

RAL-KEB02iP

USB_DAC Mode

Setup Guide

Rev. 1.0 01/July/2014

Rev. 2.0 for RAL-KEB02iPL version
01/Nov./2015

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iPod,iPad,iPhone, MacOS X are registered trade mark of Apple Inc.

1. Introduction

Thank you for purchasing RAL-KEB02iP portable USB_DAC. We are confident that you will enjoy listening Hi-Res music at anywhere, outdoors and in home with your PC audio system, Mac Book, iPhone, iPad, iPod and WALKMAN. RAL-KEB02iP receives High-Resolution digital audio data stream. KEB02iP accepts LPCM format up to 24bit/384kHz from 16bit/44.1kHz and DoP(DSD over PCM Standard 1.1 compatible) format DSD digital music stream up to DSD11.2MHz. KEB02iP passes the DSD stream to DSD Direct enabled DAC (ESS ES9018K2M) and creates clear and natural sound. RAL-KEB02iP 2.0L version is fully compatible with iOS USB Host mode Audio. The Host mode enables Lightning Direct connection and playing back High-Res and DSD native music with KEB02iP USB DAC mode. KEB02iP works with popular Music Players, such as Audirvana Plus on MacOS X, foobar2000 with foo_asio_dsd, JRiver Music Center , HQPlayer and JPLAY on Windows PC and music AP, ONKYO HF Player on iOS devices.

*1) USB Audio Class 2 Driver for Windows must be downloaded from our site below and installed prior to use RAL-KEB02ip with Windows PC.

download from www.ratocaudiolab.com/download/driver.htm

*** Note) USB Audio Class 2 Driver was updated on 10/Feb./2016.

to support Windows10/Windows 8.x/Windows 7.

*2)RAL-KEB02iP has two operation mode, iPod Compatible mode and USB_DAC Compatible mode. These two modes are switchable with slide switch at the front panel before turning on Power Switch. Refer *iPod Compatible Mode User's Guide* to use KEB02iP with iPod/iPhone/iPad and iOS USB Device Audio mode.

*3)To use iOS USB Host mode Audio, you must set KEB02iP USB_DAC mode and use Lightning to mini-B cable to connect iOS device and KEB02iP. Also iAP such as ONKYO HF Player is required to play back High-Res format music or DSD format music.

*** "Apple", "iPod", "iPhone", "iPad" and "iOS" are the Registered Trade Mark of Apple, Inc. in USA or other countries.

**** "RAL" is the Registered Trade Mark of RATOC Systems, Inc. in USA and Japan. "REX" is the Trade Mark of RICOH Corporation in Japan. RATOC has the license to use it for RATOC's products.

***** "ES9018K2M" and "SABRE32" are Registered Trade Mark of ESS Technology, Inc in USA.

1-1.Features

- Includes ESS SABRE32™ ES9018K2M Audio file class DAC.
- Fully balanced circuit and balanced earphone output.
- Earphone level switch (High <-> Low).
- Digital Filter Curve selection switch (Slow <-> Fast)
- Includes reliable 3.7V/1200mAh Li-Polymer Battery(made in Japan).
- Quick Charging time (2hr) and 5.5hr operating time.

USB_DAC mode

- Fully compatible with USB 2.0 (HS 480Mbps) Specifications.
- Fully compatible with USB Audio Class 2.0.
- Accepts DoP Standard 1.1 compliant DSD 11.2896/5.6448/2.8224MHz data and L-PCM 24bit/16bit:
384kHz/352.8kHz/192kHz/176.4kHz/96kHz/88.2kHz/48kHz/44.1kHz (2ch).
- Fully compatible with MFi iOS USB Host mode Audio specification.
*** This mode requires Lightning to mini-B cable to connect KEB02ip and iPhone, iPad or iPod .

iPod Legacy support mode

- Fully compatible with USB 2.0 (FS 12Mbps) Specifications.
- Fully compatible with MFi iOS USB Device mode Audio specification.
- Accepts L-PCM 16bit/48kHz/44.1kHz/32kHz (2ch).
*** iOS USB Device mode Audio specification supports these formats does not support any other formats.
- This mode requires 30P Dock connector to USB-A cable or Lightning to USB-A cable to connect KEB02ip and iPhone, iPad or iPod.
*** Refer and lean more *iPod Compatible Mode User's Guide* about this mode.

2. System requirements

2-1. PC running on Windows 10, 8.1, 8, 7 32/64bits

- One USB 2.0 HS(480Mbps) enabled Host port.
- Internet access to download USB Audio 2.0 Driver for Windows.
- RAL USB Audio Class 2.0 Driver installation required.
 - *** RAL USB Audio Class 2 Driver was updated on 10/Feb./2016 to support Windows10/8.x and 7.
- User's Guide, Setup Guide and Grade up Guide are available for download from RAL_Audio site.

Note) The knowledge and experience regarding 'Control Panel' for 'Sound Audio Device', 'Device Manager', Audio Music Player application such as foobar, MediaPlayer, iTunes and CD Ripping applications are required to use RAL-KEB02iP. Refer to the User Guide, Instruction Guide or Online Help of these Applications.

2-2. MacOS X 10.7 or newer

- One USB 2.0 HS(480Mbps) enabled Host port.
 - *** USB 3.x ports support HS mode.
- MacOS X 10.7 or newer.
 - *** These versions already include USB Audio Class 2 Driver.
You don't need to download and install the driver.

2-3. iOS Devices, iPhone, iPad and iPod

- iPod Legacy support mode.

Must set **Mode Select Slide Switch** to **iPod position(Left)** before turning on the Power.

*** Refer and learn more *iPod Compatible Mode User's Guide* about this mode.

- USB_DAC mode.

Must set **Mode Select Slide Switch** to **USB DAC BT position(Center)** before turning on the Power. Must use bundled Lightning to mini-B cable. KEB02ip does not work properly with other cable.

This mode is compatible with:

- Lightning connector models.

- iPod touch (5th generation)

- iPhone 5, iPhone 5C, iPhone 5S, iPhone 6, iPhone 6 Plus

- iPad(4th generations), iPad mini, iPad mini 2, iPad mini 3

- iPad Air, iPad Air 2

*** iAP such as "ONKYO HF Player" is required to play back High-Res and DSD music.

2-4. Stereo Earphone

- Stereo earphone equipped with Standard 3.5mm mini Stereo Phone Plug.

- Stereo earphone equipped with balanced cable and Standard 2.5mm mini-mini phone plug.

