

# **audiophileo**

perceive the world through hearing

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## **Owner Manual**

### **PurePower**

**Revision 1.4 November 7, 2014**

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© Audiophileo LLC  
8476 Portland Pl  
McLean, VA  
support@audiophileo.com  
Phone 703-674-816

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# Document History

Date	Revision	Change
April 16, 2012	1.0	Initial release
April 19, 2012	1.1	Added MacOS firmware upgrade procedure.
November 30, 2012	1.2	Additional connection details.
January 10, 2012	1.3	Added details on threading then pushing the power cable into the PurePower.
November 7, 2014	1.4	Added note that all cables except PP->PC USB cable need to be unplugged for firmware upgrade, removed pushing of power cable.

# Getting Started

## Introduction

**T**hank you and congratulations for purchasing the PurePower VLN battery power supply. We designed these devices to be the easy to use and provide the lowest possible noise as well as best isolation from dirty USB power, giving you peace of mind and allowing you to focus on other aspects of improving your audio system. An Audiophileo1 or Audiophileo2 enhanced with the PurePower upgrade has many advantages:

- Very low noise battery supply of the output stage and clocks. The level of noise is lower than any power supply which is powered by AC power, and much lower noise than any commonly used wall wart.
- No high frequency power supply noise gets passed through to the DAC, providing the ultimate clarity, separation, and sound staging.
- AP1/2 USB and the output stage are completely isolated from each other, causing the Audiophileo to be almost completely immune to USB power and signal noise. This makes expensive USB cables and customized USB ports even less important when trying to achieve the best sound, making the PurePower the smartest and most effective way to optimize your sound.

The PurePower supply is designed to provide the user with the cleanest possible power without user intervention. It detects when the Audiophileo1/2 is actively drawing power and always tries to provide PURE mode (running from battery and physically disconnected via relays from the “PC USB” port to avoid power pollution). When the PurePower detects that the AP1/2 stopped drawing power (which happens ~30 minutes after stopping music playback), charging automatically starts and continues until the battery is full or playback is resumed. This ensures that when you start a music listening session, the battery is always fully charged to provide 15 hours of continuous PURE music playback.

## Box Contents

The PurePower ships with the following items:

- One PurePower power supply.
- One 12 inch USB A-B Cable (for optionally daisy chaining the Audiophileo1/2 USB connection through the PurePower).
- One 12 inch custom threaded barrel connector cable for the most reliable power connection between the PurePower and Audiophileo1/2

## Connections

Figure 1 shows how to connect the PurePower and Audiophileo1/2 together. There is no need for any installations or configuration. Just make the following 3 cable connections:

1. Use the included 12 inch barrel connector cable to connect the AP1/2 barrel connector to the PurePower “AP POWER” connector. This connection is shown in **green** in Figure 1. The PurePower must be connected and providing power to the Audiophileo1/2 or there will be no sound. For PurePower units from 2011 or before: After threading the power cable into the Audiophileo1/2, it is necessary to fully push it in in order to make a solid electrical connection. Please see Figure 3 for details. For newer units, gently screw the connector on and you are done.
2. Just use a standard USB A-B cable to plug the PurePower “PC USB” connector into any available USB port on your computer and charging will begin automatically. This is also shown in **red**. Note that a Mac may ask you to configure a network device. You should do this so that it does not ask it again (While charging using Option 2 below, the PurePower has to configure itself as a USB device in order to legally draw 500mA from the USB port).
3. You have 2 options for connecting the AP1/2 USB port to the PC. If you are concerned about the sound, it is suggested to try both to see which one sounds better, but they should sound the same. Option (b) could in theory be marginally better.
  - a. **Option 1:** Connect the AP1/2 USB port to the PurePower “AP USB” port using the included 12 inch USB A-B cable. This connection is shown in **red** in Figure 1. Option 1 makes connection of the two devices very convenient due to less cabling. Note that the “AP USB” port is directly connected to the “PC USB” port and therefore simply passes power and signal

through to the AP1/2 like an extension cable. It is not a hub and therefore the total USB cable run from Audiophilleo to PurePower to PC cannot be more than 5 meters without a repeater cable.

- b. **Option 2:** You may alternatively plug the AP1/2 USB port directly into the PC as shown in Figure 2. In this case nothing is plugged into the PurePower “AP USB” port.

