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CQ Reviews the SWAN TWINS

The Radio Amateur's Journal

08240

DX Maxi-Rig.


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hen the skip is in and the bands are hot, you ed the best gear you can get . . .

hen the call comes over the land-line that a nna-Tuva Zone 23 is loose on 20, you need the st gear you can get . . .

hen Gus is out island-hopping to places that n't even on most maritime charts, you need e best gear you can get . . .

hen one more QSL will provide that coveted) sticker for your DXCC, you need the best gear u can get . . .

hether you're chasing the rare ones in AC3-land the Rare Ones in New Orleans . . . sweating t that seemingly impossible 5-band DXCC or king for #50 for WAS . . . chatting with the w at the South Pole or working everyone's end in 9N1-land – if you work serious DX, you ed the best gear you can get: the Heathkit DX axi-Rig.

e DX Maxi-Rig: the SB-303, hot new all solid-te receiver that's made DX easier to work than r. The SB-401, the most popular transmitter on air because of its modest price, top perform-ce and high reliability. The SB-220, 2 kW linear t made history when it was introduced because its low, low price and red hot performance.

e "303", "401", & "220" . . . the rig owned by re serious DXer's than any other . . . because produces results that can't be equalled. The Maxi-Rig – more hot ones from the Hams at ath.

SB-303, 21 lbs. **319.95***
A-301-1, optional 3.75 kHz AM Xtal fltr., b. **22.95***
A-301-2, optional 400 Hz CW Xtal fltr., b. **21.95***
SB-401, 36 lbs. **299.95***
SB-220, 69 lbs. **369.95***

303 SPECIFICATIONS – Frequency Range: (MHz) – to 4.0, 7.0 to 7.3, 14.0 to 14.5, 15.0 to 15.3, 21.0 to 21.5, to 30. **Intermediate Frequency:** (IF) – 3.395 MHz. **Fre-ncy Stability:** Less than 100 Hz drift per hour after minutes warmup under normal ambient conditions. s than 100 Hz drift for ±10% line voltage variation. **quency Selection:** Built-in Linear Master Oscillator. **des of Operation:** SSB – Single sideband (suppressed rier, with selectable upper or lower sideband.) CW – ed continuous wave. AM – Amplitude modulated con-ous wave. RTTY – Radio teletype (frequency-shift ed continuous wave). **Sensitivity:** Less than 0.25 uV for 10 dB S+N/N for SSB operation. **Overall Gain:** Less than 1.5 uV input for 0.5 audio output (single tone SSB). **AGC Characteristics:** Blocking – Greater than 3.0 V CW/SSB/RTTY. Dynamic Range – Greater than 150 dB CW/SSB. **RF Attenuator:** Variable 0-40 dB nominal. **Selectivity:** SSB – 2.1 kHz @ 6 dB down, 5.0 kHz maximum @ 60 dB down (crystal filter supplied). CW – 400 Hz at 6 dB down, 2.0 kHz maximum at 60 dB down (crystal filter available as an accessory). AM – 3.75 kHz at 6 dB down, 10 kHz maximum at 60 dB down (crystal filter available as an accessory). RTTY – 2.1 kHz at 6 dB down, 5.0 kHz maximum at 60 dB down (uses SSB crystal filter). **Image Rejection:** 60 dB or better. **IF Rejection:** 3.395 – greater than 55 dB. 8.595 – greater than 50 dB. **Spurious Response:** All below 1 uV equivalent signal input. **Temperature Range:** 10°C ambient. **Dial Accuracy:** Electrical – Within 400 Hz after calibration at nearest 100 kHz or 25 kHz point. Visual – Within 200 Hz. **Calibration:** Every 100 kHz or 25 kHz. **Dial Backlash:** No more than 50 Hz. **Antenna Input Impedance:** 50 ohm nominal unbalanced. **Power Requirements:** 105 to 125 or 210 to 250 VAC, 40 W max. **Dimensions (with knobs & feet installed):** 12¼ W x 7 15/16" H x 14" D. **Net Weight:** 15¾ lbs.

SB-401 SPECIFICATIONS – Emission: SSB (upper or lower sideband) and CW. **Power input:** 170 watts CW, 180 watts P.E.P. SSB. **Power output:** 100 watts (80-15 meters), 80 watts (10 meters). **Output impedance:** 50 to 75 ohm – less than 2:1 SWR. **Frequency range:** (MHz) 3.5–4.0; 7.0–7.5; 14.0–14.5; 21.0–21.5; 28.0–28.5; 28.5–29.0; 29.0–29.5; 29.5–30.0. **Frequency stability:** Less than 100 Hz per hr. after 20 min. warmup. **Carrier suppression:** 55 dB below peak output. **Unwanted sideband suppression:** 55 dB @ 1 kHz. **Intermodulation distortion:** 30 dB below peak output (two-tone test). **Keying characteristics:** Break-in CW provided by operating VOX from a keyed tone (Grid block keying). **CW sidetone:** 1000 Hz. **ALC characteristics:** 10 dB or greater @ 0.2 mA final grid current. **Noise level:** 40 dB below rated carrier. **Visual dial accuracy:** Within 200 Hz (all bands). **Electrical dial accuracy:** Within 400 Hz after calibration at nearest 100 kHz point (all bands). **Backlash:** Less than 50 Hz. **Oscillator feedthrough or mixer products:** 55 dB below rated output (except 3910 kHz crossover which is 45 dB). **Harmonic radiation:** 35 dB below rated output. **Audio input:** High impedance microphone or phone patch. **Audio frequency response:** 350-2450 Hz ±3 dB. **Power requirements:** 80 watts STBY, 260 watts key down @ 120/240 V AC, 50/60 Hz. **Dimensions:** 14 7/8" W x 6 5/8" H x 13 3/8 D.

SB-220 SPECIFICATIONS – Band coverage: 80, 40, 20, 15 and 10 meter amateur bands. **Driving power required:** 100 watts. **Maximum power input:** SSB: 2000 watts P.E.P. CW: 1000 watts. RTTY: 1000 watts. **Duty cycle:** SSB: Continuous voice modulation. CW: Continuous (maximum key-down 10 minutes). RTTY: 50% (maximum transmit time 10 minutes). **Third order distortion:** –30 dB or better. **Input impedance:** 52 ohm unbalanced. **Output impedance:** 50 ohm to 75 ohm unbalanced; SWR 2:1 or less. **Front panel controls:** Tune, Load, Band, Sensitivity Meter switch, Power CW/Tune – SSB, Plate meter, Multi-meter (Grid mA, Relative Power, and High Voltage). **Rear Panel:** Line cord, Circuit breakers (two 10 A). Antenna Relay (phono), ALC (phono), RF Input (SO-239). Ground post. RF output (SO-239). **Tubes:** Two Eimac 3-500Z. **Power required:** 120 VAC, 50/60 cycles, at 20 amperes maximum. 240 VAC, 50/60 cycles at 10 amperes. **Cabinet size:** 14 7/8" W x 8¼" H x 14½" D. **Net weight:** 48 lbs.

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CQ

OCTOBER, 1971 VOL. 27, NO. 10

The Radio Amateur's Journal

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DEPARTMENTS

Offices: 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050. Telephone: 516-883-6200.

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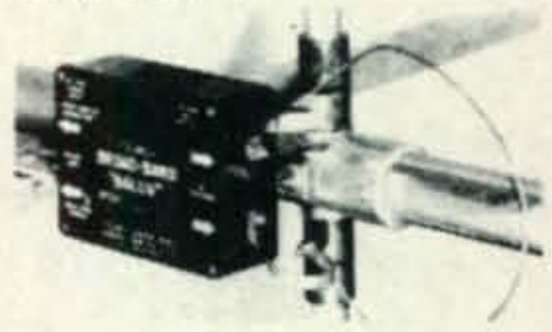

TRAP

Elements shortened to show details.

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Mod. 2M814C-	2 mtr. 8 el. array, 16.5 DB gain, 300 W pow. rat., 1.375" x 14' boom	59.00
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CQ makes selling your product or service to fellow hams easy, because CQ reaches more active ham readers each month than all the others. And CQ's ad rates are surprisingly lower than our major competitor, because CQ wants our advertisers to show a profit for their investment.

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If you have a product or service to sell, why not get in touch with our publisher right away. You won't get a hard time, and you won't get a lot of fancy promises that can't be kept. Just the straight facts about what results you should get from your sales program.

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3/16 Page	106	101	97	93
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Available November . . . see your Dealer

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OUR READERS SAY

Those Were The Days

The following letters and excerpts were received in response to the nostalgic gem by W6SAI in July *CQ*, on the famous National SW-3 receiver. From what we've seen and heard so far, Bill's upcoming articles on other nostalgic themes will be runaway winners!

Dear Bill:

Just received the July *CQ* and enjoyed reading your story on the early National Receiver very much. . . .

Jim Millen, W1HRX
Malden, MA

Dear Bill:

As a radio history buff, I greatly enjoyed your article on the SW-3 in *CQ*. I am looking forward to subsequent articles. I remember seeing your want-ads for old sets and wondering what you were up to; now I know.

While you call the SW-4 the "grandfather" of the SW-3, you do not mention at all the SW-3's father: the SW-5. This preceded the SW-3 by about a year, and was described in detail in *QST* for January 1931. It was produced concurrently with the SW-3, but had disappeared from the National catalog by 1933. It was much more common than the SW-4. I don't remember ever seeing a picture of a ham station with an SW-4, but SW-5's were quite common in both ham and commercial service.

The original SW-5 had a '24A TRF, '24A det., '27 AF, and PP'27's power amplifier. Another version, the SW-45, had '45's instead of '27's in the output stage. The '24's were later changed to '35's when the remote cutoff tube became available. Except for the PP audio, the circuit was virtually the same as that of the SW-3. The mechanical design was quite different, the SW-5 had a drum dial. The SW-5 was available with general-coverage and bandspread coils. The coil form were mica-filled bakelite, first called "R-29" and subsequently improved and called "R-39."

National later (about 1933) modernized the SW-5, calling it the SW-58. This used '58's instead of '35's. Several versions were available. There was a table model with a slide-rule dial, similar to the FB-7, and a rack-mounted version with a type N dial. The latter version had front-panel plug-in coils, like the FB-7 and AGS.

I bough a used SW-3 about 1936 for $10, including bandspread coils. I converted it to a regenerative superhet about a year later; this was a very common version. An article describing this is in *Radio*, March 1936. Many hams converted their SW-3's to preselectors, to use with the image-plagued superhets of the day. . . .

Harry R. Hyder, W7IV
Scottsdale, AZ

Dear Bill:

That was a very interesting article re the SW-3 in the last issue of *CQ* Magazine. Good going. . . .