- Impedance 8-Ohm to 110-Ohm

3. Package contents

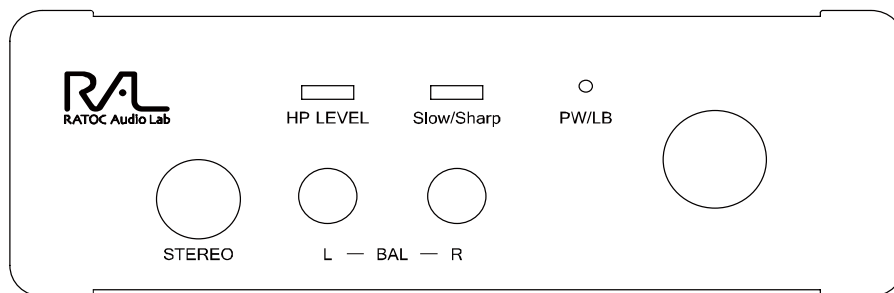
RAL-KEB02iP package includes:

- RAL-KEB02iP
- USB 2.0 Cable (USB-A to mini-B) for USB_DAC mode x1.
- USB-A to micro-B Cable for charging x1.
- USB-A to iPod 30P Dock cable (0.1m) for iPod Compatible mode x1.
- USB-A to Lightning cable (0.1m) for iPod Compatible mode x1.
- Lightning to mini-B cable (0.1m) for USB_DAC mode x1.
- Silicon Band to bundle iPod/iPhone with KEB02iP.

** AC adapter (DC +5V/1A) is not included in the package.

4. Front Panel, Rear Panel Layout

4-1. Front Panel



(1). Power & Volume Level

Power off : Turn Counter Clock wise to 7 O'clock position and check Click sound and lighting off PW/LB LED.

Power on: Turn Clock wise from 7 O'clock position and check Click sound and lighting on PW/LB LED.

Volume level control: adjust Headphone output level to your favorite level.

(2). PW/LB LED.

Light on to indicate the operating state. Green light indicates Battery level is over 3.4V and Red light indicates Low Battery state below 3.4V. In this case, charging is required.

(3). HP level Slide Switch

Select Headphone output level.

Right position shown in above brings High-Level for high impedance headphones.

Left position shown in above brings Low-Level for Low impedance headphones.

(4). Analog Filter selection Switch.

You can select Analog Filter Curve inside ES9018K2M DAC with this switch.

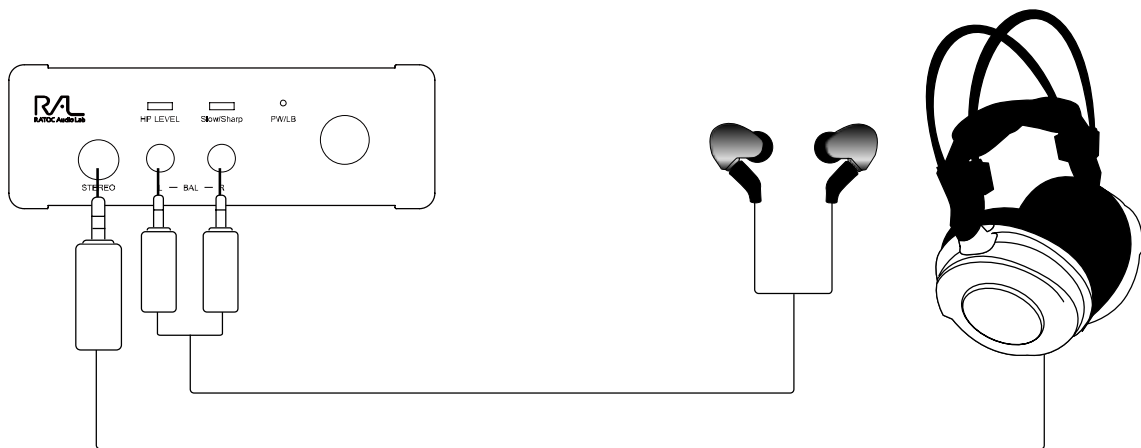
Right position brings Sharp Roll-Off Curve and Left position brings Slow Roll-off Curve.

(5). 3.5mm mini Jack.

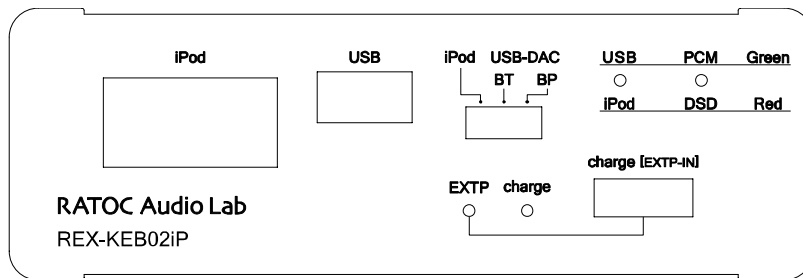
Stereo analog audio output for earphones. Supports 8 Ohm to 110 Ohm impedance.

(6). 2.5mm micro jack (L –BAL – R)

Analog Audio Balanced amp output to drive 4-wire (2 wire for L, 2wire for R) type earphone.



4-2. Rear panel



(1). Digital Audio Stream Input for iPod/iPhone/iPad

USB-A Connector : Compliant with USB 2.0 Full Speed(12Mbps) Spec.

*KEB02ip works as USB-Host but does not provide charging current from this connector.

It can provide USB Bus_Power to USB device up to 100mA.

*Don't use this connector at USB_DAC mode. Never connect iPod/iPhone/iPad to this connector when Mode select Switch is set for USB_DAC mode.

(2). Digital Audio Stream Input for PC/Mac.

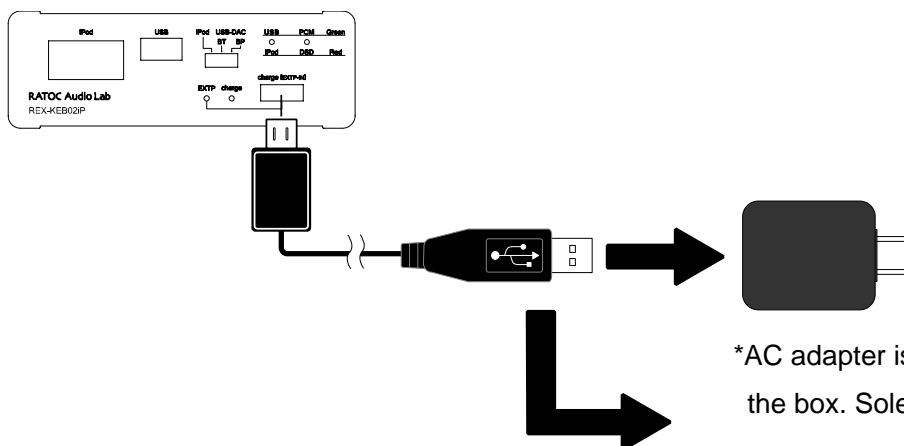
USB mini-B Connector : Compliant with USB 2.0 High-Speed(480Mbps) Spec. and KEB02iP works as the USB Audio Class 2 Audio Device.

*This connector is used in USB_DAC mode. Don't connect any device when iPod Legacy Support Compatible mode is selected.

(3). DC+5V power input for charging.

USB micro-B Connector : Must connect DC+5V(+0.25V, -0.25V, 0.5A minimum)

Power supply unit to charge internal battery with USB-A to micro USB-B cable.

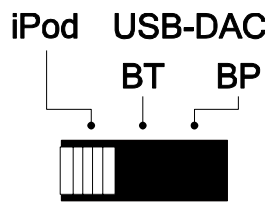


* Use DC+5V(+0.25V -0.25V)/1 to 2A Switching type AC adaptor or USB port of PC/Mac.

