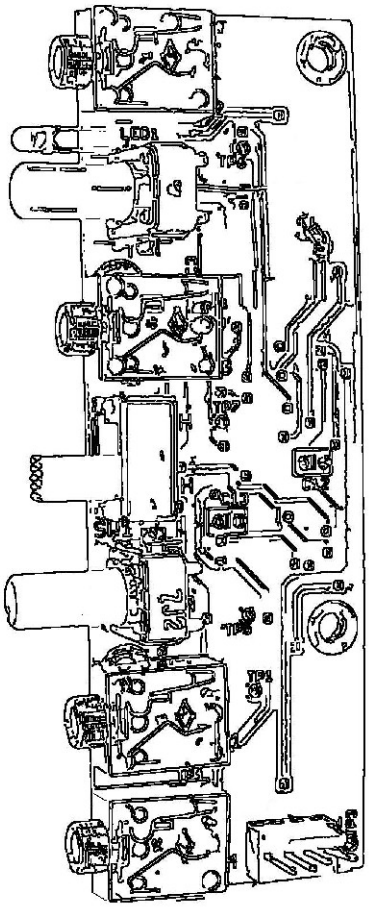
Sample and Hold

Model 9752
Assembly and Using Manual



This second-generation 9700-series processing element for modular sound synthesizers is designed to provide great sound and excellent value.

The 9752 monitors the input signal voltage and copies it to the output, synchronized to changes in an input control voltage (CV) or an input clock, or synchronized to an internal clock if there is no external input. The input may be an audio or control signal. One typical application uses noise as an input signal and a variable rate clock to control sampling. This provides a random control voltage source from the module output.

The module's use with audio signals is enhanced by a switch option to change the function from "sample and hold" to "gate and hold", where the output tracks the input signal as long as the control input voltage is above a threshold (or, if selected, the internal clock rises). After the control voltage drops, the output voltage freezes until the next high-going transition of the control voltage (or the internal clock rises again).

This high-performance module is designed to be compatible with most modular synthesizer systems with little or no modification. Most active components are already mounted, making assembly a snap.

ASSEMBLING THE 9752 Sample and Hold

Before beginning assembly, go through the manual. Look at the drawings. Feel the parts. You're naturally eager to plunge right in, but take a few deep breaths first. Check the parts supplied against the packing list at the back of this manual.

In some cases, notes packed with the parts will be used to call your attention to special situations. ***If parts are missing, please notify PAiA at missing@paia.com or by phone at (405) 340-6300, fax (405) 340-6378. A NOTES page is included at the end of this manual.***

Notice that each step in the manual is marked with a checkoff box like this:

DESIGNATION	DESC.	MARKING
( ) R27	100ohm	brn-blk-brn-gld

Checking off each step as you do it may seem silly and ritualistic, but it greatly decreases the chance of omitting a step and also provides some gratification and reward as each step is completed.

Numbered figures are printed in the Illustrations Supplement in the center of this manual. These pages may be removed for easy reference during assembly.

THE CIRCUIT BOARD

The 9752 Sample and Hold is built on a double-sided circuit board. Note the “top” side of the board has the connector and control placement designators. Surface-mounted components are on the “bottom” of the board. Install parts to the top of the board and solder them on the bottom.

TOOLS

You'll need a minimum of tools to assemble the kit – a small pair of diagonal wire cutters, pliers, screwdriver, soldering iron, and solder.

Modern electronic components are small (in case you hadn't noticed) and values marked on the part are often difficult to see. Another handy tool for your bench will be a good magnifying glass. Also use the magnifier to examine each solder joint as it is made to make sure that is doesn't have any of the problems in the SOLDERING section which follows.

SOLDERING

Select a soldering iron with a small tip and a power rating of not more than 35 watts. Soldering guns are completely unacceptable for assembling solid-state equipment because the large magnetic field they generate can damage components.

Use only a high quality electronic solder. Your kit is compatible with lead-free and/or tin-lead flux-core solders made especially for electronic assembly. Plumbing solder will destroy your kit with its acid core. Jewelry solder (silver solder) will destroy your kit with its high working heat. Neither is for electronics work.

A proper solder joint has just enough solder to cover the soldering pad and about 1/16-inch of the lead passing through it.

There are two improper connections to be aware of: Using too little solder will sometimes result in a connection which appears to be soldered when actually there is a thin layer of flux insulating the component lead from the solder bead. This situation can be cured by reheating the joint and applying more solder.

