

SC Series
SC2101
Smart Card/Tag Dedicated Reader/Writer
User's Manual

Ver.1.2

AIOI SYSTEMS CO., LTD.

Introduction

This user manual explains the function of Smart Card Reader Writer, how to set it up, how to operate, cautions and things to watch for. Be sure to read it before using it.

Safely Use This Device

To use this device safely and correctly, always follow the safety points mentioned below. AIOI Systems Co. will not provide a warranty nor will it be responsible for any malfunction if these safety points are not followed.

■ Symbols

The following symbols are used for safe operation of this device.



DANGER

Mishandling by ignoring the content of this sign can cause death or severe injury.



Warning

Mishandling by ignoring the content of this sign can cause injury and damage to the device.



Indicates “warning” or “caution”



Indicates a must-follow instruction



Indicates “prohibited” or “banned”



Means important information for understanding this manual



Indicates only a qualified person can handle



Means grounding is necessary when installing



Sections referred in this manual or other manuals

Terminologies used in this manual have the following meanings

The expressions used in this manual have the following meanings:

Definition of Terms

Terminologies	Meaning
eP2208	Model Name of Ethernet Junction Box
Controller	General term for Ethernet Junction Boxes such as eP2208
SC2101	Product name for smart card/tag dedicated reader/writer
TOUCH	Action of bringing a Smart Card/Tag close to a dedicated Smart Card/Tag Reader-Writer
RELEASE	Action of moving the Smart Card/Tag away from the dedicated Smart Card/Tag Reader-Writer
Smart Tag	Product name for ST1129L/ST1129U
Smart Card	Product name for SC1029L/SC1029U
Smart Card/Tag	Collective term for Smart Tags and Smart Cards

For safe use

■General Precaution



Caution

If there is damage to a device, it is very important to take necessary steps to prevent other devices from getting damaged.

Be aware that AIOI Systems cannot guarantee the functions and performance of this product if it is modified or misused by not following the instructions in this specification.

Do not disassemble or tamper with the device because the device may malfunction or be damaged.

To avoid possible damage, make sure that water or other liquids do not get on the device.

Use within the environmental conditions specified for this device. However, even when used within the specified environmental condition, a sudden temperature change that causes condensation can damage the device.

Do not drop or hit the device. If excessive force is going to be applied to the wiring, investigate ways to prevent this from happening. Otherwise, this device as well as other devices may be damaged.

Do not operate this device in a combustible, explosive, or steamy area. It is very dangerous to use this device in this type of environment.

If this device is used in conjunction with other devices, make sure the existing operating conditions and environment are suitable before combining it with other devices.

The company name and product name included in this manual are registered trademarks of the respective companies.

Microsoft, Windows is registered trademark of Microsoft Corporation in the United States and/or other countries.

■Proper Use of the Device



Caution

Check the wiring to be sure it is correct before supplying power to the unit.

The device is an electronic device. Therefore, when installing various devices, always investigate the installation environment (primary electrical noise, driver type of noise, static electricity discharge noise, etc.) These noises may cause system malfunction or damage.

The power supply pinpoints to light modules are very sharp. If you touch them, you may be injured.

Use within the specification limits. Use of the device beyond these limits may damage or impair the device.

Always make sure to check if this device is used within the specifications for this device. Even within the specification, you may damage the device if the current is excessive. Investigate before using.

Revision History

Print History	Version	File Name	Revision Details
October 1, 2015	Ver.1.0	SC2101_UM_V10	First Edition
June 24, 2016	Ver.1.1	SC2101_UM_V11	Revised Operating Temperature in Functional Specifications in Appendix 1.
October 1, 2025	Ver.1.2	SC2101_UM_V12	Revised expression definitions. Removed descriptions about Smart Tag battery and SLEEP. 1.2 Replaced External View drawing. 2.3.1 Replaced Connector Diagram Drawing for Ethernet Junction Box. 3 Replaced Smart Card/Tag images. Removed discontinued items. 3.3 Replaced ID Format image. 4.1.1 Command List: Added XF1-3 and XD commands. Appendix-2: Replaced External Dimensions Drawing. Appendix-3: Command Processing Time: Delete Smart Tag, add ST1129L/U. Corrected company address. Items requiring actual device verification

Related Manuals

Related Manuals



Flowlight User Manual



Smart Card User Manual



eP Series Command Reference



eP Series Controller User Manual

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1. Overview

1.1. Overview

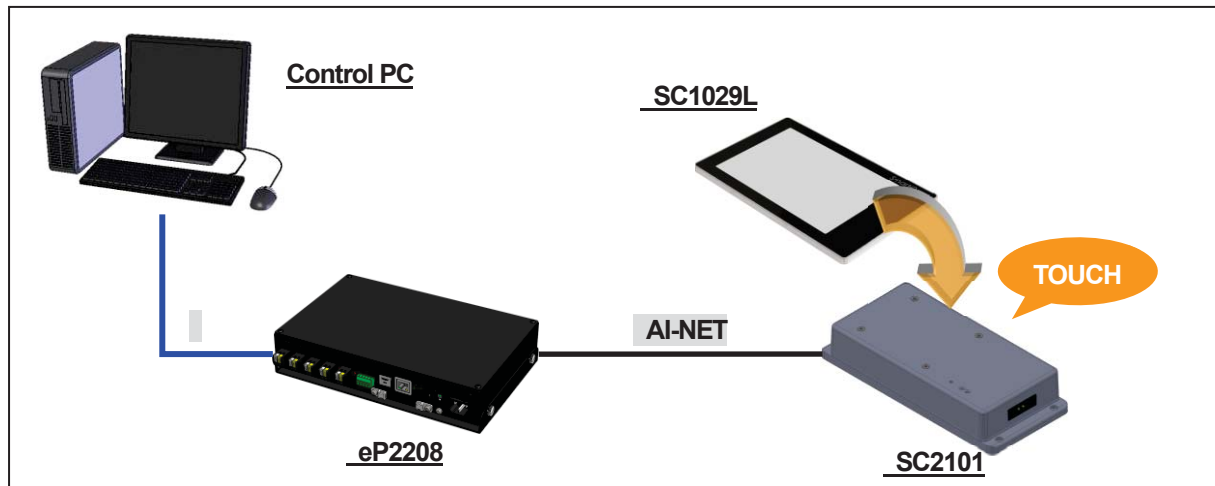
The Smart Card/Tag Dedicated Reader/Writer (SC2101) is a dedicated Reader/Writer for Smart Card and Tag that connects to the Ethernet Junction Box (eP2208).

This application communicates with the eP2208 (controller) via Ethernet and can control Smart Card/Tag.

Smart Card/Tag is an electronic paper display with an embedded NFC communication chip.

Smart Card/Tag has the following features:

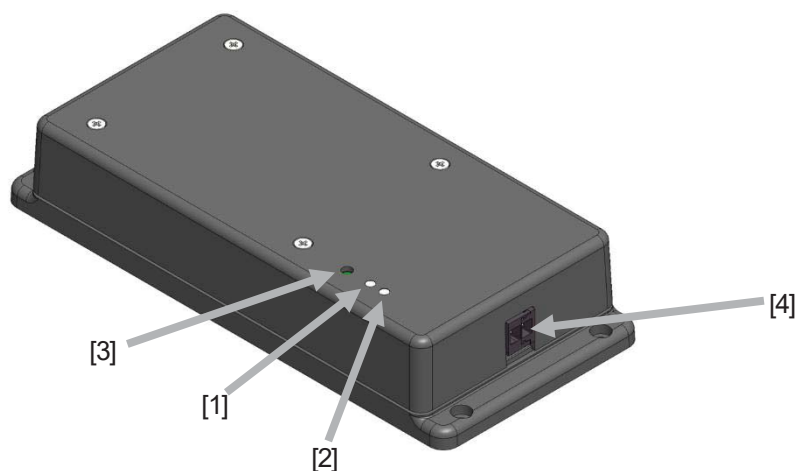
- Contactless communication is possible.
 - * The smart card/tag must be TOUCHED (brought close) to the SC2101.
- The electronic paper display content can be freely rewritten.
- Content displayed on the electronic paper is retained without power.
- Display data for the electronic paper can be registered.
 - *The maximum number of registrations varies by smart card/tag model.
- It incorporates non-volatile memory, allowing free read/write operations.



Caution

Always ensure that the connected equipment meets the specifications listed in the specifications for this device.

1.2. Appearance, Names and Functions of Parts



[1] LED Monitor 1

This is a dual-color LED (Green/Red). Its monitoring functions are as shown in the table below.

LED 1 Status	Monitor Content	
Red ON	SC2101 Status Monitor	Abnormal
Red OFF		Normal
Green ON		Open
Green OFF		Closed

※Red and green may light up simultaneously. In such cases, it will appear orange.

[2] LED Monitor 2

This is a dual-color LED (Green/Red). Its monitoring functions are as shown in the table below.

LED2 Status	Monitor Content	
Red ON	SC2101 Status Monitor	Processing
Red OFF		Standby
Green ON		IN
Green OFF		OUT

[3] Address Setting Switch Guide Hole

The address setting switch is located beneath this hole. It is hidden inside the case to prevent accidental address changes.

When setting the address, press the switch with a pointed object to configure it.

