CV-to-MIDI Assembly Manual

Please read these instructions before beginning any construction of your MIDItools Kit! These instructions modify and supplement the CPU Board Assembly and Final Assembly Manuals.

I. IMPORTANT NOTES BEFORE BEGINNING

A. Failure to take ESD precautions could permanently damage the components. ESD damage is permanent and invisible to the naked eye. (Zapped parts are terribly difficult to find once they are assembled into your MIDItools Computer.)

Although it is best to always wear your ESD ground strap while assembling your kit, all assembly steps that require ESD protection are marked with this symbol in the margin.

B. Many components are *polarized.* This means that they must be installed only in the orientation shown on the layout diagram.

All assembly steps that pertain to polarized, or directional, components are marked with this symbol in the margin. Incorrect orientation can damage components.

C. This manual may make reference to the TOP, BOTTOM, LEFT, or RIGHT sides of the circuit board. These directions correspond to the circuit board held as shown in the layout diagram. In other words, holding the circuit board with the white text markings right side up.

D. The components bodies are installed on the white text side of the circuit board (inside the component outlines). The component leads go through the holes in the circuit board and are soldered on the opposite side.

E. *Integrated circuits (ICs) are not soldered to the circuit board.* Instead, IC sockets are soldered in their place. When solder assembly is finished, ICs are pressed in into the appropriate socket.

II. SET UP YOUR WORK AREA

A. Your work surface should be well lit and well ventilated.

B. Gather your tools: ESD grounding strap; soldering iron; solder (noncorrosive electronics solder); wire cutters; screwdrivers (phillips and pan head); pliers; wire strippers; etc.

C. Prepare ESD grounding protection. A typical ESD ground strap is adequate. Put the strap around your wrist and clip the other end to the head of a slightly-loosened screw of a working, grounded AC outlet plate. The strap should have an internal 10M ohm (or equivalent) resistor in series to ground. This will safely dissipate any static charge that might otherwise damage your components during assembly and test.

D. Lay out the components. Do not remove components from their bags yet. Familiarize yourself with the parts list, layout diagram, and part numbers. Notice that the component bags are marked with the item number found on the parts list. Also, note that the reference designators can be found on the schematic, parts list, and layout diagram.

III. CPU BOARD and FINAL ASSEMBLY MODIFICATIONS

Since the MIDItools CPU board was originally designed to utilize only one Analog to Digital Converter (ADC) channel, some modifications must be made to the CPU board and/or the ribbon cable to the Human Interface board to gain access to all four channels. Follow the CPU Board Assembly and Final Assembly Manual instructions except for these changes:

A. ADC Channel 1

1. ADC channel 1 is found at pin 3 of **U4** of the CPU Board **(00029)** and is normally connected to the data potentiometer. No modifications to the board are needed to access this channel; the hole labeled "WIRE HOLE FOR CENTER PIN ON DATA POT" provides the input to this channel. Skip steps **B-1** and **B-5** of the Final Assembly Manual **(00116)** to leave this point available for connection to the rear panel mount jacks.

B. ADC Channels 2 and 3

1. ADC channels 2 and 3 are located at pin 4 and 5 of **U4** and are connected to pins 6 and 7 of socket **J6** on the CPU Board. Since these points are connected to ground on the Human Interface board via a ribbon cable, this connection must be broken before they can be used. One of two methods may be chosen to sever this connection. The first method involves snipping pins 6 and 7 of **J6** before soldering the socket to the CPU board, which is step **C-3** in the CPU Board Assembly Manual **(00117)**. The second method is to cut the ribbon cable wires **(00083)** that connect pins 6 and 7 of U4 to the Human Interface board. Use whichever approach seems easiest to you.

C. ADC Channel 4

1. ADC channel 4 is easily accessed from pin 1 of socket **J5**. No modifications are needed to use this channel.

D. EEPROM IC

2. Install **00158** in the sockets for **U3**. Align the notch on the IC with the notch on the socket. Place the IC in the socket carefully so as not to damage any leads. Be certain that all IC leads end up in the socket. Push evenly until the IC body rests on the top of the socket. DO NOT SOLDER!

