V600 FA ID System

R/W Heads and EEPROM Data Carriers

Operation Manual

Produced May 1993

Notice:

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

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

DANGER! Indicates information that, if not heeded, is likely to result in loss of life or serious injury.

WARNING Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

Caution Indicates information that, if not heeded, could result in relative serious or minor injury, damage to the product, or faulty operation.

OMRON Product References

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

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

The abbreviation “PC” means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

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

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

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

FCC Rules

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference to radio communications, in which case the user will be required to correct the interference at his own expense.

TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of the V600 FA ID System with R/W Heads and EEPROM Data Carriers and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the V600 FA ID System with R/W Heads and EEPROM Data Carriers.

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

Section 1 provides a general introduction to the FA ID System, V600-series R/W Heads and V600-series Data Carriers.

Section 2 provides information on data transmission between the R/W Head and Data Carrier.

Section 3 describes the recommended method of R/W Head and Data Carrier installation, and provides estimates of the reduction in transmission range when other methods of installation are used.

The four **Appendices** provide information relating to standard models, dimensions, specifications, and the chemical resistance of components.

SECTION 1
Features and System Configuration

This section provides a general introduction to the FA ID System, V600-series R/W Heads and V600-series Data Carriers.

1-1 Features

The V600 ID System offers powerful support to the automation of large-scale distributed control systems and multi-model small-scale production systems by means of contactless data communication.

Contactless Data Transfer Data is transmitted between the Data Carrier (DC) and Read/Write (R/W) Head electromagnetically in both directions, without physical contact between the two devices.

EEPROM Memory Nonvolatile EEPROM is used for the DC's memory, so there is no need to worry about batteries.

CRC Error Detection A 16-bit CRC (Cyclic Redundancy Check) has been added to detect data transmission errors in both directions between the ID Controller and R/W Head, and the R/W Head and DC.

Best Transmission Range Although the DC is compact, it has the best transmission range in the industry. Its small size and greater range allow installation in far more situations than other models.

256-byte Memory The DC has a 256-byte memory (254 bytes of user memory). More detailed product information and test results can be input in addition to product identification.

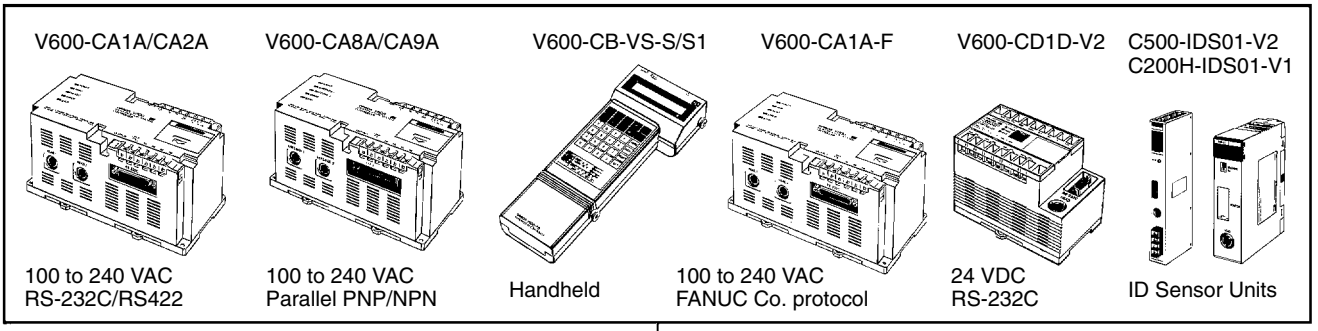
Long Memory Life Each byte in the EEPROM memory can be overwritten 100,000 times.

Exceptional Reliability The R/W Head and DC are exceptionally durable and reliable, being resistant to vibration, oil, and water.

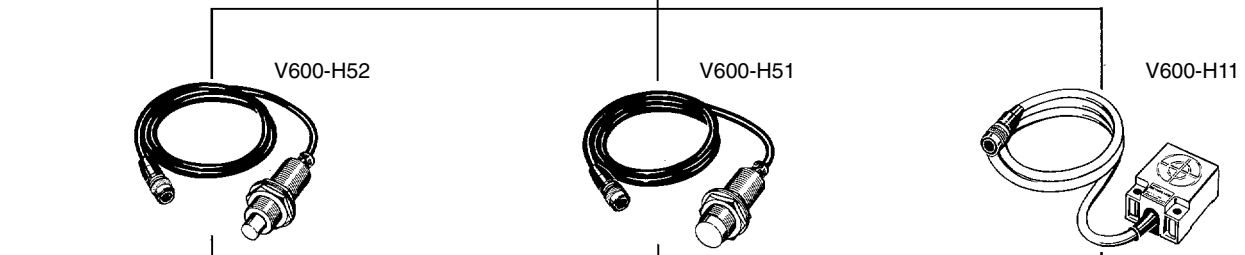
1-2 System Configuration

A V600 ID System is made up of ID controllers, R/W Heads, and DCs. A system can be assembled to suit almost any situation with different arrangements of these components.

ID Controllers



R/W Heads



Data Carriers

Note The current versions of the V600-CD1D and ID Sensor Units cannot access DCs with EEPROM memory. Contact your nearest OMRON sales office for the availability of V600-CA1A-F and V600-CD1D-V2.

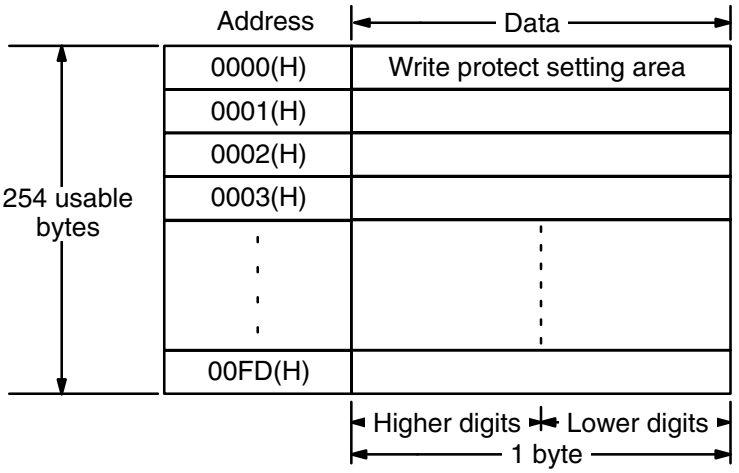
SECTION 2
Communications

This section provides information on data transmission between the R/W Head and Data Carrier.

