

## User's Guide for the MRA201SL $\mu$ -Chip Reader

REV.D

### **Usage Note**

1. The MRA201SL  $\mu$ -chip reader has been developed to evaluate the features and capabilities of a  $\mu$ -chip. Hitachi Ltd. (Hitachi) neither guarantees the same quality as our full-featured products nor guarantees service.
2. Hitachi assumes no liability and is not responsible for damages or infringement of patents and/or any other rights of third parties arising out of the use of the MRA201SL.
3. By offering the MRA201SL, Hitachi does not grant users a license to any of the patents or other rights of Hitachi or third parties.
4. Keep the following in mind when using the MRA201SL.
  - (1) The MRA201SL is equipped with parts having a limited guaranteed temperature range and operating speed. The MRA201SL, including its accessories, must be only used for evaluating the features and capabilities of the  $\mu$ -chip.
  - (2) The MRA201SL is designed to be used within a normal range of ambient temperature and humidity and does not operate properly in unusual circumstances.
  - (3) Parts used in the MRA201SL may be discontinued without notice.
  - (4) The specifications of the MRA201SL are subject to change without notice.

### **IMPORTANT**

You should thoroughly read the MRA201SL User's Guide before using the MRA201SL.

Keep this user's guide handy for ready reference and, when in doubt, reread it.

Avoid using the MRA201SL without thoroughly reading the user's guide.

**Any changes or modifications not expressly approved by Yagi Antenna Inc. could void the user's authority to operate the equipment.**

### Intended Use of the MRA201SL

The MRA201SL  $\mu$ -chip reader is an evaluation reader that allows customers considering developing a system using our smallest RFID IC, the " $\mu$ -chip," to verify its features and capabilities.

The MRA201SL should be properly used for its intended use. You may not use the MRA201SL for purposes other than its intended purpose.

### Restriction on Use

The MRA201SL has been developed to evaluate the  $\mu$ -chip. Avoid using or incorporating the MRA201SL or its accessories in your system or any other devices.

### Changes in the MRA201SL

Hitachi's policy is to continuously improve the design and performance of the MRA201SL. Hitachi reserves the right to make changes to specifications, design, software, and the user's guide for the MRA201SL without notice.

### Intended MRA201SL User

Only persons who thoroughly read this user's guide and understood how to use the MRA201SL should use it.

### Warranty Coverage

- (1) The MRA201SL has been developed to evaluate the features and capabilities of the  $\mu$ -chip. Hitachi neither guarantees the same quality as our full-featured products nor guarantees service.
- (2) The operations of the MRA201SL have been verified within the normal range of ambient temperature and humidity in Japan, and it should be used under the same conditions.
- (3) Hitachi assumes no responsibility for any defects of the MRA201SL caused by fire, actions of customers or third parties, other accidents, a customer's willful or accidental abuse, misuses, or use under any other abnormal conditions.
- (4) In no event shall Hitachi be liable for any damages arising out of the use of or inability to use the MRA201SL.
- (5) Regardless of whether or not compensation for repair is received, the duration of guarantee is one year.
- (6) In such cases as the product easily comes to be defective despite of repair, Hitachi shall take appropriate measures to such problems.

### Other Important Information

- (1) Hitachi assumes no responsibility for any damage or infringement of patents and/or any other rights arising out of the use of the information contained herein and of the MRA201SL.
- (2) Use this user's guide supplied with the MRA201SL solely for the MRA201SL  $\mu$  reader.

### Illustrations

Some of the illustrations contained in the user's guide may differ from the actual product.

### Limit of Foreseeable Risks


Hitachi cannot foresee every possible situation or misuse that may pose potential risks. Not all warnings are covered in the user's guide. Please use the MRA201SL safely at your own risk.


## **Safety Instructions**


You should thoroughly read the MRA201SL User's Guide before using the MRA201SL.


Keep this user's guide handy for ready reference and, when in doubt, reread it.

