EAS MINI DAQ

Intro

EAS MINI DAQ is an 8 channel, 12bit analog to digital converter for the IBM PC, with 4 digital input channels and 7 digital output channels. It connects to the parallel port of your PC and requires no external power. Typical uses are, high speed strip chart recording, data logging, process control, home automation, an electronic workbench, ect. When used with Labview, It becomes a very versatile instrument for process control and data logging. With the supplied software libraries, you can create custom control and data logging applications, in C, BASIC, and Excel.

Construction notes

This kit requires good soldering techniques due to its small size.
Tools necessary: A fine tip soldering gun and a good wire cutter.
Recommended tools: Mechanical clamp-known as a third hand, fine solder wick to remove excess solder.

Caution: Integrated circuits U1 and U2 are static and heat sensitive. Do not apply too much heat with your soldering iron when installing these two parts. Please take precautions while handing U1 and U2 to protect against static electricity, ground your body before handling these parts. It is also very difficult to take apart the shell coverings once they are snapped together. Leave this as the last assembly step.

Start by installing the top half components first, U1, U2, resistor pack RP1, etc. Make sure you have proper alignment before soldering. Pin 1 of U1 and U2 should be on pin 1 on the PCB board. Diode D2 follows markings on PCB board. Install JP4 and JP5 after the rest of the top half of parts have been installed. You will then be able to lay the board upside down on a flat surface and allow the headers to be held in place by the board weight while soldering.

Note: since components will be installed on the bottom side, trim off excess lead lengths. This will allow the bottom components to lay flat and the shell covering to close properly.

After the topside is done, be sure to cut any excess lead lengths before starting on the bottom. The bottom side requires enough exposed component leads to be soldered and bent 90 degrees. Another method is to pre-form and place the components before soldering. Remember it is best to heat the leads first before applying solder, then apply solder only to the leads, not to the soldering tip. Be sure to observe proper polarity for items 2 and 4 on parts list. These are tantalum capacitors that have markings for positive or longer leads to indicate positive side. Install D1 and R1 by cutting and pre-forming leads before soldering.

The Jumper setting is

INT of JP4 is for internal power from PC
EXT of JP4 is for external power - needed for low power laptops

BI of JP3 is for Unipolar mode 0v to 4v input
UNI of JP3 is for Bipolar mode -2v to 2v input

The DB25 connectors are installed with the leads lined up with the pads. Make sure the connectors are pressed flushed to the board before soldering, and that you have the correct connector gender before soldering. This will be impossible to remove if you get it wrong.

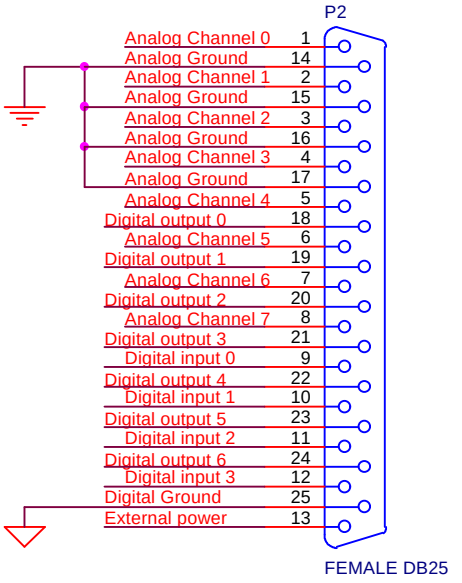
This is a good time to test the board before you close the case. We have all of the software on our web site. Please check our WEB site < http:/ / www.hooked.net / ~jfong> from time to time for new software updates and projects. Set JP4 for INT. Run minidaq.exe to verify if the board is working. This is a Windows program, select connected parallel port. If you intend to change the settings of the jumpers often, then it is recommended that you trim the latching tabs so that they don't lock so hard. To take apart the cases, we found that a dull X- acto blade works well along the tab line. The case does not fully cover the board, to keep cost down we have decided this is the next best alternative. If you know of a reliable source, please let us know.

PARTS LIST FOR EAS MINI DAQ

Item	Quantity	Reference	Part
1	2	C1,C8	.1uF, 104
2	5	C2,C3,C6,C7,C9	10uF, 106
3	1	C4	.01uF, 103
4	1	C5	22uF (longer lead is positive)
5	1	D1	1N4148 (brown with black stripe)
6	1	D2	1N4733A (silver with black stripe)
7	2	JP4,JP3	3 Pin 2mm Headers
8	1	P1	Male DB25 solder tail
9	1	P2	Female DB25 solder tail
10	1	RP1	10K Isolated Resistor Pack, 102 (orange color)
11	2	R1,R4	47 Ohms, Yellow Violet Black Gold
12	2	R3,R2	22 Ohms, Red Red Black Gold
13	1	R5	1K Ohms, Brown Black Red Gold
14	1	U1	MAX186
15	1	U2	MAX1044
16	2		2mm Shunts
17	1		RS232 Shell casing