[Caution]

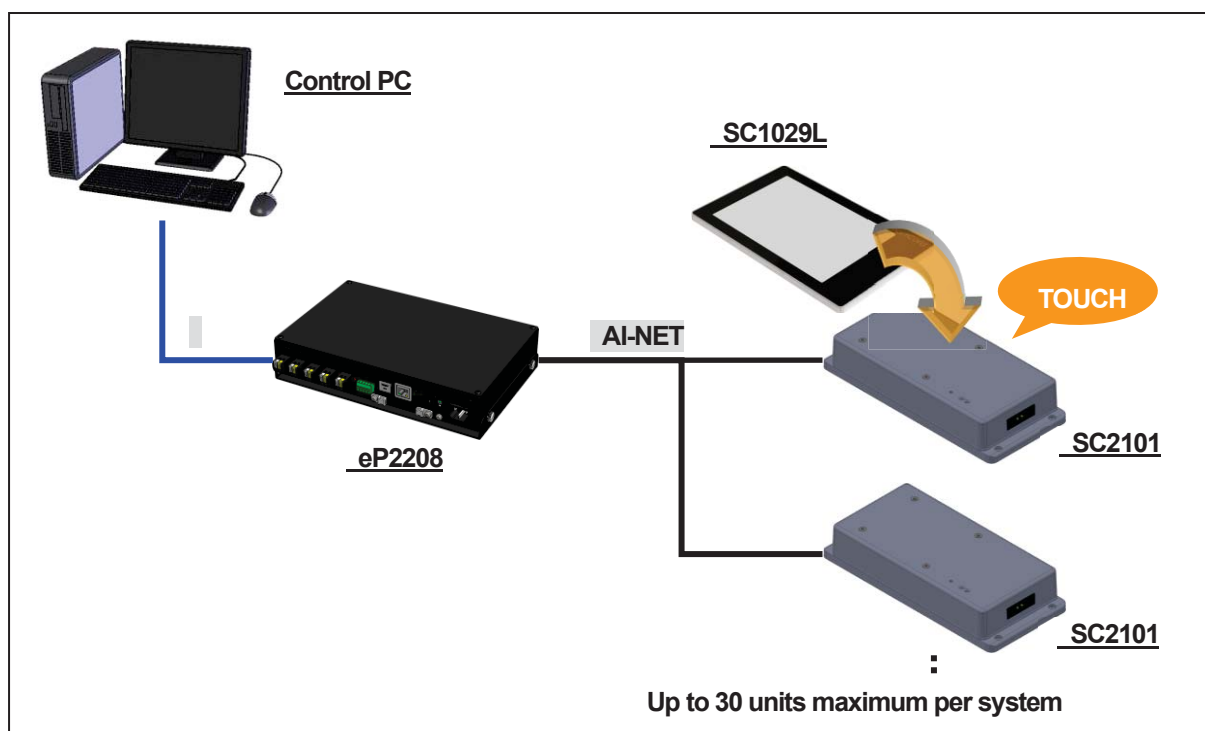
Pressing the switch while turning on the SC2101 power will set the address to "9101".

[4] AI Cable Connection Connector

2. Setup Procedure

This section explains the process from initial setup to verification of the SC2101.

2.1. Connection Configuration



2.2. Address Setting

The SC2101 is a device with a single address.

The address is stored in the internal memory by sending the address setting command while pressing the address setting switch.

Configurable Address Range	9101 to 9199	Factory Default Address Value	9101
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When using this device, you must set an address compatible with your system.

We recommend setting the address before installation.

Please configure the address using the following method.

Use an address writer to configure the address.

 **eP2706 User Manual**

Configure it by sending the 'Address Setting Command' via the controller.

 **eP Series Command Reference**

* Pressing the address setting switch while turning on the SC2101 power will restore the factory default address value.

2.3. Connection Method

SC2101 receives power and signals from the Ethernet Junction Box.
SC2101 connects using a dedicated AI cable.

2.3.1. Connection Method to Ethernet Junction Box

Connect wiring to the light module connection terminals for CH1 to CH5.

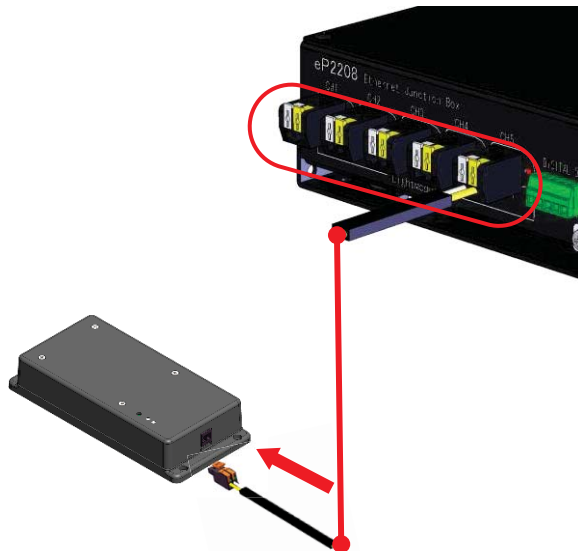


Caution

When connecting, ensure the power to the Ethernet Junction Box is turned OFF.

Verify there are no wiring errors or short circuits at the connection terminals before turning the power ON.

Failure to do so may damage the Ethernet Junction Box or SC2101.



Connection Method to the Connector

Step 1: Strip the outer jacket and inner jacket of the AI cable using a stripper. The inner jacket should be stripped to approximately 10mm.

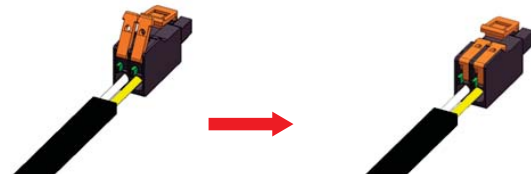
*If the strip is too short, contact may not be made.



Step 2: Raise the plug's claws.



Step 3: Insert the cable, confirm the green protrusion is visible, and return the clip.



2.3.2. Precautions when installing multiple SC2101 units

2.3.2.1. Multiple Unit Installation



When installing multiple SC2101 units, ensure a minimum spacing of 30cm between adjacent units.

2.3.2.2. Installation Environment

The presence of metal objects near the SC2101 significantly degrades the performance of wireless power supply and communication.

Smart cards/tags receive power and communicate wirelessly with the SC2101. If affected by metal, the smart card/tag display and data read/write operations may not function correctly. When installing the SC2101 in the field environment, observe the following:

(1) SC2101 Mounting Bracket



Do not use metal mounting brackets.
(Recommended) Use a plastic mounting bracket.

(2) Surrounding Metal



Do not place metal objects near the SC2101.
(Guideline) Do not place any metal objects within 20 cm of the SC2101.
*This is only a guideline. Always perform operational verification at the installation site.

(3) Retry Processing

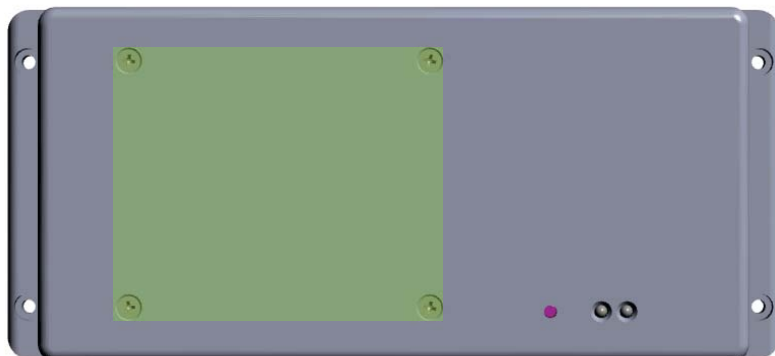
If wireless communication performance between the SC2101 and smart cards/tags is poor, consider implementing software retry processing.

For details, refer to "4.6 Retry Processing".

2.3.2.3. Positioning of SC2101 relative to Smart Card/Tag

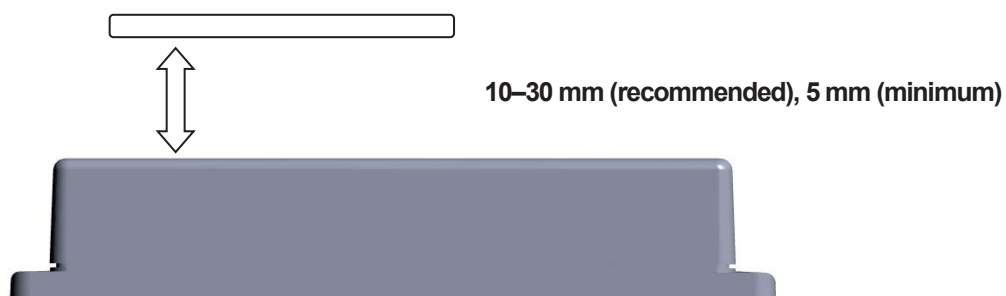
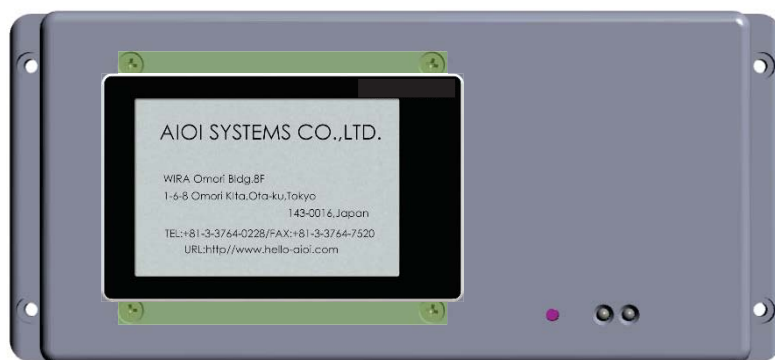
Install the SC2101 after confirming its positional relationship with the Smart Card/Tag.

(1) Confirming the antenna position



(Green area: Antenna embedded location)

(2) Confirming the Smart Card/Tag position (horizontal/vertical direction)



The explanation in "2.3.2.3 Positioning of SC2101 relative to Smart Card/Tag" assumes no metal or other objects interfering with wireless communication are present near the SC2101.

Communication distance may decrease depending on the surrounding environment (such as the influence of metal).

2.4. Address Setting and Verification

The configuration and verification method described here uses our check software [Flowlight].

For details about [Flowlight], refer to the following manual.

 **Flowlight User Manual**

For information on [Communication Methods with Controllers], please refer to the following manual.

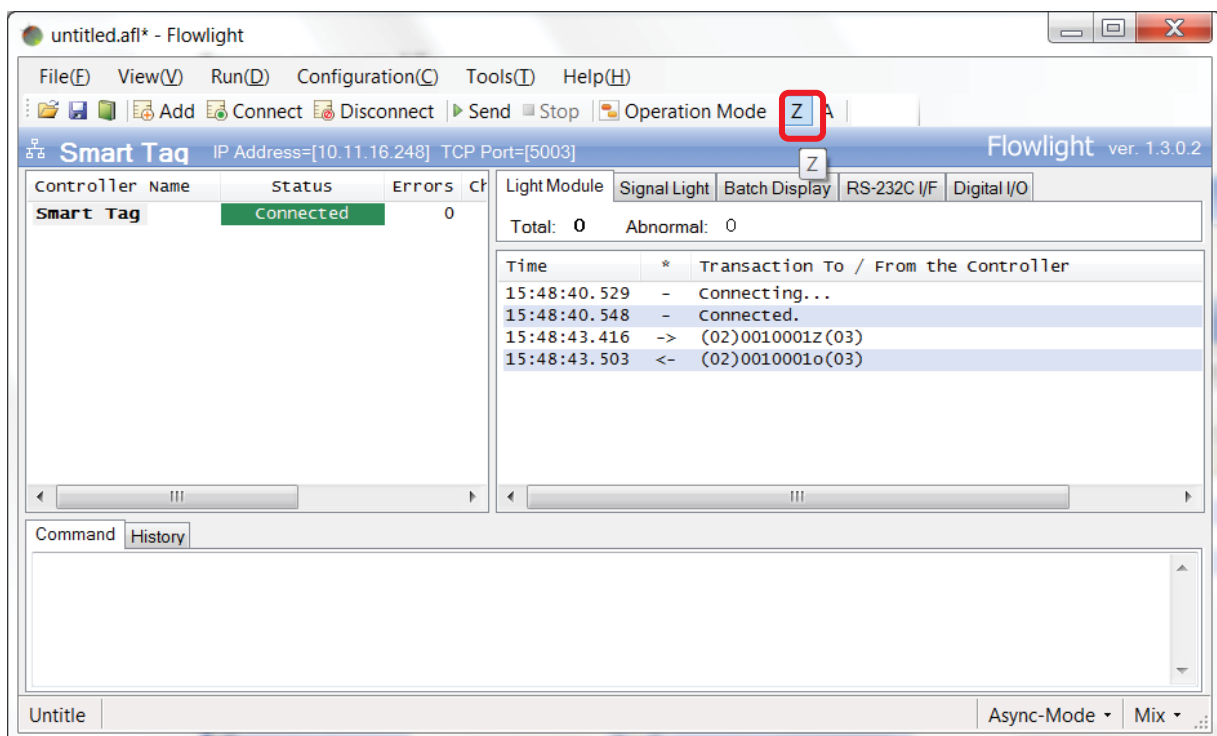
 **eP Series Controller User Manual**

(1) Starting Flowlight

Power on the controller and Ethernet Junction Box to start Flowlight. After starting, connect to the controller.

