

**V600 RFID System**  
**V600-IDSC02/V600-IDSC04**  
**Serial ID Controller**

**OPERATION MANUAL**

**OMRON**

# **V600 RFID System**

**V600-IDSC02/V600-IDSC04**

**Serial ID Controller**

**Operation Manual**

*Revised October 2005*



## **Notice:**

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

## **Visual Aids**

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

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

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

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## ***About this Manual:***

This manual describes the installation and operation of the V600-IDSC02/04 ID Controllers and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install or operate the ID Controller. Be sure to read the precautions provided in the following section.

**Precautions** provides general precautions for using the ID Controller and related devices.

**Section 1** provides a general introduction to the V600-IDSC02/04 ID Controller, including information on features, system configuration, and operation.

**Section 2** provides the part names, their functions, and the specifications of the V600-IDSC02/04 ID Controllers.

**Section 3** provides installation procedures, including information on wiring and connections.

**Section 4** provides procedures and formats required for communications with the host computer. A program example is also provided.

**Section 5** provides information required for troubleshooting errors, including indicator statuses and a list of end codes and their meanings.



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





# PRECAUTIONS

This section provides general precautions for using the ID Controllers and related devices.

**The information contained in this section is important for the safe and reliable application of ID Controllers. You must read this section and understand the information contained before attempting to set up or operate an ID Controller.**

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## **READ AND UNDERSTAND THIS DOCUMENT**

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

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- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

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Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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### **CHANGE IN SPECIFICATIONS**

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### **DIMENSIONS AND WEIGHTS**

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## Safety Precautions


### ● Definition of Safety Notices and Information

The following notation is used in this manual to provide precautions required to ensure safe usage of the product.







The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

The following notation is used.

 <b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.
--	--

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





### ● Symbols

Symbol		Meaning
Caution		<b>General Caution</b> Indicates non-specific general cautions, warnings, and dangers.
		<b>Electrical Shock Caution</b> Indicates possibility of electric shock under specific conditions.
		<b>Explosion Caution</b> Indicates a danger of explosion under particular conditions.
Prohibition		<b>General Prohibition</b> Indicates non-specific general prohibitions.
		<b>Disassembly Prohibition</b> Indicates possibility that electric shock or other injury may occur if the device is disassembled.
Mandatory Caution		<b>General Caution</b> Indicates non-specific general cautions, warnings, and dangers.

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● **Precautions**

 <b>WARNING</b>	
Do not touch any of the terminals while power is being supplied to the product. Touching the power supply terminals on the front panel of the product may occasionally result in electric shock.	
Do not attempt to disassemble the product while the power is being supplied. Doing so may occasionally result in electric shock due to the 24-VDC power supply.	
A lithium battery is contained in an S-RAM Data Carrier. Do not disassemble, deform under pressure, heat to above 212 °F (100°C), or incinerate the S-RAM Data Carrier. Otherwise serious injury may result from fire or rupturing of the battery.	

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## Precautions for Safe Use

Failure to abide by the following precautions could lead to faulty operation of the ID Controller or the system, or could damage the ID Controller. Always heed these precautions.

- Always use the power supply voltages specified in the operation manuals. An incorrect voltage may result in malfunction or burning.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable.
- Always turn OFF the power supply to the product before connecting or disconnecting any cables or wiring the system.
- Wire all connections correctly according to instructions in this manual.
- Do not attempt to disassemble, repair, or modify the product.
- Check that the DIP switch settings are correct before operating the product.
- Leave the label that is covering the vent holes attached during wiring. This label is attached to prevent wire clippings from entering the product. Remove the label after the completion of wiring to allow heat dissipation.
- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals.
- Do not pull on the cables or bend the cables beyond their natural limit. Doing either of these may break the cables.
- Do not place objects on top of the cables or other wiring lines. Doing so may break the cables.
- Double-check all wiring before turning ON the power supply.
- Before touching the product, be sure to first touch a grounded metallic object in order to discharge any static build-up.
- Stop operation and turn OFF the power supply immediately if you smell any unusual odors, if the surface of the product become abnormally hot, if smoke appears, or if the product seems unusual in any other way.

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## Precautions for Correct Use

Do not operate the control system in the following locations:

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.





# SECTION 1

## Features and System Configuration

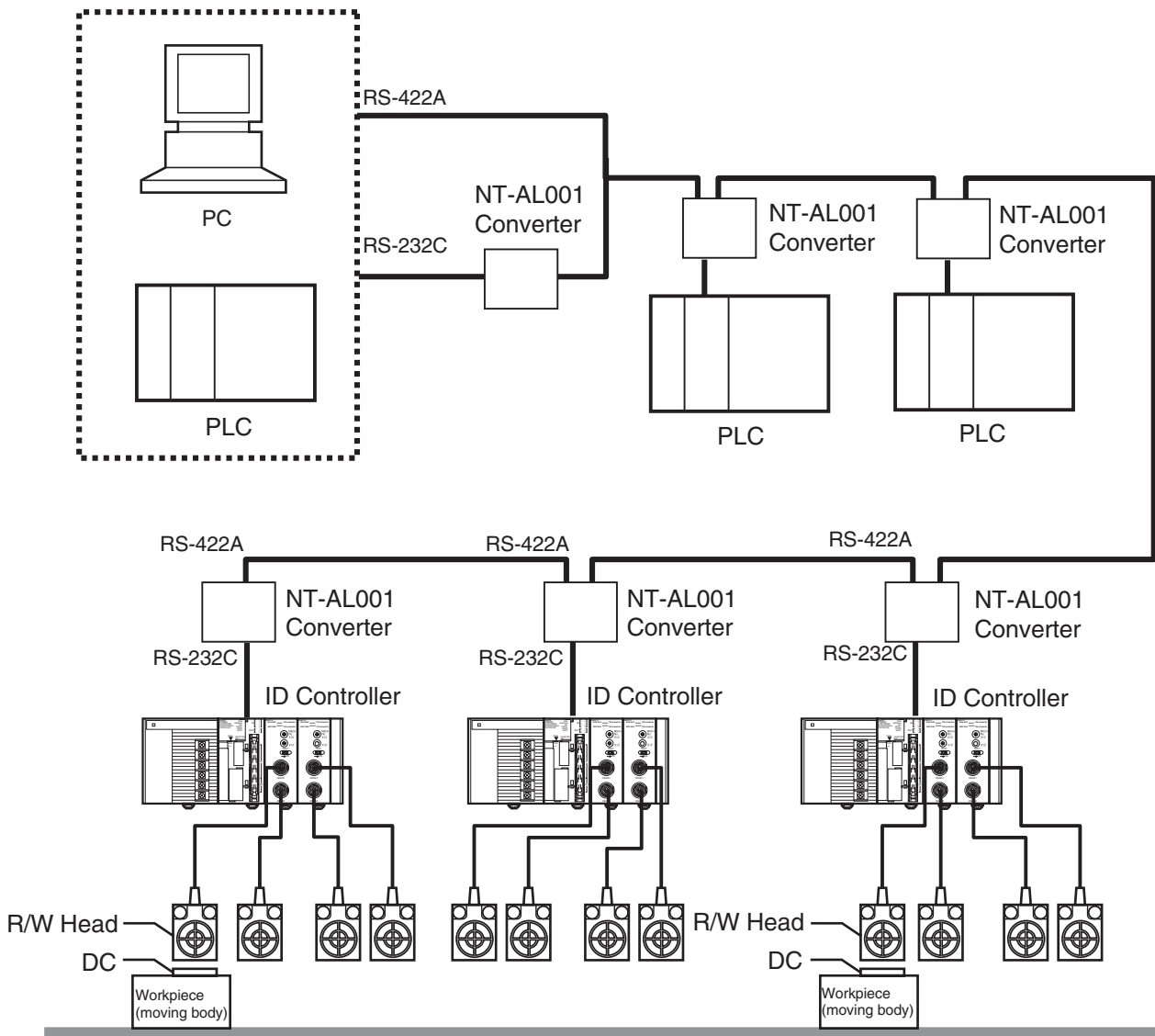
This section provides a general introduction to the V600-IDSC02/04 ID Controllers, including information on features, system configuration, and operation.

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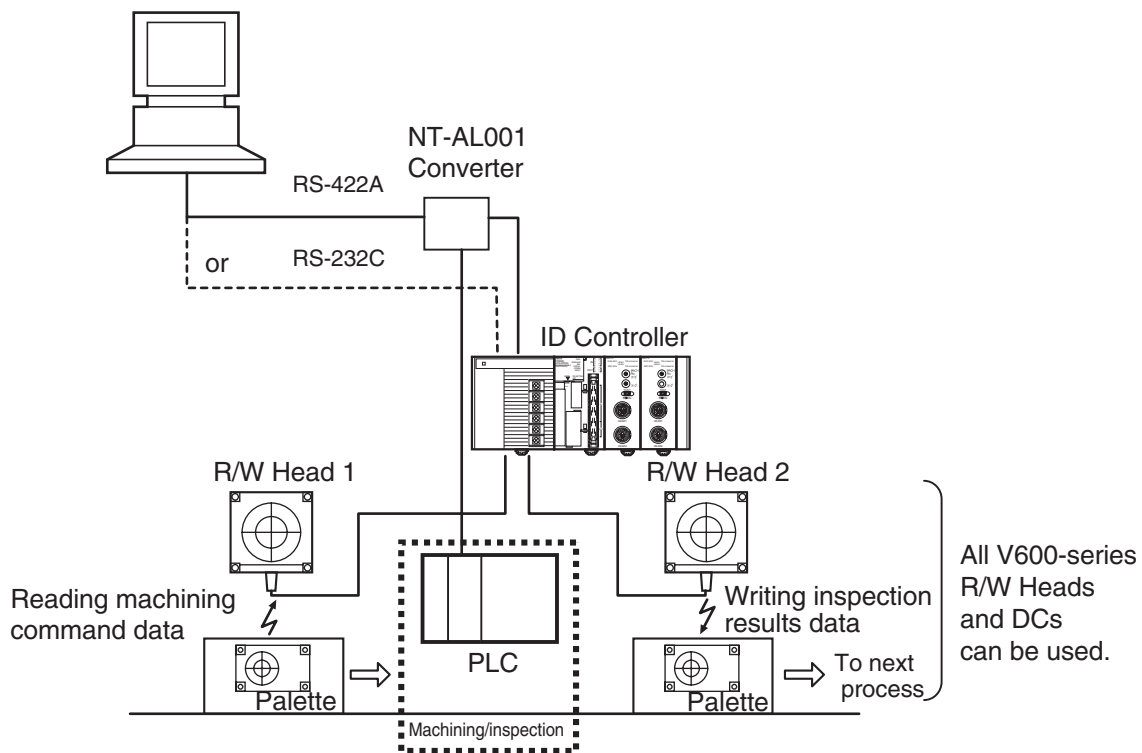


# 1-2 System Configuration

When 1:N connections are used, up to 32 ID Controllers can be connected.



### 1-3 Operation Overview



- 1,2,3...**
1. When a command is sent from the host computer to the ID Controller, R/W Head 1 enters the waiting condition and waits for the arrival of the DC. The command data at this time specifies the memory area from which data is to be read by R/W Head 1.
  2. When the DC arrives within communications range of R/W Head 1, the data (format and machining/inspection command data) in the memory area indicated by the Read command is sent to the host computer as the response.
  3. Based on the response data, the host computer transmits the workpiece machining/inspection command to the PLC.
  4. Once operations in the machining/inspection process have been completed, machining/inspection results data is sent from the PLC to the host computer.
  5. The host computer sends a Write command to the ID Controller, and this time R/W Head 2 waits for arrival of the DC. This command sets the memory area to which R/W Head 2 is to write data and set the machining/inspection results data.
  6. When the DC arrives in the R/W Head 2 communications range, the machining/inspection results data is written to the memory area specified by the DC.

# SECTION 2

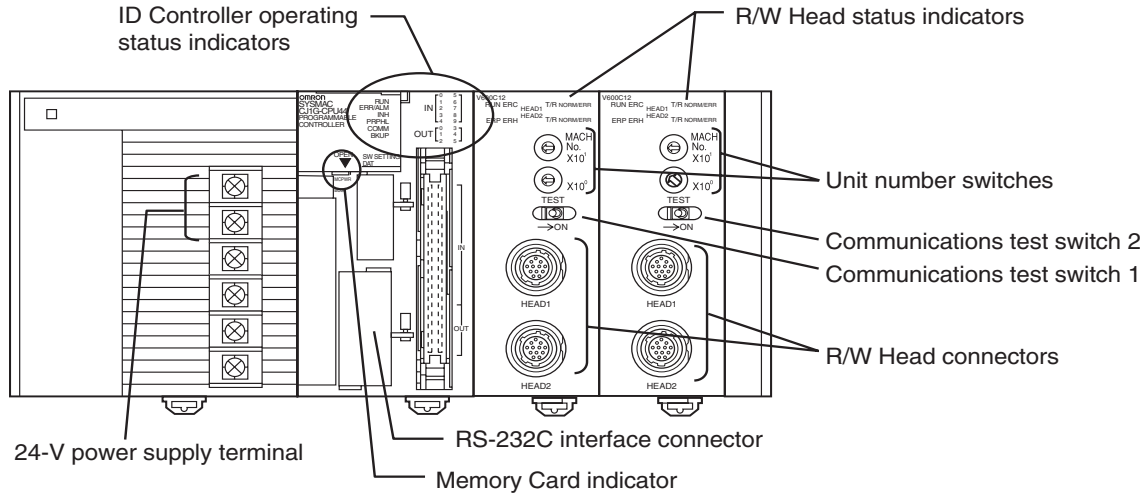
## Specifications and Performance

.This section provides the part names, their functions, and the specifications of the V600-IDSC02/04 ID Controllers.

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## 2-1 Part Names and Functions

### Part Names and Functions

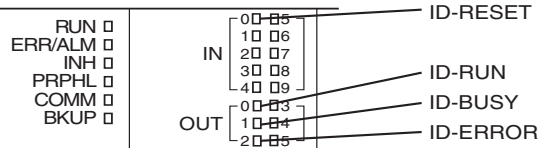


#### RS-232C Interface Connector

This connector is used for communications with the host computer. The connector conforms to RS-232C, allowing it to be connected to the host computer.

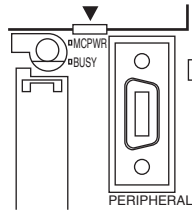
#### ID Controller Operating Status Indicators

(Front panel)



Indicator	Name	Color	Meaning	
RUN	RUN	Green	○ (Lit)	The ID Controller is operating normally.
			● (Not lit)	The power supply to the ID Controller is OFF or an error has occurred in the ID Controller.
ERR/ALM	Alarm	Red	○ (Lit)	An error has occurred in the ID Controller.
			● (Not lit)	The ID Controller is operating normally.
INH	(Not used.)	Orange	● (Not lit)	Always not lit.
PRPHL	(Not used.)	Orange	● (Not lit)	Always not lit.
COMM	Communicating	Orange	○ (Lit)	The ID Controller is communicating with the host computer.
			● (Not lit)	The ID Controller is not communicating with the host computer.
BKUP	(Not used.)	Orange	● (Not lit)	Always not lit.
ID-RESET	Reset input	Red	○ (Lit)	ID-RESET is ON
			● (Not lit)	ID-RESET is OFF (normal status)
ID-RUN	Communicating	Red	○ (Lit)	The ID Controller is operating normally.
			● (Not lit)	The ID Controller is stopped.
ID-BUSY	Communicating	Red	○ (Lit)	Either of the R/W Heads is communicating with the Data Carrier.
			● (Not lit)	No communications with the Data Carrier, or communications ended.
ID-ERROR	Error	Red	○ (Lit once)	An error has occurred in communications with the host computer or with the Data Carrier.
			● (Not lit)	Communications with the host computer or with the Data Carrier ended normally.

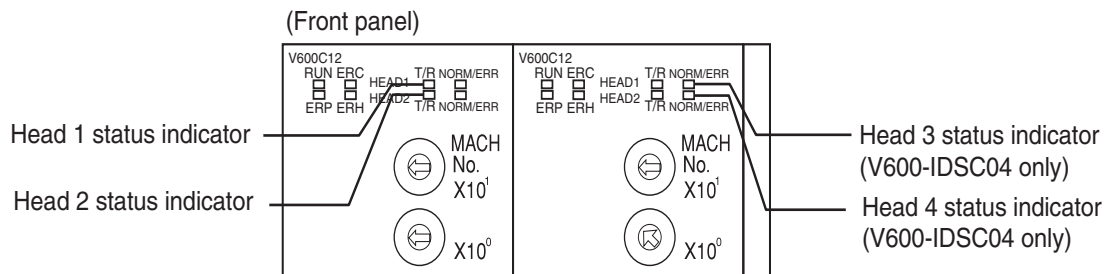
Memory Card Indicator



Indicator	Name	Color	Meaning	
MCPWR	Power supplied	Green	○ (Lit)	Always lit
BUSY	Access	Yellow	○ (Lit)	The Memory Card is being accessed.
			● (Not lit)	The Memory Card is not being accessed.

**Note** Do not turn OFF the power supply to the ID Controller when the BUSY indicator is lit. Otherwise, the ID Controller may not operate when the power supply is turned back ON.

R/W Head Status Indicators



Indicator	Name	Color	Meaning		
General indicators	RUN	RUN	Green	○ (Lit)	The ID Controller is operating normally.
				● (Not lit)	The ID Controller is stopped.
	ERC (Error of Controller)	Unit error	Red	○ (Lit)	An error has occurred in the ID Controller.
				● (Not lit)	No error has occurred in the ID Controller.
ERP (Head Power Error)	Head power error	Red	○ (Lit)	An error has occurred in the ID Controller.	
			● (Not lit)	No error has occurred in the ID Controller.	
Head 1	T/R	Communicating	Yellow	○ (Lit)	Communications are active.
	NORM/ERR	Normal end	Green	○ (Lit)	Communications with the DC ended normally.
		Error end	Red	○ (Lit)	Communications with the DC ended in an error.
Head 2	T/R	Communicating	Yellow	○ (Lit)	Communications are active.
	NORM/ERR	Normal end	Green	○ (Lit)	Communications with the DC ended normally.
		Error end	Red	○ (Lit)	Communications with the DC ended in an error.
Head 3	T/R	Communicating	Yellow	○ (Lit)	Communications are active.
	NORM/ERR	Normal end	Green	○ (Lit)	Communications with the DC ended normally.
		Error end	Red	○ (Lit)	Communications with the DC ended in an error.

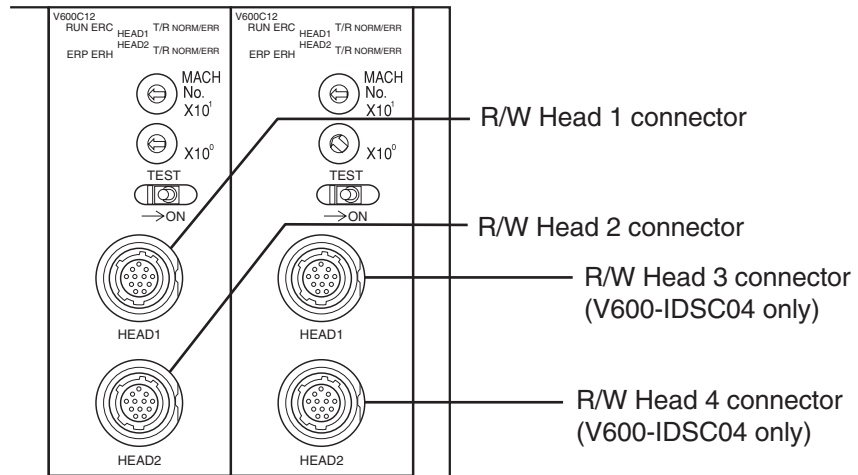


Indicator		Name	Color	Meaning	
Head 4	T/R	Communicating	Yellow	○ (Lit)	Communications are active.
	NORM/ERR	Normal end	Green	○ (Lit)	Communications with the DC ended normally.
		Error end	Red	○ (Lit)	Communications with the DC ended in an error.

**R/W Head Connectors**

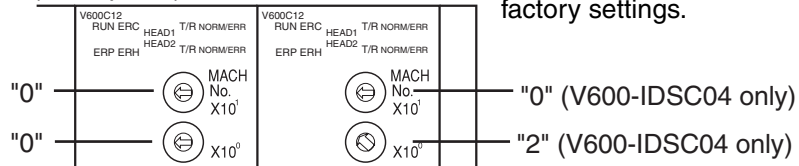
The V600-IDSC02 can be connected to up to two R/W Heads, and the V600-IDSC04 can be connected to up to four R/W Heads.

(Front panel)



**Unit Number Switches**

(Front panel)



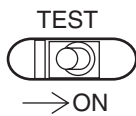
Do not change the unit number switch settings from the factory settings.

**Note**

Do not change the unit number switch settings. Otherwise, the ID Controller will malfunction.

