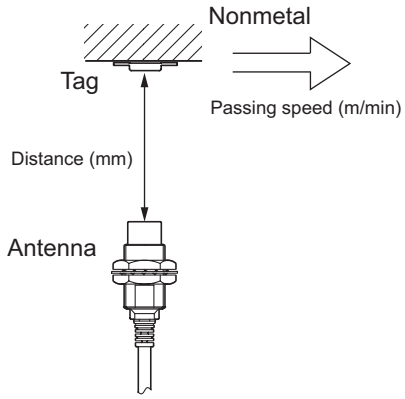
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♦ Horizontal

- **Read**

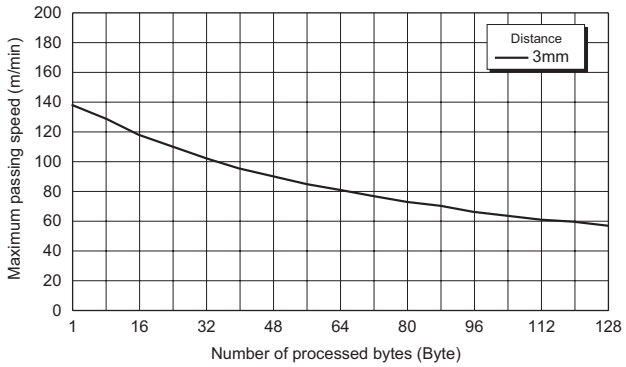


Measurement Conditions:

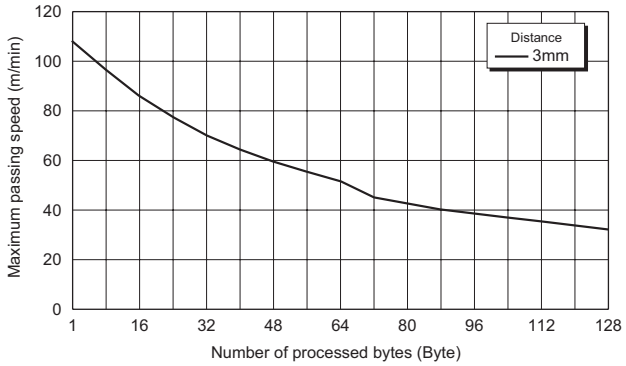


*Antenna extension cable (Model V670-A4☐: not used)

- **Write (without verification)**



- **Write (with verification)**



* Passing speed varies depending on the distance Y (between tag and antenna), axial displacement, etc. Refer to the data on communication area to use the product over its widest communication range.
* Graphs are for reference only. Prior to practical application, carry out the evaluation test of the product.
* Graphs do not include communication error correction.

- **ID Read**

Distance	Passing speed
3 mm	275 m/min

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Chapter 3 Setting and Installation

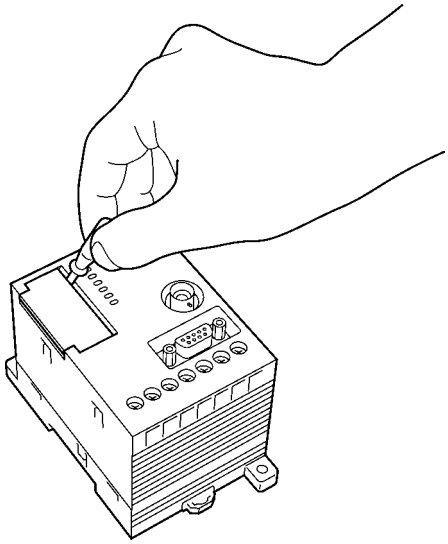
3-1 Controller

3-1-1 Switch Setting

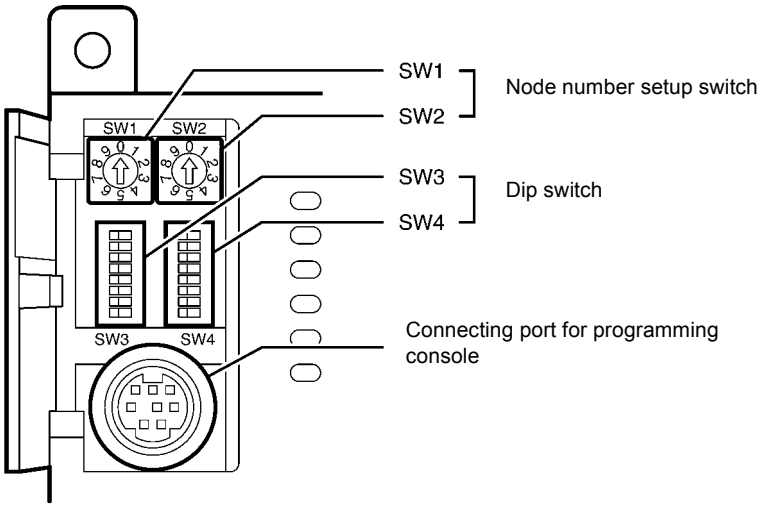
To set the switches, open a cover at the upper left part of the unit.

3-1-1-1 How to Open Cover

To open the cover, insert a screwdriver, which comes with the controller, into a notch at the left end of the cover.



When the cover opens, you can see the two node number setup switches (SW1 and SW2), two dip switches (SW3 and SW4) and connecting port for programming console.



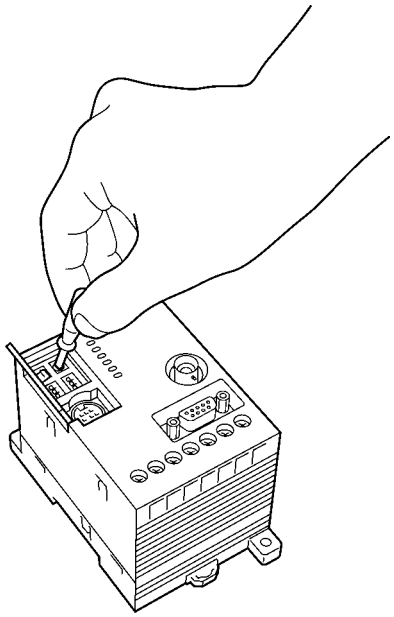
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3-1-1-2 How to Set

Set the switch using the screwdriver which comes with the controller as shown below.

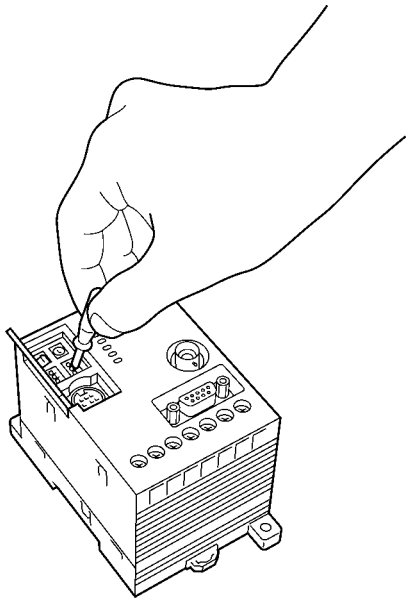
- **Setting a node number**

Turn clockwise or counterclockwise.



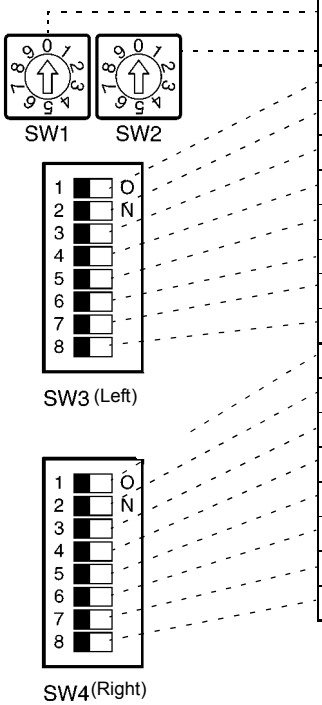
- **Setting a dip switch**

Set to the right or left.



3-1-1-3 Setting List

Set the switches according to the list below. (The switches are set to a default value at shipment from a factory.)



Name	Function	Default Value
SW1 SW2	Node number setup switch used in 1:N protocol.	00
SW3-1	Switch to change a function of input terminal (RST/IN).	Reset input
SW3-2	Switch to set an operation mode at startup.	Command execution mode
SW3-3	Switch to enable or disable verification at writing.	Disabling verification
SW3-4	Switch to set a protocol (1:1 / 1:N).	1:1 protocol
SW3-5	Set to OFF.	OFF
SW3-6		
SW3-7		
SW3-8		
SW4-1	Switch to set a communication speed of RS-232C.	9600 bps
SW4-2		
SW4-3	Switch to set data length of RS-232C.	7 bits
SW4-4	Switch to set parity of RS-232C.	Even parity
SW4-5		
SW4-6	Switch to set stop bit of RS-232C.	2 bits
SW4-7	Set to OFF.	OFF
SW4-8		

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3-1-1-4 Setting Node Number Setup Switch

♦ Node number

To connect several controllers to one host device using a link adapter etc., the host device needs to identify each of those controllers. The number to identify them is referred to as node number. A unique node number must be assigned to every controller.

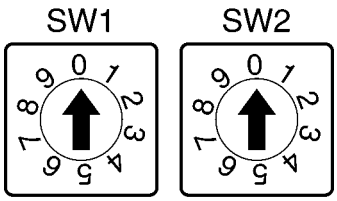
The command and response of 1:N protocol have the node number. So, unless the node number is assigned appropriately, any communication cannot be made.

♦ Setting node number

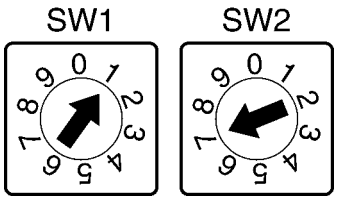
Set the node number with the two node number setup switch. SW1 (left) is for an upper order and SW2 (right) for a lower order. Available number range is from 00 to 31 as shown below.

SW1	SW2	Node Number
Upper order	Lower order	
0	0	0
0	1	1
0	2	2
0	3	3
0	4	4
0	5	5
0	6	6
0	7	7
0	8	8
0	9	9
1	0	10
1	1	11
:	:	:
2	9	29
3	0	30
3	1	31
3	2	Disabled
3	3	Disabled
:	:	:
9	9	Disabled

Example of setting:



Node No. 0



Node No. 17

The factory default setting of the node number is 00.

Correct Usage
Never assign the numbers 32 to 99 to the node number setup switch.

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3-1-1-5 Setting a Dip Switch

♦ SW3

SW3-1: Input function change

SW3-1	Description
ON	Functions as trigger input.
OFF	Functions as reset input.

SW3-2: Operation mode

SW3-2	Description
ON	Starts in the Self-Execution mode when the power supply turns ON.
OFF	Starts in the Command Execution mode when the power supply turns ON.

SW3-3: Verification at writing

SW3-3	Description
ON	Enables verification.
OFF	Disables verification.

SW3-4: Protocol designation

SW3-4	Description
ON	Uses the 1:N protocol.
OFF	Uses the 1:1 protocol.

Correct Usage
Set SW3-5, SW3-6, SW3-7 and SW3-8 to OFF always. Otherwise, any operation cannot be guaranteed.

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♦ SW4

SW4-1/4-2: Communication speed setting

SW4-2	SW4-1	Description
ON	ON	115200 bps
	OFF	38400 bps
OFF	ON	19200 bps
	OFF	9600 bps

SW4-3: Data length setting

SW4-3	Description
ON	8 bits
OFF	7 bits

SW4-4/4-5: Parity bit setting

SW4-5	SW4-4	Description
ON	ON	Even parity
	OFF	No parity
OFF	ON	Odd parity
	OFF	Even parity

SW4-6: Stop bit setting

SW4-6	Description
ON	1 bit
OFF	2 bits

Correct Usage
Set SW4-7 and SW4-8 to OFF always. Otherwise, any operation cannot be guaranteed.

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3-1-2 Installation Site

The controller model V670-CD1D-V1 has high reliability as durable control device under any environmental conditions. To increase the system reliability and to fulfill the functions completely, install the controller according to the instructions below.

♦ Installation site

Do not install the controller at any place below:

- Place where the ambient temperature is out of the range between 0 and +55°C, where the temperature fluctuates considerably and where moisture condensation occurs.
- Place where the relative humidity is out of the range between 35 and 85%RH.
- Place where there is corrosive gas, flammable gas, dust, salt or iron powder.
- Place affected by vibration or impact.
- Place exposed to the direct sunlight.
- Place splashed with water, oil or chemicals

♦ Assembly in panel

The ambient operating temperature of controller is between 0 and +55°C. The following conditions must be met.

- Provide sufficient space for ventilation.
- Do not install the controller near by any heating sources (heater, transformer and large-sized resistance).
- If the ambient temperature rises to 55°C or more, install a ventilating fan or air conditioner to keep the temperature at 55°C or less.
- If you wire a power line (for high current to drive a motor) near the controller, test it fully to reduce the influence of noise and wire it according to the wiring conditions with care.

Note
When you install the controller, be sure to follow the instructions above and test it fully.

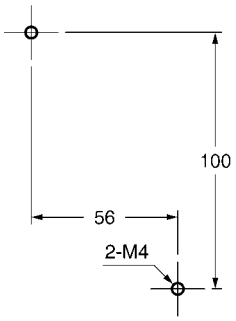
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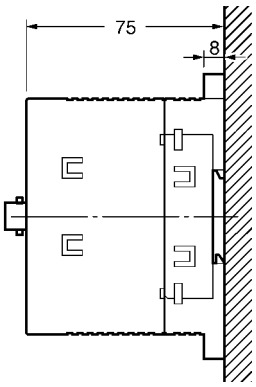
3-1-3 How to Install

The controller can be installed in a panel with screws or on a DIN rail.

♦ Installation in a panel

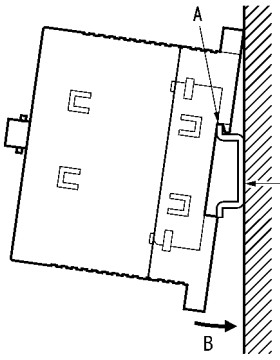
If you install the controller in a panel, be sure to use spring washers, flat washers and M4 screws. (Tightening torque: 1.2 N•m or less) Do not use any organic solvent such as lock paint to fix screws. Otherwise, the case may crack.





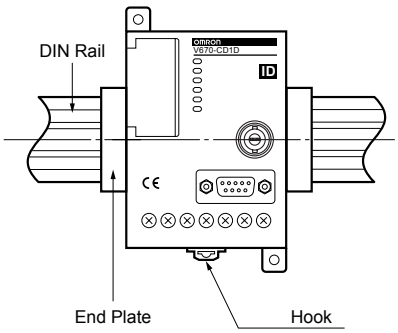
(Unit: mm)

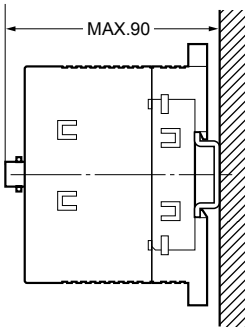
♦ Installation on a DIN rail



Recommendable DIN rail
Model PFP-100N2 (Rail length 1 m)
(OMRON)

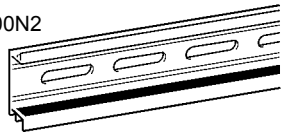
- When you install the controller on the DIN rail, hook the controller over the A and push the controller in the direction B.
- When you remove the controller from the DIN rail, pull the hook downward and remove the controller pushing slightly upward.



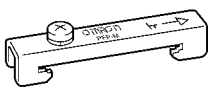


(Unit: mm)

Support Rail
Model PFP-100N2



End Plate
Model PFP-M



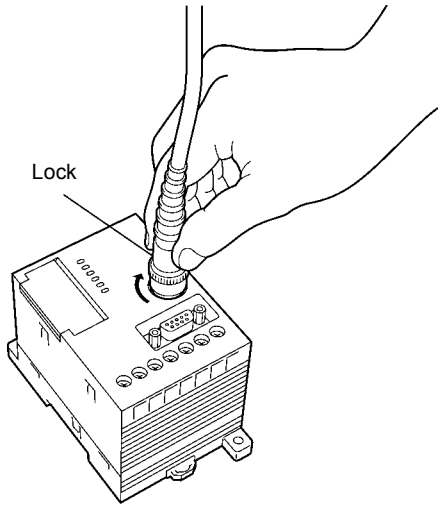
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3-1-4 How to Connect Antenna

You can connect one antenna to the controller. The antenna can be extended up to 30 m by using the extension cable model V670-A4□ (unbundled). Only one extension cable can be used.

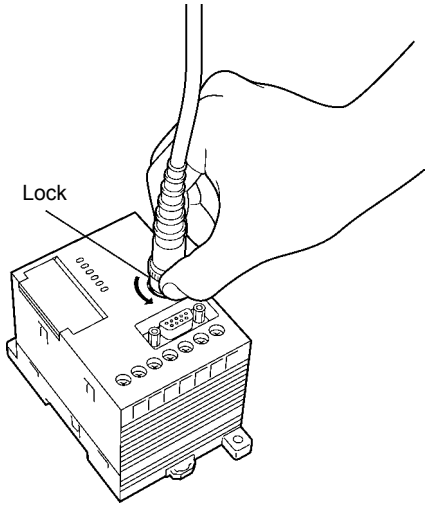
♦ How to connect and disconnect a connector

- **How to connect**



(1) Hold the cable lock of connector and fit a lug of the controller in a groove in the connector lock.
(2) Push the connector straight tightly.
(3) Turn the connector lock clockwise.

- **How to disconnect**



(1) Turn the connector lock counterclockwise.
(2) Hold the lock and pull out it straight.

Correct Usage
Do not pull the cable forcibly. Otherwise, the cable may be broken or damaged. When you connect or disconnect the connector, be sure to turn off the power supply. Otherwise, a trouble may occur.

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3-1-5 How to Connect Extension Cable and How to Extend Antenna

The antenna can be extended by using the extension cable type V670-A4□ (unbundled). The extension cables up to 28 m in length are available. When you use the extension cable, to prevent the devices being broken due to static electricity, follow the instructions below:

♦ Procedure to connect extension cable

Connect the antenna and extension cable with a connector accessory (accessory: WTN-B-384). Cover a metal part of connector joint with a sheath (Sumitomo Electric Industries: SumiTube A 20 mm in diameter) as shown below.



Heat the sheath (120°C is recommendable) using a drier etc. to shrink it.

* The cable and connector may be deformed if the sheath is heated for a long time. Heat the sheath quickly.

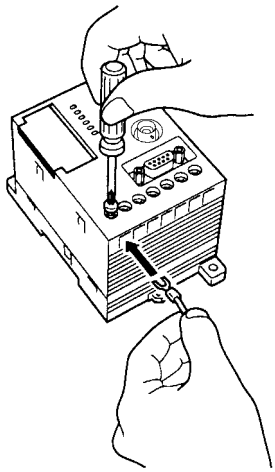


♦ Procedure to disconnect extension cable

Remove the tube using a nipper etc. first and then remove the extension cable. If a new tube is required, use the heat shrinkable tube (SumiTube A 20 mm in diameter) of Sumitomo Electric Industries which should be cut down to 10 cm.

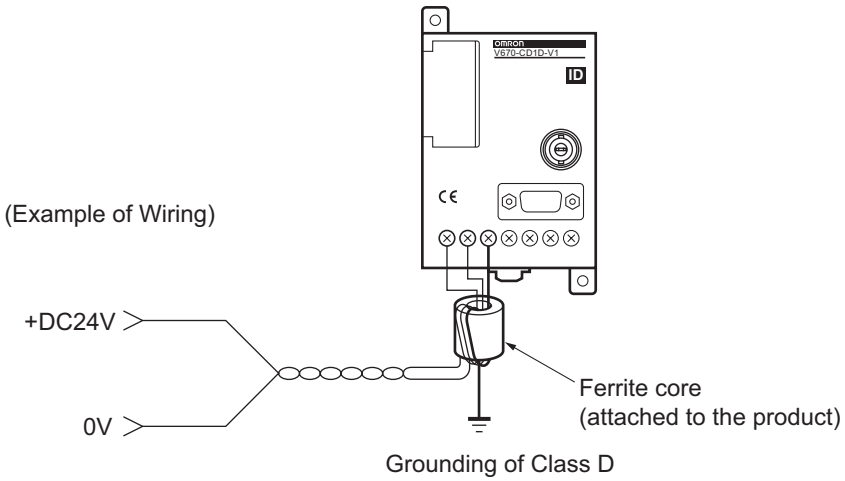
3-1-6 How to Wire

Wire as shown in this figure.



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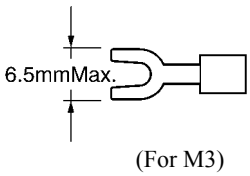
3-1-6-1 Wiring Power Supply and Grounding Cable



M3 self-up screws are used for the power supply and ground terminal. For a crimp terminal, use any of terminals below. Tightening torque should be approximately 0.6 N•m.

♦ Applicable crimp terminal

Manufacturer	Model	Applicable Wire	Type
Japan Solderless Terminal	1.25-N3A	AWG24 to AWG16	Fork
Japan Solderless Terminal	1.25-Y3A		

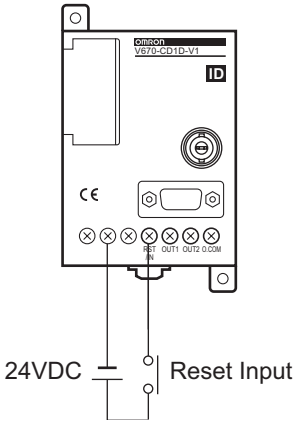


♦ Recommendable DC power supply (small-sized) (OMRON)

Model	Output Capacity	Input Voltage
S82K-03024	24 VDC 1.3 A	100/200 VAC
S82J-0224	24 VDC 1.1 A	100 VAC

* Rated power consumption of the controller is 24VDC and 0.2 A (7 W). Decide the capacity taking into consideration inrush current (approximately 5 A).

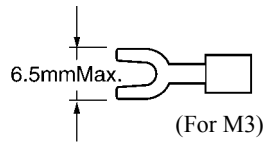
3-1-6-2 Wiring Reset Signal



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- **Crimp terminal for terminal**

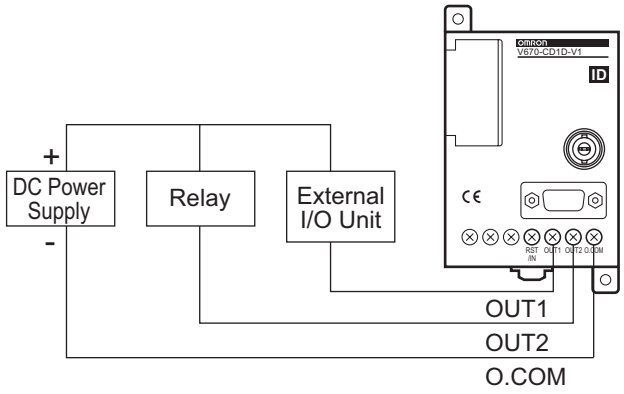
M3 self-up screws are used for the terminal.
For a crimp terminal, use the terminal below.



Tightening torque should be approximately 0.6 N•m.

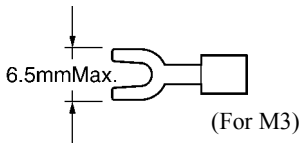
Correct Usage
Take care that the input voltage does not exceed the maximum impressed voltage (26.4 V). Otherwise, a trouble may occur in devices.

3-1-6-3 Wiring Output Signal



- **Crimp terminal for terminal**

M3 self-up screws are used for the terminal.
For a crimp terminal, use the terminal below.



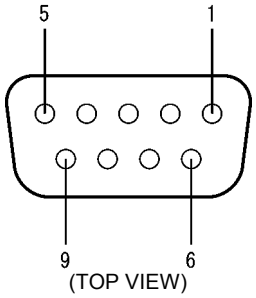
Tightening torque should be approximately 0.6 N•m.

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3-1-7 Connecting RS-232C Interface

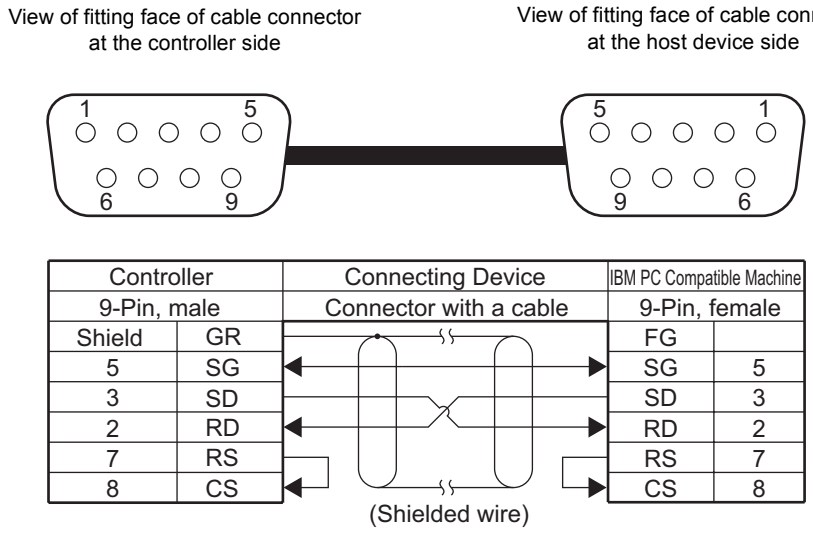
Signal Name	Code	Signal Direction		Pin No.
		Input	Output	
Ground for maintenance or ground	GR	—	—	Shield
Ground for signal or common return	SG	—	—	5
Send data	SD	—	○	3
Receive data	RD	○	—	2
Request to send	RS	—	○	7
Clear to send	CS	○	—	8

Controller Pin Layout



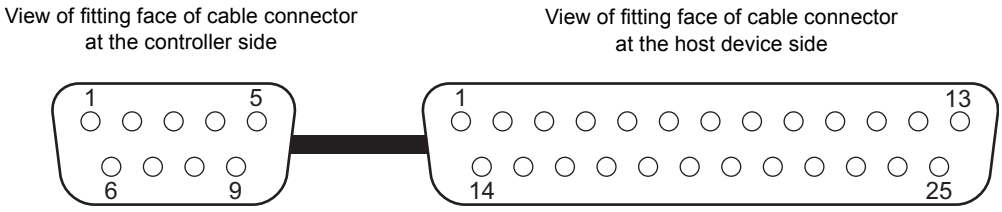
Note 1: To prevent an operation error, ground the shielded wire either at the controller side or the computer side mentioned above. (The figure above shows an example of grounding the shielded wire at the ID controller side.)
Note 2: Short-circuit pin No. 7 (RS) and pin No. 8 (CS) at the inside of the connector.

