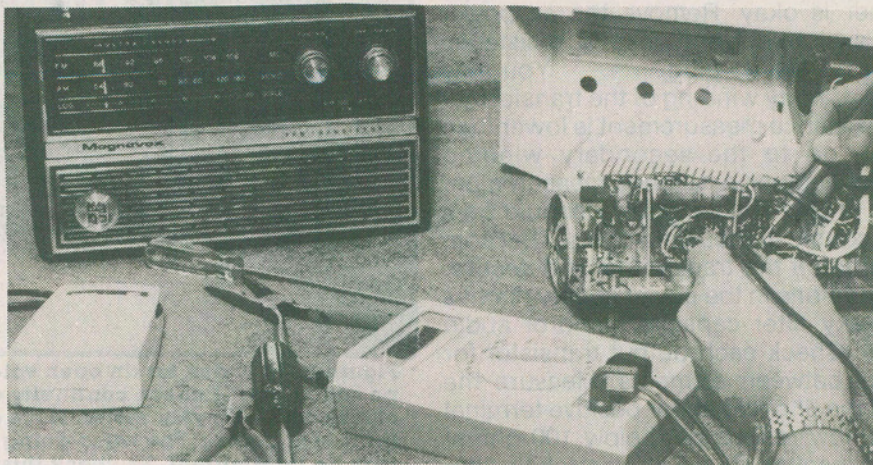


# 10 EASY WAYS TO FIX



## PORTABLE RADIOS

By Homer L. Davidson

**B**ecause most portable radios are rather inexpensive to begin with, most radio-TV repair shops won't tackle them today. But you don't have to toss that non-working set in the trash can. Most of the time you can get it back in good operating condition yourself, just by following these ten easy repair tips.

### What You Need

You'll need a meter to make these ten common repairs on most portable radios. You should have either a voltohmmeter (VOM), or the more modern DMM, a digital multimeter. Using one of these meters you'll be able to find leaky or open diodes and power supply rectifiers, bad transistors, or open speakers and transformer windings.

Before you do anything else, visually inspect the radio with the case removed. A broken dial cord or a snapped antenna is easy to spot, but lots of other problems can also be located, if you look carefully.

### Bad Sound

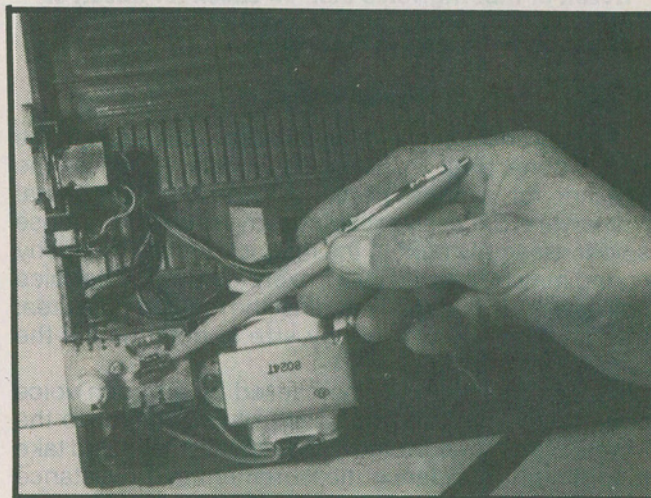
If the sound is raspy or scratchy, it may be due to a speaker with a hole or tear in its paper cone. Or the cone may be loose. You may have to remove the speaker to check this by removing the two or four screws holding it to the case. Dirty volume controls can also be detected by sound. The rest of the ten most common problems can be found using the VOM or DMM.

### Burned Diodes

Most radio problems are found in the audio output on the power supply circuits. Check the batteries and terminals if the radio is dead in battery operation. If

the radio is dead in the ac operation, inspect the on/off switch and the silicon rectifiers. A burned diode can be seen easily (Fig.1). Remove one end of each diode and take an accurate resistance measurement, if no burn marks can be seen.

A leaky diode will have a low resistance measurement in both directions. Replace the diode if you find low resistance (below 350 ohms). Now reverse the test leads and take another measurement. Install a new silicon diode if you have a low reading. A normal diode should show low ohms measurement in one direction, and infinite measurement with reversed test leads.