**You are finished. You can start to enjoy your music!**

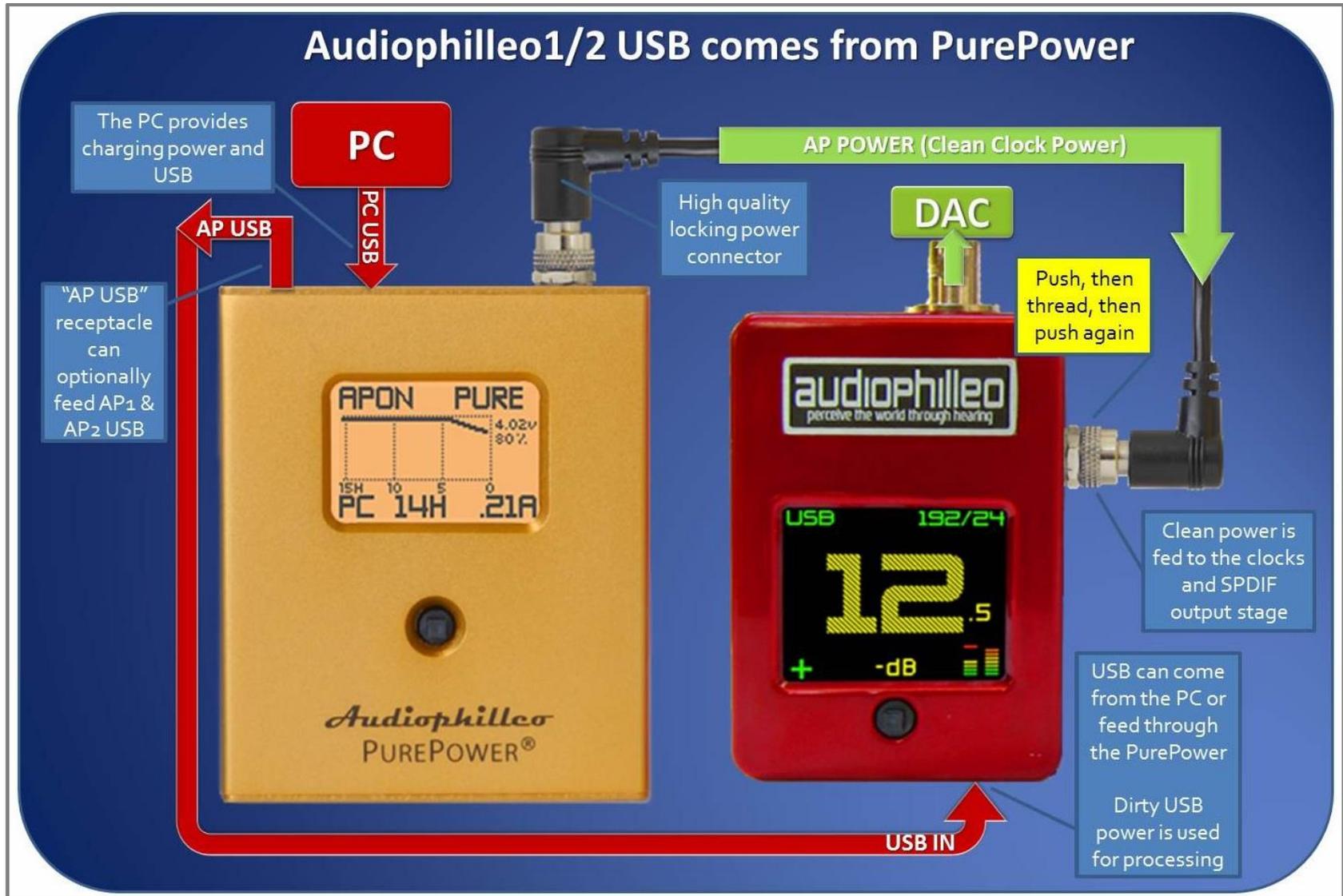


Figure 1 Connections – Option1: Audiophileo1/2 USB cable feeds through the PurePower



Figure 2 Connections – Option 2: Audiophile1/2 USB cable connected directly to PC



Figure 3 Insert the power cable into the Audiophileo, then **GENTLY** screw it on, then push it fully in. **Note that with newer units it is only necessary to gently thread the cable in. After that it is already fully pushed in.**

Chapter  
**2**

# PurePower user interface

The PurePower includes a joystick and backlit LCD display to provide status information in a user-friendly way. The joystick supports five directions: LEFT, RIGHT, UP, DOWN, and CLICK. After powering up, the main screen is displayed. The interface is similar to that of the Audiophilleo2.

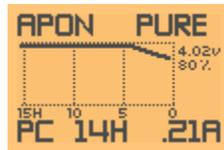
When in the main screen, UP or DOWN scrolls between 3 different main screen views:



Voltage



Battery time left



15 hour voltage graph

These screens differ in what is shown in large text in the middle. Table 1 below summarizes the meaning of the different text shown on the screen.