**Communications Test Switch 1**

(Front panel, left side)

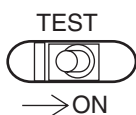


Use communications test switch 1 on the front panel of the ID Controller to switch from the normal mode of R/W Head 1 and 2 to communications test mode.

Status	Details
OFF	Normal status (factory setting status)
ON	R/W Head 1 and 2 communications test status

**Communications Test Switch 2 (V600-IDSC04 only)**

(Front panel, right side)

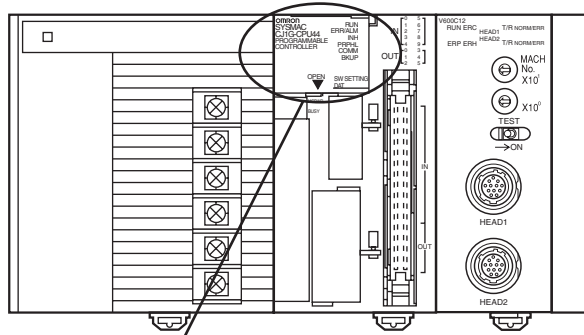


Use communications test switch 2 on the front panel of the ID Controller to switch from the normal mode of R/W Head 3 and 4 to communications test mode.

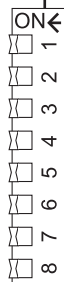
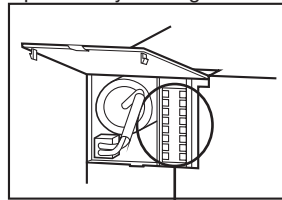
Status	Details
OFF	Normal status (factory setting status)
ON	R/W Head 3 and 4 communications test status

DIP Switch

No.	Name	Settings	
		OFF	ON
1	Not used.	Keep set to OFF.	---
2	Not used.	---	Keep set to ON.
3	Not used.	Keep set to OFF.	---
4	Not used.	Keep set to OFF.	---
5	Not used.	Keep set to OFF.	---
6	Baud rate setting	9,600 bps (factory setting)	38,400 bps
7	Not used.	Keep set to OFF.	---
8	Not used.	Keep set to OFF.	---



Open battery housing



## 2-2 Specifications

### General Specifications

Item	Specification
Power supply	24 V DC
Allowable power supply voltage/frequency fluctuation range	19.2 to 28.8 V DC
Power consumption	50 W max.
Power supply output terminals	None
Ambient operating temperature	0 to 55°C
Ambient operating humidity	10% to 90% (no condensation)
Ambient operating environment	No corrosive gases
Ambient storage temperature	-20 to 75°C (not including battery)
Grounding	Ground to 100 Ω or less

### Input Specifications

Input	ID-RESET	
Input type	Two-wire Sensor	Line driver inputs
Input current	6.0 mA typical	13 mA typical
Input voltage	24 V DC + 10%, -15%	RS-422A line driver AM26LS31 standards (See note.)
Input impedance	3.6 kΩ	---
Number of circuits	1 circuit	
ON voltage/current	17.4 V DC min./3 mA min.	---
OFF voltage/current	5 V DC max/1 mA max.	---
Delay	200 ms max.	
Circuit configuration		

- Note**
- (1) The power supply voltage on the line driver side must be 5 V±5%.
  - (2) Refer to *Section 3 I/O Specifications and Wiring* of the *CJ1M CPU Units Operation Manual (W395)*.
  - (3) ID-RESET: When input, ID-RESET resets the ID Controller.

**Output Specifications**

Output	ID-RUN	ID-BUSY	ID-ERROR
Rated voltage	5 to 24 V DC		
Allowable voltage range	4.75 to 26.4 V		
Maximum switching capacity	0.3 A per output, 1.8 A per Unit		
Number of circuits	6 outputs (6 outputs/common)		
Maximum inrush current	3.0A per output for 10 ms max.		
Leakage current	0.1 mA max.		
Residual voltage	0.6 V max.		
ON delay	0.1 ms max.		
OFF delay	0.1 ms max.		
Fuse	None		
External power supply	10.2 to 26.4 V DC, 50 mA min.		
Circuit configuration			

**Note** Refer to *Section 3 I/O Specifications and Wiring of the CJ1M CPU Units Operation Manual (W395)*.

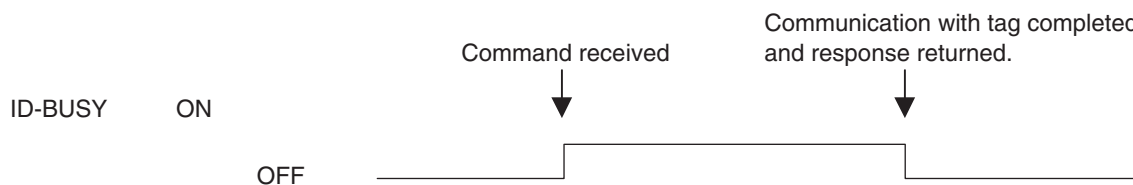
**ID-RUN**

ID-RUN output turns ON when the ID Controller is operating normally.

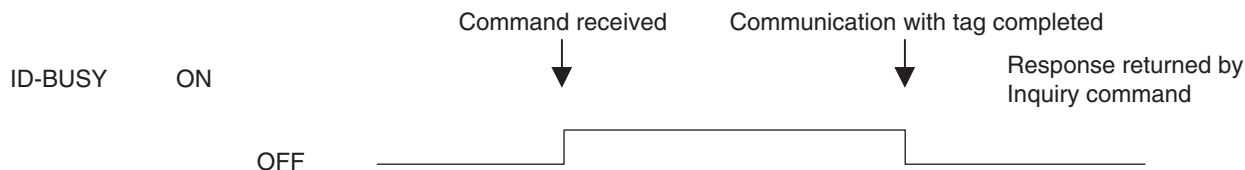
**ID-BUSY**

ID-BUSY output turns ON if the ID Controller receives a command from a host device while it is communicating with a tag. The time it is ON depends on the tag communication time.

■ **Example 1: Read and Auto Read Commands**



■ **Example 2: Polling Auto Read Command**



**ID-ERROR**

ID-ERROR output turns ON for about 500 ms after a response is sent if the Controller is communicating with a tag or an error occurred when a command was received.

**Communications Specifications with Host computer**

Standard	RS-232C
Transmission path connection	1 to 1
Communications format	2 lines, half-duplex
Sync format	Start-stop sync, stop bits: 1
Baud rate	9,600 bps (factory setting) or 38,400 bps (See note 1.)
Data length	8 bits
Parity	None
Stop bits	1 bit
Transmission code	ASCII
Communications control procedure	1: N procedure (See note 2.)
Error detection	Horizontal parity (FCS)
Path length	15 m max.

- Note**
- (1) Can be changed using DIP Switch settings. Refer to *DIP Switch* page 9 for details.
  - (2) The model number used in the 1:N procedure is set by command. Refer to *4-4-16 ID Controller Unit No. Set (SSM)* for details.

**Communications Function Specifications**

Communications frequency	530 kHz
Communications control (See note)	(1) Changing EEPROM (battery-free) Data Carrier communications mode (distance priority or speed priority) (2) Write verification ON/OFF (3) Auto Wait Time Setting
Commands	Read Write Data Fill Copy Expanded Read Auto Read Auto Write Auto Data Fill Auto Copy Polling Read Polling Write Polling Request Command Processing Cancel Data Check Data Management Status Set/Read Test Abort

- Note** Communications control functions are set by commands. Refer to *4-4-17 Verification ON/OFF (SSB)*, *4-4-18 Communications Mode Set (SSC)*, *4-4-19 Auto Wait Time Set (SSW)*, and *4-4-20 Communications Test Mode Switch (SST)* for details.

# SECTION 3

## Connections and Wiring

This section provides installation procedures, including information on wiring and connections.

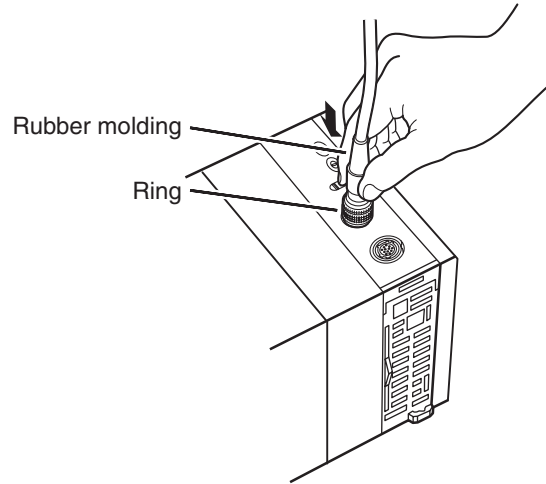
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### 3-1 Connections and Wiring

#### 3-1-1 Connecting R/W Heads

##### Connection Method

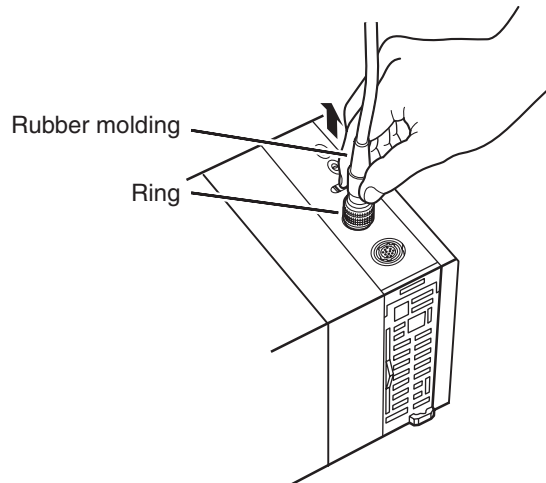
- 1,2,3...
1. Holding the rubber molding on the connector, align the connector with the key groove and press in.
  2. Press in on the connector until it locks in place.



**Note** The connector will not lock into place if you hold onto the ring. Always hold onto the rubber molding.

##### Removal Method

Hold onto the ring and pull straight out.

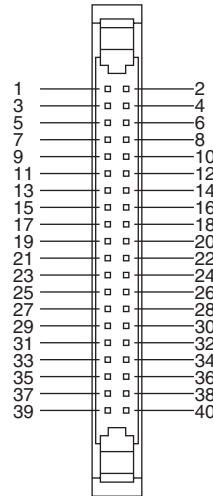


**Note** The connector cannot be removed if you hold onto the rubber molding. Never pull on the cable with excessive force. The conductors may be broken or damaged.

## 3-2 I/O Signal Wire Connections

### Used Connector Pins

Type	Name	Pin No.	Contents
Input	ID-RESET	1	24 V DC
		5	0 V
Output	ID-RUN	31	ID-RUN output
	ID-BUSY	32	ID-BUSY output
	ID-ERROR	33	ID-ERROR output
	General-purpose output	37	Power supply input (+V) for the output
		39 or 40	Output COM



### 3-2-1 Wiring

To connect to a Terminal Block, use an OMRON Cable preassembled with the special connector or attach the special connector (sold separately) to a cable yourself.

#### Note

- (1) Do not supply a voltage to the input terminals that exceeds the I/O circuit's specified input voltage range. Likewise, do not connect a voltage or load that exceeds the output circuit's max. switching capacity.
- (2) When the power supply terminals are marked with + and – indicators, verify that the power supply wires have not been reversed accidentally.
- (3) When the equipment is subject to EC Directives (the Low Voltage Directives), a DC power supply with reinforced insulation or double insulation must be used for the I/O power supply.
- (4) Check all connector wiring thoroughly before turning ON the power supply.
- (5) Do not pull on the cable. Doing so may separate the cable from the connector.
- (6) Do not bend the cable beyond its natural bending radius. Doing so may damage the cable.
- (7) Do not connect a 24-V DC output device to a line driver input. Doing so may damage the internal circuits.

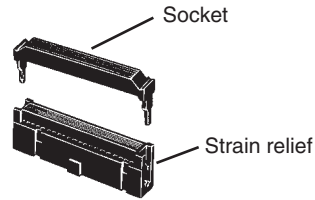


- (8) Do not connect a line driver output device to a 24-V DC input. Doing so will not damage the internal circuits, but the input will not be recognized.

**Connector Types**

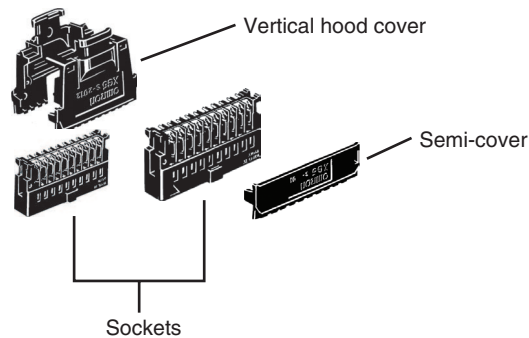
**Recommended Connectors**

MIL-type Flat-cable Connector (40-pin Pressure-welded Type)



Part name	OMRON model number	Daiichi Denshi Kogyo product code
Socket	XG4M-4030	FRC5-AO40-3TON
Strain relief	XG4M04004	---
Set	XG4M-4030-T	FRC5-AO40-3TOS
Recommended flat cable	XY3A-200□	---

MIL-type Pressure-welded Connector with Loose Wires (40-pin Pressure-welded Type)



Part name	OMRON model number	
Socket	AWG24	XG5M-4032-N
	AWG26 to 28	XG5M-4035-N
Contact	AWG24	XG5W-0031-N
	AWG26 to 28	XG5W-0034-N
Hood cover	XG5S-4022	
Semi-cover (Two semi-covers are required for each socket)	XG5S-2001	

**Wiring**

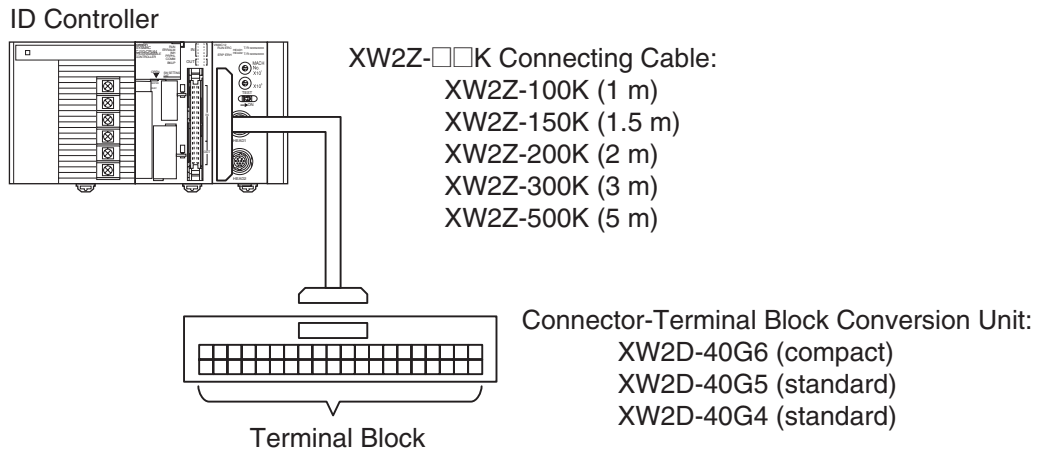
The recommended wire size is AWG24 to 28 (0.2 to 0.08 mm<sup>2</sup>). Use cables with a wire diameter of 1.61 mm, including the outer diameter.

### Terminal Block Conversion Unit

The following Terminal Block Conversion Units can be connected.

Recommended connecting cable	Connector-Terminal Block Conversion Unit	Number of Pins	Size	Operating temperature
XW2Z-□□□K	XW2D-40G6	40	Compact	0 to 55°C
	XW2B-40G5		Standard	-25 to +80°C
	XW2B-40G4			

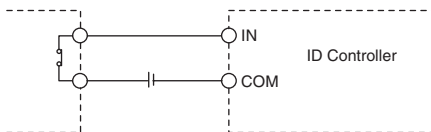
### Connecting Method



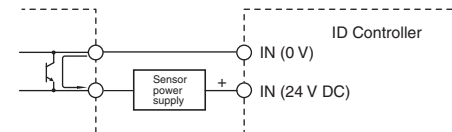
## 3-2-2 Wiring Examples

### DC Input Devices

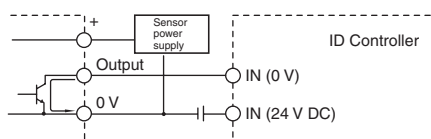
• **Device with Relay Output**



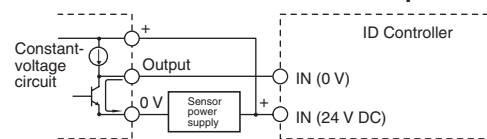
• **Two-wire DC Sensor**



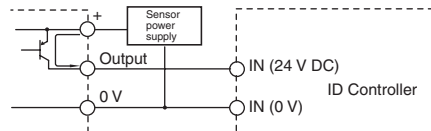
• **Device with NPN Open Collector Output**



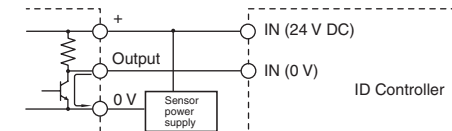
• **Device with NPN Current Output**



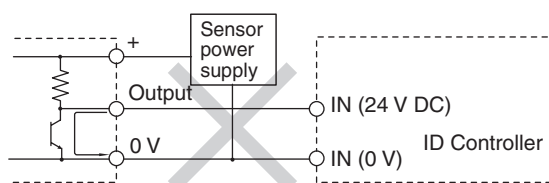
• **Device with PNP Current Output**



• **Device with Voltage Output (See Note.)**



**Note** Do not use the following wiring with voltage-output devices.

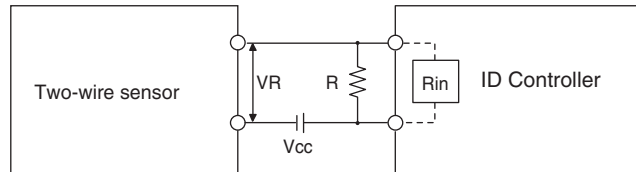


**Note** ID Controller inputs have a set polarity. If the wiring (polarity) is reversed when the inputs are connected, the inputs will not turn ON. Always check the wiring thoroughly before turning ON the power.

**Precautions when Connecting Two-wire DC Sensors**

Check that the following conditions are met when using a two-wire sensor as a 24-V DC input device. The sensor may malfunction if the conditions are not met.

1. Check the relationship between the ID Controller's ON voltage and the sensor's residual voltage.  
 $V_{ON} \leq V_{CC} - V_R$
2. Check the relationship between the ID Controller's ON current and the sensor's control output (load current).  
 $I_{OUT} (min) \leq I_{ON} \leq I_{OUT} (max)$   
 $I_{ON} = (V_{CC} - V_R - 1.5 [ID \text{ Controller's internal residual voltage}^*])/R_{IN}$   
 Connect bleeder resistance (R) if  $I_{on}$  is less than  $I_{out} (min)$ . Use the following equation to calculate the constant for bleeder resistance.  
 $R \leq (V_{CC} - V_R)/(I_{OUT} (min) - I_{ON})$   
 $Power \ W \geq (V_{CC} - V_R) \ 2/R \times 4 \ [Tolerance]$
3. Check the relationship between the ID Controller's OFF current and the sensor's leakage current:  
 $I_{OFF} \geq I_{leak}$   
 Connect bleeder resistance (R) if  $I_{leak}$  is greater than  $I_{OFF}$ .  
 Use the following equation to calculate the constant for bleeder resistance.  
 $R \leq R_{IN} \times V_{OFF} / (I_{leak} \times R_{IN} - V_{OFF})$   
 $Power \ W \geq (V_{CC} - V_R) \ 2/R \times 4 \ (Tolerance)$



Vcc: Power supply voltage	Vr: Sensor's output residual voltage
Von: ID Controller's ON voltage	Iout: Sensor's control output (load current)
Voff: ID Controller's OFF voltage	
Ion: ID Controller's ON current	Ileak: Sensor's leakage current
Ioff: ID Controller's OFF current	R: Bleeder resistance
Rin: ID Controller's input impedance	

**Output Wiring Precautions**

**Output Short Protection**

The output or PCB may be damaged if the load connected to an output is short-circuited. Therefore, installing a protective fuse in each output circuit is recommended. Use a fuse with a capacity about two times greater than the rated output capacity.

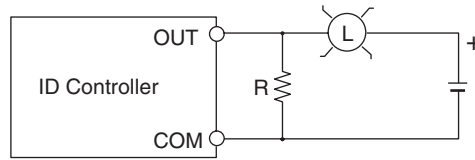
**TTL Connections**

A TTL device cannot be connected directly because of the transistor's residual voltage. Connect to a TTL Unit after receiving signals with a CMOS IC. A pull-up resistor must also be used with the transistor output.

**Inrush Current Considerations**

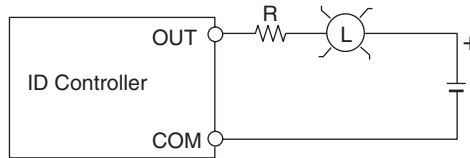
When switching a load with a high inrush current, such as an incandescent light bulb, there is a risk of damaging the output transistor. Suppress the inrush current using one of the methods shown below.