Too much solder may produce a conducting bridge of excess solder between adjacent pads causing a short-circuit. Continued feeding of solder into a hot joint can result in accumulation on the underside of the board and may cause bridges or impede the action of mechanical components. If you see this, position the board above the iron tip and the excess will flow to the tip.

Use care when mounting all components. Never force a component into place.

CONTROLS AND CONNECTORS

Controls and connectors will be installed on the top side of the board with the placement designators as shown in the illustration to the right.

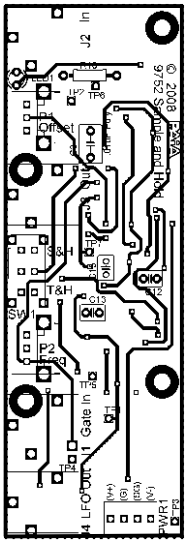
Miniature phone connectors referenced as “stereo phone jacks” in the manual parts list are specified below with the contact/terminal names, Tip, Ring and Sleeve (TRS) and are labeled on the board and schematic as such.

The potentiometers have tabs extending from their body for stability. They have a snap-fit to the board. Align the tabs and pins with their holes and press them into place. There is no need to bend the tabs or terminals.

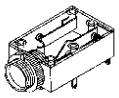
To ensure the best alignment with these parts with the front panel, begin by soldering only one of the multiple terminals associated with each of the following parts as it is installed. Then, if a part is tilted or crooked, it is only a matter of reheating the joint as the part is aligned.

Match the tab of the polarized power connector with the corresponding board marking.

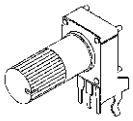
DESIG.	DESC.	MARKING
( ) J1	TRS socket, c.c.	4 terminals
( ) J2	TRS socket	3 terminals
( ) J3	TRS socket	3 terminals
( ) J4	TRS socket	3 terminals
( ) P1	100K ohm potentiometer, linear	B100K
( ) P2	1M ohm potentiometer, audio	A1M
( ) SW1	Slide Switch	
( ) PWR1	Header	



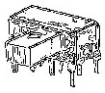
Top of circuit board



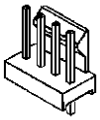
TRS socket
“stereo phone jack”



Potentiometer



Slide Switch

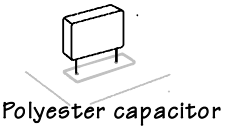


Header

CAPACITORS

Install the non-polarized polyester capacitor. Either lead can go in either hole. Locations are provided for optional, time constant altering capacitors at the Cs 12, 13 and 15 designations. Do not install these parts for standard applications.

( ) C3 0.01uF 103, 10n, 10n6J3



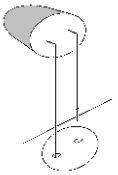
Polyester capacitor

RESISTORS

There is a designation for a fixed resistor, R16, on the board: however, it is an option made available for instances in which a substitution is made for the indicator LED. Do not install a part here for standard applications.

LED

The legs of the LED will be bent at a right angle so when it is installed, it will project through a hole on the front panel. This bend is about 1/8" (2-3mm) from the back of the part, downwards with the shorter (marking cathode) leg to the right as viewed from the rear. Installation of this LED is a three-step process: First the LED is inserted in its holes on on the board, next the board is mounted to the panel with the LED positioned in its panel hole, and finally the joints for the LED legs are soldered.



Shorter leg (cathode) this side

LED (light emitting diode)

( ) LED1 Yellow T1 LED (temporary placement)

COMPLETION

The front panel is used for mounting the module in a rack system or cabinet. Complete the module assembly by mounting the 9752 PCB sub-assembly to the front panel as follows:

Referring to Fig. 1A of the illustration supplement, use the knurled phone jack nuts to secure the sub-assembly to the front panel. Check for clearance of the potentiometer shafts to ensure they rotate freely. Finger-tighten the phone jack nuts and then use the tips of the diagonal cutters to give them another quarter of a turn or so.

Complete the soldering of all multi-terminal parts. Take care the solder doesn't run through to the opposite side of the board when soldering the mounting tabs. With practice, it is possible to flow solder to cover the opening; otherwise, just flow a bit to secure the tab to the pad ring.

Cut a 3/8" (10mm) long shim sleeve for each pot from the length of polyethylene sleeve provided. Set the shafts fully counter-clockwise, slip the shims over the pot control shafts, put the knob in place with the pointer aligned to about a 7:00 setting, and use a small screwdriver to tighten the set-screw just enough that it grips.