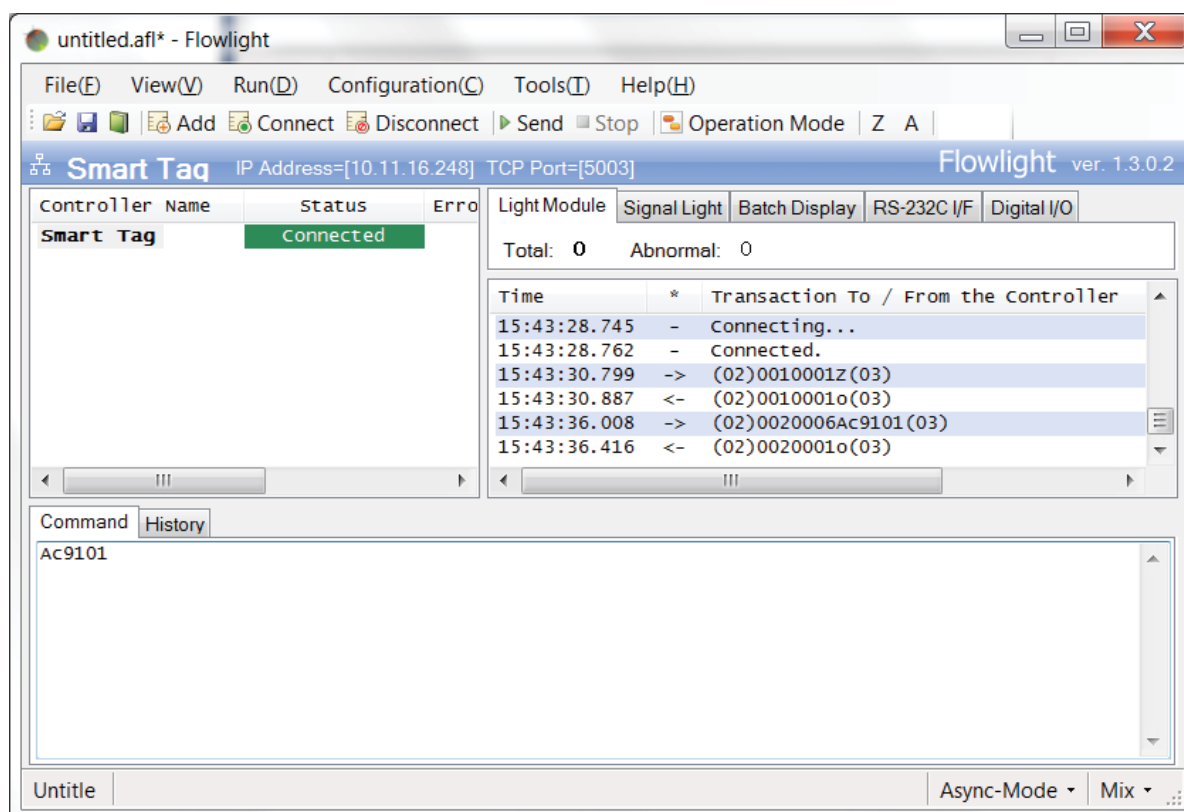
(2) Initialization

Send the Z command to initialize the SC2101.



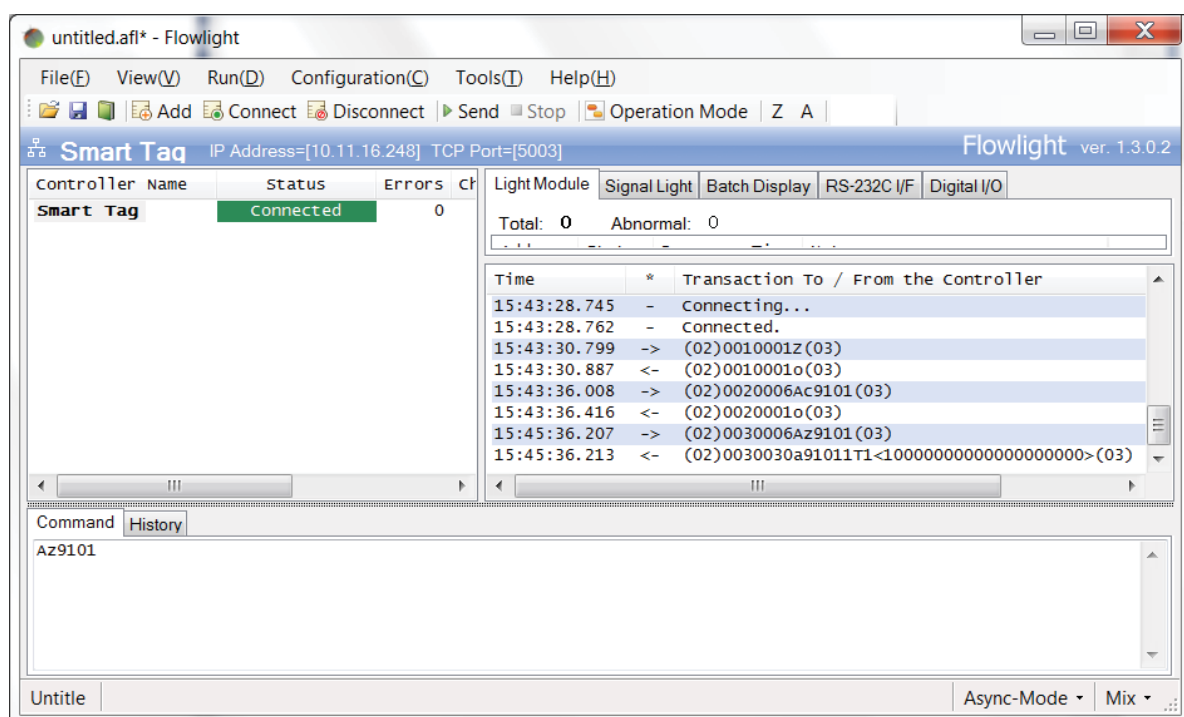
(3) Address Setting

Press and hold the address setting switch while sending the address setting command (Ac).
The following example sets the address to "9101".



(4) Address Verification

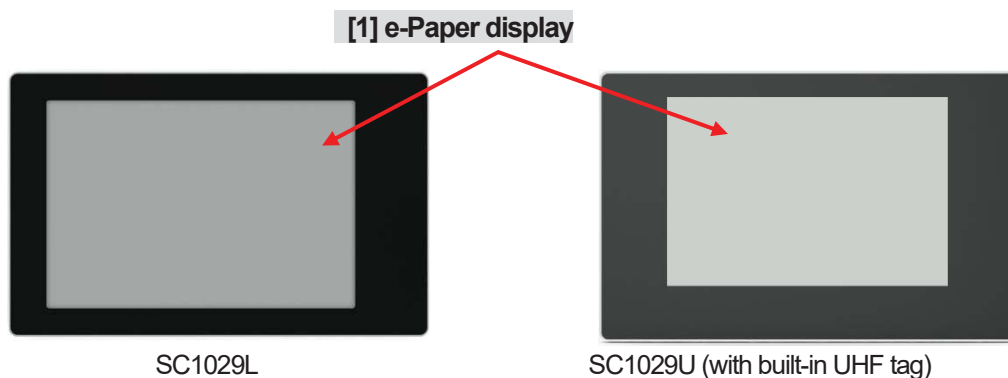
Send the Az command to verify the set address.
If the response command is returned normally, the address has been set correctly.



3. Smart Card/Tag

3.1. Smart Card Appearance, Part Names, and Functions

【SC1029L/SC1029U】



[1] e-Paper Display

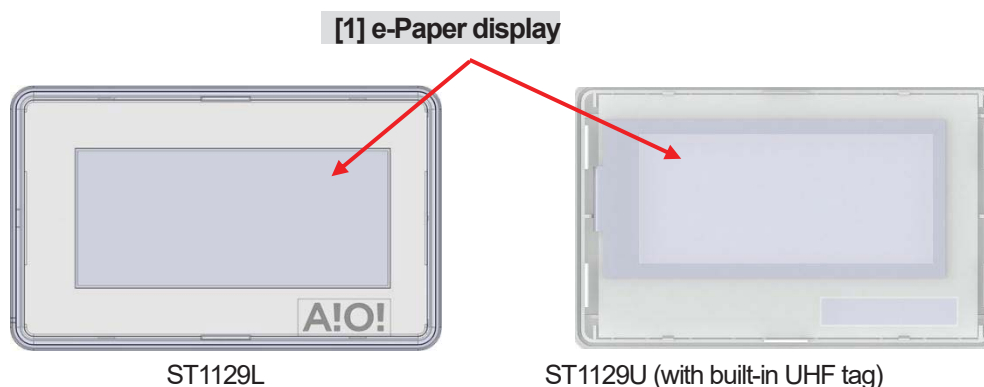
A 2.9-inch (300×200 dots) electronic paper display.

Supports bitmap format, enabling display of any font, barcode, QR code, or image.

*Bitmap format data must be prepared by the customer.

3.2. : Appearance, Part Names, and Functions

【ST1129L/ST1129U】



[1] e-Paper Display

This is a 296×128 dot electronic paper display.

It supports bitmap format and can display any font, barcode, QR code, or image.

*Bitmap format data must be prepared by the customer.

[Notes]

No built-in battery.

It receives power wirelessly from the radio waves emitted by the SC2101.

