

SID-II Instructions and Diagrams

SID-II is a sound digitizer for the Macintosh. It is compatible with all Macs. It is hardware and software compatible with the commercially available sound recorder, but features better fidelity.

The SID-II is an improvement on the original SID designed by the SID Trio. It features improved filtering, more readily available parts, and has circuit boards and kits available for it.

This archive contains four files:

README Creator: MacWrite

 This file.

SID Manual Creator: MacWrite

 The assembly and use manual that comes with the SID. Includes a circuit description and a section on special instructions for modifications. Ordering instructions are also in this section.

SID Schematic Creator: MacDraw II

 The schematic of the SID-II.

SID Parts Place Creator: MacDraw II

 A diagram showing the placement of SID parts on the circuit board.

Should you have any questions, you can write:

CEDAR Technologies
P.O. Box 224
Dublin, NH 03444

or you can email (Internet):

mikec@ai.mit.edu

SID-II Assembly and Use Manual

We hope that these instructions adequately explain everything you need to know about the SID-II. If you have any problems, don't hesitate to drop us a postcard at:

CEDAR Technologies
P.O. Box 224
Dublin, NH 03444

Documentation

Included in your SID kit are these instructions and a sheet with the schematic on one side, and a parts placement diagram on the other.

Parts List

You should check that you have the required parts. If you discover any shortage, notify us immediately and we will send you a replacement.

Parts are designated by a letter ("R" for resistors, "C" for capacitors, "D" for diodes, "U" for integrated circuits, "Y" for the crystal, "J" for connectors, and "M" for the microphone) followed by number or letter to indicate a specific component. On the circuit board, the resistors are labeled by just their numbers (no "R") and diodes are lettered (no "D").

<u>Qty</u>	<u>Component</u>	<u>Description</u>	<u>Part Designations</u>
2	22 1/4W 5% resistor	red red black	R31, R32
2	100 1/4W 5% resistor	brown black brown	R26, R27
2	1.0K 1/4W 5% resistor	brown black red	R3, R4
2	2.2K 1/4W 5% resistor	red red red	R1, R5
1	4.7K 1/4W 5% resistor	yellow purple red	R25
1	5.6K 1/4W 5% resistor	green blue red	R20
2	10K 1/4W 5% resistor	brown black orange	R21, R28
1	22K 1/4W 5% resistor	red red orange	R24
1	47K 1/4W 5% resistor	yellow purple orange	R30
2	100K 1/4W 5% resistor	brown black yellow	R2, R6
1	9.31K 1/4W 1% resistor	white orange brown brown	R8
4	10.0K 1/4W 1% resistor	brown black black red	R12, R15, R22, R23
1	14.0K 1/4W 1% resistor	brown yellow black red	R19
2	18.7K 1/4W 1% resistor	brown gray purple red	R9, R11
2	28.7K 1/4W 1% resistor	red gray purple red	R16, R18
1	35.7K 1/4W 1% resistor	orange green purple red	R14
1	39.2K 1/4W 1% resistor	orange white red red	R17
1	45.3K 1/4W 1% resistor	yellow green orange red	R13
1	53.6K 1/4W 1% resistor	green orange blue red	R10
1	500K 6mm trimmer potentiometer	marked "504"	R7
2	39pF 5% capacitor, 0.2 lead space	marked "390" or "39"	C24, C25
1	10nF 5% capacitor, 0.2 lead space	marked "103"	C16
14	100nF capacitor, 0.2 lead space	marked "104"	C2-7, C18-23, C27, C28
1	470nF capacitor, 0.2 lead space	marked "474"	C17
3	47uF 16V capacitor, 0.08 lead space	marked "47uF"	C1, C26, C29

4	470pF 2% polypropylene capacitor	cylinder “470H”	C8, C9, C14, C15
2	1.0nF 2% polypropylene capacitor	cylinder “1000H”	C10, C13
2	2.2nF 2% polypropylene capacitor	cylinder “2200H”	C11, C12
13	1N4148 silicon diode	marked “1N4148”	DA-DE, DG-DI, DK-DO
1	TL064 quad op-amp	14 pin DIP	U1
1	ADC0831 serial A/D converter	8 pin DIP	U2
1	74HC390 dual decade counter	16 pin DIP	U3
1	74HC14 hex schmitt trigger	14 pin DIP	U4
1	74HC4024 7 bit binary counter	14 pin DIP	U5
2	LM385-2.5 voltage reference	transistor like packages	U6, U7
1	6.144MHz fundamental crystal, 30pF	flat can with two leads	Y1
2	1/8” closed circuit phone jack	with mounting hardware	J1, J2
1	8 pin mini DIN jack, PC mount	cube like thing	J5
1	Electret condenser microphone	metal can w/black felt	M1
1	8 pin DIP socket	for U2	
4	4-40 by 5/8 machine screws		
4	4-40 machine nuts		
1	SID-BOARD printed circuit board	green flat thing	

Resistor color coding may have an extra band (typically: gold for 5%, and brown for 1%).

