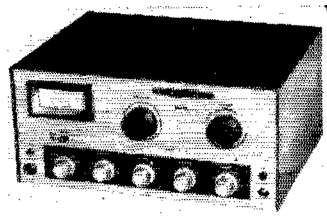
• Recent Equipment —

DX-60 Transmitter Kit



The Heathkit DX-60 is the third of a series of low-power transmitters that began with the DX-35. The set covers the amateur bands between 3.5 and 30 Mc., has three r.f. stages, and is crystal controlled with provision for operation with an external variable-frequency oscillator. The maximum rated c.w. input of the 6146 final amplifier, 90 watts, can be used on all bands. The 6146 plate tank is a pi network for working into 50- to 75-ohm coaxial line.

On phone the amplifier is screen modulated, with a species of carrier control for squeezing out a bit more power than the plate-dissipation rating of the 6146 otherwise would permit. The audio section of the transmitter uses two dual triodes. One, a 12AX7, is a two-stage speech amplifier. The second is a 6DE7, a tube which has one medium-μ and one low-μ triode. The medium-μ unit is used as a combination speech amplifier and carrier-control tube. The low-μ section is the modulator, cathode-coupled to the screen of the 6146.

Owners of the DX-40 (the successor to the DX-35) will recognize that the r.f. and the audio tube line-up shown in Fig. 1 is the same as that used in the 40. Interestingly enough, though, the actual r.f. circuit is almost a reversion to the original DX-35 arrangement — that is, the crystal oscillator is an electron-coupled Pierce, and the buffer tank is parallel-tuned. In the DX-40 the oscillator was a Colpitts of the hot-cathode type and a pi network was used to couple the driver to the amplifier.

Several innovations in the DX-60 represent distinct improvements over the earlier models. The 6146 amplifier is now neutralized by the capacitive-bridge method, and the drive-consuming series stabilizing resistor used in the 35 and 40 is no longer needed. There is a potentiometer in the d.c. screen supply to the 6CL6 buffer for controlling grid drive to the 6146; in the older sets the drive could be controlled only by the tuning of the buffer plate tank. The oscillator and buffer are no longer connected in series across the amplifier plate supply but get their plate and screen power in more orthodox fashion from a 300-volt tap on the plate supply. In the new model, all tubes in the r.f. string are keyed by the grid-blocking method, a separate negative grid-bias supply being incorporated for this purpose. The current in the keyed circuit is only a few milliamperes with this keying system. Finally, there is a built-in low-pass filter between the final tank and the antenna connector for suppressing harmonics in the TV range.

With one exception, the audio setup is the same as in the DX-40, having only minor changes in the circuit constants. The exception is one that builders of the earlier kits will appreciate — there is now an audio gain control in the speech amplifier. True, it's a screwdriver control inside the set and you have to take off the cover to get at it, but at least it's there. In some future model, maybe, it will show up on the panel among the other controls where it can be adjusted as needed.

R.F. Circuit

The screen of the 6CL6 oscillator is used as the anode for the Pierce crystal-oscillator circuit. The plate of this tube has a tank circuit permanently tuned to 7 Mc.; this circuit is resonated at around the center of the 7-Mc. range and is not adjustable from the panel. For 7 Mc. and all higher-frequency bands, the following stage, the 6CL6 buffer-multiplier, is driven on 7 Mc. It operates as a straight-through amplifier on 40 meters, as a doubler for 20 meters, as a tripler for 15 meters, and as a quadrupler for 10 meters. Crystals in the 40-meter range are recommended for operation on the last three bands. For 40-meter output either 80- or 40-meter crystals may be used; the crystal oscillator acts as a doubler in the latter