Connecting to a host device of IBM PC compatible machine, 9-pin



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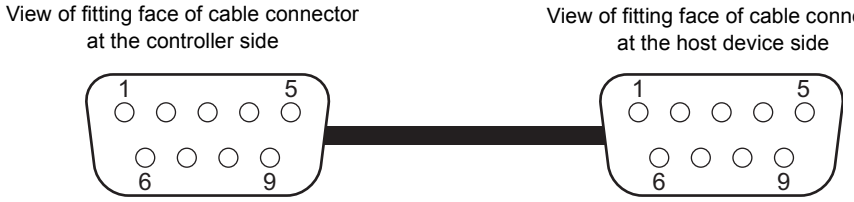
Connecting to a host device of NEC PC-9801 compatible machine, 25-pin



Controller		Connecting Device	NEC PC-9801 Compatible Machine	
9-Pin, male		Connector with a cable	25-Pin, male	
Shield	GR		FG	1
5	SG		SG	7
3	SD		SD	2
2	RD		RD	3
7	RS		RS	4
8	CS		CS	5

(Shielded wire)

Connecting to the OMRON programmable controller (PLC)



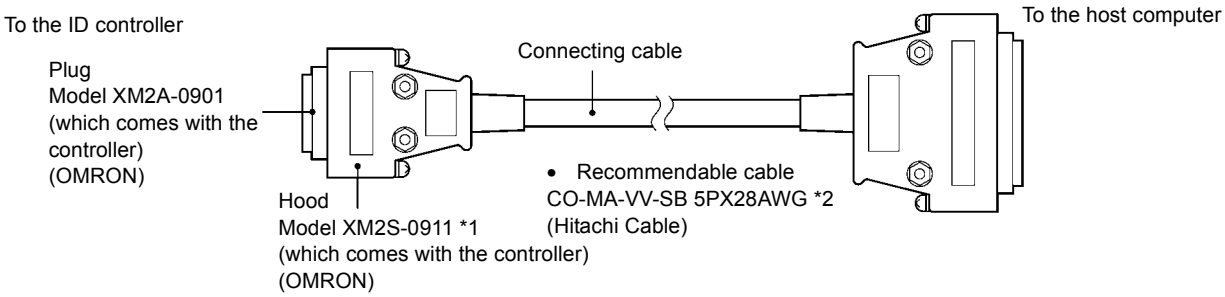
Controller		Connecting Device	Model CS1W-SCU41 Model CJ1W-SCU41	
9-Pin, male		Connector with a cable	9-Pin, male	
Shield	GR		FG	1
5	SG		SG	9
3	SD		SD	2
2	RD		RD	3
7	RS		RS	4
8	CS		CS	5

(Shielded wire)

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♦ Assembling and connecting a connector for communication

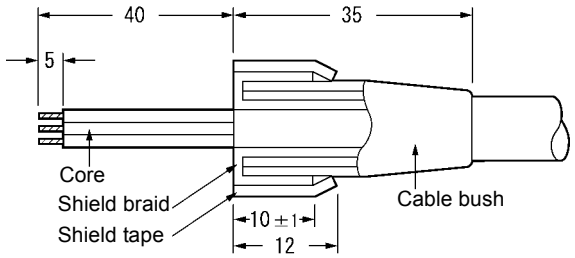
Use our connector for communication, which comes with the controller. Prepare a connecting cable and connector for a host computer by yourself. Our connector which comes with the controller is based on the countermeasures against EMI.
(Instead of our connector which comes with the controller, you may use any other commercial connector. Refer to "Appendix 2 Order Format List".)



* 1. One set of connectors (based on the countermeasures against EMI) comes with the ID controller.
* 2. You may use any other cable if the cable specifications are the same as ours. (The outer diameter is 7 mm.)

♦ How to assemble a connector

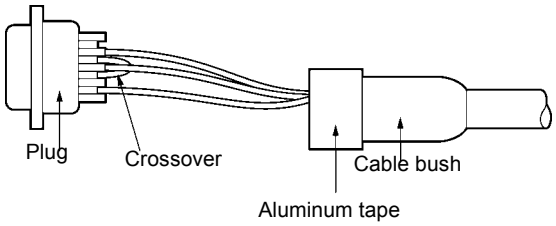
(1) Terminate the cable properly.



(Unit: mm)

- Fit the cable bush in the cable in advance.
- Ravel the shield braid, turn back it and cover the cable bush with the shield braid. The length of the shield braid covering the cable bush should be 10 mm.
- Wind the shield tape on the shield braid.

(2) Solder the core and plug pin.

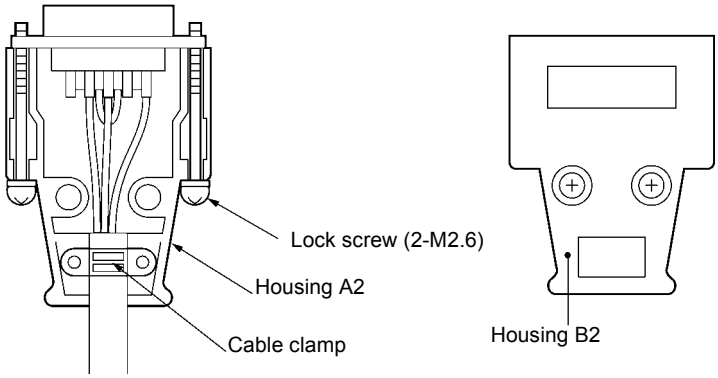


Pin No.	Code	Name
Shield	GR	Ground
5	SG	Ground for signal
3	SD	Send data
2	RD	Receive data
7 (Note)	RS	Request to send
8 (Note)	CS	Clear to send

Note: Short-circuit No. 7 (RS) and No. 8 (CS) pins with cross-over.

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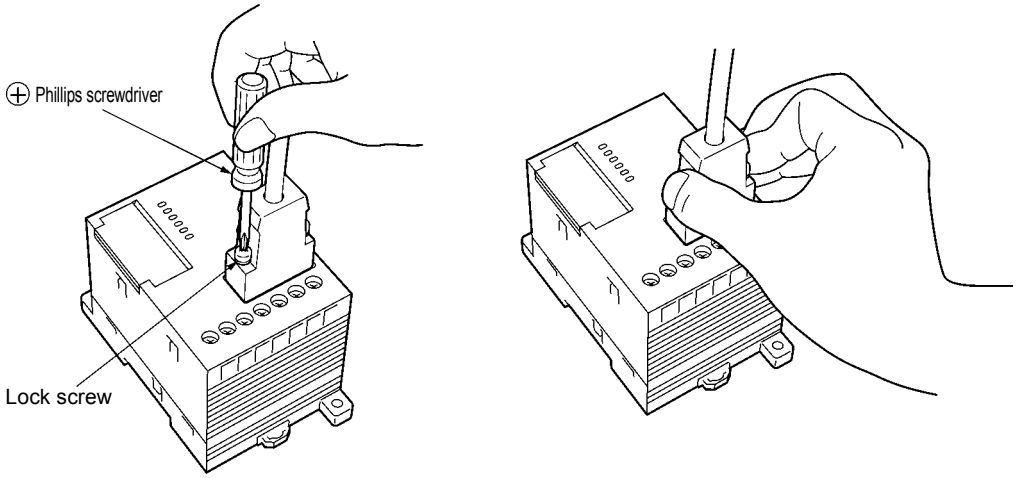
(3) Set the plug in the housing A2 of the hood and fix the aluminum tape with a clamp.



(4) Set the two connector lock screws and put the housing B2 there to complete the connector.

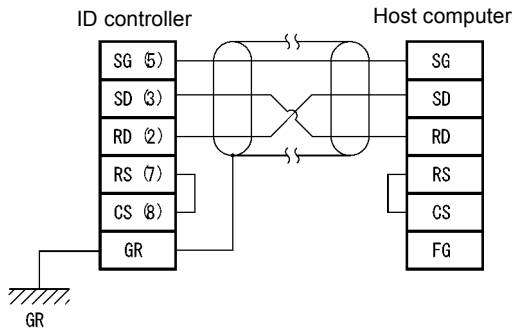
♦ How to connect and disconnect a connector

- When you connect the connector, be sure to hold the connector and insert it completely. When you have inserted the connector, tighten the two lock screws with the Phillips screwdriver.
- When you disconnect the connector, loosen the two lock screws and pull out the lug of connector hood straight. If it is hard to pull out the connector, hold the controller tightly and pull out it.



Correct Usage

Example of grounding a shielded wire at the controller side:



- To prevent an operation error, ground the shielded wire either at the controller side or the host computer side. (This figure shows an example of grounding it at the controller side.)
- Short-circuit the RS pin and CS pin inside the connector.

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3-2 Antenna

3-2-1 Installation Site

♦ Installation site

Do not install the antenna at any place below:

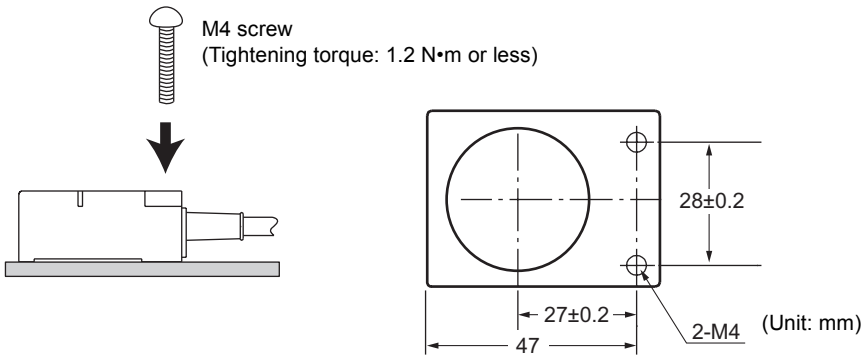
- Place where the ambient temperature is out of the range between -10 and +70°C, where the temperature fluctuates considerably and where condensation occurs.
- Place where the relative humidity is out of the range between 35 and 85%RH.
- Place where there is corrosive gas, flammable gas, dust, salt or iron powder.
- Place affected by vibration or impact.
- Place splashed with water, oil or chemicals

Note
When you install the antenna, be sure to follow the instructions above and test it fully. In addition, on both inside and outside of the control panel, lay the antenna cables separately from the power cables.

3-2-2 How to Install

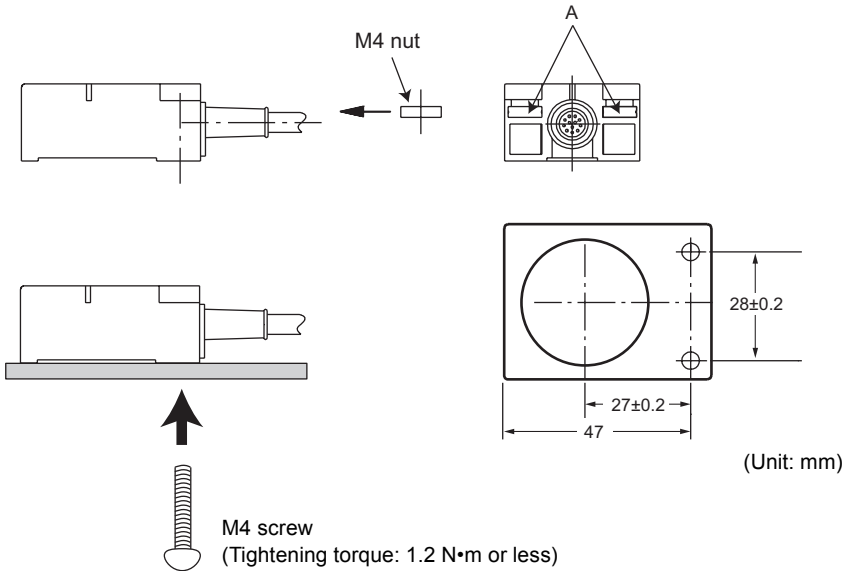
♦ Model V670-H11

- **Installation on a surface**



- **Installation on the back**

Insert a nut which comes with the antenna into the section A.



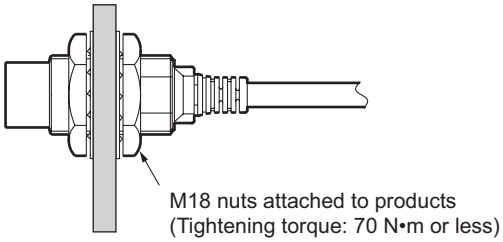
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♦ Model V670-H51/H51Q

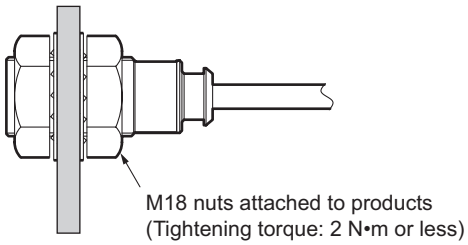
- **Installation**
  When installing the antenna, do not apply large shock to it with a hammer or other tool. Shock may damage the antenna or may reduce its water resistance.

- **Tightening strength**
  Tighten the nuts to the torque specified below. When tightening the nuts, be sure to use toothed lock washers.

♦ Model V670-H51



♦ Model V670-H51Q



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3-3 Tag

3-3-1 Installation Site

Do not install the tag at any place below:
- Place where there is corrosive gas, flammable gas or iron powder.
- Place where the ambient temperature is out of the range between -10 and +70°C, where the temperature fluctuates considerably and where condensation occurs.
- In a microwave oven.

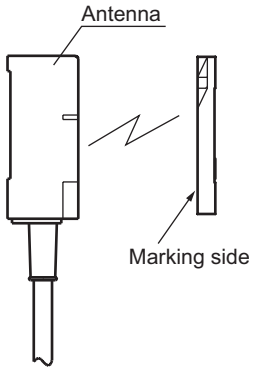
3-3-2 How to Install

Install the tag according to the following instructions:
- Neither shave, drill nor machine the tag.
- Do not apply any excessive force to the tag.
- Neither contact the tag and any metal with each other nor install the tag near any metal.

* When the tag is used in both high temperature and low temperature, the tag may bend. However, the function is not affected.

♦ Model V670-D13F03

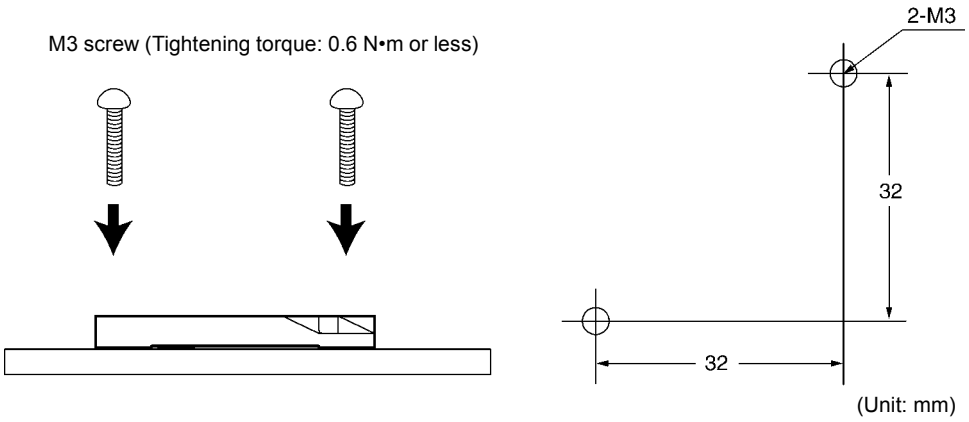
- **Tag installation direction**



Install this tag so that the tag surface can be in parallel with the antenna.

- **Example of tag installation**

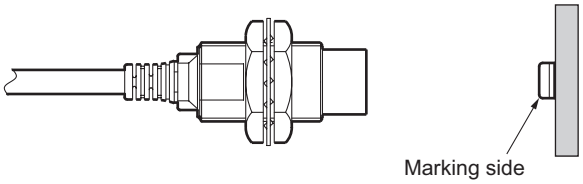
Install the tag with the screws.



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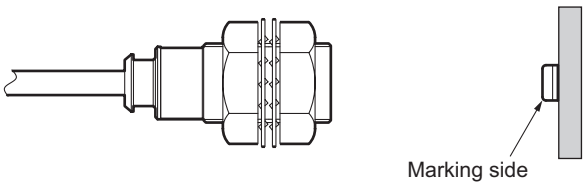
♦ Model V670-D13F01

- **Tag installation direction**



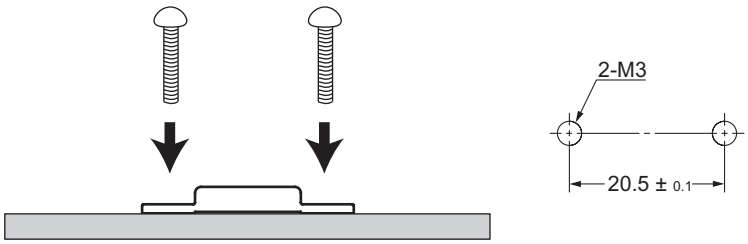
♦ Model V670-D13F01H

- **Tag installation direction**



- **Example of tag installation**

M3 screw (Tightening torque: 5 N•m or less)



(Unit: mm)

* Install the tag on a flat surface. Avoid installation on a curved surface.

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Chapter 4 Functions

4-1 Communication Designation Function

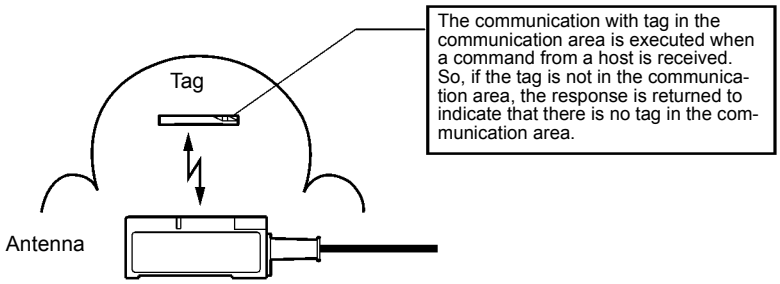
Depending on an operation sequence, you can specify various communications through the communication command for communication with a tag. The following seven communication designations are available.

Code	Name	Description
ST	Single command Trigger	When the command is received, the communication with the tag is executed and the response is returned.
SA	Single Auto command	After the command is received, the communication is executed when a tag has been detected in a communication area and the response is returned.
SI	Single Input trigger	After the command is received, the communication with the tag is executed at the leading edge timing of external input (TRG) and the response is returned.
RA	Repeat Auto command	"SA" designation is repeated. The communication with the same tag, which exists continuously, is executed only one time.
RI	Repeat Input trigger	"SI" designation is repeated.
PA	Poling Auto command	"SA" designation is executed and the response is returned by the polling query (PC) command.
PI	Poling Input trigger	"SI" designation is executed and the response is returned by the polling query (PC) command.

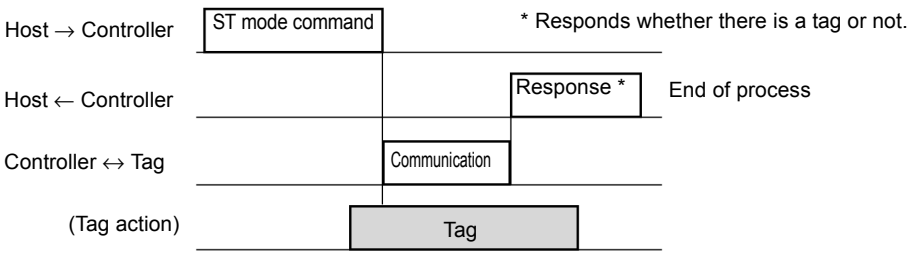
Those seven communication designations are classified into three groups; a command trigger system which starts the communication by sending a command, auto system which detects a tag automatically and executes the communication, and input trigger system which start the communication by external input.
According to this classification, the operation of every communication designation is described below.

4-1-1 Designation of Command Trigger System Communication (ST)

In the command trigger system communication designation, the communication with a tag is executed by sending a command and the controller command processing is ended by terminating the communication. If the tag is not in the communication area when the command is sent, an error (error code: 72) is returned to indicate that there is no tag in the communication area. Therefore, you must check the tag in the communication area with a sensor etc. and return a command.



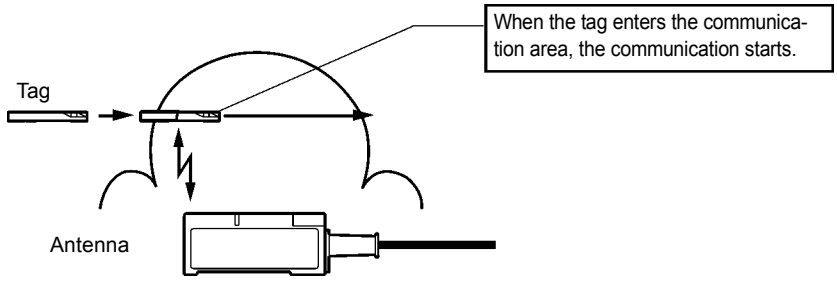
ST designation:



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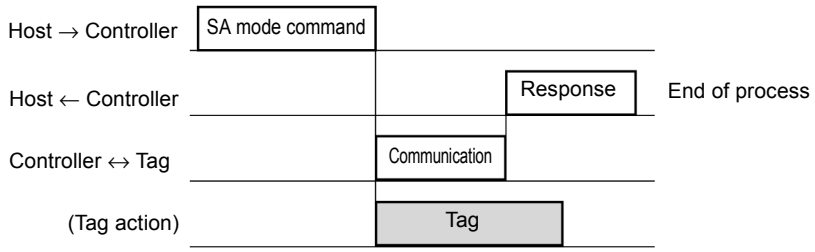
4-1-2 Designation of Automatic System Communication (SA/RA/PA)

In the auto system communication designation, a tag is detected automatically. So, unlike the command trigger system, you do not need to check the tag.



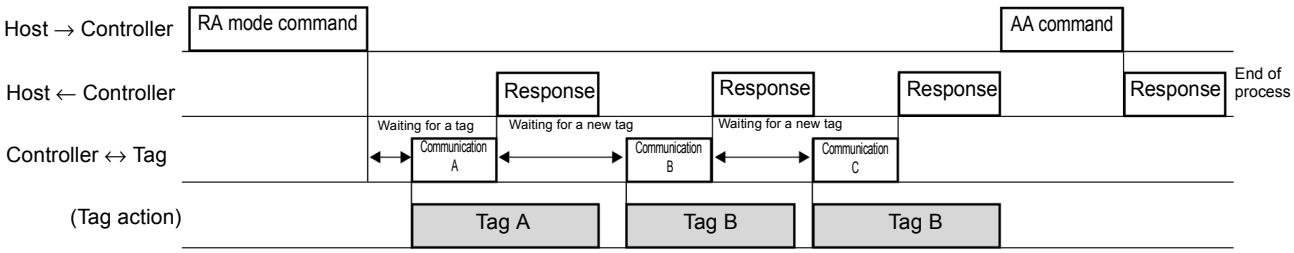
SA designation:

For the single designation (SA), the controller command processing is ended by terminating the communication.



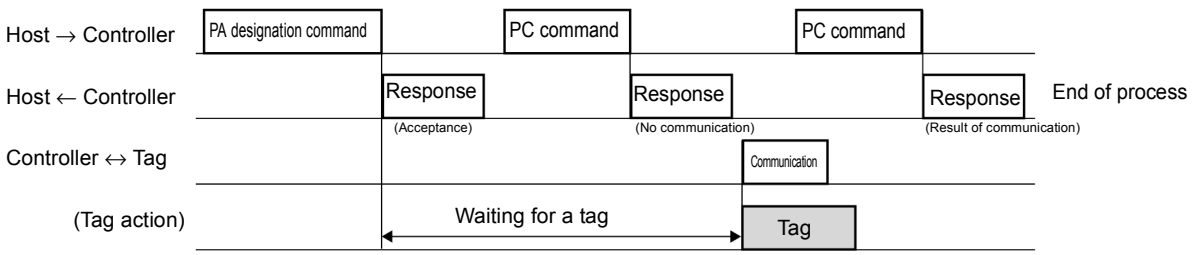
RA designation:

For the repeat designation (RA), the system waits until the next tag has come even after the communication is terminated. If the tag once executes the communication, the tag does not execute the communication until it has moved out of the communication area. Repeat processing is ended by a command process abort command (AA).



PA designation:

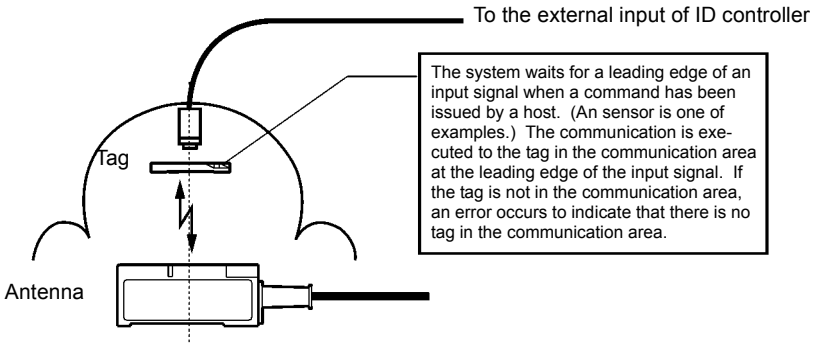
In the PA designation, similarly with RA, processing is repeated until the processing is terminated by a command process abort command (AA). However, no response is made after the communication with one tag is ended. Response is returned by a polling query (PC) command instead. Use this designation when several controllers are connected to a host device through RS-485, etc. (Commercial 232C/485 converter is required.)



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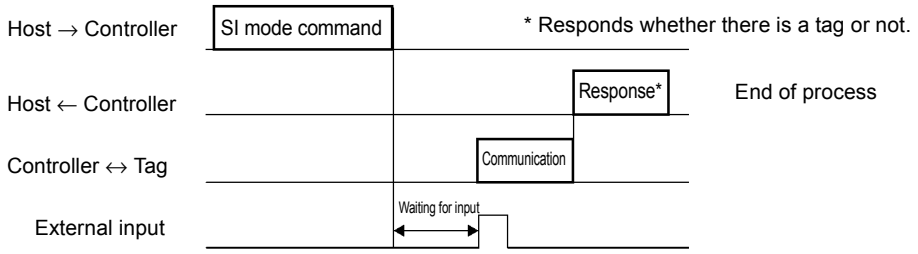
4-1-3 Designation of External Trigger System Communication (SI/RI/PI)

In the external trigger system communication designation, the communication is started at a leading edge of an external input signal. The communication is directly controlled by output of a sensor which detects a tag in the communication area. So, the communication can be executed even in a fast line without fail.



