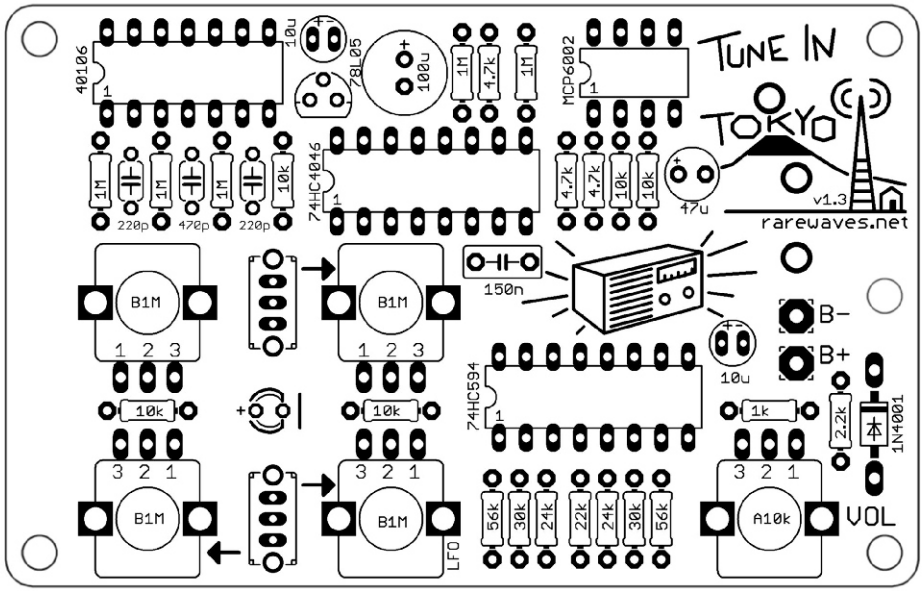


Tune In Tokyo simulates the swirling, whistling sound of tuning an old-fashioned radio.

The kit includes all parts necessary. Previous soldering experience is recommended.

The circuit has a 1/4" line level output. You'll need a 9V battery and an audio amplifier to hear it.

Tune in Tokyo first appeared in 2010 as a group project for the DIY workshop series Handmade Music Austin. This project was also taught at a workshop during Bent Fest in NYC.

Use the four knobs & two switches clustered around the LED to control the sound.

The switches select which knob is active. This is indicated with arrows that point from the switch to the knobs.

The middle knob on the bottom row is the Low Frequency Oscillator (LFO). It automatically scans through the frequencies when activated.

The VOLUME knob is located on the right side of the board.

This kit is not designed to fit in any particular enclosure. It is intended for use as a bare circuit board.

If you'd like to build Tune In Tokyo into an enclosure of your choice, don't use the potentiometers and switches included.

You can get panel-mount controls from an electronics distributor. Substitute them for the pots and switches provided, using insulated wire to extend the controls off of the circuit board. You'll also need a panel-mount 1/4" jack.

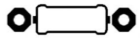
ASSEMBLING THE TUNE IN TOKYO KIT

You're about to solder all of the components to the circuit board. Check your soldering iron now. Touch the tip of the iron to some fresh solder. It should melt immediately with a puff of smoke and cling to the tip like a drop of water. Wipe the solder off the tip on a damp sponge. The tip should be shiny. Some cheap soldering irons have tips that solder won't cling to. Its difficult to make quality connections with this type.

It is recommended to use flux core solder with 0.032" diameter. You can use either tin-lead alloy solder such as SN63/PB37, or lead-free solder such as SAC305.

After you solder a component, trim its leads flush with the bottom of the board. Wipe the tip of the soldering iron clean on a damp sponge frequently.

STEP 1. RESISTORS



Bend both leads at a 90-degree angle to the resistor's body, then slip them into the holes on the board. Both leads are equivalent so it doesn't matter which way the resistor is rotated. Turn the board upside down and lay it flat on the work surface, then solder the resistor leads.

Qty	Value	Color Code		
5	10k	brown	black	orange
5	1M	brown	black	green
3	4.7k	yellow	violet	red
2	24k	red	yellow	orange
2	30k	orange	black	orange
2	56k	blue	green	orange
1	1k	brown	black	red
1	2.2k	red	red	red
1	22k	red	red	orange

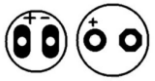
STEP 2. DIODE

The diode is black and has a light colored stripe on one end. Orient the striped end of the diode to match the printing on the board.