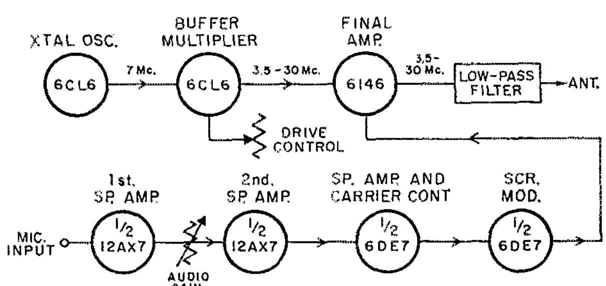


Fig. 1 — Block diagram of the DX-60 transmitter.

case. On 80, there is enough output from an 80-meter crystal to drive the buffer even though the oscillator plate circuit is not tuned to that band. The buffer plate tank uses a sectional coil which is progressively shorted when moving to higher-frequency bands. The band-selector switch is ganged with the band switch in the final plate tank.

The amplifier plate tank similarly has a progressive shorting arrangement for changing the pi-network inductance. The coil is air wound with heavy conductor, and is tuned by a 140-$\mu\mu$f. variable. On 80 meters an additional 68-$\mu\mu$f. fixed NPO ceramic capacitor is shunted across the variable. The output capacitor is a three-section gang with all sections in parallel to give a total capacitance of 1350 $\mu\mu$f. This capacitor is operated through a 2-to-1 gear reduction so adjustment of loading is not critical on any band. Neither is its tuning excessively slow, as is the case where a small capacitor is shunted by a number of fixed units.

The low-pass filter is a three-section arrangement with *m*-derived end half-sections. The cut-off frequency is 34 Mc. The filter is a much appreciated adjunct to any transmitter, but its presence does mean that the load has to be close to the design value of 50-75 ohms — in other words, coaxial line operating at a low s.w.r.

All three tubes in the r.f. section are biased beyond cutoff in the key-up position. Actual bias is around 130 volts. The key short-circuits part of a voltage divider across the bias supply and completely removes the fixed bias from the oscillator and buffer. With the key down these two tubes are grid-leak biased. Bias for the 6146 final stage is taken from a point a little higher up on the divider and does not disappear completely with the key down; the remaining fixed bias,

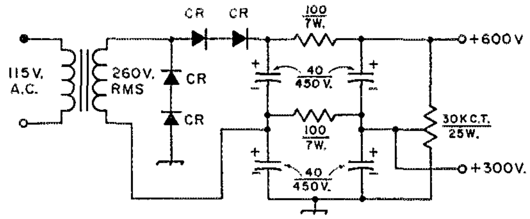


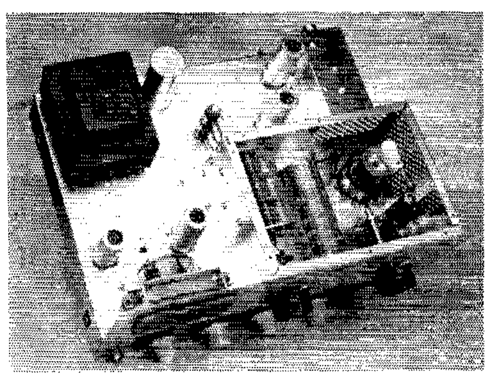
Fig. 2 — The plate power supply in the DX-60 uses a full-wave voltage doubler circuit with silicon rectifiers. Two output voltages are available. The rectifiers, CR, are Sarkes Tarzian Type K, (equivalent to the F-4) having an inverse-peak rating of about 400 volts.

about 25 volts, is enough to protect the tube if through accident it should get no excitation from the buffer-multiplier.

Keying and Modulation

As is to be expected with keyed oscillators, a small chirp could be detected at the higher frequencies, particularly 10 meters. Most of this was found to be the result of voltage variation on the oscillator screen with keying, and was easily cured by connecting a 150-volt regulator tube between screen and chassis. (There is plenty of room for a 0A2 socket on the chassis near the oscillator tube, in the space between the crystal compartment and the interstage shield.) With this change the keying is quite good through 15 meters and probably won't get criticized even on 10. The activity of the crystal used has something to do with it, of course.