The SID-STEREO kit contains everything the SID-KIT does except the following components:

R24, R28, R30, R31, C24, C25, DE, DG-DI, DK, U3, U5, and Y1.

Tools Required

Nothing can be more frustrating than not having the right tool handy when you need it. We suggest you gather the required tools before you start. The tools needed are:

Soldering iron with a small tip (more on this later).

Wire cutters for trimming component leads.

Pliers suitable to tighten J1 and J2 nuts and bend over the tabs on J5.

Screwdriver to tighten the bolt legs into place.

Using a good soldering iron will save you lots of grief. Try to get one that is temperature controlled with a small tip.

Soldering

If you do not know how to solder at all, this may not be the best project to learn on. Although there is nothing particularly difficult about assembling this kit, we did not design it for a novice solderer. We would recommend that novice solderers seek the help of someone who does know how to solder.

Step by Step Construction

You should follow these step by step instructions for assembly. Check off each step as you proceed. **WARNING:** Some assembly steps are not obvious (especially those that detail changes to the circuit). We recommend you follow these instructions carefully to avoid mistakes that are difficult to correct.

The “front” of the circuit board is the edge with the “MIC” and “LINE” connectors. Likewise, the “rear” has the din8 connector (J5). With the circuit board flat and the front towards you with the “top” (side with white lettering) up, the “left” side is on the left, and the “right” side is on the right. The “bottom”, naturally, is the side without lettering. Some components require a specific orientation when installed.

Since the lettering is quite small on the circuit board, you should refer to the enlarge diagram showing the parts placement.

- 1 Install U1 (TL064) on the circuit board. Note that the notch on the chip aligns with the notch indicated on the circuit board. When installed, the markings of the chip should read correctly when viewed from the front of the circuit board.
- 2 Solder U3 (74HC390) in the same way.
- 3 Solder U4 (74HC14).
- 4 Solder U5 (74HC4024).
- 5 Install and solder the 8 pin DIP socket in U2's position. Note that the socket does have a notch in it much like the chips do.
- 6 Install J1 and J2 at the front of the circuit board. The jacks should be installed on the underside of the circuit board with a washer and nut on the top surface. Orient the jacks such that the large protruding contact extends towards the front. Tighten securely.
- 7 Solder U6 and U7 (LM385-2.5Z) into place. Note the orientation. After soldering, you will need to clip the leads.
- 8 Solder resistor R7 (500K adjustable).
- 9 Install the 100nF capacitors. These are C2, C3, C4, C5, C6, C7, C18, C19, C20, C21, C22, C23, C27, and C28. After soldering, clip and save the leads.
- 10 On the bottom of the circuit board, install a clipped lead between the rear most solder terminal of J1 and the solder pad on the circuit board that is closest to it. Do the same for J2.
- 11 On the bottom of the circuit board, install a clipped lead between the right most solder terminal of J1 and the solder pad on the circuit board directly toward the rear. Do the same for J2.
- 12 Install microphone M1 into the rearmost pair of holes.
- 13 The resistors are installed “Japanese” style, which is upright with one lead that has a 180 degree bend in it. Install resistor R1 as shown in figure 1:

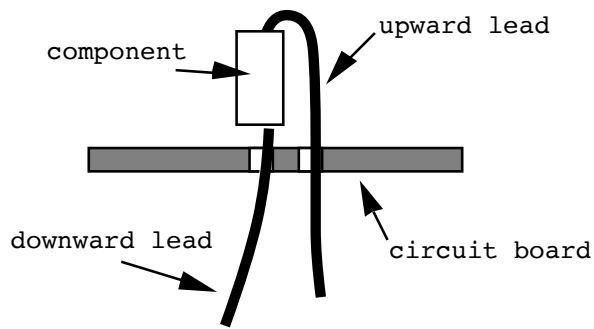


Figure 1 : “Japanese” Style Component Mounting

- 14 Install resistors R13 and R14 such that the upward lead goes toward the front most solder pad.
- 15 Do not install resistor R24 in the indicated position on the circuit board labeling. Instead, install R24 in the position indicated in figure 2.
- 16 Install a clipped lead in place of resistor R29.
- 17 Install the remaining resistors: R2, R3, R4, R5, R6, R8, R9, R10, R11, R12, R15, R16, R17, R18, R19, R20, R21, R22, R23, R25, R26, R27, R28, R30, R31, R32.
- 18 Inspect diode DA. Notice that the diode has a dark band around it near one lead. Bend this lead over and install the diode such that the banded lead fits in the square solder pad. Note that the outline marked on the circuit board is chamfered toward the square pad. Solder.
- 19 Repeat the above for diodes DB, DC, DD, DE, DG, DH, DI, DK, DL, DM, DN, and DO. Do not install DJ.