I have one of the brochures that National put out several years ago giving a history of all the goodies they brought out and it is in my library. Incidentally, I have *QST* almost solid from 1927 to date, with some incidental issues back to August 1919. It certainly is fun to browse back through them to see the progress we have made.

I also have every issue of *CQ*, *73*, and *Ham Radio* on hand.

Will be looking forward to your article on the "typical ham rig" of long ago. Hope you rounded up all the necessary parts.

Bill Stewart, K6HV
Santa Monica, CA

Dear Bill:

Your article in *CQ*, July issue, regarding the old days with the National SW-3 was a real pleasure to read. It certainly brought back my old days in amateur radio that I enjoyed the most.

Yes, I used an SW-3 but only after several years of home grown rigs. I was first licensed in 1932. At that time I had 201A detector and a 201A audio driving the fones. My transmitter was a Hartley 210, running about 30 watts input. Yes, those were the golden years of amateur radio. Now I sit here gazing at my Swan 270 and really feel nothing to get excited about.

Your article made me dig into my piles of junk and get out an absolutely dust-free SW-3 with the original power supply. Guess what? The electrolytic filter condenser is not what it used to be, but, I did get to listen a little with it tonight to some sideband sigs and c.w., before the power supply got a little warm. So I shut it down and will get some new filter condensers in it tomorrow. But, boy, what a job it did on s.s.b. I was surprised how stable it was. And the sensitivity was just too much to believe. I was listening on an old pair of W.E. cans—509W. They too are along in years. . . .

Well, it was great to read your article and will be looking for more of the same.

Paul R. Schneider, W6JXW
Oxnard, CA

Code and Licensing

Editor, *CQ:*

Why are there gripes about the 13 words per minute General class code? If only the "gripers" would get off their duffs a little while to study the code and not give up by writing letters to *CQ*, maybe they would have their General licenses now.

I realize that code does not come to some people very well, but for me the theory never did come easily either. I just kept studying and did finally pass.

The General class code should stay as it is to help the QRM situation on some bands and keep 2 and 6 meters occupied.

CQ is an FB magazine—keep up the good work.

J. Bradley, WA7LQQ
Kalama, WA.

Announcements

Marine Corps Traffic Net

The World Wide Marine Corps Traffic Net has been QSYed to 14.313 mc from its former frequency of 21.430 mc. Net time remains 1900 GMT, Monday through Friday. Military and non-military checkins are welcome.

Raleigh, N. C.

The 1971 ARRL North Carolina State Convention will be held Sunday, September 26, 1971 at the Dorton Arena in Raleigh, N. C. The convention is sponsored by the Raleigh Amateur Radio Society. Planned activities include an ARRL Forum with headquarters and field league officials; technical presentations; NC MARS meeting; code, homebrew, and QSL card contests; an INDOOR Flea Market where exhibitors may drive their vehicles inside directly to the display floor to show their junque or selected merchandise; and numerous other get-togethers and eyeball QSO's. Full convention registration and YL-XYL Program registration are $4.00 each, which includes a delicious mid-day meal. Afternoon registration is $2.00 which does not include the mid-day meal. Contact John Fried, W4-WWD, 3606 Winton Road, Raleigh, N. C. 27604 for registrations or further information.

Tampa, Florida

The Hillsborough Amateur Radio Society, Inc., (HARS) Annual Tampa Hamfest will be a gala 2 day affair, Saturday and Sunday, October 16th and 17th in the fully air-conditioned Electrical Building at the Tampa Fair Grounds, North Blvd. Fun for the whole family. Plenty of Free Parking. Awards galore.

Gaithersburg, Maryland

The Foundation for Amateur Radio, Inc., an organization consisting of 27 amateur radio clubs all located in the greater Washington, DC., metropolitan area, will hold its annual Hamfest on Sunday, 24 October 1971 from 10 a.m. until 5 p.m. at the Gaithersburg Fairgrounds in nearby Gaithersburg Maryland just off Interstate 75.

Special CQ Contest Propagation Forecast This Month —page 74

THE GALAXY 550A

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GT-550A Transceiver Order No. 855 Ham Net $495.00

The GT-550A is the best transceiver on the market for the money. Bar none. Costs just $495.00 and delivers 550 watts of power. Operating either fixed station or mobile, this transceiver is guaranteed to have a top frequency stability after warm-up. We're so proud of the stability we include a graph with each GT-550A showing the purchaser how stable his radio was when it went through final check. 550 watts SSB; 360 watts CW; sensitivity better than .5 uv for 10db S+N/N; stable—45db carrier suppression; 25 KHz calibrator and vox option; no frequency jump when you switch sidebands.

RF550A contains high accuracy watt meter; calibrated in 400 and 4,000 watt scales; switch for forward or selected power; switch to select 5 antennas or dummy load. Order No. 857 Ham Net $75.00

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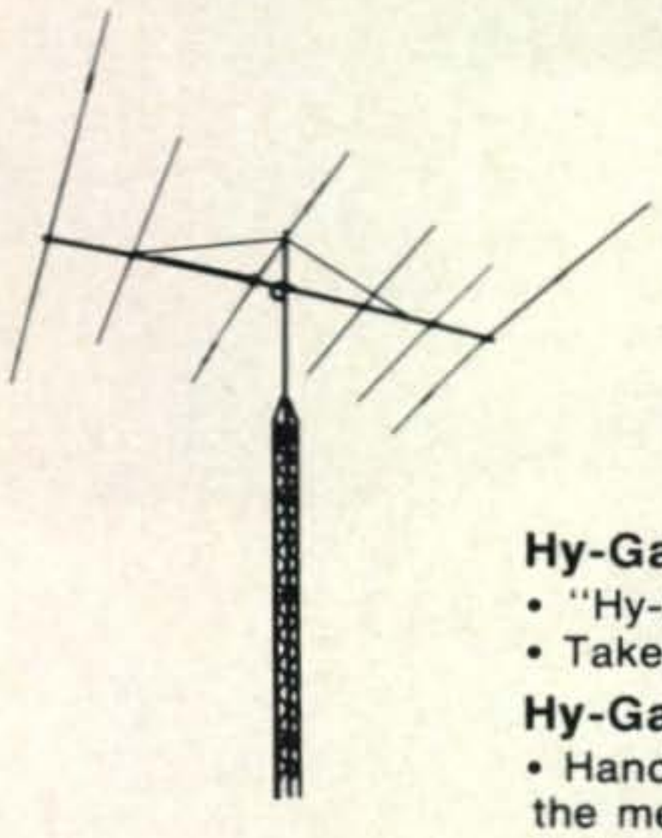
SC550A Speaker Console with headphone jack. AC400 power supply will mount inside. Order No. 858 Ham Net $29.95

AC400 Power Supply is heavy duty solid state to operate GT-550A at full power, on SSB or CW, and with switch selection of 115/230 VAC, 50/60 Hz input voltages. Order No. 801 Ham Net $99.95



Hy-Gain's *Super Thunderbird* TH6DXX

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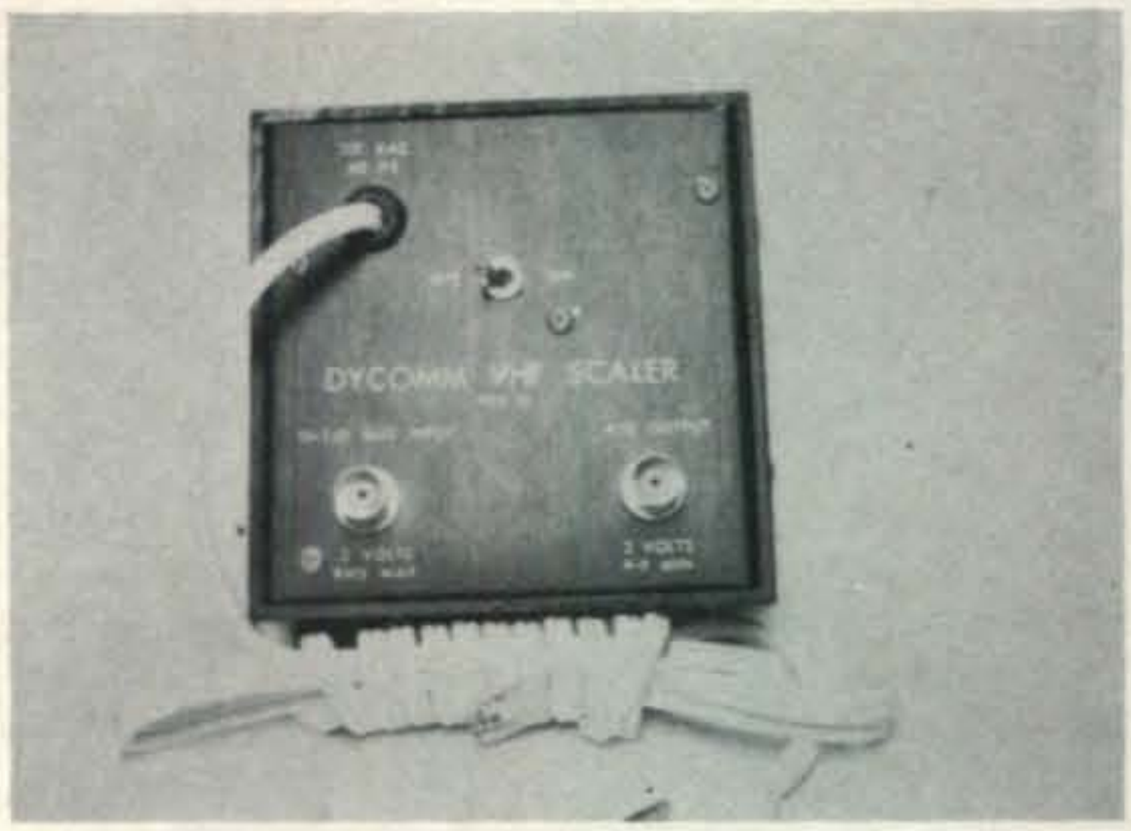
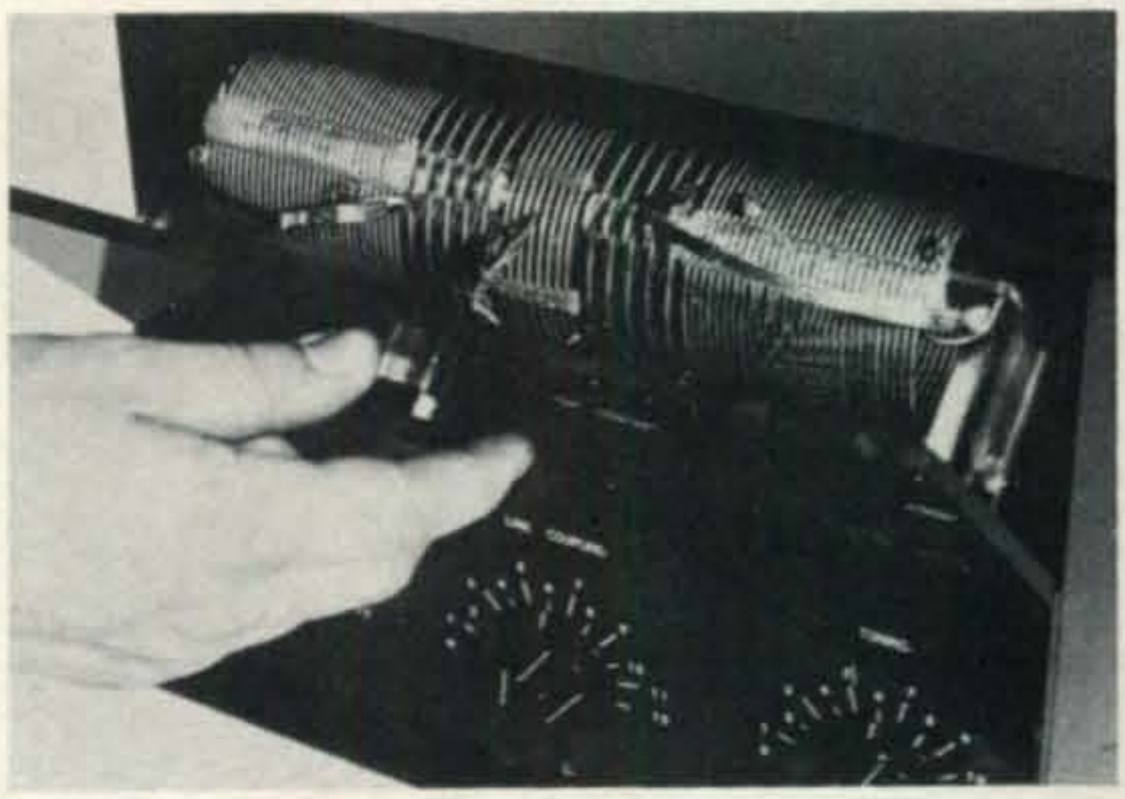