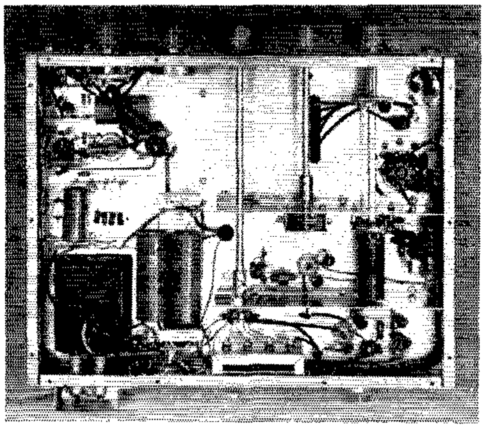
The instruction book does not seem to be as clear as it might be on the question of phone operation. The transmitter is rated at 90 watts peak input, which from our experience with the set means 90 watts peak *envelope* power input. In other words, it will modulate up, on instantaneous voice peaks, to the same input as is used on c.w. This does *not* mean that the plate meter can be kicked up to 150 ma. In the phone position of the function switch the no-modulation plate current is 70 to 80 ma. With full modulation the meter kicks to 90-100 ma. when the p.e.p. input is 90 watts. Any higher plate current causes peak flattening — which, as any phone operator should know, is accompanied by splatter.



There is no crowding in the DX-60 chassis layout. The 6146 final amplifier and its tank circuit are enclosed in the shield compartment at the right; the perforated cover which completes the shielding has been taken off for this picture. The small enclosure at the rear right edge of the chassis contains the low-pass filter. Tubes alongside it are the 6CL6 oscillator (rear) and 6CL6 buffer-multiplier. The upright resistor at the corner of the amplifier compartment is the power-supply bleeder. Tubes in the left foreground are the 12AX7 speech amplifier and 6DE7 amplifier-modulator.

Power Supply

The 600-volt power supply is of a type that is becoming a favorite with the hi-fi amplifier people — a full-wave voltage-doubling circuit using silicon rectifiers, with an *RC* filter (no chokes). This circuit results in lower peak-inverse voltage across the rectifiers, for the same d.c. output voltage, than is the case with the familiar center-tap rectifier. Thus fewer rectifier units — which are generally rated at 400 volts p.i.v. in the inexpensive types — are needed. With large filter capacitances — the DX-60 has two pairs of 40-μf. electrolytics in series, with 100-ohm filtering resistors between — the voltage regulation is good. Key up, the output was measured at 680 volts; key down, 600 volts. The a.c. voltage out



No crowding here, either. Power connections are made through a wiring harness running around three sides of the chassis. Power and bias-supply components occupy the lower left section. The audio circuits are in the upper left corner. Baffle shields separate the below-chassis wiring of the oscillator (lower right), buffer-multiplier, and final amplifier. Crystals plug into the recess at lower center. A.c. is introduced through feedthrough bypasses in the protective cover at lower left. The only departure from the straight kit assembly in this photograph is the "safety" choke connected to the band switch in the upper right corner; none was included in the original circuit diagram.

of the power transformer is a shade over 250 volts r.m.s.

The bias supply uses a half-wave silicon rectifier and *RC* filter working from a separate winding on the power transformer. Heater power for all tubes is taken from the same transformer.

The pilot-light system in the DX-60 was new to this writer, although it may have been used before. The lights are miniature neon bulbs. One is across the bias supply, with a 470K resistor in series to limit the current. This is the POWER ON indicator, since the bias supply is working in all positions of the function switch except OFF. The other bulb is similarly connected across the high-voltage supply. It lights up in the TUNE, AM and CW positions. These lights do not go off immediately when the switch is thrown to an off position, but stay lit until the filter capacitors are almost discharged — a nice safety feature, although it is a bit startling at first to shut off the power and see the pilots still glowing!