## **SIGNAL WORDS**

 This is a safety alert symbol. It is used to alert operators to potentially hazardous situations. Carefully read the message that follows the symbol to avoid possible risk or death.

 **DANGER:** Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. It is not applicable to the MRA201SL.

 **WARNING:** Indicates a potentially hazardous situation that, if not avoided, may result in death or serious injury.

 **CAUTION:** Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.

**NOTES:** The signal action word with no warning symbol indicates a potentially hazardous situation that, if not avoided, may result in property damage.

**(Note)** Notes are used to provide descriptions on the use of the MRA201SL or information about exceptional conditions or safety related to the operating steps.

## **General Instructions for Using the MRA201SL**

The following general rules of safety should be observed to safely use the MRA201SL, protect the operator and any persons in the working area from hazard, or prevent damages to property. Be sure to read the following warning messages before using the MRA201SL.

### **WARNING**

The MRA201SL uses microwaves and, if used in the vicinity of medical electrical equipment or the like, it may adversely affect their operations (causing them to generate noise or malfunction). Avoid using the MRA201SL in the vicinity of equipment susceptible to microwaves (e.g., medical electrical equipment).

### **WARNING**

To comply with FCC RF exposure compliance requirements, this device and its associated antenna must be installed to provide a minimum separation distance of 20cm from all persons (excluding hands, feet, wrist and ankles).

 WARNING

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.

 WARNING

For maximum safety, please observe the following precautions. Failure to do so could lead to death or serious failure.

(a) If any abnormality occurs

- If smoke, noise, or smells are observed, unplug the power adapter and do not use the device. Failure to do so may lead to fire, electrical shock, or accidents. The area around the plug outlet should be clear enough to allow the power adapter to be easily unplugged.

(b) Do not repair, remodel, or disassemble the device.

- Any attempt to repair, remodel, or disassemble the device may result in fire, electrical shock, or failure.
- If the reader will not be used for an extended period of time, be sure to pull out the power adapter from the AC outlet.

(c) Leaving the reader with the power on for an extended period of time increases the risk of fire. Use the device under the operator's control.

(d) Humid or Dusty Areas

- Do not use or store in areas with high relative humidity or dust. Fire or electrical shock may result.

(e) Physical Abuse

- Do not drop the device or apply shock to it. Fire or electrical shock may result..

(f) Moving to Areas of Different Temperature

- Moving the device to areas that are very different in temperature may cause internal and external condensation. Using the device in this condition may cause fire or electrical shock. Leave the device unused for a few hours at the new location before applying power.

(g) Use of accessories

- Do not use any components other than the designated accessories, including the power adapter. Using other accessories may result in fire, electrical shock, or failure.

(h) Avoid using a power strip.

- Power strips can cause the power line to overload, activating the circuit breaker and causing damage to other devices.



(i) Handling of the AC Adapter

- Use a commercial AC power supply (100-240 VAC) only. Using other power supplies could cause electrical shock or fire.
- NEVER attempt to disassemble the device.
- Never get the adapter wet or touch it with a wet hand. This may cause the adapter to generate heat or catch fire, or cause electrical shock.
- Do not use the adapter with devices other than the MRA201SL. Doing so may cause fire, electrical shock, or damage to the device.
- Do not use or leave the adapter in an ill-ventilated environment. This may cause fire.
- Do not put anything on the exterior surfaces of the adapter.
- If the adapter will not be used for an extended period of time, disconnect it from the AC

(j) Handling of the power cord

- Observe the following when handling the power cord. Failure to do so could result in power cord damage, electrical shock, or fire.
  - Never put objects on it.
  - Do not fold it.
  - Do not use it near heat generating devices.
  - Do not wrap it around your body
  - Do not pull it
  - Do not tamper with it
  - Do not apply pressure

(k) Plugging and Unplugging (power connector and plug)

- When plugging the power cord into the PC connecting cable connector or unplugging it from the connector, hold the plug with your hand. Pulling on the power cord can damage it and may result in fire.
- Do not connect or disconnect the power plug with a wet hand. Do not connect the power connector to the PC connecting cable or disconnect it from the cable with a wet hand. Doing so could result in electrical shock.

