Read herein how K2JOJ has designed a clever bandswitching VFO around the high-C Colpitts oscillato circuit from our 150-WATT SINGLE BANDER transmitters in G.E. HAM NEWS a year ago.

—Lighthouse Larry

MARCH-APRIL, 1959
In This Issue......

High-C

BANDSWITCHING VFO
..............page 2

Also—

Scanning the Spectrum..............page 2
1958 Edison Award Recipient—K2KJG........page 4
Technical Information—866-SC..............page 8
MEET THE DESIGNER . .

K!OWO—Robert A. Hall, talked the high-C oscillator circuit to his own station needs; specifically, driving his 6AG7 (vacuum-parallel-

lled 6L6GT) transmitter (adapted from the popular QST /Radio Amateur’s Handbook de-

gign) on all bands. Bob, who enjoys building as much as operating on 3.9, 7.2, 14.2 and 21.3 megacycles, is an engineer with General Electric's Manufacturing Engineering Services operation in Schenectady, N. Y.

Starting as a Novice two years ago, Bob has logged thousands of hours of building to date, both on the air and at his workbench. Another item of his handiwork—a desk-top all-band one-kilowatt final amplifier, with parallelled GL-810 triodes, driven by the above 75-watt—will be described in the September-October, 1956 issue of QST, AMATEUR NEWS. Bob even called upon another of his hobbies—photography—to supply us with pictures of his neat kilowatt package.

'QUITE OFTEN WE'RE ASKED WHAT
"Design-Maximum ratings" on our receiv-
ing, filter and special purpose tubes mean. And casting about for an answer, the most comprehensive explanation we could find appears on the Description and Rating sheet published by our tech-
nical data people for each of our tubes. This statement says:

"Design-Maximum ratings are limiting values of operating and environmental conditions applicable to a normal tube of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions."

The equipment manufacturer chooses these values to provide acceptable serviceability of the tube, taking responsibility for the effects of changes in operating conditions due to variations in tube characteristics.

"The equipment manufacturer should design so that initially and throughout life no damage-maximum value for the intended service is exceeded with a normal tube when properly loaded. Proper design of equipment is required to withstand the variations with respect to supply-voltage varia-
tion, equipment component variation, equipment control adjustment, load varia-
tion, digital variation, and environmental conditions."

High-C

BANDSWITCHING VFO

EVER SINCE K7BG helped revive interest in high-capacitance oscillator circuits,1 many requests have been received for a bandswitching oscillator utilizing this principle. Two models are described; one a Millen 1205 dial, and the other a National 2CN dial.

ONCE A NOVICE radio amateur earns his General class license, usually his first thought is directed toward adding a variable frequency oscillator (hereafter known as VFO) to his transmitter. Although there are several VFO kits on the market at moderate cost, some fel-
nows simply like to "roll their own." Thus, the High-C BANDSWITCHING VFO was de-
signed to answer this need.

The output frequency of this VFO is either at the transmitter frequency, or one half of this. This permits the oscillator in a two-stage transmitter to operate as a straight amplifier or doubler, effectively, assuring plenty of driving power for the output stage.

Rather than have just one basic oscillator tuning range—with the resultant crowding of some amateur bands into a small portion of the tuning dial—a circuit was developed whereby each of the popular amateur bands could be spread out over most of the dial. Even though the switching circuitry in the left side of the schematic diagram, FIG. 1, looks complex it largely consists of extra fixed capacitances switched in parallel and in series with one or two sections of the main tuning capacitor, C1, to obtain the desired oscillator tuning range.

TABLE 1 SHOWS the oscillator grid and plate frequencies for each amateur band and the actual components in use. Capacitors C1 and C2 (0.002 mf each) are always in series across the frequency determining circuit. They form the capacitative r-f voltage divider for feedback. The 6AK5 oscillator tube always doubles or triples the grid circuit frequency in the plate circuit. This helps reduce pulsing of the oscil-
lator frequency due to changes in loading on the output circuit. The value of C2 (100 mmfd) was selected for a 3-foot length of RG-58/U coaxial table on T5, reduce the capacitance to 0.001 mf for cable lengths between 2 and 3 feet. A long coupled output circuit also could be employed by substituting a 2-pole switch with a to connect the proper link coil to J2.

The output frequency is quite low; 6.3 volts AC or DC for the 6AK5 heater, and 150 to 250 volts DC for the output stage circuit. The recommended plate and screen voltage for the VFO is shown in FIG. 2.