Physical

In construction and layout the DX-60 bears practically no resemblance to its forerunners. It has a modern low silhouette, is wider and deeper, and the panel arrangement avoids the monotony of strictly geometrical balance. The chassis and cover (there is no cabinet as such) are of heavy-gauge steel; the cover is the "wrap-around" type with a folded lip that surrounds the top and sides of the panel.

The meter, which reads either grid or plate current of the final stage, has a d'Arsonval movement as compared with the moving-vane type used in the earlier sets, and is well damped. It is recessed and illuminated.

Crystals — there is provision for four — plug into sockets in a recess at the rear of the chassis. It is not necessary to remove a door and reach inside a cabinet to get at them, as it was in the predecessor transmitters.

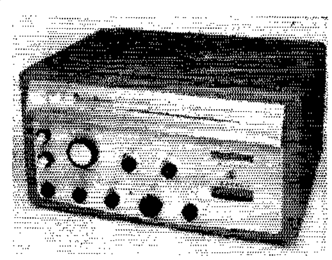
The transmitter is well shielded and filtered for v.h.f. harmonics. The final amplifier has a complete shield surrounding it, installed on top of the chassis. A bottom plate with plenty of screws is used to box in the circuits under the chassis. A.c. input terminals are brought in through feedthrough capacitors. The low-pass

(Continued on page 144)

DX-60 TRANSMITTER

Height: 6¼ inches.
Width: 13¾ inches.
Depth: 11½ inches.
Weight: 23 pounds.
Power Requirements: 225 watts at 117 volts, 60 cycles.
Price Class: $85.
Manufacturer: Heath Company, Benton Harbor, Mich.

Viking Invader Transmitter



The Johnson Viking Invader is a filter-type table-top transmitter capable of operating on all amateur bands between 80 and 10 meters on s.s.b., a.m. and c.w. Power input to the final amplifier, a pair of 6146s, is rated at 200 watts p.e.p. on s.s.b., 200 watts on c.w., and 90 watts on a.m. This can be increased to 2000 watts p.e.p. on s.s.b., and 1000 watts on c.w. and a.m. by adding an accessory amplifier, the Invader 2000. The high-power linear portion of the Invader 2000 fits inside the Invader's cabinet in place of the power supply, which is removed and remounted on an external power-supply chassis.

The Invader is v.f.o.-controlled and its fre-

Recent Equipment

(*Continued from page 44*)

filter is also completely shielded from the rest of the set.

The transmitter goes together rather easily. Much of the wiring is in a prefabricated harness, and there are no serious mechanical problems in the assembly. An unhurried job of assembly and wiring took us about 15 hours. Two hours were spent inventorying and pretesting components, and another hour sufficed for a postcheck of the wiring against the circuit diagram before actual tryout.

The instruction book does a pretty thorough job of outlining the assembly. One feature that the writer does not recall having seen in earlier Heath books is a double-page spread of drawings identifying all electrical and mechanical parts. The book does seem to be a bit skimpy on circuit description and operating data. We had to figure out from the circuit diagram just what could be expected to happen in each position of the function switch; there was no mention of it in the book. Deciphering those rotary switches with specially-shaped tabs is worse than trying to solve many puzzles!

— *G. G.*

Project OSCAR

(*Continued from page 63*)

as to how these measurements might be made by amateurs.

We also wish to thank Mr. Ed Saxton of Philco Techrep Publications, 1070 East Meadow Circle, Palo Alto, California, for furnishing the computer shown in Fig. 4.

World Above 50 Mc.