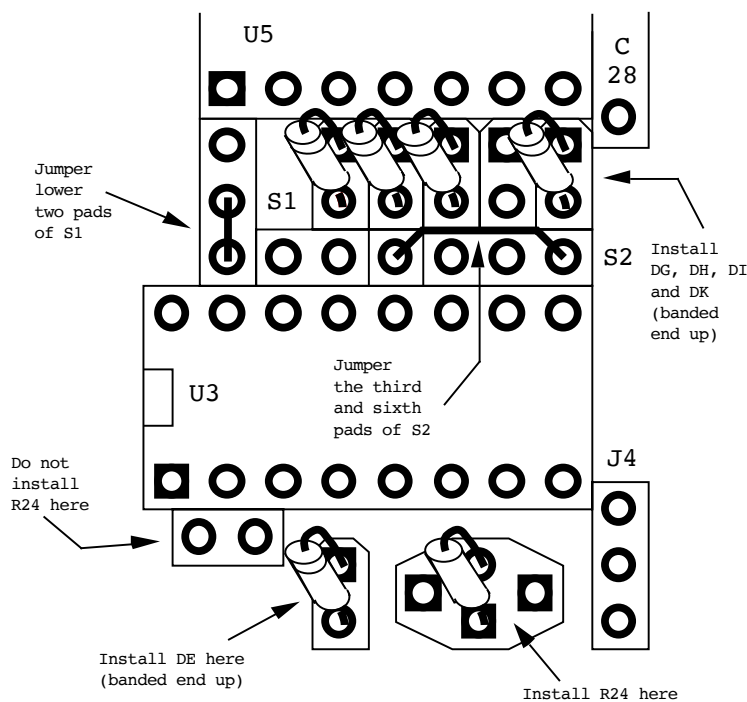


Figure 2 : Timing Configuration

- 20 Using cut off leads, install the two jumpers shown in figure 2. Be sure the jumpers do not touch any pads underneath them (that is, the arc over pads they are not connected to).
- 21 Install capacitors C8, C9, C10, C11, C12, C13, C14, and C15. These are installed “Japanese” style with the upward lead towards the front.
- 22 Install capacitors C1, C26, and C29. Note that the longer lead (positive) goes into the square pad.
- 23 Install capacitors C16, C17, C24, and C25.
- 24 Install crystal Y1 into the leftmost two holes.
- 25 Install J5. Be careful to get all 8 pins into their respective holes. Bend the mounting tabs over gently and solder the tabs to the circuit board. Do not apply excessive heat, as this will melt the plastic. Solder the 8 pins to the circuit board.
- 26 Install a 4-40 bolt in each of the four corner holes with the head on the top surface. Tighten a 4-40 nut on the underside of the circuit board.
- 27 Install U2 (ADC0831) in the 8 pin DIP socket. Note the orientation.

Operation

Your SID is now finished. In order to operate the SID, you need a printer cable for an ImageWriter II. You can obtain one from Jameco, part number APC3, or you can order one from us as SID-CABLE. And, of course, you need a Mac with the appropriate software to drive it (you can get a disk of PD or shareware stuff from us as SID-DISK).

Connect the cable from one of the Mac serial ports to J5 on the SID.

Using whatever software you choose, make recordings and adjust the gain control until the input signal just reaches the limit of the SID output. Sometimes the best results can be obtained by exceeding the limit (“clipping” the sound).

For best results, use something other than the built in Mac speaker for playback. The playback circuitry on the Mac introduces most of the distortion you will hear (especially a roll off at higher frequencies). Some of this is in the speaker, so headphones or an external speaker work really well.

Be gentle on J1 and J2. If you put excessive force on these connectors you can damage the interlock spring force. This can also happen for the Mac external speaker connection.

Troubleshooting

If your SID does not work, here is a checklist to assist you in fault finding. Each question in the checklist assumes the previous test has been passed.

- 1 Check the voltage at U1 (across pins 4 and 11). If there is no voltage present or if the voltage is not greater than 5 volts, suspect: wrong cable, DL, DM, DN, DO, C26, C29, R31, R32, U6, U7, or a short somewhere on the board.