Dynamic Communications

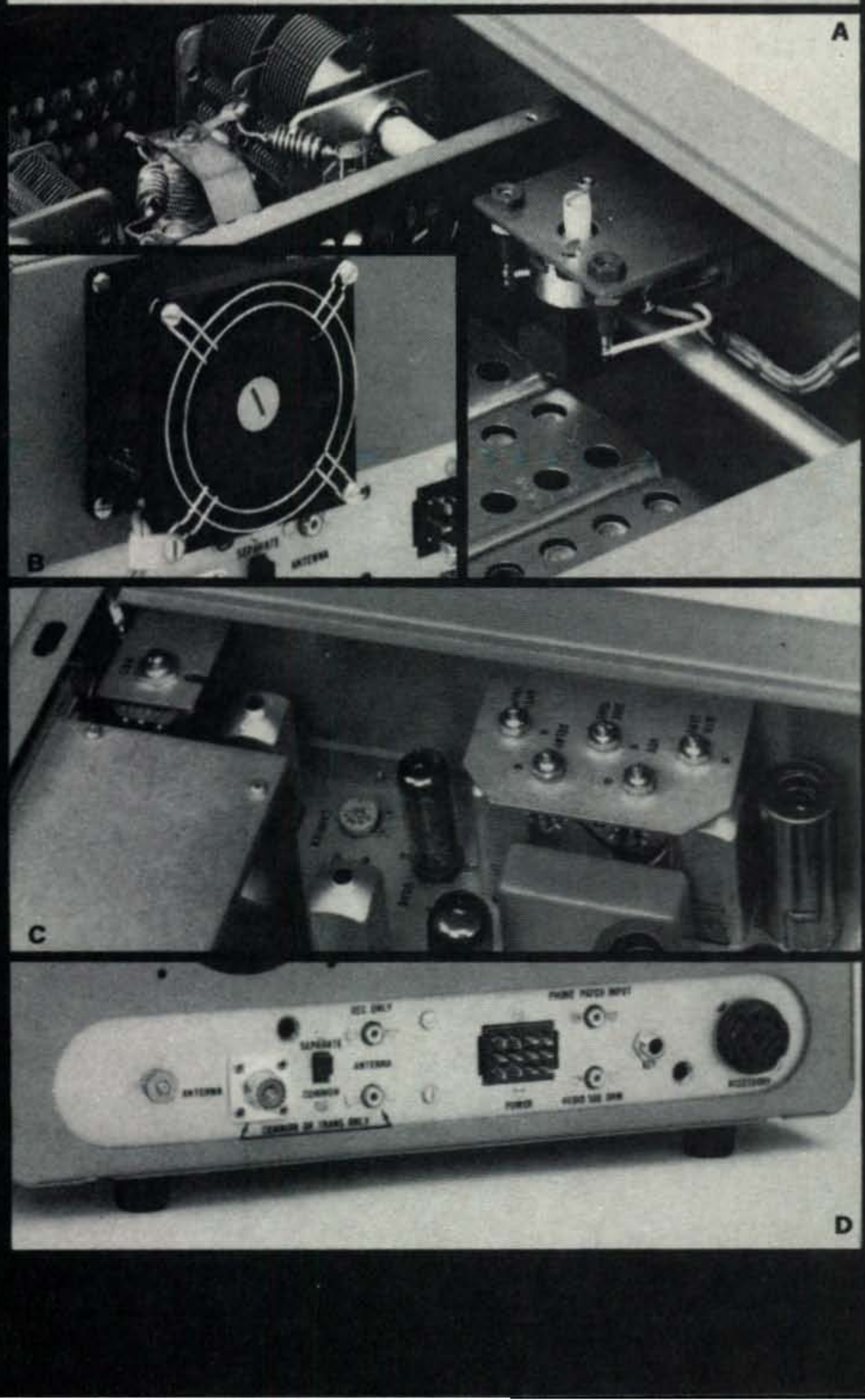
DYNAMIC Communications has introduced a a new divide-by-ten frequency pre-scaler/divider designated the PSU-13. It operates over a frequency range of 10 mc to greater than 240 mc. Circuitry and design features include such items as high input sensitivity (less than 100 mv), high output voltage (greater than 2 V p-p). Useful to expand the frequency range of counters and oscilloscope synchronization. Proper operation is automatic, and delivery is from stock. OEM Users $89.95. For more information write to Dynamic Communications, P.O. Box 10116, Riviera Beach, Florida 33404 or circle A on the Reader Service coupon.



Antec Comany

ANTEC announces their new model UT-1 transmatch unit. The transmatch covers 80-10 meters with a 1:1 s.w.r. at any frequency. It will handle 2 kw p.e.p. with 25 db average additional harmonic suppression and a 5 db average improvement in receiver s/n ratio. The transmatch can be used with any s.w.r. indicator and any type of transmission line. The unit sells for $94.95 for complete specifications write to Antec Company, 67 Briarcliffe Road, Buffalo, New York 14225 or circle B on the Reader Service coupon.

HALLICRAFTERS' NEW SR-400A HAS INCREASED POWER TO 550 WATTS P.E.P. WITH IMPROVED RELIABILITY FOR CONTINUOUS DUTY OPERATION.