2-1 Data Carrier Memory

2-1-1 Memory Map

The Data Carrier (DC) has an EEPROM memory that can contain up to 254 bytes of information, including 0000(H), the write protect setting area. The memory has a life expectancy of 100,000 cycles, i.e., each address can be overwritten 100,000 times before errors begin to occur. EEPROM errors include failure to overwrite data and failure to retain data.



2-1-2 Write Protect Function

The write protect function protects important data stored in the memory of the Data Carrier, such as product number and model, from inadvertent write access. With this function, the data up to a specified memory address can be protected. It is recommended that important data be write-protected as follows:

Setting Write Protect Function

The write protect function is set in address 0000 of the Data Carrier's memory. The most significant bit of address 0000 determines whether or not the write protect function is in effect.

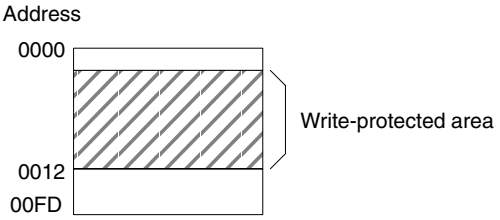
Address	Bit							
	7	6	5	4	3	2	1	0
0000	YES/ NO	Last 2 digits of end address						

Write protect execution bit (most significant bit of address 0000)
1: Write-protected
0: Not write-protected

The end address can be set between 00 and 7F. Setting the address to 00 protects all bytes from 0001 through 00FD. Setting the address to a value from 01 to 7F protects all bytes from 0001 through the specified address. It is not possible to specify an end address between 0080 and 00FF.

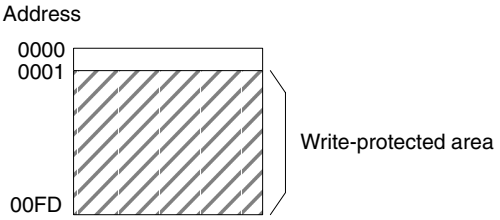
Note
1. Address 0000 cannot be write-protected.
2. Address 0001 is always the starting address of the write-protect area. Important data that needs to be protected should be input from 0001 on.

Example 1 To protect addresses 0001 through 0012:



Address	Higher digits				Lower digits			
0000	1	0	0	1	0	0	1	0
	9				2			

Example 2 All bytes from 0001 through 00FD will be write-protected when bit 7 is ON and the end address is set to 00.



Address	Higher digits				Lower digits			
0000	1	0	0	0	0	0	0	0
	8				0			

Canceling Write Protection

To cancel write protection, clear the most significant bit of address 0000 to 0. The write protection will be cancelled and the end address specified in 0000 will be invalid.

2-2 Transmission Range

The following table shows the transmission ranges for V600-series DCs when reading or writing data.

DC Model[1]	Motion	Transmission	ID Controller Mode[2]	Axial Offset	Transmission Range
V600-D23P53	Stationary	Read	Transmission range priority	+1 mm	0.5 to 4.5 mm
				+2 mm	0.5 to 4.0 mm
			Transmission time priority	+1 mm	0.5 to 3.5 mm
				+2 mm	0.5 to 3.0 mm
		Write	Transmission range/time priority	+1 mm	0.5 to 3.5 mm
				+2 mm	0.5 to 3.0 mm
V600-D23P54	Stationary	Read	Transmission range priority	+1 mm	0.5 to 7.0 mm
				+2 mm	0.5 to 6.5 mm
			Transmission time priority	+1 mm	0.5 to 6.0 mm
				+2 mm	0.5 to 5.5 mm
		Write	Transmission range/time priority	+1 mm	0.5 to 6.0 mm
				+2 mm	0.5 to 5.5 mm

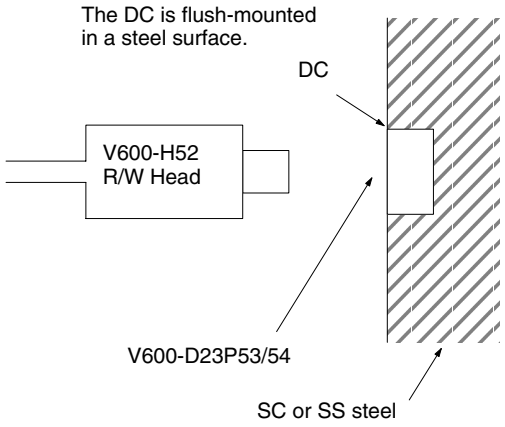
DC Model[1]	Motion	Transmission	ID Controller Mode[2]	Axial Offset	Transmission Range
V600-D23P61	Stationary	Read	Transmission range priority	+1 mm	1 to 16 mm
				+2 mm	1 to 16 mm
			Transmission time priority	+1 mm	1 to 14 mm
				+2 mm	1 to 14 mm
		Write	Transmission range/time priority	+1 mm	1 to 14 mm
				+2 mm	1 to 14 mm
	Moving	Read	Transmission range priority	+1 mm	7 to 16 mm
				+2 mm	7 to 16 mm
			Transmission time priority	+1 mm	7 to 14 mm
				+2 mm	7 to 14 mm
		Write	Transmission range/time priority	+1 mm	7 to 14 mm
				+2 mm	7 to 14 mm

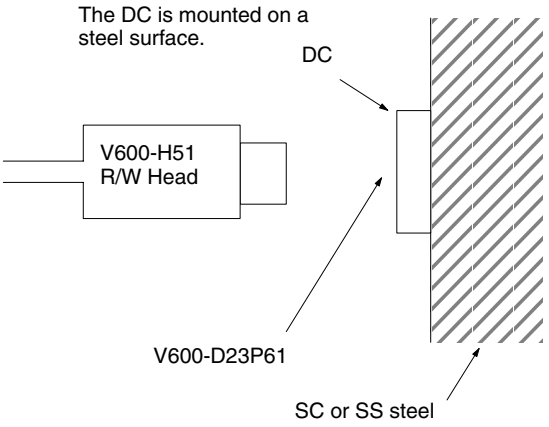
Note 1. Measurements for the V600-D23P53 and V600-D23P54 were made using a V600-H52 R/W Head. Measurements for the V600-D23P61 were made using a V600-H51 R/W Head.

