Cat. No. Z87-E1-1

V630
FA ID System

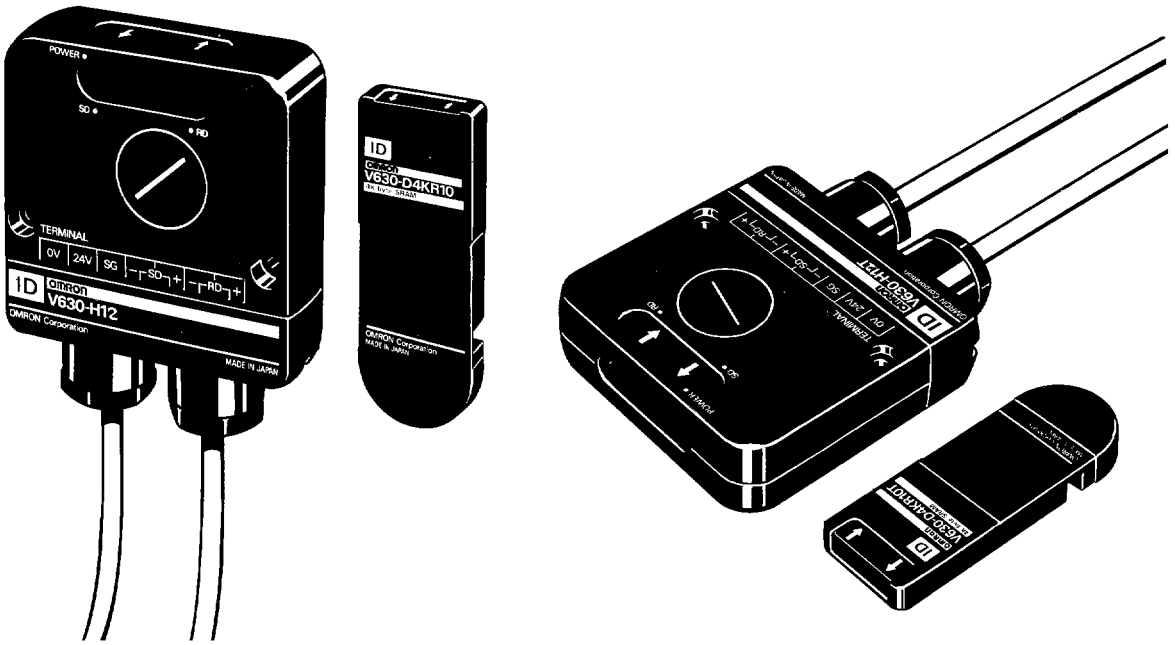
OPERATION MANUAL

OMRON

V630 FA ID SYSTEM

Operation Manual

Produced June 1992



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 warnings in this manual. Always heed the information provided with them.

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

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

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.

TABLE OF CONTENTS

About this Manual:

This manual describes the operation of the V630 FA ID System and includes the sections described below.

Please read this manual completely and be sure you understand the information provided before attempting to operate the system.

Section 1 provides a general introduction to the V630 FA ID System.

Section 2 provides the names and functions of the Read/Write Head (R/W Head) and Data Carrier (DC) parts and also provides their dimensions.

Section 3 provides the wiring instructions and the DIP switch settings required before operating the R/W Head and DC.

Section 4 provides information on the communications aspects of the FA ID System.

Section 5 provides information required to test and maintain the performance of the FA ID System.

Appendix A provides a list of standard models of V630 FA ID System components.

Appendix B provides the specifications and ratings of the R/W Head and DC.

Appendix C provides a list containing JIS 8 codes and ASCII.

Appendix D provides instructions on the use of the auto read/auto write commands.

SECTION 1
Features and System Configuration

This section provides a general introduction to the V630 FA ID System.

1-1 Features

V630 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 (infrared light) data communications.

Good Transmission Range

- Data is transmitted with infrared light, so the Read/Write (R/W) Head and Data Carrier (DC) can be separated by about 8" (20 cm).
- Communications are possible when the DC is within +15% of the axis of the R/W Head's infrared beam, so data will be transmitted reliably even if the position of the DCs varies.

High Reliability

- The S/N ratio is excellent because interference from electronic noise is greatly reduced with infrared transmission.
- Although the DC is compact, it can contain up to 4 KB of data in SRAM and that data will be retained for up to 10 years with a single lithium battery. The DC can be mounted on a pallet or other container, and the data required for any process can be accessed in realtime. Also, new data regarding that process can be recorded in the DC for future use.
- Two versions of each R/W Head and DC are available that transmit either through the top or the front, providing even more flexibility in applications.

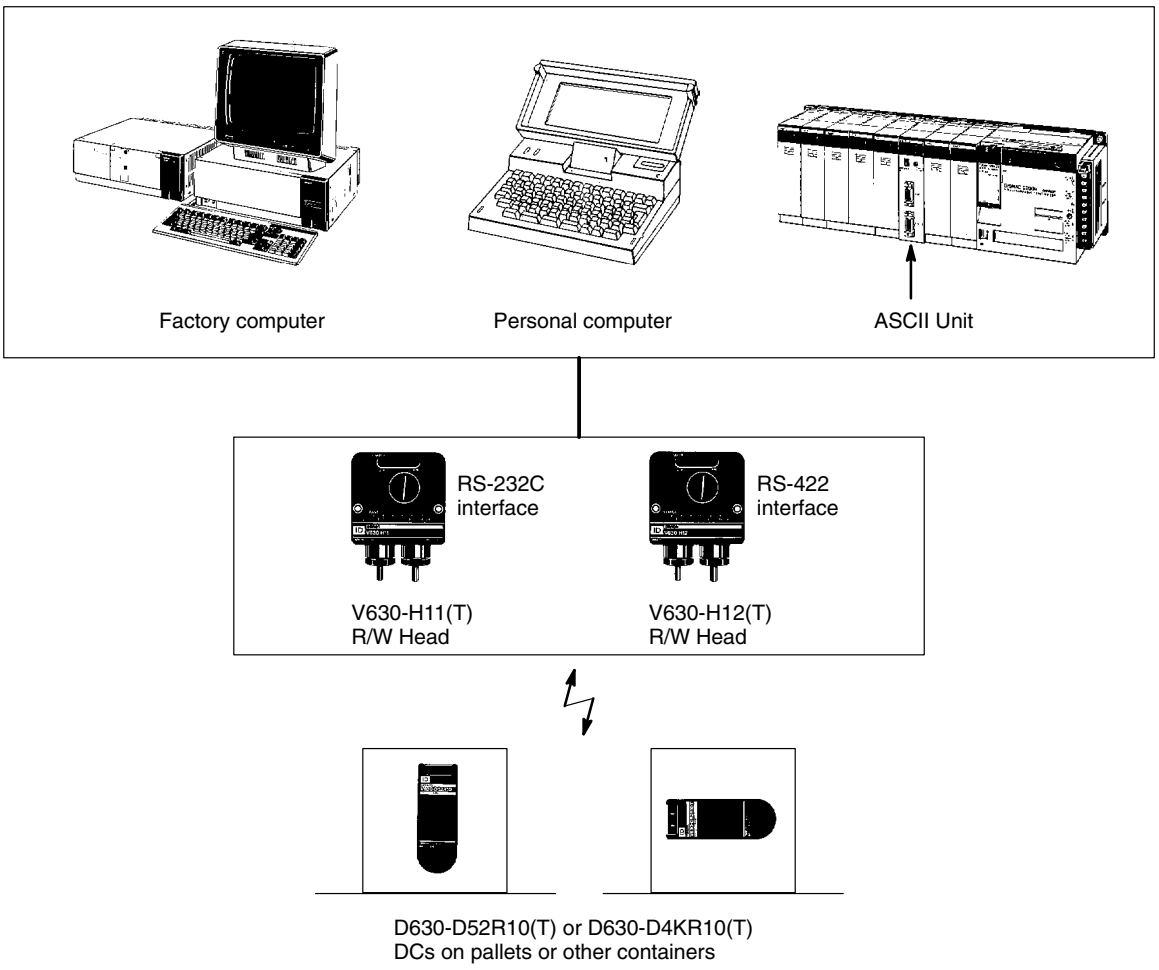
High-speed Communications Data is transmitted at up to 19,200 bps, so the R/W Head can communicate easily with a DC mounted on a moving pallet.

Easy to Use A RS-232C or RS-422 interface that can be connected to a general-purpose factory computer or personal computer is provided. Using simple commands, a large quantity of data can be processed easily.

1-2 System Configuration

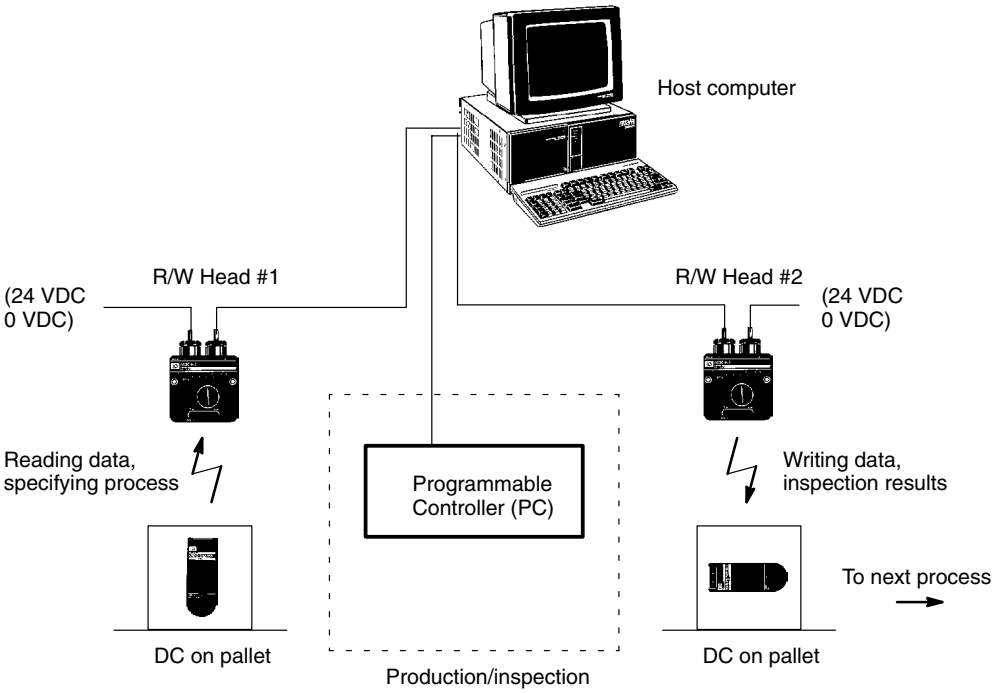
R/W Heads use infrared light to transfer data to and from DCs that are mounted on pallets or other containers. The DCs contain can contain up to 4 KB of production data that is accessed by R/W Heads as needed.

The serial interface on the V630-H11(T) R/W Head conforms to RS-232C, and the serial interface on the V630-H12(T) conforms to RS-422, so they can communicate with general-purpose factory computers (FC) and personal computers (IBM XT/AT or compatible). Communications processing is performed using the commands from a host computer (FC; IBM XT/AT or compatible) in RUN mode.



1-3 Outline of Operation

The diagram below shows an FA ID System used with a production or inspection process.



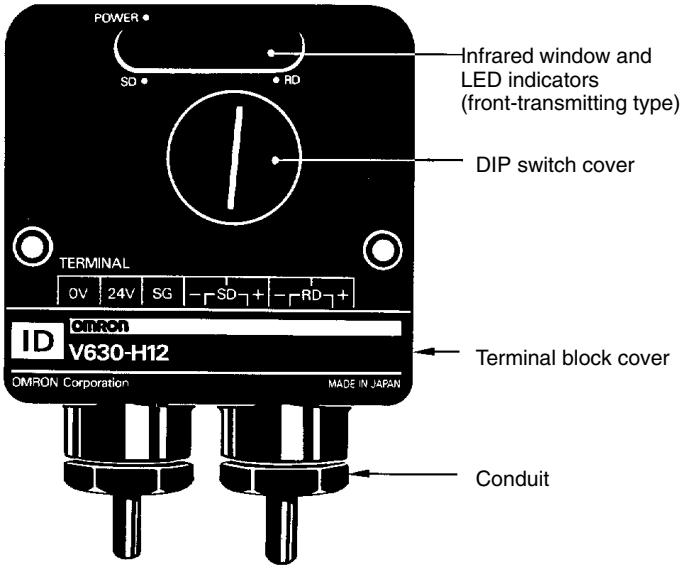
1, 2, 3...

1. When a read command is sent from the host computer (FC; IBM XT/AT or compatible) to R/W Head #1, it enters the stand-by state, waiting for a signal from the DC.
2. When a DC enters the area where it can communicate with R/W Head #1, the data (e.g., data for processing or inspection) of a memory area specified by the command is read from the DC, and that data is transmitted to the host computer as a response.
3. The host computer then transmits a command to a Programmable Controller (PC) specifying how to process or test the product.
4. When the processing or testing has been completed, the PC transmits process or test data to the host computer.
5. The host computer sends a write command to R/W Head #2 and the R/W Head enters the stand-by state, waiting for a signal from the DC. The write command contains the processing or testing result data and specifies the memory location in the DC to which the data will be written.
6. When a DC enters the area where it can communicate with R/W Head #2, the processing or testing result data will be written to the DC.

SECTION 2
Nomenclature and Dimensions

This section provides the names and functions of the R/W Head and DC parts as well as their dimensions.

2-1 Names and Functions of Parts



Operation Indicators

Name	Color	Function
POWER	Green	Lit when power is supplied.
SD	Orange	Lit when the R/W Head is sending data.
RD	Orange	Lit when the R/W Head is receiving data.

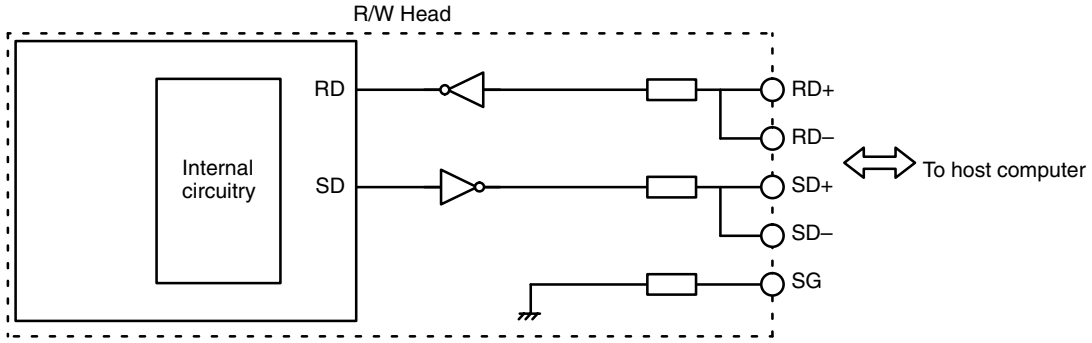
Terminal Block Connections

Name	Function	
	RS-232C interface	RS-422 interface
24VDC/0V	Supplies 24 VDC	
RD+	Receive data signal (input)	Receive data (positive input)
RD–		Receive data (negative input)
SD+	Send data signal (output)	Send data (positive input)
SD–		Send data (negative input)
SG	Signal ground	

Note When wiring, refer to the names on the case as well as the terminal block.

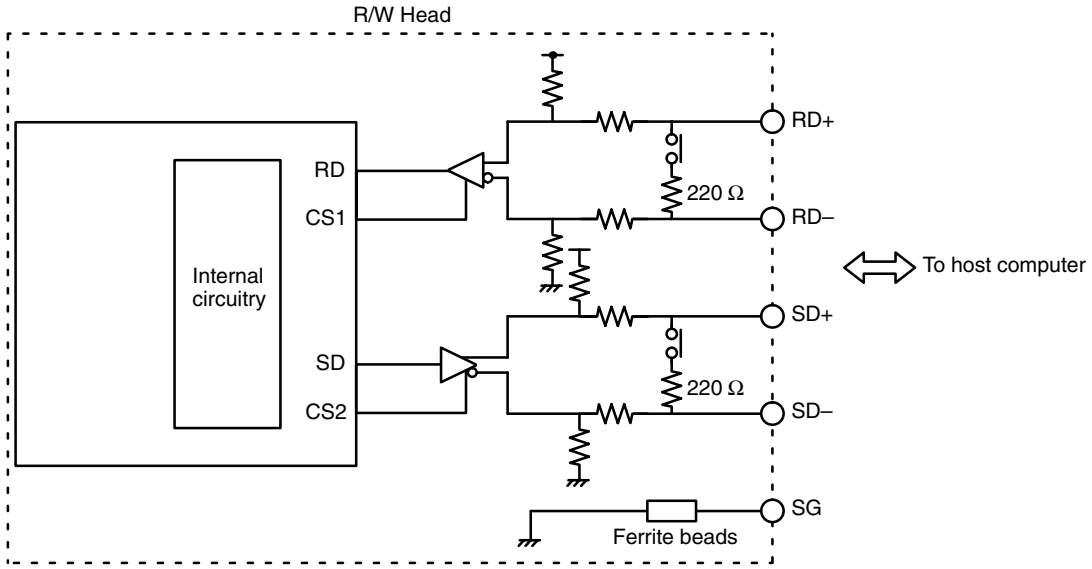
Terminal Block Circuitry

The diagram below shows the some of the internal circuitry for R/W Heads intended for RS-232C communications.



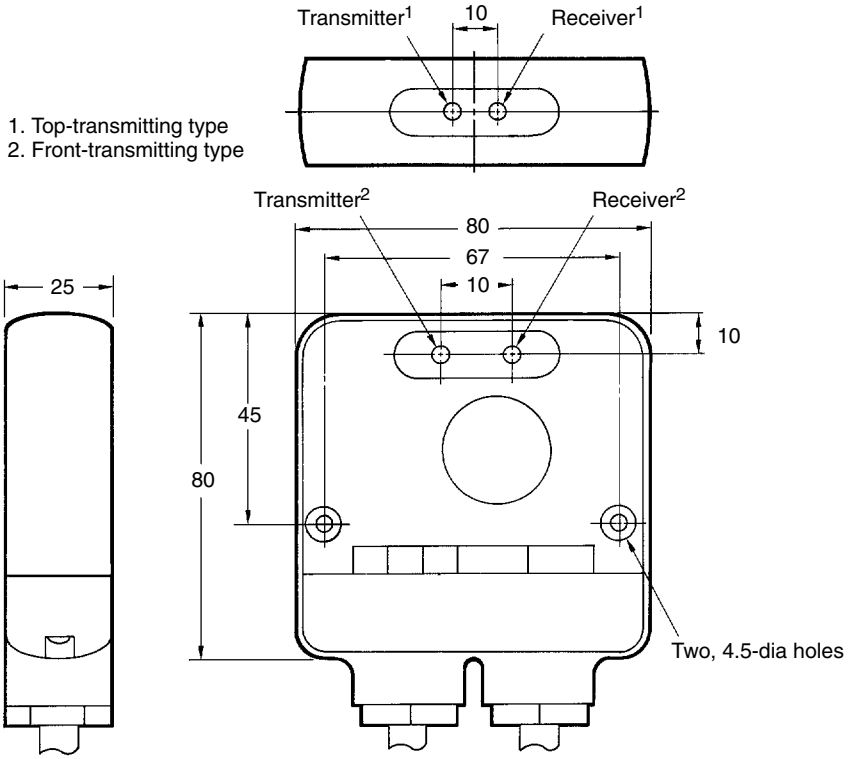
Note In the RS-232C R/W Heads, RD+ is connected to RD– and SD+ is connected to SD– within the R/W Head.

The diagram below shows the some of the internal circuitry for R/W Heads intended for RS-422 communications.

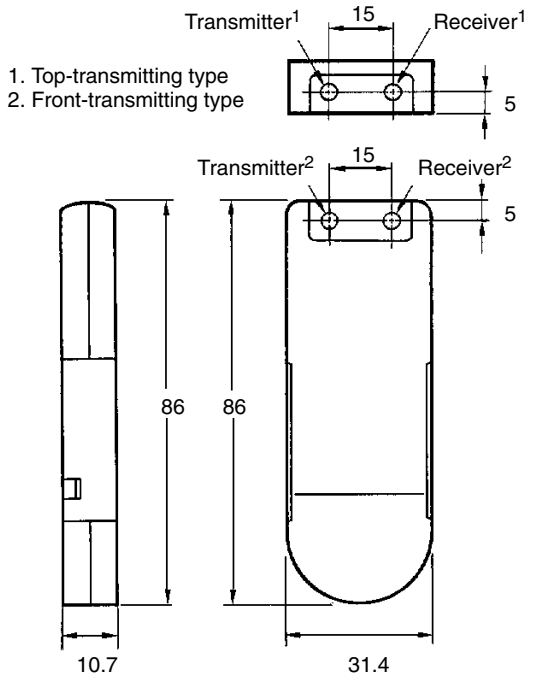


2-2 Dimensions

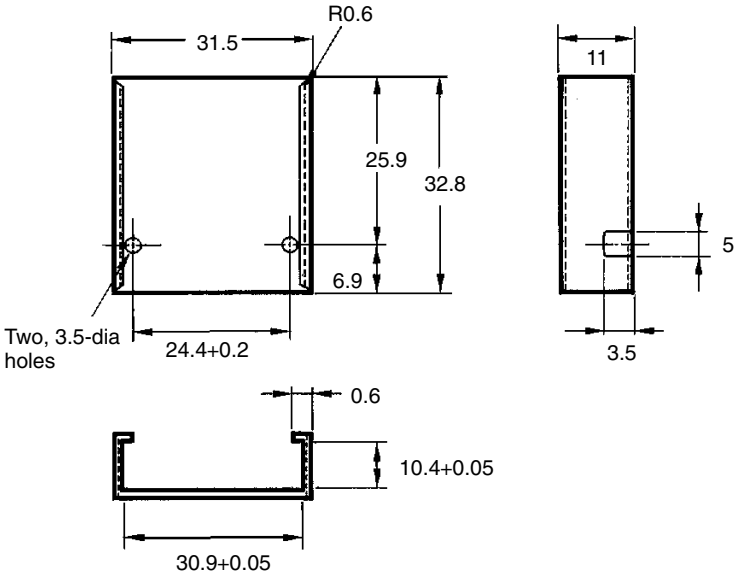
The dimensions for both top-transmitting and front-transmitting R/W Heads are shown below. All dimensions are in millimeters.



The dimensions for both top-transmitting and front-transmitting DCs are shown below. All dimensions are in millimeters.



The dimensions for the DC mounting bracket (included with the DC) are shown below. All dimensions are in millimeters.



SECTION 3
Installation and Switch Setting

This section provides instructions on installation of the R/W Head and DC, as well as wiring and DIP switch settings of the R/W Head.

3-1 Installation

Although the R/W Heads and DCs are highly reliable and durable, take the following precautions during installation in order to improve the reliability of the overall system and maximize the life of the components.

3-1-1 Installation Location

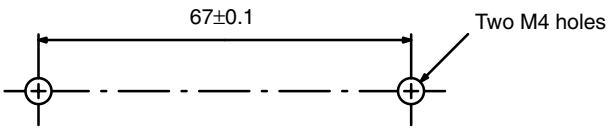
Do not install the R/W Head in the following locations:

- Where the temperature falls below –10°C or rises above +55°C, or where the temperature fluctuation is great and condensation is generated.
- Where the relative humidity falls below 35% or exceeds 85%.
- Where it is subject to corrosive gas, flammable gas, dust, salt, and iron chips.
- Where it is subject to direct vibration or shock.
- Where it is subject to direct sunlight.
- Where it is subject to splashes of water, oil, or chemical substances.

