

RICOH Unified Communication System P3500 M

Machine Codes: E0A5

Field Service Manual

April, 2017

Important Safety Notices

Warnings, Cautions, Notes

In this manual, the following important symbols and notations are used.

WARNING

- A Warning indicates a potentially hazardous situation. Failure to obey a Warning could result in death or serious injury.

CAUTION

- A Caution indicates a potentially hazardous situation. Failure to obey a Caution could result in minor or moderate injury or damage to the machine or other property.

Important

- Obey these guidelines to avoid problems such as misfeeds, damage to originals, loss of valuable data and to prevent damage to the machine.

Note

- This information provides tips and advice about how to best service the machine.

General Safety Instructions

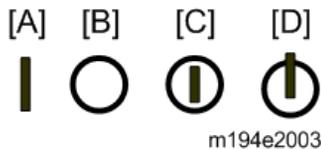
For your safety, please read this manual carefully before you use this product. Keep this manual handy for future reference.

Safety Information

Always obey the following safety precautions when using this product.

Safety During Operation

In this manual, the following important symbols and notations are used.



[A]: ON

[B]: OFF

[C]: Push ON/Push OFF

[D]: Standby

Switches and Symbols

Where symbols are used on or near switches on machines for Europe and other areas, the meaning of each symbol conforms with IEC60417.

LEAD-FREE SOLDER

This product is manufactured using lead-free solder as a part of a movement within the consumer products industry at large to be environmentally responsible. Lead-free solder must be used in the servicing and repair of this product.

WARNING

- This product is manufactured using lead free solder. DO NOT USE LEAD BASED SOLDER TO REPAIR THIS PRODUCT! The melting temperature of lead-free solder is higher than that of leaded solder by 86 °F to 104 °F (30 °C to 40 °C). Use of a soldering iron designed for lead-based solders to repair product made with lead-free solder may result in damage to the component and or PCB being soldered. Great care should be made to ensure high-quality soldering when servicing this product – especially when soldering large components, through-hole pins, and on PCBs - as the level of heat required to melt lead-free solder is high.

Prevention of Physical Injury

1. Before disassembling or assembling parts of the machine and peripherals, make sure that the machine power cord is unplugged.
2. The wall outlet should be near the machine and easily accessible.
3. If any adjustment or operation check has to be made with exterior covers off or open while the main switch is turned on, keep hands away from electrified or mechanically driven components.
4. The machine drives some of its components when it completes the warm-up period. Be careful to keep hands away from the mechanical and electrical components as the machine starts operation.

CAUTION

- RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.
- DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

Observance of Electrical Safety Standards

The machine and its peripherals must be serviced by a customer service representative who has completed the training course on those models.

Safety and Ecological Notes for Disposal

1. Dispose of replaced parts in accordance with local regulations.

WARNING

- To prevent a fire or explosion, keep the machine away from flammable liquids, gases, and aerosols. A fire or an explosion might occur.

This product contains substances which are harmful to humans and the environment.

- The lamp contains mercury.

Please dispose of this product or used lamps in accordance with local regulations.

The following information is only for EU-member states:



The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about recycling of this product, please contact your local city office or your household waste disposal service.

Symbols and Trademarks

Symbols

This manual uses several symbols and abbreviations. The meaning of those symbols and abbreviations are as follows:

	Screw
	Connector
	Spring

Trademarks

Macintosh is trademark of Apple Inc., registered in the United States and other countries. Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

The proper names of the Windows operating systems are as follows:

- The product names of Windows Vista are as follows:
 - Microsoft® Windows Vista® Ultimate
 - Microsoft® Windows Vista® Business
 - Microsoft® Windows Vista® Home Premium
 - Microsoft® Windows Vista® Home Basic
 - Microsoft® Windows Vista® Enterprise
- The product names of Windows 7 are as follows:
 - Microsoft® Windows® 7 Home Premium
 - Microsoft® Windows® 7 Professional
 - Microsoft® Windows® 7 Ultimate
 - Microsoft® Windows® 7 Enterprise
- The product names of Windows 8 are as follows:
 - Microsoft® Windows® 8
 - Microsoft® Windows® 8 Pro
 - Microsoft® Windows® 8 Enterprise
- The product names of Windows 8.1 are as follows:

Microsoft® Windows® 8.1

Microsoft® Windows® 8.1 Pro

Microsoft® Windows® 8.1 Enterprise

Other product names used herein are for identification purposes only and might be trademarks of their respective companies. We disclaim any and all rights to those marks.

TABLE OF CONTENTS

Important Safety Notices.....	1
Warnings, Cautions, Notes.....	1
General Safety Instructions.....	1
LEAD-FREE SOLDER.....	2
Prevention of Physical Injury.....	2
Observance of Electrical Safety Standards.....	2
Safety and Ecological Notes for Disposal.....	3
Symbols and Trademarks.....	4
Symbols.....	4
Trademarks.....	4
1. Product Information	
Specifications.....	9
Overview.....	12
Front and Top View.....	12
Rear and Bottom View.....	13
Control Panel.....	15
Remote Control.....	16
2. Installation	
Installation Requirements.....	19
Installation Requirements.....	19
Preventing the Deterioration of Sound Quality.....	19
About network Environment.....	20
Operating Environment for This Machine.....	21
Checking the Package Contents.....	26
Using the Menus.....	28
Menu List.....	28
System Settings.....	31
Checking the System Version.....	31
Collecting the Logs.....	32
Firmware Update.....	34
Offline Update Procedure.....	34
Online Update Procedure.....	38
Managing Address Book.....	40

Preparing Address Book.....	40
Import Address Book.....	40
Export Address Book.....	42
Changing Background Image.....	42
Import Background Image.....	42
Delete Background Image.....	43

3. Replacement and Adjustment

Parts Replacement.....	45
SIM Card.....	45
Rear Cover.....	46
Camera Unit.....	46
SSD.....	49
Fan Unit / Main Board.....	50
Microphone.....	51
Speaker.....	53
Key Top Unit.....	53
Front Cover.....	56
Front Cover Parts.....	57
Antenna Module.....	57

4. Troubleshooting

LED Behavior and Meaning.....	61
LED Behavior and Meaning.....	61
LED Type.....	61
LED Behavior.....	61
Error Table.....	63
Boot Sequence and Errors.....	63
When an Acoustic Feedback Noise Can Be Heard.....	66
Network Trouble Shooting.....	69
Problems When Using Unified Communication System Settings.....	73
Restrictions.....	74
Handling This Product.....	74
Wireless Networking.....	74
Cleaning.....	75

Copyright Notice.....	75
Electromagnetic Interference.....	75
Precautions for Use.....	76
System Operations.....	76
PC Screen Share.....	76
Cause of Acoustic Feedback.....	76

1. Product Information

Specifications

1

Item	Specification
Interface	<ul style="list-style-type: none">• Ethernet: 10BASE-T, 100BASE-TX, 1000BASE-T• IEEE802.11n, IEEE802.11a, IEEE802.11g, IEEE802.11b• Encryption method: WEP128bit/64bit, WPA-PSK(TKIP/AES), WPA2-PSK(TKIP/AES), WPA-EAP(TKIP/AES), WPA2-EAP(TKIP/AES)• USB3.0 (type A) ×2• USB3.0 (type B)• Analog RGB (VGA)• HDMI connector
Port	<p>The following port numbers are available for communication (All ports are outbound):</p> <ul style="list-style-type: none">• When no proxy is used Service Network TCP: 80, 389, 443 (Provisioning and Phone book) Calling Network TCP: 1720, 2776, 2777, 5060, 5061 (Signaling) UDP: 10000-65535 (Media) Extra Service UDP: 123 (NTP) UDP: 162 (SNMP trap)• When a proxy is used TCP: 443

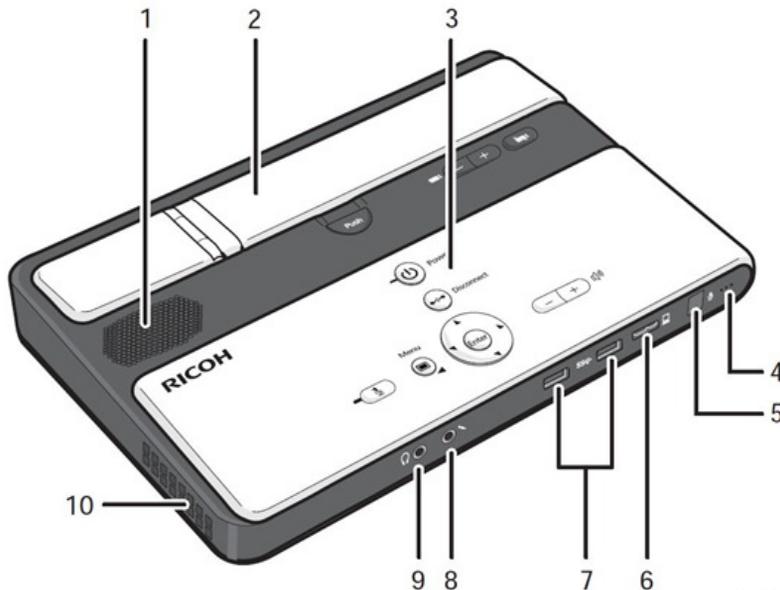
Item	Specification
Network bandwidth	<ul style="list-style-type: none"> • Device License: 1.5Mbps • High Definition mode: 1280Kbps • Medium Definition mode: 768Kbps • Low Definition mode: 384Kbps
Video resolution	<ul style="list-style-type: none"> • High Definition mode: 720 p • Medium Definition mode: 480 p • Low Definition mode: 288 p
Video frame rate	Up to 30 fps
Video mode	HDMI/D-Sub: <ul style="list-style-type: none"> • Output: 800 × 600, 1024 × 768, 1152 × 864, 1280 × 600, 1280 × 720, 1280 × 768, 1280 × 800, 1280 × 960, 1280 × 1024, 1360 × 768, 1366 × 768, 1400 × 1050, 1440 × 900, 1600 × 900, 1680 × 1050, 1920 × 1080 • Input: 720 p
Video coding	VP8
Voice coding	Opus
Data transfer	RTP (RFC1889/RFC3550) and RTCP (RFC1890/RFC3551)

Item	Specification
Automatic camera adjustment	<ul style="list-style-type: none"> • Automatic white balance control • Automatic gain control • Automatic Exposure control • Automatic flickering canceller (50 Hz/60 Hz)
Deployment sound function	<ul style="list-style-type: none"> • Adaptive echo canceller • Noise suppressor • Echo suppressor • Automatic gain control • Non-stationary noise reduction function
Noise	45 dB or less
Power Source	NA: AC120 V (±10%), 15A, 60 Hz (±3 Hz) EU: AC220 (-10%) -240 V (+10%), 2.5A, 50 Hz (±3 Hz) AP: AC110 (-10%) -240 V (+10%), 2.5-15A, 50/60 Hz (± 3 Hz) CHN: AC220 V (+-10%), 10A, 50 Hz (+-3 Hz)
Power consumption	Maximum 66 W or less
External dimensions (W×D×H)	285.0 × 189.0 × 40.0 mm (11.2 × 7.4 × 1.6 inches)
Weight	Approx. 1.6 kg (3.5 lb.)

Overview

1

Front and Top View

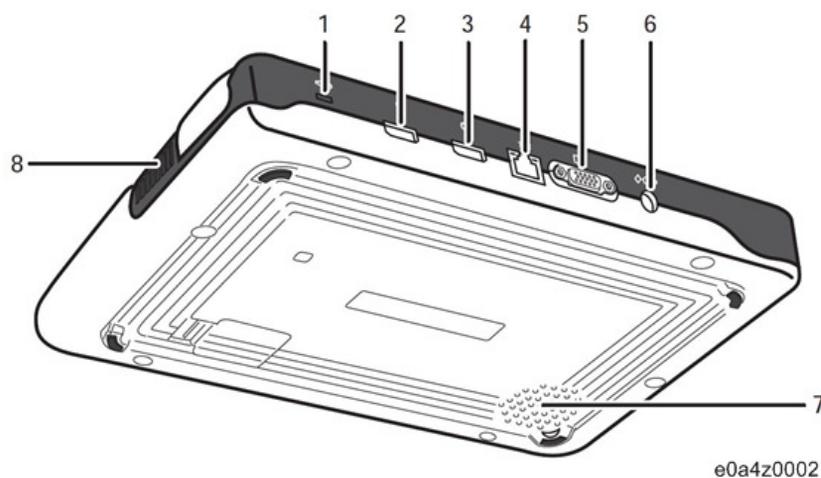


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No.	Name	Main Function
1	Speaker	Outputs audio from other parties.
2	Camera unit	Captures live video that is transmitted to other parties. The camera unit consists of a camera and an arm.
3	Control Panel	Provides a set of keys used to operate the machine.
4	Microphone	Inputs audio from the machine.
5	Remote control light receiver	Receives infrared rays from the remote control.
6	USB port (Micro-B type)	Used to connect the machine to your computer and share the computer screen.
7	USB ports (Type A)	Used to attach an external microphone speaker to the machine.
8	Audio input	Used to connect the machine to the analog audio input device, such as a microphone or headset.

No.	Name	Main Function
9	Audio output	Used to connect the machine to the analog audio output device, such as a headphones or headset.
10	Air outlet	Releases heat from inside of the machine.