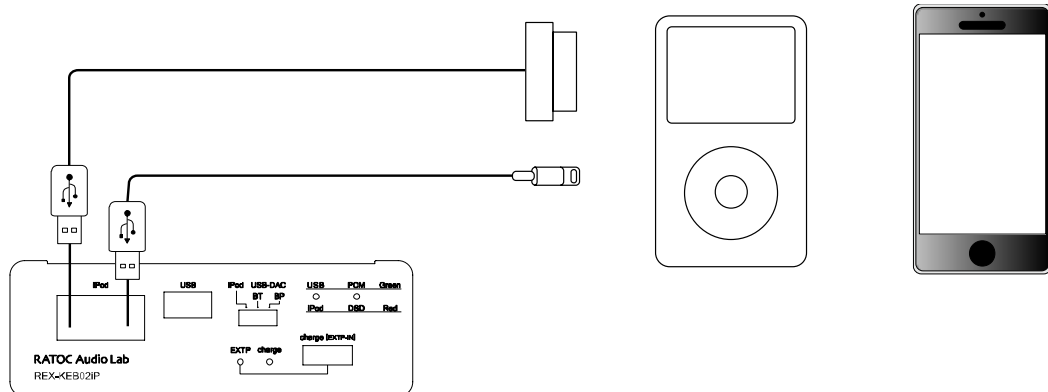
(4). Mode Select Slide Switch

Use this slide switch to change KEB02iP operation mode. This switch must be set in Power_OFF state, Volume Knob at the front panel must be set at 7'Oclock position. And the Volume Knob must be turned clockwise to enable operation mode being selected by current setting of this switch for iPod Legacy Support mode or USB_DAC mode.

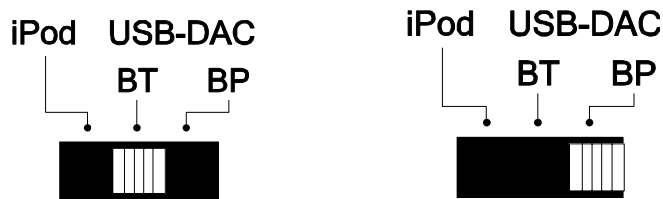
- **iPod position(Left)** : iPod Legacy Support mode.



KEB02iP works as an USB Host and iPod/ iPhone/iPad works as an USB Device. Must be set this position before turning Power_ON KEB02iP to use this mode.



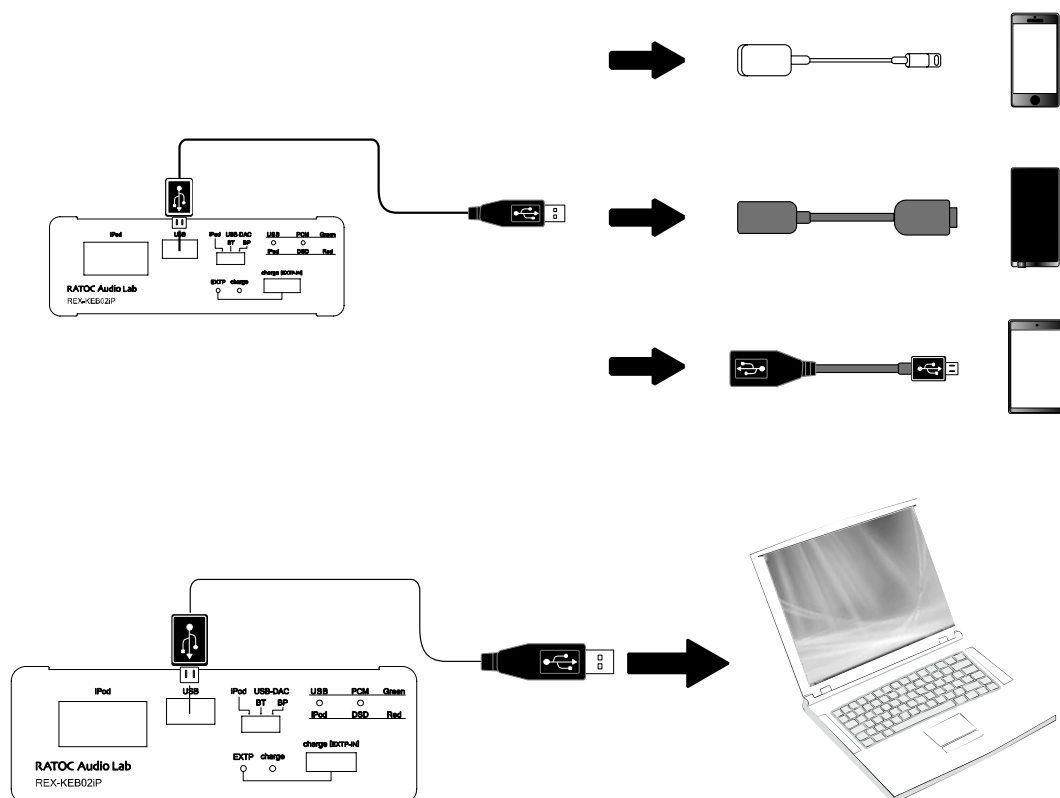
- **USB position(Middle or Right) : USB_DAC mode.**



KEB02iP works as an USB Audio Class 2 Device and High-Speed(480Mbps) Device. Must be set this position before turning Power_ON KEB02iP to connect PC or Mac to USB mini-B port. KEB02iP works with internal battery and does not require USB BUS Power at BT position. Must select BT position to connect Apple Camera Connect Kit, Lightning to USB Camera Adapter or SONY WALKMAN USB Connection canle.

KEB02ip requires USB Bus_Power to charge internal battery at BP position. In this case you can connect to USB high-speed enabled HOST port of PC or Mac.

**** Must set BT position to use Lightning to mini-B cable to enable iOS USB Host Audio mode.



(5). LEDs

(5-1) USB(Green)/ iPod(Red)

Lights on Red when succeeded to detect iPod and starts blink to indicate being communicating successfully with iPod.

(5-2) PCM(Green)/DSD(Red)

Disabled in iPod Legacy support compatible mode. Enabled only in USB_DAC mode.

(5-3) EXTP(Green)

Indicates External DC+5V Power source or USB Bus_Power(BP mode) is being supplied and KEB02iP is working and charging internal battery with the external power source or USB Bus_power(BP mode).

(5-4) Charge.

Indicates internal battery is being charged with the external power or USB Bus_Power(BP mode).