(I) Poor contact between the power connector and power plugs

- Observe the following precautions when connecting the power connector and plug. Failure to do so may lead to a poor connection, causing fire.
  - Insert the power connector and plug as far as possible
  - Check that no dirt adheres to the power connector and plug before inserting them
  - Be sure you insert the power plug into a properly installed outlet to avoid fire

 WARNING

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE

Be sure to read Section 2, "Preparation for Use," before using the MRA201SL. Misuse or an improper connection may result in damage to the MRA201SL.

## **INTRODUCTION**

Thank you for purchasing the MRA201SL  $\mu$ -chip reader.

The MRA201SL  $\mu$ -chip reader is an evaluation reader that allows customers considering developing a system using our smallest RFID IC, the " $\mu$ -chip," to verify its features and capabilities. Simply installing the software supplied with the MRA201SL in a PC and connecting the reader allows you to evaluate the basic characteristics of the  $\mu$ -chip and experiment with simple applications.

### **Procedure for Using the MRA201SL**

Use the MRA201SL following the steps below:

- (1) Read the user's guide thoroughly.  
It provides you with the information necessary for operating and maintaining the MRA201SL.
- (2) Inspect the contents of the MRA201SL package.  
See 1, "Configuration of the MRA201SL."
- (3) Connect the reader with a PC using the PC connecting cable.  
See 2.2, "Installing and Connecting the MRA201SL."
- (4) Connect the reader with a PC using the PC connecting cable.  
See 2.2, "Installing and Connecting the MRA201SL," and 2.2.4, "Powering On the MRA201SL."
- (5) After using the device, disconnect the power adapter cable and the PC connecting cable, in that order.

## 1. Configuration of the MRA201SL

The MRA201SL comprises the following components. Make sure all components are contained in the package. If any of the components is missing, please contact your dealer or our service representative (see Section 6, "Contact Information").

- (1) Reader × 1
- (2) Power adapter × 1
- (3) PC connecting cable × 1
- (4) Handle × 1

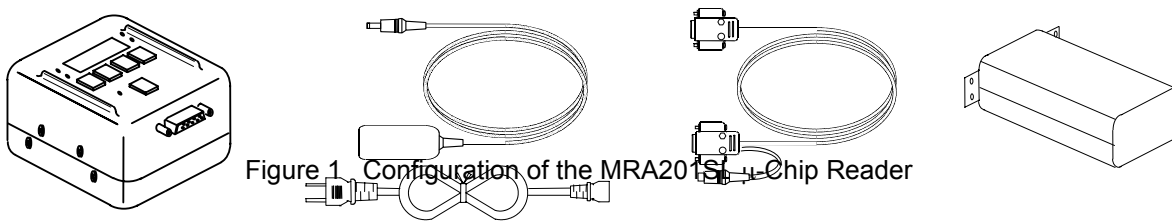


Figure 1 Configuration of the MRA201SL  $\mu$ -Chip Reader

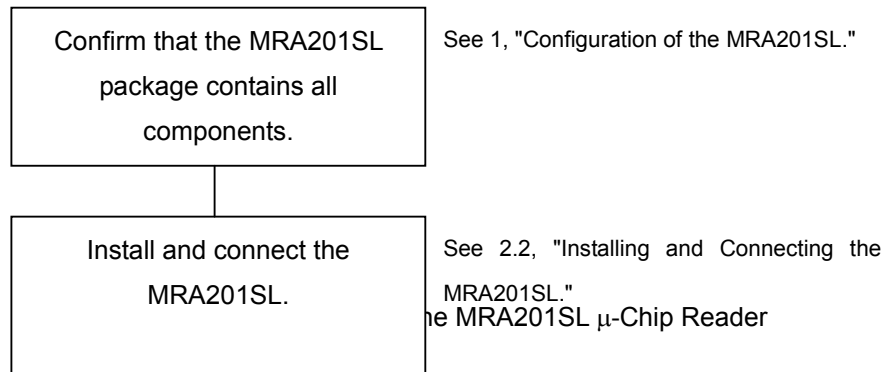
The MRA201SL comprises the following components:

