ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *OMRON V720S-BC5D4* at our website: ***Click HERE***

Cat. No. S938-E1-01

V720S-series
Electromagnetic Inductive
RFID System

Reader/Writer
V720S-BC5D4

OPERATION MANUAL

OMRON

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Notice:

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

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

⚠ **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

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

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.

© OMRON, 2002

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, mechanical, electronic, photocopying, recording, or otherwise, without the prior written permission of OMRON.

No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

PRECAUTIONS ix

1 Intended Audience x
2 General Precautions x
3 Safety Precautions x
4 Application Precautions x
5 Correct Use xi
6 Applicable Standards xii
7 EN/IEC Standards xii

SECTION 1
Features and System Configuration 1-1

1-1 Features 1-2
1-2 System Configuration 1-4
1-2-1 Example of 1-to-1 System Configuration 1-4
1-2-2 Example of 1-to-N System Configuration 1-5

SECTION 2
Specifications and Performance 2-1

2-1 Reader/Writer (V720S-BC5D4) 2-2
2-1-1 Nomenclature 2-2
2-1-2 Names of Connector Terminals 2-3
2-2 Specifications 2-4
2-2-1 General Specifications 2-4
2-2-2 Performance Specifications 2-4
2-2-3 Reader/Writer Communications Specifications 2-5
2-2-4 I/O Specifications 2-6
2-2-5 Host Communications Specifications 2-7
2-2-6 Dimensions 2-8
2-3 Cable (sold separately) 2-9
2-3-1 General Specifications 2-9
2-3-2 Dimensions 2-9
2-4 Memory Map of Tag 2-11
2-4-1 I.CODE1 Chip (Philips Semiconductor IC; SL1ICS30) 2-12
2-4-2 I.CODE2 Chip (Philips Semiconductor IC; SL2 ICS20) 2-13

SECTION 3
Functions 3-1

3-1 Single, FIFO, Multiple, and Selective Access Functions 3-2
3-1-1 Single Access Mode 3-2
3-1-2 FIFO Access Mode 3-2
3-1-3 Multiple Access Mode 3-3
3-1-4 Selective Access Mode 3-3
3-2 Memory Check Function 3-4
3-2-1 Usage 3-4
3-3 Lock Function 3-5
3-4 Tag Identification Access Function 3-6
3-5 External I/O Function 3-7
3-5-1 External Input 3-7
3-5-2 External Output 3-7
3-6 Offline Read Test Function 3-7
3-7 EAS Function 3-8

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

SECTION 4
Setting, Mounting, and Connection Methods 4-1

4-1 Reader/Writer Setting 4-2
4-1-1 Host Communications Setting (COM Port Setting) 4-2
4-1-2 Chip Operating Mode Setting 4-3
4-1-3 Read Response Method Setting 4-4
4-1-4 Anntena amd Tag Communications Setting 4-4
4-1-5 Offline Mode Setting 4-5
4-1-6 Fixing of Settings 4-5
4-1-7 Initialization of settings 4-5
4-2 Installation Environment 4-6
4-2-1 Installation 4-6
4-3 Mounting Method 4-7
4-3-1 Mounting Dimensional Drawing 4-7
4-4 Wiring Method 4-8
4-4-1 Power Supply and Grounding Wires 4-8
4-4-2 Host Communications Cabling 4-9
4-4-2-1 RS-232C Interface Cabling 4-9
4-4-2-2 RS-485 Interface Cabling 4-11
4-4-3 Assembly of Connector 4-14
4-4-3-1 Assembly of Host Communications Connector and I/O Connector 4-14
4-4-3-2 Assembly of Connector 4-16

SECTION 5
Communications Functions 5-1

5-1 Reader/Writer under Operating Conditions 5-3
5-1-1 Reader/Writer under Operating Conditions 5-3
5-1-2 Communications Phase 5-3
5-1-3 ACK/NACK Control 5-4
5-2 Command and Response Frame Structures 5-5
5-2-1 Command Frame Structure 5-5
5-2-2 Response Frame Structure 5-5
5-2-3 Command Code List 5-6
5-2-4 Response Command List 5-7
5-2-5 Example BCC Calculation 5-8
5-3 Communications Commands and Responses 5-9
5-3-1 Read (RD) 5-9
5-3-2 Write (WT) 5-10
5-3-3 Tag Detection (RD): I.CODE1 Mode Only 5-12
5-3-4 Selective Access Read (RD) 5-13
5-3-5 Selective Access Write (WT) 5-14
5-3-6 Special Read (RD): For I.CODE1 Mode Only 5-15
5-3-7 Polling Single Auto Read (PR) 5-16
5-3-8 Polling Single Auto Write (PW) 5-17
5-3-9 Polling Check (PC) 5-18
5-3-10 Polling End (PE) 5-19
5-3-11 Memory Check (MC): I.CODE1 Mode Only 5-19
5-3-12 Memory Calculation (MK): I.CODE1 Mode Only 5-20
5-4 System Command 5-21
5-4-1 System Read (SR): ISO Mode Only 5-21
5-4-2 System Write (SW): ISO Mode Only 5-22
5-4-3 System Lock (SL): ISO Mode Only 5-23
5-4-4 SNR (Tag-specified Code) Read (RD): I.CODE1 Mode Only 5-24
5-4-5 Read (RD) of Family Code and Application ID (for Tag): I.CODE1 Mode Only 5-25
5-4-6 Write (WT) of Family Code and Application ID (for Tag) : I.CODE1 Mode Only 5-26
5-4-7 EAS Setting (ES): I.CODE1 Mode Only 5-27

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

5-4-8 QuietBit Setting (QB): I.CODE1 Mode Only 5-27
5-4-9 Lock Setting (LK): ISO Mode Only 5-28
5-4-10 Lock Setting Read (LR): ISO Mode Only 5-29
5-4-11 Lock Setting (LK): I.CODE1 Mode Only 5-30
5-4-12 EAS Check (EA) 5-31
5-5 Reader/Writer Control Commands 5-32
5-5-1 Stop (ST) 5-32
5-5-2 Reset (XZ) 5-32
5-5-3 ACK (AK) 5-32
5-5-4 NACK (NK) 5-33
5-5-5 I/O Control Command (CC) 5-33
5-5-6 Test (TS) 5-34
5-5-7 Version (VS) 5-35
5-6 Setting Command 5-36
5-6-1 Reader/Writer AFI Enable/Disable Changeover (AE): ISO Mode Only 5-36
5-6-2 Reader/Writer AFI Read (AF): ISO Mode Only 5-37
5-6-3 Read and Write of Family Code (for Reader/Writer) (FC): I.CODE1 Mode Only 5-38
5-6-4 Read and Write of Application (AI): I.CODE1 Mode Only 5-39
5-6-5 SNR Addition Setting (SN) 5-40
5-6-6 Node Number Setting Command (NN) 5-41
5-6-7 Communications Port Setting Command (CP) 5-42
5-6-8 Communications Type Setting (CT) 5-43
5-6-9 Tag Communications Mode (CM) 5-44
5-6-10 Antenna Changeover Command (AC) 5-45
5-6-11 Terminal Resistance Setting Command (TM) 5-46
5-6-12 Offline Mode Setting (FL) 5-47
5-6-13 Initialization of Settings Command (IS) 5-48
5-6-14 Setting Write Command (EW) 5-48
5-6-15 Operating Mode Changeover (TY) 5-49
5-7 Other Commands 5-50
5-7-1 Command Undefined Response 5-50
5-8 Communications Method 5-51
5-8-1 Access Settings 5-51
5-8-1-1 Single Access 5-51
5-8-1-2 FIFO Access 5-51
5-8-1-3 Multiple Access 5-52
5-8-1-4 Selective Access 5-53
5-8-2 Mode Settings 5-56
5-8-2-1 Trigger Mode 5-56
5-8-2-2 Auto Mode 5-57
5-8-2-3 Repeat Mode 5-58
5-8-2-4 Polling Auto Mode 5-59
5-8-3 Table of Communications Methods 5-60
5-8-4 Table of Communications Methods for Commands 5-61
5-9 Data Code Designation 5-62
5-10 Timeslot Setting 5-63
5-11 Command Connection: In I.CODE1 Mode 5-64

SECTION 6
Startup and Full Operation 6-1

6-1 Trial Operation 6-2
6-2 Self-diagnostics 6-3
6-3 Errors and Remedies 6-4
6-4 Maintenance and Inspection 6-5
6-5 Troubleshooting 6-7

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

SECTION 7
Reference Data 7-1

7-1 Communications Time 7-2
7-2 Calculation of Tag Traveling Speed 7-6

SECTION 8
Appendix 8-1

Appendix 1 Accessories 8-2
Appendix 2 ASCII Code Table 8-3

Revision History

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

About this Manual:

This manual describes the installation and operation of the V720S-series Electromagnetic Inductive RFID System (V720S-BC5D4D Reader/Writer) and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the System.

Section 1 provides the characteristics and system configuration of the V720S RF ID System as well as an outline of its operation.

Section 2 provides the specifications and performance characteristics of the V720S-BC5D4.

Section 3 provides the modes and functions in detail.

Section 4 provides installation information for the V720S-BC5D4.

Section 5 provides the communications functions and provides details on communications–related data and commands.

Section 6 provides information on trial operation, errors and remedies, and maintenance and troubleshooting.

Section 7 provides reference data relating to V720S communications.

The ***Appendix*** provides an ASCII code table.

⚠ **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.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PRECAUTIONS

This section provides general precautions for using the V720S-series Electromagnetic Inductive RFID System and related devices.

The information contained in this section is important for the safe and reliable application of the V720S-series Electromagnetic Inductive RFID System. You must read this section and understand the information contained before attempting to set up or operate a V720S-series Electromagnetic Inductive RFID System.

1 Intended Audience x
2 General Precautions x
3 Safety Precautions x
4 Application Precautions x
5 Correct Use xi
6 Applicable Standards xii
7 EN/IEC Standards xii

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing systems.
- Personnel in charge of designing systems.
- Personnel in charge of managing systems and facilities.

2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for installing and operating the V720S-series Electromagnetic Inductive RFID System. Be sure to read this manual before attempting to use the System and keep this manual close at hand for reference during operation.

⚠ **WARNING** It is extremely important that a V720S-series Electromagnetic Inductive RFID System be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying the System to the above-mentioned applications.

3 Safety Precautions

⚠ **WARNING** Always connect to a ground of 100 Ω or less when installing the System. Not connecting to a ground of 100 Ω or less may result in electric shock.

⚠ **WARNING** Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.

⚠ **WARNING** Do not attempt to take any unit apart or touch the inside while the power is being supplied. Doing so may result in electric shock.

4 Application Precautions

⚠ **Caution** Be sure to observe the following precautions to ensure safety in installing or operating the System.

- Do not use the System in an environment subject to flammable, explosive, or corrosive gases.
- Do not attempt to take any Units apart, to repair any Units, or to modify any Units in any way.
- Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals.
- Use crimp terminals of specified size for wiring.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Be sure that the items with locking devices are properly locked into place before using the System.
- Be sure that the DC Power Supply Unit exclusively designed for the V720S Series is used and is not connected to any other device.
- Be sure that the power supply voltage is within the rated range of 24 VDC+10% and -10%.
- Install the ferrite core supplied with the V720S-BC5D4 according to the specified instructions.
- Be sure to observe all warnings, cautions, and safety precautions specified in the manual.

5 Correct Use

⚠ **Caution** Do not install the V720S-BC5D4 in the following locations:

- Locations subject to direct sunlight.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to shock or vibration.

⚠ **Caution** Be sure to observe the following wiring precautions:

- Do not wire the lines of the RFID System alongside high–tension or power lines.
- Check the polarity of each terminal and make sure not to make mistakes in polarity.
- The product uses a frequency of 13.56MHz to communicate with Tags. Some transceivers, motors, monitoring devices, power supplies (power supply IC), and the like are expected generate noise that affects communications with Tags. If you use the product in the vicinity of these items, you need to check before use to see how the product will be affected by them. In addition, follow the instructions below to minimize the influence of noise.
  - Establish a Class D grounding (Class 3 grounding) for each of the metal objects that are placed in the vicinity of the product
  - Wiring should not be in the immediate vicinity of a high voltage or heavy current.

⚠ **Caution** Be sure to observe the following precaution when cleaning the V720S-BC5D4:

- Organic solvents may damage the paint coating on the casing or resin part of the product. Do not use paint thinner or any other organic solvent to clean the product.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6 Applicable Standards

The V720S-BC5D4 conforms to the following laws and standards.

1) European Standards (R&TTE Directive)

These products conform to the R&TTE Directive (Radio Equipment and Telecommunication Terminal Equipment Directive), which was enforced in April, 2000 concerning radio equipment.

- Radio Standard : EN300 330
- EMC Standard : EN301 489-1 (EN55024, EN61000-4-2, 3, 4, 6)
- Safety : EN61010

2) American Standard:

These products will conform to the Reported Standard (FCC 01-290), into which the current Standard will be revised in FY 2002.They do not conform to the current FCC Standard (FCC Part15 Subpart C).

3) Japanese Standards

ARIB Standard : ARIB-STD-T82

“Ko-shuha riyo setsubi,Yudo-shiki yomikaki tsuushinn setsubi” :

Type Approval No. : EC-02002

* Type approval is available when connecting following antennas only.

V720-HS71,V720-HS71S,V720-HS03

7 EN/IEC Standards

- In connection with EC unification, eighteen European countries will integrate their conventional safety standards into EN standards. When the EN standards come into effect, they will apply as the unified European standards in place of the conventional safety standards.
- EN standards are based on IEC standards. Therefore, machines that are exported to Europe from Asia or North America must satisfy EN standards. Otherwise, the machines must satisfy IEC standards if the machines do not fall under EN standards.
- The CE marking is provided by EC Directives. A product bearing a CE marking meets the safety standards specified by all relevant EC Directives. If the product is a machine, it must satisfy the EC Machinery Directive, Low-voltage Directive (LVD), and EMC requirements of the EC Directives. Directives, if the product is a home electronics appliance or office machine. Machines bearing CE markings can be freely exported to European countries. In other words, a CE marking is the passport for export to Europe.
- EC Directives are provided for the purpose of European unification. Approximately 300 EC Directives have been passed. EC Directives for machines are called Machine Directives. According to the Machine Directives (EC Directive Document number 89/392/EEC), machines exported to Europe on and after January 1, 1995 must bear CE markings.
- EMC standards are for electro-magnetic compatibility. A machine must satisfy the EMC requirements of EC directives by taking countermeasures against EMI (electro-magnetic interference) and EMC (electro-magnetic susceptibility).
- R&TTE Directive, which came into effect in April, 2000, includes the requirement of LDV and EMC Directives in addition to radio standards.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

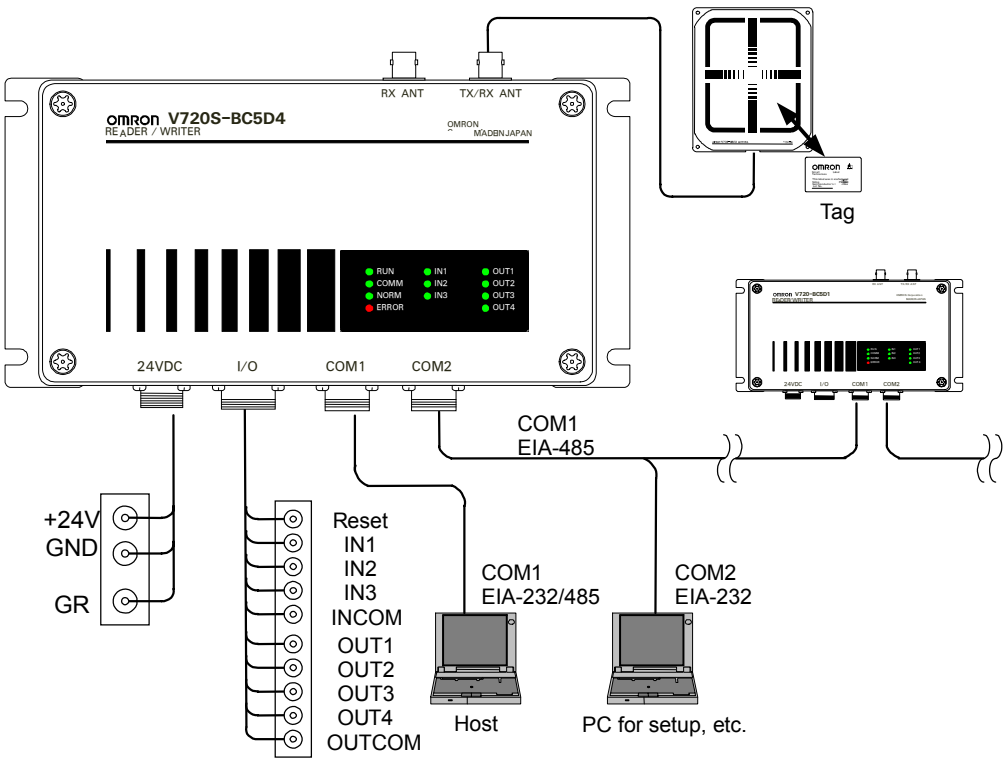
SECTION 1
Features and System Configuration

1-1 Features....1-2
1-2 System Configuration....1-3
1-2-1 Example of 1-to-1 System Configuration....1-3
1-2-2 Example of 1-to-N System Configuration....1-4

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1-1 Features

The V720S-series Electromagnetic Inductive RFID System is ideal for the construction of highly functional, long-distance wireless ID systems for material control and logistics.



V720S-BC5D4 (hereinafter called “Reader/Writer”) is the device to communicate with Tag (manufactured by OMRON) of the V720 and V720S Series that use two kinds of I-CODE chips manufactured by Philips Semiconductor (Product code: SL1 ICS30 01, Common name: I.CODE1; and Product code: SL2 ICS20, Common name: I.CODE2). The chip SL2 ICS 20 is fully conforming to ISO/EC15693.

The Reader/Writer can be connected to personal computers (PCs) and Programmable Logic Controllers (PLCs) to process large amounts of data flexibly with simple commands.

Highly Functional RFID System

In addition to 1-to-1 communication between a Tag and an antenna, the RFID System operates in either multiple simultaneous access mode, selective access mode, or FIFO (first-in, first-out) read/write mode. In multiple simultaneous access mode, if there is more than one Tag in the communications area, the RFID System reads and writes data from and to all the Tags at one time. In selective access mode, the user can specify the Tags from and to which data is read and written. In FIFO read/write mode, the RFID System reads and writes data to one Tag after another as they come into the communications area.

Support of off-line EAS mode

The Reader/Writer can operate in EAS mode (see 3-7 in Section 3) as a standalone device, with no need to connect with the host.

I/O function

By issuing commands from the host, the user can operate three input points and four output points.

Waterproof construction

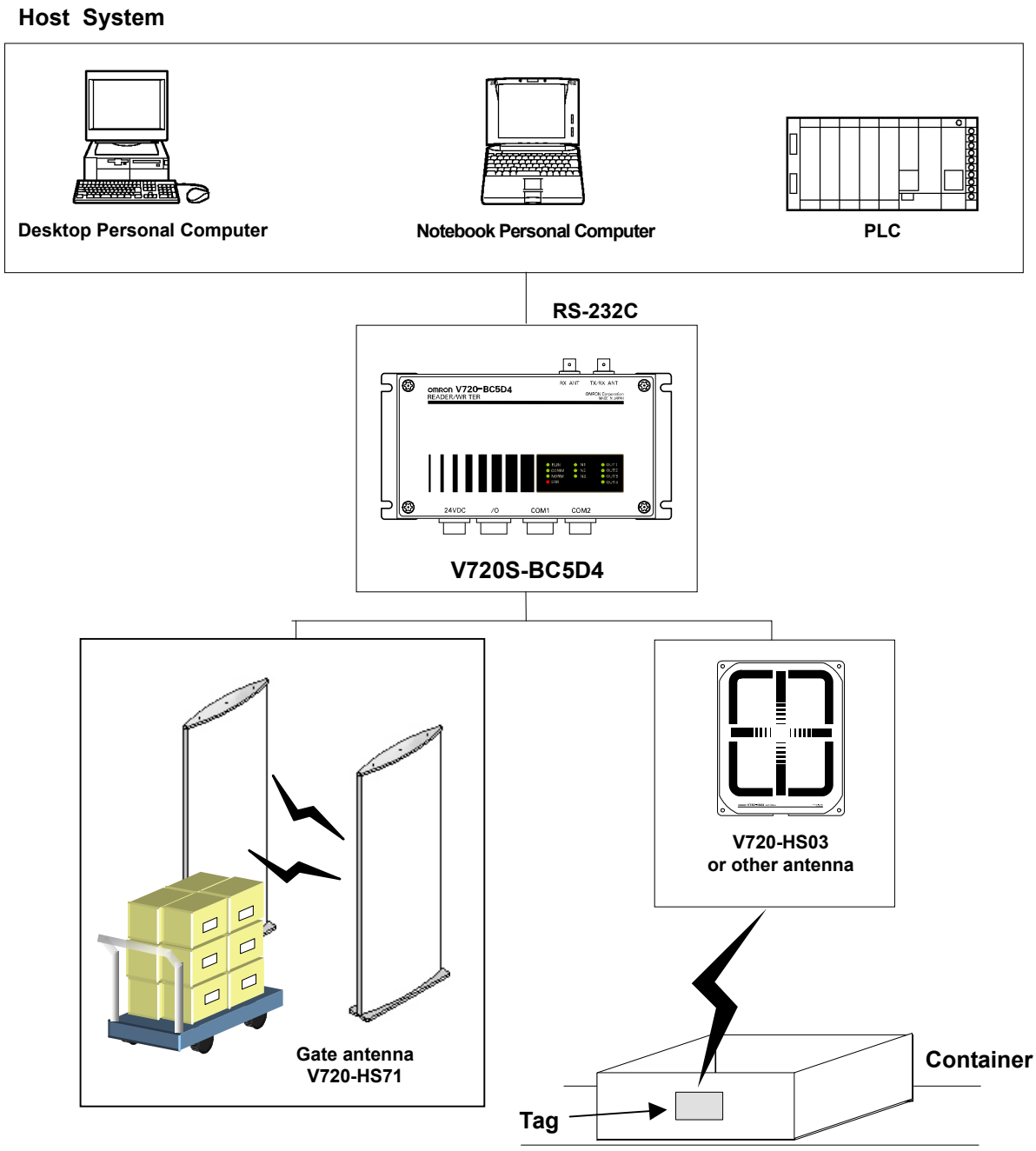
The waterproof construction IP65 has been achieved in the Reader/Writer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1-2 System Configuration

1-2-1 Example of 1-to-1 System Configuration

The V720S-BC5D4 has a built-in serial interface conforming to RS-232C and RS-485, thus making it possible to communicate with personal computers and PLCs. All the ordinary communication processes take place via commands from the host.

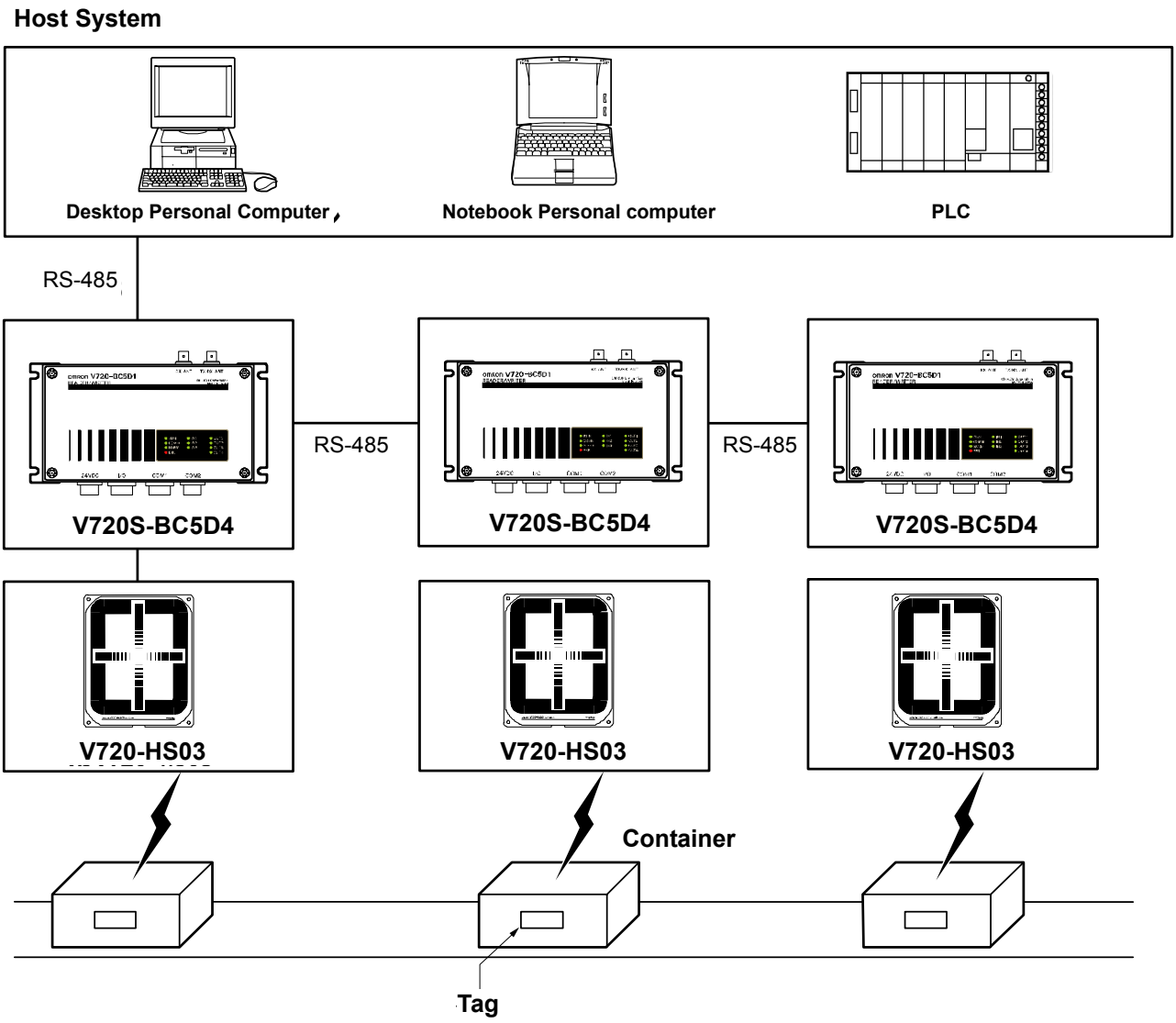


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1-2-2 Example of 1-to-N System Configuration

The Reader/Writer incorporates the RS-485 interface, which allows connection of up to 32 units of Reader/Writer to one host computer, whether it may be a general-purpose PC, PLC or other.

The cable for RS-485 can be extended to a total maximum length of 300 meters.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

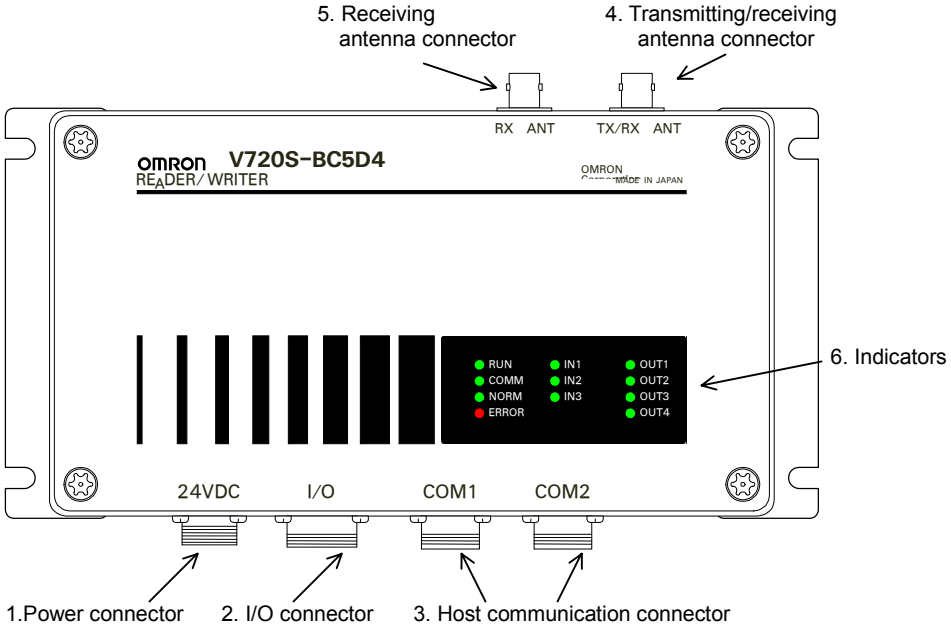
SECTION 2
Specifications and Performance

2-1 Reader/Writer (V720S-BC5D4) 2-2
2-1-1 Nomenclature 2-2
2-1-2 Names of Connector Terminals 2-3
2-2 Specifications 2-4
2-2-1 General Specifications 2-4
2-2-2 Performance Specifications 2-4
2-2-3 Reader/Writer Communications Specifications 2-5
2-2-4 I/O Specifications 2-6
2-2-5 Host Communications Specifications 2-7
2-2-6 Dimensions 2-8
2-3 Cable (sold separately) 2-9
2-3-1 General Specifications 2-9
2-3-2 Dimensions 2-9
2-4 Memory Map of Tag 2-11
2-4-1 Detailed description of memorys 2-12
2-4-2 I.CODE2 Chip (Philips Semiconductor IC; SL2 ICS20) 2-13

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-1 Reader/Writer (V720S-BC5D4)

2-1-1 Nomenclature



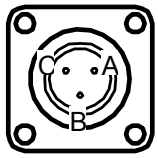
No.	Name		Function/description
1	Power connector		Connects 24 VDC.
2	Input/Output connector		This connector can connect the following signals: ● External RESET signal input (1 point) ● User input readable via command (3 points) ● User output operable via command (4 points)
3	Host communication connector		Connects a PLC, PC, or the like to transmit commands to and receives responses from the Reader/Writer.
	COM1		This is a host port used for ordinary communication. The interface conforms to RS-232C and RS-485, either of which is used selectively as appropriate.
	COM2		This port conforms to RS-232C and is solely used for setup. The RS-232C interface of this port operates independent of the RS-232C interface of COM1. The RS-485 pin is provided for extension when multi-dropped connection is used.
4	Transmitting/receiving antenna connector (TX/RX ANT)		Connects an antenna (the V720-HS03 or the like).
5	Receiving antenna connector (RX ANT)		A receive-only antennal can be connected to this connector. This connector is provided for special applications, e.g., connection with a gate antenna. Leave this connector unconnected in normal use.
6	Indicators		The indicators shows the state of operation, as shown below:
	RUN	Green	Turns on when the Reader/Writer is operating normally.
	COMM	Green	Turns on when the Reader/Writer is in communications with the Tag.
	NORM	Green	Turns on when communication has completed normally.
	ERROR	Red	●Turns on when a communication error has occurred. ●Turns on when a system error has occurred.
	IN1 - IN3	Green	Turns on when the input signal is on.
	OUT1 - OUT4	Green	Turns on when the output signal is on.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-1-2 Names of Connector Terminals

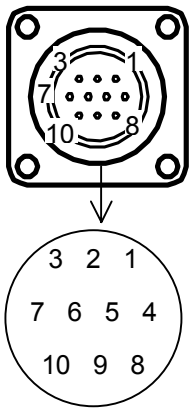
Each connector shows pin numbers ,which are viewed from the outside of the Reader/Writer.

1. Power connector

Shape of connector	Pin number	Name	Description
	A	+ 24 VDC	Connects the + side of 24 VDC.
	B	GR	Connecting to a ground of 100 Ω or less
	C	GND	Connects 0V.

2. Input/Output connector

Signals have been insulated from one another. The input and output signals are connected in a pair to INCOM and OUTCOM, respectively.

Shape of connector	Pin number	Name	Description
	1	RST	RESET signal input
	2	IN1	External input signal 1
	3	IN2	External input signal 2
	4	IN3	External input signal 3
	5	INCOM	Common terminal for common use by external input signals
	6	OUT1	External output signal 1
	7	OUT2	External output signal 2
	8	OUT3	External output signal 3
	9	OUT4	External output signal 4
	10	OUTCOM	Common terminal for common use by external output signals

3. Host communication connector

COM1 and COM2 are set commonly, as shown below.

Shape of connector	Pin number	Name	Description
	1	RD	Receive data (RS-2332C)
	2	SD	Transmit data (RS-2332C)
	3	SG	Grounding for signals (RS-232C)
	4	+	+ (RS-485)
	5	-	- (RS-485)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-2 Specifications

2-2-1 General Specifications

Item	Specifications
Supply voltage	24VDC ±10%
Power consumption	V720S-BC5D4: 25W or less
Ambient operating temperature	-10℃ to 50℃ (with no icing)
Ambient operating humidity	35% to 85% RH (with no condensation)
Ambient storage temperature	-25℃ to 65℃ (with no icing)
Insulation resistance	20 MΩ min. (by a 100 VDC megger) between both I/O terminals and both power supply terminals, between both COM terminals, and between both ANT terminals
Dielectric strength	Leakage current of 10 mA max. at 1000 VAC (50/60 Hz) for 1 minute in any of the above combinations
Vibration resistance	No abnormal condition after applying 10 sweeps of a vibration of 10 to 150 Hz and 0.2mm double amplitude in X, Y, and Z directions for eight minutes
Shock resistance	No abnormal condition after giving an impact of 150 m/s^2 three times each in X, Y, and Z directions, i.e., 18 times in total
Grounding	Connecting to a ground of 100 Ω or less
Dimensions	247 x 64 x 128 mm (W×H×D)
Protective construction	IP65(IEC60529 Standard)
Number of terminals for antenna connection	Transmitting/receiving antenna: 1 Receive-only antennal: 1
Material	Aluminum die casting
Mounting method	Fastening with M6 screws
Weight	Approx. 2,300g

⚠Caution (*1) The time that elapses after turning power ON to getting stable for communication.

2-2-2 Performance Specifications

Item	Specifications
Self-diagnostics	CPU, host communications, and Reader/Writer communications errors are checked.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-2-3 Reader/Writer Communications Specifications

1. Transmission specifications

Item	Specifications
Central carrier frequency	13.56 MHz ± 7 kHz
Antenna output	V720S-BC5D4: 4.0 W or less Output impedance: 50 Ω
Modulation method	ASK
Degree of modulation	10 % to 20 %
Coding method	Standard mode: 1 out of 256 Fast mode: RZ
Baud rate	Standard mode: 1.65 kbps Fast mode: 26.5 kbps

2. Receipt specifications

Item	Specifications
Central carrier frequency	13.56 MHz ± 7 kHz
Sub-carrier	424 kHz
Modulation method	ASK modulation on sub-carrier
Coding method	Manchester encoding
Baud rate	26.5 kbps

Note 1) For details of setting standard and fast modes, refer to Item 1 of "Reader/Writer communications setting" in Section 4-1-4.