2. The ID controller mode can be set with a DIP switch on Serial Interface ID Controllers and ID Sensor Units only.

   For Parallel Interface ID Controllers, use the transmission range values given for the transmission range priority mode settings.

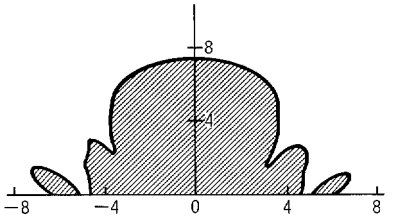
The measurements listed in the preceding table take the ambient temperature and product variation into account. The measurement configuration is shown below. (The transmission range can vary greatly depending on where and how the R/W Head and DC are installed.)



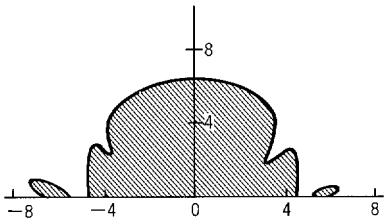


Actual transmission ranges vary with the axial offset (the distance separating the center lines of the DC and R/W Head). The following diagrams show the actual transmission ranges in mm for V600-series DCs when reading or writing data.

V600-D23P53 & V600-H52

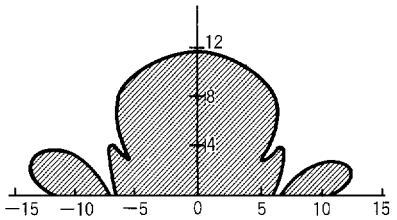


Read (transmission range priority)

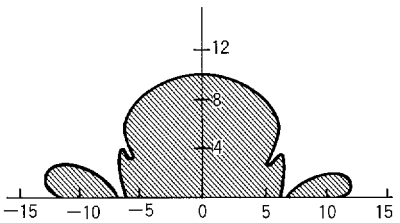


Write (transmission range/time priority)
Read (transmission time priority)

V600-D23P54 & V600-H52

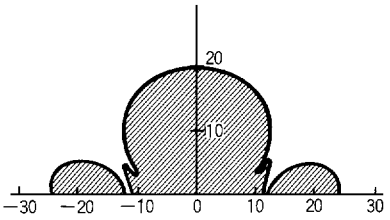


Read (transmission range priority)

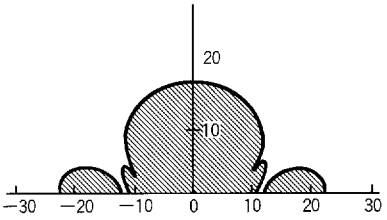


Write (transmission range/time priority)
Read (transmission time priority)

V600-D23P61 & V600-H51



Read (transmission range priority)



Write (transmission range/time priority)
Read (transmission time priority)

2-3 Transmission Time

Transmission times are the same for all models of R/W Heads and DCs covered in this manual, although transmission times are different for DCs that contain batteries. The term “transmission time” is used to indicate both the turn-around time (TAT) and the lower level transmission time between the R/W Head and DC.

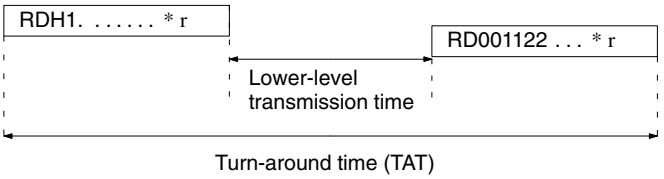
Turn-around Time

The TAT is the total time required from the transmission of a command from a host device (such as a host computer) until the reception of a response at the host device.

Lower-level Transmission Time

The lower-level transmission time is the time required for transmission of data between the R/W Head and DC.

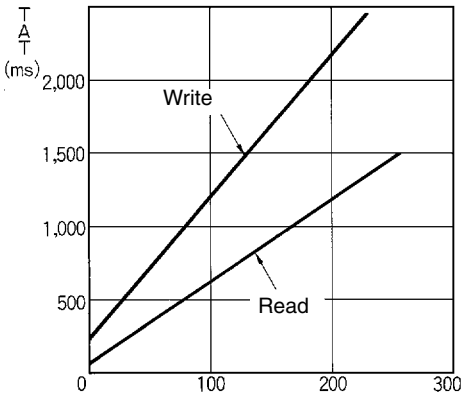
The following diagram shows the TAT and lower-level transmission time for the READ command.



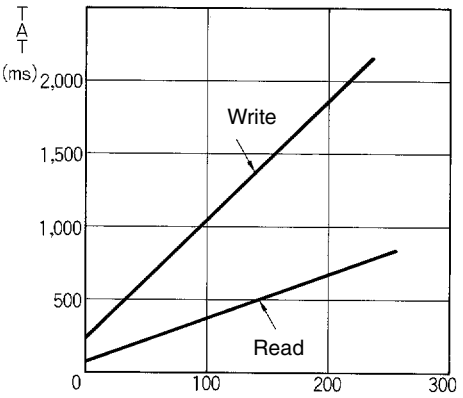
2-3-1 Turn-around Time

The following diagrams show the TAT for Serial Interface ID Controllers V600-CA1A/CA2A and V600-CD1D. (The TAT for Parallel Interface ID Controllers and ID Sensor Units varies with the host's software.)