Text	Description
APON  APOFF	The top left screen shows APON when power is being drawn by the AP1 or AP2 and APOFF otherwise. When APOFF is shown AND greyed out, this means that the barrel power cable is not plugged into the PurePower “AP POWER” connector.

<p>PURE CHARGE LOW</p>	<p>The top right screen shows PURE when the PurePower is physically disconnected from the “PC USB” power input through the use of relays. In this case there is no electrical connection between then “PC USB” port and the PurePower (except for feeding through to the “AP USB” port, of course). In this mode, very low noise power is being fed to the AP since.</p> <p>CHARGE is displayed when the PurePower is charging the internal battery. In this mode the “PC USB” power input is used to charge the battery and feed the AP for continuous operation.</p> <p>LOW is displayed when the battery voltage is too low for normal operation (&lt;3V). In this mode, the unit will also shut off the display to conserve power.</p>
<p>PC</p>	<p>The bottom left screen shows “PC” not greyed out when a good power source is plugged into the “PC USB” input.</p>
<p>14H</p>	<p>This gives a rough estimate for the remaining number of hours of PURE playtime the battery can deliver.</p>
<p>3.24V</p>	<p>This is the measured voltage of the battery. Note that a higher voltage does not make the AP perform better as the PurePower delivers the optimum voltage range.</p>
<p>.21A</p>	<p>The bottom right screen shows the number of Amps being drawn by the AP out of the “AP POWER” connector. “.21A” means 210mA. The AP automatically goes to sleep after 30 minutes without playing music and powers down the output stage. At this point, this will change to .00A since the AP no longer draws current.</p>

When in the main screen, RIGHT enters the main menu. This optionally allows for changing setting, firmware upgrades, and additional status information. When in the menu, LEFT goes back to the main screen (when in the top level menu) or to previous higher menu level. RIGHT or PUSH enters the currently highlighted sub-menu. UP and DOWN scroll through the menus or changes numeric values.

Figure 3 shows all the menu screens with a summary of what they do. Note that under normal conditions, the Charging->Advanced settings should not be changed.

In addition to the screens shown in Figure 3, various messages can pop of for 1 second. For example, when a cable is plugged into or unplugged from the PurePower, a corresponding message appears on the screen. Also, when charging starts or stops a message is displayed.

**Note:** If the PurePower malfunctions, it should restart automatically. If it ever becomes unresponsive, simply PUSH the joystick and hold for 8 seconds to reboot your unit.

**Note:** After a period of non-use, the PurePower will automatically enter a low power state and the screen may be turned off. Simply plug or unplug a cable or use the joystick to restore the screen.