- 2 Using a scope, frequency counter, or logic probe, test the output of the oscillator at pin 10 of U4. If the frequency is not 6.144MHz, then suspect fault with: Y1, C24, C25, R29, R30, or U4.
- 3 With a scope, check the output at J3 or J4. The top pad should have a 35-50% duty cycle 300KHz clock, the bottom pad should have a 15-30% duty cycle 22KHz clock. If these are missing, suspect: U3, U5, DE-K, C27, S1, S2, R24, or R28.
- 4 Connect a scope to pin 1 of U1. Without any external sound sources, talk into the microphone and observe if the signal exists. If not there, suspect: M1, R1, R2, R4-6, DA, DB, U1, or the interlock on J1 is bad.
- 5 Connect a scope to pin 2 on U2. Talk into the microphone. If no signal, then suspect: U1, U2, all the filter components, R7, the interlock on J2, DC, and DD.
- 6 Put a scope or logic probe on pin 6 of U2. If no signal, suspect: U2, U4, R25, or J5.
- 7 Put a scope or logic probe on pin 7 of U2. If no signal, suspect: U2, U4, or J5.
- 8 Give up. Send us the above checklist with your observations, the faulty SID, and \$5 (Canadian US\$7, foreign US\$12). We will, at our discretion, fix your SID, or replace it with an unassembled kit. All such mysteriously malfunctioning SIDs become the property of CEDAR Technologies for evaluation purposes.

Stereo Operation

For stereo operation, you will need to construct two SIDs, one will be the “master” and the other will be the “slave”. The “master” SID provides the timing and control for the “slave” SID so that they remain synchronized throughout a recording. A “master” SID is identical to a normal SID in every respect. A “slave” SID is constructed in a similar fashion to a normal SID, except the following parts are not installed:

R24, R28, R30, C24, C25, DE, DG-DI, DK, U3, U5, and Y1.

Do not connect the jumpers for S1 and S2. Install a short for capacitor C25.

In addition, some means of connecting J4 of the “master” SID to J3 of the “slave” SID is required. The “master” SID should be positioned to the left of the “slave” SID for minimum signal length. If you intend to always operate the SIDs as a pair, you can wire this connection permanently. Should your desire to be able to operate the “master” SID by itself, you will need to devise a connector to allow separation of the “master” from the “slave”.

When wiring J3 and J4, connect the top pin on J4 to the top pin on J3, the middle pin to middle pin, and the bottom to bottom.

Presently, very little software support is available for stereo operation. A MacII series machine is required for recording and playing back stereo sound. Note that two cables (one to each serial port) are required for stereo operation.

Mounting in an Enclosure

You may elect to mount the SID in an enclosure. If you choose to do so, you should do the following:

- 1 You should acquire a chassis mountable volume control (preferably with “audio” taper) and install this in place of R7 (the wiper goes to the center lead).
- 2 For serial connection, you have two choices. You can use the provided circuit board mount din8 connector and provide a hole in the enclosure for the cable, or you can purchase the Jameco 8MDJ connector (which is suitable for chassis mount) and wire the pins individually.
- 3 The microphone and line jacks, J1 and J2, can be easily chassis mounted. However, you should provide an explicit ground wire from the connector to the circuit board. A solder pad marked “GND” is available at each connector location. Keep wire lengths short for best results (especially on the microphone jack).
- 4 Mounting the microphone may be difficult. It is not provided with any mounting facilities. You may elect not to install it, and always use an external microphone or the line input. Note that the microphone cartridge cannot be used as an external microphone since it requires a positive voltage to operate.

Circuit Operation

The SID II circuit is divided into 6 parts. These are the microphone amp, the line amp, the low pass filter, the analog-to-digital converter, the timing generator, and the power supply.

The Microphone Amp

The internal microphone, M1, is an electret condenser microphone that requires a positive voltage to operate. Resistor R4 and capacitor C1 filter the positive supply voltage and resistor R1 provides a positive voltage bias. The output of the microphone goes through the microphone jack, J1, and is switched out if a plug is inserted into the jack. The output from J1 is AC coupled by C2 and biased to ground voltage levels by R2. Diodes DA and DB protect the input from excessive signals. Amplifier section A of U1 provides a gain of about 40, bringing the weak microphone signals to line level.

The Line Amp

Line jack, J2, selects either the internal microphone amplifier or the external line source. Resistor R3 provides input impedance, and capacitor C3 AC couples the signal. Diodes DC and DD protect the input. Variable resistor R7 provides a ground bias for the signal and outputs a variable fraction of the input. Amplifier section B of U1 buffers this output.

The Low Pass Filter

Sections C and D of U1 form a 5 pole, 4 zero elliptic low pass filter. The cutoff frequency is about 7500Hz, with all frequencies above 11Khz being at least 50DB down. In addition, the low pass filter has a gain of about 6.5. Amplifier section C of U1 implements 2 poles and 2 zeros. Amplifier section D implements 2 more poles and the last 2 zeros. Resistor R20 and capacitor

C16 implement the last pole. All resistors in the C and D sections are 1% and the capacitors are 2% tolerance.