Transmission Range Priority Mode



Transmission Time Priority Mode

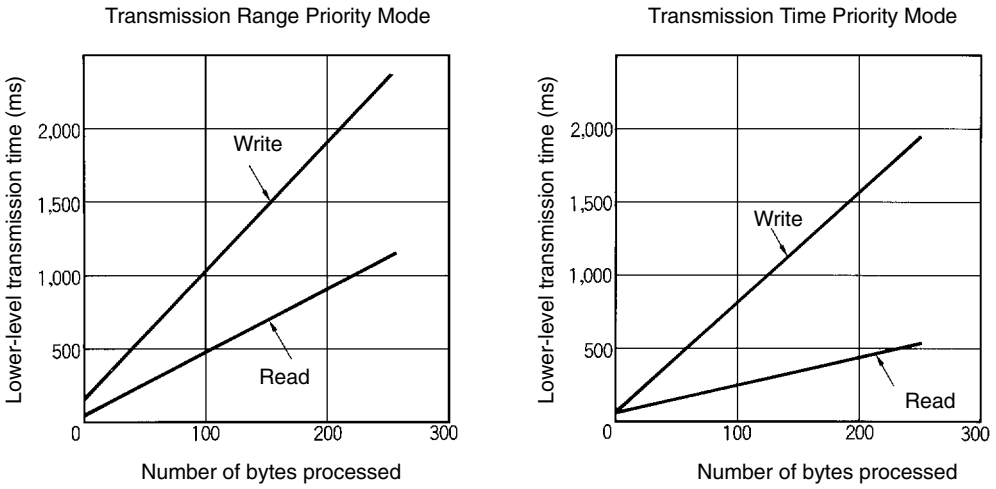


Note

1. The TAT data was measured with a V600-CA1A ID Controller. Communications between the ID Controller and host computer were set for 9,600 bps, 8 data bits, 1 stop bit, and odd parity.
   Data was transmitted continuously in this example; there were no spaces between characters.
2. The number of bytes was for ASCII code specification. Refer to the *Operation Manual* for details.
3. The ID Controller mode (transmission range/time priority mode) is determined by the DIP switch settings on Serial Interface ID Controllers (V600-CA1A/CA2A/CD1D) and ID Sensor Units. Refer to the *Operation Manual* for details.

2-3-2 Lower-level Transmission Time

The following diagrams show the lower-level transmission time.



The lower-level transmission time can also be calculated using the equations in the table below. (The term N represents the number of bytes being processed.)

ID Controller Mode	Transmission	Transmission Time (ms)
Transmission range priority	Read	t = 4.3N + 64.6
	Write	t = 8.7N + 167.1
Transmission time priority	Read	t = 1.8N + 79.0
	Write	t = 7.1N + 180.4

Note The ID Controller mode (transmission range/time priority mode) is determined by the DIP switch settings on Serial Interface ID Controllers (V600-CA1A/CA2A/CD1D) and ID Sensor Units. Refer to the *Operation Manual* for details.

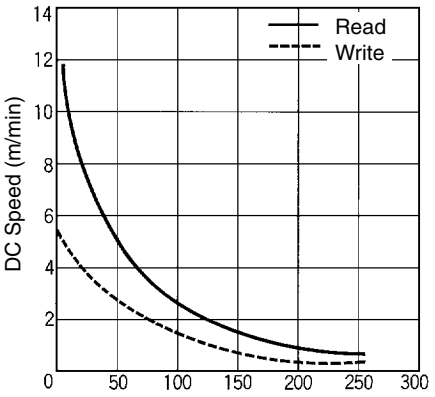
2-4 Data Carrier Speed

The number of bytes that can be processed using the Auto Read and Auto Write commands depends on the speed of the DC. The relationship between the number of bytes and DC speed can be determined from the following equation or diagrams.

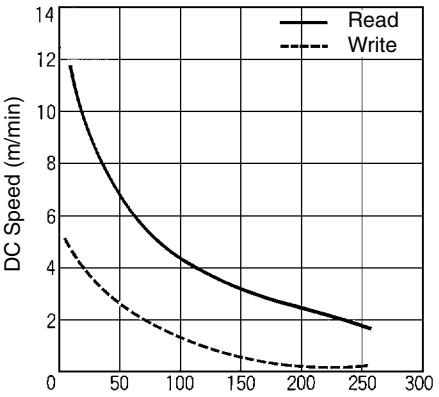
$$\text{Max. DC Speed} = \frac{\text{Distance travelled in the transmission range}}{\text{Lower-level transmission time}}$$

The following diagrams show the relationship between the number of bytes accessed and DC speed for V600-D23P61 DCs.

Transmission Range Priority Mode



Transmission Time Priority Mode



Note

1. The data above was measured with a R/W distance of 10 mm and an axial offset of +0 mm.
2. The distance travelled in the transmission range will change with variations in the R/W distance (the distance between the R/W Head and DC). Refer to *2-2 Transmission Range* for diagrams showing the transmission ranges.
3. The equation for determining the DC speed is meant as a guide. Test transmissions between the R/W Head and DC under actual operating conditions before operation.
4. The DC speed data above is for V600-CA1A/CA2A/CD1D ID Controllers. These restrictions do not apply to Parallel Interface ID Controllers (V600-CA8A/CA9A), because their lower-level transmissions are made in 1-byte units.
5. The DC speed data above do not take into account possible transmission errors in host or lower-level communications.

