

## FAQ 1

Q:

Could you comment on the (voltage/current and safety) Apple iPod charge/charger requirements for the entire iPod product line?

A:

The iPods have their own recharging circuit built in. This makes designing a charger fairly easy as all that the developer needs to do is provide a fairly clean voltage source within the range specified. Each iPod may (or may not) implement a different charging circuit, and that is not subject to publication. The specification only guarantees that iPod internal charging circuit will operate properly provided voltages are within the specified range.

The early Apple power adapters, that used FireWire Power, were 12V out and "fast-charge" time was about 2 hours (charges up to 80% of battery capacity) and "full-charge" time was about 4 hours. iPod battery and FireWire charging current has ranged from 7 to 12 Watts depending on the age and version of the iPod.

iPods are designed for stable power supplies - not oscillating ones. The early, adapter that used FireWire power input of the iPod. They took 8-30V, though 15V is the maximum for new accessories. Power supplies should be regulated so that the iPod never sees more than 30V. The current USB spec is +/-5% on 5V. USB is the only power input on the shuffle. All iPod models from the iPod mini (2004) onward support charging over USB and we strongly recommend charging via USB whenever possible.

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## FAQ 2

Q:

The iPod Accessory Protocol Interface Specification states that accessories are encouraged to keep their power usage as small as possible during the iPod's sleep, below 10 $\mu$ A, due to the impact on the iPod battery life. Is it possible for an accessory to draw more than that during light sleep?

A:

Since the spec indicates that accessories are be limited of 10 $\mu$ A during sleep, drawing more current is not supported, even if some iPods seem to allow it. The specification only guarantees that iPod will source 10 $\mu$ A of current when it is sleeping.

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### FAQ 3

Q:

Can you clarify what will happen if a dock (that charges and allows file synchronization) is developed using the 30-pin OMNI connector to supply both FireWire power and USB power?

A:

Currently, all iPods that can be charged via both FireWire and USB power can be connected to both supply voltages simultaneously. In that case, the iPod will prioritize FireWire charging.

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### FAQ 4

Q:

Must the FireWire and USB charging voltages be regulated?

A:

Charging voltages can fluctuate somewhat, but they must stay within the stated voltage limits. FireWire charging requires 8 - 15V, and the power supply should always be between those values. Below 8V, an accessory should supply 0V (that is, it should not supply 7.5V). Above 30V, the iPod could be damaged. Per the USB specification, USB charging requires 4.75 to 5.25V if the iPod is able to negotiate high-power (500mA) charging. In the low-power (100mA) case, 4.4V - 5.25V is required. Other than 0V, voltages outside of these ranges should not be supplied.

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### FAQ 5

Q:

Sending a command sequence to a 3G iPod when it is connected to a device that charges the iPod and uses simple remote commands doesn't seem to wake the iPod. Is there something else needed to wake the iPod?

A:

The 3G iPod does not wake from sleep when it receives packets over the UART serial port link. This is documented in the Device Signaling and Initialization section of The Protocol Core and the General Lingo chapter of the iPod Accessory Protocol Interface Specification. The only way to wake the 3G iPod from sleep is to apply an external power source or press a button on the iPod itself.

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## FAQ 6

Q:

Is there a command to search for items within a particular category (album, artist, song, etc.) which contain a given string?

A:

Currently there is no such search capability in the interface. Any such text searching will have to be done externally from the data returned from the iPod.

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## FAQ 7

Q:

Referring to the 30-pin OMNI connector, the iPod Interface Specification states that Pin 29 (Audio Return) should never be grounded inside an accessory. However, measuring resistance between pin 1, 29 and 30 on the iPod (Mini and Photo) shows zero ohms when nothing is connected to the 30-pin OMNI connector. It appears that pin 29 is grounded to Pin 1 and Pin 30 (digital grounds) in the iPod. If pin 29 is already connected to digital ground in the iPod, Why not ground it in the accessory?

A:

Though it may appear that the "audio return" pin is grounded in the iPod, it is not and should not be assumed to be in the accessory. FAQ 9 (below) describes the treatment of Pin 29 (Audio Return).

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## FAQ 8

Q:

Is it possible to switch between different accessory identification resistors (eg. from simple dock to battery pack) in the same accessory, on the fly?

A:

The iPod detects an accessory when "Accessory Detect" (pin 20) goes to ground. Shortly after the connection, the iPod reads the voltage level on the Accessory Identify pin (pin 10) to determine the type of accessory that's attached. The specifics of this operation are describe in greater detail as part of the Accessory Detect and Identify section of the Functional Description chapter in the iPod Accessory Protocol Interface Specification.

If the accessory detect pin is un-grounded and then grounded again, the iPod will re-read the value of the accessory identification resistor. Note that this functionality is not specifically supported in the interface specification. Also note that the time between the accessory detect event and the accessory identify read will vary between iPods.

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## FAQ 9

Q:

Can you clarify how the "Audio Return" signal should be treated on 30 pin of the OMNI Connector when using the line-out and audio return signals (pins 27, 28, and 29) as inputs into an external device?

A:

The treatment of pin 29 (audio return) is discussed througout the Line Level sections of the Functional Description chapter in the iPod Accessory Protocol Interface Specification, and some description of termination techniques is provided. To reiterate, the iPod pin for audio return is NOT ground and should not be tied directly to ground, but rather it should be treated as an audio signal.

Audio Return is a very sensitive audio reference, similar in importance to the left and right audio signals. Appearance of more noise when the iPod is charging (lots of current through the real ground) or when the drive is spinning (spikes on the power supply that sound like drive noise but are really just spikes in current from the drive) suggests that the audio return is not correctly treated in the accessory's circuit. There are a variety of transformer and differential amplifier designs that will minimize/eliminate the effect of ground currents on the audio return line, and a simple differential amplifier with good CMR may provide enough conditioning.

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## FAQ 10

Q:

The "iPod Accessory Protocol Interface Specification" does not clearly specify some issues about the accessory detect resistor. Communication is possible with iPod mini, nano, and 5G without a resistor. There is concern that this configuration won't work with all past or even future versions of iPod.

Can you please clarify what resistor should be used for a remote control to avoid any functionality or serial communication problems?

A:

Even though your device maybe able to communicate with the iPod over the serial interface without an accessory identification resistor, this is not a supported behavior. To guarantee correct behavior, there must be an appropriate accessory identification resistor in place to indicate the device type. Per the specification:

- \* 3.01K ohm = Simple/AV dock for 3G and 4G iPods

- \* 191K ohm = iAP over USB  
(used to signify to the iPod that the default USB configuration should include iAP over USB)

- \* 255K ohm = Battery pack

- \* 549K ohm = iAP over UART  
(used for devices that communicate serially that are not 3G/4G docks, battery packs, or car chargers)

- \* 1M ohm = Car charger

To choose a resistor for a remote control, first ask if your device is also a car charger or battery pack. If your device provides neither of those functions, then the appropriate choice would be would use the 549K ohm "iAP over UART" resistor.

Note that it's not the actual resistor value that's important, it's the voltage drop across the accessory identification resistor seen at the iPod. A voltage divider is created by the accessory identification resistor and the 100 Kohm pull-up resistor inside the iPod (see Figure 2-5 of the "iPod Accessory Protocol Interface Specification"), and the iPod measures the voltage at the Accessory Identify pin with respect to ground.