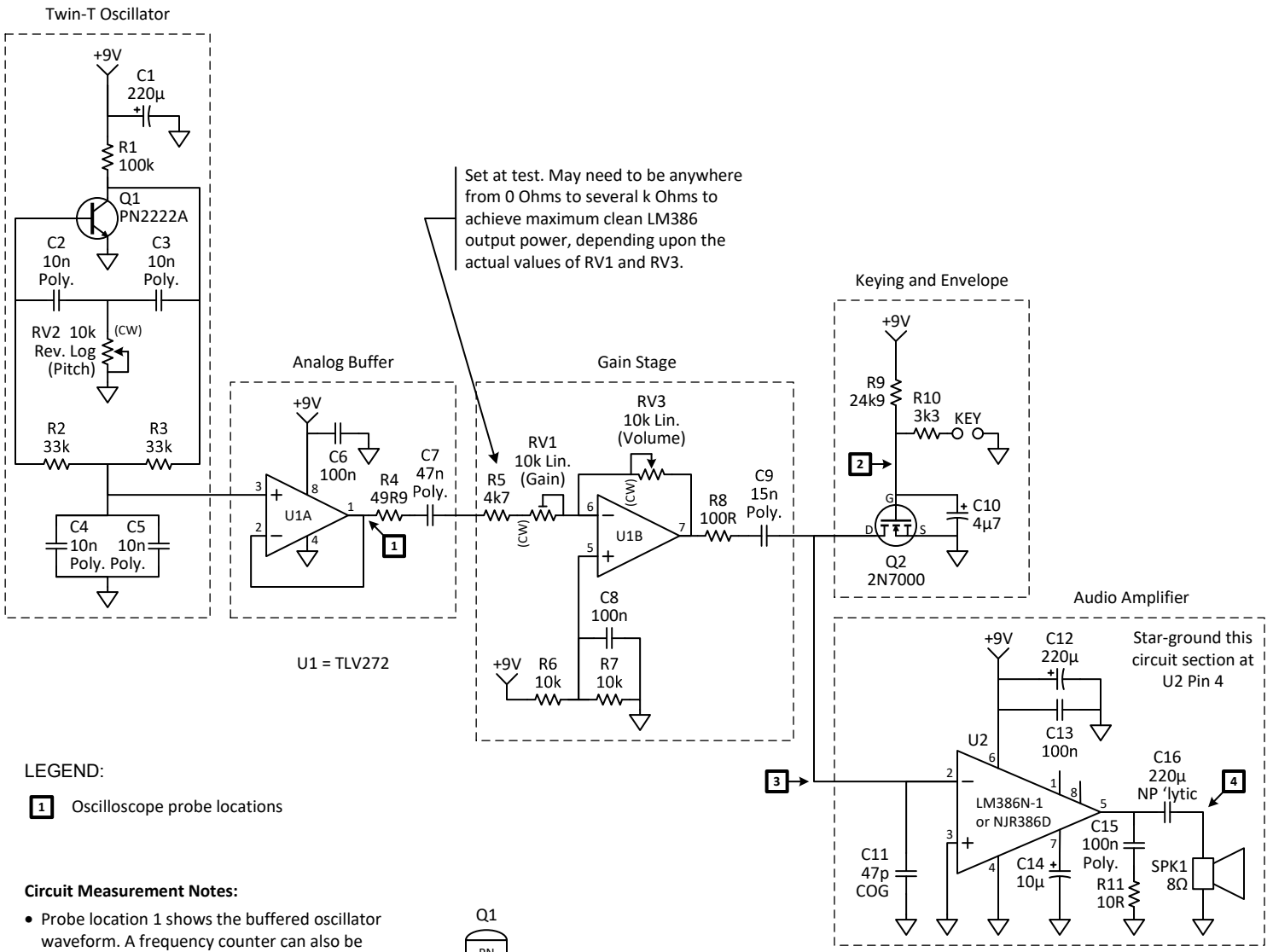
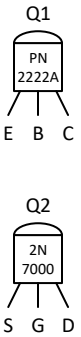


LEGEND:

[1] Oscilloscope probe locations

Circuit Measurement Notes:

- Probe location 1 shows the buffered oscillator waveform. A frequency counter can also be attached here.
- Probe location 2 shows the shape of the key's effect on Q2's gate as influenced by the RC combinations of R10 (key actuate) and C9, or R9 (key release) and C9.
- Probe location 3 shows the effect of the Envelope Shaping and Keying circuit on the signal. This is also the input signal to the audio amplifier.
- Measuring the AC RMS levels of probe locations 3 and 4 allows calculation of amplifier gain.



open source hardware

STATUS:
Breadboarded and working.
Ready to commit to PCB.