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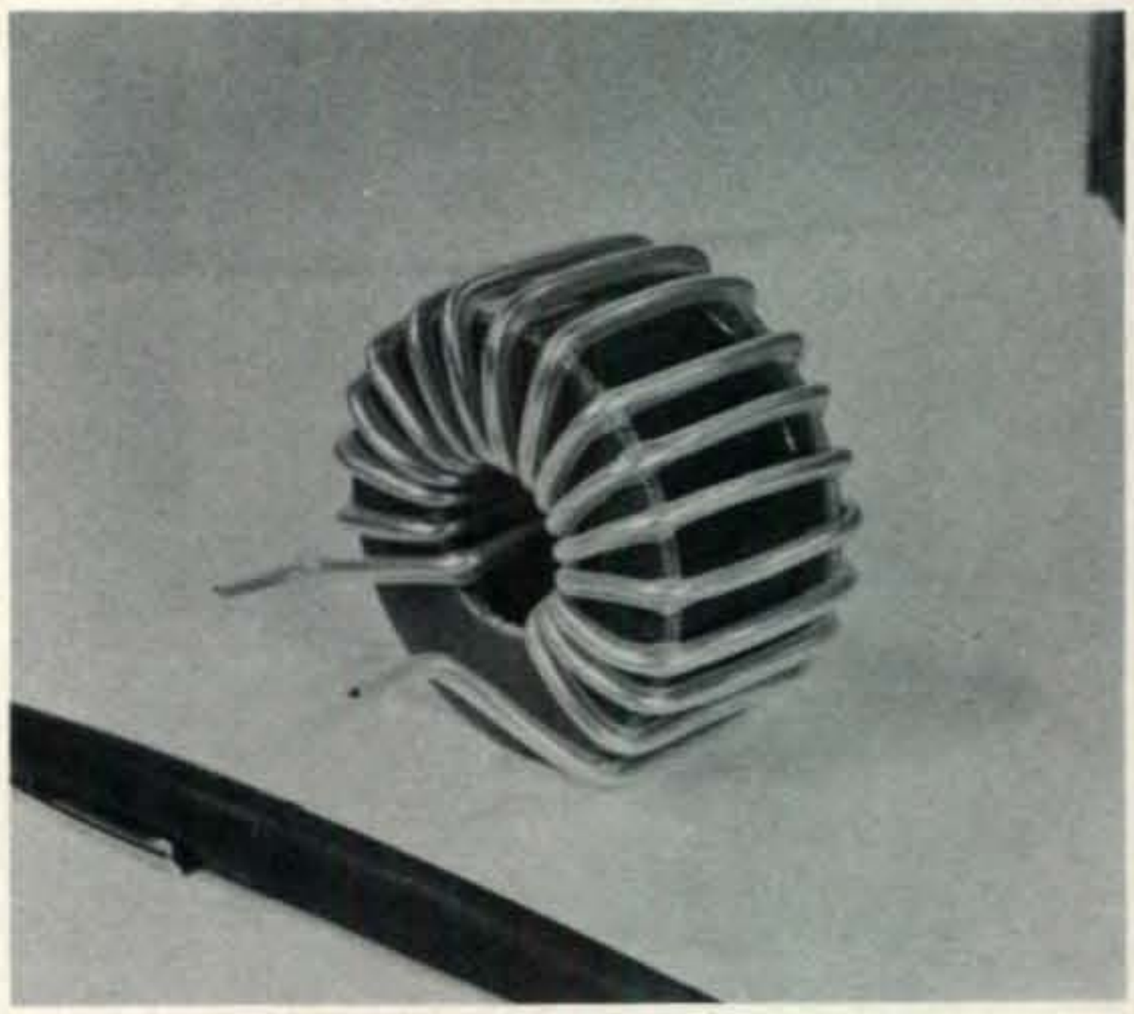
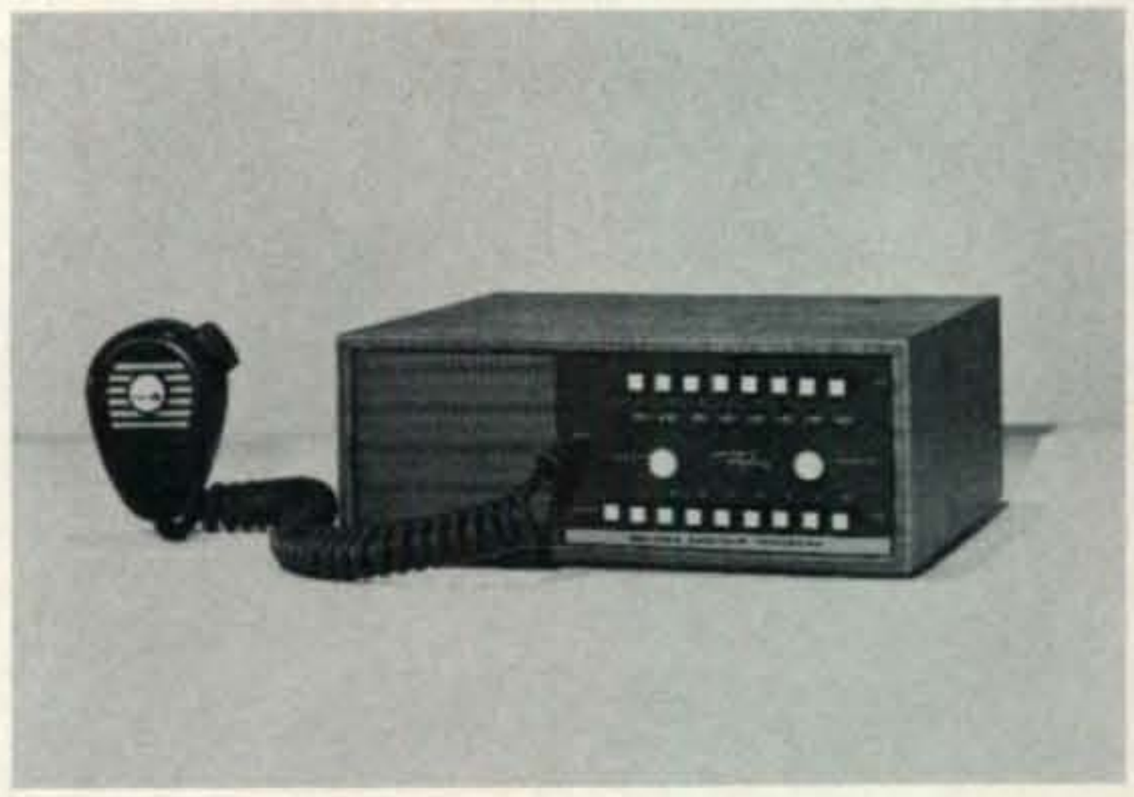


Raytrack Company

RAYTRACK is now marketing a 2 kw torroid tank coil kit (#115) for the home brewer. The kit sells for $16.95 and contains the parts required and instructions for a highly efficient compact torodial pi network circuit inductor. There are three variations in instructions for different power requirements. For further details on this and other components available from Raytrack write to them at 3498 E. Fulton Street, Columbus, Ohio 43227 or circle C on the Reader Service coupon.



Terado Corp.

The latest product out of Regency Electronics is dubbed the Transcan, and is a 2-meter f.m. transceiver combined with a receive scanner which scans up to eight channels in succession, stopping when a signal is present, and advancing when the signal disappears. The eight receive channels are push-button selected to scan only the desired channels. The transmit frequencies are also push-button selected, and upon selection, receive scanning ceases. The receiver is then automatically paired with the transmit frequency. The 13-watt-output unit is available in a fixed or mobile version (mobile shown). The HR-2MS (mobile) costs $319; the HR-2S (fixed) costs $349. For more information contact Regency Electronics, Inc., 7900 Pendleton Pike, Indianapolis, Ind. 46226, or circle D on the Reader Service coupon.

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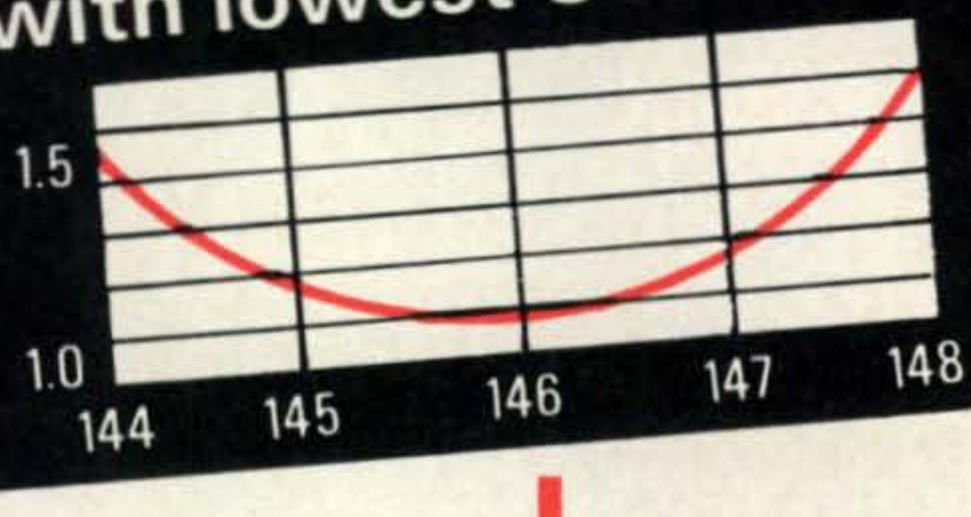

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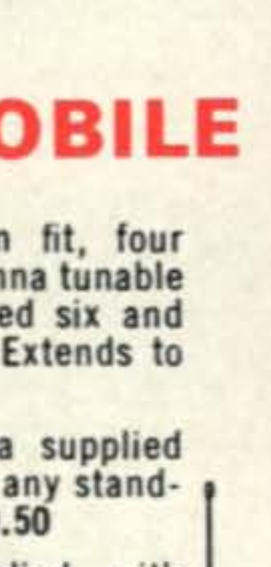

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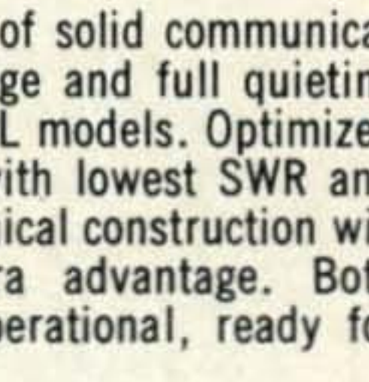

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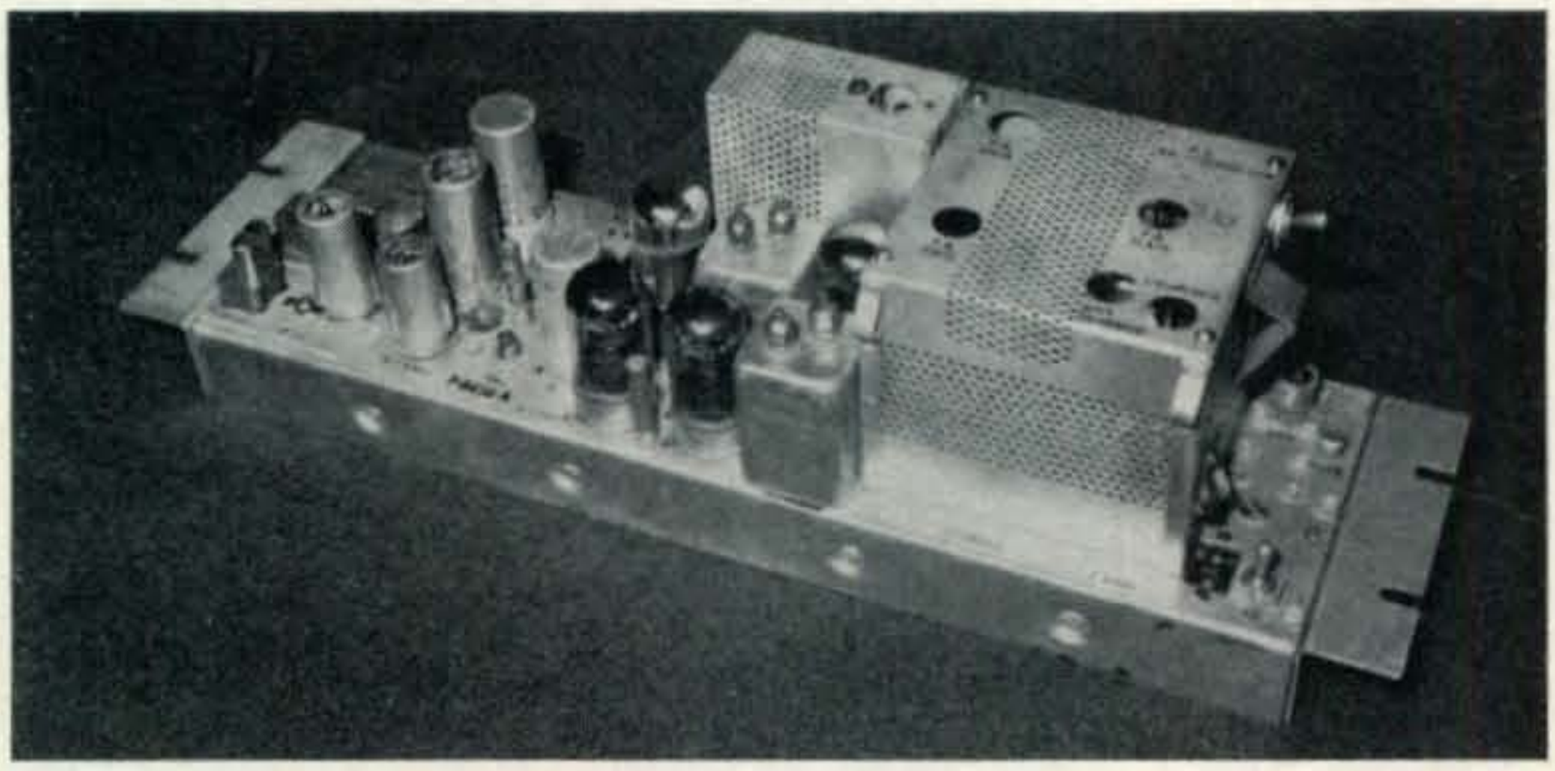


The unconverted Motorola 80D transmitter strip. The drive cage is at center rear while the PA compartment is the large square cage at the right. The modified unit appears the same, externally.