**Method 1**



This method draws a dark current that is approximately one-third of the rated value of the light bulb.

**Method 2**

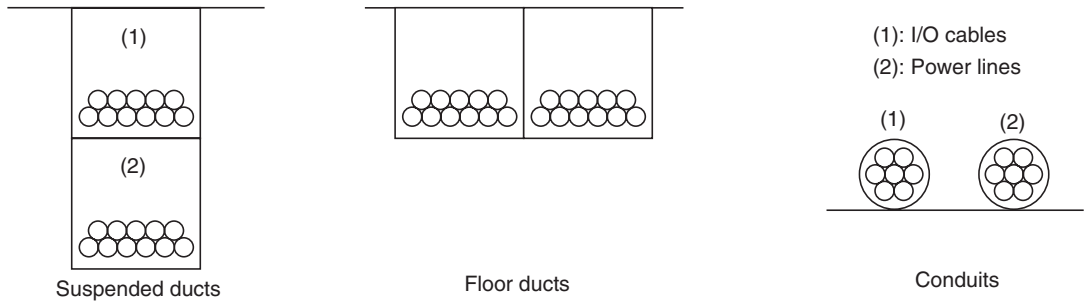


This method uses a limiting resistor.

**3-2-3 Wiring for Safety and Noise Immunity**

**R/W Head Cables and I/O Signal Lines**

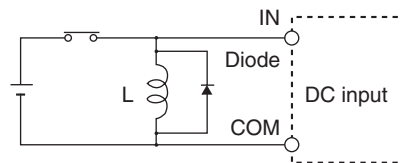
Wire the R/W Head cables and I/O signal lines in separate ducts from power circuit cables both inside and outside the control panel.



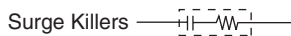
If the same ducts must be used, shielded cables can be used to increase resistance to noise. If a shielded cable is used, connect one end of the shield to ground.

**Countermeasures for Inductive Loads**

If I/O is connected to an inductive load, connect a surge killer or diode in parallel with the load.



**Note** Use surge killers and diodes that meet the following conditions:



Resistance: 50 Ω  
 Capacitance: 0.47 μF  
 Voltage: 200 V

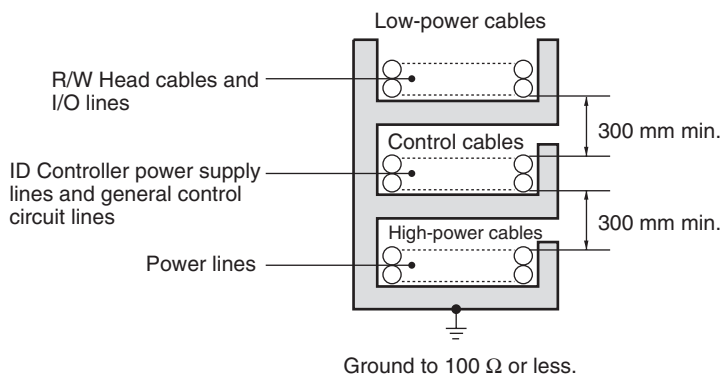


Inrush withstand voltage: 3 times load voltage min.  
 Average rectified current: 1 A

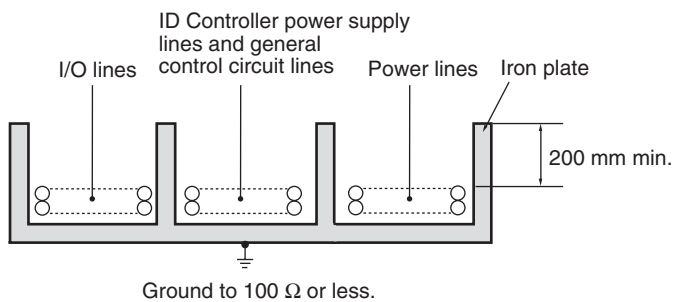
**Noise Countermeasures for External Wiring**

Consider the following items when wiring external lines, such as the R/W Head cables, I/O lines, power supply lines, and high-power lines.

- When using multiconductor cables for signal lines, do not use the same cable for both I/O lines and other control lines.
- When racks are installed in parallel with each other, keep them separated by at least 300 mm.



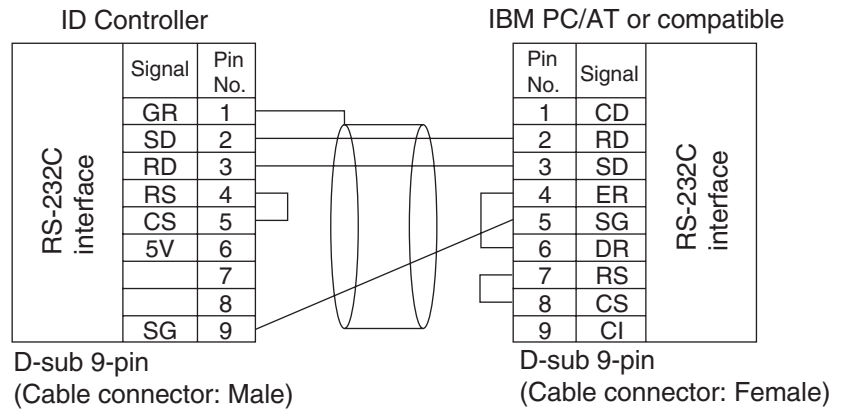
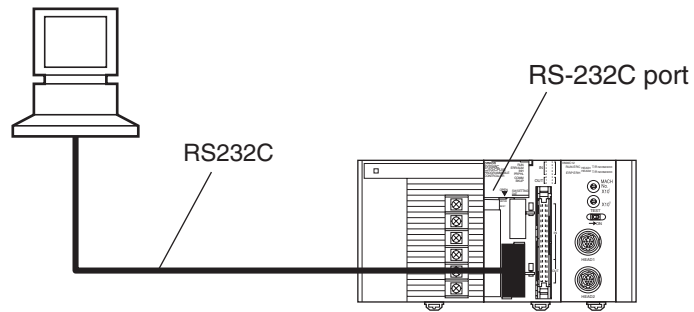
- When placing cables in the same duct, separate them with grounded iron plates.



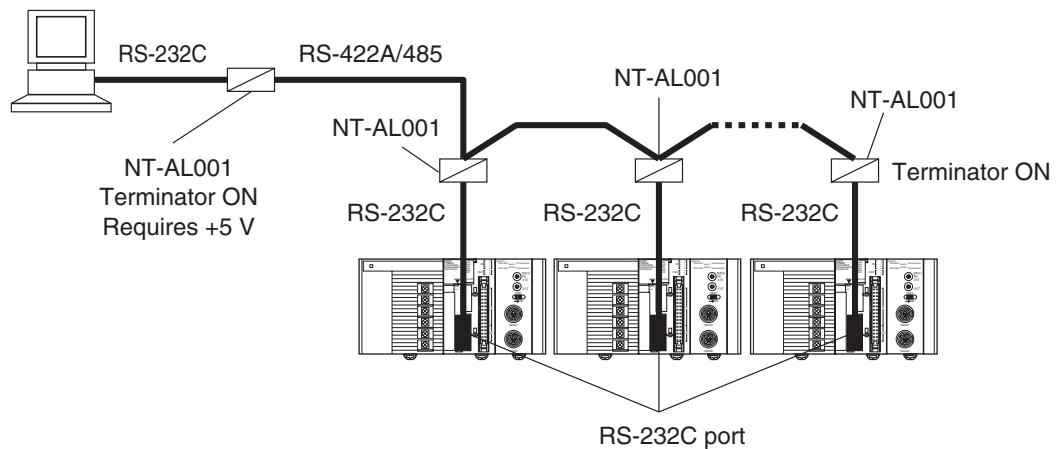
**3-3 RS-232C Interface Connections**

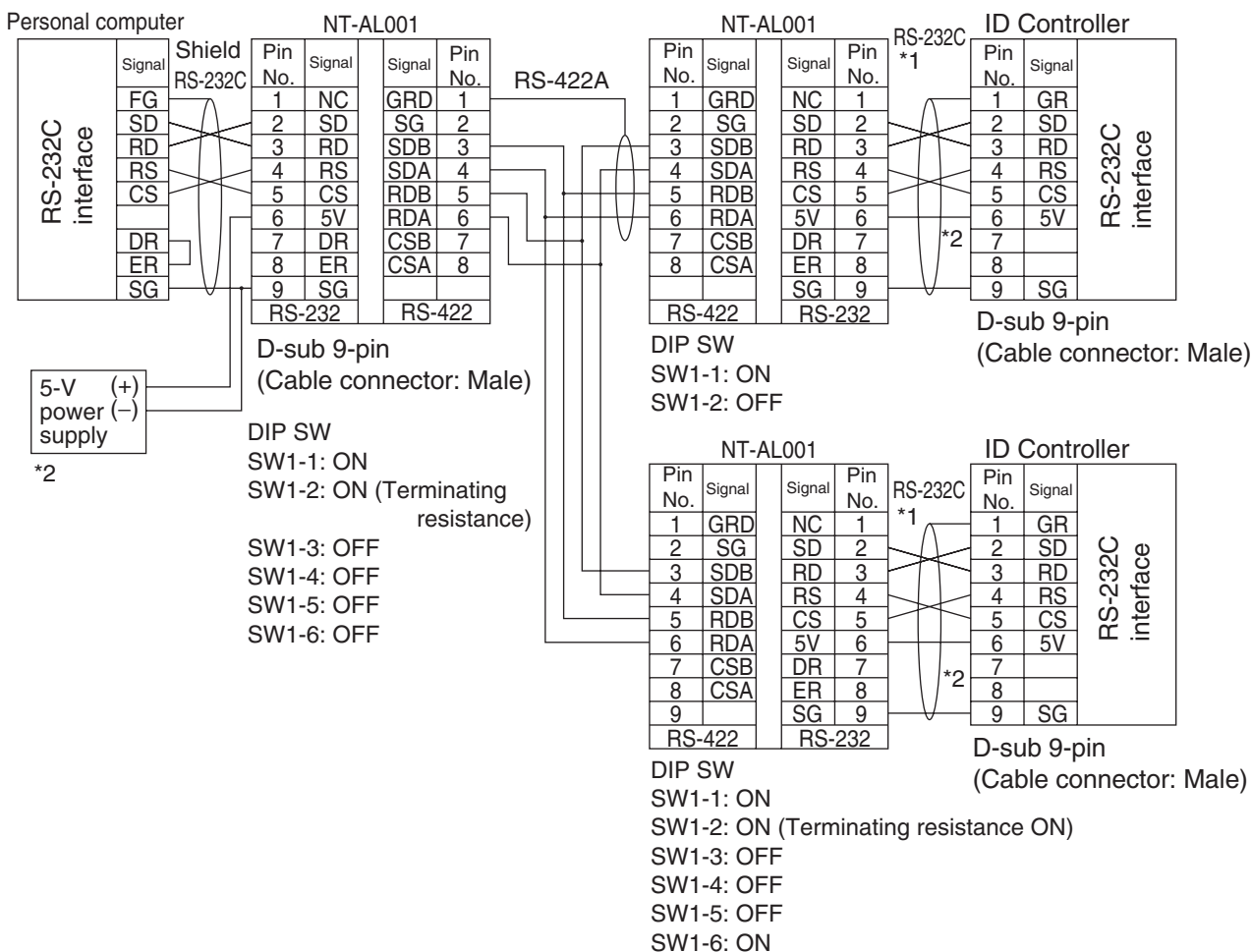
Signal name	Symbol	Signal direction		Pin No.
		Input	Output	
Safety ground or earth ground	GR	---	---	1
Signal ground or common return line	SG	---	---	9
Send data	SD	---	○	2
Receive data	RD	○	---	3
Request to send	RS	---	○	4
Can send	CS	○	---	5
5 V	5V	---	○	6

**Connecting a Single ID Controller Only**



**Connecting Two or More ID Controllers**





- Note**
- \*1 Use the following cable to connect the ID Controller to the NT-AL001 Converter.  
 Recommended NT-AL001 Connecting Cable: XW2Z-070T-1 (0.7 m)/  
 XW2Z-200T-1 (2 m)
  - \*2 Connect the +5-V power supply on pin 6 of the ID Controller's RS-232C port to the NT-AL001 Converter only. Connecting this pin to any other external device, may damage the external device and the ID Controller.

# SECTION 4

## Communications with the Host Computer

This section provides procedures and formats required for communications with the host computer. A program example is also provided.

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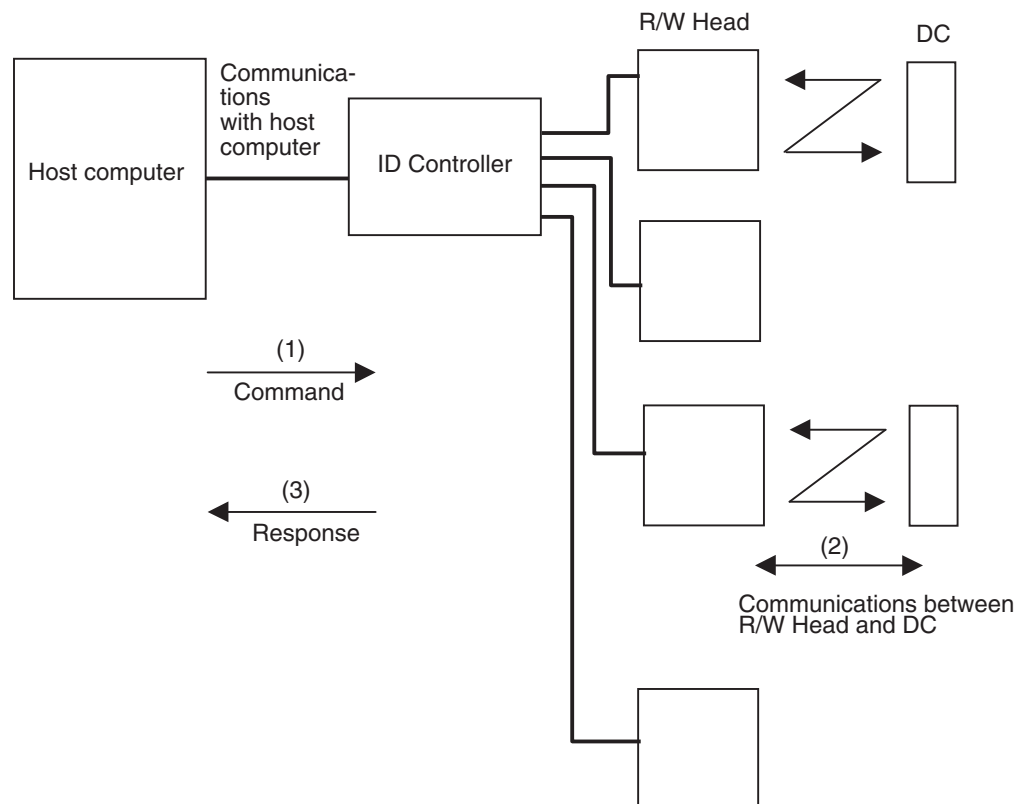
## 4-1 Data Carrier Motion and Command Conditions

### Communications Control Procedure

- 1,2,3...
1. The host computer has the initial transmission right, which is transferred to the ID Controller after command transmission is completed.
  2. Once the response is returned from the ID Controller, the transmission right goes back to the host computer.
  3. The transmission right is transferred by pressing the carriage return key.
  4. The control procedure used by the ID Controller is the 1 to N procedure.
  5. If an RS-422A/RS-485 Converter is used, multiple ID Controllers (32 max.) can be connected to a single host computer.  
The unit number of the corresponding ID Controller is inserted at the head of all commands and responses to identify the ID Controller. A horizontal parity check is included as an FCS (frame check sequence) for more effective error detection.

### Explanation

- 1,2,3...
1. The host computer sends a command to the ID Controller.
  2. The ID Controller interprets the host computer command and executes local communications, and writes/reads data to/from the DC memory.
  3. If it is a read command, the data read out is sent to the host computer as the response. If it is a write command, a message indicating the completion of processing is sent to the host computer as the response.



### Command Reception Status

#### Command Wait Status

This is the condition in which no command processing is being performed, and the ID Controller is ready to accept any command. Once a command is received, it enters the command processing status.

**Command Processing Status**

Commands received during the interval from when a command has been accepted until a response indicating the command processing has been completed has been returned, are ignored. However, one exception during processing of auto read and auto write commands is that the auto command processing's abort command can be accepted.

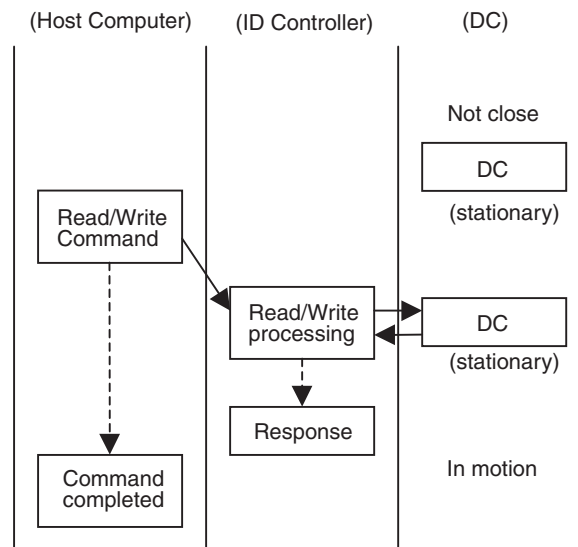
**Polling Auto Subcommand Wait Status**

This refers to the situation when a polling auto command is sent and the DC has not arrived in front of the specified R/W Head. In this status, the specified R/W Head can only accept subcommands. Subcommands are commands that query the wait status for approach of the DC at the R/W Head. In the polling auto subcommand wait status, commands can be sent to the other R/W Head.

**Read and Write Functions**

**Command Processing During Read/Write Operations**

The read/write functions are used for communications when the DC is stationary. Thus, before using these commands, it is necessary to check that the DC is at a specific position. If the DC is not in a specified position, an error response is returned.

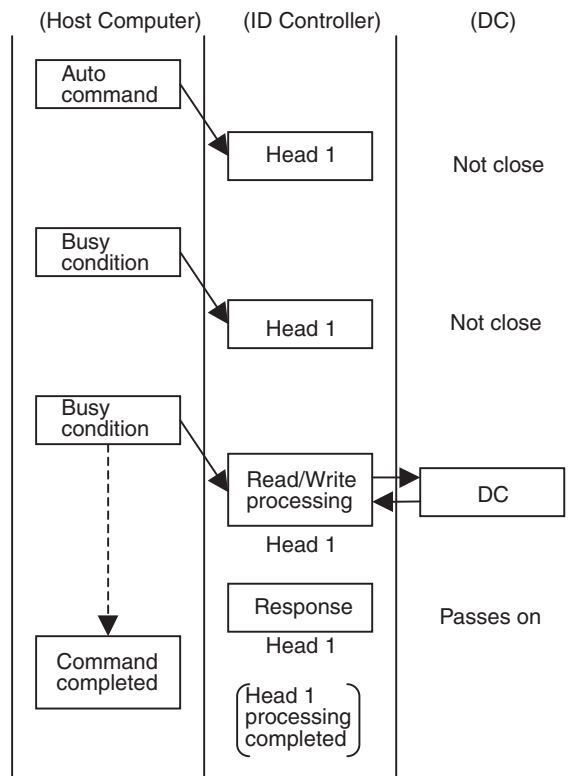


- 1,2,3...**
1. Once it is confirmed that the DC has stopped in the specified position, the host computer sends the command.
  2. The ID Controller follows the command and performs read/write operations.
  3. After processing has been completed, the ID Controller returns a processing completed response to the host computer. The host computer accepts the response and once again starts the line workpiece, with the DC attached, in motion.

**Automatic Read/Write Function**

**Automatic Command Processing**

Under the automatic commands, the ID Controller does not return a response until the DC comes close to the specified R/W Head. This means that the communications path to the host computer remains in the busy condition until the response is returned, and the host computer cannot send commands specifying another R/W Head of the same ID Controller.

