Restoration of Transistor Radios

Some Hints and Kinks, at Least

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December 2019

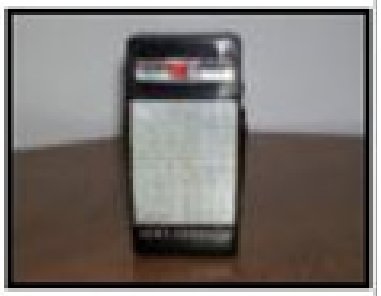
It’s not possible to capture all that’s necessary to restore transistor radios in the 20 minutes allowed here, so let’s see what tricks we can play to simplify the job.

‘Cause it’s not cheap to have others do it….

Here's an ad from the web:

Transistor Radio Repair





AM transistor radio's

Flat Rate Repair - $75.00

The flat rate does include the replacement of most of the electrolytic capacitors. The 1st 5 are **free**, the rest @ $3.95 ea. Most AM radios only have 5, AM/FM's will have more.

So, let’s say you have a cheap 6-transistor receiver that is dead. It is an AM BC-band only radio, sort of like this set, one of the simplest, probably from about 1959.

First you expose the circuit board and everything by taking off the back of the plastic case.

You confirm that the battery in it is good, and that the battery voltage gets to the circuit board, which checks the 9-volt battery's plug-in snaps and the wires from that to the circuit board. This also checks that the on-off switch on the volume control seems to work.

You notice that the six transistors, noted here by arrows, are the molded plastic round-top type, early silicon transistors, found in a whole phase of transistorized sets, but not for long. They often failed.

1st Det/ LO

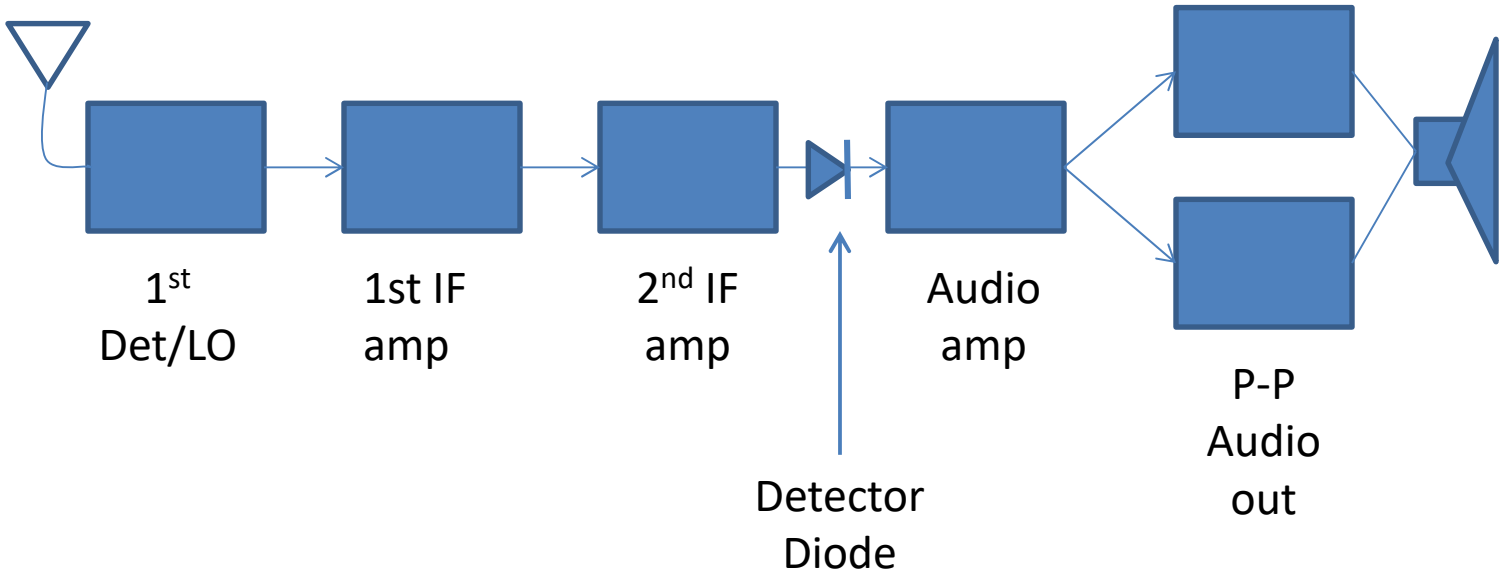
1st IF amp

2nd IF amp

Audio amp

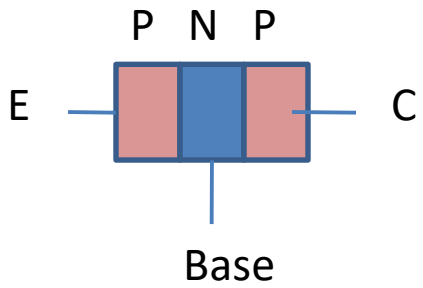
P-P audio out

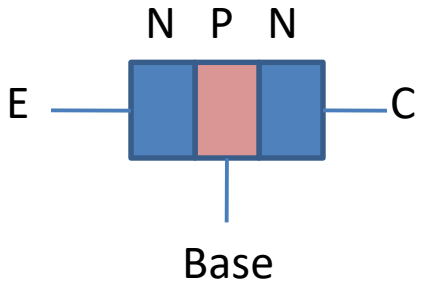
What the six transistors do in this sort of radio