5. Setting up Mac/MacOS X

5-1. Connecting RAL-KEB02iP to Mac USB port

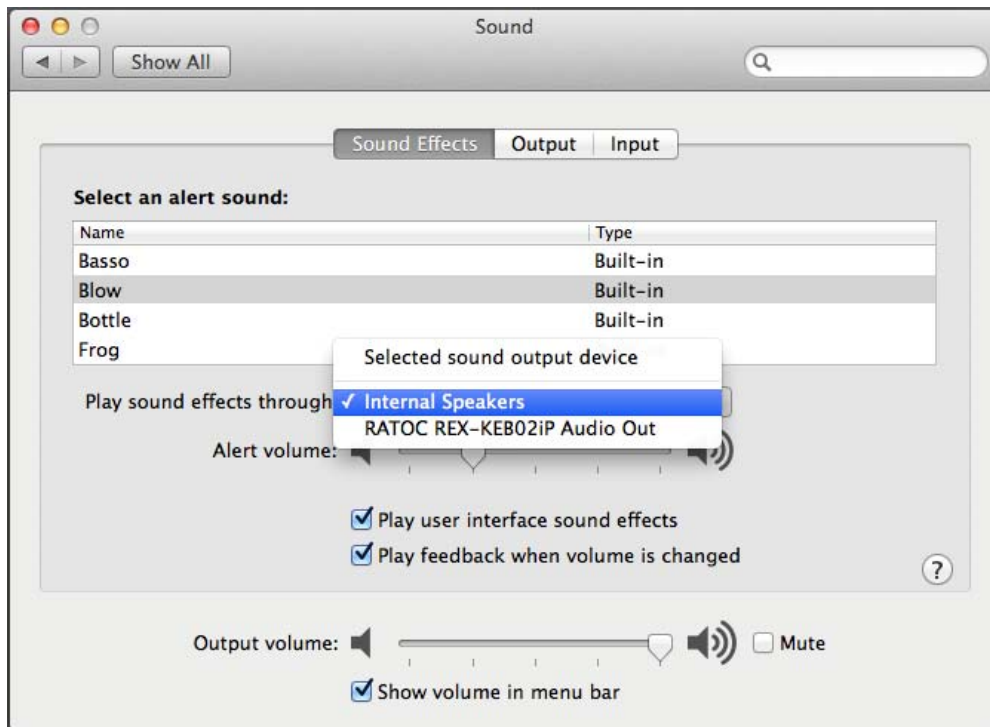
Getting started with setting up your Mac/MacOS X 10.7 or newer.

- (1) Turn off Power of KEB02iP and select USB_DAC mode. And then turn on power of KEB02iP.
- (2) Connect RAL-KEB02iP mini-B port to Mac USB port with USB-A to mini-B cable.
The cable should be compliant with USB High-Speed(480Mbps) certification.
- (3) MacOS X will detect and recognize RAL-KEB02iP.
- (4) Click on the "System Preferences" app on Dock.
- (5) Click on the "Sound" icon at the **Hardware** row.



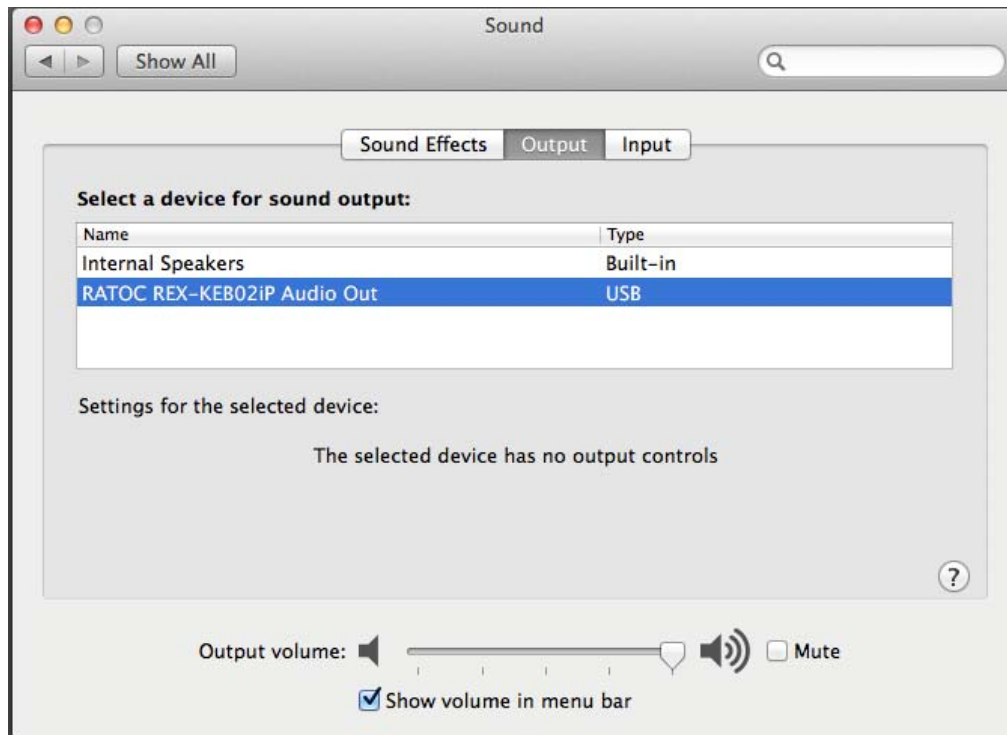
5-2. Setting 'Sound Effects' output to Internal Speakers

Click on the "Sound Effects" tab to prevent alerts and effect sounds such as "e-mail received notification sound" from being routed to Audio System.
Set Play sound effects through 'Internal Speakers'".



5-3. Setting RAL-KEB02iP as an Audio Output

Click on the "Output" tab and select "RATOC RAL_KEB02iP Audio Out". This selection will route the sound from iTunes or other Audio Applications to your Audio system.



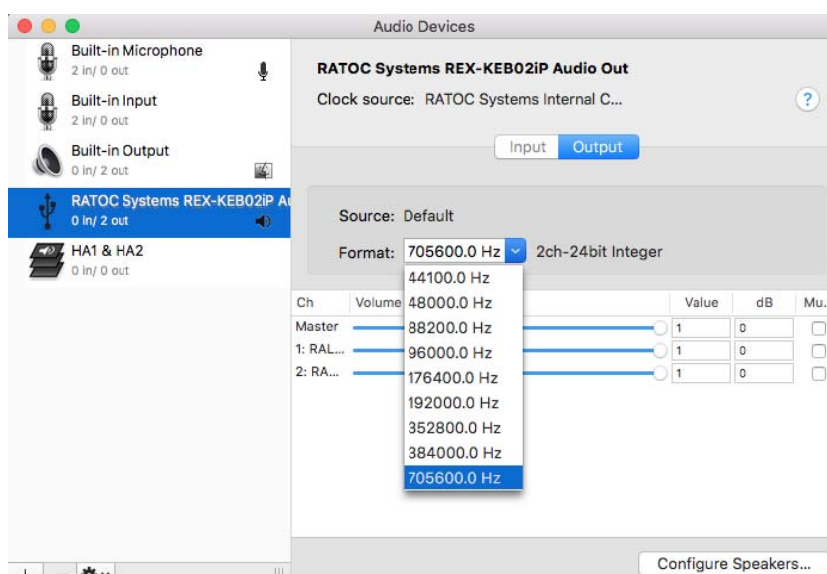
5-4. Setting up 'Audio MIDI Setup' Application

- (1) If "Audio MIDI Setup" application is not found on Dock, open the Hard Disk icon and open the "Applications" folder.

You can find the "Audio MIDI Setup" application at the "Utilities" folder.