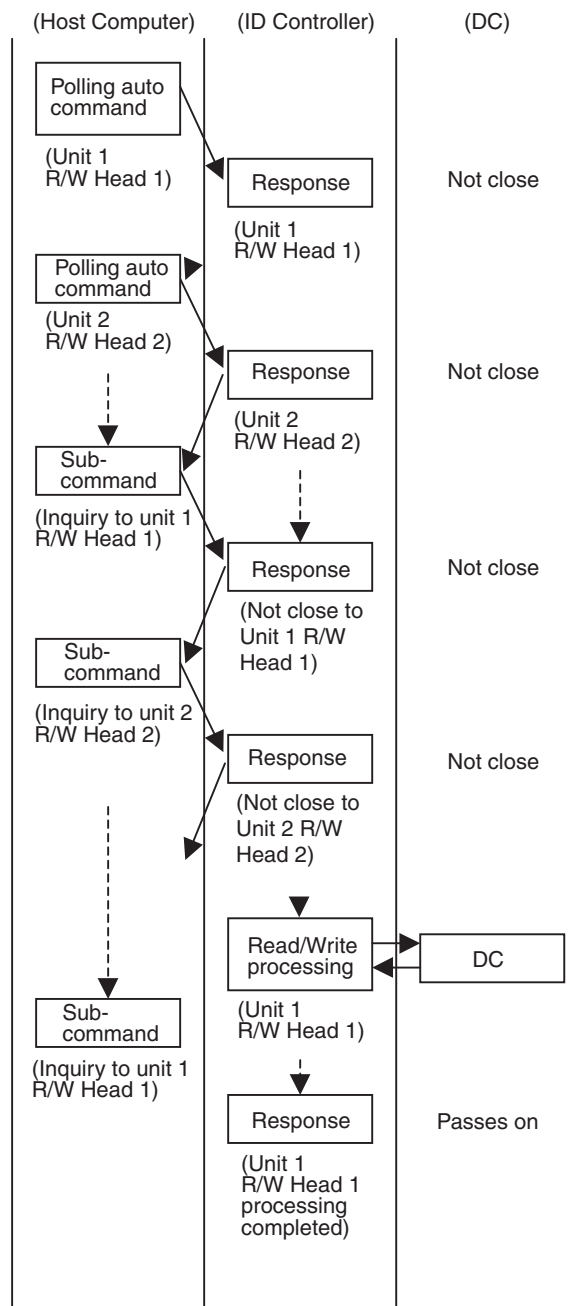


- 1,2,3...**
1. The host computer sends the auto command to Head 1.
  2. The ID Controller does not return the response until the DC comes close to the specified R/W Head, and consequently the host computer stays in the busy condition. If two R/W Heads are connected to the same ID Controller, communications to Head 2 are not possible.
  3. When the DC passes in front of a R/W Head, write or read processing is performed.
  4. Once processing is completed, the ID Controller sends a response to the host computer indicating that processing indicated by the auto command has been completed.

**Note** If another command is sent before a response has been returned for the previously executed command, an error will be returned (end code: 14), and processing of the previous command will be cancelled.

### Polling Auto Function with 1 to N Connection

In the case of normal auto commands, the ID Controller does not return a response until the DC comes close to the specified R/W Head. This means that until the response is sent, the communication path with the host computer remains in the busy condition, and the host computer cannot send commands to the other R/W Head. However, the Polling Auto command enables the ID Controller to return the response when requested by the host computer. Thus, the busy condition on the communication path to the host computer is cleared, and the host computer can then send commands to the other R/W Head.



- 1,2,3...**
1. Send a Polling Auto command to Unit 1 R/W Head 1.
  2. The ID Controller immediately receives the command and returns a response indicating that it has received the command.
  3. Send a Polling Auto command to Unit 2 R/W Head 2.
  4. The ID Controller immediately receives the command and returns a response indicating that it has received the command.
  5. The host computer can query the status of processing using subcommands or suspend polling auto processing.
  6. When the DC is not close to the specified R/W Head, a “not close” response is returned in response to a query subcommand.
  7. When a data carrier passes in front of Unit 1 R/W Head 1, write or read processing is performed.

8. Once processing is completed, the ID Controller sends a response to the host computer indicating that the processing indicated by the query sub-command has been completed.

## 4-2 Data Carrier Memory Map

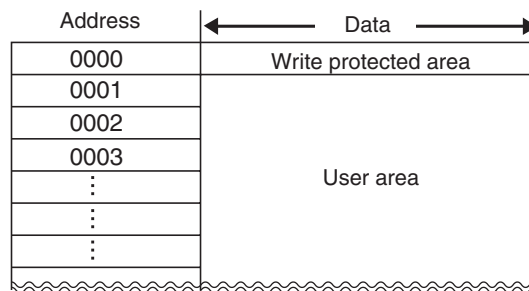
Access to a maximum of 64k bytes of (0000 to FFFF) ID Controller memory area is possible. The actual accessible memory area of the ID Controller varies with the memory capacity of the DC.

A DC with a memory capacity of more than 256 bytes has a production date (month and year) area and write protected area.

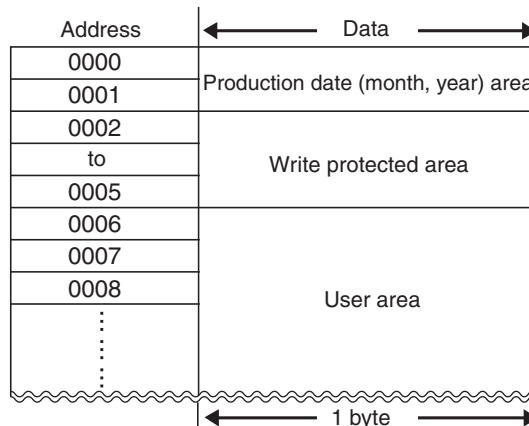
The system areas of DCs vary with the kind of memory (SRAM or EEPROM).

### 4-2-1 Memory Map

DC with a Memory Capacity of 256 Bytes or Less



DC with a Memory Capacity of 256 Bytes or Less



### 4-2-2 Production Date Format

#### 4-2-2-1 DC with a memory capacity of 256 bytes or less

DCs with a memory capacity of 256 bytes or less do not have a production date (month and year) area. The first address of these DCs is a write protect area.

**4-2-2-2 DC with a memory capacity of more than 256 bytes.**

For checking the life of the DC battery, the manufacturer registers the production date in the first two bytes of the memory area immediately prior to shipping the DC from the factory. Data can be read from this area, but cannot be written to it. If a write operation to this area is attempted by mistake, an error message, "7D," will be sent.

**Production Date Control Area**

Address	Bit							
	7	6	5	4	3	2	1	0
0000	Month, first digit				Month, second digit			
0001	Year, first digit				Year, second digit			

- Note**
- (1) The last two digits of the year is used. For example, 92 for 1992.
  - (2) The month is represented by two digits. For example, 03 for March and 10 for October.
  - (3) The years from 2000 onwards are represented by two digits starting from 00. For example, 0400 for April 2000 and 1201 for December 2001.

**Example**

For September 1992, the bits are as follows:

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

**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 up to a specified memory address can be protected. It is recommended that important data be write-protected as follows:

**4-2-3-1 Using DCs with a Memory Capacity of 256 bytes or less****Setting Write Protect Function**

If the write protect end address is set in address 0000 of the Data Carrier's memory, the area from 0001 up to the end address will be write protected. The most significant bit (MSB) of address 0000 determines whether or not the write protect function is in effect.

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

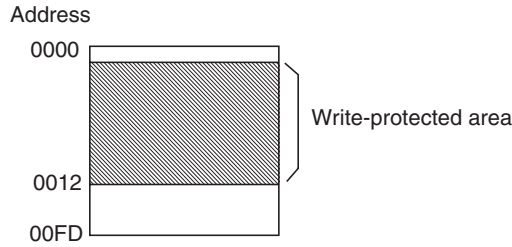
Write protect execution bit (most significant bit of address 0000)

- 1: Write-protected
- 2: Not write-protected

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

**Example 1**

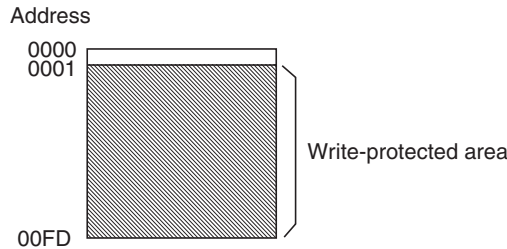
To protect addresses 0001 through 0012:



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

**Example 2**

All bytes except 0000 will be write-protected when the end address is set to 00.(In this example, the end address is set to 00.)



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

**Canceling Write Protection**

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

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

**4-2-3-2 Using DCs with a Memory Capacity Exceeding 256 Bytes**

Specify the four bytes in DC addresses 0002 to 0005. The most significant bit (MSB) of address 0002 is used to specify whether a write protect specification is to be made or not.

Bit Address	7	6	5	4	3	2	1	0
0002	Y/N	Start address lower two bits						
0003	Start address upper two bits							
0004	End address lower two bits							
0005	End address upper two bits							

- When the write protect control bit (address 0002 most significant bit) is 1 (Y), write protect is ON and when it is 0 (N), write protect is OFF.
- The start address of the available setting area is 0006 to 7FFF and the end address is 0006 to FFFF.

The following is an example of the conditions of addresses 0006 to 07FF to be write protected.

Address	Upper bits				Lower bits			
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			

When the addresses are not write protected, the conditions of the addresses are as follows:

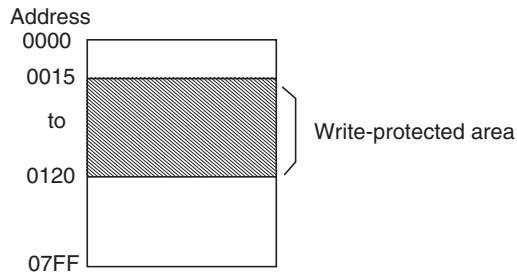
Address	Upper bits				Lower bits			
0002	0	0	0	0	0	0	0	0
	0				0			
0003	0	0	0	0	0	0	0	0
	0				0			
0004	0	0	0	0	0	0	0	0
	0				0			
0005	0	0	0	0	0	0	0	0
	0				0			



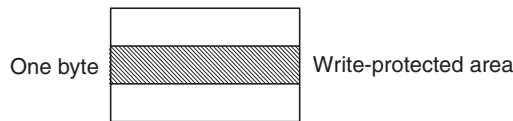
**Write Protection Setting Examples (DC Memory: 2 Kbytes)**

1. To write protect address 0015 to 0120 (start address < end address)

Address	Upper bits				Lower bits			
0002	1	0	0	0	0	0	0	0
0003	0	0	0	1	0	1	0	1
0004	0	0	0	0	0	0	0	1
0005	0	0	1	0	0	0	0	0



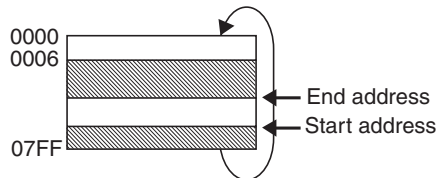
2. To write protect one byte only (start address = end address)  
Set the same address for the start and end addresses.



3. When the end address exceeds the final address of the DC (end address > 07FF)  
The DC memory area is 0000 to 07FF. Therefore, the addresses up to 07FF will be write protected.



4. When the start address exceeds the end address (start address > end address)  
The areas from DC 0006 to the end address and the start address up to 07FF will be write protected.



**Canceling Write Protection**

To cancel write protection, clear the most significant bit of address 0002 to 0. The write protection will be cancelled and the start and end address specified in 0002 to 0005 will be invalid.



**Note** The DC (except V600-D2KR16) contains a thionyl chloride-type lithium battery. One characteristic of this type of battery is its tendency to develop a higher internal resistance when it is not used. If the battery is not used for several months, the internal resistance can increase enough to cause a low battery response, even if the battery is good.

Therefore, after several months of disuse it is recommended to transmit data to/from the DC for about 10 minutes to “warm up” the battery and decrease its internal resistance. This operation will have almost no effect on the useful life of the battery.

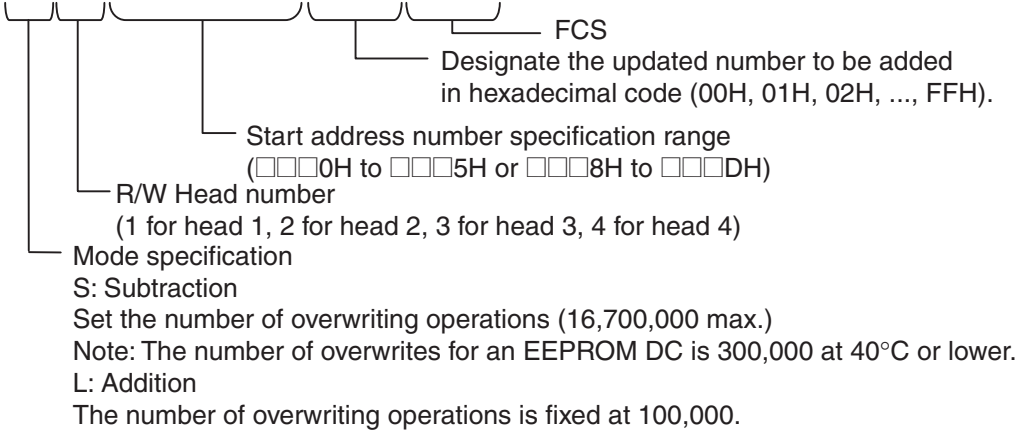
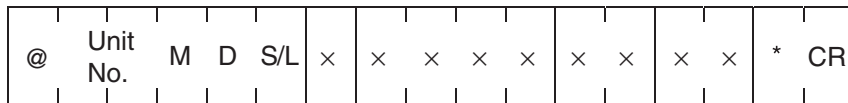
### 4-2-4-2 EEPROM DC without Battery

The Management Data Subtraction (MDS) command or Management Data Limit (MDL) command can be used to determine whether the number of times the EEPROM of a DC has been overwritten exceeds the limit.

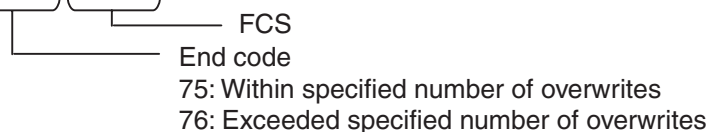
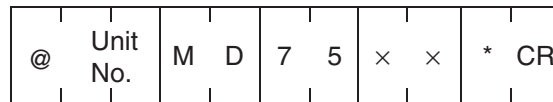
The MDS command makes it possible to check whether the EEPROM of a DC has been overwritten more than the user-set number of times by subtracting the number of overwrite operations from the data in the management area designated by the user.

The MDL command makes it possible to check whether the EEPROM of a DC has been overwritten more than 100,000 times by adding the number of overwrite operations to the data in the management area designated by the user. The MDL command is used exclusively for EEPROM DCs that allow 100,000 overwrite operations.

#### Command Format



#### Response Format



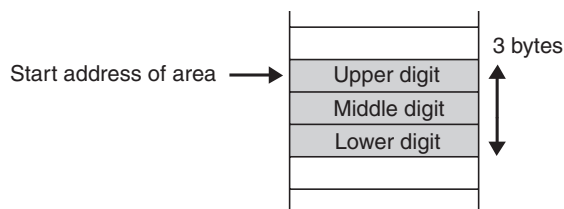
**Note** Set the area start address to 0000 to 0005 to or 0008 to 000D. If addresses 0006 to 0007 or to 000E to 000F are set, an address error (end code: 7A) will be returned.

**MDS Command**

Use the Write command to specify in the management area in advance the user-set number of overwrite operations that can be performed. The management area consists of the first three bytes. If the value obtained by subtracting the number of overwrite operations from this area is 0 (00), the end code warning of 76 will be returned. The maximum number of user-set overwrite operations that can be performed is 16,700,000. For EEPROM DCs, however, the EEPROM can be overwritten 300,000 (0493E0H) times at 40°C or lower, so set the value no higher than 300,000.

The number of overwrite operations is written in hexadecimal code in the management area. It is possible to read the data from the management area using the Read command.

If the data in the management area is already 0 times, the data in the management area will not be updated and only a warning will be returned as a response. If the number of overwrite operations that can be performed is set to 00, the recorded number of times will not be updated and only the number of overwrite operations is checked.



■ **MDS Command Example**

The following are MDS command usage examples with the condition that three bytes beginning with 0010 are used as the management area.

- 1,2,3... 1. Input 300,000 as the number of write operations.

"@00WTH100100493E040\*\*"

0010H	0 4 H
0011H	9 3 H
0012H	E 0 H

2. Input 5 as the number of overwrite operations

"@00MDS10010052F\*\*"  
5 will be subtracted from 300,000

0010H	0 4 H
0011H	9 3 H
0012H	D B H

3. The total number of operations is 300,000.

When "@00MDS10010002A\*\*" is executed, the response MD76 (excessive overwriting operations) results.

0010H	0 0 H
0011H	0 0 H
0012H	0 0 H

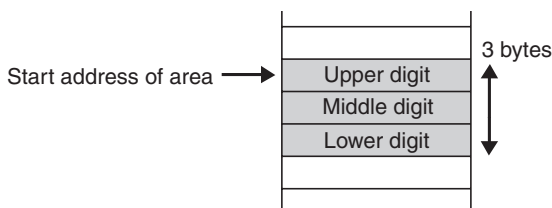
**MDL Command**

The management area consists of the first three bytes. If the value written to this area as the total number of overwrite operations is 100,000 (0186A0) times or more, an end code warning of 76 will be returned.

The number of overwrite operations is written in hexadecimal code in the management area. Data can be read from the management area using the Read command. If the management area data is already 100,000 times or more, the data in the management area will not be updated and only a warning will be returned as a response. If the updated number of overwrite operations is set to 00, the number will not be updated and only the number of overwrite operations can be checked.

■ **MDL Command Example**

The following are MDL command usage examples with the condition that three bytes beginning with 0010 are used as the management area.



- 1,2,3... 1. The management area is cleared.

"@00WTH100100000003B\*\*"

0010H	0 0 H
0011H	0 0 H
0012H	0 0 H

2. Input 4 as the number of overwrite operations.

"@00MDL100100431\*\*"

0010H	0 0 H
0011H	0 0 H
0012H	0 4 H

3. Input 5 as the number of overwrite operations.

"@00MDL100100530\*\*"  
is added, to make 9 times.

0010H	0 0 H
0011H	0 0 H
0012H	0 9 H

- The total number of overwrites is 100,000 times.

When "@00MDL100100035\*" is executed, MD76 (excessive overwriting operations) results.

0010H	0 1 H
0011H	0 0 H
0012H	0 9 H

**Note** Do not send the MDS and MDL commands together to the same Data Carrier. Doing so will prevent service life data management. The maximum number of overwrite operations for an EEPROM DC depends on the operating environment as follows:

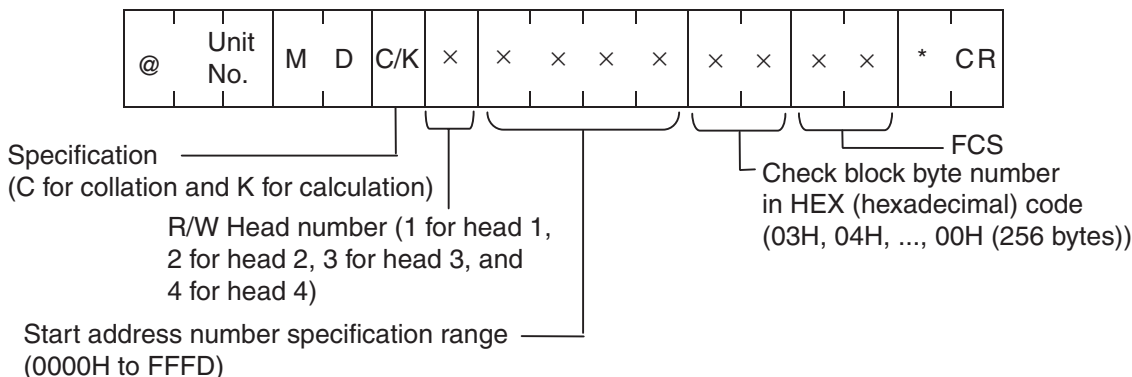
Ambient operating temperature lower limit to 70°C: 100,000 operations

Ambient operating temperature lower limit to 40°C: 300,000 operations

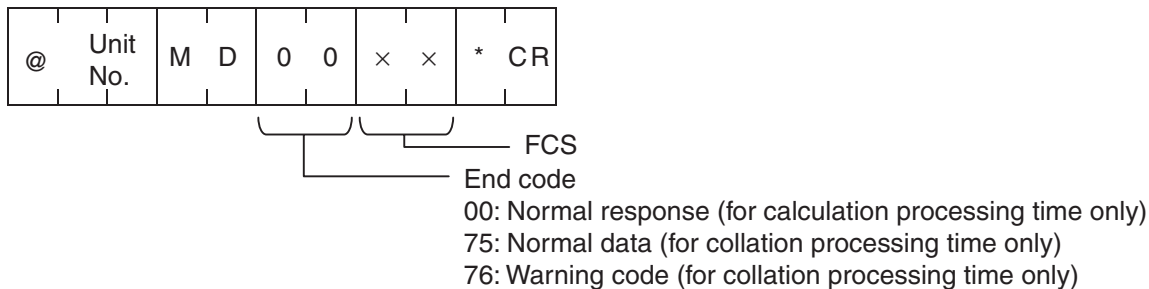
### 4-2-5 DC Memory Check Function

The MD command enables memory check. By designating the check block, it is possible to calculate, write, and verify the CRC (Cyclic Redundancy Check) code. The CRC code is calculated using the formula  $X^{16} + X^{12} + X^5 + 1$ .