2090 Madison Avenue, New York 21, N.Y.
K2KGJ—JULIUS M. J. MADEY, 18, of Clark, N. J., is the recipient of General Electric's annual Edison Radio Amateur Award for public service in 1958.

From this operating position (left), more than 12,000 messages have been handled for personnel at isolated Antarctic, Arctic and South Pacific bases. Madey devotes more than 90 hours weekly to this service, maintaining almost continuous contact with these outposts from mid-afternoon to 8 a.m. He has several times handled official Navy and Coast Guard messages, and arranged for hundreds of orders for flowers and gifts from isolated personnel to their families in the United States.

JUDGES:
E. Roland Harrigan, Chairman, American National Red Cross.
Ralph H. Hyde, Commissioner, Federal Communications Commission.
Goodwin L. Dioland, President, American Radio Relay League.

MADEY'S NOMINATOR, Mayor Jay A. Stamper of Clark Township, N. J., observes message-handling operations at K2KGJ. Stamper had also nominated Julius for the 1956 and 1957 Edison Awards. Among nominating material submitted was a personal letter of appreciation to Madey from Rear Adm. George Del fiat, commander, U. S. Naval support force, Antarctica.

FROM THIS 112-FOOT-HIGH rotary beam antenna radio link, one of the most consistent signals heard by the Antarctic stations from U.S. amateur stations, Julius is at the hub of a contest. His younger brother John, K2KPM, at base, provides relative composition of antenna height. His mother and father are hams, too, K2SPZ and K2SPF, respectively.
SPECIAL CITATION RECIPIENTS

THREE RADIO AMATEURS were awarded Special Citation by the 1958 Award judges. In addition to W4FYT and W7BA below, W5-PV, Kenneth M. Blomey, Sacramento, Calif., was cited for devoting 12 hours daily to message handling and contributing important data on observation of satellite radio signals to equipment observers.

W4FYT—Andrew C. Clark, Miami Springs, Fla., receives news of his Fifteenth Award Special Citation for his "unusual service to the Florida weather reporting network, civil defense, Red Cross and youth training activities. And it also is Editor of FLORIDA SKIF. Mrs. Clark—the daughter of W4FOQ—sent her seemingly bored yet happy son the good news.

W7BA—Lloyd A. Peck, Seattle, Wash., received a Special Citation for producing a large volume of messages for several military personnel, participating in civil defense communications, and saving the civilian Air Force and many affiliate radio systems.
A STANDARD CHASSIS and cabinet was used for both models of this VFO shown in the photos. The chassis—4⅞ x 5⅞ x 1⅞ inches in size (Bud CB-1629 miniature aluminum chassis)—was tailor-made for the 6 x 6 x 6-inch aluminum utility box (Bud AU-1039) housing the VFO. When the whole assembly is fastened together with self-tapping screws—and a nut is tightened on the stud which protrudes through the cabinet rear plate—a surprisingly rigid structure results.

Locations of major parts are shown in the photos and the chassis drilling diagram, Fig. 3. Capacitors C1 to C6 were fastened to the terminal board which also supports the band-switch; C6, C12, and C15 were placed between the terminal board and the tube socket.

The location of the chassis on the panel will depend upon the type of tuning dial selected. The panel drilling diagram, Fig. 4, shows the hole locations and chassis position for two popular makes of dials. If another type of dial will be used on your model, first position the dial properly on the panel to find the shaft location for C3. Then place the chassis at the height which permits the bottom of C1 to rest on the chassis deck when the shaft lines up with the dial coupling.

FIRST CHECK THE WIRING before applying heater and plate power. Heat check between pin 1 (center grid) on the 6AR6 socket and the chassis with a vacuum-tube or high-resistance voltmeter (20,000 ohms per volt) to see if a reading of about minus 10 volts is observed. This indicates that the oscillator is working.

THE ALIGNMENT PROCEDURE to follow will provide nearly full dial headroom for all five amateur bands. It also compensates for variations in parts values and hand-wound coils. The low frequency band edges probably will not fall at the same point on the dial, but should be within a few divisions of each other. For precise calibration, use a well-calibrated receiver and a 100-kilocycle frequency standard. Mark frequencies every 50 or 100 kilocycles on the dial card after alignment.

3.5 TO 4.0 MEGACYCLES:
Set D1, and turn C6 to maximum capacitance. Turn D3 to D4 in L3, until the oscillator frequency is about 3,510 megacycles. Turn C3 to minimum. The oscillator frequency should be about 3,990 megacycles.
7.0 TO 7.3 MICROCYCLES: Do not disturb Ls. Set Sb and turn Cc to maximum. If the oscillator is below 7.0 microcycles, decrease size of Cc by changing the 50 mfd capacitor to 30 mfd; change to 70 mfd if the frequency is high. Turn Cc to minimum and the oscillator should be near 7.3 microcycles. If high, reduce the value of Cc to 450 mfd; or, if low, increase Cc to 500 mfd. Again turn Cc to maximum, recheck the oscillator at 7.0 microcycles and reduce or increase Cc.