**Figure 1.** If there's no sound (and the speaker is OK) a good bet is burned or leaky silicon rectifier diodes in the power supply. Check with a flashlight if necessary. Replace with a one amp, two, or 2.5 amp rectifier.

A leaky or burned diode may have become defective from internal leakage, lightning damage or overloaded circuits. Usually, if lightning damage is found, you would just toss the radio out. Before attempting to replace the diodes, make sure the power transformer is okay. Remove the ac power plug. Turn the switch on and take a resistance measurement across the ac plug. You may safely assume the primary winding of the transformer is normal if the resistance measurement is lower than 500 ohms. Next, go to the secondary winding terminals and take another resistance measurement to determine if it is OK. The secondary should be a few hundred to a couple of thousand ohms. The radio is not worth repairing if the transformer is defective.

Overloaded conditions in the power supply circuits are caused by leaky filter capacitors and/or audio output transistors. Check each output transistor for shorts or leakage between elements. Measure the resistance across the filter capacitor positive terminal and ground. Real low resistance (below 100 ohms) indicates a leaky capacitor. Check all electrolytic filter capacitors in the same manner.

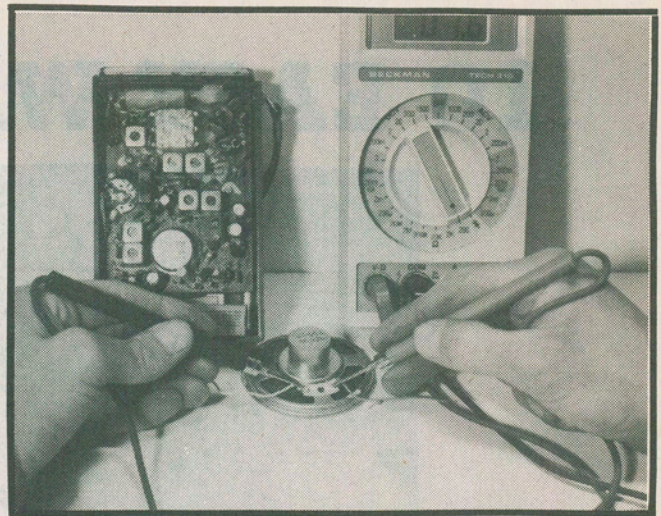


**Figure 2.** Check the speaker for holes, tears, or a frozen or rubbing voice coil. To check for frozen or rubbing coil, gently move the coil with a thumb or finger on each side of the middle.

### Noisy Speakers

A noisy speaker may have holes or torn areas in the paper cone (Fig. 2). Check the outside rim of the speaker for a cone vibrating loose from the metal framework. Excessive blatting may result from a loose spider assembly next to the magnet. A tinny or mushy sound may be caused by a frozen voice coil. The voice coil assembly is directly against the magnet pole area. Use another speaker of any size to determine if the speaker is defective.

A dead speaker may be caused by an open voice coil. Rotate the function switch of your meter to the lowest ohm range. Remove one speaker lead and take a continuity resistance measurement. No resistance indicates the voice coil is open. When a VOM is used to check the voice coil, the resistance will be 1 or 2 ohms (Fig. 3). Replace the defective speaker with the correct ohms impedance, size and shape.

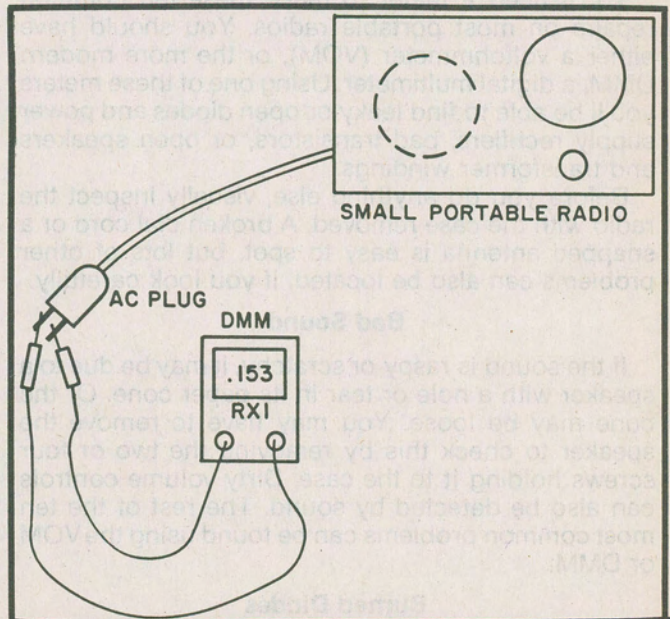


**Figure 3.** To check for an open voice coil (if there's no sound at all) check continuity on the lowest ohms scale with your meter. If it's open you'll get infinity of course. The wires going to the voice coil may be intermittent. To check this, move the cone back and forth (as described in Figure 2) while the meter is connected to the voice coil terminals.