- | (1) Reader   | (2) Power adapter | (3) PC connecting cable | (4) Handle |
|--|-------------------|-------------------------|------------|
| (1) Reader   |                   |                         |            |
| A reader that reads the $\mu$ -chip IDs on $\mu$ -chip inlets. It contains a controller and an antenna.  |                   |                         |            |
| (2) Power adapter  |                   |                         |            |
| A power adapter that supplies power to the reader. Connect one end to the power connector of the PC cable and the other end to an AC outlet (100-240 VAC). |                   |                         |            |
| (3) PC connecting cable  |                   |                         |            |
| A cable used to connect the reader with a PC. It is equipped with a power connector.   |                   |                         |            |
| (4) Handle   |                   |                         |            |
| Attach this handle to use the reader as a handy device.  |                   |                         |            |

## 2. Preparation for Use

### 2.1 Preparation for Using the MRA201SL $\mu$ -Chip Reader

This section provides information necessary to prepare the MRA201SL. Proceed with the preparation, following the steps shown in Figure 2. See the relevant description as shown on the right for further information.



### 2.2 Installing and Connecting the MRA201SL

#### 2.2.1

Power on the MRA201SL

See 2.4, "Powering on the MRA201SL."

When installing

the following places:

- Place the device in an environment where the ambient temperature and humidity are not normal.
- Places where the device is exposed to corrosive gases, dust, salty air, or air containing iron particles.
- Places where the device is subject to vibration or shock.
- Places where the device is exposed to water, oil, or chemical splashes.
- Places where the device is exposed to direct sunlight.
- Unstable places such as inclined areas or narrow spaces.

Placing the device adjacent to other electronic devices may cause them to adversely influence each other. Should this happen,

- Place them apart.
- Use a separate AC outlet for each device.

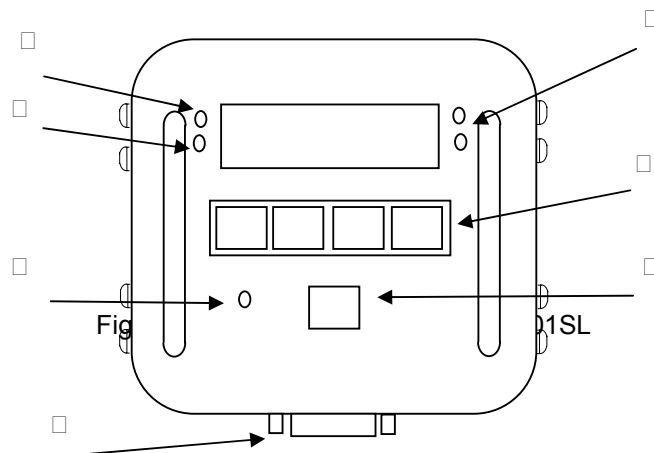
### 2.2.2 Connecting the Cable and Power Adapter

Figure 5 shows an overall view of the MRA201SL connected to a PC. Connect the MRA201SL following the steps described in 2.2.3. See Figure 3.

#### (1) Reader (1 unit)

The reader is used to read the  $\mu$ -chip IDs. It contains a controller and an antenna. Shown below are part names and functions.

- ☐ Power indicator (green).....Lights up when the reader is powered on.
- ☐ Read indicator (green).....Lights up when a  $\mu$ -chip is being read.
- ☐ Software control indicators (red and green)...Light up when the PC is under control.  
(See the software manual.)
- ☐ Function switches.....Used to control the PC.  
(See the software manual.)
- ☐ Trigger switch.....Press to read  $\mu$ -chips.
- ☐ RS-232C connector.....A D-SUB 9-pin RS-232C connector used to connect the MRA201SL with the PC connecting cable.
- ☐ Buzzer.....Built-in buzzer. (See the software manual.)