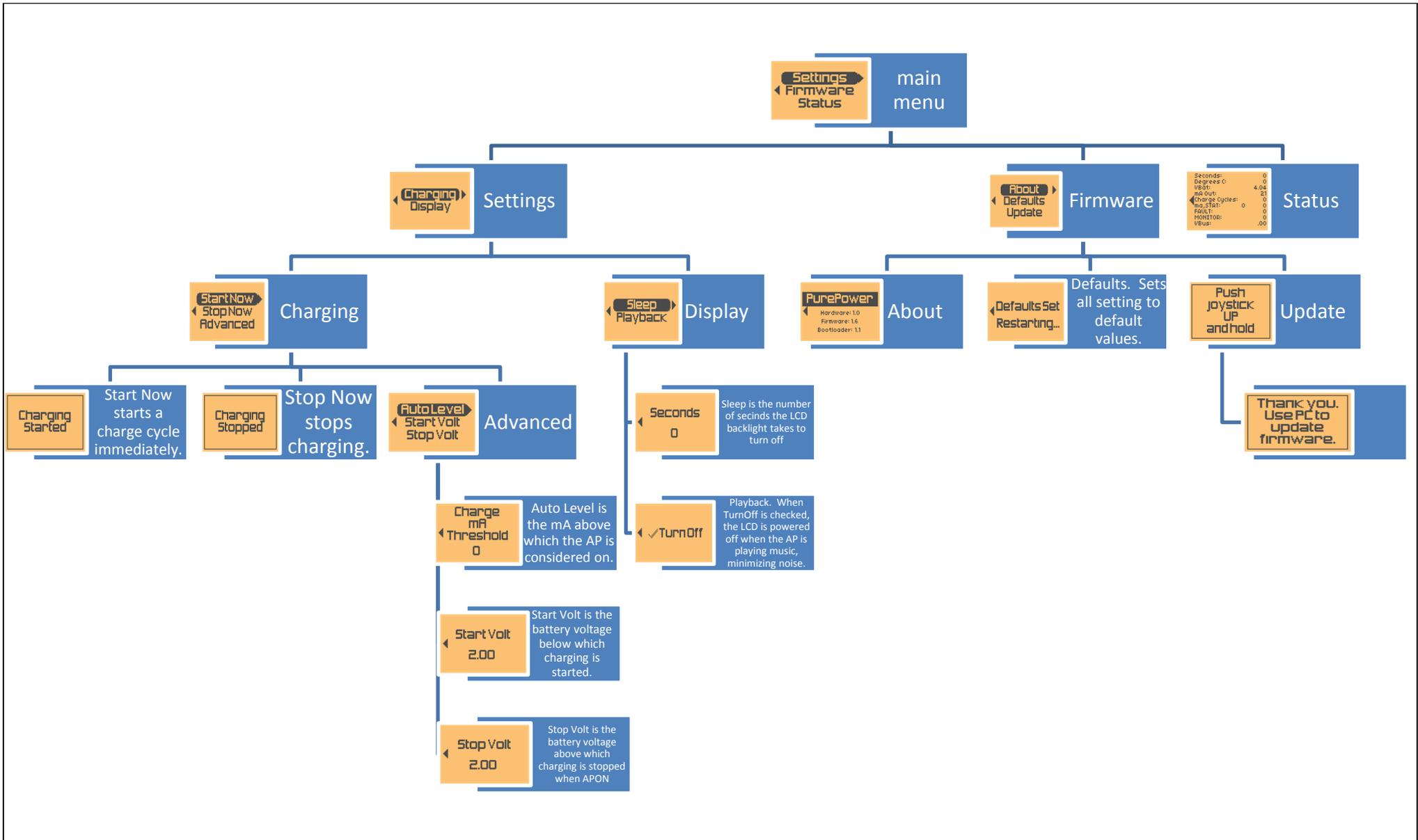


Figure 1 The menu tree

## Changing the battery

One of the design requirements was to make the battery user replaceable. This gives you the peace of mind that the power supply can provide many years of service and is not limited by the lithium polymer battery life. Typical battery life is expected to be approximately 3 years. Battery change only requires a Phillips screw driver and the removal of 2 screws.

**Note:** This section of the manual will be updated with the battery change procedure (including images) in the future.

## Firmware Update with Windows

Our devices are designed with modular firmware that is easily updated. Updates will be released based on feature requests and bug reports. Please let us know if you have any requests. We will try to include any reasonable requests in the next firmware update.

Firmware upgrade is supported under Windows and MacOS. For MacOS please see chapter 5. For updates please check <http://audiophilleo.com/support.aspx>.

**Note:** Unplug the cables between Audiophilleo1/2 and PurePower.

**Note:** If you enter firmware update mode and decide not to proceed with an upgrade, just push the joystick LEFT to resume normal operation.

**Note:** After a successful update procedure the PurePower will automatically reboot and start the new firmware. You may confirm the firmware version by going to the Firmware->About screen.

### Step 1: Enter Firmware Upgrade Mode

Plug the PurePower into the PC using the “PC USB” port. To enter firmware upgrade mode simply go to Firmware->Update. When prompted with the “Push joystick up and hold” screen, push joystick UP and hold for several seconds. After the screen displays “Thank you. Use PC to update firmware.” you may release the joystick. The backlight will rapidly flash about 5 times and then start to flash slowly (once

every few seconds). Once the backlight starts to flash slowly you may continue to the next step. The PurePower is now in firmware upgrade mode. The Windows PC sees it as a USB serial port.