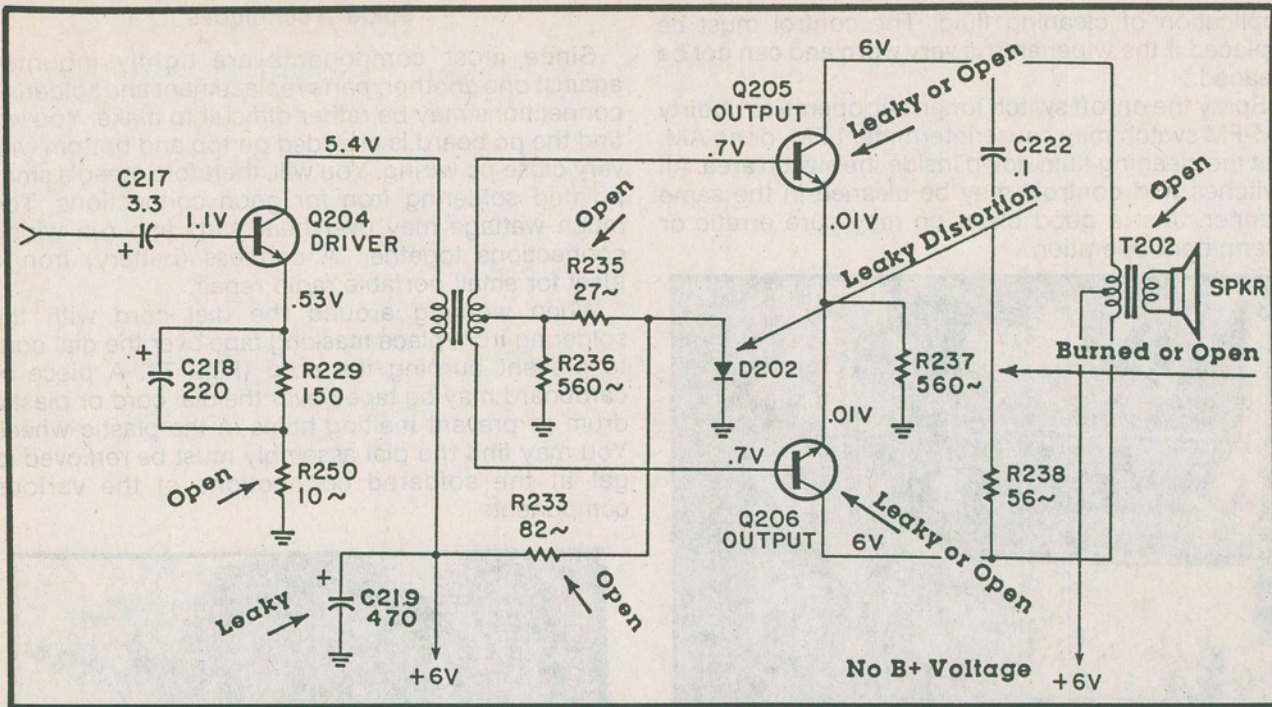
### No Sound

No hum and no click in the speaker may indicate an open on/off switch or dead batteries. Suspect the batteries or terminals if the radio operates on ac but not on dc. Check the power supply when the radio operates on batteries but not on ac. If the radio is dead on both ac and dc power, suspect a defective output transistor.

Measure the dc voltage at the on/off switch terminals. Now check the dc voltage at the collector terminals of the output transistors. No voltage at the collector terminal may indicate a broken wire or bad switch. Very low voltage may indicate a leaky output transistor. Replace output transistors if they are real hot, with no audio output.