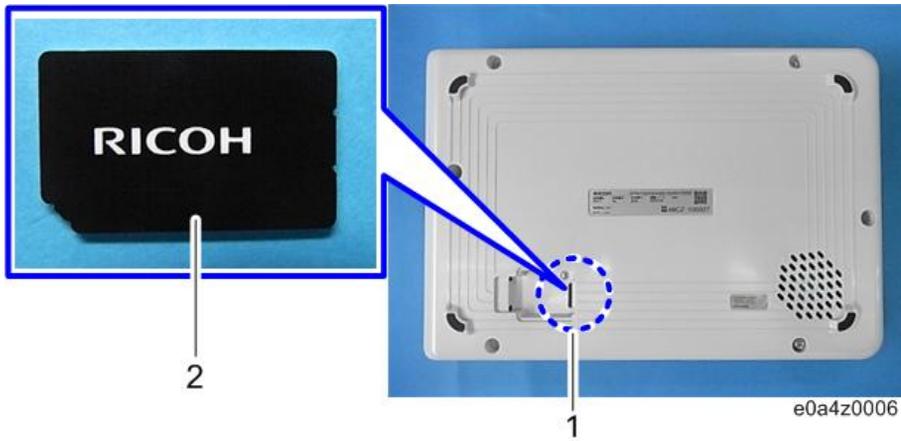
Rear and Bottom View



No.	Name	Main Function
1	Anti-theft lock hole	Hole for connecting the anti-theft chain.
2	HDMI In connector (for video input)	Used to connect a video input device, such as an external camera, to the machine through the HDMI terminal.
3	HDMI Out connector (for video output)	Used to connect a video output device, such as a projector or monitor, to the machine through the HDMI terminal.
4	Ethernet port	Port to which the 1000BASE-T, 100BASE-TX, or 10BASE-T cable connects. This port is used when connecting the machine to a wired network.
5	Analog RGB (VGA)connector	Connector used to connect this machine to a video output device, such as a projector or monitor, via a RGB (VGA) connector.

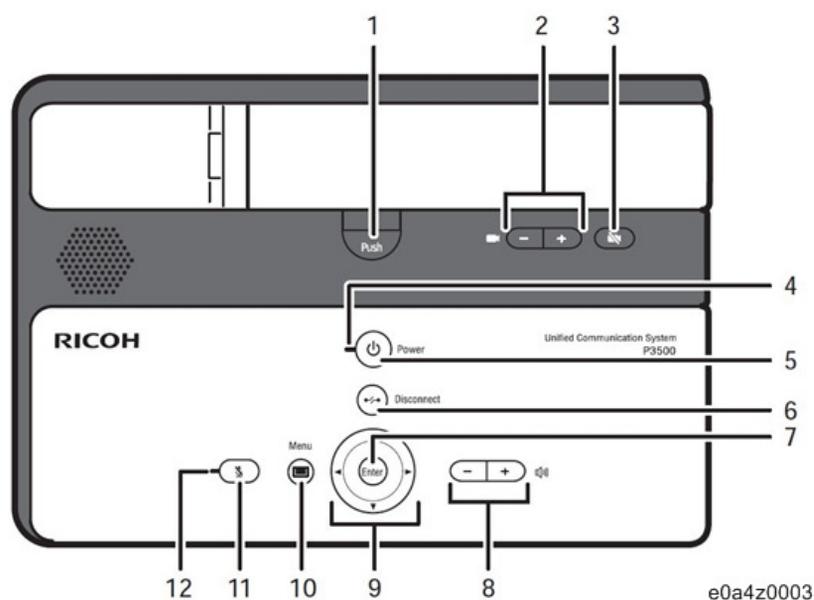
No.	Name	Main Function
6	Power connector	Connector for connecting the power cord.
7	Air inlet	Brings in air from the outside to cool the machine and prevent it from overheating.
8		

SIM Card



No.	Name	Main Function
1	SIM card slot	Slot used to read and write to a SIM card
2	SIM card	Used for Endpoint Subscription authentication.

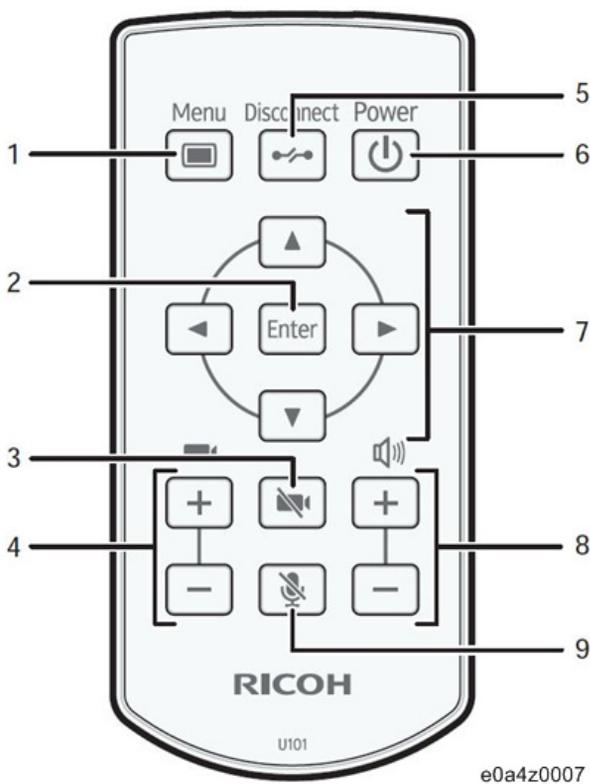
Control Panel



No.	Name	Main Function
1	Push key	Used to raise the camera unit.
2	Zoom keys (− + key)	Used to adjust the zoom of the machine's camera.
3	Camera OFF key	Used to mute this machine's camera.
4	Power indicator	Lights when the machine turns on. This indicator blinks while the machine is starting up or shutting down.
5	Power key	Used to turn the machine on and off.
6	Disconnect key	Used to leave a meeting.
7	Enter key	Used to activate the menu, setting, or set value selected with the cursor keys. This key is also used to connect and leave a meeting.
8	Speaker volume keys (− + key)	Used to adjust the speaker volume.
9	Cursor keys (▲ ▼ ◀ ▶ key)	Used to select a menu, dialog, or setting.
10	Menu key	Used to display the Menu screen.

No.	Name	Main Function
11	Mute key	Used to temporarily disable audio input on the machine.
12	Mute indicator	Flashes if the Mute key is used to disable the microphone.

Remote Control



No.	Name	Main Function
1	Menu key	Used to display the Menu screen.
2	Enter key	Used to activate the menu, setting, or set value selected with the cursor keys. This key is also used to connect and leave a meeting.
3	Camera OFF key	Used to mute this machine's camera.

No.	Name	Main Function
4	Zoom keys (− + key)	Used to adjust the zoom of the machine's camera.
5	Disconnect key	Used to leave a meeting.
6	Power key	Used to turn the machine on and off.
7	Cursor keys (▲▼◀▶ key)	Used to select a menu, dialog, or setting.
8	Speaker volume keys (− + key)	Used to adjust the speaker volume.
9	Mute key	Used to temporarily disable audio input on the machine.

2. Installation

Installation Requirements

Installation Requirements

- Do not use or store this machine in a place that is exposed to soot, cigarette smoke, or any other type of smoke. Doing so may soil the machine, resulting in shorter product life and lower video quality.
- Abrupt changes in temperature may cause drops of water to form inside the machine, resulting in a phenomenon called dew condensation. Continuing to use the machine in this condition may lead to product failure or malfunction. If dew condensation forms, wait until the drops of water evaporate before using the machine.
- Do not use this machine when it is improperly positioned or oriented. Doing so may lead to failure or shorten the product life.
- Route and position the power cord and other cables so that other users do not trip over them. Tripping over the cables may cause the machine to fall, resulting in personal injury.

Use this machine in an environment that meets the following conditions:

Specification	Description
Temperature	<ul style="list-style-type: none">• Operating 10 - 32 °C (50 - 89.6 °F)• Non-operating 0 - 43 °C (32 - 109.4 °F)
Humidity	<ul style="list-style-type: none">• Operating 15 - 80 % (Non-condensing)• Non-operating 10 - 90 % (Non-condensing)
Maximum Altitude	3,048 m (10,000 feet)

Preventing the Deterioration of Sound Quality

- Keep objects that may cause the sound quality to deteriorate away from the microphone or speaker.
- Do not block the microphone and speaker. The sound quality will deteriorate.

- Do not place devices that generate noise, such as projectors or computers, near the machine.
- When using the machine in a room where sound echoes, try keeping your voice as low as possible during meetings to avoid distracting echoes.
- Make sure there is sufficient space between this machine and the wall.
- Keep this machine away enough from the other party's device, for example, when the other party's voice can be heard directly instead of through a speaker.
- Do not move the machine during a meeting.
- If you plan to use an external microphone and speaker, see the manual for details about how to use the device.
- When using an external microphone speaker, keep it away from the air outlet of the machine. Placing an external microphone speaker too close to the air outlet can cause the audio quality to deteriorate.

About network Environment

- A poor network environment can cause delays in video streaming during meetings.
- When using a wireless network, communication quality may deteriorate or communication may be lost, depending on the environment in which the machine is used. If these problems occur, use a wired network instead. To switch to a wired network, you must first turn the machine off and then turn it back on.
- When using a wireless network, radio or electromagnetic interference or weak reception may cause the following problems to occur during meetings:
 - Delays in video streaming.
 - Video is stopped.
 - Audio of other party cuts out.
 - Synchronization between video and audio is lost.
 - Audio quality deteriorates.
 - Meetings are automatically ended or left.
 - Delays in video streaming occur when sharing computer screen.
 - Your video and the other party's video disappear and only audio is heard.
 - Screen image does not display properly when the screen layout is changed.
 - The Site List or contact status do not appear, or it takes longer than expected for each to be displayed.
 - The attempt to update the firmware fails, or it takes an excessively long time for the update to finish.
 - The machine does not start.

- You cannot connect to other party.

Solutions

If you experience one of the problems above, take one of the following actions. The action to be taken depends on the wireless network environment you are using:

- If IEEE802.11b and IEEE802.11g/n are in the same wireless network environment, the IEEE802.11b connection may be used first. The recommended line speed for the machine is 1 Mbps. To use the machine at a stable line speed, we recommend using it in a wireless network environment in which only IEEE802.11g/n is available.
- Avoid environments that have multiple wireless LAN standards.
- Turn off any wireless networking or radio devices that are not being used.
- If there are multiple devices in the environment that support IEEE802.11n, use IEEE802.11n with a single channel.
- Use the machine in an environment with stable reception, making sure to confirm the distance from the access point and check for any obstructions.
- If the environment has multiple wireless LAN standards, change the access point channel. There should be a difference of at least five between the channel settings for each LAN standard. For example, set one standard to channel 1 and the other to channel 6.
- Keep the machine as far away as possible from highly conductive objects such as metal.
- This wireless product uses the 2.4 GHz band. Make sure there is no industrial, scientific, or medical equipment that uses the same frequency band currently in operation, such as a microwave. Interference can cause communication to become unstable. Before using the machine, make sure that there is no equipment around that may potentially cause interference.
- If you experience radio interference or other wireless networking problems, please call the support desk.

Operating Environment for This Machine

The following operating environments are required to use this machine:

Power Source

Specification	Description
Power source	<ul style="list-style-type: none"> • For mainly Europe 220 V - 240 V, 50 Hz • For mainly Asia 110 V, 220 V - 240 V, 50/60 Hz • For mainly North America 120 V, 60 Hz • For China 220 V, 50 Hz

Network

Specification	Description
Interface	<p>Network with one of the following interfaces that can connect to the Internet</p> <ul style="list-style-type: none"> • Wired Network 10BASE-T, 100BASE-TX, 1000BASE-T • Wireless Network IEEE802.11n, IEEE802.11a, IEEE802.11g, IEEE802.11b
Line speed	<p>When High Definition mode is enabled: 720 p</p> <p>When Medium Definition mode is enabled: 480 p</p> <p>When Low Definition mode is enabled: 288 p</p>

Specification	Description
Port	<p>The following port numbers are available for communication (All ports are outbound):</p> <ul style="list-style-type: none"> • When no proxy is used <ul style="list-style-type: none"> Service Network TCP: 80, 389, 443 (Provisioning and Phone book) Calling Network TCP: 1720, 2776, 2777, 5060, 5061 (Signaling) UDP: 10000-65535 (Media) Extra Service UDP: 123 (NTP) UDP: 162 (SNMP trap) • When a proxy is used TCP : 443
Communication frequency	2.4 GHz band, 5 GHz band
Frequency range (Wireless Network)	<p>For mainly Europe and Asia:</p> <ul style="list-style-type: none"> • 2.4 GHz band 2412 MHz - 2472 MHz (Ch1 - Ch13) • 5 GHz band 5.18 GHz - 5.24 GHz (36, 40, 44, 48ch) 5.26 GHz - 5.32 GHz (52, 56, 60, 64ch) 5.5 GHz - 5.7 GHz (100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140ch) <p>For mainly North America:</p> <ul style="list-style-type: none"> • 2.4 GHz band 2412 MHz - 2462 MHz (Ch1 - Ch11) • 5 GHz band 5.18 GHz - 5.24 GHz (36, 40, 44, 48ch) 5.26 GHz - 5.32 GHz (52, 56, 60, 64ch) 5.5 GHz - 5.7 GHz (100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140ch)

Specification	Description
Authentication (Wireless Network)	<ul style="list-style-type: none"> Authentication method Open system authentication, shared key authentication, WPA-PSK, WPA2-PSK, WPA-EAP, WPA2-EAP Encryption method WEP (128bit/64bit), TKIP, AES

Analog Audio Input Device

Specification	Description
Supported device	Microphone, headset, and other devices
Interfaces	Audio input

Analog Audio Output Device

Specification	Description
Supported device	Speaker, headset, and other devices
Interfaces	Audio output

Digital Audio Input/output Device

Specification	Description
Supported device	USB microphone speaker
Interfaces	USB3.0 (type A)

⬇ Note

- You can use the left and right USB ports (A type) on this machine.
- You cannot connect and use an analog audio input/output device and digital audio input/output device at the same time. If the digital audio input/output device is connected, you can only use digital audio input/output device.
- You cannot connect and use two different digital audio input/output devices at the same time.