2) If you are using a receive-only antenna, be sure to enable the receive-only antenna. For the method for this setting, refer to Item 2 of "Reader/Writer communications setting" in Section 4-1-4.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-2-4 I/O Specifications

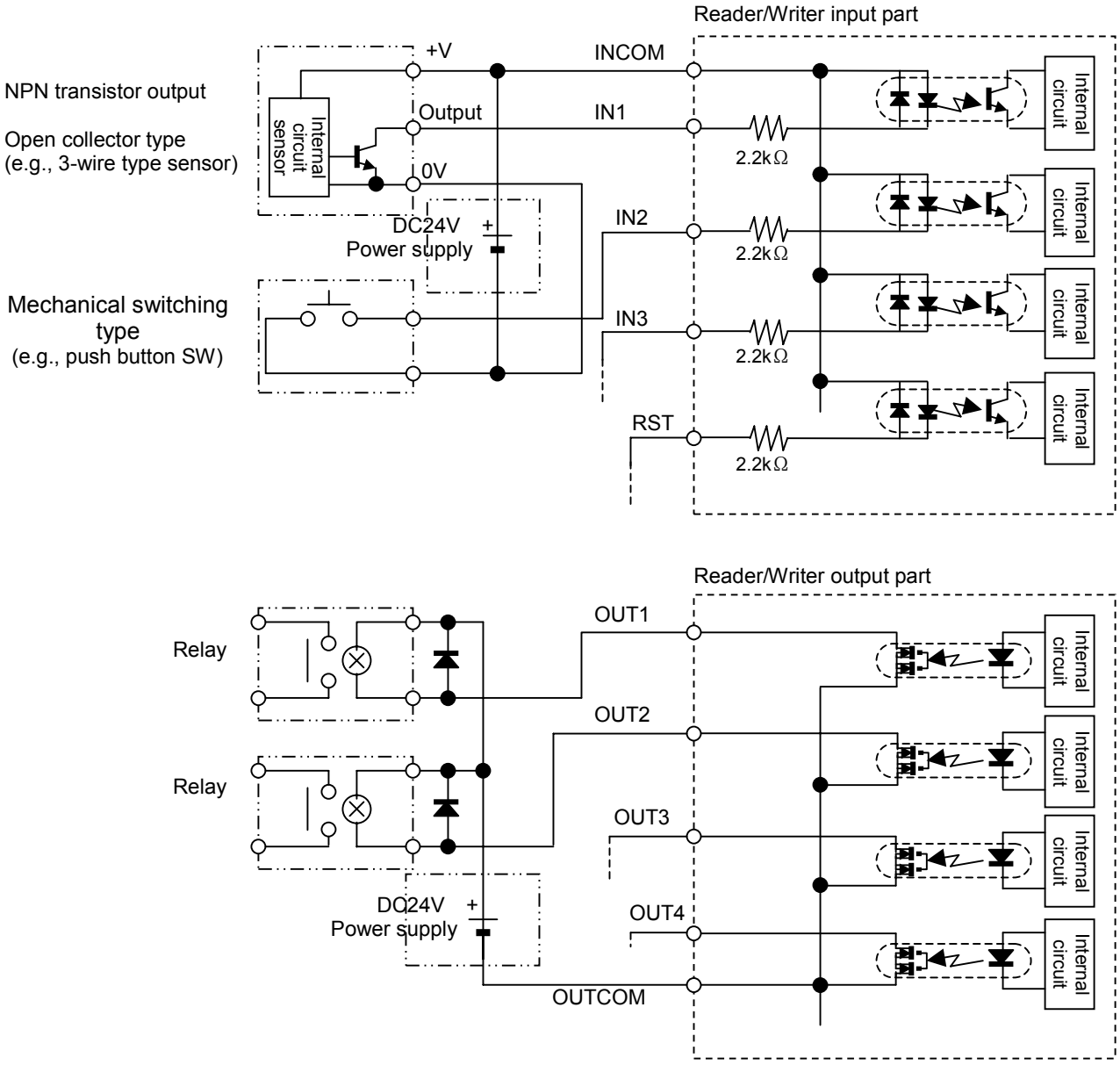
■Input specifications (RST, IN1, IN2, and IN3)

Item	Specifications
Input voltage	24VDC ± 10% (including ripples)
Input impedance	2.2 kΩ
Input current	10 mA TYP (24 VDC)
ON voltage	19 V min.
OFF voltage	5 V max.
Input response time	70ms max.

■Output specifications (OUT1, OUT2, OUT3, and OUT4)

Item	Specifications
Max. opening and closing capacity	24VDC ± 10%, 50mA (including ripples)

■Wiring with I/O equipment (Ex.)



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-2-5 Host Communications Specifications

■COM1 connector

Item	Description
Conforming standard	RS-232C or RS-485
Communications method	EIA/TIA-232-E half duplex or EIA/TIA-485 half duplex
Baud rate	9600 bps, 19200 bps, 38400 bps, 115200 bps
Sync	Start-stop synchronization (stop bit: 1 or 2)
Transmission code	ASCII7 or JIS8 unit symbols
Max. number of connections	32 (Connection via RS-485 Interface)
Error control	Vertical parity (select from even, odd, or none) For BCC, use or non-use of horizontal parity can be selected.
Line length [6)]	15 m (when RS-232C is selected) 300 m in total (when RS-485 is selected)

■COM2 connector

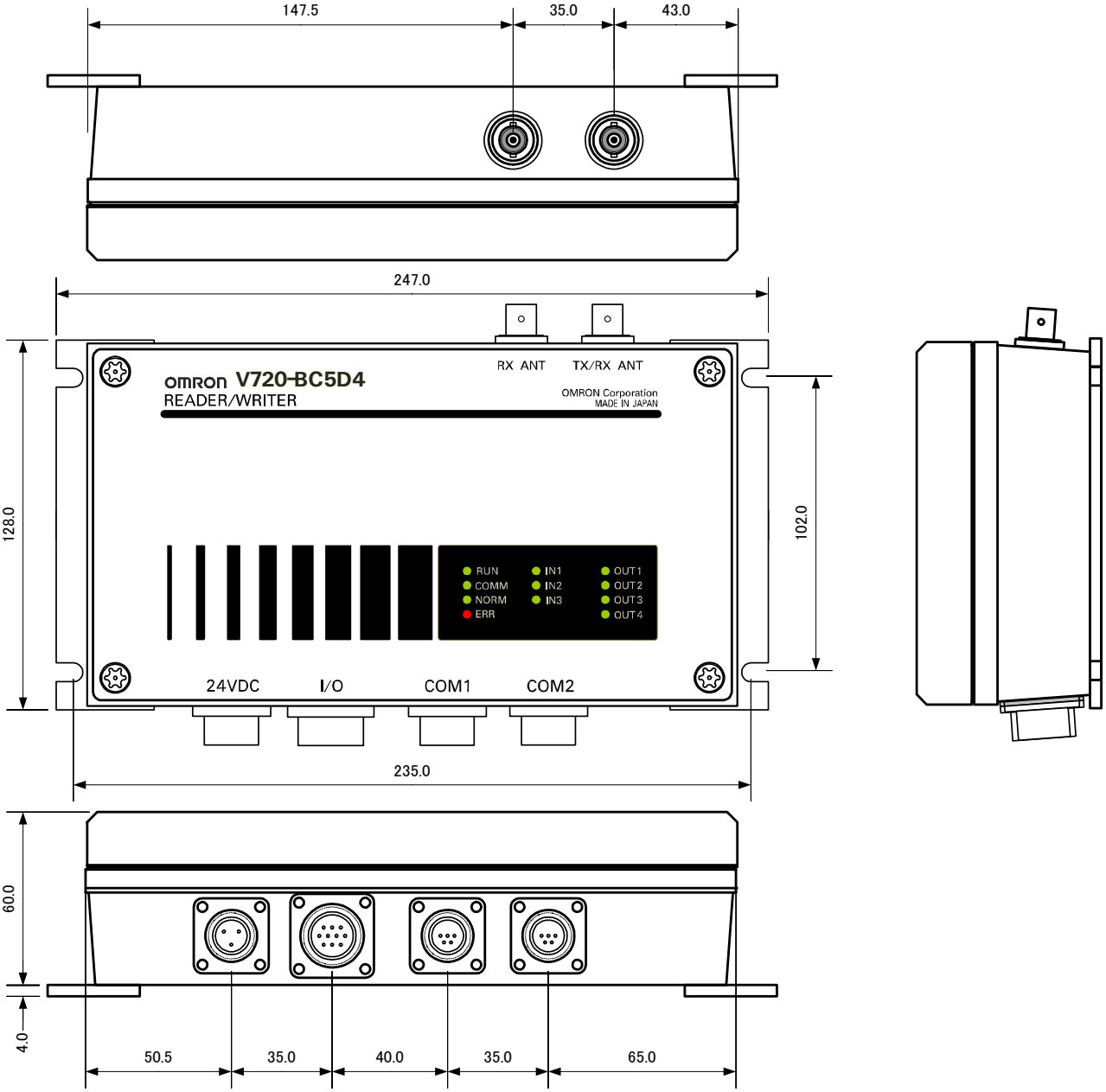
Item	Description	Initial value (after resetting power supply)
Conforming standard	RS-232C	-
Communications method	EIA/TIA-232-E half duplex	-
Baud rate	9600 bps, 19200 bps, 38400 bps, 115200 bps	9600 bps
Sync	Start-stop synchronization (stop bit: 1 or 2)	Stop bit 2
Transmission code	ASCII7 or JIS8 unit symbols	ASCII 7
Error control	Vertical parity (select from even, odd, or none) For BCC, use or non-use of horizontal parity can be selected.	• even • Use for BCC
Line length [6)]	smaller than or equal to 15 m	-

Note 1) The RS-232C interfaces for COM1 and COM2 have separate communication ports, and thus it is possible for these interfaces to have different communication settings

2) RS-232C for COM2 is primarily used for setup. Communication settings for COM2 return to the initial values upon resetting the power source.
3) For COM1, either RS-232C or RS485 can be selected.
4) The RS-485 pin at COM2 is used for connection with another Reader/Writer when multi-dropped connection is used.
5) For the method for this setting, please refer to "Host communications setting" in Section 4-1-1.
6) For high baud rates, a shorter line length may be required. Please be sure to confirm the proper line length in advance.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-2-6 Dimensions



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-3 Cable (sold separately)

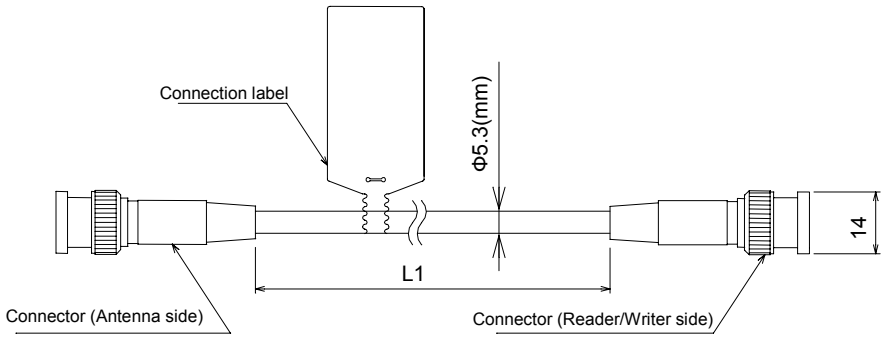
2-3-1 General Specifications

Item \ Model	V720-A 40 Antenna cable	V720-A 50 Power cable	V720-A 60 RS-232C cable
Cable type	Coaxial cable	-	-
Number of conductors	2 (shield)	3	6
Insulation resistance	10 MΩ min. (at 250 VDC) between conductor and shield	5 MΩ min. (at 250 VDC) between conductor and shield	10 MΩ min. (at 250 VDC) between conductor and shield
Dielectric strength	Leakage current of 1 mA max. at 300VAC	Leakage current of 1 mA max. at 300VAC	Leakage current of 1 mA max. at 300VAC
Cladding material	PVC	PVC	PVC
Maximum operating temperature	80°C	80°C	80°C
Connector part protective construction	IP65	IP65	IP65 (Reader/Writer side connector)

2-3-2 Dimensions

- Antenna cable: V720-A40

Item \ Model	V720-A40 3.35M	V720-A40 10.33M
Length	3350 +10-20(mm)	10330+10-20(mm)



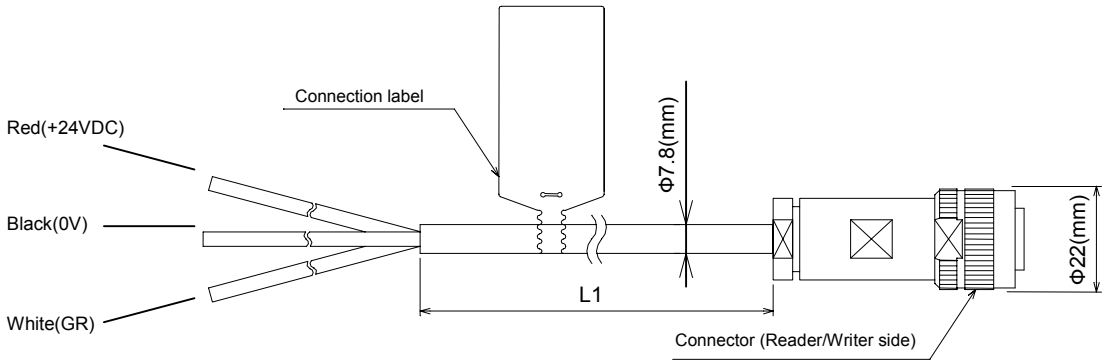
⚠ **Caution**

- For the antenna cable, be sure to use V720-A40 (3.35 m) or V720-A40 (10.33 m). Using any other cable may affect adversely the communications performance, etc., of the Reader/Writer.
- Do not change the cable length. If you do, communications performance may be affected.
- The BNC connector for antenna is of a waterproof type (IP65).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

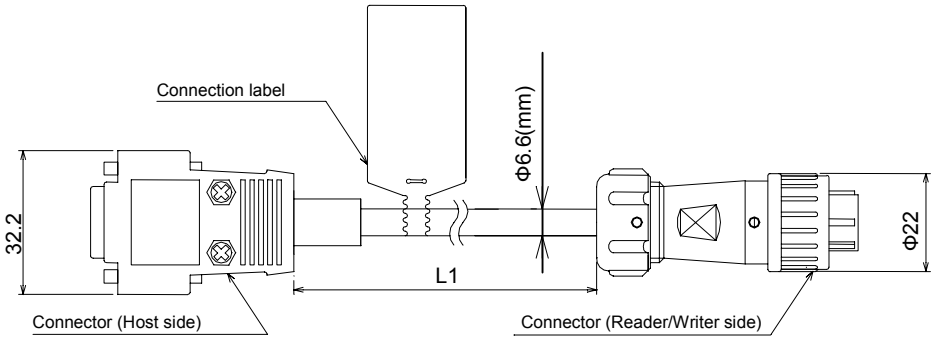
- Power cable: V720-A50

Item / Model	V720-A50
Length (L1)	3000+10-20(mm)



- Cable for RS-232C: V720-A60

Item / Model	V720-A60 3M	V720-A60 15M
Length (L1)	3000+50-0(mm)	3000+50-0(mm)



Note The D-sub connector is an inch screw thread(M2.54) type.

D-sub connector		Reader/Writer-side connector	
2 pin	RD	1 pin	RD
3 pin	SD	2 pin	SD
5 pin	SG	3 pin	SG
Housing	Shield		

Note Connect the shield wire to the connector cover on the PC side.

⚠ **Caution** Mechanical requirements for installation and operation

- The Reader/Writer should be used under installed conditions that are free of mechanical stress.
- In particular, utmost care should be taken so that the cables may not be bent repeatedly or pulled in an axial direction.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-4 Memory Map of Tag

2-4-1 I.CODE1 Chip (Philips Semiconductor IC;SL1 ICS30 01,SL ICS31 01)

These specifications describe a Tag incorporating an IC chip I- CODE1 Label IC (product name: SL1 ICS30 01) from Philips, which is accessed by the system.

This chip consists of a 64-byte memory. The upper five blocks (Blocks 0 to 4) of the memory are used as a system area having functions that do not relate to user memory. OMRON offers special commands for accessing this area in order to ensure the great ease of these functions by the user.

Refer to 5-4 "System commands" for details.OMRON defines the blocks below Block 5 as the user memory area. Block 5 is page 00, and the subsequent blocks are allocated as shown below.

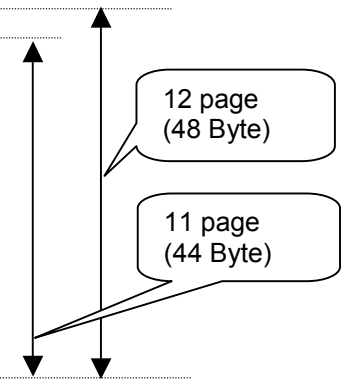
The memory is organized with four bytes as one page (4 bytes = 32 bits).

One page is the minimum unit that can be read from and written to the memory.

The memory allocation described in these specifications is in accordance with OMRON's memory allocation scheme.

1. Memory Map of I.CODE1 chip

OMRON (Page)	byte 3	byte 2	byte 1	byte 0	PHILIPS (Block)
FB	SNR (Tag-specific code)				0
FC	SNR (Tag-specific code)				1
FD	Write-protect				2
FE	QUIET/EAS				3
FF	Family code /application ID or user area				4
00	User area				5
01					6
02					7
03					8
04					9
05					10
06					11
07					12
08					13
09					14
0A					15



Special note Block 4 can be used as part of the user memory when the Distinguished Tag Read/Write function by family code (FC) or application ID (AI) is not used. If such use is preferred, define this page as FF to use it as part of the user memory. In this case, the user memory area becomes 12 pages long.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. System area of I.CODE1 chip

1) SNR (pages FB and FC)

SNR is a Tag-specific code and has been written into the memory during the chip production process.

The IC is shipped with this page write-access inhibited (refer to page FD); there is no way of making this page rewritable by the user.

2) Write-access conditions (page FD)

The pages are write-inhibited permanently if they are so indicated in the memory map. The factory settings are as follow. If the two bits of a particular page are 0,0, that page is write-protected.

Page FD	MSB							LSB
Byte 0	1	1	1	1	0	0	0	0
	Page FE		Page FD		Page FC		Page FB	
Byte 1	1	1	1	1	1	1	1	1
	Page 02		Page 01		Page 00		Page FF	
Byte 2	1	1	1	1	1	1	1	1
	Page 06		Page 05		Page 04		Page 03	
Byte 3	1	1	1	1	1	1	1	1
	Page 0A		Page 09		Page 08		Page 07	

3) QUIET/EAS (page FE)

QUIET mode :All the functions of a tag are suspended completely. Use Reset Quiet Bit to resume these functions.
(q=0: QUIET mode is disabled; q=1: QUIET mode is enabled)

EAS mode : Inhibition/permission of EAS function
(e=0: EAS mode is disabled; e=1: EAS mode is enabled)

Page FE	MSB							LSB
Byte 0	×	×	×	×	q	q	e	e
Byte 1	×	×	×	×	×	×	×	×
Byte 2	×	×	×	×	×	×	×	×
Byte 3	×	×	×	×	×	×	×	×

The pages marked with "×" in the table above are reserved for future use.

4) Family code/application ID (page FF)

Family code and application ID are special areas for enabling the user to identify an IC that is suitable to a specific user application.

Block FF	MSB	LSB
Byte 0	Family code	
Byte 1	Application ID	
Byte 2	User area	
Byte 3	User area	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-4-2 I.CODE2 Chip (Philips Semiconductor IC; SL2 ICS20)

This section describes a Tag incorporating a Philips Semiconductor IC chip SL2 ICS20 Label IC (hereinafter called “I.CODE2”), which is accessed by the system.

This chip is in conformity with international standards or ISO/IEC15693.

This Reader/Writer is organized with one page (4 bytes) as the minimum access unit of its memory block, and can be accessed up to the maximum address space defined in ISO/IEC15693. 1) shows an example of a Memory Map of an IC (hereinafter called “ISO/IEC chip”) in accordance with ISO/IEC15693.

The user memory area of I.CODE2 chip consists of 28 pages (00h through 1Bh page) or 112 bytes.

1. Maximum address space of ISO/IEC15693 chip organized with 4 bytes/page

Page	Block	Byte0	Byte1	Byte2	Byte3
0h	0				
1h	1				
2h	2				
3h					
4h					
5h					
6h					
7h					
8h					
9h					
Ah					
⋮	⋮				
Fh	15				
0h	16				
1h	17				
⋮	⋮				
Bh	27				
⋮	⋮				
F	31				
⋮	⋮				
0h	240				
1h	241				
⋮	⋮				
Fh	255				

User memory area of I･CODE2
Page 00h through 1Bh
(28 page = 112 Byte)

Caution

- The memory map above indicates the memory area defined in ISO/IEC15693, which can be accessed by this product.
- This product incorporates firmware which can access to a 4-bytes/page chip in accordance with ISO/IEC15693, however, the operating verification is performed for the Tag incorporating Philips Semiconductor IC; SL21CS20 (commonly called as I-CODE2). For other manufacturers’ tags and/or Omron’s tags incorporating other chips with accordance with ISO/IEC15693, you are recommended to verify the test of those products thoroughly.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. System area of I.CODE2 chip

This section describes a system area of I.CODE2 chip. The system area of I-CODE2 is allocated in the other area rather than user memory area.
Execute a specific command to access to the system area.

Byte0	Byte1	Byte2	Byte3
UID			
UID			
EAS/AFI/DSFID			
Write-protected			

(1) UID
UID is a Tag-specific code and has been written into the memory during the chip production process.
The IC is shipped with this page write-access inhibited; there is no way of making this page rewritable by the user.

(2) EAS/AFI/DSFID
EAS mode: Inhibition/permission of EAS function
(e=0: EAS mode is disable; e=1: EAS mode is enable)

	MSB							LSB
Byte **1**	×	×	×	×	×	×	×	**e**

The pages marked with “X” in the table above are reserved for future use.

(3) AFI
AFI is special area for enabling the user to identify a Tag that is suitable for a specific user application.

	MSB	LSB
Byte **2**	AFI higher-order 4bits	AFI lower-order 4bits

AFI higher-order 4 bits	AFI lower-order 4 bits	Applications	Example
0	0	All applications	None specified applications
X	0	X applications	Select extensively
X	Y	Y sub classification of X application	
0	Y	Limited applications to Y sub classification	
1	0,Y	Transportation	Mass transportation, bus, airplane
2	0,Y	Finance	Banks
3	0,Y	Recognition	Access control
4	0,Y	Telecommunication	Public telephone, CSM
5	0,Y	Medical care	
6	0,Y	Multimedia	Internet
7	0,Y	Game	
8	0,Y	Data storage	Portable file
9	0,Y	Physical distribution management	
A	0,Y	Package delivery	
B	0,Y	Postal mail	
C	0,Y	Air hand baggage	
D	0,Y	Hold	
E	0,Y	Hold	
F	0,Y	Hold	

*Note: X=1 through F Y=1 through F

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

(4) DSFID

DSFID indicates how data are organized in a memory.

	MSB							LSB
Byte3	DSFID							

(5) Write-access conditions

The pages are write-inhibited permanently if they are so indicated in the memory map. The factory settings are as follow. If the bit of a particular page is 1, that page is write-protected.

	MSB							LSB
Byte0	0	0	0	0	0	0	0	0
	Page 03	Page 02	Page 01	Page 00				
Byte1	0	0	0	0	0	0	0	0
	Page 0B	Page 0A	Page 09	Page 08	Page 07	Page 06	Page 05	Page 04
Byte2	0	0	0	0	0	0	0	0
	Page 13	Page 12	Page 11	Page 10	Page 0F	Page 0E	Page 0D	Page 0C
Byte3	0	0	0	0	0	0	0	0
	Page 1B	Page 1A	Page 19	Page 18	Page 17	Page 16	Page 15	Page 14

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 3
Functions

3-1 Single, FIFO, Multiple, and Selective Access Functions 3-2
3-1-1 Single Access Mode 3-2
3-1-2 FIFO Access Mode 3-2
3-1-3 Multiple Access Mode 3-3
3-1-4 Selective Access Mode 3-3
3-2 Memory Check Function 3-4
3-2-1 Usage 3-4
3-3 Lock Function 3-5
3-4 Tag Identification Access Function 3-6
3-5 External I/O Function 3-7
3-5-1 Eternal Input 3-7
3-5-2 External Input 3-7
3-6 Offline Test Function 3-7
3-7 EAS Function 3-8

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-1 Single, FIFO, Multiple, and Selective Access Functions

This Reader/Writer has four communication modes to be selected by each command corresponding to the number and/or state of Tags in the communication area. In addition, two operating modes (ISO and I.CODE1 modes) are provided, each of which can be selected according to the readout chip to be used.

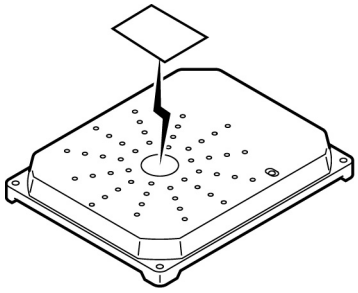
For the details and the way to use each of the modes, see the item 5-8 “Communications Phase.”

For the details of the operating mode, see the item 4-1-2 “Chip Operating Mode Setting.”

3-1-1 Single Access Mode

When operating in single access mode, be sure to have only one Tag in the communications area.

The presence of more than one Tag in the communications area will result in a communications error.



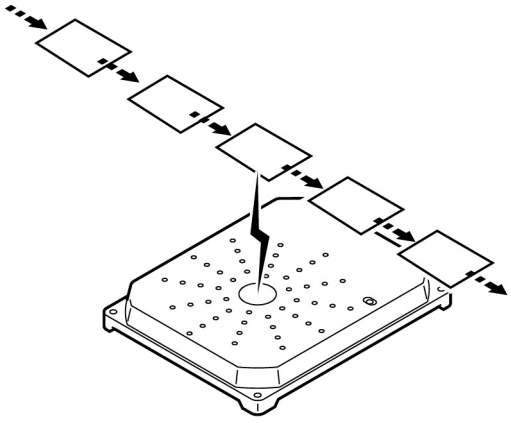
3-1-2 FIFO Access Mode

FIFO stands for First In First Out.

In the FIFO (first-in, first-out) Access Mode, the RFID System reads and writes data to and from each Tag coming into the communications area one after another.

Since every Tag finished with communications is set to access prohibit, communications will be possible if only one Tag newly arrives in the communication area of the Antenna where more than one Tag exists.

An error results, however, if two or more Tags arrive in the communications area simultaneously. Once an access-prohibited Tag leaves the communications area, access to the Tag is enabled again.



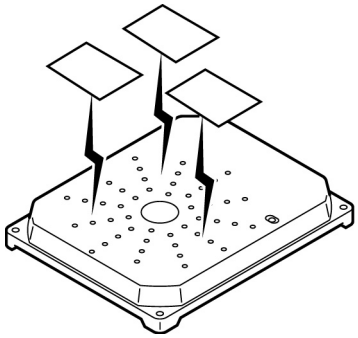
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-1-3 Multiple Access Mode

This function is also called 1:N access or multiple Tag simultaneous access.

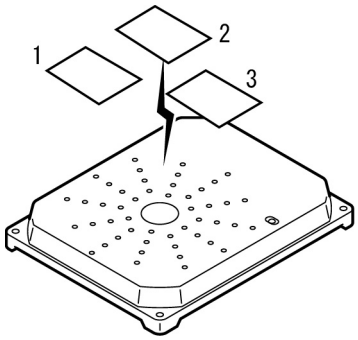
In this mode, communications with multiple Tags in the communications area will be possible.

In I.CODE1 mode, set the maximum number of Tags (number of timeslots) within the communications area (hereafter called the Tag number setting) using a command. Refer to 5-10 Timeslot Setting for details.



3-1-4 Selective Access Mode

Set Selective Access Mode when performing communications only with a specific Tag out of multiple Tags in the communications area. In ISO mode, it is possible to communicate with a specified Tag to designate for its UID code (Unique IDentifier). In I.CODE1 mode, a Tag Detection Command can be used to assign numbers to Tags within the communications area and a Tag Designation Command to communicate with a specified Tag based on the assigned numbers.



Note

- When using FIFO Access Mode, do not allow multiple Tags to enter the communications area at the same time. If multiple Tags enter the communications area at the same time, a communications error will occur, and communications will be disabled until there is only one Tag in the communications area.
- In I.CODE1 mode, be sure to set the Tag number setting in the access mode in use (Multiple Access Mode or Selective Access Mode) when using multiple Tags within the communications area. The maximum number of Tags setting is decided beforehand by the maximum number of Tags possible in the communications area. Refer to 5-10 Timeslot Setting for details.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-2 Memory Check Function : I.CODE1 Mode Only

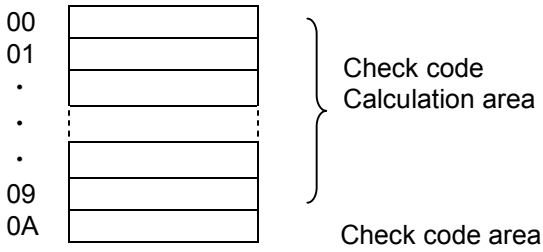
By adding a check code to the data in the Tag, you can detect data errors due to the Tag memory (EEPROM) being overwritten, service life, and unforeseen factors.

The check code uses the CRC code of the generating polynomial X16 + X12 + X5 + 1.

A memory check is performed using the Memory Check Command (MC), which writes the check code, and the Memory Calculation Command (MK), which verifies the check code. In the check block defined using the header page and the number of pages, the target calculation area is the area except for the last page of the block, and the last page is the check code area. The check code uses two bytes in the check code area.

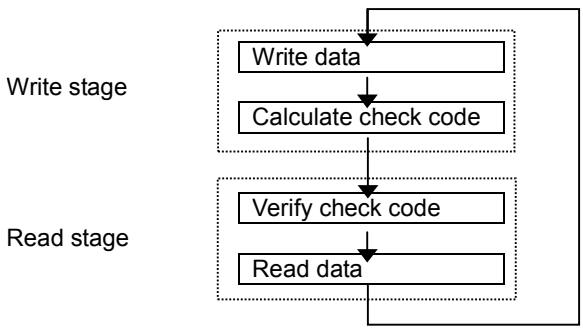
When a check code write command is sent, the CRC code for the data in the target calculation area is calculated, and written to the check code area. When the data verification command is sent, the CRC code for the data in the target calculation area is calculated, and compared with the data in the check code area. If these match, the number 75 is returned in the response code to show that the data is normal. If they do not match, the number 76 is returned to show that there is a data error.

Example: Memory check is performed when check block header page is 00 and the number of check blocks is 0B.



3-2-1 Usage

After writing the data, calculate and write the check code using the Memory Check Command (MC), and before reading the data, verify the check code using the Memory Calculation Command (MK). You can detect data corruption in advance within the Tags that are not being accessed.



Note • This Command is for I.CODE1 Mode Only.

The command is not available in ISO mode:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-3 Lock Function

The Lock function protects data from being erased due to unintentional overwriting on the fixed data in the Tags.

■ Lock setting in ISO mode

For the lock setting in ISO mode, you can write-protect any given areas by the page of Tag memory.

If you execute Write command on a write-protect page, a write processing error will occur. You can make the lock setting by executing the Lock command (LK) that enables access to the lock setting area.

For the details, see 5-4-9 “Lock Setting: ISO Mode.”

■ Lock setting in I.CODE1 mode

There is a lock setting area in the system area of I.CODE1 chip, and you can write-protect any given areas by page.

If you execute Write command on the write-protect page, the write processing error will occur.

The lock setting consists of 12 bits of data in total, giving one bit to each page. Lock setting can be made by using the Lock command (LK).

For the details, see 5-4-1 “Lock Setting: I.CODE1 Mode.”

• Lock setting area of I.CODE1 chip: “FDh page”

Lock Setting Area															
1 byte								1 byte							
b7	b6	b5	b4	b3	b2	b1	b0	b7	b6	b5	b4	b3	b2	b1	b0
Page 10	Page 09	Page 08	Page 07	Page 06	Page 05	Page 04	Page 03	Page 02	Page 01	Page 00	Family code, application ID	QU IET EAS	Write Protect	SNR	SNR

Note
- You cannot cancel write-protect setting with the lock function of V720S series.
- Be aware that you cannot write data again to write-protect pages.
- UID (SNR): Tag-specific codes are write-protected by the factory setting.

⚠ Caution Write-protect setting on the system area must be made with a great care.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-4 Tag Identification Access Function

Each of I.CODE2 and ISO/IEC chips has a one-byte identification code called AFI (APPLICATION FAMILY IDENTIFIER) which is used to extract from multiple Tags in the antenna communication field present only the Tags meeting the required application.

I.CODE1 chip has two one-byte identification codes called the family code and Application ID, respectively.

These respond only when a Tag identification code matches the identification code in the command transmitted from the antenna during communication. This function is called Tag Identification Access Function.

To make or change the Tag identification code, see 5-4 “System Command.”

Also, to make or change the identification code in the command transmitted from the antenna, see 5-6 “Setting Command.”

When perform this function in the ISO mode, make AFI settings both on the Reader/Writer above and Tag as well as the setting on the Reader/Writer to enable the function. To enable or disable the setting, execute AFI Enable/Disable Change Command of Reader/Writer described in 5-6-1.

The factory-setting of the Reader/Writer’s identification code is “00h” both for family code and application ID. This allows communications regardless of the Tag’s identification code.

In I.CODE1 mode

No.	Reader/Writer set value		No.	Tag set value	
	Family code	Application ID		Family code	Application ID
(1)	00h	00h	A	55h	AAh
(2)	55h	00h	B	55h	11h
(3)	55h	AAh	C	00h	00h

Reader/writer setting (1)

This setting enables communication with Tag A, B, and C, as both of the family code and application ID are set to “00h.”

Reader/writer setting (2)

This setting enables communications with Tag A and B as their family codes match. Communication with Tag C is not possible. This identification code has nothing to do with identifying Tags as the application ID is “00h.”

Reader/writer setting (3)

The communication with Tag “A” is possible as the family code and application ID match. The communication with Tag B and C are not possible.

In ISO mode

No.	Reader/Writer AFI set value	No.	Tag AFI set value
(1)	00h	A	5Ah
(2)	0Ah	B	0Ah
(3)	5Ah	C	00h

Reader/writer setting (1)

This setting enables communication with Tag A, B, and C as AFI is set to “00h.”

Reader/writer setting (2)

This setting enables communication with Tag A and B of which the AFI’s 4 least significant bits “Ah” match. As the 4 most significant bits are “0h,” the part of this identification code has nothing to do with identifying a Tag.

Reader/writer setting (3)

The communication with Tag “A” is possible as AFI matches.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-5 External I/O Function

3-5-1 Eternal Input

There are three external user inputs that can be controlled by commands. These can be used to design sequence operations, such as starting or stopping communications with Tags using external triggers.

3-5-2 External Input

(1) There are four external user outputs that can be controlled by commands. These can be used as control outputs, such as lamps and sounds, according to decisions made by the host based on read data and other information.

(2) In EAS mode, if a Tag for which EAS has not been released is detected, the external output 1 (OUT1) can be turned on for a specified period of time (configurable). For the details, see the items 3-6 Offline functions and 5-6-12 Offline mode setting.

3-6 Offline Read Test Function

A communication test between Tag and the antenna that is connected to the Reader/Writer is possible without connecting with the host.

In the offline mode, EAS Check command is transmitted continuously without any command execution from the host. This can be confirmed visibly as COMM LED blinks.

A Tag (un-negated Tag), of which EAS bit is enabled, enters the communication area of the antenna. External Output 1 (OUT1) turns on for the set time (initial value: 500 ms) when the ratio of EAS response coincidence from Tag (initial value 25%) exceed the set value.

This is visibly confirmed as the OUT1LED indicator lights up.

For setting this function, see 4-1-5 “Offline Mode Setting.”

Regarding the Tag EAS bit setting, see 5-4-2 “System Write (SW)” for ISO/IEC chip (I.CODE2 chip), and 5-4-7 “EAS Setting Command (ES)” for I.CODE1 chip.

For EAS Check command, see 5-4-12 “EAS Check (EA).”

Note

- To exit offline mode, connect to the host and execute Stop command (ST) (see 5-5-1). To place in the offline mode at the next startup, disable the Offline mode setting, and lock the setting (see 4-1-5)
- EAS Check command gives the communication distance longer than that of other Read- and Write-Commands.
  Execute actual commands in the online mode to set the distance precisely.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-7 EAS Function

This Reader/Writer supports EAS function of applications such as theft-prevention devices.
This function supports the online mode to be executed by the commands from the host, and the offline mode to be executed only by Reader/Writer (See 3-6 “Offline Test Function”).

(1) For Tag EAS bit setting, execute System Write (SW) (see 5-4-2) for ISO/IEC chip (I.CODE2 chip), and execute EAS Setting command (ES) (see 5-4-7) for I.CODE1 chip.

(2) Reader/Writer setting

To make this setting, execute Offline Mode Setting command (FL)” described in 5-6-12.

* The setting of the online and offline mode
* The criterion setting after reading the EAS code from Tag

A Tag returns 256-bit fixed data. When there are the certain coincidences on a percentage basis, Reader/Writer sets whether or not to detect EAS bit as un-negated (EAS bit disabled processing) Tag. The smaller the value is, less severe the criterion is. The initial value is 25%.

* When Reader/Writer setting judges EAS bit un-negated in the offline mode, Reader/Writer sets ON time of External Output 1 (OUT1) which is to be connected to a lump and a buzzer, etc.

The initial value of output time is 500 ms.