Touching the SC2101 turns the smart card power ON.

When RELEASE is performed from the SC2101, the smart card power turns OFF.

If the smart card/tag is processing, please RELEASE after processing is complete.

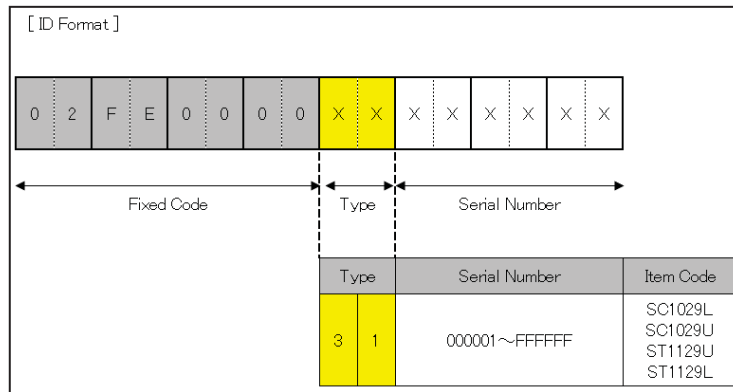
3.3. About the ID

The smart card/tag has an 8-byte ID.

The ID is a number that identifies the smart card/tag.

The ID format is described below.

Smart Card/Tag ID



3.3.1. Command Selection

The command format differs for each smart card/tag model.

Identify the smart card/tag model using the "Type" field in the ID format above.

For information on how to obtain the smart card/tag ID, refer to section 4.1.2 .

For [Commands], please refer to the following manual.

 **eP Series Command Reference**

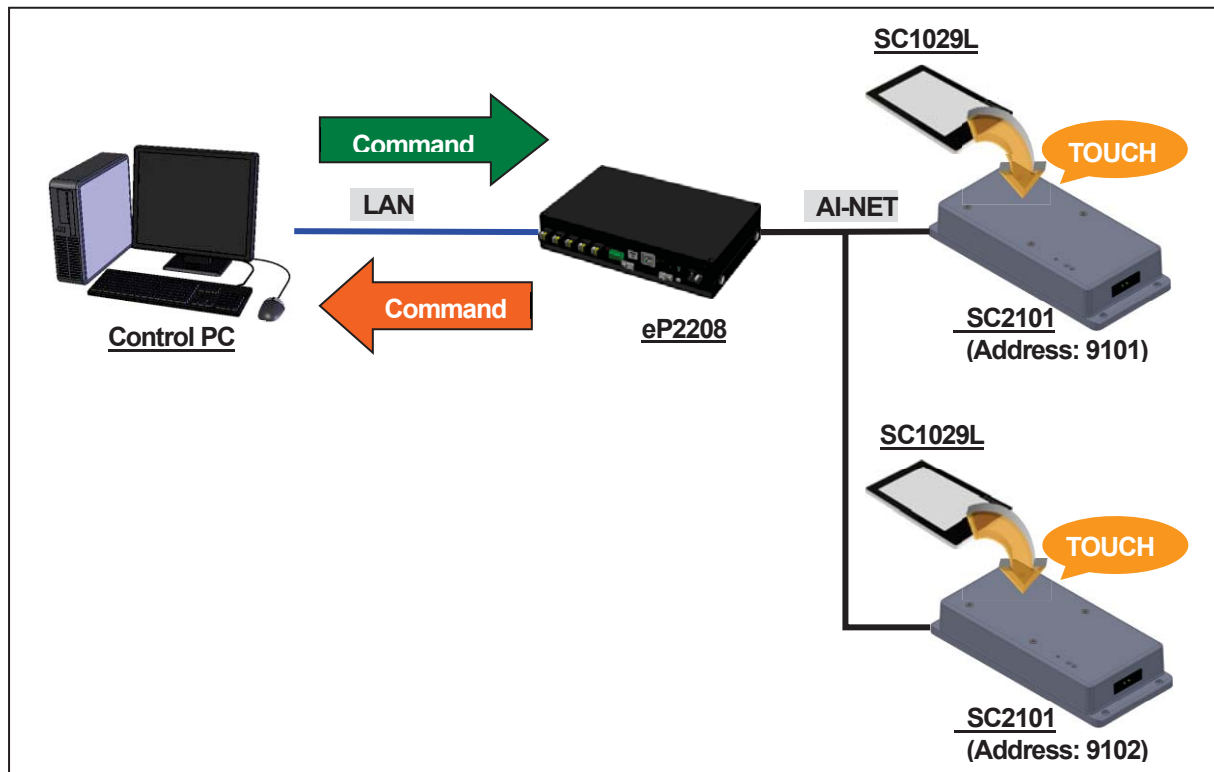
*When sending XA-T1 commands to smart cards/tags

SC1029L, SC1029U: Send commands according to the command format for 2.9-inch devices.

ST1129L, ST1129U: Send commands according to the command format for 296x128 dots.

4. Control Method

This section explains how to control smart cards/tags via the SC2101.



[Basic Control Flow]

- (1) Send an open command to the SC2101 address to initiate communication and RF output.
- (2) When a smart card/tag is TOUCHED to the SC2101, a t command is notified to the application side. The notified information includes the SC2101 address (91xx) and the smart card/tag ID.
- (3) If the application wishes to control the notified Smart Card/Tag ID, sends a command to the notified SC2101 address → The Smart Card/Tag begins processing.
- (4) The application monitors for the completion of the smart card/tag's processing. The smart card/tag also notifies completion via the t command.
- (5) Send a close command to the SC2101 address to terminate communication and RF output.

4.1. Command

4.1.1. Command List

The command list is shown in the table below.

Command	Command Description	Direction	Target
G-o-T1	Start monitoring smart cards/tags (Open)	Application → Controller	SC2101
G-c	Stop monitoring smart cards/tags (Close)	Application → Controller	SC2101
t	Notify smart card/tag information Notify SC2101 information	Application ← Controller	—
XA-T1	Displaying the smart card/tag's electronic paper	Application → Controller	SC1029L SC1029U ST1129L ST1129U
XB-T1	Registering the electronic paper display content to the smart card/tag	Application → Controller	SC1029L SC1029U ST1129L ST1129U
XF1-T1	Configuring Character Fields on Smart Tag E-Paper	Application → Controller	ST1129L ST1129U
XF2-T1	Displaying a specified character string on the smart tag's e-paper after setting the character field	Application → Controller	ST1129L ST1129U
XF3-T1	Configure character fields and display specified strings on the smart tag's e-paper	Application → Controller	ST1129L ST1129U
XD-T1	Deleting the display content from the smart card/tag to the e-paper	Application → Controller	SC1029L SC1029U ST1129L ST1129U
Gi -T1	Write user data to smart cards/tags	Application → Controller	SC1029L SC1029U ST1129L ST1129U
Aq-T1	Read user data from smart cards/tags	Application → Controller	SC1029L SC1029U ST1129L ST1129U
a	Aq-T1 Command Response Command	Application ← Controller	—
As-T1	Set the security code for the smart card/tag	Application → Controller	ST1129L ST1129U



To control smart cards/tags, commands must be sent via the SC2101.
For commands where the "Target" in the table above is "Smart Card/Tag," send the command to the SC2101.

In the following descriptions, XA-T1/XB-T1/G-i-T1/Aq-T1 commands are abbreviated.
For details on [Commands], refer to the following manual:

 **eP Series Command Reference**

For details on [Communication Method with Controller], refer to the following manual:

 **eP Series Controller User Manual**

4.1.2. How to Obtain Smart Card/Tag ID Information

(1) Send the G-o-T1 command

The SC2101 enters the [Open] state and begins monitoring the smart card/tag.
The SC2101's LED Monitor 1 will light up green.

(2) Receive the t command

Touch the smart card/tag to the SC2101.

When the SC2101 detects the smart card/tag, it performs the following actions:

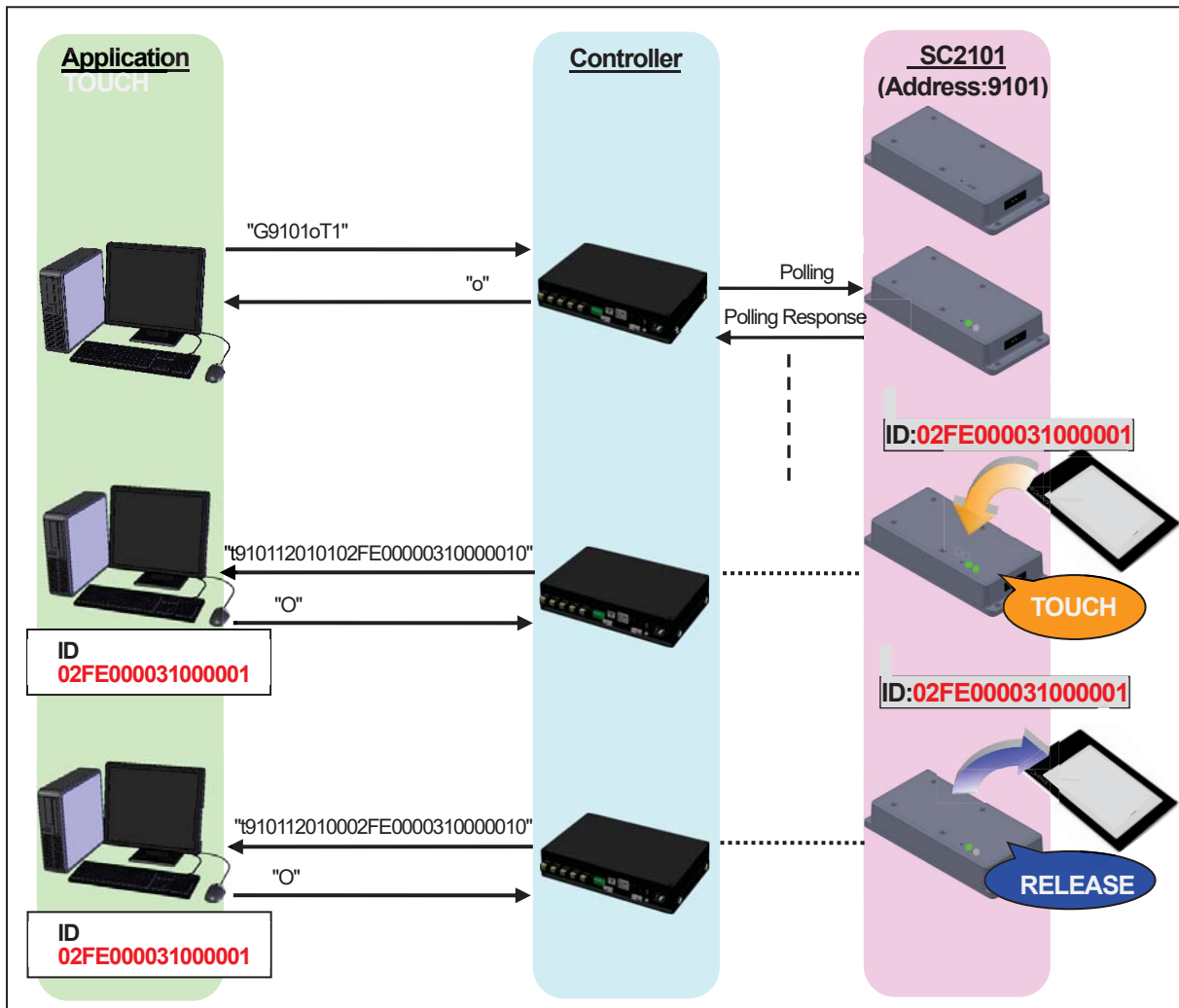
SC2101's LED monitor 2 lights up green.

