

1394b Design Seminar

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Cable Power

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Introduction - Cable Power on 1394

- Power is one of the best features in FireWire
- FireWire can provide *much more power* than USB or eSATA
- Use power wisely to make your product better
- These are the basics; you can do more:
 - Use the 1394 specifications
 - Participate in the 1394 TA working groups

Introduction - Cable Power on 1394

- Safety
- Success
- Sophistication

Safety - The Basics

- Power may be up to 33V (30V +/- 10%)
- Power may be up to 1.5A
 - So, use components with suitable ratings
 - e.g. capacitor, diode, PCB traces, wire gauge (AWG)
 - Remember, your device may find itself repeating 1.5A even if it does not supply 1.5A
- 28V is very common
 - Example: some Apple Macintosh models
- 1.5A is very common
 - Especially during connection (hot plug)

Safety - Late VG

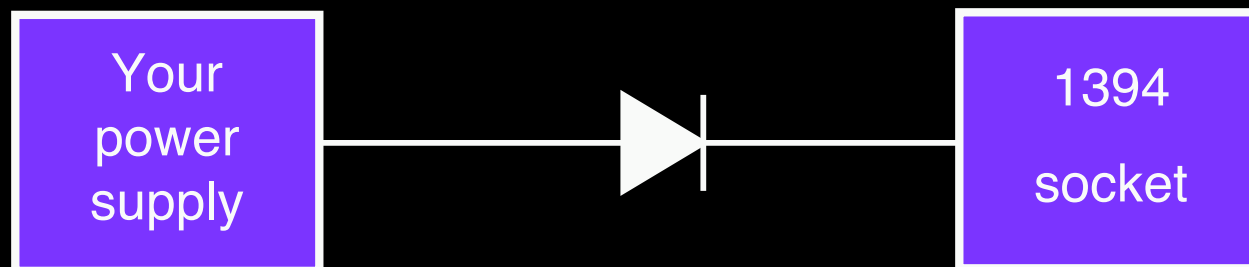
- Effect occurs if the VG connection between a power provider and a power consumer fails to connect before VP
 - protection diodes in the power consumer feed the power provider's voltage back on the signal circuits
 - can destroy the power provider's PHY
- Recommendations for power providers, repeaters and consumers:
 - DC connection between VG and connector shield
 - Robust connector design and panel mounting to resist upside-down or angled plug insertion
- Recommendations for power providers and repeaters:
 - Passive protection (enhanced ESD circuit), or
 - Active protection (withdraw outgoing/repeated power if see high voltage on incoming signals)

Success

- Cable power makes your product better:
 - Easier to use (no cables, no adapter)
 - More reliable (compare to USB HDD)

Success - Providing Power

- Provide at least 12V (no load), 9V (load)
 - Higher voltage is more efficient
 - Use a current limiter for safety
- Another device may provide higher power
 - Up to 33V!
 - Use a diode to protect your power supply



Success - Consuming Power

- Do not assume 12V
 - Any level from 8V to 33V must be accepted
 - Use an efficient circuit to produce 3.3V, or 5V, etc.
- Do not consume too much current
 - Excessive inrush can make the power supply stop
 - 1394 says inrush is “not to exceed 18 mJ in 3 ms”
 - Aim not to exceed 1.5A even momentarily during inrush
 - Avoid large capacitors as much as possible
 - Use current limiting series resistor if necessary

Success - No Power

- For some products, power is not useful or possible
 - e.g. HDTV cannot operate from FireWire power
 - e.g. Light notebook computer has no power to spare
- That's OK! But *use the 6-pin or 9-pin socket*
 - The 4-pin socket is very difficult for customers to use
 - The 4-pin socket does not repeat power (pass-thru)

Sophistication

- Use FireWire power to operate the PHY
 - as a repeater (if the device has more than one port)
- Use FireWire power only if AC power is *not* available
- If AC power is available, provide FireWire power for other devices
- See IEEE 1394a
 - No power change in 1394b, 1394c, or 1394r

Conclusion

- Power makes FireWire better
 - But only if power is used correctly
- Please follow the rules and the specifications
- *Participate in 1394 TA Compliance Testing to ensure your power design is good*



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