3-1-2 Installing R/W Heads

Mounting

Install the R/W Head using two M4 screws with lock washers to prevent loosening due to vibration or shock. The length of the screw in the R/W Head is about 20 mm (about 0.75 inch).



Be sure to position the R/W Head so that it will not be struck by objects on the conveyor belt (or anything else) and the axis of the light beam will intersect DCs as they pass by. Refer to *3-1-4 Positioning the R/W Head and DCs* for details.

When installing the R/W Head on metal, be sure that the metal is grounded to avoid electrical interference.

Interference from Light Sources

Install at least 200 mm (8”) from fluorescent lights (glow start, rapid start, or inverter type). Communications errors might occur if installed less than 200 mm away from fluorescent lights or if incandescent light intensity exceeds 4,500 ℓx. Sunlight might produce communications errors in the R/W Head if intensity exceeds 20,000 ℓx and in the DC if it exceeds 8,000 ℓx.

Water Drops and Dust

The R/W Head meets IP66 standards, but if possible do not install it in locations where water or dust are likely to accumulate heavily. The range of communication with the DC declines as water or dust accumulate on the R/W Head.

Corrosion of the Casing

The casings of the R/W Head and DC are made of U-polymer, but the casing might whiten when exposed to high octane gasoline or crack when exposed to ammonia or acetone. Consult a sales representative for more details on resistance to chemicals.

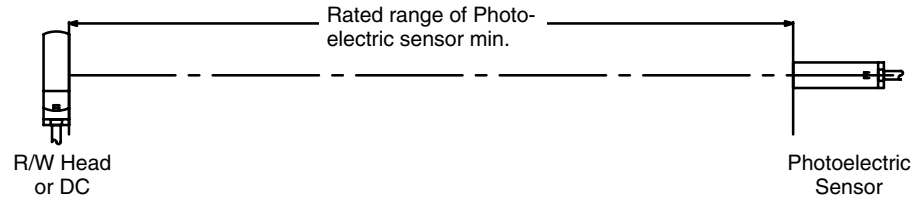
Interference from Photoelectric Sensors

If light from a Photoelectric Sensor is received by the R/W Head during communications between the R/W Head and DC, a communications error (72: Data Carrier missing) might occur.

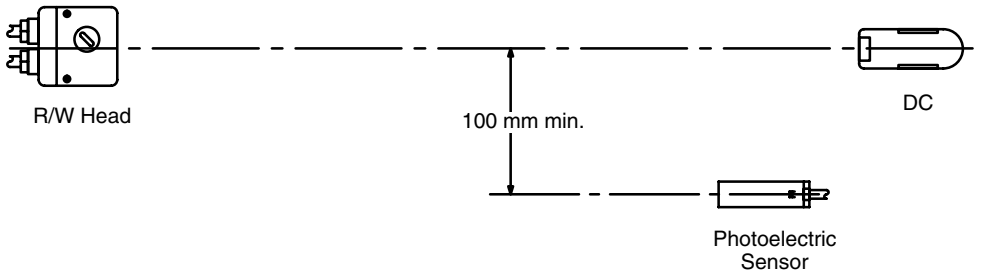
If light from a Photoelectric Sensor is received by the DC, the DC will enter active status and the DC’s battery will lose power. The light received from a Photoelectric Sensor will not be interpreted as data, however.

Photoelectric Sensors that use visible light produced by red or green LEDs will not interfere with communications between the R/W Head and DC. When Photoelectric Sensors that use infrared light must be used in the vicinity of R/W Heads and DCs, follow the guidelines below.

When a Photoelectric Sensor directly faces a R/W Head or DC, separate the devices by at least the rated range of the Photoelectric Sensor. For example an E3R-5E4 Photoelectric Sensor, with a rated sensing distance of 5 m, should be at least 5 m away.



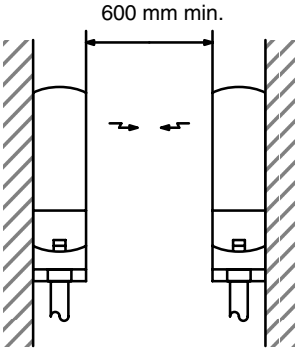
When a Photoelectric Sensor doesn't face a R/W Head or DC directly, separate the devices by at least 100 mm (4 in). The R/W Head and DC won't be affected until the Photoelectric Sensor is less than 50 mm (2 in) away, but the Photoelectric Sensor might sense the light from the R/W Head or DC at less than 100 mm.



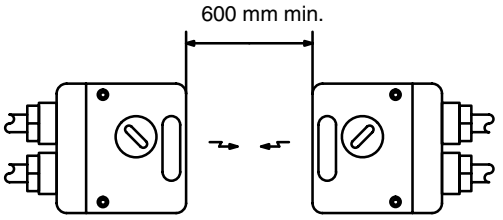
Mutual Interference

When using two or more R/W Heads, be sure to separate them enough to prevent interference from direct or reflected light. Mutual interference can vary greatly depending upon the surroundings, such as nearby reflective metal surfaces, so the distances below are intended as guidelines.

When the R/W Heads face each other directly, separate them by at least 600 mm (2 ft).

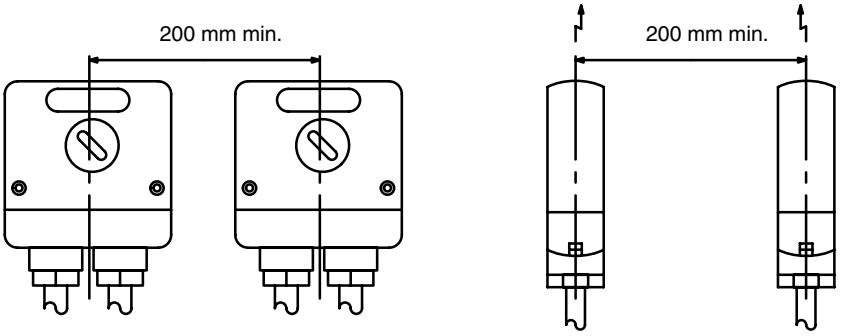


Front-transmitting type



Top-transmitting type

When the R/W Heads face the same direction, separate them by at least 200 mm (4 inches, center to center).



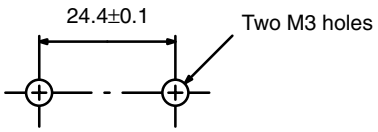
Front-transmitting type

Top-transmitting type

3-1-3 Installing Data Carriers

Mounting

To install the DC, first install the mounting bracket supplied with the DC using two M3 screws and lock washers to prevent loosening due to vibration or shock. Position the DC so that the axis of the light beam will intersect (+15%) the R/W Head as it passes by. Refer to *3-1-4 Positioning the R/W Head and DCs* for details.

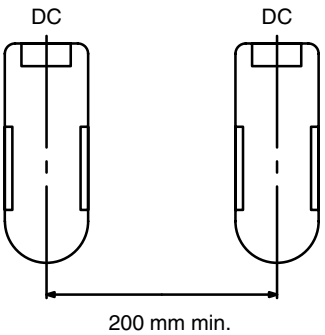


Water Drops and Dust

The DC meets IP67 standards, but if possible do not install it in locations where water or dust are likely to accumulate heavily. The range of communication with the R/W Head declines as water or dust accumulate on the DC.

Mutual Interference

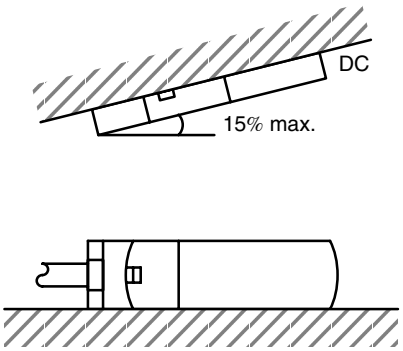
Separate DCs by at least 200 mm (4 inches, center to center) to prevent interference from direct or reflected light. The 200 mm separation is intended as a guideline because mutual interference can vary greatly depending upon the surroundings, such as nearby reflective metal surfaces.



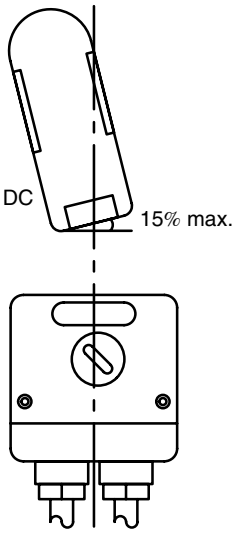
3-1-4 Positioning the R/W Head and DCs

It is important to position the R/W Head and DC so that the axes of the light beams will intersect (+15%) the infrared windows as they pass. Communication errors might occur if the angle is greater than +15% when the R/W Head and DC are 200 mm (4 in) apart.

Position the R/W Head and DC as close to parallel as possible, as shown in the following diagram.

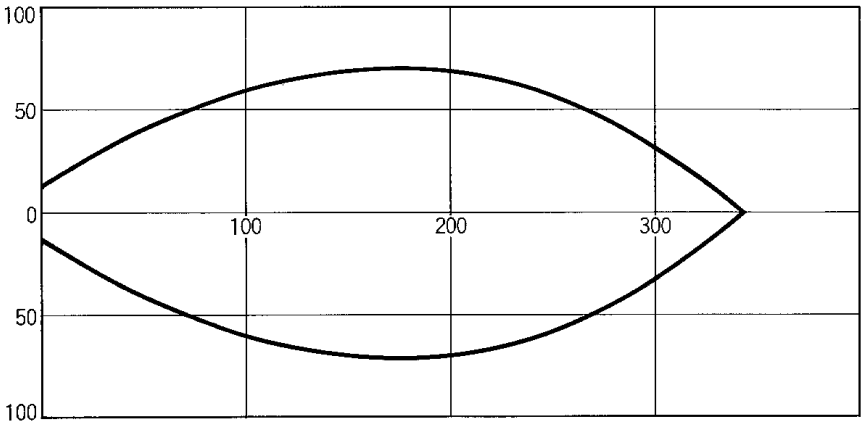


Front-transmitting R/W Head



Top-transmitting R/W Head

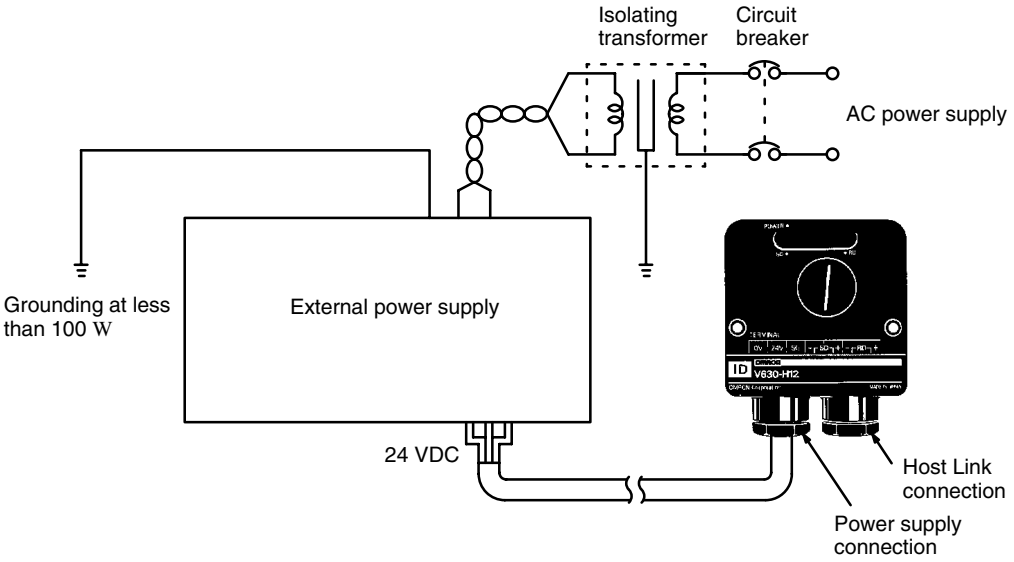
The graph below shows the operational range of the R/W Head and DC. Distances are in mm. (The R/W Head transmits along the x-axis.)



3-2 Wiring the R/W Head

Although the R/W Heads and DCs are highly reliable and durable, take the following precautions during installation in order to improve the reliability of the overall system and maximize the life of the components.

3-2-1 Power Supply Wiring



Supply 24 VDC (70 mA) to the R/W Head. Make sure that the voltage fluctuation is within the range of 19.2 to 28.8 VDC.

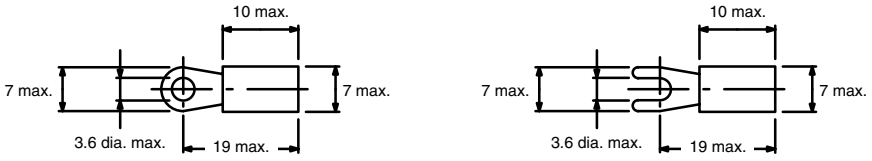
The circuits of a commercial 24 VDC power supply are sufficient to suppress most noise in power lines. However, by supplying power through an isolating transformer, noise can be substantially reduced. Use a transformer with an ungrounded secondary.

Use a power cable 2 mm^2 diameter minimum to prevent voltage drops. The use of twisted pair cables is recommended. To prevent electrical shocks and reduce noise, ground the external power supply separately. A 2 mm^2 diameter minimum, green wire that is less than 20 m long should be used.

Communication errors can occur when the external power supply is used to supply power to other I/O devices in addition to the R/W Head. If errors occur, provide a power supply for R/W Heads only.

Recommended Terminals

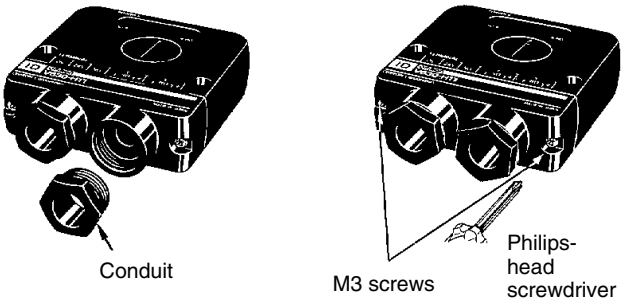
We recommend using solderless terminals for power supply and ground wires. Use terminals that have an insulating collar and are within the dimensions shown below. All dimensions are in millimeters.



Cable is not included with the R/W Head. Use a shielded two-conductor cable with an outer diameter of approximately 6 mm.

Connection to the Terminal Block

Follow the procedures below to connect power supply wires to the terminal block.



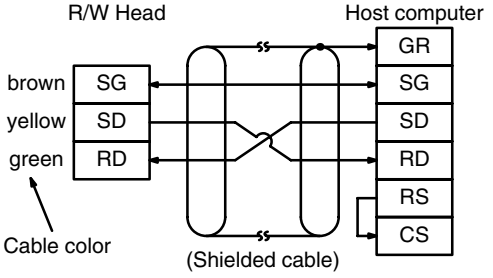
1, 2, 3...

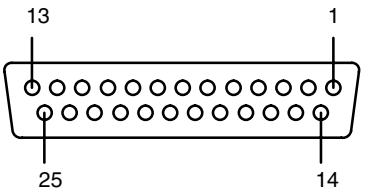
1. Remove the two M3 screws that secure the terminal cover with a Philips-head screwdriver.
2. Remove the conduit from the terminal cover with a 22 mm wrench.
3. After threading the cable through the conduit, thread it through the rubber bushing. The bushing meets IP66 standards and can accommodate some variation in cable diameter.
4. Push the rubber bushing into the conduit. Two types of bushing are provided for different types of cable.
5. Screw the conduit into the terminal block cover. Torque the conduit to about 25 kgf-cm.
6. Connect the terminals to the terminal block and replace the terminal block cover. Torque the screws to about 6 kgf-cm.

3-2-2 RS-232C Interface Connections

R/W Heads connect to the host computer with either RS-232C or RS-422 interface. The following table shows the connector pin allocation for R/W Heads that use a RS-232C interface.

Signal name	Abbr.	I/O	Pin no.
Ground	GR	——	1
Signal ground	SG	——	7
Send data	SD	Output	2
Receive data	RD	Input	3
Request to send	RS	Output	4
Clear to send	CS	Input	5
Data terminal not ready	ER	Output	(20)





Note

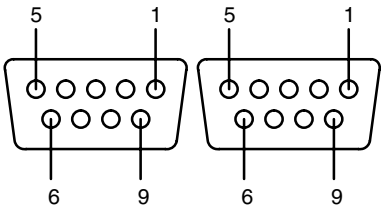
1. Ground the shielded cable at either the R/W Head side or host computer side to prevent malfunctioning. The above left figure shows an example of shielded cable grounding at the host computer side.

2. Connect pins 4 (RS) and 5 (CS) within the connector.
3. Refer to *2-1 Names and Functions of Parts* for details on R/W Head connections.

3-2-3 RS-422 Interface Connections

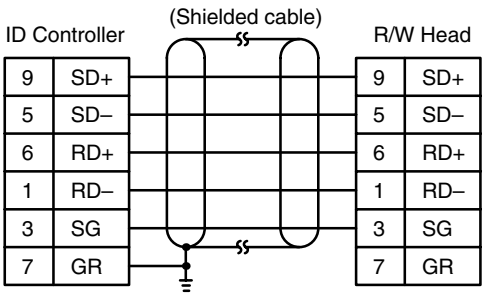
R/W Heads connect to the host computer with either RS-232C or RS-422 interface. The following table shows the connector pin allocation for R/W Heads that use a RS-422 interface.

Signal name	Abbr.	I/O	Pin no.
Ground	GR	——	7
Signal ground	SG	——	3
Send data A	SD+	Output	9
Send data B	SD–	Output	5
Receive data A	RD+	Input	6
Receive data B	RD–	Input	1

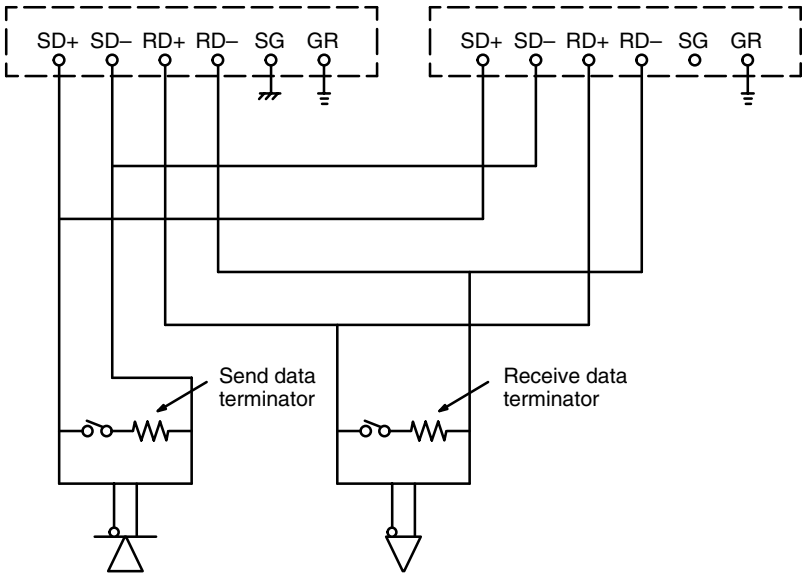


Note
1. The electrical connections are identical for the two connectors shown above. Therefore, the connections are the same for either 1:1 or 1:N communications.
2. Refer to *2-1 Names and Functions of Parts* for details on R/W Head connections.

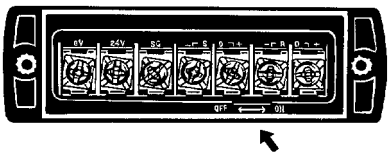
1:N Communications Connection



Note Ground the shielded cable at either side to prevent malfunctioning. The figure above shows an example of shielded cable grounded at the ID Controller.



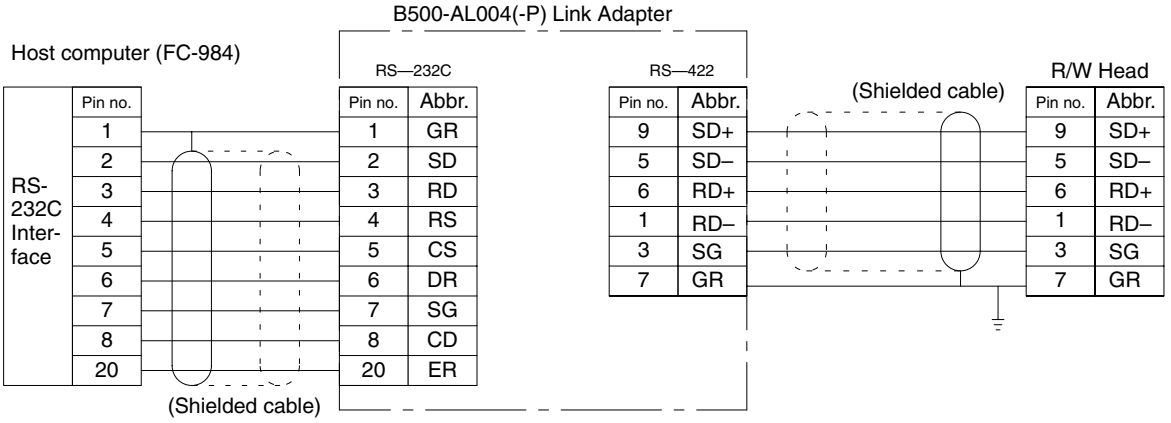
Set the terminator on the last R/W Head only. (The last R/W Head is the one with the highest unit number.) The terminator is set with the switch on the terminal block, as shown in the figure below.



Terminator switch

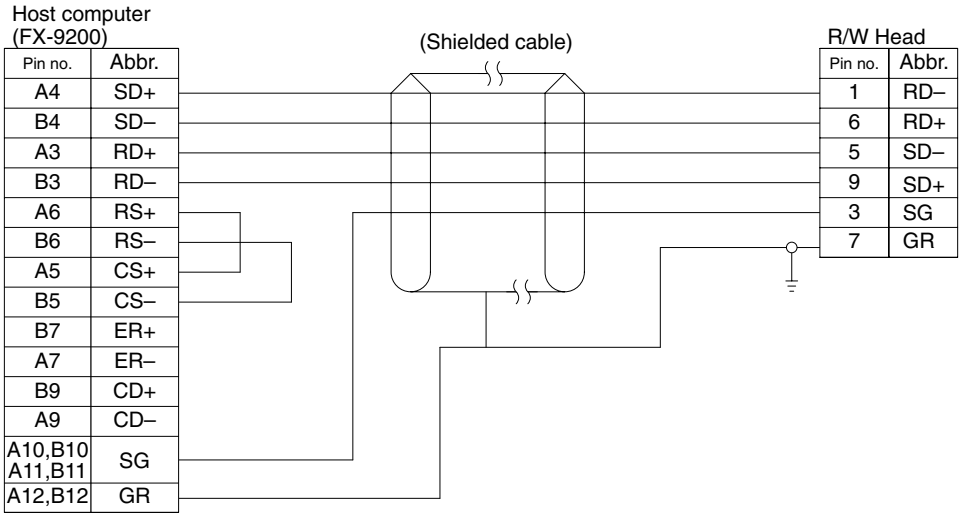
Connection to the Host Computer

RS-232C Interface



Note Ground the shield of the cable between the host computer and Link Adapter at the host computer, and ground the shield of the cable between the Link Adapter and R/W Head at the R/W Head.