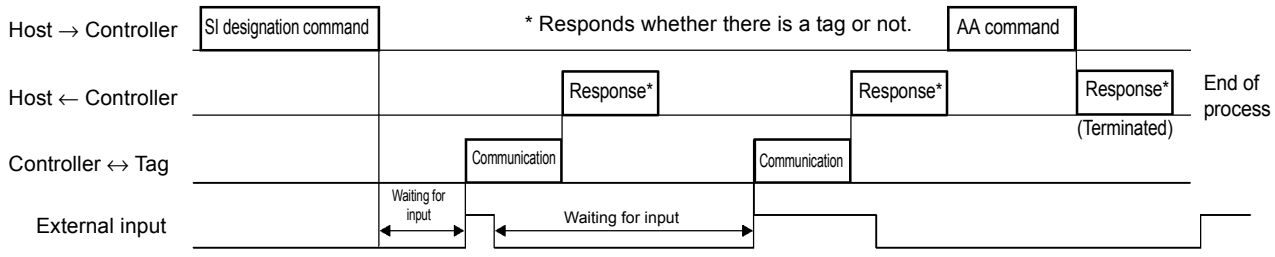
SI designation:

In the single designation (SI), the controller command processing is ended by terminating the communication.



RI designation:

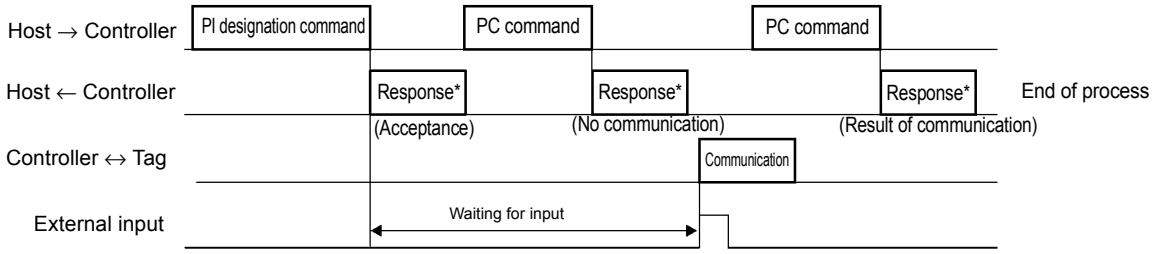
In the repeat designation (RI), the system waits for a leading edge of the next input signal even after the communication is ended. The communication is executed to the tag whenever the leading edge of input signal is detected. Repeat processing is ended by a command process abort command (AA).



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PI designation:

In the polling designation (PI), similarly with RI, processing is repeated until the processing is terminated by a command process abort command (AA). However, no response is made after the communication with one tag is ended. Response is returned by a polling query (PC) command instead. Use this designation when several controllers are connected to a host device through RS-485 etc. (Commercial 232C/485 converter is required.)



Correct Usage
To use the communication designation of SI, RI and PI, turn ON (trigger input) the dip switch 3-1.

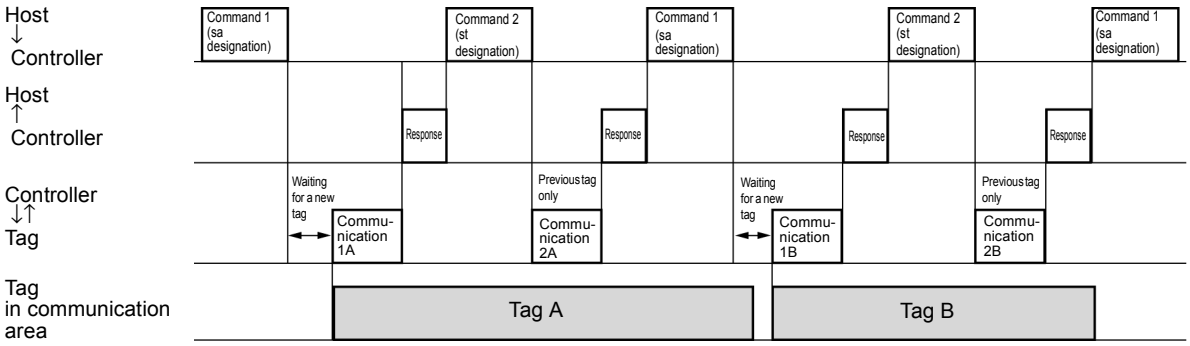
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4-2 Tag Designation Function

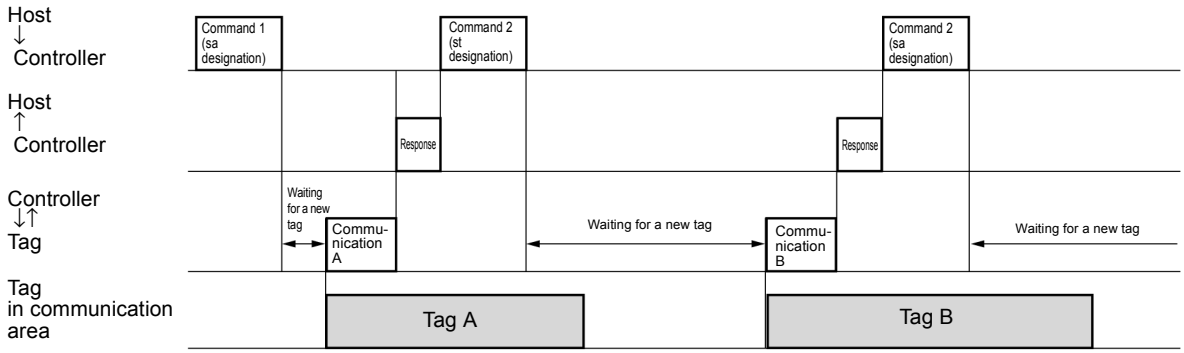
When reading data or writing fixed data, you can use "Repeat Auto" designation or "Repeat Trigger" designation. However, if you write different data per tag or if you use several commands (e.g., read → judge → write), you cannot use this function.
To enable this process, you can use the Tag Designation function. By using this function, regardless of timing, you can only send the commands consecutively to communication with an objective tag without fail. Moreover, a sensor for tag detection is not required. So, the system configuration can be simplified.

Code	Description
"sa"	When a tag enters the communication area, the communication to the tag is executed. The communication is made to any tag other than the tag to which the communication has been executed immediately before. If the same tag exists continuously, the system waits until any other tag enters the communication area.
"st"	When a command has been received, the communication is executed to the tag in the communication area. The communication is made to the same tag to which the communication has been executed immediately before. Even if any different tag is in the communication area, an error occurs to indicate that there is no tag in the communication area.

<Example of process sequence>
When you execute a command 1 and command 2 to the tags (A, B, ...) moving continuously, you can use the following sequence.



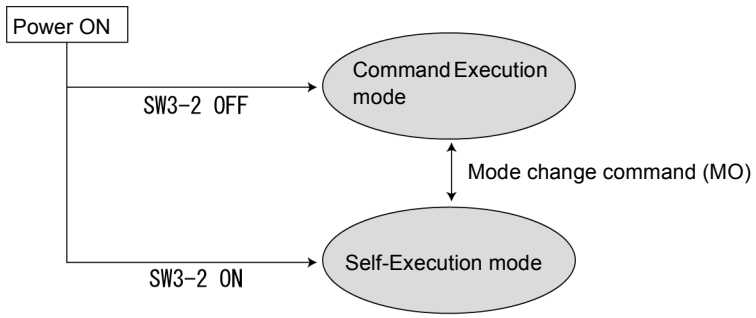
When you write different data into the tags (A, B, ...) moving continuously, you can use the following sequence.



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4-3 Operation Mode

There are two operation modes, i.e., Command Execution mode and Self-Execution mode. Through the dip switch 3-2, you can specify one mode of them to be started at the power ON. Also, you can change the mode by a mode change command (MO) from a host device.



(1) Command Execution mode
The communication is executed by an instruction (command) from a host device. In this mode, you can use all the command. All, you can read/control the external I/O terminals (IN, OUT1 and OUT2) by a command from a host device.

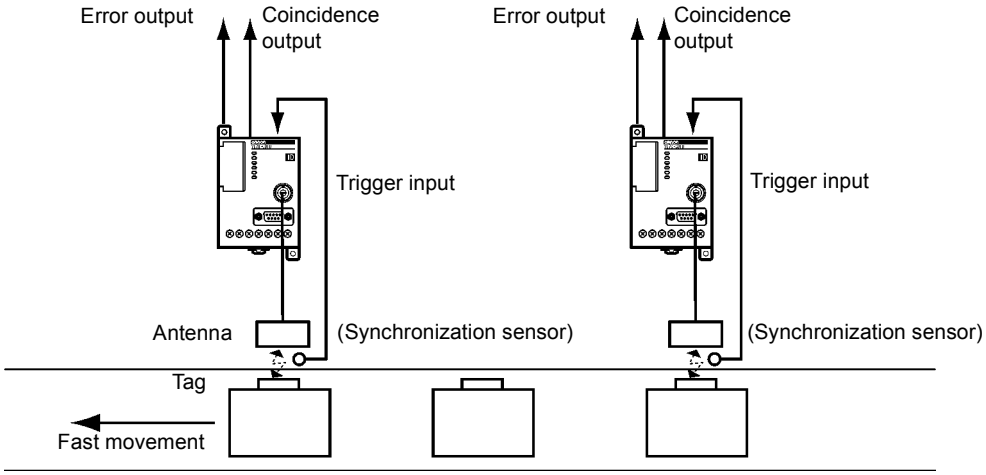
(2) Self-Execution mode
The communication to a tag is executed automatically according to the operating conditions registered in the controller, the communication result can be judged (judgment conditions), and the self-completion operation, to which is output to the two external outputs (OUT1 and OUT2) or to the RS-232C port (result output), can be performed. The ID system does not need to be controlled from a host device. So, a simplified system can be built up very quickly. The following operating conditions can be registered.

Item	Description
Execution process	A communication command only can be used. An available communication mode is RA or RI only.
Judgment conditions	One of the conditions below can be specified per output. 1) Judges the communication result and generates output. 2) Compares response data and set data with each other and generates output.
Result output	When a preset judgment condition has been met, the three outputs below can be specified. The judgment condition can be specified per output. 1) Outputs to OUT1. Output time can be specified. 2) Outputs to OUT2. Output time can be specified. 3) Responds to RS-232C.

The preset operating conditions are stored in nonvolatile memory in the controller. So, you do not need to set them at every power on.

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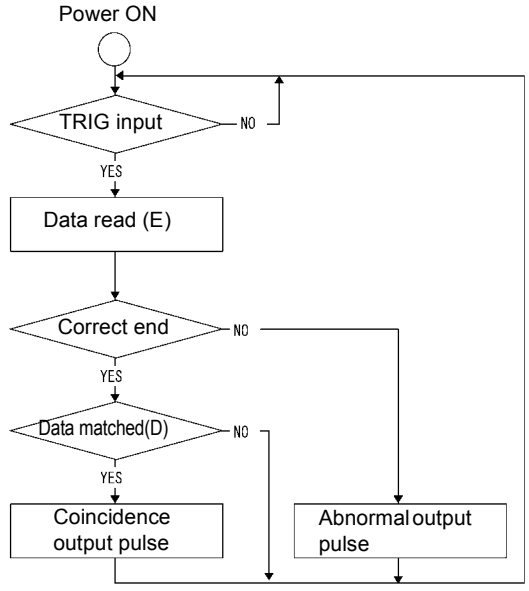
<Example of usage>
When data is read out of the tag into which destination information has been written, the applicable destination only is detected and the pulse is output, and reading could not be done due to any trouble, an error pulse is output as shown below.

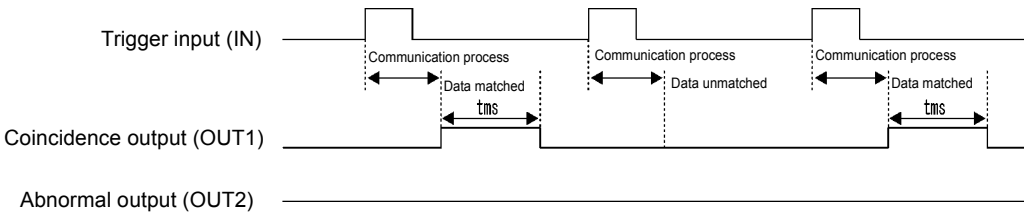


- **Setting and operation flow**

Setting of operating conditions

Item	Description
Execution process	Communication command: RD Communication mode: RI
OUT1	Outputs OUT1 in tms at data matched.
OUT2	Outputs OUT2 at abnormal end.
RS-232C	Nil





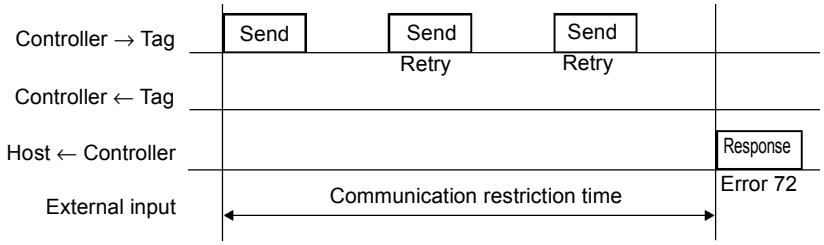
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4-4 Operation Parameter Setting

In the controller, you can specify the operation parameters (Communication Restriction Time, Character Interval Monitoring Time and Response Delay Time) according to your system to optimize the performance and reliability.
Usually, you may use the default values. However, this setting allows you to optimize your system. Those parameters are stored in non-volatile memory in the controller. So, the parameters are not erased even if the power supply turns off.

4-4-1 Communication Restriction Time

In the communication to a tag, if a response cannot be made correctly due to any trouble at the communication after tag detection, "Retry" is executed to send the same command again.
By specifying the communication restriction time, retry is repeated until the specified time has passed after the command process starts.



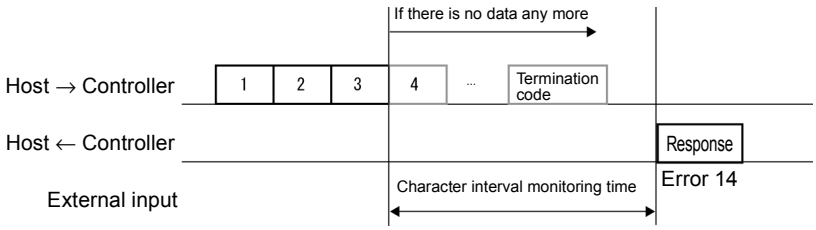
In the external trigger system command, command process starts when the command process starts. In the auto system command, command process starts when the tag has been detected.

Setting Range
10 to 990 ms. A default value is 0.

* If the default value is set, "retry" is repeated 9 times.

4-4-2 Character Interval Monitoring Time

In the controller, a command is recognized by receiving a termination code of command string sent from a host device. However, if the entire command string cannot be received completely due to any trouble, receiving is monitored for a specified time after the last character is received. Then, a format error (14) is returned.



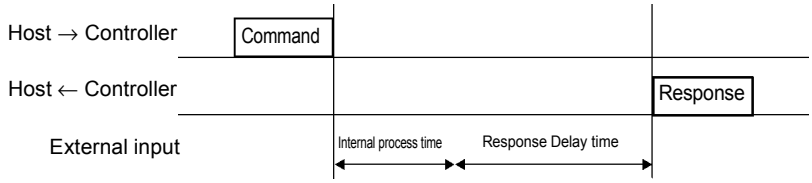
Setting Range
0 to 9999 ms.

* The default value is 100 ms.

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4-4-3 Response Delay Time

When several controllers are connected to a host device through RS-485 etc. (commercial 232C/485 converter is required), RS-485 switches into receiving after data string is sent. Switching time varies depending on a converter. So, if a response from the controller is fast, the communication cannot be executed correctly.
By specifying the Response Delay time, the response start time can be changed.
* Actual time from the transmission of command to the start of response is internal process time (a minimum time is 0 ms) of the controller + Response Delay time (specified time).



Setting Range
0 to 9999 ms.

* The default value is 0 ms.

Correct Usage
For how to use the operation parameter setting (SP) command, refer to the description of "5-8-6 Parameter Setting (SP)".

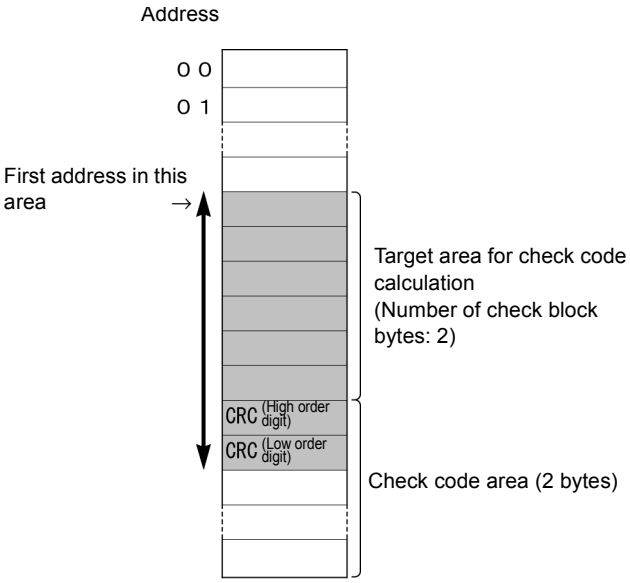
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4-5 Memory Check Function

By adding a check code to a data in a tag, you can detect a data error arisen from memory rewrite life or unintentional factor. A CRC code of generating polynomial $X^{16} + X^{12} + X^5 + 1$ is used as the check code.

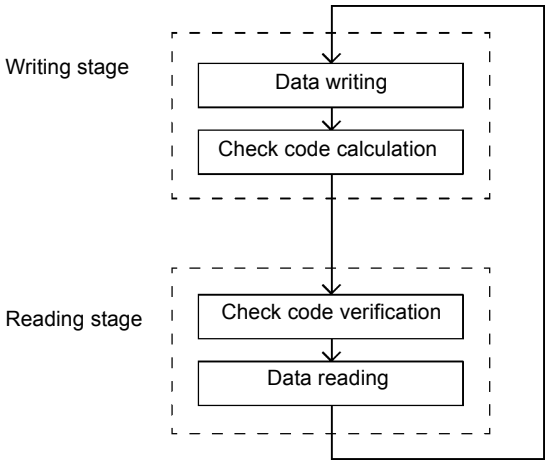
For memory check, a memory check command (MC) to write a check code and a memory calculation command (MK) to verify the check code are used.
In a check block specified by the first address and the number of bytes, an area excluding the last 2 bytes of the block is a target area to be calculated and the last 2 bytes are a check code area.

When a command to write the check code is sent, the CRC code of data in the target area for calculation is calculated and it is written into the check code area. When a data verification command is sent, the CRC code of data in the target area for calculation is calculated and it is compared with data of the check code area. If those data match, "0" is returned. This shows that the data is correct in a response status flag. If those data do not match, "1" is returned as warning.



<How to use>

Calculate/write the check code with the memory check command (MC) after writing a data and verify the check code with the memory calculation command (MK) before reading it. Beforehand, you can detect data corruption in the tag which is not accessed.



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4-6 Write Protect Function

The Write Protect Function prevents a fixed data, such as pallet information or product information stored in memory in a tag, being erased by careless writing.

By setting protect information in the tag, Write Protect can be enabled in any area (a maximum of two areas) of a specified address. If you try to write anything into a write-protected page, a Protect error occurs.
The protect area information is set by using a part (address $0000 to 0003) of user data area.
To enable the Write Protect, write the protect area information into a specified address and specify "Protect Setting" with process designation parameter using a tag function setting command (TF). Similarly, to disable the Write Protect, specify "Disable" with the process designation parameter.

♦ Relation between Protect information and Protect area

User Address	Description	Example of data
$0000	Start address of Write Protect area 1	05h
$0001	End address of Write Protect area 1	10h
$0002	Start address of Write Protect area 2	70h
$0003	End address of Write Protect area 2	75h
$0004	User Area	
$0005		Write Protect area 1
. .		
$0010		
$0011		
. .		
$006F		
$0070		Write Protect area 2
. .		
$0075		
$0076		
$007F		

* Available range of Protect area: 0004h to 007Fh

Correct Usage
If you use the Write Protect function, the area $0000 to 0003 cannot be used as a data area. Also, if you enables the Write Protect function, the communication time is prolonged (approximately 3 ms).

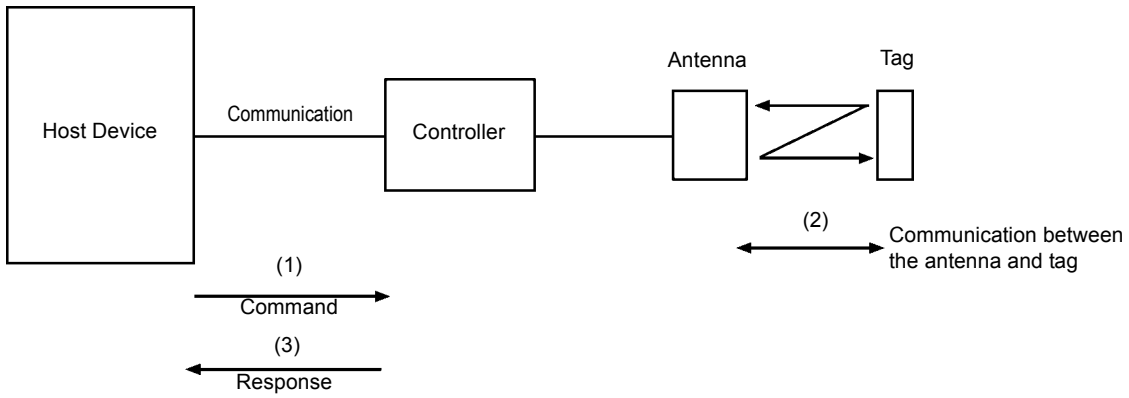
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Chapter 5 Control From Host Device

5-1 Controller Operation Status

The V670 series RFID system communicates with a tag ((2)) according to the instruction of a command ((1)) sent from a connected host device and returns the result to the host device as the response ((3)).



♦ Controller operation status

- **Waiting for command**

This refers to the status that the controller does not execute any command process. Then, the controller can accept all the commands except the subcommands etc. When the controller has accepted any command, the controller enters the command processing status.

- **Command processing**

When the command has been accepted, the next command is ignored until the process of such accepted command is completed. However, a command process termination command and reset command can be accepted always.

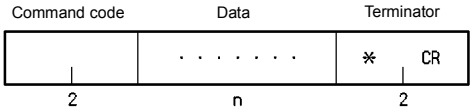
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5-2 Command Response Format

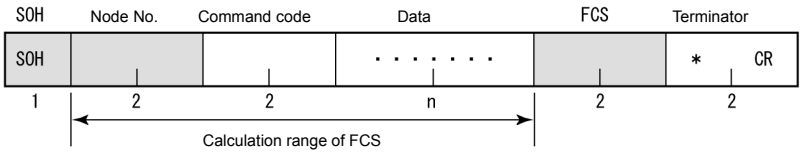
For the format of command and response communicated between a host device and controller, there are 1:1 protocol used usually and 1:N protocol used to connect several controllers and the configuration is described below.
The protocol is specified through the dip switch (SW3-4) of the controller.

(1) Command frame

1:1 Protocol



1:N Protocol



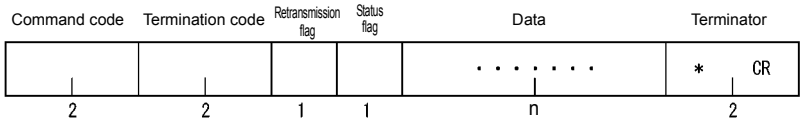
* In the 1:N protocol, a gray part is added.

Name	Description
SOH	Shows the beginning of the frame with SOH ($01).
Node No.	A number to identify a target controller at the 1:N connection. Specify it through a rotary switch (SW1/2).
Command code	Specifies the execution (command).
Data	Specifies the parameters (address, number of bytes, etc.) for the command execution or a data to be written.
FCS	Frame check sequence. This is a code to detect an error in data string. This expresses a calculation value of horizontal parity of character string between immediately after SOH and immediately before FCS in two ASCII characters.
Terminator	Shows the end of command with two characters, "*" ($2A) and CR code ($0D).

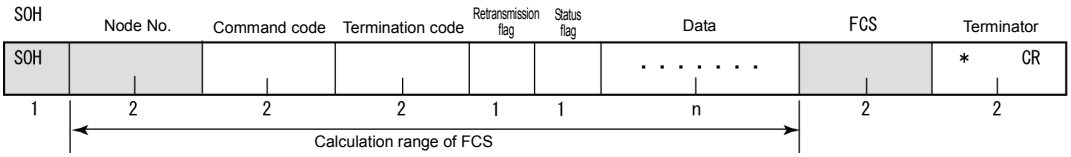
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(2) Response frame

1:1 Protocol



1:N Protocol



* In the 1:N protocol, a gray part is added.

Name	Description
Termination code	Shows the command execution result.
Retransmission flag	Flag to show the response to retransmission. This is "1" at retransmission.
Status flag	Code to show the command execution status.

* For any part other than the above-mentioned, the same data as the sent command frame is added and returned.

♦ Retransmission flag

"0"	Response after usual command process.
"1"	Response returned by a request to retransmit data (RR).

♦ Status flag

"0"	Communication status	Shows that process has been executed correctly.
"1"	Tag data status	Shows that the verification result of data check command (MD) is invalid or that overflow/underflow has occurred in the calculation of a calculation writing command (CW).
"2"	Abort status	Shows that communication to a tag has been aborted after the start by an aborting command (AA).
"4"	Polling acceptance	Shows that the polling status is enabled by accepting the communication designation "PA (pa)" or "PI".

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(3) Data code designation

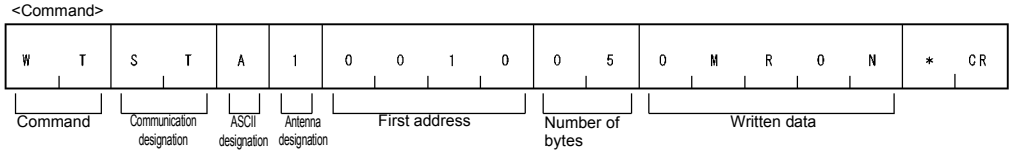
You can specify in a command a code to be used to transmit a data to be read or written between a host device and ID controller. ASCII code designation and hexadecimal code designation are available.

- **ASCII code (JIS8 unit code) designation "A"**

1 Byte of data in a tag is transmitted directly as ASCII code or JIS8 unit code. Transmitted one character is equivalent to 1 byte of data in a tag. Character data can be read/written directly. However, do not use any control code [SOH] nor [CR] in a data to be transmitted. If [SOH] or [CR] is specified in a written data, a command error occurs.

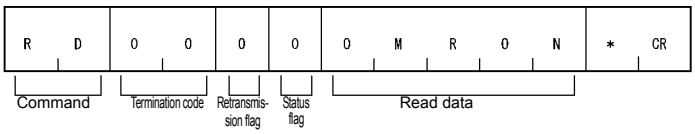
<Example of writing>

If you specify "OMRON" as a written data in 5 bytes of memory beginning with the address 10h, the data is written in memory in a tag as shown in this figure.



<Example of reading>

If you read 5 bytes of memory beginning with the address 10h, the read data is "OMRON" in the data shown in this figure.