NOTES

General Notes:

- This circuit is adapted from the original work by Michael A. Maynard (K4ICY).
- It was modified to buffer the output of the Twin-T oscillator, a variable gain stage was added to serve as the volume control, and the audio amplifier stage was simplified.
- The capacitors marked "Poly." are polyester, but this is not critical. Common MLCC types could be used.
- All capacitors without a type designation are as follows: non-polarized are MLCC and polarized are electrolytic.
- The schematic on this page is appropriate for building the circuit on a breadboard or perfboard. See subsequent pages for modifications suitable for mounting in an enclosure.

Twin-T Oscillator Section:

- Capacitors C2 and C3 should be close to each other in value, and the parallel combination of C4 and C5 should be close to the sum of the C2 and C3.
- Likewise R2 and R3 should be close to each other in value.
- RV1 (Pitch) will yield a somewhat more linear frequency adjustment if it has a reverse logarithmic taper.

Audio Amplifier Section:

- A standard polarized electrolytic capacitor could be used for C16, with the negative terminal connected to SPK1.

Original circuit designed by Michael A. Maynard (K4ICY).
http://k4icy.com/weekend_radio_3tr-audio-amp.html

Dimensional Tolerances (unless specified otherwise)		
2 Places	3 Places	Angles
±0.010	±0.005	±1 Deg