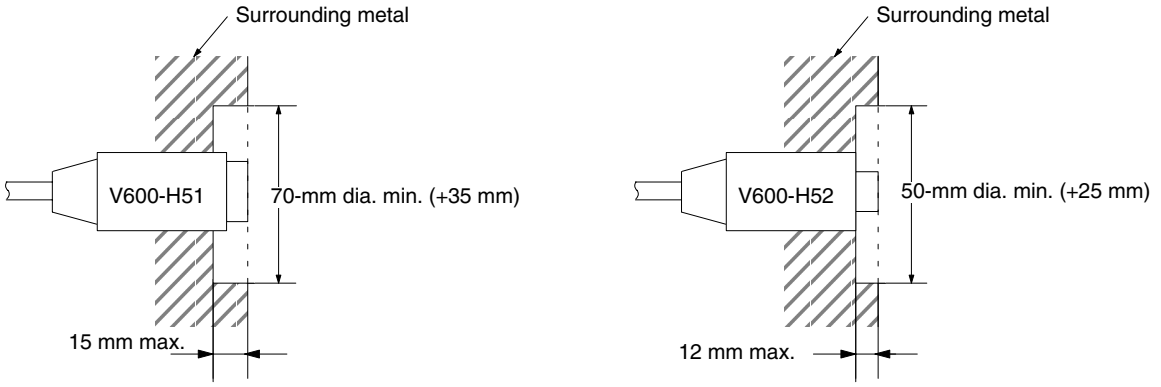
SECTION 3
Installation

This section describes the recommended method of R/W Head and Data Carrier installation, and provides estimates of the reduction in transmission range when other methods of installation are used.

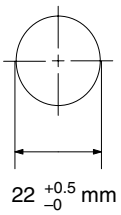
3-1 R/W Head Installation

3-1-1 Recommended Installation

The R/W Heads are 22 mm in diameter. When installing a R/W Head in metal, provide a 35-mm clearance between the V600-H51 R/W Head's coil tip and the metal surface. Provide a 25-mm clearance from the V600-H52 R/W Head's coil tip. Be sure that the metal surface doesn't extend beyond the tip of the R/W Head.

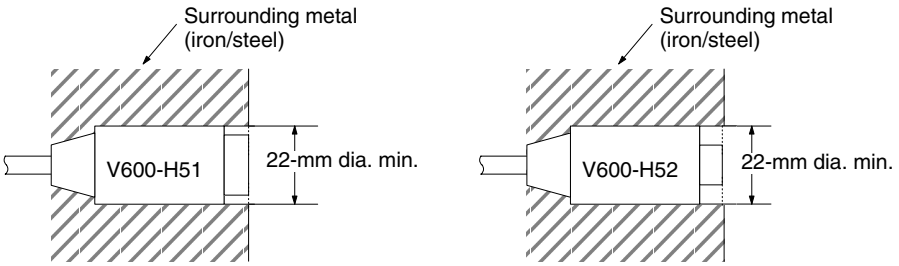


When installing a R/W Head in a metal bracket, prepare a 22-mm mounting hole, as shown below. Use the nuts and lock washers to attach the R/W Head and torque the nuts to 39 N-m (400 kgf-cm).



3-1-2 Effect of Surrounding Metals

When a R/W Head is installed with metal near the coil tip, as shown below, the transmission range is reduced by 30% for the V600-H51 and by 10% for the V600-H52 in comparison to the recommended installation shown above.



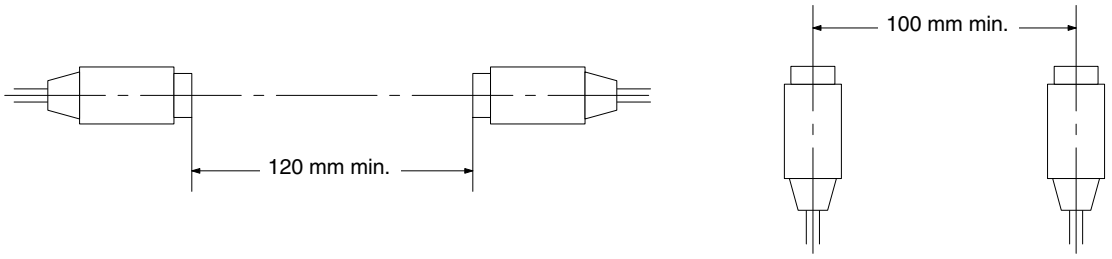
3-1-3 Interference between R/W Heads

When using two or more R/W Heads, be sure to allow enough space between the R/W Heads to avoid errors caused by mutual interference. The diagrams below show the minimum spacing required.

If the R/W Heads will not transmit or receive data at the same time, there is no risk of interference and the R/W Heads can be installed nearby.

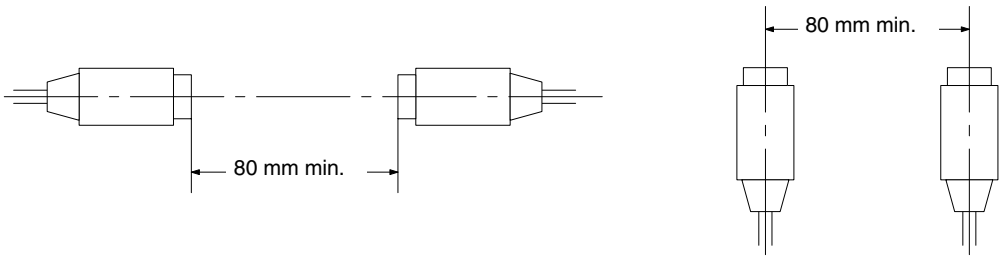
V600-H51

V600-H51 R/W Heads should be installed at least 120 mm apart when facing each other, and at least 100 mm apart when facing the same direction.



V600-H52

V600-H51 R/W Heads should be installed at least 80 mm apart whether they are facing each other or the same direction.