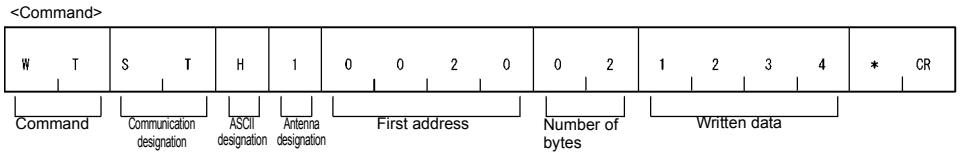
Address	Memory in tag		
10h	4	F	"O"
11h	4	D	"M"
12h	5	2	"R"
13h	4	F	"O"
14h	4	E	"N"

- **Hexadecimal code designation "H"**

1 Byte of data in a tag is converted into two hexadecimal characters ("00" to "FF") and transmitted. Transmitted two character is equivalent to 1 byte of data in a tag. Be sure to specify a written data with every two characters "00" to "FF" (even number). If any data of odd number of characters is specified, a command error occurs.

<Example of writing>

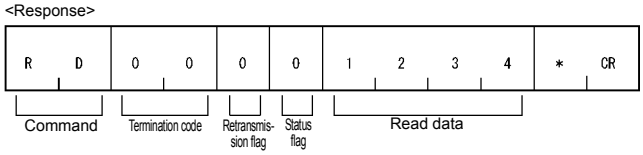
If you specify "1234" as a written data in 2 bytes of memory beginning with the address 20h, the data is written in memory in a tag as shown in this figure.



Address	Memory in tag	
20h	1	2
21h	3	4

<Example of reading>

If you read 2 bytes of memory beginning with the address 20h, the read data is "1234" in the data shown in this figure.



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(4) Available designation range of first address and number of bytes

A command to specify the first address and the number of bytes in a command and the available designation range are shown in the table below. If you specify any value out of the available range, a command error occurs.

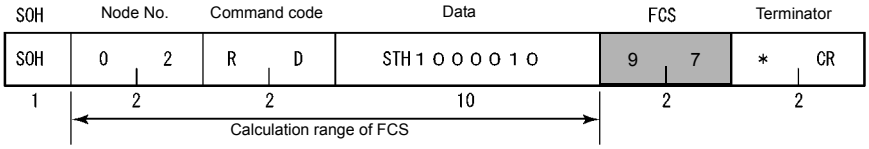
Command code	Available designation range of first address and number of bytes	Other restriction
Read (RD)	A) Available designation range of first address: 0000h to 007Fh B) Available designation range of number of bytes: 01h to 80h	A + B ≤ 80h*
Write (WT)	A) Available designation range of first address: 0000h to 007Fh B) Available designation range of number of bytes: 01h to 80h	A + B ≤ 80h*
Computation Write (CW)	A) Available designation range of first address: 0000h to 007Fh B) Available designation range of computation area: 01h to 80h	A + B ≤ 80h*
Data Fill (DF)	A) Available designation range of first address: 0000h to 007Fh B) Available designation range of end address: 0000h to 007Fh	A ≤ B
Memory Check (MD)	A) Available designation range of first address: 0000h to 007Dh B) Available designation range of number of check bytes: 03h to 80h	A + B ≤ 80h*

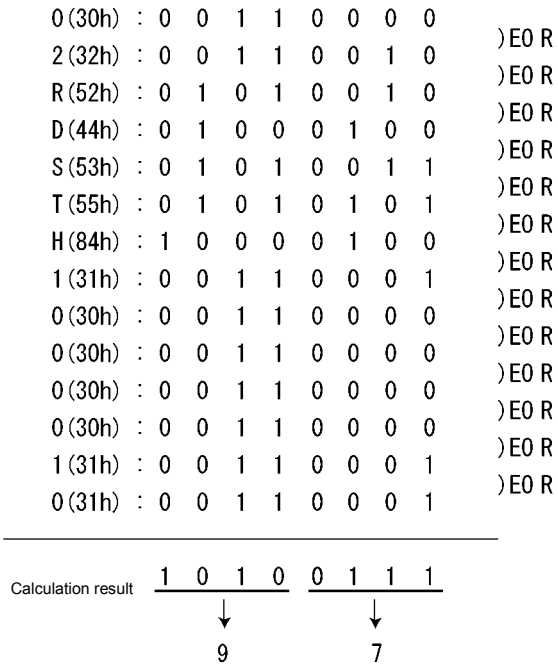
*** If the first address is 20h and the number of bytes is 70h, a command error occurs due to "A + B = 90h".**

(5) Example of calculation of FCS

Exclusive-OR is executed from the node number to the end of data at every 1 byte. The result is converted into an ASCII code and added.

Reading 16 bytes from the address 0000h





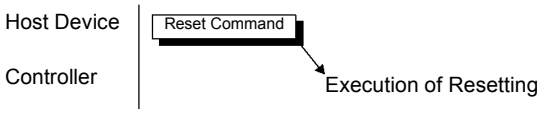
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5-3 Command Response Flow

Depending on a type of command and the communication designation, receiving the command from a host device to the controller and the response to the host device vary.

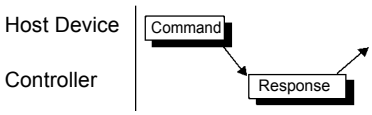
(1) No response

When the controller receives a reset command, the controller does not send any response, performs resetting and waits for a command.



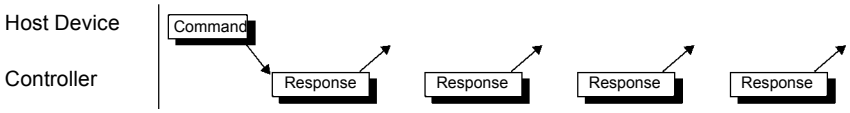
(2) Single response

When single trigger (ST/st), single auto (SA/sa), single input trigger (SI), polling auto (PA/pa) or polling input trigger (PI) is specified by a command to communicate with the tag, or when a command not for the communication with the tag (communication subcommand, controller control command or host command) is specified, one response is returned to one command.



(3) Several responses

When repeat auto (RA) or repeat input trigger (RI) is specified by a command to communicate with the tag, several responses are sent to one command.



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5-4 Command List

The commands are classified mainly into four categories.

(1) Communication command
Command to communicate with a tag.

(2) Communication subcommand
Subcommand used to inquire the execution result or abort the execution when polling auto command is used.

(3) Controller control command
Command used to terminate the communication with the tag or reset the controller.

(4) Host command
Command used for a communication test between the controller and host device.

Command Type	Command Code	Name	Description	Use of self-execution mode
Communication command	RD	Read	Reads a data from memory in a tag.	×
	WT	Write	Writes a data into memory in a tag.	×
	CW	Computation Write	Writes the calculation result of memory data into a tag.	×
	DF	Data Fill	Fills a specified area with specified data.	×
	MD	Memory Check	Specifies/verifies a check code of memory in a tag.	×
	TF	Tag Function Designation	Specifies/cancels the Write Protect function to a tag.	×
	ID	ID Read	Reads a user ID in a tag.	×
Communication subcommand	AA	Command Processing Abort	Aborts communication with a tag.	×
	PC	Polling Query	Inquires polling process.	×
Controller control command	MO	Operation Mode Change	Switches the Self-Execution mode/ Command execution mode.	○
	RR	Data Retransmission	Requests to send again the last data.	○
	XZ	Reset	Resets the controller.,	○
	CC	Controller Control	Controls/checks I/O of the controller.	×
	SE	Operation Condition Setting	Registers operation conditions in the Self-Execution mode.	×
	SP	Parameter Setting	Perform controller setting.	×
Host command	TS	Test	Sends a data received from a host device.	×
	VS	Version Information	Reads a version of software of the controller.	×

* For the use of self-execution mode, refer to Chapter 6, "How to Use Self-execution Mode."

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5-5 Communication Designation List

A communication command can specify the following ten types of communication designation:

Communication designation code	Name	Description
ST	Single trigger	When a command has been received, the communication with a tag is executed and the response is returned.
st	Tag-specified single trigger	The communication with the tag to which the last communication was executed and the response is returned. This operation is the same as the single trigger (ST).
SA	Single auto	After the command is received, the communication is executed when a tag has been detected in a communication area and the response is returned.
sa	Tag-specified single auto	The communication with any tag other than the tag to which the last communication was executed and the response is returned. This operation is the same as the single auto (SA).
SI	Single input trigger	After the command is received, the communication with the tag is executed at the leading edge timing of external input (TRG) and the response is returned.
RA	Repeat auto	"SA" designation is repeated. The communication with the same tag, which exists continuously, is executed only once. Processing is terminated by an abort command.
RI	Repeat input trigger	"SI" designation is repeated. Processing is terminated by an abort command.
PA	Polling auto	"SA" designation is executed and the response is returned by a query (polling). Acceptance response is made when a command has been received.
pa	Tag-specified polling auto	The communication with any tag other than the tag to which the last communication was executed and the response is returned. This operation is the same as the palling auto (PA).
PI	Polling input trigger	"SI" designation is executed and the response is returned by a query (polling). Acceptance response is made when a command has been received.

Correct Usage
For details of communication designation, refer to "4-1 Communication Designation Function".

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5-6 Communication Command

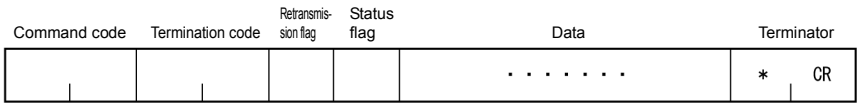
Communication commands to communicate with a tag are described here in this section. The commands are described assuming that 1:1 protocol is used. If 1:N protocol is used, follow the 1:N protocol format. (For details of protocol format, refer to "5-2 Command Response Format".)

1:1 Protocol

Example of sent data

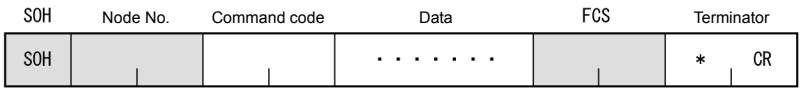


Example of received data

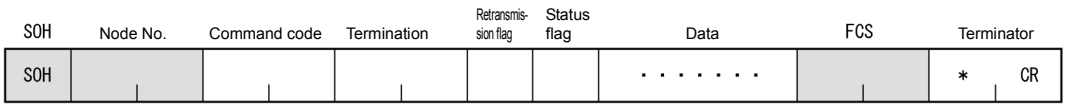


1:N Protocol

Example of sent data



Example of received data

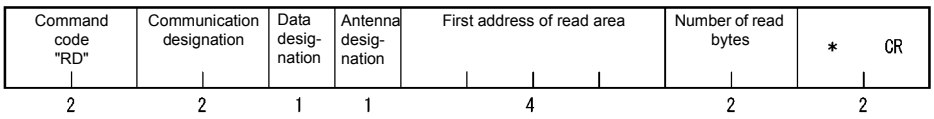


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5-6-1 Read (RD)

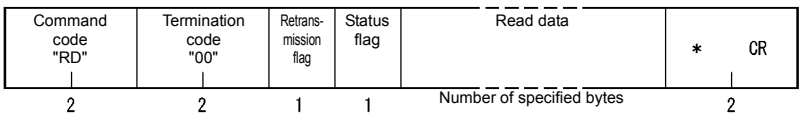
Reads a data in a area specified by the first address and the number of bytes.

<Command>



Communication designation	Specifies how to communicate with a tag. For details, refer to the communication designation list.
Data designation	Specifies a type of transmitted code of read data at the response. "A": ASCII code "H": Hexadecimal code
Antenna designation	Fixed to "1".
First address of read area	Specifies the first address of area, where data is read from a tag, in four hexadecimal digits. Available designation range: 0000h to 007Fh.
Number of read bytes	Specifies the number of bytes to be read in HEX code. The number of bytes that can be read at a time is as follows: -ASCII:256 bytes (256 characters) -HEX:128 bytes (256 characters) Available designation range: 01h to 80h.

<Response>



Read data	Data read from a tag. For the ASCII code, the number of characters is the number of read bytes. For the hexadecimal code, the number of characters is the number of read bytes x 2.

Example: Reading 8 bytes of data from the address 0000h
(Single trigger, hexadecimal code)

Sent data: RDSTH 1 0 0 0 0 0 8 * [CR]

Received data: RD 0 0 0 0 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 * [CR]

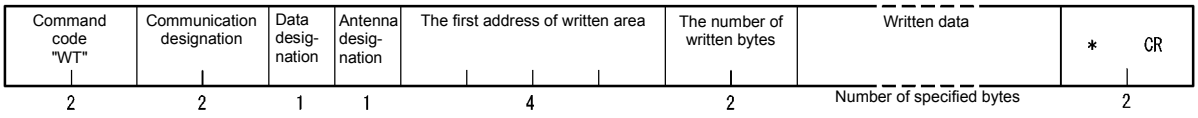
Correct Usage
Specify the number of read bytes so that the sum of the number of read bytes and the first address of read area cannot exceed the tag memory capacity (128 bytes). Example: For the address 0010h, the range between 00h and 70h can be specified.

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5-6-2 Write (WT)

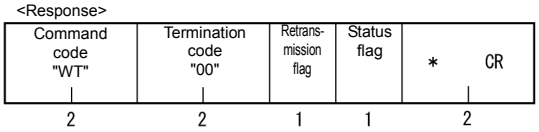
Writes the specified bytes of data from the specified first address into a tag.

<Command>



Communication designation	Specifies how to communicate with a tag. For details, refer to the communication designation list.
Data designation	Specifies a type of transmitted code of data written into a tag. "A": ASCII code "H": Hexadecimal code
Antenna designation	Fixed to "1".
First address of written area	Specifies the first address of area, where data is written into, in four hexadecimal digits. Available designation range: 0000h to 007Fh.
Number of written bytes	Specifies the number of bytes of data written into a tag in two hexadecimal digits. Available designation range: 01h to 80h.
Written data	Data written into a tag. For a hexadecimal code, two characters per byte.

<Response>



Example: Writing 4 bytes of data ("11223344") from the address 0010h
(Single trigger, hexadecimal code)

Sent data: WTSTH 1 0 0 1 0 0 4 1 1 2 2 3 3 4 4 * [CR]

Received data: WT 0 0 0 0 * [CR]

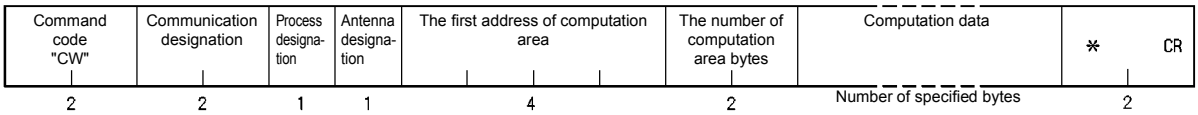
Correct Usage
Specify the number of written bytes so that the sum of the number of written bytes and the first address of written area cannot exceed the tag memory capacity (128 bytes). Example: For the address 0010h, the range between 00h and 70h can be specified.

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5-6-3 Computation Write (CW)

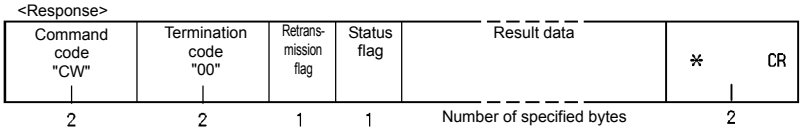
Performs the computation of data in tag memory and computation data in a hexadecimal number and writes the result into the tag. If overflow and underflow occurs in addition and subtraction, respectively, no data is written and "1" is returned to the status flag.

<Command>



Communication designation	Specifies how to communicate with a tag. For details, refer to the communication designation list.
Process designation	Specifies how to compute. "A": Hexadecimal addition "S": Hexadecimal subtraction
Antenna designation	Fixed to "1".
First address of computation area	Specifies the first address of area, where data is computed, in four hexadecimal digits. Available designation range: 0000h to 007Fh.
Number of addition area bytes	Specifies the number of bytes of area, where data is computed, in two hexadecimal digits. Available designation range: 01h to 04h.
Computation data	Specifies a numerical value to be computed in a hexadecimal number.

<Response>



Result data	Returns a calculation result data written into the tag. If overflow and underflow occurs in addition and subtraction, respectively, the result data is a data before the calculation. In this case, the status flag is "1".

Example: Subtracting the computation data ("0002") from 2 bytes data ("0010") in the address 0001h and writing the result (Single trigger, initial value "0010")

Sent data: CWSTS 1 0 0 0 1 0 2 0 0 0 2 * [CR]

Received data: CW 0 0 0 0 0 0 0 E * [CR]

Correct Usage

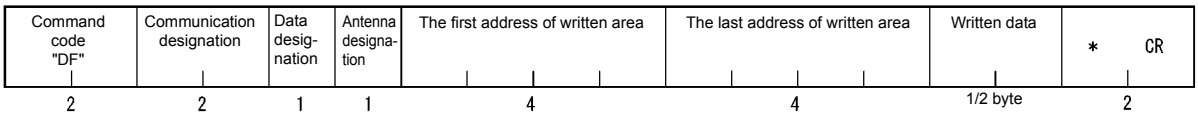
This command performs the hexadecimal computation. So, you must specify all the data in a hexadecimal code. Moreover, specify an addition area within one page. Otherwise, a command error occurs.

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5-6-4 Data Fill (DF)

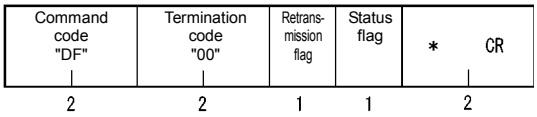
Write 1 or 2 bytes of the same data into an area specified by the first address and the last address of tag memory. Written data is specified by a hexadecimal code.

<Command>



Communication designation	Specifies how to communicate with a tag. For details, refer to the communication designation list.
Data designation	Specifies a unit of written data. "B": Byte "W": Word (2 bytes)
Antenna designation	Fixed to "1".
First address of written area	Specifies the address to write a data into a tag in four hexadecimal digits. Available designation range: 0000h to 007Fh.
Last address of written area	Specifies the last address to write a data into a tag in four hexadecimal digits. Available designation range: 0000h to 007Fh.
Written data	Data written into a tag. Specify 1 or 2 bytes of hexadecimal code.

<Response>



Example: Writing a fixed data ("00FF") from the address 0000h to 007Fh
(Single trigger, writing 2 bytes)

Sent data: DFSTW 1 0 0 0 0 0 0 7 F 0 0 F F * [CR]

Received data: DF 0 0 0 0 * [CR]

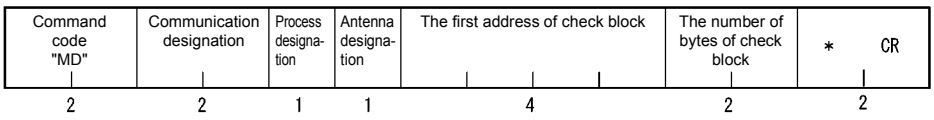
Correct Usage
When you write a fixed data into a specified area, this command can reduce the traffic to a host device and, therefore, the system can be operated fast by this command.

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5-6-5 Memory Check (MD)

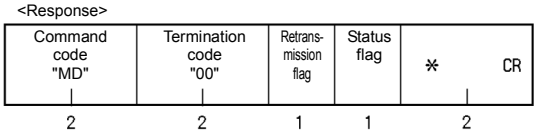
Executes the generating polynomial $X^{16} + X^{12} + X^5 + 1$ in an area per check block specified by a user and verifies with a check code added in the check block.

<Command>



Communication designation	Specifies how to communicate with a tag. For details, refer to the communication designation list.
Process designation	Specifies a type of check process. "K": Check code calculation "C": Check code verification
Antenna designation	Fixed to "1".
First address of check block	Specifies the first address of check block in four hexadecimal digits. Available designation range: 0000h to 007Dh.
Number of bytes of check block	Specifies the number of bytes of check block in two hexadecimal digits. Available designation range: 03h to 80h.

<Response>



Status flag	Shows the verification result of check code. "0": The verification result is normal. "1": The verification result is abnormal.

Example: Example of address: Adding a check code to 4 bytes of data from the address 0010h (Single trigger)

Sent data: MDSTK 1 0 0 1 0 0 6 * [CR]

Received data: DF 0 0 0 0 * [CR]

* 2 Bytes of data are added to 4 bytes of data. So, the number of specified bytes is 6.

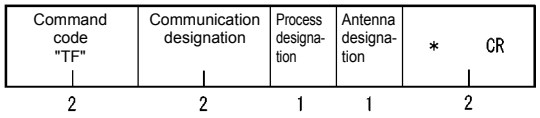
Correct Usage
Do not write necessary information into the last 2 bytes of an area because 2 bytes are used for a record of check code. For details, refer to "4-5 Memory Check Function".

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5-6-6 Tag Function Designation (TF)

Sets/cancels Write Protect etc. to a tag.

<Command>



Communication designation	Specifies how to communicate with a tag. For details, refer to the communication designation list.
Process designation	Sets/cancels a function. "P": Sets Protect "R": Cancels
Antenna designation	Fixed to "1".

Example: Setting Write Protect function of the addresses 0010h to 001Fh to a tag
(Single trigger)

Setting protect area information
Sent data: WTSTH 1 0 0 0 0 0 4 0 0 1 0 0 0 1 F * [CR]
Received data: WT 0000*[CR]

Setting protect function
Sent data: TFSTP 1 * [CR]
Received data: TF 0 0 0 0 * [CR]

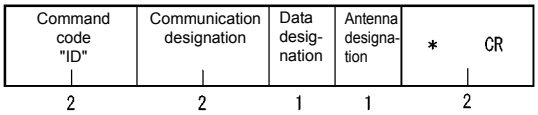
Correct Usage
For details of Write Protect, refer to "4-6 Write Protect Function".

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5-6-7 ID Read (ID)

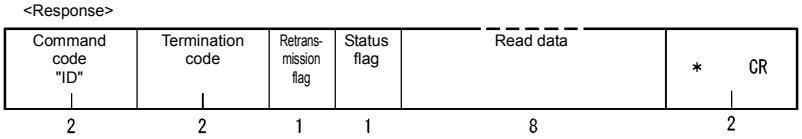
Reads a user ID of tag.

<Command>



Communication designation	Specifies how to communicate with a tag. For details, refer to the communication designation list. The communication designation "st" only is unavailable.
Data designation	Fixed to "H" (hexadecimal code).
Antenna designation	Fixed to "1".

<Response>



Read data	User ID data read out of a tag. "00000000" to "3FFFFFFF" High order 2 bits are fixed to "0" because of system bit.

Example:Reading user ID of tag
(Single trigger, user ID "1 2 3 4 5 6 7 8")

Sent data: IDSTH1*[CR]

Received data: ID 0 0 0 0 1 2 3 4 5 6 7 8 * [CR]

Correct Usage
Every tag stores its own code. If it needs to be checked only whether there is a tag or not, communication can be done very fast by this command.

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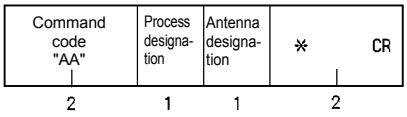
5-7 Communication Subcommand

The communication subcommand is used in combination with a communication command. Any communication to a tag cannot be done by the subcommand alone.

5-7-1 Command Processing Abort (AA)

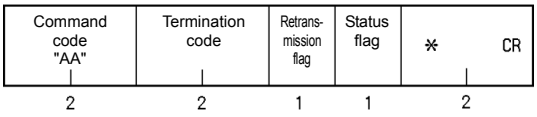
Aborts a command process in execution and returns to a state of waiting for a command. This can be executed when any command other than the communication designation "ST" is in process.

<Command>



Process designation	Fixed to "0".
Antenna designation	Fixed to "1".

<Response>

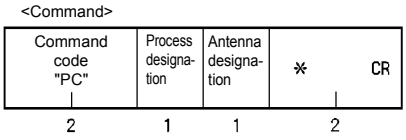


When a command process has been aborted after a tag is detected, the status flag becomes "2".

5-7-2 Polling Query (PC)

Inquires the result of communication with a tag during polling.

<Command>



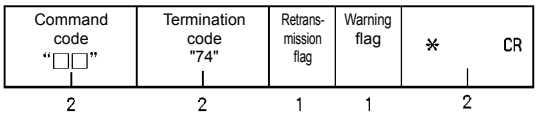
Process designation	Specifies a type of process when the result has been returned after the communication ends. "E": Process ended. "C": Executes the same command again.
Antenna designation	Fixed to "1".

<Response>

(1) Received after the communication with a tag is ended.
Response according to a type of command executed specified by the communication designation of polling.

(2) Received before the communication is ended.

<Response>



The command code is the same as one when polling is executed.

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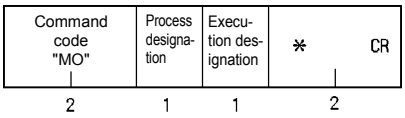
5-8 Controller Control Command

The controller control commands have no direct relation to the communication to a tag, but those commands specify the communication conditions, controller operation mode, Self-Execution conditions, etc.

5-8-1 Operation Mode Change (MO)

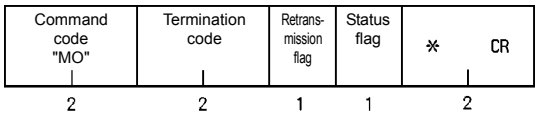
Changes a controller operation mode.

<Command>



Process designation	Specifies a controller operation mode. "S": Self-Execution mode "C": Command Execution mode
Execution designation	Fixed to "0".

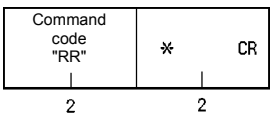
<Response>



5-8-2 Data Retransmission (RR)

Requests to send again the last response from the controller.

<Command>



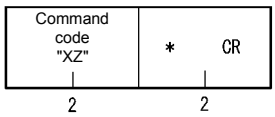
<Response>
Returns the response data returned last. In this case, the retransmission flag becomes "1".

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5-8-3 Reset (XZ)

Aborts all the controller processes and performs "Power ON" initial process. There is no response.

<Command>

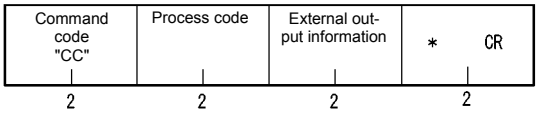


<Response>
Nil

5-8-4 Controller Control (CC)

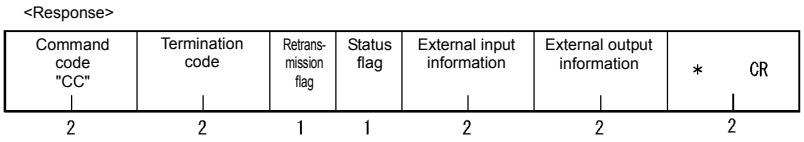
Changes or obtains the state of external I/O of controller.

<Command>



Process code	Fixed to "00" (I/O control).
External output information	Specifies the output of external output 1 and external output 2. "0": No change "1": Turned OFF forcibly. "2": Turned ON forcibly.