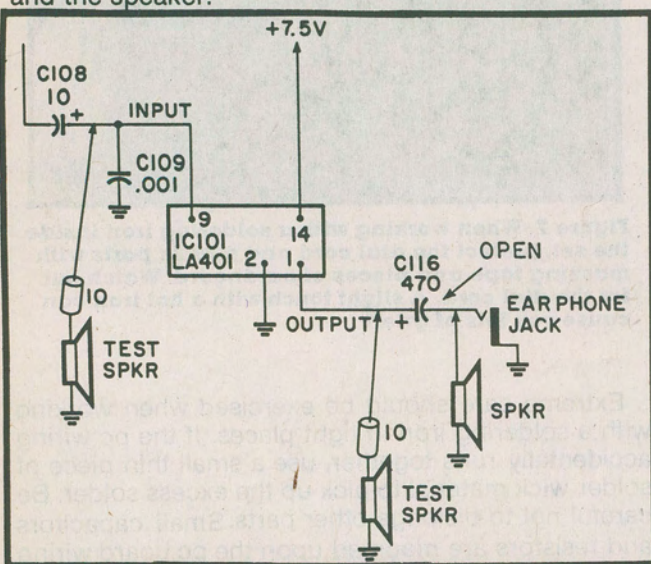
The power transformer of the portable radio may be quickly checked with a resistance measurement across the AC power cord. Remove the power plug from the wall for resistance measurements.



**Figure 5.** Here's another schematic (of a different radio). The arrows show various places to check. The schematic shows points you can inspect with your meter for dead or intermittent operation.

In large ac-dc battery operated portable radios you may find one IC output component. Check the speaker by clipping another pm speaker across the speaker terminals. Sometimes the earphone jack contacts are dirty or open, preventing speaker operation. Clip the test speaker ahead of the earphone jack terminals to see if the jack is defective.

Take accurate voltage measurements at the IC terminals. Real low voltage at the supply terminal may indicate a leaky IC or improper applied voltage (Fig. 4). In this Sanyo M2560 portable radio, all voltages were fairly normal at IC 101, but no sound. The cause? C116 (470UF) was open between IC terminal 1 and the speaker.



**Fig. 4.** Here's the schematic of a typical audio section. Use a separate speaker with an electrolytic capacitor as a signal tracer. You can also check with the second speaker at the earphone jack.

You can signal trace the audio signal after the first AF or driver transistor with an electrolytic capacitor and a small speaker. Add a couple of flexible leads to the speaker and insert the capacitor between one lead and the probe. Touch the test probe to the collector or coupling capacitor lead of the AF or driver transistor. The sound maybe weak here, but if the front end is normal, you will hear music by placing your ear next to the speaker. Go to the base terminal of the output transistor or IC component. If the signal is normal at the input, and there's none at the output, suspect a leaky or open transistor or IC.

The audio output transistor may be checked in the circuit for leakage and open test with the DMM. Set the function switch to diode test, and check leakage between all terminals. The transistor may be checked for an opening between the base and the collector or between the base and emitter terminals (Fig. 5). Remove the transistor from the circuit if the tests are erratic or you are not convinced the transistor is okay.

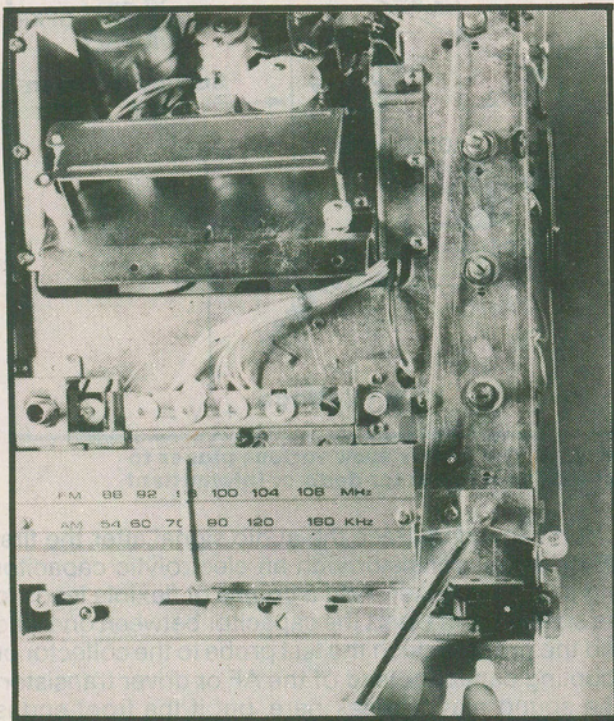
A quick way to remove and install a small output transistor with wire leads is to cut off the leads close to the body of the transistor. Since the leads are difficult to get at on a crowded pc board, this is the best and quickest method for replacement. Leave an inch or so of the lead soldered to the pc board to hook on to. Form a half circle out of the remaining terminal lead. Write down where the collector, base and emitter terminals are on a scrap of paper so you can install the new one. Push the correct terminal lead through each half circle and solder each. Double check each lead.