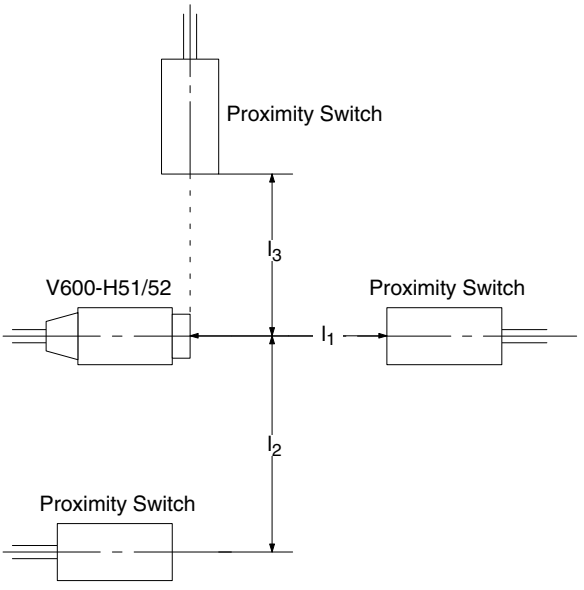


3-1-4 Interference with Proximity Switches

If R/W Heads, proximity switches, or other devices that emit radiation in the 400 to 600 kHz range are used in the same area, the proximity switches might not operate properly.

The minimum distances given in the following table are meant as a guide for OMRON Proximity Switches. Test the system under actual operating conditions to be sure that there is no interference.

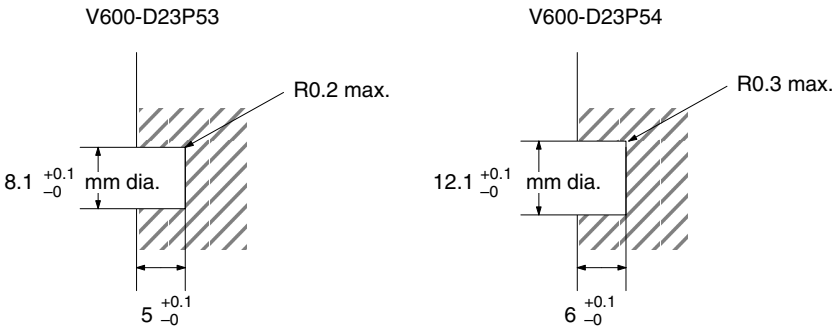
R/W Head Installation	Separation
Facing Proximity Switch (l_1)	200 mm min.
Alongside Proximity Switch (l_2)	150 mm min.
Perpendicular to Proximity Switch (l_3)	100 mm min.



3-2 Data Carrier Installation

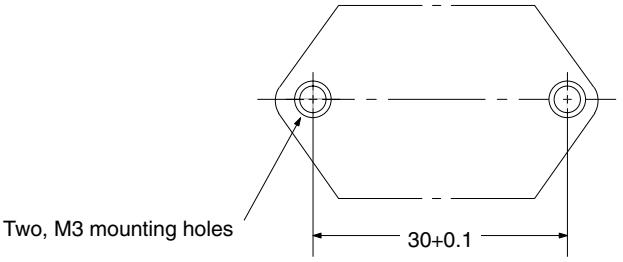
3-2-1 Recommended V600-D23P53/54 Installation

To install a V600-D23P53/54 DC, first prepare a mounting hole according to the dimensions shown in the diagram below, and then attach the DC using a 2-part epoxy adhesive.



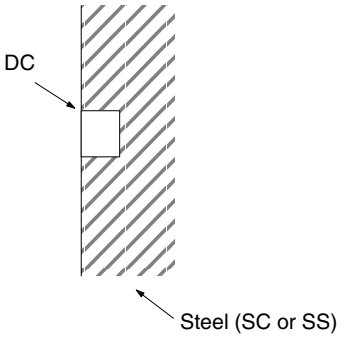
3-2-2 Recommended V600-D23P61 Installation

Install the V600-D23P61 DC with M3 (3 mm) bolts and washers; apply a thread-lock adhesive so the fasteners will not loosen with vibration or shock. The DC can be mounted in any direction as long as the front surface faces the R/W Head, and it can approach the R/W Head from any direction.

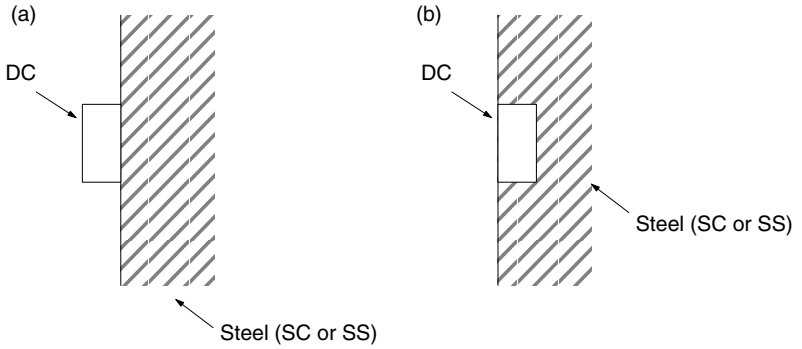


3-2-3 Effect of Surrounding Metals

The specifications given in this manual for the V600-D23P53/54 were measured with DCs flush-mounted in steel. The transmission range will be increased if the DC is installed without metal nearby.



The transmission range of the V600-D23P61 DC is reduced by 10% when it is flush-mounted in metal (figure b, below) in comparison to surface-mounting (figure a, below).



The specifications given in this manual for the V600-D23P61 were measured with surface-mounted DCs.

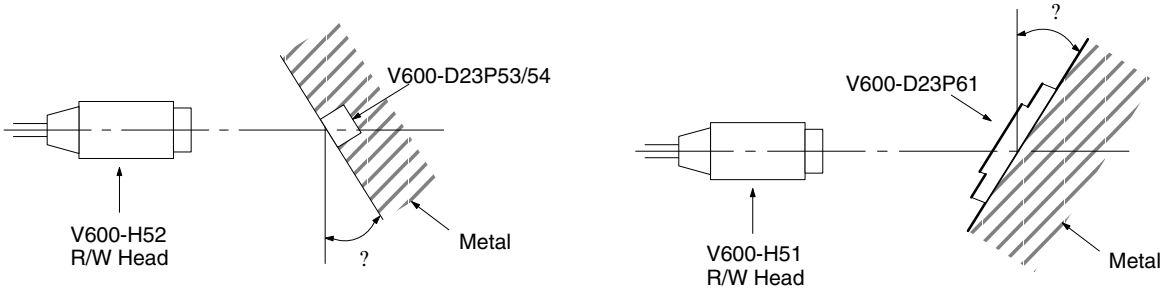
Effects of Other Metals

The transmission range is reduced more significantly by metals other than iron and steel, as shown in the table below.