(*Continued from page 66*)

VE3BSZ/VE2 were coming into W1-land via aurora along with New York, New Jersey and Pennsylvania stations. Bill also observed a short session on April 25, to W4 area. The above auroral reports both on 50 Mc. The Michigan area is represented by W8PT, Jack, who notes that he heard fourteen states during the aurora of April 14, and that WØMOX, Colorado, was coming through with 5-6 sigs. Jack is active once again on 432 Mc., calling "CQ" at 2215 EST nightly with beam on the Chicago area. To date he has worked W9AAG, W9OII, W9ZIH on 432 Mc., but still needs Michigan. In Chester, Virginia, K4EUS observed a weak aurora on 144 Mc. on April 14, hearing W1LMZ, K2GQI and K2IEJ. Sam (K4EUS) is working on gear for 432 Mc. and expects to be ready to go by the end of May. K9GSC reports several 8s heard and K8JKR in Michigan worked during the auroral session of April 15.

Sideband activity seems to be picking up all over the country on the v.h.f. bands. From W4TLV in Demopolis, Alabama we hear that "I was particularly happy and surprised to hear so many s.s.b. stations on two during the first really good temperature-inversion of the season on April 21, 22, 23. Worked during the three and a half days the band was open, on s.s.b., were: W5AJG, W5FYZ, K5TUP, K5SDM, K5PTG, K5YPJ, and W5CTJ. Hearing the tremendous punch of the sideband signals has started a building binge around these parts that should see this station (W4RLV) and W4KCQ on s.s.b. shortly. Rex, W5RCI is

(*Please turn the next page*)

capacitor having a value of perhaps 100 pF. The signal collected by the antenna is quite small and requires amplification. A simple FET amplifier with a transformer input circuit can be used for impedance matching and signal amplification.

Most VLF stations transmit vertically polarized signals. Often, the best VLF antenna is a short (2-5 m) vertical. A good ground system is more important than antenna size.

There is no lack of signals below the AM broadcast band. Most hams can hear at least several beacons in the 190-415 kHz range. These stations identify themselves with modulated CW. The Loran-C network at 100 kHz covers most of the country. Communications stations in the 15-30 kHz range can be heard anywhere in the world. The OMEGA navigation stations at 10.2, 11.3 and 13.6 kHz are used throughout the world for navigational purposes. In each case, commercial users of these services employ little more than a short vertical antenna and preamplifier.

There are several uses the average ham can make of VLF signals:

1) Loran-C transmissions are an accurate source of 100-kHz signals.

2) Monitoring the waveshape of the Loran-C signal can provide reliable information on the state of the upper atmosphere, such as D-layer absorption, E- and F-layer heights, and so on. Because the shape of the Loran pulse follows the sine-square formula, skywave and ground signals are easily discerned using an oscilloscope.

3) Monitoring the amplitude and phase of the OMEGA network stations offers data about the propagation conditions to virtually any place on the globe. The OMEGA transmitters are located in Japan, Norway, Liberia, Hawaii, North Dakota, LaReunion (Reunion) Island, Argentina and Australia.

Information about these services is available from the US Coast Guard. The Naval Observatory in Washington also maintains a bulletin board service with status on these and other navigational services. That BBS number is 202-653-1079. I use 1200 baud, 7 bits, even parity and 1 stop bit. Users must identify themselves each time they access the BBS. No general menu is displayed, but operations information can be had by sending @EXP or @TCO for an explanation of codes and services. Terminate your call with @BYE.—*Bob Fisher, K2ND, 80 Iroquois Dr, Brightwaters, NY 11718*

[3]F. Terman, *Electronic and Radio Engineering*, 4th ed (New York: McGraw-Hill, 1955), p 495.

[4]Bruce O. Williams, "Heath Model HD-1420 VLF Converter and Model HD-1422 Antenna Noise Bridge," Product Review, *QST*, Nov 1986, pp 40-41.