Solder each LED leg on the bottom side of the board and clip any excess at the top of the joint.

( ) LED1 Yellow T1 LED

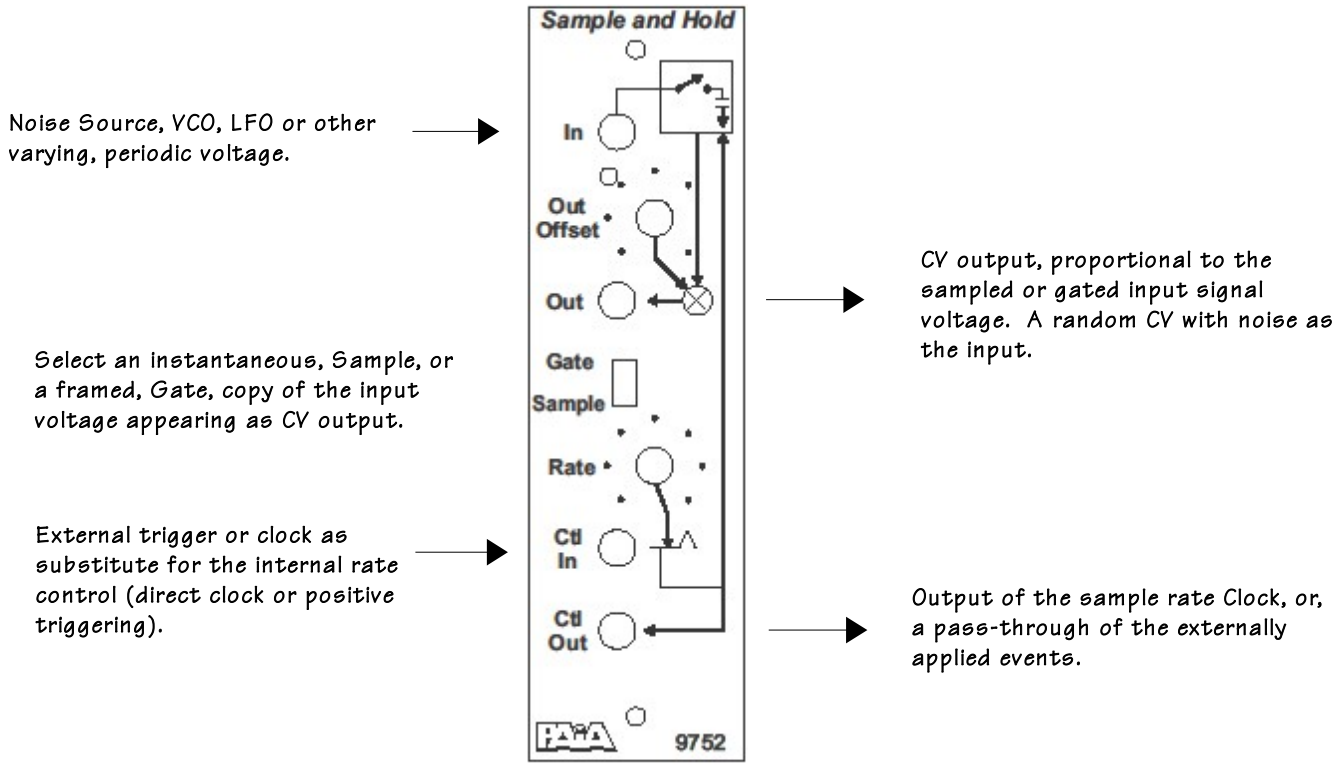
POWERING AND TESTING

Power to the circuit is via a four-circuit, dual-polarity DC power supply. A power connector cable matches the header for connection with one of the PAiA 977x supplies at 15v or more. Connect the circuit labeled (+) to the positive DC source (V+), the circuit labeled (-) to the negative DC source (V-), the circuit labeled (G) to the power ground (G), and the circuit labeled (SG) to the signal ground (SG). For other supplies without separate signal and power grounds, use two wires to join the two grounds (G and SG) to the one ground (aka GND, 0VDC or common) at the supply.

Before applying power, check again, to be sure the wiring for the two DC polarities and that the polarized 4ckt connectors are as intended (see Fig.1B).