### Erratic Controls

A noisy or erratic volume control may be repaired by spraying cleaning fluid down inside the control area. Point the spray tube inside the contact control terminals. Rotate the volume control between each

application of cleaning fluid. The control must be replaced if the wiper area is very worn and can not be cleaned.

Spray the on/off switch for erratic operation. A dirty AM-FM switch may cause intermittent FM, or no AM. Get the cleaning fluid down inside the switch area. All switches and controls may be cleaned in the same manner. Just a good clean up may cure erratic or intermittent operation.



**Figure 6. Tuning indicator slippages usually happen when the dial cord is slipping at the dial cord drive shaft. Put a little liquid rosin on the shaft.**

### Dial Cord Repair

The dial pointer may move slowly across the dial or just stay in one place, indicating dial slippage. No movement at all may be caused by a broken dial cord. Often, one end of the dial cord will break out of the plastic hole in the drum area allowing the cord to become loose. Slippage usually occurs at the dial turning shaft (Fig. 6).

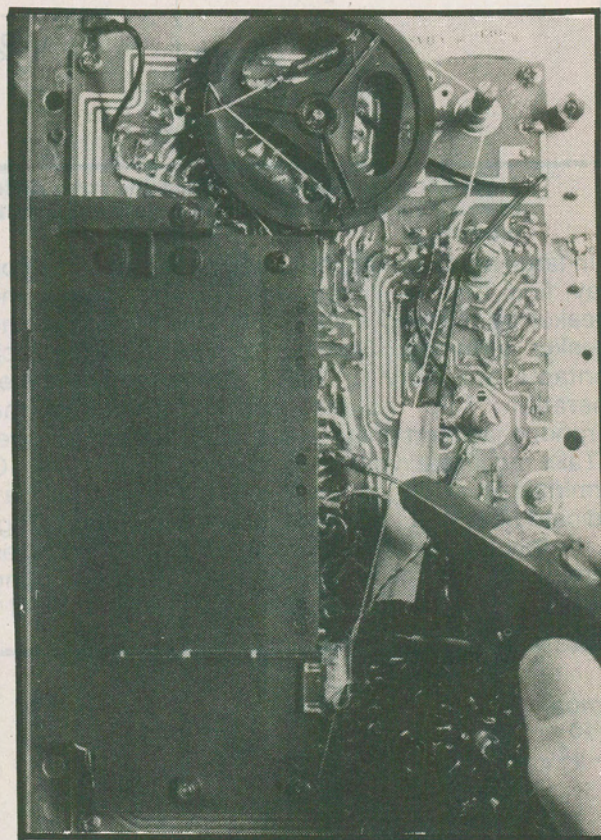
Inspect the dial cord for breakage or worn spots. If the dial cord has just stretched or become larger, remove spring and cut off a couple of turns with wire cutters. Another method is to remove the spring end and tie a couple of knots in the cord, close to the spring. This will tighten a loose cord. Alternatively, you can tie another small dial spring at the other end of the cord. Now you have a spring at each end to keep the cord tight.

Draw a rough sketch of the dial cord stringing if the cord has broken. Leave the string exactly where you find it and try to figure out where it was before it broke. Notice how many turns are around the dial shaft. Determine which direction the cord travels so the cord is not wound on backwards. In most cases, the dial pointer travels in the same direction as the dial knob is rotated.

### Solder Techniques

Since most components are tightly mounted against one another, parts replacement and soldering connections may be rather difficult to make. You will find the pc board is crowded on top and bottom with very close pc wiring. You will, therefore, need a small pointed soldering iron for good connections. Too much wattage may over heat parts and run wiring connections together. A cordless (battery) iron is ideal for small portable radio repair.