You'll find that most of the small transistor radios used PNP transistors, with the + side of the battery grounded to the "chassis," actually the "ground" trace.

PNP transistors operate mainly by “holes” moving across the alloys formed between bars of Germanium or Silicon which are bonded together. This limits their speed of response.





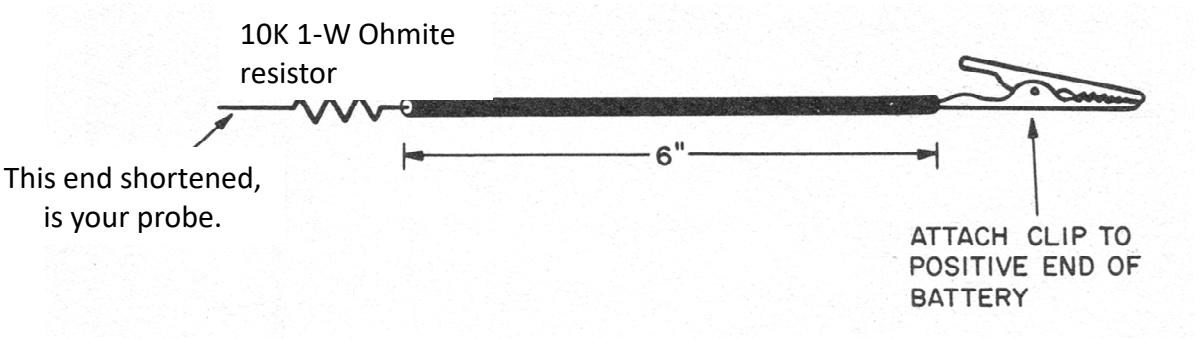
NPN transistors operate primarily by movement of Electrons, instead of Holes, and can be much faster in response, suitable for UHF, for example.

Check the audio section first. If it is broken, other tests (like RF) will not be able to be easily monitored.

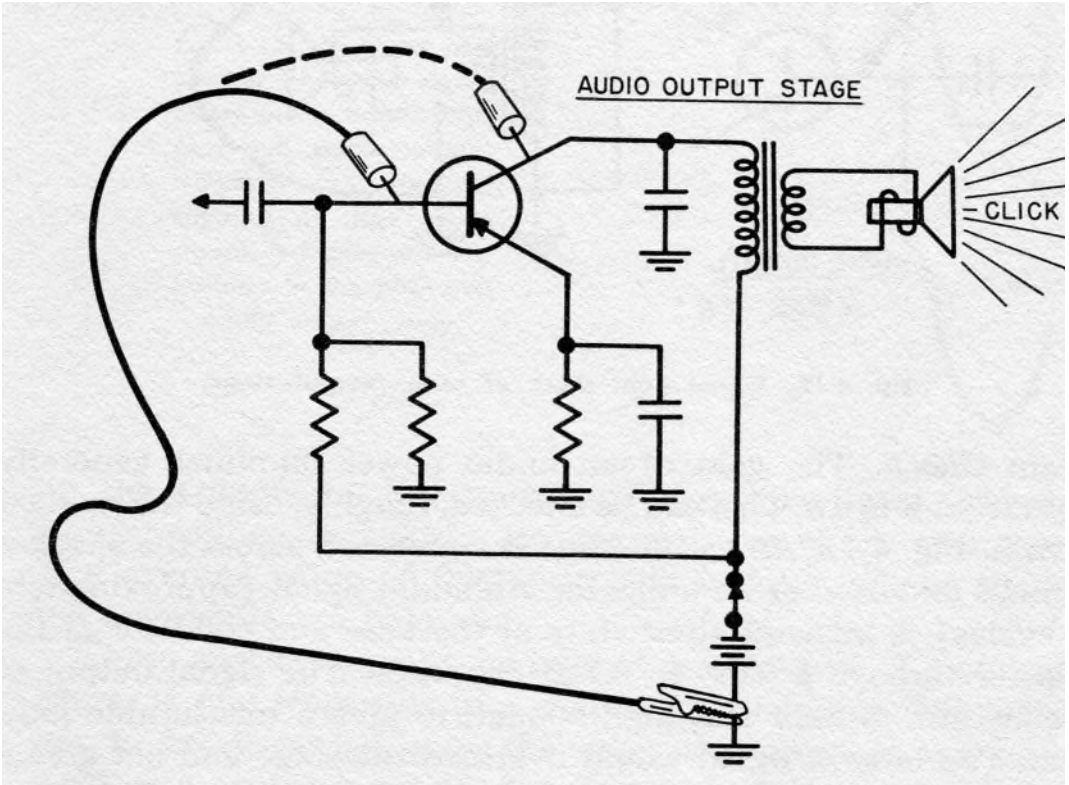
The “CLICK” test.