Transmits the smart card/tag information.

The controller notifies the application of the t command.

The application should refer to the contents of the t command to obtain the ID information.

4.1.3. Sequence



4.2. Smart Card/Tag Status

4.2.1. Status Types

Smart Card/Tag has four types of status. Status information is notified by the t command.

Status	Description	Command
OUT	Smart Card/Tag is in a state where it is being released from the SC2101.	Unable to receive
IN	Smart Card/Tag is in the TOUCH state with SC2101	Receiving enabled
Processing ※	Smart Card/Tag is processing the command	Unable to receive
Processing complete	Smart Card/Tag has completed command processing	Receiving enabled

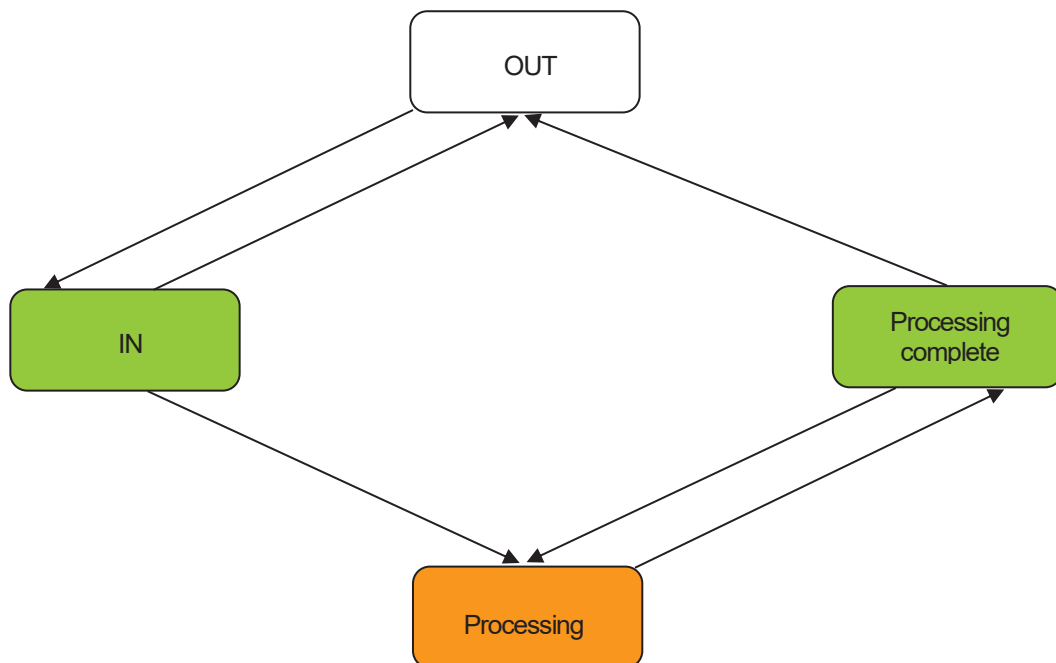
* The "Processing" status is not notified by the t command

4.2.2. Status Transition

The status transitions of the smart card/tag are as shown in the figure below.

The operation shown below assumes that the SC2101 is monitoring the smart card/tag.

(Sending the G-o-T1 command to the SC2101 initiates smart card/tag monitoring.)



- ① The timing when the smart card/tag is TOUCHED to SC2101
- ② The moment the application sends a command and the smart card/tag receives it.
- ③ The timing when the smart card/tag is released from the SC2101.
- ④ The timing when processing of the command received from the application is complete.

4.3.2. Send command to Smart Card/Tag

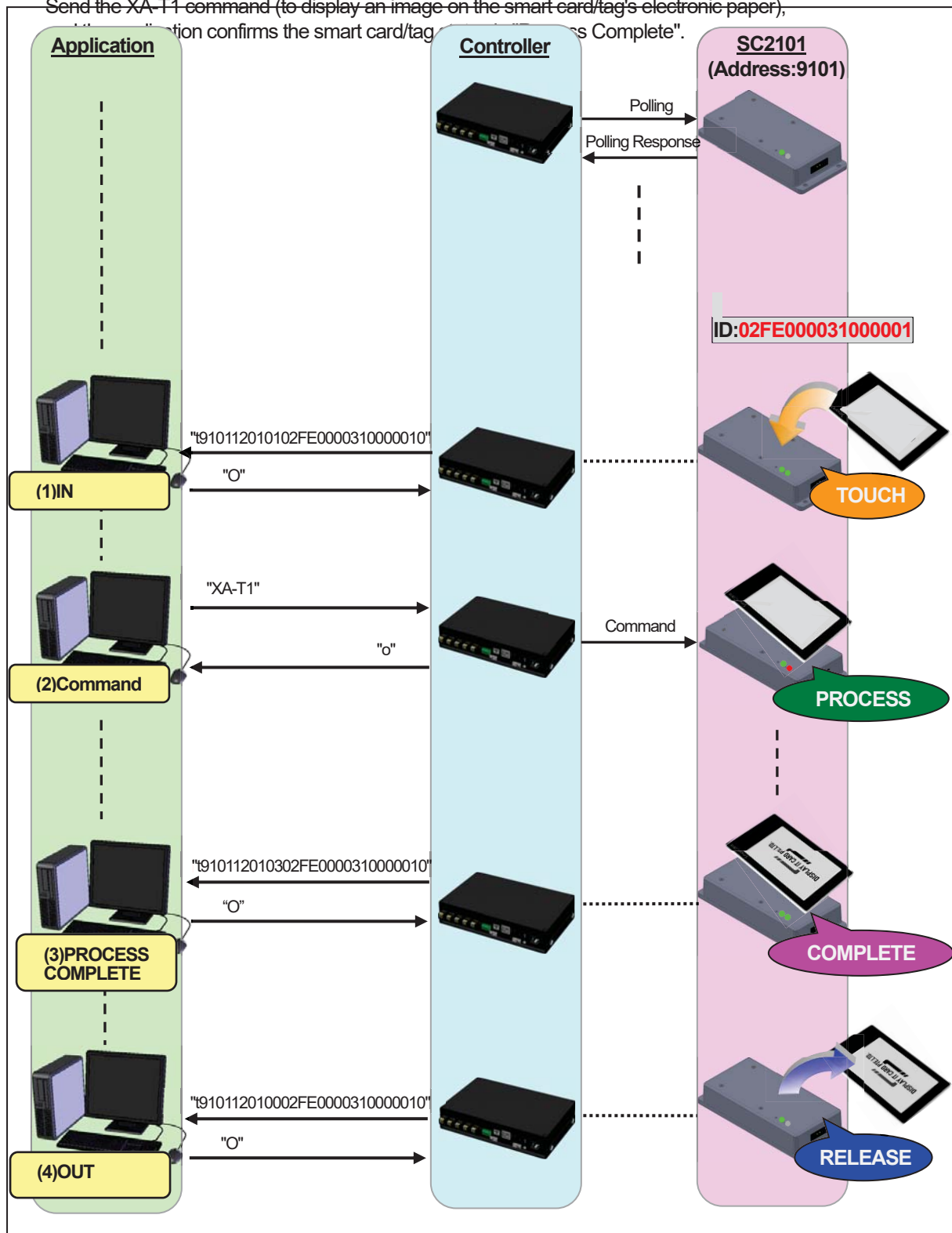
- (1) Verify that the Smart Card/Tag is in a state where it can receive commands
Touch the Smart Card/Tag to SC2101.
Receive the t command and refer to the smart card/tag status information within the command.
Confirm that the status information is "IN" or "Processing Complete".
- (2) Send the command
LED monitor 2 on the SC2101 will light up red.
- (3) Confirm that the smart card/tag has completed processing the command
Receive the t command and refer to the smart card/tag status information within the command.
Confirm that the status information is "Processing Complete".
- (4) Perform error handling if necessary
This occurs when the "OUT" status is notified while waiting for confirmation of the smart card/tag status as "Processing Complete" in step (3).
This occurs when the "OUT" status is notified.
This occurs when the operator RELEASES the smart card/tag even though processing is not complete.

In this case, the application must implement a process to notify the operator with a warning message or similar.

Please see Sequence examples on the following page and after.