The Motorola 80D on 220 mc F.M.

BY BYRON H. KRETZMAN,* W2JTP

Part I—The Transmitter

With more amateurs finding the newer solid-state built-for-the-amateur 2-meter f.m. transceivers to their liking, a great number of older, but still excellent Motorola v.h.f. units are moving to the back shelves of shacks. With easy-to-accomplish conversions, the Motorola 80D packages may be put to work on 220 mc, a relatively untapped area for amateur f.m. This first article of a 3-part series describes the conversion of the 80D transmitter to 220 mc. Subsequent installments will describe receiver conversion and antennas.

A FEW years ago an article[1] appeared in *CQ* which covered the conversion of the Motorola 80D for 2-meter f.m. Since that time 2-meter f.m. has proliferated beyond the wildest dreams (or nightmares) of its pioneers. Metropolitan areas, in particular, have achieved a density of channel occupancy that has necessitated split channel operation. Those of us in these high density areas have had to "narrow band" equipment because stations and repeaters are now 30 kc apart instead of 60 kc.

One result of this increased occupancy of the 2-meter band has been a glutting of the amateur market by more than a dozen different varieties of f.m. transceivers, mostly solid state, mostly made in Japan. A following result has been the gradual discard of the old reliable 80D. Narrow band filters are just too hard to come by. And, by comparison, the 80D is too big and heavy.

But don't throw away that 80D! Put it on 220-225 mc. Because of recent Citizens Band interest in this v.h.f. amateur band of ours, it behooves us to increase our occupancy. And, why not? Propagation is almost as good as 2-meters. Antennas are easier to build; a half-wave is only about 24-inches long. Besides ordinary local operation, such as we now enjoy on 2-meters, 220-225 mc is also legal to use for remote control of 2-meter repeater stations. And, RACES people know that they must use the 220-225 mc band for their remote control simply because there are no RACES channels 420-450 mc.

F.M. Standards for 220-225 mc

Originally the 80D was designed for ± 15 kc deviation, for 60 kc channel spacing on "high

*431 Woodbury Road, Huntington, N. Y. 11743.

[1]Kretzman, B. H., "Putting the Motorola FM-TRU-80D on 2-Meter F.M.," *CQ*, Feb. 1966, p. 65; *CQ*, Mar. 1966, p. 33.

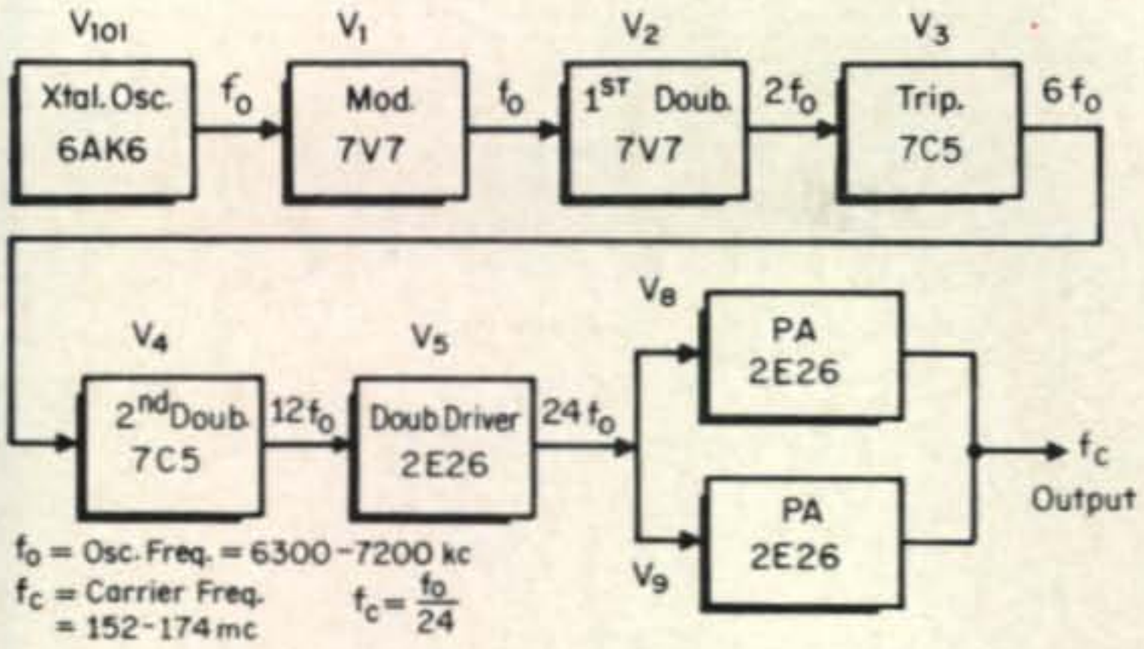


Fig. 1—Block diagram, original 80D high band transmitter PA-8461-( ).

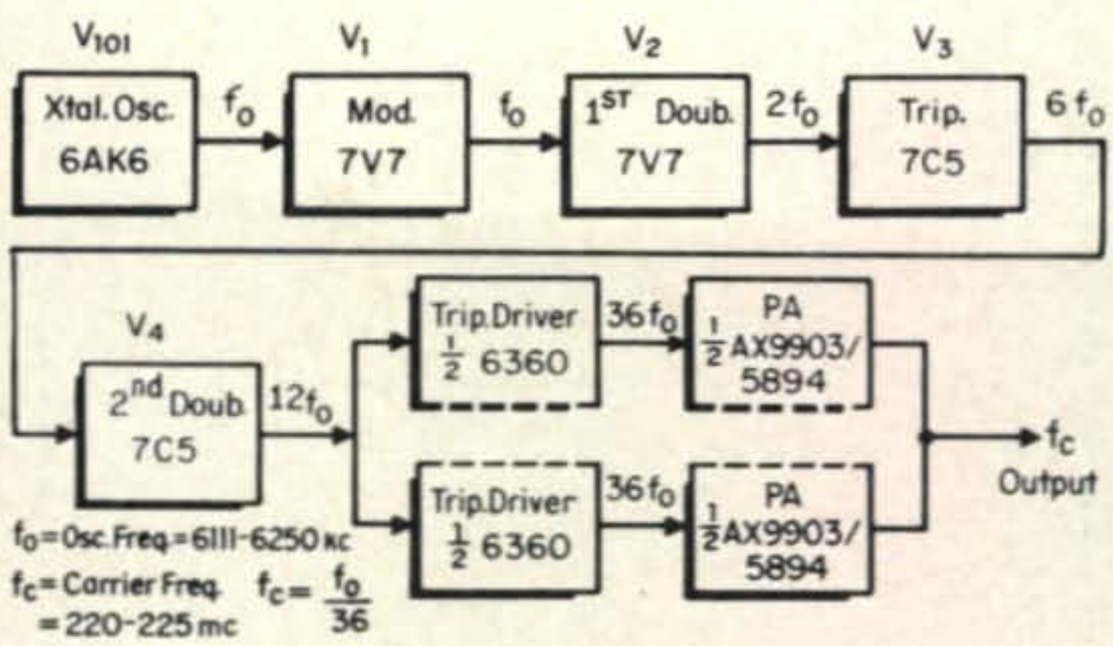


Fig. 2—Block diagram, modified 80D high band transmitter for 220-225 mc.

band" (152-174 mc) and 40 kc on "low band" (30-50 mc). This value of deviation is fine for 220-225 mc f.m. Channel spacing could be either 60 kc or 40 kc. One plan, on the west coast, established channels on a 40 kc basis, starting with 220.02 and going to 224.98. Apparently there is no generally accepted equivalent to 146.94 and 52.525. And, there is no class distinction; Technician Class licensees may use the entire band. The high end of the 220-225 mc band for f.m. is self-suggesting for about the same reasons f.m. began on the high end of 2-meters, mainly because of the concentration of the DX-ers, c.w., and a.m. 'phone stations on the low end. Another factor is the QRM from TV set local oscillators, again on the low end. Receiving problems will be discussed in detail in Part II when we cover the subject of receiver modification.

The Transmitter

Most 80D transmitter strips bear a chassis number, found underneath on a side, like PA-8461, followed by a letter indicating version. Some older versions have microphone transformers instead of the resistor networks found in later transmitters. One early version had a coaxial antenna relay. Some strips have filaments wired for 6 volts, others for 12 volts. All of these differences are relatively unimportant when it comes to putting the transmitter on 220-225 mc. The coaxial antenna relay is very desirable, but not essential. This modification takes place only in the last two stages, the driver and the power amplifier.

Figure 1 is a block diagram of the original transmitter. Note that the frequency multiplication factor is 24, with the 2E26 (V_5) doubling from about 75 mc to 150 mc. Figure 2 shows the block diagram of this transmitter modified for 220-225 mc operation. V_5 has been changed to an Amperex 6360 which now triples from about 75 mc to 225 mc. V_8 and V_9 have been replaced by an Amperex AX-9903/5894, a dual tetrode which operates straight through as a power amplifier, delivering 30 watts on 220/225. Note, especially, that both the 6360 and the AX-9903/5894 have center-tapped heaters to permit operation on either 6 or 12 volts, whichever way your 80D heater string is wired. No power supply changes or connector changes are necessary.

The modified 80D has a multiplication factor of 36. No padding of multiplier stages is necessary if you operate in the high end of the band, which is suggested. Should you have to operate on the low end, it is recommended that each coil, up to the grid coil L_4 of the 6360 tripler-driver, should be padded with an additional 3.3 mmf ceramic capacitor, such as the Stackpole Type GA. One advantage of the higher multiplication factor is an increased ability to move around the output frequency, roughly to about ±25 kc. To cover the whole band from 220 to 225 mc, crystals will fall in the range of 6111 to 6250 kc. While cheap non-oven crystals can be used, it is highly recommended that you order a commercial grade, Motorola Type RO3, crystal for use in the standard oven as originally used wit'ı this transmitter. The crystal-in-the-oven is essential should you intend to use the 220/225 80D in mobile service, where trunk temperatures can vary over wide extremes.