#### Command Format



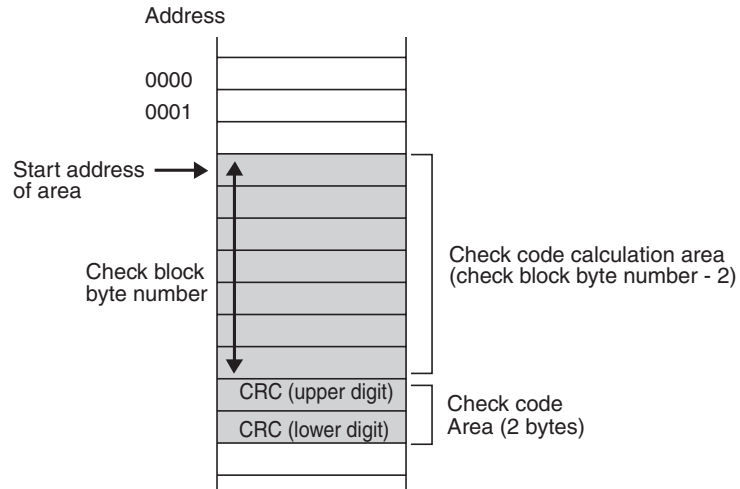
#### Response Format



In a check block, which is designated by the first address and the number of bytes, the area excluding the last two bytes can be calculated. The check code area is the last two bytes.

If the user designates to write a check code (using processing code K), the CRC of the data in the area to be calculated will be processed and the result will be written to the check code area.

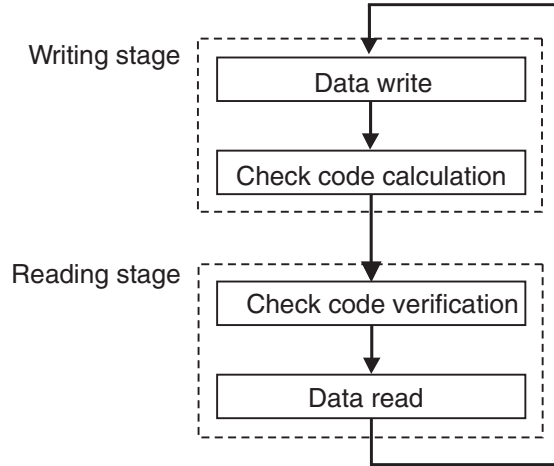
If the user designates to verify data (using processing code C), the CRC of the data in the area to be calculated will be processed and compare the result with the data in the check code area. If they coincide, an end code of 75 will be returned. If they do not coincide, an end code warning of 76 will be returned.



**Application Method**

After writing data, calculate and write the check code using the calculation processing code of the Management Data Check command. Before reading, verify the check code using the verification processing code of the Management Data Check command.

This operation can be used to detect damage to data in the Data Carrier while it is not being accessed.



**DC Memory Check Command Example**

The following is a DC memory check command usage example for checking the data in 0010 to 0012.

1. This example is on condition that the following data exists from the start.

0010H	1 2 H
0011H	3 4 H
0012H	5 6 H
0013H	

2. “@00MDK100100537\*” (calculation processing) is executed.

CRC code (5CD6) calculated from 123456 is written at addresses 0013 and 0014.

0010H	1 2 H
0011H	3 4 H
0012H	5 6 H
0013H	5 C H
	D 6 H



3. "@00MDC10010053F\*" (verification processing) is executed.

If the data values coincide, "@00MD754B\*" (normal response code) will be returned.

0010H	1 2 H
0011H	3 4 H
0012H	5 6 H
0013H	5 C H
0013H	D 6 H

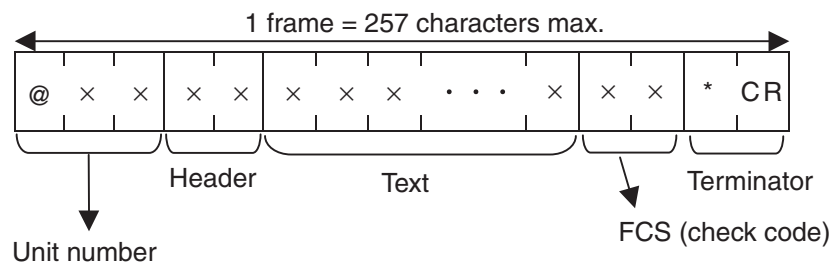
If the data values do not coincide, "@00MD7648\*" (abnormal response code) will be returned.

0010H	0 0 H	← Abnormal data
0011H	3 4 H	
0012H	5 6 H	
0013H	5 C H	
0013H	D 6 H	

## 4-3 Command Format

### Command and Response Format

The format of commands sent from the host computer to the ID Controller and the responses that are returned are explained here.

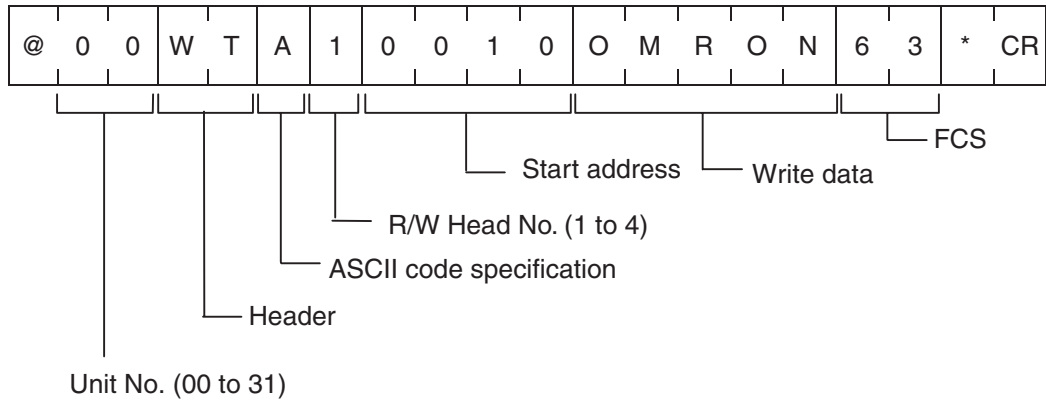


Name	Details
Unit number	This indicates the unit number of the ID Controller that is communicating. Unit numbers 00 to 31 can be specified.
Header	This contains the 2-character abbreviation for the command function. If it is a response, the same abbreviation as that of the command sent is entered here.
Text	This contains the command response. <ul style="list-style-type: none"> <li>• ASCII/Hexadecimal Code Specification</li> <li>• Destination R/W Head No. Specification</li> <li>• Start Address</li> <li>• Write Data/Read No.</li> </ul>
Terminator	This indicates end of command response.
FCS	This contains the horizontal parity check data.

### Data Code Specification

The command must include a specification indicating whether to handle the data that is to be read or written as character data in ASCII code, or as numerical data in hexadecimal code.

**ASCII Code Specification** One character of data exclusively occupies one byte (one address) of DC memory in ASCII code.



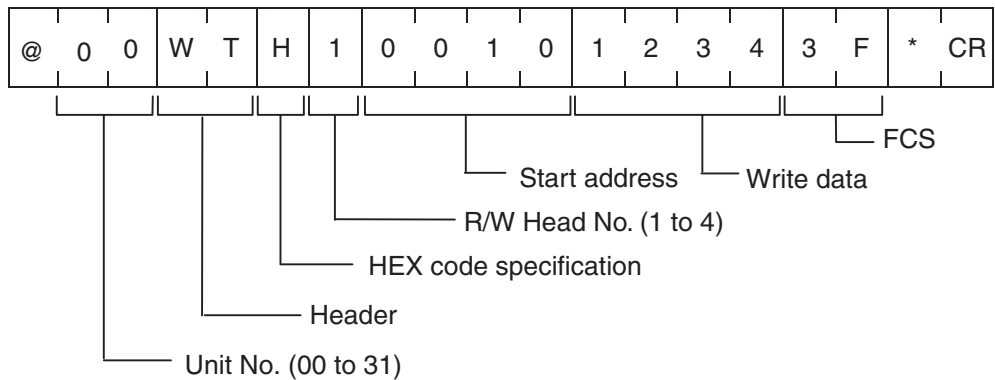
**Data Carrier Memory Address**

0010H	4	F	"O"
0011H	4	D	"M"
0012H	5	2	"R"
0013H	4	F	"O"
0014H	4	E	"N"

**Hexadecimal Code Specification**

One character is handled as hexadecimal numerical data. Therefore, only characters 0 to F can be accepted.

Two data characters exclusively occupy one byte (one address) of DC memory as is. Therefore, always make sure that all write commands are specified in two-character units (even number).



**Data Carrier Memory Address**

0010H	1	2
0011H	3	4

## 4-4 Command Types and Responses

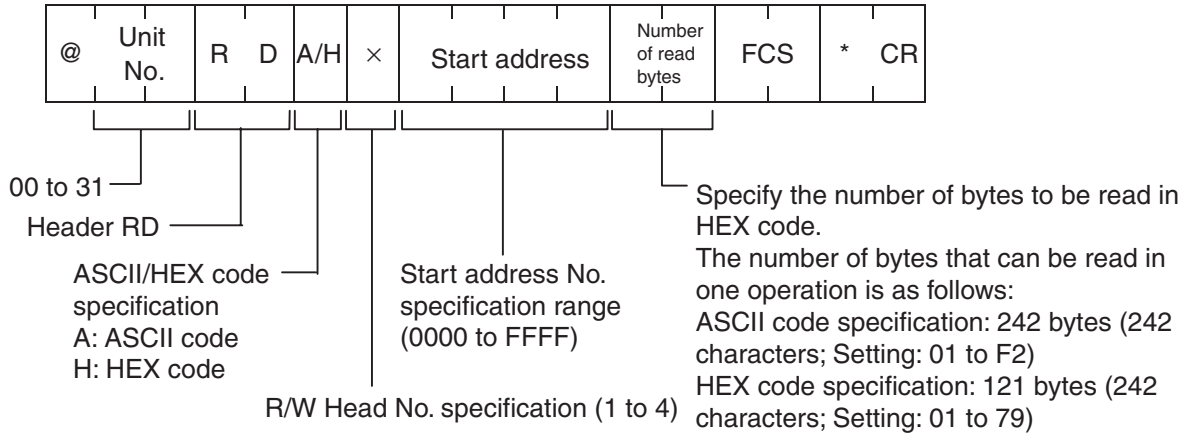
### Command Response Table

Command	Abbr.	Processing	Page	
Read	RD	Read data from or write data to DC. If DC is not present, return error response.	43	
Write	WT		43	
Data Fill	DF	Write to specified area of memory in DC using specified data. If DC is not present, return error response.	44	
Copy	CP	Write data read from DC memory by one R/W Head to the memory of a DC in the range of another R/W Head. If DC is not present at copy source or copy destination, return error response.	44	
Expanded Read	ER	Read up to 8 KB of data from the DC.	45	
Auto Read	AR	Wait until DC approaches, and read or write.	Once command processing is completed, return response data.	
Auto Write	AW			
Auto Data Fill	AF			Wait until DC approaches, and write to specified area in memory using specified data.
Auto Copy	AP			Wait until DC approaches copy source, and write data read from DC memory by one R/W Head to the DC memory in the other R/W Head.
Polling Auto Read	PR	Wait until DC approaches, and read or write data.	Command processing results can be queries.	
Polling Auto Write	PW			
Auto Command Processing Cancel	AA	Cancel auto command (Auto Read or Auto Write) processing before completion.	52	
Management Data Check command	MD C/K	Perform data check of DC memory.	53	
Management Data Subtraction and Management Data Limit commands	MDS MDL	Manage the number of times the DC memory (EEPROM) is overwritten.	54	
Status Set/Check All	SSA	Set the ID Controller system settings and auto wait time all at once, or check setting status.	Reflect settings immediately.	
ID Controller Unit Number Set	SSM	Set the unit number of the ID Controller.		
Verification ON/OFF	SSB	Set whether to verify or not.		
Communications Mode Set	SSC	Set the communications mode.		
Auto Wait Time Set	SSW	Set the auto wait time.		
Communications Test Mode Switch	SST	Set to enable/disable the communications test mode switch.		
Test	TS	Returns the same test message sent from the host computer without change.	58	
Abort (Reset)	XZ	Restore initialization status of ID Controller immediately after power turned ON. There is no response. Do not use the abort command while communicating with the DC.	58	

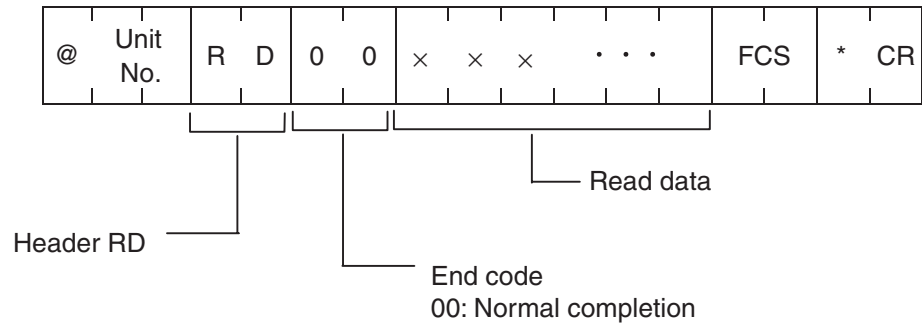
### 4-4-1 Read (RD)

Data is read from the DC. If the DC is not present, an error response (end code: 72) is returned.

#### Command Format



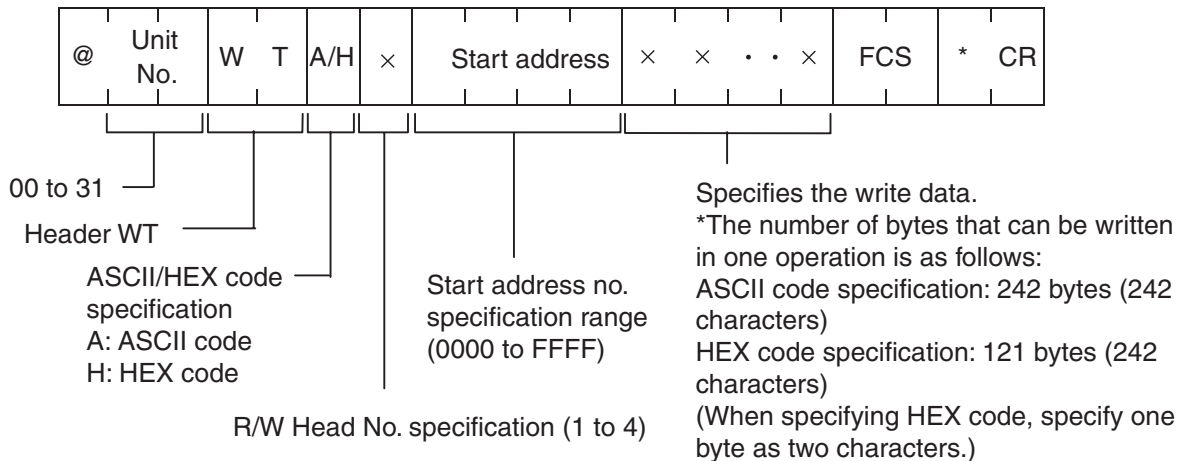
#### Response Format



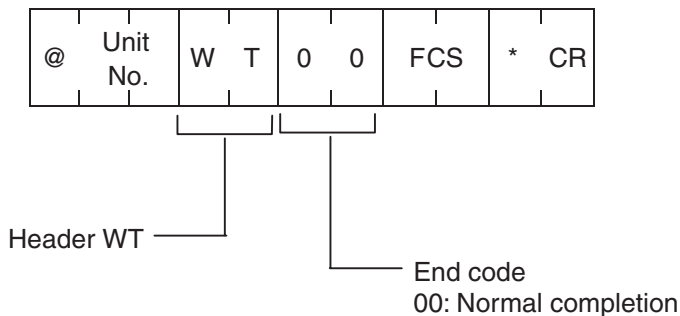
### 4-4-2 Write (WT)

Data is written to the DC. If the DC is not present, an error response (end code: 72) is returned.

#### Command Format



Response Format

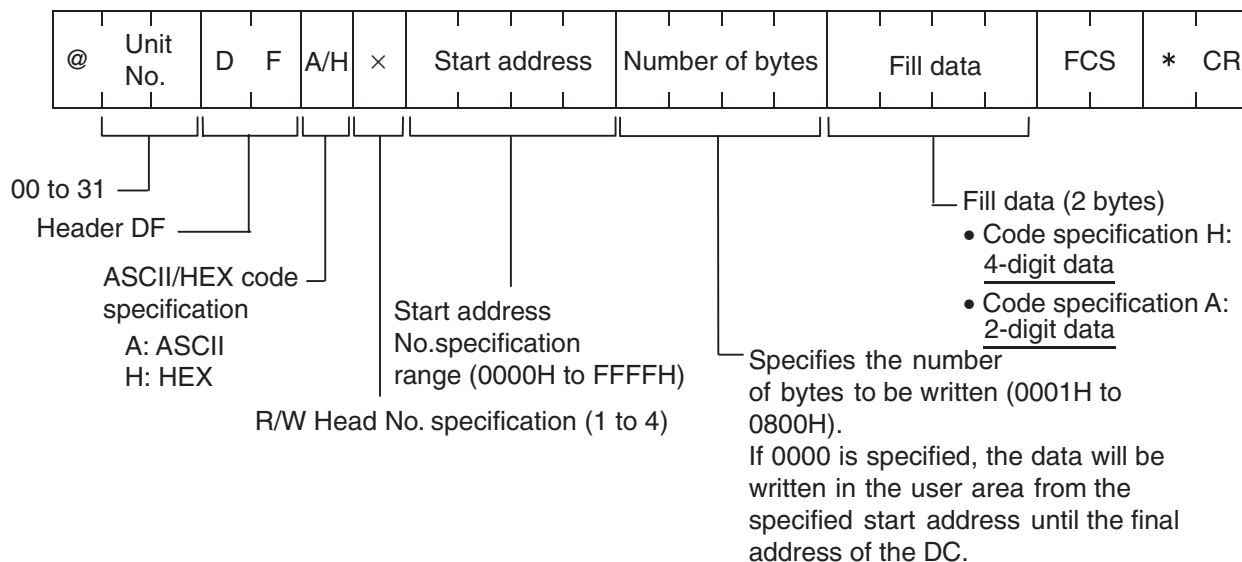


### 4-4-3 Data Fill (DF)

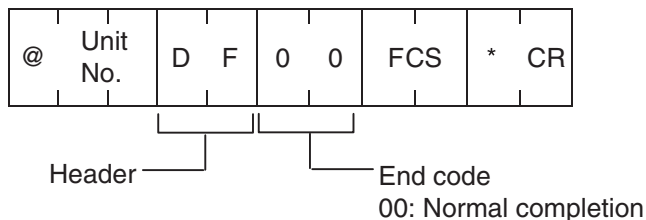
Fill data in the specified number of bytes beginning from the specified start address is written to the DC.

The maximum amount of data that can be written in one execution of the command is 2,048 bytes or the rest of the area from the specified start address.

Command Format



Response Format

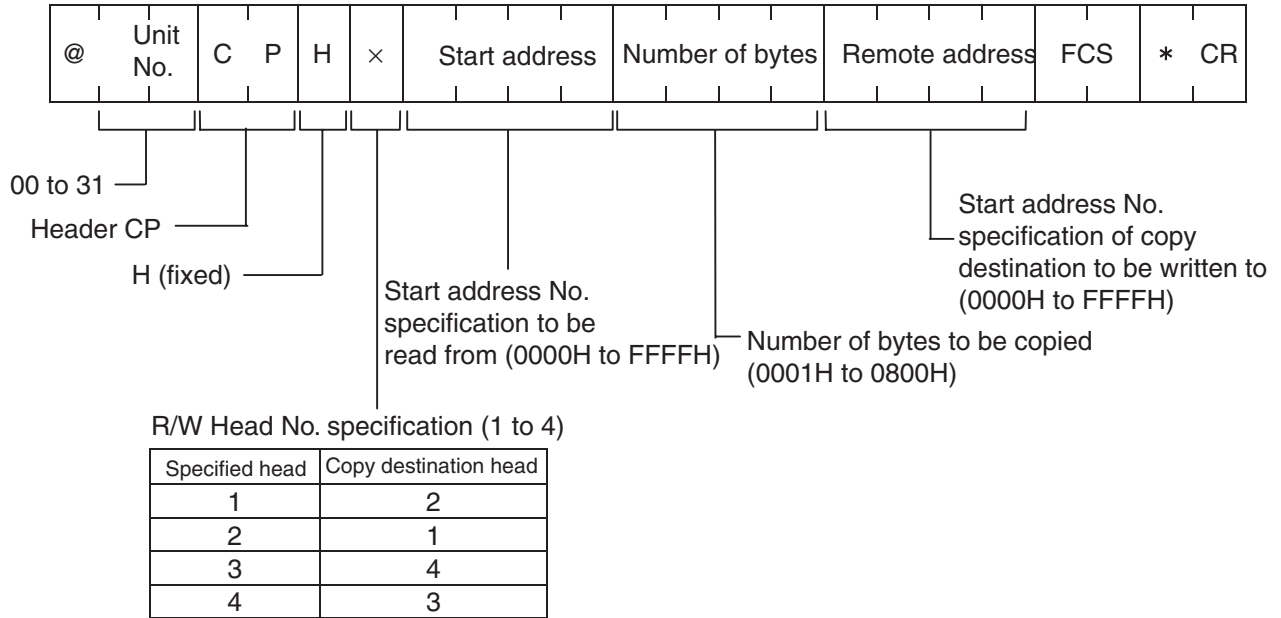


### 4-4-4 Copy (CP)

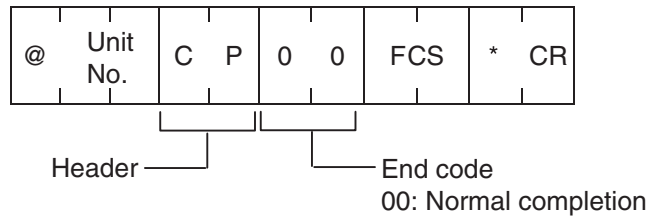
Data read from the DC memory by one R/W Head is written to the memory of a DC within the communications range of another R/W Head. A trigger is always written when writing to the DC.