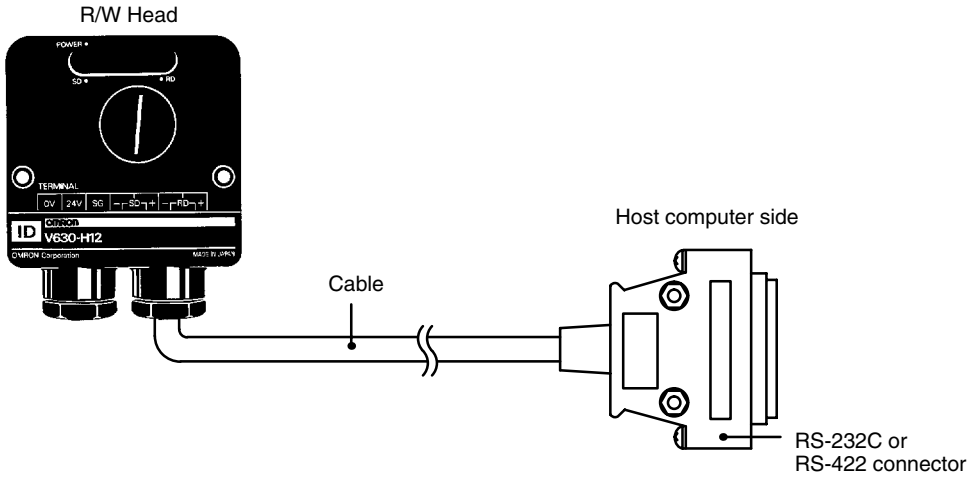
RS-422 Interface



Note
1. Ground the shield of the cable at either the host computer, the R/W Head, or both.
2. Set the terminator at the last R/W Head or Host Link Unit only.

3-2-4 R/W Head Wiring

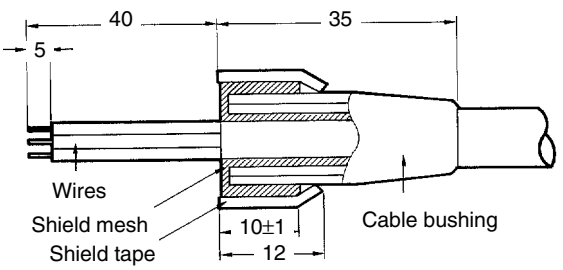
The cable and connector used to connect to the host computer are not included with the R/W Head. Preparation of the cables is described below.



Wiring the Host Computer Connector

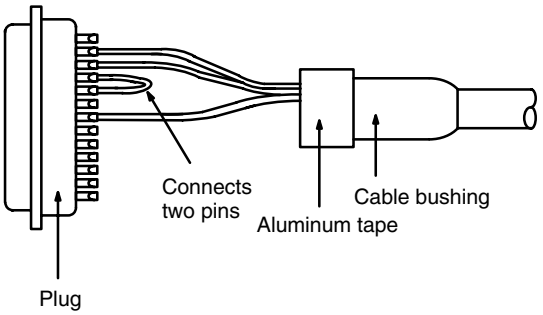
Follow the procedure below to attach the cable to the RS-232C or RS-422 connector.

1, 2, 3... 1. Process the ends of the cables.

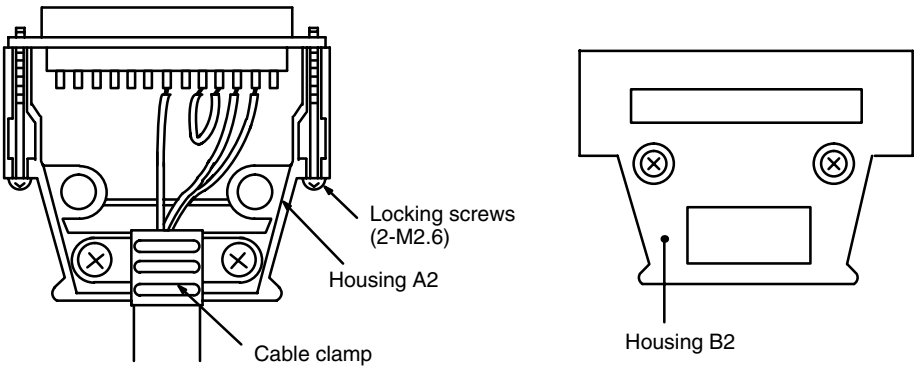


- Run the cable bushing through the cable in advance.
- Loosen the shield mesh and return it on the cable bushing. At this time, keep the returning length to about 10 mm.
- Wind the shield tape onto the shield mesh.

2. Solder the cable wires to the pins. (Pins 4 (RS) and 5 (CS) are connected in RS-232C connectors.)



3. Fit the plug into hood housing A2 and tighten the cable clamp onto the cable so that the clamp contacts the aluminum tape.

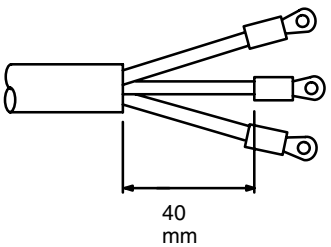


4. Attach housing B2 to A2 to complete the connector.

Wiring the Cable to the R/W Head

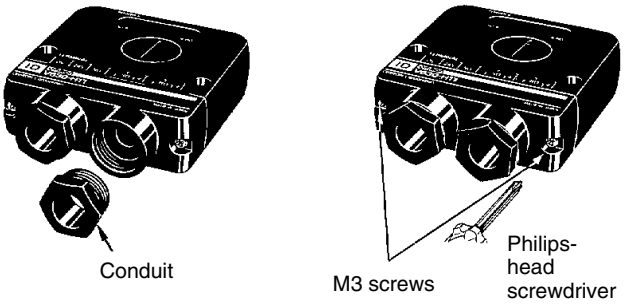
RS-232C Interface

The cable wires should be prepared as shown in the following diagram. We recommend using solderless (crimp-on) terminals. (40 mm ≅ 1.5 in.)



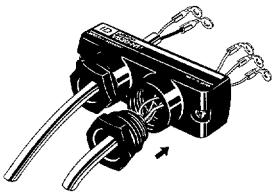
1, 2, 3...

1. Remove the two M3 screws that secure the terminal cover with a Philips-head screwdriver.
2. Remove the conduit from the terminal cover with a 22 mm wrench.

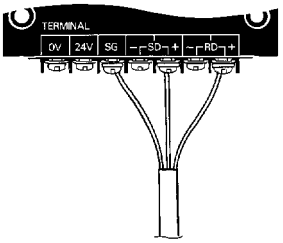


3. After threading the cable through the conduit, thread it through the rubber bushing. Use the bushing that best fits the cable.
4. Push the rubber bushing into the conduit. Two types of bushing are provided for different types of cable.

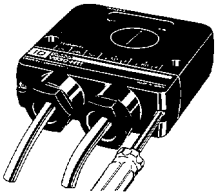
5. Screw the conduit into the terminal block cover. Torque the conduit to about 25 kgf-cm for IP66 standards.



6. Connect the terminals to the terminal block with a Philips-head screwdriver. The wires go to SG, RD+. and SD+. Torque the screws to about 6 kgf-cm.

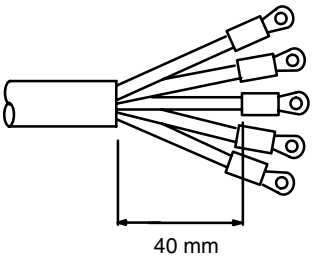


7. Replace the terminal block cover. Torque the screws to about 6 kgf-cm for IP66 standards.



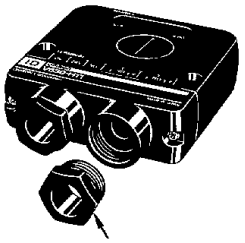
RS-422 Interface

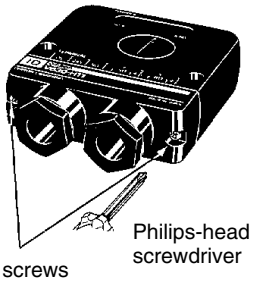
The cable wires should be prepared as shown in the following diagram. We recommend using solderless (crimp-on) terminals. (40 mm ≅ 1.5 in.)



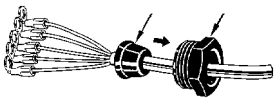
1, 2, 3...

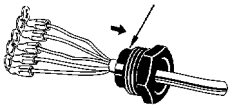
1. Remove the two M3 screws that secure the terminal cover with a Philips-head screwdriver.
2. Remove the conduit from the terminal cover with a 22 mm wrench.



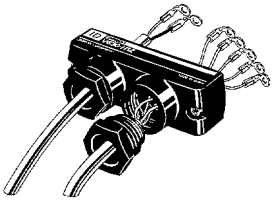


3. After threading the cable through the conduit, thread it through the rubber bushing. Use the bushing that best fits the cable.
4. Push the rubber bushing into the conduit. Two types of bushing are provided for different types of cable.

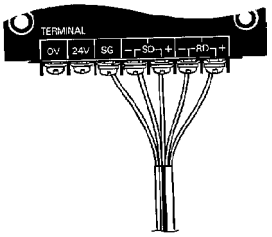




5. Screw the conduit into the terminal block cover. Torque the conduit to about 25 kgf-cm for IP66 standards.



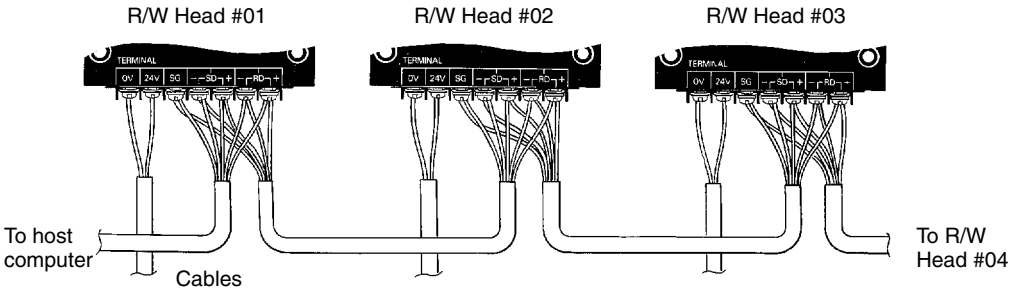
6. Connect the terminals to the terminal block with a Philips-head screwdriver. The wires go to SG, RD+, RD–, SD+. and SD–. Torque the screws to about 6 kgf-cm.



7. Replace the terminal block cover. Torque the screws to about 6 kgf-cm for IP66 standards.

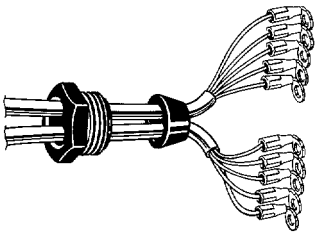
Multi Drop Connections (RS-422 Interface)

Up to 31 R/W Heads can be connected in series with an RS-422 interface. This method of connection does not meet IP66 standards. If the system must meet IP66 standards, use a B500-AL001 Link Adapter.



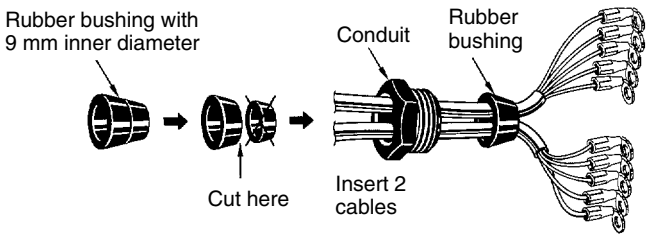
1, 2, 3...

1. Remove the the terminal cover with a Philips-head screwdriver and remove the conduit from the terminal cover with a 22 mm wrench.
2. Insert the two cables (with solderless terminals attached) into conduit and bushing.

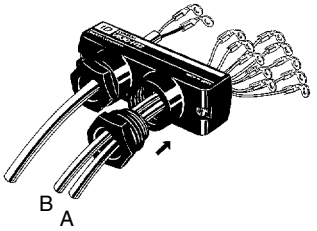


Note The standard rubber bushing cannot be used. Modify the bushing designed for 9 mm cable and insert two 6 mm cables (outer diameter about 6 mm). This seal does not meet IP66 standards.

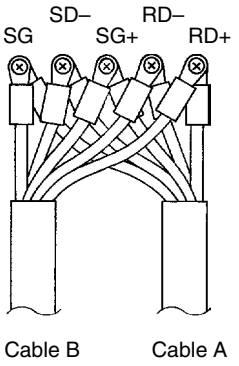
3. Insert the rubber bushing into the conduit.

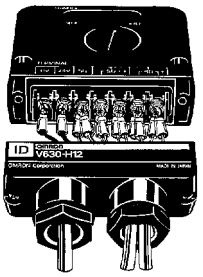


4. Screw the conduit into the terminal block cover. Torque to about 25 kgf-cm.



5. Connect the terminals to the terminal block with a Philips-head screwdriver. Overlap wires from cable A and cable B on the appropriate SG, RD+, RD–, SD+. and SD– terminals. Torque the screws to about 6 kgf-cm.





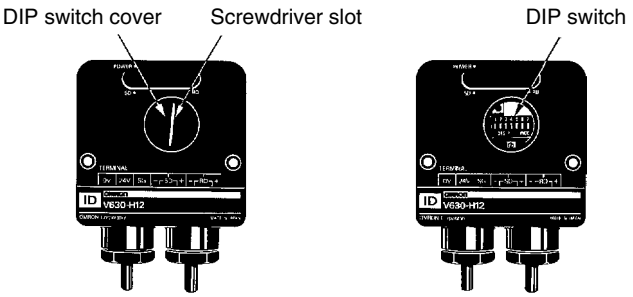
6. Replace the terminal block cover. Torque the screws to about 6 kgf-cm.

3-3 DIP Switch Setting

The baud rate of communications between the R/W Head and the host computer and the unit numbers of R/W Heads using the RS-422 interface are set with the DIP switch on the R/W Head. Turn the power OFF and ON again to make the new settings effective.

DIP Switch Cover Removal

To gain access to the DIP switch, unscrew the DIP switch cover on the front of the R/W Head with a standard screwdriver or a coin.



Setting the Baud Rate

Pins 1 to 2 set the baud rate of communications between the R/W Head and the host computer. The table below shows the settings for the RS-232C interface. (Model numbers V630-H11□)

Pin settings		Baud rate
1	2	
OFF	OFF	4,800
OFF	ON	9,600
ON	OFF	
ON	ON	

The table below shows the settings for the RS-422 interface. (Model numbers V630-H12□)

Pin settings		Baud rate
1	2	
OFF	OFF	4,800
OFF	ON	9,600
ON	OFF	19,200
ON	ON	

Setting the Unit Number

Pins 3 to 7 of the front DIP switch are used to set the unit number of R/W Head as seen from the host computer. The unit number can be 0 to 31, and is set as a binary number. Pin values (when ON) are shown in the table below.

Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Unit no.
0	0	0	0	0	00
0	0	0	0	1	01
0	0	0	1	0	02
0	0	0	1	1	03
0	0	1	0	0	04
0	0	1	0	1	05
0	0	1	1	0	06
0	0	1	1	1	07
0	1	0	0	0	08
. . .	. . .	. . .	. . .	. . .	. . .
1	1	1	0	0	28
1	1	1	0	1	29
1	1	1	1	0	30
1	1	1	1	1	31

Set the unit number to 0 for point-to-point (1:1) communications. Be sure to set the unit numbers between 01 and 31 for multi drop (1:N) communications.

Example

The following diagram shows the DIP switch set for 9600 baud and a unit number of 7 (0+0+4+2+1=7).

Caution Be sure to turn off the power to the R/W Head after changing the DIP switch settings. When the settings are changed with the power ON, the new settings will not be effective until the power is turned OFF and ON again.

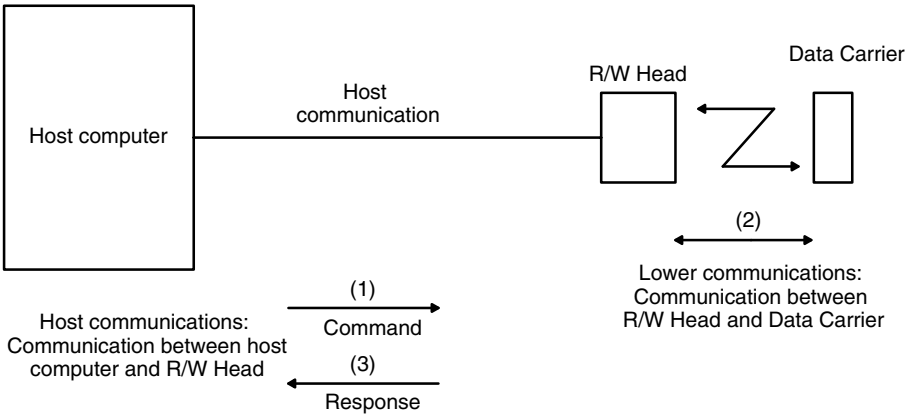
SECTION 4
Communications

This section provides information on the communications aspects of the V630 FA ID System.

4-1 Movement of Data Carrier and Command Status

Communications Control Procedure

The host communication control procedure conforms to the Host Link System procedure.



Description

1, 2, 3...

1. The host computer transmits commands to the R/W Head.
2. The R/W Head analyzes the commands from the host computer, executes lower communications, and writes/reads data to/from a DC.
3. When a read command has been executed, the R/W Head transmits the contents of the data it has read as a response to the host computer. When a write command has been executed, the R/W Head transmits a response indicating the end of processing to the host computer.

Command Reception

The R/W Head assumes the following status in response to a command sent from the host computer:

Command Wait Status

In this status, the R/W Head processes no command and is ready to receive any command. The R/W Head enters the Command Processing Status when it receives a command.

Command Processing Status

(Not including polling auto commands) In this status, the R/W Head ignores new commands until it has processed the current command and returned a response to the host computer.

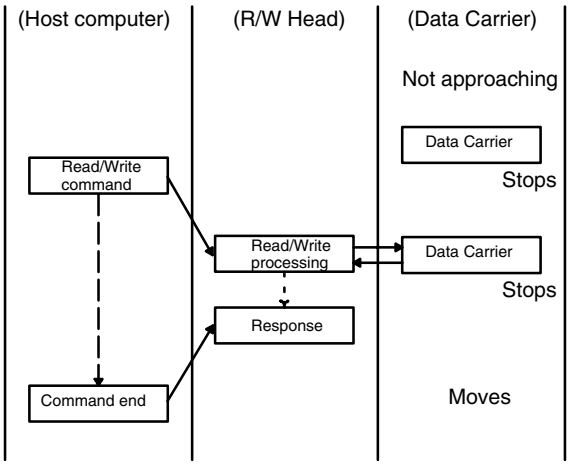
The exceptions to this rule are the auto read and auto write commands, which will receive the command processing terminating command during processing.

Polling Auto Subcommand Wait Status

The R/W Head is in this status when it has received a polling auto command but a DC hasn't arrived yet. When the R/W Head is in the polling auto subcommand wait status, it can receive only a polling subcommand (inquiry, termination). Refer to *3-4-7 Polling Auto Read* and *3-4-8 Polling Auto Write* for details.

Read/Write Function

Read/Write Command Processing: The read/write function is used for communication when the Data Carrier is motionless. Therefore, it must be confirmed that the Data Carrier is at a specified position, i.e., in the communication area of the R/W Head. If the Data Carrier is missing, the R/W Head returns a response to that effect.

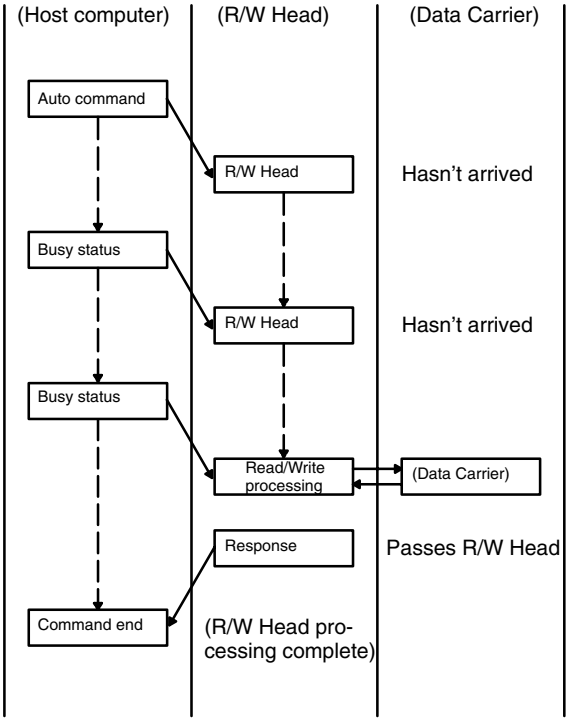


1, 2, 3...

1. The host computer confirms that the Data Carrier is at a specified position and transmits a command to the R/W Head.
2. The R/W Head performs write or read processing in accordance with the command.
3. After the processing is complete, the R/W Head returns a response to the host computer to indicate that the processing has ended. The host computer, on receiving the response, moves the workpiece (with a Data Carrier) on the conveyor line.

Auto Read/Write Function

Auto Command Processing: When the R/W Head has received an auto command, it does not respond to the host computer until the Data Carrier arrives. The host computer's communication line is busy until the Data Carrier arrives and processing is completed.



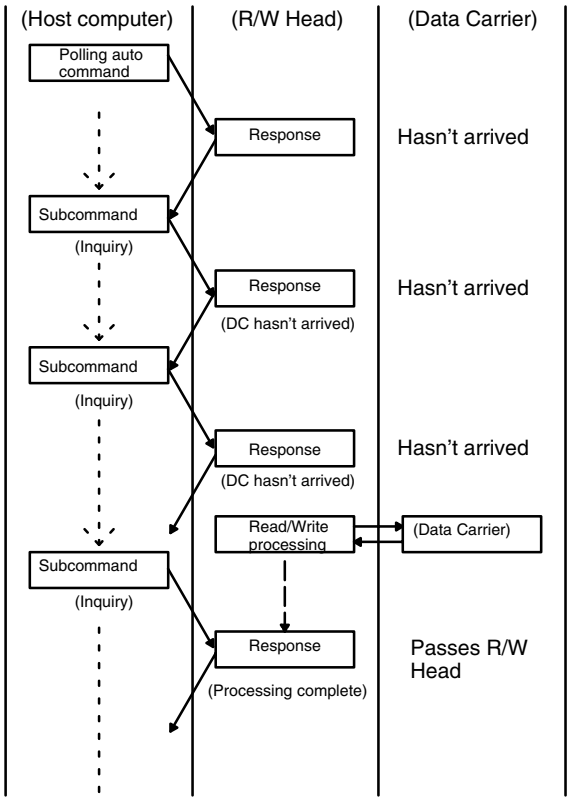
1, 2, 3...

1. The host computer transmits an auto command to the R/W Head.
2. The R/W Head does not respond to the host computer and the host computer is busy until the read/write processing is completed.
3. When the Data Carrier passes by the R/W Head, data is read or written.
4. After the processing has been completed, the R/W Head returns a response to the host computer indicating the end of processing.

For further details, refer to Appendix B.

Polling Function

When an ordinary auto command is executed, the R/W Head does not respond to the host computer and the host computer's communication line is busy until the DC arrives. However, when a polling auto command is executed, the R/W Head will respond to requests from the host computer, so the communication line isn't busy.