<Response>



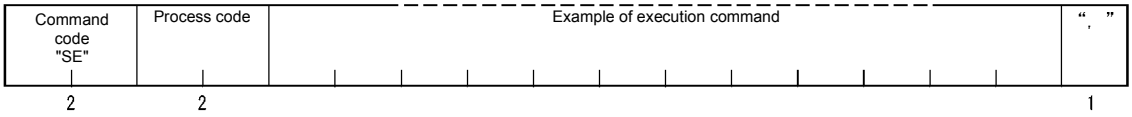
External input information	Returns the signal status when a command of external input has been received. (The second character is always "0".) "0": "OFF" "1": "ON"
External output information	Returns the signal status when a command of external output 1 and external output 2 has been received. "0": "OFF" "1": "ON"

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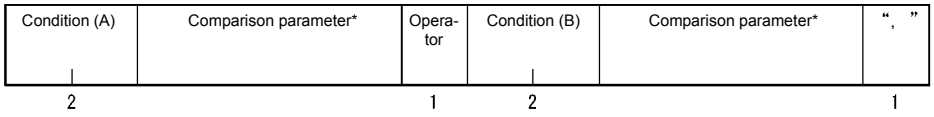
5-8-5 Operation Condition Setting (SE)

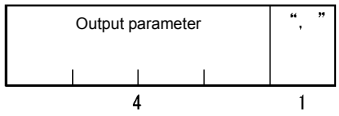
Specifies operating conditions in the Self-Execution mode.

<Command>
(1) Process command

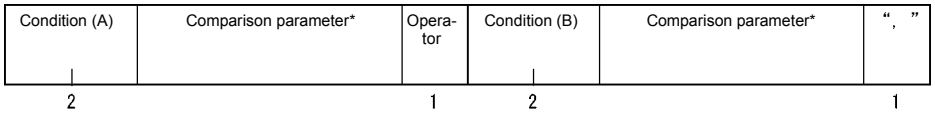


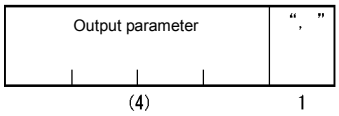
(2) OUT1 output



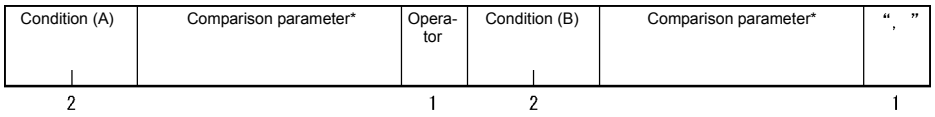


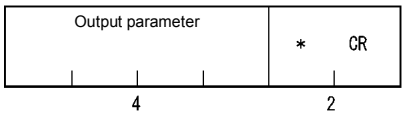
(3) OUT2 output



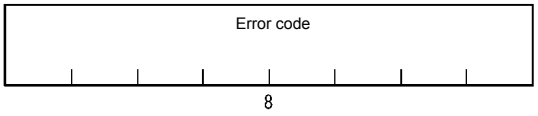


(4) RS-232C output

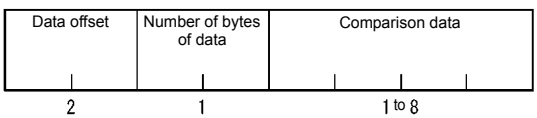




* There are the following three patterns in the comparison parameter section.
The condition is regarded as ER (Communication NG) in the communication judgment:



The condition is regarded as anything other than ER in the communication judgment:
No parameter
The condition is data judgment:



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Process code		Specifies an operation to be executed in the operating condition. "00": Setting "10": Read	
Example of execution command		Specifies a command to be executed according to the following conditions. Condition 1: A command can be specified by a communication command only. Condition 2: The communication designation is "RA" and "RI" only. Condition 3: The number of written bytes is a maximum of 8 bytes (for both of ASCII and hexadecimal).	
Condition (A) (B)		Communication judgment	"OK": Communication OK. "ER": Communication NG. "DS": Data status. "AL": Always. "xx": Nil.
		Data judgment	"= =": Judgment data matched. "! =": Judgment data unmatched. "> =": Judgment data or more. "< =": Judgment data or less. The data judgment can be used by an execution command "RD" or "CW".
Comparison parameter	Data offset (A) (B)	Condition is data judgment	Specifies an offset value of area used for judgment in read data string. Available designation range is between 00h and 7Fh.
	Number of bytes of data (A) (B)	Condition is data judgment	Specifies the number of bytes which performs judgment.Available designation range is between 01h and 04h.
	Comparison data (A) (B)	Condition is data judgment	Specifies a comparison data for data judgment.
		Condition is "ER" judgment	Error code designation. If "00000000" is specified, process is executed when any error occurs. Example: "707A0000" Communication error and address error.
Operator		Operator for the condition A and condition B. "&": AND, "+": OR	
Output parameter		Specifies the output ON time in millisecond assuming that a process method is output. 1 to 9999 millisecond. Continued to the next judgment (0000 is specified). Fixed to "0000" in the RS-232C output part.	

* The communication judgment condition DS performs the process only when the status flag becomes "1" ("CW" and "MD" only).

<Response>

Command code "SE"	Termination code "00"	Retransmission flag	Status flag	* CR
2	2	1	1	2

Even if no condition is specified (e.g., OUT1/2 is "1 condition judgment", there is no output to "OUT2 RS-232C" etc.), send an unconditional symbol ("X") according to the format (underlined in the data string below). If this symbol is not sent, a format error (14) occurs.

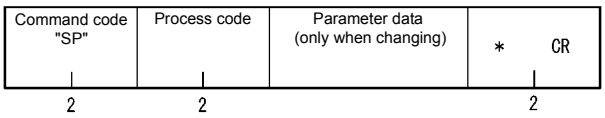
Sent data string: "SE00RDRAH1001010, = 080400000001 + XX, 0500, ER00000000 + XX, 0000, XX + XX, 0000"

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5-8-6 Parameter Setting (SP)

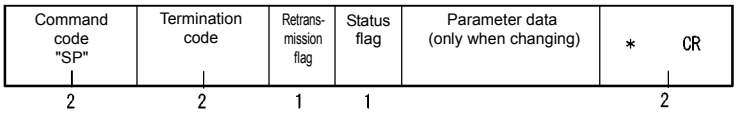
Operates the parameters used in the controller from a host device.

<Command>



Process code (High order digit)	Specifies a type of process to parameter. "0": Change "1": Read "9": Initialize (set to a default value)	
Process code (Low order digit)	Specifies a type of parameter. "1": Character interval monitoring time "2": Response Ready time "3": Communication restriction time setting	
Parameter data (only when changing)	Data No.	Available value
	"1"	Specifies four decimal digits. 0 to 9999 (ms)
	"2"	Specifies two decimal digits. 0 to 99 (ms)
	"3"	Specifies two decimal digits. 01 to 99 (x 10 ms). For "00", nothing is specified.

<Response>



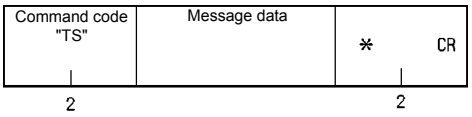
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5-9 Host Command

5-9-1 Test (TS)

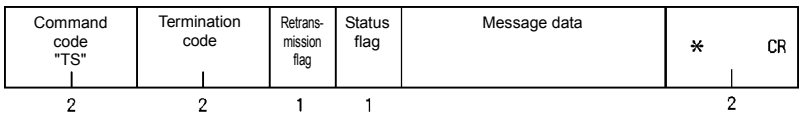
Makes a response directly to a message sent by a host device. This command is used for a communication test between the host device and ID controller.

<Command>



Message data	Any character string to execute a test communication.

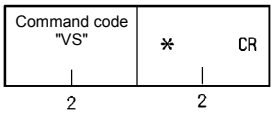
<Response>



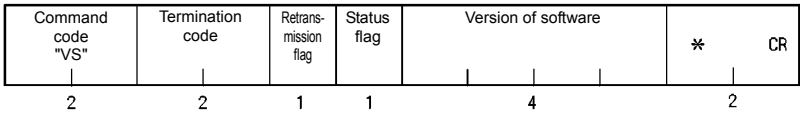
5-9-2 Version Information (VS)

Reads a version of software of the controller.

<Command>



<Response>



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5-10 Termination Code List

The meanings of termination code of response are described below.

Type	Termination Code	Name	Description
Normal end	"00"	Normal end	Command execution has ended correctly. A command was executed correctly when polling process is specified.
Host communication error	"10"	Parity error	A parity error has occurred in any character of command.
	"11"	Framing error	A framing error has occurred in any character of command.
	"12"	Overrun error	An overrun error has occurred in any character of command.
	"13"	FCS error	FCS of received command is invalid.
	"14"	Format error	A command format is incorrect. Character interval has exceeded a preset time.
	"15"	Execution status error	Communication designation is SI/RI/PI when input setting is RESET. The "MO" command was executed when no operating condition is registered.
	"18"	Frame length error	A command string more than 300 characters was received.
Tag communication error	"70"	Communication error	An error has occurred during the communication with a tag and the communication cannot be completed correctly.
	"71"	Verification error	A correct data cannot be written into a tag (only when verification is enabled).
	"72"	No-tag error	There is no tag in a communication area of antenna when a trigger system command is executed. In a command which performed communication designation of "st", there is no tag, which communicated immediately before, in a communication area of antenna. The antenna is not connected.
	"74"	Outstanding tag error	In polling query, a communication process has not yet been completed.
	"7A"	Address designation error	Designation of process address is unsuitable and the execution is impossible.
	"7D"	Write protect error	Something was written into a write-protected page.
	"7E"	ID system error (1)	A tag cannot execute a command process.
	"7F"	ID system error (2)	An inapplicable tag was used.
System error	"7C"	Antenna section error	No communication can be executed due to antenna trouble.
	"9A"	EEPROM error	An error in writing into/reading from nonvolatile memory in the controller (the SP/SE command). The "MO" command was executed under invalid operating condition.

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5-11 Example of Communication Program

Example of BASIC program

1:1 Protocol

```
100 '***** V670-CD1D SAMPLE PROGRAM *****
110 CLS
120 OPEN "COM:E73NN" AS #1                          'Opens a RS-232C port.
130 '
140 '***** MAIN LOOP ****
150 *LOOP
160    LINE INPUT "Input TX Data : ", ITD$          'Inputs a command data.
170    TXD$=ITD$+"*"+CHR$(13)                       'Sets a data string to be sent.
180    PRINT "[TX] : ";ITD$                         'Displays a command data.
190    PRINT #1,TXD$;                               'Sends a data string.
200    GOSUB *RECEIVE                               'Receives a data string.
210    PRINT "[RX] : ";REC$                         'Displays a response data.
220 GOTO *LOOP
230 '
240 '***** RECEIVE DATA *****
250 *RECEIVE
260    RXD$=" "
270    WHILE (LOC(#1)=0):WEND                       'Checks a receiving buffer.
280    WHILE (INSTR(RXD$,"*"+CHR$(13))=0)           'Checks a termination code.
290       RXD$=RXD$+INPUT$(1,#1)                    'Reads a received data.
300    WEND
310    REC$=LEFT$(RXD$,LEN(RXD$)-2)                 'Extracts a response data.
320 RETRUN
330 '
340 END
```


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1:n Protocol

```
100 '***** V670-CD1D SAMPLE PROGRAM2 *****
110 CLS
120 OPEN "COM:E73NN" AS #1                          'Opens a RS-232C port.
130 '
140 '***** MAIN LOOP ****
150 *LOOP
160    LINE INPUT "Input TX Data : ", ITD$          'Inputs a command data.
170    IP$="00"+ITD$:GOSUB *FCS                     'Calculates FCS.
180    TXD$=CHR$(1)+IP$+OP$+"*"+CHR$(13)            'Sets a data string to be sent.
190    PRINT "[TX] : ";ITD$                         'Displays a command data.
200    PRINT #1,TXD$;                               'Sends a data string.
210    GOSUB *RECEIVE                               'Receives a data string.
220    PRINT "[RX] : ";REC$                         'Displays a response data.
230 GOTO *LOOP
240 '
250 '***** RECEIVE DATA *****
260 *RECEIVE
270    RXD$=" "
280    WHILE (LOC(#1)=0):WEND
290    WHILE (INSTR(RXD$,"*"+CHR$(13))=0)
300       RXD$=RXD$+INPUT$(1,#1)
310    WEND
320    IP$=MID$(RXD$,2,LEN(RXD$)-5):GOSUB *FCS      'Calculates FCS
330    REC$=MID$(RXD$,4,LEN(RXD$)-7)
340    FCS$=MID$(RXD$,LEN(RXD$)-3,2):GOSUB *CHK.FCS  'Checks FCS
350 RETRUN
360 '
370 '***** CALCULATE FCS *****
380 *FCS
390    K=0
400    FOR I=1 TO LEN(IP$)
410       TMP$=MID$(IP$,I,1)
420       K=K XOR ASC(TMP$)
430    NEXT I
440    OP$=HEX$(K)
450 RETURN
460 '
470 '***** CHECK FCS *****
480 *CHK.FCS
490    IF FCS$<>OP$ THEN REC$="FCS ERR!!"
500 RETURN
510 '
520 END
```


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Chapter 6 How to Use Self-Execution Mode

6-1 Available Conditions

In the Self-Execution mode, by executing automatically the operating conditions (communication command, judgment condition, output condition, etc.) registered in the controller, the communication and peripheral devices can be controlled without control from a host device.

In the Self-Execution mode, the following conditions can be specified.

Item	Condition	Remarks
Execution command	Communication command.	For the communication command, refer to "5-4 Command List".
Communication mode	RA, RI.	Continuous operation is required in the Self-Execution mode. So, a repeat system command only can be specified.
Output	Signal output: OUT1/2. Data output: RS-232C.	In the signal output, output time can be specified. Data output is a response of execution command.
Number of judgments	Two judgments per output.	One judgment also can be specified.
Judgment conditions	• Judgment in communication result • Comparison of data of response (matched, unmatched, large or small).	For data comparison, an area to be compared can be specified. (1 to 4 bytes)

* For a format and any other details, refer to "5-8-5 Operation Condition Setting (SE)".
* There is a limited number of commands that can be used in self-execution mode. For details, refer to Chapter 5-4, "Command List."

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6-2 Setting Procedure

Procedure to use the Self-Execution mode is described below.

(1) Connect a host interface, power supply and antenna.
(2) Turn on the power supply.
(3) Check a host communication with a test command.
(4) Register an operating condition with the SE (Operation Condition Setting) command.
(5) Enter the Self-Execution mode through the dip switch (turn ON SW 3-2) or with the MO (Operation Mode Change) command.

If you enters the Self-Execution mode through the dip switch, turn OFF the power supply once, turn on the power supply again and check the operation.

-- Then, the antenna starts communicating. --

(6) Check an operation by using an applicable tag to check the operating condition.

Here, you can use the Self-Execution mode.
If you want to cancel the Self-Execution mode due to any reason, use the MO (Operation Mode Change) command.

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6-3 Example of Setting

An example of setting to execute the following items is described.
Communication process : Reads 16 bytes from the address 10h in a hexadecimal number in an automatic operation.
Judgment, OUT1 output : 4 Bytes of data from the address 18 is "00000001" and turning ON for 0.5 seconds.
Judgment, OUT2 output : ON at an error. (Time is not monitored.)
Judgment, RS-232C output : No output.

- **Sent command string**

"SE00RDRAH1001010, = = 080400000001 + XX, 0500, ER00000000 + XX, 0000, XX + XX, 0000"

- **Description of sent command string**

SE00RDRAH1001010 ← Execution command

Read 16 bytes from the address 10h.

==080400000001+XX, 0500, ← Specifies a condition of OUT1 output.

Output time (0.5 seconds).
No condition (B).
Condition (A) is judged as matched.

ER00000000+XX, 0000, ← Specifies a condition of OUT2 output.

ON (unlimited)
No condition (B).
Condition (A) is judged as unmatched. (All the error codes)

XX+XX, 0000 ← Specifies a condition of RS-232C output.

Fixed data.
No condition (B).
No condition (A).

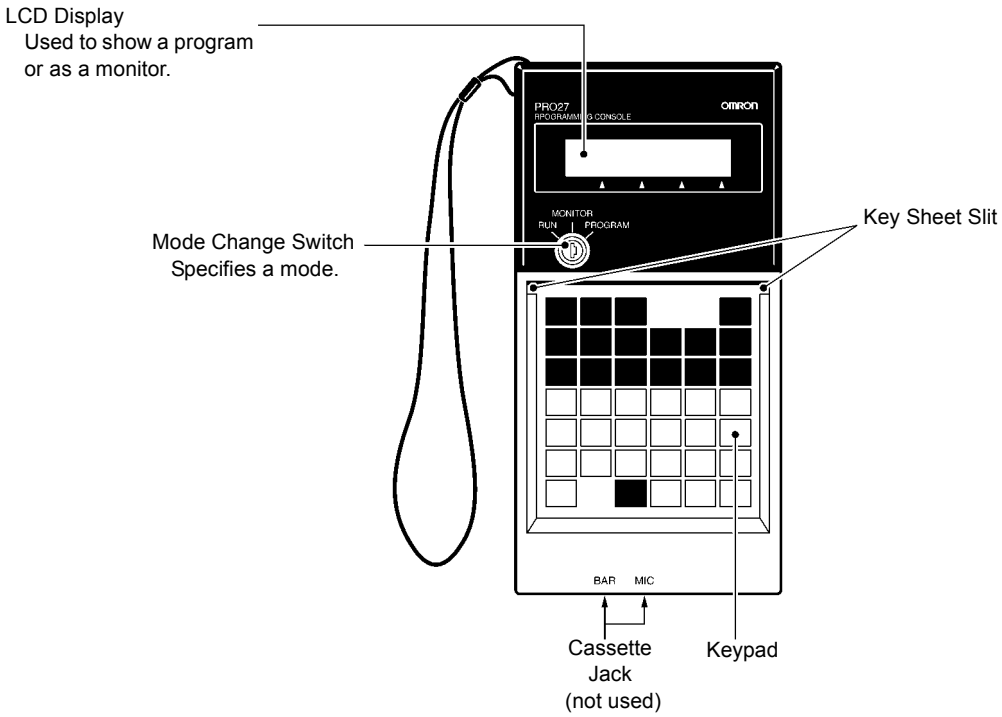
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Chapter 7 How to Use Programming Console

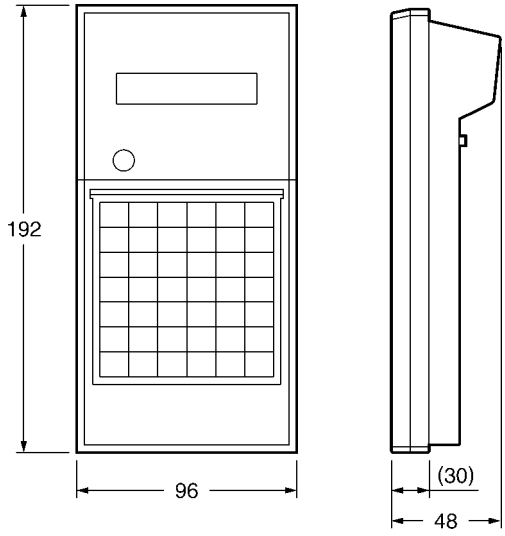
7-1 Component Name

By using a Programming Console, the controller model V670-CD1D-V1 can check the communication with a tag at the system startup, read/write a data of tag, check the controller setting and read the details of error. We recommend you to use our Programming Console model C200H-PRO27 (unbundled). To connect the Programming Console to the controller, the cable model V700-P10 (unbundled) is required.



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7-2 Outside Dimension



(Unit: mm)

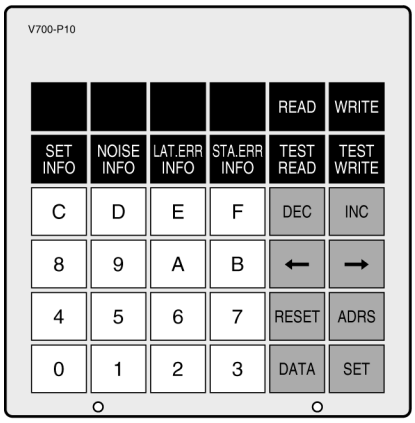
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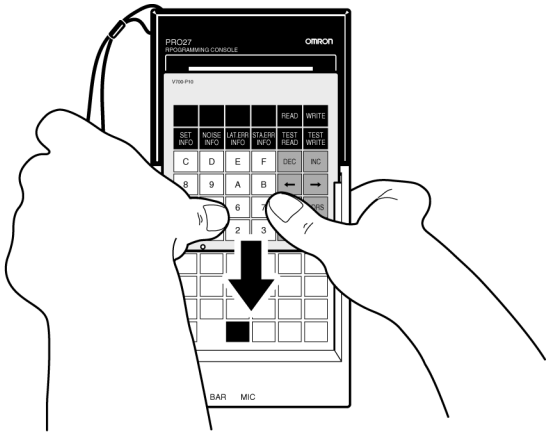
7-3 Connection of Programming Console

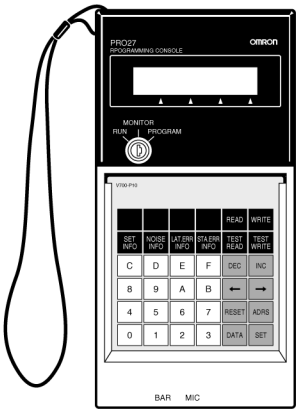
To connect the programming console to the controller, the cable model V700-P10 (unbundled) is required. A key sheet comes with the cable model V700-P10.

7-3-1 Inserting Key Sheet

As shown below, insert the dedicated key sheet into the slit at the top of programming console. Insert the key sheet pressing it with your fingers softly until the key sheet has been held completely in place.







Correct Usage
Insert the key sheet correctly as shown above. Otherwise, the keypad of the programming console may not function properly.

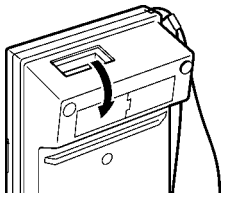
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7-3-2 Connecting Cable

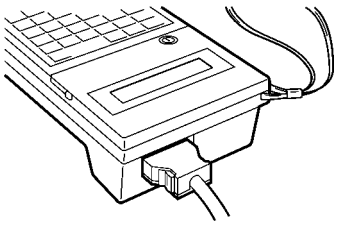
Connect the programming console with the dedicated cable model V700-P10. A round connector and square connector come with the cable. Use the round connector and square connector to the controller, and the programming console respectively.

A connector always can be plugged into and unplugged from the programming console when the power supply turns on.

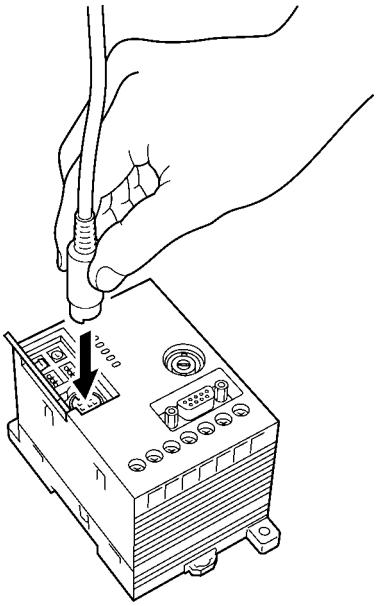
(1) Remove the connector cover at top of the reverse side or at the reverse side. Keep the removed panel as shown in the figure.



(2) Insert the square connector of the connecting cable completely until a lock lever clicks to fix it.



(3) Open a cover at the front panel of the controller.
(4) The round connector of the connecting cable is marked with an arrow. Insert the connector with the arrow up into the programming console connector of the controller completely. This connector is not equipped with a lock.



⚠ Caution

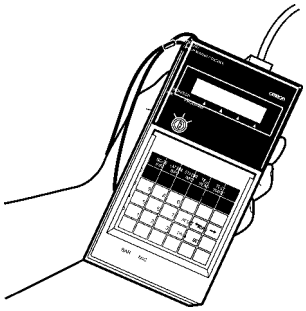
When you plug or unplug the connector into the programming console when the power supply turns on, take care not to touch the controller wire. Otherwise, you may get an electric shock.



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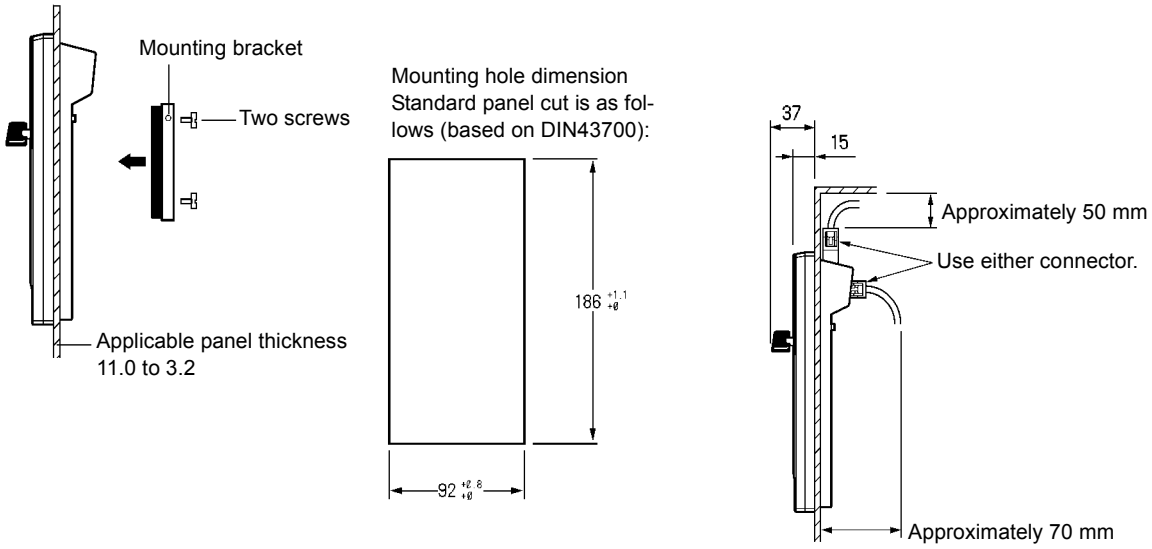
7-4 How to Use

- **Holding in your hand**



- **Panel installation**

To install a panel, use a mounting bracket Type C200H-ATT01 (unbundled).



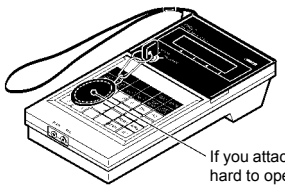
(Unit: mm)

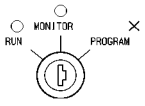
When you install the panel, take the cable height into consideration.

When you use this unit in a control panel etc., keep the ambient temperature within 0 and 45°C.