(3) EAS Check

In the online mode, execute EAS Check command (EA) described in 5-4-12.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 4
Setting, Mounting, and Connection Methods

4-1 Reader/Writer Setting 4-2
4-1-1 Host Communications Setting (COM Port Setting) 4-2
4-1-2 Chip Operating Mode Setting 4-3
4-1-3 Read Response Method Setting 4-4
4-1-4 Antenna and Tag Communications Setting 4-4
4-1-5 Offline Mode Setting 4-5
4-1-6 Fixing of Settings 4-5
4-1-7 Initialization of settings 4-5
4-2 Installation Environment 4-6
4-2-1 Installation 4-6
4-3 Mounting Method 4-7
4-3-1 Mounting Dimensional Drawing 4-7
4-4 Wiring Method 4-8
4-4-1 Power Supply and Grounding Wires 4-8
4-4-2 Host Communications Cabling 4-9
4-4-2-1 RS-232C Interface Cabling 4-9
4-4-2-2 RS-485 Interface Cabling 4-12
4-4-3 Assembly of Connector 4-14
4-4-3-1 Assembly of Host Communications Connector and I/O Connector 4-14

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-1 Reader/Writer Setting

The Reader/Writer has been designed to set all of the settings by executing commands from the host. The user can use either the COM1 or COM2 port to make settings. However, we recommend use of the COM2 port because its communications settings have been fixed at factory after power-on- reset.

In order to fix the settings of the Reader/Writer after power-on-reset, it is necessary to execute the setting write command (EW) (refer to 10) in 5-6-14 of Section 5). (This does not apply to the communications settings for the COM2 port).

4-1-1 Host Communications Setting (COM Port Setting)

Make settings for host communications by using the communications port setting command (CP) (refer to 5-6-14 of Section 5).

Setting name (command name)	Port	Default set value	Setting range	Description
Baud rate setting *1 (CP command)	COM1	38400 bps	9600 bps 19200 bps 38400 bps 115200 bps	This command sets the baud rate for use in communications with the host.
	COM2	9600 bps		
Data length setting *1 (CP command)	COM1	7bits	7 bits 8 bits	This command sets the data length for use in communications with the host.
	COM2	7 bits		
Parity bit setting *1 (CP command)	COM1	Even	None Odd Even	This command sets the parity bit for use in communications with the host.
	COM2	Even		
Stop bit setting *1 (CP command)	COM1	2bits	1bit, 2 bits	This command sets the stop bit for use in communications with the host.
	COM2	2 bits		
BCC bit setting *1 (CP command)	COM1	Enabled	Disabled Enabled	This command sets whether the BCC for command frames and response frames for communications with the host will be en-abled or disabled. Using the BCC is referred to as "BCC enabled."
	COM2	Enabled		
ACK/NACK setting *1 (CP command)	COM1	No	No Yes	This command sets whether or not ACK/NACK control is performed between the host and the Reader/Writer. If this control is not performed, it is referred to as "no ACK/NACK control."
	COM2	No		
Timeout setting *1 (CP command)	COM1	5 sec.	0.5 sec. 5 sec.	This command sets the timeout period for ACK/NACK control. This setting will be meaningless unless this command (ACK/NACK control) is set to ON.
	COM2	5 sec.		

Note (*1) The communications settings for the COM2 port can also be changed but will return to the Default set values on resetting the power of the Reader/Writer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1) Communications type setting for COM1 port

Set whether COM1 will be used as RS-232C or RS-485 by using the communications type setting command (CT) (refer to in 5-6-8 of Section 5).

Setting name (command name)	Default set value	Setting range
Communications type setting *1 (CT command)	RS-232C	RS-232C RS-485

2) Node No. setting

If more than one Reader/Writer is connected to a single host, each Reader/Writer needs an ID number so that the host can discriminate one Reader/Writer from another. Such an ID number is called node number. Each Reader/Writer must be assigned a unique node number. Each command or response includes the node number of the Reader/Writer. Communications will not be possible if the node number is wrong.

The setting can be saved by executing the setting write command.

Use the node number setting command (NM) to set a node number (refer to 5-6-6 of Section 5).

Setting name (command name)	Default set value	Setting range
Node No. setting (NM command)	00	00～31

Note Communications through COM2 are possible regardless of the node number setting.

3) Terminal resistance setting

This setting is necessary when COM1 is used as RS-485.

If more than one Reader/Writer is connected to a single host, terminal resistance must be turned on for both the host and the Reader/Writer connected to either end of the host in order to ensure stable operation. The setting can be saved by executing the setting write command.

Use the terminal resistance setting command (TM) to set the terminal resistance (refer to 5-6-11 of Section 5).

Setting name (command name)	Default set value	Setting range
Terminal resistance setting (TM command)	OFF	ON/OFF

Note For more information, refer to 4-4-2-2 RS-485 Interface Cabling.

4-1-2 Chip Operating Mode Setting

This Reader/Writer consists of 2 types of operating modes (hereinafter called “operating mode”) in accordance with a type of the Tag (an incorporated IC chip). You have to set either of the operating modes in accordance with the Tag you choose.

Execute the operating mode switch setting command (TY) (refer to 5-6-15 of Section 5).

Setting name (command code)	Default value	Setting range	Remarks
Operating mode switch (TY command)	I.CODE1 mode	ISO mode	Adherence to ISO/IEC15693 standards (I.CODE2 chip)
		I.CODE1 mode	Adaptable to I.CODE1 chip

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-1-3 Read Response Method Setting

• SNR addition setting

Select whether or not UID(SNR) (a serial number representing an ID unique of a Tag) will be added to the response when a read-related command is executed.

Make this setting by using the SNR addition command (SN) (refer to 5-6-5 of Section 5).

Setting name (command name)	Default set value	Setting range
SNR addition setting (SN command)	Disable (do not add)	Enable/Disable

Note When enabled, this command makes association of data contained in a Tag to the serial number of that Tag considerably easier. Use of this command also leads to a much shorter communications time than when using other commands.

4-1-4 Antenna and Tag Communications Setting

Set how communications should take place between the Reader/Writer and a Tag.

1) Reader/Writer-Tag communications speed setting

Set the speed of communications between the Reader/Writer and a Tag (baud rate from the Reader/Writer to a Tag).

This setting can be made by using the Tag communications mode setting command (CM) (refer to 5-6-9 of Section 5). The baud rate from a Tag to the Reader/Writer is fixed (26.5kbps).

Setting name (command name)	Default set value	Setting range	Baud rate
Communications speed setting (CM command)	Standard mode	Standard mode	1.65 kbps
		Fast mode	26.5 kbps

2) Receiving antenna setting

Set whether your receiving antenna will be enabled or disabled.

This setting can be made by using the receiving antenna Changeover command (AC) (refer to 5-6-10 of Section 5).

Setting name (command name)	Default set value	Setting range
Receiving antenna setting (AC command)	Disable (the receiving antenna will not operate)	Enable/Disable

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-1-5 Offline Mode Setting

Set whether the Reader/Writer will start in offline mode or online mode.
If you choose offline mode, the Reader/Writer will perform EAS check without connecting the host.
This setting can be made by using the offline mode setting command (FL) (refer to 5-6-12 of Section 5).

Setting name (command name)	Default set value	Setting range
Offline Mode Setting (FL command)	Enable (offline mode)	Enable/Disable

Note The default mode is offline mode. You can exit offline mode by connecting to the host and sending a Stop Command (ST) (refer to 5-5-1 of Section 5). If you want to start the product with online mode the next time, first disable off-line mode as stated above and then fix this setting (4-1-6, Section 4).

4-1-6 Fixing of Settings

By fixing the settings that you have made using various setting commands, you can write them into the EEPROM (Nonvolatile memory) so that they will survive a power reset of the Reader/Writer.
Use the EEPROM write command (EW) to fix your settings (refer to 5-6-14 of Section 5).

Setting name (command name)
EEPROM write (EW command)

Note
- Settings are only saved in the S-RAM (Volatile memory) in the Reader/Writer. Unless you fix your settings with this command, they will return to the initial values on a power reset.
- This command does not work on communications settings for COM2.
- Depending on setting items, power-on-reset of the Reader/Writer will be required for settings to be effective.

4-1-7 Initialization of settings

If necessary, you can return all the settings to their default set values.
Use the initialize settings command (IS) to return your settings to their default set values (refer to 5-6-13 of Section 5).

Setting name (command name)
Initialize settings (IS command)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-2 Installation Environment

The V720S-BC5D4 Reader/Writer is a highly reliable control device withstanding tough environments. In order to ensure the full, reliable performance of the RFID system, however, follow the installation conditions below.

4-2-1 Installation

- Do not install the Controller under the following conditions.
- The ambient temperature is not within a range between -10℃ and 50℃ or there are radical temperature changes resulting in condensation.
- The humidity is not within a range between 35% and 85%.
- There is corrosive gas, flammable gas, dust, salt, or metal powder.
- The Reader/Writer is affected by direct vibration or shock.
- The Reader/Writer is exposed to direct sunlight.
- Oil, or chemical is sprayed onto the Controller.
- Do not install the Reader/Writer close to heaters, transformers, or resistors that radiate excessive heat.
- If power lines or high-tension lines with large currents are located close to the Reader/Writer, be sure to test the Reader/Writer carefully and make sure that wires connected to the Reader/Writer are not affected by the noise of power lines or high-tension lines.

Note Be sure to abide by the above before installing the Reader/Writer and carefully test the Reader/Writer.

⚠ **Caution**

- Be sure to wire antenna cables separately from other cables. For the antenna cable, be sure to use V720-A40 3.35M or V720-A40 10.33M that is specially designed for this product. Using any other cable may affect adversely the communications performance, waterproof performance, etc.
- For wire power and I/O cables as well, wire them separately wherever possible in order to avoid malfunctions.
- Be sure to use Class D grounding (previous Class 3 grounding) for the Reader/Writer power connector.

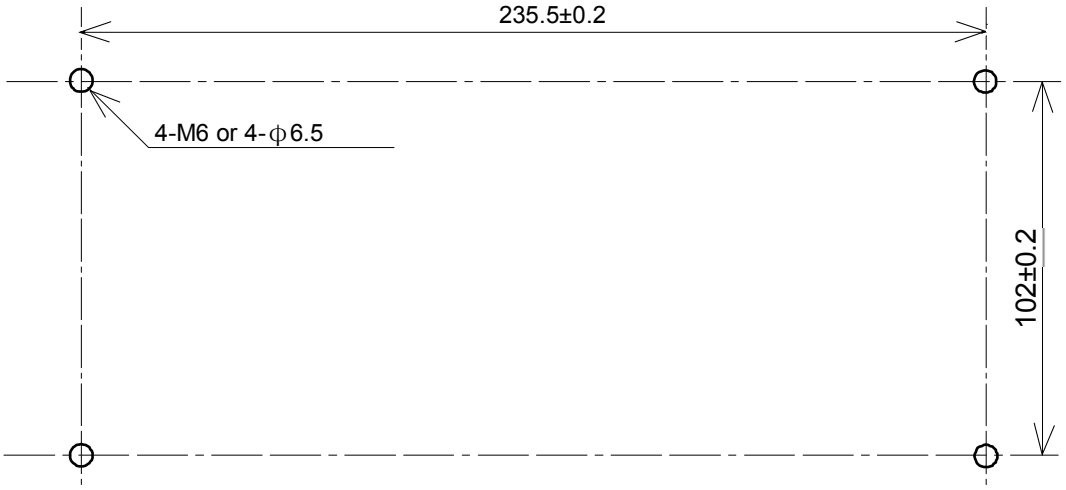
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-3 Mounting Method

The Reader/Writer must be mounted using a mounting plate. When mounting, be sure to secure it onto the mounting plate with M6 screws, spring washers and flat washers.

Do not apply organic solvent, e.g., screw lock solvent, to the screws to secure the Reader/Writer. If you do, the Reader/Writer body and the mounting plate may be damaged.

4-3-1 Mounting Dimensional Drawing

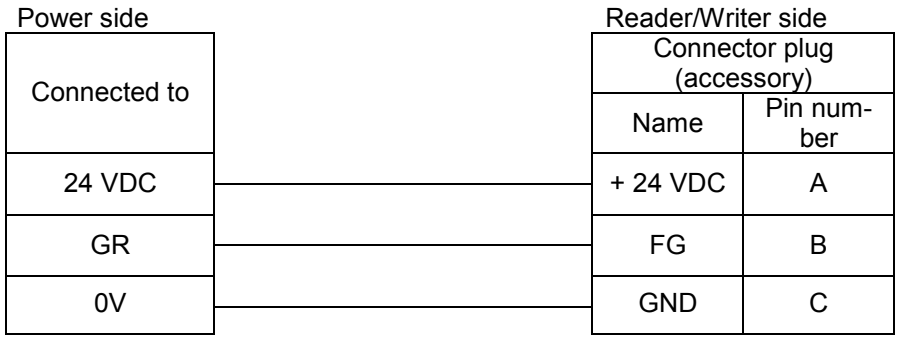


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-4 Wiring Method

4-4-1 Power Supply and Grounding Wires

• Power cable



• Recommended Compact DC Power Supply (OMRON)

Model	Output capacitance	Input voltage
S82K-03024	24VDC at 1.3A	100/200V

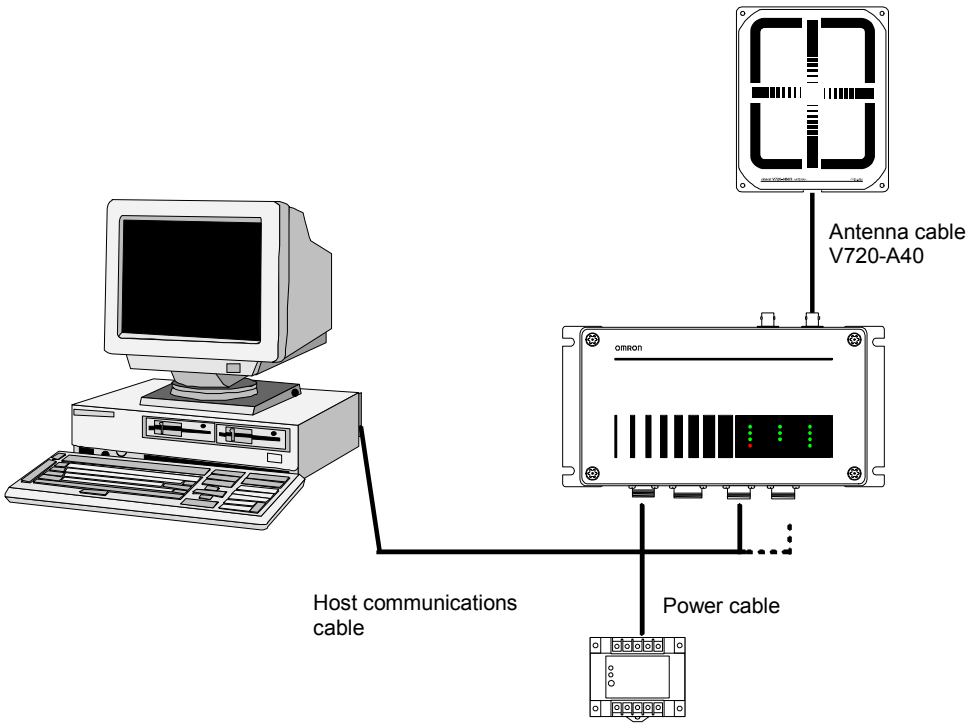
Note
- Use 24 VDC to supply power to the Reader/Writer. When you use the recommended power supply, S82K-03024, and a cable with a thickness of AWG16, the cable can be extended to 7 meters at maximum .If a longer power wire is desirable, use a power supply with remote sensing function.
- The maximum power consumption of the Reader/Writer is 25 W. An in-rush current of approximately 30 A at 24 VDC, however, flows when the Reader/Writer is turned ON. Take this into consideration when preparing the power supply.
- Provide a power wire with a thickness of AWG16 in order to prevent the dropping of voltage. It is recommended that twisted-pair wire be used for the power line. The thickness of AWG16 is the maximum wire diameter that can be used with the power connector of the Reader/Writer.
- Use Class D grounding (previous Class 3 grounding) for the Reader/Writer for improved noise tolerance.

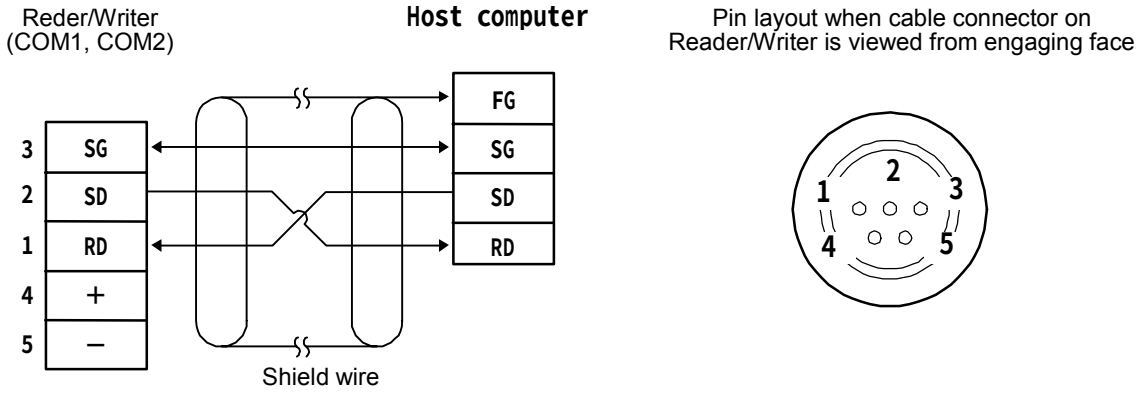
⚠ **WARNING** Be sure to connect to a power supply with a maximum power supply capacity of 24V 4.2A (100W) or less .In case a short-circuit failure should occur within the Reader/Writer, a burnout in the power cable may result.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-4-2 Host Communications Cabling

4-4-2-1 RS-232C Interface Cabling





⚠ Caution

- The shield wire must always be grounded on the host side.
- Internally short-circuit pins 7 (RS) and 8 (CS).
- Leave the pin for RS-485 unconnected.
- Cables must not be longer than 15 meters.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1) Connection to a DOS/V Host with 9-pin Port
(Pin layout when cable connector is viewed from engaging face)

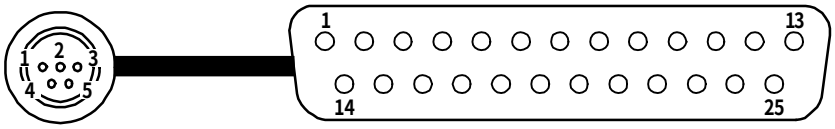


Reader/Writer COM1, COM2		Connecting Devive Connector of cable	DOS/V PC 9-pin, female	
			GR	
3	SG		SG	5
2	SD		SD	3
1	RD		RD	2
4	+			
5	−			

Shield wire

Note Connect the shield wire to the connector cover on the PC side.

2) Connection to Host through NEC 98 or Compatible Computer, 25-pin Port
(Pin layout when cable connector is viewed from engaging face)



Reader/Writer COM1, COM2		Connecting Devive Connector of cable	NEC98 Compatible PC 25-pin, male	
			GR	1
3	SG		SG	7
2	SD		SD	2
1	RD		RD	3
4	+			
5	−			

Shield wire

3) Connection to OMRON C200H PLC
(Pin layout when cable connector is viewed from engaging face)

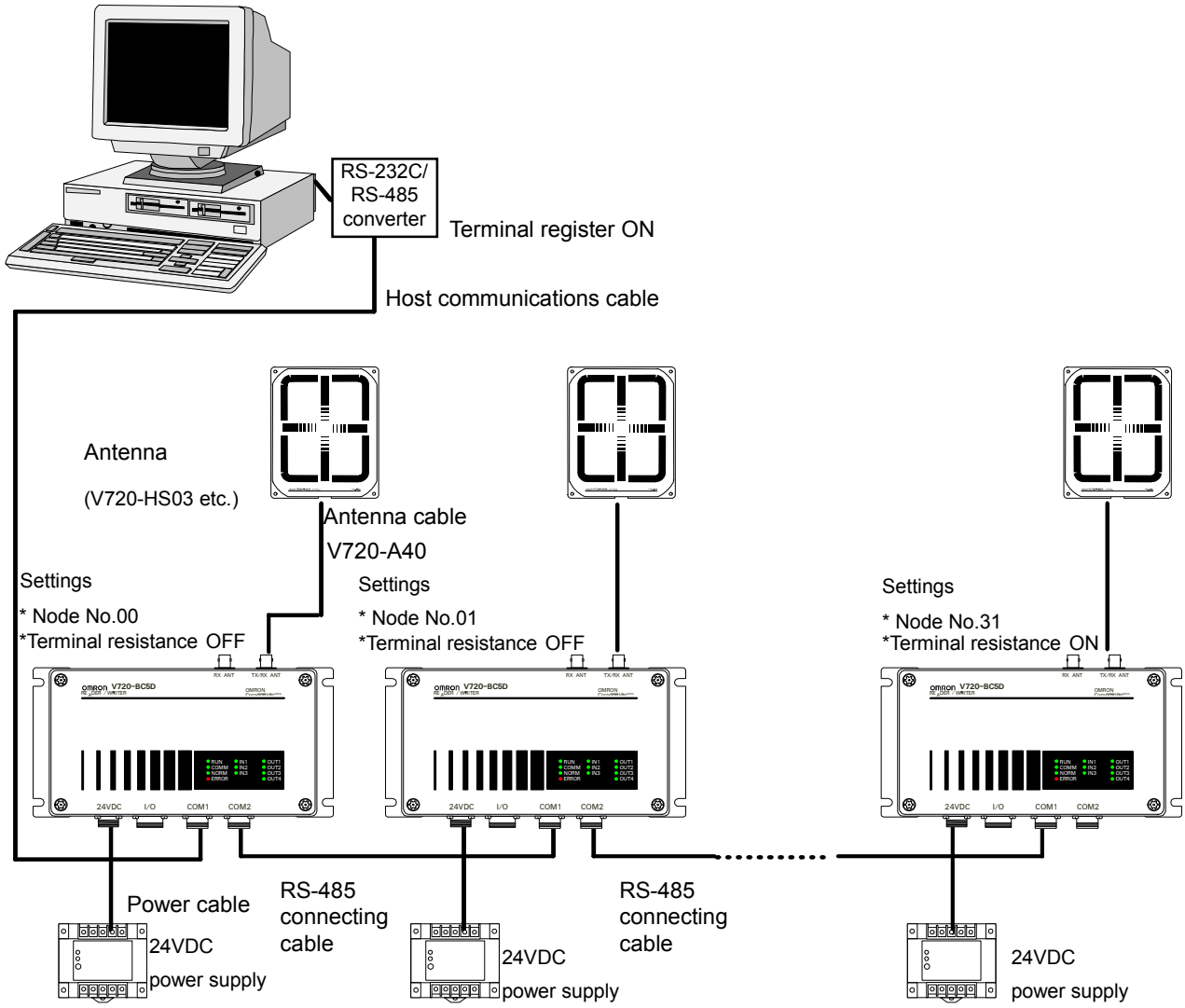


Reader/Writer COM1, COM2		Connecting Devive Connector of cable	C200H ASC02 9-pin, male	
			GR	1
3	SG		SG	9
2	SD		SD	2
1	RD		RD	3
4	+			
5	−			

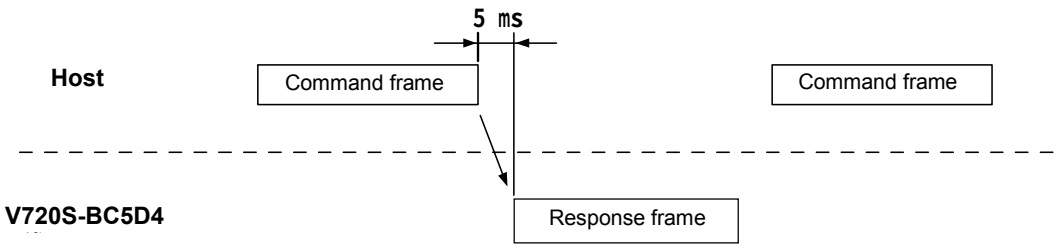
Shield wire

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-4-2-2 RS-485 Interface Cabling

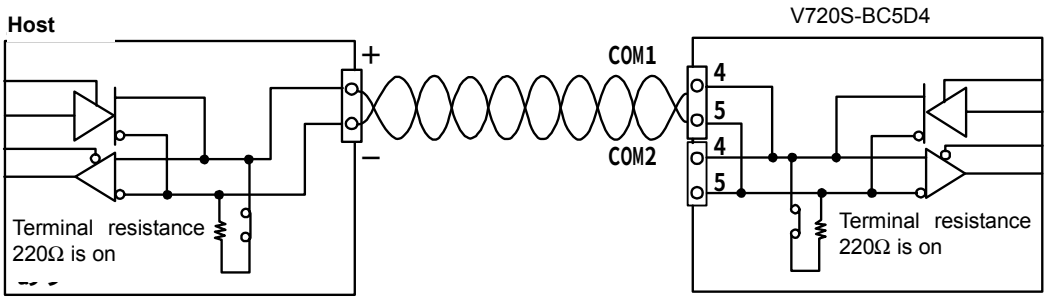


Note On the host side, send the following commands after confirming that the Reader/Writer responds normally.
Do not begin sending commands until the host is completely ready for transmission. Switch the host to receive mode within 5 ms after completion of transmission of commands. If you fail to do this, the host may not be able to communicate with the Reader/Writer.



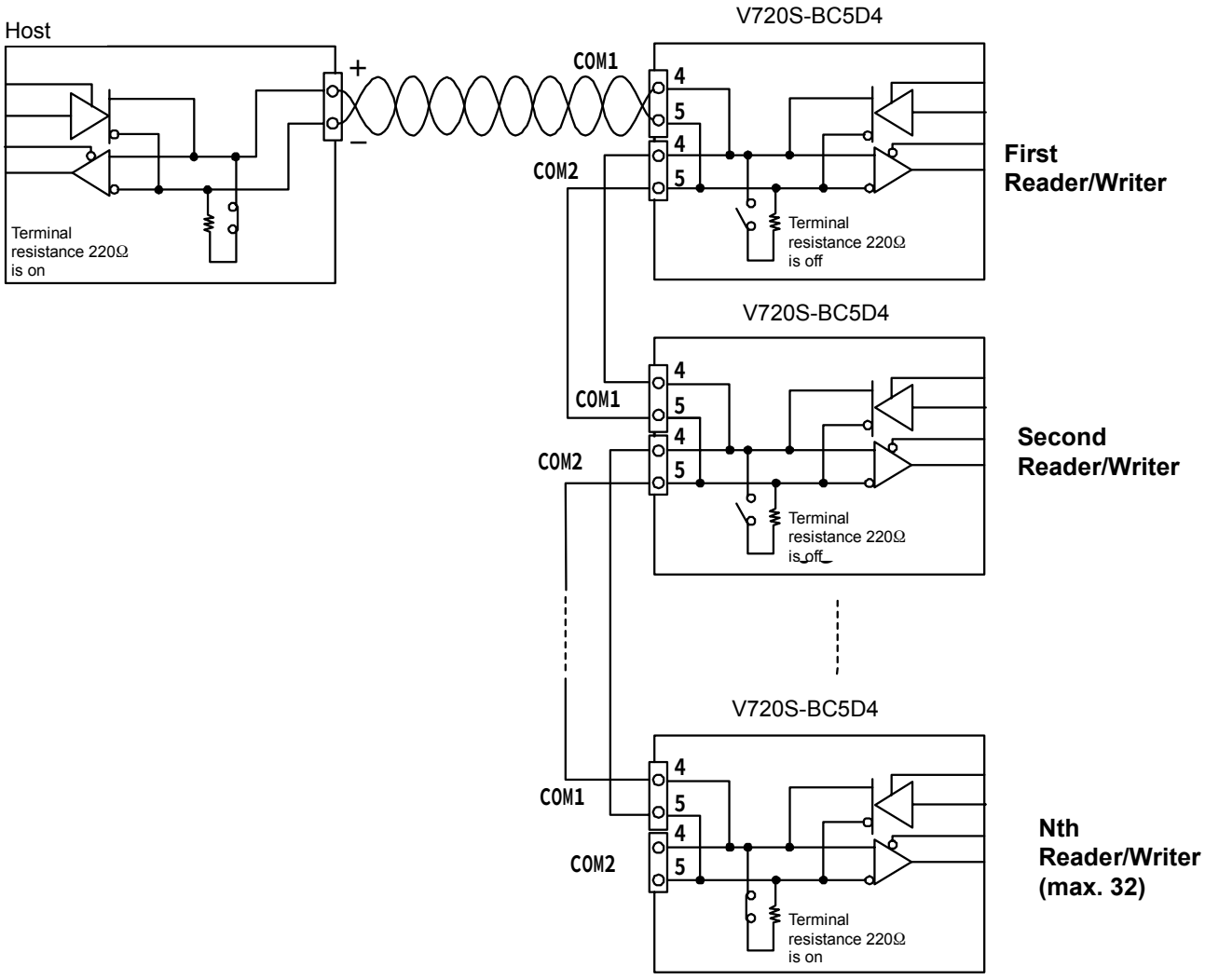
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1) Example of wiring for 1-to-1 connection



Note Be sure to turn on the terminal resistance on both the host and Reader/Writer sides.

2) Example of wiring for 1-to-N connection



Note When you connect more than one Reader/Writer, turn on the terminal resistance for the Reader/Writer that is located farthest from the host and the terminal resistance for the host. The terminal resistance for all the other Reader/Writers must be off.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ Example of wiring between host and Reader/Writer

Host side / Reader/Writer side

Connected to	Connector plug (accessory) Name	Pin number
	RD	**1**
	SD	**2**
	SG	**3**
+	+	**4**
-	-	**5**

Pin layout when cable connector on Reader/Writer is viewed from engagingface



Port	COM1		COM2	
Terminal No.	4	5	4	5
Polarity.	+	-	+	-

* Short circuits have been established within RS-485 between Pin 4 of COM1 and Pin 4 of COM 2 and between Pin 5 of COM2 and Pin 5 of COM1.

■ Example of cabling between Reader/Writers

Reader/Writer side (COM1)

Connector plug (accessory)	
Name	Pin number
1	RD
2	SD
3	SG
4	+
5	-

Reader/Writer side (COM2)

Connector plug (accessory)	
Name	Pin number
RD	1
SD	2
SG	3
+	4
-	5

Note
- Leave the pin for RS-232 unconnected.
- Be sure to use a twisted-pair wire for the signal line.
- Be sure to use a wire with a thickness of AWG20 for the signal line.
- When you use a shielded cable, be sure to ground on the host side.
- Make sure that the total cable length for 1-to-1 and 1-to-N connection is not longer than 300 m.

Note When you connect more than one Reader/Writer, give special attention to communications timing between Reader/Writers. To ensure proper timing, you will need to perform both theoretical calculation of timing and verification of communications on real machines.

1) The Reader/Writers cannot operate simultaneously except through polling-related commands. This means that, even when you connect more than one Reader/Writer, only one Reader/Writer can communicate with the host at a time.
Multiple Reader/Writers can access the host only in a time-phased manner.

2) When you use an Auto command, the Reader/Writer will not return a response but continue to wait if there are no Tags in the communications area. In this state, if you send a command to another Reader/Writer, no command will be accepted until a response is returned. To avoid this, you must abort the Auto command using the STOP command before sending any command.

3) Polling-related commands do not support any commands but Auto commands. These commands are not available in Multiple Access Mode (which permits access to multiple Tags) to avoid processing complexities.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

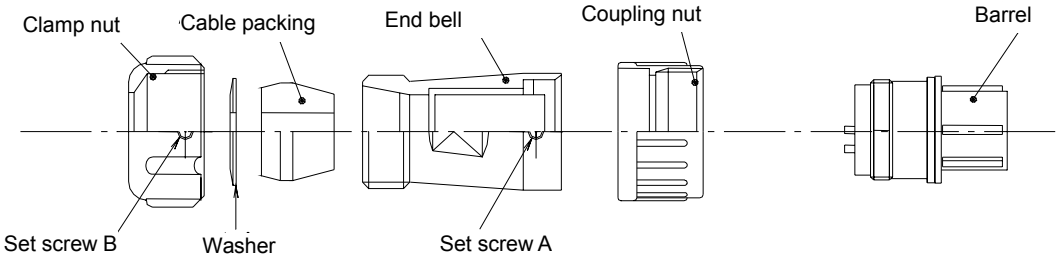
4-4-3 Assembly of Connector

4-4-3-1 Assembly of Host Communications Connector and I/O Connector

1) Disassemble the connector as follows:

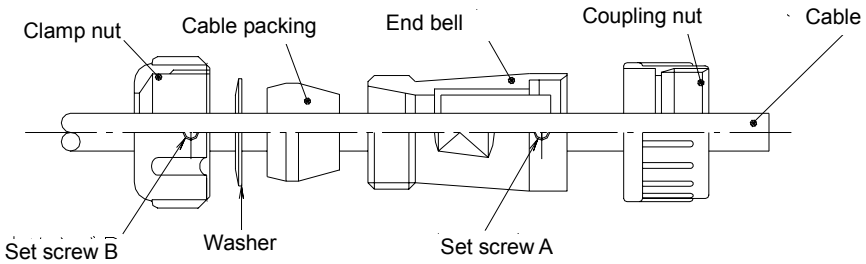
a) Loosen the set screws and remove the barrel from the end bell (by turning it counterclockwise).

b) Loosen Set Screw B, remove the clamp nut from the end bell, and pull out the washer and the cable packing.

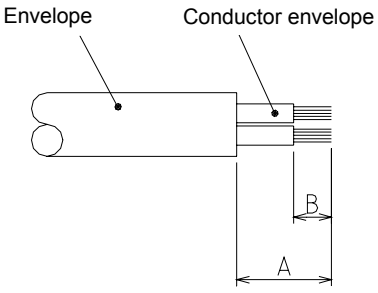


2) Draw the cable through the disassembled parts in the order shown below.

- Make sure that the parts are in the correct order and orientation.



3) Strip a part of the sheath and insulator of each cable to be used according to the measurements specified in the table below.



- Cable terminal treatment measurement table

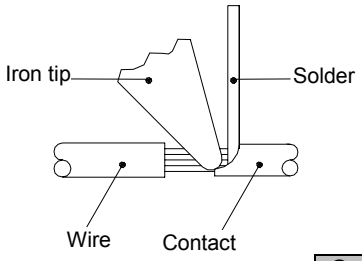
Usage	Connector name	Mesure-ment A (mm)	Mesure-ment B (mm)	Conductor cross-sec-tional area (mm^2)	Iron tip tempera-ture(%)
Host communica-tions/IO	NJW-165 + PF, PM, A**d**F	16	3.2	0.5	280
Power supply	NJW-2010 + PF, PM, A**d**F	18			350

4) Pre-solder the conductors complete with terminal treatment.

Note
- Be careful not to pre-solder the cable cladding.
- When finished, the pre-soldered part should be smaller in diameter than the contact hole and have no uneven portion on the entire surface.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5) Soldering



(1) Insert the pre-soldered wire into the solder pot of the contact.
(2) Heat the contact and the conductors with a soldering iron.
(3) Pour solder to fill the opening between the contact and the conductors.

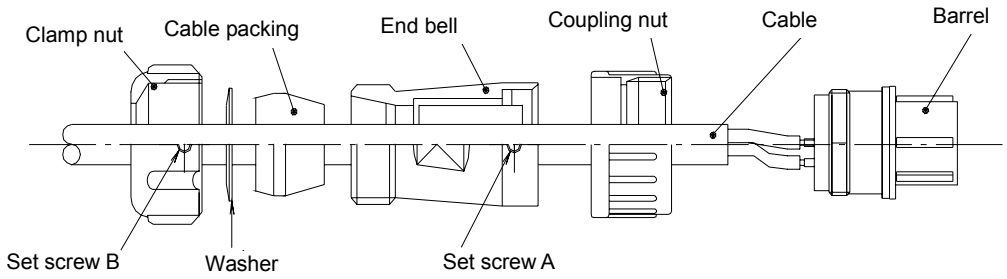
Soldering iron to use	Conductor cross-sectional area (mm^2)
30W	0.5

6) Reassemble the connector as follows.

Screw the barrel into the end bell and secure it with Set Screw A.