## **Step 2: Driver installation.**

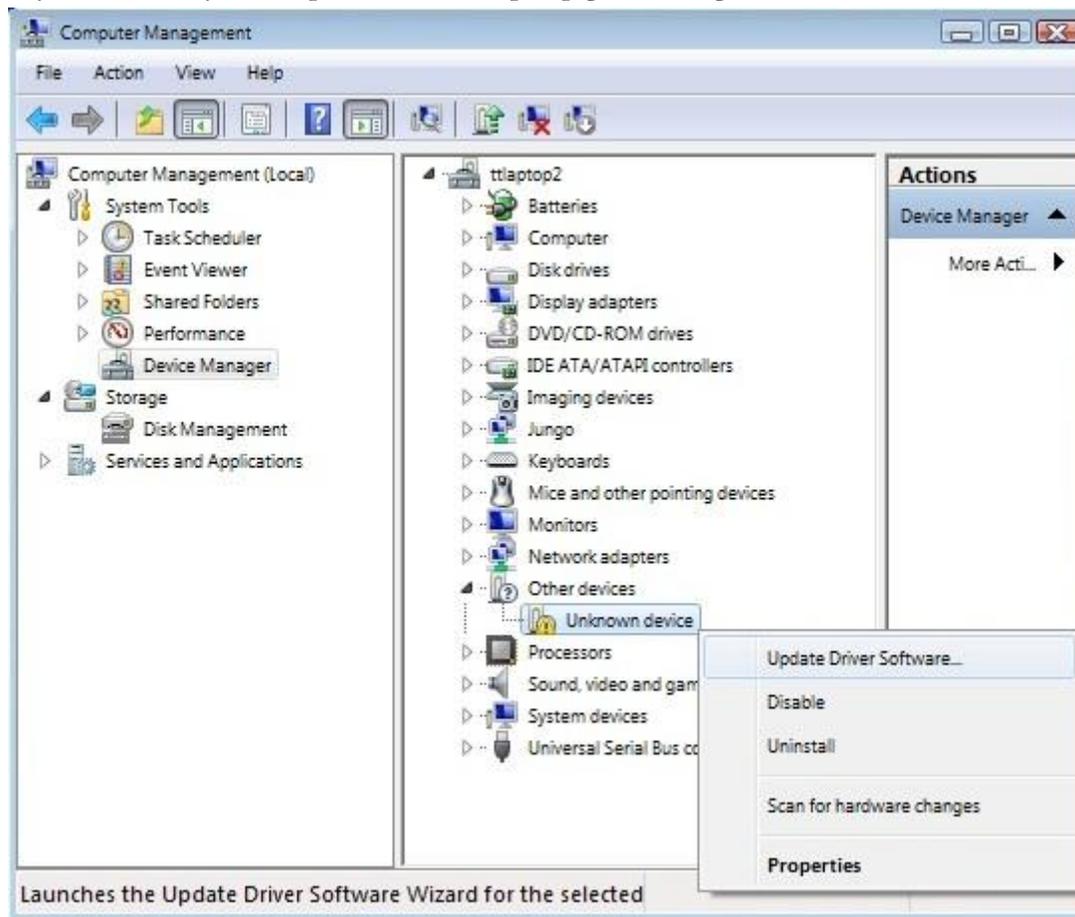
**Note:** Under 64 bit windows, you need to disable driver signing in order to install the device driver. This video is a nice summary for how to do this under Windows 8: <http://www.youtube.com/watch?v=NM1MN8QZhnk>. Under Windows Vista/7, you may simply press “F8” during boot and select “disabled driver signing” in the boot screen. This only needs to be done once, and after the firmware upgrade you may reboot your PC normally.

1. Unzip the contents of this zip file into a folder anywhere on your hard disk. You can do this by right clicking on the zip file and selecting “Extract All...” from the popup menu.
2. Click on the windows “Start” menu in the bottom left of the screen, then right click on “Computer” and left click on “Manage”



If a security message pops up, select yes. The “Computer Management” console windows will open. Left click “Device Manager”, double click “Ports (COM & LPT)”. This gives you a list of installed ports. You want the PurePower to show up as one of these ports.