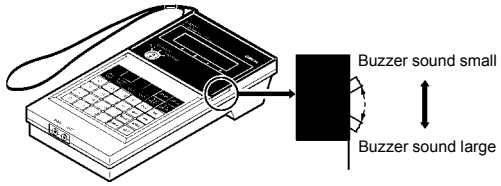
Correct Usage

- Do not attach a key holder etc. to the mode change key switch. Otherwise, it becomes hard to operate the key pad.
- You can pull out the mode change key when it is positioned at RUN or MONITOR. You cannot pull of the mode change key, when it is positioned at PROGRAM.
- In the V670 Series, the PROGRAM mode is not used. Do not position the key at PROGRAM when you use the V670 Series.
- To reduce the buzzer sound when you press the key pad, set the lever at the side face of the programming console to an upper position.
- When you disconnect the connecting cable from the programming console, nip the levers at the both sides of the connector and then pull out it.





○ : You can pull out the key.
× : You cannot pull out the key.

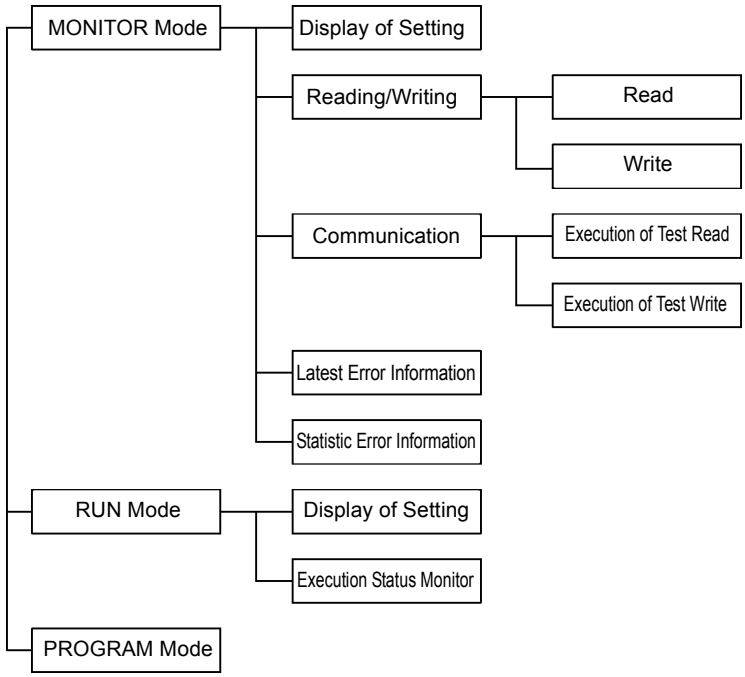


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7-5 Functions

By using a programming console, the controller model V670-CD1D-V1 can check the communication with a tag at the system startup, read/write a data of tag, check the controller setting and read the details of error.

7-5-1 Programming Console Function List



(1) MONITOR Mode

- Display of Setting
  Displays every item of controller setting (DIP-SW).
- Reading/Writing
  Reads/Writes the content of a tag put in front of an antenna.
- Communication Test
  Used to check the communication or communication area when a tag moves.
- Latest Error Information
  Displays a maximum of 30 items of error information in order of occurrence.
- Statistic Error Information
  According to the error code, displays the number of errors occurred after the controller started the operation.

(2) RUN Mode

- Display of Setting
  Displays every item of controller setting (DIP-SW).
- Execution Status Monitor
  Displays any command, termination code, etc., which the controller received, in real time.

(3) PROGRAM Mode

This mode is unavailable in this controller.

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7-5-2 How to Operate

7-5-2-1 Password Input Screen

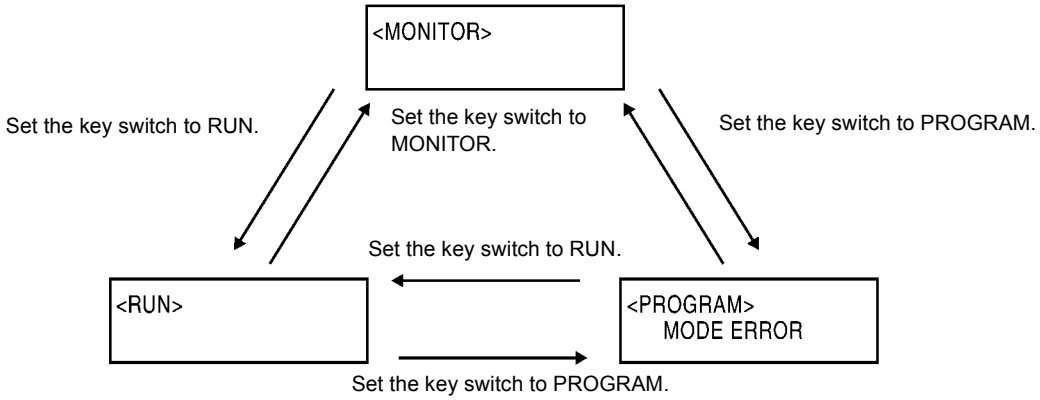
When the programming console is connected, the screen below appears. Press RESET and then SET. An initial status of the mode is displayed according to key switch setting.
If you enter the password when the key switch is set to the MONITOR mode, all the operations are aborted even if the controller works. Please note that the screen is ready to accept the execution of operation in the MONITOR mode then.



7-5-2-2 Changing Operation Mode

The controller operation mode is switched by changing the key switch of the programming console.

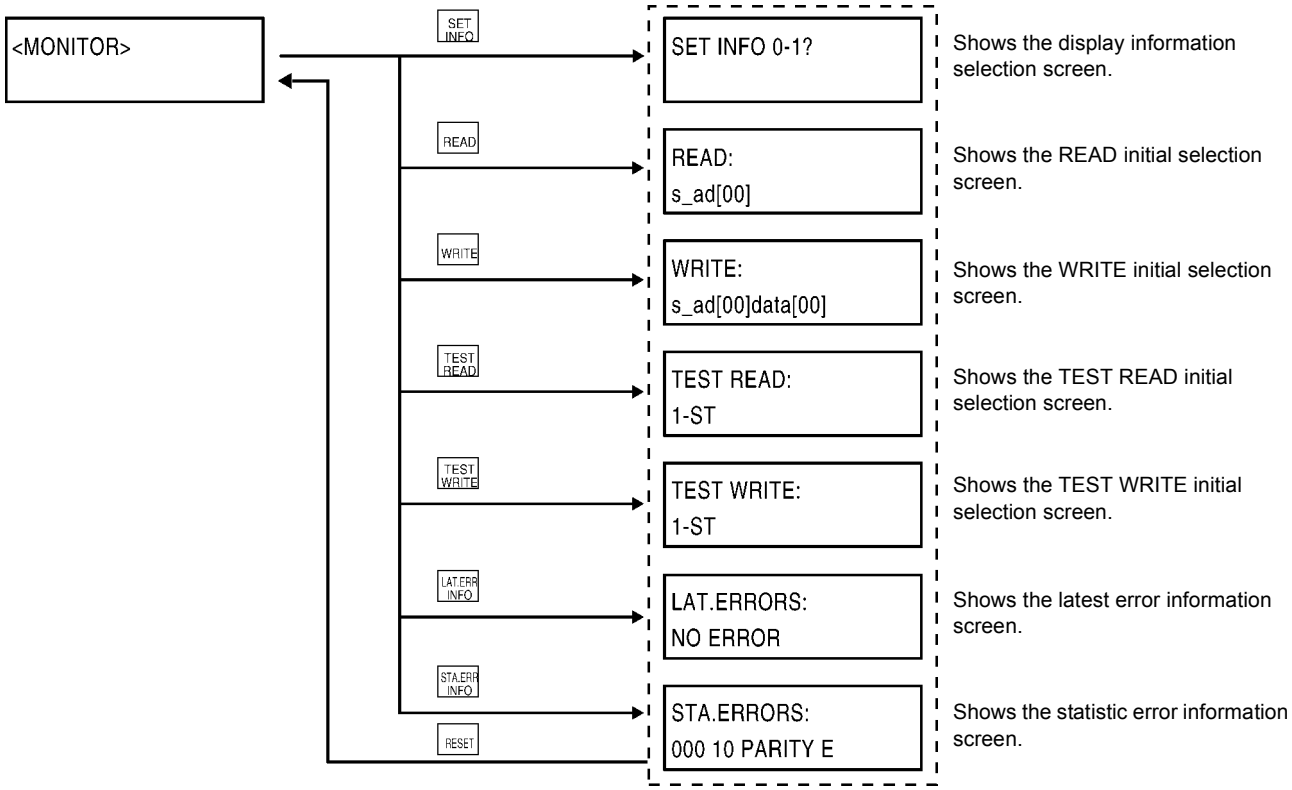
- MONITOR Mode
  Communication with a tag can be executed by using the programming console in the MONITOR mode. Any command cannot be controlled from a host device.
- RUN Mode
  The controller setting and execution status can be displayed in the RUN mode. Any other functions cannot be used.
- PROGRAM Mode
  This mode is unavailable in this controller.



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7-5-2-3 Accepting Key in Initial Screen of Monitor Mode

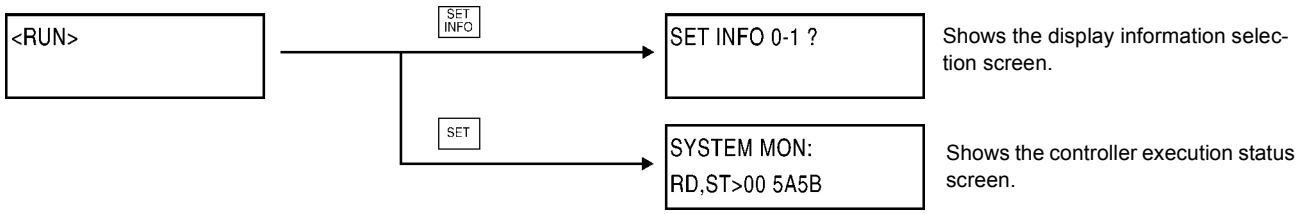
When the key switch is set to MONITOR, an initial screen of MONITOR mode is appears. In this screen, the [READ], [WRITE], [TEST READ], [TEST WRITE], [LAT.ERR INFO], [STA.ERR INFO] and [SET INFO] keys only can be accepted.



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7-5-2-4 Accepting Key in Initial Screen of Run Mode

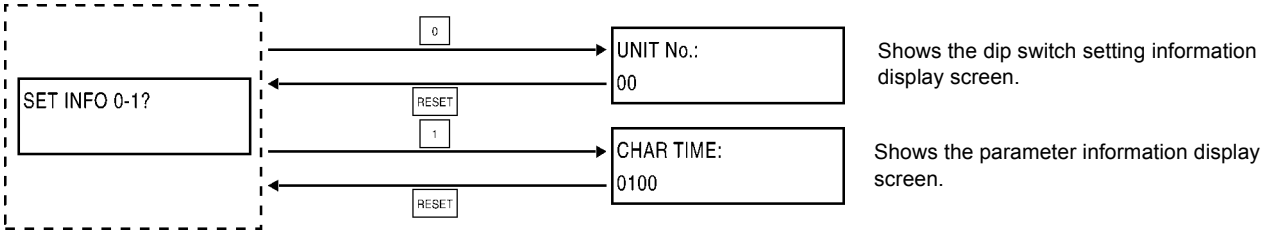
When the key switch is set to RUN, an initial screen of RUN mode is appears. In this screen, the SET INFO and SET keys only can be accepted.



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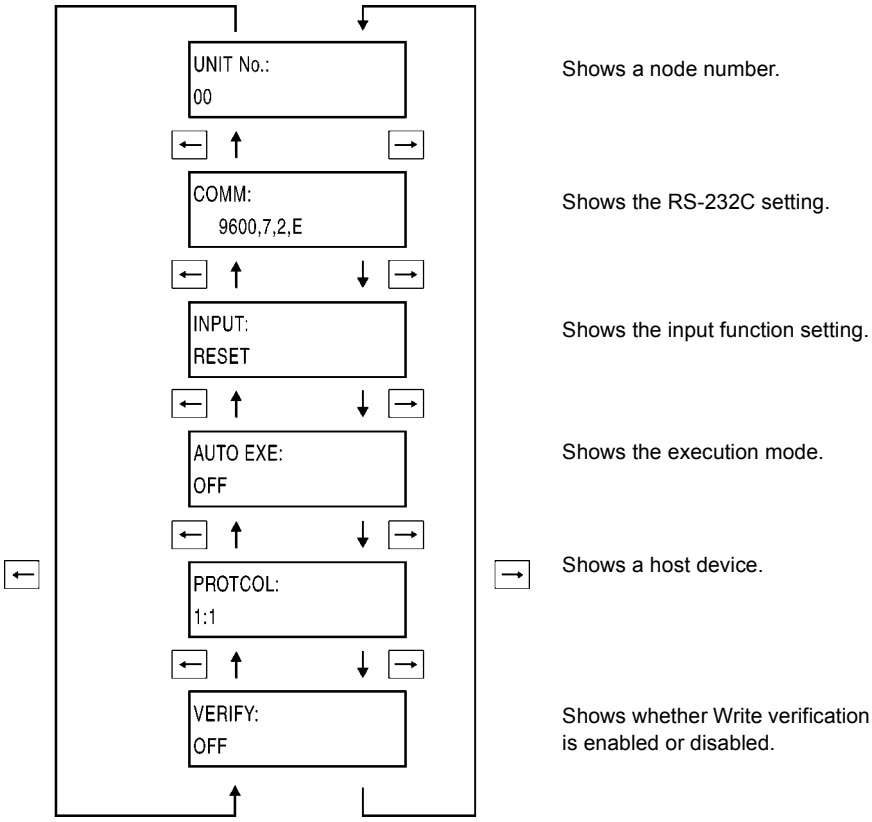
7-5-3 Displaying Details of Setting

This function of displaying details of setting of the programming console displays every item of controller setting. By pressing the SET INFO and then 0 or 1 key, an item to be displayed can be selected.



♦ Dip switch setting information [0]

The dip switch setting information shows every item of controller setting specified by the dip switch.



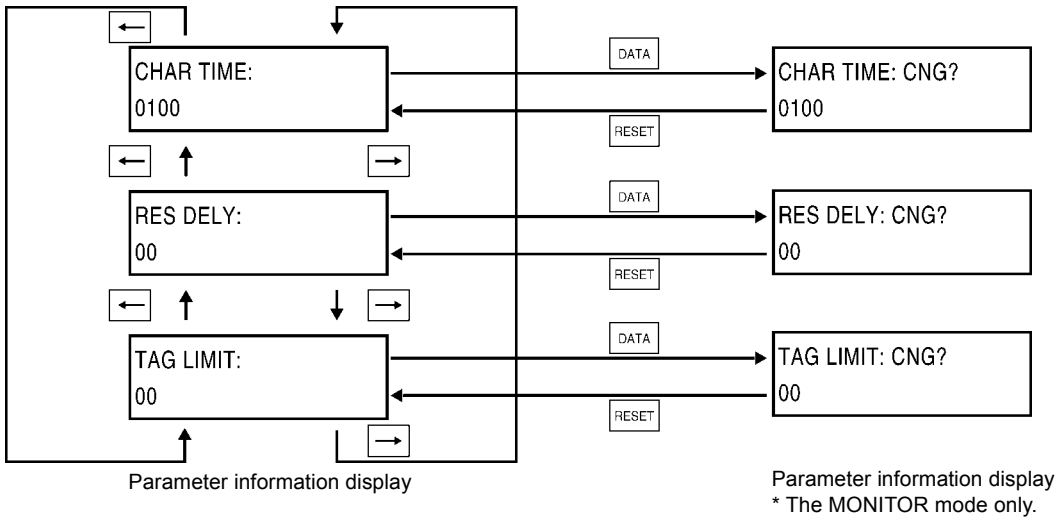
The items are shown as follows:

Item		Display
Node No.		00 to 31
RS-232C communi-cation setting	Communication speed	9600, 19200, 38400, 115200
	Data length	7, 8
	Stop bit	1, 2
	Parity	E, O, N
Input function changeover		RESET, TRIGGER
Operation mode at startup		OFF, ON
Protocol designation		1:N, 1:1
Verification at writing		OFF, ON

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♦ Parameter information [1]

The parameter information shows every item of controller setting stored in internal nonvolatile memory.

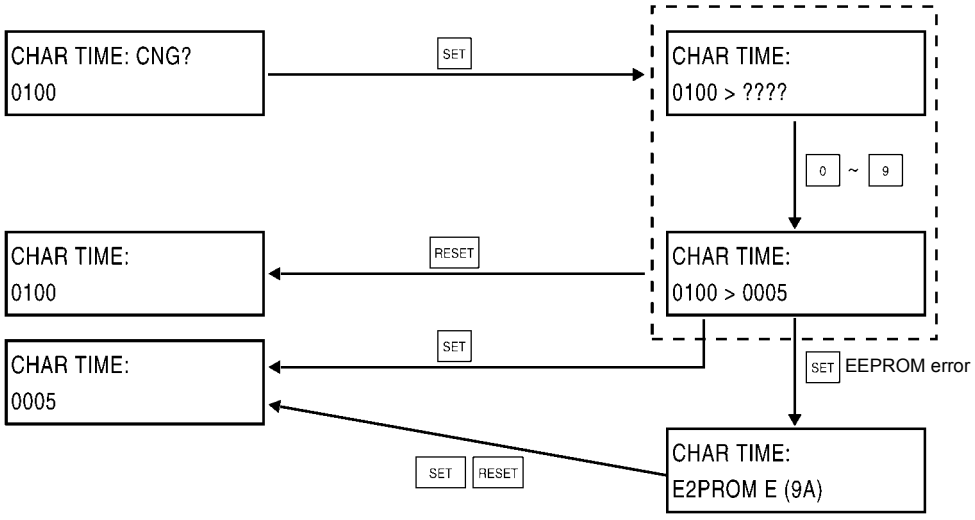


The items are shown as follows:

Item		Display	Value
CHAR TIME	Character interval monitoring time	Other than 9600 bps: 0001 to 9999 9600 bps : 0002 to 9999	x 1 m-second
RES DELY	Response Ready time	00 to 99	x 1 m-second
TAG LIMIT	Communication restriction time	00 to 99	x 10 m-second

♦ Parameter setting change

In the parameter setting change, you can change the controller setting stored in internal nonvolatile memory. The figure below shows the character interval monitoring time as an example. When you change any other parameter, the sequence is the same.



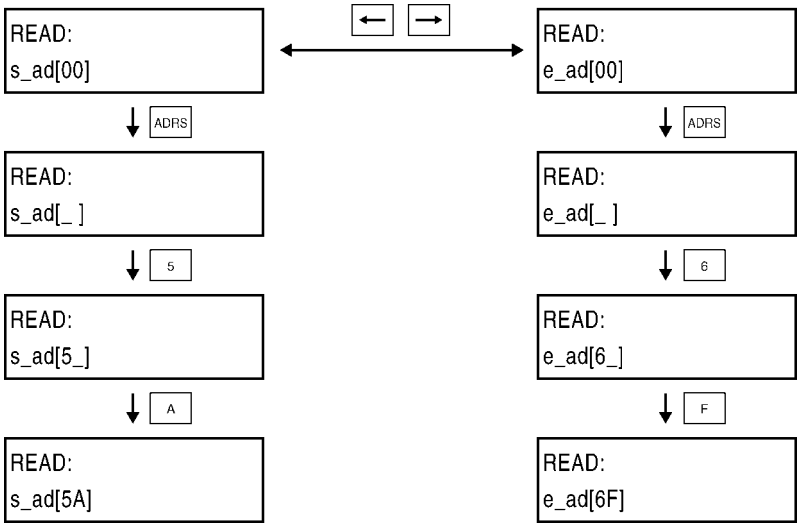
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7-5-4 Address Setting

In this screen, you can specify the first address and end address, from which a data is read, to which a data is written and to be tested.

7-5-4-1 For Reading

An example to set the start address to 5Ah and the end address to 6Fh is shown below.



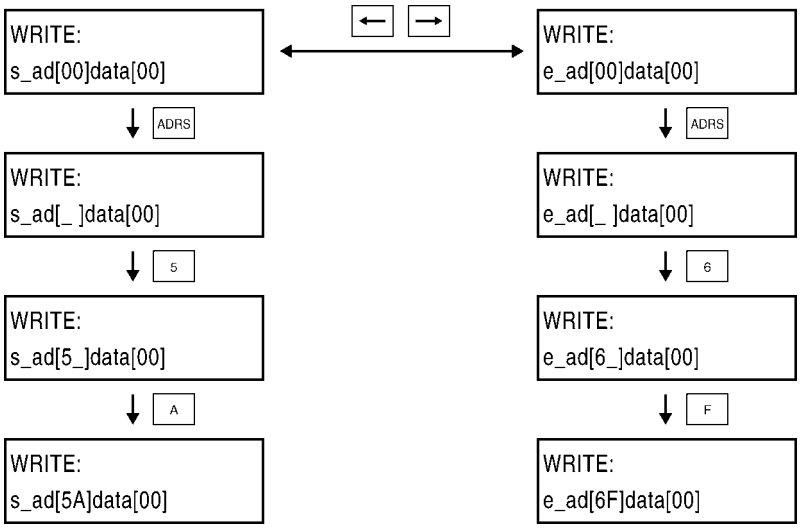
You can select the start address and end address with ← and →.

When you press ADRS, the screen is ready to accept the address input. The available characters are 0 to 9 and A to F.

The start address value must be equal to the end address value or less. If the start address value is more than the end address value, an address error occurs during the communication. Also, if the address value more than 7Fh is specified, an address error occurs.

7-5-4-2 For Writing

An example to set the start address to 5Ah and the end address to 6Fh is shown below.



You can select the start address and end address with ← and →.

When you press ADRS, the screen is ready to accept the address input. The available characters are 0 to 9 and A to F.

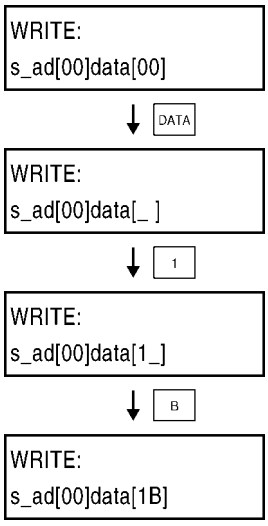
The start address value must be equal to the end address value or less. If the start address value is more than the end address value, an address error occurs during the communication. Also, if the address value more than 7Fh is specified, an address error occurs.

Correct Usage
• The start address value must be equal to the end address value or less. • When you use the available designation range, check the tag memory capacity.

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7-5-5 Data Setting

In this screen, you can specify a written data in two hexadecimal digits within 00 and FF.
Setting a data in 1B:

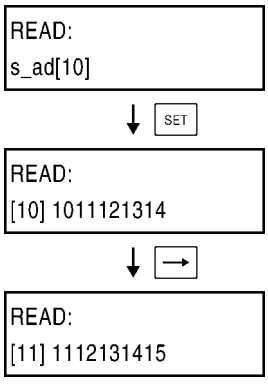


When you press the DATA key, the screen is ready to accept the address entry. The available keys are 0 to 9 and A to F.

7-5-6 Reading/Writing Data

7-5-6-1 Reading

In this screen, you can read a data from any address of the tag and display it.



Set the start address to 10h and the end address to 1Fh.

When you press the SET key, a data is read out of the tag and a maximum of 4 bytes of data beginning with the specified start address is displayed.

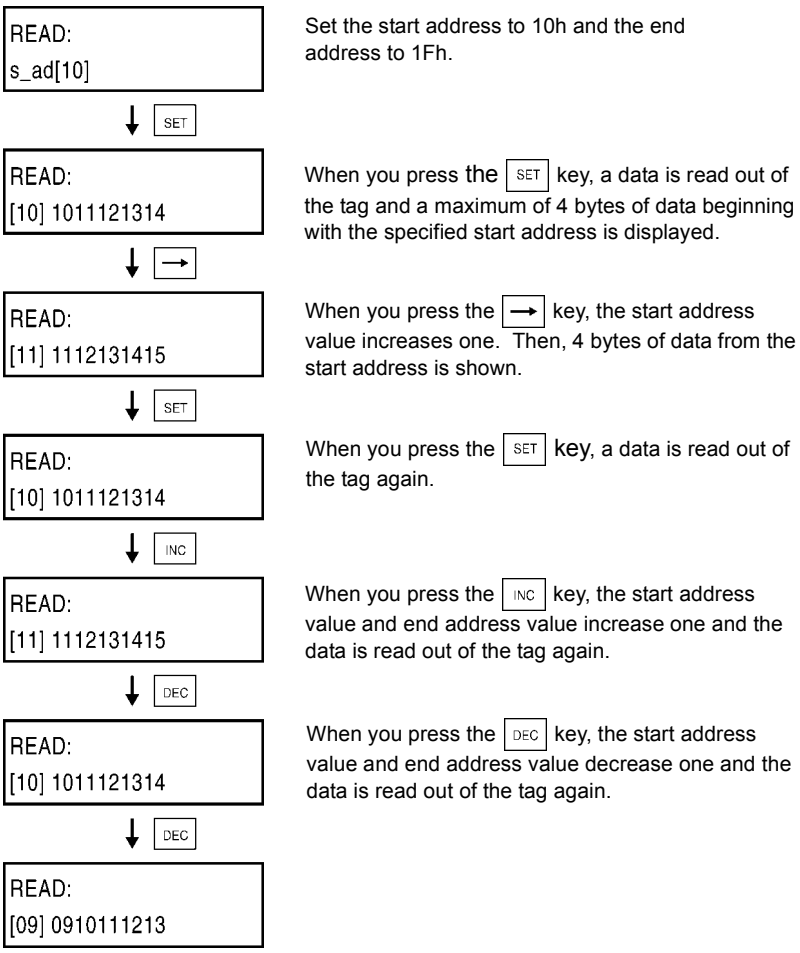
When you press the → key, the start address value increases one. Then, the first address of the displayed 4 bytes of data is changed.

Correct Data
When you use the available designation range, check the tag memory capacity.

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7-5-6-2 Reading Again

When you press the [SET] key again after reading the content of tag, you can read the data again according to the specified start address and end address. When you press [INC] or [DEC], the start address value and end address value increase or decrease one. Then, the data is read again.



Set the start address to 10h and the end address to 1Fh.

When you press the [SET] key, a data is read out of the tag and a maximum of 4 bytes of data beginning with the specified start address is displayed.

When you press the [→] key, the start address value increases one. Then, 4 bytes of data from the start address is shown.

When you press the [SET] key, a data is read out of the tag again.

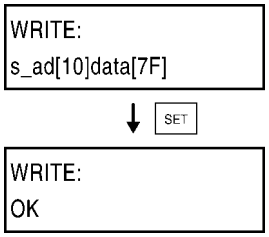
When you press the [INC] key, the start address value and end address value increase one and the data is read out of the tag again.