DX-60B SWITCH REPLACEMENT

☐ I was off the air for four months because of a malfunctioning switch in my old Heath DX-60B transmitter. There are still a number of these old rigs on the air, and the FUNCTION switch is often the first part to fail. When I inquired about a replacement switch (part no. 63-246) for my transmitter, Heath said replacement switches were no longer available. But they are! I thought other DX-60B owners might like to know that a Centralab switch, PA 077-0018, works just fine as a *direct replacement*. [The DX-60 and DX-60B FUNCTION switches bear the same Heath part number.—Ed.]

To provide a slightly larger working area when replacing the switch, I removed the adjacent DRIVE LEVEL control mounting hardware and moved the control to one side. When wiring the replacement switch, solder the leads to the *front* wafer first.—*Gordon ("Gus") R. White, KA8BFY, 1944 Northfield NW, Warren, OH 44485.*

VIEW: DIGIVFO

☐ Sometimes, poor choices for electronics terminology lead to misunderstanding of circuit function and design. For example, take "dual digital VFOs"—please! Even though "dual digital VFOs" is a common phrase these days in discussions of synthesized-tuning transceivers and receivers, I suggest that its application to most current consumer step-tuned radio equipment is usually incorrect, in at least two senses, even when there's a switch or button marked VFO A/B somewhere on the front panel.

True enough, nearly every new amateur transceiver these days sports these VFO characteristics: (1) microprocessor frequency control; (2) phase-locked-loop (PLL) frequency synthesis; and (3) digital (that is, direct numeric) frequency readout. But this does not make such a VFO "digital"! Far from it, in fact: The nondigital nature of PLL VFOs is the main reason for the specter we're coming to know all too well as phase noise. High receiver dynamic range is more or less accepted as important by amateur equipment manufacturers. Now, we must increase their understanding of the fact that noisy oscillators can and do offset improvements in dynamic range. (If you've noticed in some receiver/transceiver reviews that a given dynamic-range measurement was said to be "noise limited," you've seen the result of phase-noisy PLL VFOs.)

What does this have to do with whether or not a VFO is PLL or digital? If it's commanded and displayed digitally, it's digital, right? Not necessarily. At the heart of almost all of our PLL VFO rigs are phase-locked LC (inductor/capacitor) or VXO (variable crystal oscillator) circuits. Phase locking is simply a method of forcing a VFO or VXO to a desired frequency and holding it there by negative feedback. (Oscillators tuned in this way are almost always controlled by varying the tuning voltage of one or more varactor diodes; such a VFO is thus called a VCO; a voltage-controlled crystal oscillator is a VCXO.) Because it's possible to use microprocessors to monitor and control PLL circuitry, and because microprocessors "speak digital," many of us feel safe in referring to such microprocessor-controlled PLL VCOs and VCXOs as "digital."

Trouble is, such PLL oscillators aren't digital—they're "analog" oscillators controlled through the use of digital techniques. When your transceiver "remembers" a frequency, its microprocessor isn't actually setting an internal oscillator to that frequency and leaving it there. Rather, the radio's microprocessor/RAM system stores the set of instructions necessary to force the VCO back to that frequency. (Information concerning front-end filters, operator choice of emission [CW, SSB, etc] and IF selectivity is just part of this set of instructions.)

Yes, there are truly digital VFOs—VFOs in which the output signal is fabricated piece by piece in digital circuitry.[5] Because such circuits do not use phase-locked loops to achieve good frequency stability, they can, in theory, provide output very low in phase noise. But the VFOs in most of our "digital VFO" rigs aren't digital at all.

What about the fallacy of the "dual" in "dual digital VFOs"? Well, remember that the designers of most "digital" transceivers have merely implemented digital means of commanding nondigital circuitry. Band/frequency/mode memories involve only the storage and re-execution of commands. Although there are usually several VCOs/VCXOs in a given "digital" transceiver, this is done for enhancement of oscillator function and not for redundancy. (Each oscillator operates over a relatively narrow frequency range; this allows for optimization of frequency control and output purity.) Any VFO "duality" in such a synthesized rig arises from multiple means of storing band/frequency/mode/filter commands. That's all. There is only one set of VCOs/VCXOs in the radio!