- (2) Open the "Audio MIDI Setup" application and select "Audio Devices".
- (3) Click on "Output" tab. Select "RATOC RAL_KEB02iP Audio Out" for the "Default Output" to send the sounds from iTunes or other applications to Audio system.
- (4) Select "Built-in Output" for the "System Output" to route system alert sound such as "new mail received" sound to built-in speaker.
- (5) Select "RATOC RAL_KEB02iP Audio Out" and then select your desired sample rate such as 192000 Hz. at "Format".
- (6) Important notice for Mac OS X 10.9.x or newer.

MacOS X 9.x or newer set this sample rate to 705600 Hz at the first time, but KEB02iP 2.0L does not support L-PCM 705.6 kHz. This sample rate must be set below 384000 Hz before starting playing back music.



If sample rate which is not identical to the sample rate of original music file itself is selected, MacOS X Audio driver will execute sample rate conversion. As this conversion will affect audio quality, we recommend to select adequate sample rate which is identical to one of music file at this field.

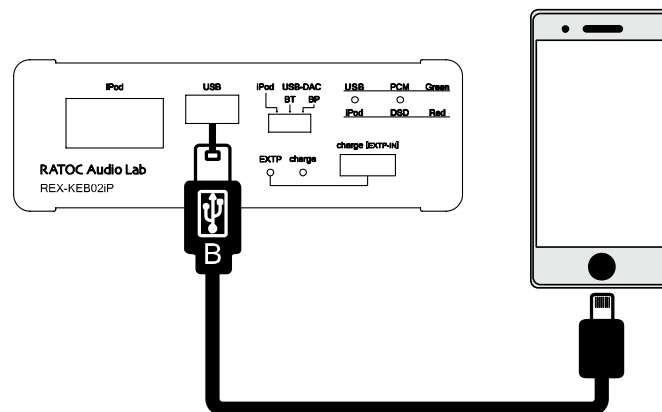
5-5. Launch and play iTunes or other Music Player application

Launch iTunes or other Music Player application. Start it and select Music file. You will listen and enjoy fine and clear sound from your Audio system. To learn more about Music Player application, refer to User Guide or Online Help of the application.

6. iPhone, iPad, iPod with USB_DAC mode and Lightning to mini-B cable.

*** Must set Mode Select Slide Switch to USB DAC BT(Center) position and use bundled Lightning to mini-B cable.

1. Check PW/LB LED of the front panel turns light off and confirm KEB03 is in Power OFF state.
2. Set Mode Select Slide Switch to USB_DAC BT(Center) position and connect Headphone/earphone to Audio Out jacks at front panel.
 - * 3.5mm Single-end Stereo output jack and 2.5mm balanced Stereo output jacks are not enabled at the same time to save battery energy.
 - * 2.5mm balanced output is disabled when Single-end stereo headphone is connected to 3.5mm Jack.
3. And then turn Volume Knob clockwise to enable Power ON.
If PW/LB LED does not light on, turn Volume Knob counter clockwise to turn Power off and connect DC+5V Power Adaptor to Micro-USB connector at Rear panel. Turn Power ON again and check PW/LB LED lights on.
4. Hook up iPod/iPhone/iPad to KEB02iP with the bundled Lightning to mini-B cable.



5. Check KEB02iP is being recognized and configured properly by iOS device.
Touch and select 'Settings' -> 'General' -> 'About'. The string, 'Portable USB-DAC/HPA' will be shown up. If this string is not shown up, remove the cable and turned off KEB02iP. After a couple of seconds, turn Power KEB02iP ON and connect the cable again.
6. Launch and start 'Music' player app. on iOS device and select music.

7. Setting up Windows PC Windows PC.

This chapter describes the driver installation and setting on Windows 7 as an example, these process is almost the same as one on Windows 10, 8.1 or 8.0.

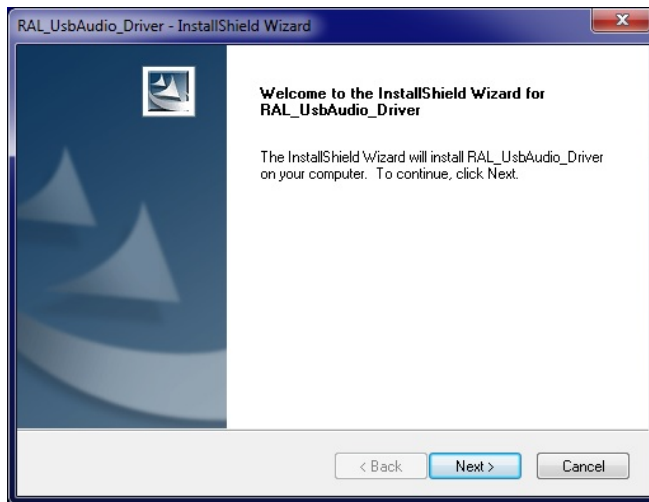
Getting started with setting up Windows 7 (32bit or 64bit) PC.

6-1. Installation of USB Audio 2.0 Class Driver

RAL-KEB02iP requires USB Audio Class 2.0 Driver. You need to install it before using it. If you forgot it or failed to install the driver, RAL-KEB02iP would not be configured as a USB Audio Device.

- (1) Turn off Power of KEB02iP and select USB_DAC mode. And then turn on power of KEB02iP.
- (2) Check PW/LB LED at the front panel, and wait step (9) below.
- (3) Log in as an Administrator. You must log in as an Administrator to install USB Audio Class 2.0 Driver.
- (4) Download RATO Audio Lab DAC Windows10 Driver (ral_win10_driver.zip) from http://www.ratocsystems.com/english/download/driver/ral_win10_driver.html and follow the instructions at the site and install the driver.
*** If you had downloaded and installed any previous USB Audio Driver for RAL/REX USB Audio devices, you must remove them before installing new RAL USB Audio Class 2 Driver for Windows10 by using "Program and Features" at "Control Panel" .
- (5) Click "RAL USB Audio 0330-Driver-Setup.exe", extract all files and run it. User Account Control window will appear and show RATO Systems, Inc. as the Verified publisher name. Click 'Yes' to go to next step.

- (6) "RAL-KEB02iP installer" will start automatically. Click 'Next' to start installation.



InstallShield will start and show status.

- (7) Click 'Install' button at 'Windows Security' dialog box below and continue installing the driver.



- (8) Windows Security dialog box may be shown up again, if so, click 'Install' to continue the installation.