The Analog to Digital Converter

The analog to digital conversion is done by U2, the ADC0831. Since the signal input to U2 is +/- 1.25 volts, the VREF pin is tied to ground making the full range 2.5 volts. The V- pin is tied to -1.25 volts made by R23, R22, and C18. Thus the full conversion range is available from -1.25 volts to +1.25 volts signal. The data output is pulled up by R25 and buffered by inverters A and B of U4. Resistor R27 protects the output of U4 and slows down the edges of the signal to reduce radiated noise. Inverters C and D of U4 perform a similar service for the data bit rate clock.

The Timing Generator

The timing generator generates two signals. One, CLK, is the bit rate clock for use by the analog to digital converter. The other, CS, is the chip select signal that runs at the conversion rate. The timing section will accept a variety of crystals, but only the 6.144MHz crystal option will be discussed here. Inverters E and F form an oscillator running at the crystal fundamental frequency. Capacitors C24 and C25 are larger than the crystal specifications state in order to “pull” or slow down the crystal slightly. Experimentation has revealed that C24 and C25 pull the oscillator frequency almost exactly toward 6.142254 Mhz, the required value. The output of the oscillator is sent to U5, a binary ripple counter. U5 counts pulses until a preset number have arrived, and then resets itself. With diodes DG, DH, DI, and DK installed, the counter resets itself after 23 pulses. By changing the number and location of diodes installed, any divisor up to 32 can be selected. One of the outputs from U5 is chosen as the data rate bit clock. The output chosen should have between 33% and 50% duty cycle. For the 6.144Mhz clock, output Q4 is chosen which is high for 8 counts and low for 15 giving a 35% duty cycle. U3, a dual decade counter is wired to provide a low pulse for the first 10 bit clock pulses, and then reset after 12, 14, or 15 pulses. The reset count is determined by the position of the resistor R24. The CLK and CS pulses are then delivered to the analog to digital converter and to the J3 and J4 master/slave ports.

The Power Supply

The SID II draws its power from the transmitter drivers in the Mac. This means the Mac must enable the transmitter drivers for the SID II to be powered. Diodes DL, DM, DN, and DO form a full wave bridge rectifier. Capacitor C26 filters the positive voltage, and R31, C23, and U6 regulate the positive voltage to 2.5 volts above ground. C29, R32, C28, and U7 do the same for the negative voltage. The amplifier, U1, is driven from the preregulated voltage to improve its dynamic headroom.

Miscellaneous Information

An improved version of the A/D converter is available as the Micro Linear ML2281. It features a sample and hold on the input and improve performance. U2 is socketed so that this upgrade can be made.

The electronic design and circuit layout are released into the public domain. Any use of the design and/or layout, include commercial use, is expressly allowed. The only thing you cannot do is prevent CEDAR Technologies from marketing, selling, supporting, and improving the SID-II.

Ordering Information for SID-II

CEDAR Technologies sells the following products:

SID-KIT	A complete kit of all parts to build a SID-II. It does not include an enclosure, software, or a cable. An enclosure is optional; the PC board can stand alone. Includes a full instruction sheet.
SID-STEREO	A slave kit for building a slave synchronous stereo SID. Requires a full SID in order to operate.
SID-BOARD	The bare PC board. The PC board is 2 by 4 inches, double sided, plated through holes, solder mask both sides, and a label screen on the top side. Includes a full instruction sheet.
SID-FILTER	Precision filter parts kit. Includes all the 1% resistors and 2% capacitors. These parts are in the SID-KIT and SID-STEREO.
SID-DIN8	Circuit board mount right angle miniature din 8 pin connector. Very hard to find. Included in the SID-KIT and SID-STEREO.
SID-DISK	An 800K disk with the public domain software from the original SID. May contain other PD or shareware programs that the SID is compatible with. The software is supplied "as is" without any warranty.
SID-CABLE	An ImageWriter II to Mac printer cable. One is required to operate the SID-II (which is not included in the kit).

There is a 90 day warranty against defects in materials and workmanship. CEDAR Technologies liability in any event shall be limited to the value of the product.

All orders must be received by mail. For US orders, shipping is included and there is no sales tax in New Hampshire. For Canadian orders, funds must be in US dollars and there is a \$2 shipping fee. For foreign orders, funds must be in US dollars and there is a \$7 shipping fee. The shipping fee applies regardless of the size of the order (foreign orders will benefit greatly from group ordering since you have to get a US check only once and do not have to pay the shipping charge multiple times). Do not send cash, we accept checks or money orders only.

SID-II Order Form

Mail order to: CEDAR Technologies
P.O. Box 224
Dublin, NH 03444

Valid until 8/1/90

All funds MUST be in US dollars.