When working around the dial cord with the soldering iron, place masking tape over the dial cord to prevent burning the cord (Fig. 7). A piece of cardboard may be taped over the dial cord or plastic drum to prevent melting holes in the plastic wheel. You may find the dial assembly must be removed to get at the soldered connections of the various components.



**Figure 7. When working with a soldering iron inside the set, protect the dial cord and plastic parts with masking tape and pieces of cardboard. Watch out for the dial cord. A slight touch with a hot iron can cause you lots of grief!**

Extreme care should be exercised when working with a soldering iron in tight places. If the pc wiring accidentally runs together, use a small thin piece of solder wick material to pick up the excess solder. Be careful not to dislodge other parts. Small capacitors and resistors are mounted upon the pc board wiring area and drop off while soldering nearby. Take the blade of a pocket knife and clean out between wiring and terminals.

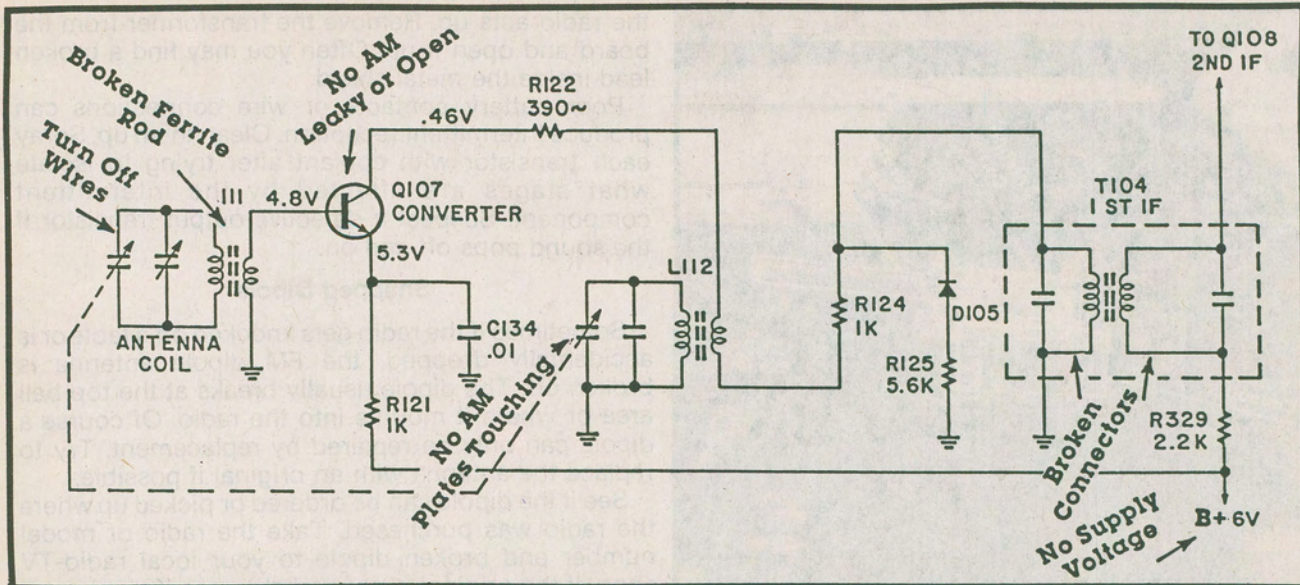


Figure 9. Most small portables have one transistor serving as both the RF amplifier and the local oscillator. If you have no AM reception, test this transistor.

### Weak AM

Suspect a broken ferrite antenna rod or defective RF transistor when only local stations can be heard (Fig. 8). Carefully inspect the antenna coil for a broken black rod. The ferrite rod may break inside the coil if the radio is dropped. The antenna coil may be repaired by installing a new rod. Replace the whole antenna coil assembly if a rod replacement is not available.

Check the antenna coil for broken leads. The fine wiring found on most antenna coils must be tinned before a good connection is made. Scrape off the insulation with the blade of a pocket knife. Apply rosin core paste to the wire. Heat the piece of wire with the soldering iron while applying solder. Now the broken wire may be replaced with a good soldered connection.

