

In the time since the 9505 Theremax was first introduced and appeared in Electronics Now (February 1996) there have been some minor changes and updates.

In our production version of the kit, resistors R7 and R12 were updated to be 3300ohm instead of 3900ohm and Rs 10 and 15 to be 1500ohm instead of 1000ohm. Capacitors (5pF) were added to connect the ends of the antenna cables to the antenna mtg. hdw. solder lugs. Capacitor C39 was changed to be 0.005uF and C37 was changed to be 33pF. The resistor changes will have affected the fixed oscillator frequency and strength in the volume and pitch pairs. The antenna coupling capacitors helped minimize the load introduced with direct contact with the antenna and tailored the hand-antenna response. C37 in the volume cv f-v circuit affects the response too. The higher value at C39 helped mask bleed of the volume heterodyne signal into the audio output as a fainter, secondary pitch tone.

It was determined that the bleed of the volume het. could be masked even more by adding filtering in the VCA section and increasing the pitch heterodyne signal presented to the VCA section. Capacitor C44 a 0.005uF was added to couple the collectors of transistors Q10 and Q11 and the Timbre control R81 was substituted with a 100k which decreased the load to the signals connected and to tame the stronger square wave derived from the pitch f-v circuit, 22k resistor R40 was substituted 470k. The circuit board was updated to 9505b to accommodate the added C44.

While the unit can be tuned to have the heterodyne frequency increase or decrease with inward hand movement, it's most accepted to have the pitch increase and the volume decrease. In working out the calibration procedure for this new "traditional" response, it was found that by optimizing things so the volume heterodyne in the 'tuned' range was post-audio, the bleed we had minimized with circuit changes could be eliminated. The changes were a compromise in terms of frequency response and to get back 'high-end' they can be made back to more normal values. We also found that the new procedure worked out best when a 1000uH choke was substituted for the 5pF at the end of the volume antenna cable. The 5pF at the end of the pitch antenna cable was eliminated. *An alternate, simplified tuning procedure is listed at the end of these notes.*

C44 can go away. C39 can be much lower in capacitance. A 100pF is a more normal value here. Making capacitor C44 a 100pF is suitable too.

Then, with this new wider frequency response, it is apparent that the hot sine to Q10 needs to be tamed a bit and the addition of a 6800ohm on the Timbre control (from R81-3 to R81-2) will bring it down out of overdrive and return the ccw extreme of the adjustment back to sine, and the square at the other end will sound bright and buzzy.

A 100pf at the C37 position gives a better 'feel' to the volume hand-to-antenna control.

Availability, or lack thereof, of the 1N34A germanium diodes caused us to change the circuit for use with CDSH270 types. The modulator action on these is different enough that the circuits were updated to have only two diodes per modulator and a direct connection to ground in place of one of the omitted ones. The board was updated to 9505c for this. On boards prior to this with CDSH270 diodes, omit Ds 2, 4, 6, and 8 and install jumper wires at the D2 and D6 designations.

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A quick tuning method (no test lead jump used): Back all four tuning slugs fully out (ccw). Turn L1 and L4 one turn in. Connect the audio output to an amp/speaker and set the Volume control R83 to about 3:00. Set the Velocity to max. Slowly adjust L3 inwards through it's range listening for a faint wheep-wheep as it goes through its audio heterodyne frequencies. Now, as you go back and forth through this point, the Gate/Trigger LED should be lighting indicating the Volume CV is increasing and decreasing and the velocity cv is causing a trigger. For Traditional volume control response, leave L3 set just before the onset of the first audio band encountered with the

inward adjustment. This causes a volume CV output and audio output that decreases with inward hand movement. Adjust L2 inwards for the pitch heterodyne tone (the 3:00 R83 Volume setting may be a bit high now as the pitch tone will come through loud and clear in comparison to the volume het).

For controller response (opposite of traditional), adjust L3 to null, or, to keep the volume heterodyne at a post-audio frequency (for no faint background volume 'pitch') adjust it further inwards to be just beyond the second volume (volume cv) peak.

Note the front panel Volume Trim control is optimized for tweaking the volume pair to be at null. For these post audio heterodyne settings, start with it centered and then you'll notice it will work to bring the pair into or out of audio range. Also it won't make very much change in volume in comparison to the way it did in varying the pair about null.

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Note the unit can be tuned/tested with the antennae detached. I often work on board and panel assemblies just spread out on a piece of wood or cardboard. It can sometimes make the difference having the antennae or their cables not attached if there is trouble with the proximity of the antenna (or its mount) to a ground or a conductor to the floor. A near short between the shield and the internal wire can adversely load the attached oscillators one or four.

Moving the initial setting of L4 more inwards than the specified 1 turn in can provide more output if there is something loading it more than usual. The f-v circuits must have a normal strength heterodyne (no adverse loading of either oscillator in the pair) to produce the volume CV which varies the amplitude of 'tone' to the output; whereas, the 'tone' simply must be there--it being weak or not isn't doesn't have the consequences the volume pair does.

If available, an oscilloscope can be useful to confirm the oscillator transistor collector has a normal 10-12v pp oscillation. Then, preceding the volume f-v comparator stage IC1:B, the next spot to check for the volume heterodyne is on the collector of the amp Q9. There should be a 0.5 to 1v audio range wave when the pair is tuned at either side of null.

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