Video Output Device (Analog RGB/VGA)

Specification	Description
Supported device	Monitor or projector

Specification	Description
Resolution	1024 × 768 pixels (XGA), 1280 × 800 pixels (WXGA)
Interfaces	Analog RGB

Video Output Device (HDMI)

Specification	Description
Supported device	High-definition monitor, projector and other devices
Resolution	800 × 600, 1024 × 768, 1152 × 864, 1280 × 600, 1280 × 720, 1280 × 768, 1280 × 800, 1280 × 960, 1280 × 1024, 1360 × 768, 1366 × 768, 1400 × 1050, 1440 × 900, 1600 × 900, 1680 × 1050, 1920 × 1080
Interfaces	HDMI (type A)

↓ Note

- If a video output device is connected, video is output only to the video output device.
- Some projectors or monitors may not be able to display images from this machine correctly.
- Video output devices that do not meet these operating environment conditions may not be able to display images from this machine correctly.
- A video output device only outputs video.
- An analog RGB (VGA) interface and HDMI interface cannot be used to connect to multiple video output devices at the same time.

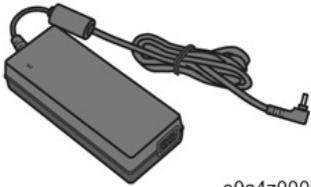
Video Input Device

Specification	Description
Supported device	USB camera
Interfaces	HDMI (type A), USB3.0 (type A)

Checking the Package Contents

The product package contains the following items:

2

Package Contents	
Unified Communication System P3500 (this machine)	 e0a4z0008
AC adapter	 e0a4z0009
Power plug NA: Type A EU: Type C, BF, O, A CHN: Type A	 e0a4z0010
USB cable	 e0a4z0011

Package Contents	
Remote Control	 <p>e0a4z0012</p>
Carry Bag	 <p>e0a4z0013</p>
Quick Guide	
Read This First	
Other documents	
SIM card (Pre-installed in the machine)	

Note

- Use the USB cable to share your computer screen.
- Be sure to use the power cord set and USB cable that come with this machine.
- This machine is factory-shipped with a protective sheet covering the camera lens. Remove the protective sheet from the lens before using the camera.
- When this machine is not being used, store it together with the other accessories (including the power cord set and USB cable) in the supplied bag. Do not store any other items in the supplied bag.
- When placing this machine in the supplied bag, be sure to remove all cables and the power cord set.

Using the Menus

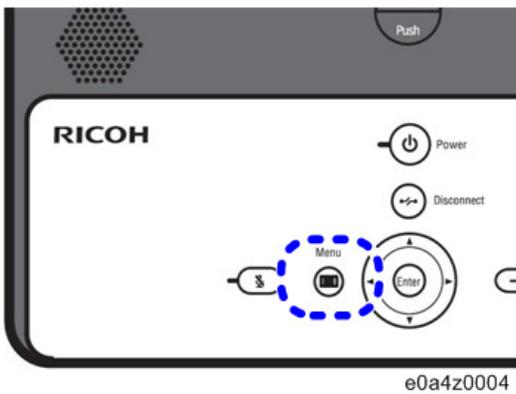
Menu List

2

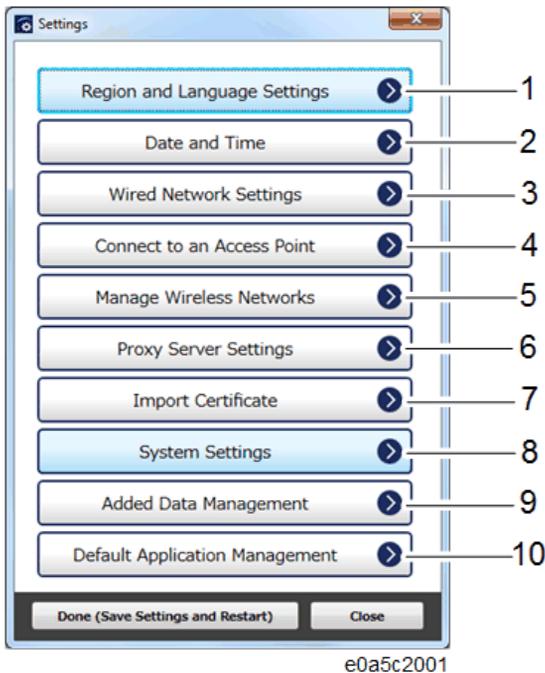
Change the machine settings according to the environment in which the machine is used.

For changing the network settings, ask the network administrator about which settings need to be specified in wired/wireless network settings, and then enter the correct values.

1. Press the [Menu] key.



2. Select the setting menu you want to change.



1	Region and Language Settings	Used to change the region or language.
2	Date and Time	Used to change date, time, or timezone.
3	Wired Network Settings	Used to change the wired network settings.
4	Connect to an Access Point	Used to change the access point.
5	Manage Wireless Networks	Used to change the wireless network settings.
6	Proxy Server Settings	Used to change the proxy server settings.
7	Import Certificate	<p>Used to add or change a certificate.</p> <p>If you change the location or network where you use the machine, you may need to add or change a certificate, depending on the new network environment.</p> <p> Note</p> <ul style="list-style-type: none">• If the network environment requires a certificate, use a USB flash drive to download the certificate from your computer.

8	System Settings	<p>Used to change the system settings.</p> <ul style="list-style-type: none"> • Update system from the network on startup If this check box is selected, the machine will check the server for system updates when it starts up. If an update is available, the system will be updated via the network. Follow the instructions on the screen to update the system files. • Connection Test Used to test whether the machine can connect to the system update server. If your network environment requires proxy server authentication, a dialog box prompting for authentication is displayed. • System update from USB memory Used to update the system files downloaded on your computer. Store the system files in a USB flash drive, and then insert it into this machine. Follow the instructions on the screen to update the system files. • Collect Log Used to collect the logs. Insert a USB flash drive, and then follow the instructions on the screen to collect and save the logs. For details, see page 32 "Collecting the Logs".
9	Added Data Management	<p>Used to managing Address Book.</p> <p>For details, see page 40 "Managing Address Book" and page 42 "Changing Background Image".</p>

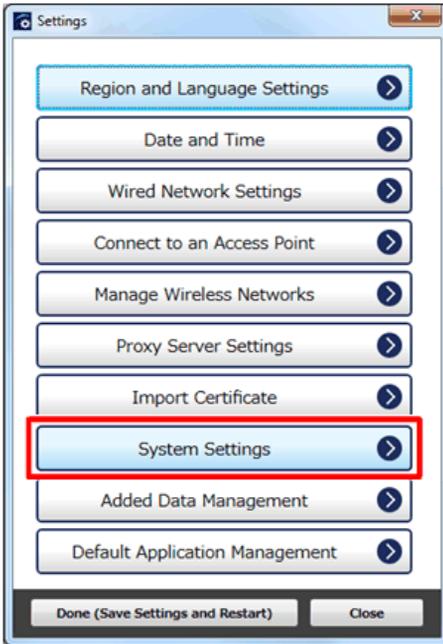
10	Default Application Management	<p>Select the application that you want to display when the machine starts up.</p> <ul style="list-style-type: none"> • Address Book (This Machine) Displays Address Book. If you select Address Book, specify the URL of the page to be displayed when you press [Manual Entry]. • My Meeting Video Displays My Meeting Video using the RICOH UCS Advanced service. For details about the RICOH UCS Advanced service and My Meeting Video, see "Connecting to the RICOH UCS Advanced Service". • Browser (Startup Page) Displays the specified page in the web browser If you select Browser, specify the URL of the page to be displayed.
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System Settings

Checking the System Version

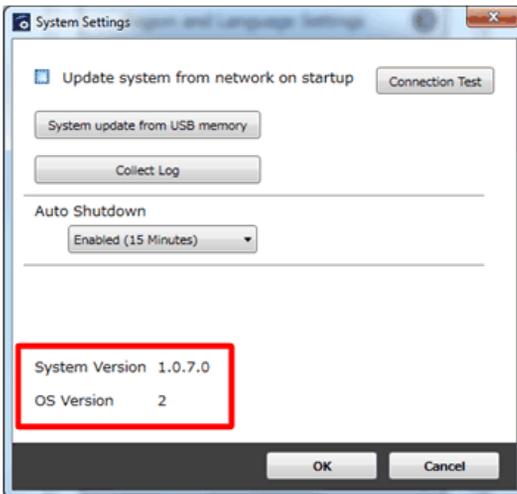
1. Press the [Menu] key.

2. Select [System Settings].



e0a5c2006

3. Check the "System Version" and "OS Version."

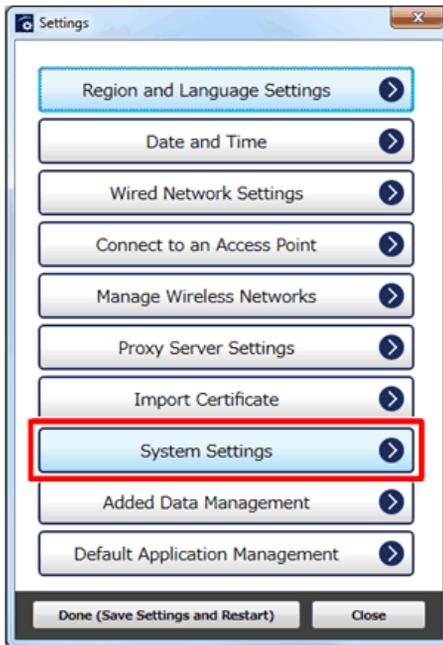


e0a5c2007

Collecting the Logs

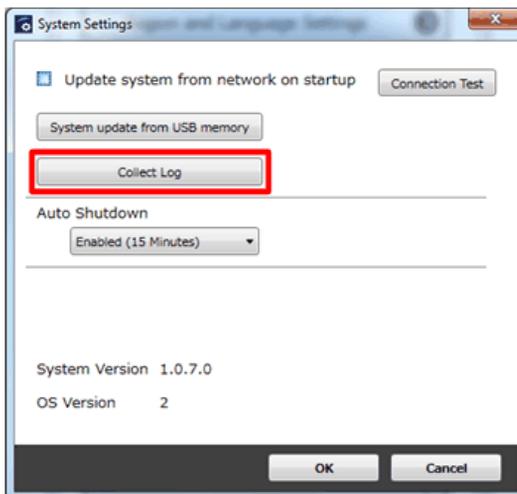
1. Press the [Menu] key.

2. Select [System Settings].



e0a5c2006

3. Select [Collect Log].



e0a5c2008

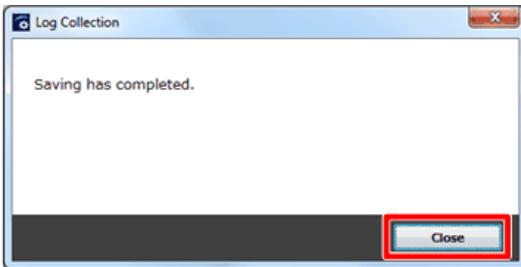
4. Insert the USB flash drive into this machine.

5. Click [OK].



e0a5c2009

6. Click [Close].



e0a5c2010

Log file has been made at to the top directory of the USB flash drive.

Firmware Update

There are two different ways to update the system of this machine.

- Offline update: A USB flash drive is used to update the firmware.
- Online update: Updating works via connecting to network.

Offline Update Procedure

With this update method, a USB flash drive is used to update the system.

Download an available update file on a computer and save the file to a USB flash drive.

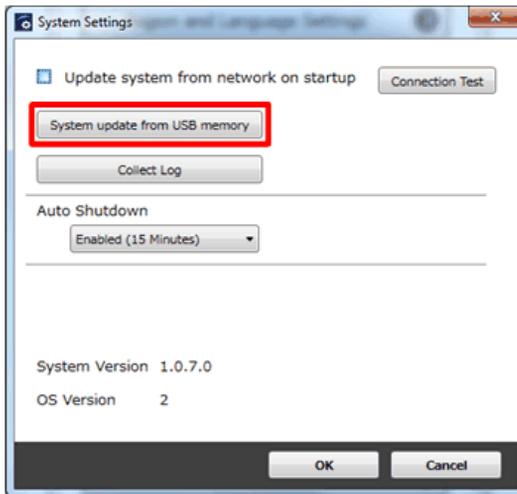
Note

- If an error occurs during the system update, an error message is displayed and the update process is terminated before completion. If this is the case, the system reverts to the version prior to the update.

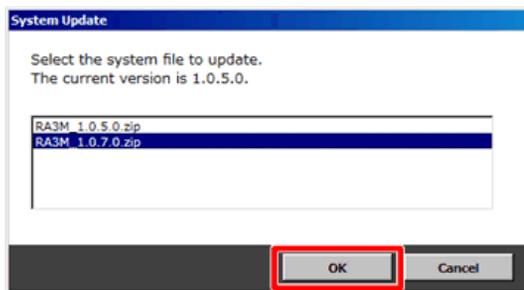
1. On a computer, access the Ricoh home page and download an available P3500M system update file.

2. Save the download system update file to a USB flash drive.

The system update file is a compressed file. Save it to the USB flash drive without decompressing it.