A leaky or open RF transistor may cause weak AM reception. You will not find an RF transistor in smaller portable radios. A converter transistor serves both as RF and oscillator transistors (Fig. 9). An RF transistor will be found near the three-ganged tuning capacitor, in large multiband receivers. Separate RF, oscillator and mixer transistors will be found in these radio circuits.

### No AM, No FM

Clean the AM-FM switch for poor contacts when no AM or FM can be tuned in. Check the low voltage source feeding both circuits. With low (or no) supply voltage, check for a leaky zener diode or decoupling filter capacitor. Usually, the FM circuits have RF and converter transistors while the AM circuit may consist of one converter transistor (Fig. 10).

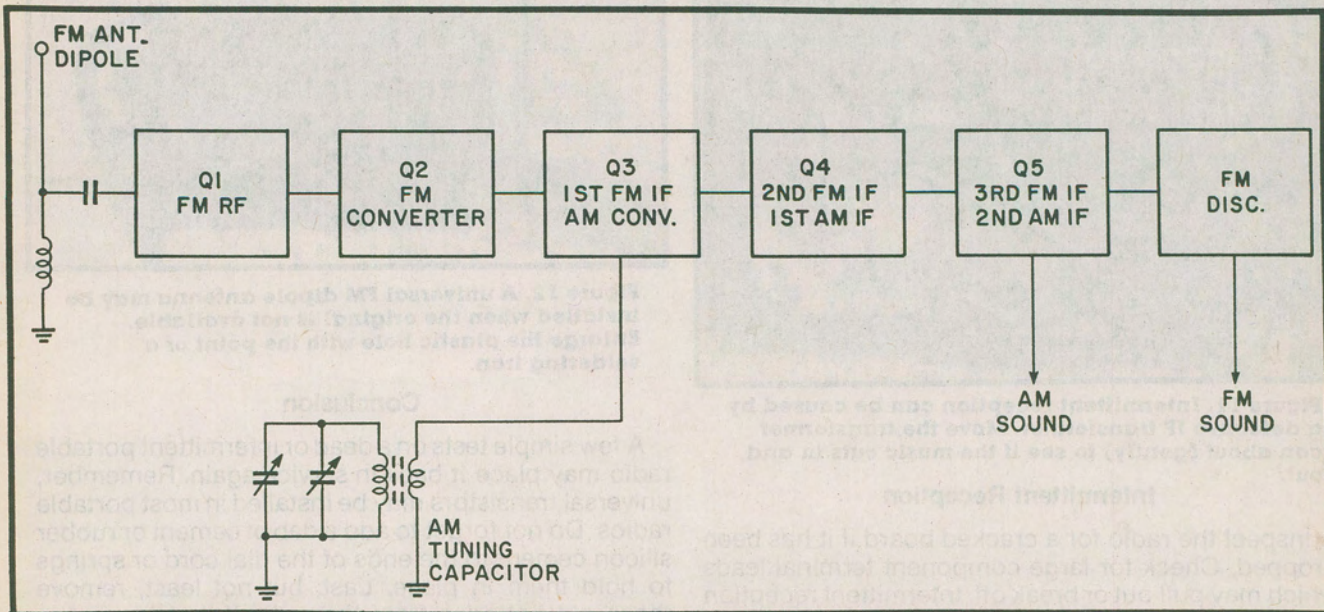
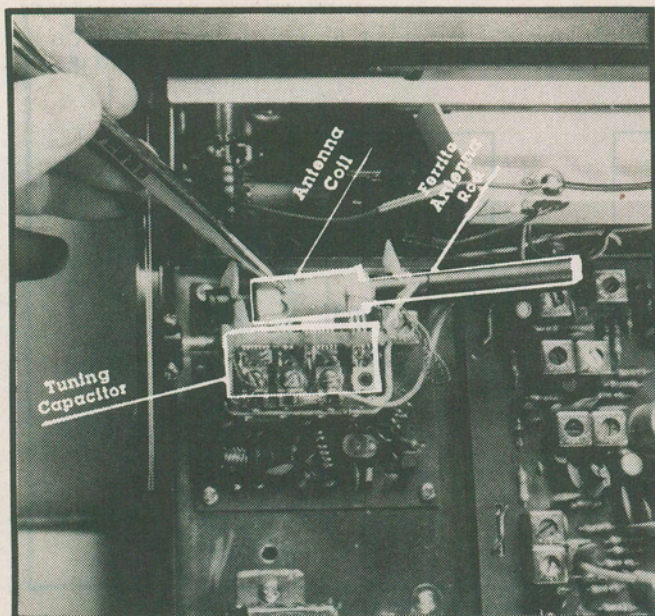
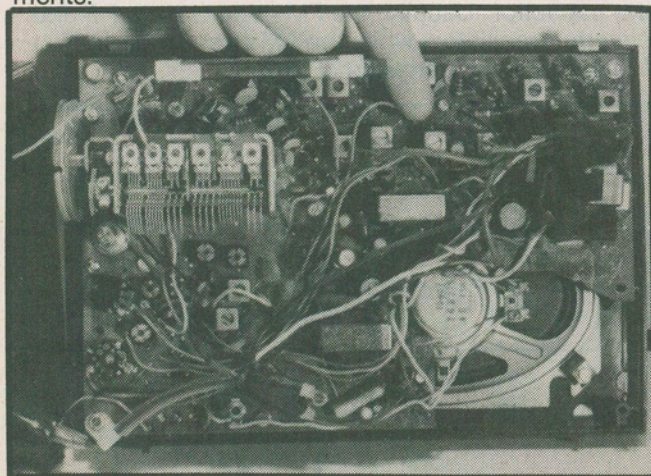