Name: _____ Date: _____

Street: _____

City/State/Zip: _____

Phone: _____ How did you hear of SID? _____

Qty	Description	Cost	Total
_____	SID-KIT (complete kit)	\$45.00	_____
_____	SID-STEREO (stereo slave kit)	\$38.00	_____
_____	SID-BOARD (bare circuit board)	\$10.00	_____
_____	SID-FILTER (precision filter parts)	\$8.00	_____
_____	SID-DIN8 (board mount din 8 connector)	\$5.00	_____
_____	SID-DISK (PD or shareware software)	\$8.00	_____
_____	SID-CABLE (Mac printer cable)	\$8.00	_____
	Subtotal	_____	
	Shipping (US: \$0, Canadian \$2, Foreign \$7)		_____
	Total	_____	

Please allow 4 to 6 weeks for delivery (6-8 weeks for foreign orders).

Special Instructions for SID-II

READ THIS FIRST! You have received this additional document since you did not order a complete kit and therefore require some additional information.

Parts List for SID-II

Since you do not have all the parts necessary, here is a parts list listing some sources for the parts:

Qty	Description	Designations	Source	Part Number
2	22 1/4W 5% resistor		R31, R32	Digi-Key 22Q
2	100 1/4W 5% resistor		R26, R27	Digi-Key 100Q
2	1.0K 1/4W 5% resistor		R3, R4	Digi-Key 1.0KQ
2	2.2K 1/4W 5% resistor		R1, R5	Digi-Key 2.2KQ
1	4.7K 1/4W 5% resistor		R25 Digi-Key	4.7KQ
1	5.6K 1/4W 5% resistor		R20 Digi-Key	5.6KQ
2	10K 1/4W 5% resistor		R21, R28	Digi-Key 10KQ
1	22K 1/4W 5% resistor		R24 Digi-Key	22KQ
1	47K 1/4W 5% resistor		R30 Digi-Key	47KQ
2	100K 1/4W 5% resistor		R2, R6	Digi-Key 100KQ
1*	9.31K 1/4W 1% resistor		R8 Digi-Key	9.31KX
4*	10.0K 1/4W 1% resistor		R12, R15, R22, R23	Digi-Key 10.0KX
1*	14.0K 1/4W 1% resistor		R19 Digi-Key	14.0KX
2*	18.7K 1/4W 1% resistor		R9, R11	Digi-Key 18.7KX
2*	28.7K 1/4W 1% resistor		R16, R18	Digi-Key 28.7KX
1*	35.7K 1/4W 1% resistor		R14 Digi-Key	35.7KX
1*	39.2K 1/4W 1% resistor		R17 Digi-Key	39.2KX
1*	45.3K 1/4W 1% resistor		R13 Digi-Key	45.3KX
1*	53.6K 1/4W 1% resistor		R10 Digi-Key	53.6KX
1	500K 6mm trimmer potentiometer		R7 Digi-Key	36C55
2	39pF 5% capacitor, 0.2 lead space		C24, C25	Digi-Key P4019
1	10nF 5% capacitor, 0.2 lead space		C16 Digi-Key	P4513
14	100nF capacitor, 0.2 lead space		C2-7, C18-23, C27, C28	Digi-Key P4525
1	470nF capacitor, 0.2 lead space		C17 Active	32050
3	47uF 16V capacitor, 0.08 lead space		C1, C26, C29	Digi-Key P6213
4*	470pF 2% polypropylene capacitor		C8, C9, C14, C15	Digi-Key P3471
2*	1.0nF 2% polypropylene capacitor		C10, C13	Digi-Key P3102
2*	2.2nF 2% polypropylene capacitor		C11, C12	Digi-Key P3222
13	1N4148 silicon diode		DA-DE, DG-DO	Digi-Key 1N4148
1	TL064 quad op-amp		U1 Active	54041
1	ADC0831 serial A/D converter		U2 Digi-Key	ADC0831CCN
1	74HC390 dual decade counter		U3 Active	16324
		Digi-Key	74HC390N	
1	74HC14 hex schmidt trigger		U4 Active	16101
		Digi-Key	74HC14N	
1	74HC4024 7 bit binary counter		U5 Active	16353
2	LM385-2.5 voltage reference		U6, U7	Active 54151
		Digi-Key	LM385Z	
1	6.144MHz fundamental crystal, 30pF		Y1 Digi-Key	X054
		Active	68022	
2	1/8" closed circuit phone jack		J1, J2	Radio-Shack 274-248
1	8 pin mini DIN jack, PC mount		J5 AMP	749268-1
	CEDAR		SID-DIN8	

1	Electret condenser microphone Radio-Shack	M1 Digi-Key 270-090	P9931
4	4-40 by 5/8 machine screws		
4	4-40 machine nuts		
1	SID-BOARD printed circuit board	SID-BOARD	CEDAR SID-BOARD

* Included in the SID-FILTER parts package.