STEP 3. CAPACITORS

The polyester capacitor looks like a rectangular plastic box. The ceramic caps are orange and disc shaped. Both legs are equivalent so the rotation does not matter.

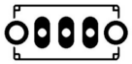
Qty	Value	Description
2	220p	orange disc, marked 221
1	470p	orange disc, marked 471
1	150n	rectangular, marked µ15



The electrolytic capacitors are polarized. Make sure their long leg goes into the hole marked plus (+). Also, you can identify the negative side of the capacitor by the stripe printed on its side.

Qty	Value	Description
2	10u	cylinder, 4 mm diam.
1	100u	cylinder, 7 mm diam.
1	47u	cylinder, 5 mm diam.

STEP 4. SWITCHES

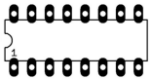


There are two SPDT slide switches. They mount in the middle of the cluster of four potentiometers. It does not matter which way they are rotated.

STEP 5. LED

The LED serves as a power indicator. It can be any visible color. Insert its long leg into the hole with the (+) sign printed next to it.

STEP 6. CHIPS



Install the four chips into their positions. Use a bright light to read the printing on the chips. Sockets are not necessary, but make sure to install them in the correct orientation - align them so the text on the chips reads right side up like the *Tune In Tokyo* logo printed on the circuit board.

Before inserting the ICs, it helps to bend the leads inward slightly so they are pointing straight down. Press the IC flat against a conductive surface like aluminum foil. This makes the rows of leads parallel so they will line up with the holes.

Qty	Value	Description
1	CD 40106	14-pin DIP
1	74HC4046	16-pin DIP
1	74HC594	16-pin DIP
1	MCP6002	8-pin DIP

Don't solder any of the leads until you are certain the chips are placed correctly!

Mount the voltage regulator 78L05 in its position. It is a black plastic package with three leads. Make sure its flat side is matched with the outline printed on the board.

STEP 7. POTENTIOMETERS

There are a total of five potentiometers. The volume control must be A10k or A5k. The remaining four potentiometers are B1M or B500k.

STEP 8. CONNECTORS

The output jack mounts on the underside of the board. It is located underneath the Tune In Tokyo logo. Solder the three leads in place.

The battery snap connects to the two pads marked B+ and B-. The red lead goes to B+ and the black lead goes to B-. There is an extra hole drilled next to the battery connections. Before soldering, loop the battery wires through this hole once or twice to provide strain relief.

STEP 9. LEGS

This kit needs its four legs to sit flat on a tabletop. Install the legs into the corner holes using the screws provided.

STEP 10. CLEANUP

Remember to wash your hands, especially if you used tin-lead alloy solder. The cut ends of the component leads can be dicarded.

TESTING

Now all of the parts should be in place and the unit is ready to test. Connect a 9V battery that is known to be good, and plug a 1/4" cable into the jack. The LED should be on. If it doesn't come on, it may be installed backwards, or one of the chips may be installed backwards.