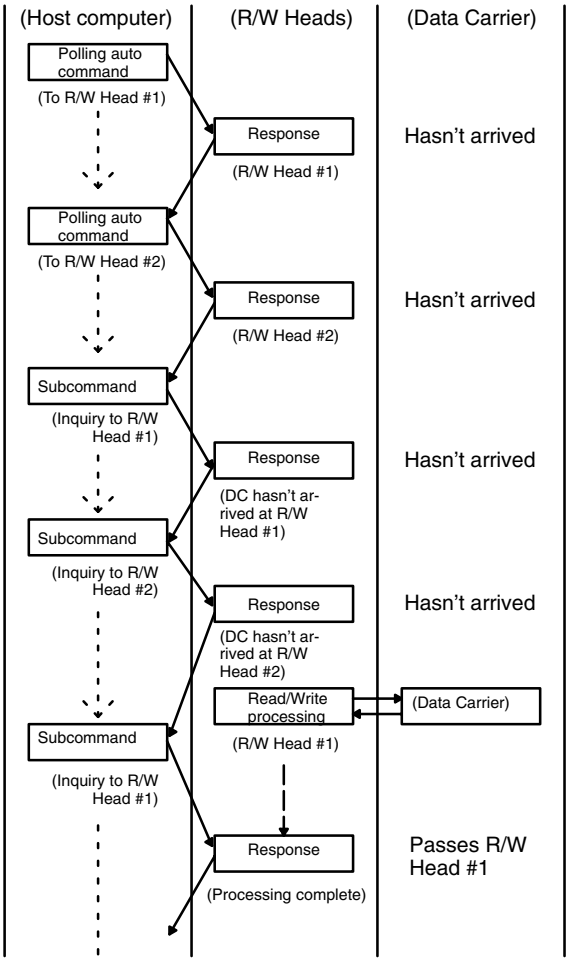
1, 2, 3... 1. The host computer sends a polling auto command to the R/W Head.

2. As soon as the R/W Head has received the command, it responds to the host computer to indicate the reception of the command.
3. The host computer can make an inquiry on the progress of the processing or terminate the polling auto processing by using a subcommand.
4. If the Data Carrier hasn't arrived, the R/W Head responds to that effect to the host computer in response to a subcommand making an inquiry.
5. When the Data Carrier passes by the R/W Head, read or write processing is performed.
6. When processing has ended, the R/W Head responds to the host computer to indicate the end of the processing in response to a subcommand making an inquiry.

Polling Function in 1:N Communications

The polling auto function is particularly useful when more than one R/W Head is used. When an ordinary auto command is executed, the R/W Head does not respond to the host computer and the host computer's communication line is busy until the DC arrives, so the host computer cannot send commands to other R/W Heads.

However, when a polling auto command is executed, the R/W Heads will respond to requests from the host computer, so the communication line isn't busy and the host computer can send commands to other R/W Heads.



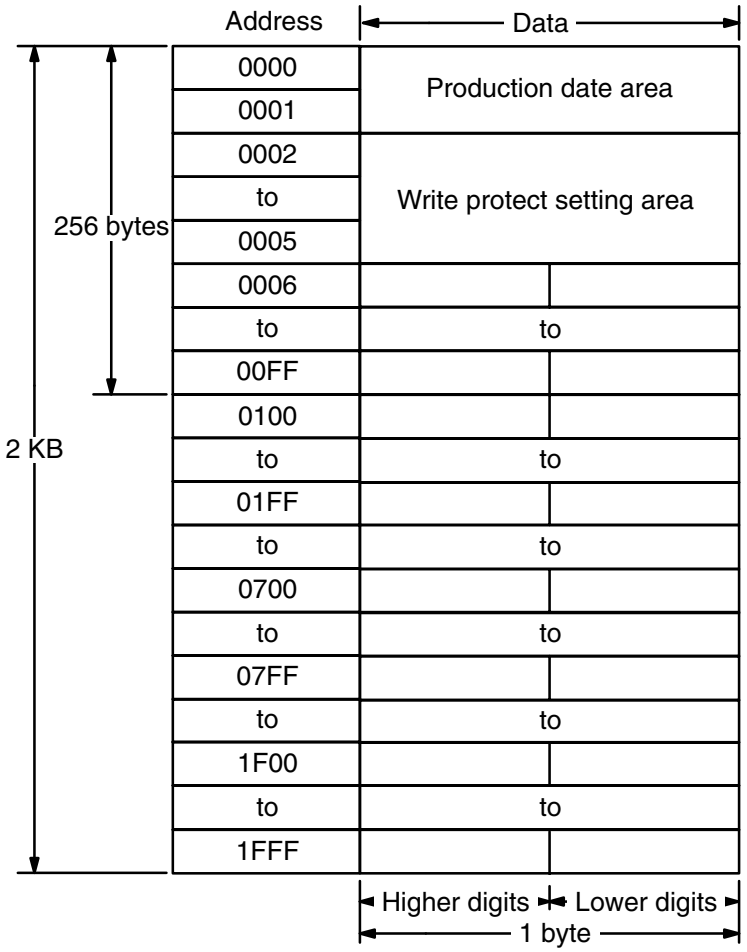
1, 2, 3...

1. The host computer sends a polling auto command to R/W Head #1.
2. As soon as R/W Head #1 has received the command, it responds to the host computer to indicate the reception of the command.
3. The host computer sends a polling auto command to R/W Head #2.
4. As soon as R/W Head #2 has received the command, it responds to the host computer to indicate the reception of the command.
5. The host computer can make an inquiry on the progress of the processing or terminate the polling auto processing by using a subcommand.
6. If the Data Carrier hasn't arrived, the R/W Head responds to that effect to the host computer in response to a subcommand making an inquiry.
7. When the Data Carrier passes by R/W Head #1, read or write processing is performed.
8. When processing has ended, the R/W Head responds to the host computer to indicate the end of the processing in response to a subcommand making an inquiry.

4-2 Memory Map of Data Carrier

4-2-1 Memory Map

The Data Carrier (DC) has a memory capacity of up to 4 KB (4,096 bytes). Each address of the memory area contains 1 byte of data.



Note 1. Addresses 0000 and 0001 are the production date area in which the date of shipment is set. Addresses 0002 through 0005 are used to set write protection.

2. The highest address in the 64 byte DCs is 003F.

4-2-2 DC Production Date (Written by Manufacturer)

To manage the battery life of the Data Carrier, the date of production is written to the first 2-byte area of the Data Carrier memory at shipment. The data in this area can be read, but no data can be written to this area by the user. If a write operation is performed on this area by mistake, an error will occur.

Contents of Production Date Area

Address	Bit							
	7	6	5	4	3	2	1	0
0000	Digit 10 of month				Digit 1 of month			
0001	Digit 10 of year				Digit 1 of year			

Note 1. Lower 2 digits of year are recorded (1991 → “91”).

2. Month is expressed in two digits (June → “06”, October → “10”).

Example: October, 1991

Address	Bit							
	7	6	5	4	3	2	1	0
0000	0	0	0	1	0	0	0	0
	1				0			
0001	1	0	0	1	0	0	0	1
	9				1			

Note The battery life of the Data Carrier can be managed not only by reading the sticker on the battery, but also by the host computer through software by using a read command.

4-2-3 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 in a specified memory area can be protected. It is recommended that important data be write-protected as follows:

Setting Write Protect Function

The write protect function is set by 4 bytes of the addresses 0002 through 0005 of the Data Carrier’s memory. Whether or not the write protect function is effected is specified by the most significant bit of address 0002. The start and end addresses can be set to any addresses between 0006 and 0FFF for the 4 KB DCs, or 0006 and 003F for the 64 byte DCs.

Address	Bit							
	7	6	5	4	3	2	1	0
0002	YES/ NO	Higher 2 digits of start address						
0003	Lower 2 digits of start address							
0004	Higher 2 digits of end address							
0005	Lower 2 digits of end address							

Write protect execution bit (most significant bit of address 0002)
1: Write-protected
0: Not write-protected

Note
1. Addresses that exceed the DC’s memory capacity (1000 to FFFF in 4 KB DCs or 0040 to FFFF in 64 byte DCs) can be set, but will be regarded as 0FFF or 003F.
2. Use addresses 0002 through 0005 as a dedicated write protect area.

To protect addresses 0006 through 07FF:

Address	Higher digits				Lower digits			
0002	1	0	0	0	0	0	0	0
	8				0			
0003	0	0	0	0	0	1	1	0
	0				6			
0004	0	0	0	0	0	1	1	1
	0				7			
0005	1	1	1	1	1	1	1	1
	F				F			

To not protect addresses:

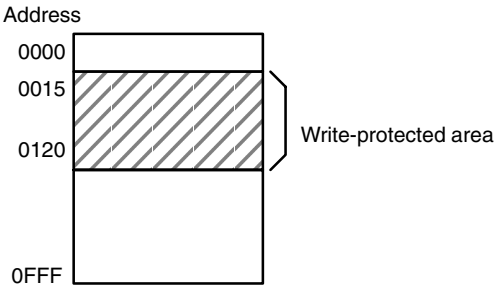
Address	Higher digits				Lower digits			
0002	0	0	0	0	0	0	0	0
	0				0			
0003	0	0	0	0	0	0	0	0
	0				0			
0004	0	0	0	0	0	0	0	0
	0				0			
0005	0	0	0	0	0	0	0	0
	0				0			

Example of Setting Write Protect Function

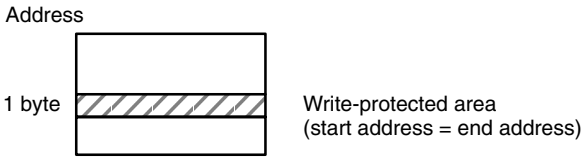
The examples below show the memory areas for 4 KB DCs (0000 to 0FFF). The last address of 64 byte DCs is 003F.

1, 2, 3... 1. To write-protect addresses 0015 through 0120.

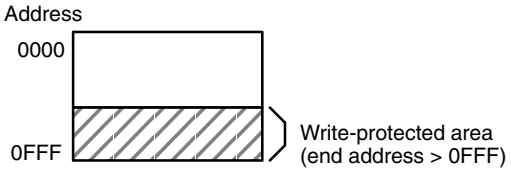
Address	Bit							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0002	1	0	0	0	0	0	0	0
	8				0			
0003	0	0	0	1	0	1	0	1
	1				5			
0004	0	0	0	0	0	0	0	1
	0				1			
0005	0	0	1	0	0	0	0	0
	2				0			



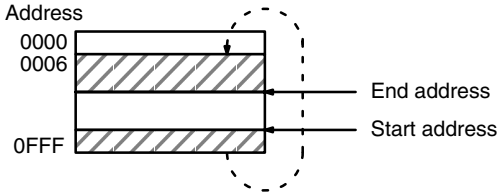
2. To write-protect only 1 byte, set the same address as the start and end addresses.



3. If the end address exceeds the last address of the Data Carrier memory, the memory will be protected up to the last address.



4. If start address exceeds end address (start address > end address), all addresses except those between the end address and the start address will be write-protected.



Canceling Write Protection

To cancel write protection, clear the most significant bit of address 0002 to 0. The write protection is canceled and both the start and end addresses specified in addresses 0002 through 0005 become invalid.

4-3 Command Format

Command/Response List

No.	Command	Header	Description		Address range
1	Read	RD	Reads or writes data to or from DC. If the DC is missing, an error response is returned.		0000 to 0FFF
2	Write	WT			0002 to 0FFF
3	Auto read	AR	Reads or writes data to or from DC. If the DC is missing, waits until carrier arrives.	Responds upon completion of command processing.	0000 to 0FFF
4	Auto write	AW			0002 to 0FFF
5	Polling auto read	PR		Inquiries can be made about processing results.	0000 to 0FFF
6	Polling auto write	PW			0002 to 0FFF
7	Command processing terminate	AA	Terminates processing of auto commands (auto read or auto write).		
8	Expansion read	XR	Up to 2 KB of DC data can be read at one time.		0000 to 0FFF
9	Response request	QQ	Requests that the last R/W Head response be retransmitted.		
10	Test	TS	Returns as a response a test message sent from host computer.		
11	Abort (reset)	XZ	Restores R/W Head to previous state upon power application. No response is returned. Do not execute this command while the R/W Head and DC are communicating.		
12	Command undefined response	IC	Response returned by R/W Head when the R/W Head receives an undefined command from host computer.		

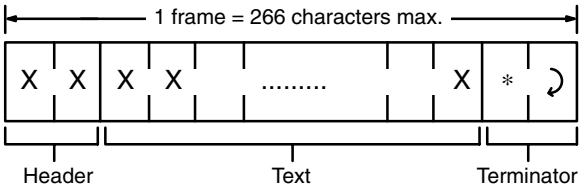
Note Only uppercase letters can be used in commands. Lowercase letters will cause an error to occur.

4-3-1 Command/Response Format

The format for commands sent from the host computer to the R/W Head, and responses returned from the R/W Head to the host computer is shown below for point to point and 1:N communications.

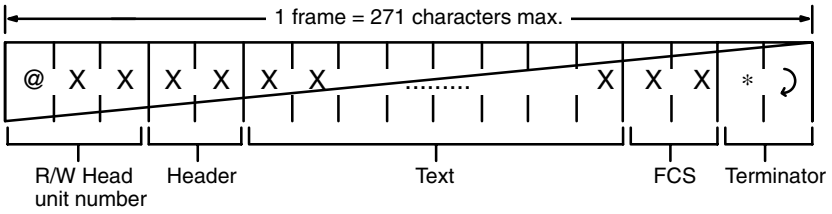
Point to Point (1:1) Communications

In point to point communications, the host computer is connected to a single R/W Head.



1:N Communications

In 1:N communications, the host computer is connected to N R/W Heads.

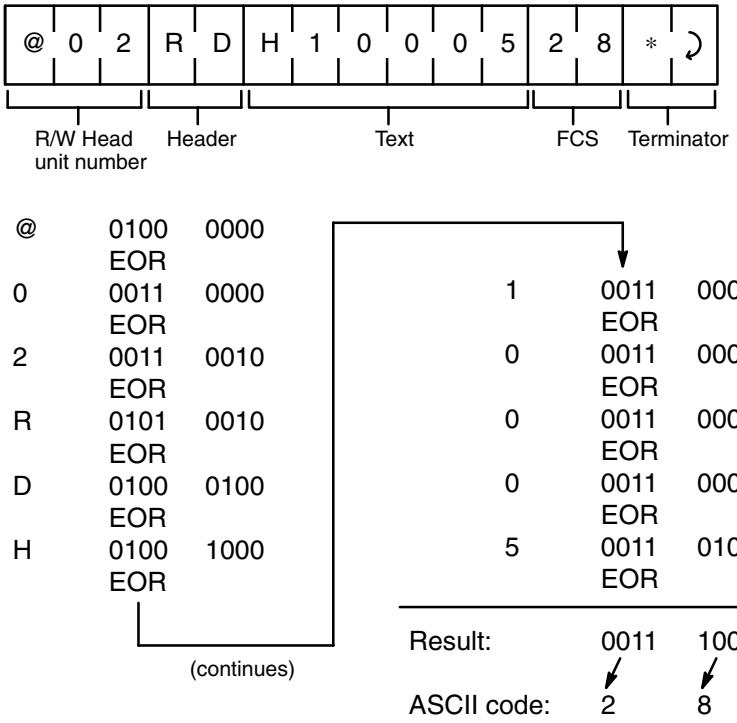


Type	Description	
Header	Command	Two-character symbol indicating operation.
	Response	Symbol same as header of executed command
Text	Command	Contents of processing: – ASCII/HEX code specification – R/W Head no. specification (always 1) – Processing start address – Number of bytes to be processed (for read command), write data (for write command)
	Response	Result of processing – End code – Read data (for read command)
Terminator	Indicates end of command or response. Note: * indicates “2A”H of ASCII code, and CR indicates “0D”H.	
R/W Head unit number	Included in 1:N communications only. The unit number of the R/W Head (01 to 31) follows the @ character.	
FCS	Included in 1:N communications only. The FCS (frame check sequence) is used for a parity check to detect errors in transmission.	

4-3-2 Calculating the FCS

The FCS is calculated by performing exclusive ORs on every byte of data from the first character in the frame (@) to the last character in the text string.The resulting byte is converted to its equivalent ASCII-code characters.

Example



Example FCS Calculation Program

The subroutine below is for checking FCS in received data. Refer to *3-5 Example of Communication Program* for details on a program that calculates the FCS in data transmission.

```
1000  *******FCSCHECK*******
1010  *FCSCHECK
1020  Q=0:FCSCK$="OK"
1030  PRINT RESPONSE$
1040  LENGS=LEN(RESPONSE$)-3
1050  FCSP$=MID$(RESPONSE$, LENGS+1, 2)
1060  FOR I=1 TO LENGS
1070  Q=ASC(MID$(RESPONSE$, I, 1))×OR Q
1080  NEXT I
1090  FCSD$=HEX$(Q)
1100  IF LEN(FCSD$)=1 THEN FCSD$="0"+FCSD$
1110  IF FCSD$< >FCSP$ THEN FCSCK$="ERR"
1120  PRINT "FCSD$=" ; FCSD$, "FCSP$=" FCSP$, "FCSCK$="
; FCSCK$;
1130  RETURN
```

Address 1050 calculates the response data FCS, address 1060 calculates the FCS calculation range, address 1100 gives the FCS calculated in the program, and address 1120 will print "OK" if the data was received normally or "ERR" if an error occurred during transmission.

Note In this example, CR (CHR$ (13)) is not included in RESPONSE$. Change address 1040 to include CR.

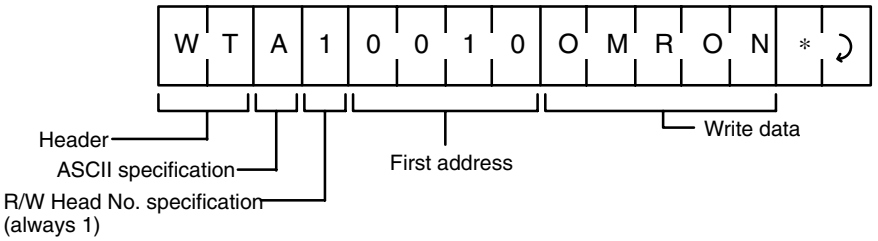
4-3-3 Specifying Data Code

Whether the read or write data is treated as an ASCII (or JIS 8) code or HEX code is specified in a command.

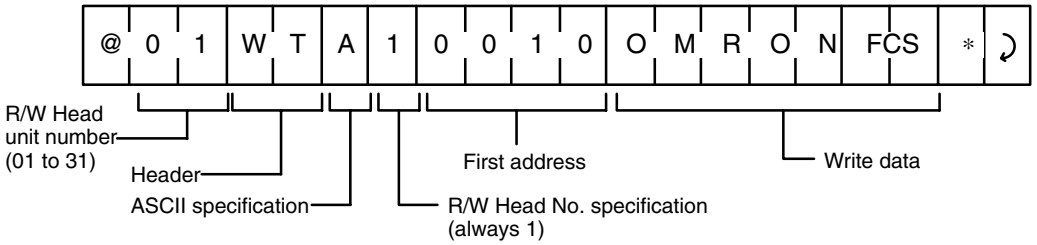
ASCII (JIS 8 Code)

One character of ASCII or JIS 8 code data occupies 1 byte (1 address) of the Data Carrier memory.

Example of specifying ASCII code in point to point (1:1) communications:



Example of specifying ASCII code in 1:N communications:



Data Carrier memory address:

Address			
0010	4	F	“O”
0011	4	D	“M”
0012	5	2	“R”
0013	4	F	“O”
0014	4	E	“N”

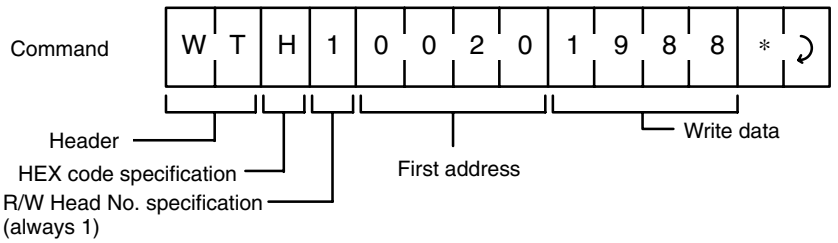
Note For ASCII (JIS 8 code), refer to Appendix A.

Hex Code

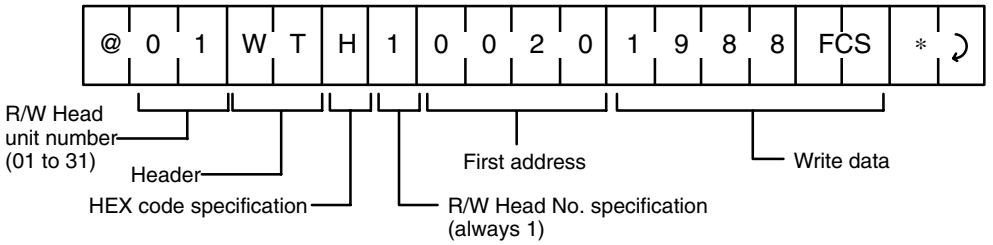
One character is treated as a hexadecimal number. Therefore, only numerals 0 through 9 and A to F can be accepted.

Two characters of data occupy 1 byte (1 address) of the Data Carrier memory. Therefore, specify data in 2-character units (in even numbers) when using a write command. If an odd number of characters is specified by mistake, an error occurs.

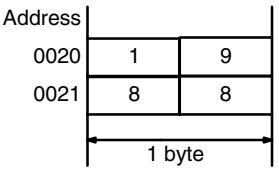
Example of specifying HEX code in point to point (1:1) communications:



Example of specifying HEX code in 1:N communications:



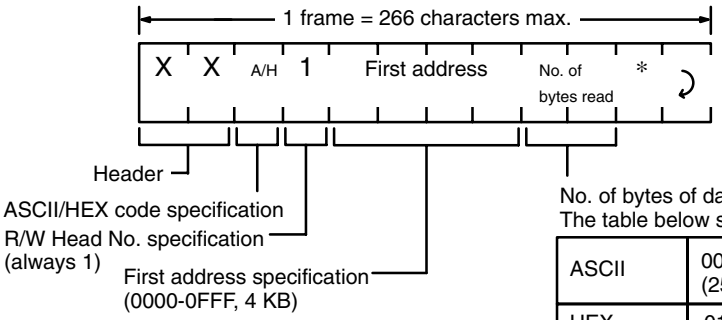
Data Carrier memory address:



4-3-4 Range of Address and Number of Bytes

Read Command

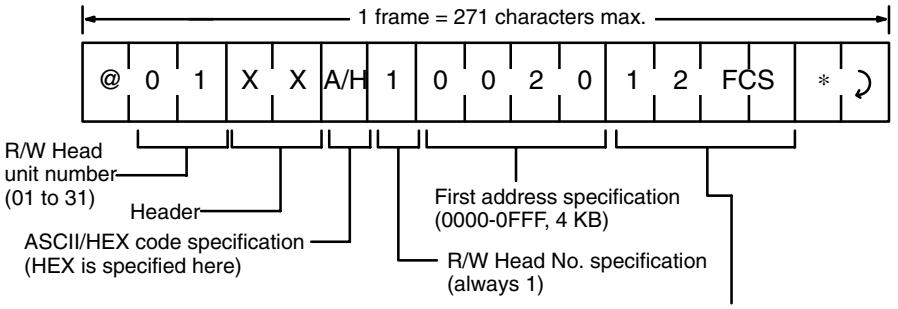
In point to point (1:1) communications:



No. of bytes of data to be read from the DC (in hexadecimal)
The table below shows how many bytes can be read at one time.