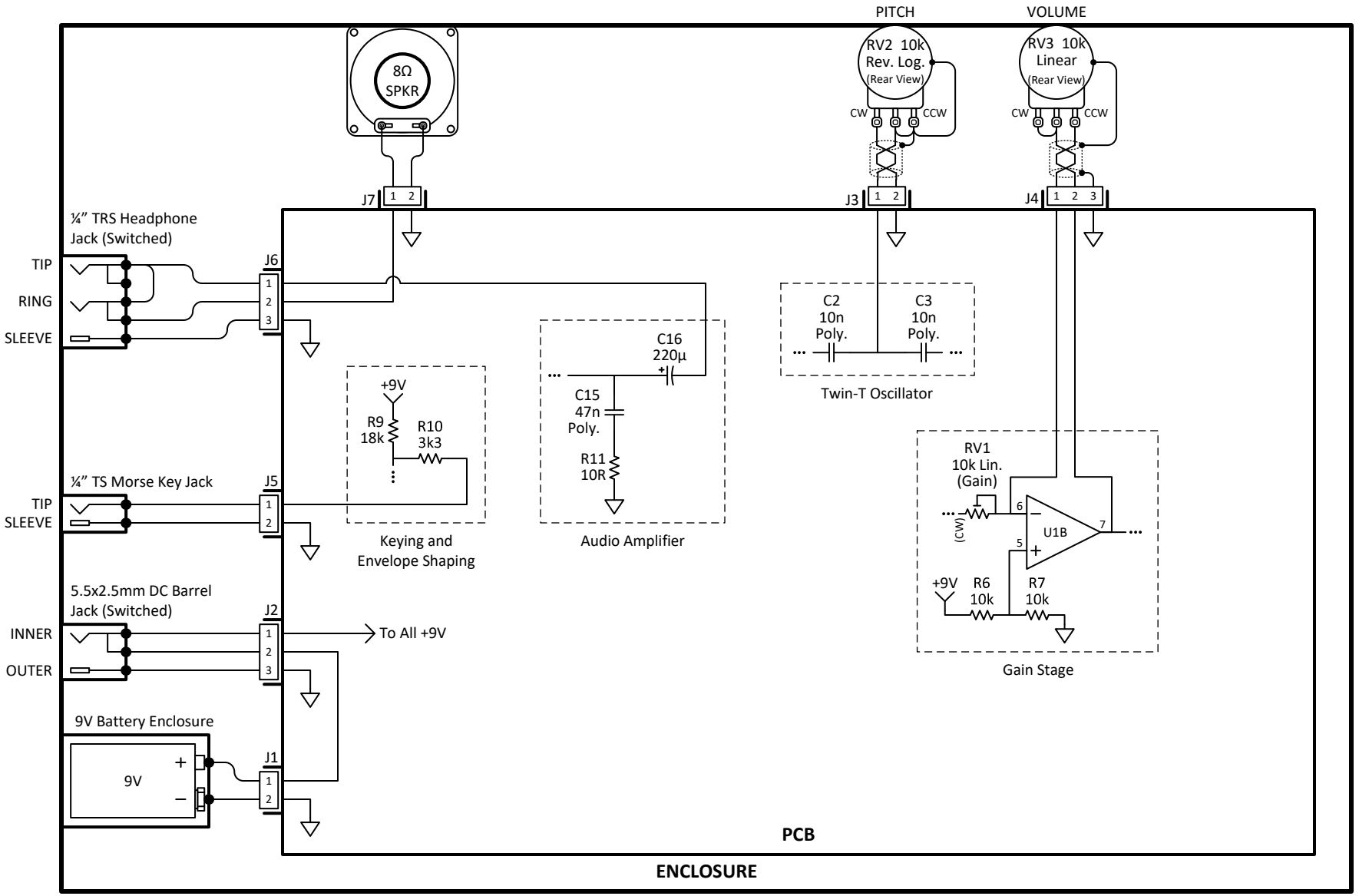
DRAWN BY	J. BENSEN
ISSUED	2020-09-02

https://github.com/JeffB-BE
BENSEN ENGINEERING
https://www.youtube.com/channel/UCjZB0LE4ZC2Q2Tl3gbietnw

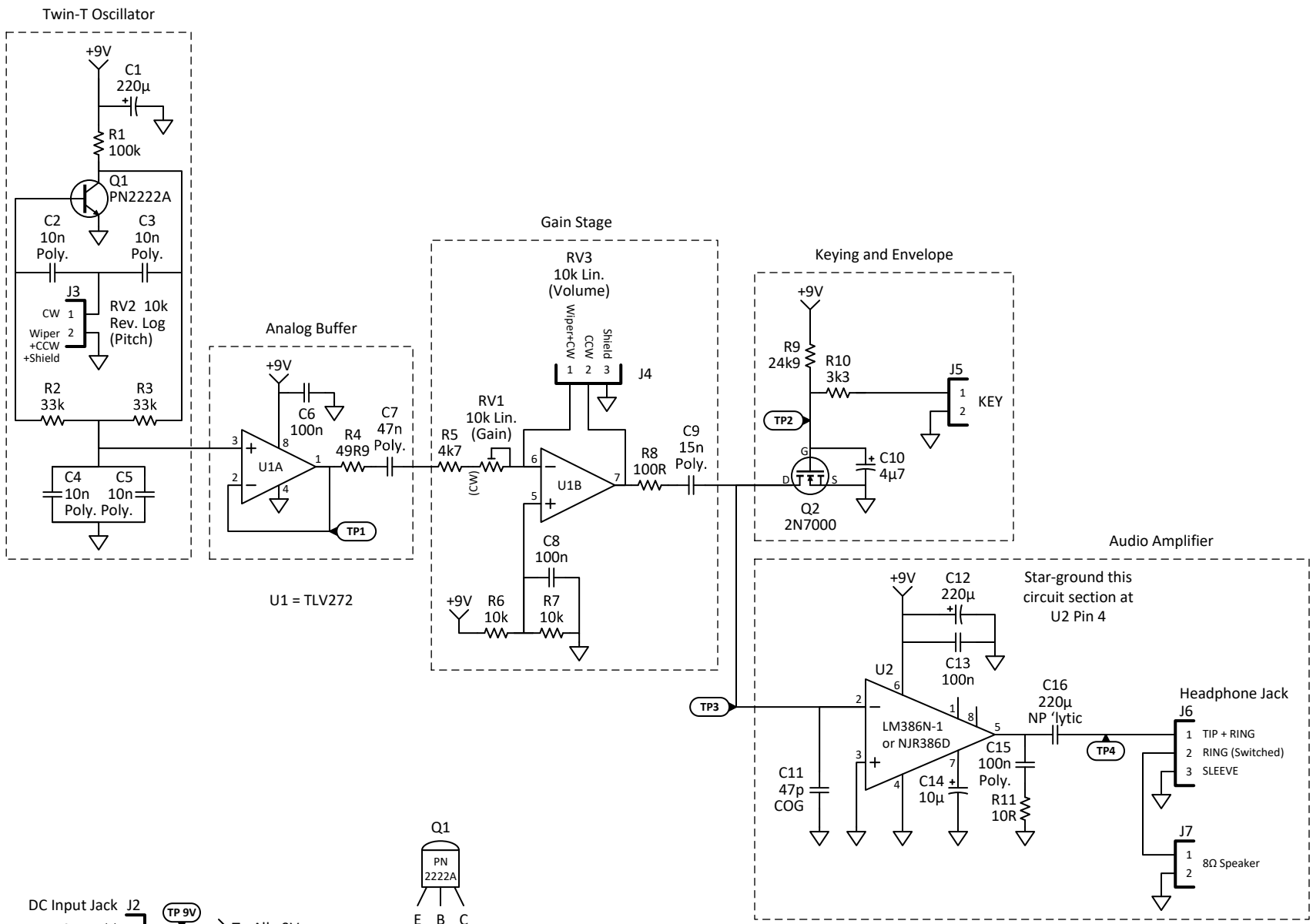
Twin-T Code Practice Oscillator : Schematic