Make up a voltage spike probe, which is French for a pair of alligator clips or hook clips and a resistor of about 10K ohms.

Use this simple device to momentarily “short” the collector to ground or “B+” of the audio stage transistor. You should hear a click.

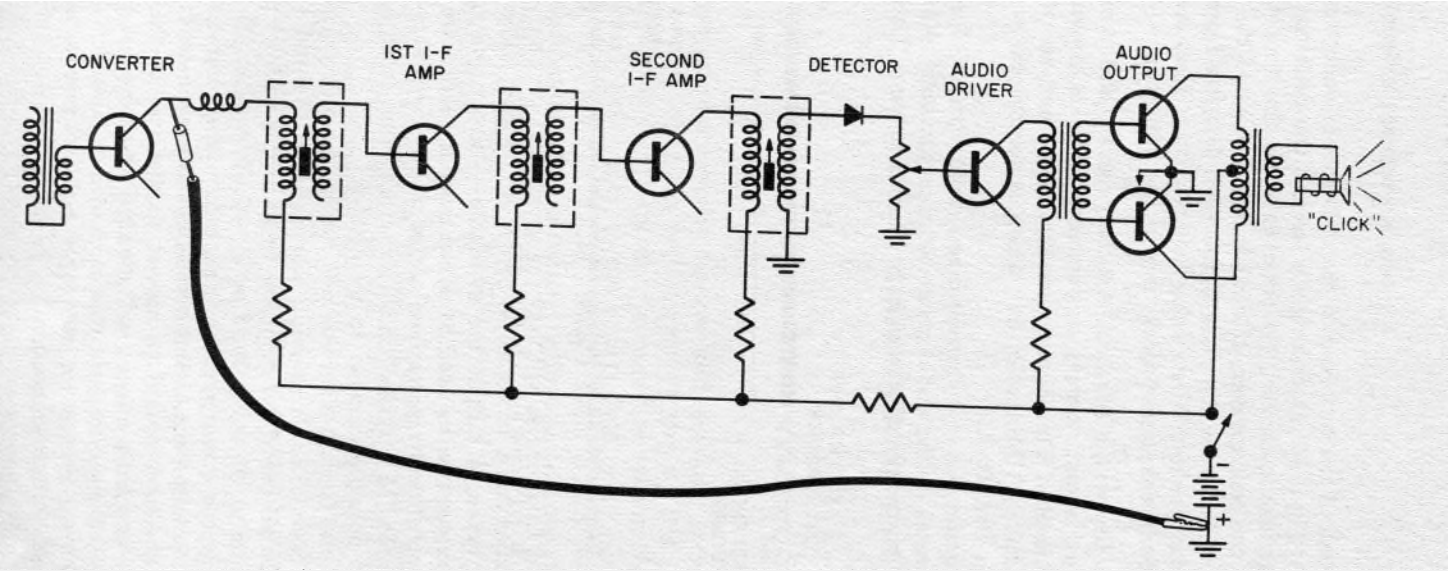


Of course, it’s more elegant to use a signal generator to inject a known signal, but we are taking short-cuts here.



This is, generically, how to use the “clicker.” In the radio at hand, the output is push-pull, so you would do this for both output transistors and for the driver, also transformer-coupled to the output pair.

The “Click” test is so easy, it can be run on each stage of the receiver, best to start with the output stage and go backwards through all stages.



Let's say the transistor set is dead, but the audio section seems OK, based on the clicker test. Then, the elegant way to proceed is this:

Coil of ~ 50-100 turns

Signal generator

Set signal generator to, say, 455+800 kHz (1255 kHz) with modulated signal, high strength. Lay the coil on the dead transistor radio.
Search for this signal with dead radio dial around 800 kHz. If it comes in, the full audio section is working, Thus either the IF amplifier or LO is inoperative.

But a fast way to do this, without having to get out the signal generator, is to use another small transistor radio, in working order, to create or detect signals. Its LO will generate a signal that's 455 kHz above the dial reading, Set both radios to about 800 kHz dial settings.

Here, we use a little Philco AM-FM set to create a LO signal for the broken radio. Sweep the LO frequency through the 1255 kHz region, with the good radio's gain at minimum, and the broken radio's gain at maximum.