(2) Power adapter (1 pc)

A power adapter that supplies power to the reader. Connect one end to the power connector of the PC cable and the other end to an AC outlet (100-240 VAC).

(3) PC connecting cable (1 pc)

A cable used to connect the reader with a PC. Power is supplied to the reader through this cable.

### 2.2.3 Connecting the Cable

(a) Connecting the PC connecting cable.

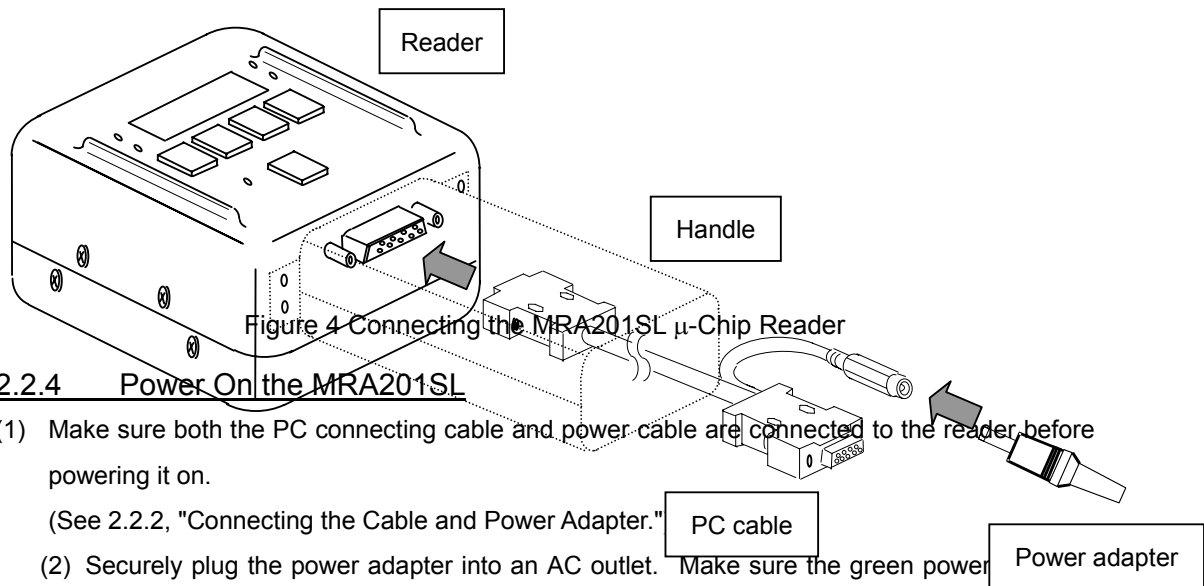
- Connect the reader with the PC using the D-SUB 9-pin serial interface.
- Connect the reader with the PC using the PC connecting cable. Connect one compact-type RS-232C connector of the PC connecting cable to the reader and the other to the COM port on the PC.
- Make sure you insert both connectors of the PC connecting cable as far as possible.
- If an extension cable is used, use a D-SUB 9-pin serial (straight) cable for extension use.

(b) Connecting the AC adapter

- Plug the power adapter plug into an AC outlet. Connect the other power connector to the power adapter connector of the PC connecting cable.
- Make sure you insert the power adapter plug and power connector as far as possible.

(c) Attaching the handle

- To use the reader as a handy device, attach this handle using an M3 screw.



## 2.2.4 Power On the MRA201SL

- (1) Make sure both the PC connecting cable and power cable are connected to the reader before powering it on.

(See 2.2.2, "Connecting the Cable and Power Adapter.")

- (2) Securely plug the power adapter into an AC outlet. Make sure the green power on the reader is lit to determine whether it is properly powered on (it has no power switch).

### ⚠ WARNING

DO NOT connect or disconnect the PC connecting cable while power is being supplied to the PC and reader. Doing so may damage both.

## 3. Using the MRA201SL

This section describes how to use the MRA201SL.