SIZE	DWG NO	REV
A		A

SCALE		SHEET
NONE		1 OF 6

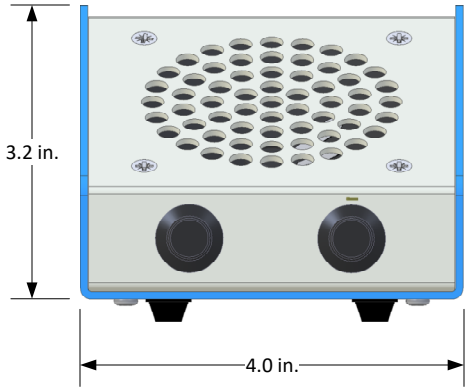


Twin-T Code Practice Oscillator : Enclosure Integration Circuit Modifications				
DRAWN BY J. BENSEN	SIZE A		DWG NO	REV A
ISSUED 2020-09-02	SCALE NONE		SHEET 2 OF 6	



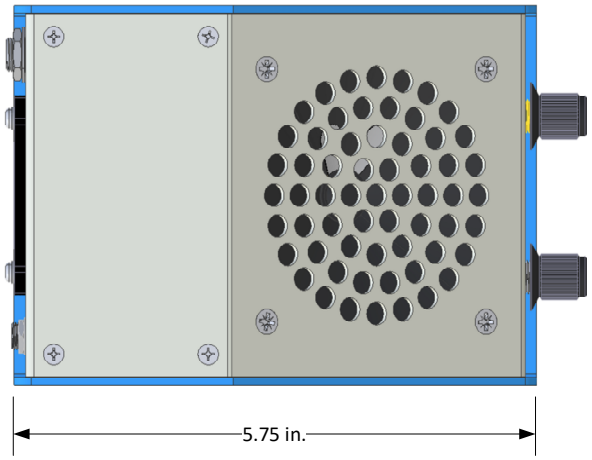
Twin-T Code Practice Oscillator : Schematic with Connectors for Enclosure			
DRAWN BY J. BENSEN	SIZE A	DWG NO	REV A
ISSUED 2020-09-02	SCALE NONE		SHEET 3 OF 6