DC Model	Iron/steel	SUS	Brass	Aluminum	Installation
V600-D23P53	100%	70 to 80%	55 to 70%	55 to 70%	Flush-mount
V600-D23P54	100%	85 to 90%	80 to 85%	80 to 85%	Flush-mount
V600-D23P61	100%	95%	95%	95%	Surface-mount

3-2-4 Effect of Misalignment

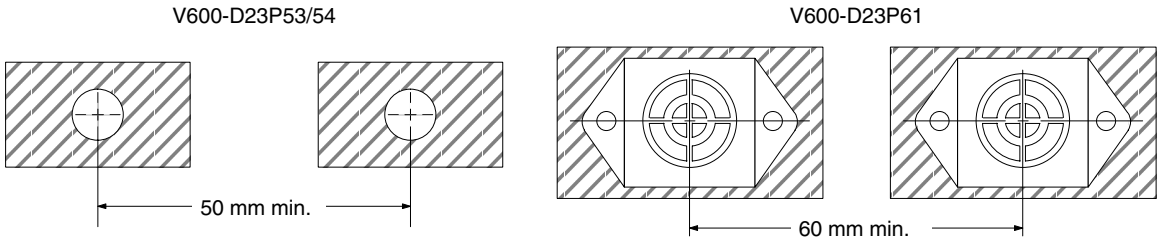
The transmission range will be reduced if the R/W Head isn't perpendicular to the DC when data is transmitted. The table below shows the reduction in the transmission range due to the misalignment of the DC.



Angle (?)	Transmission Range Reduction		
	V600-D23P53	V600-D23P54	V600-D23P61
10°	8%	4%	0%
20°	16%	8%	1%
30°	30%	16%	5%
40°	60%	30%	15%

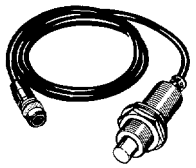
3-2-5 Interference between Data Carriers

When DCs pass the R/W Head, be sure that they are not closer than the distances given in the diagram below so that 2 DCs cannot be in the R/W Head's transmission range at the same time.

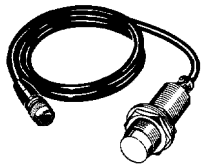
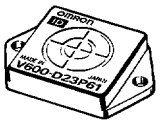


Appendix A
Standard Models

The following products can be used together.

Name	Specifications	Model
Read/Write Head 	0.5 m cable	V600-H52
	2 m cable	
	5 m cable	
	10 m cable	
Data Carrier 	DC dimensions: 12 mm diameter, 6 mm deep Memory capacity: 256 bytes (254 usable) Memory type: EEPROM, can be overwritten 100,000 times	V600-D23P54
Data Carrier 	DC dimensions: 8 mm diameter, 5 mm deep Memory capacity: 256 bytes (254 usable) Memory type: EEPROM, can be overwritten 100,000 times	V600-D23P53

The following products can be used together.

Name	Specifications	Model
Read/Write Head 	0.5 m cable	V600-H51
	2 m cable	
	5 m cable	
	10 m cable	
Data Carrier 	Memory capacity: 256 bytes (254 usable) Memory type: EEPROM, can be overwritten 100,000 times	V600-D23P61

The following products are accessories. Robotic cables are also available.

Name	Specifications	Model
R/W Head Extension Cable 	3 m cable	V600-A45
	5 m cable	V600-A44
	10 m cable	V600-A40
	20 m cable	V600-A41
	30 m cable	V600-A42

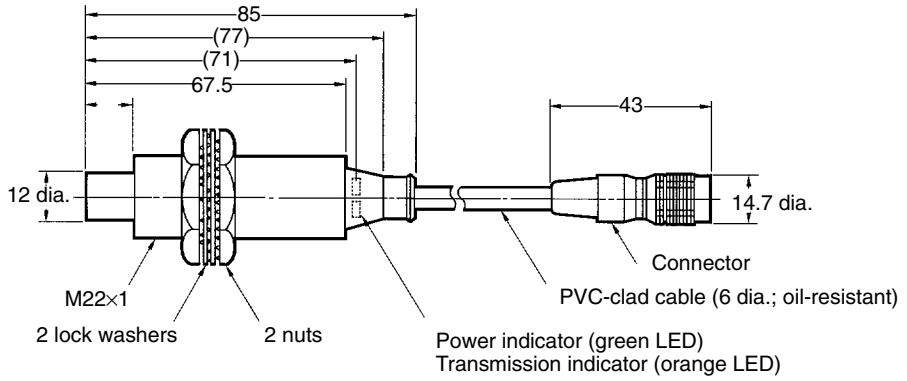
Appendix B
Dimensions

All dimensions are in millimeters unless otherwise specified.

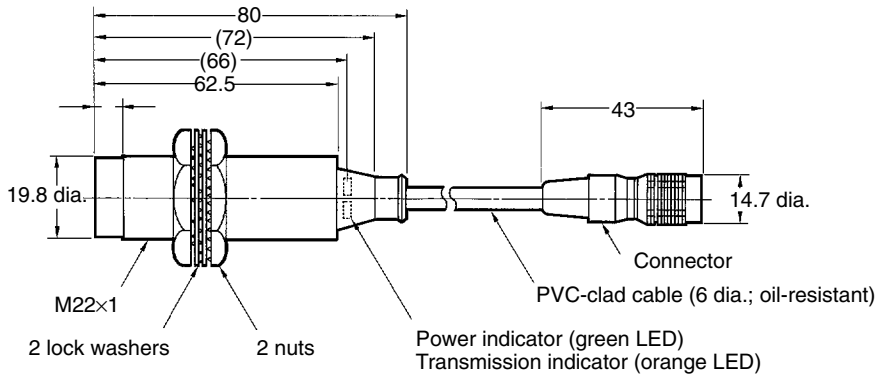
Read/Write Heads

R/W Head cases are made of brass and filled with epoxy resin. The transmission face is made of ABS resin, and the cable is made of oil-resistant PVC.