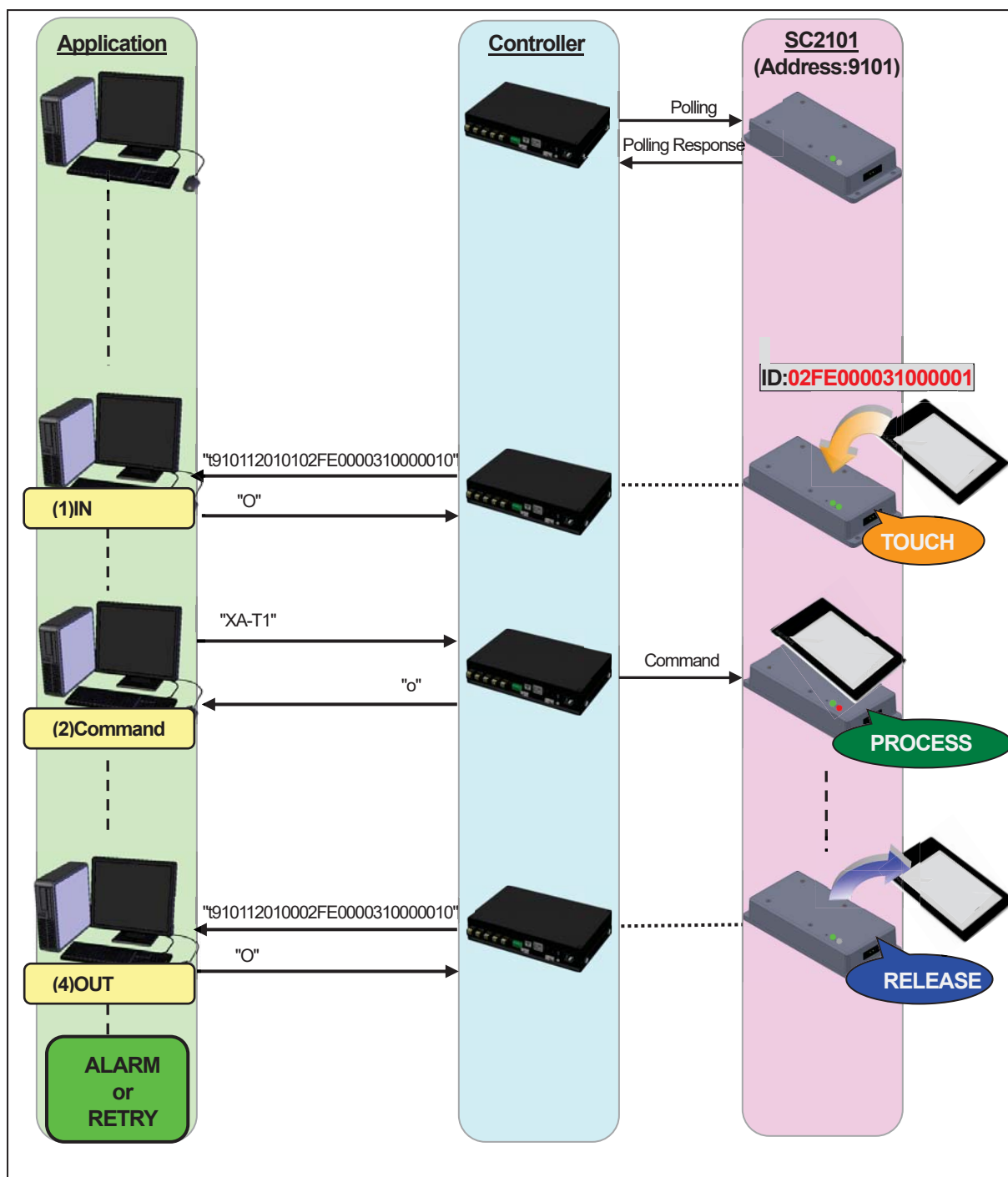
[Normal Sequence]

Send the XA-T1 command (to display an image on the smart card/tag's electronic paper),
 ... confirms the smart card/tag ... ss Complete".



[Abnormal Sequence]

Example when the XA-T1 command (displays an image on the smart card/tag's electronic paper) is sent, before the smart card/tag status changes to "Process Complete".

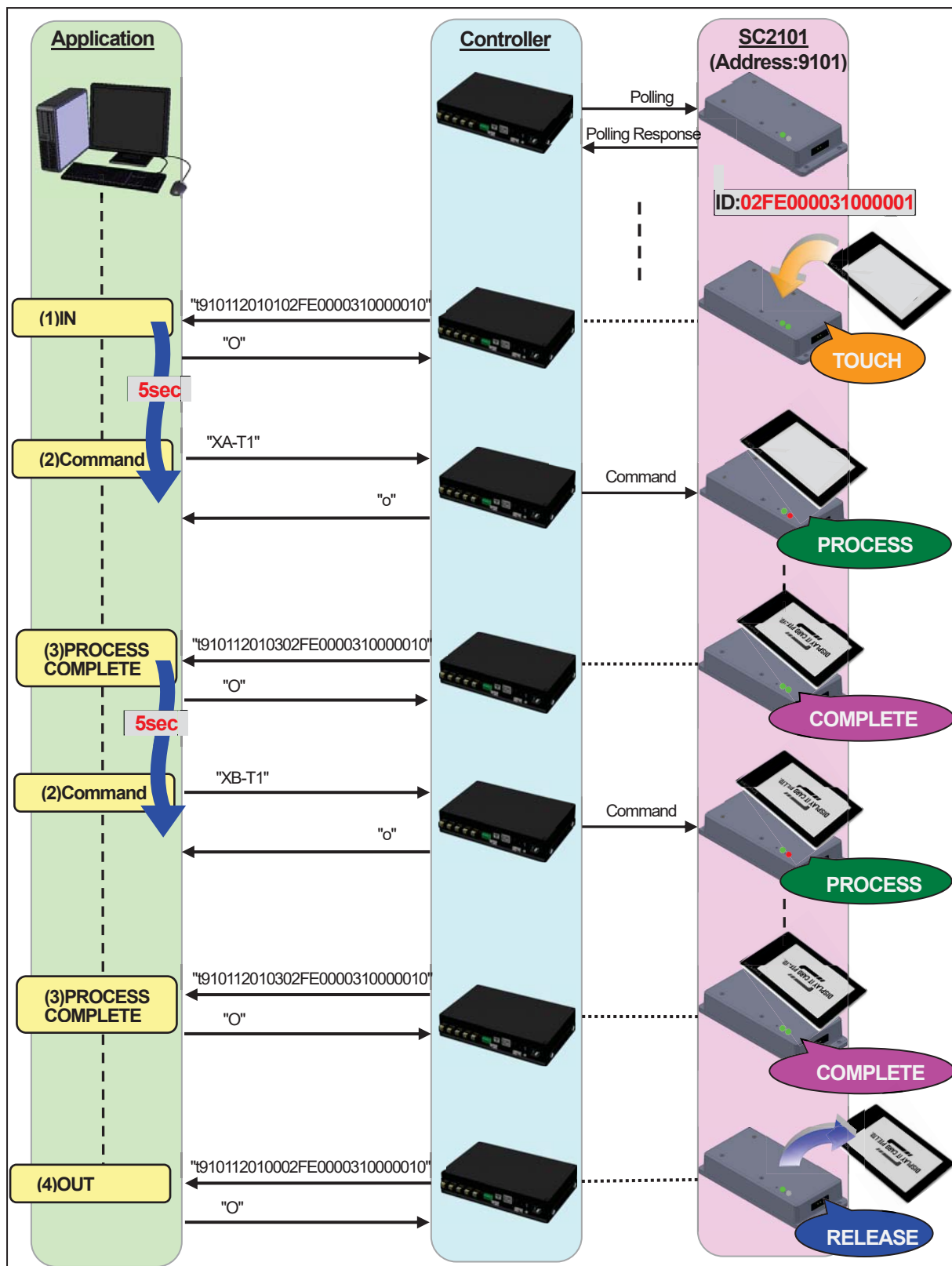


※For details on the RETRY procedure, refer to "4.6 .Retry Processing ".

[Continuous Command Transmission Sequence]

Example of sending the XA-T1 command (to display an image on the smart card/tag's e-paper) followed by the send the XB-T1 command to register the e-paper display content to the smart card/tag.

The command is sent within 5 seconds after confirming "IN" or "Process Complete".



4.4. SC2101, Smart Card/Tag Abnormal Detection

[SC2101]

Anomalies related to SC2101 are notified via the t command. There are two types of anomaly information.

If an application detects an anomaly, implement appropriate recovery procedures such as "replace with a spare."

*This assumes the command to set SC2101 to [Open] state (G-o-T1) has been sent.

(1) Communication Error

- Indicates the communication status between the SC2101 and the Ethernet Junction Box.

- If "Abnormal," please verify the following:

- (1) Verify that the SC2101 address matches the address specified in the G-o-T1 command.

- (2) No other device has the same address as the SC2101.

- (3) The cable connecting the SC2101 is not broken.

If (1), (2), and (3) are not the issue, the SC2101 is faulty. Replace it.

[Command Format]

t	9	1	0	1	0
---	---	---	---	---	---

0 : 異常

(2) Reader/Writer Status

- This indicates the status of the reader/writer built into the SC2101.

- If "Abnormal", LED Monitor 1 will light red. (It lights orange when sending the G-o-T1 command)
Replace SC2101.

[Smart Tag]

Smart tag abnormalities are notified via the t command. Only one type of abnormality information is provided.



[Precautions when replacing Smart Card/Tag spare unit]

The ID of the Smart Card/Tag cannot be changed.

If you wish to transfer registered information when replacing with a spare, implement backup management and handover procedures for the registration data on the application side.
backup management and necessary transfer procedures within the application.

4.5. If you forget the security code

Smart Card/Tag has a security code.

The security code can be changed to any value. (As-T1 command)

However, to enhance security, there is no method to read the security code.

Therefore, please be careful not to lose or disclose the security code.

If the security code is leaked, even our company cannot retrieve it.

We will accept it for a fee, reset it to factory default settings, and return it to you.

Please take the following steps.

(1) Reset security codes 1 to 3 to their factory default values.

(2) All recorded data (Free Information Area/Display Data Save Area) will be erased.

4.6. Retry Processing

The SC2101 communicates wirelessly with smart cards/tags. Therefore, communication may not always be processed successfully.

If command transmission to the smart tag does not complete successfully, perform a retry process.

Typically, after sending a command to the smart card/tag, the application receives a t command and confirms the status information is "Process Complete". If the wireless communication environment is poor, the application may receive an "OUT" or "IN" command while waiting for this "Process Complete" (communication instability).

[Retry Procedure]

(1) Receive the t command and confirm the smart card/tag is in "IN" or "Processing Complete" state

