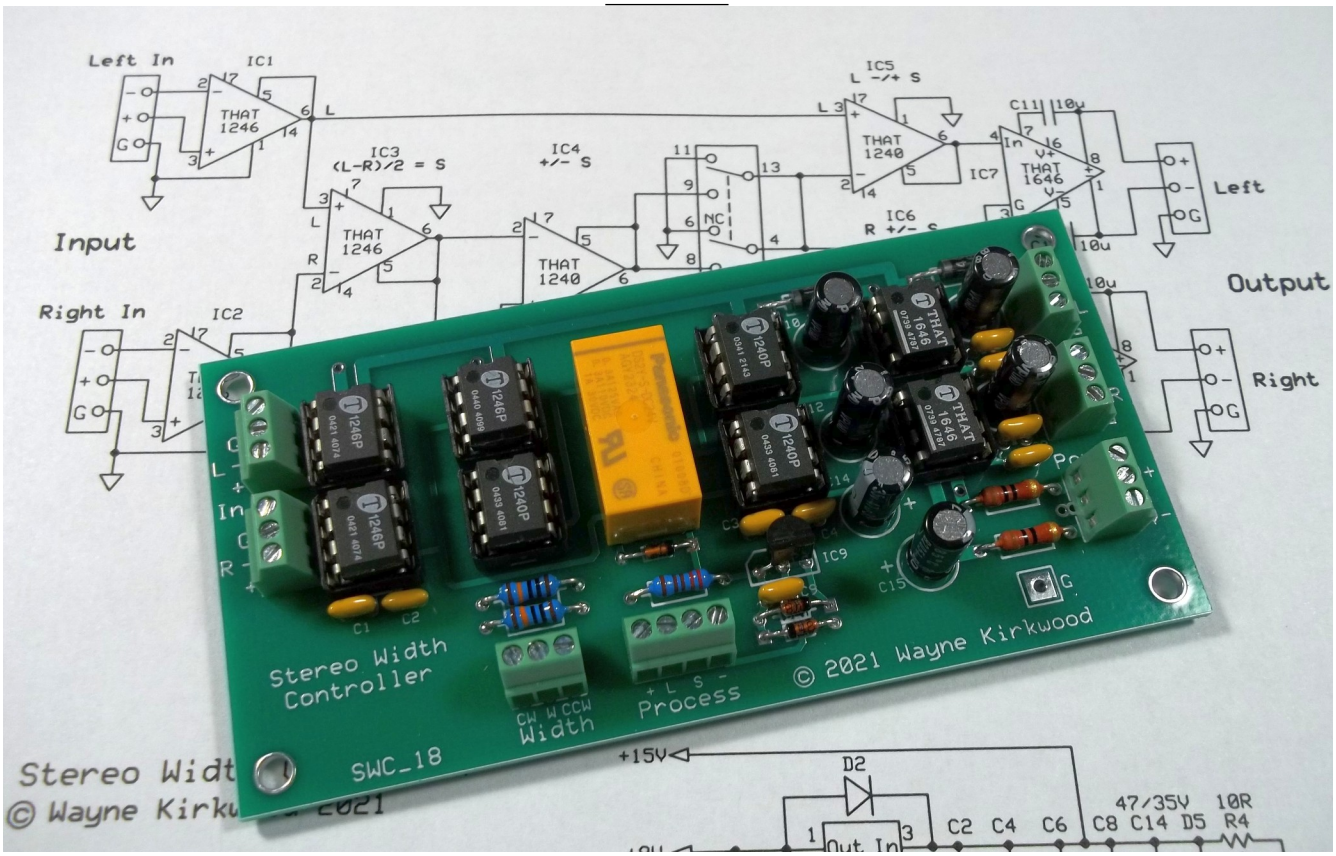
Assembly Instructions for the KA Electronics Stereo Width Controller

9.26.24



Stereo Width Controller PC Board

Install IC sockets

Place the PC Board on the work bench silkscreen side face up.

Place **(8)** 8 pin IC sockets into their respective locations. Observe orientation of the notch. Make sure that you do not place the sockets in the bypass capacitor holes.