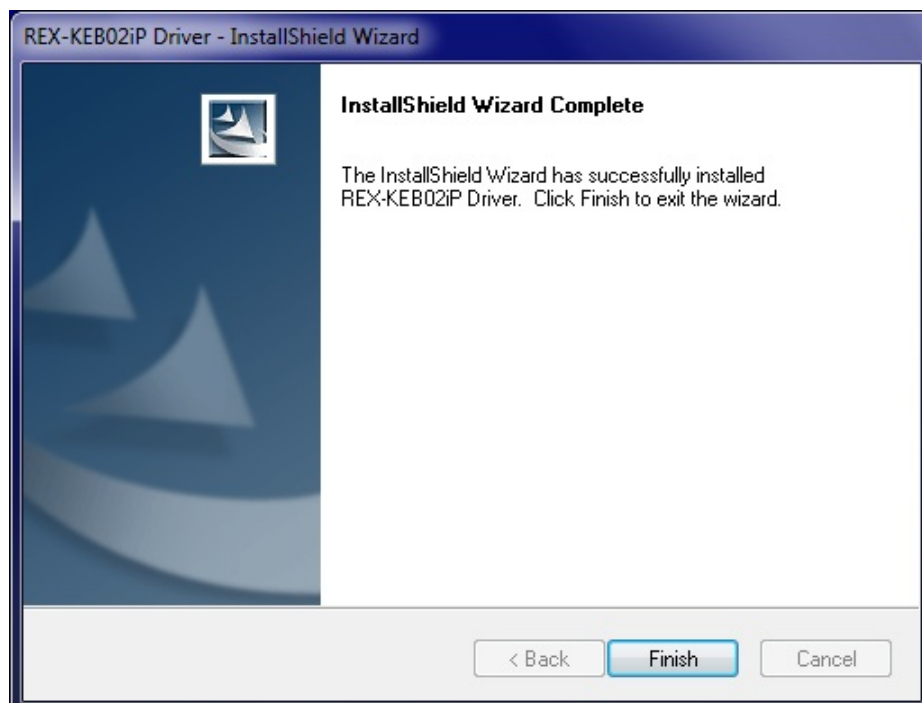
(9) Connect RAL-KEB02iP to your PC when the dialog box below is shown up.

Click 'OK' after the connection is completed. InstallShield Wizard will check system, prepare and start the installation.

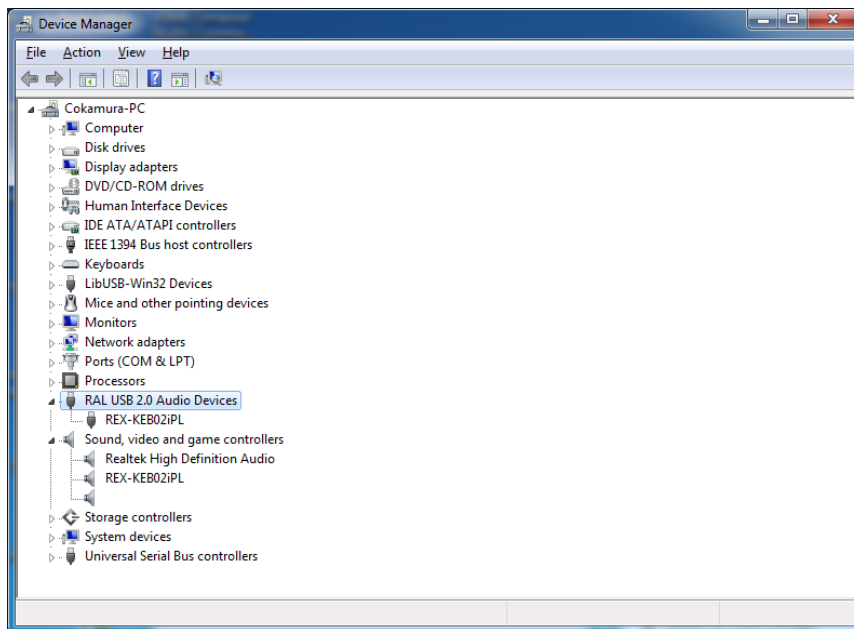


*** It may take few minutes for searching Windows update by Windows device manager.
This activity is depends on Windows OS, please wait until InstallShield will complete.

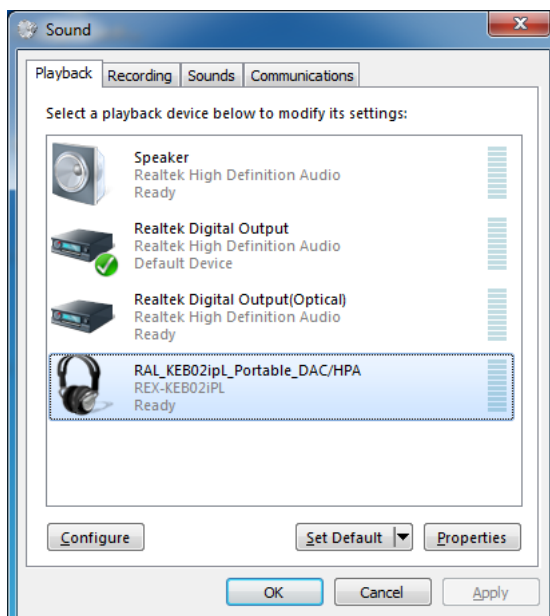
(10) InstallShield Wizard will complete. Click "Finish".



- (11) Open Device Manager Window and check "RAL USB 2.0 Audio Devices".
Audio Devices REX-KEB02iPL' will be shown up.



Open "Sound" at "Control Panel", RAL_KEB02iPL will be shown up.

