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Technical Note HW12

Macintosh Portable PDS Development

CONTENTS

[I've Got a Bad Feeling About This](#)

[So Why Have a PDS Connector at All?](#)

[Hang On](#)

[References](#)

[Downloadables](#)

The Technical Note describes the unique aspects of the Macintosh Portable Processor Direct Slot (PDS), including the severe limitations in its use.

The internal operating environment of the Macintosh Portable is unique within the Macintosh family due to the additional design goals that are not normally applied to other Macintoshes. In particular, two of these goals which limit the use of the PDS are that the unit shall have a long (eight-hour) battery operation life and that the unit shall meet all FCC regulations, including the ability to operate on commercial aircraft.

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I've Got a Bad Feeling About This

Because of these design goals and the subsequent limitations on the use of the PDS, you must severely limit your card design for the Macintosh Portable.

The first and foremost limitation is that the PDS has **no power budget** for your card. Seeing that there are +12V and +5V connections on the PDS connector, we all realize that you could draw some power directly from the Macintosh Portable. Please don't do it. Instead, you should add your own power supply (i.e., battery) to your board, thus controlling your own destiny (or at least the destiny of your PDS board) and ensuring that the Macintosh Portable has the longest battery life of any portable on the market. You are the best judge as to whether or not your board needs to run continuously when the Macintosh Portable is in sleep mode, therefore requiring a long current life. You might find that the functionality of your board is only optimal when the Macintosh Portable is in full-operating mode (or powered by an external source), and in this case, you could conserve its current demands.

For those of you who are convinced that your product is so important that your users will overlook a 50% reduction in their system operating time, Table 1 shows a worst-case power budget that could apply.

Power Supply	Operating State	Sleep State
+5 V, always on	50 mA maximum	1 mA maximum
+5 V, switched	▪	0 mA maximum
+12 V	25 mA maximum	0 mA maximum

- The 50 mA maximum applies to the loads of the switched and unswitched +5 V supplies.

Table 1-Worst-Case Power Budget

The second limitation is that to meet FCC limits on radio frequency emissions, no connector or cable attached to an expansion card can penetrate the case of the Macintosh Portable.

[Back to top](#)

So Why Have a PDS Connector at All?

The decision to include the PDS connector is a recognition that we can't know it all. Although it may seem that next to no power availability and absolutely no custom cables to the outside world would block all possible products, providing the expansion connector allows for that spark of genius for which developers are known and the unanticipated product which usually results. So, if after all these dire warnings you still want to proceed, following are the available details (at least until *Designing Cards and Drivers for the Macintosh* can be updated).

[Back to top](#)

Hang On

The PDS in the Macintosh Portable provides the microprocessor address, control, data, clock power, and Macintosh Portable-specific lines for your expansion card's use. Table 2 lists these signals, while Table 3 lists their descriptions.

Pin Number	Row A	Row B	Row C
1	GND	GND	GND
2	+5V	+5V	+5V
3	+5V	+5V	+5V
4	+5V	+5V	+5V
5	/DELAY.CS	/SYS.PWR	/YPA
6	/VMA	/BR	/BGACK
7	/BG	/DTACK	R/W
8	/LDS	/UDS	/AS
9	GND	+5/0V	A1
10	A2	A3	A4
11	A5	A6	A7
12	A8	A9	A10
13	A11	A12	A13
14	A14	A15	A16
15	A17	A18	reserved
16	reserved	reserved	nc
17	nc	reserved	reserved
18	reserved	reserved	reserved
19	reserved	+12V	D0
20	D1	D2	D3
21	D4	D5	D6
22	D7	D8	D9
23	D10	D11	D12
24	D13	D14	D15
25	+5/3.7V	+5V	GND
26	A19	A20	A21
27	A22	A23	E
28	FC0	FC1	FC2
29	/IPL0	/IPL1	/IPL2
30	/BERR	/EXT.DTACK	/SYS.RST
31	GND	16M	GND

32 GND GND GND

Table 2-Macintosh Portable 68000 Direct Slot Expansion Connector Pinouts

Mnemonic	Description
nc	No connection
GND	Logic ground
D0-D15	Unbuffered data bus, bits 0 through 15
A1-A23	Unbuffered address bus, bits 1 through 23
16M	16 MHz clock
/EXT.DTACK	External data transfer acknowledge. This signal is an input to the processor logic glue. Assertion delays external generation of the /DTACK signal.
E	E (enable) clock
/BERR	Bus error signal generated whenever /AS remains low for more than about 250 μ s
/IPL0-IPL2	Input priority level lines 0 through 2.
/SYS.RST	Initiates a system reset.
/SYS.PWR	A signal from the Power Manager indicating that associated circuits should tri-state their outputs and go into idle state; /SYS.PWR is pulled high (deasserted) during sleep state.
/AS	Address strobe
/UDS	Upper data strobe
/LDS	Lower data strobe
R/W	Defines bus transfer as read or write signal
/DTACK	Data transfer acknowledge
/DELAY.CS	Indicates that a wait state is inserted into the current memory cycle and that you can delay a CS.
/BG	Bus grant
/BGACK	Bus grant acknowledge
/BR	Bus request
/YMA	Valid memory access
/YPA	Valid peripheral address
FC0-FC2	Function code lines 0 through 2
+5/0V	Provides +5V when the system is running normally and 0V when the system is in sleep mode.
+5V/3.7V	Provides +5V when the system is running normally and 3.7V when the system is in sleep mode.

Table 3-Functional Description of the Macintosh Portable PDS Signals

The signals listed in Tables 2 and 3 are presented to your PDS card through a Euro-DIN 96-pin socket connector on the main logic board.