Tip: Lift the board up and place a piece of cardboard on top of the board to form a sandwich of PC board, sockets and cardboard. The cardboard is used to hold the sockets in place so the board can be turned over without the sockets dropping out. Flip the board over.

Tack Solder only two of the corner IC pins. Put downward pressure on the PC board to make certain the sockets are seated on the board as you solder.

Once all the IC sockets are tack soldered, flip the board over.

Make certain that each socket is correctly oriented, fully seated on the board and square.

If you're satisfied with the placement of the sockets, solder all of the remaining pins. Do not overfill the connection with solder because it can run underneath the socket and form a short between pins.

Visually check each pin's connection particularly those to the ground plane. Reheat any pins if needed. Do not trim the IC socket leads.

Install resistors and diodes

Install **(2)** 100KΩ 1% resistors at R1 and R2.

Install **(1)** 2K21Ω 1% resistor at R3.

Install **(2)** 1Ω 1W metal film "fusible" resistors at R4 and R5.

Install diodes in the following locations.

Install **(3)** 1N4148 diodes at D1-D3. Observe polarity.

Install **(2)** 1N4004 diodes at D4 and D5. Observe polarity.

Install ceramic capacitors

Install **(9)** 100 nF (0.1uF) at C1-C9.

Install Phoenix connectors

When installing the Phoenix connectors make sure the openings for the wires point outward to the edge of the board. When installing the connectors, tack solder only one pin and reheat it to adjust the position of the connector so that it's square and flush with the board. Once you're satisfied with the orientation of the connector, solder the remaining pins.

Install **(6)** 3 pin Phoenix connectors.

Install **(1)** 4 pin Phoenix connector.

Install electrolytic capacitors

Note: The + (positive) terminals for the electrolytic capacitors have a square pad. Where space permits there is also a "+" silkscreen marking. The longer capacitor lead is the positive lead.

Bipolar capacitors, which do not have a polarity, will also be installed in four locations. Make certain that you have the right type of capacitor before soldering it.

Install **(4)** 10uF 35V (or 50V) bipolar electrolytic capacitors at C10-C13.

Install **(2)** 47uF 35V polarized electrolytic capacitors at C14 and C15. The polarity of these capacitors are critical.

Install the relay

When soldering the relay tack-solder the corner pins first. This will allow you to adjust the relay so it lines up correctly.

Install **(1)** 24V DPDT relay at RY1.

Install the relay voltage regulator

Install **(1)** LM78L24 regulator. Note the orientation of the TO-92 package.

Note: Do not install the ICs at this time.

Check all solder connections and reheat or re-flow them if necessary

When component leads are trimmed after soldering the solder joint becomes fractured. It is always a good idea to reflow all solder connections after lead trimming while checking for bridges or pins which may have missed being soldered.

If you add solder during this step do so sparingly particularly under IC sockets. Solder can flow through the PC board vias to the underside of the IC socket and cause shorts between pins.

If you prefer to remove the solder flux residue from the PC board now is a very good time to do it.

When you're finished cleaning the PC board inspect every joint under magnification.

Install spacers

Install **four** 4-40 threaded hex spacers at the board mounting holes. Place the **four** fiber washers between the PC board and the hex spacer and secure using four 4-40 1/4" screws. Four additional screws and fiber washers are in the bill-of-materials for securing the PC board to the chassis.

Initial Tests

The board should be tested on a power supply before installing the ICs.

Initial DC Tests

Connect a source of bipolar DC power.

If a variable power supply is used, slowly raise the voltage to about +/-15V.

There should be no significant current draw other than 3-6 mA for the 78L24 voltage regulator. If excess current is drawn check the board for solder bridges and correct polarity of D4 and 5 and all the electrolytic capacitors.

Check the voltages at pin 7 of IC1-IC6. It should be +15V. The voltages at pin 4 of the aforementioned ICs should be -15V.

Check the voltage at pin 6 of IC7 and IC8. It should be +15V. The voltages at pin 5 should be -15V.

Check the relay power supply. Connect the - lead of the meter to the "-" terminal of the Process Phoenix connector. Connect the DC voltmeter positive lead to the "+" terminal of the Process Connector. The DC voltage should read about +24V.