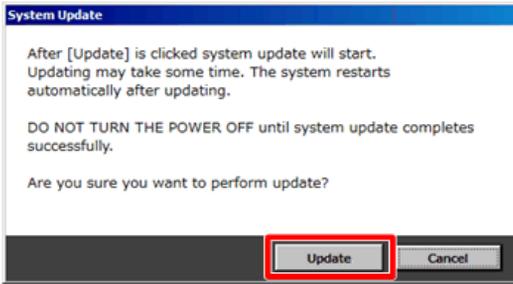
3. Insert the USB flash drive into this machine.**4. Press the [Menu] key.****5. Select [System Settings].****6. Select [System update from USB memory].**

e0a5c2011

7. Select the system update file you want to update, and then click [OK].

e0a5c2012

8. Click [Update].

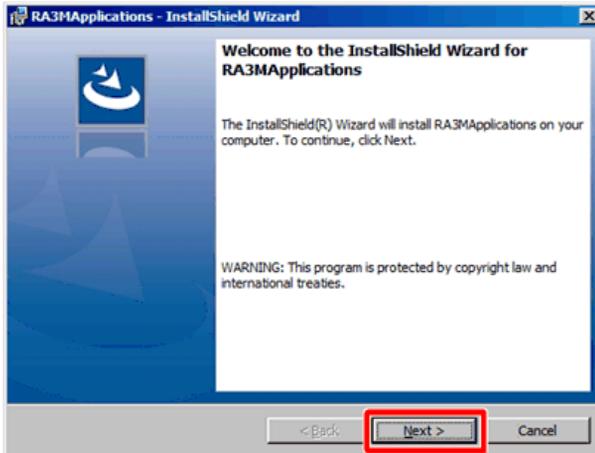


e0a5c2013

If you select system software update, proceed to STEP9.

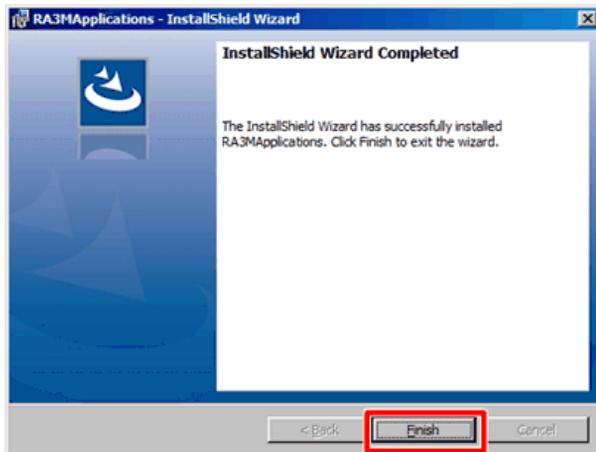
If you select OS update, proceed to STEP11.

9. When the Install Shield dialog appears, click [Next].



e0a5c2014

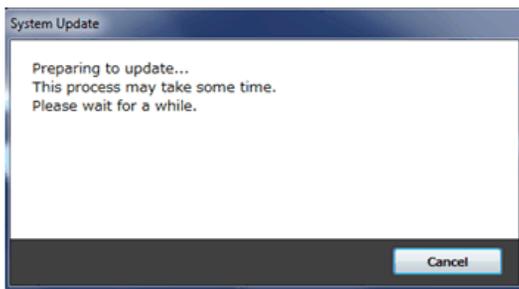
10. Click [Finish].



e0a5c2015

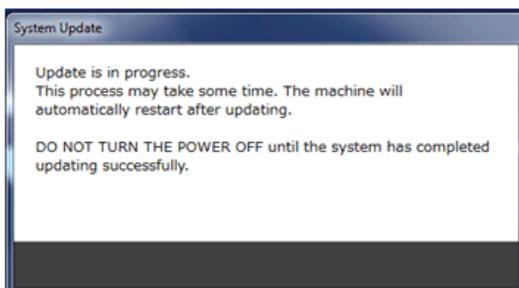
The machine restarts automatically.

If any OS updates are available online, after the machine restarts, the following dialog box is displayed and download will start. When you click [Cancel], return to "Setting" dialog.



e0a5c2016

11. OS update is executed. After the update is completed, the machine restarts automatically.



e0a5c2017

If there is another available update, the update process repeats after machine restarts.

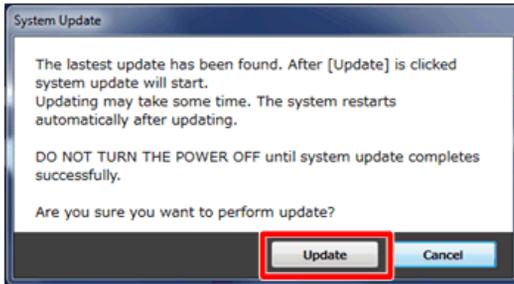
Online Update Procedure

When the machine is "Online," update data is downloaded in the background except for a status of "video meetings."

Only available system update file is downloaded whether OS update exists or not.

2

1. After updating data is downloaded and the machine restarts, then the following dialog box is displayed. Click [update] to start the update.

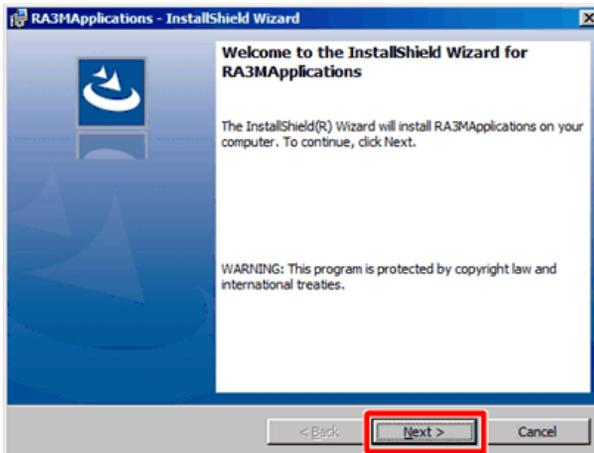


e0a5c2018

If you find system software update, proceed to STEP2.

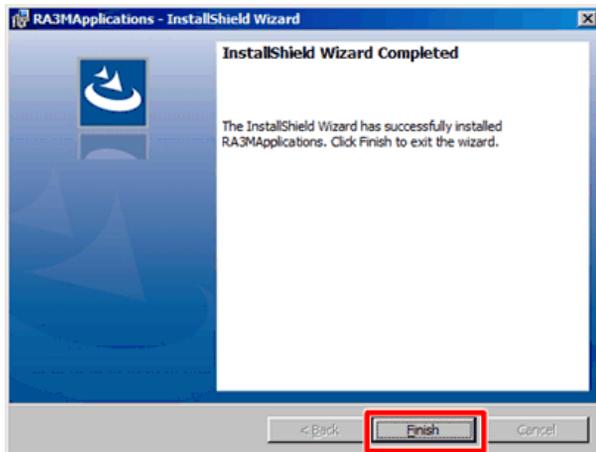
If you find OS update, proceed to STEP4.

2. When the Install Shield dialog appears, click [Next].



e0a5c2014

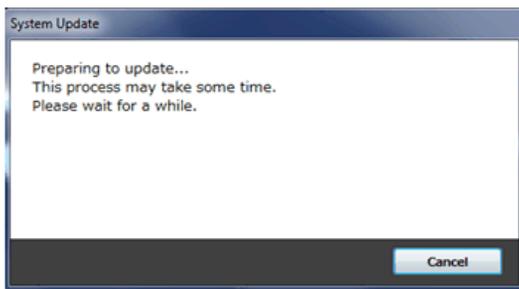
3. Click [Finish].



e0a5c2015

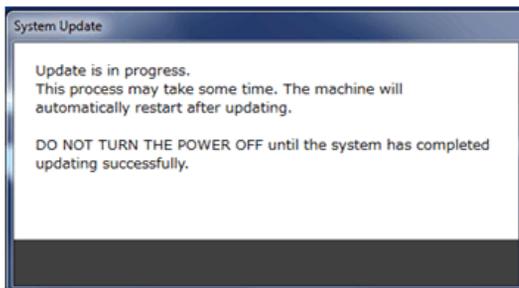
The machine restarts automatically.

If any OS updates are available online, after the machine restarts, the following dialog box is displayed and download will start. When you click [Cancel], return to "Setting" dialog.



e0a5c2016

4. OS update is executed. After the update is completed, the machine restarts automatically.



e0a5c2017

If there is another available update, the update process repeats after machine restarts.

Managing Address Book

Preparing Address Book

You must first create a text file that contains the destination list.

Create a text file (.txt) with tab-separated values and enter the destination address in accordance with the following format.

File name:

Format	rucs-addrbook-*.txt
Example	rucs-addrbook-20160101.txt

Destination address:

Format	Label line: name<tab>url 2nd and subsequent lines: destination name<tab>destination URL
Example	name url Room1 https://url1.com/ Room2 https://url2.com/

To transfer the Address Book file to this machine, save the text file to a USB flash drive.

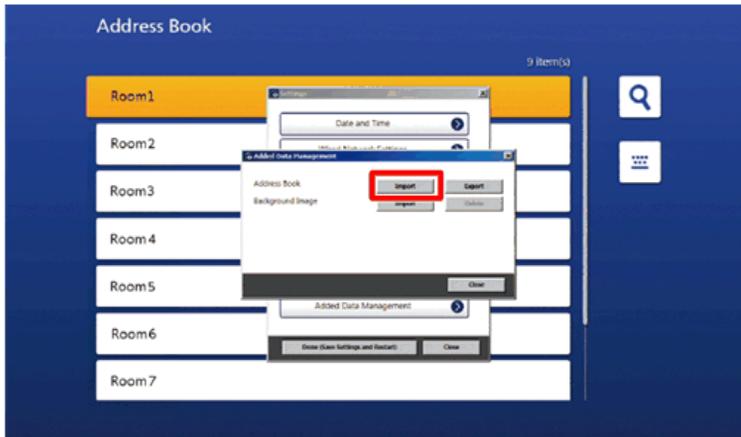
Note

- The destination name is a name displayed in the Address Book application of this machine.
- A destination name can contain one or more spaces. If there is a blank line that only contains spaces and the like, that line and succeeding lines are not registered.
- If there is no destination registered in Address Book, a text file only containing a label line is exported. You can enter destinations into the text file for use.
- To change a specific destination, export the Address Book file, edit or delete the destination line in the file, and then import the edited file into the machine.
- When you import a new Address Book file, any existing Address Book files will be deleted.
- To clear the entire contents of Address Book, import an Address Book file that only contain.

Import Address Book

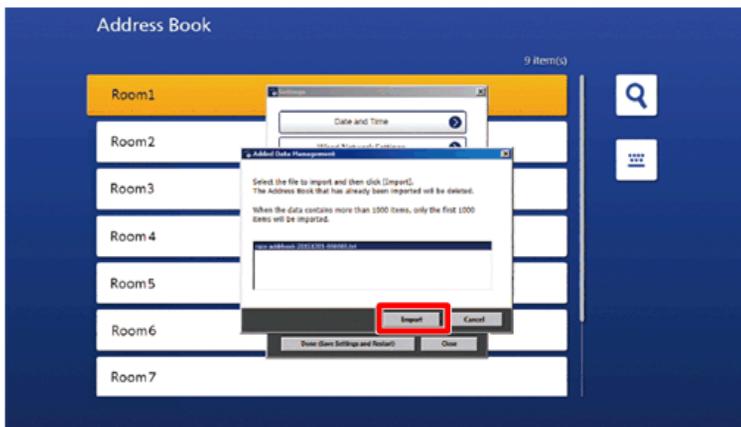
1. Insert the USB flash drive containing the Address Book file into this machine.
2. Press the [Menu] key.

3. Select [Added Data Management].
4. Select [Import] of "Address Book."



e0a5c2002

5. Select the text file you want to import, and then select [Import].



e0a5c2003

If the Address Book file has been imported successfully, a confirmation message is displayed.

6. Select [Close].
7. Select [Done (Save Settings and Restart)].

The machine restarts automatically.

↓ Note

- If an error message is displayed, check the destination addresses in the file and check the file name to make sure they are correct.

Export Address Book

1. Insert a USB flash drive into this machine.
2. Press the [Menu] key.
3. Select [Added Data Management].
4. Select [Export] of "Address Book."

If Address Book is exported successfully, a message will be displayed.

5. Select [Close].

Changing Background Image

You can change the background image in Address book.

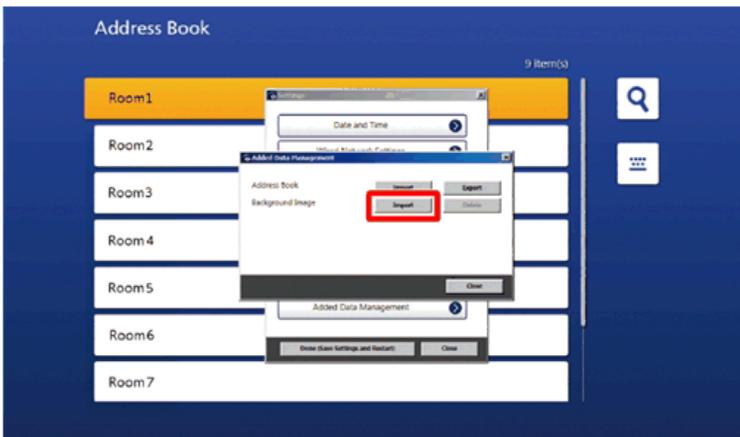
To do so, save the image you want as a JPEG file on a USB flash drive.

Note

- When you import a new background image file, any existing image file is deleted.