Push the cable packing and washer into the end bell, secure the end bell, and screw the clamp nut in.

After swinging the cable in various directions to settle the parts on the cable (Fig. 1), re-tighten them to the specified torques and secure them with Set Screw B.



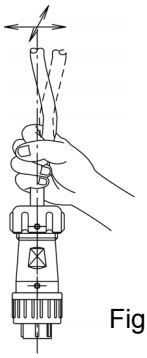


Fig.1

• Tightening torque for screws Unit:N•m

End bell	0.010 - 0.015
Clamp nut	0.015 - 0.020
Set Screws A and B	0.002 - 0.003

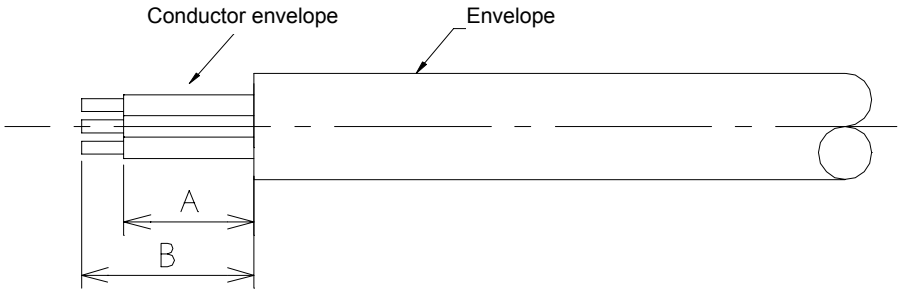
⚠ Caution

Model name of connector plug for host communications: NJW-165-PM7 from Nanaboshi Electric Mfg. Co., Ltd.
Model name of I/O connector plug: NJW-2010-PM10 from Nanaboshi Electric Mfg. Co., Ltd.
Waterproofing effects vary depending on the finish of the cable envelopes and the condition of the materials inside the cable. Before use, be sure to check for the proper torques and the waterproof effects of the cable of your choice. OMRON does not offer any guarantee for customer-made cables. Please inquire to the manufacturer for details of these connectors.

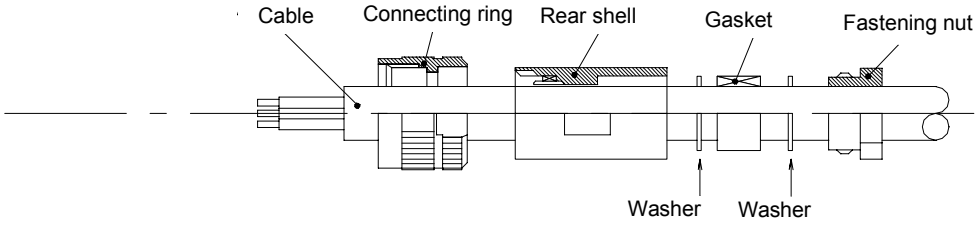
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-4-3-2 Assembly of Connector

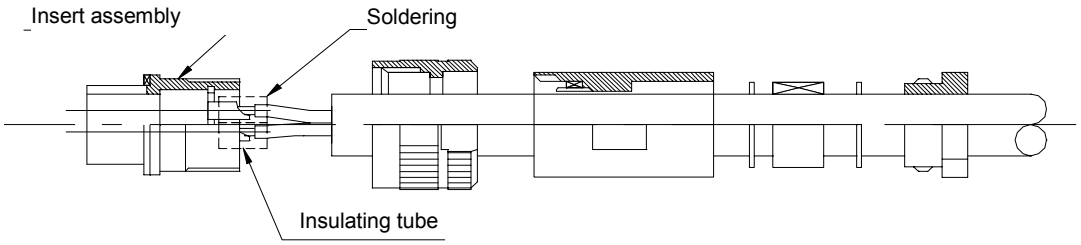
1) Strip a part of the envelopes of the cable terminal and the conductors according to the measurements specified in Tables A and B.



2) Insert the fastening nut, washer, gasket, washer, rear shell, and connecting ring (this is not necessary if a jack is used) in this order at any desired part of the cable.

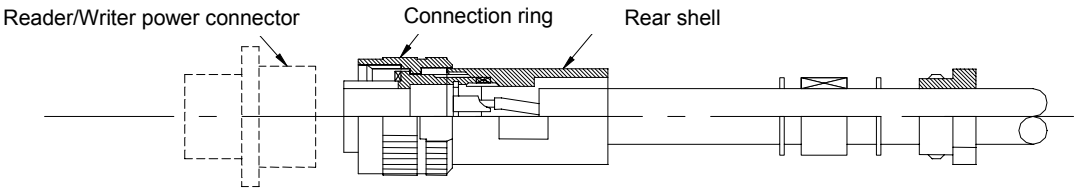


3) Solder the conductors to the contact.



Note
- After the soldering process, remove paste, dirt and any other foreign matter from the insulation surface.
- Protect the soldered part with an insulating tube or the like.

4) Secure the insert assembly (plug and jack) to the dummy receptacle and fasten the rear shell to the fastening torque specified in C, Table 1.
Use the power connector of the Reader/Writer to serve as a dummy receptacle for wire bound.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5) Into the fastened rear shell, insert the washer, gasket, and washer in this order and fasten the fastening nut to the fastening torque specified in D, Table 1.

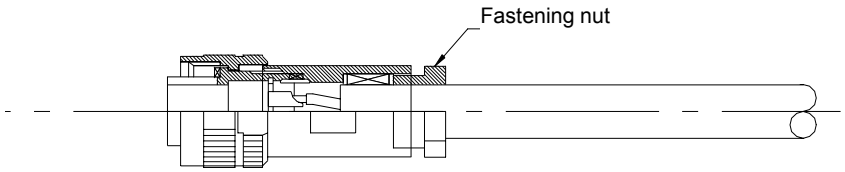


Table 1: Cable stripping measurements and recommended fastening torques

Insert Size	A (mm)	B (mm)		C (N•m)	D (N•m)
		1.0 mm contact	1.5 mm contact		
10	6.0	10.0	11.5	0.03 - 0.06	0.04 - 0.08

⚠ **Caution** Model name of power connector: 1108-12A10-3AF (8.6) from Tajimi Musen Electronics Co., Ltd.
OMRON has established a range of cables suitable for the 1108 series products of 0.3 mm to 0.8 mm in diameter of their cord feed ports. Please note that the waterproofing effects of these cables vary, depending on the finish of the cable envelopes and the condition of the materials inside the cable. Before use, be sure to check for the proper torques and the waterproof effects of the cable of your choice.
OMRON does not offer any guarantee for customer-made cables. Please inquire the manufacturer about details of these connectors.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 5
Control from Host

5-1 Reader/Writer under Operating Conditions 3
5-1-1 Reader/Writer under Operating Conditions 3
5-1-2 Communications Phase 3
5-1-3 ACK/NACK Control 4

5-2 Command and Response Frame Structures 5
5-2-1 Command Frame Structure 5
5-2-2 Response Frame Structure 5
5-2-3 Command Code List 6
5-2-4 Response Command List 7
5-2-5 Example BCC Calculation 8

5-3 Communications Commands and Responses 9
5-3-1 Read (RD) 9
5-3-2 Write (WT) 10
5-3-3 Tag Detection (RD): I.CODE1 Mode Only 12
5-3-4 Selective Access Read (RD) 13
5-3-5 Selective Access Write (WT) 14
5-3-6 Special Read (RD): I.CODE1 Mode Only 15
5-3-7 Polling Single Auto Read (PR) 16
5-3-8 Polling Single Auto Write (PW) 17
5-3-9 Polling Check (PC) 18
5-3-10 Polling End (PE) 19
5-3-11 Memory Check (MC): I.CODE1 Mode Only 19
5-3-12 Memory Calculation (MK): I.CODE1 Mode Only 20

5-4 System Command 21
5-4-1 System Read (SR): ISO Mode Only 21
5-4-2 System Write (SW): ISO Mode Only 22
5-4-3 System Lock (SL): ISO Mode Only 23
5-4-4 SNR (Tag-specified Code) Read (RD): I.CODE1 Mode Only 24
5-4-5 Read (RD) of Family Code and Application ID: I.CODE1 Mode Only 25
5-4-6 Write (WT) of Family Code and Application ID: I.CODE1 Mode Only 26
5-4-7 EAS Setting (ES): I.CODE1 Mode Only 27
5-4-8 QuietBit Setting (QB): I.CODE1 Mode Only 27
5-4-9 Lock Setting (LK): ISO Mode Only 28
5-4-10 Lock Setting Read (LR): ISO Mode Only 29
5-4-11 Lock Setting (LK): I.CODE1 Mode Only 30
5-4-12 EAS Check (EA) 31

5-5 Reader/Writer Control Command 32
5-5-1 Stop (ST) 32
5-5-2 Reset (XZ) 32
5-5-3 ACK (AK) 32
5-5-4 NACK (NK) 33
5-5-5 I/O Control Command (CC) 33
5-5-6 Test (TS) 34
5-5-7 Version (VS) 35

5-6 Setting Command 36
5-6-1 Reader/Writer AFI Enable/Disable Changeover (AE): ISO Mode Only 36
5-6-2 Reader/Writer AFI Read (AF): ISO Mode Only 37
5-6-3 Read and Write of Family Code (FC):I.CODE1 Mode Only 38
5-6-4 Read and Write of Application (AI): I.CODE1 Mode Only 39
5-6-5 SNR Addition Setting (SN) 40

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-6 Node Number Setting Command (NN) 41
5-6-7 Communications Port Setting Command (CP) 42
5-6-8 Communications Type Setting (CT) 43
5-6-9 Tag Communications Mode (CM) 44
5-6-10 Antenna Changeover Command (AC) 45
5-6-11 Terminal Resistance Setting Command (TM) 46
5-6-12 Offline Mode Setting (FL) 47
5-6-13 Initialization of Settings Command (IS) 48
5-6-14 Setting Write Command (EW) 48
5-6-15 Operating Mode Changeover (TY) 49

5-7 Other Commands 50
5-7-1 Command Undefined Response 50

5-8 Communications Method 51
5-8-1 Access Settings 51
5-8-1-1 Single Access 51
5-8-1-2 FIFO Access 51
5-8-1-3 Multiple Access 52
5-8-1-4 Selective Access 53
5-8-2 Mode Settings 56
5-8-2-1 Trigger Mode 56
5-8-2-2 Auto Mode 57
5-8-2-3 Repeat Mode 58
5-8-2-4 Polling Auto Mode 59
5-8-3 Table of Communications Methods 60
5-8-4 Table of Communications Methods for Commands 61

5-9 Data Type 62

5-10 Timeslot Setting 63

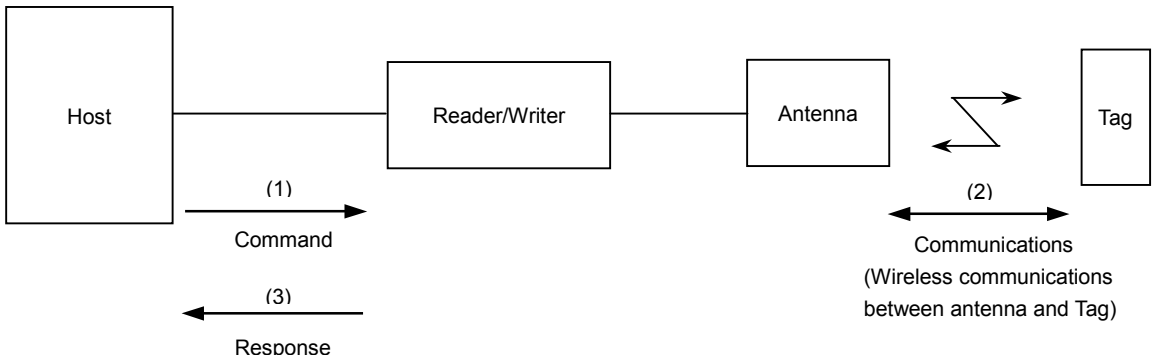
5-11 Command Connection: In I.CODE1 Mode 64

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-1 Reader/Writer under Operating Conditions

5-1-1 Reader/Writer under Operating Conditions

The V720S series of RFID system receives a command (1) from the host, communicates with the Tag (2), and returns its result to the host as a response (3).



■Reader/writer under operating conditions

●Command wait state

The command wait state indicates that a Reader/Writer executes no commands. The Reader/Writer can receive all commands except for AK and NK commands, which control ACK/NACK. When the Reader/Writer receives a command, it goes into command processing state.

●Command processing state

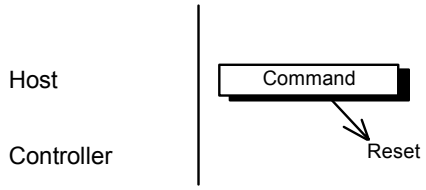
After the Reader/Writer receives a command, the next command is ignored until the command processing is completed, however, the stop and reset commands will be executed anytime.

5-1-2 Communications Phase

The following commands and responses can be made by specifying different command communications settings.

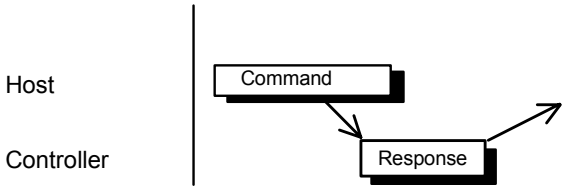
(1) No Response

When the Reader/Writer receives the Reset Command, it is reset without returning a response and waits for the next command.



(2) 1-to-1

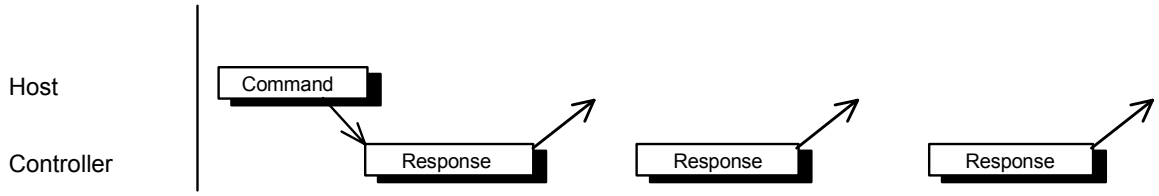
One response is sent per command with the following commands: Single Trigger, Single Auto, FIFO Trigger, FIFO Auto (commands that communicate with Tags) or commands that do not communicate with Tags.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

(3) Multiple Response

Multiple responses are sent per command when the following commands have been specified: Single Repeat, FIFO Repeat, Multi-trigger, Multi-repeat, or Selective Access (for commands that communicate with Tags).



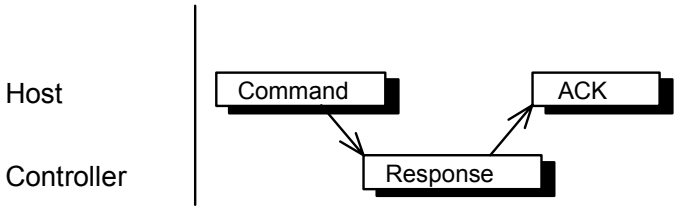
5-1-3 ACK/NACK Control

When using ACK/NACK control, if the host does not receive a normal response, the Reader/Writer will resend the response by either (1) when the host sends a NACK command to the Reader/Writer or (2) when there is no response within a set period of time. Consequently, a response can be received without communicating with a Tag again. The host checks that responses have been received normally using the ACK/NACK commands, so response data can be communicated dependably.

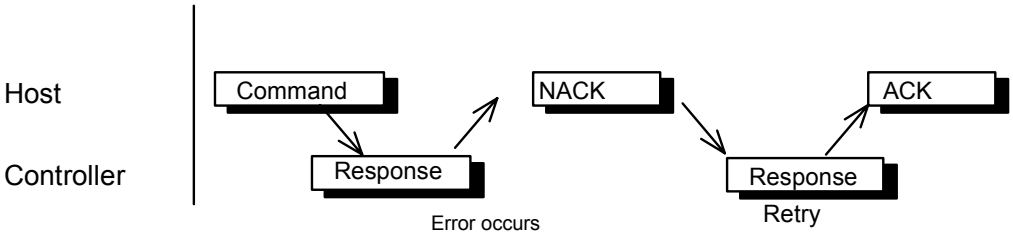
- Using ACK/NACK Control

If the host receives a normal response, it sends an ACK command to the Reader/Writer. The Reader/Writer judges that the host has received a normal response, and enters a command-waiting state. If, after the Reader/Writer has sent the response, an ACK is not received normally within the time set using the time out setting, or a NACK is received, the Retry Flag is set and the last response is sent again. The maximum number of response retries that can be made is nine.

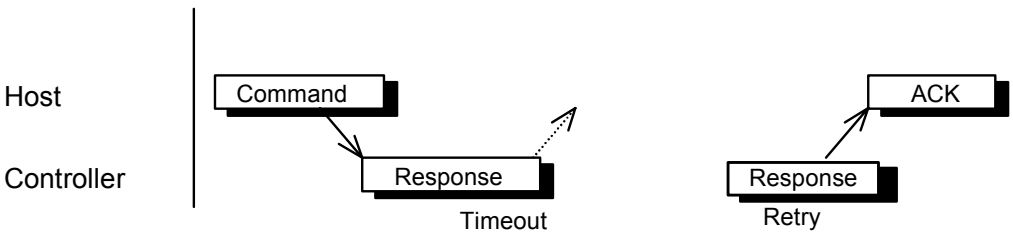
(1) Host Receives a Normal Response and Sends ACK Command



(2) Host Cannot Receive a Normal Response and Sends a NACK Command



(3) Host Did Not Send an ACK/NACK Command within the Timeout Period

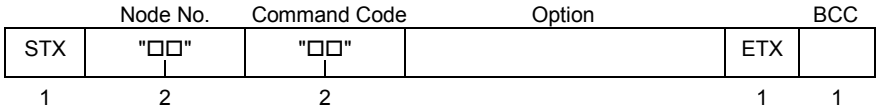


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-2 Command and Response Frame Structures

5-2-1 Command Frame Structure

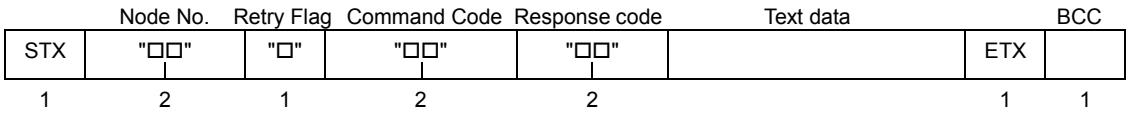
The Reader/Writer continuously receives signals from STX through ETX, and executes the command when the correct node number is received (*1). If, after receiving an STX signal, another STX signal is received before an ETX signal is received, the second STX signal is given command priority.



Name	Description
STX	Indicates the beginning of a communication frame (text). Expressed by ASCII code 02h.
Node No.	Indicates the Reader/Writer to communicate with by its node No. This number can be set within the range between 00 and 31 decimal.(*1)
Command Code	Indicates the command that the Reader/Writer executes. For the command codes that are available, refer to Command Code List in 5-2-3.
Option	Makes specified optional settings or specifies read/write data. For details, refer to the format of the appropriate command.
ETX	Indicates the end of a communication frame (text) Expressed by ASCII code 03h.
BCC	Stands for Block Check Character (hereinafter referred to as "BCC"). The result of the horizontal parity calculation from immediately after STX through ETX is expressed using one character. You can enable or disable the BCC command using the communications port setting command.For BCC calculation method, refer to 5-2-5 Example BCC Calculation.

Note COM2 is a port for setup and can communicate without depending on a node No.

5-2-2 Response Frame Structure



Name	Description
Node No.	Indicates the node No. that has been assigned to the Reader/Writer.
Retry Flag	This flag will be set to "0" when ACK/NACK control has been disabled. In ACK/NACK control, a response will be re-transmitted with the retry flag set to "1" if, after returning a response, ACK has not been received within a pre-determined period of time or if NACK has been received.
Command code	Indicates the code of the command that the Reader/Writer executed.
Response Code	Indicates the result of command execution. Refer to 5-2-4 Response Code List for different response codes.
Text data	Sent in response to specific commands. For the content, refer to the frame structure of each command.

Note The contents of STX, ETX, and BCC are the same as those in command frames.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-2-3 Command Code List

There are four major types of commands.

(1) Communications command
This command communicates with a Tag.

(2) System command
This command accesses to the system area of a Tag.

(3) Reader/Writer control command
This command controls the Reader/Writer, e.g. stopping a command in process, and/or resetting.

(4) Setting command
This command sets the system of the Reader/Writer.

Command type	Command code	Command name	Description	Remarks
Communi-cations Command	RD	Read	Reads data from a Tag memory.	
	WT	Write	Writes data to a Tag memory.	
	PR	Polling Read	Executes a Single Auto Read through Polling processing.	
	PW	Polling Write	Executes a Single Auto Write through Polling processing.	
	PC	Polling Check	Inquires the Reader/Writer under Polling processing.	
	PE	Polling Cancel	Cancels Polling processing.	
	MC	Memory Check	Compares check codes in Tag memory.	I.CODE1 Mode Only
	MK	Memory Calculation	Calculates check codes in Tag memory.	I.CODE1 Mode Only
System Command	SR	System Read	Reads system information of a Tag.	ISO Mode Only
	SW	System Write	Sets AFI, DSFID and EAS of a Tag.	ISO Mode Only
	SL	System Lock	Locks AFI, DSFID and EAS of a Tag.	ISO Mode Only
	ES	EAS Setting	Enables or disables the EAS command.	I.CODE1 Mode Only
	QB	QuietBit Setting	Sets QuietBit	I.CODE1 Mode Only
	LK	Lock	Write-protects Tag memory by page. Once a page has been write-protected, the write protection cannot be cleared.	
	EA	EAS Check	Checks EAS.	
Reader/ Writer Control Command	ST	Stop	Stops the communications with a Tag.	
	XZ	Reset	Resets the Reader/Writer after receiving a command.	
	AK	ACK	In a case where the system under ACK/NACK control cannot receive a response properly, send this command to the Reader/Writer.	
	NK	NACK	In a case where the system under ACK/NACK control cannot receive a response properly, send this command to the Reader/Writer.	
	CC	I/O Control	Changes and reads user input and output.	
	TS	Test	Sends the data received from the host back to the host.	
	VS	Version	Reads the software version of the Reader/Writer.	
Setting Command	AE	AFI Enable/diable Changeover	Sets whether AFI is used or not when communicating with a Tag.	ISO Mode Only
	AF	AFI Reading	Sets AFI in the Reader/Writer.	ISO Mode Only
	FC	Family Code Setting	Sets a Family Code in the Reader/Writer.	I.CODE1 Mode Only
	AI	Application ID Setting	Sets an Application ID in the Reader/Writer.	I.CODE1 Mode Only
	SN	UID (SNR) Additional Setting	Sets whethr or not UID (SNR) will be added to a read response.	
	NN	Node No.	Sets the node number in the Reader/Writer.	
	CP	Communications Port Setting	Sets the baud rate, data length, parity bit, stop bit, ACAK/NAK con-trol, timeout period, BCC addition, etc, in the Reader/Writer.	
	CT	Communications Type Setting	Sets the communications type in the Reader/Writer.	
	CM	Tag Communications Mode	Set the Tag communications mode in the Reader/Writer.	
	AC	Antenna Changeover	Sets the antenna changeover in the Reader/Writer.	
	TM	Terminal Resistance	Sets the terminal resistance for RS485 in the Reader/Writer.	
	FL	Offline Mode Setting	Sets which mode the Reader/Writer will start online or offline.	
	IS	Initialization of Setting	Reset the Reader/Writer to the factory settings.	
	EW	EEPROM writing	Saves the settings of the Reader/Writer. (EEPROM write-→Setting value write)	
	TY	I.CODE1/2 Change-over	Switches between I.CODE1 and I.CODE2.	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-2-4 Response Command List

Response codes in response frames are shown below.

Type	Response Code	Name	Description
Normal completion	“00”	Normal completion	The received command ends normally with no error.
	“72”	Multi-processing end	Communications end response when a multi-trigger function is used.
		Selective detection completion	Communications end response when a selective access/detection function is used.
	“74”	Polling command received	Polling command has been received normally. Polling Check is received before the completion of communications with a Tag.
	“75”	Polling processing canceled	Polling processing is canceled before the completion of communications with an ID Tag.
		Data normal	Results of the memory calculation command (MK) check code verification are normal.
	“76”	Polling processing canceled Data error	Polling processing is canceled after the start of communications with an ID Tag. Results of the memory calculation command (MK) check code verification show an error.
Host communications error	“10”	Parity error	A parity error occurs in one of the characters of the received command.
	“11”	Framing error	A framing error occurs in one of the characters of the received command.
	“12”	Overrun error	An overrun error occurs in one of the characters of the received command.
	“13”	BCC error	The received command has an incorrect BCC.
	“14”	Format error	The command format is incorrect. A stop command is received in command-waiting status. In Selective Access mode; 1) A temporary number not saved using the Tag detection command is specified. 2) A tag detection command normal end is retried after it has been sent.
	“18”	Frame length error	ETX is not received in 151 characters or less after STX is received.
Communications error	“70”	Communications error	An error occurs during the communications with an ID Tag, and communications cannot end normally.
	“71”	Write process error	Tag is in an area that can be read, but not written to. You are trying to write to a locked page (i.e., write-protected). The correct data cannot be written to the Tag. Verify read results in an error.
	“72”	No Tag error	No Tag is present in front of Antenna when a Trigger command is executed. There are multiple Tags within the communications area when using Single Access mode.
	“79”	Command error	Refer to the correlation table of ISO/IEC Error Codes.
System error	“93”	Memory error	An error has occurred in the Reader/Writer memory.
Warning	“01”	Specified No. of Tags exceeded	More Tags than have been specified in the Tag No. setting have entered the communications area.
	“02”	Specified No. of retries exceeded	Tag detection has been retried the specified number of times to find all the Tags in the communications area, but some Tags have not been detected.
	“03”	No. of Tags exceeded No. of retries exceeded	Two of the warning, “01” and “02,” have occurred.
	“04”	Communications error	An error occurs during communicating with Tags, resulting in successful communications with only some of the Tags.
	“05”	Specified No. of Tags exceeded Communications error	Two of the warnings, “01” and “04,” have occurred.
	“06”	No. of Tags exceeded Communications error	Two of the warnings, “02” and “04,” have occurred.
	“07”	No. of Tags exceeded No. of retries exceeded Communications error	All the three warnings, “01,” “02,” and “04,” have occurred.

Note The warning codes are used in a response code that is generated during the multi-read process, in order to return read data in a Tag when a communications error occurs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1) Correlation table of ISO/IEC Error Codes

When a Tag incorporating ISO/IEC chip (including I.CODE2 chip) returns an error response, the Reader/Writer responses a Response Code shown in the table below.

ISO code	Description	Response code of module
01	An unadopted command. No request command can be recognized.	79
02	An unrecognizable command. ex. format error.	79
03	An unadopted arbitrary command	79
0F	An unaccountable error or unadopted error code.	79
10	A specific block cannot be use. (There is none)	7A
11	A specific block cannot be relocked since the block has been already locked.	00
12	A specific block cannot be rewritten since it is locked.	71
13	A specific block has not completed writing correctly.	71
14	A specific block has not completed locking correctly.	71
Others	RFU	79

5-2-5 Example BCC Calculation

BCC is the result of the horizontal parity calculation of the data right after STX up to ETX inclusive. Refer to JIS5001 Transmission Path Character Configuration and Using Horizontal Parity for details.

	Node No.		Command code				Text						BCC	
STX	0	0	R	D	S	T	A	0	0	0	0	1	ETX	62

Command data	ASCII code data		
0	0011		0000
		EOR	
0	0011		0000
		EOR	
R	0101		0010
		EOR	
D	0100		0100
		EOR	
S	0101		0011
		EOR	
T	0101		0100
		EOR	
A	0100		0001
		EOR	
0	0011		0000
		EOR	
0	0011		0000
		EOR	
0	0011		0000
		EOR	
0	0011		0000
		EOR	
1	0011		0001
		EOR	
ETX	0000		0011
Calculation results	0110		0010

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3 Communications Commands and Responses

This section describes commands and responses when BCC has been enabled. When BCC has been disabled, BCC is not attached to either the command or response frames.

5-3-1 Read (RD)

This command reads data from a Tag in the communications area.

<Command Format>

STX	Node No..	Command Code "RD"	Communi-cations method	Data type	Tag type	First read page	No. of read pages	ETX	BCC
1	2	2	2	1	1	2	2	1	1

Communications method		Specifies a communications method ST: Single Trigger FA: FIFO Auto SA: Single Auto FR: FIFO Repeat SR: Single Repeat MT: Multi Trigger FT: FIFO Trigger MR: Multi Repeat * For details, refer to 5-8 Communications Methods
Data type		Specifies whether the read data is represented in ASCII or HEX. A : ASCII code H : HEX code * For details, refer to 5-9 Data Type
Tag type *	In ISO mode	Specifies the Tag type. A: I.CODE2 chip
	In I.CODE1 mode (Tag No. setting)	Set the number of Tags which communicate simultaneously. 0 : when executing single or FIFO communications "1 to 7" : when executing multi-communications * For details, refer to 5-10 Tag Number Setting.
First read page		Specifies the first page in hexadecimal to read from the Tags. Specification range: 00 to FFh (in ISO mode: 00 to 1Bh for I.CODE2 chip) Specification range: FB to 0Ah (in I.CODE1 mode) * For details, refer to 2-4 Memory Map of Tag.
No. of read pages		Specifies the number of pages in hexadecimal to read from the Tags. Specification range: 01 to FFh (in ISO mode: 01 to 1Ch for I.CODE2) Specification range: 01 to 10h (in I.CODE1 mode)

* The setting number of each Tag type is valid only when it is within the range of each operating mode in Reader/Writer.

<Response Format>

(1) Read data: there are responses according to the number of Tags in its communications area when multi- communications method is executed.

STX	Node No.	Retry Flag	Command Code "RD"	Response Code "00"	UID(SNR)	Read data	ETX	BCC
1	2	1	2	2	16	As specified	1	1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

(2) Completion of communications (Multi/Trigger only): When the communications with all tags in communications area is completed.

STX	Node No.	Retry Flag	Command Code "RD"	Response Code "72"	ETX	BCC
1	2	1	2	2	1	1

Response code	00: Normal completion For other response codes, refer to 5-2-4 Response Code List.
UID (SNR)	Indicates UID (SNR) having been read from a Tag. When UID (SNR) (Tag-specific code) additional setting (refer to 5-6-5 SN Command) is valid, read data will be preceded by UID. UID(SNR)
Read Data	Indicates the data having been read from a Tag. The number of characters of data is as follows. ASCII code: No. of read pages x 4 HEX code: No. of read pages x 8

Points For write command, only UID (SNR) (Tag identification code) additional setting (refer to 5-6-5 SN Command) is valid when it is in ISO mode.

5-3-2 Write (WT)

This command writes data to a Tag in the communications area.
There is no need to perform the verify read process, since this command performs it as part of its execution.

<Command Format>

STX	Node No.	Command code "WT"	Communi-cations method	Data type	Tag type	First write page	No. of write pages	Write data	ETX	BCC
1	2	2	2	1	1	2	2	As specified	1	1

Communications method		Specifies the communications method with a Tag. ST: Single Trigger FR: FIFO Repeat SA: Single Auto MT: Multi Trigger FT: FIFO Trigger MR: Multi Repeat FA: FIFO Auto * For details, refer to 5-8 Communications Methods
Data type		Specifies whether the read data is represented in ASCII or HEX. A: ASCII code H: HEX code * For details, refer to 5-9 Data Type
Tag type *	In ISO mode	Specifies the Tag type. A: I.CODE2 chip
	In I.CODE1 mode (Tag No. set-ting)	Set the value with accordance with the number of Tags communicating simultaneously. 0 : when performing Single or FIFO communications method "1 to 7" : when performing multi communications method * For details, refer to 5-10 Tag No. setting.
First write page		Specifies the first page in hexadecimal to write to the Tags. Specification range: 00 to FFh (in ISO mode: 00 to 1Bh for I.CODE2 chip) Specification range: FD to 0Ah (in I.CODE1 mode: the range of the writable user area is FF page to 0A page) * For details, refer to 2-4 Memory Map of Tag.
No. of write pages		Specifies the number of pages to which data is written to Tags in hexa-decimal. Specification range: 01 to FFh (in ISO mode: 01 to 1Ch for I.CODE2) Specification range: 01 to 0Eh (in I.CODE1 mode)
Write data		Indicates data to be written to the Tag. The number of characters of the data is as follows. ASCII Code: No. of write pages x 4 HEX code: No. of write pages x 8

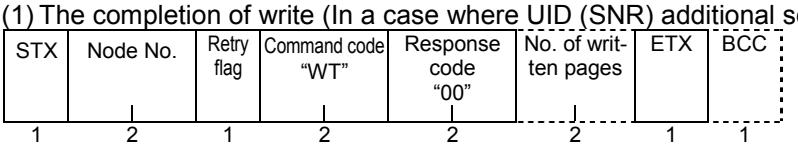
* Setting values of each Tag type is valid in the operating mode setting range in Reader/Writer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

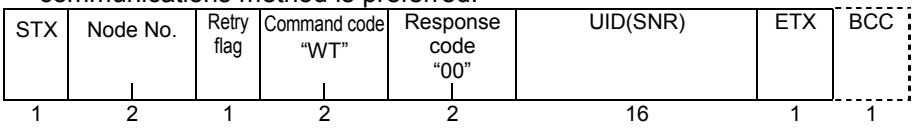
Caution From Page FD to Page FE is a system area for write-protect and QUIET/EAS settings. Depending on the content of write data, a Tag may become write-protected or inaccessible, so be sure to understand these pages fully before use.
It is strongly recommended that you use a system command to write in these pages (refer to 5-4) rather than using the write command.

<Response Format>

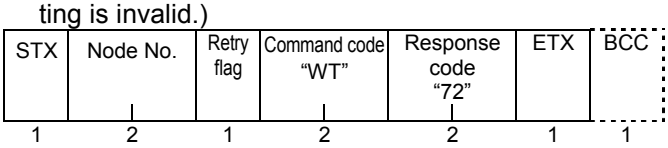
●In ISO mode
(1) The completion of write (In a case where UID (SNR) additional setting is invalid)



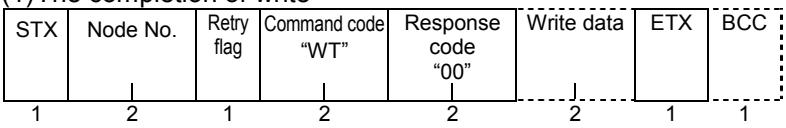
(2) The completion of write (In a case where UID (SNR) additional setting is valid)
There are responses according to the number of Tags in communications area when multi-communications method is preferred.



(3) The completion of communications (In a case where multi-trigger and UID (SNR) additional setting is invalid.)



●In I.CODE1 mode
(1) The completion of write



Response code	00: Normal completion For other response codes, refer to 5-2-4 Response code List.
No. of write pages	Returns the number of pages which data is written normally. Does not return a response except that it completes normally. Does not add during Single and FIFO communications.
UID(SNR)	Indicates UID (SNR) having read from written Tags. UID (SNR) (Tag-specified code) additional setting (refer to 5-6-5 SN Command) is added when it is valid.

Points For write command, only UID (SNR) (Tag-specified code) additional setting (refer to 5-6-5 SN Command) is valid when it is in ISO mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3-3 Tag Detection(RD):I.CODE1 Mode Only

This command assigns temporary Tag numbers to each of multiple Tags that are present in the communications area. This command is available only when the system is in I.CODE1 mode. In ISO mode, you must enable UID (SNR) additional setting, execute 5-3-1 Read Command (RD), and get UID since the system uses UID (SNR) data as a temporary number.

<Command Format>

STX	Node No.	Command code "RD"	Communi-cations method	Data type	Tag number setting	First read page	No. of read page	ETX	BCC
1	2	2	2	1	1	2	2	1	1

Communications method	Specifies a communications method with a Tag. LT: Selective Access * For details, refer to 5-8 Communications Methods.
Data type	Specifies whether the read data is represented in ASCII or HEX. A : ASCII code H : HEX code * For details, refer to 5-9 Data Type
Tag No. setting	Set the value with accordance with the number of Tags communicating simultaneously. Specification range:1 to 7 * For details refer to 5-10 Tag No. setting.
First read page	Specifies the first page in hexadecimal to read from the Tags. Specification range: FB to 04h (when Block 4 for a Philips product is used as the user memory,, refer to 2-4 of Section 2 Memory Map of Tag)
No. of read pages	Specifies the number of pages from which data is read in hexadecimal. Specification range: 01 to 10h

<Response Format>

(1) There will be as many responses as the number of Tags that are present in the communications area.