If any of the voltages are out of range look for solder bridges or an un-soldered pin or component lead.

Remove power.

Install the ICS

Install **(3)** THAT1246 at IC1-IC3.

Install **(3)** THAT1240 at IC4-IC6.

Install **(2)** THAT1646 at IC7-IC8.

Offset and Current Draw Tests

Reconnect power.

Connect a wire between the Phoenix connector Width "CW" (clockwise) and "W" (wiper) connections. (A component lead trimmed during construction makes a good link.)

If a variable power supply is used slowly raise the voltage to about +/-15V.

Measure the voltages across R4 and R5, the 1Ω resistors. The voltages should typically be about 25 mV indicating a current draw of less than 25 mA.

Measure the DC voltages of the IC pins listed below. No input or output should be pinned to a supply rail. Typical offsets will be +/- 15 mV or less.

IC1-IC6 pin 6 output.

IC7 and IC8 pins 1 and 8.

Remove power.

Signal Tests

An on-board relay is used to engage Width processing. The first group of tests are made with the relay un-powered.

The second group of tests checks operation of the relay and Width processing.

A signal generator (or DAC output) and level meter (or A/D inputs) are required. The instrument connections may be balanced, un-balanced or a combination of both.

Test the Input and Output Circuitry

The level measurements performed here check the board for unity gain signal passage.

Tip: It is important to note that when testing the Width Controller that mono test signals do not, by definition, produce a Side signal. Test signals in only one channel produce the Side or difference signal needed for internal tests. For this reason pay particular attention when instructed to feed tone into only one channel.

When making level measurements on THAT1646 outputs use a high impedance or "bridging" (approx. 10KΩ or greater) loading. A THAT1646 loaded in 600Ω will read approximately -0.7 dB less. If a 600Ω load is anticipated in final use, take this into account.

Unless specified all AC and DC measurements are made relative to ground.

Apply power.

Check the Left and Right Path

Make certain that the wire between the Phoenix connector Width "CW" (clockwise) and "W" (wiper) connections installed earlier is still in place.

Feed a 0 dBu (775 mV RMS) 1 kHz tone into the Left and Right Inputs. The generator can be either balanced or unbalanced. If unbalanced, ground both the G and "-" inputs.

Measure the output level at the Left and Right Outputs. If a single-ended unbalanced instrument is used, ground the "-" output. The output levels for both channels should measure 0 dBu.

Remove the tone feeding the Left Channel. Continue feeding tone into the right channel. The Right channel output should continue to read 0 dBu. The Left output should read below -50 dBu typically -60 dBu.

Reconnect tone to the Left channel input and remove tone from the right channel input. The Left channel output should continue to read 0 dBu. The Right output should read below -50 dBu typically -60 dBu.

With tone feeding only the Left channel measure the signal level at IC3 pin 6 or the "CCW" terminal of the Width connector. The level should read -12 dBu.

Reconnect tone to the Right channel so that both Left and Right are fed. The level at IC3 pin 6 should drop to -50 dBu or better. (The level balance between Left and Right will have a significant effect on this measurement.)

If the steps above provide correct results then proceed to check operation of the relay. If one or more measurements don't seem correct then check the following test points.

Feed a 0 dBu 1 kHz tone into the Left and Right Inputs.

Measure the levels at the outputs (pin 6) of IC1 and IC2. They should read -6 dBu.

Measure the levels at the outputs (pin 6) of IC5 and IC6. They should read -6 dBu.

Measure the levels at the inputs (pin 4) of IC7 and IC8. They should read -6 dBu.

Measure the levels between "+" and "-" at the Left and Right Output Phoenix connectors. They should read 0 dBu.

If you don't read the correct levels at any stage but the levels are correct in the previous stage then look at the stage following the one that measures correctly. The most likely problem is an open, not soldered, connection to an IC socket.

Check operation of the Width Control and Relay

Make certain that the wire between the Phoenix connector Width "CW" (clockwise) and "W" (wiper) connections installed earlier is still in place.

Connect a bus wire or short length of hookup wire to to the Process Phoenix connector's "S" and "-" terminals.