Use the Copy command for the combination of R/W Heads 1 and 2, or R/W Heads 3 and 4.

**Command Format**



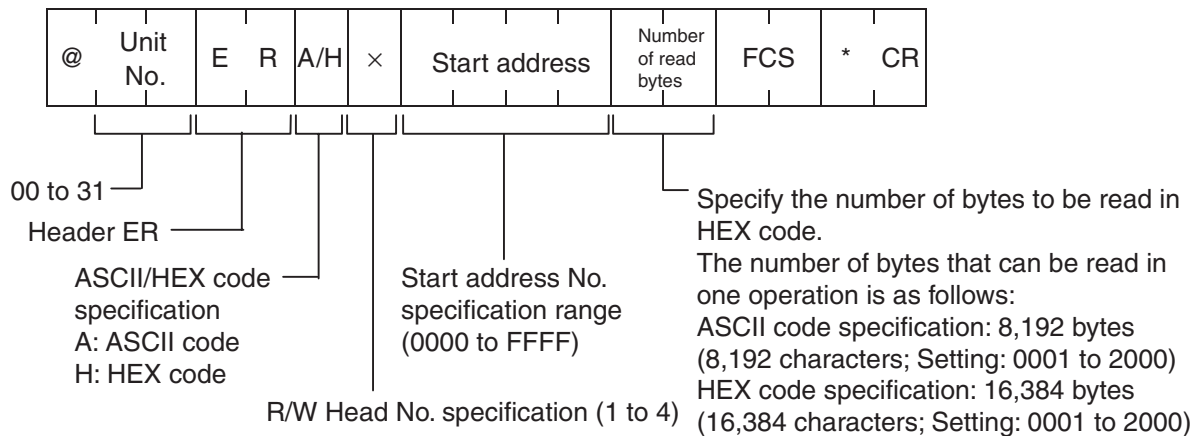
**Response Format**



**4-4-5 Expanded Read (ER)**

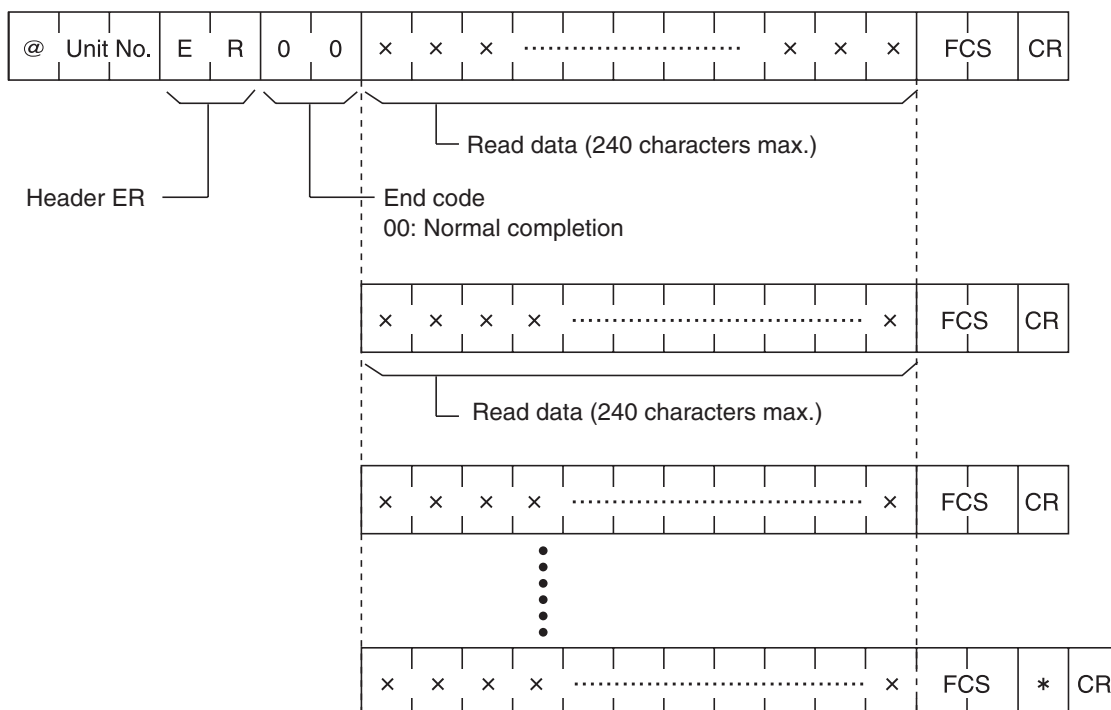
Up to 8 KB of data is read from the DC. If the DC is not present, an error response (end code: 72) is returned.

**Command Format**



**Response Format**

If more than 240 characters of data is read, a delimiter (CR = 0D hex) is inserted every 240 characters.

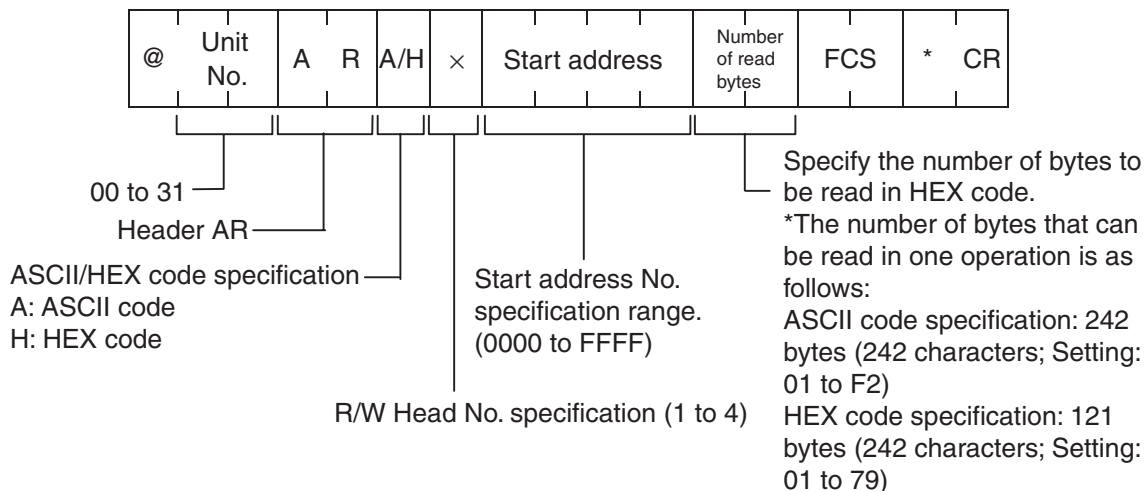


**Note** All other commands are ignored while ER is being executed.

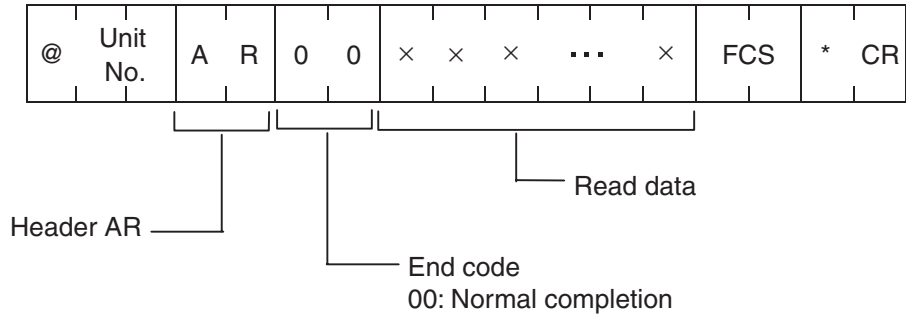
**4-4-6 Auto Read (AR)**

This is a command to wait for the approach of the DC, and then read the data. After local communications are completed, the ID Controller returns the response. The host computer cannot send commands to the other R/W Heads until the response has been received.

**Command Format**



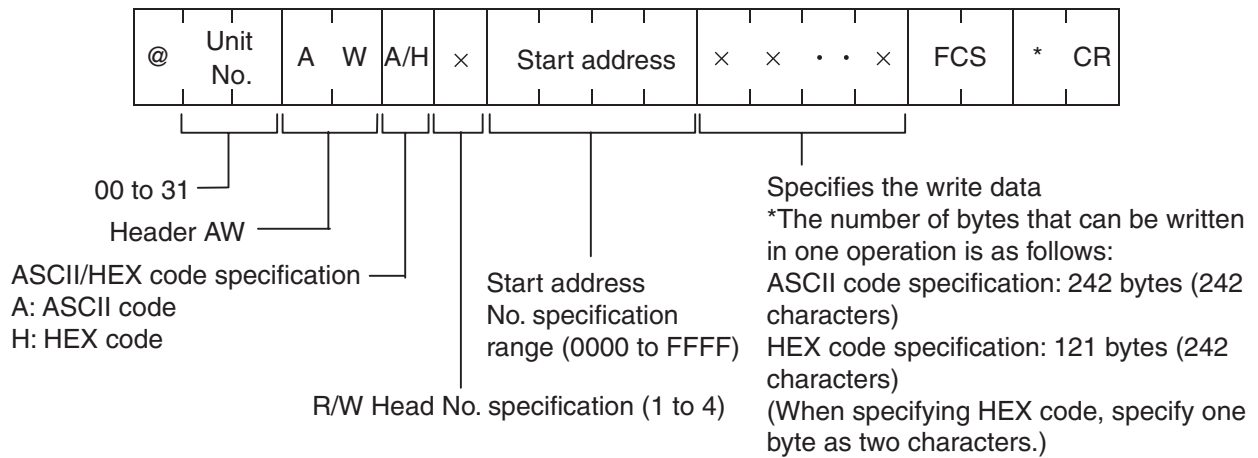
**Response Format**



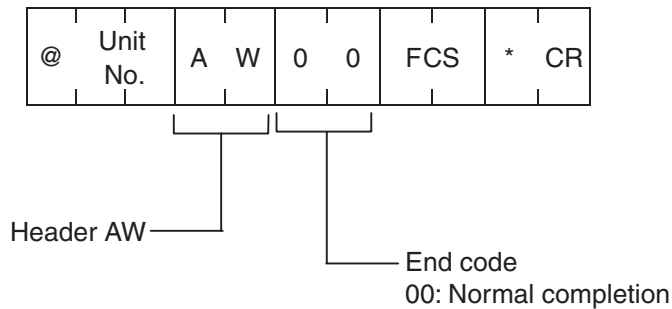
**4-4-7 Auto Write (AW)**

This is a command to wait for the approach of the DC, and then write the data. After local communications are completed, the ID Controller returns the response. The host computer cannot send commands to other R/W Heads until the response has been received.

**Command Format**



**Response Format**



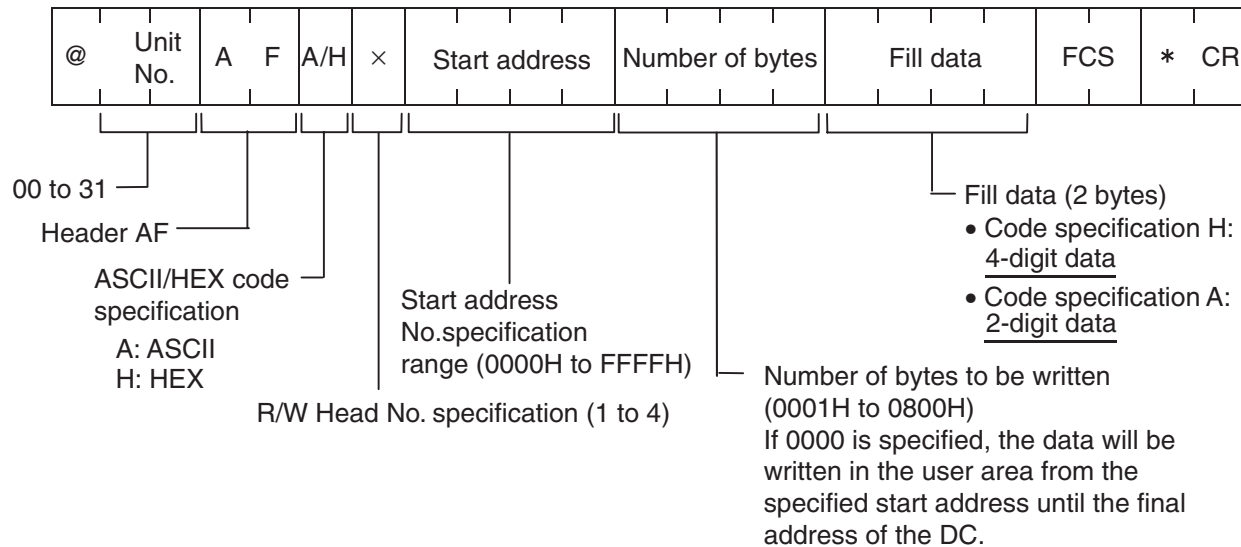
**4-4-8 Auto Data Fill (AF)**

This is a command to wait for the approach of the DC, and then write to the DC the specified number of bytes of fill data beginning from the specified start address. The maximum amount of data that can be written during one execution of the command is 2,048 bytes or the whole area from the specified start address.

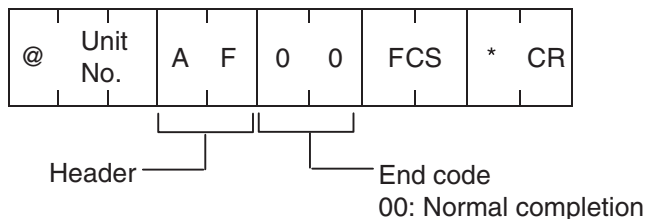
The host computer cannot send commands to other R/W Heads until the response has been received.



**Command Format**



**Response Format**



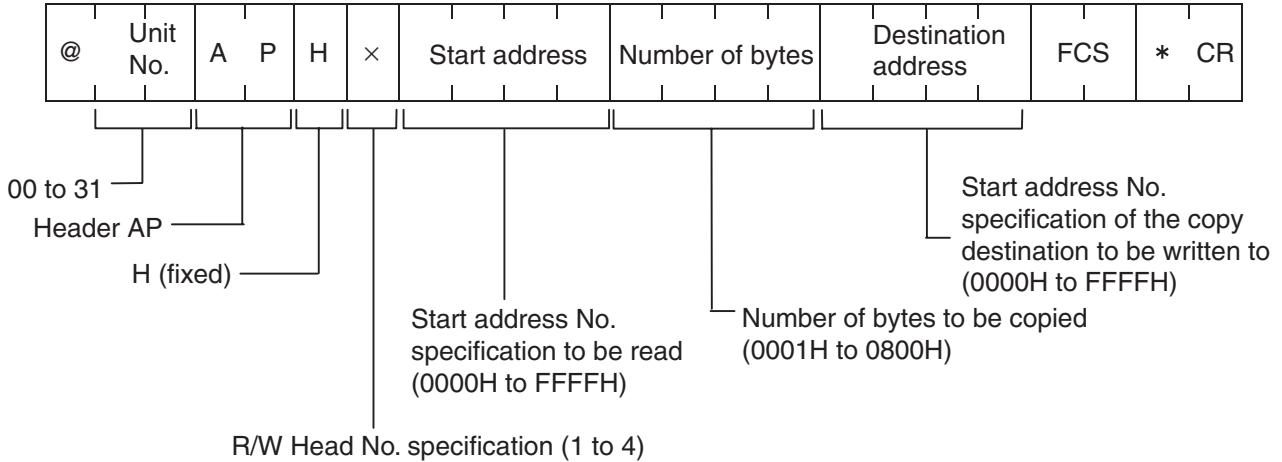
**4-4-9 Auto Copy (AP)**

This is a command to wait for the approach of the DC, and then write data read from the DC memory by one R/W Head to the DC memory in the communications area of another R/W Head. A trigger is always written when writing to the DC.

The Auto Copy command is used for the combination of R/W Heads 1 and 2, or 3 and 4.

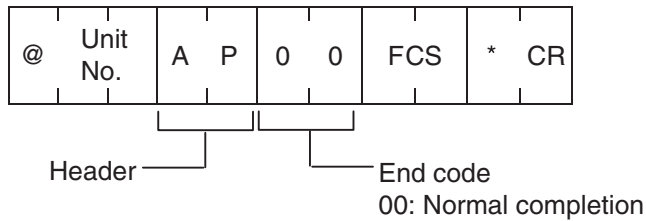
The host computer cannot send commands to other R/W Heads until the response has been received.

**Command Format**



Specified head	Copy destination head
1	2
2	1
3	4
4	3

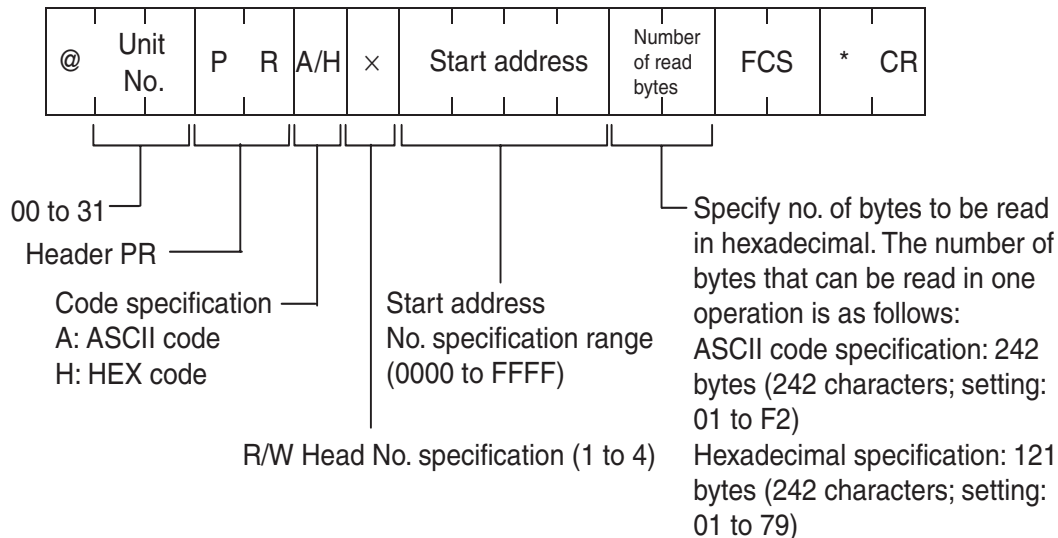
**Response Format**



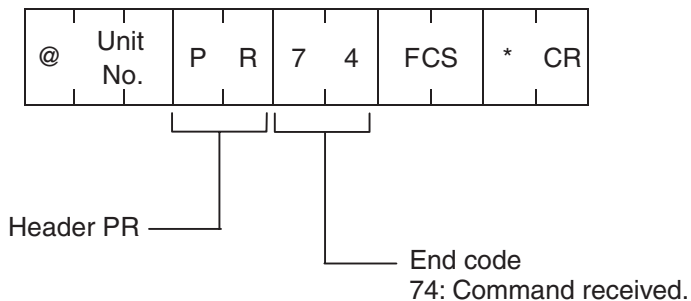
**4-4-10 Polling Auto Read (PR)**

Immediately after the host computer sends a polling auto command, the ID Controller returns a response indicating that a command has been received. Subsequently, after waiting for the approach of the DC, the ID Controller reads the data. During this time, the host computer can use subcommands to query the command processing results. It can also send commands to other R/W Heads.