(2) Send a command to the smart card/tag

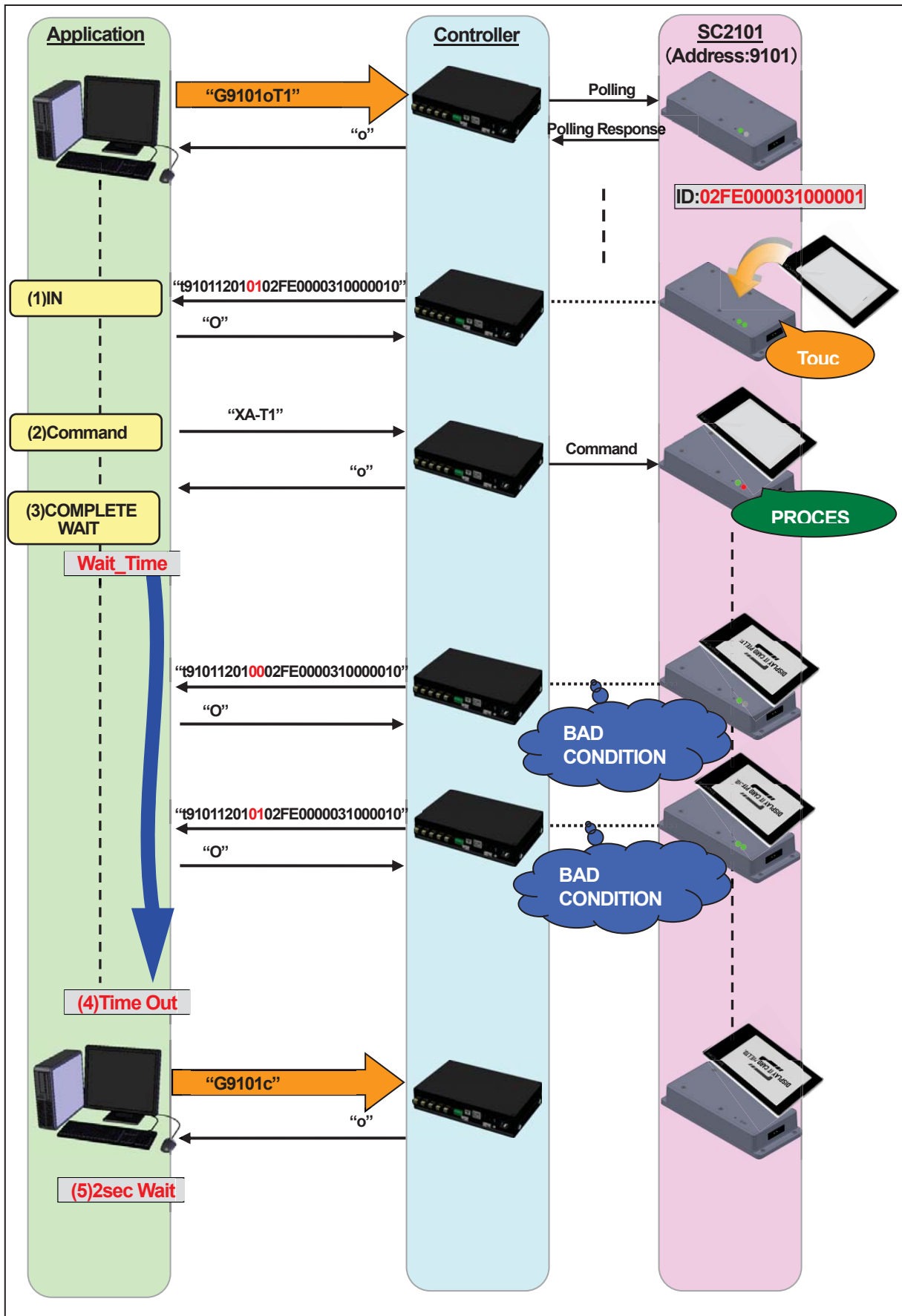
(3) Wait for the t command "Processing Complete" for Wait Time

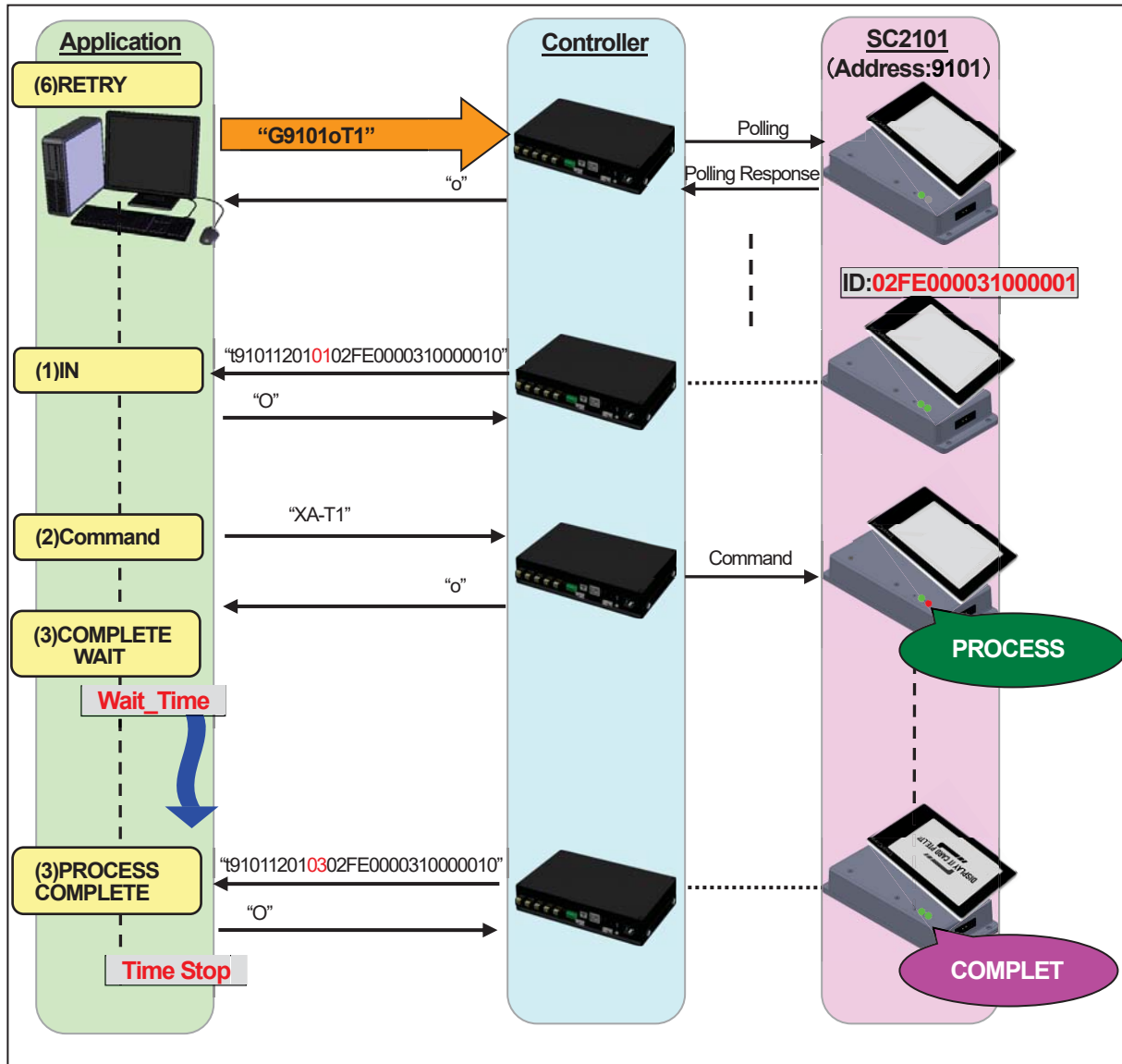
If "OUT" or "IN" is received during this time, discard it. (WaitTime is described later)

(4) If a timeout occurs, send G9101c (close command).

(5) Send G9101oT1 (open command)

The smart tag will be detected again, and you can obtain "IN" with the t command. Please return to (1) and perform the retry process.





[Retry Count]

Please perform the overall retry process 2 to 3 times. If all retry attempts fail, you need to review the SC2101 installation environment. For details on the SC2101 installation environment, refer to:2.3.2 . Precautions when installing multiple SC2101 units

[WaitTime]

This is the time until the SmartTag reaches "Processing Complete". Use the values in the table below as Wait_Time.

Smart Card	Wait_Time [sec]
SC1029L	10
SC1029U	10

Smart Tag	Wait_Time [sec]
ST1129L	10
ST1129U	10

4.7. Precautions for Simultaneous Processing

Precautions when controlling multiple smart tags simultaneously.



Caution A single controller can simultaneously control up to 8 Smart Tags.

[Explanation]

(1) The processing time for each controller command is as follows. (Time until ACK(o, a) is returned)

No.	Command	Processing Time (ms)	Remarks
1	XA-T1 (2400 bytes)	600	e-Paper display command
2	XA-T1 (5808 bytes)	1100	e-Paper Display command
3	Gi-T1 (1 to 512 bytes)	600	Data Write
4	Aq-T1 (257 to 512 bytes)	1600	Data Read
5	Aq-T1 (129-256 bytes)	1100	Data Read
6	Aq-T1 (1-128 bytes)	600	Data Read

*The ACK for the Aq-T1 command is the "a" command.

*The table above does not represent the Smart Tag processing completion time. For an estimate of Smart Tag processing time, refer to "0 Appendix-3 Command Processing Time".

※The XB-T1 command is not listed in the table above because the controller's processing time is short.

(2) After sending a command to the controller, the application must wait for an ACK.

Considering the points in (1) and (2) above, examples are provided below for explanation.

(Example) When controlling 10 SC2101 units with one controller, if events ① to ④ below occur,

- (1) Opening all 10 SC2101 units
- (2) 10 ST1027 units are touched simultaneously
- (3) 10 t commands are notified to the application
- (4) The application sends 10 XA-T1 (5808-byte) commands

The time required to complete sending XA-T1 commands to all 10 SC2101 units is as follows:

$$1100\text{ms} \times 10 \text{ units} = 11000\text{ms} (11 \text{ seconds})$$

During the 11-second period, smart tags unable to receive commands due to the reason stated in (1) above will occur.

In this case, the number of units that can be processed simultaneously is 4.

To simultaneously control 10 smart tags, 3 controllers are required.

[Calculation Method]

When the number of smart tags to be controlled simultaneously is 4 or more, determine the required number of controllers using the following procedure.

- (1) Determine the commands used in operation and the number of SC2101 units
- (2) Extract the maximum time required for each command executed on each SC2101 (from the table in (2))
- (3) Calculate the total sum of the times for each SC2101 in step (2)
- (4) Divide the value from step (3) by 5000 ms (round up any fractional part).
The calculated result is the number of controllers required.
- (5) Assign SC2101 units to each controller such that the total sum of (2) for simultaneously controlled SC2101 units is 5000ms or less

[Example 1]

Using 10 SC2101 units (addresses: 9101–9110), with 10 smart tags to be simultaneously controlled.

- (1) The commands used are as follows:
All addresses 9101–9110 XA-T1 (2400 bytes)
- (2) Maximum processing time per SC2101: 600ms
- (3) The total processing time for all SC2101 units is 6000ms
- (4) Number of controllers: 2 units
- (5) The allocation of SC2101s controlled by each controller is as follows
Controller 1 : 9101–9108 ($5000\text{ms} \geq 600\text{ms} \times 8$)
Controller 2 : 9109–9110 ($5000\text{ms} \geq 600\text{ms} \times 2$)
(The following pattern is also possible)
Controller 1 : 9101–9105 ($5000\text{ms} \geq 600\text{ms} \times 5$)
Controller 2 : 9106–9110 ($5000\text{ms} \geq 600\text{ms} \times 5$)

[Example 2]

Use 10 SC2101 units (Addresses: 9101–9110). The number of smart tags controlled simultaneously is 10.

