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Technical Note HW530

Power Supply Q&As

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This Technical Note contains a collection of archived Q&As relating to a specific topic--questions sent the Developer Support Center (DSC) along with answers from the DSC engineers. Current Q&A's can be found on the [Macintosh Technical Q&A's web site](#).

[Oct 01 1990]

PowerBook battery pack cell count

Date Written: 9/1/92

Last reviewed: 11/24/9292

How many cells are contained in the PowerBook 140/170 battery packs?

Your answer has two segments to it:

1. The Disclaimer: Apple is currently discouraging third-party developers from designing and manufacturing PowerBook replacement batteries. The manufacturing process of batteries has proven to be problematic to Apple developers, and the finished product may impose a safety hazard to end users.

2. The Answer :The PowerBook 140/170 battery packs have 10 cells

IEC 801-2 ESD testing standard

Date Written: 9/17/91

Last reviewed: 6/14/9392

Where can I get specs for environmental and electrostatic discharge (ESD) testing?

Apple doesn't disclose its testing specs; however, there is an international ESD testing standard specification called the IEC 801-2 Although not every company adheres to it, as ESD testing becomes written into law, it is almost a sure thing to say that this specification will be the standard on which that law is written up. As it stands now, the manufacturers of the testing equipment are already setting their machines to test at the levels set forth in the specification.

For more information regarding this issue, contact your source for ESD testing equipment. Since that portion of the industry has already taken notice of and implemented the specification, they'd be the best source for the kind of information you're looking for.

Macintosh Classic, LC, & IIsi internal hard disk power specs

Date Written: 5/31/91

Last reviewed: 8/1/9292

What is the maximum current available on the +5V and +12V hard disk power lines on the Macintosh IIsi, LC, and Classic?

Here are Apple's internal hard disk drive power specifications for the Macintosh Classic, Macintosh LC and Macintosh IIsi computers:

| | +5V | +12V | Total Power |
|------------------|-------|--------|--------------------------------------|
| | ----- | ----- | ----- |
| Startup | 700mA | 1000mA | (see explanation below) |
| Accessing | 700mA | 300mA | <= 5.5 Watts (see explanation below) |
| Operating (Idle) | 500mA | 300mA | <= 5.5 Watts (see explanation below) |

- The initial power consumption during startup must be less than 10 Watts RMS as measured during the first 2 seconds. After 2 seconds, the accessing/operating requirements govern.
- These specifications include terminator power which must be supplied by the drive.
- These are the absolute maximum allowable numbers (not the mean of a distribution of drives). Any drive that operates above any one of these numbers may not work.
- There is a discrepancy in maximum total operating power in Watts (5.5W) and standard power calculations ($500\text{mA} * 5\text{V} + (300\text{mA} * 12\text{V}) = 6.1\text{W}$). This means that drives cannot draw the maximum current from both the +5V and +12V supplies.
- On the Macintosh Classic, there must be a delay of at least 700 msec before hard disk spin-up to prevent the +12V startup peak from happening at the same time as the Macintosh Classic's floppy drive's startup head recalibration.

Auto-restarting a Macintosh II after a power failure

Date Written: 8/30/91

Last reviewed: 8/1/9292

What does it take to make a Macintosh II auto-restart after a power failure?

To get the Macintosh II to auto-restart after a power failure, the "reserved" Apple Desktop Bus (ADB) pin #2 (PWRON) must be grounded for a couple of seconds when the power comes up.

X-Ref:

Macintosh Technical Note ["Space Aliens Ate My Mouse \(ADB--The Untold Story\)."](#)

Low-power hard drive requirements for Macintosh Portable

Date Written: 12/14/90

Last reviewed: 8/1/9292

We can't get some internal hard drives to work in the Macintosh Portable.