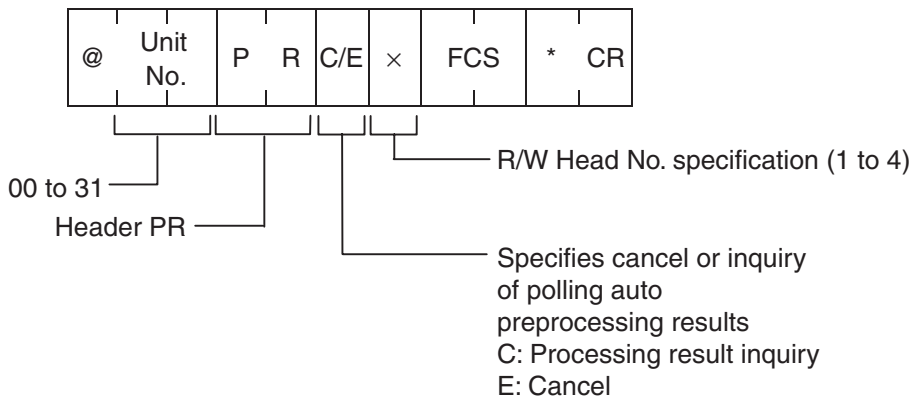
**Command Format**



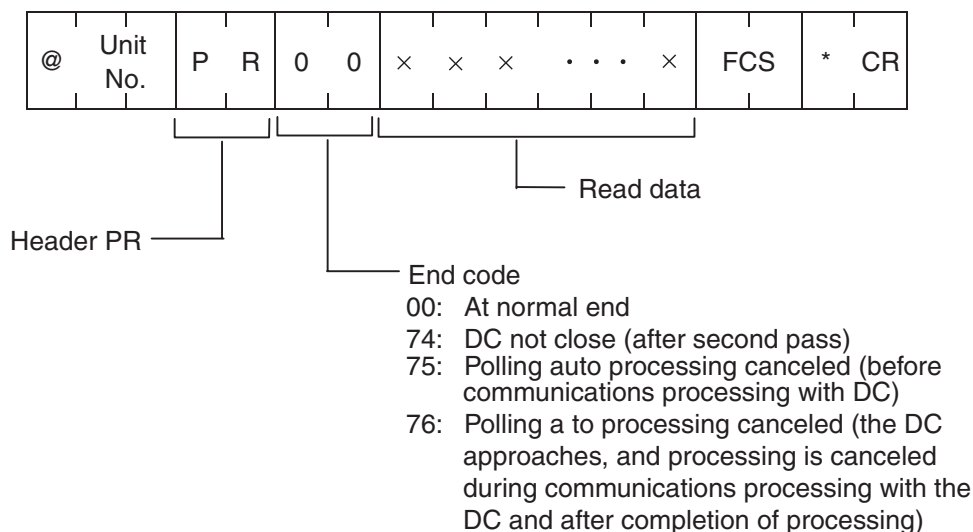
**Response Format**



**Subcommand Format**



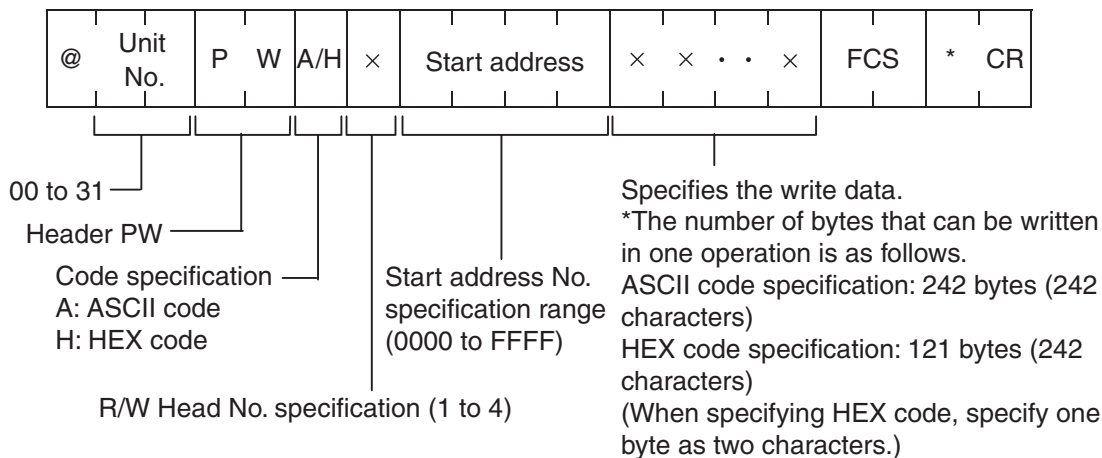
**Subcommand Response Format**



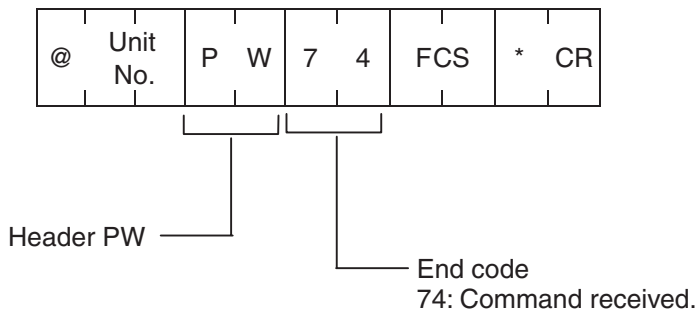
**4-4-11 Polling Auto Write (PW)**

Immediately after the host computer sends a Polling Auto command, the ID Controller returns a response indicating that a command has been received. After waiting for the approach of the DC, the ID Controller then writes the data. During this time, the host computer can use subcommands to query the command processing results. It can also send commands to other R/W Heads.

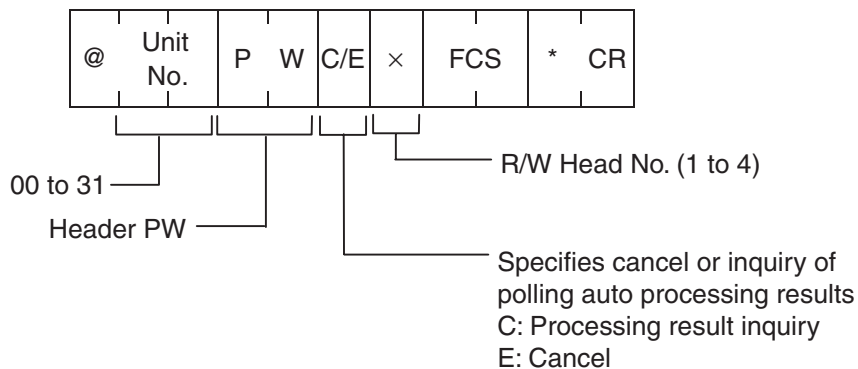
**Command Format**



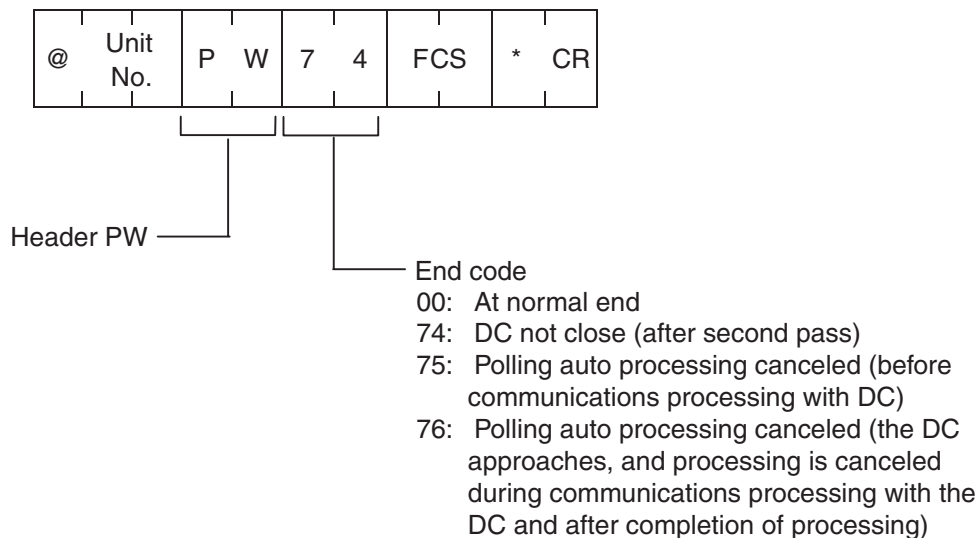
**Response Format**



**Subcommand Format**



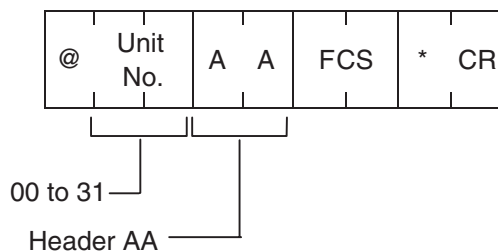
**Subcommand Response Format**



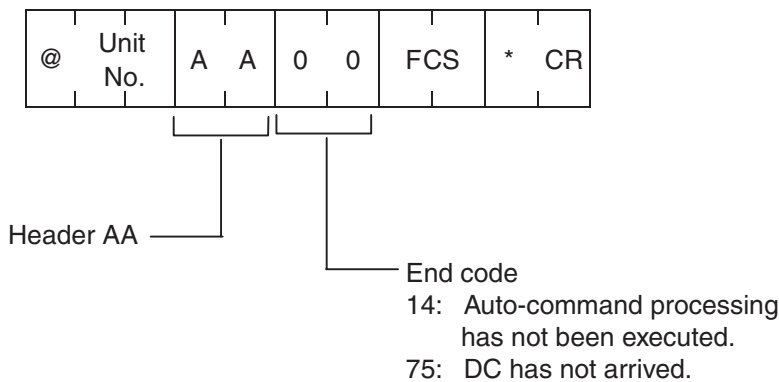
**4-4-12 Auto Command Processing Cancel (AA)**

Auto command processing is cancelled, and the command wait status is restored.

**Command Format**



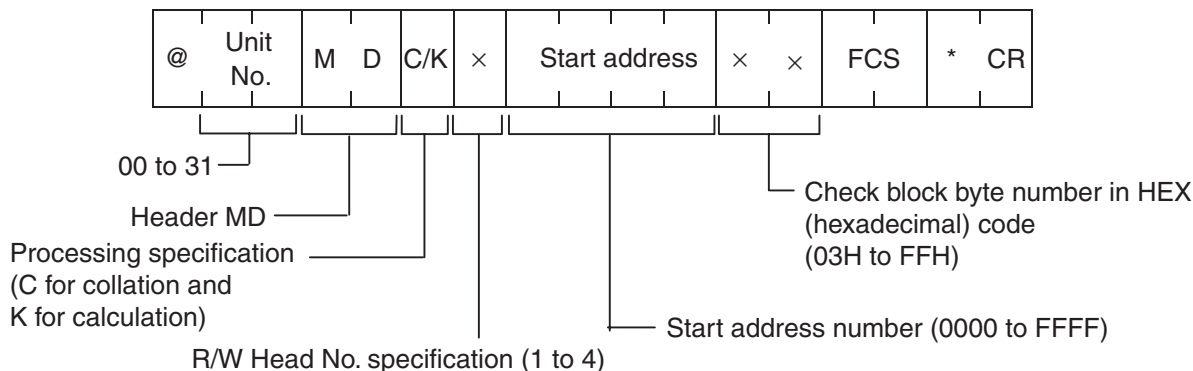
Response Format



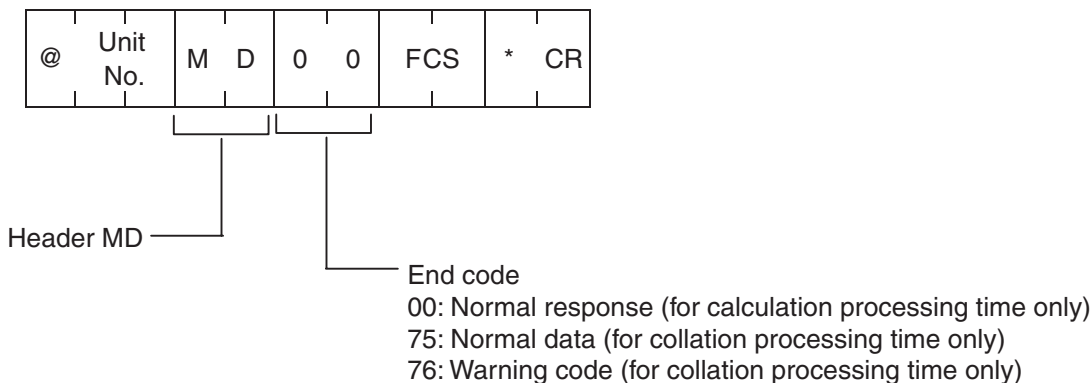
### 4-4-13 Management Data Check (MD C/K)

This command makes it possible to write or verify the CRC code in a check block that the user designates. The CRC code is calculated using the formula  $X^{16} + X^{12} + X^5 + 1$ .

Command Format



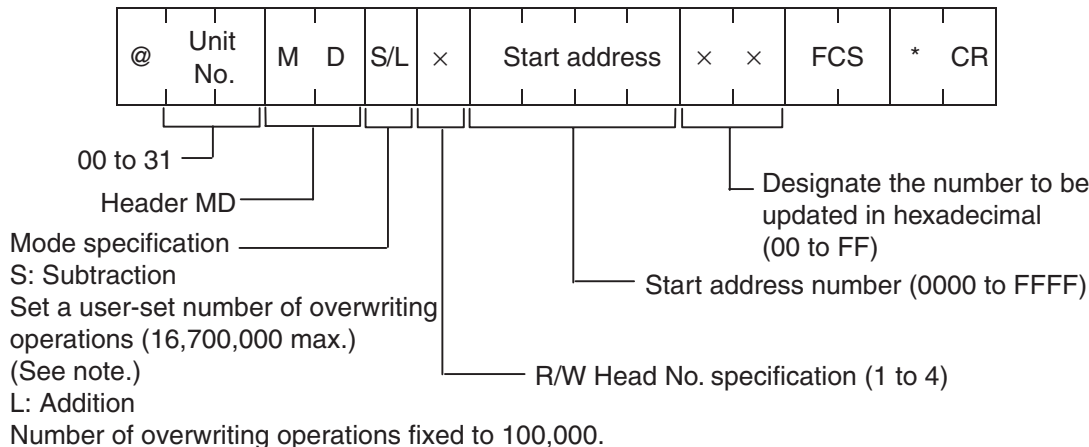
Response Format



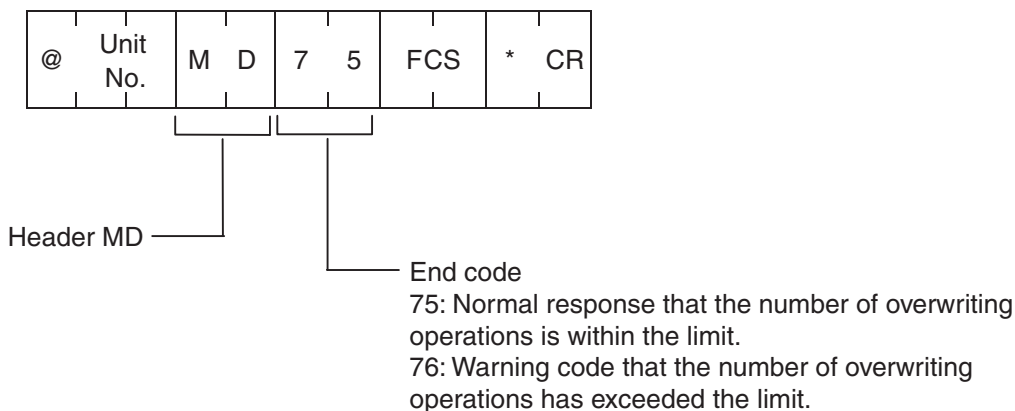
### 4-4-14 Management Data Subtraction (MDS) and Management Data Limit (MDL)

These commands are used to control the number of times that the EEPROM of a DC can be overwritten. By updating the management area designated by the user, the user can determine whether the number of times the EEPROM has been overwritten exceeds the set number.

#### Command Format



#### Response Format



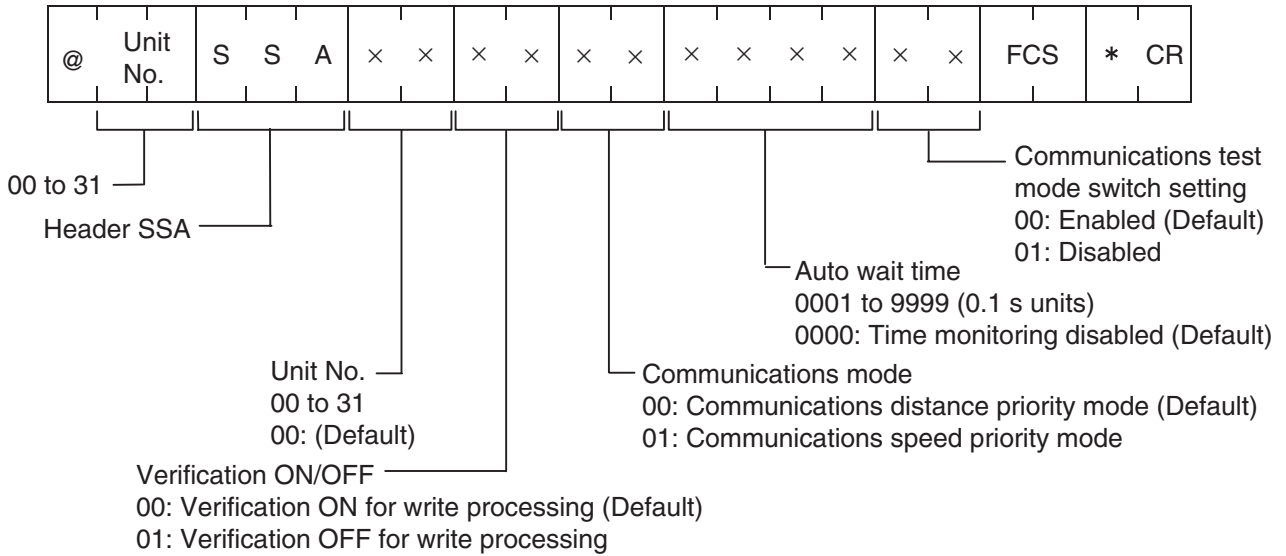
**Note** The service life of an EEPROM DC is 300,000 write operations at 40°C max.

### 4-4-15 Status Set/Check All (SSA)

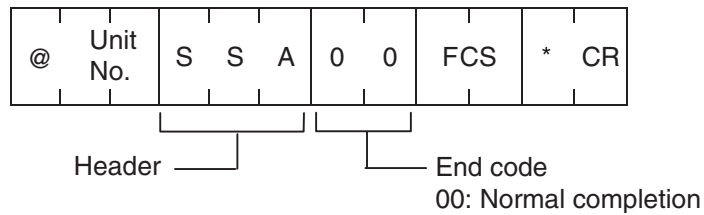
The ID Controller's system settings and auto wait time are set all at once. The status can be read by adding FF.

The settings are immediately reflected, and the ID Controller is set to command wait status.

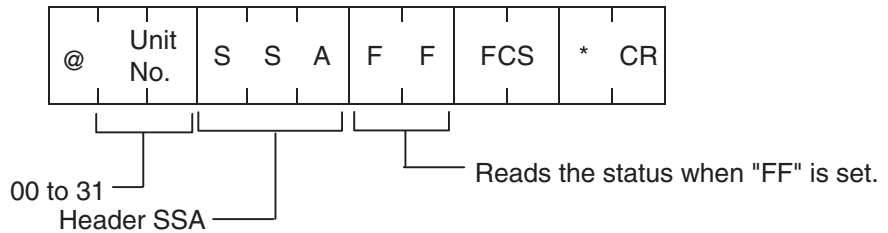
**Command Format  
(Status Set All)**



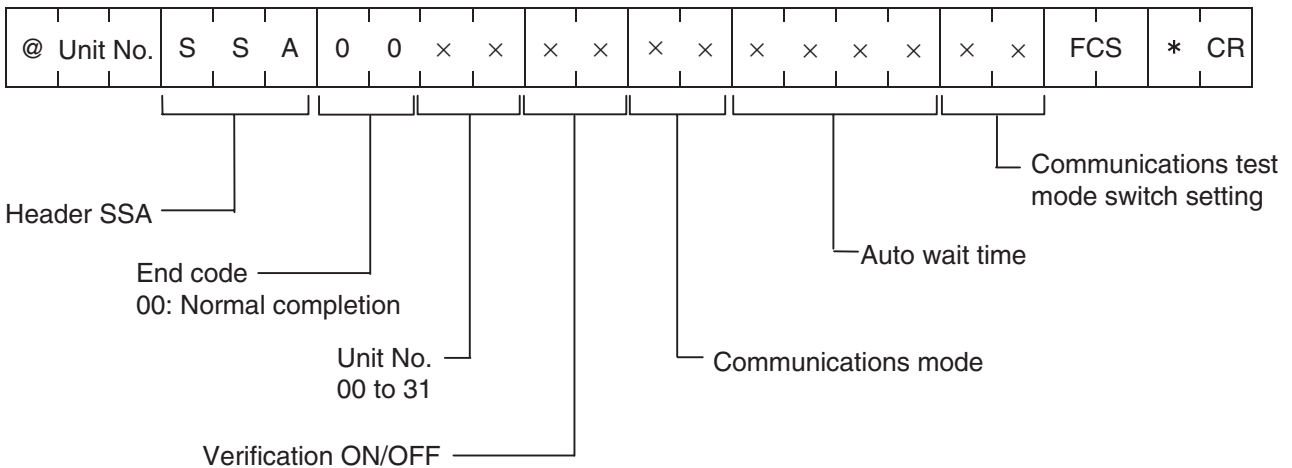
**Response Format  
(Status Set All)**



**Command Format  
(Status Check)**



**Response Format  
(Status Check)**



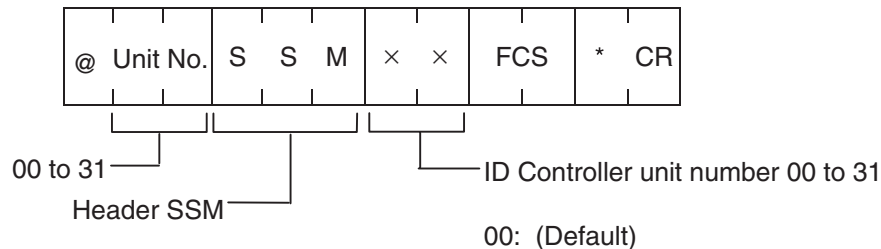


### 4-4-16 ID Controller Unit No. Set (SSM)

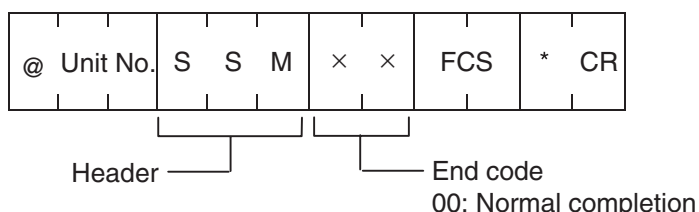
The unit number of the ID Controller is set.