ASCII	00-FF (1-256 bytes, 1-256 characters) (256 bytes when 00 is specified)
HEX	01-80 (1-128 bytes, 2-256 characters)

In 1:N communications:

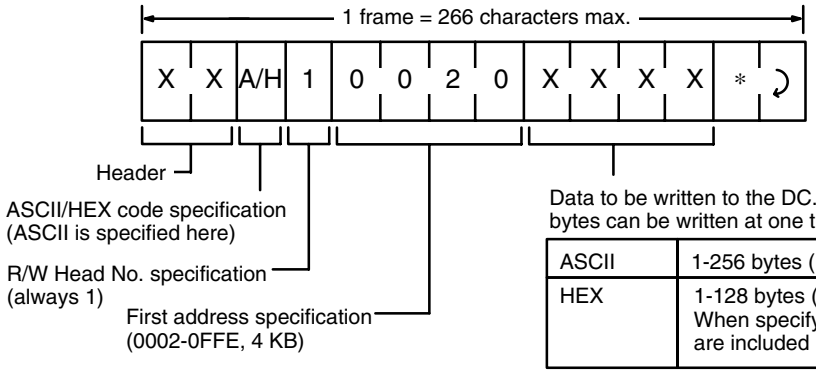


No. of bytes of data to be read from the DC (in hexadecimal)
The table below shows how many bytes can be read at one time.

ASCII	00-FF (1-256 bytes, 1-256 characters) (256 bytes when 00 is specified)
HEX	01-80 (1-128 bytes, 2-256 characters)

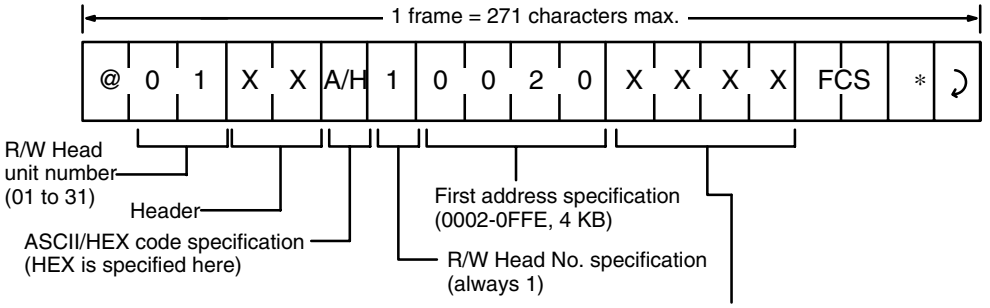
Write Command

In point to point (1:1) communications:



ASCII	1-256 bytes (1-256 characters)
HEX	1-128 bytes (2-256 characters) When specifying HEX code, 2 characters are included in each byte of data.

In 1:N communications:



ASCII	1-256 bytes (1-256 characters)
HEX	1-128 bytes (2-256 characters) When specifying HEX code, 2 characters are included in each byte of data.

Note Addresses 0000 and 0001 contain the production date data and cannot be written to.

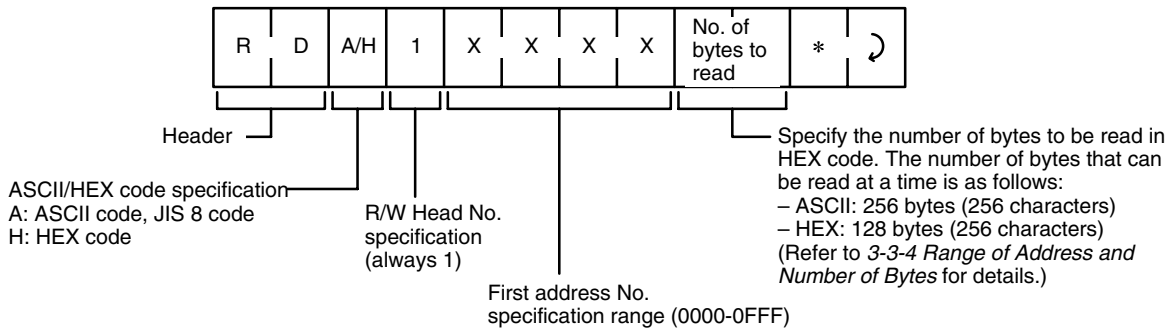
4-4 Types of Commands and Responses

4-4-1 Read (RD)

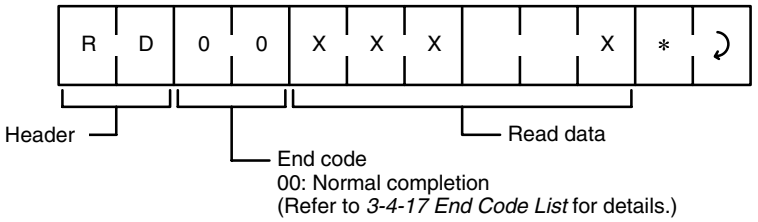
Reads data from the Data Carrier. If the Data Carrier is missing, an error response (end code: 72 = Data Carrier missing) is returned.

Point to Point (1:1) Communications

Command Format

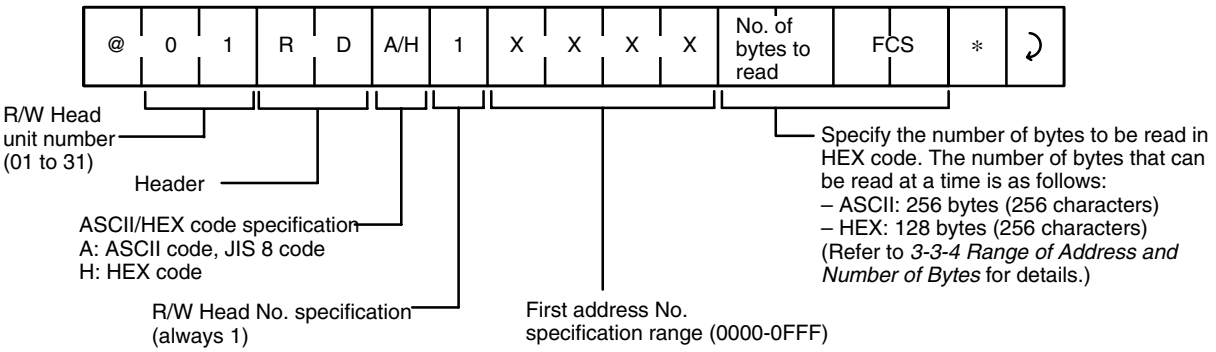


Response Format

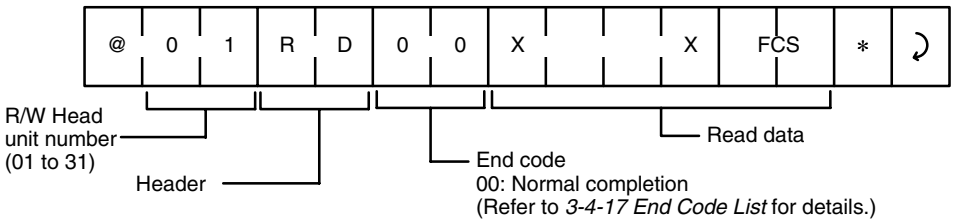


1:N Communications

Command Format



Response Format

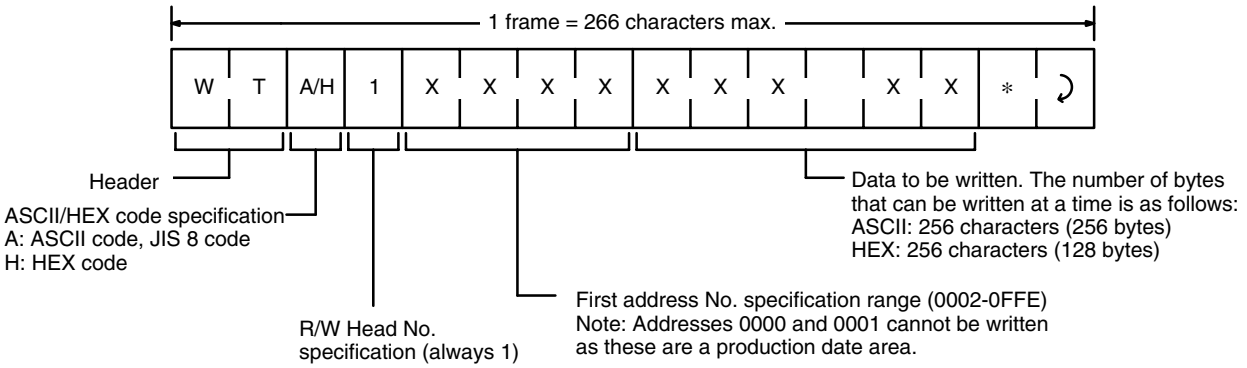


4-4-2 Write (WT)

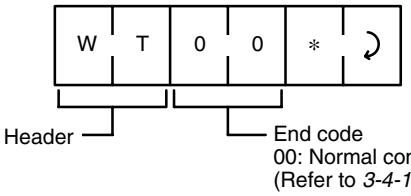
Writes data to the Data Carrier. If the Data Carrier is missing, an error response (end code: 72 = Data Carrier missing) is returned.

Point to Point (1:1) Communications

Command Format

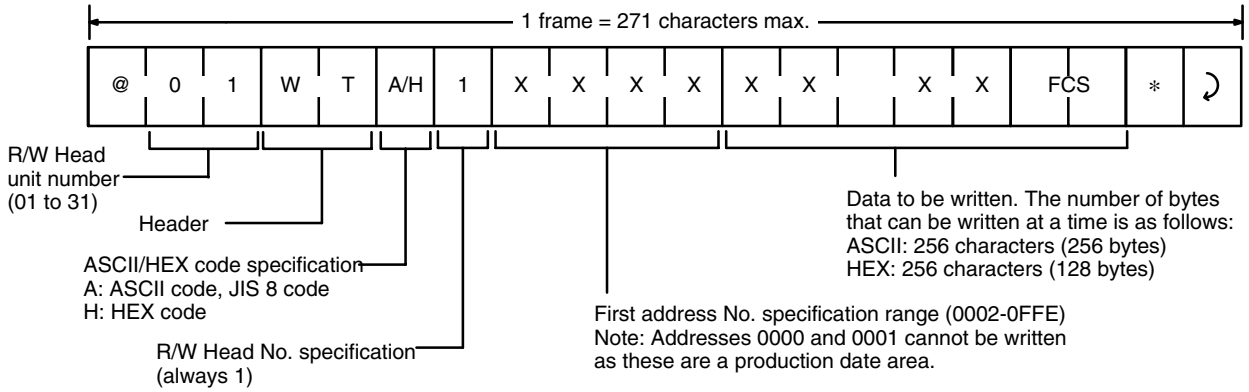


Response Format

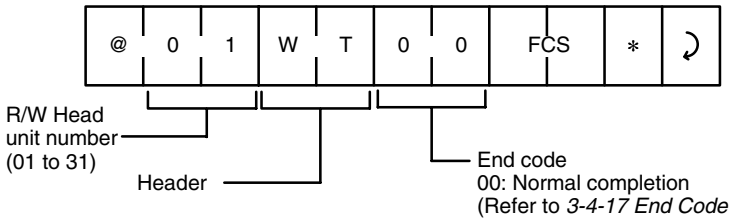


1:N Communications

Command Format



Response Format

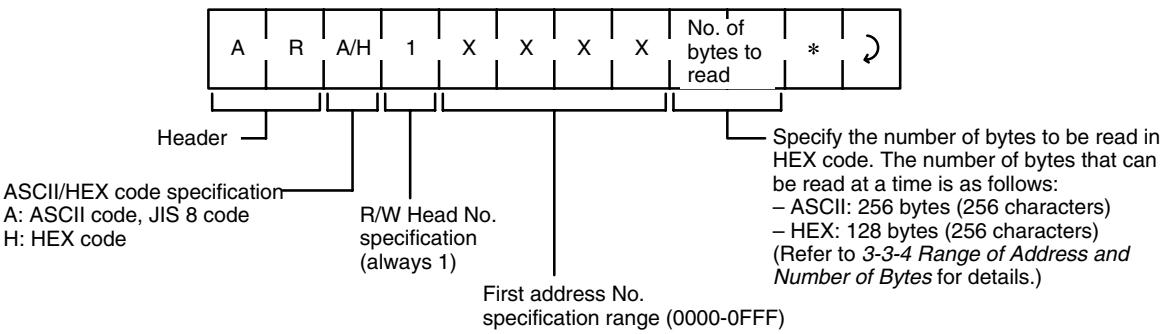


4-4-3 Auto Read (AR)

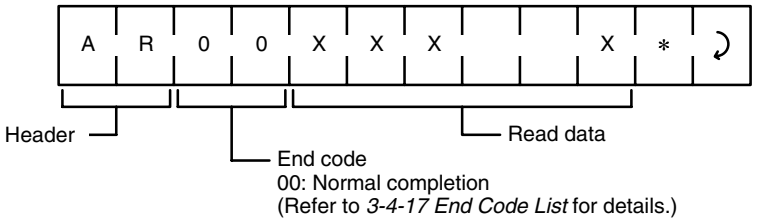
Reads data when the Data Carrier has approached. The R/W Head responds when the lower communication (between the R/W Head and DC) has ended.

Point to Point (1:1) Communications

Command Format

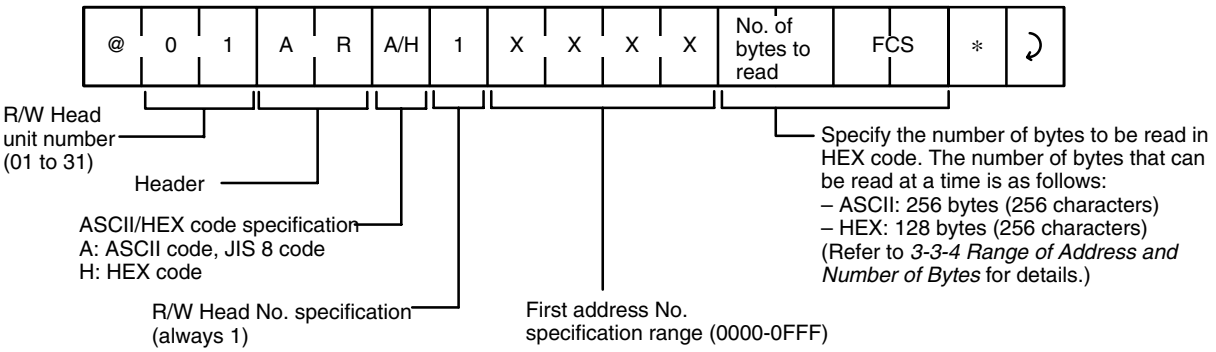


Response Format

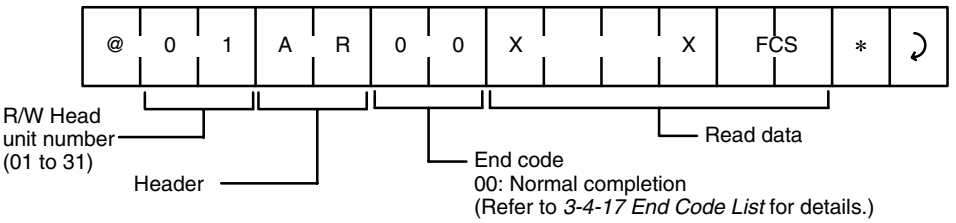


1:N Communications

Command Format



Response Format

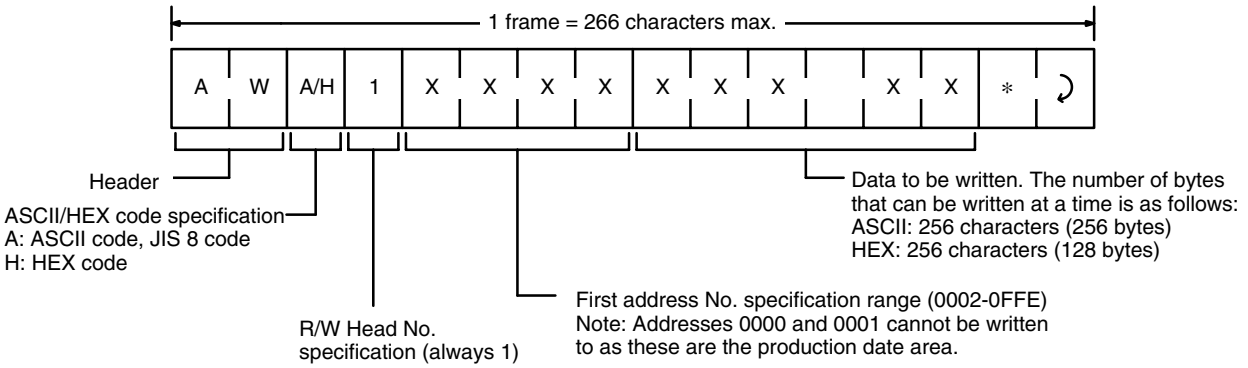


4-4-4 Auto Write (AW)

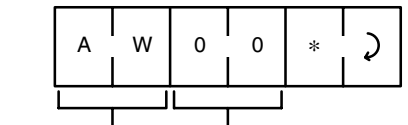
Writes data when the Data Carrier has approached. The R/W Head responds when the lower communication (between the R/W Head and DC) has ended.

Point to Point (1:1) Communications

Command Format

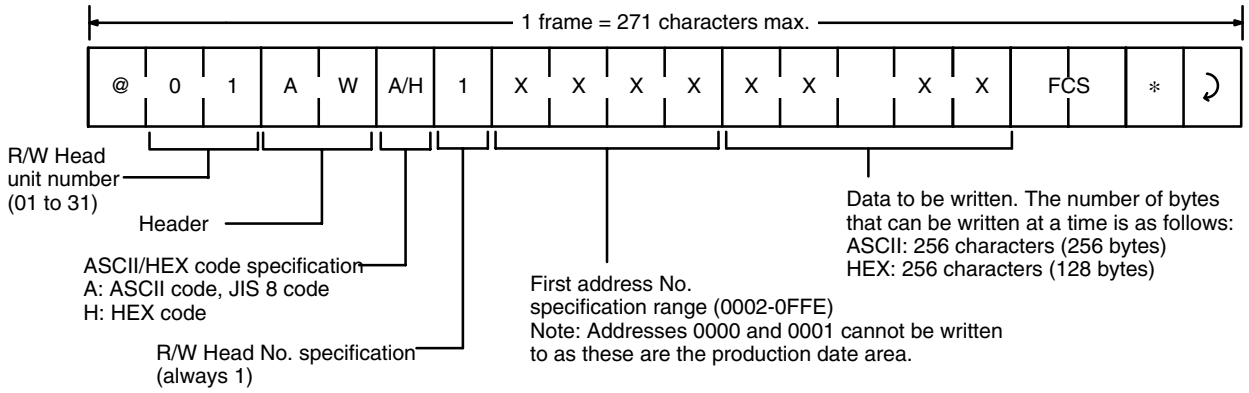


Response Format

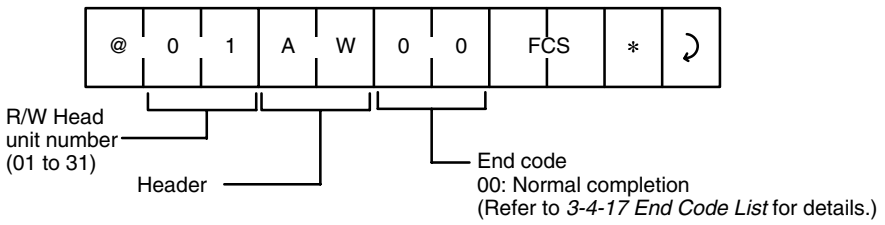


1:N Communications

Command Format



Response Format

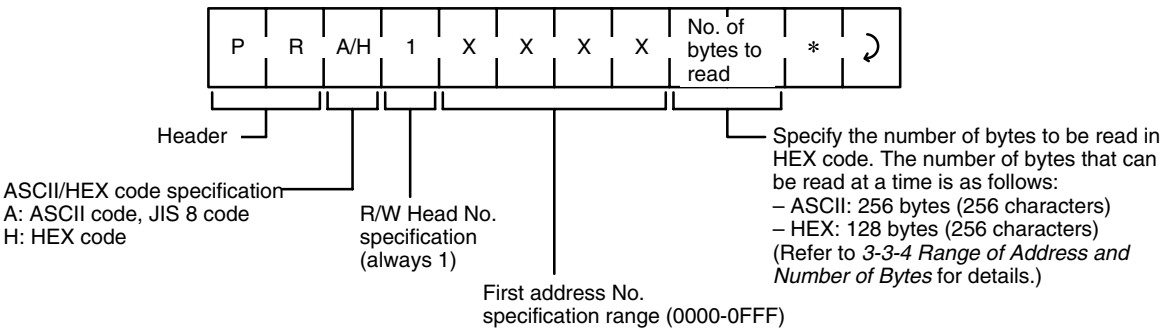


4-4-5 Polling Auto Read (PR)

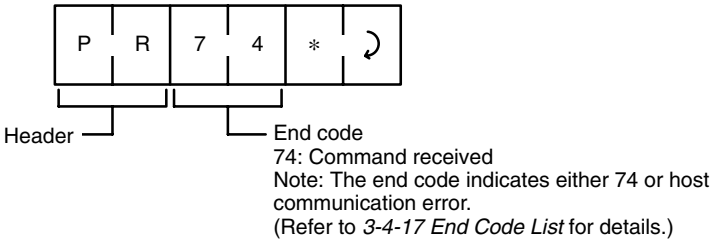
When the host computer transmits the polling auto command, the R/W Head immediately responds, indicating the reception of the command. After this, the R/W Head reads data when the Data Carrier approaches. Meanwhile, the host computer can make an inquiry on the status of the command processing or terminate processing by using a subcommand.