E. Reference Voltages

1. Each analog voltage must be properly referenced to the CPU board ground. The "WIRE HOLE FOR GND ON CCW SIDE OF DATA POT" provides this reference. Do not perform step **B5** of the Final Assembly Manual until the rear panel assembly has been completed. If you are using the CPU board's +5VDC as a reference for your Control Voltage, the hole labeled "WIRE HOLE FOR +5V ON CW SIDE OF DATA POT" will provide this reference. Please note that the MIDItools power supply is rated at 1 amp, and that the MIDItools computer uses

up 400 mA. If you are using power from the MIDItools power supply you may need to beef up the CPU board heat sink.

2. Skip step **G1** of the Rackmount Human Interface Assembly Manual. Since channel 1 of the ADC is connected to a rear panel jack, the fader potentiometer should not be connected. Step **G2** may or may not be performed. You may want to attach the fader knob for future use or cosmetic purposes.

IV. REAR PANNEL ASSEMBLY

Complete these steps just prior to beginning the Final Assembly. Read through section B of the Final Assembly Manual to get an overview of the process of mounting the subassemblies. Remember to skip steps **B1** and **B5** of the Final Assembly Manual. Use the attached **Assembly Diagram** as a guide.

A. Attach the switching jacks to the rear panel.

1. Remove the washer and nut from the switching jack **(01293)** and slide the threaded end through one of the holes in the Rear Panel **(00054).** Slide the washer onto the threaded end on the opposite side of the panel, and then screw on the nut to hold the jack in position. Do not tighten yet. Similarly mount the remaining three jacks.

2. Orient the panel so that you are looking at the black plastic jack housings. The jacks should appear more towards the top of the panel than the bottom. Rotate the jacks so that the chamfered (cut) corners are oriented to the lower right-hand corner.

3. Tighten the washers to hold the jacks in this position (so they will not rotate).

B. Solder the 1K ohm resistor between the switch and ground of the jacks.

1. Bend a 1 K ohm resistor **(00097)** to 0.4“. Solder the resistor between the solder lug on the chamfered corner and the solder lug on the bottom left of the jack.

C. Connect the grounds of the jacks.

1. Cut the supplied piece of bus wire **(01139-08)** in half. Thread the wire through the holes of the solder lugs on the chamfered corners of all four jacks. Solder the wire to each of the solder lugs. Trim any bus wire that sticks out of the far right or left of the ground lugs.

D. Connect the +5VDC lugs of the jacks.

1. Solder the remaining section of bus wire to the four solder lugs on the top of the mounted jacks. Trim any bus wire that sticks out of the far right or left of the +5VDC lugs.

E. Attach the rear panel.

1. Attach the assembled rear panel to the Rackmount Enclosure **00041** using the supplied 1/2” screws **(00106)** and kep nuts **(01137)**. Attach the panel to the inside of the enclosure so that the threaded sides of the jacks face out and the resistors are oriented towards the bottom. Once the panel is in its proper position tighten the nuts so that the panel is securely fastened.

F. Connect the CV inputs.

1. Place the assembled CPU board in the Rackmount Enclosure in the position where it will eventually be mounted (refer to the final assembly instructions). Do not mount the CPU board yet as you will be soldering the CV inputs to it before final assembly. The remaining solder lug on the left side of each jack is the CV input connection. Wires will be attached from these lugs to the ADC input points on the CPU board. The jack on the far left provides the input for channel 1, the next for channel 2, the third for channel 3, and finally, the far right jack supplies the input for channel 4.

2. Connect ADC channel 1. Measure a length of the yellow wire **(00103-18)** provided from the CV lug on the far left to the point on the CPU board labeled "WIRE HOLE FOR CENTER PIN ON DATA POT". Add 2 additional inches to this length and cut the wire. Strip ¼" off of both ends of the wire and tin. Bend a loop onto one end of the wire and and attach to the CV lug of jack # 1. Close the loop with needle nose pliers and solder the wire to the lug. Insert the other end of the wire through the hole on the CPU board labeled "WIRE HOLE FOR CENTER PIN ON DATA POT" and solder the wire to the pad on the back of the board. Trim any excess wire poking through.

3. Connect ADC channel 2. Measure a length of the yellow wire provided from the second CV lug to **pin 6** of **J6.** Add 2 additional inches to this length and cut the wire. Strip ¼" off of both ends of the wire and tin. Bend a loop onto one end of the wire and and attach to the CV lug of jack # 2. Close the loop with needle nose pliers and solder the wire to the lug. Solder the other end of the wire to the solder pad on the back of the CPU board corresponding to **pin 6** of **J6**. Trim any excess wire not soldered to the pad.