Preliminary Mechanical Work

Modifying the transmitter of the 80D is almost easier to do than to describe. No machine shop is necessary. The primary tools required are a hand drill, a 100-watt soldering iron, and a rat-tail file. After removing the driver and PA cage covers, disassemble

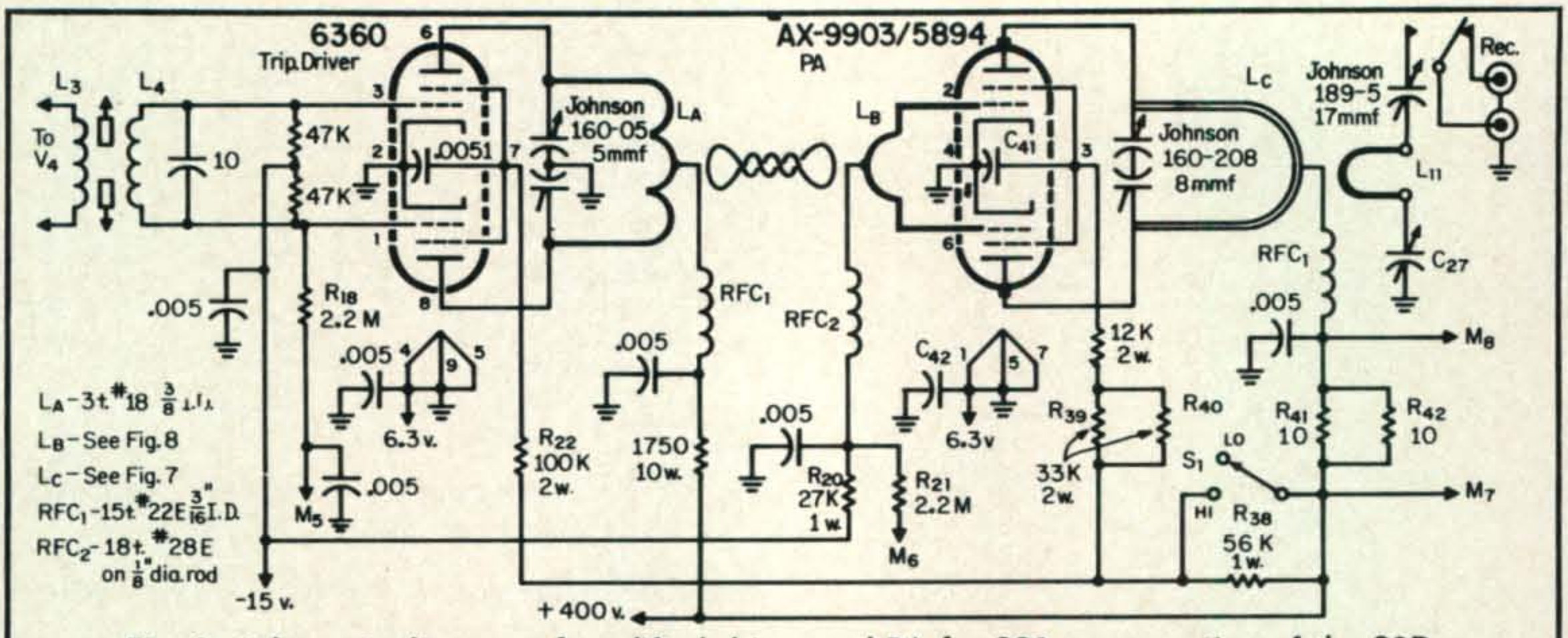


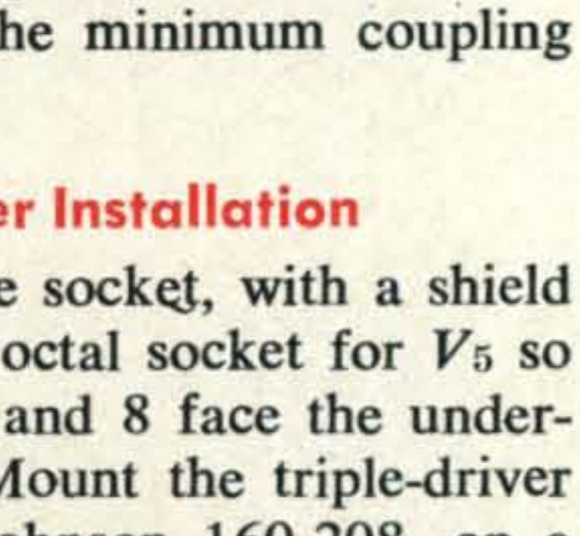
Fig. 3—Schematic diagram of modified driver and PA for 220 mc operation of the 80D.

the complete output line assembly and the can T_3, which houses the double-driver plate circuit, C_{18} and L_5. Carefully unsolder all components on tube sockets for V_5, V_8, and V_9. The tube sockets themselves will be discarded so don't worry about breaking them. Clear all lumps of solder, where the tube sockets were, off the chassis. Temporarily remove the antenna trimmer C_{27}. Leave in the antenna coupling loop L_{11}, but move it out of the way, to the minimum coupling position.

Tripler-Driver Installation

Mount a 9-pin tube socket, with a shield base, in place of the octal socket for V_5 so that the plate pins 6 and 8 face the underside of the T_3 can. Mount the triple-driver tuning capacitor, a Johnson 160-208, on a small aluminum plate (fig. 4) so that the shaft extends up into the T_3 can. You *could* discard the T_3 can, but then you couldn't use the original cage which mounts on T_3 and which nicely shields the 75 mc driver stage. We elected to use the cage. To make tuning easy, we extended the shaft of the tripler-driver tuning capacitor so that it came out of the top of T_3, through a bushing, as did the original C_{18}. Tinned #18 wire was used to bring the plate leads up to one side of the stator ends of the tuning capacitor. The other ends connect to the 3-turn plate coil L_A of the tripler-driver. Remove the ground and C_{16}, on the bottom of L_4, wiring the 75 mc grid circuit as shown on the schematic diagram, fig. 3. Note that L_4 must now be padded by a 10 mmf dipped mica capacitor. A one turn link of #20 solid insulated hook-up wire, shoved into the 3-turn plate coil L_A of the tripler-driver couples its output to the untuned grid coil L_B of the power amplifier via a short length of the same wire twisted together.

Fig. 4—Driver capacitor mounting plate is made from 1/32" aluminum. ➧



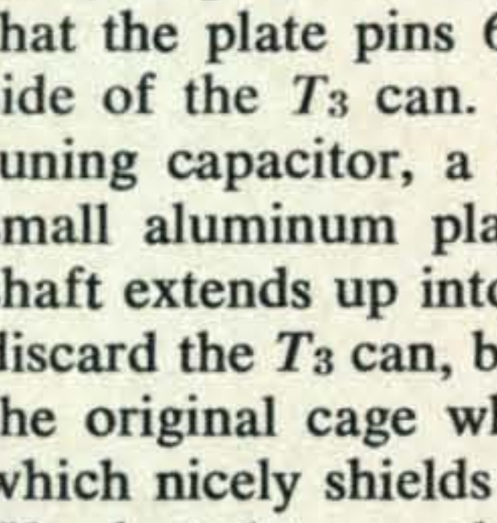
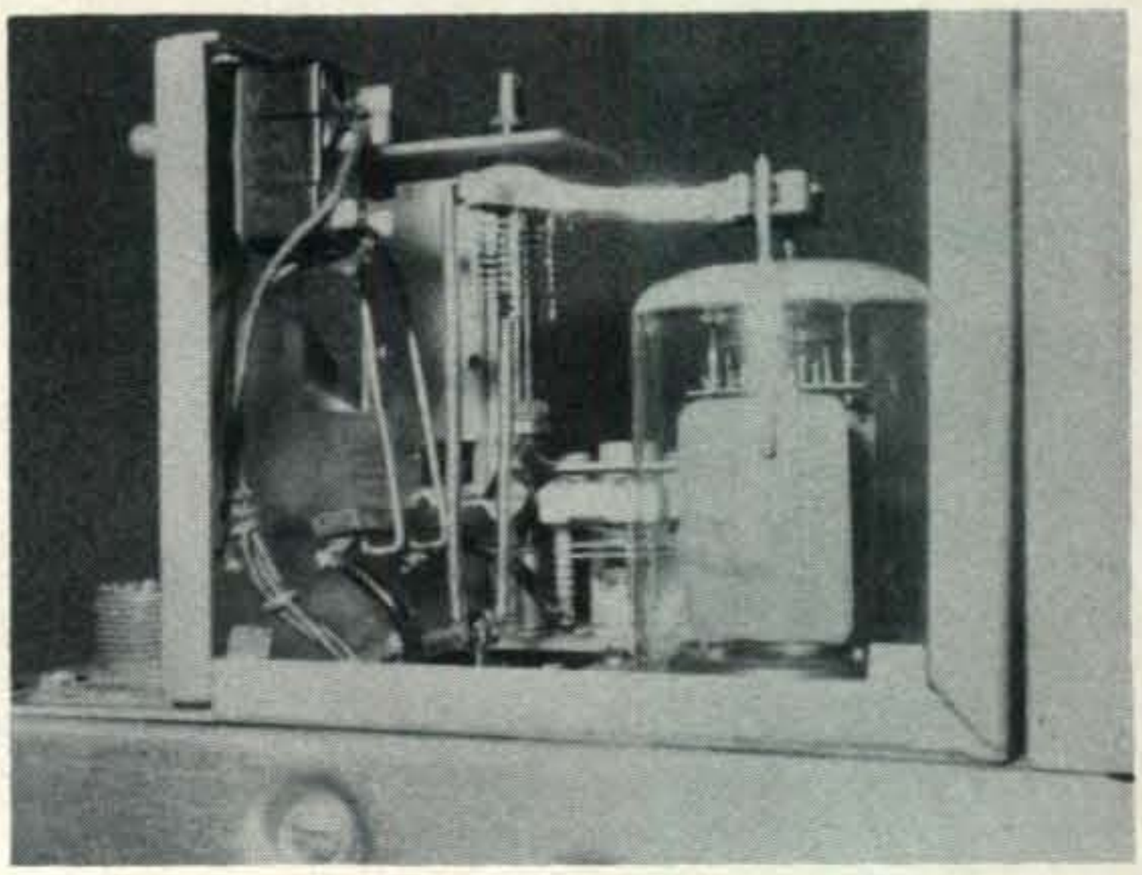