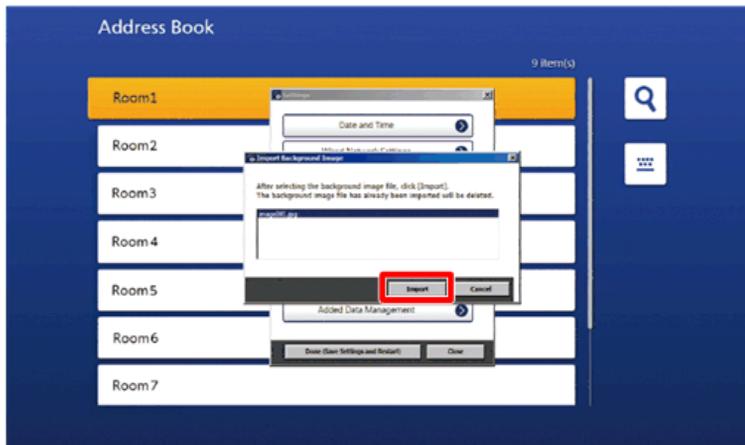
Import Background Image

1. Insert the USB flash drive containing the JPEG file you want into this machine.
2. Press the [Menu] key.
3. Select [Added Data Management].
4. Select [Import] of "Background Image."



e0a5c2004

5. Select the image file you want to import, and then select [Import].



e0a5c2005

If the background image is imported successfully, a message will be displayed.

6. Select [Close].
7. Select [Done (Save Settings and Restart)].

The machine restarts automatically.

Delete Background Image

If the existing background image is deleted, the background of Address Book is reset to the factory setting.

1. Press the [Menu] key.
2. Select [Added Data Management].
3. Select [Delete] of "Background Image."
4. Select [Delete].
5. Select [Done (Save Settings and Restart)].

The machine restarts automatically.

3. Replacement and Adjustment

Parts Replacement

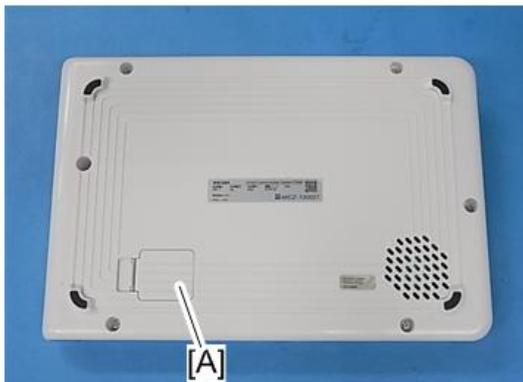
★ Important

- When the user has a device license, the SIM card is pre-installed. Make sure to remove the SIM card before starting the operation. After completing the operation, insert the SIM card again.
- Please never attempt to remove the battery from the main board. If you removed, you can not repair the failure.
- If main board failure occurred, the device must be swapped as the main board can not be replaced.

3

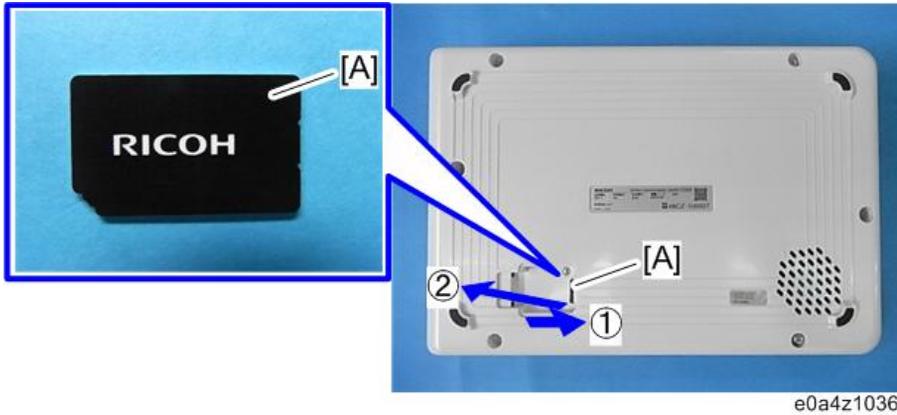
SIM Card

1. Open the SIM card slot cover [A].



e0a4z1035

2. Remove the SIM card [A].



↓ Note

- Push the SIM card, and then pull it.

Rear Cover

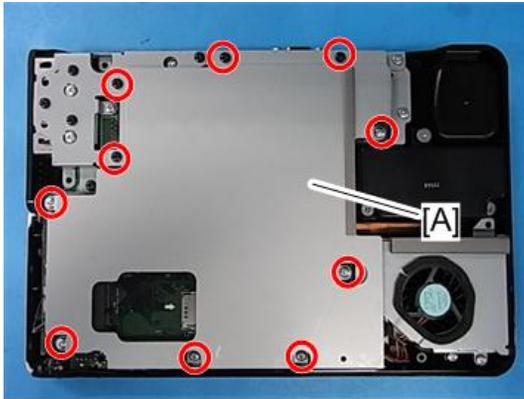
1. Remove the SIM card (page 45).
2. Remove the rear cover [A] (Ⓜ M3×10 Tapping screw×6, Screw×1).



Camera Unit

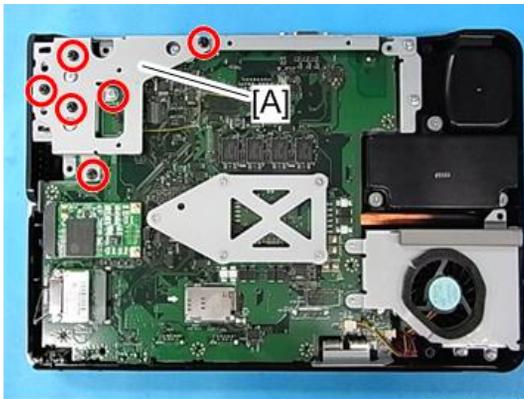
1. Remove the rear cover (page 46).

2. Remove the bracket [A] (⊕ M3×6 Screw×6, M3×4 Screw×4).



e0a4z1003

3. Remove the small bracket [A] (⊕ M3×6 Screw×1, M3×4 Screw×5).



e0a4z1005

4. Remove the right cover [A].



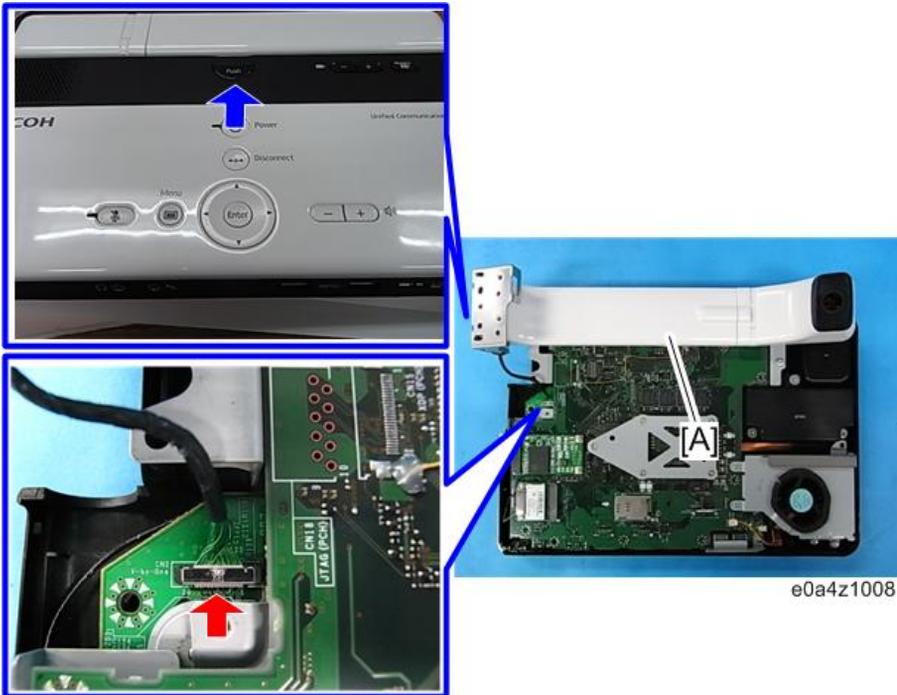
e0a4z1006

5. Remove the screws (🔩 M3×10 Tapping screw×2).



e0a4z1007

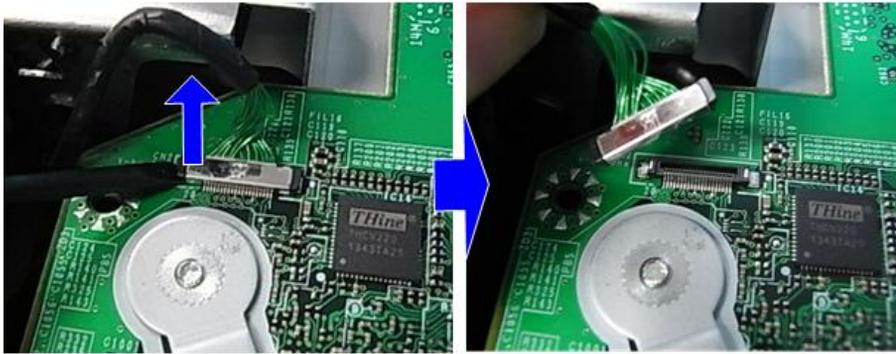
6. Push the "Push" button and remove the Camera unit [A] (🔑 ×1).



e0a4z1008

↓ Note

- When removing the connector, lift the connector by a jeweler's screwdriver.

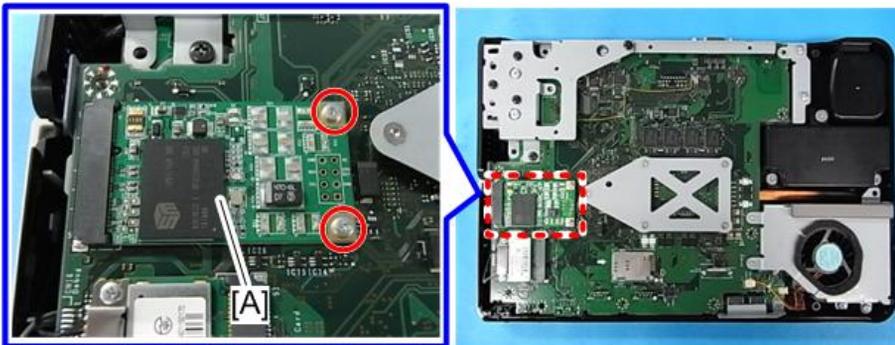


e0a4z1034

3

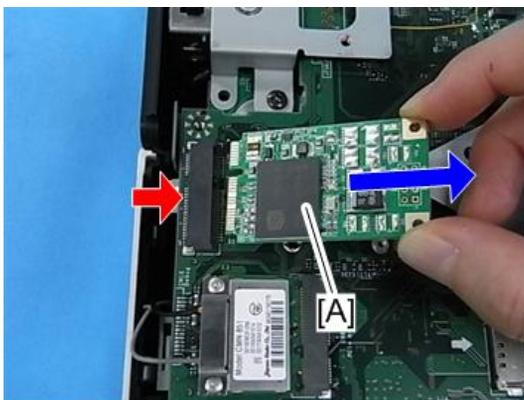
SSD

1. Remove the bracket (page 46).
2. Remove the screws of the SSD [A] (🔩 ×2).



e0a4z1009

3. Remove the SSD [A] (📦 ×1).



e0a4z1010

Fan Unit / Main Board

★ Important

- If main board failure occurred, the device must be swapped as the main board can not be replaced.

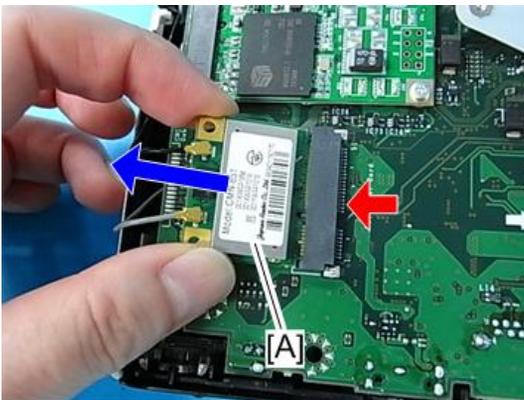
1. Remove the bracket (page 46).
2. Remove the cover [B] of the LAN card [A] (🔩×2).