Front View

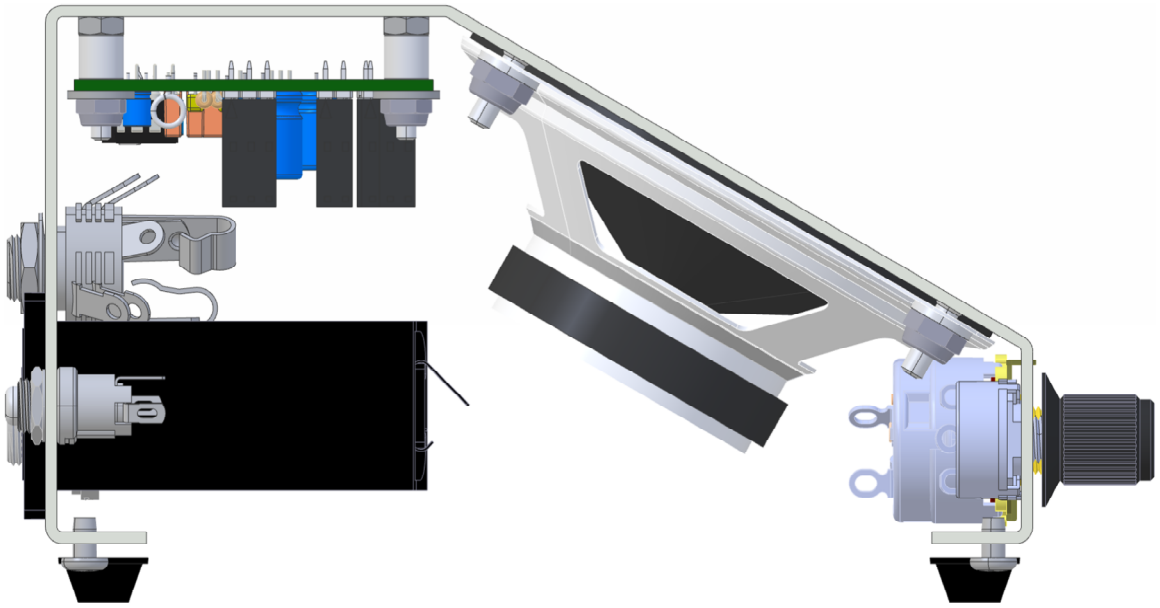


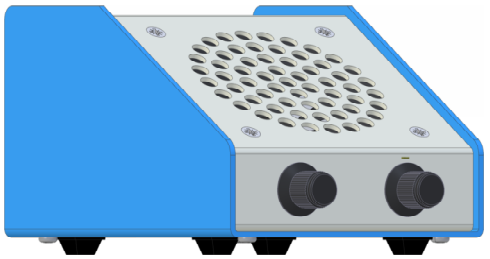
Rear View

Top View



Side View (Blue Cover Removed)

