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QST Issue: Apr 1955
Title: "Tiny Tim" Portable, The
Author: Stuart D. Cowan, Jr., W1RST

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The "Tiny Tim" Portable

A Complete Dry-Battery Station for 40 and 80 C.W.

BY STUART D. COWAN, JR.,* W1RST

• Here is a little item that many hams will like to have around the shack, since it has a variety of uses. The unit, which includes transmitter, receiver and battery power supply, has been variously used by the author in the field, on a boat, and in the home station for the thrill of operating real low power.

WEIGHING in at 18 lbs., "Tiny Tim" is a complete ham station in one compact case, for use in emergencies, portable operation on land or sea, or in your regular station for the thrill of real low-power work (or when the power fails).

"Tiny Tim" has been operated from my 19-foot Hurricane-class racing sloop on Long Island Sound, from my home location, and in the field. The little rig performs amazingly well considering its 2 watts of transmitter input. On 3510 kc. one Sunday night, a W4 and W2 were hooked on one call in a mountain of QRM. Signal-strength reports are nothing to write home about, but almost solid QSOs are possible in most cases. The thrill of contacts with true low power is something you know only after you've tried it. And, *building* a rig, for a change, is good for many of us who sometimes lose sight of the values that made ham radio what it is today.

The rig is built in a steel utility cabinet 8 inches deep, 11 inches wide, and 12 inches high (Bud C-881). Two shelves, 5 by 8 inches, were cut from sheet aluminum. After bending one edge to permit bolting to the panel, each shelf ended up 4½ by 8 inches. The whole rig can be easily removed by disconnecting the batteries and unscrewing the front panel.

The Receiver

The receiver is a simple regenerative type with a single stage of audio, but it works well. With a good antenna, strong signals pound in and you sometimes use the volume control which normally is wide open. Selectivity, of course, is not the best but good bandspread helps a lot.

While one coil to cover both 40 and 80 can be wound, two coils are recommended for maximum

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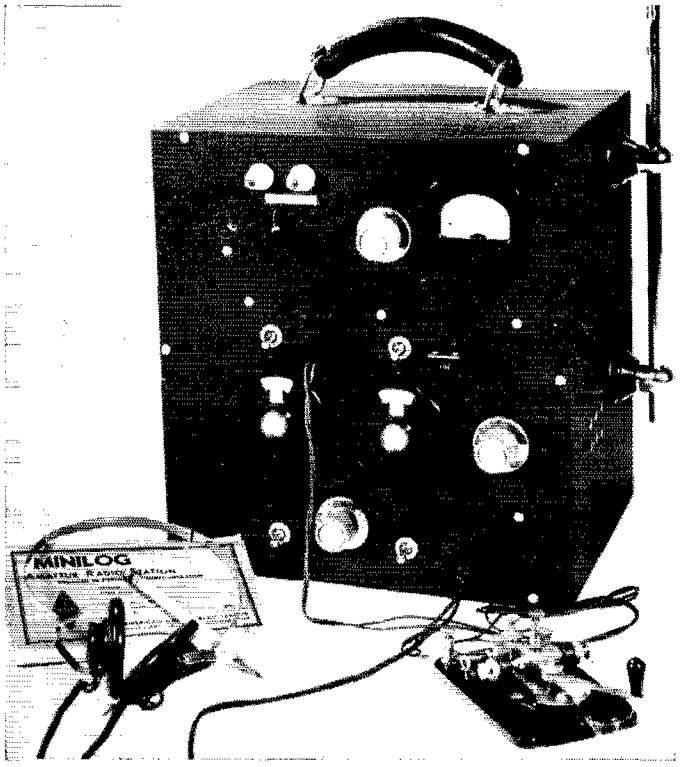


The "Tiny Tim" with 'phones, key and crystal plugged in ready to go. The receiver is on the bottom and the transmitter at the top. The dial to the left is for the bandset condenser, the one to the right for bandspread tuning. The knob in between is the regeneration control, and the one to the right is the audio gain control. Above, left to right, are the indicator lamp, antenna terminals and switch, transmitter tuning control, and the meter. The four toggle switches are in the battery circuits. The holes at the right and on top are for ventilation.