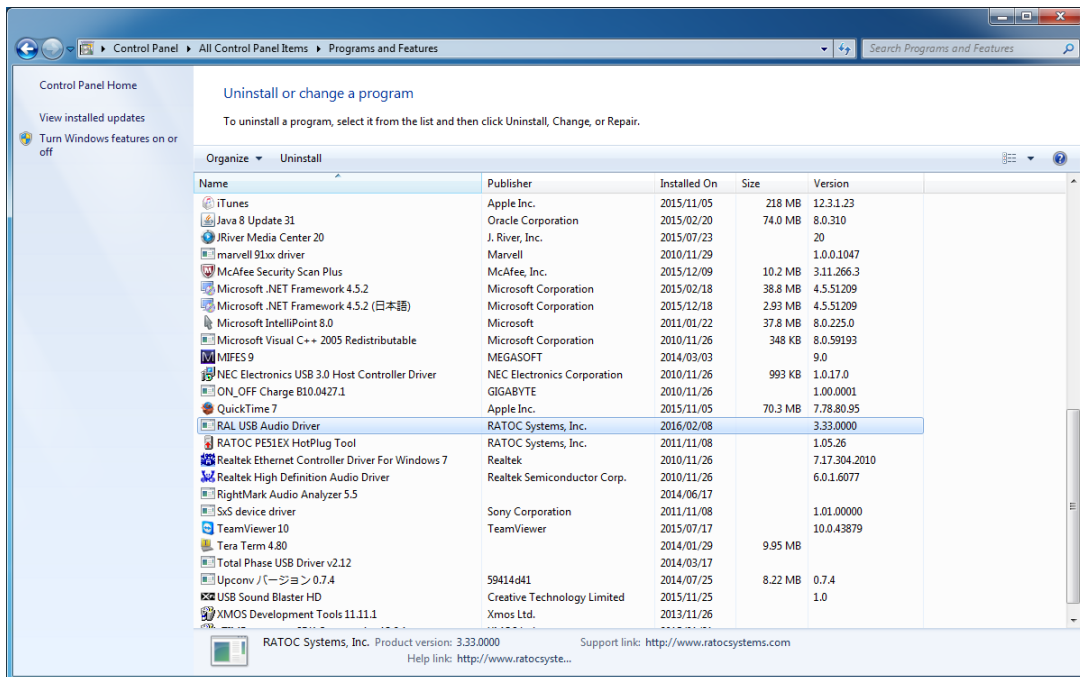


-2. Uninstall RAL-KEB02iP Device Driver

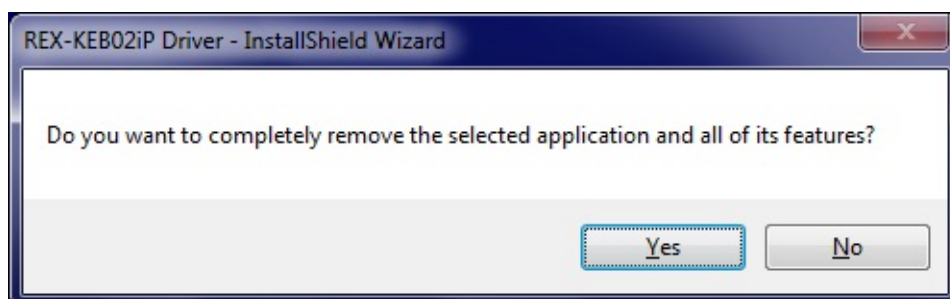
If you failed in RAL-KEB02iP Driver installation or desire to remove it from your Windows PC, uninstall it and re-install again.

Follow the instructions below.

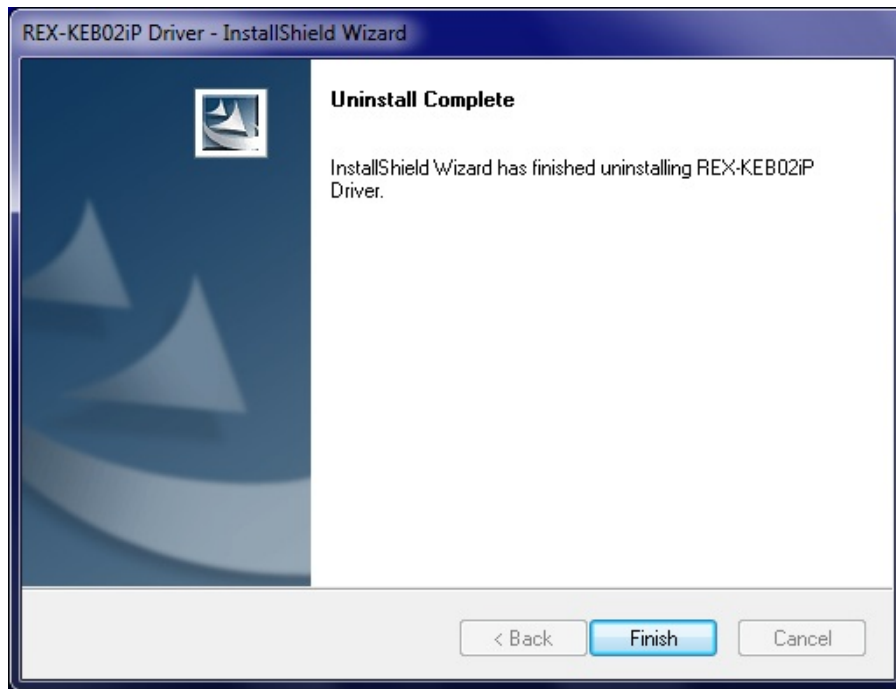
- (1) Open 'Control Panel' and select 'Programs and Features' icon.
- (2) Select and click 'REX-KEB02iP Driver'.



- (3) InstallShield will start and show dialog box below. Just in case, make sure you will start to uninstall. And then click 'Yes.'



(4) Click "Finish" at InstallShield Wizard window below.



7. Grade up setting for Windows

This chapter describes how to improve sound quality and tune up your PC to listen high fidelity and pure sound.

Before installation of Music Player application or additional drivers:

- Check Compatibility and Combination of Sound Drivers and Applications. And select most suitable one for your PC/Mac Audio system. You also need some setting at Device Manager Window to use the application or add-on drivers.

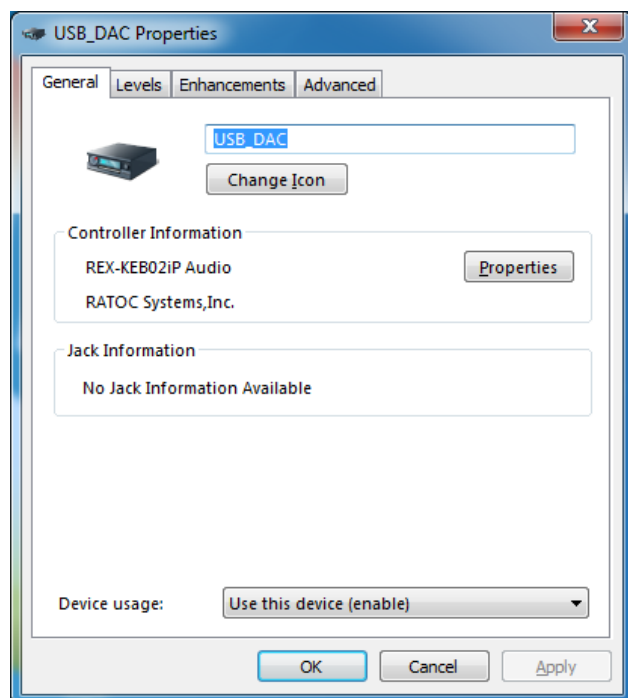
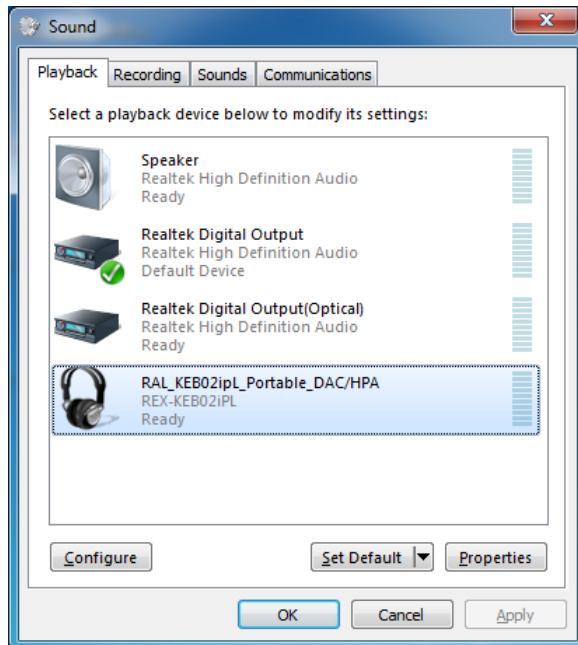
- Set disable to route "System Sound" to your Audio system. Follow steps below:

- (1) Launch "Control Panel" and click on "Sound".
- (2) Select "Built-in Sound card" at the "Playback" tab. Click "Set Default" button to route system sound such as "new mail received" to built-in speaker.
- (3) Select "RAL-KEB02iP" at the "Playback" tab and click "Properties" button.
- (4) Click "Advanced" tab. And set check mark at both "Allow applications to take exclusive control of this device" and "Give exclusive mode applications priority".

