The slogan to remember when building oscillator tank circuits is "Keep 'em cool and solid, OMI!" By placing the tubes outside the box, W2RMA does just that with this versatile VFO which covers three ranges to multiply into all popular amateur bands. —Lighthouse Larry

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Solid mechanical construction is a necessity if you dare to move a number after setting the VFO on fre-
quency. Let's open the little black box pictured on the
front panel of our unit. Reasonable mechanical rigid-
ity can be obtained by housing the tank circuits in
a 4 x 5 x 1-inch aluminum utility box, when a few
extra self-tapping screws are used to hold the two hal-
es of the box together. Adequate rear support is obtained
by a single fielded board from hardwood or insu-
lating board, pictured in Fig. 3. If your name in me-
chanical rigidity is more elaborate, a fancy home made
box fashioned from sheet aluminum at least 1-inch
thick is indicated.

Omitting good quality ceramic insulated compo-
nents is a simple shop-and-save process. Silvored mica
fixed capacitors and a double bearing main tuning
capacitor with a wide air gap are essential ingredients.
Even though a standard capacitor was used in our
model, similar multi-section units are available on the
surplus market. The high frequency end of each tuning
range will be spread out in this particular circuit if the
capacitor has a mullard rotor plate shape. Also, a disc
with a moveable scale and fixed pointer must be used
instead of the low frequency end of each range at the
left side of the dial. A capacitor with semi-circular
plates will have a more linear tuning rate and permits
use of a dial with a fixed scale and moveable pointer.

This type dial may be calibrated directly in fre-
quency, but many amateurs distrust this refinement.
The reasoning—its better to check your operating
frequency with your receiver and a 100-kilocycle crystal
calibrator than to depend on setting the VFO dial
where you believe the correct frequency is.

Experimental work performed during the develop-
ment of this VFO indicated that coil segmentation is
unnecessary. Ceramic forms caused only a fraction of the frequency drift
measured when plastic insulated coils were used. Bratite pillar standoff insulators make excellent coil
forms when the coil wire is shrunk onto the form.
Winding instructions are given under "MECHANICAL-
DETAILS." Shaping a heat lamp or reflector type flood-
lamp on the tank circuits for a moment when the oscil-
lator is running will show up any frequency drift
in a hurry. Applying heat in this manner is an ex-
cellent means of determining the value of temperature
compensating capacitors which should be used if the tank
circuit has to be placed where it will be exposed to
extreme temperature variations.

CIRCUIT DETAILS

The popular series-tuned Colpitta pentode oscillator
circuit, shown in the schematic diagram, Fig. 3, is
a capable of excellent frequency stability. Three tuning
ranges—1.5-2.0, 3.3-3.7, and 4.9-5.4 megacycles—are
given full dial coverage by tailoring a separate tank
circuit for each range. Band selector switch B connects
the desired frequency determining component to the
grid of the FA95 oscillator tube. Stability is improved by
keeping this switch out of the critical portion of the fre-
quency determining circuit. Each section of a three-gang
variable capacitor, C3, parallelled with fixed and variable
flushed capacitors, serves as the oscillator coils.

The plate circuit load for the oscillator is simply a
2.5-millihenry RF choke, capacity coupled to the grid
of the VFO. This tube operates as an amplifier on 1.6-
2.0 megacycles and a doubler in the 3.5-4.5, 7.0-7.5
and 8.0-9.0 megacycle ranges. The tuned plate circuit
for this stage combines two parallel-connected C1 and
C2, in series with variable capacitor C3, across coil
L3. The effective capacity, created by C1 and C2, is
maximum to minimum capacity covers this range. A
crane of 0.1 millihenry is placed to short-circuit this
oscillator at maximum capacity, connecting C1 and
C2 across L3 to tune the 1.6-2.0 megacycle range.
Capacitor C3 need be adjusted only once for each
10-kilocycle segment on this band. Output may be
taken directly from C2 at the plate of the VFO through
J2 if the external coaxial cable length is less than 3 feet.
Fig. 4. Inverted view of tank circuit box showing coil assembly.

Fig. 6. Bottom view of the tube chassis.
before they are assembled with a short threaded stud. A short machine screw holds a similar lug at the other end of the form. A coating of oilamentos covers the unground ends of the statorite when these parts are assembled. After winding, the completed assembly is held in the shield box by a short machine screw which must not touch the stud holding the base and form together.