V600-H51



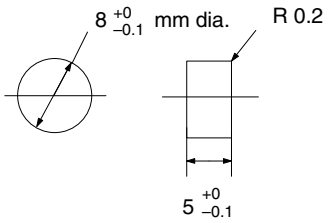
V600-H52



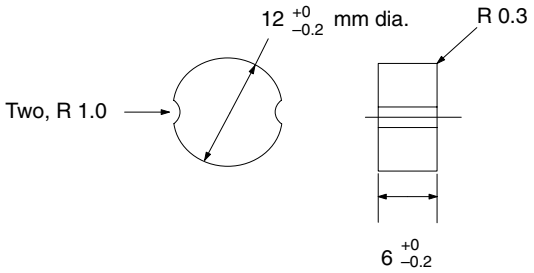
Data Carriers

Data Carrier cases are made of ABS resin and filled with epoxy resin.

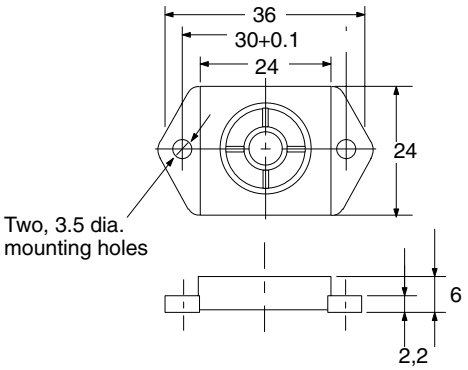
V600-D23P53



V600-D23P54



V600-D23P61



Appendix C
Specifications

R/W Heads (V600-H51 and V600-H52)

Operating temperature	–10%C to 60%C
Storage temperature	–25%C to 75%C
Operating humidity	35% to 95% RH
Insulation resistance	50 MW min. between cable terminals and case (at 500 VDC)
Dielectric strength	1,000 VAC 50/60 Hz for 1 minute between cable terminals and case.
Construction	IEC IP67
Vibration	10 to 500 Hz, 1.0 mm in each direction, 3 times for 11 minutes each time.
Shock	490 m/s^2 (about 50 G) three times in each direction, 18 times total.
Cable length*	Standard lengths of 0.5, 2, 5, and 10 m.
Error detection	16-bit CRC (Cyclic Redundancy Check) is used in both directions of transmission.
LED indicators	Power indicator: green Transmission indicator: orange
Weight	650 g (with a 10 m cable)

Note Extension cables of various lengths are also available (max. total cable length is 50.5 m). Refer to *Appendix A Standard Models* for details.

Data Carriers (V600-D23P53/54/61)

Memory capacity	256 bytes (254 usable for data)
Memory type	EEPROM
Data storage	10 years max.
Memory life	100,000 times (each address can be overwritten 100,000 times)
Error detection	16-bit CRC error detection is used in both directions of transmission.
Operating temperature	–25%C to 70%C
Storage temperature	–40%C to 85%C
Operating humidity	35% to 95% RH
Construction	IEC IP67
Vibration	10 to 2000 Hz, 1.5 mm in each direction, 2 times for 15 minutes each time.
Shock	981 m/s^2 (about 100 G) three times in each direction, 18 times total.
Weight (approximate)	V600-D23P53: 0.4 g V600-D23P54: 1.0 g V600-D23P61: 5.8 g

Appendix D
Chemical Resistance of Components

R/W Heads and Data Carriers are constructed using both ABS resin and epoxy resin. Avoid using the chemicals that have an effect on the ABS or epoxy resins. The test results listed were obtained at room temperature (about 23℅C). Some of the chemicals listed as having little or no effect might become corrosive at higher temperatures.

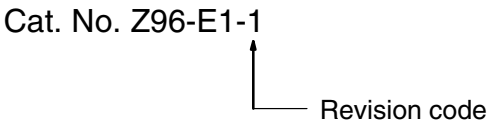
Chemical	Effect on ABS	Effect on Epoxy
Acetic acid	None	Small
Acetone	Large	Large
Ammonia	None	None
Ammonia (liquid)	Small	Large
Aniline	Large	——
Alcohol	Small	Small
Aqua regia	Large	Large
Benzene	——	Small
Benzine	Small	Small
Calcium hydroxide	None	Small
Chromic acid	Large	Large
Cresol	Large	Small
Cyclohexane	Large	Small
Developing agent	None	None
Gasoline	Large	None
Grease	None	Small
Formic acid (80% RT)	Large	——
Freon	Small	——
Hydrochloric acid (10% RT)	None	None
Hydrochloric acid (30% RT)	Small	Small
Hydrogen peroxide	Small	——
Kerosene	None	——

Chemical	Effect on ABS	Effect on Epoxy
Methylene chloride	Large	Large
Methyl ethyl ketone	Large	——
Mineral oil	None	——
Monochlorobenzene	Large	——
Nitric acid (10% RT)	Small	Small
Nitric acid (60% RT)	Large	Large
Nitrobenzene	Large	——
Nitrohydrochloric acid	Large	Large
Oil, petroleum	None	None
Oxalic acid	None	Small
Phenol	Large	Large
Phosphoric acid (30% RT)	None	——
Phosphoric acid (85% RT)	Small	——
Potassium hydroxide	None	None
Pyridine	Large	——
Sodium hydroxide	Small	——
Sulfuric acid (10% RT)	Small	Small
Sulfuric acid (90% RT)	Large	Large
Toluene	Large	Small
Trichloroethylene	Large	Large
Xylene	Large	Small

Index

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	May 1993	Original production