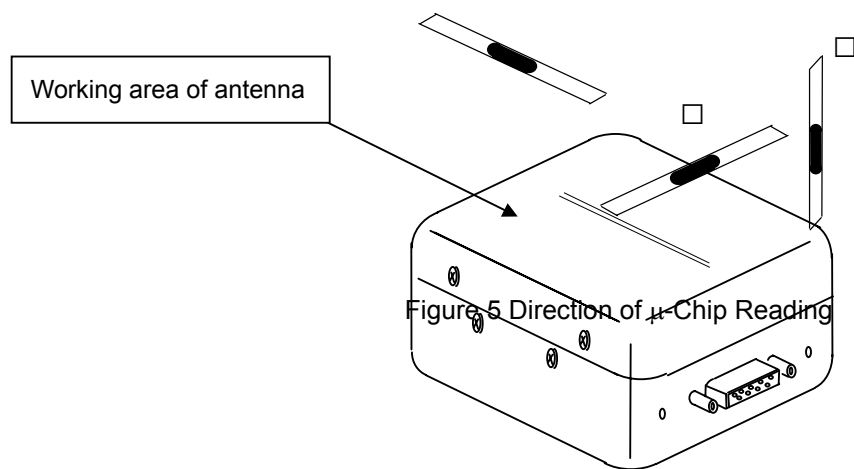
### 3.1 Using the μ-Chip Inlet

Place a μ-chip inlet parallel to the top face of the reader as shown in Figure 5 (□ and □). Placing a μ-chip inlet at a right angle to the top face of the reader as shown in Figure 5 □ may not provide an appropriate reading distance or may cause the reader to fail to read it. The MRA201SL reads μ-chip inlets at a distance of about 10 cm.

Avoid holding a μ-chip inlet with your hand when placing it over the reader.

If a μ-chip inlet is attached to a Styrofoam stick or the like, hold it far away from the μ-chip inlet when placing it over the reader.





### 3.2 Information for Using the MRA201SL Properly

The communication distance between the MRA201SL and a  $\mu$ -chip inlet is influenced by the way it is attached or by the environment in which the reader is installed.

The following information should help you to ensure communication between the reader and a  $\mu$ -chip.

#### (a) Influence of RF interference

Radio waves emitted by the following devices may cause the communication distance between the reader and  $\mu$ -chip to shorten:

- ☐ A wireless LAN system or a system similar to this device.
- ☐ A microwave oven or electromagnetic cooking device.
- ☐ An antenna for a mobile phone, PHS device, or walkie-talkie.
- ☐ A radio or television.
- ☐ Something that generates a strong magnetic or electrical field.

#### (b) Effect of obstacles

Any of the following obstacles that absorb or reflect radio waves emitted by the reader may cause the reading distance between the reader and  $\mu$ -chip to shorten or cause the reader to fail in reading  $\mu$ -chips within a normal communication range:

- ☐ A concrete wall, ceiling, or floor close to the reader.
- ☐ A piece of metal near the reader or  $\mu$ -chip.
- ☐ Water or a liquid near the reader or  $\mu$ -chip.
- ☐ A  $\mu$ -chip inlet directly held with your hand.
- ☐ A hand or part of the human body between the reader and a  $\mu$ -chip.
- ☐ A metallic or damp object to which a  $\mu$ -chip inlet is attached.

#### (c) See 3.3 "If the Reader Fails to Read $\mu$ -Chips," and Section 4, "Troubleshooting."

### 3.3 If the Reader Fails to Read $\mu$ -Chips

If the reader fails to read  $\mu$ -chips, check the following:

#### (1) Hardware

- ☐ Reader power  
Check that the reader power indicator is lit.
- ☐ Reader wave output  
Check that the read indicator is lit.
- ☐ Connection between the reader and the PC  
Check that the reader communication indicator is flashing. Check the steps for powering on the reader.
- ☐ Orientation of the  $\mu$ -chip inlet and reader and the distance between them  
Check that the  $\mu$ -chip inlet is parallel to the reader top and that they are not too far

apart.