Use two-circuit, Tip-Sleeve (TS or mono), cords for patching in or out of the Sample and Hold when connecting with external devices. Within a 9700-series system, either single conductor (Tip-only), or TS cords may be used. If this seems confusing, remember that a regular mono cable will always work for most home studios. PAiA equipment allows tip-only connections for professional applications where star grounding is required.

Test operation by inputting a 0-10V Noise Source such as the 9751 or some other periodic signal such as an LFO or VCO to the Sample Input and patching the Output from this section to a VCO CV input so the control to the VCO can be heard. There should be a change controllable with the s/h Rate control, Output Offset control and Gate/Sample switch settings. Note that as the Offset is adjusted for a more positive CV output range, the glow will vary more brightly. Offset adjustment helps match the output range attained for a range of input signal sources which don't necessarily have to be a full 10V range (or DC, ie 0 to +10). Patching the Ctl Out, a copy of the sampling over to another devices trigger or clock input should elicit an action synchronized to the s/h Output. An external trigger or clock can be substituted for the internal one by making a patch into the Ctl In.



Notes

DNI marking is Do Not Install note to manufacturer. These are designations where optional capacitors may be installed, parallel-connecting with capacitors associated with time constants: Cs1/12, 4/13 and 5/15.

Resistor R16 may be installed to parallel or replace on-board resistor R13 to match the current flow for a substitute LED (subtract the LED voltage from 10v and divide this result by the current (ie 0.01) for the resistance value).

Mounting holes are provided on the board for custom applications.

DESIGN ANALYSIS

The heart of the sample and hold module is based around the LF398 IC. Samples are taken from an input on Pin 3 when the (not)SH pin is pulled low and are stored in capacitor C3. When the (not)SH pin is pulled high, the sample is output from Pin 5 into U1A and U1B which provide output offset scaling as well as driving the S&H LED through U1D.

The (not)S&H pin is connected to switch SW1, which selects between sample-and-hold and track-and-hold operation. S&H operation is driven from the U1C square wave oscillator, transistor switch T1 and monostable multivibrator. The oscillator output is normally connected to the T1 switch through the closed circuit jack, J1. The transistor circuit then drives the monostable multivibrator which limits the pulse width of the trigger signal to about 47uS. If an external signal is plugged into J1, the oscillator is taken out of the circuit. T1 switches at about 1.5V minimum, so just about any signal can be used to control the sample and hold. When in trigger-and-hold mode, T1 and the 4538 are bypassed and the S&H IC is connected directly to the J1 input signal. The second 4538 provides a pulse train output in sync with the transistor switching.

9752 Parts List

Please check the parts against this list. As you locate a part type and verify the quantity (and mounting hardware -- if required) check it off in the space provided.

Because we have introduced surface-mount parts with these kits, we are providing the printed circuit card as a sub-assembly with the surface-mount parts already in place.

Also, we want to make you aware that we are using both linear- and audio-taper potentiometers in some of the modules. They are marked differently so we are asking that you check carefully.

If anything is missing please notify PAiA at missing@paia.com or by phone at (405) 340-6300, fax (405) 340-6378.

	Quan	Description	Ref Des	Marking
( )	1	9752 PCB Sub-assembly, Sample and Hold		
( )	1	9752 Front Panel, Sample and Hold		
( )	1	100K ohm Potentiometer, 9 mm Snap-In, Linear	P1	B100K
( )	1	1M ohm Potentiometer, 9 mm Snap-In, Audio	P2	A1M
( )	3	Phone Jack, Stereo, 3.5mm	J2, J3, J4	
( )	1	Phone Jack, Stereo, 3.5mm, w/switch	J1	
( )	1	Switch, Slide, DPDT, RA, PCB Mount	SW1	
( )	2	Knob, Set Screw		
( )	1	Shim, Knob, Polyethylene Sleeve		
( )	1	.01uF, 63V Capacitor, Metalized Polyester Film, Radial	C3	10nJ63
( )	1	LED, Yellow Diffused, Through-hole	LED1	
( )	1	Header, Vertical, 1row, 4pin	PWR1	
( )	1	Cable Assembly, Power, 4-wire		
( )	2	Screw, Self tap, #4 x 3/8, Pan Head Phillips, Black Oxide		

9752 Test Point Data

TP1	+12 VDC	TP5	Complement of Internal Clock
TP2	-12 VDC	TP6	LED Voltage
TP3	0 VDC	TP7	CV Output
TP4	Internal Clock		