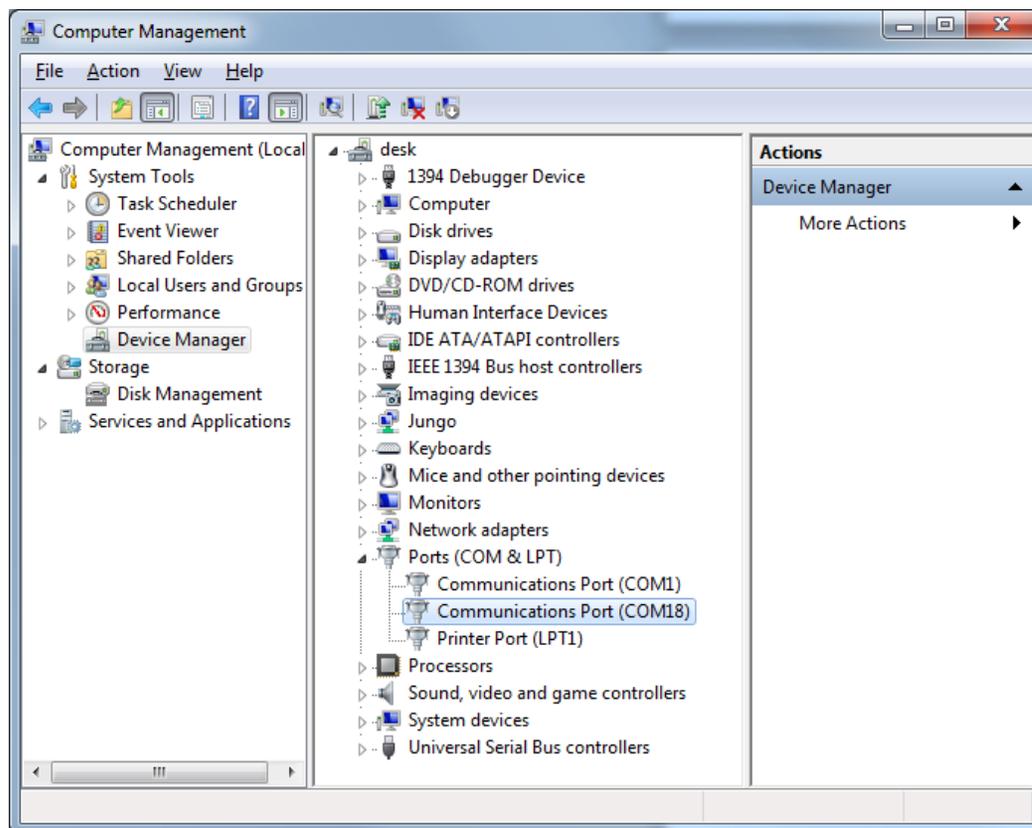
- To determine which port is the PurePower, unplug the PurePower and check which port disappears. Then re-plug the PurePower to check that the port once again reappears. If instead of a COM port you get an “unknown device” (or something similar), then this means that the computer did not recognize the PurePower as a serial port. In that case, right click on the “unknown device” as shown in the image above and select “Update Driver Software...” in the popup menu. Then select “Browse my computer for driver software”. Then click the “Browse” button and browse to the directory where you unzipped this file. Click “Next” and finish the update procedure. If you receive any warnings about driver signing, please accept them and install the driver anyway. It should finally



say “Windows has successfully updated your driver software”.

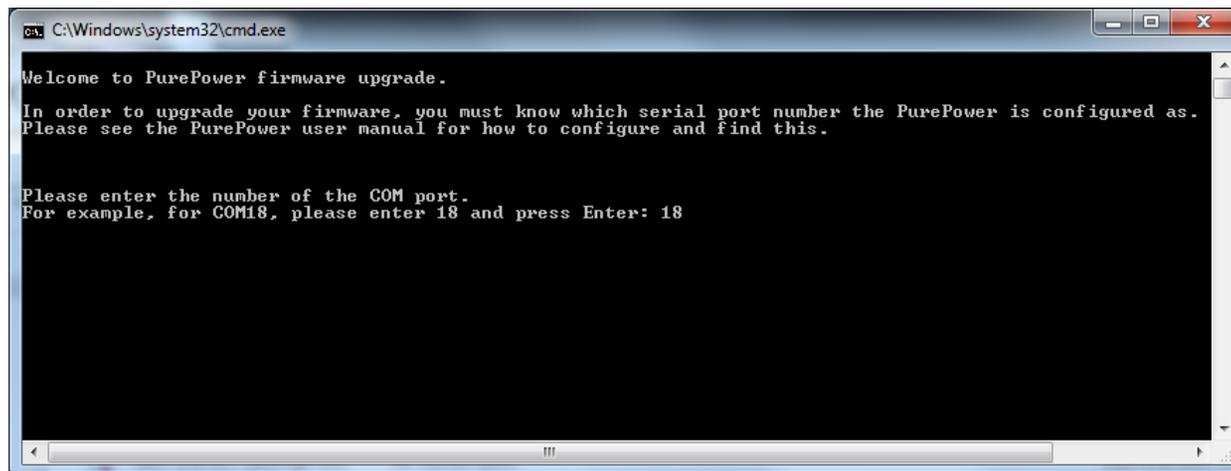
- Note the COM port which is assigned to the PurePower. For example, in the figure below we are showing the PurePower as “COM18”. Since your computer may have several COM ports, you can determine which one belongs to the PurePower by

disconnecting it from the computer and seeing which COM port disappears from the device manager. Then you can reconnect it to the computer and the COM port should re-appear.