3



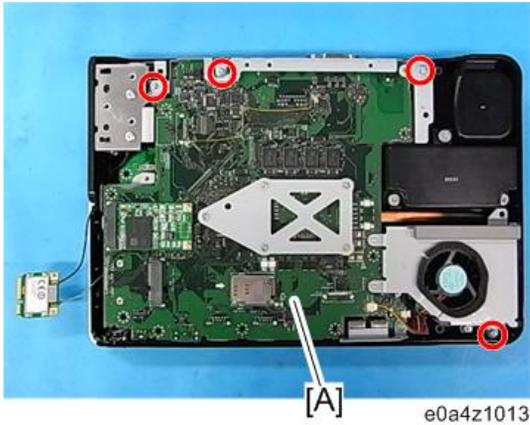
e0a4z1011

3. Remove the LAN card [A] (🔧×1).

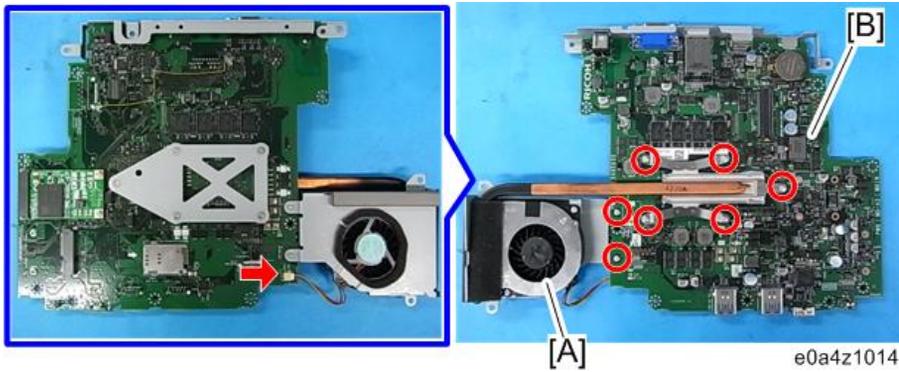


e0a4z1012

4. Remove the main board assembly [A] (⚙️ M3×10 Tapping screw×3, M3×6 screw×1).



5. Remove the fan unit [A] from the main board [B] (⚙️ ×7, 📦 ×1).



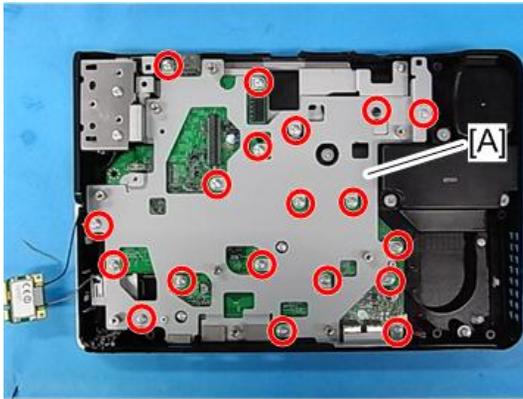
★ Important

- Please never attempt to remove the battery from the main board. If you removed, you can not repair the failure.

Microphone

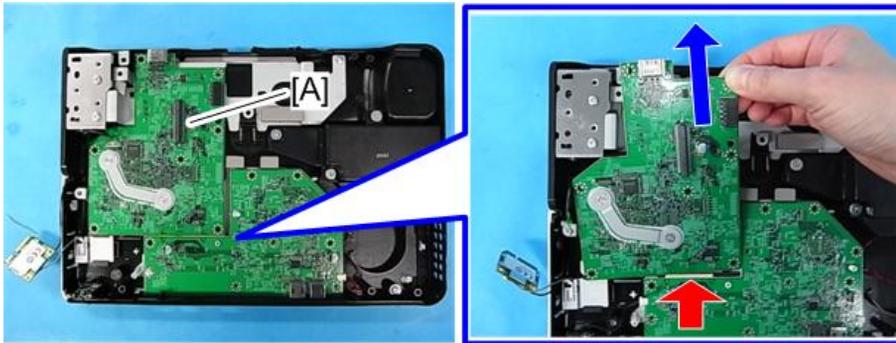
1. Remove the main board assembly (page 50).

2. Remove the bracket [A] (🔩 M3×10 Tapping screw×17, M3×6 Screw×1, M3×4 Screw×1).



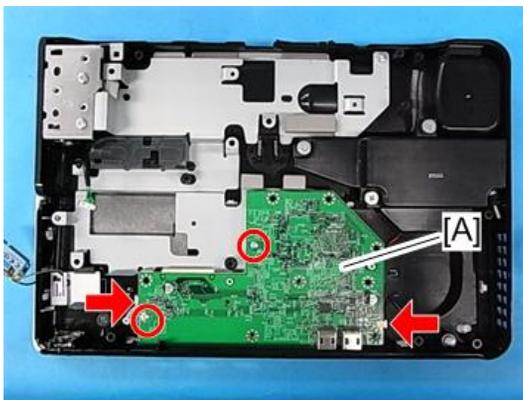
e0a4z1015

3. Remove the image board [A] (🔩 ×1).



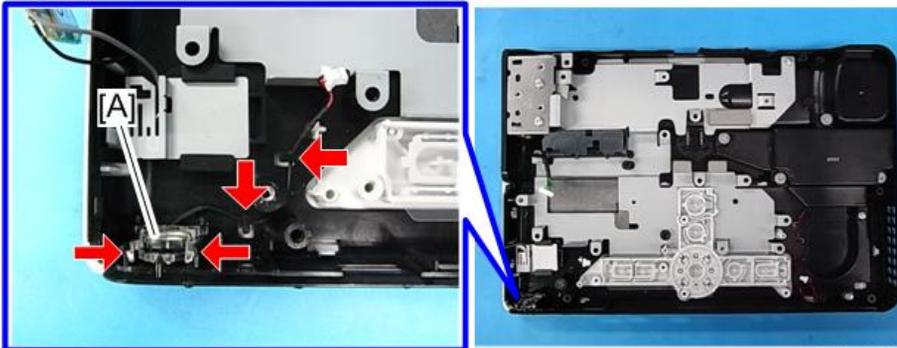
e0a4z1016

4. Remove the audio board [A] (🔩 M3×10 Tapping screw×2, 📦 ×2).



e0a4z1018

5. Remove the microphone [A] (hook×4).



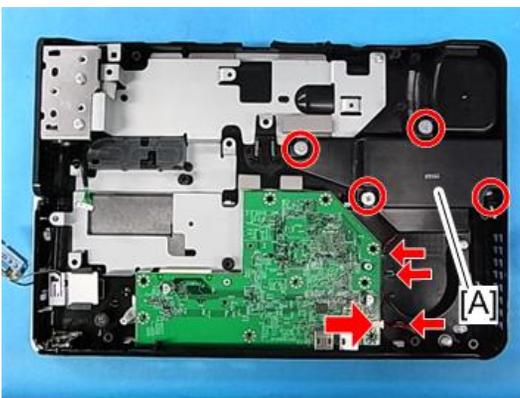
e0a4z1019

⚠ CAUTION

- The microphone harness is thin. When removing the microphone, make sure to hold the microphone by the connector section.

Speaker

1. Remove the image board (page 51).
2. Remove the speaker [A] (🔩 Tapping screw×4, 📦 ×1, hook×3).

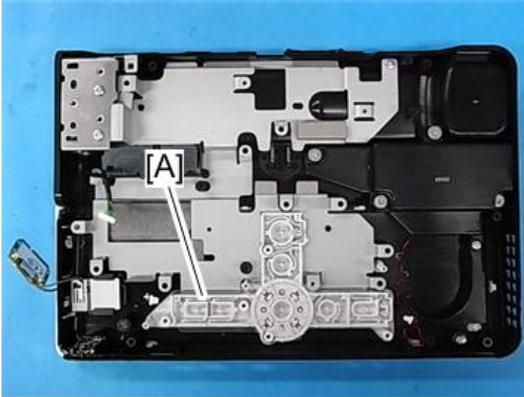


e0a4z1017

Key Top Unit

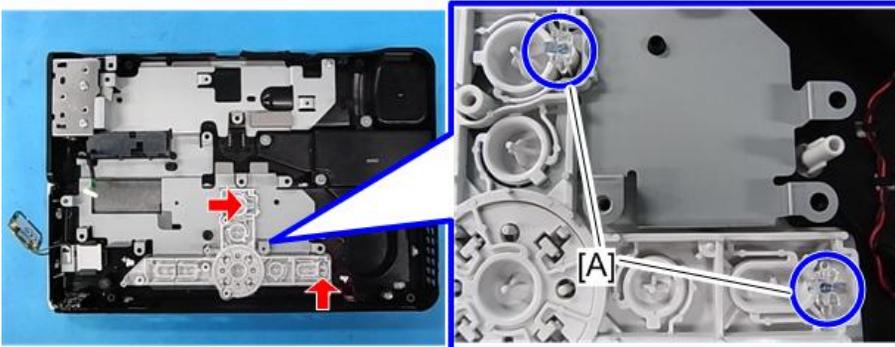
1. Remove the audio board (page 51).

2. Remove the protector film [A].



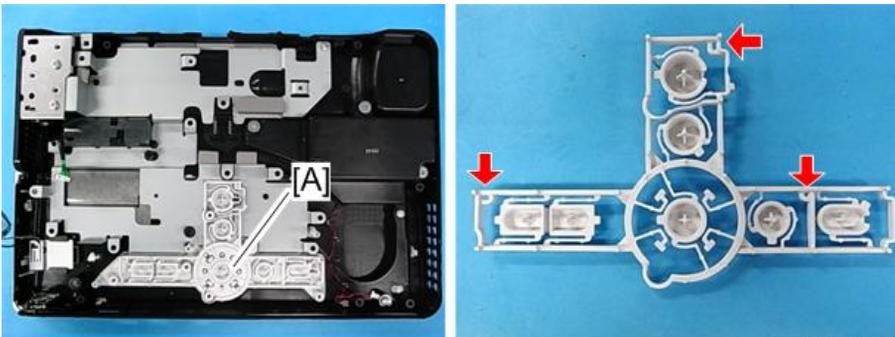
e0a4z1020

3. Remove the lenses [A].



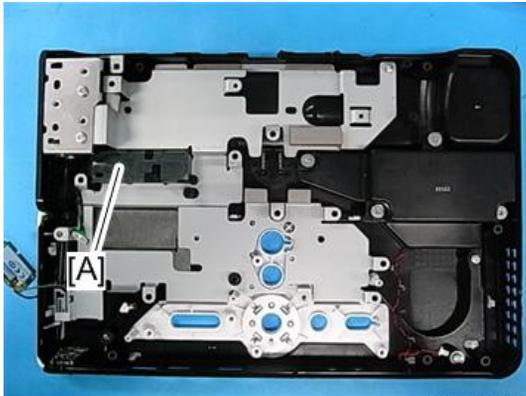
e0a4z1021

4. Remove the key top [A] (hook×3).



e0a4z1022

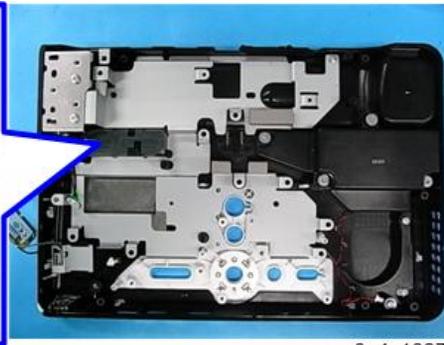
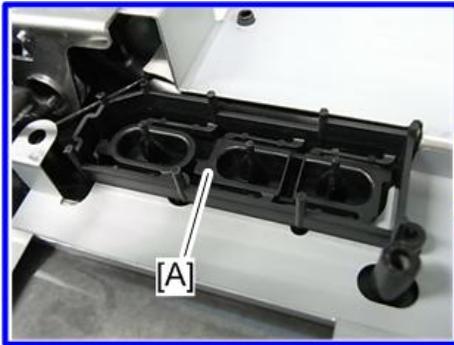
5. Remove the protector film [A].



e0a4z1026

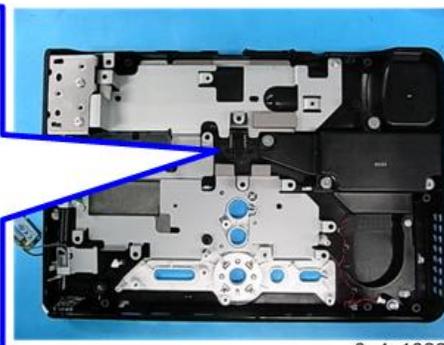
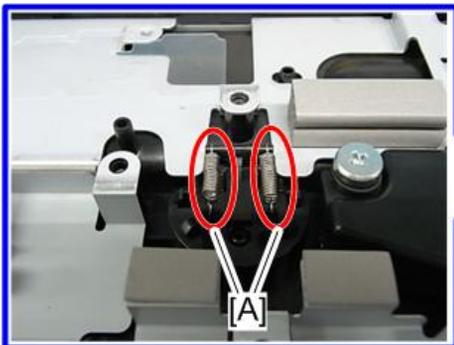
3

6. Remove the key top [A].



e0a4z1027

7. Remove the springs [A] (🌀x2).

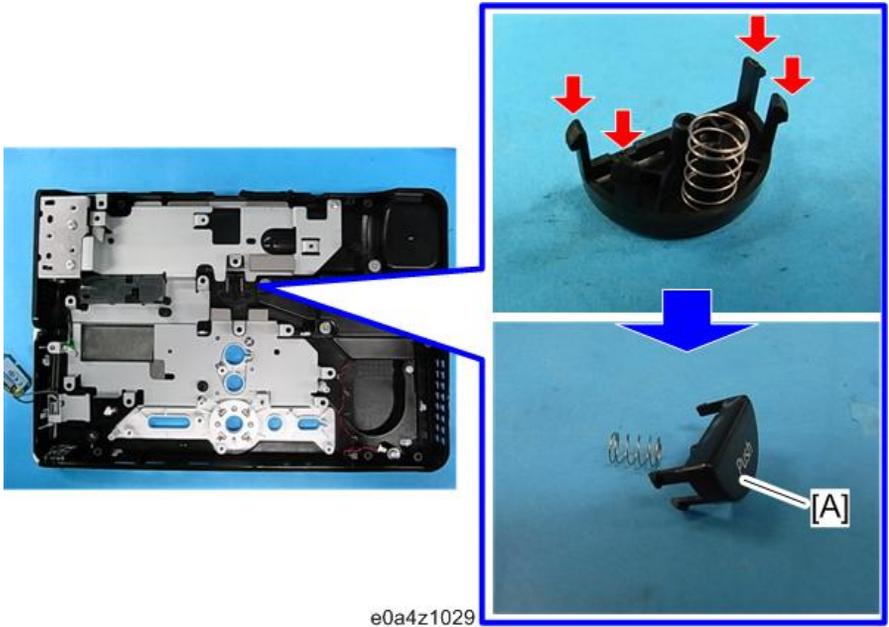


e0a4z1028

↓ Note

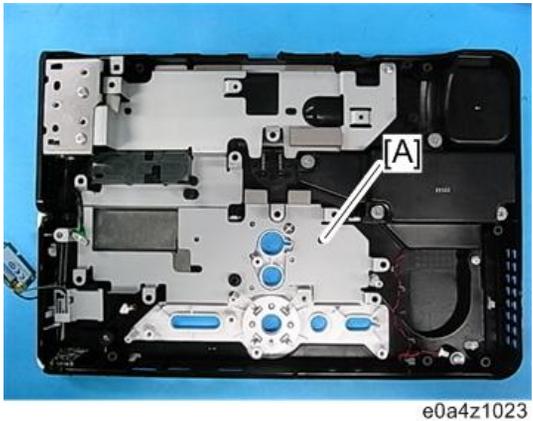
- Take care not to lose these springs.