9752 Power Requirements

Voltage	Current
+12 VDC	21.0 mA
-12VDC	33.0 mA

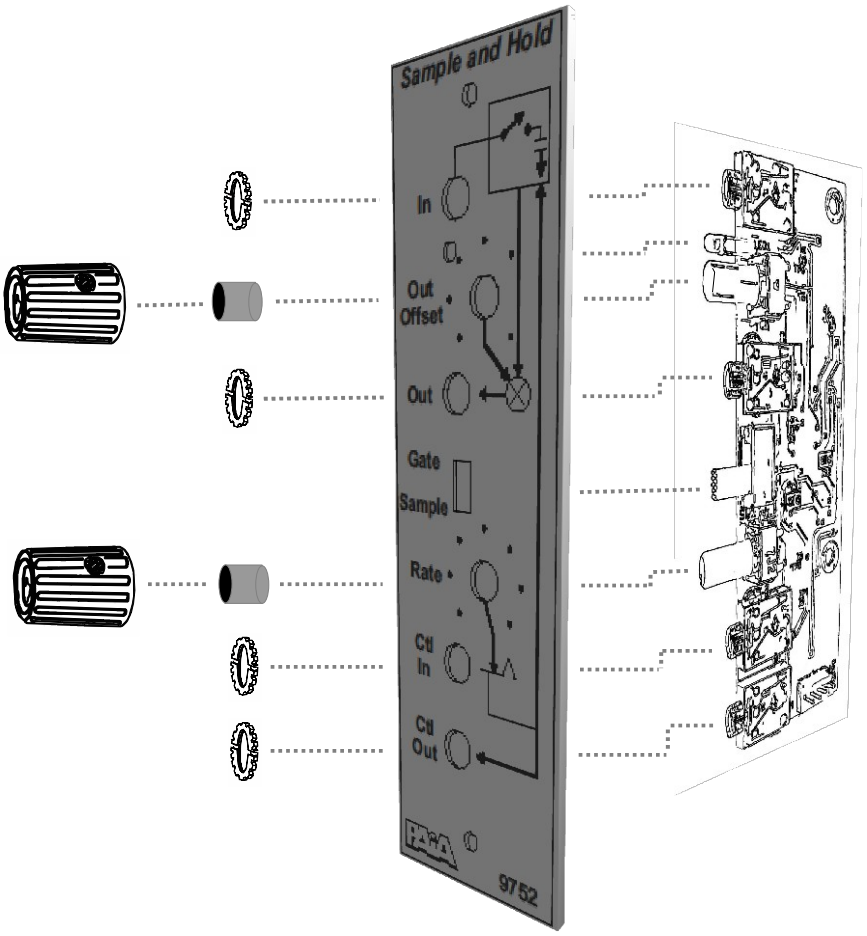


Fig. 1A Attach board to panel using connector nuts, shim control shafts, and rotate controls to minimum and tighten set-screw knobs to agree.