Point to Point (1:1) Communications

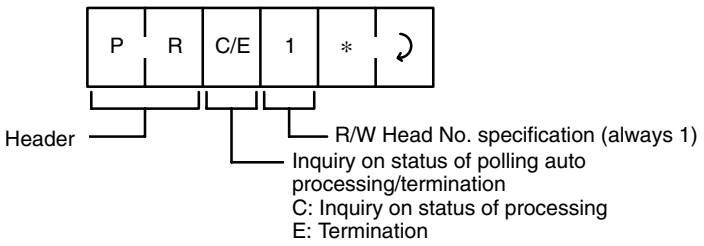
Command Format



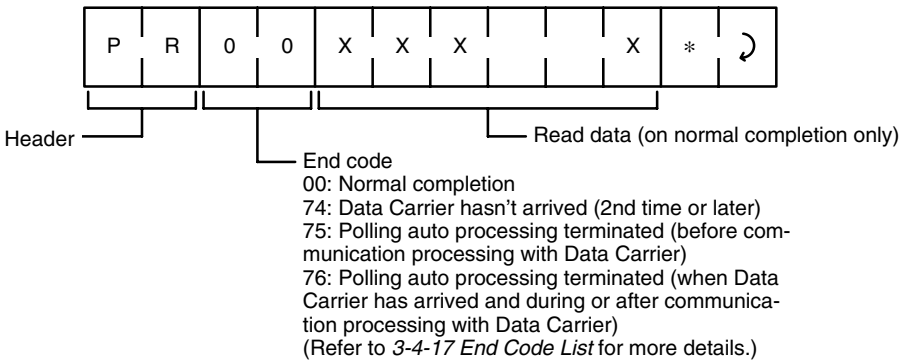
Response Format



Subcommand Format

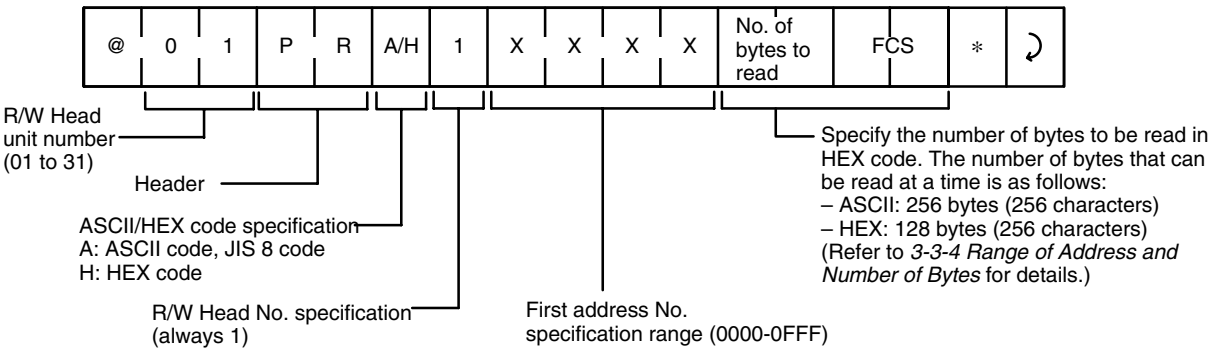


Subcommand Response Format

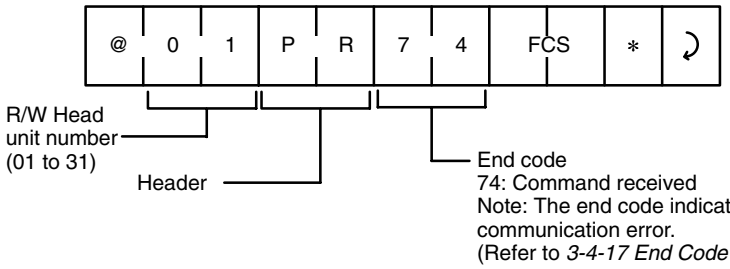


1:N Communications

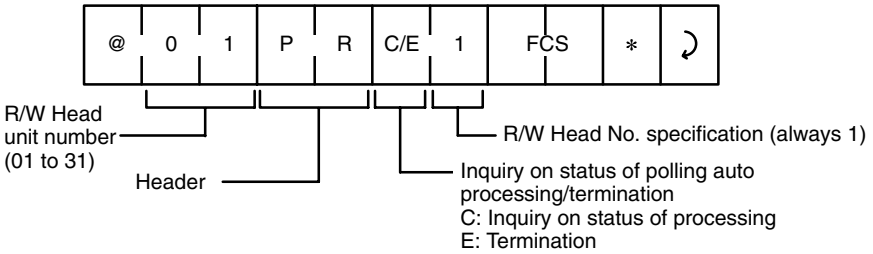
Command Format



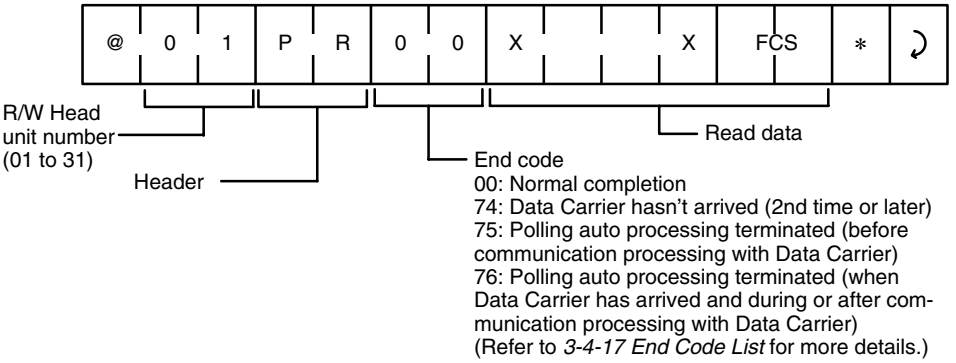
Response Format



Subcommand Format



Subcommand Response Format

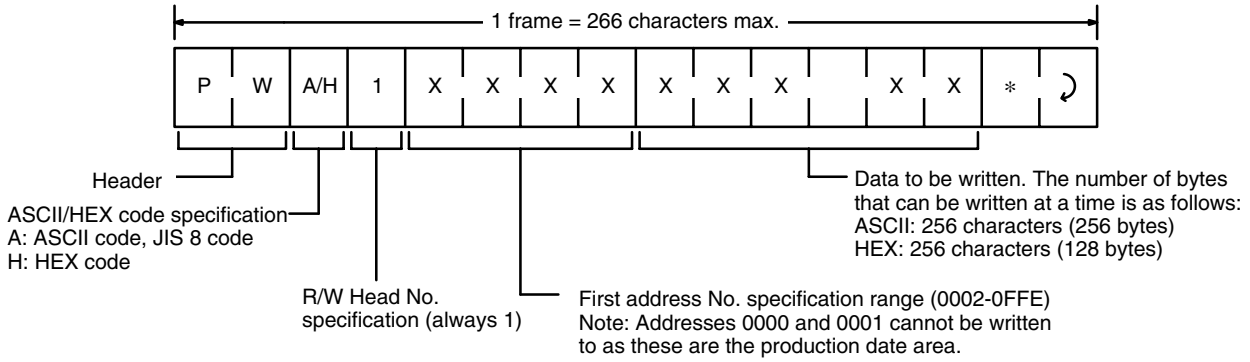


4-4-6 Polling Auto Write (PW)

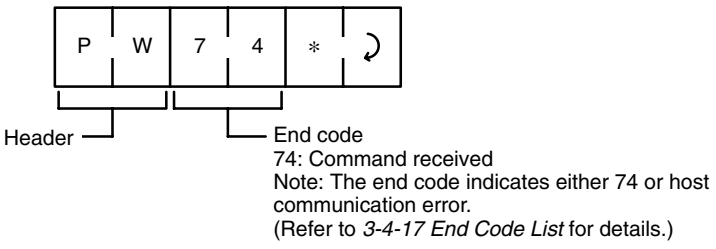
When the host computer transmits the polling auto command, the R/W Head immediately responds, indicating the reception of the command. After that, the R/W Head writes data when the Data Carrier approaches. Meanwhile, the host computer can make an inquiry on the status of the command processing or terminate processing by using a subcommand.

Point to Point (1:1) Communications

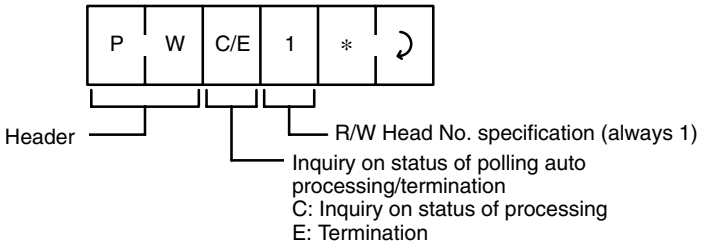
Command Format



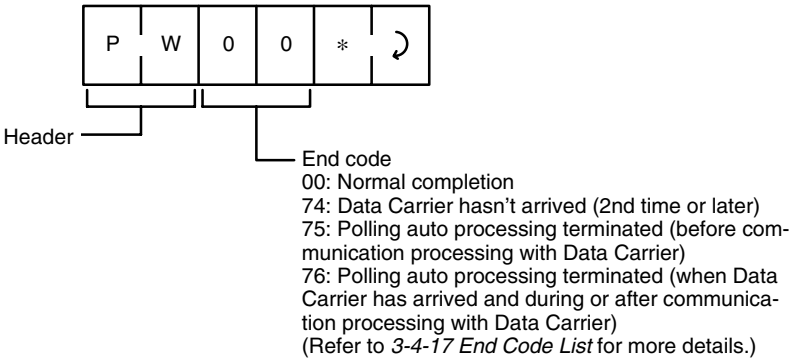
Response Format



Subcommand Format

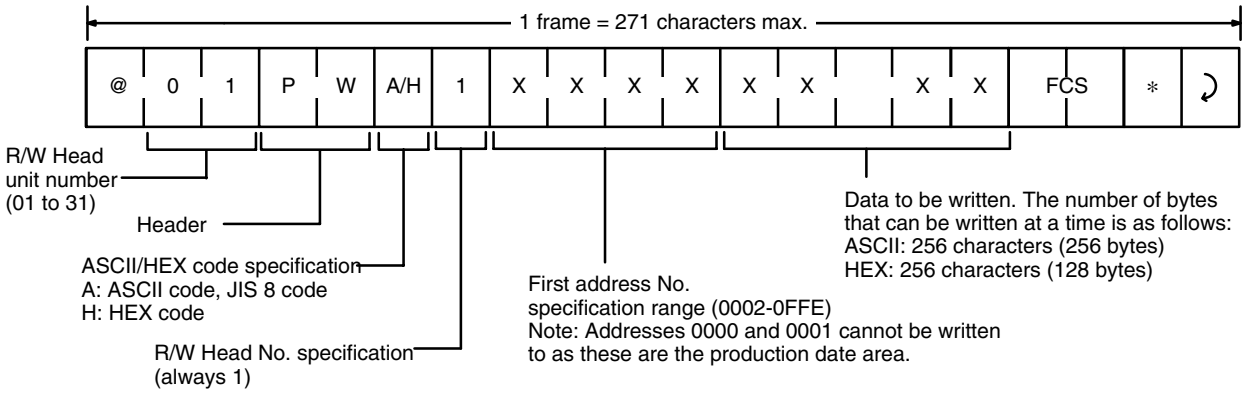


Subcommand Response Format

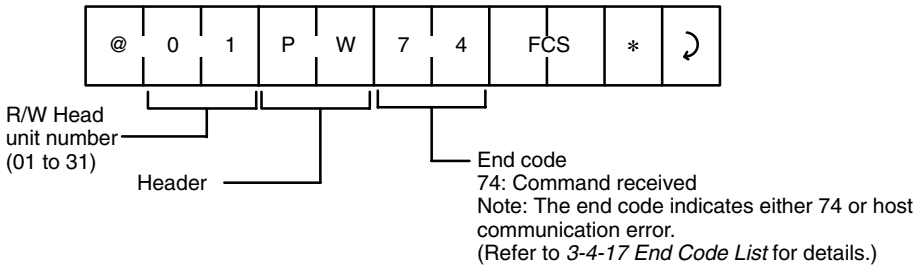


1:N Communications

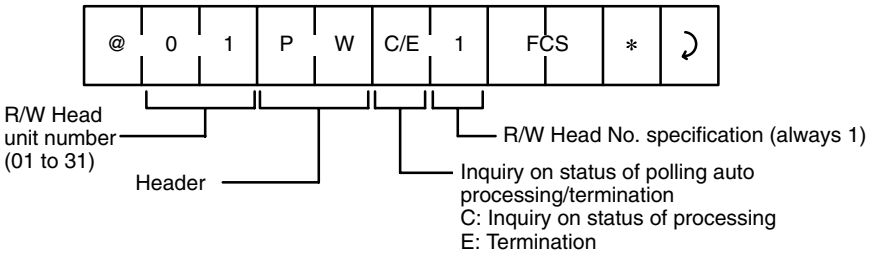
Command Format



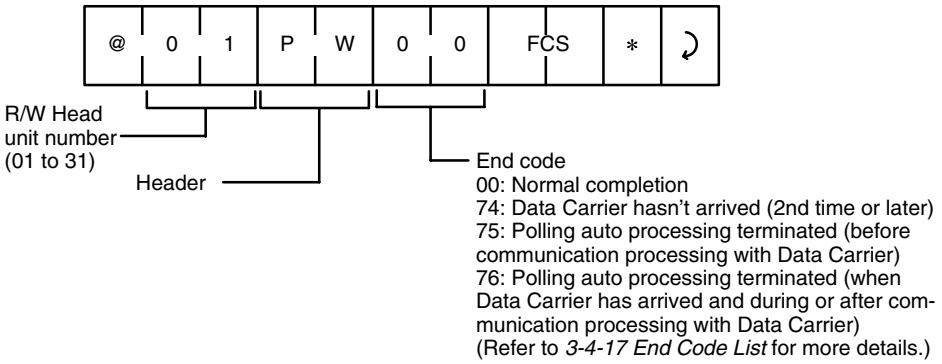
Response Format



Subcommand Format



Subcommand Response Format

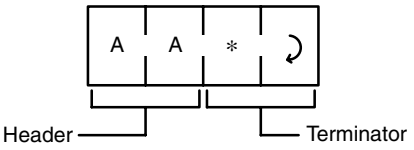


4-4-7 Command Processing Terminating Auto Command (AA)

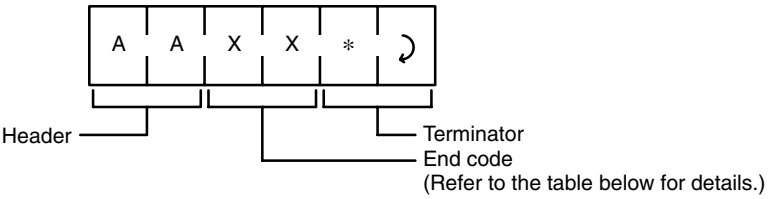
Terminates the processing of the auto commands (auto read and auto write) and restores the command wait status.

Point to Point (1:1) Communications

Command Format

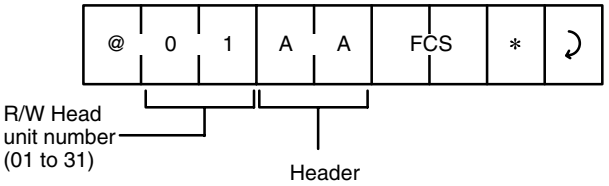


Response Format

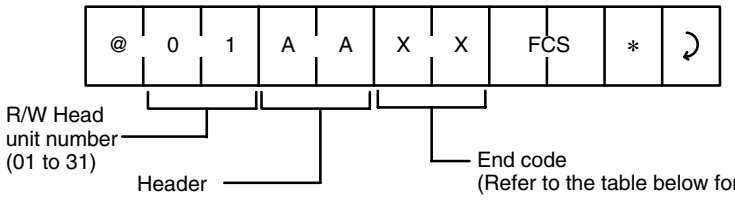


1:N Communications

Command Format



Response Format



End code	Meaning
75	This end code is returned when the AA command was received while the R/W Head was in command wait status (before the DC arrived).
76	This end code is returned when the AA command was received while the auto command was being executed. (If an auto write command is terminated during execution, part of the data may have been written to the memory area of the DC.)
00	This end code is returned when the AA command was received after the auto command was executed. In this case, the auto command response will be returned.

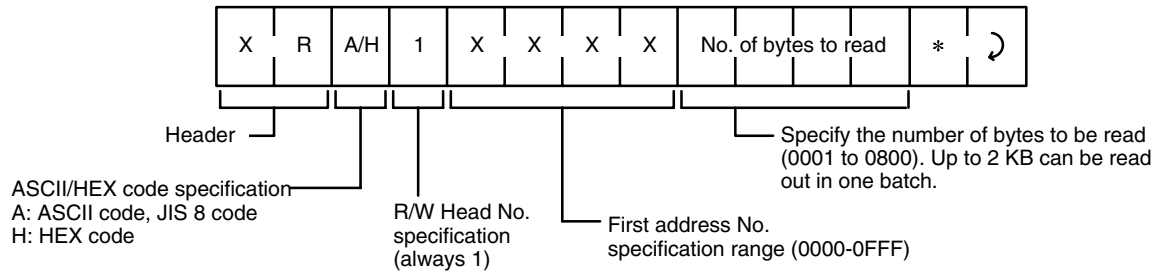
Note When this command is received in the command wait status, it will be treated as a command input error. Refer to *3-4-17 End Code List* for more details.

4-4-8 Expansion Read Command (XR)

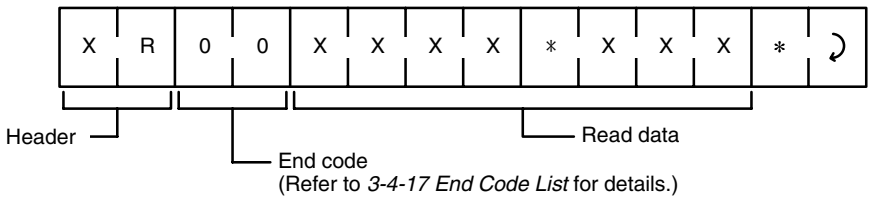
Performs batch read processing of up to 2 KB. The processing procedure to the DC is the same as that of the read command.

Point to Point (1:1) Communications

Command Format

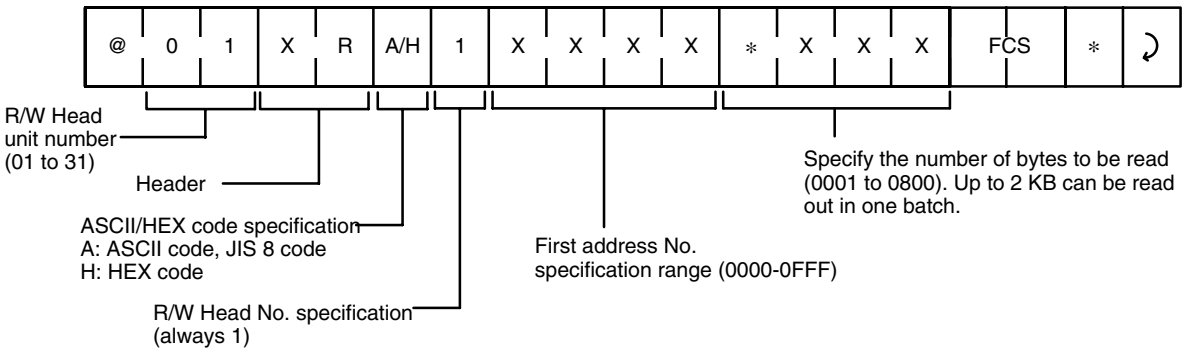


Response Format

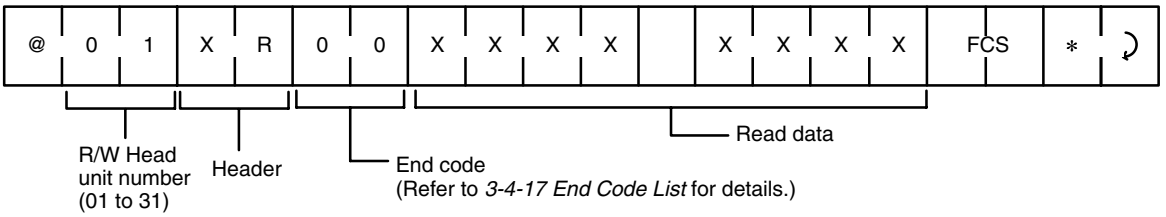


1:N Communications

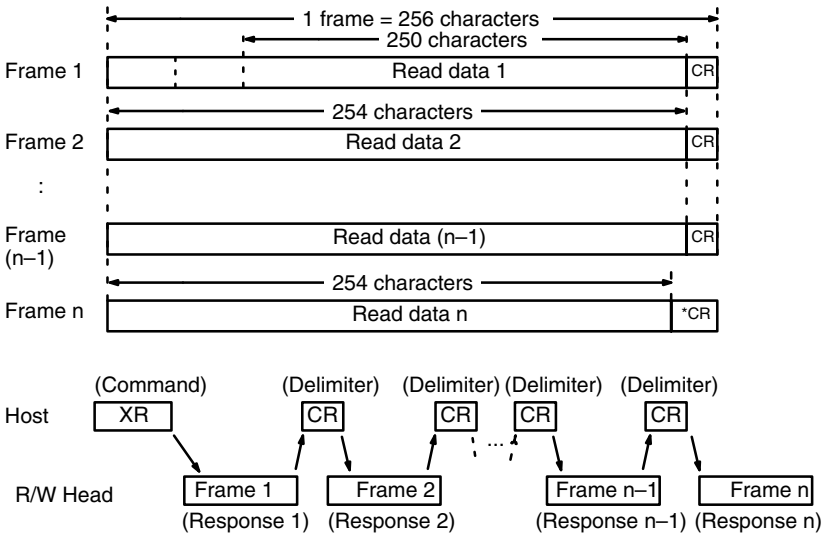
Command Format



Response Format



If the number of characters of read data is greater than 250, the frame is divided as follows:

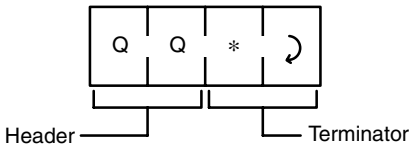


4-4-9 Response Request Command (QQ)

This command causes the R/W Head to retransmit the last response that was sent to the host computer. Used when the last response was not received for some reason.

Point to Point (1:1) Communications

Command Format

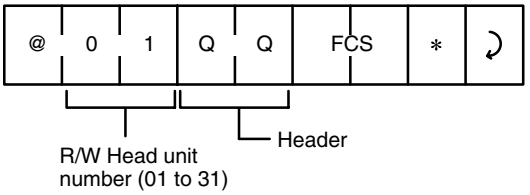


Response Format

The response will be identical to the last response that was transmitted.

1:N Communications

Command Format



Response Format

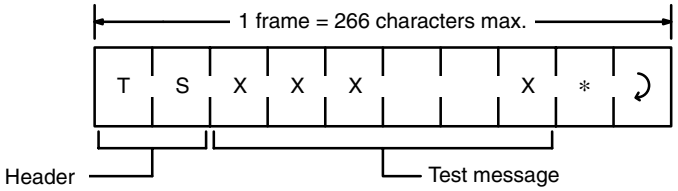
The response will be identical to the last response that was transmitted.

4-4-10 Test Command (TS)

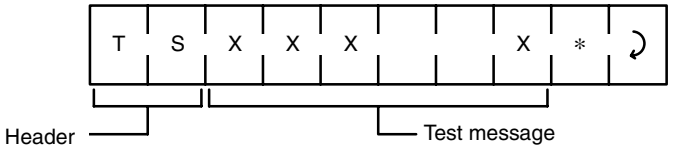
Returns a test message sent from the host computer as is. The test command is used to test communication between the host computer and the R/W Head.

Point to Point (1:1) Communications

Command Format

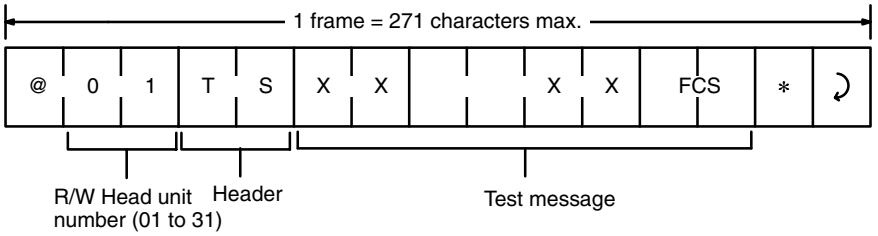


Response Format

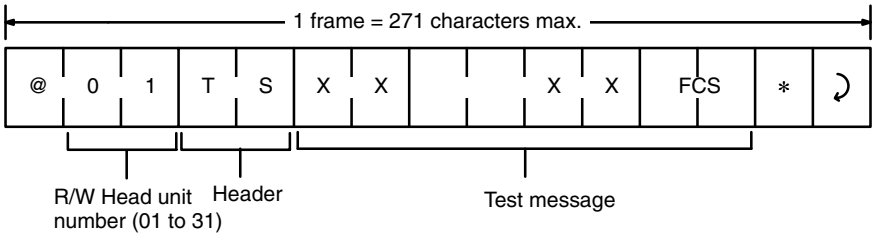


1:N Communications

Command Format



Response Format

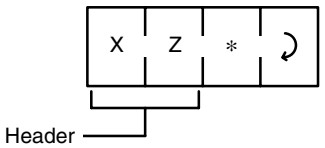


4-4-11 Abort Command (XZ)

If the R/W Head does not return a response due to a problem during the host communication or lower communication, the abort command can restore the R/W Head to the command wait status. There is no response to the abort command.