If you have three or more hands, you probably can wind the coils tightly without help. The following two-man method worked fine on the coils shown on page 4. Measure the approximate length of wire needed and clamp one end to a rigid object. Rider the loose end of the wire to the base at the base of the form. One person then attaches the wire twist with a few bousy loops and prepares to wind the coil. The second person holds a light lamp or saddling iron close to the wire just ahead of the coil winder. The coil winder should wear gloves to avoid burning his hands in the wire. The wire gets very hot. When the proper number of turns has been counted, the winder keeps the wire twist while the second person removes the enamal from the wire. The bare wire is then wrapped around and saddled to the other base. As soon as the wire coils, two or three turns at each end are cemented in place, but the entire coil is not covered with cement.

WIRING DETAILS

Tinned No. 12 wire is used for all connections in the tube circuit box, except the B28-5 U, matted cable trays from capacitors C3 and C4 to the crystal socket. All power connections on the tube chassis are made with coated jumpers. A short length of 300-cm wire, soldered to pin 5 on the 5407 socket and an insulated terminal to which one end of C5 is fastened, plugs into the crystal socket. A matching plug or two clips from an octal tube base are soldered to the other end of the twindled. Leads made from short lengths of B18-5 U cable with the shield braid removed connect the 5VA to its plate tank circuit. These leads and the short twin lead run through rubber grommets in the rear of the cabinet.

OPERATION

A voltage-regulated source for the oscillator screen and plate supplies will improve the frequency stability of this VFO. A pair of OB1 regulator tubes and a resistor, connected as shown in Fig. 7, may be easily added to meet power supplies. After a final wiring check and power supply, the tubes are inserted and power applied. A well-calibrated receiver and 100-kilometre test standard simplifies adjusting the frequency coverage to suit your particular needs. Trim capacitors C3, C4, and C5 may be adjusted so that the oscillator will not tune outside your favorite amateur band limits, for example, if you operate near 5.5 megacycles, set C4 to maximum capacity. Win the 1.75 megacycles position and adjust C5 until the oscillator tunes near the high point. Thereafter, trim the frequency range as desired.

If you wish to place the tube chassis several feet from the tank circuit box, do not use the octal-cable. The cable should be used for connecting similar units in place of the octal-cable. A single coaxial cable will suffice if C3 and C4 are moved to the tube chassis, shown in Fig. 7. The shielding capacity of the cable must be subtracted from the series value of these capacitors in either case, otherwise the frequency coverage in each tuning range will be altered. For instance, the series capacitance of C3 and C4 is 480 mmfd. (by the formula C = 1/2 X 1.75 megacycles). Subtracting the 23 mmfd capacitance of 8 feet of B18-5 U cable, the new value for C is 457 mmfd. Checking the formula shows you have a value of 430 mmfd for C3 and 530 mmfd for C4. A single unknown can be used for C. C4, because the ratio between these capacitors does not change.
1955 EDISON AWARD

Winner Robert W. Gundersen, W2BD, "tales" his tube tuner (top right) by listening to audio tones generated by his tube checker adapter, one of the more than 30 types of special test equipment he has developed (bottom left) which enable blind persons to earn a living in the expanding electronics field. These devices also use Braille-collated discs.

His full schedule of activities includes editing and publishing the 15,000-word monthly magazine for other sightless engineers, technicians and constructors, The Braille Technical Press, for which he is shown "proofreading" copy (below) with XLO, Lilian—also the non-profit publishing corporation's secretary-treasurer, lecturing 3 nights a week at the New York Institute for the Education of Blind, has radio consultant 3 days weekly at Hudson Radio & Television stores in New York City, manufacturing test gear for blind persons in his "spare" time (bottom right), and working his home station on several bands (middle right).

JUDGES

E. BULAND HARRIMAN
President, The American Red Cross

STEPHEN HODGEN, JR., W4LRF
The Union Television B.C., Superintendent of Safety

EDWARD M. WEBSTER
Commemorative, Federal Communications Commission

RUSSELL L. BOSLAND, W8EJP,
President, American Radio Relay League
Replying to many recent queries whether our Log Form QRL card offer will continue, I want to make clear the fact that these cards will be available as long as you OMs (and YAs) keep sending in those dollars for packages of 100 cards. Drop me a postcard for a sample if you haven’t seen them, or this column in the Volume 16, Nos. 8 and 1 Naval News.

When you order Log Form QRL cards and also request some back issues of G-E HAM NEWS or technical data on tubes (we have that too), these items are mailed in separate packages. Why? I send you the back issues from my office and have the QRL cards shipped from our warehouse, which means they may arrive at your QTH several days apart.

Congratulations to the eight 1951 Edison Radio Amateur Award Special Citation winners who were chosen by the judges after careful deliberation. The following amateurs were cited for their outstanding emergency communications work during the 1951 flood disasters: Paul M. Crowe, Jr., WYJJ; Alfred E. Gardini, WITT; Roland E. Lenier, W1JZU; Milton W. Lyons, W1EBO; Lewis J. Papp, W1MAC; and Stephen P. Tumby, K5HBR.