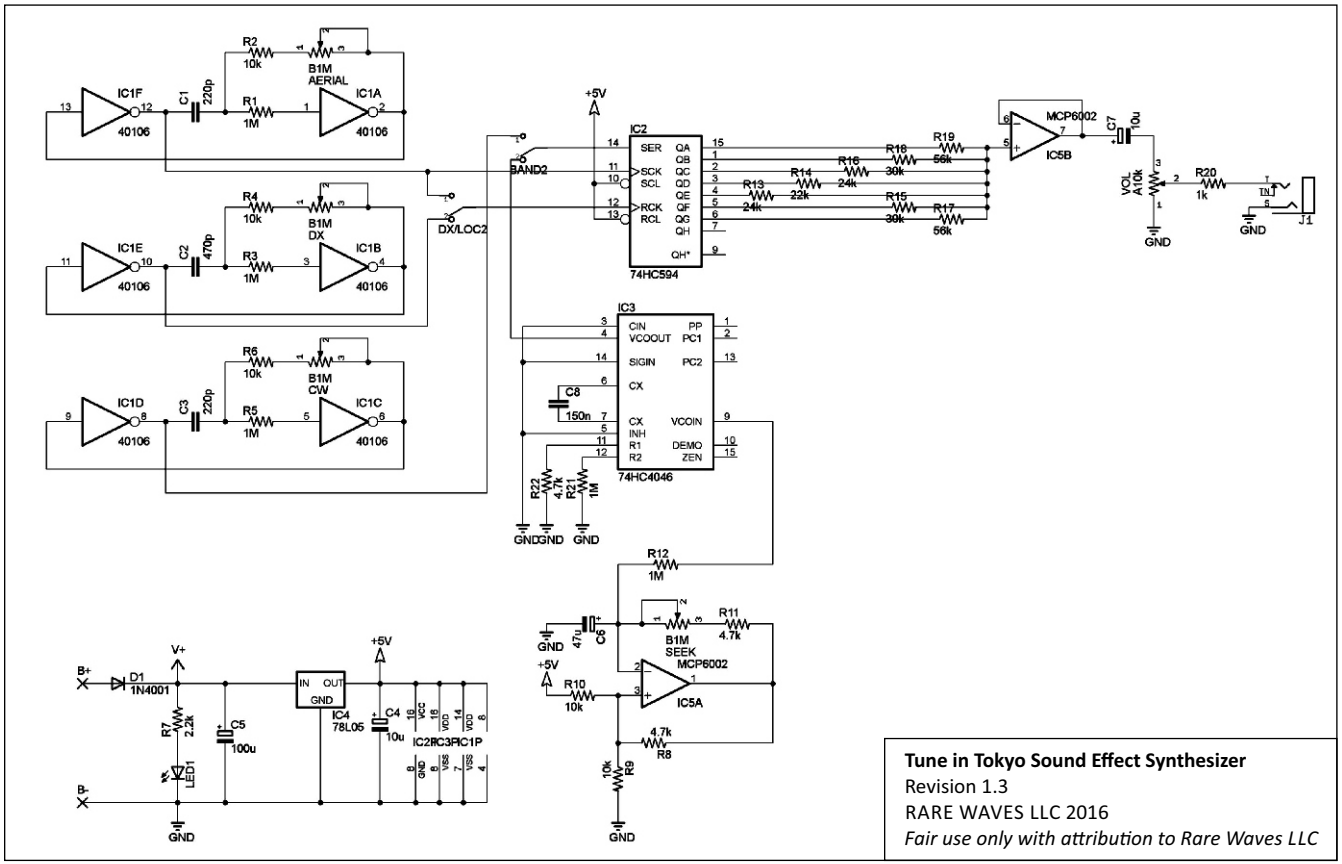
Plug the unit in to a mixer or guitar amp, turn up the volume on your Tune In Tokyo, and listen for sound.

SOLUTIONS

If you don't hear swirling frequencies, you may have an assembly error, a dead battery, or a bad connection to your amplifier or monitor speakers. The first thing you can do is make sure all the parts are installed in the proper places. Check the photos on the Tune In Tokyo web page for reference. If that looks OK, you probably have a bad solder connection. Another possible error is mounting a chip in the wrong location.

Inspect all the solder connections and be sure there is no solder bridging adjacent points. Re-heat each connection with the soldering iron until you see the solder liquefy and become shiny all over, then lift the iron. You can add a little bit of fresh solder here if it looks like there may be too little.

If a chip is installed incorrectly, you will need to remove it. Unfortunately there is no way to desolder it and re-use it. Simply cut all of its leads, and remove the body of the chip. Then remove the remnant of each lead from each hole by heating with the soldering iron and pulling the lead out with tweezers. Finally, use desoldering braid to clean up the holes before installing a new IC.



CIRCUIT DESCRIPTION

The circuit contains three manually tuned high frequency oscillators, built with a CD 40106. One of them is a serial data stream for input to the 8-bit shift register 74HC594. Another oscillator serves as a clock to move the data through the register in a first-in, first-out manner. The third oscillator is used to capture snapshots of the shift register, which appear at its output terminals QA..QH. The shift register's 8-bit parallel digital output is converted to analog audio with an array of weighted-value resistors. The LFO modulates the 74HC4046 VCO, which can be substituted for the serial data stream from one of the fixed oscillators. The analog output is buffered by the opamp, and appears at the output jack, with variable level controlled by the volume knob.

POWER

The unit can be powered with a 9 volt battery. Rechargeable batteries are recommended.

The device uses 10 mA of current. A fresh battery should last for several long sessions.

Tune In Tokyo is protected against reverse polarity by the 1N4001 diode. If reverse DC voltage is applied, the unit will not power up, and no damage is done.

It is OK to power the unit with any DC voltage from 7 to 15 volts. It has an internal voltage regulator, so the sound will be the same regardless of DC voltage input.