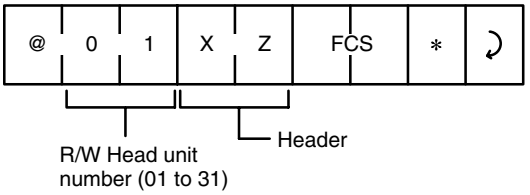
Point to Point (1:1) Communications

Command Format



1:N Communications

Command Format



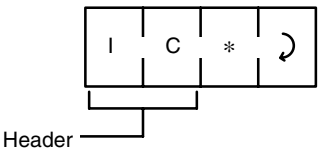
Note The R/W Head requires about 100 ms to get ready for reception of the next command after it has received the abort command.

4-4-12 Command Undefined Response (IC)

This is a response the R/W Head returns if it cannot read the header of a given command.

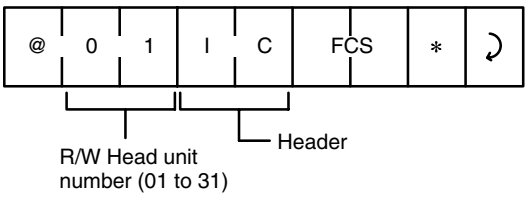
Point to Point (1:1) Communications

Response Format



1:N Communications

Response Format



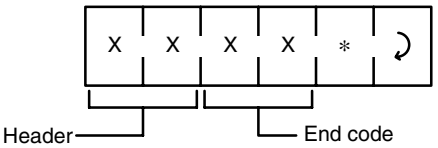
4-4-13 Error Response

If an error occurs during the host communication or lower communication, the error is identified by the end code.

Point to Point (1:1) Communications

Response Format

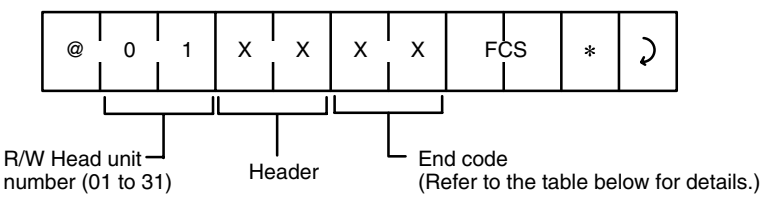
The header is same as that of the transmitted command.



1:N Communications

Response Format

The header is same as that of the transmitted command.



4-4-14 End Code List

The end code is expressed as a 2-digit hexadecimal number. Refer to *5-3 Error Lists* for details on errors.

Type	End code	Name
Normal	00	Normal completion
	7B	Normal completion, but DC battery needs to be replaced.[1]
	74	Command was received, but the DC hasn't arrived yet.[2, 3]
	75	Command was terminated before communication with the DC.
	76	Command was terminated either during or after communication with the DC.
Host communication	10	Parity error
	11	Framing error
	12	Overrun error
	14	Command input error
	18	Frame length MAX error
Lower communication	70	Data Carrier communication error
	71	Unmatching error
	72	Data Carrier missing
	7A	Address over
	7D	Write protect error

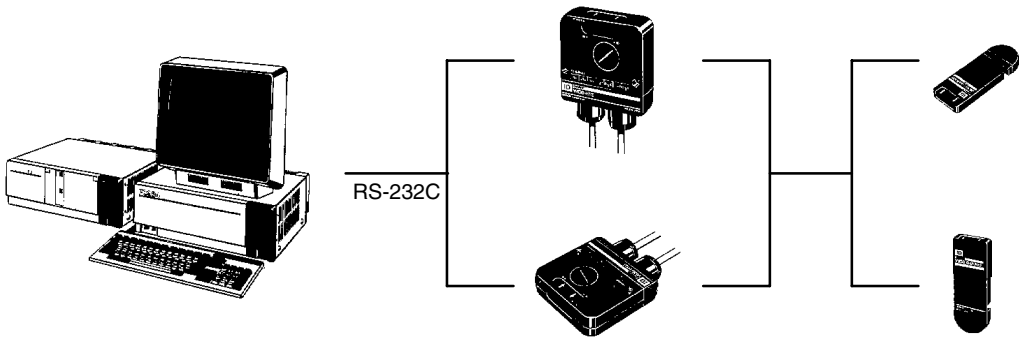
Note

1. When a "7B" error code is returned, the command was completed normally, but the battery voltage is low. If the battery voltage is so low that a response cannot be returned, an error code such as "70" will result.
2. When a polling auto command is sent to the R/W Head, this response is returned immediately to indicate that the command was received.
3. When a polling auto subcommand inquiry is sent to the R/W Head, this response is returned to indicate that the DC hasn't arrived yet.

4-5 Example Communication Programs

Host Link Serial System

System Configuration



Example BASIC Program 1

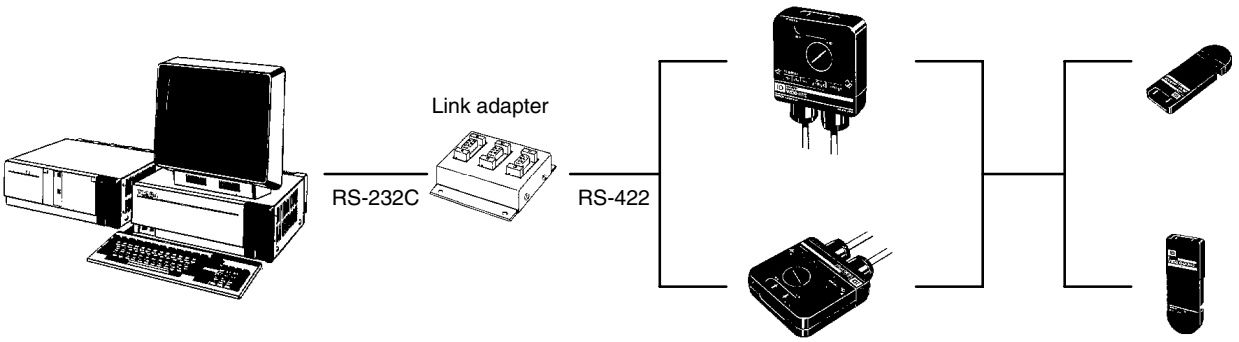
This program writes data in HEX code from the R?W Head to the DC with the write command. The beginning address is in the range of 0006 to 0FFF, and there must be an even number of characters since data can only be written in whole bytes and 2 HEX characters make up one byte. Up to 256 characters can be entered. Set the communication protocol of the R/W Head with its DIP switch to match the protocol of the host computer.

```
 10  CLS
 20  OPEN "COM1:O81NN" AS#1
 30  WIDTH #1.255
 40  PRINT "Writing HEX data to the DC."
 50  INPUT "Starting address? (HEX data: 0006-07FF)"=WA$
 60   INPUT "Input data (an even number of HEX dig-
its)."":WD$
 70  TX$="WTH1"+WA$+WD$+"*"+CHR$(&HD)
 80  PRINT TX$
 90  PRINT #1, TX$;
100  INPUT #1, RX$
110  PRINT "RS data=":RX$
120  GOTO 40
```

Note The above program is written for an FC-984. The program might have to be modified depending on the host computer used.

Link Adapter System

System Configuration



Example BASIC Program 2

This program tests communications with the R/W Head set to unit number 1 in a system with more than one R/W Head (1:N communications). The program contains subroutines that time out if a response isn't returned in a set time, display error messages, and calculate FCS.

```
10    OPEN "COM1:O81NN" AS#1          (opens RS-232C port)
20    NG=0:I=0:CNT=0;PRINT
40    T$="@01TS010123456789ABCDEF"    (test data)
50    GOSUB*FCSSET
70    TXD$=T$+FCS$+"*"
80    PRINT "TXD$=";TXD$
90    PRINT #1, TXD$                  (sends the TS command)
100   IF LOC(1)<>0 THEN 140           (judges whether response
                                      came)
110   CNT=CNT+1
120   IF CNT=1000 THEN 1000           ("time out" timer)
130   GOTO 100
140   INPUT #1, RXD$                  (inputs response)
150   IF RXD$<>TXD$ THEN 2000         (compares response to test
                                      data)
160   PRINT "RXD$=";RXD$+"OK"
170   GOTO 20
1000  *******TIME OUT*******
1010  CNT=0
1020  ER$(NG)= "TIME OUT"
1030  NG=NG+1
1040  IF NG=3 THEN 3000               (3 retries)
1050  GOTO 80
2000  *******ERROR RESPONSE*******
2010  ER$(NG)=RXD$+"NG"
2020  NG=NG+1
2030  IF NG=3 THEN 3000               (3 retries)
2040  GOTO 80
3000  *******ERROR MESSAGES*******
3010  PRINT "ERROR OCCURRED"
3020  PRINT "RXD$1=";ER$(0)
3030  PRINT "RXD$2=";ER$(1)
3040  PRINT "RXD$3=";ER$(2)
3050  GOTO 20
4000  *******FCS CALCULATION******* (FCS calculating subroutine)
4010  *FCSSET
4020  L=LNE(T$)
4030  A=0
4040  FOR J=1 TO L
4050  TJ$-MID$(T$, J, 1)
4060  A=ASC(TJ$)XOR A
4070  NEXT J
4080  FCS$=HEX$(A)
```

```
4090  IF LEN(FCS$)=1 THEN FCS$="0"+FCS$
4100  RETURN
```

SECTION 5
Testing

This section provides the information required to test and maintain the performance of the V630 FA ID System.

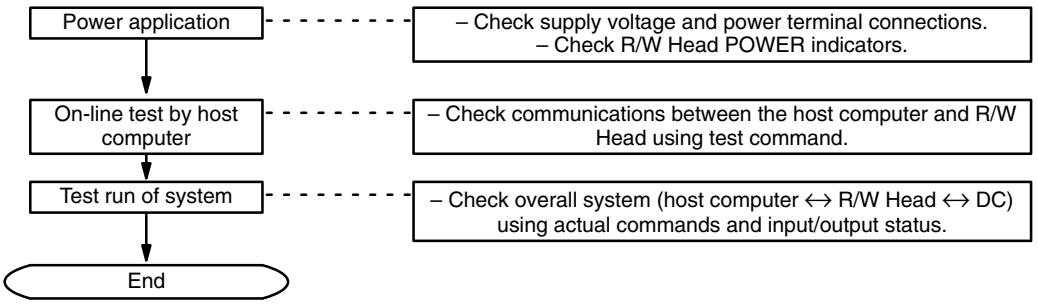
5-1 Test Run

Checklist

Check the items in the table below before doing a test run.

No.	Item	Criteria
1	Connection of power and I/O lines	Is the wiring correct? Are all terminals tightly secured?
2	Data Carrier position	Are the Data Carriers and R/W Head correctly positioned?
3	Connection of host computer	Is the RS-232C or RS-422 connector correctly connected?

Test Run Procedure

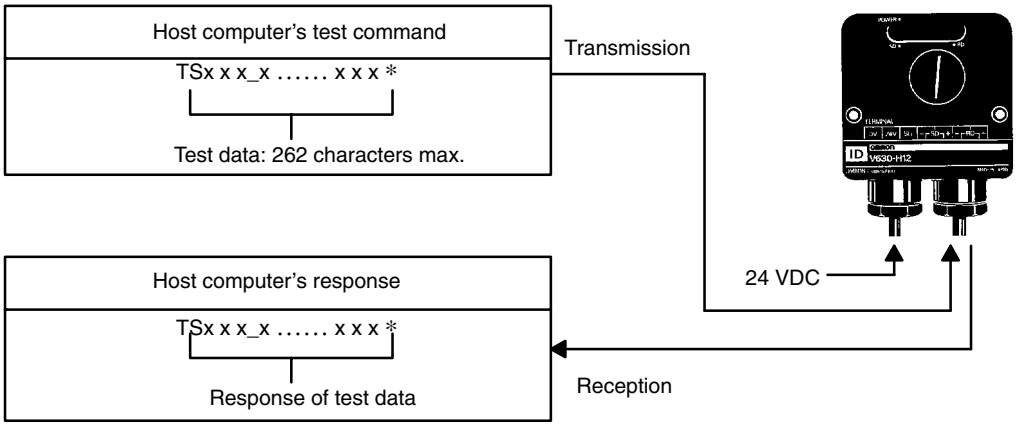


Communications Test with Host Computer

Communications between the R/W Head and the host computer can be tested with the test command, so that connections of the cables and communications operation can be checked before the test run of the overall system.

1, 2, 3...

1. Create a simple communications program on the host computer and transmit the test command (TS).
2. If the communication system is alright, the R/W Head will return the test data it has received as is.



5-2 Error Lists

Communication Errors

Location	Error code	Type	Condition
Host communication error	10	Parity error	Error occurs during communication between host computer and R/W Head. – Incorrect setting of communication format – Malfunctioning due to noise
	11	Framing error	
	12	Overrun error	
	14	Command input error	Wrong command format.
	18	Frame length MAX error	Command or data length exceeding 266 characters.
Lower communication error	70	Data Carrier communication error	Error during communication between R/W Head and DC. – Setting error such as passing speed and distance – Malfunctioning due to obstacle
	71	Unmatching error	Read or write processing is not performed correctly.
	72	Data Carrier missing	DC does not exist in specified area when write/read command is executed.
	7A	Address over	Address exceeding memory area of DC is specified.
	7D	Write protect error	Production date area or write-protected area is specified for write command.

Note
1. The host communication error is an error that has occurred during communications between the host computer and R/W Head.
2. The lower communication error is an error that has occurred during communications between the R/W Head and DC.

5-3 Troubleshooting

The following are the major causes of R/W Head malfunctioning:

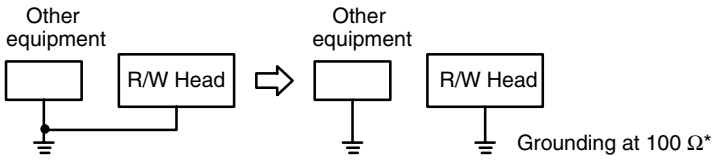
Cause	Measures
Influence of noise	Take countermeasures against noise.
Malfunctioning of external devices	Repair is needed.
Malfunctioning of R/W Head	
Others	

Influence of Noise

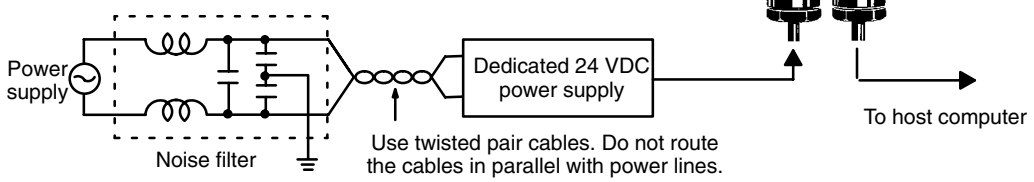
If the system malfunctions due to noise, take appropriate countermeasures against noise by referring to the following table:

No.	Occurrence	Possible cause	Countermeasures
1	On power application to motor, transformer, or capacitor.	Momentary voltage drop due to inrush current of large load.	Increase the capacity of the power supply facility or use larger power cables.
		Common mode noise due to the above.	Supply power through a dedicated 1:1 non-grounded insulated transformer. Do not share the ground lines with other high-capacity loads. Independently ground at less than 100 Ω.
2	Irregular.	Noise superimposed on power lines.	Supply power through a dedicated 1:1 non-grounded insulated transformer or noise filter.
3	Input signal turns ON when it should be OFF.	Inductive noise of input wiring.	Separate input signal lines from other power lines. If the influence of noise is high, route input lines using a grounded metal conduit or use shielded cables.

(1) Improvement of grounding



(2) Countermeasures against noise



Note *Ground the R/W Head's mounting bracket at 100 Ω or less.

5-4 Maintenance and Inspection

The R/W Head should be inspected daily or periodically to keep it in top condition. Although the R/W Head is a solid state device, the following problems might occur depending on the environment and conditions in which the R/W Head is operated:

1, 2, 3...

1. Degradation of elements due to overcurrent and overvoltage.
2. Degradation of elements due to long-term stress, if the R/W Head is used at high temperatures.
3. Degradation of insulation and faulty connector contact due to humidity and dust.
4. Faulty connector contact or corrosion due to corrosive gas.

Inspection Checklist

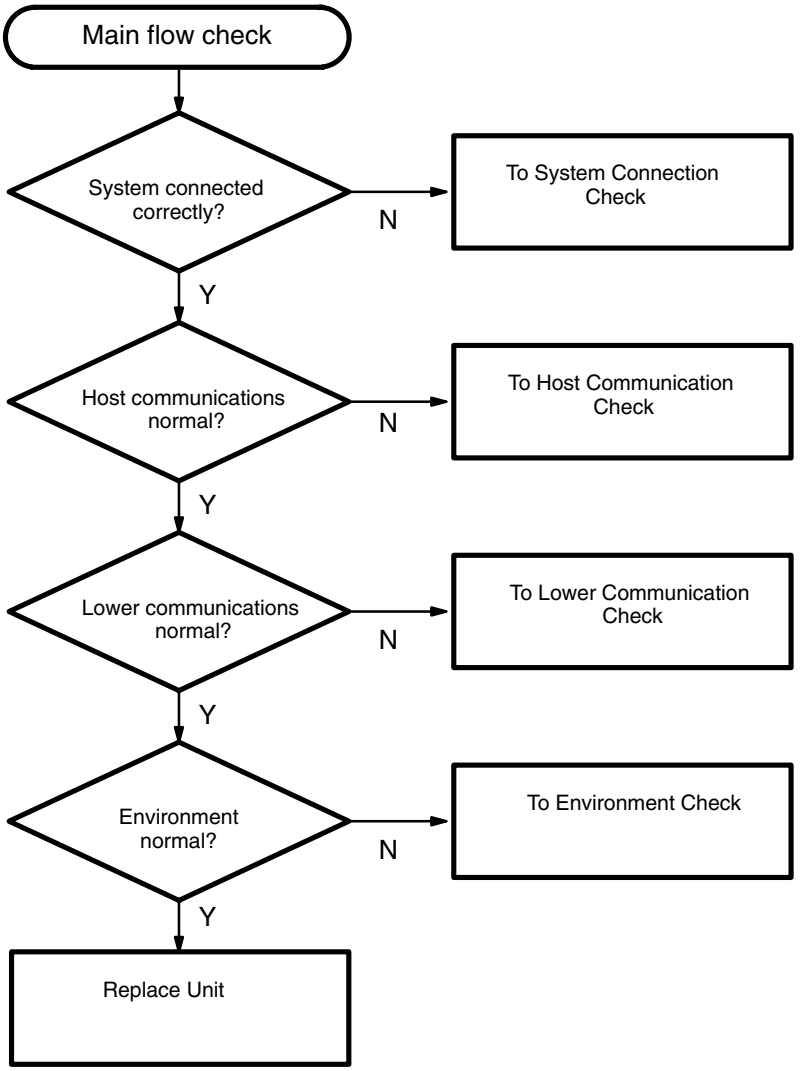
No.	Item	Particulars	Criteria	Remarks
1	Supply voltage fluctuation	Voltage measured at terminal block within rated range?	Supply voltage must be within rated range.	Tester
		Momentary power failure frequently occurs? Abrupt rise in supply voltage occurs?	Supply voltage must be within rated range.	Power analyzer
2	Ambient conditions:			Thermometer, hygrometer
	(a) Temperature	(a), (b) Must be within rated ranges	(a) –10% to +55%C	
	(b) Humidity		(b) 35 to 85% RH.	
	(c) Vibration, shock	(c) Is the R/W Head subject to vibration or shock from surrounding machines?	(c) Must be in specified range.	
	(d) Dust	(d) Do dust or debris collect on the R/W Head or DC?	(d) Must be free from dust and debris.	
	(e) Corrosive gas	(e) Are the metallic parts discolored or corroded?	(e) Must be free from discoloration and corrosion.	
3	I/O power (a) Voltage fluctuation (b) Ripple	Is voltage measured at terminal block of each I/O within rated level?	Must be within rated range.	Tester, oscilloscope
4	Mounting condition	(1) Is each device fixed securely?	Must be tightened.	——
		(2) Are connectors inserted securely?	Must be locked and tightened with screws.	——
		(3) Aren't screws of terminal block loose?	Must not be loose.	——
		(4) Is the wiring damaged?	Must be free from damage.	——
		(5) Are the communications specifications between DC and R/W Head satisfied?	Must be within rated range.	——
5	Battery life of DC	Is the battery low alarm on?	Replace battery when the battery low alarm comes on.	——

Caution A lithium battery is provided with the Data Carrier in order to supply power. When the battery life ends, do not throw the battery into fire as it may explode.