STX	Node No.	Retry flag	Command code "RD"	Response code "00"	Temporary No.	Read data	ETX	BCC
1	2	1	2	2	2	As specified	1	1

(2) Tag detection end response

STX	Node No.	Retry flag	Command code "RD"	Response code "72"	ETX	BCC
1	2	1	2	2	1	1

Response code	01: Normal completion 72: The completion of Tag detection For other response codes, refer to 5-2-4 Response code List.
Read data	Indicates the data having been read from a Tag. The number of characters of the data is as fellows. ASCII code : No. of read pages x 4 HEX code : No. of read pages x 8
Temporary No.	The Temporary Number 00 to 7F are returned under normal conditions.

⚠ Caution In the selective access mode of I.CODE1 mode, UID (SNR) additional setting 5-6-5 of Section 5 is disabled. Be sure to set it disable. When you set it enable, UID (SNR), which is added to the response of the selective access read will be short of data.

Note This command works in I.CODE1 mode only. ISO mode is not available.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3-4 Selective Access Read(RD)

In ISO mode, this command reads data from the Tag in communications area by specifying UID(SNR).In I.CODE1 mode, this command reads data from the Tag which is specified by the Temporary Number.

<Command Format>

STX	Node No.	Command code "RD"	Communi-cations method	Data type	Tag type	First read page	No. of read pages	UID(SNR)	ETX	BCC
1	2	2	2	1	1	2	2	16	1	1

Communi-cations method	In ISO mode	Specifies the communications method with a Tag. SL: UID (SNR) select * For details, refer to 5-8 Communications Methods
	In I.CODE mode	Specifies the temporary No. in hexadecimal to read from the Tags. □□: Temporary No. (The value of □□ should be within the range of 00h to 7Fh) * For details, refer to 5-8 Communications Methods.
Data type		Specifies whether the read data is represented in ASCII or HEX. A: ASCII code H: HEX code For details, refer to 5-9 Data type.
Tag type *	In ISO mode	Specify the Tag type. A: I.CODE2 chip
	In I.CODE1 mode	"0" fixeded.
First read page		Specifies the first page in hexadecimal to read from the Tags. Specification range: 00 to FFh (In ISO Mode: I.CODE2 chip should be from 00 to 1Bh) Specification range: FB to 0Ah (In I.CODE1 Mode) * For details, refer to 2-4 Memory Map of Tag.
No. of read pages		Specifies the number of the pages in hexadecimal to read from the Tags. Specification range: 01 to FFh (In ISO Mode: I.CODE2 chip should be 01 to 1Ch) Specification range: 01 to 10h (In I.CODE1 Mode)
UID (SNR)	In ISO Mode	Specifies UID (SNR) in hexadecimal to read from the Tags.
	In I.CODE1 mode	Not added.

* Tag Type Setting is valid in the operating mode setting range of Reader/Writer.

<Response Format>

STX	Node No..	Retry flag	Command code "RD"	Response code "00"	Temporary No.	UID(SNR)	Read data	ETX	BCC
1	2	1	2	2	2	16	As specified	1	1

Response code	00: normal completion For other response codes, refer to 5-2-4 Response code List.
Temporary No.	* ISO mode: Temporary No. is not added. * I.CODE1 mode: Returns the temporary numbers of "00" to "7F" in normal conditions.
UID(SNR)	Indicates UID (SNR) having read from a Tag. When UID (SNR) (Tag-specific code) additional setting (refer to 5-6-5 SN Command) is enabled, read data will be preceded by UID. UID(SNR).
Read data	Indicates data having read from the Tag. The number of characters of the data is as follows. ASCII Code: No. of write pages x 4 HEX code: No. of write pages x 8

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3-5 Selective Access Write(WT)

This command writes data to the Tag of specified UID (SNR) (in ISO mode) or Temporary Number (in I.CODE1 mode).

<Command Format>

STX	Node No..	Command code "WT"	Communi-cations method	Data type	Tag type	First write page	First write page	UID(SNR)	Write data	ETX	BCC
1	2	2	2	1	1	2	2	16	As specified	1	1

Com-munica-tions method	In ISO mode	Specifies the communications method with a Tag. SL: UID (SNR) select * For details, refer to 5-8 Communications Methods
	In I.CODE1 mode	Specifies the temporary No. in hexadecimal to write to the Tags. □□: Temporary No. (The value of □□ should be within the range of 00h to 7Fh) * For details, refer to 5-8 Communications Methods.
Data type		Specifies whether the read data is represented in ASCII or HEX. A: ASCII code H: HEX code For details, refer to 5-9 Data type.
Tag type *	In ISO mode	Specify the Tag type. A: I.CODE2 chip
	In I.CODE1 mode	"0" fixed.
First write page		Specifies the first page in hexadecimal to write to the Tags. Specification range: 00 to FFh In ISO mode: I.CODE2 chip should be between 00 to 1Bh) Specification range: FB to 0Ah (In I.CODE1 mode: The available user area should be between FF page and 0A page) * For details, refer to 2-4 Memory Map of Tag.
No. of read pages		Specifies the number of the pages in hexadecimal to write to the Tags. Specification range: 01 to FFh (In ISO Mode: I.CODE2 chip should be from 01 to 1Ch) Specification range: 01 to 0Eh (In I.CODE1 Mode)
UID (SNR)	In ISO mode	Specifies UID (SNR) in hexadecimal to write to the Tags.
	In I.CODE1 mode	Not added.
Write data		Indicates data to write to the Tag. The number of characters of the data is as follows. ASCII Code: No. of write pages x 4 HEX code: No. of write pages x 8

* Tag Type Setting is valid in the operating mode setting range of Reader/Writer.

<Response Format>

STX	Node No..	Retry flag	Command code "WT"	Response code "00"	Temporary No.	ETX	BCC
1	2	1	2	2	2	1	1

Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Temporary No.	* ISO mode: Temporary No. is not added. * I.CODE1 mode: Returns temporary number of "00" to "7F" in normal conditions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

⚠ Caution From Page FD to Page FE is a system area for write-protect and QUIET/EAS settings. Depending on the content of write data, a Tag may become write-protected or inaccessible, so be sure to understand these pages fully before use.
It is strongly recommended that you use a system command to write in these pages (refer to 5-4) rather than using the write command.

5-3-6 Special Read (RD): For I.CODE1 Mode Only

When there is only a single Tag in the communications area, this command enables to read data from the Tag faster than a usual Read.

<Command Format>

STX	Node No..	Command code "RD"	Communi-cations method	Data type	Setting Tag No.	First read page	No. of read pages	ETX	BCC
1	2	2	2	1	1	2	2	1	1

Communications method	Specifies the communications method with a Tag. UT: Special Read Trigger UA: Special Read Auto UR: Special Read Repeat * For details, refer to 5-8 Communications Methods
Data type	Specifies whether the read data is represented in ASCII or HEX. A : ASCII code H : HEX code * For details, refer to 5-9 Data Type
Tag No. setting	Set the number of Tags which communicate simultaneously. * For details, refer to 5-10 Tag No. setting. Specification range: 0 to 7
First read page	Specifies the first page in hexadecimal to read from the Tags. Specification range: FB to 04h (when Block 4 for a Philips product is used as the user memory, refer to 2-4 of Section 2 Memory Map of Tag)
No. of read pages	Specifies the number of pages from which data is read in hexadecimal. Specification range: 01 to 10

<Response Format>

STX	Node No..	Retry flag	Command code "RD"	Response code "00"	Read data	ETX	BCC
1	2	1	2	2	As specified	1	1

Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Read data	Indicates data having read from the Tag. The number of characters of the data is as follows. ASCII Code: No. of write pages x 4 HEX code: No. of write pages x 8

Note This Special Read (RD) Command enables you to read from multiple Tags, however, unlike the read command (5-3-1) of multi-communications method, this Special Read Command does not execute anti-collision processing (a collision avoidance processing against the responses from a Tag). Thus when a collision (conflict between responses) occurs, it will be unable to read data from a Tag. To read data from a Tag, the host must retry Repeat Command. When there are a few Tags, the Special Read Command has an advantageous communication speed rather than multi-command does even if it executes Retry processing. The command works in I.CODE1 mode only, and ISO mode is not available.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3-7 Polling Single Auto Read (PR)

Immediately after receiving the Polling Single Auto Read Command, the Reader/Writer returns a response indicating the acceptance of the command, and waits for a Tag to enter the communications area of the Antenna. Then it reads the data of the entering Tag. The host can inquire of the Reader/Writer about the results of communications processing using the Polling Check (PC) command.

<Command Format>

STX	Node No..	Command code "PR"	Data type	Tag type	First read page	No. of read pages	ETX	BCC
1	2	2	1	1	2	2	1	1

Data type		Specifies whether the read data is represented in ASCII or HEX. A : ASCII code H : HEX code *For details, refer to 5-9 Data Type
Tag type *	In ISO mode	Specify the Tag type. A: I.CODE2 chip
	In I.CODE1 mode	Not added
First read page		Specifies the first page in hexadecimal to read data from the Tags. Specification range: 00 to FFh (In ISO mode: I.CODE2 chip should be from 00 to 1Bh) Specification range: FB to 0Ah (In I.CODE1 mode) * For details, refer to 2-4 Memory Map of Tag.
No. of read pages		Specifies the number of the pages in hexadecimal to read data from the Tags. Specification range: 01 to FFh (In ISO mode: I.CODE2 chip should be from 01 to 1Ch) Specification range: 01 to 10h (In I.CODE1 mode)

* Tag Type Setting is valid in the operating mode setting range of Reader/Writer.

<Response Format>

STX	Node No..	Retry flag	Command code "PR"	Response code "74"	ETX	BCC
1	2	1	2	2	1	1

Response code	74: Command acceptance For other response codes, refer to 5-2-4 Response code List.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3-8 Polling Single Auto Write (PW)

Immediately after receiving the Polling Single Auto Write Command, the Reader/Writer returns a response indicating the acceptance of the command and waits for a Tag to enter the communications area of the Antenna. Then it writes data to the entering Tag. The host can inquire of the Reader/Writer about the results of communications processing using the Polling Check (PC) command.
There is no need to perform the verify read process, since this command performs it as part of its execution.

<Command Format>

STX	Node No..	Command code "PW"	Data type	Tag type	First write page	No. of write pages	Write data	ETX	BCC
1	2	2	1	1	2	2	As specified	1	1

Data type		Specifies whether the write data is represented in ASCII or HEX. A : ASCII code H : HEX code *For details, refer to 5-9 Data Type
Tag type *	In ISO mode	Specify the Tag type. A: I.CODE2 chip
	In I.CODE1 mode	Not added
First write page		Specifies the first page in hexadecimal to write data to the Tags. Specification range: 00 to FFh (In ISO mode: I.CODE2 chip should be from 00 to 1Bh) Specification range: FB to 0Ah (In I.CODE1 mode: the range of the writable user area is FF page to 0A page) * For details, refer to 2-4 Memory Map of Tag.
No. of read pages		Specifies the number of the pages in hexadecimal to write data to the Tags. Specification range: 01 to FFh (In ISO Mode: I.CODE2 chip should be from 01 to 1Ch) Specification range: 01 to 0Eh (In I.CODE1 Mode)
Write data		Indicates data to write to the Tag. The number of characters of the data is as follows. ASCII Code: No. of write pages x 4 HEX code: No. of write pages x 8

* Tag Type Setting is valid in the operating mode setting range of Reader/Writer.

<Response Format>

STX	Node No..	Retry flag	Command code "PW"	Response code "74"	ETX	BCC
1	2	1	2	2	1	1

Response code	74: Command acceptance For other response codes, refer to 5-2-4 Response code List.

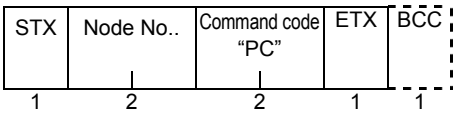
⚠ **Caution** From Page FD to Page FE is a system area for write-protect and QUIET/EAS settings. Depending on the content of write data, a Tag may become write-protected or inaccessible, so be sure to understand these pages fully before use.
It is strongly recommended that you use a system command to write in these pages (refer to 5-4) rather than using the write command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3-9 Polling Check (PC)

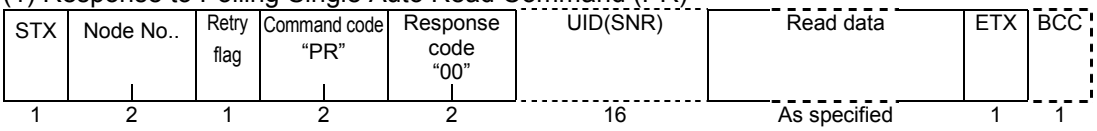
You can check the results while the Polling Single Auto Read Command and Polling Single Auto Write Command are being executed. You can use Polling Check after the Polling Single Auto Read Command and Polling Single Auto Write Command have been sent.

<Command Format>

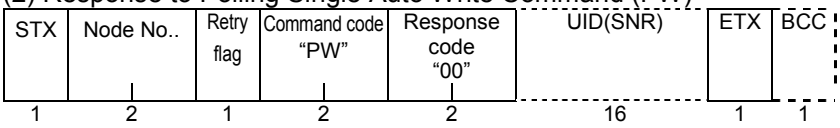


<Response Format>

(1) Response to Polling Single Auto Read Command (PR)

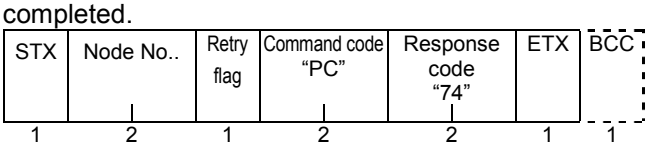


(2) Response to Polling Single Auto Write Command (PW)



(3) Response when a Tag is not detected

A response when Polling Check Command is received before the communications with a Tag is completed.



Response code	00:normal completion 74: In a case before the communications with a Tag is completed. For other response codes, refer to 5-2-4 Response code List.
UID (SNR)	Indicates UID (SNR) data having read from a tag. UID (SNR) (Tag-specified code) additional setting (refer to 5-6-5 SN Command) is added when it is valid as follow • Polling Single Auto Read: UID (SNR) is added before Read data. • Polling Single Auto Write: When it is in ISO mode, UID (SNR) is added after the Response code “00.”
Read data	Indicates data to read from the Tag. The number of characters of the data is as follows. ASCII Code: No. of write pages x 4 HEX code: No. of write pages x 8

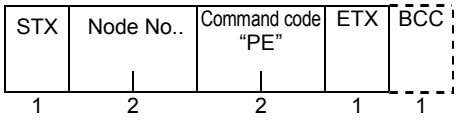
⚠ Caution With regard to the response of polling command (PR), read data will be preceded by UID (SNR) when SNR (Tag-specific code) addition setting (refer to 7 SN Command, 5-6-5) is enabled.
With regard to the response of polling write command (PW), end code “00” in the ISO mode will be followed by UID (SNR) when SNR (Tag-specific code) addition setting (refer to SN Command, 5-6-5) is enabled.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3-10 Polling End (PE)

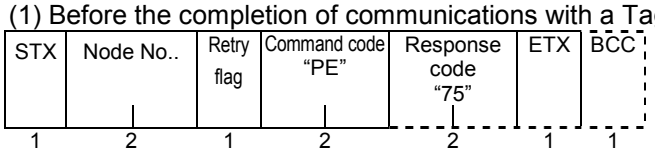
This command aborts the execution of Polling commands. It is used after a Polling command is sent.

<Command Format>

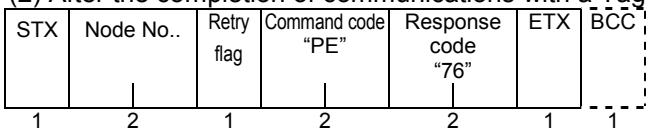


<Response Format>

(1) Before the completion of communications with a Tag



(2) After the completion of communications with a Tag

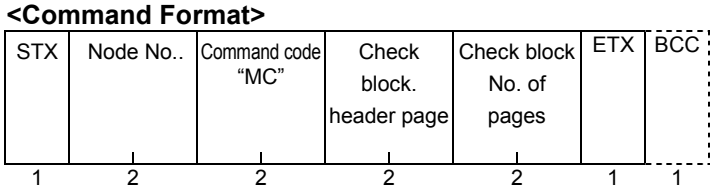


Response code	75:Before the completion of communications with a Tag 76:After the completion of communications with a Tag For other response codes, refer to 5-2-4 Response code List.

5-3-11 Memory Check (MC): I.CODE1 Mode Only

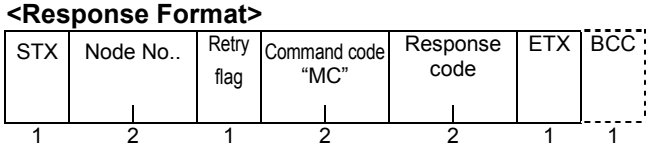
This command uses the generating polynomial, $X^{16} + X^{12} + X^5 + 1$ to calculate the range of the check block designated by a user and to compare the results with the check code attached to the check block.

<Command Format>



Check block Header page	Specifies the header page of check block in hexadecimal. Specification range: FF to 09 (when Block 4 for a Philips product is used as the user memory,, refer to 2-4 of Section 2 Memory Map of Tag)
Check block No. of pages	Specifies the number of the pages of check block in hexadecimal. Specification range: 02 to 0C

<Response Format>



Response code	75: When the check results are correct 76: When the check results are incorrect For other response codes, refer to 5-2-4 Response code List.

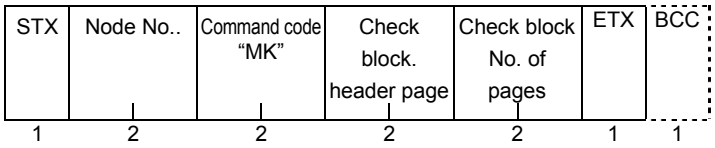
Note This command is for I.CODE1 Mode Only. The command is not available in ISO mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-3-12 Memory Calculation (MK): I.CODE1 Mode Only

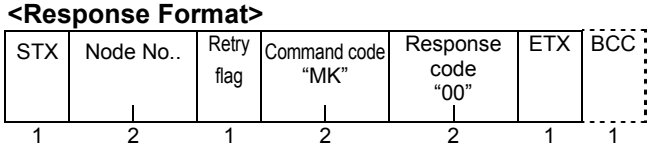
This command uses the generating polynomial, X16 + X12 + X5 + 1 to calculate the range of the check block designated by a user and writes the check code to the last page of the check block.

<Command Format>



Check block header page	Specifies the header page of check block in hexadecimal. Specification range: FF to 09 (when Block 4 for a Philips product is used as the user memory, refer to 2-4 of Section 2 Memory Map of Tag)
Check block No. of pages	Specifies the number of the pages of check block in hexadecimal. Specification range: 02 to 0C

<Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.

Note This command is for I.CODE1 Mode Only. The command is not available in ISO mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4 System Command

5-4-1 System Read (SR): ISO Mode Only

This command read system information in the system area of the Tag.

<Command Format>

STX	Node No..	Command code "SR"	Tag type	System method"00"	ETX	BCC
1	2	2	1	2	1	1

Tag type	Specified a Tag type A: I.CODE2 chip
System method	Specified the kind of system information. "00" fixed.

<Response Format>

STX	Node No..	Retry flag	Command code "SR"	Response code "00"	Information flag	UID(SNR)	Information field	ETX	BCC
1	2	1	2	2	2	16	2to10	1	1

Response code		00:normal completion For other response codes, refer to 5-2-4 Response code List.
Information flag		Indicates information in the Information field with a flag. Bit / Information **0** DSFID **1** AFI **2** VICC memory size **3** IC reference information **4** to **7** For future use * Information field is stored in order of bit when the bit above is 1. * For the contents of information flag, refer to 2-4 Memory Map.
UID(SNR)		Indicates UID (SNR) data having read from a Tag.
Information field	DSFID	DSFID of a Tag
	AFI	AFI of a Tag
	VICC memory size	Defines the memory and block sizes of a Tag. MSB LSB 15 13 12 8 7 0 Un-assigned | Block size | Block length * Block length: the number of blocks of a Tag (00h to FFh=1 to 256) * Block size: the number of bytes per one block (00h to 1Fh=1 to 32) <As for I.CODE2 chip: "1B03"> Block length: "1B"=28 blocks Block size: "03"= 4 bytes
	IC reference information	IC reference Information of Tag * IC reference Information is a form of data defined by IC manufacturer.

Note This command is in ISO Mode Only. The command is not available for I.CODE1 mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-2 System Write (SW): ISO Mode Only

This command writes the settings of AFI, DSFID, and EAS to a Tag.

<Command Format>

(1) For normal write

STX	Node No..	Command code "SW"	Tag type	System method	data	ETX	BCC
1	2	2	1	2	2	1	1

(2) When UID of a Tag is specified

STX	Node No..	Command code "SW"	Tag type	System method	UID	data	ETX	BCC
1	2	2	1	2	16	2	1	1

Tag type		Specifies the Tag type. A: I.CODE2 chip
System method		Specifies the kind of system information to write to. 01: AFI 02: DSFID 03: EAS (For normal write) 83: Select EAS (When specifying UID of a Tag)
UID		Specifies UID of a Tag in hexadecimal to write to.
Data	AFI	Specifies UID of a Tag in hexadecimal to write to. Specification range: 00 to FFh
	DSFID	Specifies UID of a Tag in hexadecimal to write to. Specification range: 00 to FFh
	EAS setting	00: Enables EAS setting 01: Disables EAS setting

<Response Format>

STX	Node No..	Retry flag	Command code "SW"	Response code "00"	ETX	BCC
1	2	1	2	2	1	1

Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.

Note This command is in ISO Mode Only. The command is not available for I.CODE1 mode.

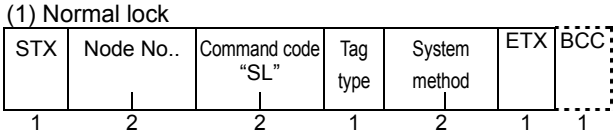
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-3 System Lock (SL): ISO Mode Only

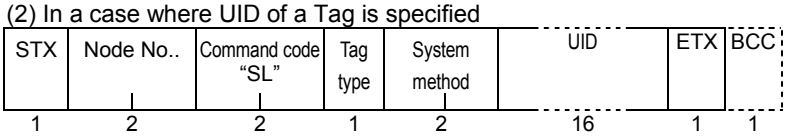
This command locks (write-inhibit) to write to system area information of a Tag.

<Command Format>

(1) Normal lock

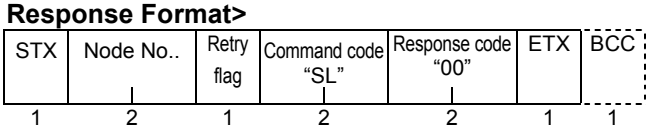


(2) In a case where UID of a Tag is specified



Tag type	Specifies the Tag type. A: I.CODE2 chip
System method	Specifies the system information to lock. 01:AFI 02: DSFID 03: EAS (normal lock) 83: Select EAS (In a case where UID of a Tag is specified and locked)
UID	Specifies the UID of a Tag to lock in hexadecimal.

Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.

Note This command is in ISO Mode Only. The command is not available for I.CODE1 mode.

⚠ **Caution** Be careful that once system information has been locked, the lock cannot be cleared.

Note This command is in ISO mode Only. The command is not available for I.CODE1 mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-4 SNR (Tag-specified Code) Read (RD): I.CODE1 Mode Only

This command read SNR (Tag-specified code) which incorporates I.CODE1 chip. Refer to 2-4 of Section 2 Memory Map of Tag.

<Command Format>

STX	Node No..	Command code "RD"	Communica-tions method	Data type	Tag No. setting	Fixed value "**"	Fixed value "**"	ETX	BCC
1	2	2	2	1	1	2	2	1	1

Communications method	Specifies the communications method with a Tag. ST: Single Trigger SA: Single Auto SR: Single Repeat FT: FIFO Trigger FR: FIFO Repeat	MT: Multi-trigger MR: Multi-repeat LT: Selective Access (Tag detection) □□: Selective Access (Read) (For □□, the values from 00h to 7Fh are available.) UT: Special Read Trigger UA:: Special Read Auto UR: Special Read Repeat For details, refer to 5-8 Communica-tions Methods.
Data type	"H" fixed (HEX code)	
Tag No. setting	For Single/FIFO/Selective Access (Read) Set the number of Tags "0."	
	For Multi/Selective Access (Tag detection command) Set the number of Tags which communicate simultaneously. * For details, refer to 5-10 Tag No. setting. Specification range: 1 to 7	

<Response Format>

(1) For Single/FIFO/Multi (except for the response of the completion of communications)

STX	Node No..	Retry flag	Command code "RD"	Response code "00"	Serial No.	ETX	BCC
1	2	1	2	2	16	1	1

(2) For Selective Access (except for the response of the completion of Tag detection)

TX	Node No..	Retry flag	Command code "RD"	Response code "00"	Temporary No.	Serial No.	ETX	BCC
1	2	1	2	2	2	16	1	1

Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Serial No.	Indicates serial number written to a Tag in advance. You cannot rewrite the number.

Note This command is for I.CODE1 Mode Only. The command is not available in ISO mode:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-5 Read (RD) of Family Code and Application ID (for Tag): I.CODE1 Mode Only

This command is used to read the Family Codes and Application IDs from Tags incorporated I.CODE1 chip..

<Command Format>

STX	Node No..	Command code "RD"	Communi-cations method	Data type	Tag No. setting	Fixed "FF"	Fixed "01"	ETX	BCC
1	2	2	2	1	1	2	2	1	1

Communications method	S Specifies the communica-tions method with a Tag. ST: Single Trigger SA: Single Auto SR: Single Repeat FT: FIFO Trigger FR: FIFO Repeat	MT: Multi-trigger MR: Multi-repeat LT: Selective Access (Tag detection) ☐☐: Selective Access (Read) (For ☐☐, the values from 00h to 7Fh are available.) UT: Special Read Trigger UA:: Special Read Auto UR: Special Read Repeat For details, refer to 5-8 Communications Methods.
Data type	Specifies whether the read data is represented in ASCII or HEX. A : ASCII code H : HEX code For details, refer to 5-9 Data Type	
Tag No. setting	When using a Single Access, FIFO Accesses, or Selective Access (read) command, the Tag No. setting should be "0."	
	When using a Multiple Access or Selective Access (Tag detect) command, the Tag No. setting must be appropriate to the number of Tags that will communicate at one time. Refer to 5-10 Tag No. Setting for details. Specification range: 1 to 7	

<Response Format>

(1) Single, FIFO, and Multiple access (excluding Communications End Response)

STX	Node No..	Retry flag	Command code "RD"	Response code "00"	Read data				ETX	BCC
					Family Code	Appli-cation ID	Not defined	Not defined		
1	2	1	2	2	4(ASCII),8(HEX)				1	1

(2) Selective Access (excluding Tag Detection End Response)

STX	Node No..	Retry flag	Command code "RD"	Response code "00"	Temporary No.	Read data				ETX	BCC
						Family Code	Appli-cation ID	Not defined	Not defined		
1	2	1	2	2	2	4(ASCII),8(HEX)				1	1

Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Read data	Indicates the data having been read. The number of characters of the data is as follows. in ASCII or HEX. ASCII code: 4 HEX code: 8

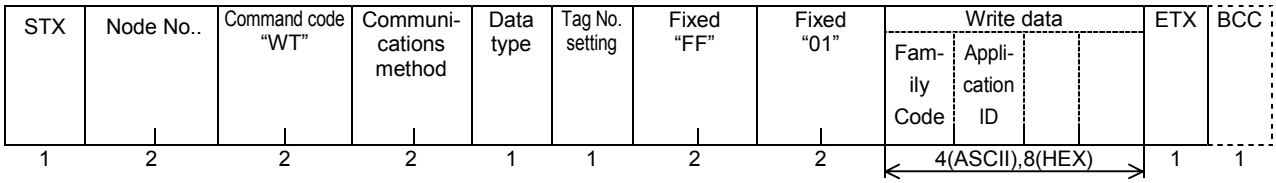
Note This command is for I.CODE1 Mode Only. The command is not available in ISO mode:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-6 Write (WT) of Family Code and Application ID (for Tag) Tag: I.CODE1 Mode Only

This command is used to write Family Codes and application IDs to Tags incorporating I.CODE1 chip.
There is no need to perform the verify read process, since this command performs it as part of its execution.

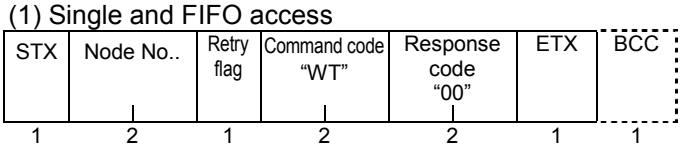
<Command Format>



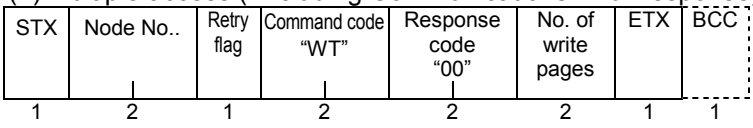
Communications method	Specifies communications method ST: Single Trigger SA: Single Auto SR: Single Repeat FT: FIFO Trigger FR: FIFO Repeat	MT: Multi-trigger MR: Multi-repeat ☐☐: Selective Access (write) (For ☐☐ , the values from 00h to 7Fh are available.) For details, refer to 5-8 Communica-tions Methods
Data type	Specifies whether the write data is represented in ASCII or HEX. A : ASCII code H : HEX code For details, refer to 5-9 Data Type.	
Tag No. setting	When using a Single Access, FIFO Accesses, or Selective Access (write) command, the Tag No. setting should be "0."	
	When using a multiple command, the Tag No. setting must be appropriate to the number of Tags that will communicate at one time. Refer to 5-10 Tag No. Setting for details. Specification range: 1 to 7	
Write data	Indicates data to be written to the Tag. The number of characters of the data is as fellows. ASCII code: 4 HEX code: 8	

<Response Format>

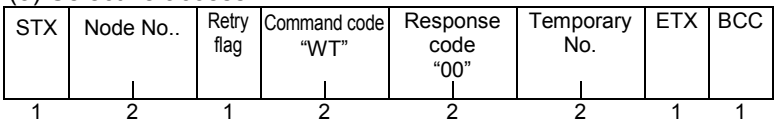
(1) Single and FIFO access



(2) Multiple access (Excluding Communications End Response)



(3) Selective access



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.

Note This command is for I.CODE1 Mode Only. The command is not available in ISO mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-7 EAS Setting (ES): I.CODE1 Mode Only

This command sets the EASBit of a Tag incorporating I.CODE1 chip. When the EASBit is disabled, the Reader/Writer will not return a response to the EAS Check Command (EA).

<Command Format>

STX	Node No..	Command code "ES"	Setting 00to01 00:EAS enabled 01:EASdisabled	ETX	BCC
1	2	2	2	1	1

<Response Format>

STX	Node No..	Retry flag	Command code "ES"	Response code "00"	ETX	BCC
1	2	1	2	2	1	1

Response code	00:normal completion For other response codes, refer to 5-2-4 Response Code List.

Note The relative commands are set in offline mode (refer to 5-6-12 FL Command). This command is for I.CODE1 mode Only. The command is not available in ISO mode.

5-4-8 QuietBit Setting (QB): I.CODE1 Mode Only

This command sets QuietBit of a Tag incorporating I.CODE1 chip. If you enable this bit, a Tag ceases to return a response to any command (excluding the EAS Command).

<Command Format>

STX	Node No..	Command code "QB"	Setting	ETX	BCC
1	2	2	2	1	1

Setting	Specification range:00h to 01h 00: Disable QuietBit 01: Enable QuietBit

<Response Format>

STX	Node No..	Retry flag	Command code "QB"	Response code "00"	ETX	BCC
1	2	1	2	2	1	1

Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.

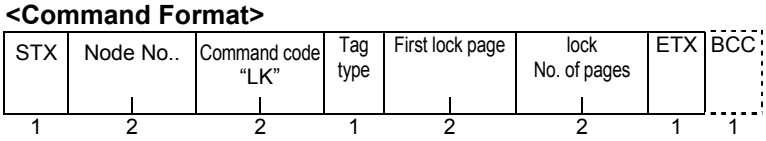
Note This command is for I.CODE1 Mode Only. The command is not available in ISO mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-9 Lock Setting (LK): ISO Mode Only

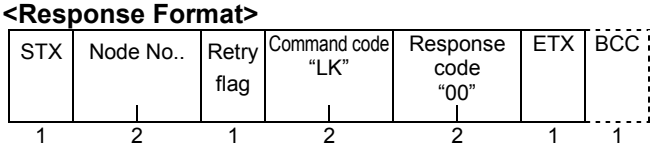
This command is used to set and check the write-protection of Tags incorporating I.CODE1 chip. A Tag can be locked (or write-protected) by memory page.

<Command Format>



Tag type	Specifies Tag type. A: I.CODE2 chip
First lock page	Specifies the first page to be locked in hexadecimal. Specification range: 00 to 1Bh * For details, refer to 2-4 Memory Map of Tag.
No. of lock pages	Specifies the first lock page t in hexadecimal. Specification range: 01h to 1Ch

<Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.

⚠ Caution Be careful that once a lock is set, the lock cannot be cleared.

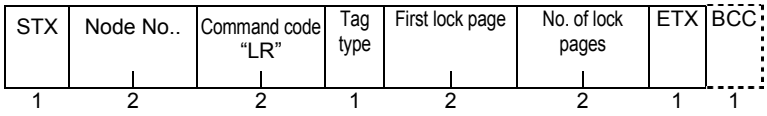
Note This command is for ISO mode Only. The command is not available in I.CODE1 mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-10 Lock Setting Read (LR): ISO Mode Only

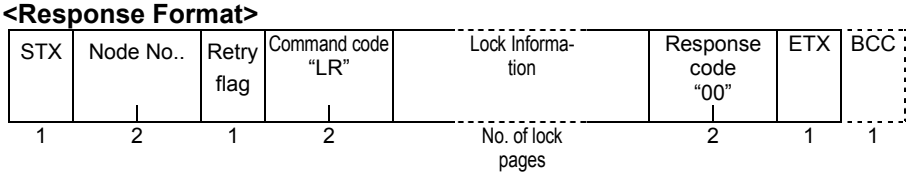
This command reads lock setting information of a Tag incorporating I.CODE2 chip.

<Command Format>



Tag type	Specifies Tag type. A: I.CODE2 chip
First lock page	"00" fixed.
No. of lock pages	Specifies the number of pages, from which reads lock information, in hexa-decimal. Specification range: 01h to FFh (I.CODE2 chip: 01 to 1Ch)

<Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Lock information	Indicates lock information having read from Tag. Locked:"01" Not locked :"00" The number of characters of the data: "read pages x 2.

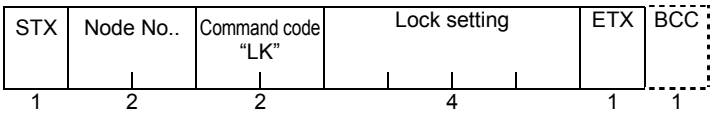
Note This command is for ISO Mode Only. The command is not available in I.CODE1mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-11 Lock Setting (LK): I.CODE1 Mode Only

This command is used to set and check the lock (write-protection) of Tags incorporating I.CODE1 chip. A Tag can be locked (or write-protected) by memory page. To read lock information set in a Tag, set all lock information in the commands to 0.

<Command Format>



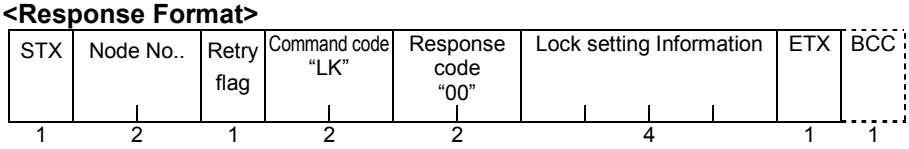
Lock setting	Set the bit corresponding to the page you want to lock to 1. *See the table below. <Lock setting check> Set all lock settings to 0 to read the lock information in a Tag.