Currently, you can order these Euro-DIN 96-pin connectors (which meet Apple specifications) from: AMP Incorporated, Harrisburg, PA 17105.

Disclaimer: This listing for AMP Incorporated neither implies nor constitutes an endorsement by Apple Computer, Inc. If your company supplies these connectors and you would like to be listed, contact DTS at the address in Technical Note #0.

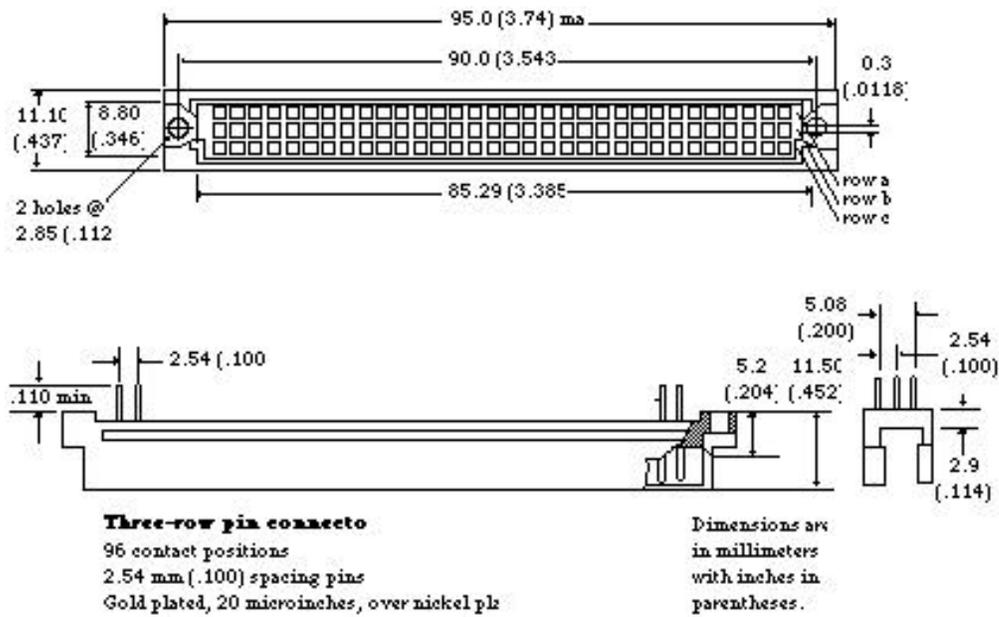


Figure 1-96-Pin Plug Connector

Due to the limited space within the Macintosh Portable's case, your card is limited to the size indicated in Figure 2. Apple highly recommends the use of CMOS circuits to reduce the total power necessary for your card's operation.

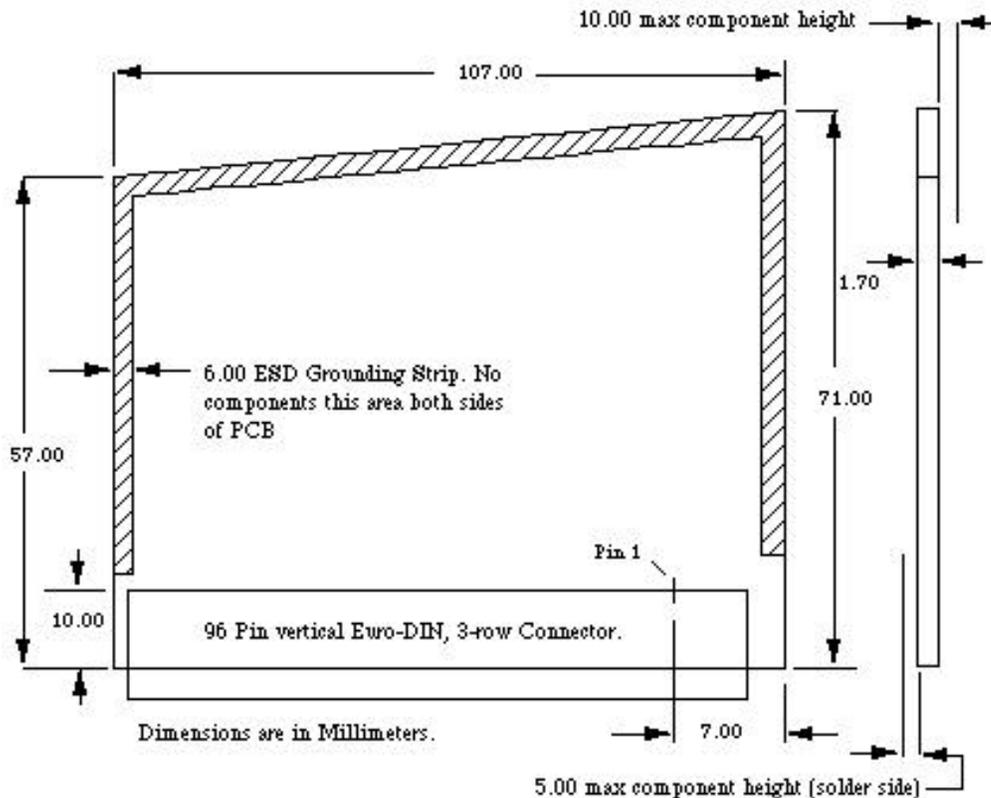


Figure 2-PDS Expansion Card Dimensions

[Back to top](#)

References

Designing Cards and Drivers for the Macintosh

Guide to the Macintosh Family Hardware

[Back to top](#)

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[Back to top](#)

Technical Notes by [Date](#) | [Number](#) | [Technology](#) | [Title](#)
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