These two setting must be set to use our driver, Kernel Streaming or WASAPI mode with Music Player applications. If you would like to use Media Player or iTunes, these applications use Direct Sound or QuickTime Player.

7-1.Listen HD Music with Direct Sound and Kernel Mixer

(1) Double click "RAL-KEB02iP Audio" at "Playback" tab. Click "Properties" button.

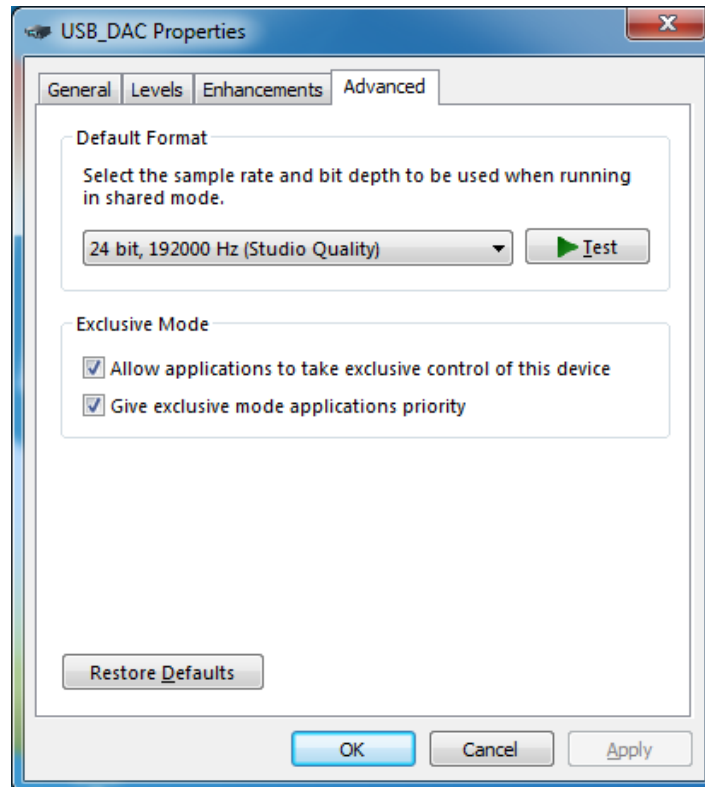


You can change icon and device name as you like.

(2) Click "Advanced" tab and select Sampling Rate/bit rate corresponding to property of music files you like at "Default Format" box.

Note) 24bit/88.2kHz, 24bit/176.4kHz, 24bit/352.8kHz and 24bit/384kHz are not shown up at the list box.

This is the known issue of Windows 7/Vista Direct Sound Driver.

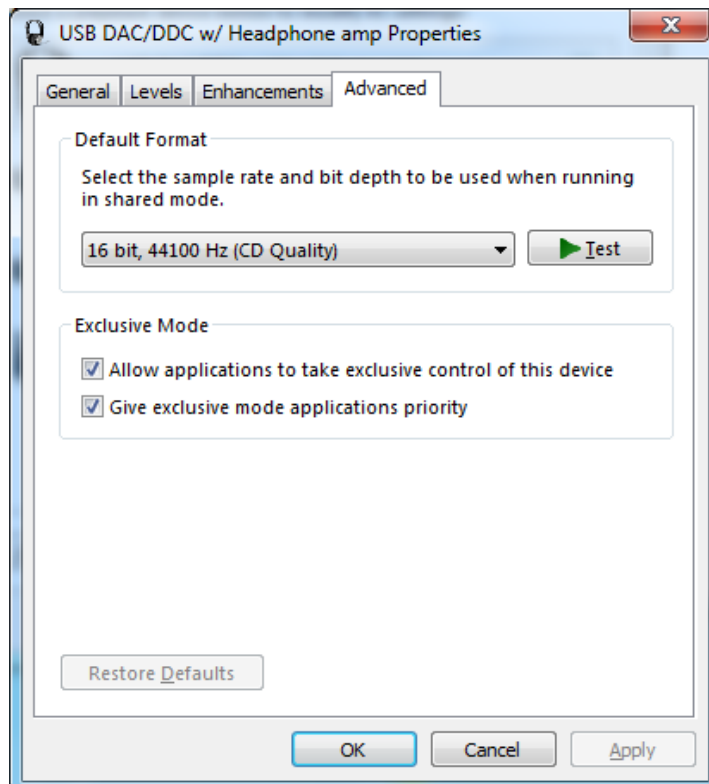


7-2. Using WASAPI mode, skip Kernel Mixer

Windows 8, 7 and Vista(SP1 or newer) includes this function. Once enabled, Windows Kernel Mixer is bypassed and Audio application can pass music data to Audio drivers directly.

** iTunes does not work with WASAPI setting on 64bit Windows 8, 7, Vista.

- (1) Click "Start" and launch "Control Panel".
- (2) Double click "Sound".
- (3) Double click "RAL-KEB02iP Audio" at "Playback" tab. And click "Properties" button.
- (4) Click "Advanced" tab and mark Checkbox of both "Allow applications to take exclusive control of this device" and "Give exclusive mode applications priority" at "Exclusive Mode" box.
- (5) Download components suitable for your application such as foobar2000 from the application web site. Install it and follow instructions described at the web page.



8. Specifications

Name	DSD and High-Reso PCM ready portable USB DAC	
Model Number	RAL-KEB02iP	
Inputs	Terminals	USB mini-B for USB_DAC mode. USB-A for iPod Compatible mode.
	Supported PC	Windows 8, 7, Vista, XP, Mac OS X 10.7 or later. *Windows 64 bit versions are supported.
	Supported Audio	<i>USB_DAC mode</i> USB Audio Class 2.0 (480Mbps required) Input Format (Hi-Speed mode is required) DSD 11.2896/5.6448/2.8224MHz (DoP standard 1.1 compliant). L-PCM24bit/16bit,384kHz/354.8kHz/192kHz /176.4kHz/96kHz/88.2kHz/48kHz/44.1kHz (2ch) <i>iPod Compatible mode</i> USB Full speed (12Mbps). L-PCM 16bit, 32kHz/44.1kHz/48kHz
Outputs	Terminals	Analog Stereo 3.5 mini Jack. Analog balanced output, 2.5mm mini-mini jacks.
	Compatible earphones.	Impedance 8Ω to 110Ω
	Frequency Characteristics	DC~90 kHz (24bit/192 kHz), 10 Hz to 40 kHz (24bit/96 kHz), 20 Hz to 20 kHz (16bit/44.1 kHz)
	rated output	Balanced output (2.5 mini-mini): 131mW/ch. @22 ohm load. Stereo output (3.5mm mini) 38mW/ch. @68 ohm load.
Internal Battery		Li-Polymer 3.7V 1200mAh. USB charger required.
Unit Dimensions/Weight		70 (W) x 103 (D) x 24 (H) mm. 230g.