* The lock information for each page is represented by a 1-bit datum.

Lock setting															
b7	b6	b5	b4	b3	b2	b1	b0	b7	b6	b5	b4	b3	b2	b1	b0
Page 10	Page 9	Page 8	Page 7	Page 6	Page 5	Page 4	Page 3	Page 2	Page 1	Page 0	AI,FC	EQUIET	Write-protect	SNR	SNR

AI: Application ID FC: Family Code

<Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Lock setting Information	Indicates lock information set in a Tag.

Description: This is an example of command and response when locking pages 1, 3, 7, and 8 in a Tag in which page 10 has already been locked. This example does not include STX, ETX, BCC, and the node number. The lock setting in the response included information concerning the pages that have already been locked.

Command: LK3140
Response: LK00B143

Note SNR (Tag-specific code) is locked at factory. SNR 2 bit in the lock setting in the response is always on.

⚠ Caution Use utmost care when using the LK Command because once a page has been locked, it cannot be unlocked. It is strongly recommended that you use a system command to lock a page rather than using this command.

Note This command is for I.CODE1 Mode Only. The command is not available in ISO mode.

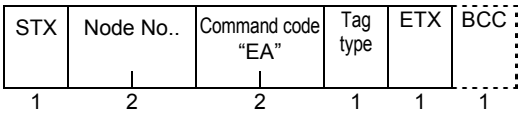
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-4-12 EAS Check (EA)

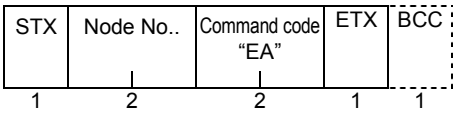
This command transmits the EAS command continuously and returns the percentage of data that matches the EAS response code.

<Command Format>

●In ISO mode

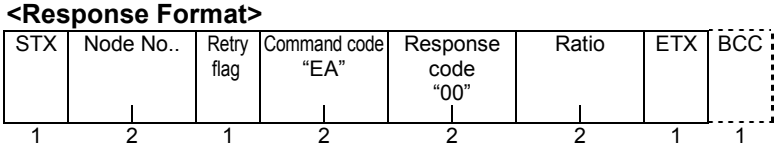


●In I.CODE1 mode



Tag type (ISO mode)	Specifies Tag type. A: I.CODE2 chip * Not added in I.CODE1 mode.

<Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Ratio	Indicates the ratio of data that matches the EAS response code in hexa-decimal. (00h to 64h[%])

How to use properly

- In some cases, this command will not indicate 0% even though there are no Tags. Be sure take this into account when determining the presence or absence of Tags.
- The EAS Check Command works as a repeat command. After this command is sent once, only a response will be returned. To discontinue transmission of this command, you need to use the Stop Command (refer to ST Command in 5-5-1).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-5 Reader/Writer Control Command

5-5-1 Stop (ST)

This command causes the Reader/Writer to abort the execution of Auto Mode, Repeat Mode, FIFO Access, Selective Access, EAS Check and other commands and return to wait mode for a command.

<Command Format>

STX	Node No.	Command code "ST"	ETX	BCC
1	2	2	1	1

<Response Format>

STX	Node No.	Retry flag	Command code "ST"	Response code "00"	ETX	BCC
1	2	1	2	2	1	1

Response code	00: Normal completion For other response codes, refer to 5-10 Response Code List.

5-5-2 Reset (XZ)

This command software-resets the Reader/Writer.

<Command Format>

STX	Node No.	Command code "XZ"	ETX	BCC
1	2	2	1	1

5-5-3 ACK (AK)

This command is used during ACK/NACK control to inform the Reader/Writer that the host device normally received a response from the Reader/Writer. There is no response if this command is used in ACK/NACK control, but if the Reader/Writer is not waiting to receive ACK/NACK signals, an error will occur when the command is received. Refer to 5-9 ACK/NACK Control for details.

<Command Format>

STX	Node No.	Command code "AK"	ETX	BCC
1	2	2	1	1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-5-4 NACK (NK)

This command is used during ACK/NACK control to inform the Reader/Writer that the host device did not normally receive a response from the Reader/Writer. When the Reader/Writer receives a NACK command, the previous response is retried provided that the maximum number of retries (9) has not been exceeded.
If the Reader/Writer is not waiting to receive ACK/NACK signals, an error will occur when the command is received. Refer to 5-9 ACK/NACK Control for details.

<Command Format>

STX	Node No.	Command code "NK"	ETX	BCC
1	2	2	1	1

5-5-5 I/O Control Command (CC)

This command changes the state of the user output terminals (OUT1 to OUT4) and reads the state of the user input terminals (IN1 to IN3).

<Command Format>

STX	Node No.	Command code "CC"	OUT 1	OUT 2	OUT 3	OUT 4	ETX	BCC
1	2	2	1	1	1	1	1	1

OUT1to OUT4	The state of an output is designated in hexadecimal. Specification range: 0 to 1 (1: ON / 0: OFF) When * is specified, the Reader/Writer reads the state of a terminal.

<Response Format>

STX	Node No.	Retry flag	Command code "CC"	Response code "00"	OUT 1	OUT 2	OUT 3	OUT 4	IN 1	IN 2	IN 3	ETX	BCC
1	2	1	2	2	1	1	1	1	1	1	1	1	1

Response code	00: Normal completion For other response codes, refer to 5-10 Response Code List.
OUT1 to OUT4	Indicates the state of the output. 1: ON, 0: OFF
IN1 to IN3	Indicates the state of the input. 1: ON, 0: OFF

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-5-6 Test (TS)

This command returns test messages sent from the host with no change made. The test command is used for testing communications between the host and the Reader/Writer and other purposes.

<Command Format>

STX	Node No.	Command code "TS"	Test message	ETX	BCC
1	2	2		1	1

Test message	The number of characters from 0 up to 64 max is available.

<Response Format>

STX	Node No.	Retry flag	Command code "TS"	Response code "00"	Test message	ETX	BCC
1	2	1	2	2		1	1

Response code	00: Normal completion For other response codes, refer to 5-10 Response Code List.
Test message	Returns the test message received using commands.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-5-7 Version (VS)

This command reads the software version for the Reader/Writer.

<Command Format>

STX	Node No.	Command code "VS"	ETX	BCC
1	2	2	1	1

<Response Format>

STX	Node No.	Retry flag	Command code "VS"	Response code "00"	Software version	ETX	BCC
1	2	1	2	2	4	1	1

Response code	00: Normal completion For other response codes, refer to 5-10 Response Code List.

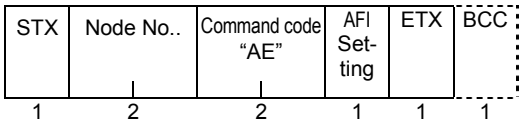
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6 Setting Command

5-6-1 Reader/Writer AFI Enable/Disable Changeover (AE): ISO Mode Only

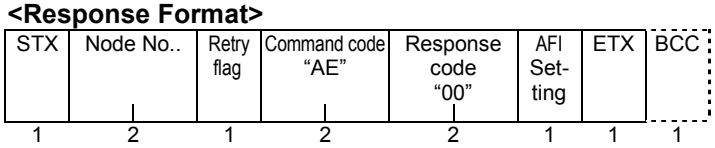
In ISO mode, you must set AFI of the Reader/Writer either enable or disable when communicating with a Tag. If you set AFI enable, only Tags, which has the same AFI, can be communicated. When you set AFI disable, the communications are enabled no matter AFI in Reader/Writer is set or not.

<Command Format>



AFI enable/disable	Specifies either valid or invalid of AFI setting in Reader/Writer. 0: invalid (factory setting) 1: valid For "*", the Reader/Writer reads and writes current settings.

<Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
AFI valid/invalid	Indicates valid/invalid of AFI in hexadecimal.

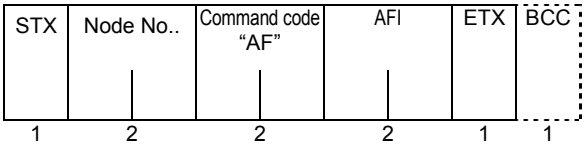
Note
- A setting becomes valid after executing Reset Command. To keep the setting valid next startup, you need to save with Setting Write Command (refer to 5-6-14 EW Command).
- This command is for ISO Mode Only. The command is not available in I.CODE1 mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-2 Reader/Writer AFI Read (AF): ISO Mode Only

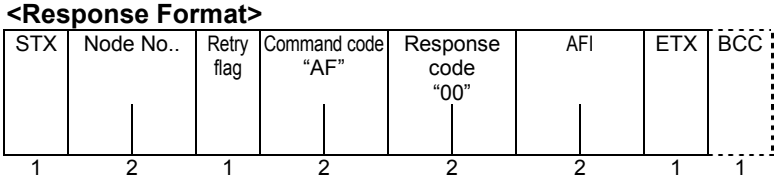
In ISO mode, you must set and read AFI of the Reader/Writer. When you set AFI enable, only Tags, which has the same AFI, can be communicated. When the setting is “00”, the communications are enabled.

<Command Format>



AFI	Specifies AFI in hexadecimal. Specification range:00h to FFh (factory setting “00”) For “*”, the Reader/Writer reads and writes current setting of AFI.

<Response Format>



Response code	00: normal completion For other response codes, refer to 5-2-4 Response code List.
AFI	Specifies AFI in hexadecimal.

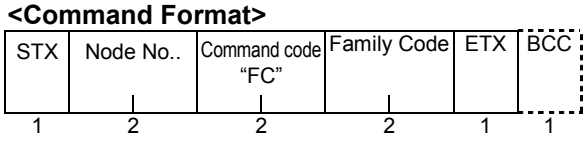
Note
- A setting becomes valid after executing Reset Command. To keep the setting valid next startup, you need to save with Setting Write Command (refer to 5-6-14 EW Command).
- This command is for ISO Mode Only. The command is not available in I.CODE1 mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-3 Read and Write of Family Code (for Reader/Writer) (FC): I.CODE1 Mode Only

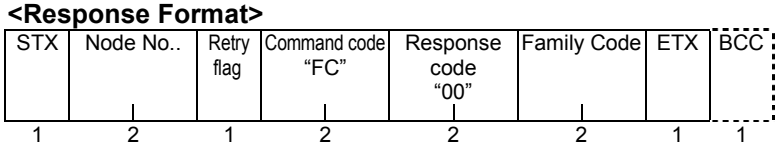
The FC Command is used to set or read the Family Code in the Reader/Writer. Only Tags that have the same Family Code as the one set by this command can perform communications. If this Family Code is set to 00, communications will be possible with all Tags. The default set value of the Reader/Writer is 00.

<Command Format>



Family Code	The Family Code is designated in hexadecimal. Specification range: 00h to FFh (factory setting: ”00”) When the Family Code set to "⁎⁎," the Family Code currently set in the Reader/Writer will be read.

<Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Family Code	Indicates current Family Code in hexadecimal.

Note
- A setting becomes valid after executing Reset Command. To keep the setting valid next startup, you need to save with Setting Write Command (refer to 5-6-14 EW Command).
- This command is for I.CODE1 Mode Only. The command is not available in ISO mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-4 Read and Write of Application (AI): I.CODE1 Mode Only

This Command is used to set or read and read the application ID in the Reader/Writer in 1.CODE1 Mode Only Tags that have the same application ID as the one set by this command can perform communications. If the application ID in the Reader/Writer is set to 00, communications will be possible with all Tags.

<Command Format>

STX	Node No..	Command code "AI"	Application ID	ETX	BCC
1	2	2	2	1	1

Application ID	The application ID is designated in hexadecimal. Specification range: 00h to FFh When the application ID is set to "**," the application ID currently set in the Reader/Writer will be read.

<Response Format>

STX	Node No..	Retry flag	Command code "AI"	Response code "00"	Application ID	ETX	BCC
1	2	1	2	2	2	1	1

Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Application ID	Indicates current Application I in hexadecimal.

Note

- A setting becomes valid after executing Reset Command. To keep the setting valid next startup, you need to save with Setting Write Command (refer to 5-6-14 EW Command).
- This command is for I.CODE1 Mode Only. The command is not available in ISO mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-5 SNR Addition Setting (SN)

This command selects whether SNR will be added to a response to a Read Command (excluding Special Read).

<Command Format>

STX	Node No.	Command code "SN"	Addition mode	ETX	BCC
1	2	2	1	1	1

Addition mode	Specify whether SNR will be added to a response. Setting range: 0 to 1, or * When * is specified, the Reader/Writer reads the number that is currently set.			
	Specification number	0	1	*
	SNR addition mode	Disabled	Enabled	-

<Response Format>

STX	Node No.	Retry flag	Command code "SN"	Response code: "00"	ETX	BCC
1	2	1	2	2	1	1

Response code:	00: Normal completion For other response codes, refer to 5-10 Response Code List.
addition mode	Indicates the number corresponding to the specified addition mode.

<Response when setting is invalid>

STX	Node No.	Retry flag	Command code "RD"	Response code: "00"	Read data	ETX	BCC
1	2	1	2	2	As specified	1	1

<Response when setting is valid>

STX	Node No.	Retry flag	Command code "RD"	Response code: "00"	SNR	Read data	ETX	BCC
1	2	1	2	2	8	As specified	1	1

Response code:	00: Normal completion For other response codes, refer to 5-10 Response Code List.
SNR	Indicates the SNR read from the Tag.
Read data	Indicates the data read from the Tag.

⚠ Caution SNR cannot be added to a response to the Special Read Command (refer to 5-3-8 Special Read).

Note
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-6 Node Number Setting Command (NN)

This command sets and reads the node number of the Amp-Reader/Writer.

<Command Format>

STX	Node No.	Command code "NN"	Node number change specification	ETX	BCC
1	2	2	2	1	1

Node number change specification	Specifies the node number in decimal that you want to change. Specification range: 00 to 31, * When * is specified, the Reader/Writer reads the current setting.

<Response Format>

STX	Node No.	Retry flag	Command code "NN"	Response code "00"	Node number	ETX	BCC
1	2	1	2	2	2	1	1

Response code	00: Normal completion For other response codes, refer to 5-10 Response Code List.
Node number	Indicates the specified node number in decimal.

Note
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-7 Communications Port Setting Command (CP)

This command sets the baud rate for the communications port (COM Port), data length, parity bit, and stop bit for use in communications with the host.

<Command Format>

STX	Node No.	Command code "CP"	Port No.	Baud rate	Data length	Parity bit	Stop bit	BCC Enabled /Disabled	ACK NACK	time-out	ETX	BCC
1	2	2	1	1	1	1	1	1	1	1	1	1

Port No.	Specify the port number that you want to change in decimal. Specification range: **1** or 2 Specification number 1 2 Port COM1 COM2
Baud rate	Specify the number corresponding to the baud rate that you want to change. Specification range: 0 to 3, * When * is specified, the Reader/Writer reads the current setting.

Specified number	0	1	2	3	*
Baud rate	9600 bps	19200 bps	38400 bps	115200 bps	-

Data length	Specify the number corresponding to the data length that you want to change. Specification range: 0, 1, * When * is specified, the Reader/Writer reads the current setting. Specification number 0 1 * Data length 7Bit 8Bit -
Parity bit	Specify the number corresponding to the parity bit that you want to change. Specification range: 0, 1, 2, * When * is specified, the Reader/Writer reads the current setting.

Specification number	0	1	2	*
Parity	No	Odd	Even	-

Stop bit	Specify the number corresponding to the stop bit that you want to change. Specification range: 0, 1, * When * is specified, the Reader/Writer reads the current setting. Specification number 0 1 * Stop bit 1 bit 2 bits -
BCC Enabled/Disabled	Specify the number corresponding to the BCC setting that you want to change. Specification range: 0, 1, * When * is specified, the Reader/Writer reads the current setting. Specification number 0 1 * BCC Enabled Disabled -
ACK/NACK	Specify the number corresponding to the communications mode that you want to change. Specification range: 0, 1, * When * is specified, the Reader/Writer reads the current setting. Specification number 0 1 * ACK/NACK Control Disabled Enabled -
Timeout ACK/NACK timeout period setting	Specify the number corresponding to the timeout period that you want to change. Specification range: 0, 1, * When * is specified, the Reader/Writer reads the current setting. Specification number 0 1 * Timeout period 5 sec 0.5 sec -

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

<Response Format>

STX	Node No.	Retry flag	Command code "CP"	Response code: "00"	Port No.	Baud rate	Data length	Parity bit	Stop bit	BCC Enabled /Disabled	ACK NACK	Time-out	ETX	BCC
1	2	1	2	2	1	1	1	1	1	1	1	1	1	1

Response code:	00: Normal completion For other response codes, refer to 5-10 Response Code List.
Port No.	Indicates the number corresponding to the specified terminal resistance.
Baud rate	Indicates the number corresponding to the specified baud rate.
Data length	Indicates the number corresponding to the specified data length.
Parity bit	Indicates the number corresponding to the specified parity bit.
Stop bit	Indicates the number corresponding to the specified stop bit.
BCC Enabled/Disabled	Indicates the number corresponding to the specified BCC setting.
ACK/NACK	Indicates the number corresponding to the specified control mode.
Timeout	Indicates the number corresponding to the specified timeout period.

Note
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM..

5-6-8 Communications Type Setting (CT)

This command selects whether COM1 will be used as RS-232C or RS-485.

<Command Format>

STX	Node No.	Command code "CT"	Commni-cations type	ETX	BCC
1	2	2	1	1	1

Communications type	Specify the number corresponding to the communications type that you want to select. Specification range: 0, 1, * When * is specified, the Reader/Writer reads the current setting.			
	Specification number	0	1	*
	Communica-tions type	RS232C	RS485	-

<Response Format>

STX	Node No.	Retry flag	Command code "CT"	Response code: "00"	Commu-nications type	ETX	BCC
1	2	1	2	2	1	1	1

Response code	00: Normal completion For other response codes, refer to 5-10 Response Code List.
Terminal setting	Indicates the number corresponding to the specified terminal resistance.

Note
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM..

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-9 Tag Communications Mode (CM)

This command sets and reads the communications mode for use in communications with Tags.

<Command Format>

STX	Node No.	Command code "CM"	Commni-cations mode	ETX	BCC
1	2	2	1	1	1

Communica-tions mode	Specify the number corresponding to the communications mode that you want to select for communications with Tags. Specification range: 0, 1, * When * is specified, the Reader/Writer reads the current setting.			
	Specification number	0	1	*
	Tag communi-cations mode	Standard Mode	Fast Mode	-

<Response Format>

STX	Node No.	Retry flag	Command code "CM"	Response code: "00"	Com-muni-cations mode	ETX	BCC
1	2	1	2	2	1	1	1

Response code	00: Normal completion For other response codes, refer to 5-10 Response Code List.
Communications mode	Indicates the number corresponding to the specified terminal resistance.

Note
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM..

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-10 Antenna Changeover Command (AC)

This command selects whether the receiving function of each antenna will be enabled or disabled.

<Command Format>

STX	Node No.	Command code "AC"	An-tenna selec-tion	ETX	BCC
1	2	2	1	1	1

Antenna selec-tion	Specify the number corresponding to how TX/RX ANT and RX ANT will be used. Setting range: 0 to 3, or * When * is specified, the Reader/Writer reads the current setting.					
	Setting	0	1	2	3	*
	TX/RX ANT	Disabled	Enabled	Disabled	Enabled	-
	RX ANT	Disabled	Disabled	Enabled	Enabled	-

<Response Format>

STX	Node No.	Retry flag	Command code "AC"	Response code: "00"	ETX	BCC
1	2	1	2	2	1	1

Response code:	00: Normal completion For other response codes, refer to 5-10 Response Code List.
Antenna selection	Indicates the number corresponding to the specified antenna selection.

Note
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM.
- This setting enables or disables the receiving circuit of each antenna. Therefore. if TX/RX ANT (transmitting/receiving antenna) is disabled by this setting, the antenna can perform transmission only.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-11 Terminal Resistance Setting Command (TM)

This command sets and reads the terminal resistance (for RS-485).

<Command Format>

STX	Node No.	Command code "TM"	Terminal specifi-cation	ETX	BCC
1	2	2	1	1	1

Terminal specification	Specify the value, 0 or 1, that corresponds to the terminal resistance that you want to change. Specification range: 0, 1, or * When * is specified, the Reader/Writer reads the current setting. Specification number 0 1 * OFF ON -

<Response Format>

STX	Node No.	Retry flag	Command code "TM"	Response code "00"	Terminal setting	ETX	BCC
1	2	1	2	2	1	1	1

Response code	00: Normal completion For other response codes, refer to 5-10 Response Code List.
Terminal setting	Indicates the setting corresponding to the specified terminal resistance in decimal.

Note
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-12 Offline Mode Setting (FL)

This command selects whether the Reader/Writer will start in offline mode or offline mode.
When offline mode is selected, the Reader/Writer will perform EAS check independent of the host, and output a signal from the output port (OUT1) if the result exceeds the specified criterion.

<Command Format>

STX	Node No.	Command code "FL"	On/OFF mode	Time	Threshold	ETX	BCC
1	2	2	1	2	2	1	1

On/OFF mode	Specify the number corresponding to the mode in which the Reader/Writer will start. Specification range: 0, 1, * When * is specified, the Reader/Writer reads the current setting.			
	Specification number	0	1	*
	On/OFF mode	Online mode	Offline mode	-
Time (*100ms)	Specify the length of time in HEX for which the signal will be output to OUT1 in offline mode. Specification range: 01 to FFh (100ms to 22.5s) When * is specified, the Reader/Writer reads the current setting.			
Threshold (%)	Specify the threshold in HEX to be output to OUT1 in offline mode. Specification range: 00h to 64h (%) (Refer to EAS Check Command.) When * is specified, the Reader/Writer reads the current setting.			

<Response Format>

STX	Node No.	Retry flag	Command code "FL"	Response code: "00"	On/OFF mode	Time	Threshold	ETX	BCC
1	2	1	2	2	1	2	2	1	1

Response code:	00: Normal completion For other response codes, refer to 5-10 Response Code List.
On/OFF mode	Indicates the number corresponding to the specified On/Off mode.
Time	Indicates the time corresponding to the specified On/Off mode.
Threshold	Indicates the criterion corresponding to the specified On/Off mode.

Note

- The default value for the threshold is 19 h (25%) and that for the output time is 500 ms.
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM.
- The command related to this is the EAS Setting (refer to EA Command in 6, 5-2-2) and EAS Check (refer to EA Command in 7, 5-2-2).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-13 Initialization of Settings Command (IS)

If necessary, you can return all the settings to their factory settings.

<Command Format>

STX	Node No.	Command code "IS"	ETX	BCC
1	2	2	1	1

<Response Format>

STX	Node No.	Retry flag	Command code "IS"	Response code: "00"	ETX	BCC
1	2	1	2	2	1	1

Response code:	00: Normal completion For other response codes, refer to 5-10 Response Code List.

Note
- The setting becomes effective after resetting using the Reset Command.
- In order to make your setting survive system shutdown, you need to save the Setting Write Command (refer to EW Command in 10, 5-2-4) in the EEPROM..

5-6-14 Setting Write Command (EW)

This command is executed to make the settings made using the commands from 1} to 9} survive shutdown of the Reader/Writer.

<Command Format>

STX	Node No.	Command code "EW"	ETX	BCC
1	2	2	1	1

<Response Format>

STX	Node No.	Retry flag	Command code "EW"	Response code: "00"	ETX	BCC
1	2	1	2	2	1	1

Response code:	00: Normal completion For other response codes, refer to 5-10 Response Code List.

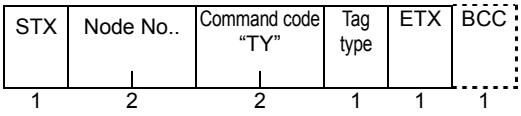
Note
- On successful completion of this command, the settings are written to the nonvolatile memory (EEPROM) of the Reader/Writer. Once the EW command has been executed, all the settings made up to this point in time are written to the nonvolatile memory, thereby eliminating the need to execute this command every time you make a setting.
- Unless you execute the EW command, the settings you have specified will return to the previous values next time you start the Reader/Writer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-6-15 Operating Mode Changeover (TY)

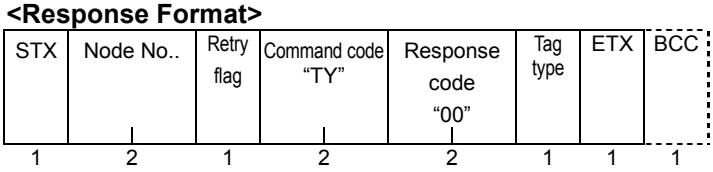
This command changes the operating mode (ISO/I.CODE1) of the Reader/Writer.

<Command Format>



Tag type	Specifies the mode. 0: I.CODE1 mode 1: ISO mode When the Operating Mode is set to "**," the Operating Mode currently set in the Reader/Writer will be read.

<Response Format>



Response code	00:normal completion For other response codes, refer to 5-2-4 Response code List.
Tag type	Specifies the mode.

Note A setting becomes valid after executing Reset Command. To keep the setting valid next startup, you need to save with Setting Write Command (refer to 5-6-14 EW Command).

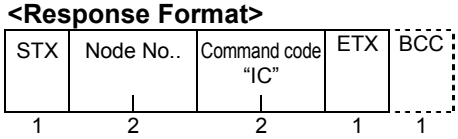
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-7 Other Commands

5-7-1 Command Undefined Response

When the Reader/Writer receives a command code which is not on the command list, the Reader/Writer returns the Command Undefined Response.

<Response Format>



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-8 Communications Method

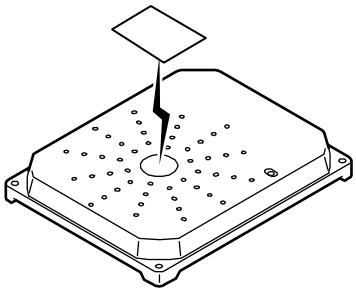
The operation sequence, e.g., how communications with a Tag will take place and when a response will be returned, varies depending on the specification made for a command. For communications, settings for access and mode should be made according to the state of Tags n the communications area of the Antenna and their operation after the Tags receive commands.

5-8-1 Access Settings

There are the following four access settings according to the number of Tags in the communications area and their states.

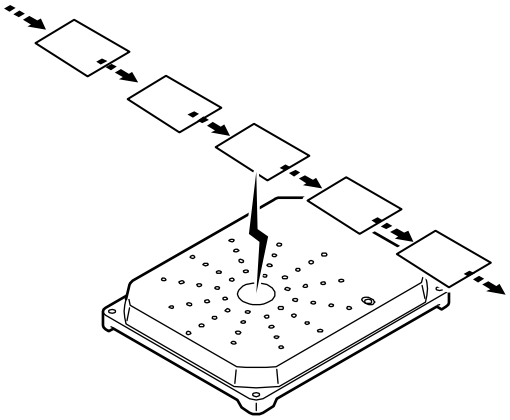
5-8-1-1 Single Access

In single access, a single Tag can exist in the communications area. The presence of two or more Tags in the communications area causes a communications error.



5-8-1-2 FIFO Access

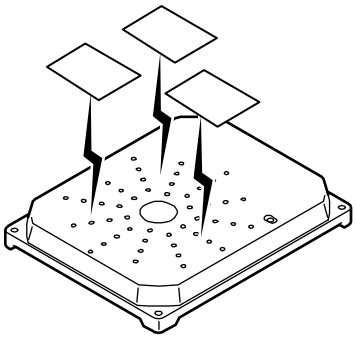
In FIFO (first-in, first-out) access, communications with Tags entering the communications area one after another are carried out in sequence. Once communications with Tags are completed, access to them is prohibited. Consequently, even if Tags with which communications are already completed exist in the communications area, a newly entering Tag can be accessed. Simultaneous entering of two or more Tags causes a communications error. Once an access-prohibited Tag leaves the communications area, access to the Tag is enabled again.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

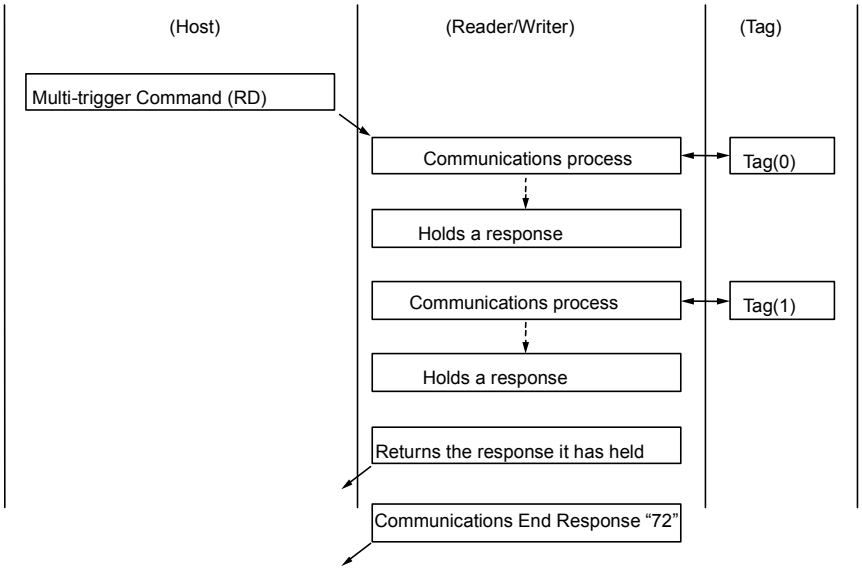
5-8-1-3 Multiple Access

In multiple access, communications with all of Tags existing in the communications area can be carried out. In this case, the Tag No. setting commensurate with the number of Tags within the communications range is set using the commands.



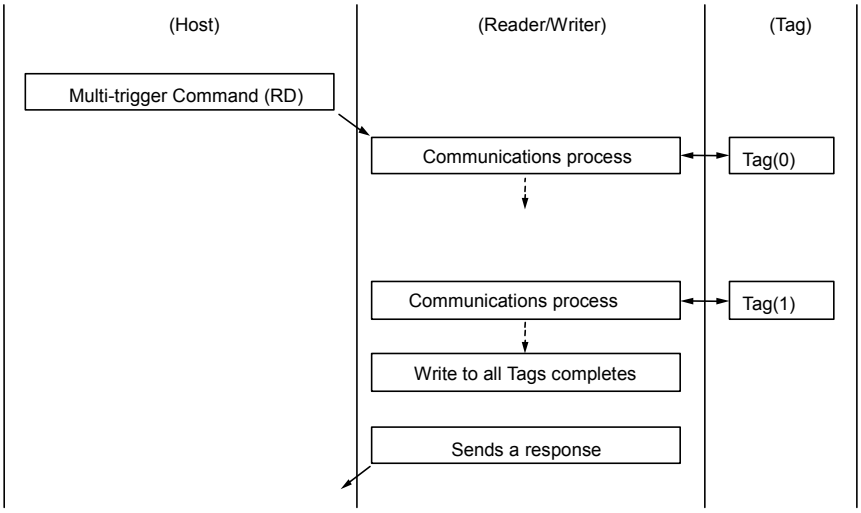
Multiple Access Read

A response is returned once only when communications with all Tags within the communications range ends for the Multiple Access Write Command (WT).



Multiple Access Write

A response is returned once only when communications with all Tags within the communications range ends for the Multiple Access Write Command (WT).



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-8-1-4 Selective Access

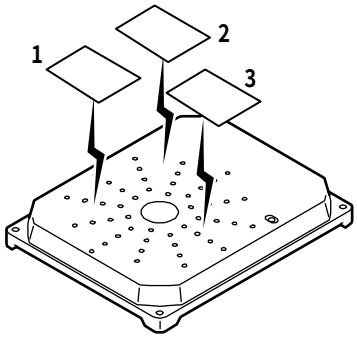
A Selective Access has a function to communicate with the selected Tags among Tags in the communications area of antenna. This access has different processing according to the modes of the Reader/Writer.

<ISO mode>
Firstly, (Multi-) Read Command reads UID (SNR) of a Tag in communications area. You can read UID (SNR) if you set UID (SNR) Additional Setting Command valid in advance. (If UID (SNR) is known beforehand, there is no need to execute Read Command) Next, communicate with Tags according to UID (SNR) received.

<I.CODE1 mode>
Firstly, you need to allocate Temporary Number in communications area with Tag Detection Command. Next, communicate with Tags according to UID (SNR) received.

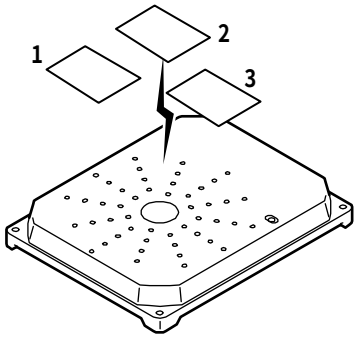
(1) ISO mode: Read Command reads UID (SNR) of a Tag.

I.CODE1 mode: Tag Detection Command allocates numbers to a Tag.



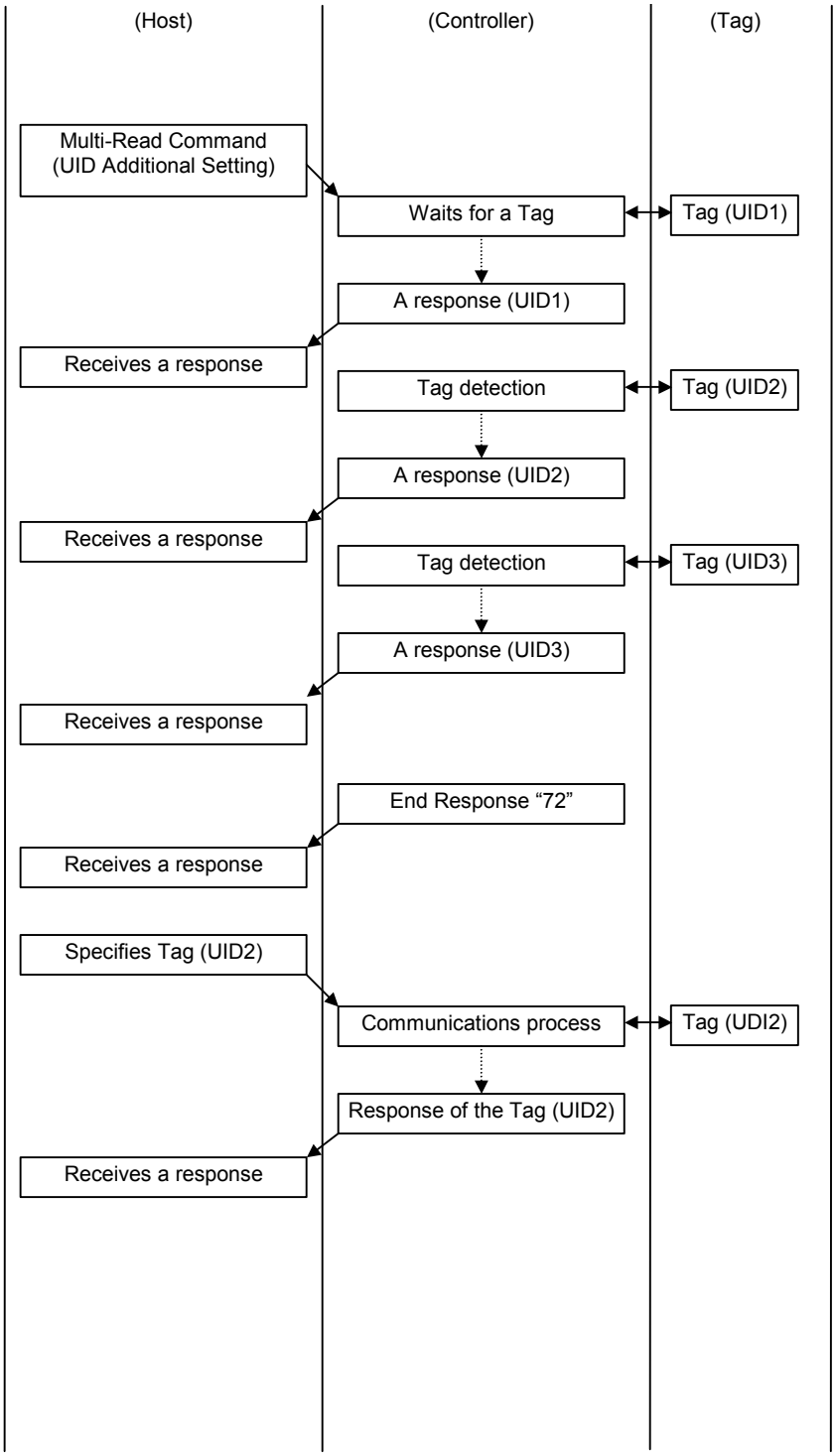
(2) ISO mode: Selective Access Read/Write Command specifies UID (SNR), which is received at (1), and communicate with selected Tag (No.2 as shown below).“

I.CODE1 mode: After allocating numbers to a Tag, Tag Specified Command communicates with selected Tag (No.2 as shown below).