That was a test at the dead radio's 'tuned-in" frequency.

If nothing was heard, we can check on the dead radio's LO by seeing if the good radio's LO can radiate enough signal to make the dead radio operate.

To do this simply move the good radio's tuning up to 455 kHz PLUS the dial reading. So, with the dead radio set at 800, set the good radio to 1255, and rock its tuning back and forth there. If it has a wire or whip antenna, bring that right up close to the dead radio's LO coil. If the good radio has a loop-stick antenna, bring the loop-stick up close to the dead radio's LO area.

If the dead radio can bring in static when the good radio is sweeping past 1255 kHz, then it is the LO that is bad. Change its transistor.

But, let's say the LO is working, as it can be heard on the good radio tuned to 455 plus the dead radio's dial reading. But the dead radio is still dead.

Then it's downstream of the LO stage, like in the IF amplifier stage.

Now you can inject the RF signal generator signal, isolated by a 0.01 uF cap, directly to the base of the IF amplifier transistor, Clip the signal generator's output neutral lead to either battery terminal of the dead radio, via a 0.1 uF cap.

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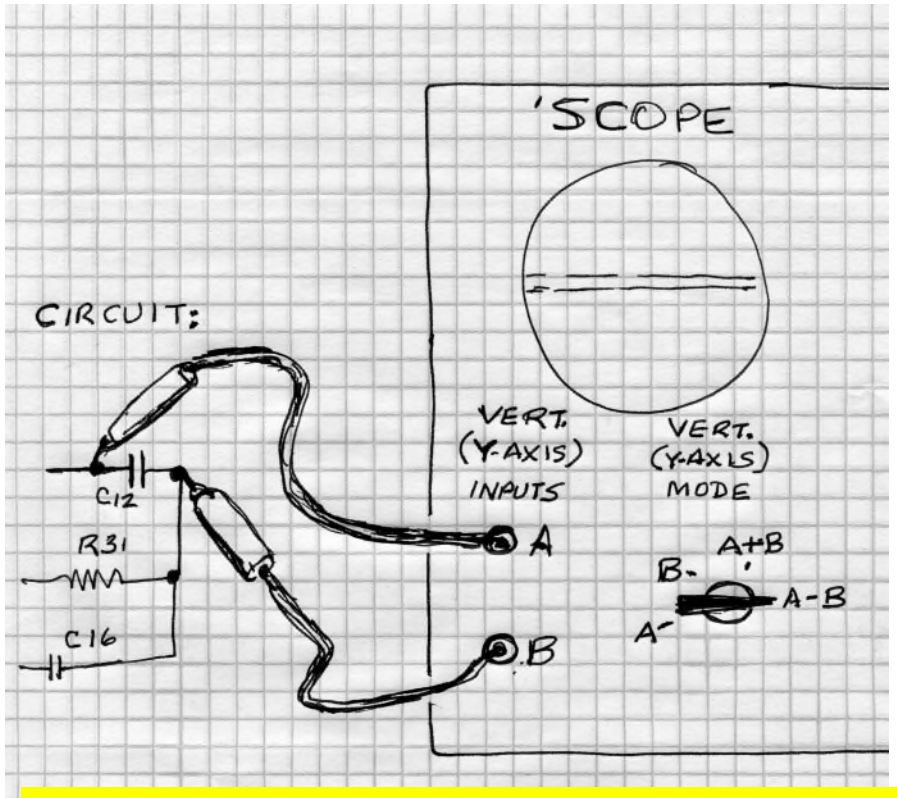
A ‘scope is the best tool for fast diagnosis of bad components in these little radios (or any radios).

Take an electrolytic cap for example. These radios use the smallest ones imaginable, and they dry out after storage or use for several years. Read the voltage DIFFERENCE across the suspect cap, using both probes.



Any a-c signal showing on ‘scope means that the electrolytic cap is dried out. If the expected d-c voltage does NOT show up, the cap may be shorted.

These type electrolytics are famous for getting dried out and showing huge signal losses. Used in Zenith 500 Owl Eyes radios.

Set your ‘scope up with two inputs, A and B, set to read the DIFFERENCE in voltage impressed on the two inputs, i.e., (A – B) . If the two probes, (A and B input probes) are connected to the terminals of any electrolytic cap in a radio, the a-c reading should always be zero volts, and the d-c reading should be a reasonable value for the circuit.

If the scope shows any a-c signal voltage, then the cap is dried out. If is shows zero d-c voltage, see if that makes sense from that part of the circuit; if not, the cap is shorted.

This has been a short teaser for the real scoop on diagnosing and repairing problems in transistor radios. The full story is going to be told in Radio Age. Part 1 starts in the January 2020 issue.