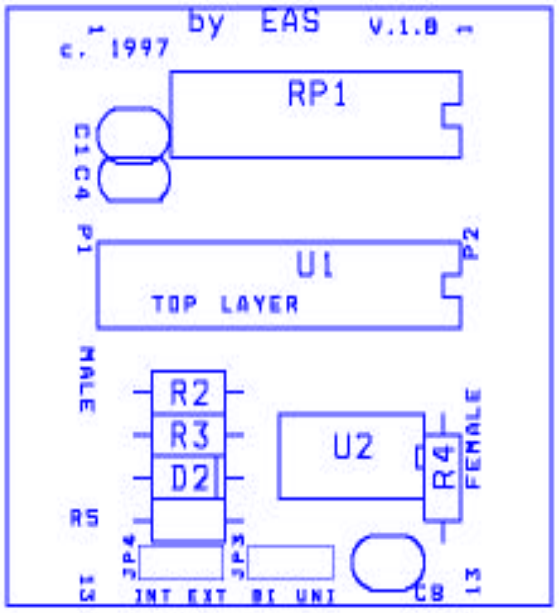
Connecting to the MINI DAQ

Connect P1 to the parallel port, P2 pinout is as follows

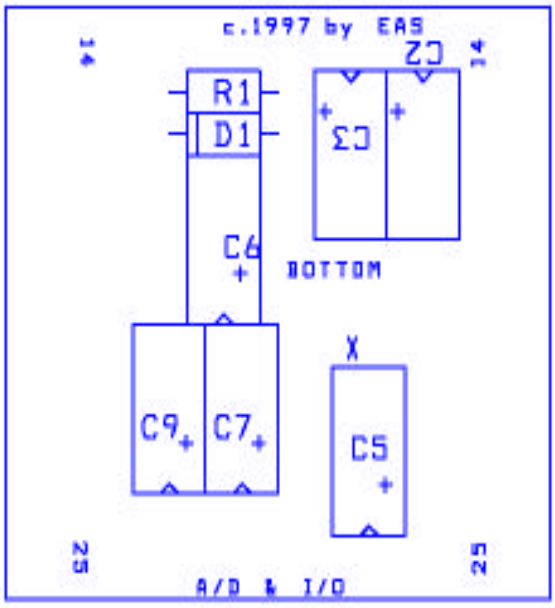


You can purchase several male DB25 from your local Radio Shack and dedicate those connectors to various projects, allowing you to plug Mini Daq among them.

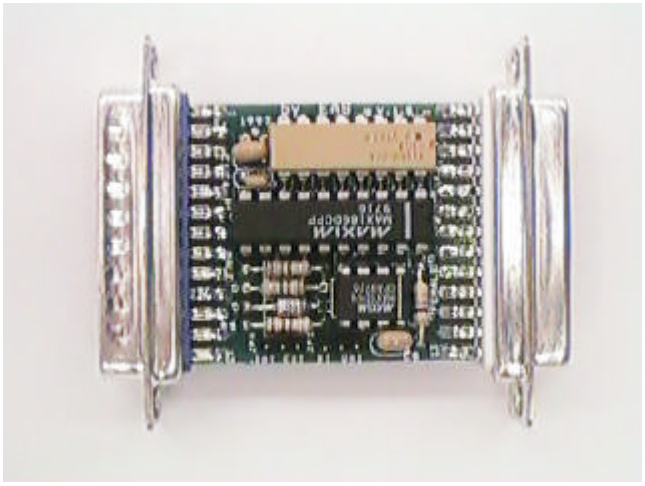
Silkscreen Top View



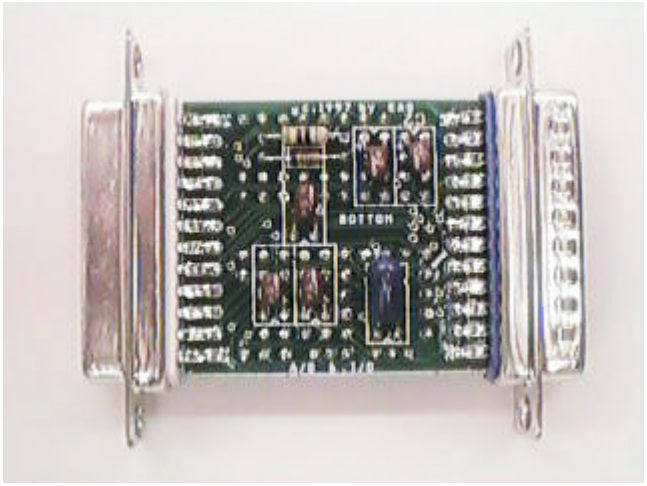
Silkscreen Bottom View



Top Image



Bottom Image



Frequently Asked Questions (FAQ)

The board shows voltages on other A/D channels, even though nothing is connected.
This should not effect the readings of your current channel. Because of the internal multiplexing done by the A/D, other channels will float. We recommend grounding all unused analog input channels.

The board works but it doesn't zero when grounded.
This is normal, you will get minor offset between all channels. These are very small and consistent offsets that can be nulled out in software. Typically, all A/D routines incorporate a calibrate procedure. By grounding all A/D channels and recording the offsets, they then add these small offsets to the final value read.