Figure 10. Here's a block diagram of a typical radio. This shows how the AM and FM sections tie together near the front end.



**Figure 8.** If there's weak AM reception a common cause is a broken wire at the ferrite rod antenna. Check it for broken wires leading to the circuit. One wire should go directly to the tuning capacitor (the part with the most plates).

No AM or FM reception may be caused by a defective IF stage. Sometimes the first IF stage serves as both the AM converter and FM IF stage. To determine if the AM converter is working, place the portable radio near another radio and tune the entire band. If the AM oscillator stage is functioning, you will hear a squeal in the other radio as you cross the band indicating the AM converter stage is normal. Then check each transistor in the IF stages. Isolate the defective transistor with in-circuit voltage measurements.



**Figure 11.** Intermittent reception can be caused by a defective IF transformer. Move the transformer can about (gently) to see if the music cuts in and out.

#### Intermittent Reception

Inspect the radio for a cracked board if it has been dropped. Check for large component terminal leads which may pull out or break off. Intermittent reception may be caused by poor IF transformer connections (Fig. 11). Move the transformer around and notice if

the radio acts up. Remove the transformer from the board and open it up. Often you may find a broken lead inside the metal shield.

Poor battery contacts or wire connections can produce intermittent reception. Clean them up. Spray each transistor with coolant after trying to isolate what stages are affected by the intermittent component. Suspect a defective output transistor if the sound pops off and on.

#### Snapped Dipole

Sometimes if the radio gets knocked off a table or is accidentally dropped, the FM dipole antenna is broken off. The dipole usually breaks at the top ball area or where it mounts into the radio. Of course a dipole can only be repaired by replacement. Try to replace the antenna with an original if possible.

See if the dipole can be ordered or picked up where the radio was purchased. Take the radio or model number and broken dipole to your local radio-TV shop. If the original is not available, see if a universal type will mount into the plastic case (Fig.12). You may be able to pick up universal dipole antennas at Radio Shack or at a local electronic supply house.

The universal replacement can be mounted on any plastic case provided there is room inside the radio. A larger hole may be drilled to accommodate the new antenna mount. The hole may be enlarged with the tip of a soldering iron. Be careful not to make the hole too large. Metal washers may be used on top and bottom if the original hole is too big for the universal replacement.



**Figure 12.** A universal FM dipole antenna may be installed when the original is not available. Enlarge the plastic hole with the point of a soldering iron.

#### Conclusion

A few simple tests on a dead or intermittent portable radio may place it back in service again. Remember, universal transistors may be installed in most portable radios. Do not forget to add a dab of cement or rubber silicon cement to the ends of the dial cord or springs to hold them in place. Last, but not least, remove those old batteries from the radio if it stays on the shelf or remains unused too long. This will prevent battery leakage over the other components. ■