### Step 3: Run Firmware Tool

You are now ready to perform the upgrade. This is done by double clicking on the “updatePP” file in this unzipped folder. The following window will open:



Please enter the number of the PurePower serial port and press Enter. In this example it is 18. Then you should see the following:

```

C:\Windows\system32\cmd.exe

Welcome to PurePower firmware upgrade.

In order to upgrade your firmware, you must know which serial port number the PurePower is configured as.
Please see the PurePower user manual for how to configure and find this.

Please enter the number of the COM port.
For example, for COM18, please enter 18 and press Enter: 18

Performing upgrade. Please wait a few seconds...

Connecting to programmer: .
Found programmer: Id = "LUFACDC"; type = S
Software Version = 1.0; No Hardware Version given.
Programmer supports auto addr increment.
Programmer supports buffered memory access with buffersize=128 bytes.

Programmer supports the following devices:
Device code: 0x44

avrdude.exe: AVR device initialized and ready to accept instructions

Reading | ##### | 100% 0.00s

avrdude.exe: Device signature = 0x1e9587
avrdude.exe: NOTE: FLASH memory has been specified, an erase cycle will be performed
To disable this feature, specify the -D option.
avrdude.exe: erasing chip
avrdude.exe: reading input file "apXbattery.hex"
avrdude.exe: input file apXbattery.hex auto detected as Intel Hex
avrdude.exe: writing flash (25168 bytes):

Writing | ##### | 100% 2.93s

avrdude.exe: 25168 bytes of flash written
avrdude.exe: verifying flash memory against apXbattery.hex:
avrdude.exe: load data flash data from input file apXbattery.hex:
avrdude.exe: input file apXbattery.hex auto detected as Intel Hex
avrdude.exe: input file apXbattery.hex contains 25168 bytes
avrdude.exe: reading on-chip flash data:

Reading | ##### | 100% 1.22s

avrdude.exe: verifying ...
avrdude.exe: 25168 bytes of flash verified

avrdude.exe: safemode: Fuses OK

avrdude.exe done. Thank you.

Upgrade finished! Please press "Enter" key to close this window.

Press any key to continue . . . _

```

The PurePower will reboot and the update procedure is finished. Congratulations!



## Firmware Update with MacOS

Our devices are designed with modular firmware that is easily updated. Updates will be released based on feature requests and bug reports. Please let us know if you have any requests. We will try to include any reasonable requests in the next firmware update.

Firmware upgrade is supported under Windows and MacOS. For Windows please see chapter 4. For updates please check <http://audiophilleo.com/support.aspx>.

**Note:** If you enter firmware update mode and decide not to proceed with an upgrade, just push the joystick LEFT to resume normal operation.

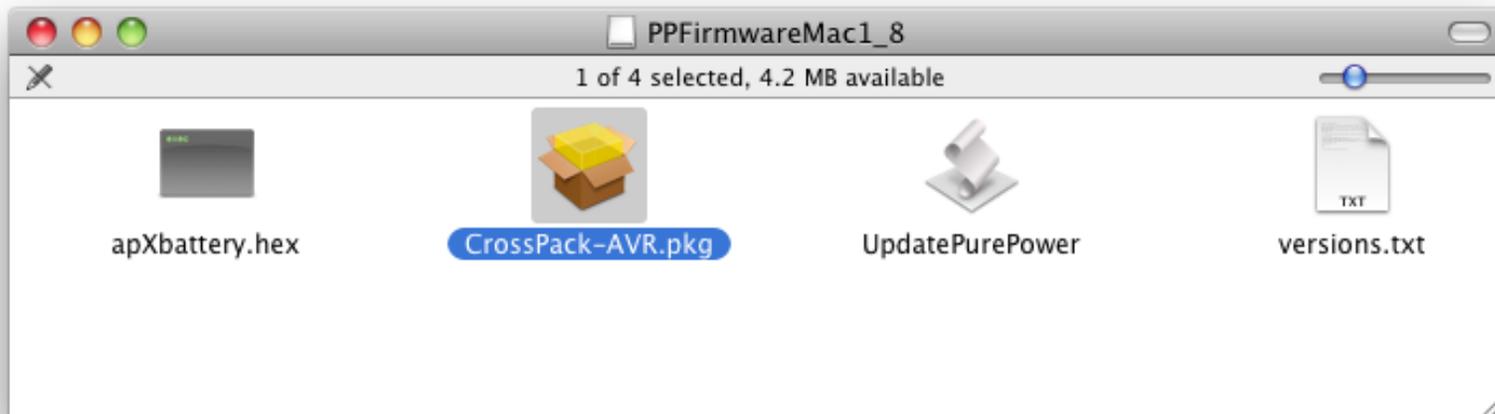
**Note:** After a successful update procedure the PurePower will automatically reboot and start the new firmware. You may confirm the firmware version by going to the Firmware->About screen.