4. Connect ADC channel 3. Measure a length of the yellow wire provided from the third CV lug to **pin 7** of **J6.** Add 2 additional inches to this length and cut the wire. Strip ¼" off of both ends of the wire and tin. Bend a loop onto one end of the wire and and attach to the CV lug of jack # 3. Close the loop with needle nose pliers and solder the wire to the lug. Solder the other end of the wire to the solder pad on the back of the CPU board corresponding to **pin 7** of **J6**. Trim any excess wire not soldered to the pad.

5. Connect ADC channel 4. Measure a length of the yellow wire provided from the fourth, far right, CV lug to **pin 1** of **J7.** Add 2 additional inches to this length and cut the wire. Strip ¼" off of both ends of the wire and tin. Bend a loop onto one end of the wire and and attach to the CV lug of jack # 4. Close the loop with needle nose pliers and solder the wire to the lug. Place the other end of the wire in the **pin 1** socket of **J5**. For permanence, a small amount of solder can be used to secure the wire. (f you plan to use the CPU board for other MIDItools applications you may need to replace this socket if solder is used.)

G. Connect the 5VDC lugs to the reference +5VDC source.

1. Use the supplied length of red wire **(00102-12)** to connect the +5VDC lugs to the point on the board labeled "WIRE HOLE FOR +5V ON CW SIDE OF DATA POT". Strip ¼" off of both ends of the wire and tin. Bend a loop onto one end of the wire and and attach to the +5VDC lug of jack # 4. Close the loop with needle nose pliers and solder the wire to the lug. Insert the other end of the wire through

the hole on the CPU board labeled “WIRE HOLE FOR +5V ON CW SIDE OF DATA POT” and solder the wire to the pad on the back of the board. Trim any excess wire poking through.

H. Connect the ground lugs to ground reference source on the MIDItools CPU board.

1. Use the supplied length of black wire **(00101-12)** to connect the +5VDC lugs to the point on the board labeled “WIRE HOLE FOR GND ON CCW SIDE OF DATA POT”. Strip ¼” off of both ends of the wire and tin. Bend a loop onto one end of the wire and and attach to the Ground (chamfered corner) lug of jack # 4. Close the loop with needle nose pliers and solder the wire to the lug. Insert the other end of the wire through the hole on the CPU board labeled “WIRE HOLE FOR GND ON CCW SIDE OF DATA POT” and solder the wire to the pad on the back of the board. Trim any excess wire poking through.

I. Complete Final Assembly

1. Now it’s time to complete the assembly of your MIDItools unit. Follow the instructions in the Final Assembly Manual **00116,** taking care not to loosen or detach any of the wires you have just attached.