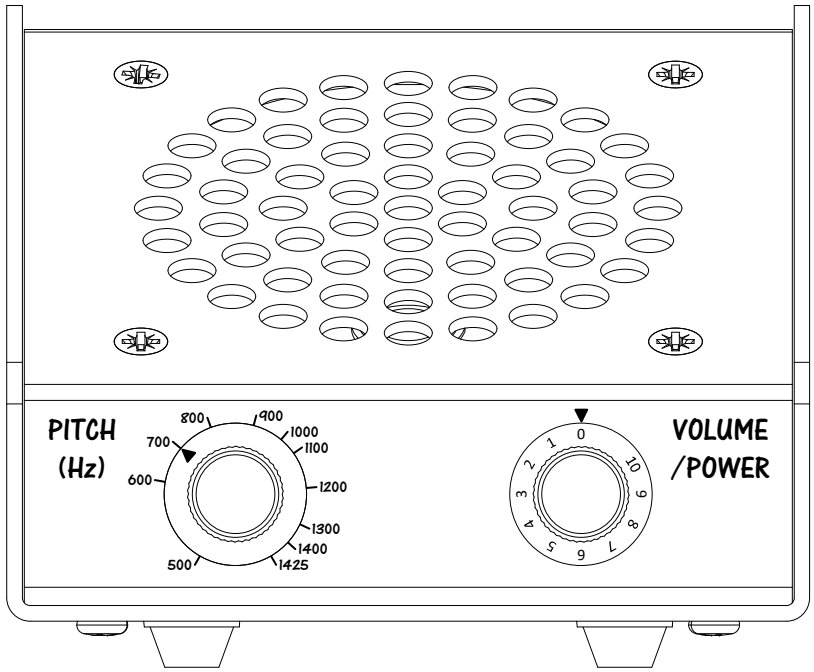


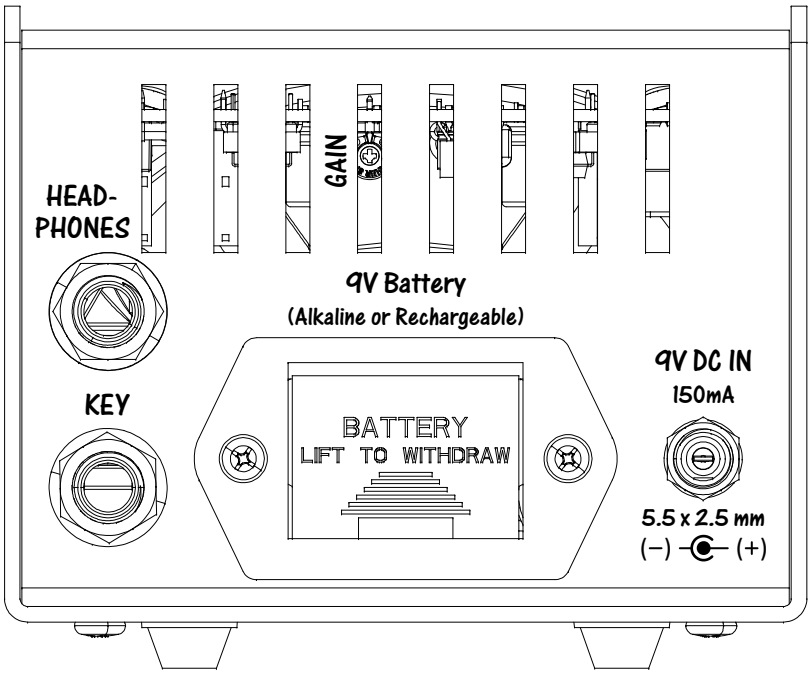


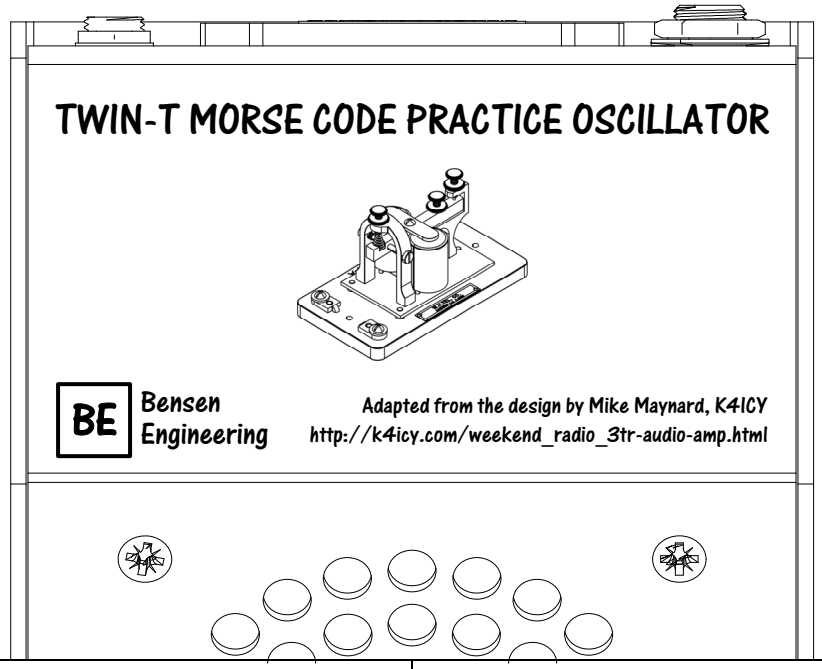
Enclosure is
Hammond 1456CE3WHBU

See file
“Twin-T_Morse_CPO_Fab-Drawings.pdf”
for mechanical layout and drill templates.

Twin-T Code Practice Oscillator : Enclosure 3D Renderings				
DRAWN BY J. BENSEN	SIZE A		DWG NO	REV A
ISSUED 2020-09-02	SCALE NONE		SHEET 4 OF 6	

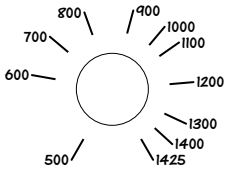






Twin-T Code Practice Oscillator : Artwork Overview				
DRAWN BY J. BENSEN	SIZE A		DWG NO	REV A
ISSUED 2020-09-02	SCALE 1:1		SHEET 5 OF 6	

PITCH (Hz)



VOLUME /POWER

HEAD-PHONES

GAIN

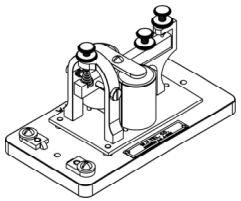
KEY

9V Battery
(Alkaline or Rechargeable)

9V DC IN
150mA

5.5 x 2.5 mm
(–) (+)

TWIN-T MORSE CODE PRACTICE OSCILLATOR



BE Bensen Engineering

Adapted from the design by Mike Maynard, K4ICY
http://k4icy.com/weekend_radio_3tr-audio-amp.html

Twin-T Code Practice Oscillator : Printable Artwork					
DRAWN BY J. BENSEN	SIZE A		DWG NO		REV A
ISSUED 2020-09-02	SCALE 1:1			SHEET 6 OF 6	