When you press the [DEC] key, the start address value and end address value decrease one and the data is read out of the tag again.

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7-5-6-3 Writing

In this screen, you can write any data into any address of the tag. The same data is written into all the specified areas.

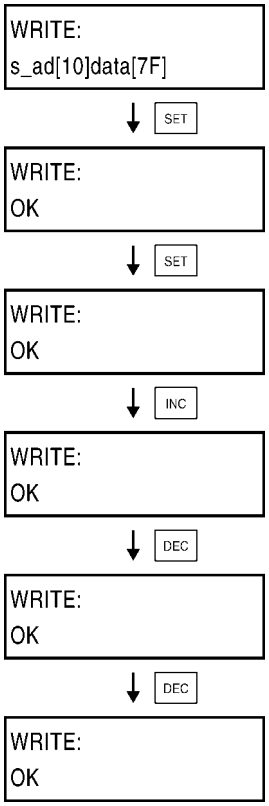


Set the start address to 10h, the end address to 1Fh and a data to 7F.

When you press the SET key, the data is written into the tag. When the data has been written correctly, "OK" is shown.

7-5-6-4 Writing Again

When you press the SET key again after writing a data into the tag, you can write the data into the tag again according to the specified start address and end address. When you press the INC or DEC key, the start address value and end address value increase or decrease one. Then, the data is written into the tag again.



Set the start address to 10h, the end address to 1Fh and a data to 7F.

When you press the SET key, the data is written into the tag. When the data has been written correctly, "OK" is shown.

When you press the SET key, the data is written into the tag again.

When you press the INC key, the start address value and end address value increase one and the data is written into the tag again.

When you press the DEC key, the start address value and end address value decrease one and the data is written into the tag again.

Correct Data
When you use the available designation range, check the tag memory capacity.

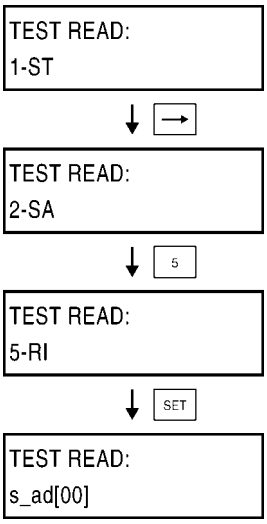
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7-5-7 Test

When you check the position of antenna and tag in an applicable communication mode, you can execute the communication in a test operation to judge whether the location and relative speed are suitable or not.

7-5-7-1 Setting Communication Mode

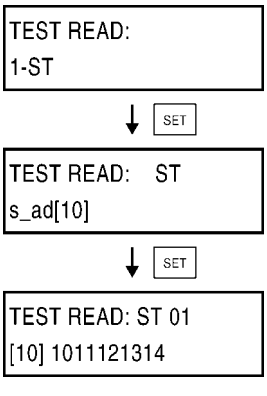
When you execute the Test Reading and Test Writing, you need to specify a communication mode first.



Specify a communication mode. Using the →/← key(s) or the 1 to 5 keys, change a communication mode to be displayed.

Decide with the SET keys.

7-5-7-2 Test Reading

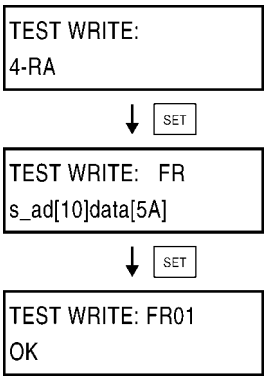


Specify the Single Trigger mode as a communication mode.

Specify the start address and end address.

When you press the SET keys, the number of repeats and a data of tag are displayed.

7-5-7-3 Test Writing



Specify Repeat Auto as a communication mode.

Specify the start address, end address and data to be written.

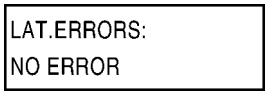
When you press the SET key, the number of repeats and the result are displayed.

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7-5-8 Reading Latest Error Information

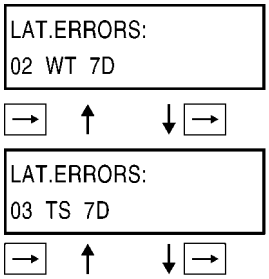
The controller can store a maximum of 30 errors occurred in the RUN mode after the power supply turns on. When the controller stores 30 errors, if an error occurs, the oldest error is deleted from the controller memory and the new one is stored. When the power supply turns off or the system is reset, all the stored errors are erased.

- **No error occurs**

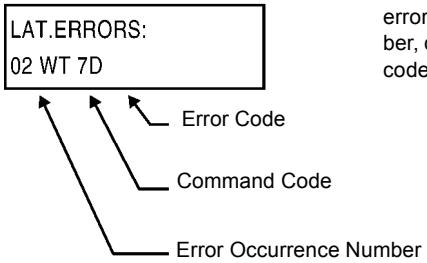


If any error does not occur, "NO ERROR" is displayed.

- **An errors occur**



If any errors occur, the stored errors are read out in reverse order of occurrence. The error information is displayed in order of occurrence with the ← / → key(s).



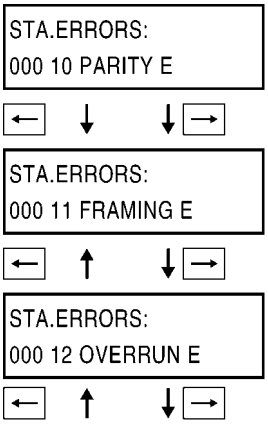
As shown in this screen, the details of the latest error information are the error occurrence number, command code and error code. For the error code, refer to "5-10 Termination Code List".

Correct Usage
If you want to keep the details of errors, neither turn off the power supply nor reset the system.

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7-5-9 Statistic Error Information

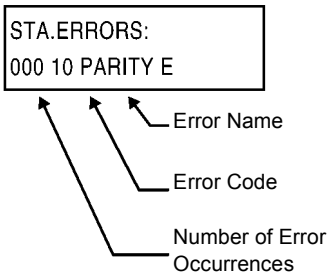
The controller adds the number of error occurrences per error at every error occurrence. At the same time, the controller calculates MCBF. Those data are all stored in memory. However, when the power supply turns off or the system is reset, all the stored data are erased.



Those are read out per error code in ascending numeric order of error code number. The error information is changed and displayed with the ← / → key(s).

When the details of all the error occurrences have been displayed, MCBF is displayed by pressing the → key.

MCBF = Total number of host commands / number of total error occurrences



As shown in this screen, the details of the statistic error information are the number of error occurrences, error code and error name. A maximum number of error occurrences is 999. No error is added any more.

$$MCBF = \frac{\text{Total number of commands}}{\text{Communication error/ Number of total system error occurrences}}$$

♦ Error Indication List

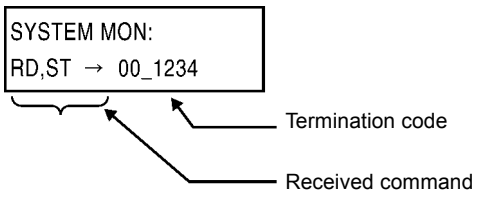
Error Code	Error Name	Error Code	Error Name
10	PARITY E	70	COM.DC E
11	FRAMING E	71	VERIFY E
12	OVERRUN E	72	NO DC E
13	FCS_E	7A	ADRS E
14	FORMAT E	7B	WT AREA E
15	RUN E	7C	ANT E
18	FRAME E	7D	PROTECT E
		7E	ID SYS1 E
9A	E2PROM_E	7F	ID SYS2 E

Correct Usage
If you want to keep the statistic error information, neither turn off the power supply nor reset the system.

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7-5-10 Execution Monitor

In this screen, you can monitor a command, which the controller received, and the execution result in the RUN mode.



This screen shows the received command and termination code. If there are any received command, communication designation, termination code and response data in the tag communication, the first 4 characters of the response data are displayed.

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Chapter 8 From Startup to Run

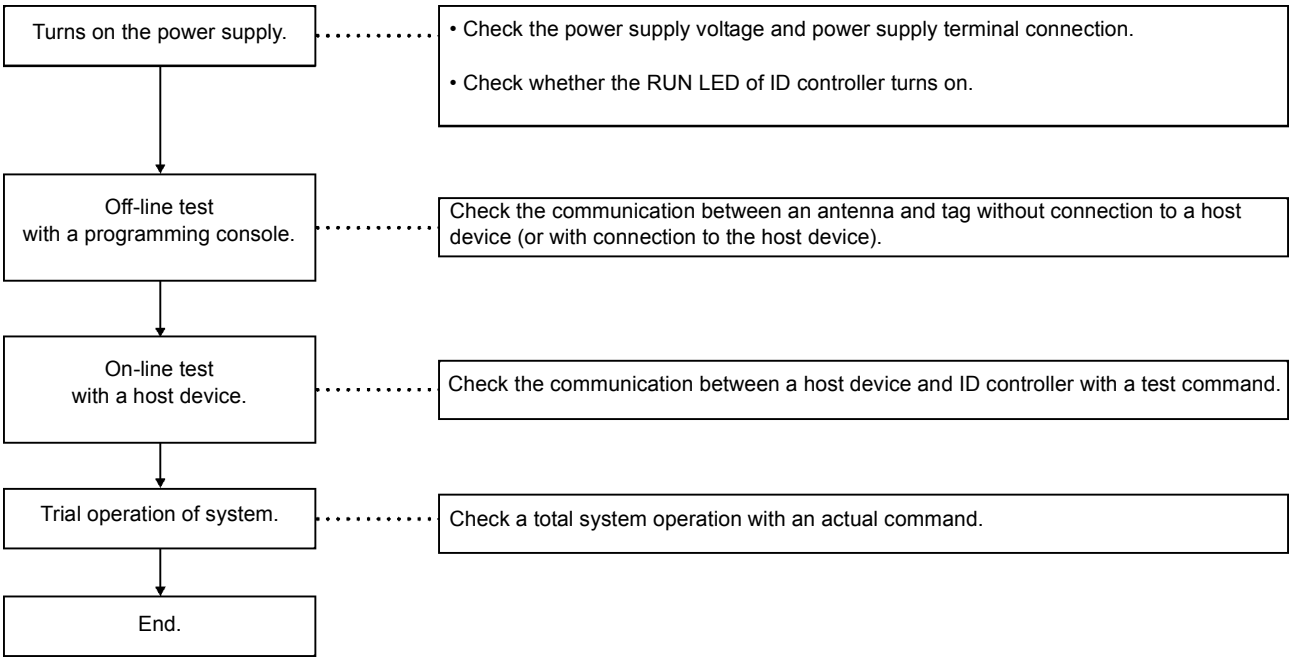
8-1 Trial Operation

♦ Items to be checked

Before performing a trial operation, check the following items:

No.	Items to be checked	Checking	Page
1	Connection of power supply and I/O cable	• Whether wiring is correct. • Whether terminal screws are tightened completely.	3-10
2	Setting of dip switch	• Whether the node number is set properly. • Whether the communication is set properly. • Whether the operation mode is set properly. • Whether the protocol is set properly.	3-3 3-4
3	Connection of antenna	Whether the antenna is connected properly.	3-8
4	Connection to a host device	Whether the RS-232C connector is connected properly.	3-12
5	Location of antenna and tag	Whether the antenna and tag are located properly.	Chapter 9

♦ Trial operation procedure



♦ Off-line test with a programming console.

By using the programming console, you can test the communication between an antenna and tag without connection to a host device. Use this off-line test to check the installation position and movement speed before the trial operation. For how to operate, refer to "Chapter 7 How to Use Programming Console".

♦ Communication test to a host device

You can test the communication between the controller and host device with a test command. Before performing a trial operation of the entire system, you can check the cable connection and communication process.

• Create a simple communication program and let the host device send a test command.
• If the communication system is correct, the controller returns received data.

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8-2 Diagnosis Function

The controller diagnoses many items to shorten the system down time preparing for error. When an error occurs, depending on a type of error, you may read out the details of error through the programming console.

♦ Details of error

Errors detected by the controller are classified into the two types of errors. One terminates an operation and the other does not terminate any operation.

- **Error which terminates an operation**

When a hardware error has occurred in the controller, the CPU operation is terminated and NORM/ERR (red) turns on.

- **Error which does not terminate an operation**

When an error in the communication between the controller and host device (host communication error) or between the antenna and tag (communication error), the ERR LED turns on. A maximum of 30 errors are stored in memory. When 30 errors are stored in memory, if an error occurs, the oldest error is deleted from memory and the new one is stored. By using the programming console, you can read out the details of those errors and, moreover, the total number of occurrences per error.

	Items	LED Display			
		RUN	COMM	NORM	ERR
Normal operation	Waiting for a command	○	●	●	●
	Communicating with a tag	○	○	●	●
	Communication with a tag completed correctly	○	●	○	●
Error which terminates an operation	CPU error	●	●	●	○
Error which does not terminate an operation	Communication error	○	●	●	○*
	Host communication error	○	●	●	○*

○ : Turns on
● : Turns off

* Turns on once when an error occurs.

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8-3 Errors and Countermeasures

Main six causes of troubles in V670 Series are as follows:

- External device failure
- Controller failure
- Antenna failure
- Cable failure
- Tag failure
- Others

} Must be repaired.

♦ Host communication error

Error Code	Name	Description
"10"	Parity error	A parity error has occurred in any character of command.
"11"	Framing error	A framing error has occurred in any character of command.
"12"	Overrun error	An overrun error has occurred in any character of command.
"13"	FCS error	FCS of received command is invalid.
"14"	Format error	A command format is incorrect. Character interval has exceeded a preset time.
"15"	Execution status error	Communication designation is Input Trigger (SI/RI/PI) when input setting is RESET. The "MO" command was executed when no operating condition is registered.
"18"	Frame length error	A command string more than 300 characters was received.

♦ Communication error

Error Code	Name	Description
"70"	Communication error	An error has occurred during the communication with a tag and the communication cannot be completed correctly.
"71"	Verification error	Correct data cannot be written into a tag (only when verification is enabled).
"72"	No-tag error	There is no tag in a communication area of antenna when a trigger system command is executed. In a command which performed communication designation of "st", there is no tag, which communicated immediately before, in a communication area of antenna. The antenna is not connected.
"74"	Outstanding tag error	In polling query, a communication process has not yet been completed.
"7A"	Address designation error	Designation of process address is unsuitable and the execution is impossible.
"7D"	Write Protect error	Something was written into a write-protected page.
"7E"	Lock error	Writing into a locked area has been specified.
"7F"	Tag error	Communication has been made to unavailable tag (password is not specified, etc.).

♦ System error

Error Code	Name	Description
"7C"	Antenna section error	No communication can be executed due to antenna trouble.
"9A"	EEPROM error	An error in writing into/reading from nonvolatile memory in the controller (the SP/SE command). The "MO" command was executed under invalid operating condition.

Correct Usage
The details of those error are all stored in the controller and you can read out an error code or error message through the programming console.

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8-4 Maintenance and Inspection

To maintain V670 Series in the best condition, you need to inspect it daily or periodically. V670 Series mainly consists of semiconductor components which have a long life. However, the following malfunctions are expected depending on the service environment or operating condition.

(1) Deterioration of element due to over-voltage or over-current.
(2) Deterioration of element due to long-term stress arisen from use in a high-temperature site.
(3) Deterioration of insulation or imperfect contact of connector due to unsuitable humidity or dust.
(4) Imperfect contact of connector or corrosion of element due to corrosive gas.

♦ Inspection item

No.	Inspection Item	Inspection	Criterion	Remarks
1	Fluctuation of power supply voltage	(1) Check at a terminal block of power supply whether the criterion is satisfied.	Within the specifications for power supply voltage.	Tester.
		(2) Check whether instantaneous power failure occurs frequently and whether voltage fluctuates considerably.	Within a allowable voltage fluctuation range.	Power supply analyzer.
2	Ambient environment (a) Temperature (b) Humidity (c) Vibration or impact (d) Dust (e) Corrosive gas	(a) Within the specifications. (b) Within the specifications. (c) Influence of vibration or impact of machines. (d) Adherence or sedimentation of dust or foreign matter. (e) Discoloration or corrosion in a metal part.	(a) Within the specifications. (b) Within the specifications. (c) Within the specifications. (d) Neither dust nor foreign material is acceptable. (e) Neither discoloration nor corrosion is acceptable.	Lowest temperature thermometer. Hygrometer.
3	Panel conditions (a) Whether the panel is ventilated. (b) Whether packing material of sealed structure is deteriorated.	(a) Check whether natural ventilation, forced ventilation and cooling are performed. (b) Check whether packing material in the panel is removed or damaged.	(a) Ventilation must be made properly. Temperature must be within -10 to +55°C. (b) Any damage is unacceptable.	—
4	Power supply for I/O (a) Voltage fluctuation (b) Ripple	Check at a terminal block of every I/O section whether criterion is satisfied.	Within the specifications.	Tester. Oscilloscope.
5	Mounting state	(1) Whether every device is fixed tightly.	Every device must be fixed tightly.	—
		(2) Whether every connector is inserted completely.	Every connector must be locked properly and fixed by screws.	—
		(3) Whether terminal block screws are tightened completely.	The terminal block screws must be tightened completely.	—
		(4) Whether wire is not damaged.	The wire must not be damaged.	—
		(5) Whether condition between a tag and antenna is within the specifications.	The condition must be within the specifications.	—
		(6) Whether grounding complies with the Class D (conventional Class III).		—
6	Error logging	Check the details of error.		—

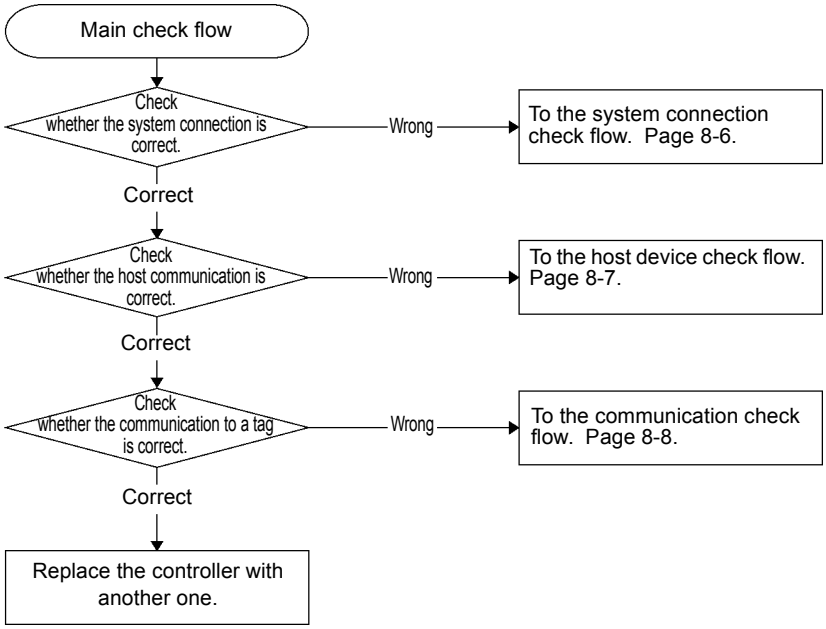
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8-5 Troubleshooting

When an error has occurred, grasp the situation fully, check whether the error occurs repeatedly or not, judge the relation to any other devices properly and check according to the flow below.

♦ Main check flow

Judge this main check flow according to the details of error.



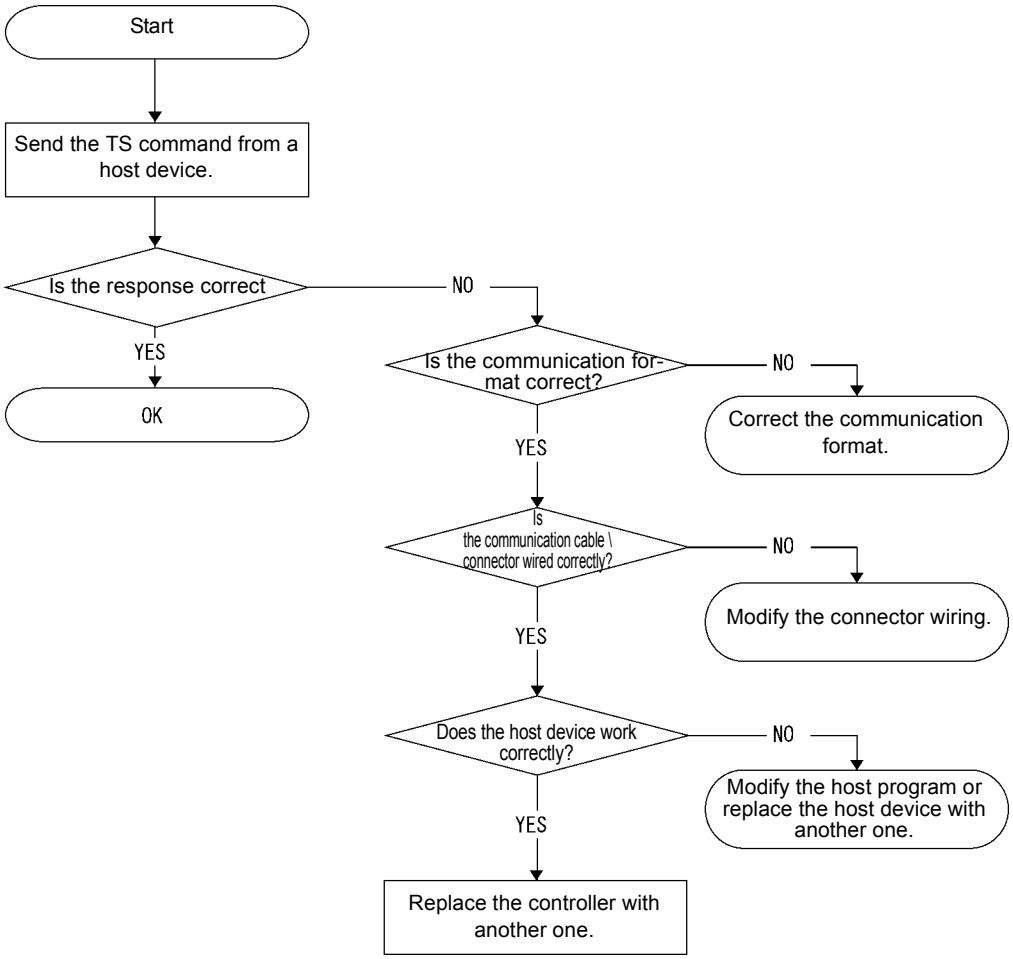
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♦ System connection check flow



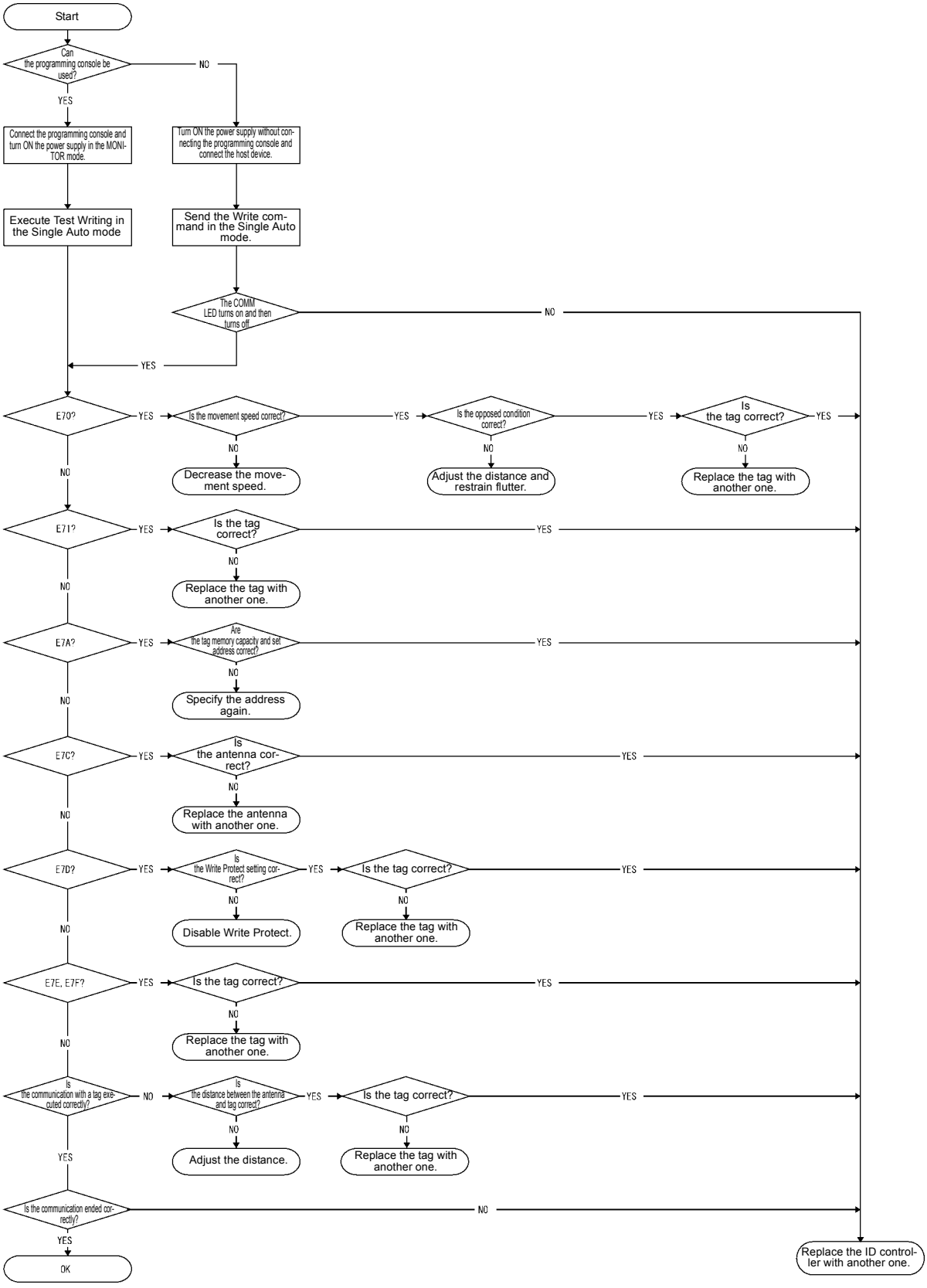
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♦ Host communication check flow



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♦ Communication check flow



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Chapter 9 Characteristic Data Depending on Operating Condition (Reference)

9-1 Influence of Metal of Antenna (Reference)

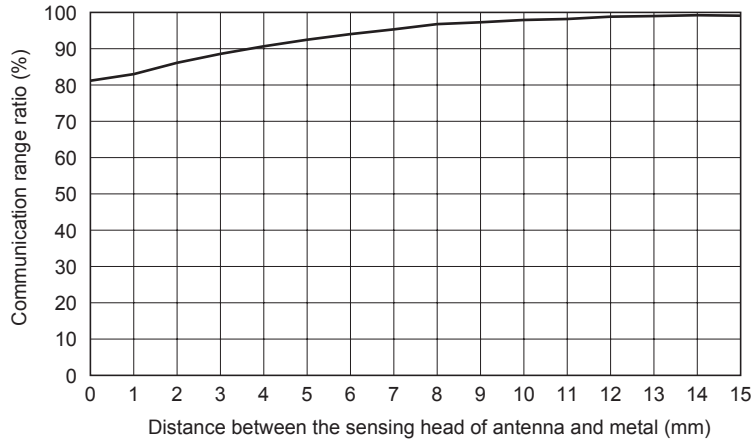
Even if the antenna is mounted on any metallic material, the antenna is not affected. However, be sure to check the antenna when you install it.