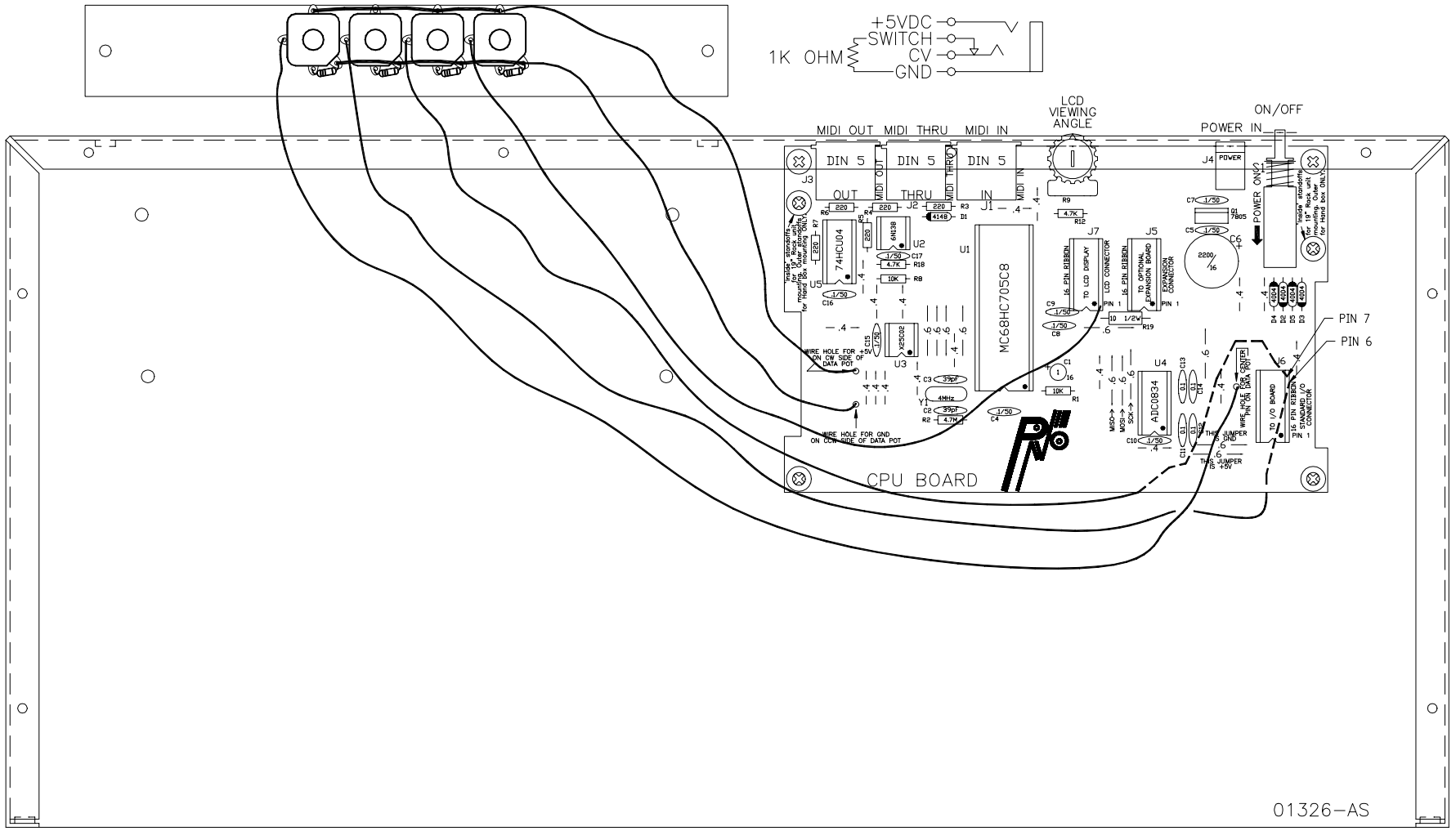
2. Consult diagrams **1, 2, and 3** in the user manual to connect the ¼” plugs and CV sources.

IV. INSPECT YOUR WORK

Before proceeding, take some time to inspect your workmanship. Look for and correct the following potential problems:

- solder that bridges two or more traces
- missed solder joints
- untrimmed leads
- incorrect component orientation
- forgotten parts (did you have any leftover components?)
- ICs not inserted in sockets properly
- ICs not oriented properly
- are all the jumpers installed?

CV–TO–MIDI ASSEMBLY DIAGRAM



01325-PL KIT, INTERFACE, CV-TO-MIDI

01325

KIT, INTERFACE, CV-TO-MIDI

Type	PL	Class	BOM
Revision	A	User2	M
Status	R	User3	
Date	5/18/99	Reorder	
By	SPT	User5	

Item	Qty Unit	Part Number	Type Stat	Title Detail	Reference
1	**1** each	**00054**	PS R	**MIDITOOLS, RELAY DRIVER REAR** 1.1X7.75IN	
2	**4** each	**00097**	PS R	**1K, 1/4W, 5%** AXIAL	
3	**1** each	**00101-12**	PL R	**7X32 STRANDED, BLACK, 12IN** AWG24	
4	**1** each	**00102-12**	PL R	**7X32 STRANDED, RED, 12IN** AWG24	
5	**4** each	**00103-18**	PL R	**7X32 STRANDED, YELLOW, 18IN** AWG24	
6	**2** each	**00106**	PS R	**SCREW, MACHINE, PANHEAD, PHILLIPS,** 06-32	
7	**2** each	**01137**	PS R	**NUT, KEP** 06-32	
8	**1** each	**01139-08**	PL R	**BUS WIRE, 0.0321IN DIA, 8IN** AWG20	
9	**4** each	**01293**	PS R	**FEMALE, STEREO, SWITCHED, PANEL** 1/4IN	
10	**1** each	**01326**	PL R	**ASSEMBLY MANUAL, MIDITOOLS,** 8.5X11IN	

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