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■Selective Access Operation: In ISO Mode



(1) Controller receives a command.

(2) Controller communicates with the Tag.

(3) Controller returns a response with UID.

(3) When a Tag is in the communications area of the Reader/Writer Antenna, the controller communicates with the Tag.

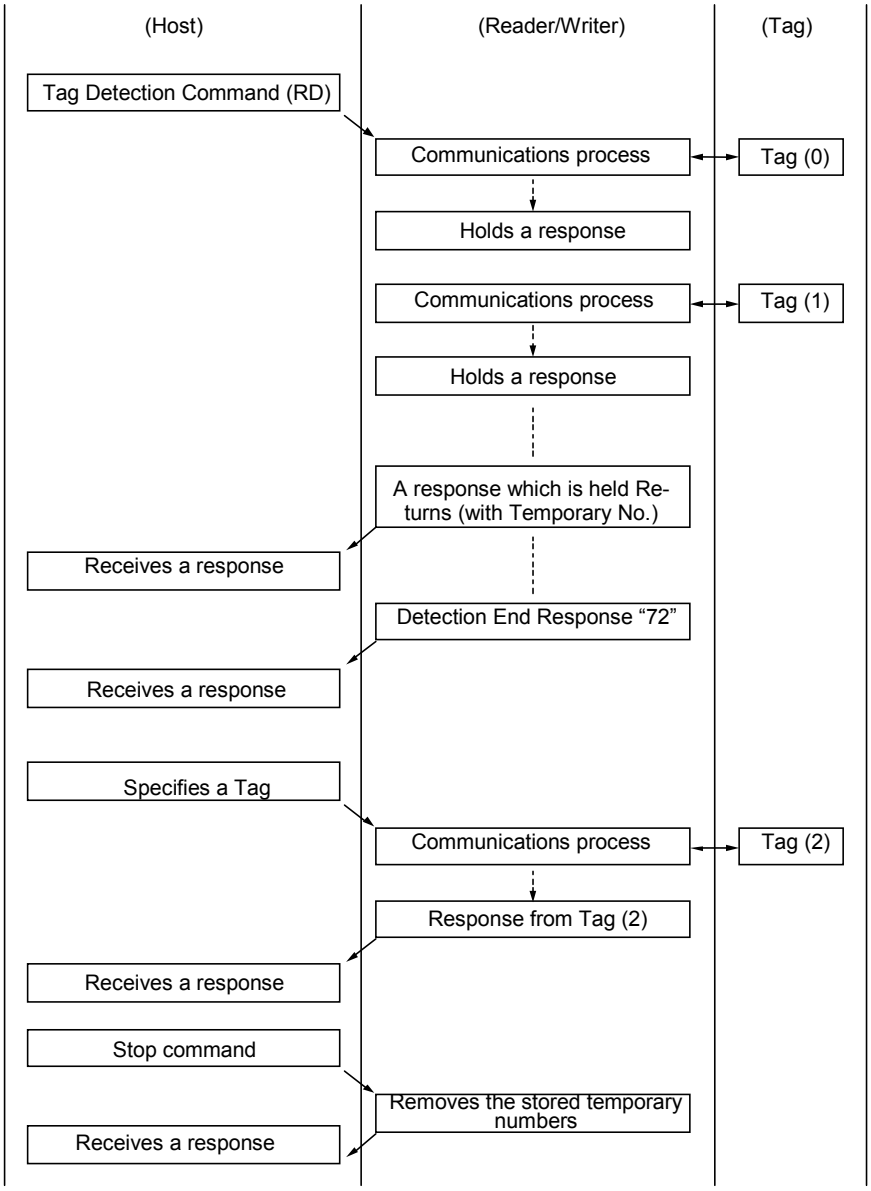
(4) Returns an end response when the controller completes to communicate with all Tags in the communications area.

(5) Controller receives UID Additional Command of the Tag to communicate with.

(6) The controller performs the communication processing with the UID designated Tag.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■Selective Access Operation: In I.CODE1 Mode



■Exception（In I.CODE1 Mode）

1) When the Tags with the temporary numbers selected by the Tag Selection Command are not present, the Reader/Writer returns a communications error to the host.

2) When the Tag Selection Command selects temporary numbers other than those stored by the Reader/Writer by the Tag Detection Command, the Reader/Writer returns a format error to the host.

3 The temporary number once stored by the Reader/Writer is not deleted until the Reader/Writer executes the Stop Command. Commands other than selective access commands (excluding the Reset Command (XZ)) are not accepted until the Reader/Writer executes the Stop Command. When the Tag Detection Command has been executed once, it cannot be performed again until processing has been completed.

How to use properly The Tag Detection Command means that "LT" is set to the "communications method" for a command frame. Also, the selection of Tag(1) means that "01" is set to the "communications method " for the command frame.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Exceptions

When the Tags with the temporary numbers selected by the Tag Selection Command are not present, the Reader/Writer returns a communications error to the host.

When the Tag Selection Command selects temporary numbers other than those stored by the Reader/Writer by the Tag Detection Command, the Reader/Writer returns a format error to the host.

The temporary number once stored by the Reader/Writer is not deleted until the Reader/Writer executes the Stop Command. Commands other than selective access commands (excluding the Reset Command (XZ)) are not accepted until the Reader/Writer executes the Stop Command. When the Tag Detection Command has been executed once, it cannot be performed again until processing has been completed.

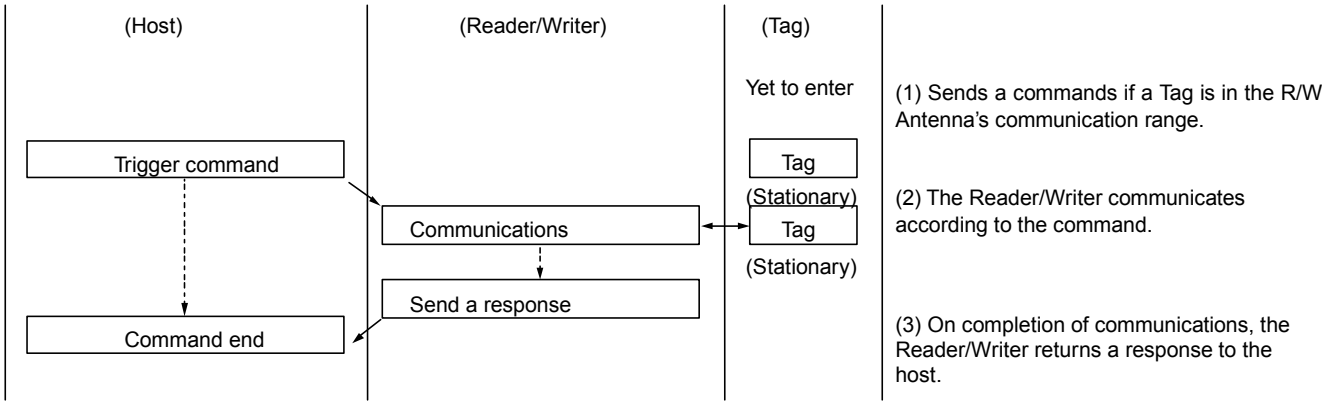
Note The Tag Detection Command means that "LT" is set to the "communications method" for a command frame. Also, the selection of Tag(1) means that "01" is set to the "communications method " for the command frame.

5-8-2 Mode Settings

There are the following four mode settings according to the state of the Reader/Writer and of Tags.

5-8-2-1 Trigger Mode

In trigger mode, communications with a stationary Tag in the communications area are carried out. When no Tag is present in the area, an error response is returned.

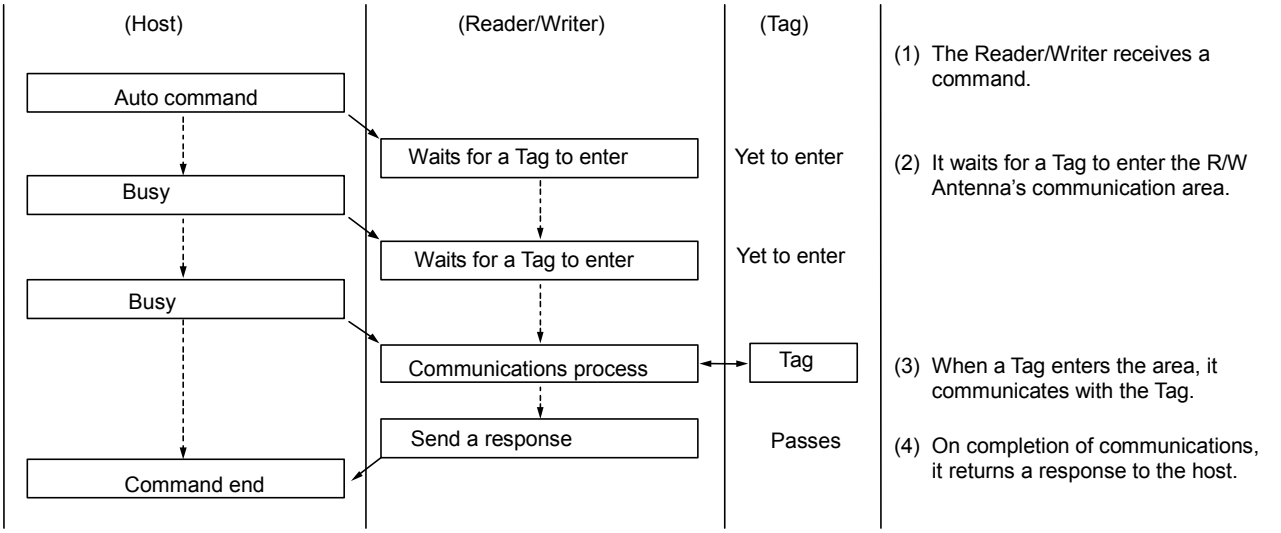


Note Before using Trigger Mode, check that the Tags are not moving and are within the Antenna's communications area.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-8-2-2 Auto Mode

In auto mode, after receiving an Auto command from the host, the Reader/Writer waits for a Tag to enter the Antenna's communications area. Since the Reader/Writer is in a busy state between Auto command reception and the completion of communications with the Tag, it does not accept any commands other than the Stop or Reset Command during the period.

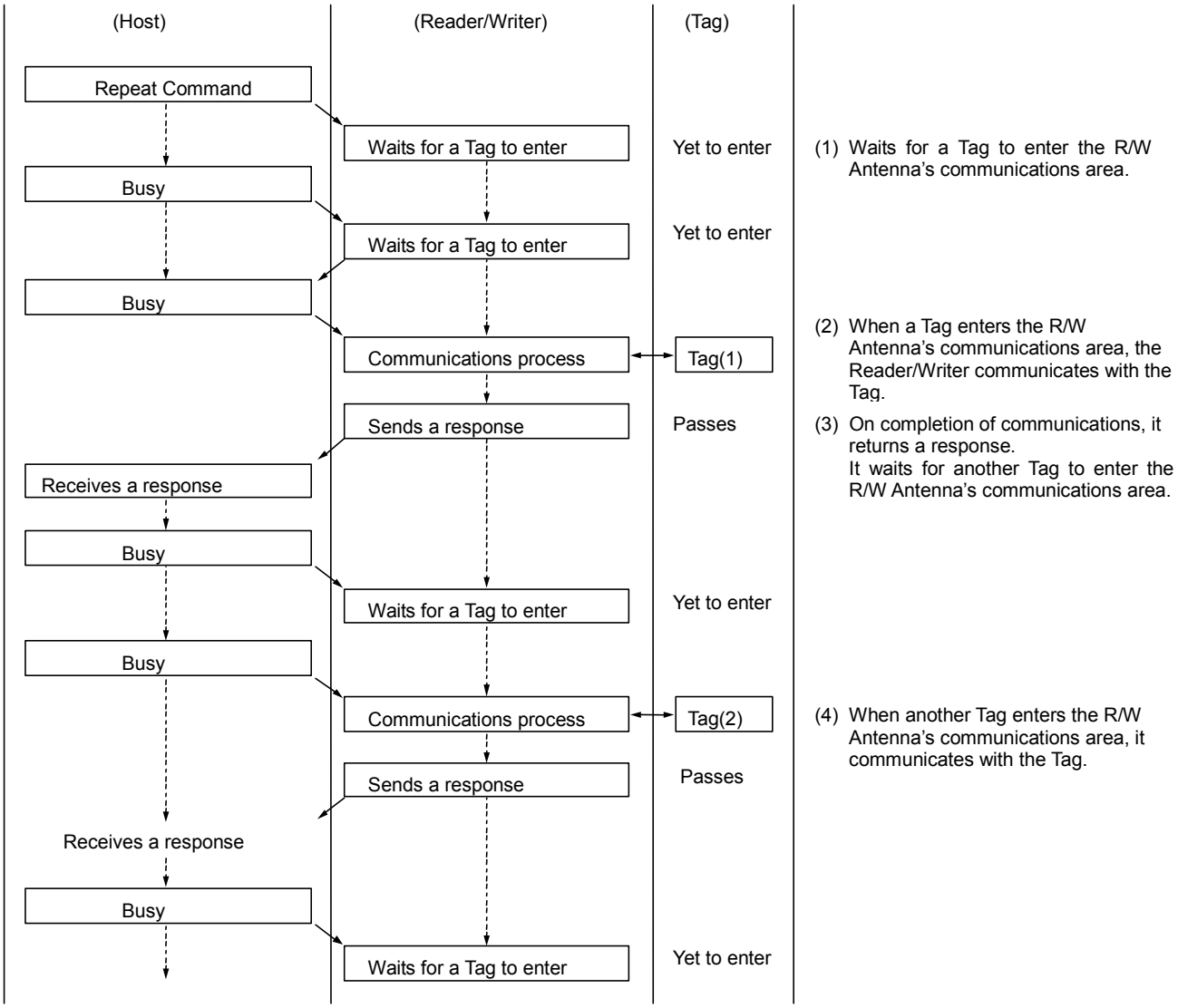


Note In Auto Mode, the communications path between the host device and the Reader/Writer is busy until a Tag approaches the Reader/Writer, so the host device cannot send the next command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-8-2-3 Repeat Mode

The Reader/Writer waits for a Tag to enter the R/W Antenna's communications area. Every time an Tag enters the communications area, the Reader/Writer communicates with the Tag and returns a response. It is not until communications are stopped by the Stop or Reset command that the Reader/Writer accepts the next command.

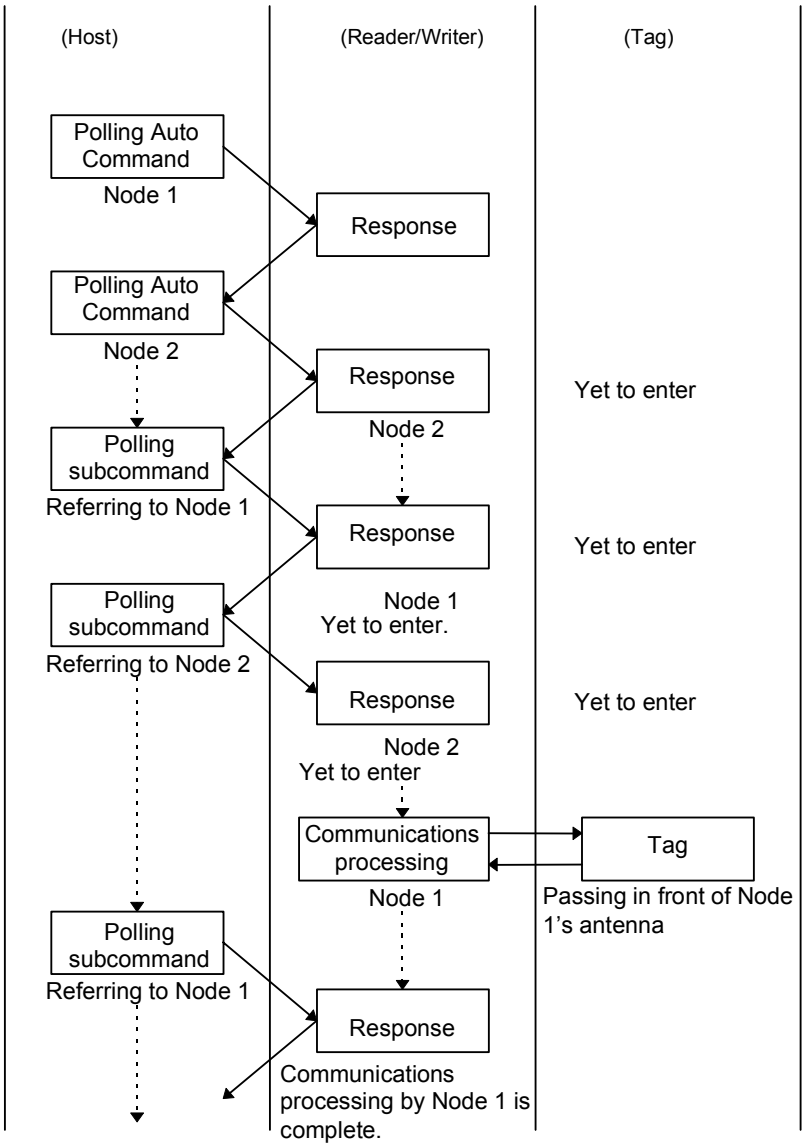


Note To send another command from Repeat Mode, be sure to use either the stop command or reset command, and make sure that the Reader/Writer has finished processing commands and is in command waiting status before sending the new command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-8-2-4 Polling Auto Mode

If an Auto command is used when a single host controls more than one Reader/Writer, the communications path between the host and one of the Reader/Writers to which the command is sent becomes busy, disabling the host to control other Reader/Writers. On the other hand, when a Polling Auto command is sent instead, the Reader/Writer returns a response according to the request from the host. The communications line with the host will not remain busy, allowing the host to send a command to other Reader/Writers. During the execution of the Polling Auto command, commands other than the Polling subcommand, Reset and Stop commands are not executed. The following flowchart shows the case where the Polling Auto Command is sent to 2 Reader/Writers.



(1) The host sends the Polling Auto Command to the Node 1 Reader/Writer.

(2) Immediately after command reception, Node 1 returns a response indicating the acceptance of the command.

(3) The host sends the Polling Auto Command to Node 2.

(4) Immediately after command reception, Node 2 returns a response indicating acceptance of the command.

(5) The host inquires after the progress of the communications processing or stops the Polling Auto processing using the Polling sub command. When the communications processing is not yet complete, the Reader/Writer returns a response indicating unfinished processing in reply to the inquiry of the Polling sub command.

(6) The Node 1 communicates with a Tag entering the communications area.

(7) Node 1 returns a response indicating the results of communications with the Tag in reply to the Polling subcommand.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-8-3 Table of Communications Methods

Name	Code	Description
Single Trigger	ST	Immediately after receiving a command, the Reader/Writer communicates with a Tag and returns a response. If the Tag is missing, an error is returned. During communications, only one Tag should exist in the communications area.
Single Auto	SA	After receiving a command, the Reader/Writer waits for a Tag to enter the communications area. Next, the Reader/Writer communicates with the entering Tag and returns a response. During communications, only one Tag exists in the communications area.
Single Repeat	SR	After receiving a command, the Reader/Writer waits for a Tag to enter the communications area. Next, the Reader/Writer communicates with the entering Tag and returns a response. After sending the response, the Reader/Writer enters a Tag waiting state again and repeats this process until receiving the Stop or Reset Command. During communications, only one Tag should exist in the communications area.
Multi-trigger	MT	Immediately after receiving a command, the Reader/Writer communicates with all of the Tags existing in the communications area and returns responses corresponding to each Tag. If the Tag is missing, an error is returned.
Multi-repeat	MR	The Reader/Writer waits for Tags to enter the communications area. It communicates with all of the Tags existing in the communications area and returns responses corresponding to each Tag. After completing communications, the Reader/Writer disables the operation of the Tag. After sending the response, the Reader/Writer enters a Tag waiting state again and repeats this process until receiving the Stop or Reset Command.
FIFO Trigger	FT	Immediately after receiving a command, the Reader/Writer communicates with a Tag and returns a response. After completing communications, the Reader/Writer disables the operation of the Tag. After sending the response, the Reader/Writer will continue to operate until it receives a FIFO command, stop command, or reset command. During communications, only one Tag in the Communications area is operable.
FIFO Auto	FA	After receiving a command, the Reader/Writer waits for a Tag to enter the communications area. Next, the Reader/Writer communicates with the entering Tag and returns a response. After sending the response, the Reader/Writer will continue to operate until it receives a FIFO command, stop command, or reset command. After sending the response, the Reader/Writer enters a command waiting state. During communications, only one Tag in the Communications area is operable.
FIFO Repeat	FR	The Reader/Writer waits for a Tag to enter the communications area and communicates with the entering Tag. After completing communications, the Reader/Writer disables the operation of the Tag. After sending the response, the Reader/Writer enters a Tag waiting state again and repeats this process until receiving the Stop or Reset Command. During communications, only one Tag in the Communications area is operable.
Selective Access Trigger	LT、□□	A Tag selected from among multiple Tags in the communications area is accessed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-8-4 Table of Communications Methods for Commands

Communications Method / Command	Single			FIFO			Multiple		Selective		Special Read
	Trigger	Auto	Repeat	Trigger	Auto	Repeat	Trigger	Repeat	Tag Detection	Tag Selection	
Read	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Note	✓	✓	–	✓	✓	✓	✓	✓	–	✓	–
Polling Read *1	–	✓	–	–	–	–	–	–	–	–	–
Polling Write *1	–	✓	–	–	–	–	–	–	–	–	–
Memory Check *2	✓	–	–	–	–	–	–	–	–	–	–
Memory Calculation *2	✓	–	–	–	–	–	–	–	–	–	–
Lock *2	✓	–	–	–	–	–	–	–	–	–	–

✓ : :Able to select communications method

– : :Not able to select communications method

*1: The specified communications mode is fixed as Single Auto. The user cannot specify another mode.

*2: The specified communications mode is fixed as Single Trigger. The user cannot specify another mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-9 Data Type

Specify using the commands whether read/write data is to be handled as ASCII (or JIS8 code) character data, or as hexadecimal numerical data.

Name	Code	Description
ASCII Code	A	A character of data occupies 1 byte (1 address) on a Tag as an ASCII code or a JIS 8 code. Control codes 02 (STX) and 03 (ETX) cannot be used.
HEX code	H	A character is handled as hexadecimal data. Therefore, only characters from 0 to F are accepted. Two characters of data occupy 1 byte (1 address) on a Tag.

Example of ASCII Representation
When writing "V720" to four bytes of memory of page 00 using ASCII data, the data will occupy the Tag's memory as follows:

	Byte 0		Byte 1		Byte 2		Byte 3	
Page 00h	5	6	3	7	3	2	3	0
Content	V		7		2		0	

Example of Hexadecimal Representation
When writing "12345678" to four bytes of memory of page 01h using hexadecimal data, the data will occupy the Tag's memory as follows:

	Byte 0		Byte 1		Byte 2		Byte 3	
Page 01h	1	2	3	4	5	6	7	8

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-10 Timeslot Setting

The timeslot setting is the setting in the command frame when communicating with multiple Tags simultaneously using Multi-system commands. This setting must be set according to the number of Tags with which to communicate simultaneously. Refer to the table below for the relationship between the number of Tags and this setting.

Timeslot setting	Max. No. of Tags with which simultaneous communication is possible
0	1
1	～2
2	～4
3	～8
4	～16
5	～32
6	～64
7	～128

Example: If the number of Tags is seven, select Tag Number setting 3.

Note
- If more Tags than have been set using the timeslot setting enter the communications range, a "70" error (warning) may occur. (e.g., When the timeslot setting is "2" and there are five Tags in the communications area.)
  Select a suitable setting by referring to the above table.
- For the Special Read (refer to 5-2-1-6) command, the anti-collision process is not performed. Therefore, read data will be returned even If there are more Tags than the timeslot setting in the communications area.If a collision occurs, such data will not be returned.
- The higher the timeslot setting is, the longer the communications time is required. Consequently, setting a higher timeslot setting than required for the number of Tags in use unnecessarily lengthens communications time, so select a suitable setting.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

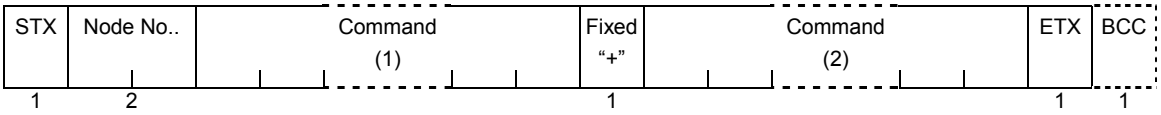
5-11 Command Connection: In I.CODE1 Mode

This Command Connection works in I.CODE1 Mode Only, and does not support ISO Mode.
A command connection function allows the Reader/Writer to perform a pair of read and write operations at a time by sending a command only once.
Any of the following six commands can be paired.

- Read (RD) This excludes Special Read.
- Write (WT)
- Polling Single Auto Read (PR)
- Polling Single Auto Write (PW)
- Memory Check (MC)
- Memory Calculation (MK)

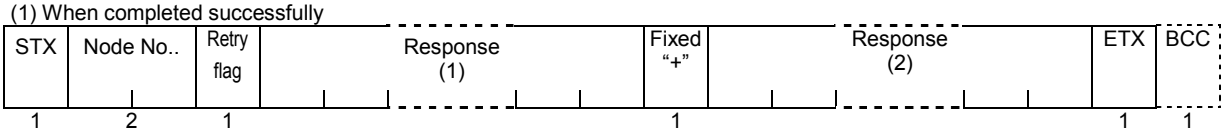
Example of command connection
In a command connection function, a single STX, Node No., BCC and ETX are shared each, and connected to each other using "+."

<Command Format>

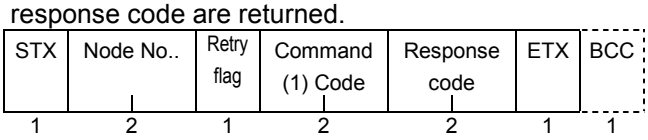


<Response Format>

(1) When completed successfully



(2) When completed unsuccessfully
When a command has not completed successfully, the command code of the command (1) and a response code are returned.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Following Combinations of Command Connections Are Possible

		Command (1)					
		Read (RD)	Write (WT)	Memory Calculation (MK)	Memory check (MC)	Polling read (PR)	Polling write (PW)
Command (2)	Read (RD)	✓	✓	–	–	–	–
	Write (WT)	✓	✓	–	–	–	–
	Memory Calculation (MK)	–	✓	–	–	–	–
	Memory check (MC)	✓	–	–	–	–	–
	Polling read (PR)	–	–	–	–	✓	✓
	Polling write (PW)	–	–	–	–	✓	✓

✓: Command connection is possible;– : Command connection is not possible

How to use properly

1. Communications method
   The communications method specified using command (1) is given priority. Single Auto is specified for Polling commands, and Single Trigger is specified for the memory check and memory calculations.
2. Polling process
   If a Polling command is specified as command (1), the Reader/Writer will perform Polling.
3. Tag No. setting
   The number of Tag No. setting made using command 1 is given priority.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 6
Startup and Full Operation

6-1 Trial Operation 6-2
6-2 Self-diagnostics 6-3
6-1 Errors and Remedies 6-4
6-2 Maintenance and Inspection 6-5
6-3 Troubleshooting 6-6

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

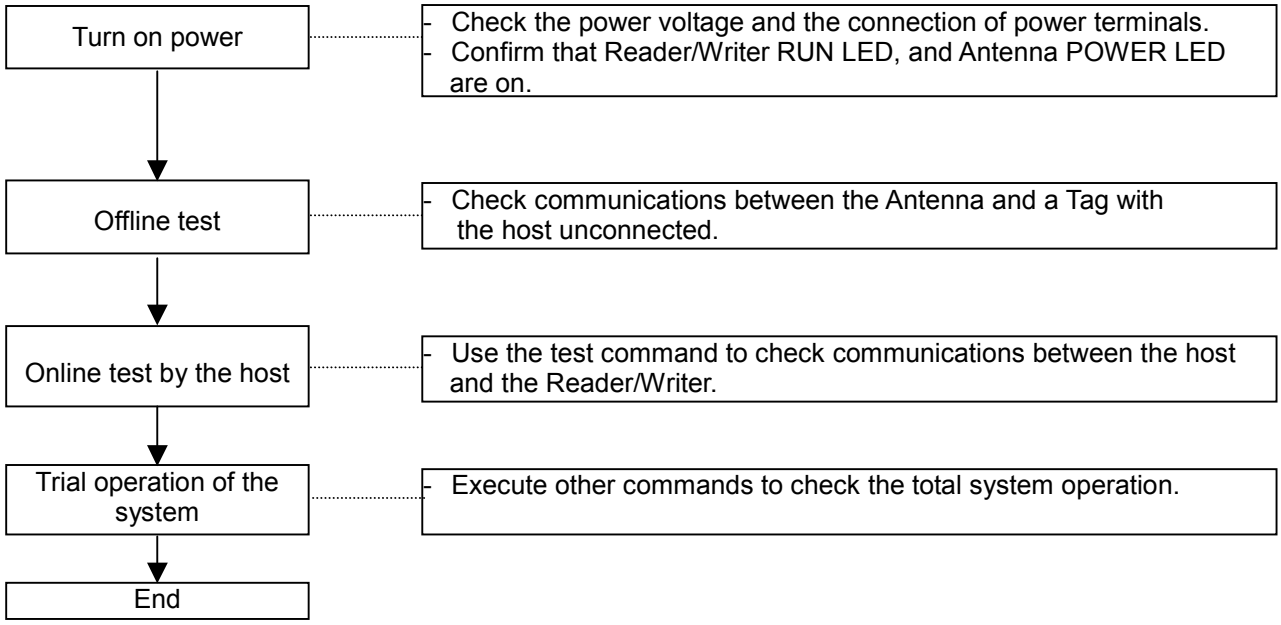
6-1 Trial Operation

Items

Check the following on the RFID System before the trial operation of the whole system.

No.	Items	Detail	Section-Item
1	Power supply and I/O lines	・ Are the power supply and I/O lines properly wired? ・ Are the terminal screws fastened tightly?	4-4
2	Reader/Writer Setting	・ Is the node number set correctly? ・ Are the communications specifications set correctly?	4-1
3	Antenna	Is the Antenna connected properly?	4-4
4	Host	Are the RS-232C and RS485 connectors connected properly?	4-4
5	Location of Antenna and Tag	Are the Antenna and Tag located properly?	Refer to the instruction manual for your antenna.

Procedure for Trial Operation



Offline Read Test in Test Mode setting

Use the Offline Mode Setting Command (FL) to select offline test mode. The default mode is offline mode.
For details, refer to 3-6 Offline Test Function, Section 3.
By setting the Test Mode, the communications between the Antenna and Tag can be tested without connecting the host.You can exit offline mode by connecting to the host and sending a Stop Command (ST) (refer to 1), 5-2-3, Section 5).

Communications Test with Host

By using test commands, the communications between the Reader/Writer and host can be tested. This test allows the checking of the cable connection and the processing operation of communications before the trial operation of the whole system.

- Prepare a simple communications program on the host and transmit test commands.
- If the communications line is normal, the Reader/Writer returns the data received.
- Refer to 4) Test Command (TS), 5-2-3 of Section 5.

Note Conduct the test of the final installation positions of both the antenna and Tag after the lapse of standby time (15 minutes) Standby time means the time that elapses after turning the power on to getting the product ready for stable communications.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-2 Self-diagnostics

The Reader/Writer has a self-diagnostic function to check a variety of items in order to reduce the downtime of the system that may result due to operational failures.

Details of Errors

Errors detected by the Reader/Writer can be classified into “fatal errors” and “nonfatal errors.”

Fatal error

If the hardware of the Reader/Writer fails, the operation of the CPU will be interrupted and the ERROR indicator will turn ON or flash.

Nonfatal error

If there is a communications error between the Reader/Writer and host or the Antenna and Tag, the ERROR indicator will turn ON.

	Item	Indicator			
		RUN	COMM	NORM	ERROR
Normal operation	Awaiting command	○	●	●	●
	Communicating with Tag	○	○	●	●
	Normal completion of communications with Tag	○	●	○	●
Fatal error	CPU error	●	●	●	○
	Memory error	●	●	●	◑
Nonfatal error	Communications error	○	●	●	○
	Host communications error	○	●	●	○
	Setting error	○	●	●	◑

○: ON
●: OFF
◑ : Flashing

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-3 Errors and Remedies

The following are considered to be main causes of system breakdowns.

- Noise Interference ..... Take appropriate countermeasures against noise.
- Failures in any of the external devices
- Failures in the Reader/Writer
- Failures in the Antenna
- Failures in the cable
- Failures in any of the Tags
- Others

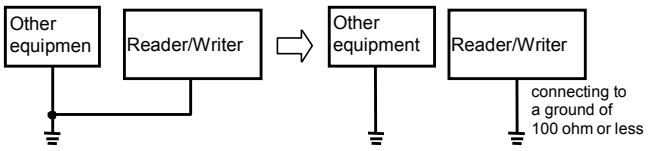
} Repairs are required.

Noise Interference

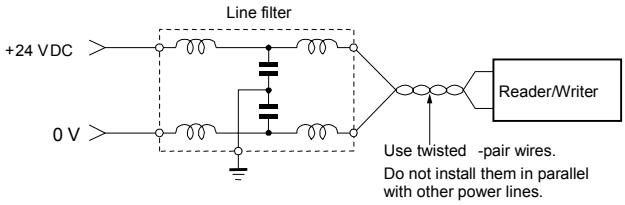
If the system malfunctions due to noise, refer to the following and take appropriate countermeasures.

No.	Circumstance of failure	Probably cause	Remedy
1	Occurs when a heavy-duty motor, transformer, or capacitor is turned ON.	An instantaneous voltage drop due to inrush current to the heavy load.	Increase the capacity of the power supply and that of the power cable.
		Common mode noise caused by the above cause.	Provide the power through a 1-to1non-grounded insulating transformer. Independently ground the Reader/Writer at a resistance less than 100 ohm.
2	Occurs irregularly	Noise on power line	Provide the power through a 1-to-1 non-grounded insulating transformer or noise filter. Independently ground the Reader/Writer at a resistance less than 100 ohm.
		More than one V720-series Antenna	When operating more than one V720-series Antenna, provide a sufficient clearance between the Antennas. Refer to the instruction manual for your antenna for details.

Improvement of grounding



Remedy for power noise



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-4 Maintenance and Inspection

The V720 Series must be inspected on a daily or regular basis so that the functions of the V720 Series can be used in good condition.
The V720 Series consists of semiconductors that last almost indefinitely. The following malfunctions may, however, result due to the operating environment and conditions.

a. Element deterioration due to overvoltage or overcurrent.
b. Element deterioration due to continuous stress caused by high ambient temperature.
c. Connector contact faults or insulation deterioration due to humidity and dust.
d. Connector contact faults or element corrosion due to corrosive gas.