Source Addresses

Active 133 Flanders Road Westborough, MA 01581	Retail stores in some areas 1-800-ACTIVE4 (outside New England) 1-800-ACTIVE6 (in New England)
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Digi-Key P.O. Box 677 Thief River Falls, MN 56701	Mail order only 1-800-DIGIKEY
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Jameco 1355 Shoreway Road Belmont, CA 94002	Mail order only 1-415-592-8097
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Radio Shack	Just about everywhere
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Notes on Particular Parts

The Radio Shack microphone should be installed in the lower two holes (the holes closest to the front) as opposed to the Digi-Key microphone which installs in the upper two holes. If you are using the Radio Shack microphone with wire leads (part number 270-085), the positive lead goes to the round hole, and the ground lead goes to the square hole (it doesn't matter which one).

The precision caps (C8-C15) supplied with the kit are not the ones listed above. The Digi-Key capacitors given as a replacement are slightly larger and do not fit quite as well, but do work.

We recommend using a socket for U2, the analog to digital converter. You may also use sockets for all the integrated circuits, if you wish.

U2 can be replaced by a Micro Linear ML2281 which offers a sample and hold input (which improves signal to noise ratio somewhat).

Some parts values are not very critical. The SID-FILTER parts and the following, however, should be quite close to their stated values:

R5, R6, R20, R21, R31, R32, C16, C24, C25.

For a stereo slave kit, you need everything in a master SID, except the following parts:

R24, R28, R30, R31, C24, C25, DE, DG-DI, DK, U3, U5, and Y1.

The cable we recommend is the Jameco APC3 cable. It is much more flexible and cheaper than the Apple cable. CEDAR can supply this cable as SID-CABLE.

Using The Original Crystal

The original SID was designed with a 1.558Mhz resonator or crystal. To use the original crystal or resonator, make the following modifications:

- 1 Do not install R28, DG, DH, DI, DK, or U5.
- 2 Use the original values for C24, C25, R29, and R30 as given in the original SID documents:

Y1	C24	C25	R29	R30
1.558MHz resonator	100pF	100pF	1K	1M
1.558MHz crystal	33pF	33pF	Short	1M

- 3 Do not jump the bottom two pins of S1, instead jump the top two pins.
- 4 Do not jump the 3rd and 6th pads of S2, instead jump the 3rd and 4th pads.
- 5 Install resistor R24 in the “14” state position (from the center top round hole, to the lower right square hole).

Now your SID should function with the original crystal.