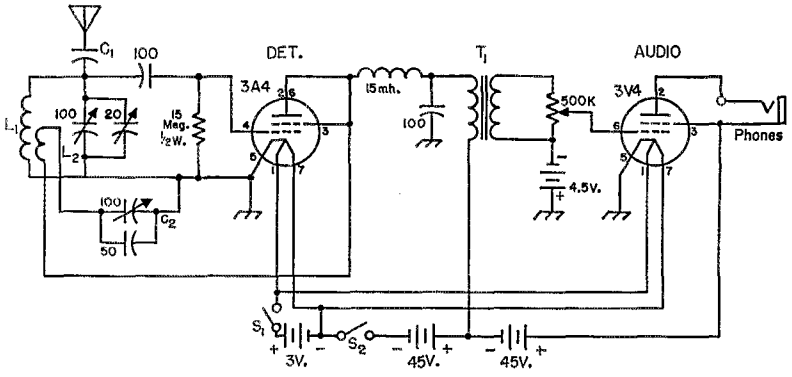


Fig. 1 — Circuit of the "Tiny Tim" receiver.

C_1 — Antenna-terminal lead cut, and 3 or 4 turns twisted together to form small condenser.
L_1 — 80 meters — 24 turns No. 26 enam., close-wound. 40 meters — 10 turns No. 26 enam., ⅝ inch long.
L_2 — 80 meters — 7 turns No. 26 enam., close-wound, spaced ¼ inch from L_1. 40 meters — 5 turns No. 26 enam., close-wound, spaced ⅜ inch from L_1.
S_1, S_2 — Toggle switch.
T_1 — Interstage audio transformer.
Batteries — 4.5-volt — RCA VS-028; 3-volt — Burgess F2BP; 45-volt — Burgess Z30NX; or equivalents.
All capacitances in μμf. All fixed condensers mica.
Coils wound on 1-inch-diameter 4-prong forms (Millen 45004).

bandspread. On 40, the dimensions given result in 57 divisions of bandspread, while on 80 the main tuning setting must be changed three times to cover the band! If the bandspread doesn't suit you at first, spread the L_1 turns, or remove a few. L_1 and L_2 must be wound in the same direction, with the bottom of L_1 and the top of L_2 going toward ground. If, with these connections, the receiver does not oscillate when you rotate the regeneration knob (indicated by a "plop" and a rushing sound in the 'phones), check the wiring carefully. Add a turn or two to the tickler coil, L_2, if needed, or experiment with the fixed condenser across C_2.

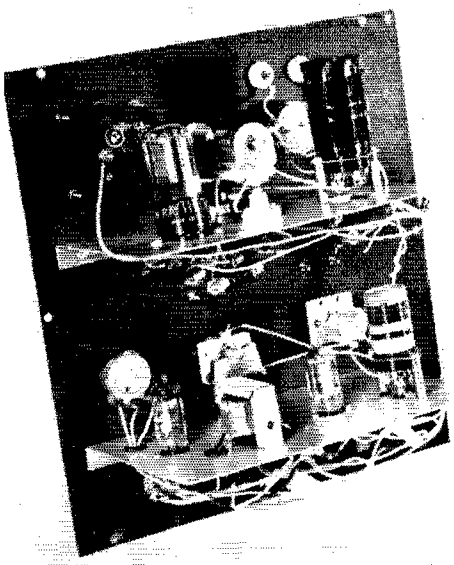
Microphonics are quite bad so try not to hit the receiver when operating.

It is a good idea to calibrate the receiver so you can locate exact frequencies out in the field. Note the dial settings of "main tuning" and "bandspread" on a card and keep it in the logbook.

To lengthen battery life, turn off filament and plate voltages on receiver and transmitter at every opportunity (turn off receiver when sending, transmitter when receiving). The tubes heat almost instantly.

Label all battery leads with small pieces of paper fastened to the leads with Scotch Tape.

[1] Paddon, "The Last Ditcher," *QST*, August, 1947.