8. Remove the button [A] (hook×4, ×1).

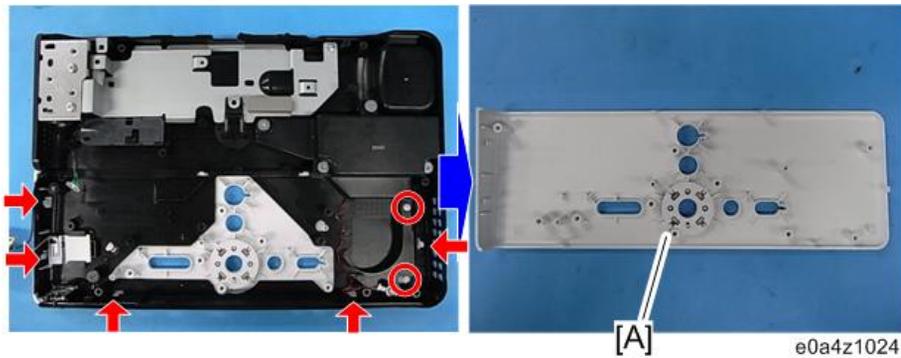


Front Cover

1. Remove the key top (page 53).
2. Remove the bracket [A].



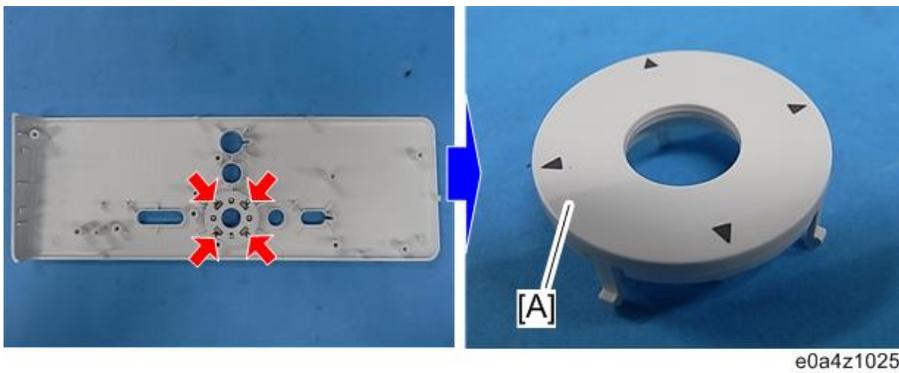
3. Remove the front cover [A] (Ⓜ M3×10 Tapping screw×2, hook×5).



3

Front Cover Parts

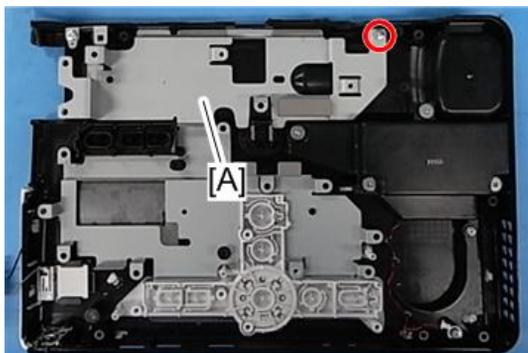
1. Remove the front cover (page 56).
2. Remove the part [A] (hook×4).



Antenna Module

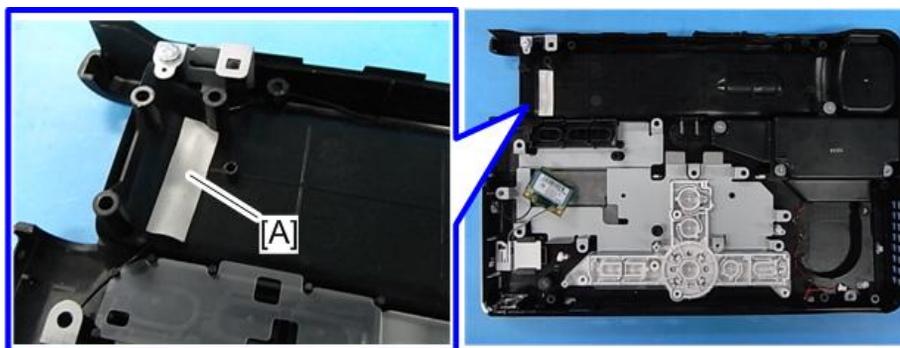
1. Remove the camera unit (page 46).
2. Remove the audio board (page 51).

3. Remove the bracket [A] (⌀M3×10 Tapping screw×1).



e0a4z1030

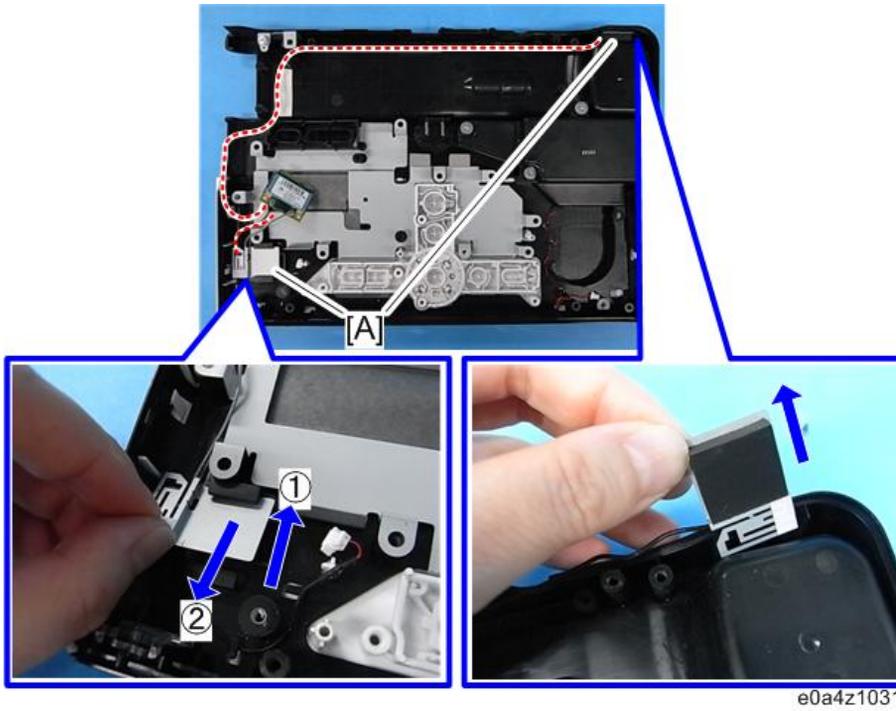
4. Remove the tape [A].



e0a4z1032

5. Remove the antenna modules [A].

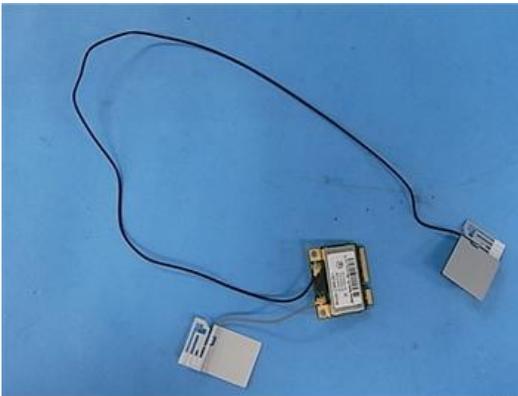
A harness runs along the red-dot line in the picture.



e0a4z1031

↓ **Note**

- Be careful about the handling, because a junction of harness and antenna modules is easy to broken.



e0a4z1033

4. Troubleshooting

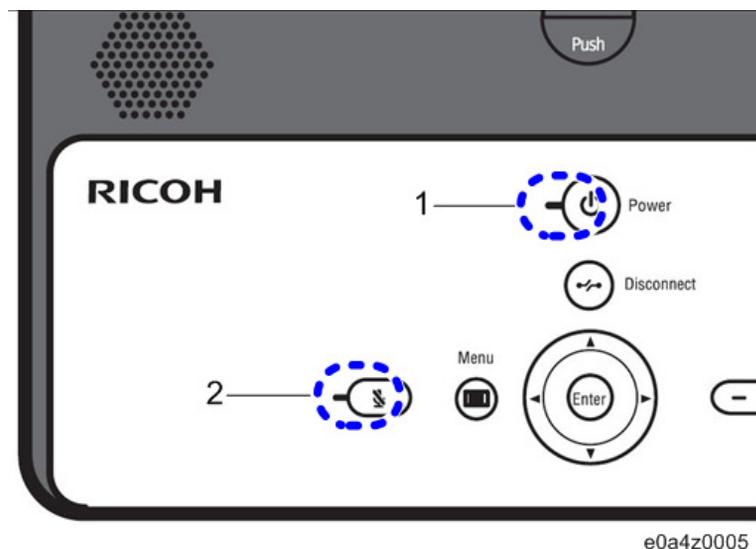
LED Behavior and Meaning

LED Behavior and Meaning

LED Type

No.	Name	LED
1	Power indicator	Blue
2	Mute indicator	Blue

4



LED Behavior

When the machine is turned on, the Power LED lights up for 0.5 seconds to verify they are operating normally.

After the check finishes, the Power LED turn off and the machine starts up.

Power indicator

Status	LED	Interval of blinking
Power off	Not lit	-
Powering up/down	Blinking	0.5 sec
Standby	Lit	-

Mute indicator

Status	Microphone mute: ON	Microphone mute: OFF
Internal mic.	Blinking (Lit for 1.5sec, off for 0.5 sec)	Not lit
External mic.	Not lit	Not lit

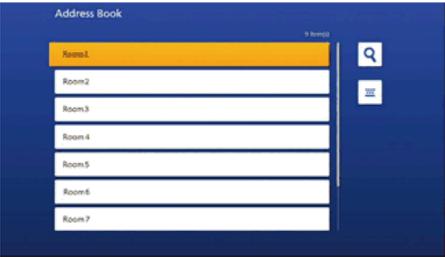
Error Table

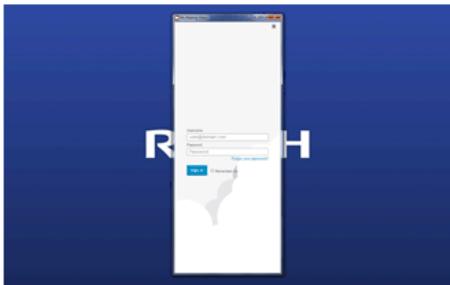
Boot Sequence and Errors

Explanatory notes

No	Normal boot sequence		
	Screen Transition	LED	
		Process	
	Device Errors		
	Symptom	Possible Cause	Workaround

1	Black	Power LED: blinking (0.5sec)	
	 <p>e0a01039</p>	Powering up	
	While powering up, the device stops and the screen remains black.	Possible HW issue.	Swap the device.

2	<p>Logo screen</p>  <p>e0a01040</p>	<p>Power LED: blinking (0.5 sec)</p> <p>The OS is booting.</p>
	<p>While powering up, the device automatically and continuously reboots.</p>	<p>Possible HW issue.</p>
3	<p>Standby screen sample 1 *</p>  <p>e0a5c4001</p> <p>*: The standby screen depends on the user's setting.</p>	<p>Power LED: blinking (0.5 sec)</p> <p>The address book is displayed. The device is waiting for the user to make a selection.</p>
	<p>Screen/video discoloration</p>	<p>Possible HW issue</p> <p>Possible display issue</p>

4	Standby screen sample 2*		Power LED: blinking (0.5 sec)
	 <p>e0a5c4002</p> <p>*: The standby screen depends on the user's setting.</p>		The login screen for my meeting video is displayed. The device is waiting for the user to login.
	Screen/video discoloration	Possible HW issue Possible display issue	Make sure the display works properly. If so, swap the device.
-	-		-
	-		-
	No sound or sound volume is too low to hear.	Possible HW issue Possible FW issue	Swap the device.
-	-		-
	-		-
	Buttons do not work.	Possible HW issue.	Swap the device.
-	-		-
	-		-
	No output from the camera.	Possible HW issue	Swap the device.
-	-		-
	-		-
	The sound/video being received from other parties is not clear.	Possible HW issue Possible FW issue Possible network issue	Make sure the network connection being used by both parties has sufficient bandwidth. If so, swap the device.

-	-		-
	-		-
-	Cannot connect to the network.	Possible network issue Possible HW issue (NIC) Possible FW issue	Once network problems have been ruled out, swap the device.
-	-		-
	-		-
-	No sound.	Possible HW issue Possible FW issue	Swap the device.
-	-		-
	-		-
-	Unable to share a PC screen.	Possible HW issue Possible FW issue PC Screen share driver is not installed	Make sure that the PC screen share driver is installed properly. Once the problems with the PC have been ruled out, swap the device.