The setting is reflected immediately, and the ID Controller is set to command wait status.

#### Command Format



#### Response Format

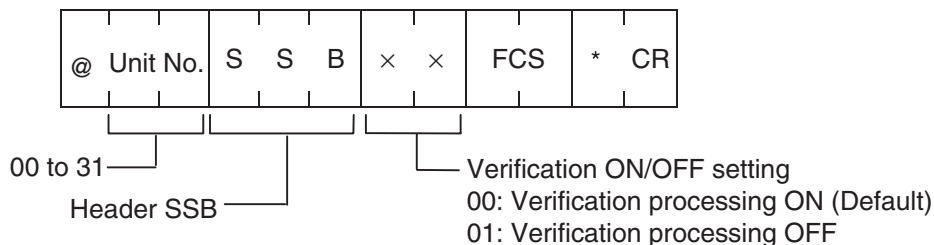


### 4-4-17 Verification ON/OFF (SSB)

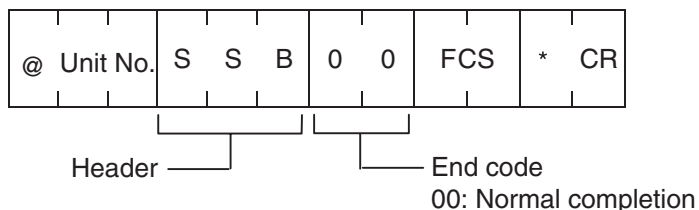
Verification during command processing for writing to the DC is either set to ON or OFF. By turning OFF verification processing, the communications time can be shortened.

The settings are reflected immediately, and the ID Controller is set to command wait status.

#### Command Format



#### Response Format

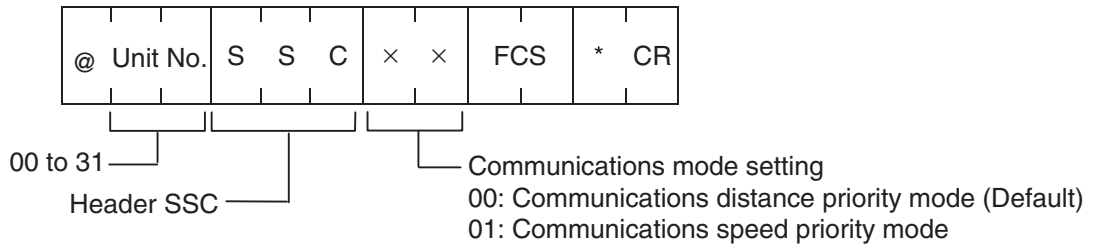


### 4-4-18 Communications Mode Set (SSC)

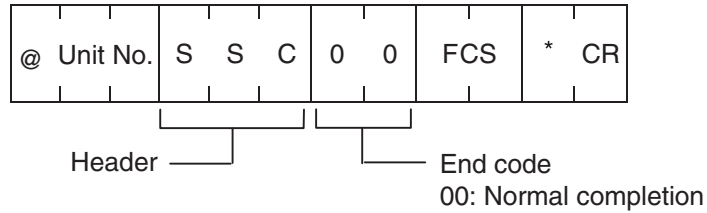
This command is enabled only when accessing an EEPROM DC.

The settings are reflected immediately, and the ID Controller is set to command wait status.

**Command Format**



**Response Format**



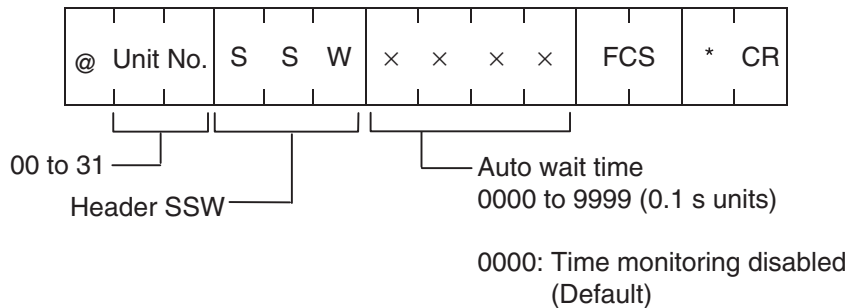
**4-4-19 Auto Wait Time Set (SSW)**

When a normal response for communications with the DC is not returned due to a malfunction detected by the DC, the same command is resent (retry processing).

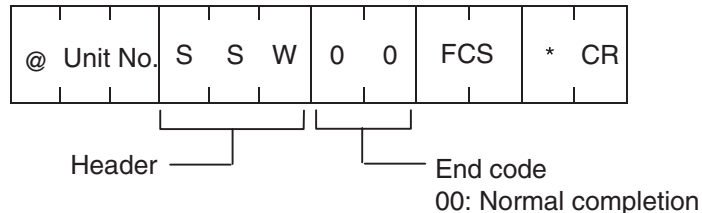
By setting the auto wait time, retry processing is performed with the DC in wait status until the set time lapses.

The settings are reflected immediately, and the ID Controller is set to command wait status.

**Command Format**



**Response Format**

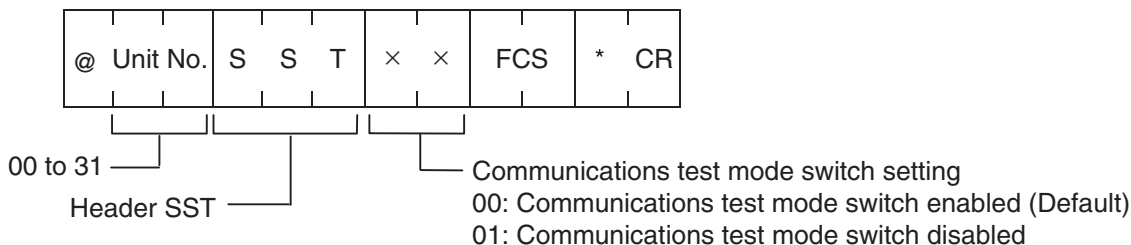


**4-4-20 Communications Test Mode Switch (SST)**

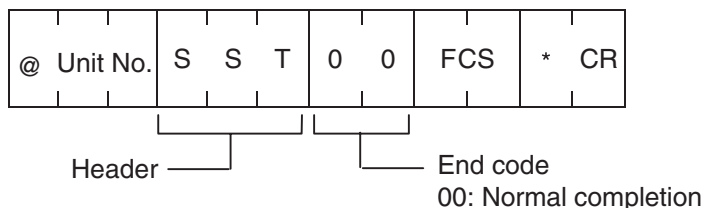
The communications test mode switch on the front panel of the ID Controller is enabled/disabled.

The settings are reflected immediately, and the ID Controller is set to command wait status.

**Command Format**



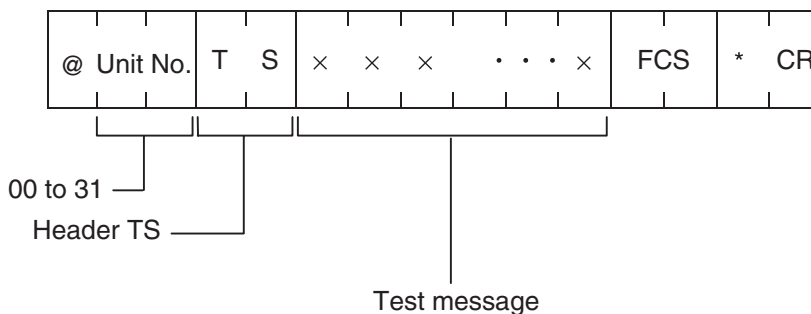
**Response Format**



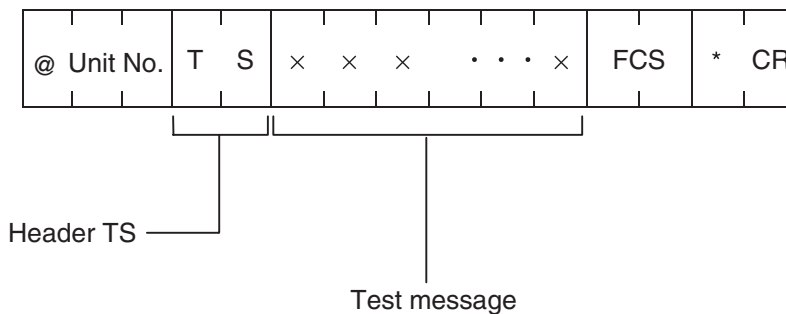
**4-4-21 Test Command (TS)**

The test message sent from the host computer is returned without change.

**Command Format**



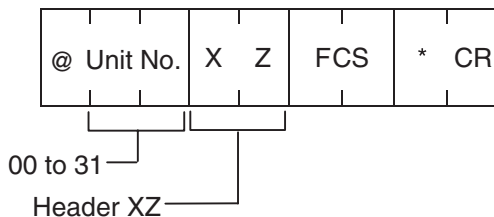
**Response Format**



**4-4-22 Abort Command (XZ)**

If a problem results in the response not being returned during communications with the host computer or the DC, the abort command can be used to restore the ID Controller to the command wait status. There is no response to the abort command.

Command Format

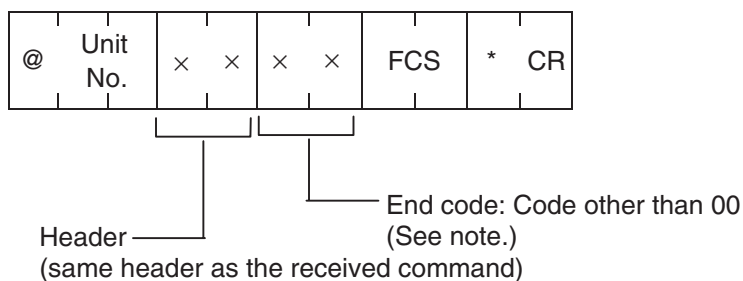


## 4-5 Error Responses

### 4-5-1 Error Responses

When an error occurs during communications with the host computer or Data Carrier, the end code is used to indicate the details of the error.

Response Format

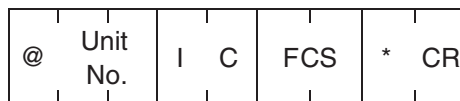


**Note** For details on end codes, refer to *End Code List* on page 59.

### 4-5-2 Undefined Command Response

This is the response returned when the command header cannot be decoded.

Response Format



## 4-6 End Code List

End codes are given in two digits as hexadecimal numbers.

Type	End code	Name
Normal completion	00	Normal end code
	74	Polling Auto command received or DC not close. (See notes 2 and 3.)
	75	Command autoprocessing cancelled (before processing communications with DC). (See note 4.)
	76	Command autoprocessing canceled (DC is near and processing is canceled during or after communications) (See note 5.)
	7B	Low battery voltage warning (battery need to be replaced) (See note 1.)

Type	End code	Name
Error in communications with host computer	13	FCS error (only for 1 to N connection)
	14	Command input error
	18	Frame length maximum error
Error in communications with DC	70	DC communications error
	71	Disagreement error
	72	DC not present
	76	Copy write error
	7A	Address too high
	7C	R/W Head not connected
DC memory warning	7D	Write protect error
	75	Normal end code returned (with no error) after a Management Data command (MD C/K, MDS, or MDL) was executed.
	76	Error code returned after a Management Data command (MD C/K, MDS, or MDL) was executed.

- Note**
- (1) Processing is normal when 7B as an end code has been returned. If the voltage of the battery is low and no communications are available, an error response such as 72 will be returned.
  - (2) When a Polling Auto command is sent, the ID Controller promptly returns a “command received” response (74).
  - (3) When a Polling Auto command is set to query processing results before the DC approaches, the R/W Head returns a “DC not near” response (74).
  - (4) When a polling auto subcommand to cancel processing or command processing cancel command is sent before the DC begins communications, the R/W Head returns a response indicating that processing was cancelled before communications with the DC started (75).
  - (5) When a polling auto subcommand to cancel processing or command processing cancel command is sent after the DC has approached and communications with the DC have begun, the R/W Head returns a response indicating that processing was cancelled during or after communications with the DC (76).

## **SECTION 5**

### **Error Processing**

This section provides information required for troubleshooting errors, including indicator statuses and a list of end codes and their meanings.

**Indicator Status**

If a response is not returned for a command, check the indicator status after sending the Test command.

Indicators							Condition	Error processing
RUN	ERR/ALM	COMM	ID-RESET	ID-RUN	ID-BUSY	ID-ERROR		
● (Not lit)	○ (Lit)	---	---	---	---	---	Error in ID Controller operation	<ul style="list-style-type: none"> <li>• ID Controller power supply</li> <li>• Replace ID Controller</li> </ul>
○ (Lit)	● (Not lit)	● (Not lit)	○ (Lit)	● (Not lit)	● (Not lit)	● (Not lit)	ID Controller is being set	<ul style="list-style-type: none"> <li>• ID-RESET status</li> </ul>
○ (Lit)	● (Not lit)	● (Not lit)	● (Not lit)	○ (Lit)	● (Not lit)	● (Not lit)	The communications settings at the host computer are incorrect or the command format is incorrect.	<ul style="list-style-type: none"> <li>• Reset the communications settings at the host computer.</li> <li>• Check the cable wiring and noise interference.</li> <li>• Check the ID Controller unit number and the terminator.</li> </ul>
○ (Lit)	● (Not lit)	○ (Lit once)	● (Not lit)	○ (Lit)	● (Not lit)	● (Not lit)	The command format is incorrect or communications are in progress.	<ul style="list-style-type: none"> <li>• Check the ID Controller unit number and the terminator.</li> <li>• Check the cable wiring and noise interference.</li> <li>• Check the communications test switch setting.</li> </ul>

**Command Responses**

If the command header is incorrect, a response with a specific header is returned.

**Response Header: IC**

Header	Error name	Details	Processing
IC	Undefined command response	Cannot interpret command header.	<ul style="list-style-type: none"> <li>• Check the command header.</li> </ul>

**Other Response Headers (Not IC)**

If a command is not received properly or communications with the DC fail, an end code other than 00 will be returned in the response. Depending on the command, however, a non-00 end code may indicate normal completion. For details on normal completion, refer to *4-6 End Code List*.

End code	Error or warning name	Cause	Processing
13	FCS error	<ul style="list-style-type: none"> <li>• The FCS calculation method is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>• Recalculate the FCS value.</li> </ul>
14	Command input error	<ul style="list-style-type: none"> <li>• The command format is incorrect.</li> <li>• The command was received when commands cannot be received.</li> </ul>	<ul style="list-style-type: none"> <li>• Reset the command contents.</li> <li>• Reset the command send timing.</li> </ul>
18	Frame length maximum error	<ul style="list-style-type: none"> <li>• The received command frame is longer than 257 characters.</li> </ul>	<ul style="list-style-type: none"> <li>• Reset the command contents.</li> </ul>
70	DC communications error	<ul style="list-style-type: none"> <li>• An error occurred in communications with the DC, and the command cannot be completed normally.</li> </ul>	<ul style="list-style-type: none"> <li>• Check for excessive noise.</li> <li>• Check the travel speed.</li> <li>• Check the distance between the R/W Head and the DC. (See note.)</li> </ul>

End code	Error or warning name	Cause	Processing
71	Disagreement error	<ul style="list-style-type: none"> <li>The data written to the DC is incorrect. (Occurs only when verification is set to ON during writing.)</li> </ul>	<ul style="list-style-type: none"> <li>Check the travel speed.</li> <li>Check for excessive noise. (See note.)</li> </ul>
72	DC not present	<ul style="list-style-type: none"> <li>The DC is not present within the communications range during read/write execution or after the auto wait time has lapsed.</li> <li>The DC battery is dead (battery low), so communications are not possible.</li> </ul>	<ul style="list-style-type: none"> <li>Check the distance between the R/W Head and the DC.</li> <li>The axis has slipped.</li> <li>Replace the DC.</li> </ul>
74	(Normal end)	<ul style="list-style-type: none"> <li>A Polling Auto command is being received or processed normally.</li> </ul>	<ul style="list-style-type: none"> <li>Refer to 4-6 <i>End Code List</i> for details.</li> </ul>
75		<ul style="list-style-type: none"> <li>Processing was cancelled normally.</li> </ul>	
76	DC memory warning	<ul style="list-style-type: none"> <li>The verification results from executing the Data Check command (MDC) did not match.</li> </ul>	<ul style="list-style-type: none"> <li>Check the data contents of the DC.</li> </ul>
		<ul style="list-style-type: none"> <li>The Data Management command (MDS/MDL) detected that the number of operations was exceeded.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the DC.</li> </ul>
	Copy/write error	<ul style="list-style-type: none"> <li>An error occurred in write processing after reading data for the Copy command, and command could not be completed normally.</li> </ul>	<ul style="list-style-type: none"> <li>Check the distance between the copy destination R/W Head and the DC.</li> <li>The axis of the copy destination R/W Head has slipped.</li> </ul>
	(Except Data Check, Data Management, and Copy commands)	<ul style="list-style-type: none"> <li>Processing was cancelled normally.</li> </ul>	<ul style="list-style-type: none"> <li>Refer to 4-6 <i>End Code List</i> for details.</li> </ul>
7A	Address error	<ul style="list-style-type: none"> <li>The specified DC address is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>Check that the address is within the range of possible DC addresses.</li> </ul>
7B	DC battery low	<ul style="list-style-type: none"> <li>Processing was completed normally, but the DC battery is low.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the DC or the battery (See note.)</li> </ul>
7C	R/W Head not connected	<ul style="list-style-type: none"> <li>A R/W Head is not connected to the specified R/W Head channel.</li> </ul>	<ul style="list-style-type: none"> <li>Check the R/W Head connection.</li> </ul>
7D	Write protect error	<ul style="list-style-type: none"> <li>Attempt to write data to a write protected area.</li> </ul>	<ul style="list-style-type: none"> <li>Check the specified address and number of bytes.</li> <li>Turn OFF write protection.</li> </ul>

**Note** If a communications error (70) or disagreement error (71) occur while the command for writing data to the DC is being executed, perform retry processing from the host computer until an error response is no longer returned. When an error occurs, part or all of the data in the address specified in the command may be overwritten (data in addresses not specified to be written to will not be affected). The overwritten data will not be limited to the data specified in the command.

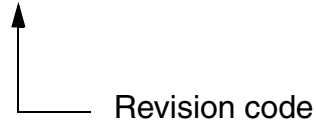




## Revision History

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

Cat. No. Z194-E1-03



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

Revision code	Date	Revised content
01	February 2004	Original production
02	July 2004	<b>Cover:</b> Model name changed to Serial ID Controller. <b>Page 8:</b> DIP switch settings (table and graphic) added. <b>Page 9:</b> Information on ID-RESET added as note 3. <b>Page 10:</b> Information on ID-RUN, ID-BUSY, and ID-ERROR ADDED added below the <i>Output Specifications</i> table. <b>Page 10:</b> Baud rate setting changed. <b>Page 10:</b> Notes added below the <i>Communications Specifications</i> table. <b>Page 11:</b> Note added below the <i>Communications Function Specifications</i> table. <b>Pages 33 through 40:</b> Command codes, command formats, and response formats changed. <b>Page 55:</b> Default indication added to the Command Format (Status Set All). <b>Pages 56, 57, 58:</b> Default indication added to the Command Format.
03	October 2005	<b>Pages xii and xiii:</b> Information on <i>Read and Understand this Manual</i> updated.

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*Revision History*

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