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## Step 2: Software installation.

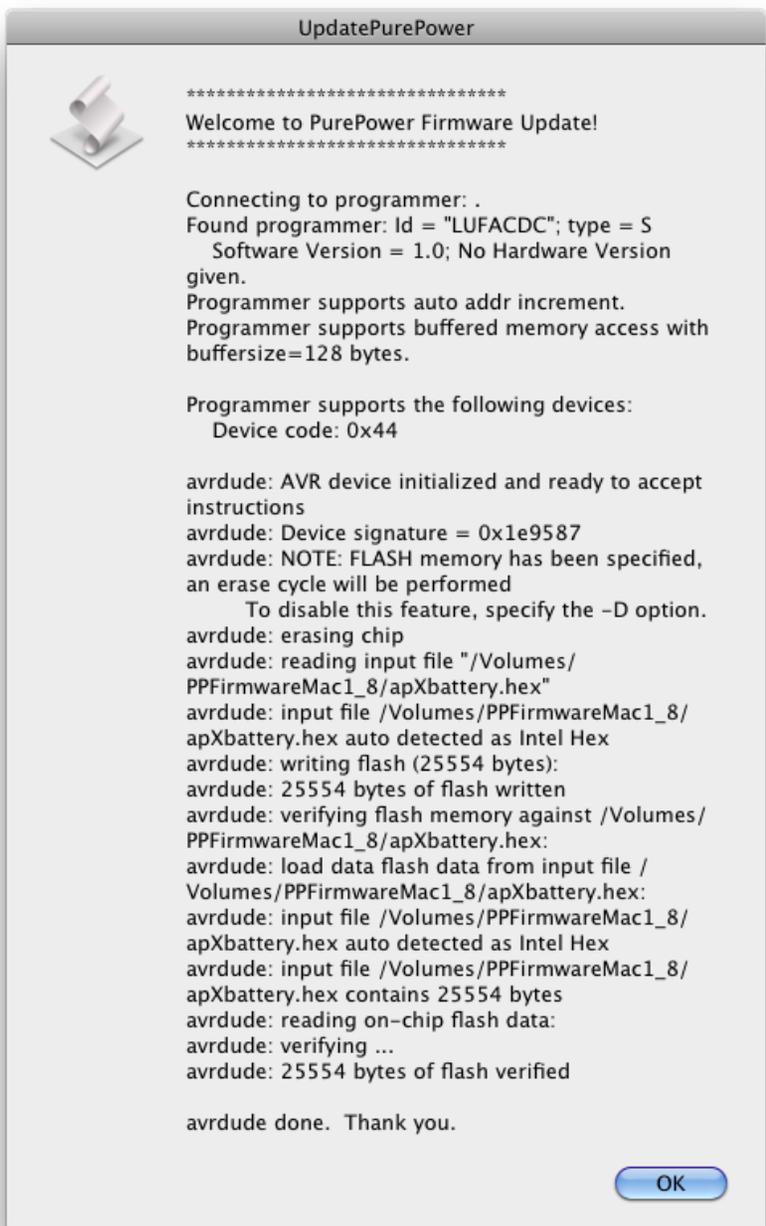
1. Double click the firmware DMG image file you downloaded in order to mount it. You will see this window:



2. Double click on "CrossPack-AVR.pkg" and follow the installation instructions to the end. Note that this only needs to be done once per computer.

## Step 3: Run Firmware Tool

You are now ready to perform the upgrade. This is done by double clicking on the "UpdatePurePower" file. After a few seconds, the following window should open. Note that the bottom should say "avrdud: xxxx bytes of flash verified". The PurePower should reboot and be running the new firmware.



## Specifications

### Noise

PurePower output noise levels are below the noise floor of our test equipment. Because the PurePower enters ultra-low power modes during music playback, its controller electronics effectively contribute zero noise to the output feeding the Audiophileo1/2, making the output noise that of the internal battery itself.

### Compatibility

The PurePower needs to be plugged into a power source via the “PC USB” connector. This is typically a computer USB port but can also be a USB wall wart. In both cases a 500mA current draw must be supported.

### Physical

Display: 102 x 64 pixels, 1.38” (3.5 cm) diagonal

Dimensions: 3.5 x 2.8 x 0.85 in (89 x 75 x 21 mm)

Weight: ~ 7 oz (200 g)

## **Electrical**

USB Bus Power (“PC USB”): 0 to ~500mA, 4.3 to 5.5 volts.

“AP POWER” output: up to ~500mA, current limited.

Max USB Cable Length: 5m