- **Model V670-H11 / Model V670-D13F03**

The metal has hardly any influence on the performance of Model V670-H11. However, be sure to check the performance after installation.

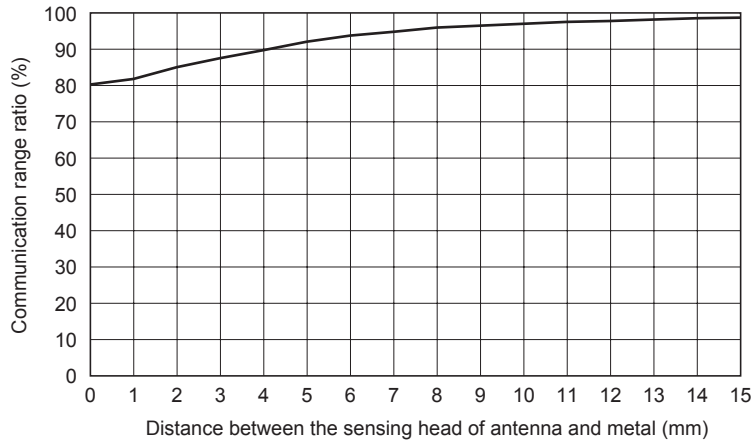
- **Model V670-H51 / Model V670-D13F01 (H)**

Metal: Iron

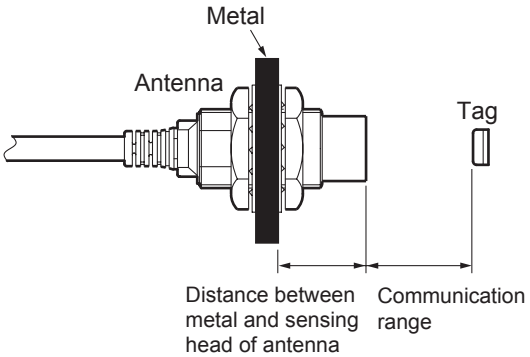


* Assume that the communication distance without metal is 100%.

Metal: Aluminum



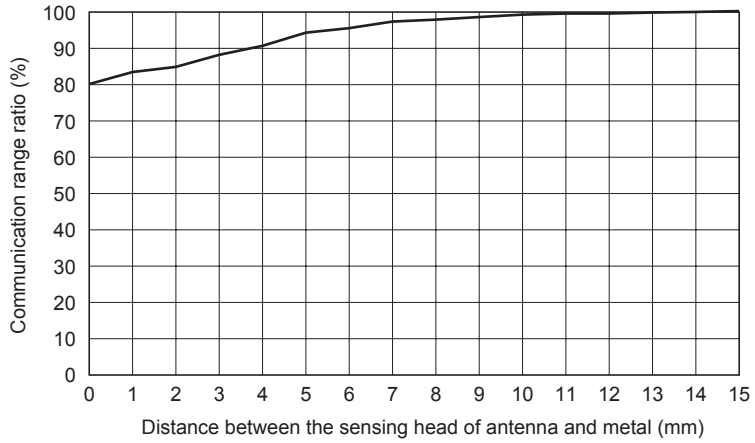
* Assume that the communication distance without metal is 100%.



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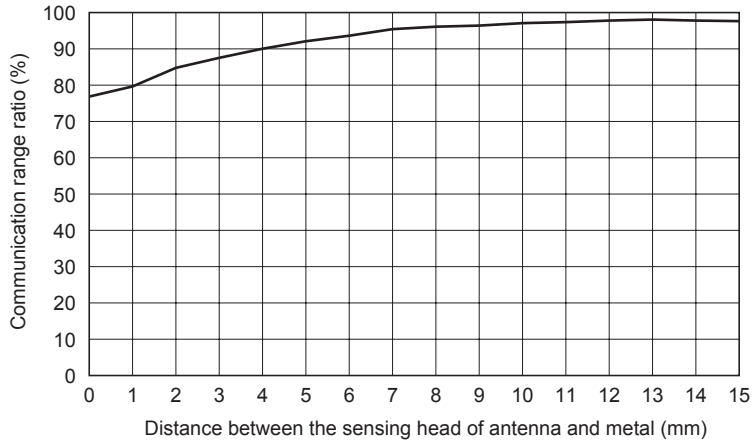
- **Model V670-H51Q Model V670-D13F01 (H)**

Metal: Iron

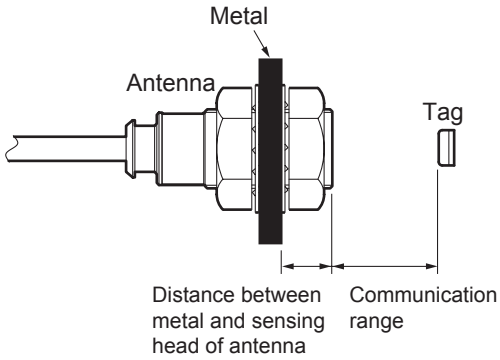


* Assume that the communication distance without metal is 100%.

Metal: Alminum



* Assume that the communication distance without metal is 100%.

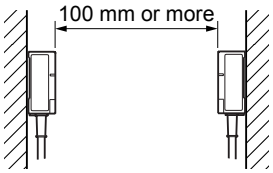


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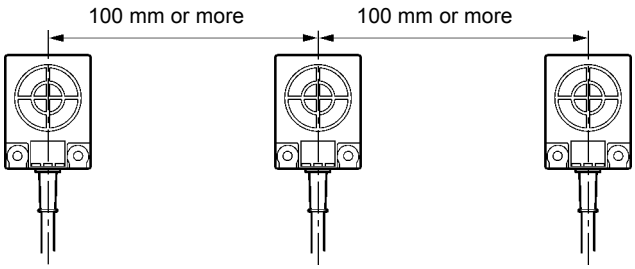
9-2 Mutual Interference between Antennas (Reference)

When you use several antennas, to prevent the mutual interference between them, keep the specified distance between those antennas as shown below.

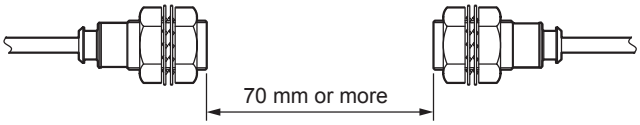
- **Model V670-H11**
  - Installing the antennas facing each other



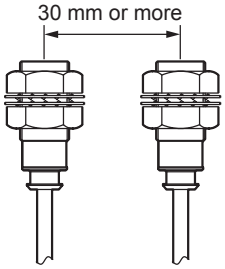
  - Installing the antennas in parallel



- **Model V670-H51 (Q)**
  - Installing the antennas facing each other



  - Installing the antennas in parallel



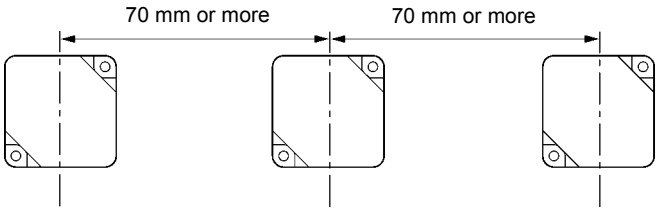
Precaution for Correct use
With the above description as reference, carry out a preliminary test or take other appropriate measures to ensure successful installation of the product.

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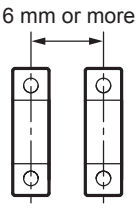
9-3 Mutual Interference between Tags (Reference)

When you use several tags, to prevent the mutual interference between them, keep the specified distance between those tags as shown below.

- **Model V670-D13F03**



- **Model V670-D13F01 (H)**



Precaution for Correct use
With the above description as reference, carry out a preliminary test or take other appropriate measures to ensure successful installation of the product.

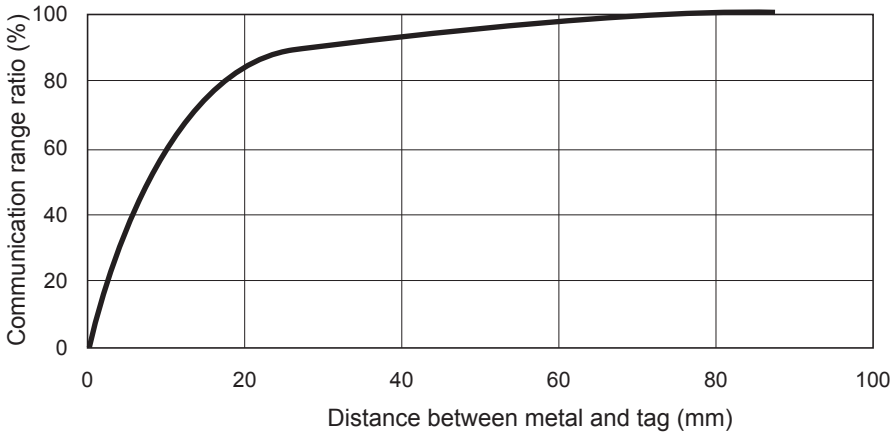
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9-4 Influence of Back Metal of Tag (Reference)

When you install the tag, take into consideration the influence of back metal.
If there is any metallic material behind the tag, the communication range deteriorates. The characteristic of communication range deterioration depending on the distance between the tag and back metal of tag (the same size as antenna) is shown below.

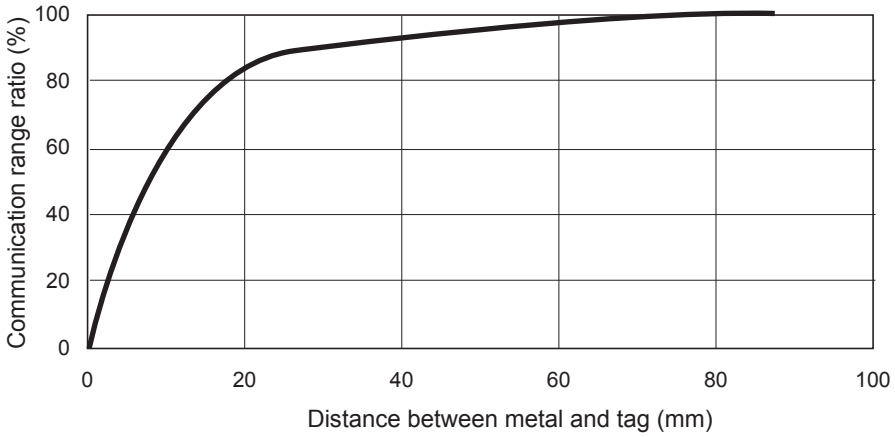
- **Model V670-H11 ↗ Model V670-D13F03**

Metal: Iron

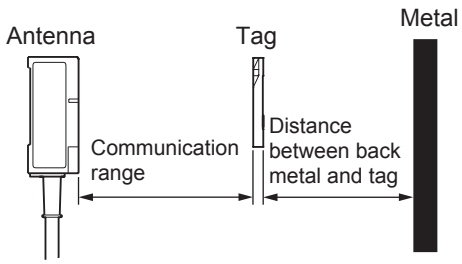


* Assume that the communication distance without metal is 100%.

Metal: Aluminum



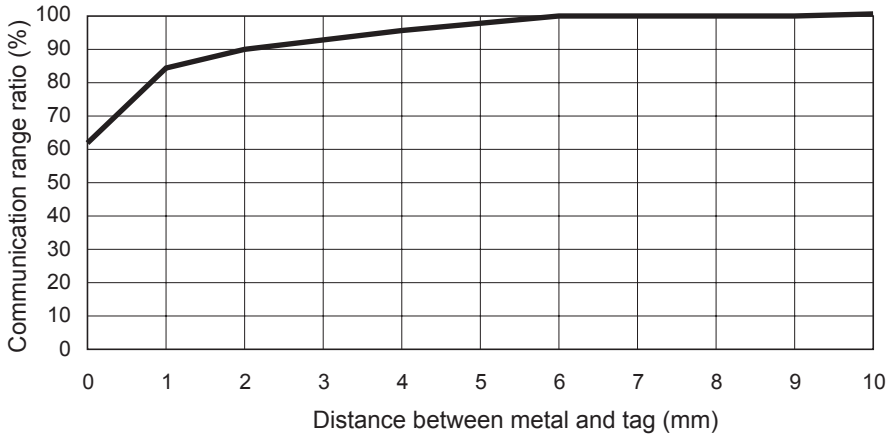
* Assume that the communication distance without metal is 100%.



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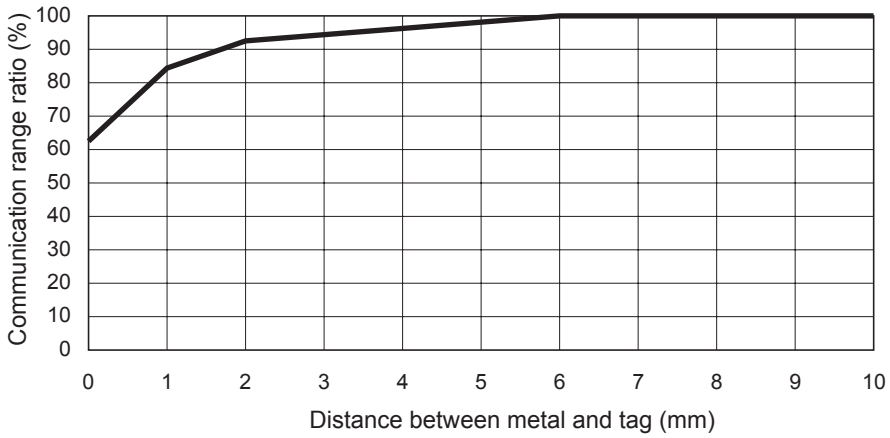
- **Model V670-H51 Model V670-D13F01 (H)**

Metal: Iron

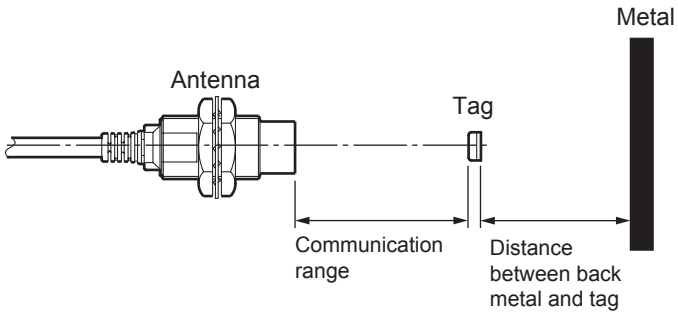


* Assume that the communication distance without metal is 100%.

Metal: Aluminum



* Assume that the communication distance without metal is 100%.



Precaution for Correct use
With the above description as reference, carry out a preliminary test or take other appropriate measures to ensure successful installation of the product.

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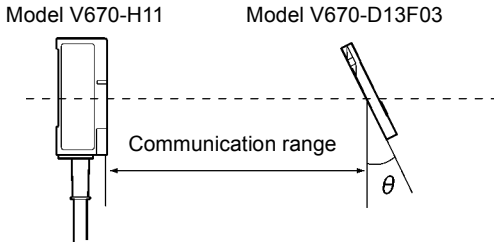
9-5 Influence of Tag Angle (Reference)

A maximum communication range can be obtained by installing a tag so that the antenna surface and tag surface can be parallel to each other. When you install the tag, take into consideration the influence of tag angle.
If the tag surface is not parallel to the antenna surface, the communication range deteriorates. The characteristic of communication range deterioration depending on the tag angle is shown below.

- **Model V670-D13F03**

Communication range deterioration

θ°	Deterioration ratio
0	0%
10	0%
20	1%
30	2%
40	3%
50	4%
60	9%
70	18%

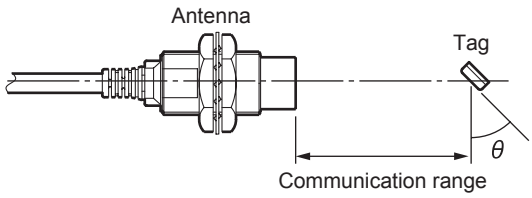


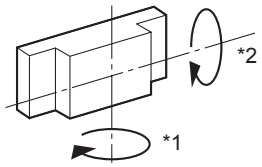
- **Model V670-D13F01 (H)**

Communication range deterioration

θ°	*1	*2
10	2%	2%
20	2%	3%
30	2%	6%
40	2%	10%
50	2%	14%
60	(*)	20%
70	(*)	29%
80	(*)	41%

The tag makes contact with the sensing head of antenna when it is tilted to 60 degrees or more in the longitudinal direction (*1) in the above measurement.





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9-6 Chemical Resistance of Tag (Reference)

Chemicals which affect a tag are shown below.
ABS resin and epoxy resin are used as case material and filling material, respectively. Referring to the list below, use suitable chemicals. Do not use any chemicals which affect the ABS resin and epoxy resin.
Any chemicals cannot be used for explosion-proof application.

- **Chemicals which cause deformation, crack, etc.**

ABS Resin	Epoxy Resin
Trichlene, acetone, xylene, toluene, gasoline, creosol, methylene chloride, phenol, miclohexanone, aqua regia, chromic acid, sulfur (90% RT), methyl ethyl ketone, aniline, nitrobenzene, monochlorobenzene, pyridine, nitric acid (60% RT), and formic acid (80% RT).	Aqua regia, chromic acid, sulfuric acid (90% RT), nitric acid (60% RT), liquid ammonia, acetone, methylene chloride, phenol, and trichlene.

- **Chemicals which may cause discoloration, swelling, etc.**

ABS Resin	Epoxy Resin
Hydrochloric acid, alcohol, freon, sodium hydroxide, hydrogen peroxide, benzine, sulfuric acid (10% RT), nitric acid (10% RT), phosphoric acid (85% RT), and liquid ammonia.	Sulfuric acid (10% RT), nitric acid (10% RT), hydrochloric acid (30% RT), acetic acid (50% RT), nitric acid, calcium hydroxide, benzene, creosol, alcohol, miclohexanone, toluene, xylene, benzine, and grease.

- **Chemicals which do not affect ABS resin nor epoxy resin.**

ABS Resin	Epoxy Resin
Ammonia, kerosene, mineral oil, developer, YUSHIROKEN S50, CHEMICOOL Z, VELOCITY NO. 3, YUSHIROKEN EEE-30Y, petroleum, grease, acetic acid, nitric acid, calcium hydroxide, phosphoric acid (30% RT), hydrochloric acid (10% RT) and potassium hydroxide.	Ammonia, hydrochloric acid (10% RT), potassium hydroxide, petroleum, gasoline, YUSHIROKEN S50, CHEMICOOL Z, VELOCITY NO. 3, YUSHIROKEN EEE-30Y.

Note: The test above is the result at a room temperature (23°C). Even if the chemicals do not affect the ABS resin or epoxy resin at the room temperature (23°C), such chemicals may affect the resin at a high temperature or low temperature. Check the chemicals fully in advance.

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Appendix

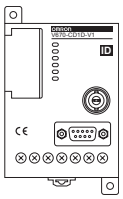
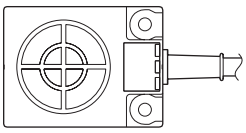
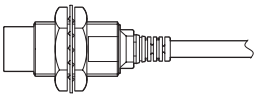
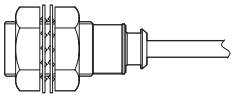
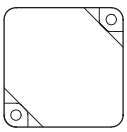
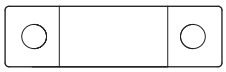
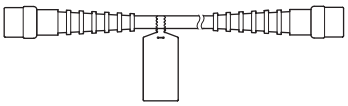
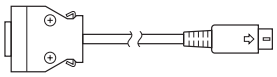
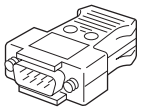
Appendix 1 ASCII Code List

High order digit / Low order digit	b8~b5	0000	1001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
b4~b1	Column / Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0000	0	NUL	TC_7(DLE)	(SP)	0	@	P	`	p	Undefined	Undefined	Undefined	Undefined	Undefined	Undefined	Undefined	Undefined
0001	1	TC_1(SOH)	DC_1	!	1	A	Q	a	q								
0010	2	TC_2(STX)	DC_2	”	2	B	R	b	r								
0011	3	TC_3(ETX)	DC_3	#	3	C	S	c	s								
0100	4	TC_4(EOT)	DC_4	$	4	D	T	d	t								
0101	5	TC_5(NEQ)	TC_8(NAK)	%	5	E	U	e	u								
0110	6	TC_6(ACK)	TC_9(SYN)	&	6	F	V	f	v								
0111	7	BEL	TC_{10}(ETB)	’	7	G	W	g	w								
1000	8	FE_0(BS)	CAN	(	8	H	X	h	x								
1001	9	FE_1(HT)	EM	)	9	I	Y	i	y								
1010	10	FE_2(LF)	SUB	*	:	J	Z	j	z								
1011	11	FE_3(VT)	ESC	+	;	K	[	k	{								
1100	12	FE_4(FF)	IS_4(FS)	,	<	L	\	l	|								
1101	13	FE_5(CR)	IS_3(GS)	-	=	M	]	m	}								
1110	14	S0	IS_2(RS)	.	>	N	^	n	~								
1111	15	S1	IS_1(US)	/	?	O	_	o	DEL								Undefined

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Appendix 2 Order Format List

♦ Main unit and system components

Name/Shape	Specifications	Model	Remarks
Controller 	RS-232 interface 24 VDC power supply Outside dimension: 90 × 66 × 75 mm	Model V670-CD1D-V1	—
Antenna 	Outside dimension: 40 × 53 × 23 mm	Model V670-H11	—
Antenna 	Outside dimension: M18 × 43 mm	Model V670-H51	—
Antenna 	Outside dimension: M18 × 47 mm	Model V670-H51Q	—
Tag 	Memory capacity: 128 bytes Outside dimension: 40 × 40 × 4.5 mm	Model V670-D13F03	—
Tag 	Memory capacity: 128 bytes Outside dimension: 8 × 16 × 3.5 mm	Model V670-D13F01	—
Tag 	Memory capacity: 128 bytes Outside dimension: 8 × 28 × 3.5 mm	Model V670-D13F01H	—
Junction cable 	3 m	Model V670-A40	For connection of antenna and controller.
	10 m	Model V670-A41	
	18 m	Model V670-A42	
	28 m	Model V670-A43	
Programming console 	—	Model CR200H-PRO27	—
Programming console connecting cable 	2 m	Model V700-P10	A dedicated key sheet comes together.
Communication connector 	Connector plug	Model XM2A-0901	One set comes with Model V670-CD1D.
	Connector hood	Model XM2S-0911	

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Appendix 3 Protective Structure

- **Protective Structure**

Note: IP-□□ is classified by a test method below. Check sealing in working environment and operating conditions in advance.

♦ **IEC (International Electrotechnical Commission) Standards (IEC60529: 1989-11)**

IP-□□

Protective property code (International Protection)
Protective classification for "1st Symbol" solid foreign material

Class	Protection Level	
0		No protection.
1		Solid foreign material 50 mm or more in diameter (hand etc.) cannot come in.
2		Solid foreign material 12.5 mm or more in diameter (finger etc.) cannot come in.
3		Solid foreign material 2.5 mm or more in diameter (wire etc.) cannot come in.
4		Solid foreign material 1 mm or more in diameter (wire etc.) cannot come in.
5		Dust, which interferes a normal operation of device or spoils the safety, cannot come in.
6		Any dust cannot come in.

♦ **JEM (Japan Electrical Manufacturers' Association) Standards (JEM1030: 1991)**

IP-□□□

Complies with the 1st and 2nd symbols of IEC60529.
Protective classification for oil penetration.

Class	Protection Level	
f	Oil retaining type	Not affected considerably by oil drops or oil spray in any direction.
g	Oil resistance type	Any oil drop or oil spray in any direction cannot come in.

Note) There are four other classes: "h", "c", "d", and "e".

♦ **NEMA (National Electrical Manufacturers Association)**

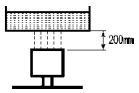
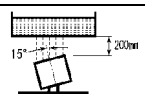
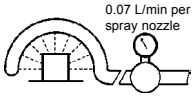
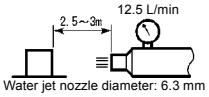
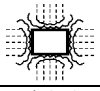
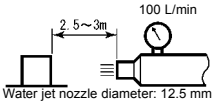
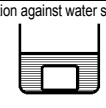
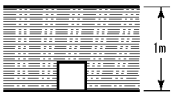
Table for conversion from NEMA enclosure into IEC60529. (Conversion from IEC60529 into NEMA enclosure is unavailable.)

NEMA250	IEC60529
1	IP10
2	IP11
3	IP54
3R	IP14
3S	IP54

NEMA250	IEC60529
4, 4X	IP56
5	IP52
6, 6P	IP67
12, 12K	IP52
13	IP54

Note: Based on the NEMA Standards. The difference between NEMA enclosure classification and IEC60529 is anticorrosion, rust prevention, moisture condensation on surface, etc.

Protective classification for "2nd Symbol" water penetration

Class	Protection Level		Test Method Overview (Test with fresh water)
0	No particular protection	Any particular protection is not taken to water penetration.	No Test.
1	Protection against drop of water 	Not to be affected by water dropped vertically.	Drop water for 10 minutes using a water drop tester. 
2	Protection against drop of water 	Not to be affected by water dropped deviating 15° from a vertical line.	Drop water to an object set inclined 15° for 10 minutes (2.5 minutes per direction) using a water drop tester. 
3	Protection against water spray 	Not to be affected by water spray deviating within 60° from a vertical line.	Spray water in an area within 60° to the right and left from a vertical line for 10 minutes using a tester shown in this figure. 
4	Protection against water splash 	Not to be affected by water splash from all the directions.	Spray water from all the directions for 10 minutes using a tester shown in this figure. 
5	Protection against water jet flow 	Not to be affected by direct water jet flow from all the directions.	Spray water from all the directions for 1 minute per surface area 1 m^2, total 3 minutes or more using a tester shown in this figure. 
6	Protection against extreme water jet flow 	Not to be affected by extreme direct water jet flow from all the directions.	Spray water from all the directions for 1 minute per surface area 1 m^2, total 3 minutes or more using a tester shown in this figure. 
7	Protection against water soaking 	Even if an object is immersed in water of specified pressure for a specified time, any water penetration must not be observed.	Immerse an object at 1 m deep in water for 30 minutes (assuming that device height is lower than 850 mm). 
8	Protection against water immersion 	An object must work always in water.	According to an agreement between a manufacturer and device user.

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