Measure the DC voltage between the Process Phoenix connector's "+" and "L" terminals. It should read about +24 VDC.

Feed a 0 dBu 1 kHz tone into the Left channel only.

With tone feeding only the Left channel measure the signal level at IC3 pin 6 or the "CCW" terminal of the Width connector. The level should read -12 dBu.

Measure the output level at the Left Phoenix connector. The measurement should be between the "+" and "-" terminals. The level should read +3.5 dBu.

Measure the output level at the Right Phoenix connector. The measurement should be between the "+" and "-" terminals. The level should read -6 dBu dBu.

Move the test jumper on the Width Phoenix connector so that the "W" and "CCW" terminals are linked.

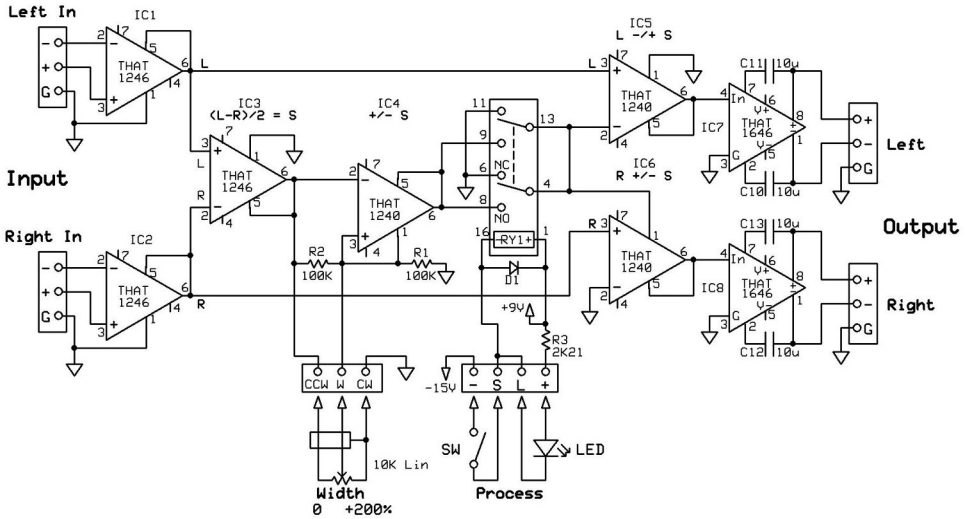
Measure the output levels at the Left and Right Phoenix connectors. The measurement should be between the "+" and "-" terminals. The level should read –6 dBu.

Final operation of the Width control can be checked by installing a 10KΩ linear pot or stepped switch with make-before-break contacts at the Width Phoenix connector. Full CCW rotation results in a mono output, normal stereo is in the center and "200%" width (6dB Side gain) is at full CW rotation.

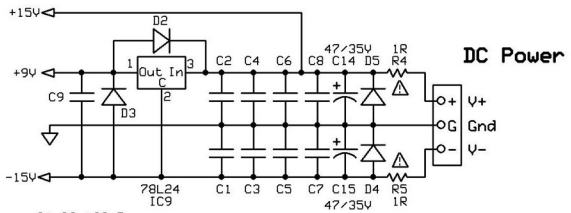
A schematic for a 21 position stepped switch is included in this document.

This completes functional checkout of the Stereo Width Controller circuitry.

For those that wish to do so we recommend also performing noise and distortion measurements using software-based tools and audio converters.