- ☐ Communication failure or radio interference

Be sure the surrounding environment is free of communication failures or radio interference.

(2) Communication ports

Referring to the instruction manual for your PC, check the assignments of the communication ports.

If the communication port set by the reader's program does not agree with the COM port to which the PC connecting cable is fitted, or if it conflicts with the one assigned for another purpose, the reader could fail to read  $\mu$ -chips.

See also 3.2 "Information for Using the MRA201SL Properly" and Section 4, "Troubleshooting."

#### 4. Troubleshooting

The following problems may occur as a result of misusing the MRA201SL.

In case of difficulty, check the following. See also 3.2, "Information for Using the MRA201SL Properly," and 3.3, "If the Reader Fails to Read  $\mu$ -Chips."

If the problem persists after taking the specified action, disconnect the power adapter for safety. Then, contact our service personnel (see Section 6, "Contact Information").

(1) The reader is not powered on.

- ☐ Check that the green power indicator attached to the side of the reader is lit.

If it is not, make sure the power adapter is securely connected and the AC outlet is active (see 2.2, "Installing and Connecting the MRA201SL").

**Note: The reader has no power switch. Connecting one end of the power adapter to the outlet and the other to the reader supplies power to the reader, causing the green power indicator to turn on.**

(2) The reader does not read  $\mu$ -chip IDs or often fails to read them.

- ☐ Check that the green read indicator attached to the side of the reader is flashing.

If it is not, make sure the PC connecting cable is securely connected (see 2.3, "Installing and Connecting the MRA201SL").

Check that the COM port to which the PC connecting cable is fitted agrees with the communication port used by the program (see 3.2, "Information for Using the MRA201SL Properly").

**Note: Check the number assigned to the COM port in your PC by following the instruction manual supplied with the PC.**

- ☐ Be sure not to hold a  $\mu$ -chip inlet directly with your hands. Place it on a piece of paper or similar material and keep it away from your body.

Read the instructions in 3.2, "Information for Using the MRA201SL Properly," containing precautions.

- ☐ Check that the  $\mu$ -chip inlet and the reader are oriented and positioned as specified in this manual.

Make sure that they are oriented as specified in 3.1, "Using the  $\mu$ -Chip Inlet."

The MRA201SL reads  $\mu$ -chip inlets at a distance of about 10 cm (maximum). Check that device is at the specified reading distance.

- ☐ Check for communication failures or radio interference.

Please read 3.2, "Information for Using the MRA201SL Properly."

(3) Other problems

- ☐ If any other problem occurs, please contact your dealer or our service personnel (see Section 6, "Contact Information").

## 5. Specifications of the MRA201SL $\mu$ -Chip Reader

### (1) General specifications of the reader:

- (a) Built-in antenna: Circular polarized patch antenna
- (b) Radio frequency: 2.4 GHz band
- (c) Transmission power: Less than 1W EIRP
- (d) Applicable standards: Complies with FCC Part 15 (without Tags)
- (e) Supply voltage: 5 VDC (Use the power adapter provided as an accessory.)
- (f) Maximum power consumption: Less than 3.0 W
- (g) Interface to PC: RS-232C
- (h) Operating environment: Indoor use only
- (i) Operating temperature: 0-40 degrees Celsius
- (j) Dimensions: 90 × 90 × 52 mm (convex surface not included)
- (k) Readable range: more than 50mm(effective:Min70mm,Max150mm  
:when read with  $\mu$ -chip boundary inlet)

### (2) Specifications of the power adapter

- (a) Input voltage: 100 to 240 VAC
- (b) Input frequency: 50/60 Hz
- (c) Output voltage: 5 VDC
- (d) Rated output current: 2 A
- (e) Ambient temperature: 0-40 degrees Celsius (in operation)

### (3) Specifications of the PC connecting cable

- (a) PC-side connectors: D-SUB 9-pin connector and power adapter connector
- (b) Reader-side connector: D-SUB 9-pin connector

## 6. Contact Information

Please contact us as below:

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