14.0 TO 14.35 MICROCYCLES: Set Sb and turn Cc to maximum. Adjust the oscillator frequency to 14.010 microcycles with slug in Lc. Turn Cc to minimum and if frequency is higher than 14.350 microcycles, reduce Cc to 250 mfd. Again turn Cc to maximum and set oscillator to 14.010 microcycles with Lc. Finally, tune Ls for maximum output at 14.35 microcycles.

21.0 TO 21.45 MICROCYCLES: Set Sb and turn Cc to maximum. If the oscillator frequency is higher than 21.9 microcycles, increase Cc to 330 mfd. Turn Cc to minimum and if the frequency is higher than 21.450 microcycles, reduce Cc to 90 mfd. Again turn Cc to maximum and recheck oscillator at 21.0 microcycles. Finally, tune Ls for maximum output at 21.35 microcycles.

29.0 TO 29.7 MICROCYCLES: Do not disturb Ls. Set Sb and turn Cc to maximum. If the oscillator frequency is lower than 28.0 microcycles, reduce Cc to 240 or 250 mfd. Turn Cc to minimum and if the frequency is higher than 29.7 microcycles, reduce Cc to 450 mfd. Again turn Cc to maximum and check the oscillator at 28.0 microcycles. If the frequency is again too low, reduce Cc to about 220 mfd. Do not disturb Ls.

Small air trimmer capacitors could be added across Cc to Cc to aid in the above adjustments, but mica insulated trimmers are not recommended. The oscillator as described is capable of maintaining good long-term calibration when quality components are used in its construction.

FIG. 6. PANEL LAYOUT diagrams for the high-carbon oscillator. Note the location and chassis height for the MIL-10039 dial is shown in the left, those for the National SON dial are at the right. The bandwidth (50) remains at the same location for either dial. The tip on the lower front edge of the chassis should be removed to clear the switch index plate.
TECHNICAL INFORMATION—6L6-GC

Beam pentode for AF power amplifier applications

The 6L6-GC is a beam-power pentode primarily designed for use in audio-frequency power amplifier applications. Features of the tube include high power output capabilities, high plate and screen dissipation ratings, high efficiency, high power sensitivity, and low distortion. The 6L6-GC is unilaterally interchangeable with the 6L6-GB.

Comparative ratings with the 6L6-GB below indicate that the 6L6-GC features lower interelectrode capacitances, higher maximum plate and screen voltages, and higher plate and screen dissipation ratings.

**ELECTRICAL DATA**

<table>
<thead>
<tr>
<th>6L6-GB</th>
<th>6L6-GC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cathode—Cathode Unpotential</td>
<td>6.3</td>
</tr>
<tr>
<td>Heater Voltage, AC or DC</td>
<td>0.9</td>
</tr>
<tr>
<td>Heater Current</td>
<td>Direct Inter-electrode Capacitances, approximate</td>
</tr>
<tr>
<td>Grid-Number 1 to Plate</td>
<td>0.9</td>
</tr>
<tr>
<td>Input</td>
<td>11.5</td>
</tr>
<tr>
<td>Output</td>
<td>9.5</td>
</tr>
</tbody>
</table>

**MAXIMUM RATING**

| Plate Voltage | 350 | 500 Volts |
| Screen Voltage | 270 | 450 Volts |
| Plate Dissipation | 19 | 30 Watts |
| Screen Dissipation | 2.5 | 3.0 Watts |
| Heater-Cathode Voltage | Heater Positive with Respect to Cathode | 180 | 200 Watts |
| Heater Negative with Respect to Cathode | 180 | 200 Watts |
| Grid Number 1 Circuit Resistance | With Fixed Bias | 0.1 | 0.1 Megohms |
| With Cathode Bias | 0.5 | 0.5 Megohms |

**MARCH-APRIL, 1959**

_Vol. 14—No. 2_  

Available FREE from your G-E Tube Distributor

_E. A. Need, W3JZK—Editor_  

_Published bi-monthly by_  

**ELECTRONIC COMPONENTS DIVISION**  

**GENERAL ELECTRIC**  

Schenevus, N. Y.  

Copyright 1959, General Electric Co.