There are directly perceptible differences between the performances of true digital and digitally commanded PLL (that is, indirectly synthesized) oscillator circuitries. These circuitries are greatly different electrically. Words do exist that allow us usefully to signify these differences—and improper application of words to a circuit configuration can, as usual, lead to inadequate comprehension of circuit performance and quality on the part of buyers of equipment containing that circuitry.

So, "dual digital VFOs"? Usually not. Here's my vote for better terminology where microprocessor-controlled VFOs are neither dual nor digital: "Dual VFO command registers." It almost sounds like something new.—*David Newkirk, AK7M, Assistant Technical Editor, QST*

[5]Fred Williams, "A Digital Frequency Synthesizer," pp 24-30, Apr 1984 *QST* (Feedback, p 43, Jun 1984), and "A Microprocessor Controller for the Digital Frequency Synthesizer," pp 14-20, Feb 1985 *QST*. A distillation of both articles appears in the 1986 and 1987 editions of *The ARRL Handbook* (Newington: ARRL), M. Wilson, editor, p 29-23. The Apr 1984 *QST* article and *Handbook* writeups also explain the difference between direct, indirect and digital frequency synthesis. As far as I know, all of our present HF/MF "synthesized" receivers and transceivers employ indirect synthesis.—*AK7M*

Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary.

Feedback

☐ Footnote 2 of the article, "A New Chip For Charging Gelled-Electrolyte Batteries" (*QST* Jun 1987, p 26) should read: A complete kit (the PC board the Unitrode chip and other parts) is available from A & A Engineering for $49.95. Their address is 2521 W La Palma, Unit K, Anaheim, CA 92801, tel 714-952-2114. Add $2.50 to all orders for shipping and handling.

COMMODORE USER'S GROUP ADDRESS

☐ In "Pictures By Packet,"[7] I noted that the address of the Commodore User's Group of Kansas City (CUGKC) was listed as unknown. I'm the Disk Librarian for the CUGKC. Interested readers can contact the CUGKC at PO Box 36492, Kansas City, MO 64111. The Koala Pictures disk referenced in the article may be obtained by mail for $10, including shipping and handling; specify disk "KP." A disk containing the club library catalog is also available for $5.—*Neil Preston, WB0DQW, 1019 Noel Ct, Lee's Summit, MO 64081*

[7]C. Pratt and V. Yarbrough, "Pictures By Packet," *QST*, May 1988, pp 15-17.

DX-60 SWITCH UPDATE

☐ In the September 1987 issue of *QST*, Gus White provided some information on replacing the Heath® DX-60 transmitter FUNCTION switch.[8] I was unable to purchase the recommended Centralab® switch (PA 077-0018) locally. Gus suggested I contact Centralab.

Kim Motl, Customer Service Representative of MEPCO/Centralab, Inc, indicated that she's had many requests for the switch and provided me with the following cost breakdown: For 1 to 9 pieces, $62.67 each; 10 to 25 pieces, $34.86 each; 25 or more pieces, $18.13 each. Also, they've a minimum charge order of $250.—*Howard Hartzell, Jr, WA3YKD, RD 2, Mifflinburg, PA 17844*

[Here's an opportunity for a parts distributor to provide a service to DX-60 owners.—Ed.]

[8]G. White, "DX-60B Switch Replacement," Technical Correspondence, *QST*, Sep 1987, p 43.

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New Products

HEATH DUAL-BAND HAND-HELD TRANSCEIVER

☐ Heath® has introduced the HWS-24-HT dual-band 144- and 440-MHz hand-held transceiver. The '24-HT features two VFOs, 20 memory channels, frequency entry via front-panel keypad or rotary switches, a vacant-channel-search feature, automatic power turn-off circuitry and tone-operated squelch. Semi-duplex capability is provided on either band between the two VFO frequencies, or between one VFO and a memory channel. Full-duplex capability is available during cross-band operation.