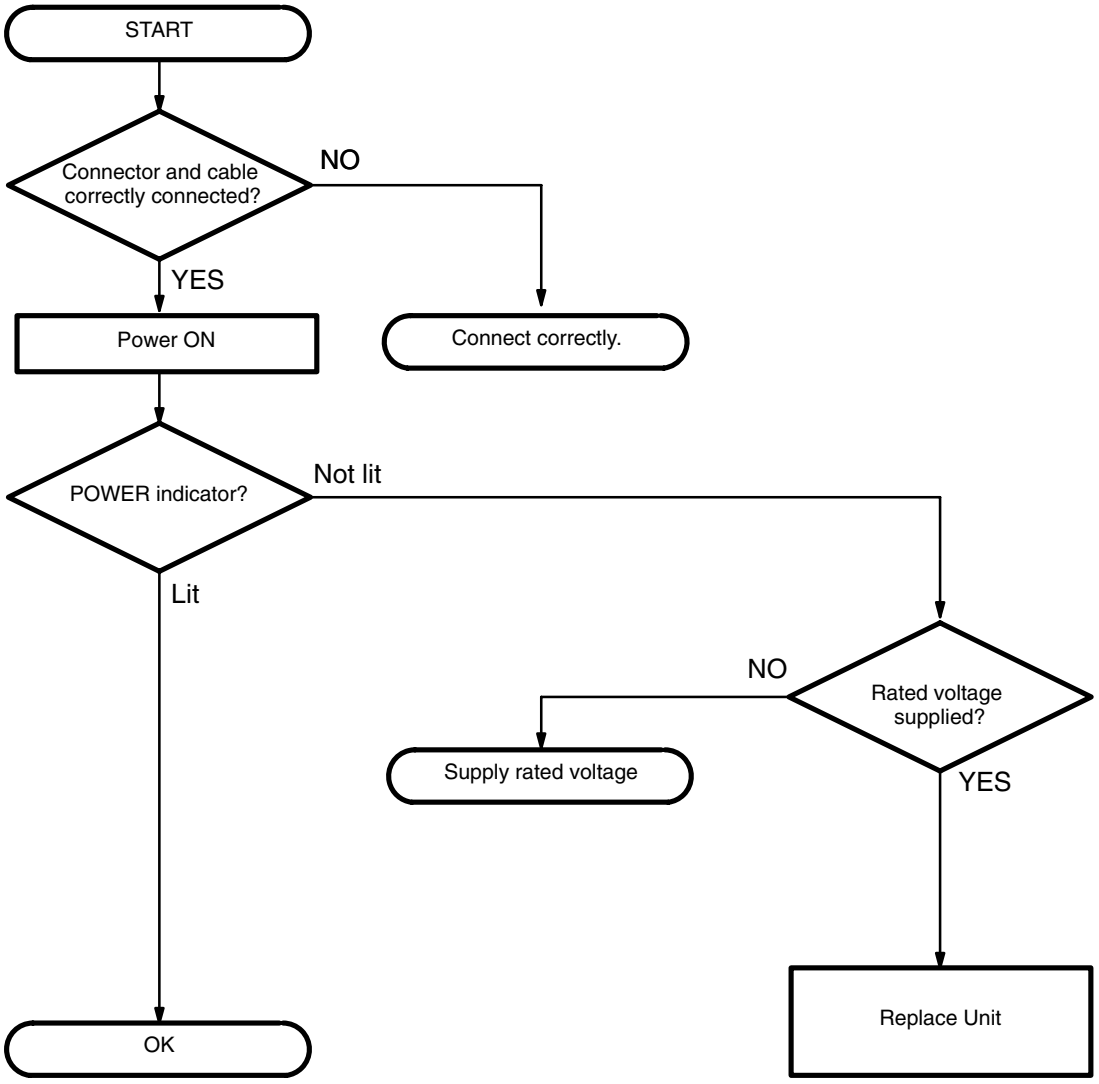
5-5 Systems Check

If a malfunction has occurred, carefully investigate the surrounding conditions and check whether the trouble still persists or is related to other equipment. Then track down the malfunction according to the following procedure:

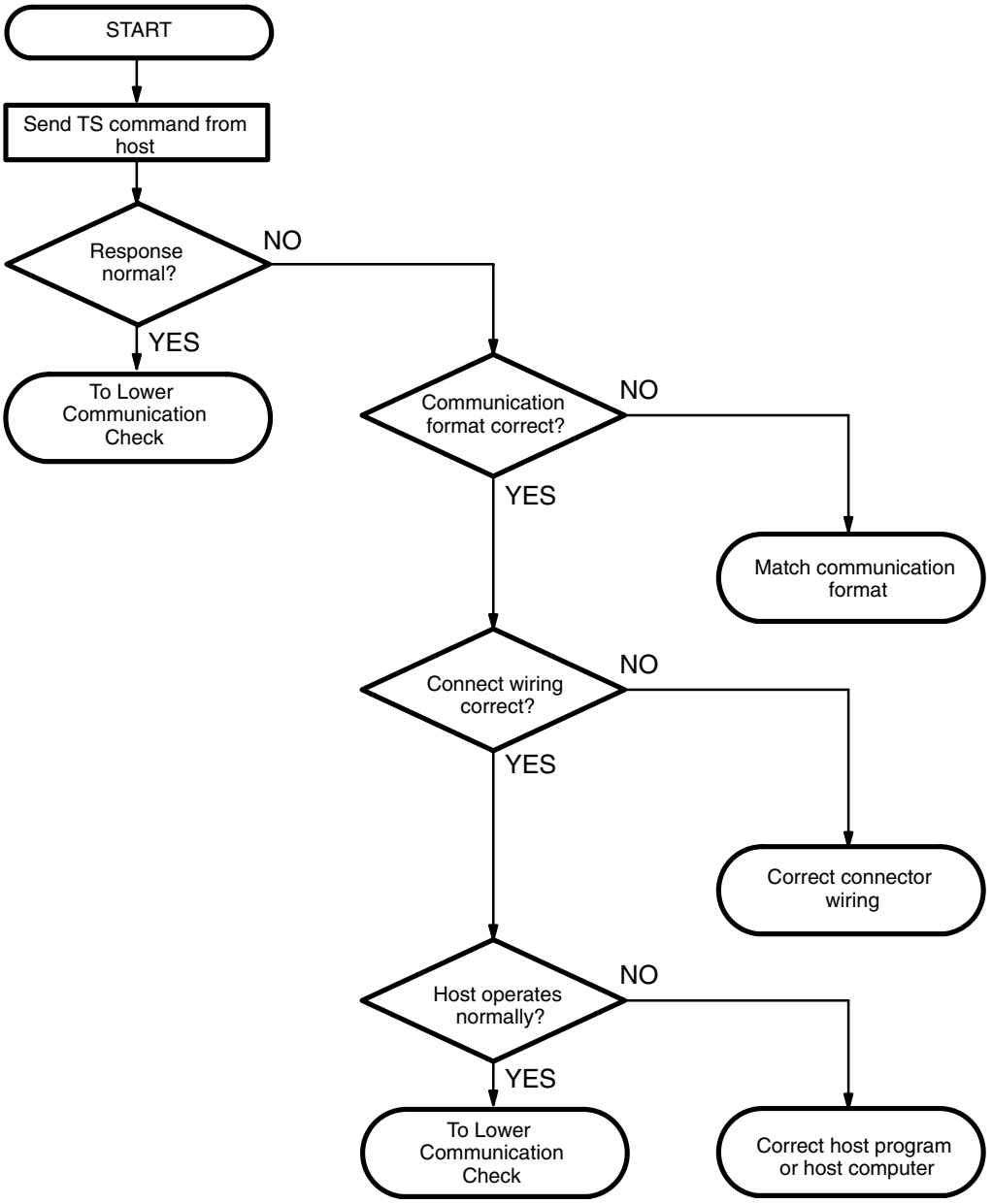
Main Check


Main flow check
System connected correctly?
N
To System Connection Check
Y
Host communications normal?
N
To Host Communication Check
Y
Lower communications normal?
N
To Lower Communication Check
Y
Environment normal?
N
To Environment Check
Y
Replace Unit

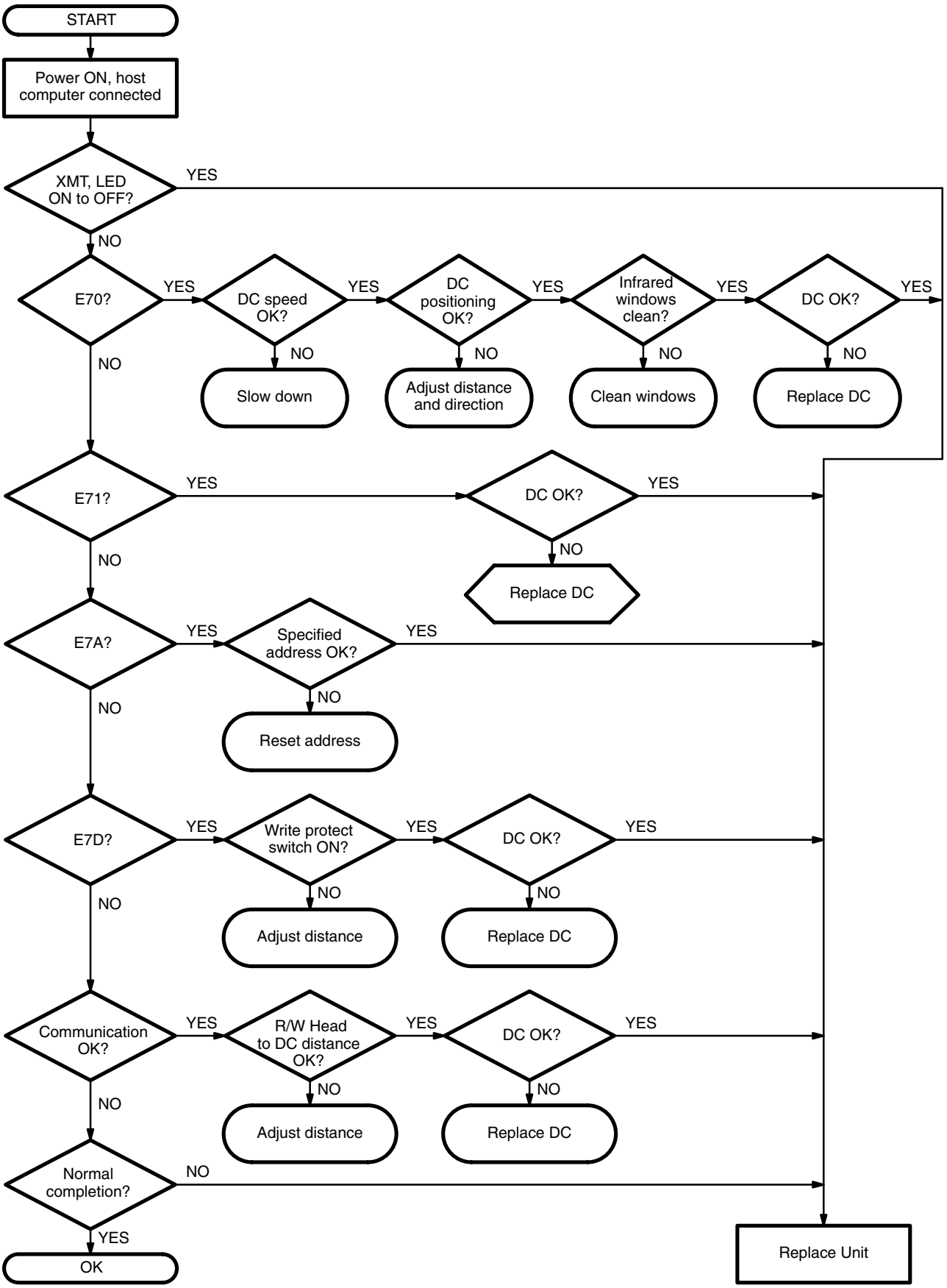
System Connection Check



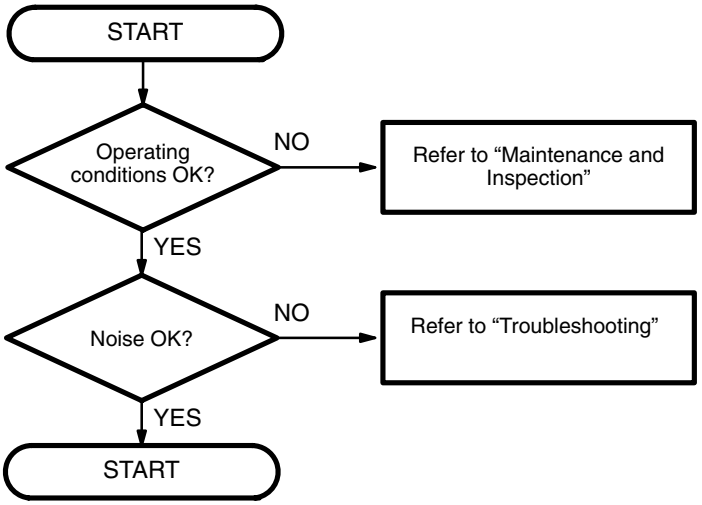
Host Communication Check



Lower Communication Check



External Environments Check



Appendix A
Standard Models

R/W Heads and Data Carriers

Name	Specifications		Model number
R/W Head	Top-transmitting	RS-232C interface	V630-H11T
		RS-422 interface	V630-H12T
	Front-transmitting	RS-232C interface	V630-H11
		RS-422 interface	V630-H12
Data Carrier	Top-transmitting	64 byte memory	V630-D52R10T
		4 KB memory	V630-D4KR10T
	Front-transmitting	64 byte memory	V630-D52R10
		4 KB memory	V630-D4KR10

Host Computer Connectors

Name		Model number
Solder-type	Plug	XM2A-2501 (OMRON)
	Hood	XM2S-2511 (OMRON)
Solder-type	Plug	XM2A-0901 (OMRON)
	Hood	XM2S-0911 (OMRON)
Dip solder-type	Plug	GM-25MD
	Hood	GM-25LB

Optical Interface (RS-232C)

Name	Model number
Optical Module	Z3RN-□
AC Adapter	Z3RP-01
Optical Fiber Cable	Z3F2-4□D□

Appendix B
Codes

JIS 8 Code List (ASCII List)

Higher digits / Lower digits b8~b5	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
b4~b1 Row / Column	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			Undef.	−	タ	ミ		
0001	1	TC_1(SOH)	DC_1	!	1	A	Q	a	q			。	ア	チ	ム		
0010	2	TC_2(STX)	DC_2	"	2	B	R	b	r			「	イ	ツ	メ		
0011	3	TC_3(ETX)	DC_3	#	3	C	S	c	s			」	ウ	テ	モ		
0100	4	TC_4(EOT)	DC_4	$	4	D	T	d	t			、	エ	ト	ヤ		
0101	5	TC_5(ENQ)	TC_8(NAK)	%	5	E	U	e	u			・	オ	ナ	ユ		
0110	6	TC_6(ACK)	TC_9(SYN)	&	6	F	V	f	v			ヲ	カ	ニ	ヨ		
0111	7	BEL	TC_{10}(ETB)	'	7	G	W	g	w			ァ	キ	ヌ	ラ		
1000	8	FE_0(BS)	CAN	(	8	H	X	h	x			ィ	ク	ネ	リ		
1001	9	FE_1(HT)	EM	)	9	I	Y	i	y			ゥ	ケ	ノ	ル		
1010	10	FE_2(LF)	SUB	*	:	J	Z	j	z			エ	コ	ハ	レ		
1011	11	FE_3(VT)	ESC	+	;	K	[	k	{			ォ	サ	ヒ	ロ		
1100	12	FE_4(FF)	IS_4(FS)	,	<	L	¥	l	|			ャ	シ	フ	ワ		
1101	13	FE_5(CR)	IS_3(GS)	−	=	M	]	m	}			ュ	ス	ヘ	ン		
1110	14	S0	IS_2(RS)	.	>	N	^	n	~			ョ	セ	ホ	゛		
1111	15	S1	IS_1(US)	/	?	O	_	o	DEL			ッ	ソ	マ	°		

Undefined (1000 column, rows 0101–1001)

Undefined (1001 column, rows 0101–1001)

Undefined (1110 column, rows 0101–1001)

Undefined (1111 column, rows 0101–1110)

Undef. (1111 column, row 1111)

Note The code at the 5th row, 12th column is "\" in ASCII code.

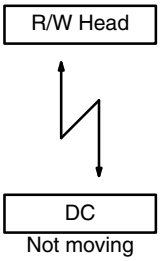
Appendix C
Auto Read/Auto Write

Use of Auto Read/Auto Write Command

Generally, the read or write command is used while the DC is not moving. The auto command, in contrast, is used while the DC is moving.

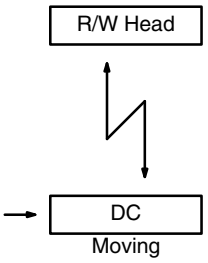
Read/Write Commands

- The communication range is wider than when the DC is moving, so communications can be accurately performed.

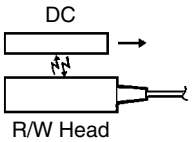
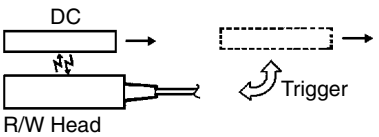


Auto Read/Write Commands

- When using the auto command, the presence or absence of the DC is detected automatically.
- If the DC moves slowly and its position is consistently accurate, the communication range is not limited much.



Application Example of Command

Item	Application	Description	Note
Command transmission by timer	Transmits next auto command after response is returned. 	–When DC passes through the communications area of R/W Head at fixed intervals. – If a long time elapses before next DC arrives. – Overlapping of the same communication with the same DC can be avoided if wait time during which DC leaves the communication area elapses after the end of communication.	– Keep transportation speed constant. – Valid only for systems where communication is not made more than once with same DC. – Make sure that another DC does not pass through the area.
Trigger	Transmits next auto command when some trigger is received after a response is returned. 	– For example, auto command is transmitted after end of processing of preceding process is confirmed. – Trigger must be input before the next DC approaches.	– Trigger processing is necessary. – Make sure that the trigger is accurately input.

Appendix D
Specifications and Ratings

General Ratings and Characteristics

R/W Head Ratings

Supply voltage		24 VDC
Operating voltage range		24±20% VDC
Current consumption		70 mA max.
Insulation resistance		50 MΩ min. (at 500 VDC) between the power terminals and mounting brackets
Dielectric strength		1,000 VAC 50/60 Hz for 1 minute. (Leakage current: 1 mA max.)
Noise immunity		1200 Vp-p, pulse width: 100 ns to 1 μs, rise time: 1 ns (common mode noise) 500 Vp-p (normal mode noise)
Vibration	**Mechanical durability**	10 to 55 Hz, 2.0 mm double amplitude for 1 hour in X, Y, and Z directions.
	Malfunction durability	10 to 55 Hz, 1.3 mm double amplitude for 1 hour in X, Y, and Z directions.
Shock		50 G, six times in X, Y, and Z directions.
Operating temperature		–10° to 55°C
Operating humidity		35% to 85% RH (without condensation)
Atmosphere		Must be free from corrosive gas.
Storage temperature		–25° to 65°C
Grounding		Less than 100 W
Construction		IP 66[1]
Ambient light intensity		4000 ℓx max. (fluorescent bulbs), 3000 ℓx max. (incandescent bulbs),
Cable length	**RS-232C**	15 m max.
	RS-422/485	500 m max.
Cable dia.[2]	**RS-232C**	5.8 to 6.5 dia. (power supply and RS-232C connection)
	RS-422	7.0 to 9.2 dia. (RS-422 connection)
Weight		120 g

Note 1. The rating is IP 40 for RS-422 interface R/W Heads in a multi drop system. Use a B500-AL001 Link Adapter if IP66 standards are required.

2. The R/W Heads are shipped with two types of rubber bushings to fit either cable diameter.

Communications Specifications

The communications specifications conform to RS-232C or RS-422, and a general-purpose factory computer or personal computer can be connected to the R/W Head. The communications protocol conform to those of the SYSMAC WAY Host Link System.

Host Computer Communications Specifications

	RS-232C interface	RS-422 interface
Transmission path connection	Point-to-point	1:N (31 points max.) (see note 1)
Communications method	Two-line, half-duplex	Four-line, half-duplex
Synchronization method	Start-stop synchronization (stop bit = 1)	
Transmission rate	4,800/9,600 bps (see note 2)	4,800/9,600/19,200 bps (see note 2)
Transmitted codes	ASCII (7 bits) or JIS (8 bits)	
Communications control procedure	Point-to-point (1:1) communications	Point-to-point (1:1) or 1:N communications
Error detection	Vertical parity (odd)	Vertical parity (odd), horizontal parity with 1:N communications only
Line length	15 m max.	500 m total
Battery life	10 years at 20% (with 1000 one byte read or write operations per day and low battery detection)	

Note 1. The R/W Head's unit number is set on the DIP switch. (Set to 0 at the factory.)

2. The baud rate is also set on the DIP switch. (Set to 4,800 bps at the factory.) Refer to *3-4 DIP Switch Setting* for details.

Data Carrier Ratings

Vibration	Mechanical durability: 10 to 55 Hz, 2.0 mm double amplitude for 1 hour in X, Y, and Z directions.
Shock	50 G, 10 times in X, Y, and Z directions.
Operating temperature	–10° to 55°C
Operating humidity	35% to 85% RH (without condensation)
Storage temperature	–25° to 65°C
Construction	IP67
Weight	30 g

Data Carrier Characteristics

	V630-D52R10	V630-D52R10T	V630-D4KR10	V630-D4KR10T
Memory capacity	64 bytes		4 KB	
Infrared window location	Front	Top	Front	Top
Read/write distance	0 to 200 mm (Refer to *3-1-4 Positioning the R/W Head and DCs* for details.)			
Inclination from R/W Head	±15°C			
Read/write range	±60 mm (when the line is 200 mm from the R/W Head)			

Communication Times

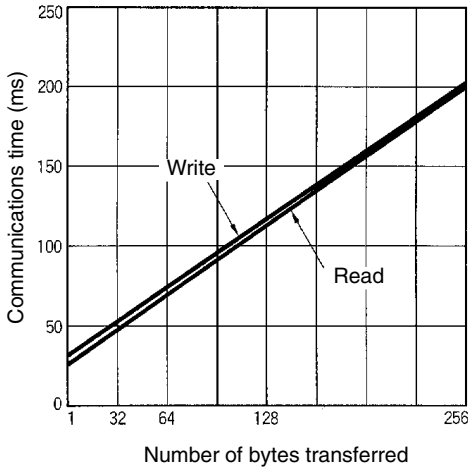
The following table shows the time required for read and write operations with selected quantities of data. The maximum speed of the DC is given in parentheses (for a DC on a line 200 mm from the R/W Head, communicating between +60 mm from the R/W Head with no retries).

Bytes	Read time	Write time
1	47 ms (153 meters/minute)	50 ms (144 meters/minute)
8	51 ms (141 meters/minute)	54 ms (133 meters/minute)
16	56 ms (128 meters/minute)	59 ms (122 meters/minute)
32	66 ms (109 meters/minute)	70 ms (102 meters/minute)
64	85 ms (84 meters/minute)	90 ms (80 meters/minute)
128	131 ms (54 meters/minute)	135 ms (53 meters/minute)
256	222 ms (32 meters/minute)	223 ms (32 meters/minute)

The following table shows the time required for read and write operations (TAT) with ASCII code specified and communications with the host computer at 9600 bps.

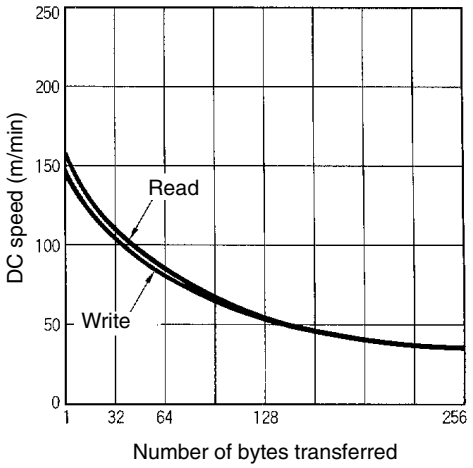
Bytes	Read time	Write time
1	60 ms	55 ms
16	86 ms	82 ms
256	546 ms	552 ms

The diagram below shows the communication time as a function of the number of bytes of data that are transferred by the read or write commands.



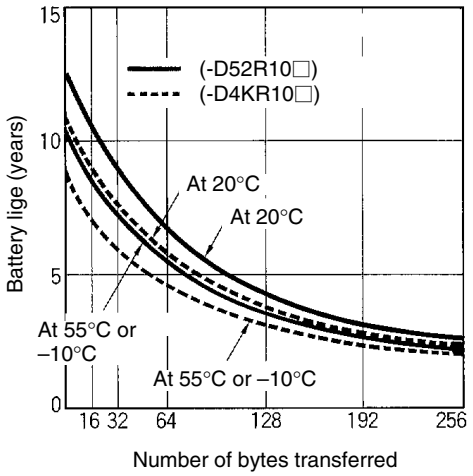
DC Speed vs. Bytes Transferred

The diagram below shows the DC speed in meters/minute as a function of the number of bytes of data that are transferred by the read or write commands. These values are for communications when the R/W Head is 200 mm from the line on which the DC travels, and the communications take place within +60 mm of the nearest point.



Battery Life

The diagram below shows the expected battery life as a function of the number of bytes of data that are transferred by the read or write commands (1000 transfers daily).



After the battery low alarm is output, about 5000 read or write operations of 64 bytes of data can be performed at 50°C. Given the conditions above, the DC can operate for about 18 days after the battery low alarm is output. No memory errors (false data) will occur due to low battery voltage.

Index

M

N

O

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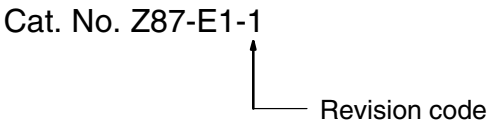
Revision History

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



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

Revision code	Date	Revised content
1	June 1992	Original production

OMRON

Authorized Distributor:

Cat. No. Z87-E1-1

Note: Specifications subject to change without notice.

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