Is it possible to build the board from scratch?
Yes, but we don't recommend it, our several prototypes ended up being quite noisy, we were only able to meet the specification of the Maxim chip after we professionally laid out the PCB board. You might as well build an 8 bit A/D for you efforts.

How do I make differential readings?
You have 4 channels of differential inputs. You must place a .1uf capacitor between the negative input and analog ground of each channel used for proper readings to be taken. The negative input should not vary.

	Negative	Positive
Channel 0	pin 1	pin 2
Channel 1	pin 3	pin 4
Channel 2	pin 5	pin 6
Channel 4	pin 7	pin 8

The Mini Daq was working until I put a higher voltage than specified.
Try unplugging the Mini Daq from the PC parallel port and plugging it back in. This will reset the board and release any latch up conditions. Damage to the Mini Daq may occur if you exceed recommended input voltage.

Can the input to the parallel port be damaged?
You can damage the parallel port by not using proper TTL logic levels for the digital I/O. A good practice is to provide a buffer such as a 74LS244 in your circuit. Check out our web page for various interface circuits and projects.

How can I get more I/O?
You can run up to 4 Mini Daqs by providing 4 parallel ports for your PC. This will give you a total of 32 A/D channels, 16 TTL input channels and 28 TTL output channels

How can I further protect my Computer from my experiments?
You can use a separate parallel port ISA card for the interface to the Mini Daq. If the maximum input voltages have been exceeded, the separate parallel board provides an extra layer of protection between your circuit and the motherboard of your PC. You can purchase 3 rd party add on ISA parallel port boards for $19 or less at your local computer supply store.

How are input and output ports connected to the PC?
The digital input and output ports are passed directly to your parallel port with no buffers or protection circuitry. You must observe TTL levels or provide buffers to protect your parallel

port from excessive input voltage. To learn more about the PC parallel port, there is a Parallel Port FAQ located on our Web site.

Can I damage the A/D if I accidentally exceed the maximum input voltage?
The input to the A / D are protected by internal clamping diodes as well as a current limiting resistor. It provides a fair amount of protection. We have tested the Mini Daq with a 9volt analog input source without any problems for a short period of time.

How do I interface relays and other devices to the MiniDaq.
We have provided circuits on our web page in PDF format to do this. If you have further questions feel free to email us.

How can I increase the A/D sample rate?
Sample speed varies with the speed of your PC. The faster your PC, the higher the sample rate. Although the A / D chip is rated at 133 Khz sampling rate, sampling frequency is quite effected by software overhead and by Windows itself. You can run in a Dos environment to get better results. We have provided interface libraries to C and Quick Basic. In Labview, optimized loops will significantly increase your sample rate.

I'm getting A/D fluctuations every time I control an output port
Connect unused A / D inputs to ground. You might be drawing too much current from the parallel port, effecting the power input to the Mini Daq. Try switching to external power such as a 9V battery.

Why does my Mini Daq not work with jumper JP4 set to INT power?
We have designed the Mini Daq with the option to get its supply voltage from the PC parallel port. Some parallel port adapters may not be able to supply enough current to fully power the Mini Daq. This is common with laptop computers that use low power 3.3 volt logic circuits. If you are experiencing this problem, set jumper JP4 to the EXT setting and connect an external 6 to 12volt supply to Pin 13 of DB25 connector P2. A 9volt battery works quite well for this.

Trouble shooting

Check and make sure all components are installed and properly orientated.
Check diode polarity.
Check IC positions.
Check Tantalum capacitor polarities.
Check for shorts
Check for cold solder joints, especially around RP1 and U1.
Cable from PC to Mini Daq should be 6 foot or less. Shorter is better.
Try external power, PC port may not provide adequate power

Specifications:

12 bit, eight channel analog to digital converter or four channel differential
(4096 discrete points)
bipolar mode -2 to +2 volt input
unipolar mode 0 to 4 volt input
Relative accuracy +- 1 LSB
Offset error +- 3 LSB
Do not exceed maximum analog input voltage or damage to Mini Daq may occur.

A / D sample speed
6000 samples / sec using a Pentium 166 with data acquisition program written in Microsoft Quick Basic version 4.5 for DOS. Depending on the speed of your computer, the actual sample rate may vary.

The maximum sample rate of Mini Daq is dependent on how fast your computer is and by using acquisition programs written in optimized C and assembly language.

4 digital TTL inputs (0 to 5 volts). Do not exceed TTL input voltage range or damage to your PC parallel port may occur.

7 digital TTL outputs (0 to 5 volts).

Power requirements:
5volts DC taken internally from PC parallel port or external 5 to 12volt DC supply. Unit can be run from a 9V battery for best results. This is set using jumper JP4.

Current consumption: 7ma DC.

Dimensions:
2.45" long
2.1" wide
.65" deep

Software:
Labview, C, Quick Basic, Visual Basic and Excel libraries, demos and example software provided on floppy disk. Software and updates may also be downloaded from our WEB site.

Embedded Acquisition Systems
1565 Shrader Street
San Francisco, CA 94117
WEB http://www.hooked.net/~jfong
EMAIL jfong@hooked.net

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