Components are mounted on two aluminum shelves, 4½ by 8 inches. The regeneration-control condenser is underneath the lower shelf.

The Transmitter

The transmitter circuit is almost identical to that of the "Last Ditcher," [1] and uses a 1J6G twin triode in a push-pull crystal oscillator. Properly loaded, the tube draws about 20 ma. at 135 volts, or 2.7 watts. The note will be pure and sharp if the crystal is a good one. An inactive crystal will cause a chirpy note. Separate crystals are required for each band, of course.

R_1 drops the 3-volt supply to 2 volts for the 1J6G. It can be made up from two 10-ohm and one 20-ohm 1-watt resistors in parallel. However, a variable rheostat is preferable so that compensation may be made as the battery voltage drops off. Plate voltage is not critical, and a maximum of 180 volts may be used; the tube will oscillate with only 22½ volts. For greater plate-battery life, two identical batteries can be added in parallel, if desired.

At the top of the panel, to the left, a ½-inch hole permits the 2.5-volt 0.06-amp. tuning bulb to peek ¼ inch through the panel. This makes it easy to take out blown bulbs. When the batteries are new, the 2.5-volt bulb may

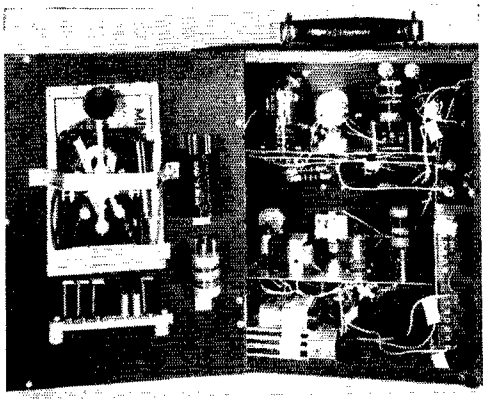
burn out, so you will want to have a 7–8-volt bulb handy.

Next to the bulb is the 3-position switch, S_1. When the switch is turned to the left to receive, the antenna is connected to the receiver. When the switch is in the middle (transmit) the link, L_2, is connected to the antenna. With the switch in the right-hand position (test) and the antenna terminals shorted, the tuning bulb is placed across the link and will light brightly when the transmitter is oscillating. With the short removed from the antenna terminals and the switch still in the test position, the bulb is in series with one leg of the feeders. Tune the condenser for maximum radiation (brightest bulb). Now that the antenna is taking the load, switch to transmit, which removes the bulb from the circuit and you're in business.

The Antenna

The antenna is the key to success with low power (and with high power, too). So far, three antennas have been used with "Tiny Tim":

1) A 4-section automobile radio antenna (Ward SC-8) is mounted on the side of the cabinet (the whip can be pulled out easily, the mountings removed and the holes plugged with bezels, when desired). This antenna is base-loaded, using a coil 2½ inches in diameter with about 45 turns of No. 14 wire, and is worked against a ground consisting of four wires, each 10 feet long, joined like the spokes of a wheel, at 90 degrees to each other, pegged to the ground. The ground connection is to the junction of these radials. Better counterpoises are described in the ARRL *Handbook*, but this one works well. The advantage of this antenna is that it is easy to disconnect and pack up in a box. It is not very efficient for receiving or transmitting but it works. A center-loaded or top-loaded whip would increase efficiency but would not telescope into a short length like this does.



The rear panel of the cabinet is cut and hinged to permit easy bandchanging. Spare coils, key, crystals, as well as log and pencil, are stowed in racks inside the door. The three transmitter batteries are at the upper right, and the receiver batteries are below. Aluminum straps hold the batteries securely in place.

2) The stainless-steel rigging on our 19-foot sailboat was connected to one side of the link and worked against a 4½-foot bronze centerboard in the water. The loading coil and a series condenser were ready but not needed. This antenna, again, is not very efficient, but was the best possible under the often hectic conditions and limited space in a small sailboat!

3) The best antenna, by far, is one 136 feet long, as high as possible and in the clear. A good portable antenna can be made from solid copper trolling line, with nylon fishing line as combination insulator-halyards. A 72-ohm receiving-type line can be used as the feeder. This antenna can be rolled up on a light wooden reel, and works well.