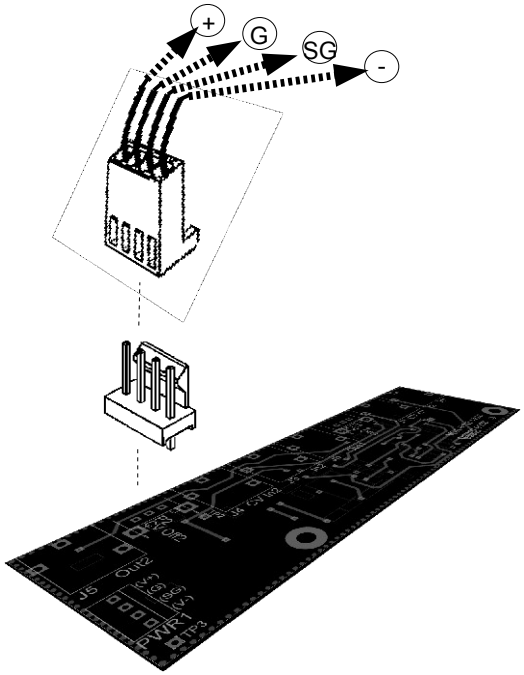
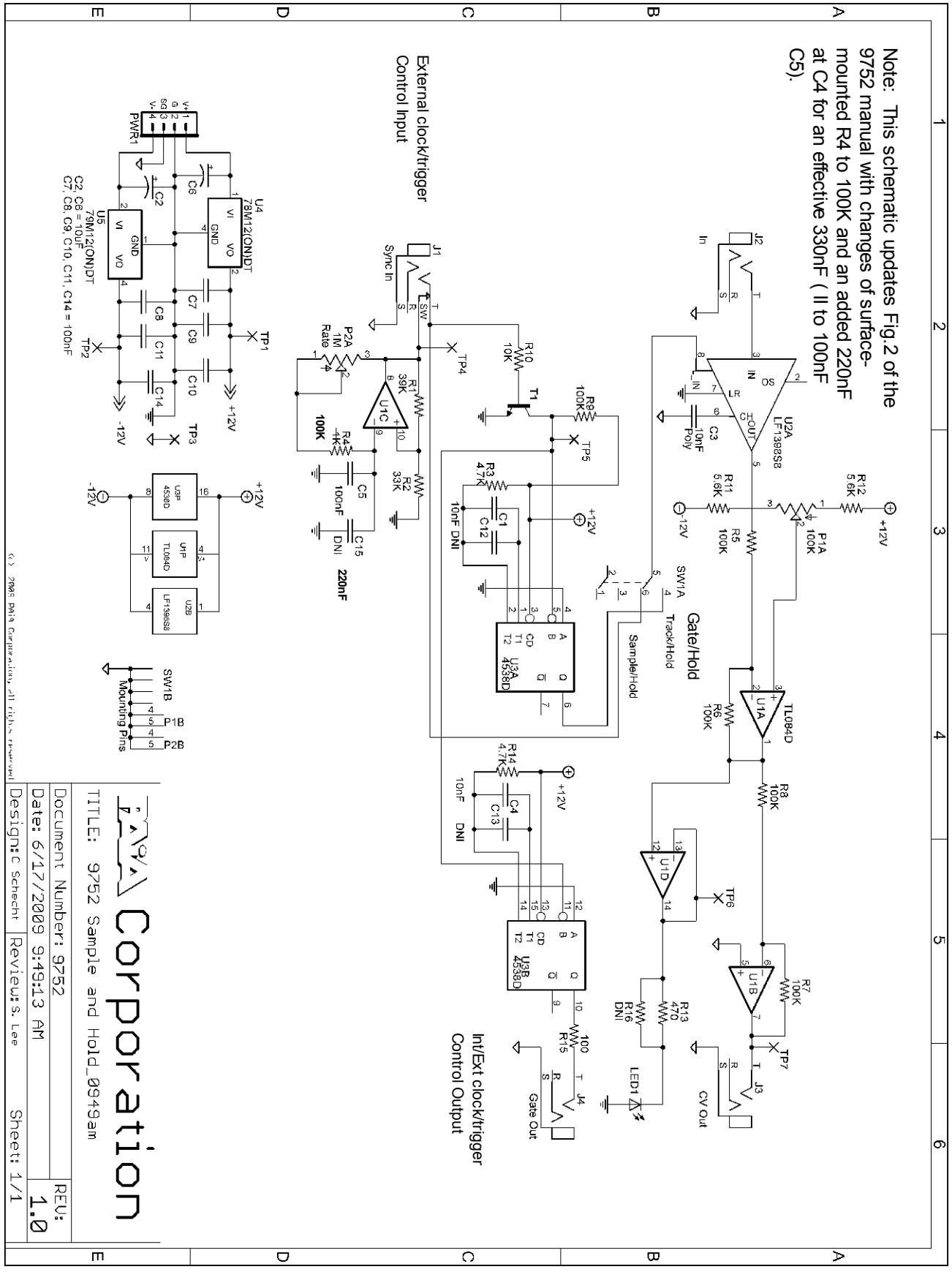


Fig. 1B Orientation of power connector with respect to the printed-circuit-board.


Note: This schematic updates Fig.2 of the 9752 manual with changes of surface-mounted R4 to 100K and an added 220nF at C4 for an effective 330nF (II to 100nF C5).
Gate/Hold
Track/Hold
Sample/Hold
External clock/trigger Control Input
Sync In
Rate
Int/Ext clock/trigger Control Output
Gate Out
CV Out
Mounting Pins
Corporation
TITLE: 9752 Sample and Hold_0949am
Document Number: 9752
REV: 1.0
Date: 6/17/2009 9:49:13 AM
Designer: C Schecht
Reviewer: S. Lee
Sheet: 1/1