Also named were: Louis Arietta, W4CPL, for his traffic handling work during which he has received 39 consecutive Brass Pounders League certificates; and George F. Beaud, KSHC, who has helped more than 240 recipients obtain their licenses, furnishing much of the equipment needed to conduct his classes.

The Edison Award Judges also voted to award disaster citations to the hundreds of radio amateurs who participated in group emergency work and also helped police the frequencies being used for this purpose. The text of this citation will be published in-futural magazines, as records do not exist for awarding these citations on an individual basis.

More nominations were received this year than ever before in the four-year history of the Edison Award. The deadline for receiving nominations was extended from Jan. 2 to Jan. 15, 1952, so that the Northern California area amateurs could select the recipients for the December 1951 contest. Twenty-four judges in the Edison Award's 125-member judging area selected the Edison Award winners and made these nominations for the 1952 Edison award.

Nominating letters should include complete details of the public service rendered, give tear-off copies of letters to documents giving additional details. Photostats of these items are acceptable. If the originals are sent in, they will be returned upon request. Before me, now is the time to start collecting that nomination material!!

The recent shift of emphasis in Civil Defense preparations from "digging in" to evacuation alters the requirement for Radio Amateur Civil Emergency serv-

s sometimes equipment in most areas. Mobile rigs will be necessary to provide adequate communications in place of the fixed stations that many civil defense groups now have installed. If your equipment was originally designed for DC operation from storage batteries, mobile mountings and control circuits may be the only changes needed.

But, whether you have RACES gear or simply a "sophomore hobby" mobile rig on hand, some good construction ideas can be found by simply studying the novel unified assembly of the G-E "Progressive Line" of two-way mobile radio equipment, which can now be found in many vehicles equipped with that communications medium.

The idea can be easily carried out in the as-

sembly of your RACES and other emergency network installations. A simple rack into which your present module can be installed, several types still available as war-surplus, or you can build a rack from angle iron and stack modules. Standard cable connectors should be substituted for the survival found on surplus equipment. Another handy item: Add a pair of carrying handles wherever con-

venient. You may want to haul the gear to some strategic location on foot. Lastly, make provision for connecting the rig to a fixed antenna for improved coverage when the mobile temporarily serves in a fixed location.

The multitude of opportunities in electronics self-

solving careers that will be available to young men now competing high school or early college terms was forcibly emphasized the other day when the boys (that's the editor) showed me a prediction recently made by Charles M. Young, Manager of Engineering for the G-E Power Tube-Bak Department in Schenectady. He stated, "In the next ten years, we will increase our manufactured products to four times their present volume, largely in the area of new products."

A quick check indicated that this market growth highlights the 10-20% expansion per year in engineering, production, and facilities in each of these sub-

departments in the G-E Tube-Bak Department; developing low power tubes for use in television sets, color television picture tubes; power systems; plus materials and processes involved in the rapidly evolving expansion in electrical engineering, physics, ceramics, metallurgy and physical chemistry. We are seeing seemingly more related fields of cathodes, vacuum systems and plain, electron tube applications as well."

What I am leading up to is, if you have taken a sly peek between the above lines, at that engineering stuff openings at the seven G-E Power Tube Plants are constantly occurring. Present qualification is in the above fields, not now engaged in national defense projects, are invited 'in' to talk about these opportunities. The way to do it is through me and I will see to it that it reaches the proper hands.

"Eighteenth Century"

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Availability of a new low-cost transistor, the G-E 2N107, makes practical the publishing of circuits using three units. At the top right, a collocated crystal detector feeds a transistor audio amplifier. Substituting the transistor detector at the lower right, connected as points A to D, will increase the headphone volume several times. Introducing regeneration as shown below by wrapping an R-turn feedback coil around the fiber sleeve of a vari-lagstatk produces a noticeable increase in gain and selectivity. Reverse the connections or add a few more turns to the feedback coil if regeneration is non-existent at first. This detector also can be con-
ected to the amplifier through an audio transformer to improve the output. Thanks to Bob Nelson, WgKLO, Danell, Minn.; Donald L. Kallio, Abiquiu, N. M.; and Larry Dewdney, Brunz, N. Y., for sending in ideas used in these circuits.

Even though OPERATION CRYSTAL has officially ended, the boss is keeping me on the line to check interesting crystal and translator circuit ideas, also submitted for the TRICKS and TOPICS, and QUESTIONS in ANSWERES columns. Certificates for $10 in G-E Tubes will be awarded for ideas published in G-E HAM NEWS.

—Danny Diode

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