Other features of the HWS-24-HT include optional 100-kHz tuning steps, VFO and memory-channel scanning modes, switch-selectable tone-squelch frequencies, frequency lock, PTT inhibit and a DTMF pad for repeater and autopatch use. Included with the HWS-24-HT are a NiCd battery pack, wall charger and an extra battery shell. Price class: $450. For more information, contact Heath Company, PO Box 8589, Benton Harbor, MI 49022, tel 800-253-0570.—*Rus Healy, NJ2L*

VEHICULAR CALL-SIGN DISPLAYS

☐ Sign On, of Merrick, New York, makes vehicular call-sign displays in two varieties: A magnetic sign for metal vehicle panels, and a suction-cup mounted version for inside-window mounting. The flexible, vinyl 2 × 8-inch in-window signs are available in white lettering on black, blue and red backgrounds. Magnetic signs, also 2 × 8 inches, are available in black, blue or red lettering on a white background. Price: $8.50 per sign, postage paid; volume discounts are available. For more information, contact Sign On, Dept PT, 1923 Edward Ln, Merrick, NY 11566.—*Rus Healy, NJ2L*

Feedback

☐ Please refer to "A Simple Tuning Indicator," *QST*, Jul 1988, pp 28-31. On p 29, Fig 1, + 12 V should be shown connected to the common point of pin 8 of U2, the wiper of R12, the cathode of D5 and the emitter of Q9. In Fig 2, p 30 (in the upper-right corner of the PC-board pattern), the trace connecting the commoned wipers and one end each of R8 and R12 to pin 11 of U1 is not needed (see Fig 1). (That pin of the IC is not internally connected, however, and the presence of the trace in the prototype units presents no problems.) On p 31, Table 1, the third entry in the fourth column should be 850, not 250. Also, the fifth entry in the third column should be 1360, not 1350. In Fig 3, p 30, U5 and U6 should be labeled DS1 and DS2, respectively. (*Tnx Norman Monro, K4FRY*)

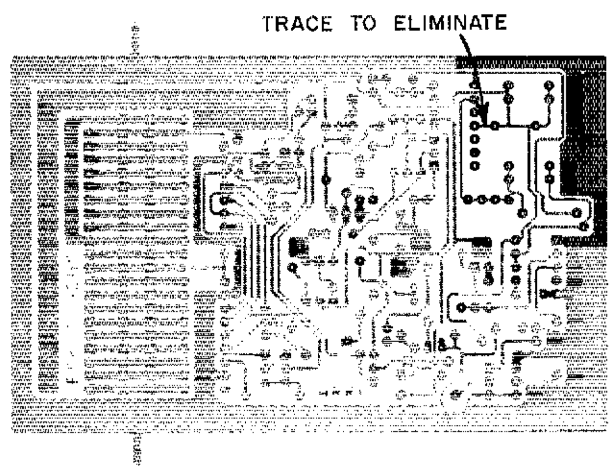

Fig 1—Correction to the PC-board layout Fig 2, p 30, of "A Simple Tuning Indicator." The trace indicated may be physically removed from an existing PC board, or the trace on the original PC-board pattern can be eradicated before copying.

Strays

***QST* congratulates...**

☐ the following radio amateur on 60 years as an ARRL member:

• Glen F. Peterson, W0ELY, of Minneapolis, Minnesota

☐ the following radio amateurs on 50 years as ARRL members:

• Wilfred T. Siddle, W4ELB, of Birmingham, Alabama

• Harry R. Hyder, W7IV, of Tempe, Arizona

• Theodore P. Cocores, W6CSP, of South Lake Tahoe, California

• Otto M. Arnquist, W5NT, of Dallas, Texas

• Camille S. Marie, W3EPR, of Pikesville, Maryland

• Earl W. Smith, W1BML, of Groton, Connecticut