Any antenna and antenna loading method can be used with "Tiny Tim" but the higher the antenna, the better the results. The rig could

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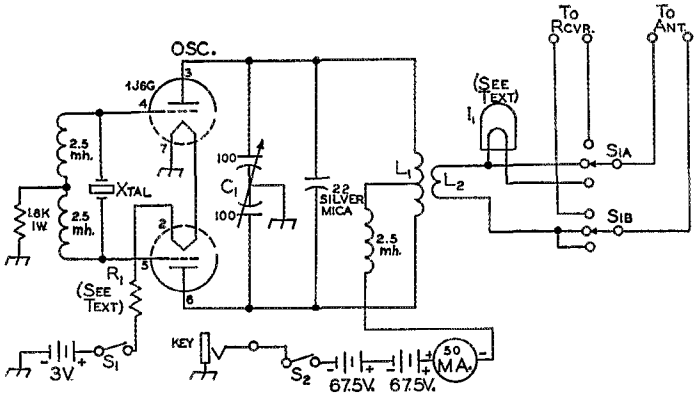

Fig. 2 — The "Tiny Tim" transmitter circuit.

C_1 — Hammarlund HFD-100.
L_1 — Wound in two sections, with ¼-inch space between sections.
80 meters — 19 t. No. 22 e. each section, 1½-inch diam., close-wound (ICA 2159 5-prong form).
40 meters — 12 t. No. 18 e. each section, 1-inch diam., close-wound (Millen 45005 5-prong form).
L_2 — Wound in space between sections of L_1.
80 meters — 4 turns No. 18, close-wound.
40 meters — 3 turns No. 18, close-wound.
S_1 — Rotary ceramic.
Batteries — 3-volt — Burgess F2BP; 67.5-volt — RCA VS-216; or equivalent.

Applying the Principle to Long Yagi Arrays

A conventional 6-element Yagi with one reflector and four directors gave a measured gain of 9 db. over the reference dipole. A special Yagi with two shortened driven elements and four directors (no reflector) gave 10-db. gain at 145 Mc. Apparently, this design can be used on Yagi antennas to give better performance, and preliminary calculations indicate that a single long Yagi can be tuned up to operate over one megacycle of the 2-meter band with a forward gain of 17 db. This would involve a boom length of some 24 feet, however. Experimentally, it may be possible to better this figure for a very narrow bandwidth. This offers interesting possibilities for long-distance 2-meter c.w. communication, say, between 144.0 and 144.2 Mc., with selective receivers and a few hundred watts of transmitter output.

"Tiny Tim"

(Continued from page 27)

be operated from a car using an 8-foot whip, properly loaded, worked against the car body as ground. I'm even thinking of trying it as aircraft mobile!

With this self-contained ham station you built yourself, you're ready for any emergency with a reliable, low-power c.w. station on 40 and 80 — and you can have plenty of fun with it from your home station, out in a boat, at the beach, climbing a mountain, or whatever.

I wish to acknowledge the helpful suggestions of the late Walter Bradley, W1FWH, of ARRL, and the assistance of my 11-year-old son, WN1BRS, in assembling the rig and manning the home station during tests.

I.F. Amplifier

(Continued from page 34)

The over-all bandwidth of the amplifier can be calculated from

$$\triangle f \cong k_c f_o \sqrt{2^{\frac{4}{n}} \sqrt{\left[\frac{1}{m^2}\right]^{\frac{1}{n}} - 1}}$$

where $m = \dfrac{\text{voltage at } \frac{\triangle f}{2} \text{ cycles off resonance}}{\text{voltage at resonance}}$,

n = number of identical stages.

For the bandwidth at 3 db. ($n = 3$),

$m = 0.707$,

$\triangle f = 112$ cycles.

The response curve of the complete amplifier is given in Fig. 6. The bandwidth is 220 cycles at 20 db. down and 1000 cycles at 100 db. down.

B.F.O.

In the unit constructed by the author, the b.f.o. inductor, L_7, has a Q of about 25. The coil

(Continued on page 132)