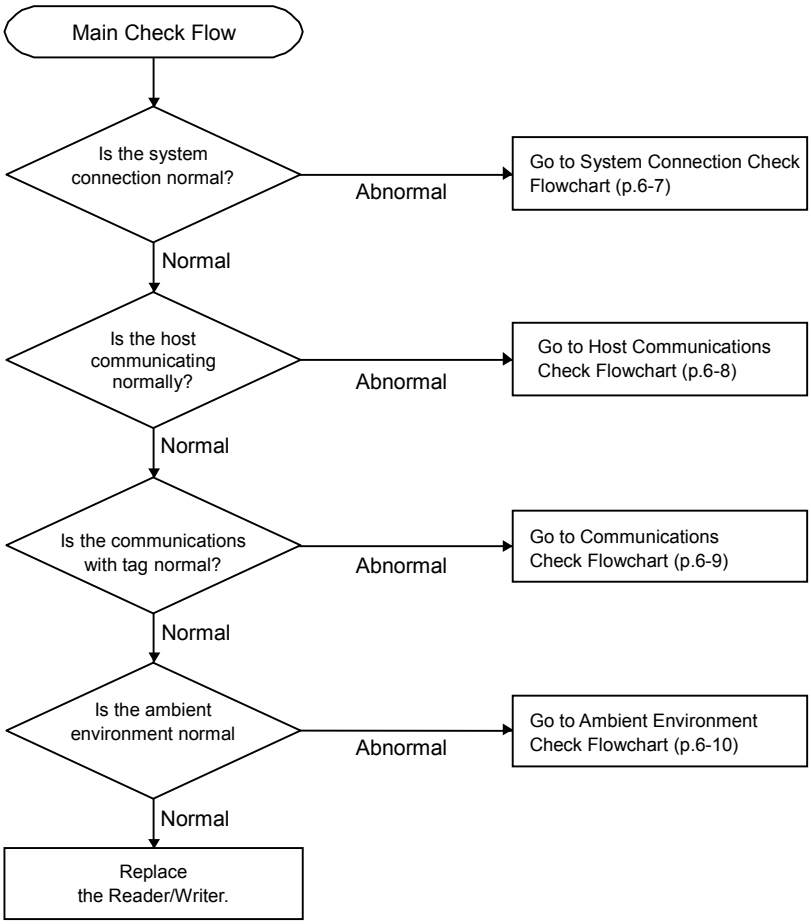
Item

No.	Item	Detail	Criteria	Remarks
1	Supply voltage fluctuation	(1) Check that the supply voltage fluctuation at the power supply terminal block is within the permissible range.	Supply voltage rating	Voltage tester
		(2) Check that there is no frequent instantaneous power failures or radical voltage drops.	Within permissible voltage fluctuation range	Power supply analyzer
2	Environment a. Ambient temperature b. Ambient humidity c. Vibration and shock d. Dust e. Corrosive gas	a. Check that the ambient temperature is within the specified range. b. Check that the humidity is within the specified range. c. Check that no vibration or shock is transmitted from any machines. d. Check that the system is free of adherence or accumulation of dust or foreign matter. e. Check that no metal part of the system is discolored or corroded.	a. Check that the ambient temperature is within the specified range. b. Check that the humidity is within the specified range. c. Check that the ambient temperature and humidity are within the specified ranges. d. Check that there is no dust or foreign matter. e. Check that there is no discoloration or corrosion.	Maximum and minimum thermometer Hygrometer
3	Panel condition a. Ventilation b. Packing for any enclosed construction	a. Check that the system is ventilated properly with natural ventilation, forced ventilation, or cooling air. b. Check that the packing is properly attached with no damage.	a. The interior temperature must be within a range between -10°C and 50°C with proper ventilation. b. The packing has no damage.	-
4	I/O power supply a. Voltage fluctuation b. Ripple	Check on the I/O terminal block that the voltage fluctuation and ripple are within the permissible ranges.	The voltage fluctuation and ripple must be within the specified range.	Voltage tester Oscilloscope
5	Mounting condition	(1) Check that each device is securely mounted.	There must be no loose screws.	-
		(2) Check that each connector is securely connected.	Each connector is locked or securely tightened with screws	-
		(3) Check that no screw of the terminal block is loosened.	There must be no loose screws.	-
		(4) Check that no wire is broken or nearly broken.	There must be no wire that is broken or nearly broken.	-
		(5) Check that the distance between the Tag and Antenna is within the specified range.	The distance between the Tag and Antenna must be within the specified range.	-
		(6) Check that the GR terminal is grounded.	The terminal must be grounded to a resistance of 100 ohm or less.	-

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

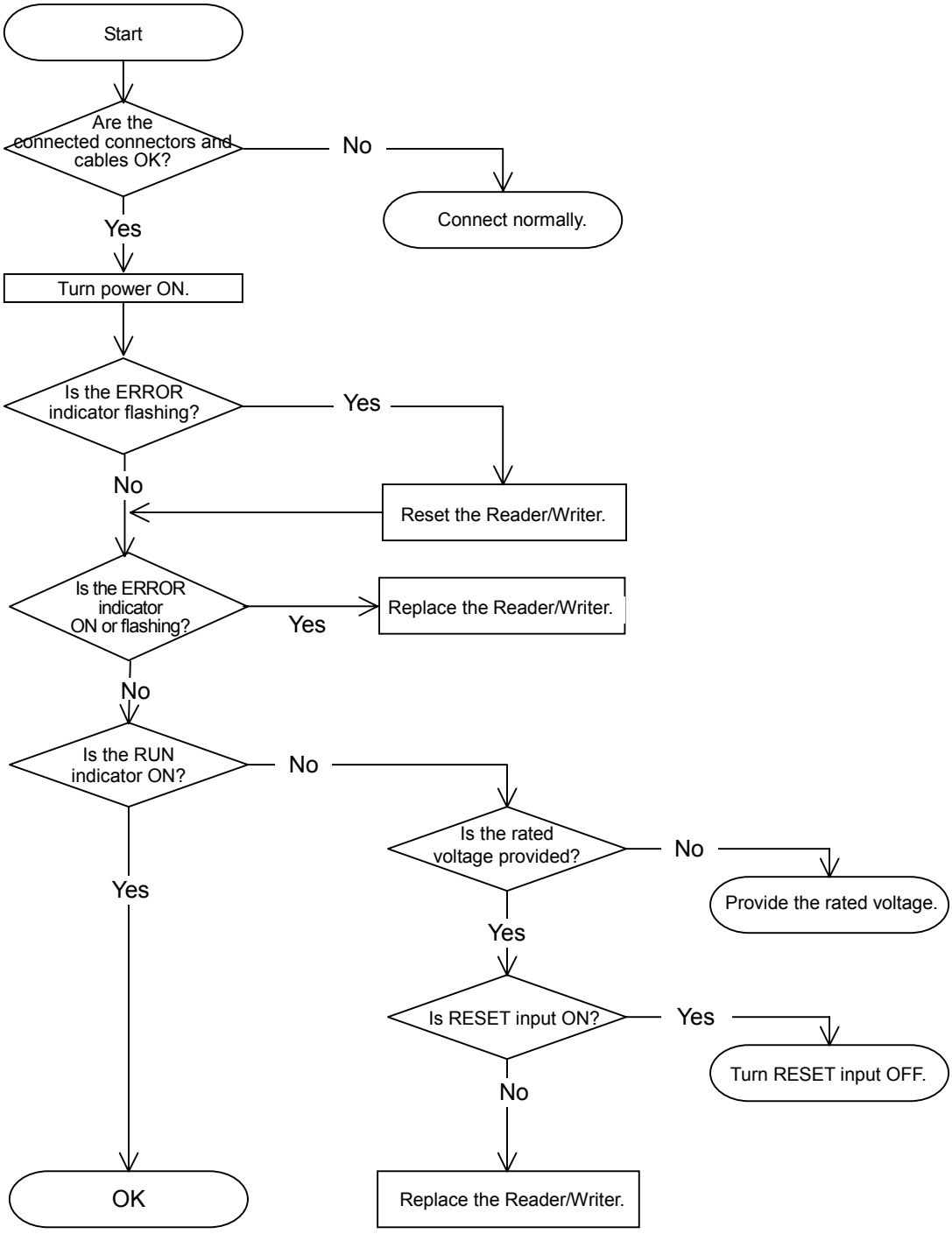
6-5 Troubleshooting

Main Check Flowchart Use the following main check flowchart to determine the cause of the error.



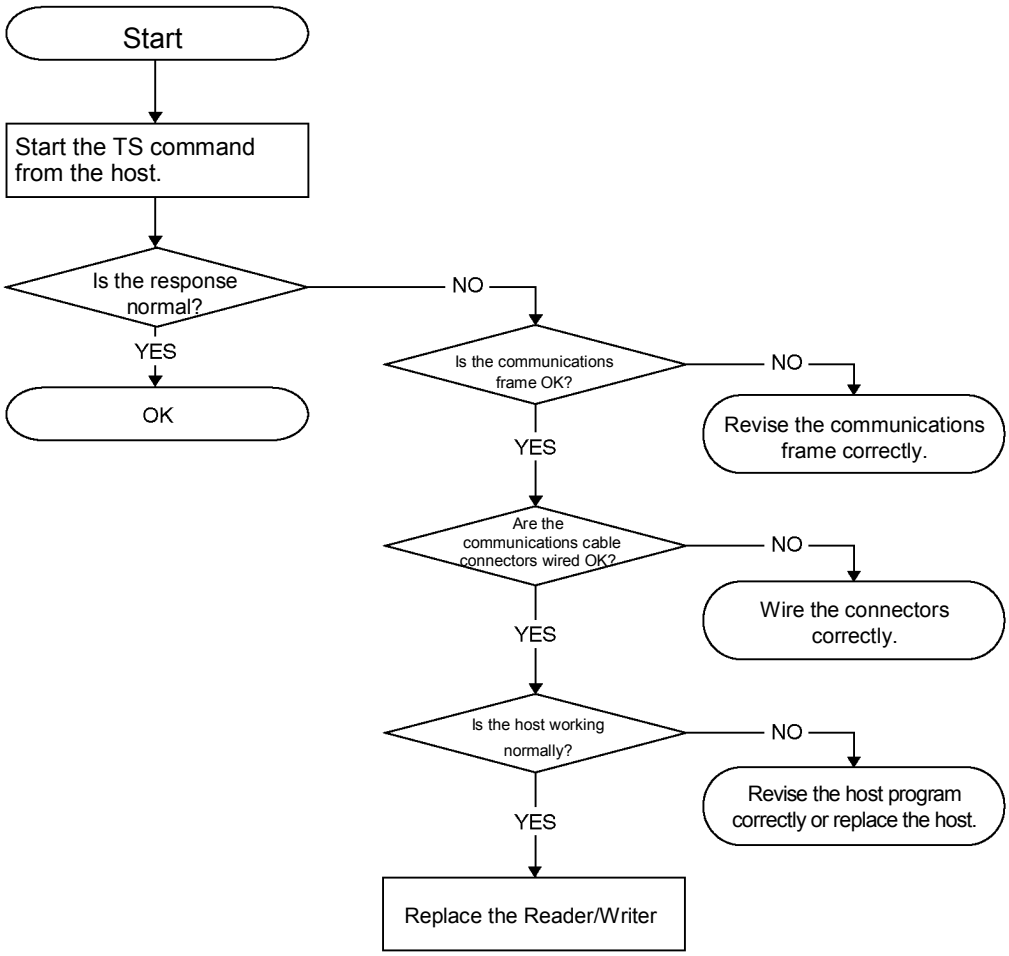
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

System Connections Check Flowchart



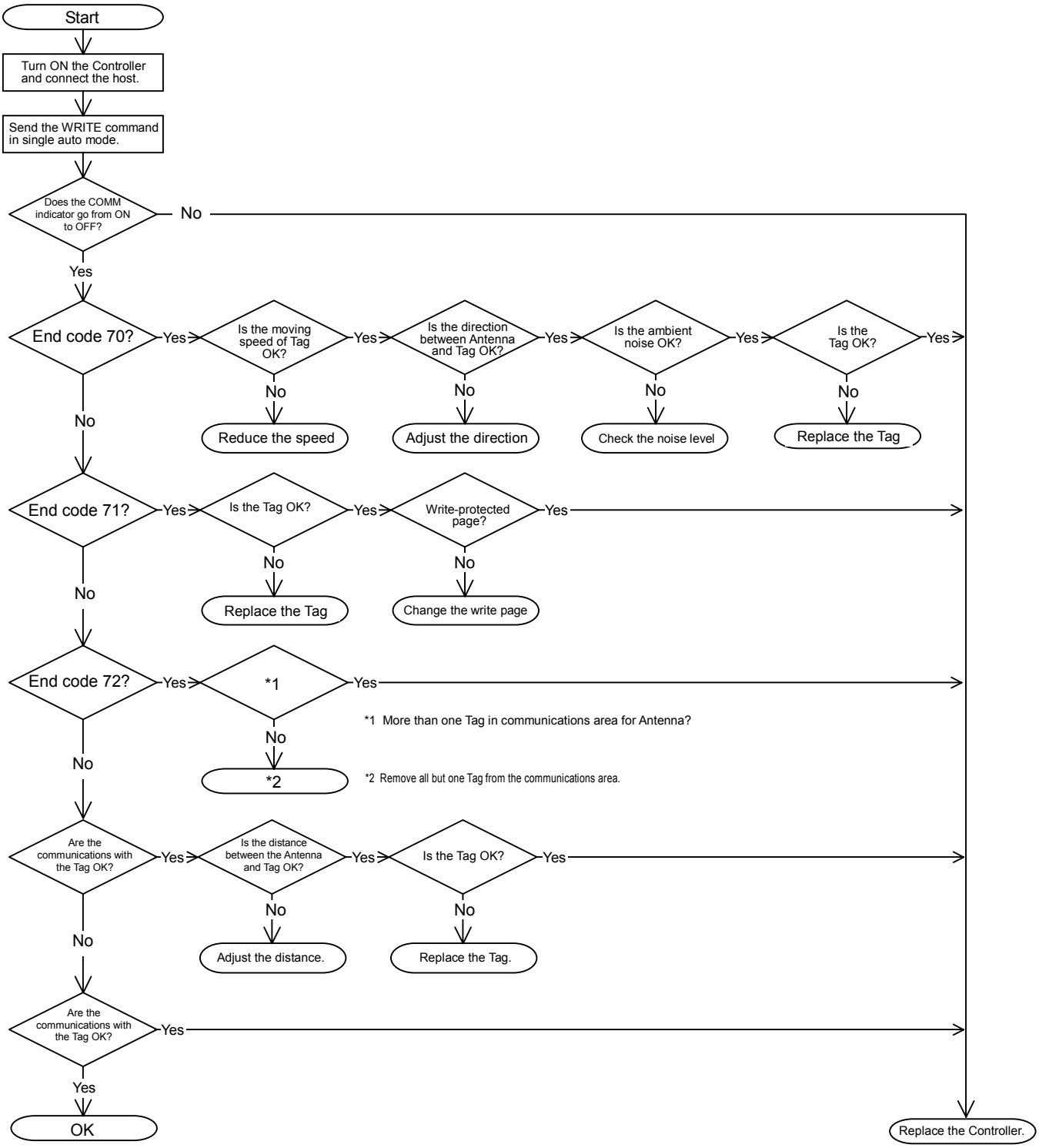
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Host Communications Check Flowchart



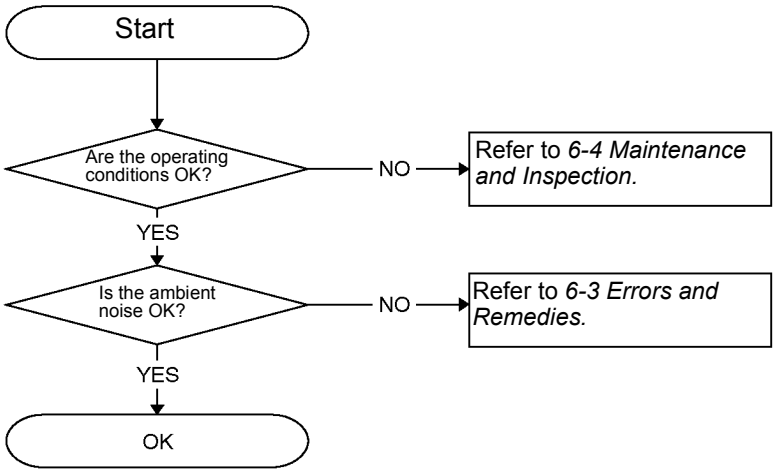
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Communications Check Flowchart



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Operating Environment Check Flowchart



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 7
Reference Data

7-1 Communications Time 7-2
7-2 Calculation of Tag Traveling Speed 7-6

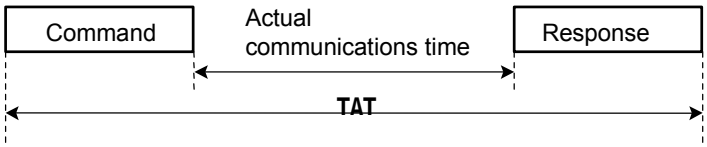
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-1 Communications Time

In the V720S-series Reader/Writer, actual communications with a Tag are performed by reading or writing four-byte data per page.

- The following chart specifies the TAT (turn-around time) and actual communications time.
- The actual communications time in the following chart is the time required for communications between the Antenna and Tag, not including communications with the host. Use this for calculating the speed of the Tag for the execution of auto commands.

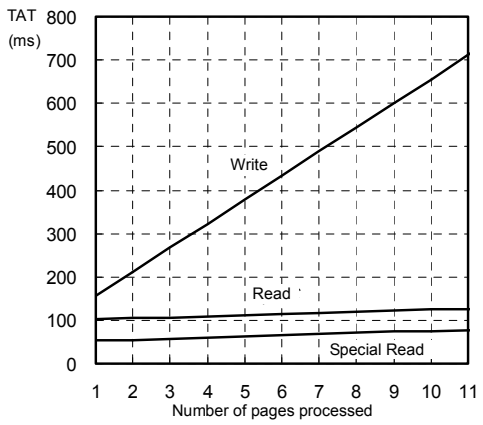
Ex.)

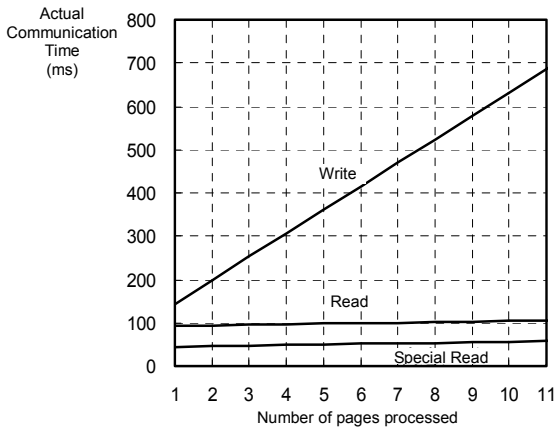


1) I.CODE1 Mode

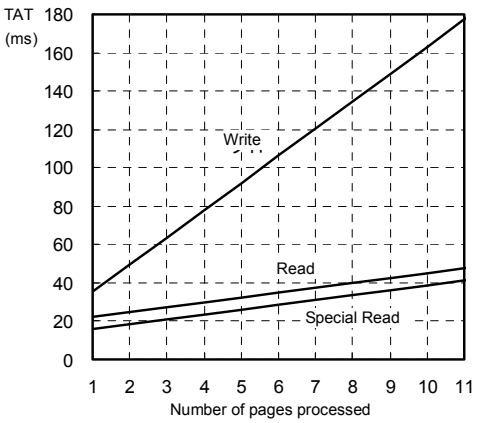
1-1) Communications Time in Single Access Mode

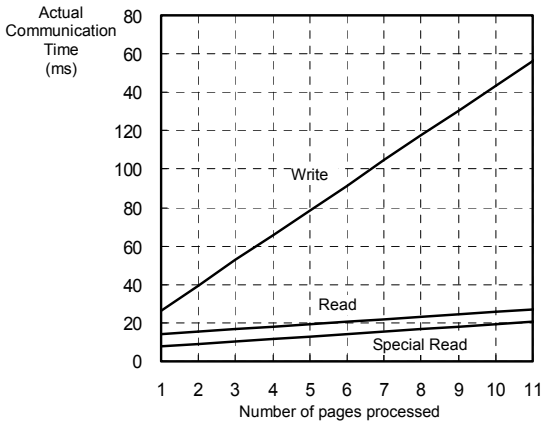
<Standard Mode>





<Fast Mode>





Calculation Formula of Actual Communication time : I.CODE1 Chip **N: Number of Pages**

	Standard Mode (msec)	Fast mode (msec)
Special read	T = 1.3N + 43.4	T = 1.3N + 6.2
Read	T = 1.3N + 91.6	T = 1.3N + 12.7
Write	T = 54.2N + 90.0	T = 13N + 13.5

Note

- The provided TAT graph data shows an example in which the V720S-BC5D4 Controller is used with the following communications specifications for host communications: The data is continuously sent with no space between characters, at a baud rate of 38,400 bps, in a data length of 7 bits with 1 start bit, 2 stop bits and even parity.
- The number of bytes in TAT data is the number of code-specified bytes in ASCII.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1-2) Communications Time in Multiple, Simultaneous Access Mode : I.CODE1 Chip

The actual communications time between the Controller and Tag using commands for multiple access varies with the operating conditions, such as the number of Tags in the communications area as well as the number of bytes to be processed.

Refer to the following table for standard values in consideration of these conditions.

(msec)

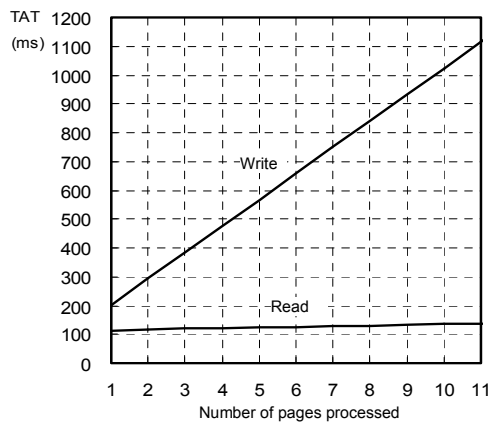
Number of Tags	Timeslot setting	2 pages (8 bytes) to read (ms)		2 pages (8 bytes) to write (ms)	
		Standard mode	Fast mode	Standard mode	Fast mode
2	1	560	144	715	190
4	2	917	301	1139	378
8	3	1659	644	2016	784
16	4	3239	1391	3867	1656

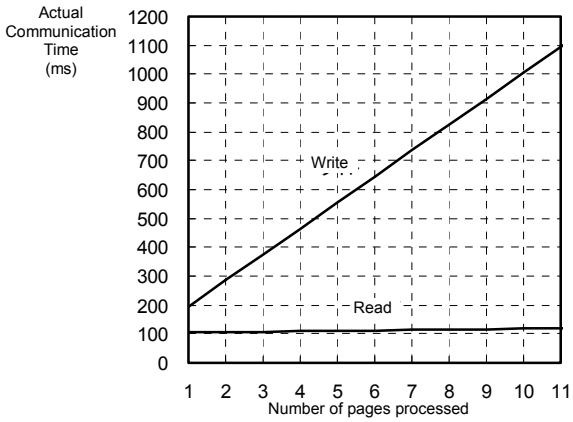
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2) ISO Mode : I.CODE2 Chip

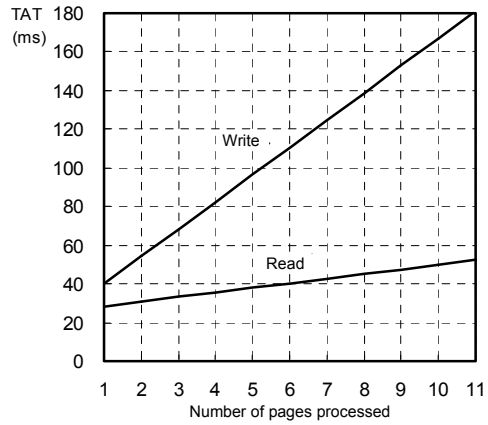
2-1) Communications Time in Single Access Mode

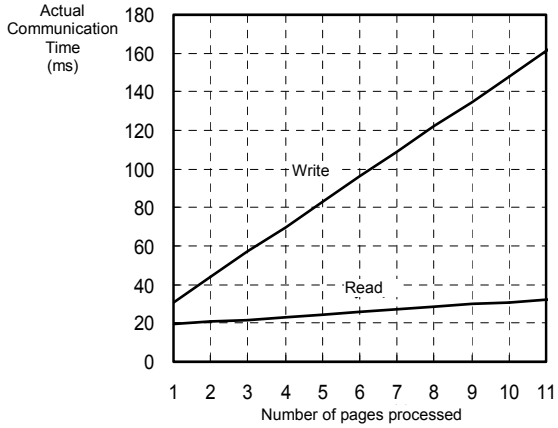
<Standard Mode>





<Fast Mode>





Calculation Formula of Actual Communication time : I.CODE2 Chip **N: Number of Pages**

	Standard Mode (msec)	Fast mode (msec)
Read	T = 1.3N + 104	T = 1.3N + 18.0
Write	T = 90N + 105	T = 13N + 18.0

Note
- The provided TAT graph data shows an example in which the V720S-BC5D4 Controller is used with the following communications specifications for host communications: The data is continuously sent with no space between characters, at a baud rate of 38,400 bps, in a data length of 7 bits with 1 start bit, 2 stop bits and even parity.
- The number of bytes in TAT data is the number of code-specified bytes in ASCII.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-2) Communications Time in Multiple, Simultaneous Access Mode :I.CODE2 Chip

The actual communications time between the Controller and Tag using commands for multiple access varies with the operating conditions, such as the number of Tags in the communications area as well as the number of bytes to be processed.
Refer to the following table for standard values in consideration of these conditions.

(msec)

Number of Tags	2 pages (8 bytes) to read (ms)		2 pages (8 bytes) to write (ms)	
	Standard mode	Fast mode	Standard mode	Fast mode
2	1095	581	1449	627
4	1358	610	2067	703
8	2002	746	3421	933
16	3291	1019	6129	1393

3) Calculation of TAT

TAT can be calculated by adding the host communications time to the actual communications time. The host communications time varies depending on the communications settings and the codes that you specify.

Example of calculation: when operating in Single Access Mode and Trigger Mode to read 1 page (4 bytes) data

Code-specified in ASCII:

The total number of characters is 29, i.e., 15 characters in the command part and 14 characters in the response part. From this, the host communications time would be 29 * 11 bits /38400(bps) * 1000 = 8.3 (ms). The communications time would be14 ms for Fast Mode and 92.9 ms for Standard Mode. TAT, therefore, would be 8.3 + 14 = 22.3 ms for Fast Mode and 8.3 + 92.9 = 101.2 ms for Standard Mode.
Code-specified in HEX:

The total number of characters is 33, i.e., 15 characters in the command part and 18 characters in the response part. From this, the host communications time would be 33 * 11 bits /38400(bps) * 1000 = 9.5 (ms). The communications time would be14 ms for Fast Mode and 92.9 ms for Standard Mode. TAT, therefore, would be 9.4 + 14 = 23.5 ms for Fast Mode and 9.4 + 92.9 = 102.4 ms for Standard Mode.

Note The provided TAT graph data shows an example in which the V720S-BC5D4 Controller is used with the following communications specifications for host communications: The data is continuously sent with no space between characters, at a baud rate of 38,400 bps, in a data length of 7 bits with 1 start bit, 2 stop bits and even parity.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-2 Calculation of Tag Traveling Speed

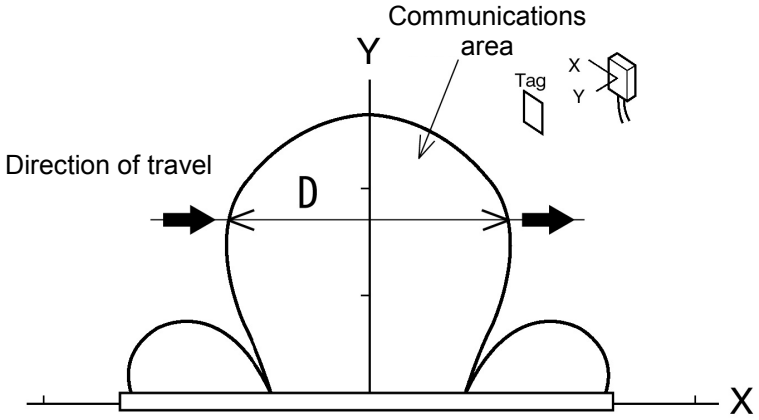
When communicating with a Tag in motion, select Auto or Repeat for the communications method.

The maximum speed at which the Tag can travel can be obtained easily, using the formula below.

$$\text{Max. traveling speed} = \frac{\text{D (travel distance in communications area)}}{\text{T (communications time)}} \times \text{Safety factor (0.5)}$$

Calculate D from the communications area drawing between the Antenna and the Tag or from the actual measurement.

Note The formula above is for communications with one Tag. Be sure to check the traveling speed of multiple Tags in advance.



Caution 1) As remedy for noise, the Reader/Writer is designed to retry using the internal software process when a communications error occurs between a Tag and the Antenna. The time required for communications vary depending on the noise condition of the environment in which the Reader/Writer is used. Be sure to check the actual communications time using actual machines in advance. The formula for communications time relates to cases where the re-transmission process is not used.

2) The formula above is for communications with one Tag. If you need to access multiple Tags while they are moving, be sure to experiment before actual use. This cannot be checked by calculation. In access to multiple Tags, the anti-collision algorism operates based on the theory of probability. The communications time, therefore, may vary depending on how collisions take place. It is strongly recommended that you allow for sufficient time for communications.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 8
Appendix

Appendix 1. Accessories.....8-2
Appendix 2. ASCII Code Table.....8-3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix 1. Accessories

No	Name	Model	Quantity
1)	Mounting plate (already attached to the Reader/Writer)		2
2)	Power connector plug	1108-12A10-3AF (8.6) from Tajimi Musen Electronics Co., Ltd.	1
3)	I/O connector plug	NJW-2010-PM10 from Nanaboshi Electric Mfg. Co., Ltd.	1
4)	Host communication connector plug	NJW-165-PM7 from Nanaboshi Electric Mfg. Co., Ltd.	2
5)	I/O connector cap	NJW-20-Rca from Nanaboshi Electric Mfg. Co., Ltd.	1
6)	Host communication connector cap	NJW-16-RCA from Nanaboshi Electric Mfg. Co., Ltd.	1
7)	Antenna connector cap	BNCW103-RC from Tajimi Musen Electronics Co., Ltd.	1

Description

1) Mounting plate (already attached to the Reader/Writer)
   Secure the Reader/Writer by using four M6 screws to .
2) Power connector plug
   Use the power connector plug under the following conditions:
   Applicable power line size Conductor cross-sectional area: 1.25 mm2 or less; AWG: #16 or less
   The finished outer diameter of the cord should not exceed the diameter of the cord inlet of the connector (ϕ8.6).
3) I/O connector plug
   Use the I/O connector plug under the following conditions:
   Outer diameter of the cable to be used ϕ8.0 to ϕ11.0
4) Host communication connector plug
   Use the host communication connector plug under the following conditions:
   Outer diameter of the cable to be used ϕ5.7 to ϕ6.8
5) I/O connector cap
6) Host communication connector cap
7) Antenna connector cap
   Fasten the cap that fits the unused connector.
   Be sure to use the cap whenever water droplets may be sprayed on the Reader/Writer, e.g, when the Reader/Writer is installed semi-outdoor.

Contact

Tajimi Musen Electronics Co., Ltd.
29-1, Ebisu Minami 2-chome, Shibuya-ku, Tokyo 150-0022
Tel: (03) 3713-7131 (key)
Fax: (03) 5721-7205
http://www.tajimi.co.jp/

Nanaboshi Electric Mfg. Co., Ltd.
49-15, Kamitakada 1-chome, Nakano-ku, Tokyo 164-0022
TEL: 03-3386-3181
FAX: 03-3388-1561
http://www.nanabosi.co.jp/nanabosi/7bs000j.htm

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix 2. ASCII Code Table

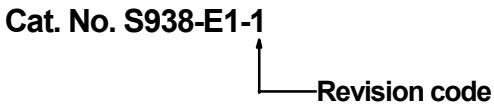
High Order / Low Order	b8 - b5	0000	0001	0010	0011	0100	0101	0110	0111
b4 - b1	Colum / Row	0	1	2	3	4	5	6	7
0000	0	NUL	TC_7(DLE)	(SP)	0	@	P	`	p
0001	1	TC_1(SOH)	DC_1	!	1	A	Q	a	q
0010	2	TC_2(STX)	DC_2	"	2	B	R	b	r
0011	3	TC_3(ETX)	DC_3	#	3	C	S	c	s
0100	4	TC_4(EOT)	DC_4	$	4	D	T	d	t
0101	5	TC_5(NEQ)	TC_8(NAK)	%	5	E	U	e	
0110	6	TC_6(ACK)	TC_9(SYN)	&	6	F	V	f	v
0111	7	BEL	TC_{10}(ETB)	'	7	G	W	g	w
1000	8	FE_0(BS)	CAN	(	8	H	X	h	x
1001	9	FE_1(HT)	EM	)	9	I	Y	i	y
1010	10	FE_2(LF)	SUB	*	:	J	Z	j	z
1011	11	FE_3(VT)	ESC	+	;	K	[	k	{
1100	12	FE_4(FF)	IS_4(FS)	,	<	L	\	l	|
1101	13	FE_5(CR)	IS_3(GS)	-	=	M	]	m	}
1110	14	S_0	IS_2(RS)	.	>	N	^	n	~
1111	15	S_1	IS_1(US)	/	?	O	_	o	DEL

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Revision History

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



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

Revision code	Date	Revised content
1	Dec 2002	First Edition

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Terms and Conditions of Sale

1. Offer; Acceptance. These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiary companies ("Omron"). Omron objects to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.
2. Prices; Payment Terms. All prices stated are current, subject to change without notice by Omron. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are due net 30 days unless otherwise stated in the invoice.
3. Discounts. Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.
4. Interest. Omron, at its option, may charge Buyer 1-1/2% interest per month or the maximum legal rate, whichever is less, on any balance not paid within the stated terms.
5. Orders. Omron will accept no order less than $200 net billing.
6. Governmental Approvals. Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or sale of the Products.
7. Taxes. All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Omron.
8. Financial. If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Omron may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
9. Cancellation; Etc. Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.
10. Force Majeure. Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
11. Shipping; Delivery. Unless otherwise expressly agreed in writing by Omron:
    a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
    b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
    c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
    d. Delivery and shipping dates are estimates only; and
    e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. Claims. Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
13. Warranties. (a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied. (b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty. See http://oeweb.omron.com or contact your Omron representative for published information.
14. Limitation on Liability; Etc. OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.
15. Indemnities. Buyer shall indemnify and hold harmless Omron Companies and their employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not Omron is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless Omron and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party.
16. Property; Confidentiality. Any intellectual property in the Products is the exclusive property of Omron Companies and Buyer shall not attempt to duplicate it in any way without the written permission of Omron. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Omron. All information and materials supplied by Omron to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
17. Export Controls. Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (iii) sale of products to "forbidden" or other proscribed persons; and (ii) disclosure to non-citizens of regulated technology or information.
18. Miscellaneous. (a) Waiver. No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) Assignment. Buyer may not assign its rights hereunder without Omron's written consent. (c) Law. These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) Amendment. These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) Severability. If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) Setoff. Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) Definitions. As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

Certain Precautions on Specifications and Use

1. Suitability of Use. Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given:
   (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
   (ii) Use in consumer products or any use in significant quantities.
   (iii) 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.
   (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.
   NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
2. Programmable Products. Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
3. Performance Data. Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.
4. Change in Specifications. Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.
5. Errors and Omissions. Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OMRON

OMRON ELECTRONICS LLC

1 Commerce Drive
Schaumburg, IL 60173
847.843.7900
For US technical support or
other inquiries: 800.556.6766

OMRON CANADA, INC.

885 Milner Avenue
Toronto, Ontario M1B 5V8
416.286.6465

OMRON ON-LINE

Global - http://www.omron.com
USA - http://www.omron.com/oei
Canada - http://www.omron.ca

UNITED STATES

To locate a Regional Sales Office, local Distributor or to obtain product information, call: 847.843.7900

CANADA REGIONAL SALES OFFICES

Ontario	Toronto	416.286.6465
	Kitchener	519.896.1144
	Kingston	613.376.3968
Quebec	Montreal	514.636.6676
British Columbia	Vancouver	604.522.8855
Alberta	Edmonton	403.440.0818
	Calgary	403.257.3095

BRAZIL SALES OFFICE

Sao Paulo	55.11.5564.6488

ARGENTINA SALES OFFICE

Cono Sur	54.114.787.1129

MEXICO SALES OFFICES

Florida	954.227.2121	**Ciudad Juarez**	656.623.7083
Mexico, D.F.	555.534.1195	**Monterrey, N.L.**	818.377.4281

S938-E1-01 08/05

©2005 OMRON ELECTRONICS LLC
Printed in the U.S.A.

Specifications subject to change without notice.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP