RION CO., LTD.

Multi Function Measuring Systems

RIONOTE

Instruction Manual



Manuals Provided with The unit

The following manuals are provided with the unit.

RIONOTE Instruction Manual (This Manual)
Explains the functions, operating and setup procedures of the RIONOTE.
It also describes how to operate and configure the Waveform Recording Program "SX-A1WR".

HTML for Instruction Manual Application
The HTML help that describes settings for RIONOTE and SX-A1WR. This help can be viewed using the Instruction Manual Application provided with the unit. Also, the online help that converts the HTML for Instruction Manual Application into a chm file is included in the CD-ROM provided with the unit.

* Viewing the chm file
  If nothing is displayed by opening the online help file (*.chm), right-click the file, select Properties, and click the "Unblock".

Overview of This Manual

This manual mainly describes the functions and operations of RIONOTE and SX-A1WR. When the measuring system is used with another device, be sure to read the manual of the device for the operation. The iii and subsequent pages provide safety precautions. Be sure to read them before use.

This manual contains the following sections.

Preparation Before Use

Part Names and Functions
Describes the names and functions of ports and other parts of RIONOTE.

Attaching/Removing the Battery
Describes how to attach or remove the battery.

Charging
Describes how to charge the battery.

SD memory card
Describes how to attach or remove a SD memory card.

Amplifier unit
Describes how to attach or remove the amplifier unit.

Powering On/Off
Describes how to power on/off RIONOTE.

Auto Screen Off
Describes the function of auto screen off.

Connecting External Devices
Describes the ports of the amplifier unit and connection of sensors.

Connecting the Voice memo microphone/Earphones
Describes how to connect a voice memo microphone or earphones.

Connecting to Computer
Describes how to connect RIONOTE to a computer.

Configuring The unit

HOME Screen

Describes the RIONOTE HOME screen and operations on the screen.

Configuring The unit

Describes the RIONOTE settings.

Amplifier Unit Management

Describes the settings or operations related to the connected amplifier unit.

Configuring the Calibration

Describes the settings or operations on the Input settings screen.

Managing the Program/System

Describes the program/system related operations such as installing a program on RIONOTE and upgrading the system version.

SA-A1 File Converter

Describes how to install or operate the SA-A1 file converter.

Specifications

Provides the RIONOTE specifications.

Waveform Recording Program SX-A1WR

SX-A1WR Overview
Describes the overview of this program.

Screen Layout
Describes the layout of the screen displayed.

Starting/Exiting the SX-A1WR
Describes how to start and exit this program.

Measuring Wave
Describes the measurement related operations using this program such as how to start and stop measurement.

Voice Memo/Marker
Describes the voice memo and marker.

Operating the Project
Describes the project related operations such as how to open and delete a project.

Operating Recall Screens
Describes the operations on the Recall screen.

Operating Graphs
Describes the graph operations on the Measurement or Recall screen.

Settings
Describes how to configure the setting items on the Measurement settings screen.

WAVE File Format
Describes the WAVE file format used for saving.

Approximate recording times
Provides the approximate recording times available with an SD memory card inserted in the unit

Specifications
Provides the specifications of this program.

* Company names and product names mentioned in this manual are usually trademarks or registered trademarks of their respective owners.

Safety Precautions

Disclaimers

- RION Co., Ltd. will not be liable for any damages arising from natural disasters such as earthquakes, lightning, storms and floods, as well as fires through no fault of RION Co., Ltd., acts by third-parties, other accidents, improper use by the user, whether intentionally or negligently, or use under other abnormal conditions.
- RION Co., Ltd. will not be liable for any incidental damages arising from the use or inability to use the unit (such as corruption or loss of recorded data, lost business revenue, or suspension of business operations).
- RION Co., Ltd. will not be liable for any damages arising from use not in accordance with the instructions in this manual.
- RION Co., Ltd. will not be liable for any damages arising from malfunctions caused by use in combination with any connected equipment and/or software not authorized by RION Co., Ltd.
- RION Co., Ltd. will not be liable for any damages or lost revenue resulting from recovery of recorded data that is corrupted or lost due to failure, repair, or other operations of the unit .

For Safe Operation

Explanation of Displays and Symbols

The following messages are displayed in this manual to warn and protect users from potential danger:
These are necessary to secure the lives and health of the user and prevent the unit and peripheral equipment from being damaged.

Note	- Disregarding such information may cause injury to people or damage to equipment around them.
Important	- Disregarding such information may cause malfunction of the unit.
MEMO	- It does not directly affect the safety but includes information that assists in ensuring correct and efficient use of the unit .

Precautions

RIONOTE Precautions

- Do not attempt to play the supplied CD-ROM disc in an audio CD player. Inserting the disc into an audio CD player poses the risk of excessive volume levels. This could cause hearing damage and result in damage to the player.
- When earphones or headphones are connected to the earphone jack of the unit, high volume levels may be produced. To prevent the risk of excessive levels due to differences in gain, use only the monitoring earphones available as an option from Rion.
- Do not apply signals with a voltage exceeding the rated maximum input voltage range to the input/output terminals and voice memo microphone jack. Otherwise the unit may be damaged by excessive voltage and there is a risk of electric shock or fire.
- Connect only supplied Rion products or the AC adapter available as an option from Rion to the power jack.
- The LAN port, USB miniB port, and USB port of the unit must only be used in compliance with the respective standards. Otherwise the unit may be damaged by excessive voltage and there is a risk of electric shock or fire.
- Do not subject the touch panel of the unit to strong force or shock. Otherwise the panel may break, involving the risk of laceration or damage to peripheral equipment.
- Do not touch the docking connector of the unit with your fingers. Otherwise there is a risk of damage or malfunction.
- During use and storage of the unit, avoid proximity to heat sources (including equipment that may get hot) or open fire (including stoves, gas cookers etc.).
- Do not use this unit for an extended time in contact with any part of your body. The unit and the battery may become warm, involving the risk of burns or low-temperature burns.
- This unit is designed to be powered from a dedicated rechargeable lithium ion battery. Do not use any other kind of battery. Otherwise there is a risk of malfunction, damage, overheating, smoke emission etc.
- Remove the battery while not using the unit.
- If you notice any sign of a problem such as overheating, smoke emission etc., disconnect the AC adapter and remove the battery.

- Take care when handling the unit to avoid the risk of laceration or other injury from the connector section.
- Take care not to drop the unit on someone to avoid the risk of bruises or other injury.
- Take care so that any cables connected to the unit will not get caught in rotating machinery or similar.
- We recommend to have the packing inside the case, the bumper, and the cover replaced regularly (fare-paying service). The recommended replacement cycle is two years. If more than two years have elapsed, water resistant performance of the unit will no longer be guaranteed. Regarding replacement of these parts, please contact your supplier.

Amplifier unit SA-A1B2/B4 Precautions

- Do not apply signals with a voltage exceeding the rated maximum input voltage range to the input/output terminals. Otherwise the unit may be damaged and there is a risk of electric shock or fire.
- The USB miniB port of the unit must only be used in compliance with the respective standard. Otherwise the unit may be damaged by excessive voltage and there is a risk of electric shock or fire.
- Do not use the docking connector except for connection to the RI-ONOTE. Otherwise the unit may be damaged and there is a risk of electric shock or fire.
- Do not touch the docking connector of the unit with your fingers. Otherwise there is a risk of damage or malfunction of the unit.
- Do not use this unit for an extended time in contact with any part of your body. The unit and the battery may become warm, involving the risk of burns or low-temperature burns.
- If you notice any sign of a problem such as overheating, smoke emission etc., disconnect the AC adapter and remove the battery.
- Take care when handling the unit to avoid the risk of laceration or other injury from the connector section.
- Take care not to drop the unit on someone to avoid the risk of bruises or other injury.
- Take care so that any cables connected to the unit will not get caught in rotating machinery or similar.

Battery Precautions

If you notice any sign of a problem with the battery, contact the supplier.

Transport related precautions

- When transporting the battery, take care not to drop it. Otherwise the internal circuitry may be damaged and there is a risk of overcurrent, overheating, rupture, or combustion.
- If the battery is to be transported by air or by sea, follow the instructions of the shipper.
- When transporting the battery, as when changing the system installation location, do not throw the battery or otherwise subject it to strong shocks from hitting, dropping etc. Otherwise there is a risk of damage.
- Do not carry the battery while holding it by the connector section. Otherwise there is a risk of electric shock or damage.

Safety precautions

- If a problem has occurred at the location where the battery is stored (explosion, rupture, combustion), do not approach the location because there may be flammable or harmful gases.
- If you notice deformation, fluid leakage, or any other sign of a problem when opening the package in which the battery was shipped, do not use the battery and contact the supplier. If the battery is used in this condition, there is a risk of electric leak, combustion, or fatal damage to the battery.
- Do not place any conductive objects such as metal tools etc. on the battery and take care not to drop such objects on the battery. Otherwise there is a risk of short-circuiting.
- When charging the battery (either standalone or inserted in the RIONOTE), use only the AC adapter specified by Rion.
- Be sure to observe the following precautions when handling the battery, to ensure safety. Otherwise there is a risk of fluid leakage, overheating, rupture, or combustion.
- Use the battery only in the product it is designed for.
- Do not heat the battery or throw it into a fire.
- Do not try to disassemble or modify the battery.

- Do not charge or use the battery with the positive (+) and negative (-) terminals reversed.
- Do not short-circuit the positive (+) and negative (-) terminals of the battery.
- Do not subject the battery to strong shocks, and do not throw or drop it.
- Do not use the battery if it has been dropped or is deformed.
- If the battery gets unusually warm, immediately stop using it.
- If the battery looks deformed or bloated or has cracks, immediately stop using it.
- If the battery has a fluid leak, immediately stop using it.
- Do not continue to use the battery in a unit that has developed a problem. Otherwise there is a risk of equipment damage or fire.
- If battery fluid has come into contact with your eye(s), immediately consult a doctor.
- Clean the battery only by wiping it with a dry cloth. Do not use any organic solvents (cleaning alcohol, benzene, paint thinner etc.) on the battery. Otherwise there is a risk of deformation, discoloration, or damage to the plastic parts of the battery.

Environment related precautions

- The usage temperature range for the battery is as follows. If the battery is used in conditions outside this range, it may degrade faster and freezing or overheating may occur, involving the risk of damage and deformation.

  Usage temperature range: -10°C to +40°C
  Temperature range during charging: +5°C to +35°C
  (Both no condensation)

- Turn off the power of the RIONOTE when the battery is attached to the RIONOTE for charging.
- During use and storage of the battery, avoid locations subject to direct sunlight and other locations that may get hot, such as an asphalt surface in summer. Otherwise there is a risk of fluid leakage, overheating, rupture, or combustion.

- During use and storage of the battery, avoid proximity to heat sources (including equipment that may get hot) or open fire (including stoves, gas cookers etc.). Otherwise there is a risk of fluid leakage, overheating, rupture, or combustion.
- Using the battery in a low temperature environment will shorten its service life.
- Do not use or store the battery in locations with high levels of dust. Otherwise there is a risk of short-circuiting.
- Do not allow the battery to get wet. Otherwise there is a risk of damage or fire. Moisture may also lead to corrosion of the terminals and connector plate.
- Condensation forming on the battery may lead to rust or other problems. Use the battery so as to avoid condensation.

Disposal related precautions

- Do not transport a damaged battery by air.
- Even a battery destined for disposal will still contain electrical energy. Avoid sparking and short-circuiting. Otherwise there is a risk of electric shock or fire.
- For disposal, the battery must be handled as industrial waste. Do not throw the battery out with regular household trash. For disposal, contact the supplier. (Alternatively, have the battery disposed of by a licensed operator in compliance with waste disposal laws and environmental regulations.)

Other precautions

- The battery life (available operation time when the RIONOTE is powered by the battery) will depend on various factors including ambient temperature, age and usage status of the battery, storage conditions, etc.
- The battery is a consumable part. After many repeated charge/discharge cycles, the battery capacity will diminish and the battery life available with one charge will become shorter. When the available operation time on battery power has become too short, replace the battery.
- Storage of the battery either in fully charged condition or in empty condition will shorten its service life. It is recommended to store the battery at about half-full capacity.

- If the battery is left for an extended period of time, it will self-discharge, which reduces the remaining charge.
- If you have any other questions or concerns, please contact the supplier.

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Open source software

This product contains the open source software of the following licenses.

(1) GPL
(2) GPL v 2
(3) GPL v 3
(4) Boost Software License
(5) Apache License
(6) Apache License v 2

Those source codes of the open source software according to the license agreement will be given. Those source codes are given the Rion Support Room (http://svmeas.rion.co.jp/).
Note that we assume no responsibility for the source code.
Note that we are not responsible for exact details of the source code.
For details on the license, click [Manual] - [Open Source License] folder in the supplied CD-ROM.

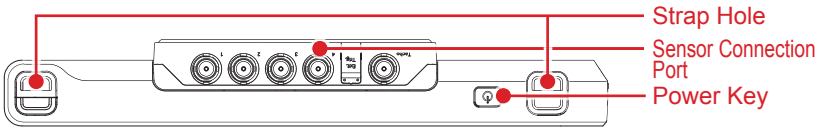
Preparation Before Use

This section describes necessary preparation before using the unit.

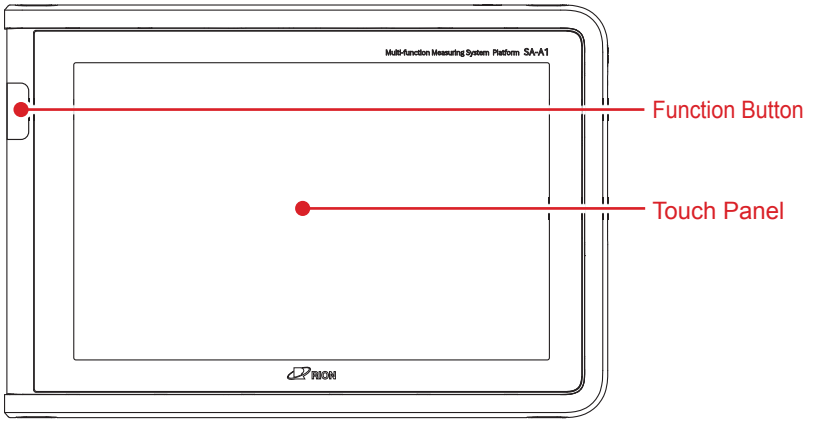
Part Names and Functions

There are the following part names and functions in the unit:

Top View/Bottom View



[Top View]



[Front View]

Strap Hole
Fixes a strap.

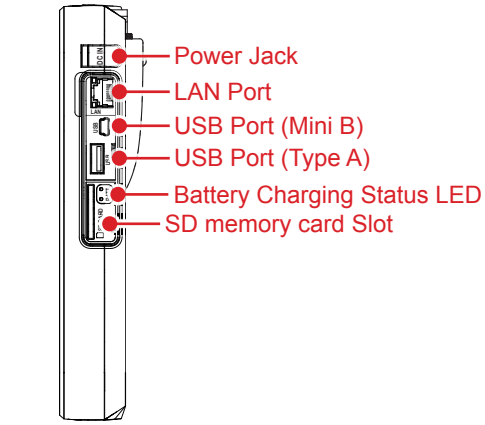
Sensor Connection Port (when the amplifier unit is connected)
Connects a sensor.

Power Key
Pressing and holding for more than two seconds displays a power on/off message. Pressing for a moment, enters/exits the auto screen off state.

Touch Panel (Display)
A liquid crystal panel with back light.

Function Button
Performs a function assigned to the button.

Right Side View



[Right Side View]

Power Jack

Connects the power cable.

LAN Port

Connects a LAN cable. This is not used in the current version.

USB Port (Mini B)

Connects a Mini B USB cable.

USB Port (Type A)

Connects a Type A USB cable. This is not used in the current version.

Battery Charging Status LED

Indicates the charging status of the battery connected to the unit.

SD memory card Slot

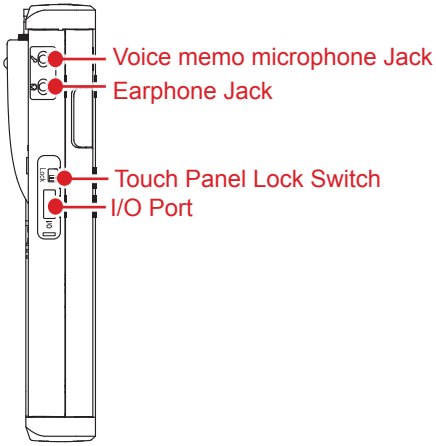
Inserts a SD memory card.

The relation between the battery charging status LED and the battery charging or energization status is as follows.

Upper LED Indicates the energization status of the battery connected to the unit by the AC adapter.
- Solid blue: The battery is energized by the AC adapter.
- Off: The battery is not connected to the unit, or not energized by the AC adapter.

Lower LED Indicates the charging status of the battery connected to the unit by the AC adapter.
- Solid green: The battery is being charged.
- Solid orange: The battery is put into the charging standby state due to increase in ambient temperature or other reasons.
- Off: Charging is completed.

Left Side View



[Left Side View]

Voice memo microphone Jack

Connects a voice memo microphone.

Earphone Jack

Connects earphones for playback.

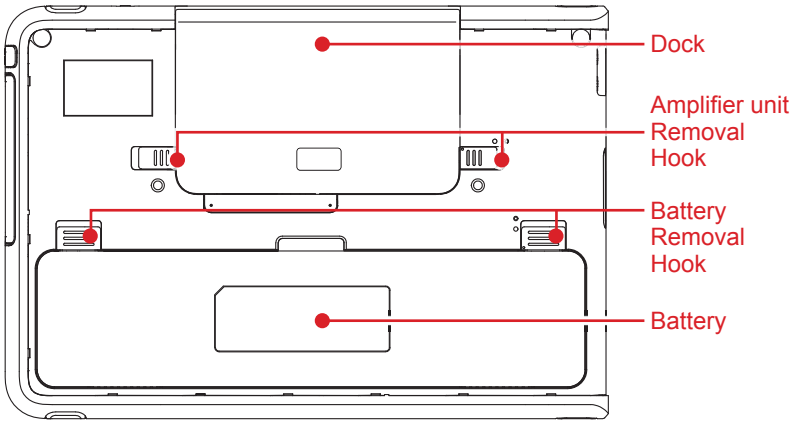
Touch Panel Lock Switch

Raising the switch locks the touch panel and disables window operations.

I/O Port

This is not used in the current version.

Back View



[Back View]

Dock

Connects the amplifier unit (SA-A1B2/B4).

Important	- When the amplifier unit is not connected, do not touch the connection port on the dock.

Amplifier unit Removal Hook

Slide the hook to remove the amplifier unit.

Battery Removal Hook

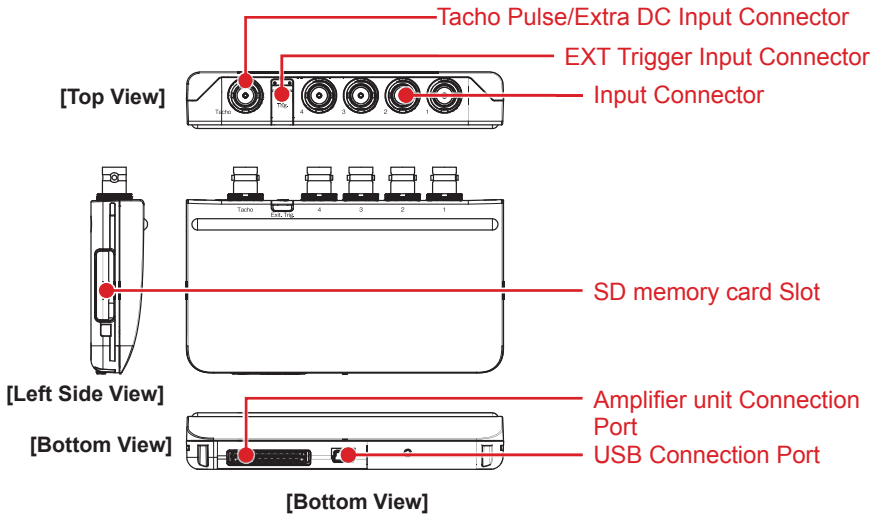
Slide the hook to remove the battery.

Battery

Attaches the battery.

Amplifier unit (SA-A1B2/B4)

The figure shows the view of SA-A1B4.



Tacho Pulse/Extra DC Input Connector

Inputs the tacho pulse signal for tracking analysis or DC signals.

EXT Trigger Input Connector

A φ2.5 mm mono jack for external trigger signal input.

Input Connector

Connects a sensor such as a microphone or vibration pickup.

Important	- Do not short-circuit the ports while CCLD is ON.

SD memory card Slot

This is not used in the current version.

Amplifier unit Connection Port

Connects the amplifier unit to the dock.

USB Connection Port

This is not used in the current version.

Attaching/Removing the Battery

Note

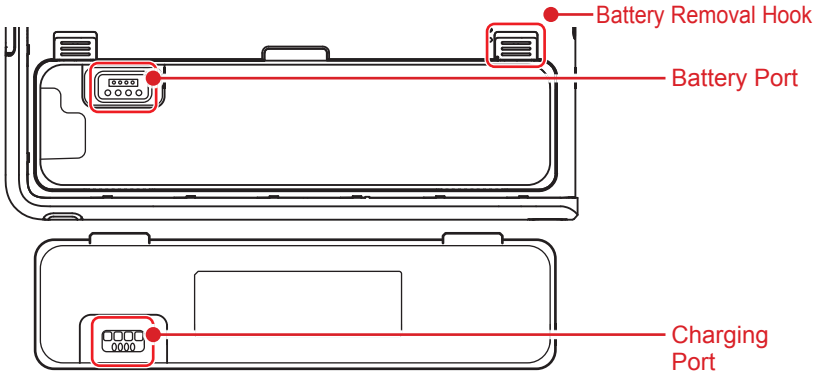
- Be sure to power off and remove the power cable before attaching/removing the battery.

Attaching the Battery

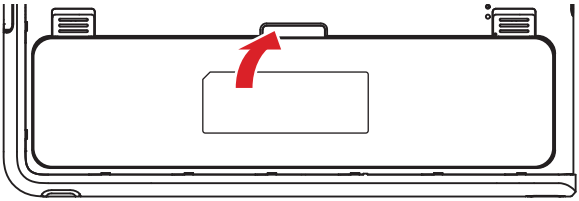
Important

- Before attaching the battery, check that the right battery removal hook is held in the upper side.
- Do not touch the battery port with hands or short-circuit it.

1. **Position the charging port on the battery with the battery port on the unit.**



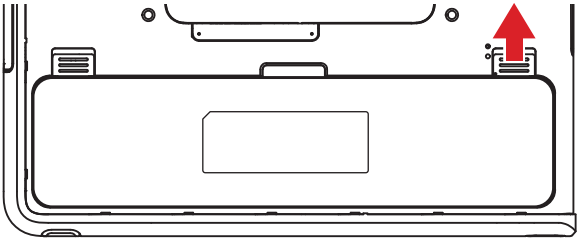
2. **Slowly insert the battery in the direction of the arrow until it clicks.**



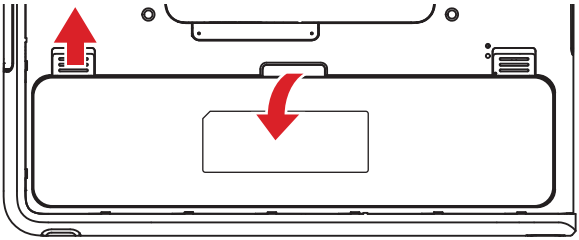
3. **Slide the right battery removal hook and lock it.**

Removing the Battery

1. **Slide the right battery removal hook in the direction of the arrow and lock it.**



2. **Slide the left battery removal hook in the direction of the arrow and put your fingertips on the battery through the recessed area of the unit and then remove the battery in the direction of the arrow.**



Charging

About Charging

When you purchase this product, the battery is not fully charged. Be sure to charge the battery before use. The battery lasts for about four hours when it is fully charged. However, please note that it depends on the usage environment and battery status.

MEMO	- Be sure to use the specialized battery. - Use the AC adapter provided with the unit for charging. - It is normal that the unit becomes slightly warm during charging. - Charging may stop for safety reasons if the ambient temperature becomes higher than the allowable temperature of the battery during charging. - We recommend to charge the battery after powering off the unit to prevent increase in ambient temperature. - Remove or insert the AC adapter plug slowly without placing any excess force. - Repeated charging shortens the operating time due to decrease in charging amount of the battery.

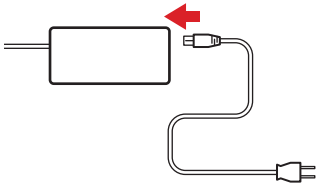
Battery Status

The battery status is displayed with an icon on the right side of the status bar.

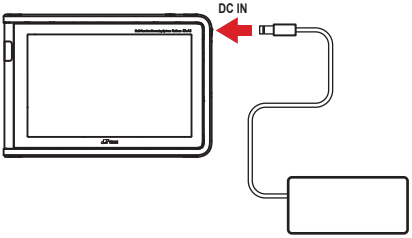
Icon	Content
	AC adapter is connected
	AC adapter is not connected
	Battery is being charged
	Battery is full
	Battery is more than half charged
	Battery is low
	Battery is almost empty
	Battery is empty
	Battery is not connected

Charging

1. **Connect the power cable to the AC adapter.**



2. **Insert the AC adapter plug to the power jack on the unit in the direction of the arrow.**



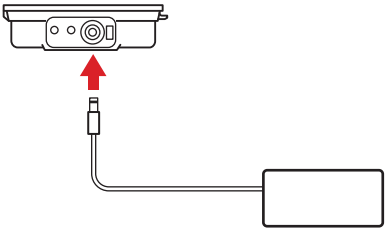
3. **Insert the plug of the power cable to an outlet of 100 to 240 V AC.**

Important	- Be sure to use the dedicated AC adapter. It has different polarity and port shape from our conventional AC adapters.

MEMO	- The battery can be charged with the unit powered on but it takes longer to finish charging.

Charging the Battery Only

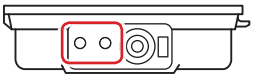
1. **Insert the AC adapter plug to the power jack on the battery in the direction of the arrow.**



2. **Connect the power cable to the AC adapter.**

3. **Insert the power plug of the power cable to an AC100 to 240V outlet.**

Important	- Be sure to use the AC adapter dedicated for RIONOTE to charge the battery.

MEMO	- The battery has a lamp to indicate the charging status. - Solid blue of right lamp: AC adapter connected. - Solid green of left lamp: Battery being charged. - Solid orange of left lamp: Battery in the charging standby state due to increase or decrease in ambient temperature or other reasons. Charging will start when the internal battery temperature falls within the range of +5°C to +35°C. - Left lamp off: Charging completed. 

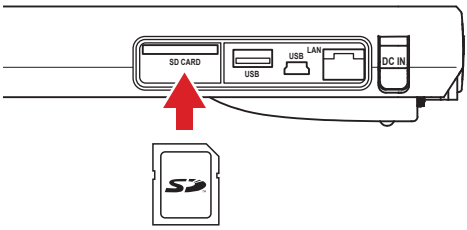
SD memory card

Important	- Be sure to power off and remove the power cable before installing/removing the SD memory card. If you install/remove the SD card accidentally while the power is on and this device does not recognize the SD card, power off with the SD card inserted and then power on again. - Data in the SD memory card can be damaged if you remove the SD memory card when writing/reading the data. - Use a SD memory card sold by RION Co., Ltd. Operation will not be guaranteed with a third-party SD memory card. - RION Co., Ltd. will not be liable for any damages or loss of data recorded with the unit.

Installing the SD memory card to The unit

1. **Open the side cover of the unit.**

2. **Slowly insert the SD memory card with the label side faced up to the SD memory card slot until it clicks.**



3. **Close the side cover.**

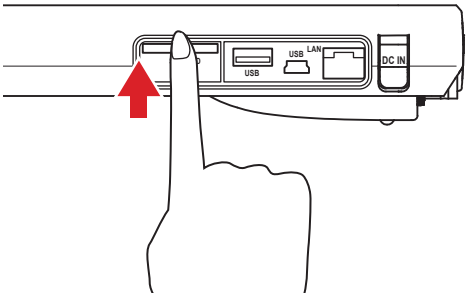
Important	- A SD memory card has the top/bottom sides and front/back sides. Inserting it forcefully may cause damage. - Do not touch the port on the SD memory card.

MEMO	- This device may not recognize the SD card when it is full. - An Android-secure file is created in the inserted SD card. You can either leave or delete the file.

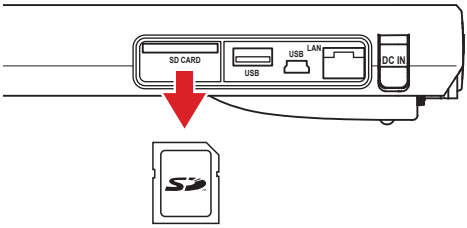
Removing the SD memory card from The unit

1. **Open the side cover of the unit.**

2. **Slowly insert the SD memory card as far as it goes.**



3. **When it clicks, pull the card straight.**



4. **Close the side cover.**

Important	- Do not remove the SD memory card while running a program, performing measurement or immediately after saving. It may cause damage or data loss. - Do not pull the SD memory card forcefully. It may cause damage or data loss.
MEMO	- A removed SD memory card may be warm after a long period of use, but it is not a failure.

Amplifier unit

The amplifier unit (SA-A1B2/B4) can be attached to the unit to connect the sensor. The amplifier unit is connected through the unit dock.

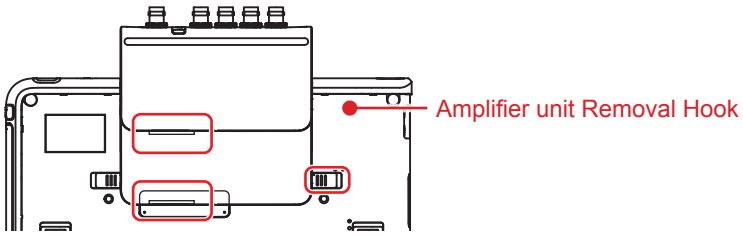
Note
- When you attach or remove the amplifier unit, be careful not to get your fingers caught in or hit your fingers against the unit.

Important
- Be sure to power off before attaching/removing the amplifier unit.

Attaching the Amplifier unit to the Dock

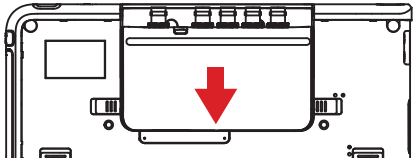
Important
- Before attaching the amplifier unit, check that the right amplifier unit removal hook is held in the right side.

1. **Power off the unit.**
2. **Position the connection port on the dock with the connection port on the amplifier unit.**



Important
- Do not touch the connection port on the dock. It may cause a failure.

3. **Slide the amplifier unit in the direction of the arrow and insert until it clicks.**

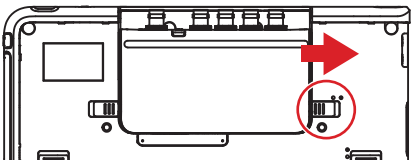


4. **Slide the right amplifier unit removal hook and lock it.**

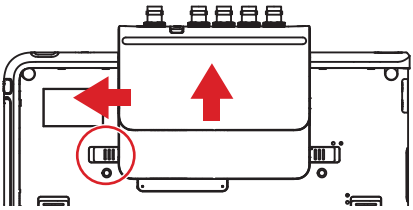
Removing the Amplifier unit from the Dock

1. **Power off the unit.**

2. **Slide the right amplifier unit removal hook in the direction of the arrow and lock it.**



3. **Slide the left amplifier unit removal hook in the direction of the arrow and slide the amplifier unit in the direction of the arrow.**



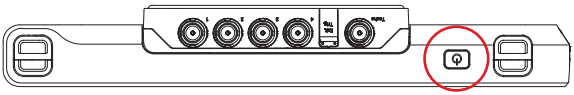
Important

- Do not remove the amplifier unit with the unit powered on. It may cause damage to the system.

Powering On/Off

Powering On

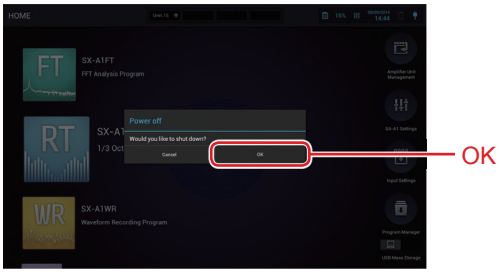
1. **Press and hold the power key for more than two seconds.**



MEMO	- The touch panel is in the initialization state until it stops displaying "Rion" after power-on. Do not touch the screen. The touch panel may not work correctly.

Powering Off

1. **Press and hold the power key for more than two seconds.**
2. **Tap [OK].**



Important	- Remove the battery and AC adapter if you store the unit with the power off for a long time.

MEMO	- Wait for more than 10 seconds before powering on the unit again after powering off. - If a lead battery is used as an external power supply, the automatic shut-down does not function. In this case, this device will be shut down forcibly when the battery runs out.

Forcefully Powering Off

If the screen freezes or the unit cannot be powered off, you need to forcefully power off.

1. **Press and hold the power key for more than ten seconds.**

Important	- When you forcefully power off, be sure that the data is not being written/read.

Auto Screen Off

Auto Screen Off

A function to temporarily turn off the screen to save the battery is called "auto screen off".
If you press the power key or do not operate for a given time (specified time: P.58), the screen will be turned off automatically except during measurement.

Exiting the Screen Off State

1. **Press the power key while the screen is turned off.**

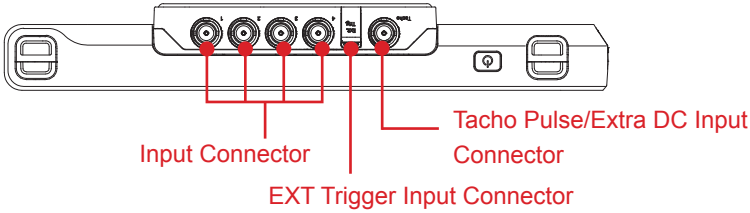
MEMO	- When you exit the screen off state, the screen before entering the screen off state may appear depending on the program in use. - Do not touch the screen when you exit the screen off state. The touch panel may not work correctly.

Connecting External Devices

You can connect a sensor to the amplifier unit attached.

Input Jack Location

The amplifier unit input jacks are located as follows.



Input Connector

A connector to connect a sensor such as a microphone or vibration pick-up. You can connect up to two sensors for SA-A1B2 and up to four for SA-A1B4.

EXT Trigger Input Connector

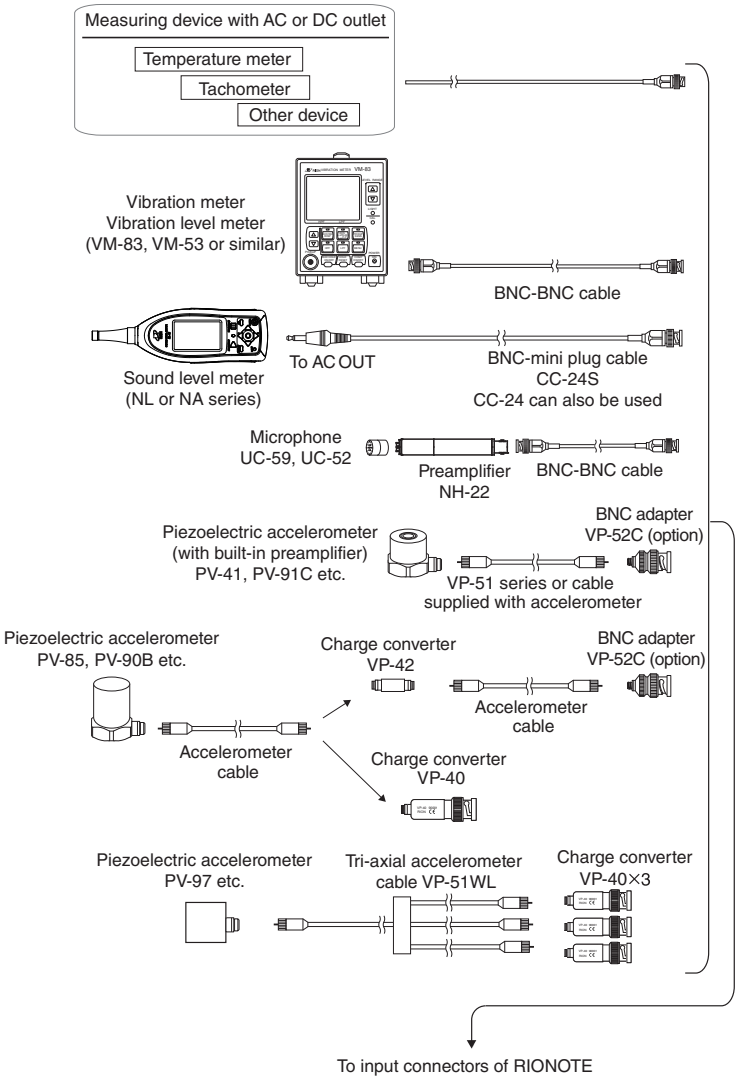
A φ2.5 mm mono jack for external trigger signal input.

Tacho Pulse/Extra DC Input Connector

Inputs the tacho pulse signal for tracking analysis or DC signals.

Connecting the Sensor

1. Insert the sensor code firmly to the BNC connector.



Removing the Sensor

1. **Power off the unit.**

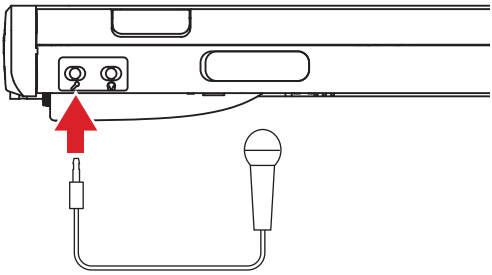
2. **Hold the sensor code plug and remove the cord.**

> **Important** - Remove the cord by holding the plug.

Connecting the Voice memo microphone/Earphones

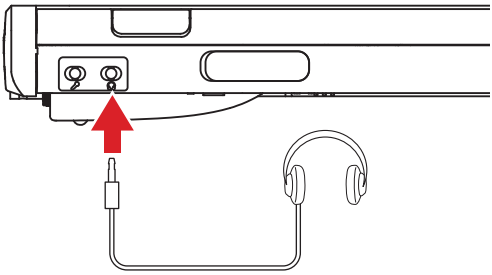
Connecting the Voice memo microphone

When you input voice memo data, use a voice memo microphone that is provided with this product or sold separately. Insert a voice memo microphone 3.5 mm mini plug to the voice memo microphone jack.



Connecting the Earphones

To play recorded data, use earphones that are provided with this product or sold separately. Insert an earphone 3.5 mm mini plug to the earphone jack.



Important	- To protect ears from the noise generated at power-on, remove earphones from the jack or keep them away from ears.

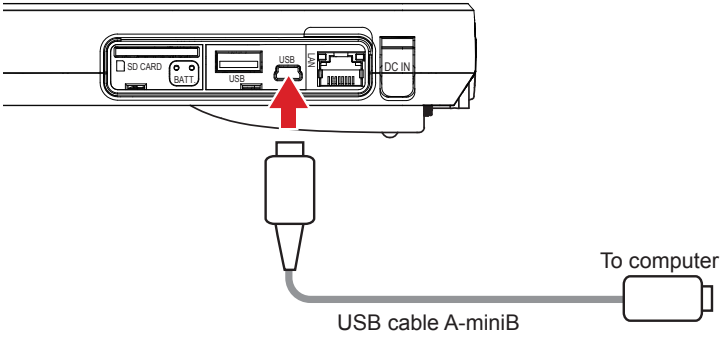
MEMO	- The pin assignment of earphone jack is L, R and Ground from the end of the pin. Because there is one channel for output, the same signal is output to L and R channels. - The data playback includes delay. - The data at a frequency range of 5 kHz or more can be output to the monitor as a playback signal.

Connecting to Computer

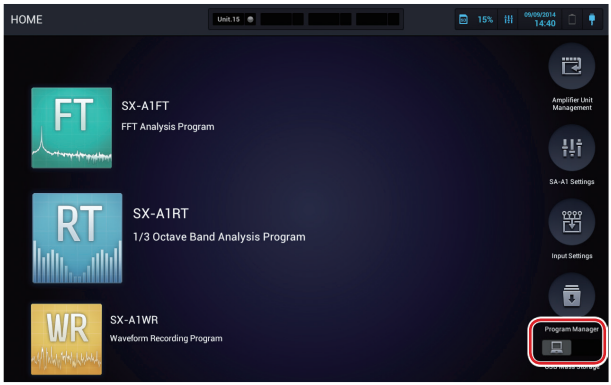
A SD memory card inserted to the unit is recognized as a removable disk through USB connection with a computer.

Connecting to Computer

1. **Connect the USB port (Mini B) of the unit to the USB port of a computer with an A-miniB USB cable sold separately (commercially available) as shown in the following figure.**



2. **Power on the unit and tap [USB Mass Storage] on the HOME screen.**



Configuring The unit

This section describes necessary settings when using the unit.

Use the following procedures to configure the settings before starting measurement using the unit. After the settings are complete, start the program for measurement.

1. Configuring The unit
Configure the unit as needed, such as for date and time and screen brightness.



2. Registering the Amplifier Unit
Register the amplifier unit connected to the unit. (P.60)



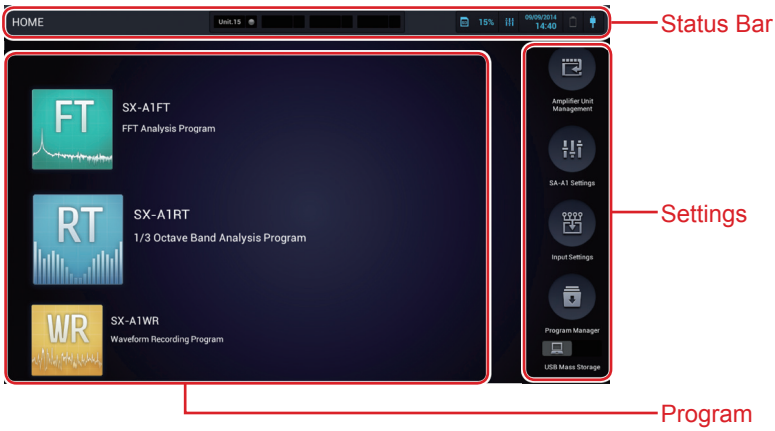
3. Configuring the Calibration
Configure the channel type, sensor type, and calibration information. (P.68)



4. Starting the Program
Start a program used for measurement and start measurement.

HOME Screen

HOME Screen Layout



Status Bar

Displays the registered unit and battery status.

Program

Displays the buttons of programs installed on the unit. Tap the button to start the program.

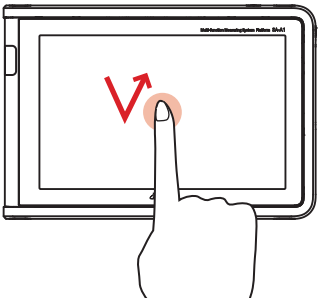
Settings

Provided setting buttons for the unit. Tap the button to display its settings.

Basic Operation

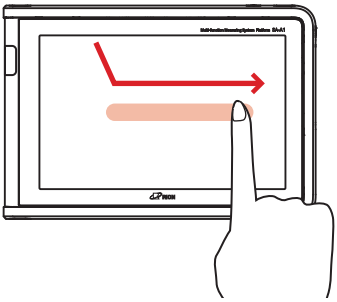
Import-ant	- The touch panel is designed to be gently touched by fingers or stylus pen. Do not press the panel hard with fingers or touch it with a sharp object (such as ballpoint pen/pin). - Please note that the touch panel may not work correctly or cause malfunction on the following conditions. - Operation with a glove - Operation with a nail tip - Operation while putting foreign objects on the touch panel - Operation with a protective film or label attached on the touch panel - Operation with a water droplet or condensation on the touch panel - Operation with wet or sweaty fingers

Tap/Double-Tap



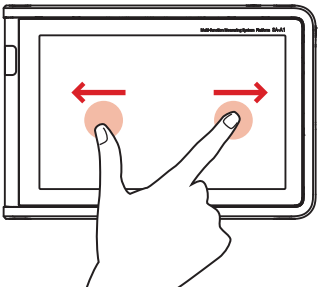
Tap is to lightly touch the screen with a finger and immediately release the finger. Tap is used to select an item or icon displayed on the screen. Double-tap is to tap twice quickly.

Slide



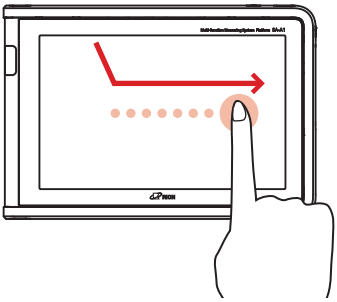
When all of data cannot be displayed on the screen, you can move the finger to the desired direction while lightly touching the screen. Slide is used to scroll the screen or switch pages. It is also used to move a gauge or bar to adjust the volume and brightness.

Pinch



You can open two fingers (pinch out) or close (pinch in) while touching the screen. It can be used to zoom in or out of a graph.

Drag

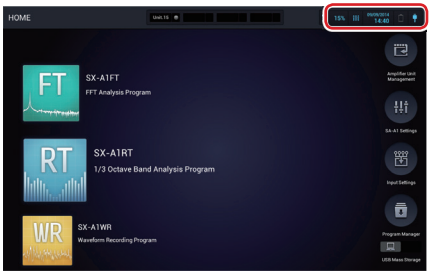


You can drag an item or icon to move to the desired location while lightly touching the screen.

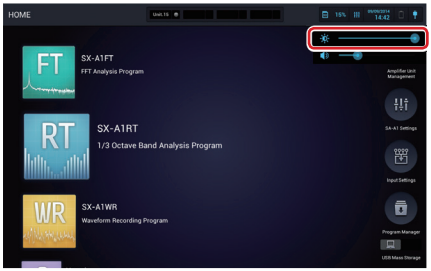
Configuring The unit

Configuring the Screen Brightness

1. **Tap the unit information display area of the status bar.**



2. **Slide the brightness adjustment slide bar to adjust the brightness.**



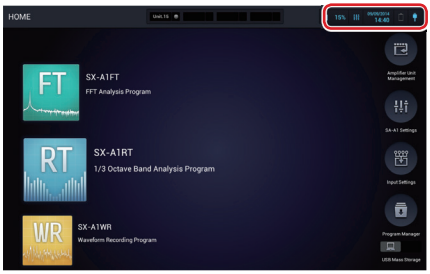
Slide the bar to the right to make it brighter and to the left to make it darker.

MEMO	- Making the screen brighter can drain the battery quicker.

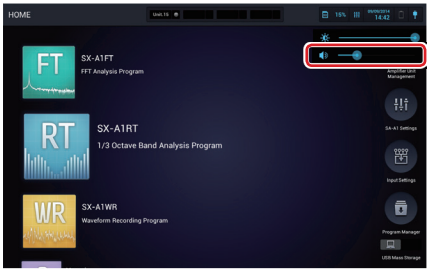
Adjusting the Monitor Output Volume

Adjust the volume of the monitoring channel playback signal output from the earphone jack. This signal can be input to earphones or monitoring devices to check the recorded data contents.

1. **Tap the unit information display area of the status bar.**



2. **Slide the volume adjustment slide bar to adjust the volume.**



Slide the bar to the right to turn up the volume and to the left to turn down the volume.

Note - Please note that the volume may get loud rapidly as you turn up.

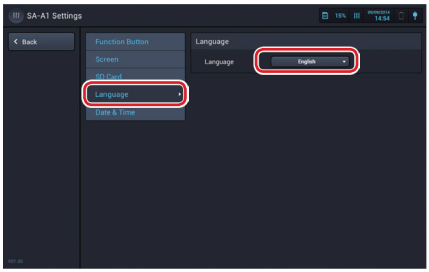
MEMO - Making the volume louder can drain the battery quicker.

Configuring the Language

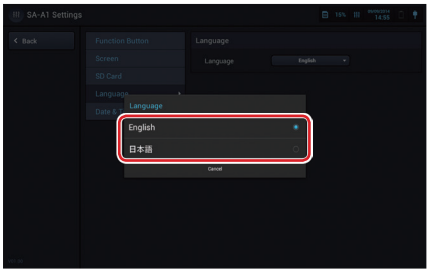
Set the language used for the screen display.

1. **Tap [SA-A1 Settings] on the HOME screen.**

2. **Tap [Language] and tap the language name.**



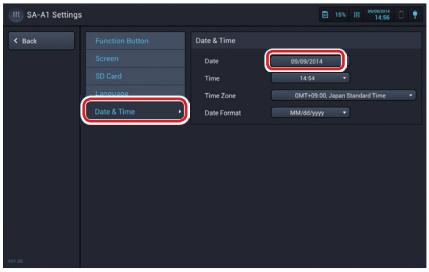
3. **Select the language to display from [Language].**



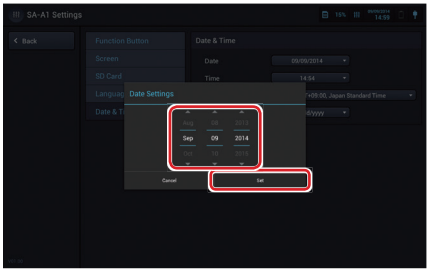
Configuring the Date and Time

1. **Tap [SA-A1 Settings] on the HOME screen.**

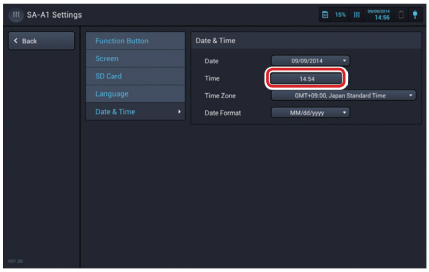
2. **Tap [Date & Time] and tap [▼] on the right side of [Date].**



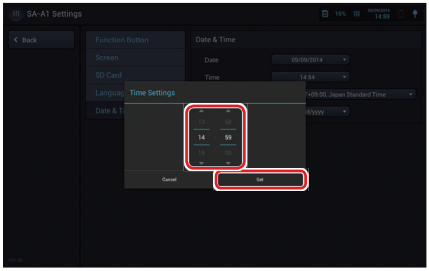
3. **Slide the values for Year, Month, and Day up or down to configure and tap [Set].**



4. **Tap [▼] on the right side of [Time].**



5. **Slide the values for Hour and Minute up or down to configure and tap [Set].**

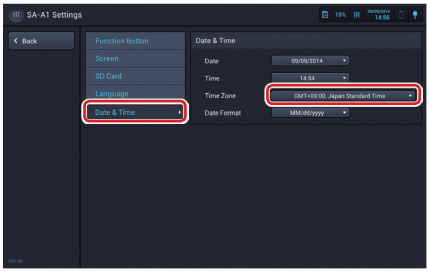


MEMO	- The date and time is recorded as a data and time for measured data. The date and time must be configured correctly. - When you did not use the unit for a long time, be sure to configure the date and time before use again.

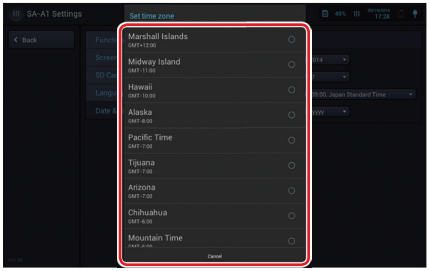
Configuring the Time Zone

1. **Tap [SA-A1 Settings] on the HOME screen.**

2. **Tap [Date & Time] and tap [▼] on the right side of [Time Zone].**



3. **Slide the displayed time zone up or down and tap the time zone of your location.**

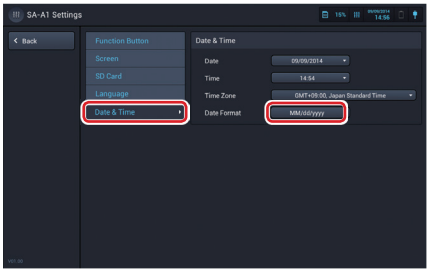


MEMO	- Date and time is adjusted based on the specified time zone. The time zone must be configured correctly. - When you did not use the unit for a long time, be sure to configure the time zone before use again. - The unit supports the date up to 2030/12/31.

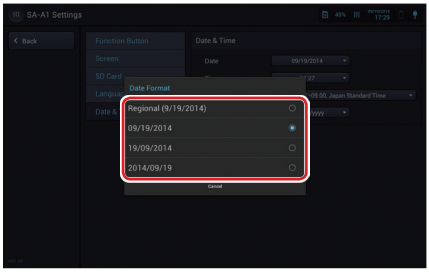
Configuring the Date Format

1. **Tap [SA-A1 Settings] on the HOME screen.**

2. **Tap [Date & Time] and tap [▼] on the right side of [Date Format].**



3. **Tap the date format to display.**



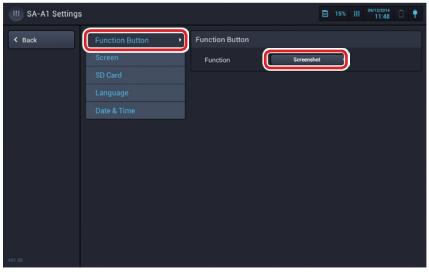
MEMO	- If you select [Region], the display format is automatically set up as configured in [Language].

Configuring the Function Button

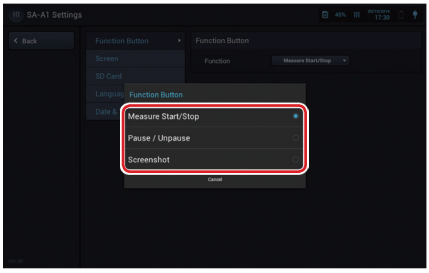
You can assign a frequently-used function to the function button, so that it can be easily executed.

1. **Tap [SA-A1 Settings] on the HOME screen.**

2. **Tap [Function Button] and tap [▼] on the right side of [Function].**



3. **Tap the function to assign to the function button.**

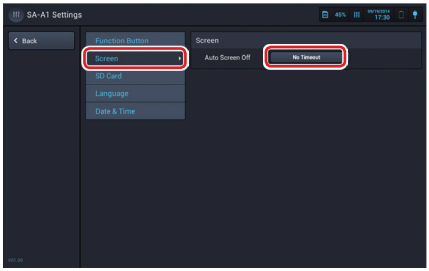


Configuring the Screen Off Time

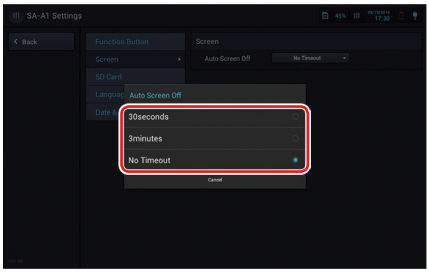
If you do not operate the HOME screen for a given time, the screen will be turned off (except during measurement). Use the following procedures to set the time before the screen is turned off.

1. **Tap [SA-A1 Settings] on the HOME screen.**

2. **Tap [Screen] and tap [▼] on the right side of [Auto Screen Off].**



3. **Tap the Auto Screen Off time.**



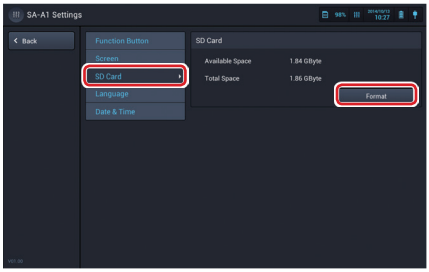
MEMO	- If you set to [No Timeout], the screen will not be turned off until you press the power key.

Formatting the SD Memory Card

Use the following procedures to delete all the data in the SD memory card inserted to this device and format it.

1. **Tap [SA-A1 Settings] on the HOME screen.**

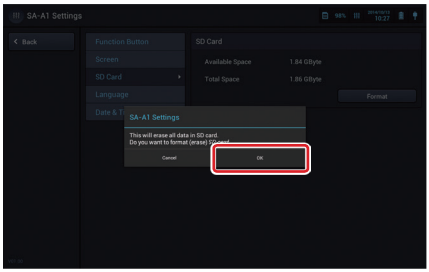
2. **Tap [SD Card].**



The SD Card screen is displayed. You can check the total space and available space of the SD memory card inserted to this device.

3. **Tap [Format].**

4. **Tap [OK].**



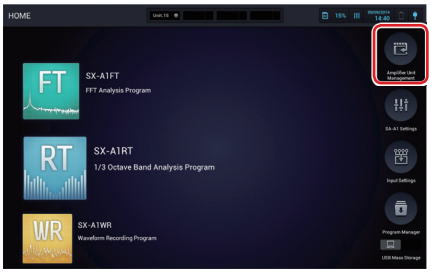
MEMO	- After formatting, you will see the difference between the available space and total space displays (about 2 GBytes for a 32-GByte card); however, it will be eliminated once the SD card is removed.

Managing the Amplifier Unit

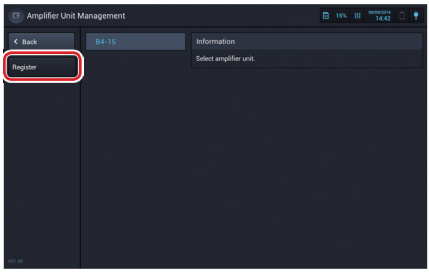
Registering the Amplifier unit Connected to The unit

When you connect the amplifier unit through the dock, you need to register the amplifier unit to the unit. Use the following procedures to register the amplifier unit.

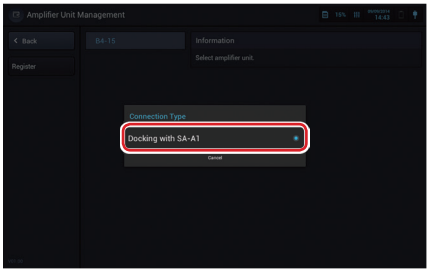
1. **Tap [Amplifier Unit Management] on the HOME screen.**



2. **Tap [Register].**

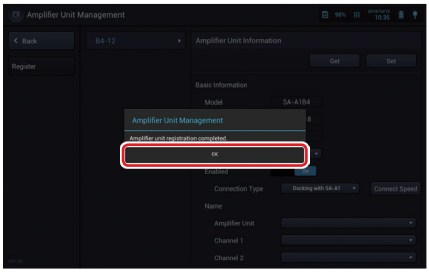


3. Tap [Docking with SA-A1].



The connected amplifier unit is automatically detected and registered.

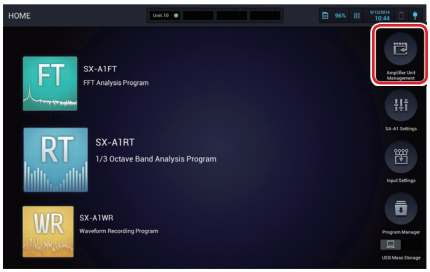
4. Tap [OK].



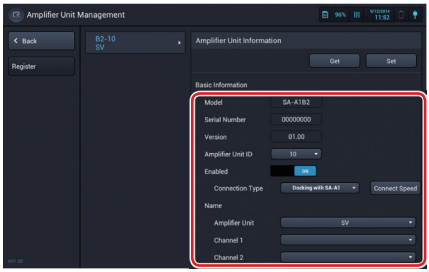
Configuring the Amplifier unit

You can configure such as the amplifier unit name and channel name for the registered amplifier unit. It is useful when measuring if you use an easy-to-understand name depending on the purpose.

1. **Tap [Amplifier Unit Management] on the HOME screen.**

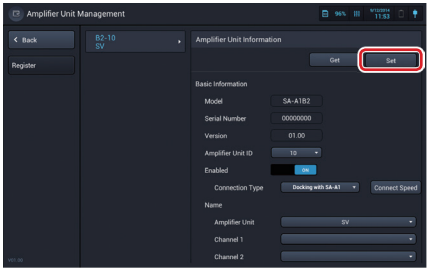


2. Configure each item in [Basic Information].

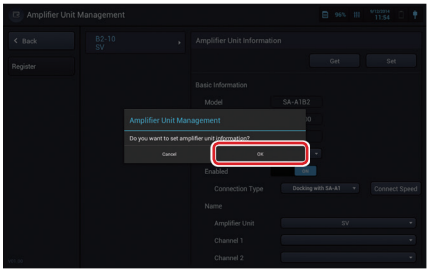


MEMO	- The displayed information is the amplifier unit settings last configured in the unit. If the amplifier unit settings were changed by other devices, tap [Get]. The amplifier unit settings are updated to the unit. - For details on settings for each item, see "Instruction Manual Application" provided with the unit.

3. Tap [Set].



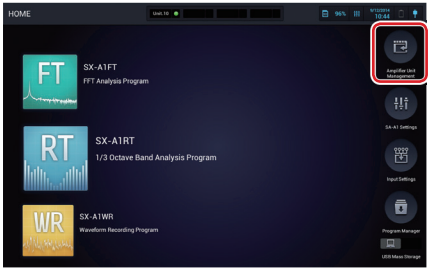
4. **Tap [OK].**



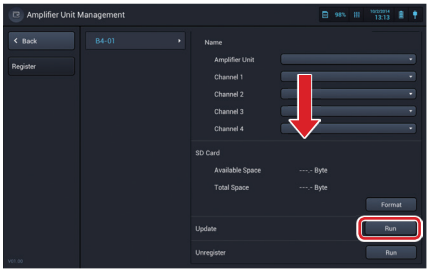
Updating the Amplifier Unit Program

Use the following procedures to update the amplifier unit program.

1. **Tap [Amplifier Unit Management] on the HOME screen.**



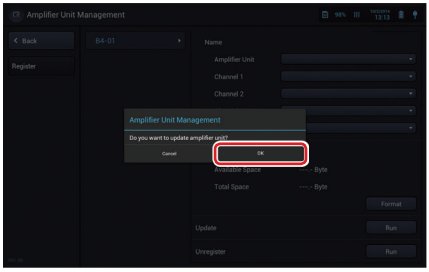
2. Slide the screen down and tap [Run] in [Update].



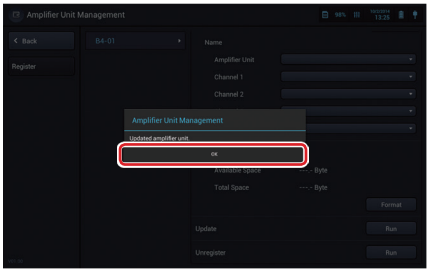
Confirm whether a program file which can be updated is saved on the SD memory card. When conformation is complete, the update screen is displayed.

MEMO	- It takes long to check depending on the capacity. - If a system file which can be updated is not found, "Available update program does not exist or multiple update programs exists." is displayed. In this case, check if a program file is saved on SD memory card.

3. Tap [OK].



4. **Tap [OK].**

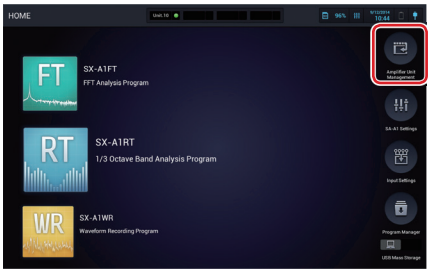


Important - Do not power off or pull out the SD memory card during update of the amplifier unit.

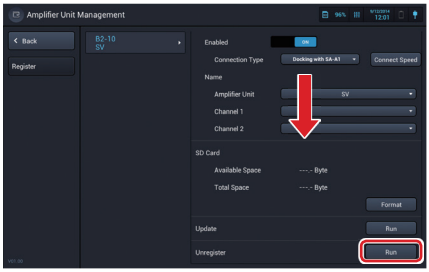
Deleting the Amplifier unit

Use the following procedures to delete the amplifier unit not used in the unit.

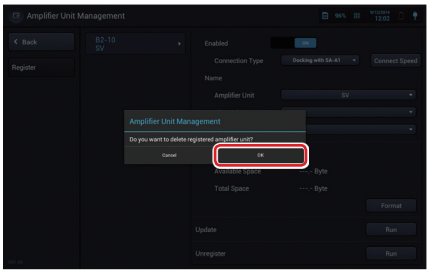
1. **Tap [Amplifier Unit Management] on the HOME screen.**



2. Slide the screen down and tap [Run] in [Unregister].



3. Tap [OK].



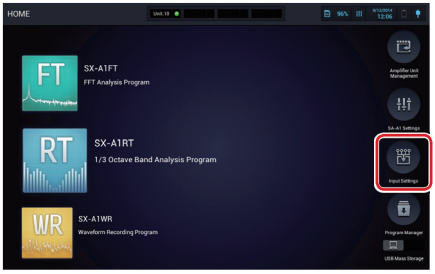
MEMO	- If you use the deleted amplifier unit again, you need to register it again. (P.60)

Configuring the Calibration

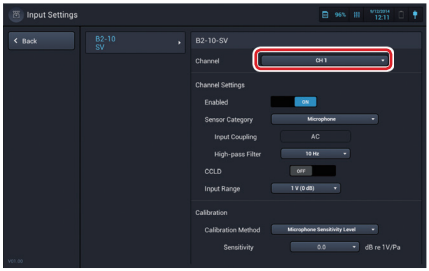
Configuring the Calibration

Calibration information such as the channel or sensor type can be configured for each amplifier unit and channel. Be sure to perform the appropriate calibration for the connected sensor before starting measurement in order to obtain correct measurement results.

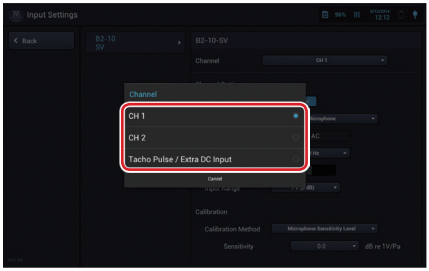
1. **Tap [Input Settings] on the HOME screen.**



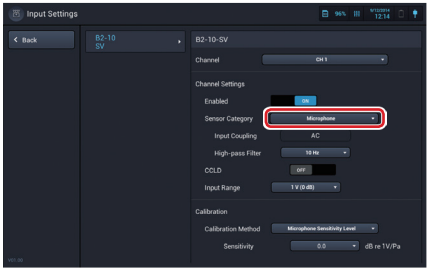
2. **Tap [▼] on the right side of [Channel].**



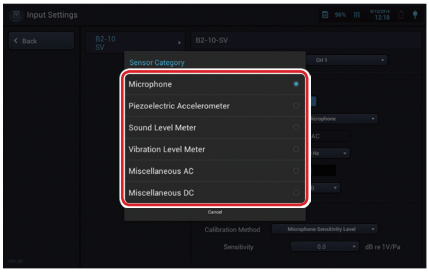
3. **Tap the name of the channel of which you want to configure the calibration.**



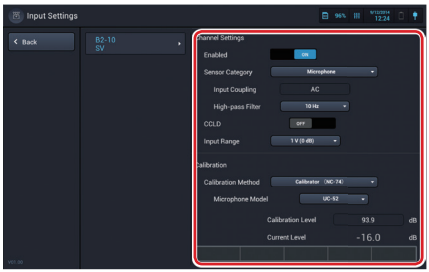
4. **Tap [▼] on the right side of [Sensor Category].**



5. Tap the type of the sensor connected.

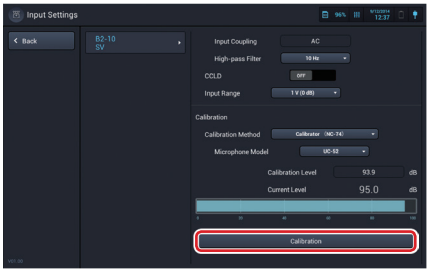


6. Configure each item as needed.



MEMO	- For details on settings for each item, see "Instruction Manual Application" provided with the unit.

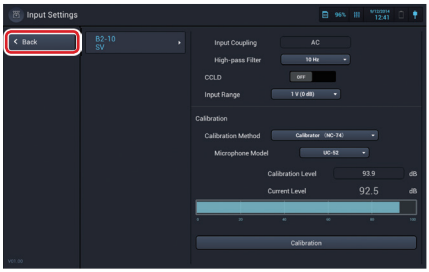
7. Tap [Calibration].



Monitoring stops and calibration is configured with selected settings. When the calibration settings are complete, monitoring is resumed.

MEMO	- The step 7 may be unnecessary depending on the calibration method.

8. Tap [Back].



Managing the Program/System

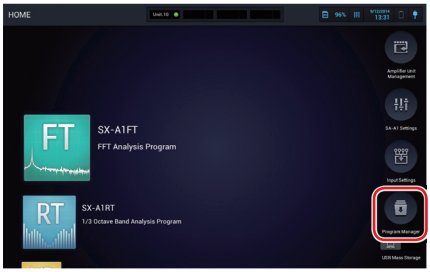
Installing the Program

You can install a program on the unit to add new features.

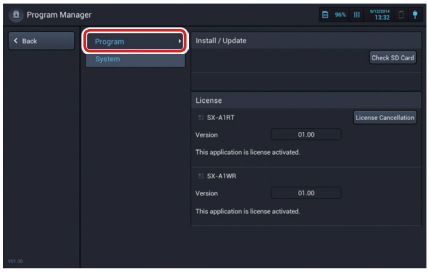
1. **Power off the unit and insert the SD memory card on which a program is saved to the SD memory card slot. (P.33)**

Important	- Save an installation target program on a SD memory card without creating a folder. - A zip file is used for the program, but there is no need to decompress it.

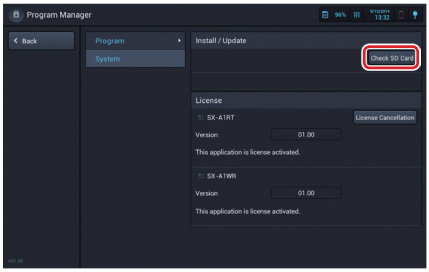
2. **Power on the unit and tap [Program Manager] on the HOME screen.**



3. **Tap [Program].**



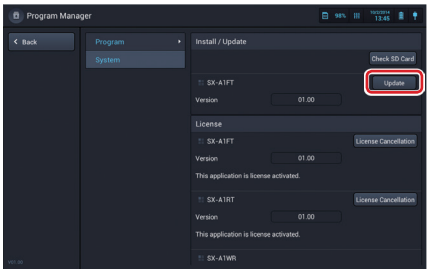
4. Tap [Check SD Card].



Check whether an installable program is saved on the SD memory card. If an installable program exists, the program name is displayed.

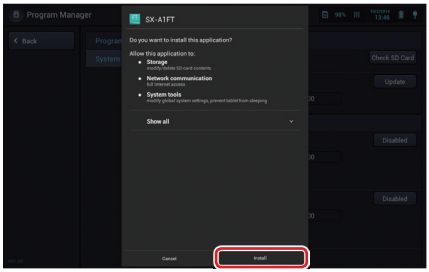
MEMO	- It takes long to check depending on the capacity. - If an installable program file is not found, "Available update program does not exist or multiple update programs exists." is displayed. In this case, check if a program file is saved on the SD memory card.

5. Tap [Installation].



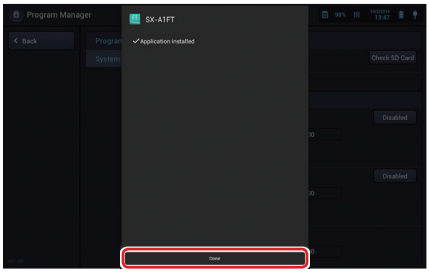
A message to check installation is displayed.

6. Tap [Install].



Installation is executed.

7. Tap [Done].

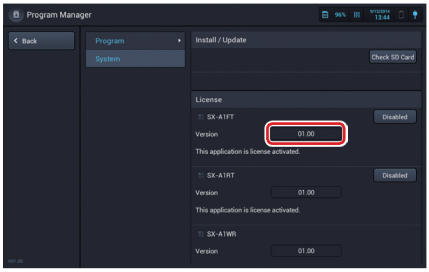


Checking the Program Version

1. **Tap [Program Manager] on the HOME screen.**

2. **Tap [Program].**

3. **Check [Version] in the program name displayed.**



Updating the Program

The program version may be updated for the improved operations or functions. We recommend to use the latest version.

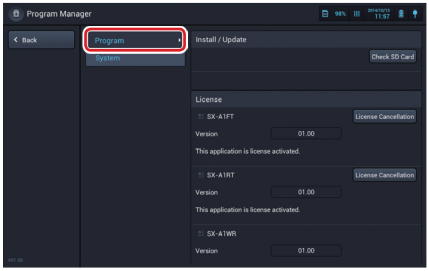
MEMO	- It takes time to update the program. Connect the fully charged battery (three segments of the battery icon light up) and also the AC adapter before updating the program.

1. **Power off the unit and insert the SD memory card on which the latest program is saved to the SD memory card slot. (P.33)**

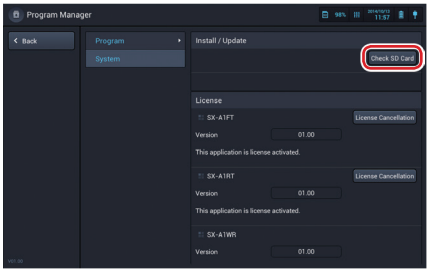
Important	- Save an update target program on a SD memory card without creating a folder. - Save one update file for a single program on a SD card. An error message is displayed when multiple update files exist for a single program. - A zip file is used for the program, but there is no need to decompress it.

2. **Power on the unit and tap [Program Manager] on the HOME screen.**

3. **Tap [Program].**



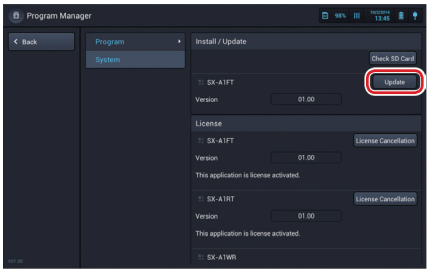
4. Tap [Check SD Card].



Confirm whether a program file which can be updated is saved on the SD memory card. If a program which can be updated exists, the program name is displayed.

MEMO	- It takes long to check depending on the capacity. - If an installable program file is not found, “Available update program does not exist or multiple update programs exists.” is displayed. In this case, check if a program file is saved on the SD memory card.

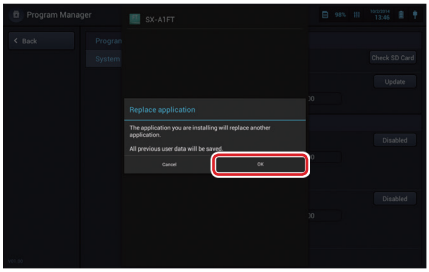
5. Tap [Update].



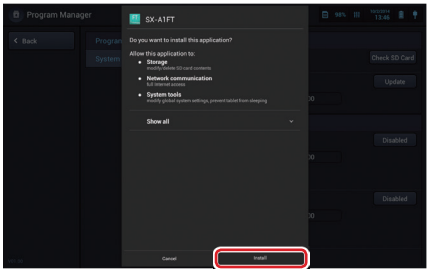
A message to check update is displayed.

A message to check program update is displayed.

6. **Tap [OK].**

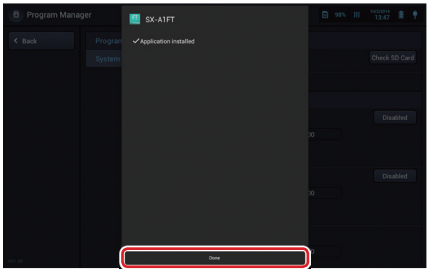


7. **Tap [Install].**



An update is executed.

8. **Tap [Done].**

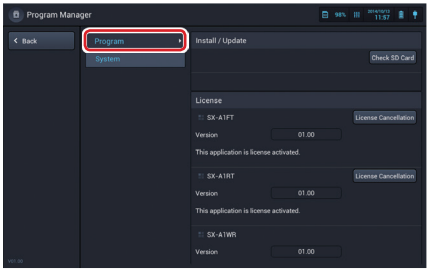


Important - Do not power off or pull out the SD memory card during installation of the program.

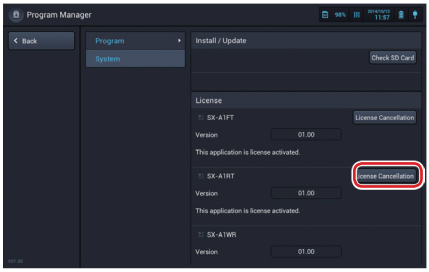
Canceling the Program License

1. **Tap [Program Manager] on the HOME screen.**

2. **Tap [Program].**

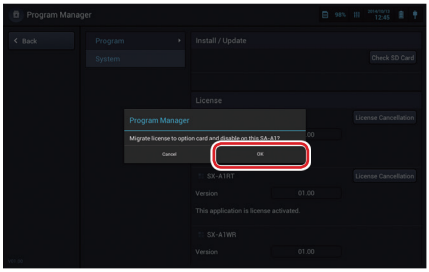


3. **Tap [License Cancellation] in the program to cancel the license.**



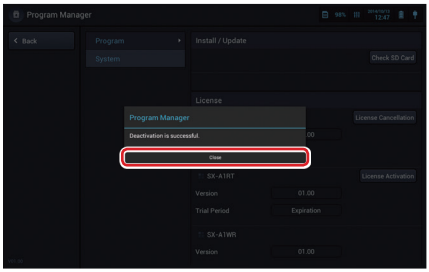
A message to check cancellation is displayed.

4. **Tap [OK].**



Cancellation is executed.

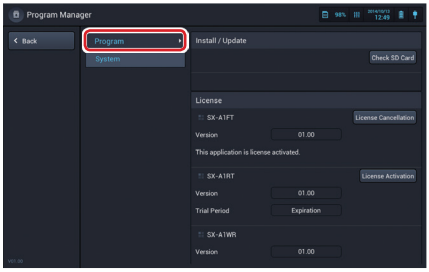
5. **Tap [Close].**



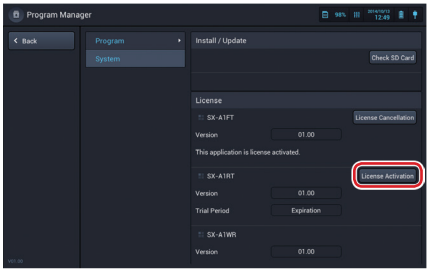
Activating the Program License

1. **Tap [Program Manager] on the HOME screen.**

2. **Tap [Program].**

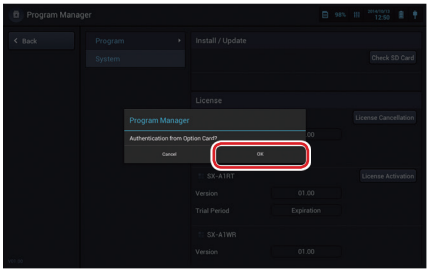


3. **Tap [License Cancellation] in the program to activate the license.**



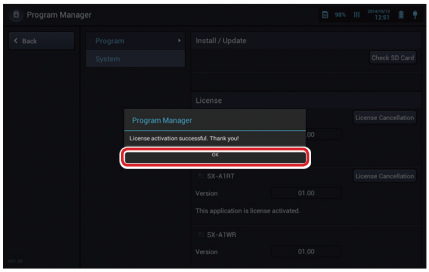
A message to check activation is displayed.

4. **Tap [OK].**



Activation is executed.

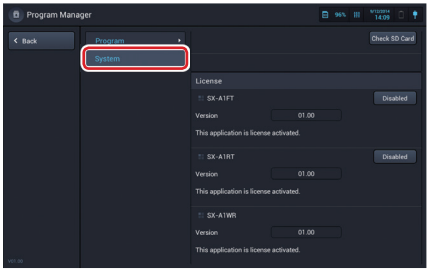
5. **Tap [OK].**



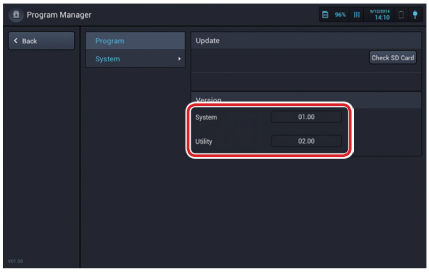
Checking the System Version

1. **Tap [Program Manager] on the HOME screen.**

2. **Tap [System].**



3. **Check [Version].**



Updating the System

The system version may be updated for the improved operations or functions. We recommend to use the latest version.

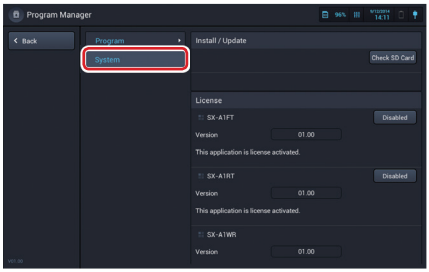
MEMO	- It takes time to update the program. Connect the fully charged battery (three segments of the battery icon light up) and also the AC adapter before updating the program.

1. **Power off the unit and insert the SD memory card on which the latest system file is saved to the SD memory card slot. (P.33)**

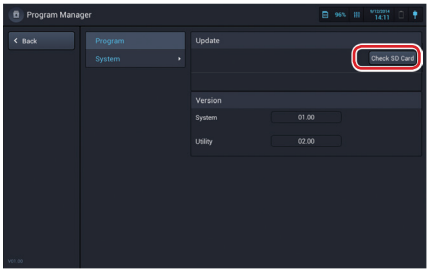
Important	- Save an update target system file on a SD memory card without creating a folder. - A zip file is used for the program, but there is no need to decompress it.

2. **Power on the unit and tap [Program Manager] on the HOME screen.**

3. **Tap [System].**



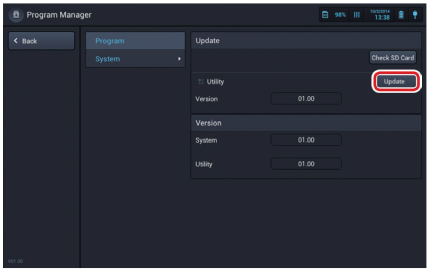
4. Tap [Check SD Card].



Confirm whether a system file which can be updated is saved on the SD memory card. When conformation is complete, the update screen is displayed.

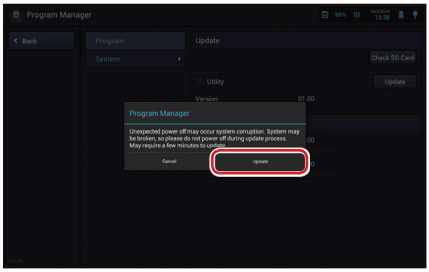
MEMO	- It takes long to check depending on the capacity. - If a system file which can be updated is not found, "Available update program does not exist or multiple update programs exists." is displayed. In this case, check if a system file is saved on SD memory card.

5. Tap [Update].



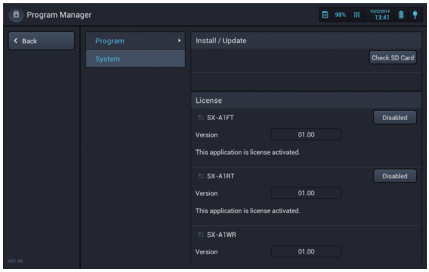
A screen to confirm the update is displayed.

6. Tap [Update].



The screen displays "Preparing Update" and then "Updating". When the update is complete, it returns to the version display screen.

Important - Do not power off or pull out the SD memory card during update of the system.



SA-A1 File Converter

The SA-A1 File Converter is a software program running under Windows, designed to convert binary files saved by the RIONOTE programs SX-A1FT or SX-A1RT into text files. Files to be converted can be added either individually or by project folder. It is also possible to drag & drop multiple files or folders together. Files added to the list can be converted in one go (bulk conversion). The saved text files can be opened with a text editor or imported into Excel.

Software installation

To install the File Converter software, proceed as follows. Supported operating systems are Microsoft Windows 7 Professional, Windows 8 Pro, or Windows 8.1 Pro (every 32 bit or 64 bit), Japanese version or English version (The screen examples shown here are for Windows 7.)

1. **Insert the CD-ROM supplied with the unit into the disc drive of a computer.**

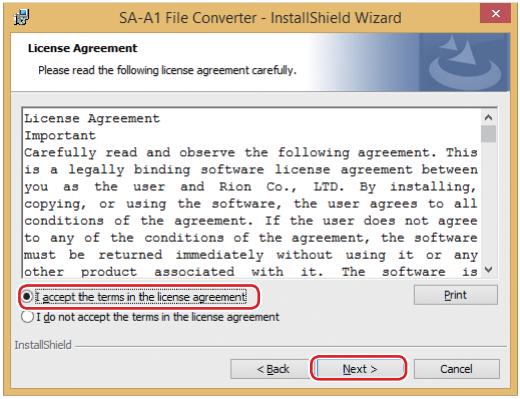
2. **Copy the “Setup” file from the “FileConverter” folder to the desktop of the computer, and double-click the file.**

3. **A screen showing pre-requirements for installing the File Converter may appear. In such a case, click the [Install] button on this screen.**

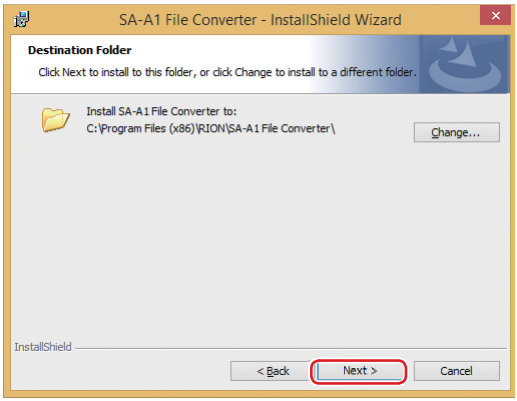
4. **After the required software shown on the pre-requirements screen has been installed, the initial screen for the File Converter installation will appear. Click the [Next] button to proceed.**



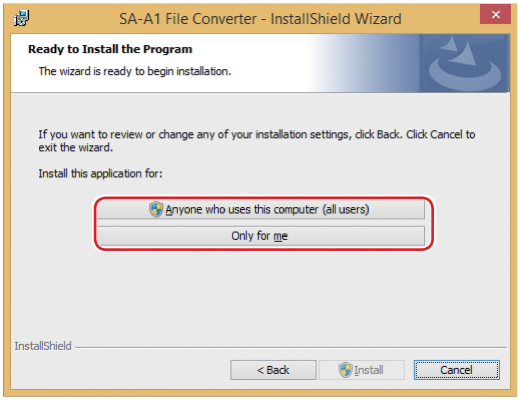
5. **The Software Usage License Agreement will be shown. Select [I accept the terms in the license agreement] and click the [Next] button.**



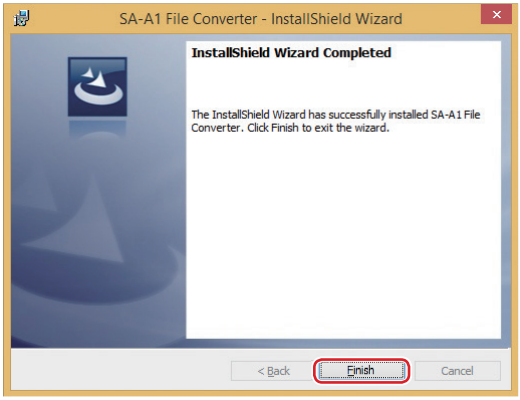
6. **The screen for selecting the installation target folder appears. If there is no change necessary, click the [Next] button.**



7. **Specify the user(s) for whom to install the File Converter.**



8. **The installation process for the File Converter starts. When the completion screen is shown, click the [Finish] button to terminate the process.**

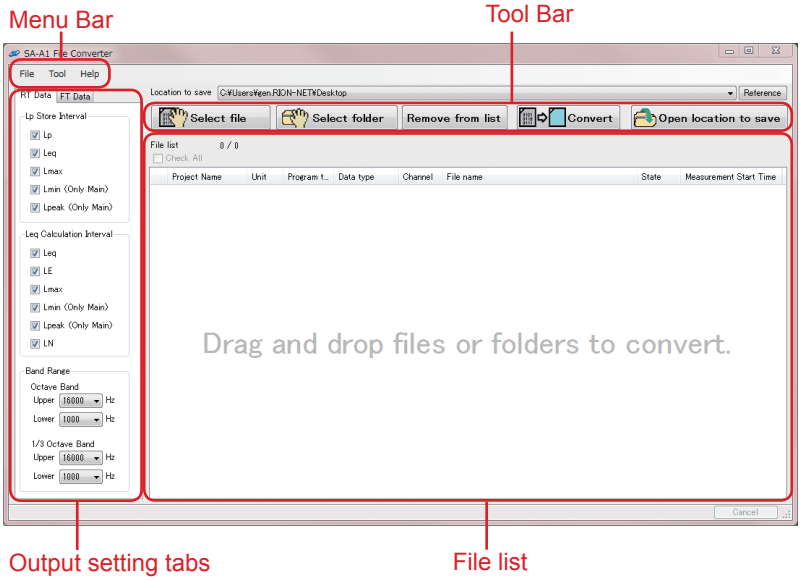


Starting the software

After installation is completed, start the program by double-clicking the shortcut icon that was created on the desktop.

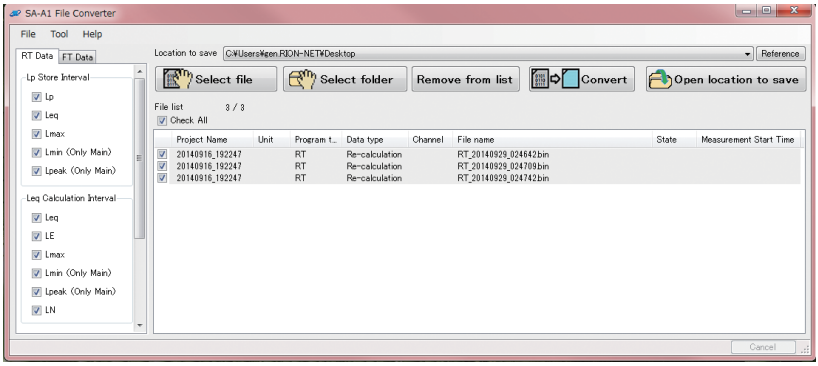
Screen configuration

The main screen of the software has the elements shown below.

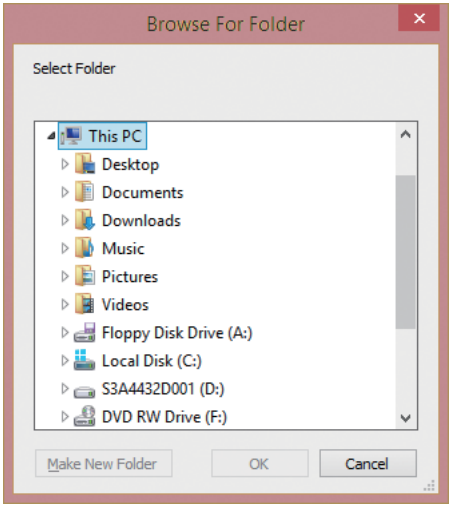


Converting files

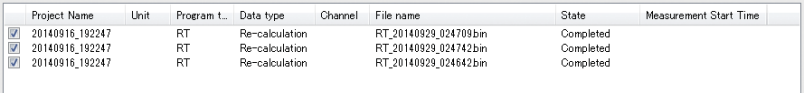
1. **Use drag & drop to add a file or folder to the file list window. It is also possible to drag & drop multiple files or folders together. Another method of adding files is to access the [File] menu and click on [Convert File]. This lets you select files or folders to add. To remove a file from the list, select the file in the list and click the [Remove from list] button. You can select multiple entries (rows in the list) by using the Shift and Ctrl keys. Ctrl + A selects all entries. Files can also be removed from the list by using the Delete key.**



2. **Click the [Reference] button and select the location where the converted files are to be saved.**



3. **Click the [Convert] button on the tool bar to convert the files in the list. After conversion, each file will be saved in the location specified in step 2, and the "State" column for the file shows "Completed".**



Clicking the [Open location to save] button on the tool bar opens the folder where the files are saved.

Unless the original binary files have been deleted, conversion can be performed as often as desired. The File Converter software does not modify or delete the original binary files.

Information about text files created by the conversion (SX-A1RT)

Text files (extension ".txt")

Conversion of one project will result in two files being created, which are named as follows: "<Project name>_0001_RT_Long. txt" and "<Project name>_0001_RT_Short. txt". The contents are largely identical to the items in the ".rnh" file in the project folder.

Data files (extension ".csv" or ".tsv")

With both file types, columns show the time and rows show the level for each frequency and the AP level in 0.1 dB units.

Rows are created for every 100 ms in the case of L_p store cycle data (data in files containing the "RT_Short" string). L_{eq} calculation interval data (data in files containing the "RT_Long" string) are created for each specified time interval (100 ms or higher, for example every second).

Columns contain the data for the band range specified with the File Converter software. For example, if the range from 100 Hz to 5000 Hz was specified, only data for these bands are saved.

An example is shown below. The "Date" column indicates year/month/date, and the "Time" column indicates hours/minutes/seconds in 100 ms units. The "Main AP" column indicates the all-pass level, and the "100" and "125" columns indicate the 100 Hz and 125 Hz band level respectively.

Date	Time	Main AP	100	125	• • •
2014/7/8	53:01.9	44.8	35.1	34.2	
2014/7/8	53:02.9	49.3	34.4	35.4	
2014/7/8	53:03.9	43.5	32.7	32.4	
2014/7/8	53:04.9	40.1	30	28.1	
2014/7/8	53:05.9	48.6	33.4	30.1	

Data files are created separately for each calculation type, as listed below.

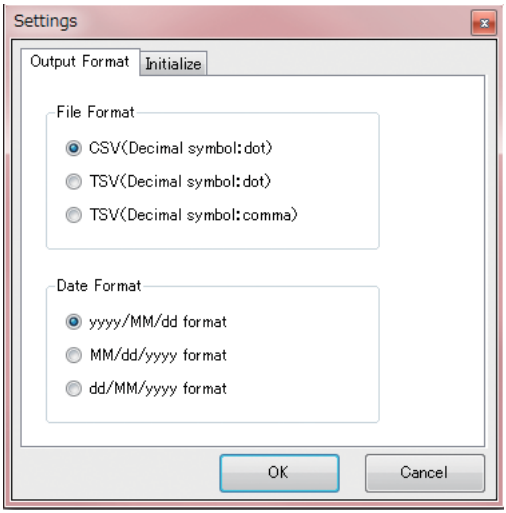
a) LN file
   Separate files are created for each time percentile level LN1, LN2, LN3, LN4, and LN5.
b) LE file
c) Leq file
d) Lmax file
e) Lmin file
f) Lpeak file

When opening CSV files in Microsoft Excel, the date and time columns may not show up correctly, depending on the display format settings for the cell. To ensure correct display, select the respective column, right-click to bring up the menu, select [Format Cells] and use the “Custom” option to specify “hh:mm:ss.0”.

Settings

Changing the delimiter and date format for saved text files

Select [Tool] **>** [Settings] to open the “Settings” window.

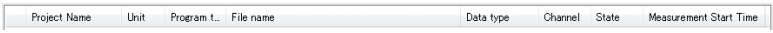


Selecting calculation type and data selection

Make sure that the required items are checked under the operation setting tabs [RT Data] and [FT Data]. In order to save the same data as the SX-A1FT results displayed on the RIONOTE screen, match the Power/Amplitude and Peak/RMS settings to the display settings of the RIONOTE.

List display

The sort order of list items can be changed by clicking on the column title such as “Project name” or “Data type”.



Clicking on a list item toggles the sort order between ascending and descending.

Use of output setting tab [FT Data]

For the conversion output from SX-A1FT files, you can select the unit, linear or dB indication, dimension (power or amplitude), power spectral density, and peak/RMS.

If acceleration has been calibrated in m/s2 in SX-A1FT, selecting “EU” as unit and selecting the “dB” check box allows conversion into a dB calibration unit value.

Use of output setting tab [RT Data]

For SX-A1RT files, the calculation types to be saved (L_p, L_{eq}, L_{max} etc.) can be specified separately for 100 ms L_p store interval data (data in files containing the “RT_Short” string) and for L_{eq} calculation interval data for each specified interval (data in files containing the “RT_Long” string). The required band range can also be specified. (The names “L_p store interval data” and “L_{eq} calculation interval data” are used for distinction, but the L_p store data also comprise L_{eq} data.)

For example, if only the L_p and L_{eq} data for each 100 ms interval are required, select only the “Lp” and “Leq” check boxes for Lp mode. Also, if only data in the range from 100 Hz to 5 kHz for 1/3 octave bands are required, specify “100 Hz” as lower limit and “5 kHz” as upper limit.

Specifications

System Requirements

Operating system

Microsoft Windows 7 Professional, Windows 8 Pro, or Windows 8.1 Pro (every 32 bit or 64 bit), English version or Japanese version

CPU CPU supporting the above operating systems

RAM RAM capacity supporting the above operating systems

HDD Sufficient free space for handling data

Supported files

Binary files created by SX-A1RT or SX-A1FT

Language support

English, Japanese

Date formats

U.S. style (MM/dd/yyyy), European style (dd/MM/yyyy) , or Japanese style (yyyy/MM/dd) can be selected. yyyy stands for the year, MM for the month, and dd for the day of the month.

File type Text file format can be selected from CSV (comma delimited) or TSV (dot delimited, comma delimited).

Specifications

Applied Laws, Regulations and Standards
- CE marking
- WEEE Directive, Battery Directive
- Chinese RoHS (only the products exported to China)

Input/Output
- USB A Connector x 1
  - USB 2.0
- USB Mini B Connector x 1
  - Mass storage class
- GPIO Connector x 1 (for extended)
- Dock Connector Dedicated for SA-A1B2/B4 Connection x 1
- LAN port x 1
  - 100BASE-TX
- Monitor Output Port x 1 (φ3.5 Stereo Mini Jack)
- Voice Memo Input Port x 1 (φ3.5 Mini Jack)
- SD Memory Card Slot x 1
- Battery Port (For BP-30) x 1
- DC Jack x 1

Operation Area
- Projected Capacitive Touch Panel
  - Up to two points can be detected.
- Function Button x 1
  - Any one of the following functions can be selected.
  - (Note that the function depends on the program running on RIONOTE.)
    - Measure Start/Stop
    - Pause/Unpause
    - Screenshot

Power Key

While power is off, press and hold the key to power on.

While power is on, press and hold the key and then operate the touch panel to shut down.

While power is on, press the key short to turn off LCD (except during measurement).

Press and hold the key for more than 10 seconds to force power-off.

Touch Panel Lock Switch

Disable the touch panel operations.

The function button and power key are available.

Display

LCD 10.1-inch transmissive TFT color LCD (1280 x 800 pixels)

LED (Battery Status Display)

Charging energization status display (De-energized: None, Energized: Lights in blue)

Charging status display (Not charged: None, Charging: Lights in green, Standby: Lights in orange)

LED (LAN Status Display)

Link activity status display (No link: None, Link: Lights in yellow, In communication: blinks in yellow)

Communication speed status display (10BASE-T or no link: None, 100BASE-TX: Lights in green)

Language Japanese/English

Status Bar Display

Amplifier status

RIONOTE power status

SD memory card available space

Time

Calibration Reading can be changed for the following sensors.
Microphone
Piezoelectric Accelerometer
Sound Level Meter
Vibration meter
Miscellaneous AC
Miscellaneous DC
Tacho sensor
(Available only for the tacho pulse/extra DC input port)
Extra DC input (10 Hz sample)
(Available only for the tacho pulse/extra DC input port)

Recording Area

Storage Media

SD memory card (operation guarantee is limited to those specified by RION Co., Ltd.)
Maximum capacity 32 GB (SDHC)

File system
FAT 16/FAT 32

Power Supply

Power Supply

Lithium-ion rechargeable battery dedicated for RIONOTE (BP-30)
Dedicated AC adapter for RIONOTE (NE-20P)

External DC
11 - 20 V

Continuous Measurement Time (23°C)

Application	LCD brightness setting	CCLD	Amplifier	Estimated battery life
SX-A1WR	0%	ON	SA-A1B2	Approx. 4:20
SX-A1WR	0%	ON	SA-A1B4	Approx. 4:00
SX-A1WR	0%	OFF	SA-A1B4	Approx. 4:30
SX-A1RT	100%	ON	SA-A1B4	Approx. 2:45

BP-30 is considered new.

Charging Time

Approx. 7.5 hours (at an ambient temperature within the charging temperature range)

Pre-installed Program

Waveform Recording Program SX-A1WR

Instruction Manual Browsing Function

RIONOTE, SX-A1RT, SX-A1FT and SX-A1WR instruction manuals in HTML format can be referenced.

Update

The application or system can be updated using an update file downloaded from the web site.

Waterproof Performance

IP Code IPX4

The following conditions are required to maintain the waterproof performance.

RIONOTE is equipped with any one of the followings.

Blind cover for RIONOTE

SA-A1B2

SA-A1B4

Followings must be observed in attaching SA-A1B2 or SA-A1B4.

The BNC jack is not exposed to water.

A rubber cover is attached to the Ext trigger port.

The right connector cover of RIONOTE is attached.

The left connector cover of RIONOTE is attached.

The DC jack cover of RIONOTE is attached.

The earphone and microphone jacks are not exposed to water.

BP-30 is attached.

Rubber seals are not worn out.

Temperature Range

Ambient conditions for operation

Using BP-30 (lithium-ion rechargeable battery) only

-10°C to +40°C, 90%RH or less (No condensation)

Connecting NE-20P (AC adapter)

-10°C to +50°C, 90%RH or less (No condensation)

Charging Temperature Range

+5°C to +35°C

RIONOTE should be powered off.

Ambient conditions for storage

Same as the operating temperature/humidity range

Others: Screw holes for fixing 2 (M4 screw depth: 8 mm)

Dimensions: Approx. 30 mm (H) x 275 mm (W) x 188 mm (D) (without SA-A1B2/SA-A1B4)

Approx. 40 mm (H) x 275 mm (W) x 188 mm (D) (with SA-A1B2/SA-A1B4)

Weight: Approx. 1120 g (including the battery weighing 280 g, without SA-A1B2/SA-A1B4)

Approx. 1200 g (including the battery weighing 280 g, with SA-A1B2/SA-A1B4)

Supplied accessories

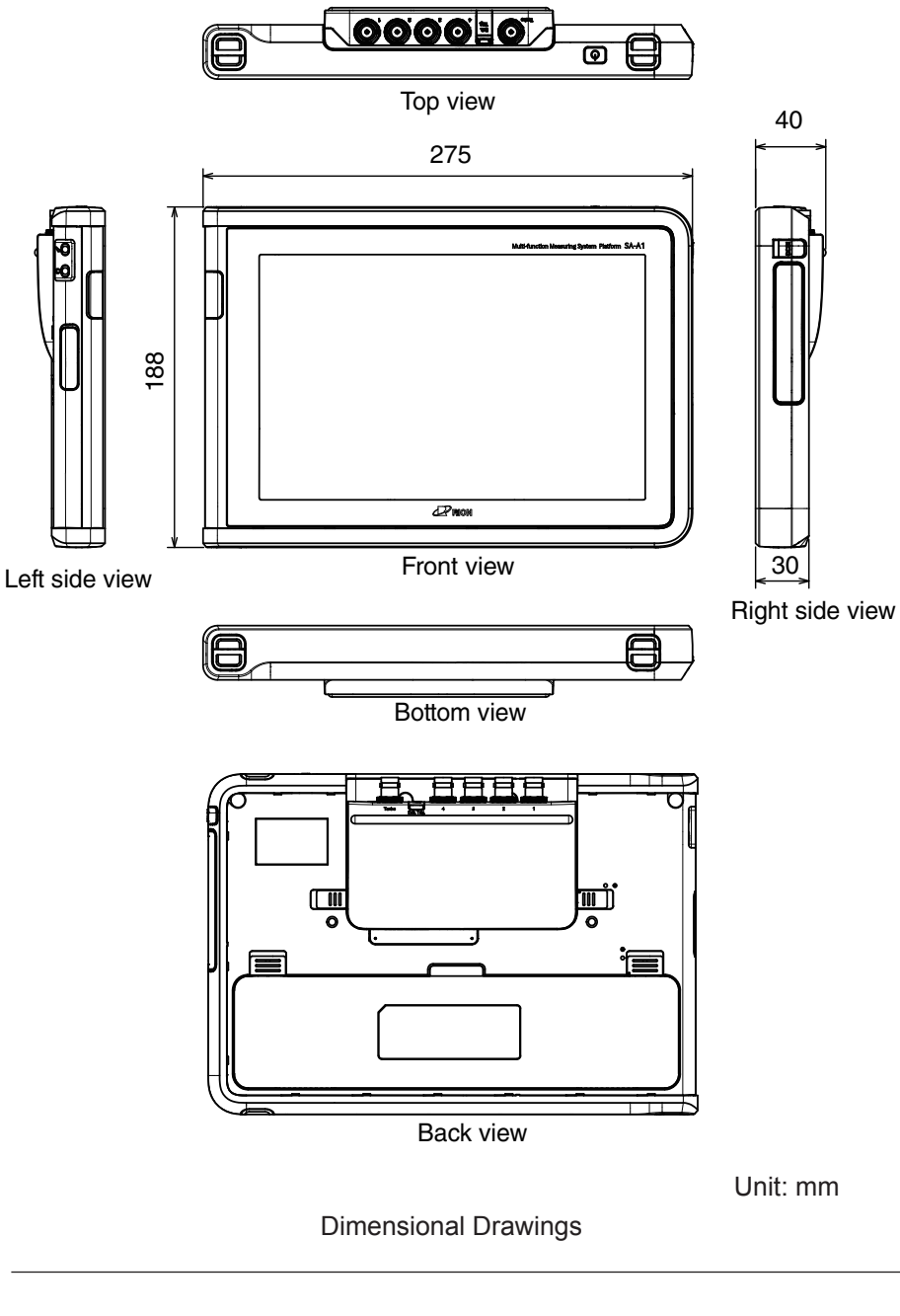
AC adapter NE-20P	1
Lithium-ion rechargeable battery BP-30	1
Blind cover	
CD-ROM	1

(SA-A1 File Converter, AS-70 Viewer, Readme, RIONOTE Instruction Manual, SX-A1RT Instruction Manual, SX-A1FT Instruction Manual, RIONOTE Online Help, SX-A1WR Online Help, SX-A1RT Online Help, SX-A1FT Online Help)

	Please Read This First	1
	RIONOTE Precautions	1
	SA-A1B2/B4 Precautions	1
	Inspection certificate	1

Optional accessories

Lithium-ion rechargeable battery	
	BP-30
Shoulder strap	VA-12-015
AC adapter	NE-20P
Memory card (SD)	2 GByte
	32 GByte
Voice memo microphone	iBUFFALO BSHSM03BK
In-ear headphones for monitor playback	
	Audio-Technica ATH-C320-BK
BNC-BNC cable	EC-90 series
Preamplifier	NH-22
Charge converter	VP-40/VP-42
Microphone for measurement	
	UC series: Electret type only
Acceleration pickup	PV series
BNC-Pin output cable	CC-24/CC-24S
CCLD 4 mA modification (factory option)	
LCD protection sheet for RIONOTE	



Unit: mm

Dimensional Drawings

Waveform Recording Program (SX-A1WR)

This section explains the operating and setup procedures of the Waveform Recording Program SX-A1WR.

Software Usage License Agreement

Important	In order to use this Software, you must agree to the terms of the Software Usage License Agreement (hereinafter “this Agreement”). Please read the following text carefully, and only proceed to use the Software if you agree to be bound by all the terms and conditions of this Agreement.

Article 1 Authorized Use

This Software (including updated or customized versions) is designed for use with the platform RI-ONOTE (hereinafter “the Product”). You are authorized to use the Software only in conjunction with the Product, in such a way as stipulated in this Agreement.

Article 2 Ownership of the Software

All rights to this Software are retained by Rion Co., LTD, (hereinafter “Rion”) and/or its rightful owners. This Agreement grants you only a limited right to use the Software. This Agreement does not grant you any other rights other than specified herein.

Article 3 Limitations to Use and Transfer

1. This Agreement does not grant you any rights to copy the Software and any associated documentation.
2. This Agreement does not grant you any rights to alter or modify the Software.
3. This Agreement does not grant you any rights to reverse engineer, decompile, recompile, or disassemble the Software.
4. Unless prior written permission from Rion has been obtained, this Agreement does not grant you any rights to lend the Software to any third parties, regardless of whether this is done for payment or free of charge.
5. This Agreement does not grant you any rights to transfer the rights specified in this Agreement to any third parties.

Article 4 Warranty Scope

1. Rion does not make any representation or promise that this Software will be able to perform without problems under any and all conditions. If a problem occurs while the Software is being used under normal conditions, contact Rion using the information provided in the Instruction Manual. As far as possible based on the information provided by you about the problem, Rion will provide guidance and information about possible errors, improved operation procedures and similar.
2. Rion (including any affiliated companies or subsidiaries) does not assume any liability for any damage caused by alteration or loss of data stored in the Product, even if this is due to a defect or other problem with the Software.
3. In no event does Rion assume liability for any kind of direct or indirect damage, loss of profit or anticipated gain, or any other damage caused by the use of the Software, or the inability to use the Software.
4. In no event does Rion assume liability for any problem caused by an alteration or modification of the Software by you. Rion also does not assume liability for any damage caused to yourself by such an alteration or modification.

5. Liability of Rion for any damages will not exceed the actual price that was paid for the license to use the Software. This limitation does not apply in the case of intentional faults or gross negligence.

Article 5 Remedy

1. Rion guarantees that the Software as supplied contains the functions that are explicitly listed in the specifications.
2. If the software does not operate according to specifications, and the cause is the responsibility of Rion, and if this is detected and Rion is informed of this fact within 90 days from the purchase date of the Software, Rion will undertake to remedy the problem free of charge.
3. In cases other than above, Rion will undertake to remedy the problem against charge.

Article 6 Duration of this Agreement

1. You can terminate this Agreement at any time by stopping to use the Software and destroying the Software and all associated documentation.
2. If you violate any of the conditions of this Agreement, Rion can cancel this Agreement and terminate the usage of the Software. In such a case, you are obligated to destroy the Software and all associated documentation (including any unauthorized copies).

Article 7 Other Items

If the Software and the Product are taken from Japan to any other country, the Japanese Foreign Exchange and Foreign Trade Law, the United States Export Administration Act, and all other applicable laws and regulations must be strictly observed. This Agreement shall be exclusively governed by the laws of Japan.

Article 8 Third Party Beneficiaries

This Software includes components for which the rights are held by other parties except Rion. In the case of a violation of this Agreement, in addition to Rion, such third parties shall also have the right to demand compensation for damages.

* This Software comprises open source software components. For license information on open source software, refer to the Instruction Manual of the Product.
If there is any discrepancy between the conditions of this Agreement and the conditions of the open source software license, the open source software conditions shall take precedence.

SX-A1WR Overview

SX-A1WR is a waveform recording program that runs on the RIONOTE.
Recorded wave data is saved on the SD memory card installed on the RIONOTE. You can also record a voice memo and save a graph in an image format.
You can record frequency bands in six ranges of maximum of 20 kHz for data such as sound pressure, vibration, revolution speed, and temperature.

Screen Layout

Measurement Screen Layout



MEMO	- The screen above is an example of the display with four graphs.

Status Bar

Displays the registered amplifier unit status, date and time, and battery status.

Operation Area

Provides measurement related buttons and information such as measurement start/stop button and measurement time display.

Time-Level Display Area

Provides a Time-Level display (for a maximum of 120 seconds) for the wave data currently input to the selected monitoring channel. By changing the channel, you can change the data to display.

Tacho Pulse/Extra DC Display Area

Displays the tacho pulse/extra DC input. You can change the settings to hide it.

Bar Graph/Time-Level Display Area

Displays wave data currently being input. The number of graphs to display can be selected from one, two and four. You can also check the abnormal state during recording, such as OVERLOAD.

Recall Screen Layout



Status Bar

Displays the selected project name, date and time, and battery status.

Operation Area

Provides the buttons and information for playing recall data and operating files.

Time-Level Display Area

Provides a Time-Level display (for a maximum of 120 seconds) for the wave data currently opened by the selected monitoring channel. By changing the channel, you can change the data to display.

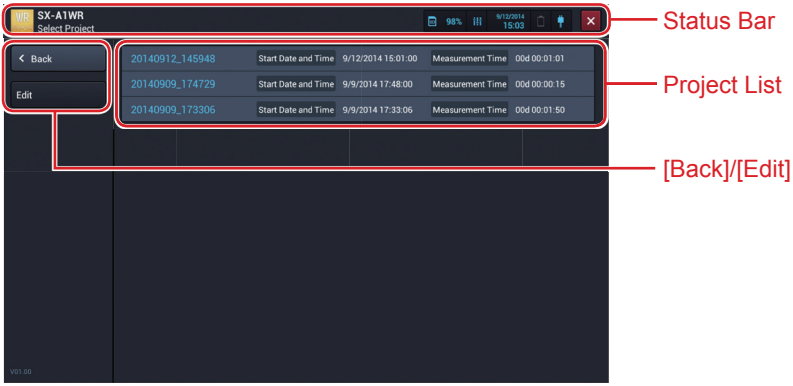
Tacho Pulse/Extra DC Display Area

Displays the tacho pulse/extra DC input. You can change the settings to hide it.

Bar Graph Display Area

Displays wave data currently opened. The number of graphs to display can be selected from one, two and four.

Project Select Screen Layout



Status Bar

Displays the date and time and the battery status.

[Back]

Tap the button to return to the previous screen.

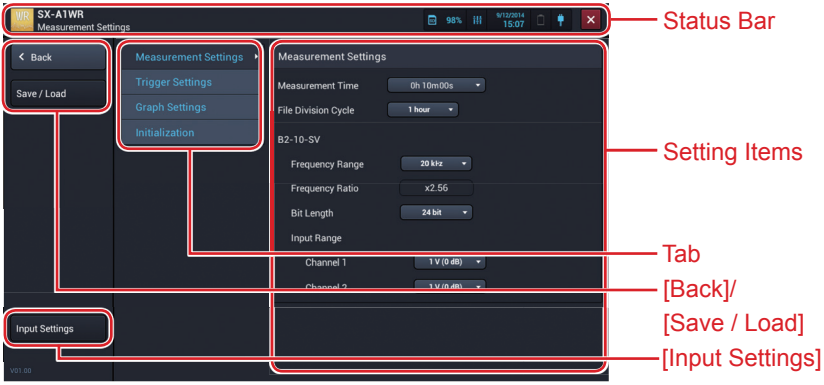
[Edit]

Tap the button to display the screen to change a project name or delete a project.

Project List

Displays the list of saved projects.

Measurement Settings Screen Layout



Status Bar

Displays the date and time and the battery status.

[Back]

Tap the button to return to the previous screen.

[Save / Load]

Tap the button to display the screen to save the settings. This button appears when you move from the Measurement screen to the Setting screen.

[Input Settings]

Tap this to display the Input settings screen. This button appears when you move from the Measurement screen to the Setting screen.

Tab

The items settable on the Setting screen are displayed with tabs according to the purpose. You can tap to display items that can be configured on the tab.

Setting Items

Displays the setting items of the selected tab.

Starting/Exiting the SX-A1WR

Starting the SX-A1WR

1. **Tap [SX-A1WR] on the HOME screen.**



The SX-A1WR starts and the Measurement screen appears.

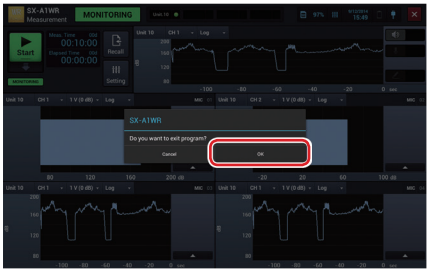
MEMO	- You may not see [SX-A1WR] displayed on the screen if multiple programs are installed. In this case, slide the programs up or down on the HOME screen to display [SX-A1WR].

Exiting the SX-A1WR

1. **Tap [X] on the right side of the status bar.**



2. **Tap [OK].**



MEMO	- You cannot exit the SX-A1WR during measurement.

Measuring Wave

Starting Measurement

1. Slide [Start] down.



Measurement is started and the data is saved on the SD memory card.

Important - Do not power off or pull out the SD memory card during measurement.

MEMO

- Depending on the Trigger Mode you selected, the operation after starting measurement becomes as follows.
  - Free: Starts measurement immediately. Measurement stops after the specified measurement time.
  - Single: Puts in a trigger standby state. Measurement starts when trigger conditions are met. Measurement stops after the specified measurement time.
  - Repeat: Puts in a trigger standby state. Measurement starts when trigger conditions are met. An operation goes back in a trigger standby state after a specified measurement time.
- When you start measurement, [Start] changes to [Stop].
- The screen displays [MEASUREMENT] during measurement, and [STAND-BY] during a trigger standby period.
- You can change the graph size, channel to display or scale type during measurement. (The level range cannot be changed.)
- Measurement stops automatically when the available SD memory card space becomes small or the battery level becomes low.

Stopping Measurement

1. **Slide [Stop] down.**



MEMO	- Use this operation to stop measurement manually before the specified measurement time ends. - When you stop measurement, [Stop] changes to [Start] and the screen displays [MONITORING].

Configuring the Measurement Time

Configure time to measure. You can configure measurement time between 1 second and 1000 hours.

1. **Tap [Meas. Time].**



2. Slide the measurement time to configure.



MEMO	- Select the unit from [seconds], [minutes], or [hours] and slide the measurement time to configure. [seconds]: Configure between 10 and 59. [minutes]: Configure between 1 and 59. [hours]: Configure between 0 01 and 10 00. - If you select [hours], 24 hours are converted into 1 day and the measurement time displays it as "01d" and fractions as hours. <Example> If you set to 100 hours, the measurement time displays as "04d" and fractions as 4 hours. - The measurement time can be configured on the Measurement settings screen as well.

3. Tap [OK].



Voice Memo/Marker

Inserting the Voice Memo

Voice memo is a function to record comments for measurement status, etc. during measurement. You can record a voice memo during measurement.

MEMO	- You need a voice memo microphone to insert a voice memo. (P.43) - You cannot use the voice memo microphone jack and earphone jack at the same time.

1. **Slide [ ] to the right during measurement.**



It changes to [ ], allowing the insert of a voice memo.

2. **Speak what you want to record to the voice memo microphone.**

3. **To stop the insert, slide [ ] to the left during the insert of the voice memo.**



It changes to [ ], stopping the insert of the voice memo.

MEMO	- Inserted voice memo is saved in the measured data project. - This function is used to record a voice memo and not intended for measurement.

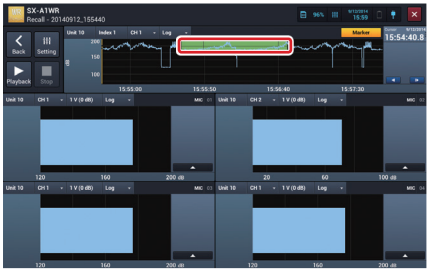
Playing the Voice Memo

The voice memo recorded during measurement can be played on the Recall screen.

MEMO	- Earphones are required to play a voice memo. (P.43) - You cannot use the microphone jack and earphone jack at the same time.

1. **Open a project and display the Recall screen. (P.129)**

2. **Tap the voice memo marker in the Time-Level display area.**



The cursor color changes to green and the voice memo playback is output from the earphone jack.

3. **To stop the playback, tap the Stop button.**



The voice memo playback is stopped

Inserting the Marker during Measurement

Marker is a function to mark measured wave data. It is used to mark when you add notes during measurement.

1. **Slide Marker icon to the right during measurement.**



The marker is inserted in the measured data.

2. **To end the insert, slide Marker icon to the left.**



The insert of the marker is ended.

Inserting the Marker to Measured Wave Data

The marker can be inserted in the recall data in a project as well.

1. **Open a project and display the Recall screen. (P.129)**

2. **Tap [Marker].**



3. **Slide the marker to the position to which you want to insert the marker.**



4. **To change the marker starting point, tap the starting line of the marker.**



The color of the marker starting line changes, enabling the move of the line.

5. **Slide the starting line to the desired position.**



MEMO	- You cannot move the starting line after the ending line. If you move it after the ending line, the ending line moves too.

6. **To change the marker ending point, tap the ending line of the marker.**



The color of the marker ending line changes, enabling the move of the line.

7. **Slide the ending line to the desired point.**



MEMO	- You cannot move the ending line before the starting line. If you move it before the starting line, the starting line moves too.

8. **When you decide the marker position, tap [ENTER] below the marker.**



The marker is inserted in the selected area.

9. **Tap [Marker].**



Deleting the Marker

1. **Open a project and display the Recall screen. (P.129)**

2. **Tap [Marker].**



3. **Tap [Delete] below the marker to delete.**

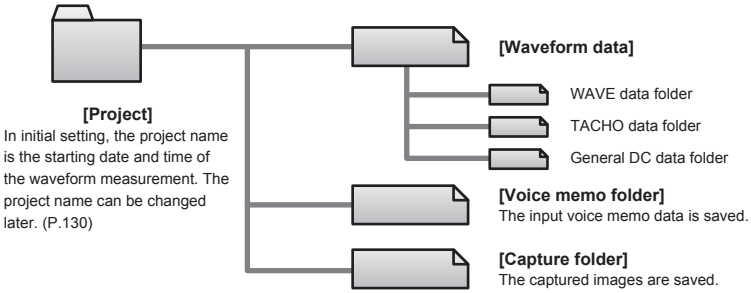


MEMO	- You can delete an inserted marker during measurement.

Operating the Project

Project

Project is a folder to save data such as a measured record or voice memo. All data regarding measured records are saved in the same project.
The project name is saved as the starting date and time of recording measurement but can be changed to any name later.



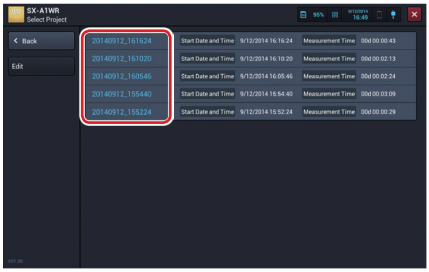
MEMO	- To use the project, which was transferred from a SD memory card to a computer, again on the unit, save the program on a SD memory card without creating a folder.

Opening the Project

1. **Tap [Recall] on the Measurement screen.**



2. **Tap the name of the project you want to open.**



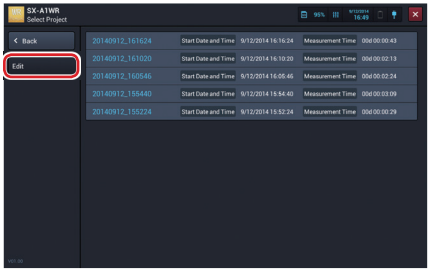
The Recall screen appears and displays wave data of the selected project .

MEMO	- If the recall data is large, it may take time to be ready for playing a waveform on the Recall screen.

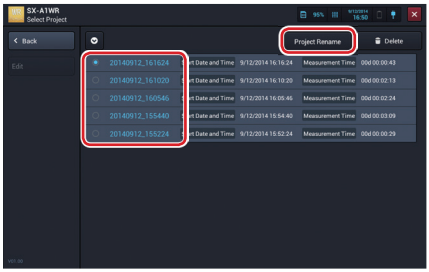
Changing the Project Name

1. **Tap [Recall] on the Measurement screen.**

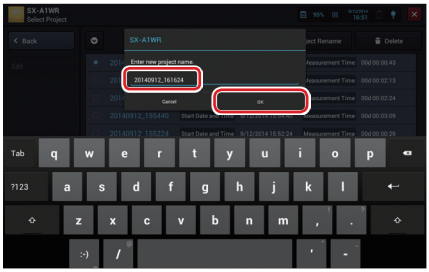
2. **Tap [Edit].**



3. **Tap the project of which you want to edit the name and tap [Project Rename].**

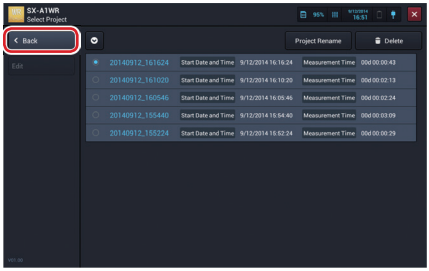


4. **Enter the name and tap [OK].**



MEMO	- You can use alphabetical and numeric characters and underscore for a project name.

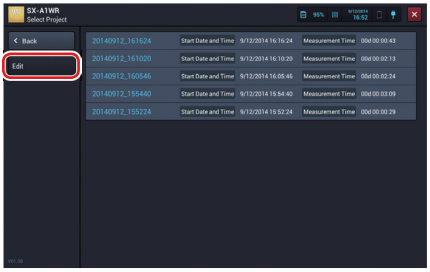
5. **Tap [Back].**



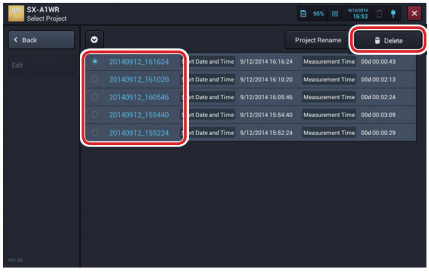
Deleting the Project

1. **Tap [Recall] on the Measurement screen.**

2. **Tap [Edit].**

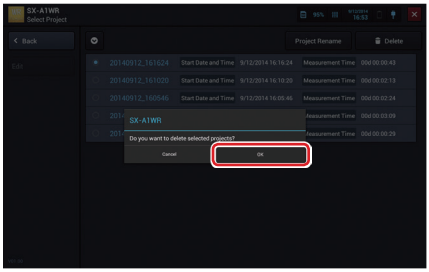


3. **Tap the project to delete and tap [Delete].**



MEMO	- You can select multiple projects. - When the project is selected, [●] appears to the left of the project. - Tap the selected project again to cancel the selection. - Tap [ ] to select all projects. Tap it again to cancel all the selections.

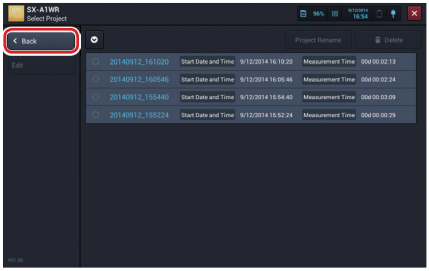
4. **Tap [OK].**



Important

- If you delete the project, you cannot restore data. Check if data is unnecessary before deleting.

5. **Tap [Back].**



Operating Recall Screen

Playing the Recall Data

1. **Open a project and display the Recall screen. (P.129)**

2. **Tap [Playback].**



The cursor in the Time-Level display area starts moving to play the wave data.

MEMO	- The playback signal is output from the earphone jack. - Tap [Stop] to stop playback. - Tap within the Time-Level display area while playback is stopped to cause the cursor to move to the tapping point. - After moving the cursor, tap [Playback] to start playback from the moved cursor point.

Checking the Recall Data Settings

1. **Open a project and display the Recall screen. (P.129)**

2. **Tap [Setting].**



The measurement settings of recall data are displayed.

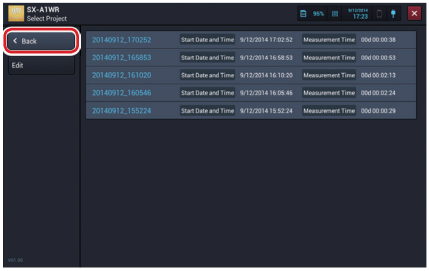
Closing the Recall Screen

1. **Tap [Back] on the Recall screen.**



The Select project screen is displayed.

2. **Tap [Back].**



The Measurement screen is displayed.

Operating Graphs

Zooming in on the Time-Level Graph View

1. **Pinch out on the graph on which you want to zoom in.**



MEMO	- You cannot zoom in on the bar graph display. - The zoomed in graph is returned to previous display by double-tapping a graph.

Zooming out of the Time-Level Graph View

1. **Pinch in on the graph of which you want to zoom out.**



MEMO	- You cannot zoom out on the bar graph display. - The zoomed out graph is returned to previous display by double-tapping a graph.

Using the Single Graph View

When using the multiple graph display (two or four graphs), you can zoom in on the selected graph for the single graph view.

MEMO	- You can zoom in on a graph when using the multiple graph view. You cannot zoom in when using the single graph view. - The number of graphs to display can be selected from [Graph Settings] in [Measurement Settings]. (P.150)

1. Tap [▲] on the graph on which you want to zoom in.



2. Tap [Single Graph View] on the graph.



The selected graph is displayed all in the graph display area.

MEMO	- The graph view can also be switched by double-tapping a graph.

Returning the Graph to the Multiple View

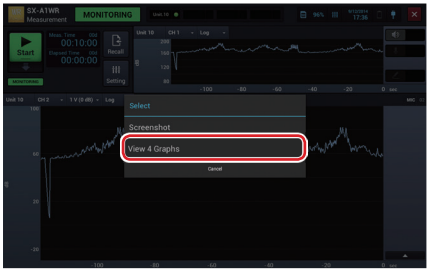
You can return the graph view displayed all in the graph display area (single graph view) to the original multiple view.

MEMO	- You can zoom out of a graph when using the multiple graph view. You cannot zoom out when using the single graph view.

1. Tap [▲] on the graph of which you want to zoom out.



2. Tap [View 2 Graphs] (or [View 4 Graphs]).



The graph is returned to the multiple view.

MEMO	- The graph view can also be switched by double-tapping a graph.

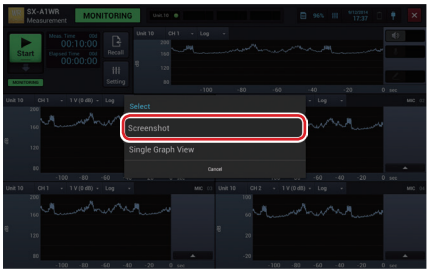
Capturing the Graph

Graph capture is a function to save a graph currently displayed in a PNG format image file.

1. **Tap [▲] on the graph you want to capture.**



2. **Tap [Screenshot].**



MEMO	- A captured graph image file is highlighted and saved. - A file of graph image captured during measurement is saved in the project folder. - A file of graph image captured other than during measurement is saved in the [Others] folder created in a SD memory card. - You can use the function key to capture all graphs currently displayed on the screen.

Changing the Display Contents on Graphs

The graph of the selected channel, input range, and scale is displayed. Changing the selection changes the graph view.

1. **To change the channel, tap the channel number.**



2. **Tap the channel number to display.**



3. To change the input range, tap the input range.



MEMO	- Configure the setting so that OVERLOAD is not displayed when the input range is changed.

4. Tap the input range to display.



5. **To change the X-axis on the graph, tap the scale name.**



6. **Tap the scale to display.**

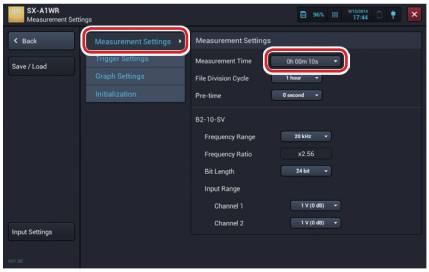


Settings

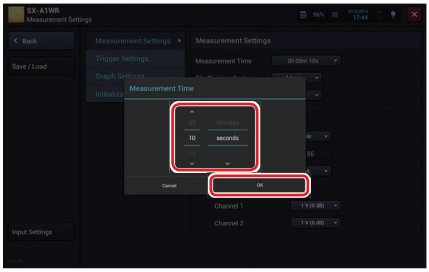
Configuring the Measurement Time

1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Measurement Settings] and tap [▼] on the right side of [Meas. Time].**



3. **Slide the measurement time to configure and tap [OK].**



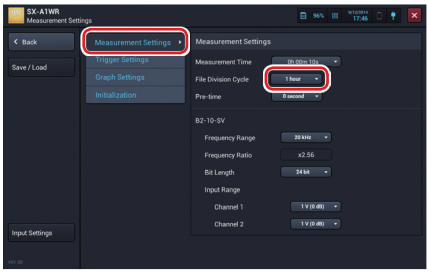
MEMO	- Select the unit from [seconds], [minutes], or [hours] and slide the measurement time to configure. [seconds]: Configure between 10 and 59. [minutes]: Configure between 1 and 59. [hours]: Configure between 0 01 and 10 00.

Configuring the File Division Cycle

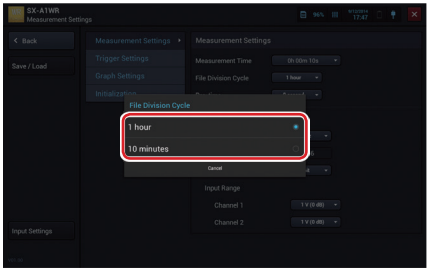
Select the size (duration) of a single file for measured data.

1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Measurement Settings] and tap [▼] on the right side of [File Division Cycle].**



3. **Tap the measured file division cycle to save.**

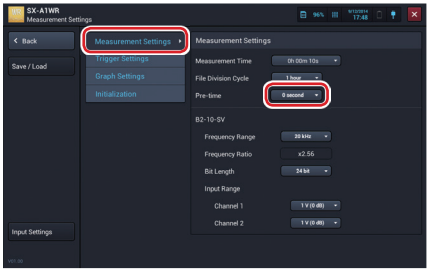


Configuring the Pre-time

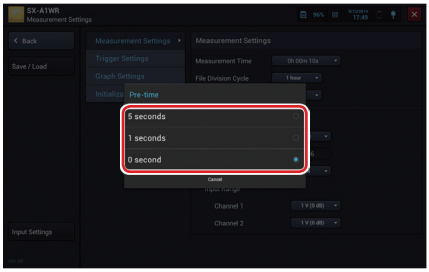
Select the range (duration) to record past data for a certain period of time from the start of measurement. Pre-time is not displayed when [Time] is selected for [Trigger Source] in [Trigger Settings].

1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Measurement Settings] and tap [▼] on the right side of [Pre-time].**



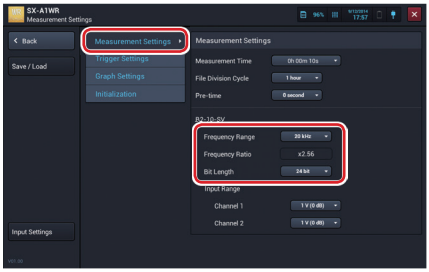
3. **Tap the pre-time to configure (5 seconds, 1 seconds, or 0 second [no pre-time]).**



Configuring the Amplifier unit Items

1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Measurement Settings] to configure each item for the amplifier unit.**



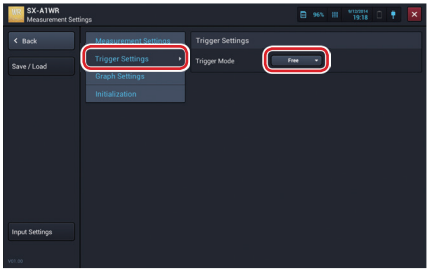
MEMO	- For details on settings for each item, see "Manual" provided with the unit.

Configuring the Trigger

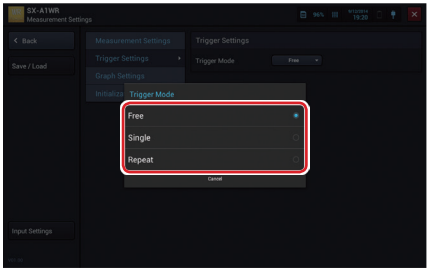
Configure the trigger conditions for starting measurement.

1. **Tap [Setting] on the Measurement screen.**

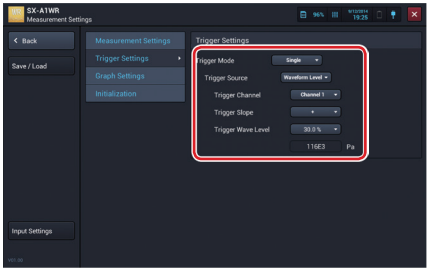
2. **Tap [Trigger Settings] and tap [▼] on the right side of [Trigger Mode].**



3. **Tap the trigger mode to configure.**



4. If you select [Single] or [Repeat], configure the trigger conditions.

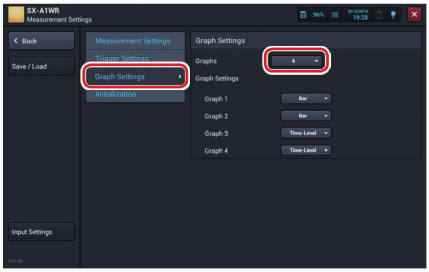


MEMO	- For details on settings for each item, see "Instruction Manual Application" provided with the unit.

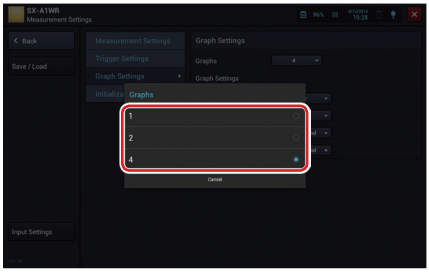
Configuring the Number of Graphs to Display

1. **Tap [Setting] on the Measurement screen.**

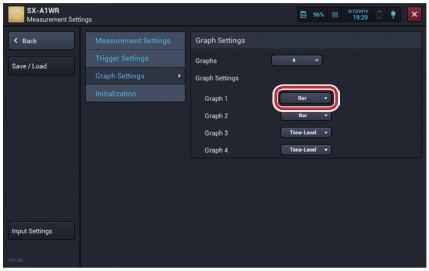
2. **Tap [Graph Settings] and tap [▼] on the right side of [Graphs].**



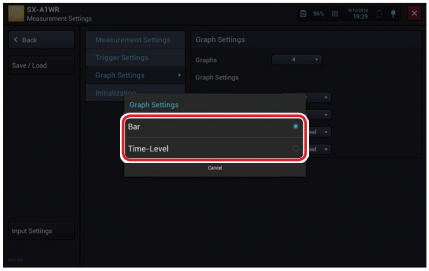
3. **Tap the number of graphs to display.**



4. **Tap [Graph Settings] and tap [▼] on the right side of each graph name.**



5. **Select the type of the graph to display.**

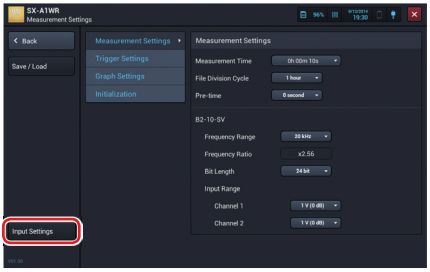


MEMO	- Configure as many graph types as the number of configured graphs. - You can change the number of recall data graphs in the Settings Confirmation screen but cannot change the type.

Calibrating

1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Input Settings].**

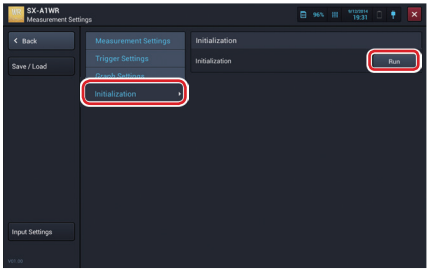


MEMO	- For details on Input Settings, see "Configuring the Calibration" (P.68).

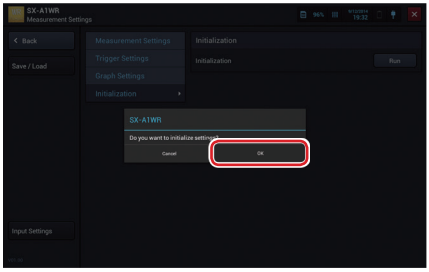
Initializing the Settings

1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Initialization] and then [Run].**



3. **Tap [OK].**



The default settings are as follows.

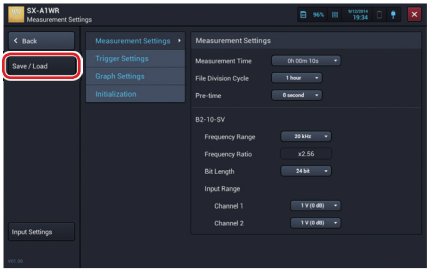
Item		Default
Measurement Settings	Measurement Time	10 m
	File Division Cycle	1 hour
	Pre-time	0 seconds
	Frequency Range	20 kHz
	Frequency Ratio	x 2.56
	Bit Length	24 bit
	Input Voltage Range	10 V (20 dB)
Trigger Settings	Trigger Mode	Free
	Trigger Source	Waveform Level
	Trigger Channel	Channel1
	Trigger Slope	+
	Trigger Wave Level	30.0%
	Repeat Count	2
	Interval	1 hour
	Start Date and Time (Year/Month/Day)	Current date
	Start Date and Time (Hour:Minute)	Current time + 5 minutes
	Stop Date and Time (Year/Month/Day)	Current date + 1 day
	Stop Date and Time (Hour:Minute)	Current time + 5 minutes
Graph Settings	Graphs	2
	Graph Settings	Bar
Measurement Screen	Graph Display Type	Linear graph

Save the Current Settings

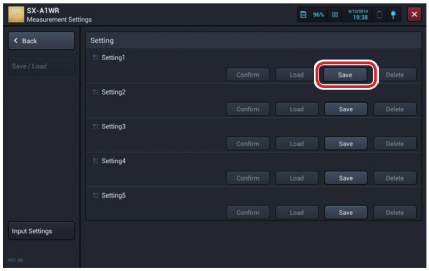
You can save settings configured in the Measurement settings screen. This allows you to load and restore the settings whenever you want. It is useful to save frequently-used settings.

1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Save / Load].**

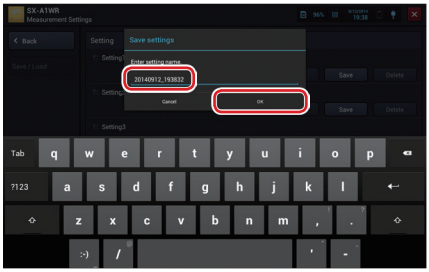


3. **Tap [Save].**

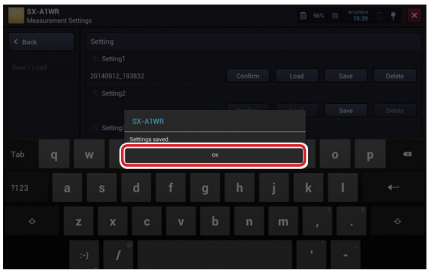


MEMO	- If you tap [Save] in a memo already saved, new settings overwrite the old settings.

4. Enter the name to save and tap [OK].



5. Tap [OK].



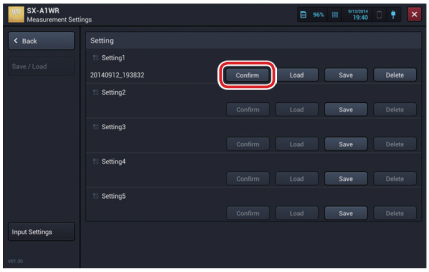
MEMO	- You can save up to five settings.

Confirming the Saved Settings

1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Save / Load].**

3. **Tap [Confirm] in the settings to check.**



4. **Check the settings and then tap [Close].**

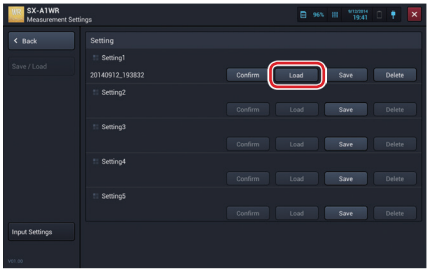


Load the Settings

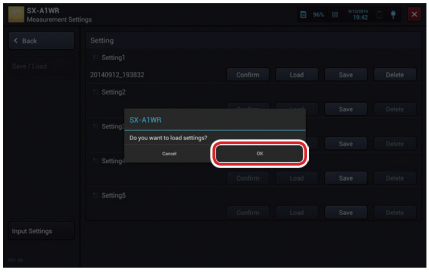
1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Save / Load].**

3. **Tap [Load] in the settings to load.**

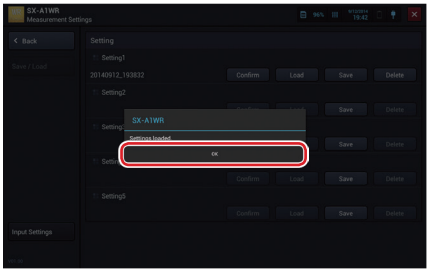


4. **Tap [OK].**



The settings are loaded.

5. **Tap [OK].**



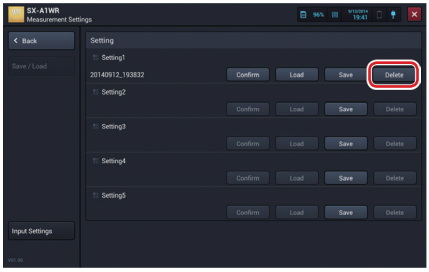
MEMO	- If you load the settings, the current settings will be deleted.

Delete the Settings

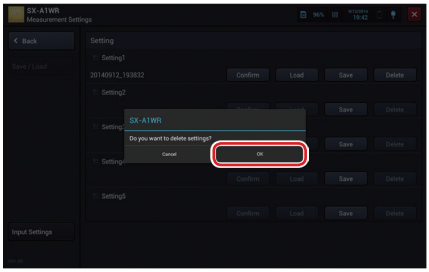
1. **Tap [Setting] on the Measurement screen.**

2. **Tap [Save / Load].**

3. **Tap [Delete] in the settings you want to delete.**

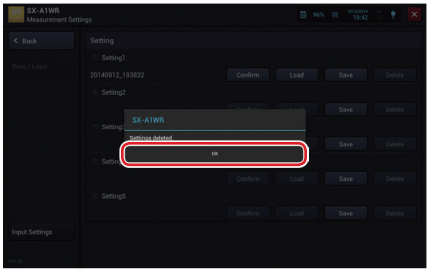


4. **Tap [OK].**



The settings are deleted.

5. **Tap [OK].**

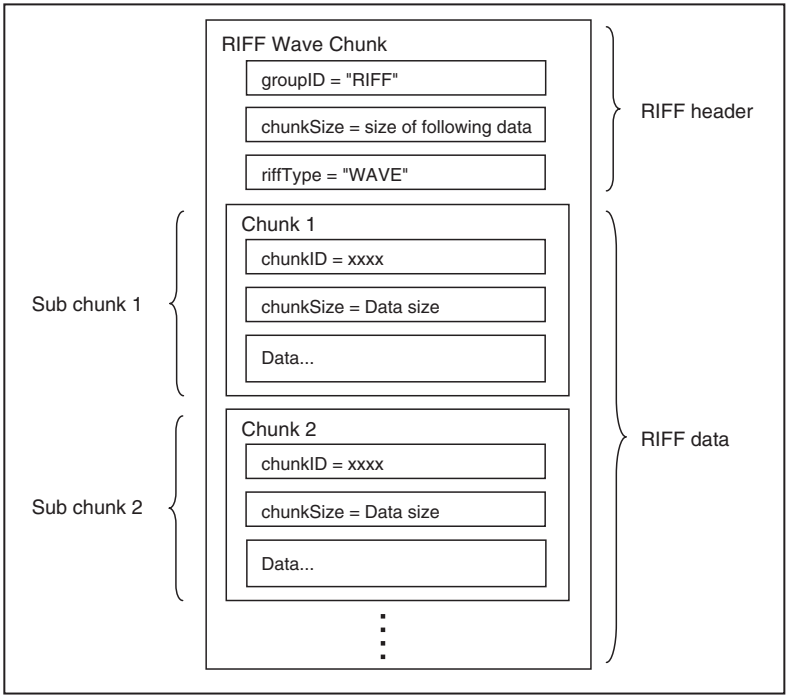


WAVE File Format

This section provides details about the WAVE file format used by the SX-A1WR.

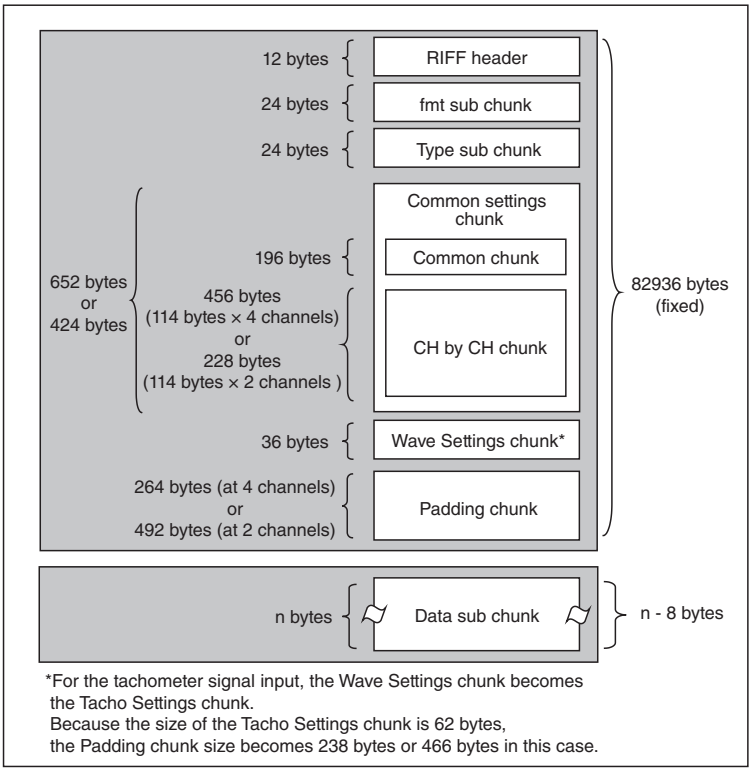
Basic structure

The WAVE file is made up of variable-length blocks called “chunks”. The basic structure is as follows.



Basic WAVE file structure

The chunks and file structure used by the SX-A1WR are shown below.



File structure and size

Invalid values

For unused items, a value defined as an invalid value is inserted.
The invalid values for the respective data types are shown in the table below.

Type	Invalid values
char	Blank
int16	Minimum value
uint16	Maximum value
int32	Minimum value
uint32	Maximum value
int64	Minimum value
uint64	Maximum value
float	Minimum value
double	Minimum value

Data types

The SX-A1WR uses the following specially defined data types.

```
typedef struct {
  uint32      dwDataAddress;      /* < Address as counted from start of data chunk */
  uint32      dwDataSize;
  uint32      dwFatDateTime;
  } MARKERFORMAT;

typedef struct {
              year    :6;          /* < Year (offset from 2000)          */
              mon     :4;          /* < Month (1 to 12)                  */
              day     :5;          /* < Day (1 to 31)                    */
              hour    :5;          /* < Hours (0 to 23)                  */
              min     :6;          /* < Minutes (0 to 59)                */
              sec     :6;          /* < Seconds (0 to 59)                */
  } FATDATETIME;
```

dwFatDateTime

The date is a packed value with the following format.

Bits	Values	Meaning
0 to 5	0 to 59	Second
6 to 11	0 to 59	Minutes (0 to 59)
12 to 16	0 to 23	Hours (0 to 23, 24-hour format)
17 to 21	0 to 31	Day of the month (1 to 31)
22 to 25	1 to 12	Month (1 = January, 2 = February etc.)
26 to 31	0 to 63	Year offset from 2000 (add 2000 to get actual year)

Chunks

The following tables provide details about the structure of the RIFF header (RIFF chunk) and the various sub chunks listed in the section “File structure and size”.

RIFF chunk

Table 1 RIFF chunk

Type	Variable name	Size (Byte)	Description	Value
char[4]	Chunk ID	4	Indicates RIFF	"RIFF"
uint32	Chunk Size	4	Total size of following data (not including this item)	Depends on recording parameters
char[4]	riffType	4	Indicates RIFF type	"WAVE"

fmt sub chunk

Table 2 fmt sub chunk

Type	Variable name	Size (Byte)	Description	Value
char[4]	Chunk ID	4	Indicates chunk type	"fmt_"
uint32	Chunk Size	4	Total size of following data (not including this item)	16
uint16	wFormatTag	2	Format type	0x0001
uint16	nChannels	2	Number of channels	1 to 4
uint32	nSamplesPerSec	4	Number of samples per second	See Table 3
uint32	nAvgBytesPerSec	4	Number of bytes per second	See Fig. 1
uint16	nBlockAlign	2	Block size	See Fig. 2
uint16	wBitsPerSample	2	Number of bits per sample	16 / 24

Table 3 nSamplesPerSec

Range / Rate	100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
2.56	256	1280	2560	12800	25600	51200

$$nAvgBytesPerSec = nSamplesPerSec \times nChannels \times \frac{wBitsPerSample}{8}$$

Fig. 1 nAvgBytesPerSec

$$nBlockAlign = nChannels \times \frac{wBitsPerSample}{8}$$

Fig. 2 nBlockAlign

Type sub chunk

Table 4 Type sub chunk

Type	Variable name	Size (Byte)	Description	Value
char[4]	Chunk ID	4	Indicates chunk type	"TYPE"
uint32	Chunk Size	4	Total size of following data (not including this item)	616
char[8]	File Type	8	File type	“WR_____”
uint16	File Revision	2	Chunk format version number	1 or more
Reserved		6		

CommonShareSetting (common) chunk

Stores setting information of the unit, including trigger settings etc.

Table 5 CommonShareSetting (common) chunk

Type	Variable name	Size (Byte)	Description	Value
char[4]	Chunk ID	4	Indicates chunk type	"CSET"
uint32	Chunk Size	4	Total size of following data (not including this item)	416 : SA-A1B2 644 : SA-A1B4
char[12]	Product Type	12	Product designation	“SX-A1WR_____”
uint16	Repeat Serial Number	2	Repeat trigger sequential number	Top number is 1, *N*th number is *N*
uint16	File Serial Number	2	Split file sequential number	Top number is 1, *N*th number is *N*
int64	Start Time	8	File start time	UNIX time (msec)
int64	Actual Record Time	8	Actual record time from Start Time	Time accuracy is 10 ms. Refer to the Wave Data chunk for the exact number of samples.
int16	Unit Equipped Channels	2	Number of total channels	2 / 4
int16	Total Enabled Channels	2	Number of enabled channels	1 to 4
Reserved		2		
int16	Unit ID	2	Unit ID number	1 to 99
char[40]	Unit Name	40	Unit name	

Type	Variable name	Size (Byte)	Description	Value
char[8]	Unit Type	8	Unit type	B2_____ / B4_____
char[16]	Unit Serial Number	16	Serial number	
int32	Unit CPU Version	4	CPU version	AA.BB.XXYY (8 digits in hex number)
int32	Unit DSP Version	4	DSP version	AA.BB.XXYY (8 digits in hex number)
int32	Unit CPLD Version	4	CPLD version	AA.BB.XXYY (8 digits in hex number)
int32	Unit SubMicon Version	4	Sub-microcomputer version	AA.BB.XXYY (8 digits in hex number)
int16	Trigger Mode	2	Trigger mode	0: Free 1: Single 2: Repeat
int16	Trigger Source	2	Trigger source	4: External 16: Level 512: Time
int16	Trigger Channel	2	Trigger monitored channel	1 to 4
int32	Trigger Level Wave	4	Trigger level	Digit value in signed 16bit or 24bit is inputted by Int32 of MSB stuffing
Reserved		2		
Reserved		4		
int16	Trigger Slope	2	Trigger slope	0 : + 1 : -

Type	Variable name	Size (Byte)	Description	Value
int64	Trigger Start Date Time	8	Trigger start time	UNIX time
int64	Trigger Stop Date Time	8	Trigger stop time	UNIX time
int32	Trigger Interval	4	Trigger interval	Second time scale
int16	Measure Frequency Range	2	Frequency range	3: 100 Hz 5: 500 Hz 6: 1 kHz 8: 5 kHz 9: 10 kHz 10: 20 kHz
int16	Measure Frequency Ratio	2	Frequency ratio (Sampling frequency / Frequency range)	1: 2.56
Reserved		26		

CommonChSetting (each CH) chunk

Stores setting information of the unit, including each channel (for four channels or 2 channels) settings etc.

Table 6 CommonChSetting (each CH) chunk

Type	Variable name	Size (Byte)	Description	Value
char[40]	Chx Name	40	Channel name	
int16	Chx Number	2	Channel number	1 to 4
int16	Chx Enabled	2	Channel input enable	0: false 1: true
int16	ChxMeasure Enabled	2	Channel measurement enable	0: false 1: true
int16	Chx Sensor Type	2	Sensor type	2: Microphone 3: Piezoelectric Accelerometer 4: Sound Level Meter 6: Vibration Level Meter 7: Miscellaneous AC 8: Miscellaneous DC
int16	Chx Sensor Input Range	2	Input voltage range (V_{rms})	102: 0.01 V (-40 dB) 104: 0.1 V (-20 dB) 106: 1 V (0 dB) 108: 10 V (20 dB)
int16	Chx Coupling	2	Input coupling	0: AC 1: DC
int16	Chx CCLD	2	CCLD setting	0: false 1: true
int16	Chx Inversion	2	Input inversion	0: false 1: true

Type	Variable name	Size (Byte)	Description	Value
int16	Chx HPF Cutoff Frequency	2	High-pass digital filter cutoff frequency	0: OFF 4: 1 Hz 12: 10 Hz
Reserved		2		
char[8]	Chx Measurement Unit	8	Unit	V inputted EU unit dB m/s2
double	Chx ValuePerBit	8	Calibration value (physical quantity per 1 bit)	Setting value on calibration
double	Chx ValuePerVolt	8	Calibration value (sensitivity)	Setting value on calibration
double	Chx Offset Value	8	Calibration value (offset value of physical quantity)	Setting value on calibration
double	Chx Zero dB Reference (EU)	8	Calibration value (notation of 0 dB reference index)	Setting value on calibration
uint16	Chx Overload	2	Overload information in the file	0: No overload has occurred 1: Overload has occurred at least once
Reserved		2		
Reserved		10		

Wave Settings chunk

Table 7 Wave Settings chunk

Type	Variable name	Size (Byte)	Description	Value
char[4]	Chunk ID	4	Indicates chunk type	"WSET"
uint32	Chunk Size	4	Total size of following data (not including this item)	28
Reserved		2		
int16	Pre-time	2	Pre recording time	0 -1 -5
Reserved		24		

Padding chunk

Table 8 Padding chunk

Type	Variable name	Size (Byte)	Description	Value
char[4]	Chunk ID	4	Indicates chunk type	"padi"
uint32	Chunk Size	4	Total size of following data (not including this item)	Wave file: 260 Tacho file: 234
Reserved			Padding bytes to place the header on a 512 byte boundary	

Wave Data chunk

Recorded raw waveform data are stored here.

Table 9 Wave Data chunk

Type	Variable name	Size (Byte)	Description	Value
char[4]	Chunk ID	4	Indicates chunk type	"data"
uint32	Chunk Size	4	Total size of following data (not including this item)	See Fig. 3
WAVEData	Data	Depends on recording time	Store the recorded raw waveform data	

WAVEData follows the data conventions for regular WAVE files (16 bit/24 bit, little endian, 16 bit range full-scale value 15910, 24 bit range full-scale value 4072960).

$$\text{nBlockAlign} = \text{nChannels} \times \frac{\text{wBitsPerSample}}{8}$$

Fig. 3 Chunk Size

Approximate recording times

Approximate recording times

The approximate recording times available with an SD memory card inserted in the unit are as shown in the table below. The figures apply to a bit length setting of 16 bit. With the 24 bit setting, times are about one third shorter.

The maximum time for a single recording operation is 1,000 hours. When this limit is reached, recording is terminated automatically. The maximum number of files that can be recorded in a single recording operation is 1,000 (including voice memo files and revolution speed files). When this number is reached, recording is terminated automatically.

The available recording time differs depending on the type of SD memory card. Please note that these are approximate values provided for reference.

2 GByte SD memory card						
Number of channels	Frequency range					
	100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
1	1066 h 40 m	213 h 20 m	106 h 40 m	21 h 20 m	10 h 40 m	5 h 20 m
2	533 h 20 m	106 h 40 m	53 h 20 m	10 h 40 m	5 h 20 m	2 h 40 m
3	355 h 32 m	71 h 6 m	35 h 33 m	7 h 6 m	3 h 33 m	1 h 46 m
4	266 h 40 m	53 h 20 m	26 h 40 m	5 h 20 m	2 h 40 m	1 h 20 m

16 GByte SD memory card						
Number of channels	Frequency range					
	100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
1	8533 h 20 m	1706 h 40 m	853 h 20 m	170 h 40 m	85 h 20 m	42 h 40 m
2	4266 h 40 m	853 h 20 m	426 h 40 m	85 h 20 m	42 h 40 m	21 h 20 m
3	2844 h 16 m	568 h 48 m	284 h 24 m	56 h 48 m	28 h 24 m	14 h 12 m
4	2133 h 20 m	426 h 40 m	213 h 20 m	42 h 40 m	21 h 20 m	10 h 40 m

32 GByte SD memory card						
Number of channels	Frequency range					
	100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
1	17066 h 40 m	3413 h 20 m	1706 h 40 m	341 h 20 m	170 h 40 m	85 h 20 m
2	8533 h 20 m	1706 h 40 m	853 h 20 m	170 h 40 m	85 h 20 m	42 h 40 m
3	5688 h 32 m	1137 h 36 m	568 h 48 m	113 h 36 m	56 h 48 m	28 h 24 m
4	4266 h 40 m	853 h 20 m	426 h 40 m	85 h 20 m	42 h 40 m	21 h 20 m

Specifications

Data Format WAVE

Frequency Range

20 kHz, 10 kHz, 5 kHz, 1 kHz, 500 Hz, 100 Hz

Frequency Ratio

(Ratio between Frequency Range and Sampling Frequency)

× 2.56

Quantization Bit Rate

24 bits, 16 bits

Measurement Time

Set arbitrarily from 10 to 59 seconds (at 1-sec interval), 1 to 59 minutes (at 1-min interval) and 1 to 1000 hours (at 1-hour interval).

File Division Cycle

10 minutes, 1 hour

Pre-time 0 seconds, 1 second, 5 seconds

Recording Function

Time-domain Waveform Recording

Save a time-domain waveform as a WAVE file.

Tacho Pulse Recording

Save the tacho pulse information when the tacho pulse is enabled by the amplifier setting.

The pulse is measured by the counter of range 5,000 pulse/sec (300,000 r/min).

As a result, the revolving speed of 24 bit and 0.1 sec cycle is obtained.

Extra DC Information Recording

Save the extra DC information when the extra DC is enabled by the amplifier setting.

Sampling frequency: 10 Hz

Bit rate: 16 bits

Voice Memo Input

Save a voice memo recorded during measurement.

Sampling frequency: 12 kHz

Bit rate: 16 bits

Marker Input

Insert a marker to measured data.

Trigger Measurement

Waveform recording is performed when trigger conditions are met.

Trigger Measurement Settings

Trigger Mode: Free, Single, Repeat

Trigger Source: Waveform level, Time, External

Settings for Waveform Level Trigger

Trigger Slope: +, -

Trigger Wave Level: -99.9 to +99.9%

Repeat Count: 2 to 1000

Settings for Time Trigger

Start Time

Stop Time

Interval:

8 hours, 1 hour, 30 minutes, 15 minutes, 10 minutes, 5 minutes

Settings for External Trigger

Repeat Count: 2 to 1000

* Setting item for repeat trigger

Display

Graph Display

Display input data in a bar graph or Time-Level display form.

Up to four graphs are displayed simultaneously.

Overload Display

Display the Inst. Over indication when an excessive signal is input during monitoring or measurement.

Once an instantaneous overload occurs during measurement, the indication of excessive calculation value is displayed after Inst. Over lights up.

Underrange Display

Display the UNDERRANGE indication when a deficient signal is input during monitoring or measurement.

UNDERRANGE is displayed for the tacho data only.

Memo Marker and Voice Memo Display

Display a memo marker or voice memo recorded during measurement.

Memo Marker Input

Insert a memo marker to measured data.

Monitor Output Perform monitor output for the selected channel.

This function becomes available when the frequency range is set to 5 kHz, 10 kHz or 20 kHz.

This function is for monitoring and is not a re-analysis use.

Recall View saved projects or play a WAVE file.

Waveform Playback

The WAVE file measured by SX-A1WR which is saved on a SD card is reproduced from the earphone jack.

This function becomes available when the frequency range is set to 5 kHz, 10 kHz or 20 kHz.

Voice Memo Playback

The voice memo recorded during measurement is reproduced from the earphone jack.

Marker Edit

Edit a marker inserted to measured data or add a new marker.

Function Button

Screen Capture

Capture the entire screen and save it as an image file.

Pause/Unpause

Pause/Unpause does not function on SX-A1WR.

Measure Start/Stop

Start measurement by pressing the function button during monitoring.

Stop measurement by pressing the function button again during measurement.

Initialization Initialize the settings.



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