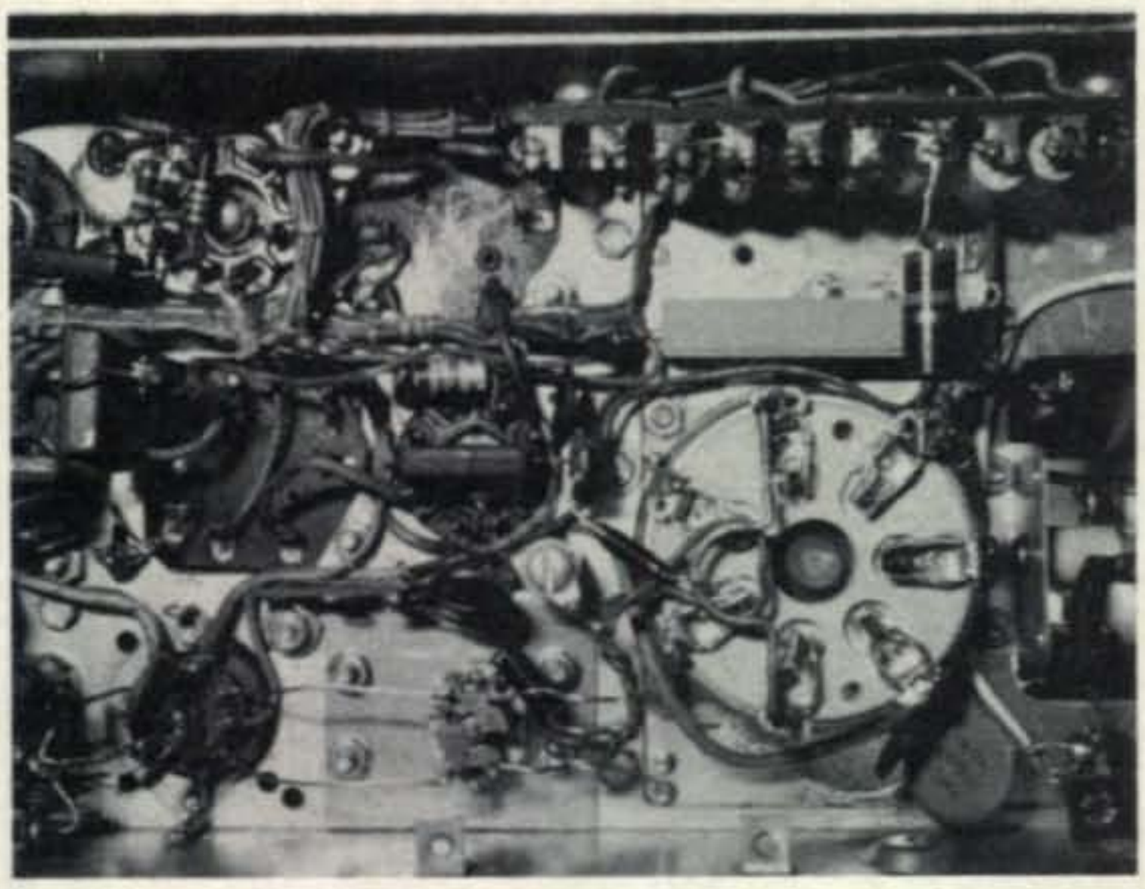
Fig. 5 — PA capacitor mounting plate is made from 1/16" phenolic or glass PC board with no foil. ➧

PA Deck Modifications

The PA deck marked P-8466, needs only a little mechanical work, mainly consisting of cutting a hole for the Johnson 122-105-100



Close-up of the PA cage with the cover removed, on the converted 80D transmitter. The PA capacitor is mounted on the PC board bracket on the top lip of the cage.



Underchassis view of the driver and PA stages showing the new 6360 tripler/driver socket at lower left and 5894 PA socket at right.

socket for the AX-9903/5894. Lay out the clearance circle of 2 3/16" diameter as shown on the mechanical drawing of the modified PA deck, fig. 6. Drill out along the circumference, finishing the cut with the rat-tail file. Mount the socket and replace C_{27}. Next prepare the PA tuning capacitor mounting plate from a foil-less piece of printed circuit board material as shown in fig. 5. This is simply mounted on the top lip of the PA cage end as shown in fig. 6. The plate is mounted 1/4" below the lip with spacers. Flat head screws are used to allow the cage cover to fit flush so the two holes drilled in the lip must be countersunk. The PA balancing switch S_2 can be removed, since it is not used, or simply turned 90 degrees to get it out of the way.

Below the deck a 1/2" high ceramic insulator is mounted on a right-angle bracket to support the center tap of the PA plate line, L_C, shown in fig. 7. The other end of the line connects to the PA plate tuning capacitor, a

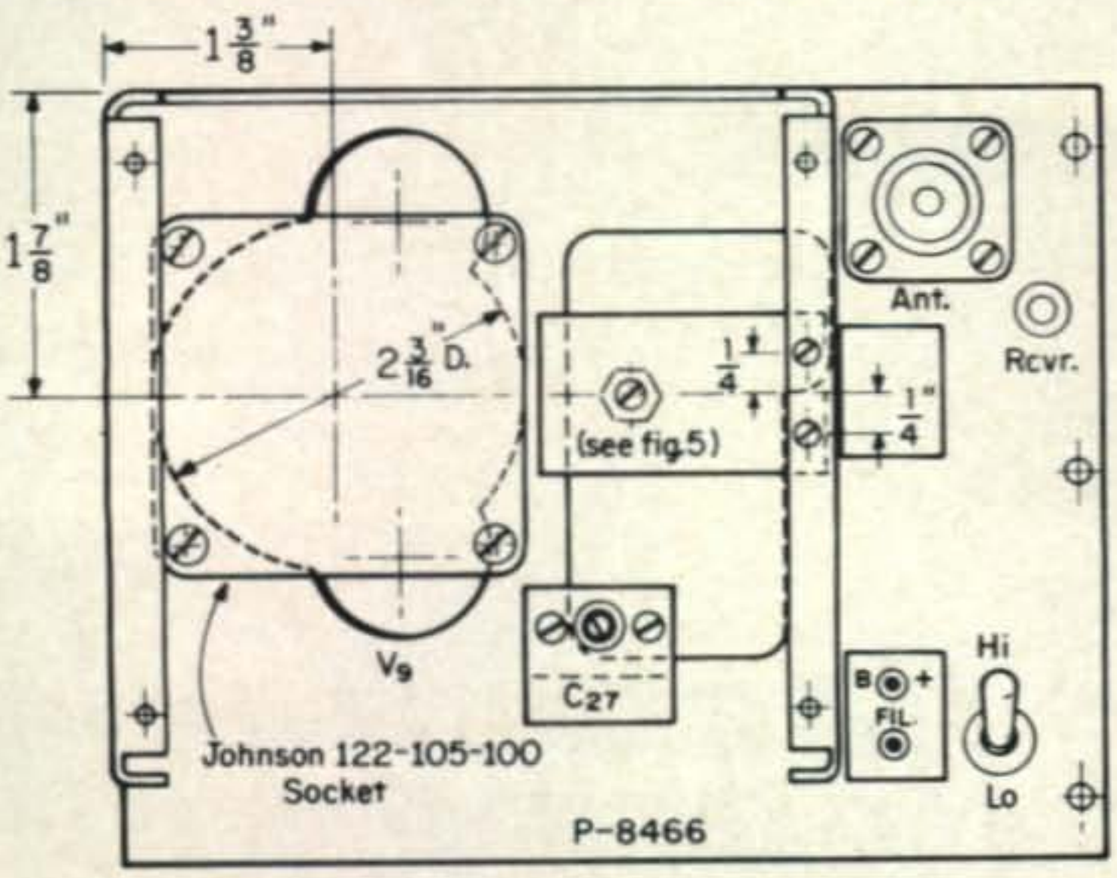
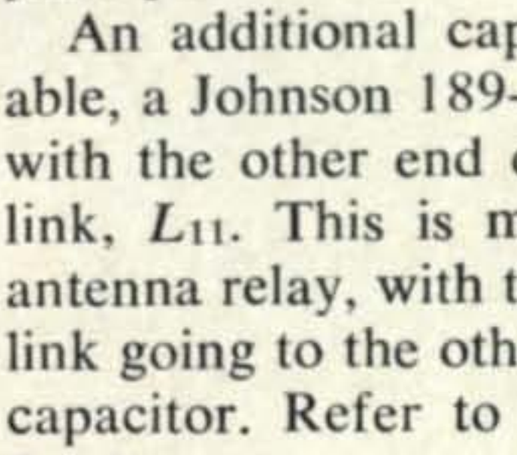


Fig. 6—PA deck modifications.

Fig. 7 — L_C, PA plate line. #10 copper wire is used.



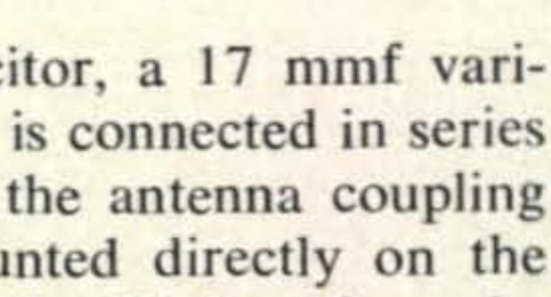


Fig. 8—L_B, PA grid line is made from #14 copper wire.

Johnson 160-208. Connections from the tuning capacitor are made from thin copper 1/8" wide semi-flexible strips to Fahnestock clips which are used to connect to the tube plate pins.

An additional capacitor, a 17 mmf variable, a Johnson 189-5, is connected in series with the other end of the antenna coupling link, L_{11}. This is mounted directly on the antenna relay, with the flexible lead from the link going to the other terminal of the added capacitor. Refer to the schematic diagram, fig. 3.

The untuned grid circuit of the PA, L_B, is detailed in fig. 8. A one-turn link of #20 solid hook-up wire, shoved under L_B, couples to the tripler-driver plate circuit via a short length of twisted pair. It should be anchored in place with coil dope.