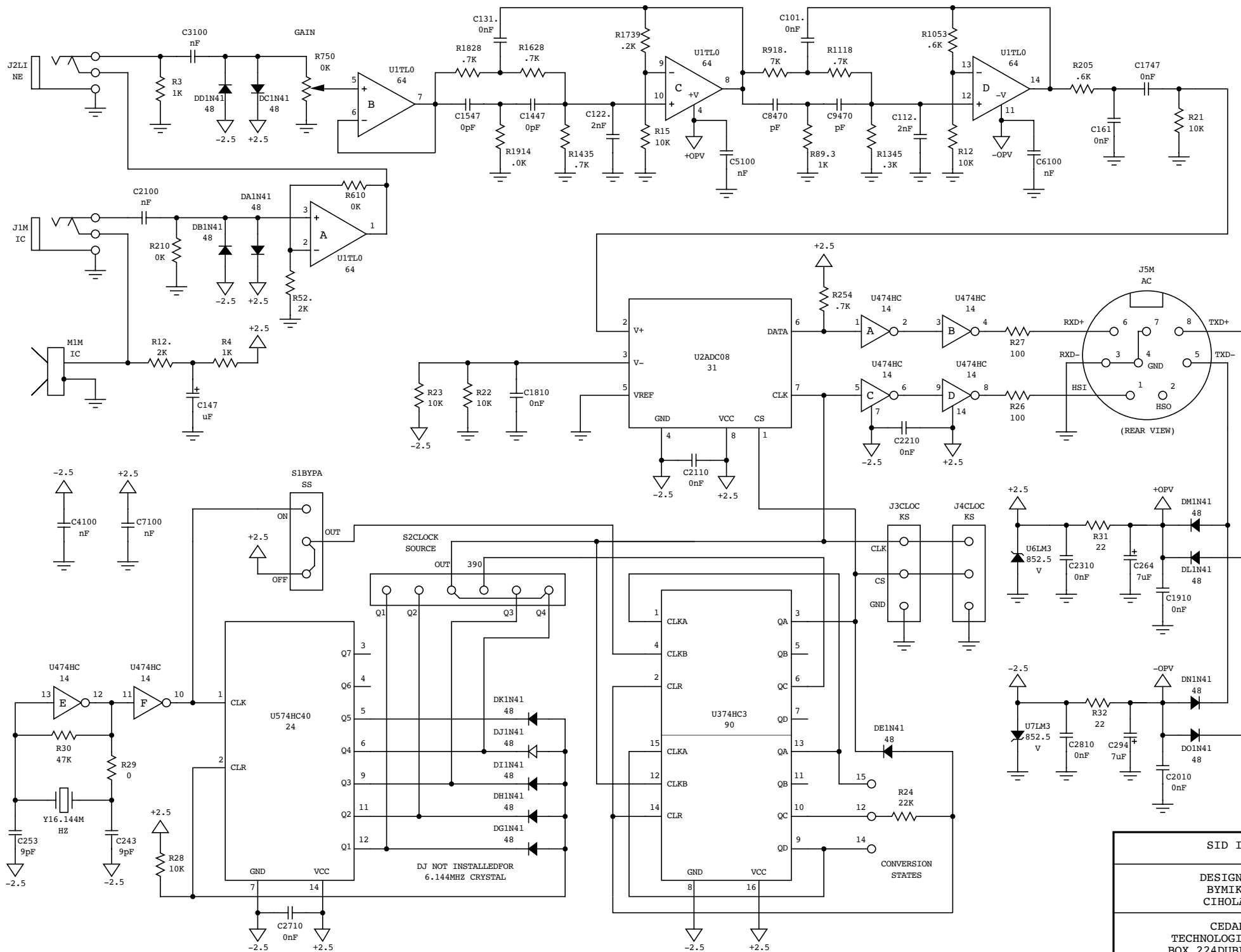
Using Different Crystals

Several crystals can be used with the SID-II. The following chart lists the component that need to be changed for each crystal:

Y1 (MHz)	C24-25	DG	DH	DI	DJ	DK	R24	S2
1.000	15pF	yes	yes	no	no	no	15	1st
2.000	15pF	no	yes	yes	no	no	15	2nd
3.000	20pF	yes	no	no	yes	no	15	5th
4.000	20pF	no	no	yes	yes	no	15	6th
5.000	20pF	yes	yes	yes	yes	no	15	6th
6.144	39pF	yes	yes	yes	no	yes	12	6th

All diodes are 1N4148. A “yes” means the diode is installed. The values in the “R24” column indicate where resistor R24 should be placed. The “15” position is from the top center round hole to the lower left square hole, the “12” position is from the top center round hole to the lower middle square hole. The values in the “S2” column indicate which pad of S2 to jump with the 3rd pad (count pads from the left to the right).

The errors in the above table are 0.145% slow for the integral MHz crystals and 0.028% fast for the 6.144MHz crystal (although the extra loading of the 39pF capacitors does bring this error down to about 0.01%).



SID-II Parts Placement

RESISTORS: (INDICATED BY

NUMBERS) R1 2.2K

5% R2 100K 5% R3

1.0K 5% R4 1.0K

5% R5 2.2K 5% R6

100K 5% R7 500K

POTR8 9.31K

1% R9 18.7K

1% R10 53.6K

1% R11 18.7K

1% R12 10.0K

1% R13 45.3K

1% R14 35.7K

1% R15 10.0K

1% R16 28.7K

1% R17 39.2K

1% R18 28.7K

1% R19 14.0K

1% R20 5.6K 5% R21

10K 5% R22 10.0K

1% R23 10.0K

1% R24 22K 5% R25

4.7K 5% R26 100

5% R27 100 5% R28

10K 5% R29

SHORT R30 47K

5% R31 22 5% R32

22 5% MISC: U1

TL064 U2

ADC0831 U3

74HC390 U4

74HC14 U5

74HC4024 U6

LM385-2.5Z U7

LM385-2.5ZY 1

6.144 MHZ M1

ELECTRET MIC J1

MINI JACK J2

MINI JACK J3

CLOCK PORT J4

CLOCK PORT J5

MINI DIN 8

CAPACITORS: C

1 47uF C2

100nF C3

100nF C4

100nF C5

100nF C6

100nF C7

100nF C8

470pF 2% C9

470pF 2% C10

1.0nF 2% C11

2.2nF 2% C12

2.2nF 2% C13

1.0nF 2% C14

470pF 2% C15

470pF 2% C16

10nF C17

470nF C18

100nF C19

100nF C20

100nF C21

100nF C22

100nF C23

100nF C24

39pF C25

39pF C26

47uF C27

100nF C28

100nF C29

47uF

DIODES: (INDICATED BY

LETTER) DA

1N4148 DB

1N4148 DC

1N4148 DD

1N4148 DE

1N4148 DF

1N4148 DI

1N4148 DJ

1N4148 DK

1N4148 DL

1N4148 DM

1N4148 DN

1N4148 DO

1N4148