When an Acoustic Feedback Noise Can Be Heard

Note

- Because the automatic learning function of the echo canceller is active for approximately 5 to 10 seconds after a meeting starts, you may hear a loud noise or acoustic feedback for a short while. Although this noise dramatically lowers the audio quality and makes it difficult to hear the other party at the beginning of the meeting, there is nothing wrong with the machine.
- The audio quality gradually improves as you continue the meeting and speak with the other party.

If the machine is being used in one of the following locations, move the machine to a different location.

Inappropriate location	Solution	Description
Audio from the other party can be heard directly.	Move away to a place where audio from the other party cannot be heard directly.	Direct audio input from the other party into the microphone produces repeated feedback. This feedback is not canceled by the echo canceller, resulting in an acoustic feedback noise.
The machine is set next to a wall.	Keep the machine away from walls.	If the level of the sound input exceeds the capacity of the echo canceller, some of the echoes cannot be canceled, resulting in an acoustic feedback noise.
The machine is placed next to a device that generates noise.	Keep the machine away from devices that generate noise.	If the volume of noise exceeds the capacity of the noise reduction function used to cancel noise, the remaining noise that is not canceled will generate repeated feedback, resulting in an acoustic feedback noise.
Room that echoes	Lower the volume of the speaker and adjust the orientation of the machine.	If the cycle of the sound input is longer than the cancelable time (up to 128 ms) of the echo canceller, some echoes cannot be canceled, resulting in an acoustic feedback noise. To reduce the amount echoes, lower the volume of the speaker and turn the machine to face a direction in which echoes are not picked up easily.

* This table applies to both the internal and external speaker.
Avoid doing the following things when using the machine.

Inappropriate use	Solution	Description
You have placed your hand or object in front of the microphone.	Do not place your hand or object in front of the microphone.	The echo canceller cannot handle abrupt changes in the acoustic environment and fully cancel echoes, resulting in an acoustic feedback noise.

Inappropriate use	Solution	Description
The machine is moved during a meeting.	Before moving the machine, set Mic Mute to ON. After you finish moving the machine, reset Mic Mute to OFF.	The echo canceller cannot handle abrupt changes in the acoustic environment and fully cancel echoes, resulting in a acoustic feedback noise.
The speaker volume is too loud.	Lower the volume of the speaker.	If the level of sound input exceeds the capacity of the echo canceller, some echoes cannot be canceled, resulting in an acoustic feedback noise. If the speaker output is distorted, the echo canceller cannot handle the distortion, resulting in an acoustic feedback noise.
The external microphone speaker is placed next to the fan outlet of the machine. * Only when an external microphone speaker is being used.	Keep the external microphone speaker away from the fan outlet.	If the volume of fan noise exceeds the capacity of the noise reduction function, the remaining noise that is not canceled will generate repeated feedback, resulting in an acoustic feedback noise.

* This table applies to both the internal and external speaker.
 Echo canceller: Automatically cancels echoes.
 Noise reduction: Automatically cancels noise.

Network Trouble Shooting

For both wired and wireless connections

Questions	Causes	Solutions
The machine failed to start	One of the network settings is incorrect, such as the IP address, subnet mask, or default gateway.	Check the network settings
	MAC addresses are limited. (When using DHCP, the machine fails to obtain an IP address.)	Improve the ambient environment. Register additional MAC addresses.
	<ul style="list-style-type: none"> • A required proxy server setting is not specified. • A proxy server is specified even though it does not exist. • A proxy server setting is incorrect. 	Review the proxy server settings.
	<p>When using a fixed IP address and a proxy exists:</p> <p>The proxy server name has not been resolved by DNS.</p>	<p>Configure the PC to use the same DNS and proxy server settings, and then use a browser to check whether it passes proxy authentication.</p> <p>Configure the DNS settings so that DNS can resolve the proxy server name.</p>

Questions	Causes	Solutions
Failure to start a meeting	<p>The mandatory network ports are closed. Please confirm following ports are opened.</p> <ul style="list-style-type: none"> When no proxy is used: TCP: 80, 389, 443, 1720, 2776, 2777, 5060, 5061 UDP: 10000-65535 When using a proxy: TCP: 443 <p>Remarks: Under no proxy environment, users can connect to the meeting at least TCP443 is opened.</p>	<ul style="list-style-type: none"> When no proxy is used: Please ask the users to download "Activate Endpoint" from https://adv.ucs.ricoh.com/download. Save it on their computer and run it. Click "START TEST" and check ports are opened. If not, please ask to work with their network administrator for troubleshooting. If ports are opened, then network might be unstable so please wait for a while then retry. When using a proxy: Network might be unstable so please wait for a while then retry.

For wired connections only

Questions	Causes	Solutions
The machine failed to start	The cable is broken or the hub has failed.	<p>Improve the ambient environment.</p> <ul style="list-style-type: none"> Check whether the indicator LED for the port is on. If the LED is off, replace the cable or reconnect it to a different port on the hub. If the hub has failed, replace it. Check whether the cable latch and connector are firmly engaged. Do not use a cable that has a broken latch.

Questions	Causes	Solutions
The machine failed to start A PC can connect to a network with the same network settings.	The spanning tree function of the switch connected to the MD discards the request issued when the meeting is started.	<p>Improve the ambient environment.</p> <ul style="list-style-type: none"> • Install a hub between the switch and MD. • Disable the spanning tree function on the port of the switch connected to the MD. (You must check with the network administrator to determine whether this can be done.)

For wireless connection only

Questions	Causes
The video stream of the meeting stops.	This is a video specification limitation. If there is a lack of bandwidth for wireless communication, the video becomes still gray image and only the audio is played.
The video as if it is being played frame by frame.	The lack of bandwidth during wireless communication causes the frame rate to decrease.
The audio cuts in and out.	This problem occurs because electromagnetic interference and a lack of bandwidth causes wireless communication to be temporarily lost.
The video and audio fall out of sync, with the audio being heard first.	Lip sync (for synchronizing video and audio) does not work properly because there is a lack of bandwidth for wireless communication.
There seems to be an echo in the audio.	The echo canceling function fails to work properly because there is a lack of bandwidth for wireless communication.
The meeting ends or is left abruptly. (This occurs when video and audio are lost for approximately five seconds.)	This problem occurs because electromagnetic interference and a lack of bandwidth causes wireless communication to be temporarily lost. As a result, the machine becomes disconnected from the access point.
A delay occurs when PC Screen Share attempts to switch to a different screen.	This problem occurs because there is a lack of bandwidth for wireless communication.

Questions	Causes
<p>The firmware update takes longer than expected, and fails before it is complete.</p>	<p>This problem occurs because the wireless communication speed decreases when there is a lack of bandwidth for wireless communication. This results in electromagnetic interfere that causes wireless communication to be temporarily lost.</p>
<p>There are times the machine fails to start.</p>	<p>This problem occurs as result of electromagnetic interference that prevents the machine from connecting to the access point while starting (50-second timeout).</p>
<p>There are times the machine fails to connect.</p>	<p>This problem occurs because not enough bandwidth (300 kbps or more) can be reserved when starting a meeting.</p> <p>Note</p> <ul style="list-style-type: none"> If the bandwidth is 384kbps or less, the network connection may be failed or the meeting may be disconnected.

Solutions

To fix this problem, the following measures can be performed on the terminal side:

- Switch to a wired communication
- Do not use a proxy server.
- Place the machine as close as possible to the access point.

Improve the ambient environment.

- Turn off any unused wireless LAN devices or other devices using the same frequency range (such as a microwave oven), or eliminate the electromagnetic interference.
- Use a network projector. If any of the Questions on “For wireless connection only” occurs, disable the wireless LAN function of the projector.
- If multiple access points exist, specify channel settings that are at least five channels apart (for example, 1ch and 6ch, or 7ch and 12ch).
- Keep conductive objects such as metal away from the machine.
- Do not obstruct the access point (such as setting the access point near a wall, standing in front of the access point, or placing furniture in front of it).
- Do not use an IEEE802.11b wireless LAN device. (In a wireless environment in which both 11b and 11g exist, packet control is implemented to avoid packet conflicts, which in turn causes the speed to decrease. There are also times 11b is used for communication because it has a lower rate.)
- If an access point that supports IEEE802.11n is available, use Single Channel (20 MHz).

Problems When Using Unified Communication System Settings

Problem	Possible cause/location	Solution/Judgment
The screen sharing software does not start automatically.	An appropriate USB driver is not installed.	Install the appropriate USB driver.

Restrictions

Handling This Product

Do the following when moving the machine:

- Turn off the machine and disconnect the power plug from the power connector.
- Disconnect all cables connected to the machine.
- Return the camera to the closed position.
- Do not attempt to raise or move this machine by the camera unit.
- To carry the machine by hand:
 - Use the bag that comes with the machine.
 - When traveling by plane, take this machine onboard as carry-on luggage.
- To transport the machine:

This machine contains many glass and precision parts. To prevent the machine from being damaged by excessive shock, make sure to do the following:

- Wrap the machine in a cushioning material to prevent it from being directly exposed to shock.
- Place the machine in the supplied bag and pack it in the original box or a sturdy cardboard box.
- Inform the transport company that the machine is breakable.
- For more information about transporting the machine, consult the transport company.

Avoid contact with rubber and plastic materials for an extended period of time. Doing so may lead to discoloration or cause the exterior coating to peel off.

Do not use this machine for an extended period of time. Doing so may lead to failure or shorten the product life.

Wireless Networking

- This product features a certified construction. Disassembling or modifying this product without permission may be punishable by law.
- Before using a wireless LAN, make sure there is nobody with a pacemaker nearby. This product may cause pacemakers to malfunction due to electromagnetic interference.
- Before using a wireless LAN, make sure there is no medical equipment nearby. This product may cause medical equipment to malfunction due to electromagnetic interference.

- Before using a wireless LAN, make sure there are no limitations or restrictions in the place you will be using it. There may be restricted use in places such as medical facilities due to electromagnetic interference.
- Do not use a wireless LAN if there is electromagnetic interference from other equipment. Doing so may cause an accident due to the other equipment malfunctioning from the electromagnetic interference.

Cleaning

- Never use benzene or thinner to clean the machine. Doing so may lead to deformation, discoloring, or cause the exterior coating to peel off.
- Do not use a chemically treated cloth.
- Periodically remove the dust that accumulates in the air outlet. If the air outlet becomes clogged, the flow of air inside the machine decreases. Poor air flow can result in failure.

Copyright Notice

Using this machine to perform any of the following acts, without permission from the copyright holder, for purposes other than personal use may constitute an infringement on the copyright and/or neighboring rights of the commercial video software or cable broadcasting program. These acts include broadcasting or transmitting commercial video software or cable broadcasting programs, modifying videos, such as by freezing, or resizing videos to be displayed in an aspect ratio different from the original. To avoid the risk of possible infringement, we advise you to obtain permission from the copyright holder and take all other measures necessary before performing any of the above-mentioned acts.

Electromagnetic Interference

1. Interference may occur if the machine is placed next to other electronic devices.
In particular, noise may be generated if the machine is placed near a television or radio.
If noise or interference occurs, take the following actions:
 - Place the machine as far away as possible from the television or radio.
 - Readjust the direction of the television or radio antenna.
 - Use different AC outlets.

Precautions for Use

1. A separate video output device (such as a monitor or projector) is required in order to use this product.
2. Be sure to use the power cord set and USB cable included with the machine.
3. Pack and store the machine together with the power cord set, USB cable, and Quick Guide in the supplied bag. Do not store any other items in the supplied bag.

System Operations

1. Wireless

If there are many wireless LAN access points near the machine, it may fail to connect to wireless LAN (or may fail to start up as a terminal).

PC Screen Share

1. Screen Sharing

Translucent windows cannot be shared.

* If Windows Aero is enabled, a translucent window can also be shared.

2. Performance

The frame rate may drop to 5 fps or less due to network delays or high resource load inside the machine.

Cause of Acoustic Feedback

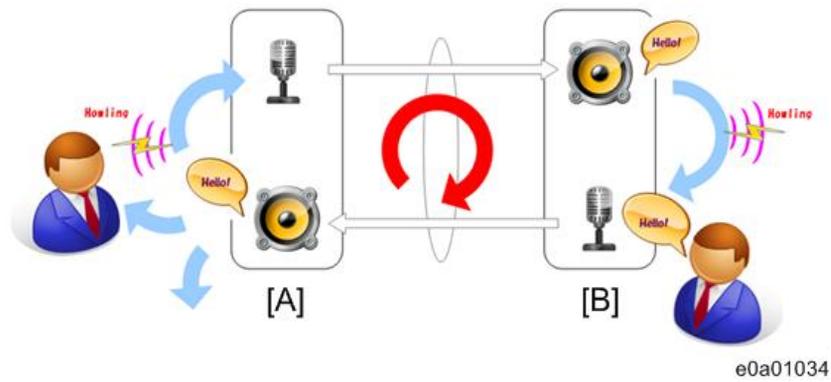
The common cause of acoustic feedback in a karaoke room or hall is illustrated below.



e0a01035

Acoustic feedback occurs when sounds from the speaker diffract and surround the microphone at the same time as when the same speaker produces echoes.

The cause of acoustic feedback during video conferencing is illustrated below.



[A] : Listener

[B] : Person talking

Acoustic feedback occurs when the voice of the person talking (including ambient noise) diffracts through the speaker and microphone on the listener side at the same time as when the speaker on the side of the person talking produces echoes.

MEMO

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