- (1) The commands used are as follows
All 9101–9110 Aq-T1 (512 bytes)
- (2) Maximum processing time per SC2101: 1600ms
- (3) The total processing time for all SC2101 units is 16000ms
- (4) Number of controllers: 4 units
- (5) The allocation of SC2101s controlled by each controller is as follows
Controller 1 : 9101–9103 ($5000\text{ms} \geq 1600\text{ms} \times 3$)
Controller 2 : 9104–9106 ($5000\text{ms} \geq 1600\text{ms} \times 3$)
Controller 3 : 9107–9109 ($5000\text{ms} \geq 1600\text{ms} \times 3$)
Controller 4 : 9110 ($5000\text{ms} \geq 1600\text{ms} \times 1$)

[Example 3]

Use 10 SC2101 units (Addresses: 9101–9110). The number of smart tags controlled simultaneously is 10.

- ① The commands used are as follows
9101 Aq-T1 (1 to 128 bytes),
9102–9109 XA-T1 (5808 bytes),
9110 Gi-T1 (1 to 512 bytes)
- ② Maximum processing time per SC2101: 9101: 600ms, 9102–9109: 1100ms, 9110: 600ms
- ③ Total processing time for all SC2101 units: 10000ms
- ④ Number of controllers: 2 units
- ⑤ The allocation of SC2101s controlled by each controller is as follows
Controller 1 : 9101–9105 ($5000\text{ms} \geq 600\text{ms} \times 1 + 1100 \times 4$)
Controller 2 : 9106–9110 ($5000\text{ms} \geq 1100\text{ms} \times 4 + 600 \times 1$)



The maximum number of SC2101 units connectable per controller is 30.
When simultaneous control is not performed, up to 30 units can be controlled per controller.

Appendix-1 Functional Specifications

Number of units connectable to System	Maximum number of units connectable per controller: 30 units
Number of Ethernet Junction Boxes Connected	30 units *1
Configurable Addresses	9101 to 9199
Wiring cable length	Dedicated AI cable: 1.5 sq cable, maximum 30m
Power	Supplied from Ethernet Junction Box (360mA)
Operating Temperature/Humidity	0°C to 35°C, 20% to 80% (non-condensing)
Storage Temperature/Humidity	-20°C to 70°C, 10% to 90% (no condensation)
Power	4.4W
Electrostatic Discharge Resistance	*2 IEC 61000-4-2 Level 4 Contact discharge ±8kV / Air discharge ±15kV
Weight	Approx. 220g
Controller – SC2101 Communication Standard	RS-485 compliant (AI-NET)
SC2101 – Smart Card/Tag Interconnect Communication Standard	ISO/IEC 18092
SC2102 – SC1029L Communication Distance	10 to 30 mm *2
SC2102 – SC1029U Communication Distance	10 to 30 mm *2
SC2102 – ST1129U Communication distance	10 to 50 mm *2
SC2102 – ST1129L Communication Distance	10 to 40 mm *2
Electronic Paper Display Display Speed	Refer to the Smart Card/Tag User's Manual
Compliance Standards	Complies only with Japan's Radio Law*4

*1 The maximum number may decrease depending on the cable wiring length.

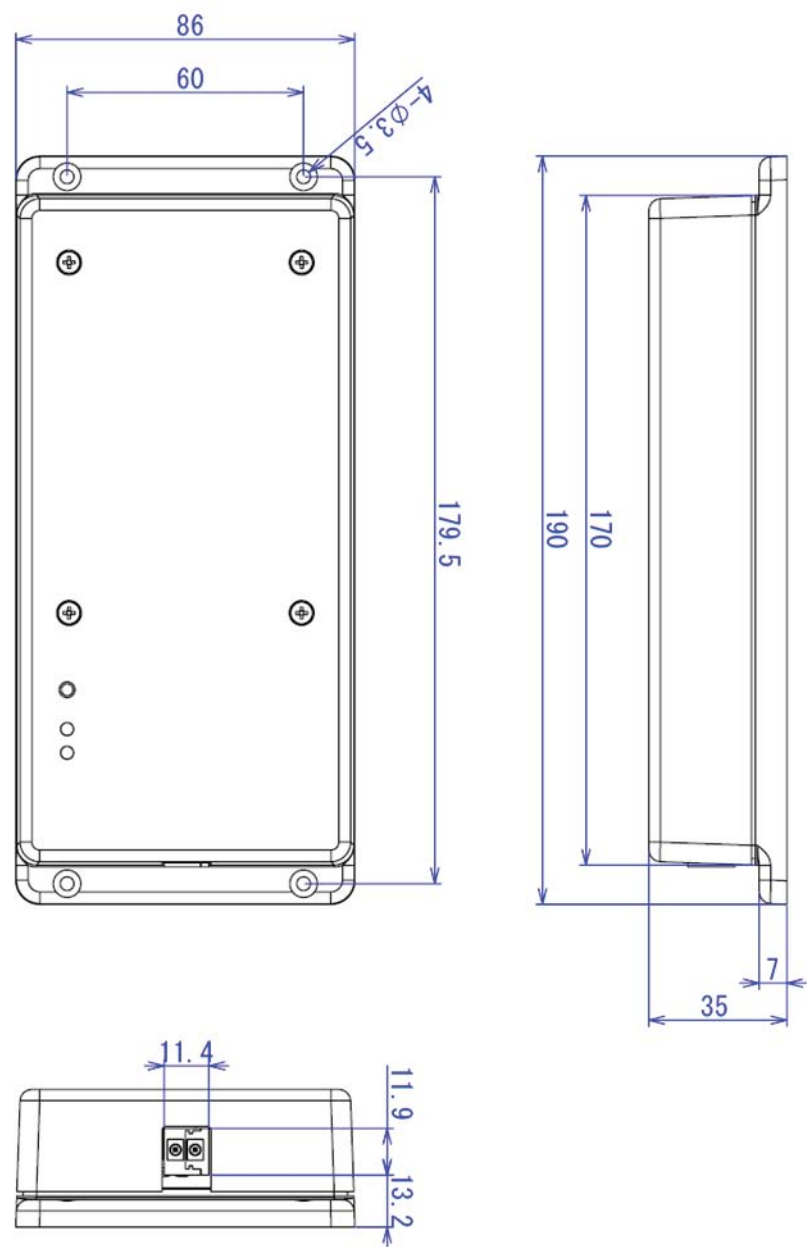
*2 Ground the surrounding metal parts where the reader/writer is installed.

*3 Distance may be reduced depending on the installation environment.

*4 For overseas export, please contact our representative.

Appendix-2 External Dimensions

[mm]



Appendix-3 Command Processing Time

The table below shows the approximate time from when the application sends a command to the smart card/tag until the "Process Complete" status is notified via the t command.

Command		Time
For 2.9-inch Smart Cards (SC1029L/SC1029U)		
XA-T1	7600 byte full data transfer	Approx. 6500ms ※
XB-T1	7600 byte Full data registration	Approx. 400ms
Gi-T1	512 byte Full data write	Approx. 500ms
Aq-T1	512-byte full data read	Approx. 1500ms
For 296 x 128 dot Smart Tag (ST1129L)		
XA-T1	4736 byte Full Data Transfer	Approx. 4500ms ※
XB-T1	4736 byte Full data registration	Approx. 400ms
Gi-T1	512 bytes Full data write	Approx. 500ms
Aq-T1	512-byte full data read	Approx. 1500ms
For 296 x 128 dot Smart Tag (ST1129U)		
XA-T1	4736 byte Full data transfer	Approx. 5000ms ※
XB-T1	4736 byte Full data registration	Approx. 400ms
Gi-T1	512 bytes Full data write	Approx. 500ms
Aq-T1	512-byte full data read	Approx. 1500ms

* Values when using the smart card/tag in a room-temperature environment. Values may vary depending on the operating temperature of the smart card/tag.

Appendix-4 Troubleshooting

Symptom	Cause	Check
Unable to communicate with SC2101	Address mismatch	Please verify the address set on the SC2101. Check if there is another SC2101 with the same address.
	Short circuit in cable wiring	Check the lamp on the connected JB CH. If it is off, check the wiring and then turn the power back on.
Unable to acquire smart card/tag ID The command to the smart card/tag does not complete processing	Influence of metal objects near the SC2101	Refer to the section "2.3.2.2 .Installation Environment " and review the installation environment.
	Positioning of SC2101 relative to smart card/tag	Please review the positioning between the SC2101 and the smart card/tag. Especially when the vertical gap is 10mm, increase the gap. (20–40mm: Recommended)



If the issue persists after these checks, please contact our Customer Support Center.

Appendix-5

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

AIOI Systems USA Corp.

ADDR. 10080 N. Wolfe Rd., Suite SW3-200 Cupertino, CA 95014

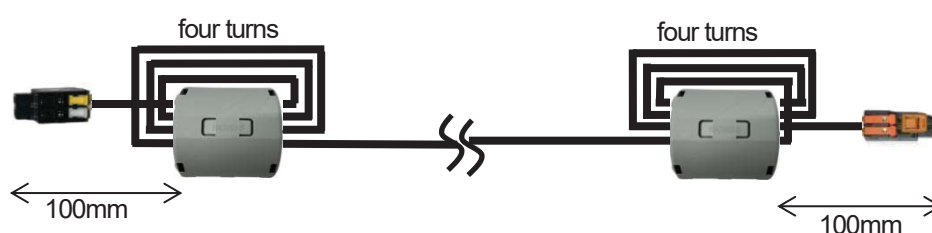
TEL. +1-408-973-7835

FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Attach ferrite cores to the cables to suppress radio interference.

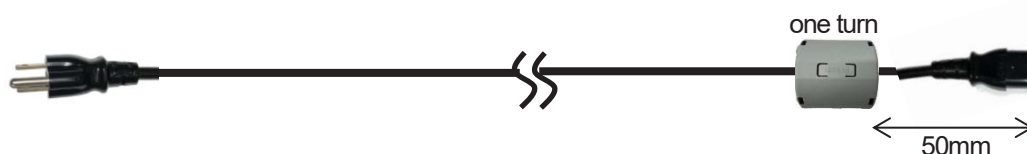
- Attach the ferrite cores(SEIWA:E04SR482648) to both ends of the AI cable. Wind four turns.



- Attach the ferrite cores(SEIWA:E04SR301334) to both ends of the LAN cable. Wind three turns.



- Attach the ferrite core(SEIWA:E04SR301334) to the connector end of the power cable. Wind one turn.



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

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment must be installed and operated keeping the radiator at least 20cm or more away from person's body.

[Caution] Specifications and manual contents for the SC series are subject to change without notice. Copying or reproducing any part or the entirety of this manual, in any form, is strictly prohibited without written permission from AIOI Systems Co., Ltd.

[Contact] For any questions regarding the specifications or manual content of the SC series, or for inquiries about application program development, please contact our Customer Support Center via fax or email. info1@hello-aioi.com

SC Series SC2101 Smart Card Reader/Writer

User's Manual



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