We think this is a power draw problem. The Macintosh Portable drive needs to be a low-power drive. According to the "Macintosh Portable Developer Notes," power requirements are as follows:

| | |
|----------|---------------------------------------|
| Voltage: | 12 Vdc and 5 Vdc with +/-5% tolerance |
| | Voltage ripple to be <=100 mv |

Current (Amps): Currents drawn must be less than or equal to the values shown below.

| DC Current: | 5 Vdc | | | 12 Vdc | | |
|-------------------------------|-------|----------|----------|--------|----------|----------|
| | Peak | Max(rms) | Typ(rms) | Peak | Max(rms) | Typ(rms) |
| Startup (<5 sec) | 1.5 | 1.1 | 1.0 | .8 | .56 | .53 |
| Seeking (<100 ms) | 1.5 | 1.1 | 1.0 | .44 | .31 | .28 |
| Read/write | TBD | TBD | .45 | .65 | .46 | .42 |
| Standby (spindle on) | TBD | TBD | .25 | .15 | .11 | .10 |
| Autoshutdown (spindle off) | TBD | TBD | .16 | TBD | TBD | .06 |

Note also that the Portable must have the battery installed; the adapter alone can't spin a drive. Also the drive must be at SCSI ID 0 and the time-out value has to be sufficient to allow the drive to come up (you can look at the values and set them with GetTimeout and SetTimeout which are documented in *Inside Macintosh* Volume V, page 356). If this doesn't solve the problem, then it's possible there may be a SCSI termination problem.

Macintosh power supply limits

Date Written: 11/28/90

Last reviewed: 8/1/9292

Table 6-24 on page 263 of the 2nd edition of the Macintosh Family Hardware Guide gives a limit of 18 amps @ 5 volts on the Macintosh power supply. Can we exceed the recommended $6 \times 2 = 12$ amp limit at +5V on our cards?

It's not a good idea to exceed this limit, unless you don't need the card to work in machines with internal hard drives or single-slot Macintosh systems such as the Macintosh IIsi. The remainder of the 18 amps not used by NuBus are used by the motherboard and the hard drive. If you do go with machines that do not have internal hard drives, then you will be able to use a little more power, but you will still need to leave some power for the video card. This leaves you back at about a 12-amp limit. If you put your own power converter on your card, you could convert the 12-volt power to 5 volts, but this is not going to gain a lot. In general, third parties who use too much power have ended up adding an external power source to their cards. In some cases there have been cards that required replacing the entire Macintosh power supply. Adding power will also require a bigger fan--that is, these limits aren't just electrical; they represent maximum thermal values as well. This is particularly important in the Macintosh IIsi.

Macintosh Classic and Macintosh LC power information

Date Written: 11/1/90

Last reviewed: 8/1/9292

We need a cable to use our external card with the Macintosh Classic and Macintosh LC. The only available powered port seems to be the Apple Desktop Bus (ADB). How much power does the ADB on the Classic and LC supply?

You can approach your problem a couple of ways. We suggest that developers do not steal power from any of the CPU's ports but if you insist on doing otherwise, then consider the following:

Maximum ADB power available is low--only about 125 ma per device at +5. You would have to provide an in-and-out connector since our newest CPUs have only one ADB port on them. We suggest that only three devices be used on each ADB port, and your device would count as one of those devices. See Chapter 8, page 295, of the Guide To Macintosh Family Hardware, Second Edition.

Power is available on the floppy drive port (+12, +5) and the maximum current available is higher than ADB. Allowing for a floppy drive plugged into your adapter, you would still have 200 ma @ +5 with a 400K drive connected and 340 ma @ +5 with an 800K drive connected. You must also provide a way for a floppy to be plugged into your adapter using a DB19 connector back to back on the Classic and you would have to run a cable out the back from the second floppy port on the inside of the LC. See Chapter 9, page 335, of the Guide To Macintosh Family Hardware, Second Edition, for more information.

If you still decide to use the ADB, remember that your device must support the following: ADB pass through and only about 100-125 ma @+5 current draw. Also, remember to add documentation to your product user's manual that your device counts as one of the three allowed devices per ADB connector.

Macintosh LC power supply ripple and noise max

Date Written: 8/13/92

Last reviewed: 9/15/9292

What is the Macintosh LC noise/ripple specification?

The following table specifies the maximum allowable ripple and noise on each of the power supply outputs, under all specified load and input voltage conditions, and assuming resistive loads bypassed only by 0.1 uF ceramic and 47 uF electrolytic capacitors on each rail. These voltages are to be measured differentially at the output power connector with a Tektronix differential probe P6046 and 80 MHz oscilloscope, or equivalent.

| | +5 V | +12 V | -5 V |
|-----------------------|---------|---------|---------|
| Line frequency ripple | 30 mVpp | 35 mVpp | 30 mVpp |
| Switching noise | 50 mVpp | 55 mVpp | 50 mVpp |

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