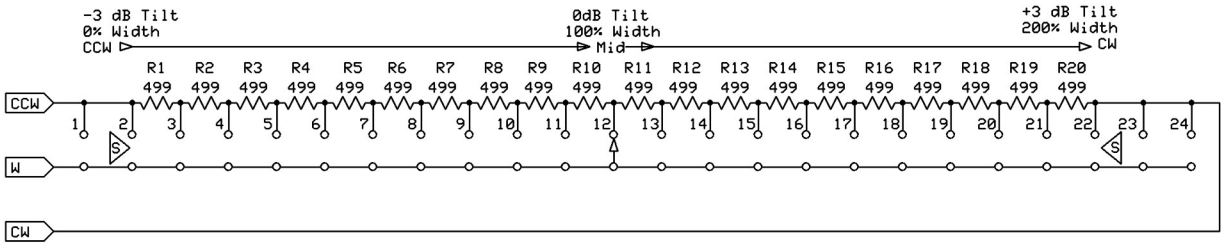
Stereo Width Controller



C1-C9 100nF
D1-D3 1N4148 D4-D4 1N4004
⚠ Fusing Resistor

Rockmore-Labs		
Stereo Width Controller		
Wayne Kirkwood © 2021	Rev 1.2 SWC_18 9/26/2024	Sheet 1 of 1

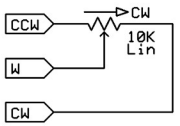
10K "Center Detent" Stepped Switch
For Width and Tilt Control



Elma Type 04 24 Pos 15 Degree Shorting Contacts.

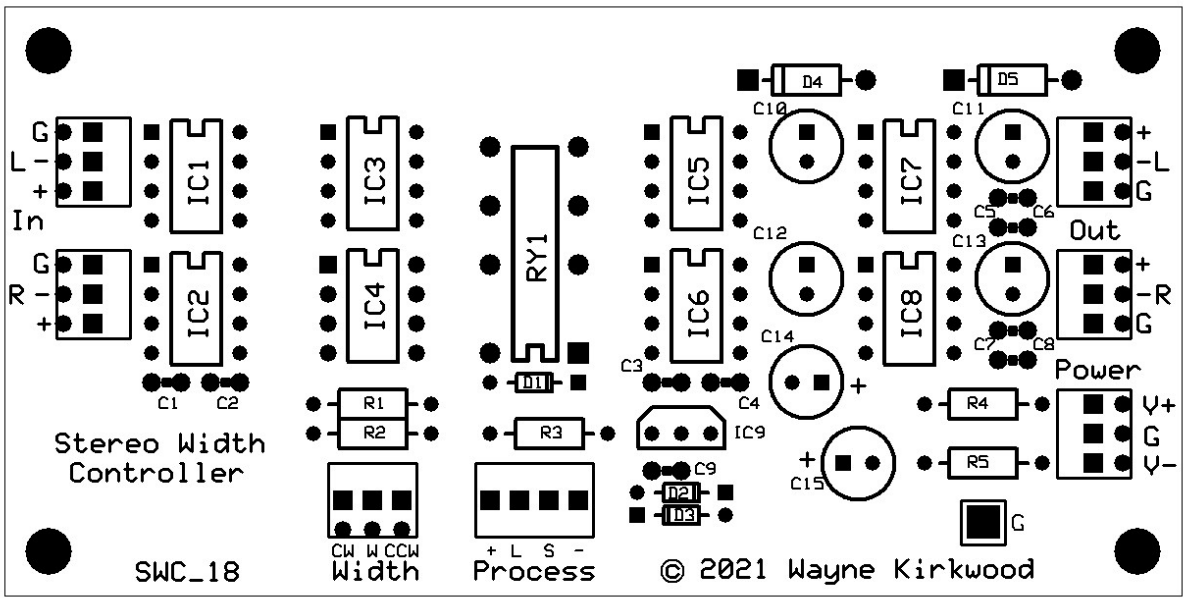
S For 21 Steps Install M1.4 mechanical stop screws Elma PN 4124-21 at openings 1 and 23

Shown in center position.
Total Resistance: 9980 Ohms.



Equivalent Circuit

Rockmore-Labs		
10K "Center Detent" Stepped Switch		
Wayne Kirkwood (c) 2021	Rev 1.0 8/31/2021	Sheet 1 of 1



Detailed Parts List

A complete bill of materials is available from Mouser Electronics:

Stereo Width Controller BOM V18 PCB with THAT ICs:

https://www.mouser.com/ProjectManager/ProjectDetail.aspx?AccessID=79f46d59ae

Other Resources

Pro Audio Design Forum Stereo Width Controller Build Thread:

https://www.proaudiodesignforum.com/forum/php/viewtopic.php?f=7&t=1266

For more information contact: sales@ka-electronics.com