Wiring

Changes in the wiring are relatively simple. If you have a 6 volt transmitter strip, wire the filament circuits of the driver and PA as shown in the schematic diagram, fig. 3. If you have a 12 volt strip, ground pin 5 on the 6360 and connect the by-passed pin 4 to the 12 volt bus; and, on the AX-9903/5894 ground pin 7 and connect the by-passed pin 1 to the 12 volt bus. Only two resistors, on the resistor board mounted on the side of the chassis under the PA deck, need be changed. R_{20}, originally 10K is changed to 27K, 1 watt; and, R_{21}, originally 1.8M, is changed to 2.2M, 1/2 watt. The original PA screen-dropping resistors R_{39} and R_{40} are left on the board, however, an additional 12K, 2 watt, resistor is placed in series, connecting directly between the two original resistors and pin 3 on the PA tube socket. The two tie points which separately fed B+ to the 2E26's through r.f. chokes, are simply tied together. This makes

[*Continued on page 94*]

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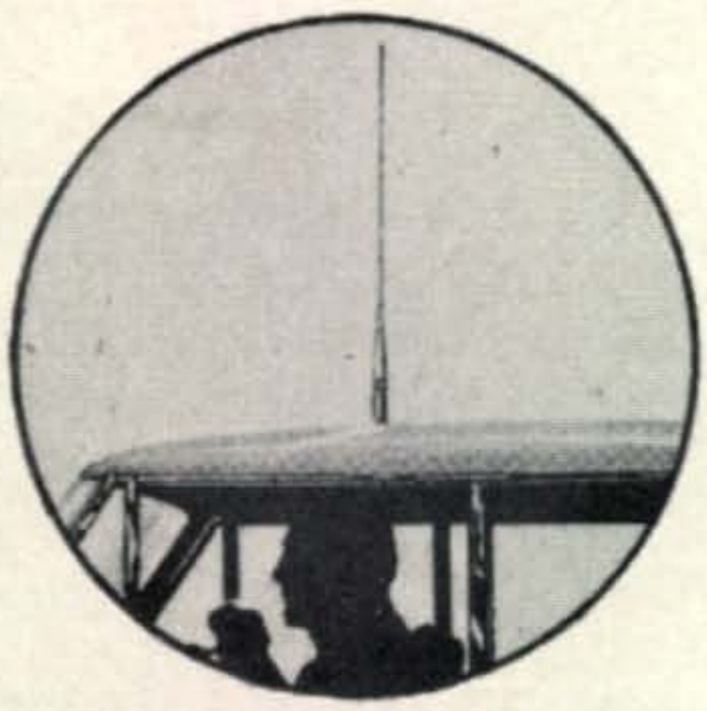

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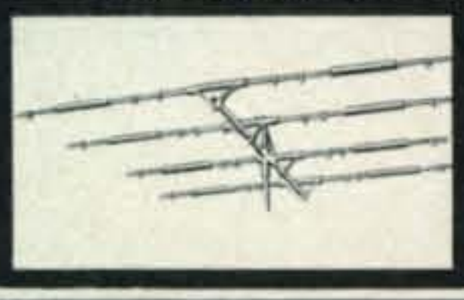
ANTENNAS 	Tri-band Beams 10-15-20 meters	
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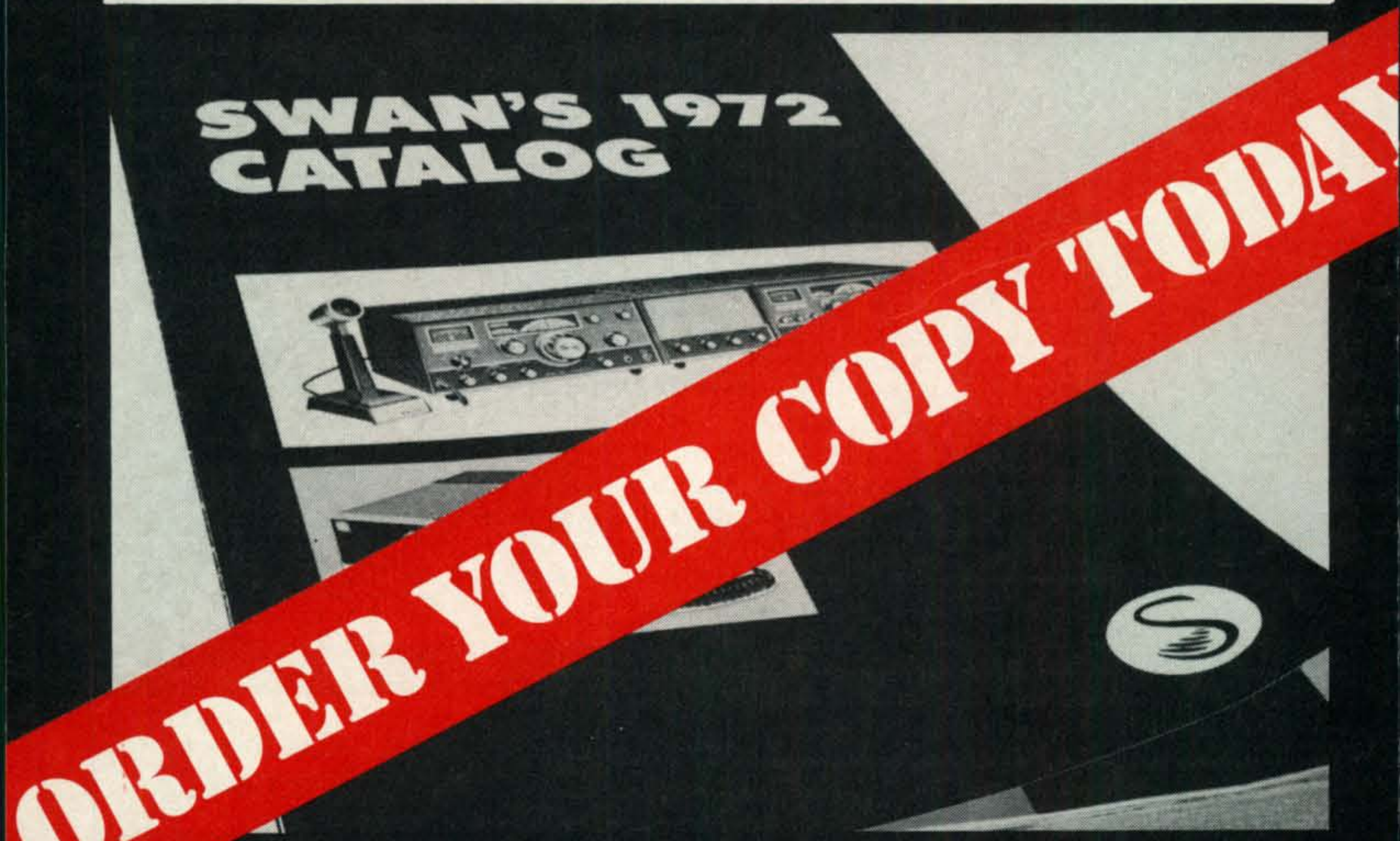

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Scandinavia, the Balkans and North Africa

What do they have in common? Why, amateurs, of course!

BY GEORGE PATAKI,* WB2AQC (ex-YO2BO)

LAST year, after a trip through 10 West European countries, I wrote a travelogue for *QST* entitled "Visiting my relatives in Europe," which was published in the November 1970 issue.

This year my wife and I decided to visit our native Romania, and to make it more interesting, we chose to include Scandinavia on our way there, and North Africa on our return.

Even in small Europe, there are great differences from one country to another: climate, customs, languages, etc. But after meeting amateurs in all these places you won't feel the language barrier or the political differences, and most important, you will understand them much better.

Oslo

Leaving New York on a 747 "jumbo jet" and changing planes in Bergen, we arrived in Oslo on a cold February day. After getting to the hotel, I called up the Norsk Radio Relae Liga and told the secretary that I would like to meet some local amateurs. She was very helpful; after making a few phone calls she told us to wait that evening at the hotel. At the agreed time, a car with a huge whip antenna and two callsigns stopped in front of the hotel and Steinar, LA5OM, and Jan, LA9IL, got out to greet us. Steinar is a student in electronics and Jan is a broadcast technician.

They drove us to the club station LA4O where we met Knut, LA6XI, Morten, LA6-MN, and a few more young amateurs. The station is very impressive, the set-up is quite professional and the enthusiasm for amateur radio of these young Vikings is enormous.

We saw their QSL bureau, a large work shop and a comfortable "coffee room," where in front of a large panel with hundreds of QSL cards, the serving of coffee and cake, and rag chewing was going on, and on, and on. On the wall, I saw the QSL cards of PAØFM, 4X4MT, etc., people whom I had met personally. In my scrap book they recognized 4X4NY who visited them a few years ago, and Gus Browning, W4BPD, the famous DXpeditioner, so there was plenty of talk about.

This club has about 200 members and they have meetings weekly. Most of the amateurs speak English quite well.

To describe this country briefly, I would say it's a cold country with very warm people.

I recommend spending a few hours in the Frogner Park with the Vigeland sculptures, visiting Bygdøy, the Museum Centre, and don't forget the radio club.

I don't recommend visiting Oslo in the winter as I did because it is too cold.

Copenhagen

From Oslo to Copenhagen, the plane stops in Göteborg, Sweden, then continues to the Copenhagen/Kastrup airport. From the airport I called up John, OZ6KL. I knew him from New York, but John was out of town. His wife gave me the phone number of Svend, OZ4SJ, the secretary of the Danish Amateur Radio Association, who set up a meeting for us with Bent, OZ6RT.

In the mean time we went sightseeing. Copenhagen, the charming capital of a fairy-tale country is worth-while visiting. The Tivoli Gardens, an immense Coney Island type amusement park, was closed during the winter but there are plenty of other interesting places.

That evening Bent, OZ6RT, who lost his sight a few years ago, came with his wife to our hotel and took us to their home in Albertslund, near Copenhagen. I was amazed

*34-24 76 st., Jackson Heights, N. Y. 11372

At the club station LA4O in Oslo, Steimar, LA5OM is operating and Jan LA9IL explains the set-up to my wife Eva, WA2BAV.

Pante, YO2BN, a civil engineer, is the principal of the technical school where the YO2KBO club station is located.

Milorad, YU1NGE is using a Yaesu FTdx 560 with excellent results.

Scandinavia, the Balkans and North Africa

Arne, OZ1AJ in Copenhagen is a radio technician; he is active on all bands.

Mircea, YO2QM, one of my former students, built himself a transceiver.

Pierre, 3V8AB, leaving Tunis will be back on the air as F5HZ.

Using Bent's station, OZ6RT, I called Belgrade and Timisoara in vain.

Lars, 3V8AH, using the Drake line, continues to give to many amateurs a rare country.

Boby YO2AAG, an excellent technician, builds everything from mike to antenna.

In Belgrade, Gog, YU1NWS operating the club station, YU1BKL.

Moktar, CN8MD in Casablanca can not work 4X4 stations. Perhaps the skip?

watching Bent directing his wife, who was driving. He remembered exactly the streets, the highways, the exits, and we had a nice ride and a very pleasant chat. Through his mobile rig we talked with Arne, OZ1AJ, who later came to Bent's house.

At OZ6RT I made a few QSOs but I tried in vain to get a station from Belgrade, our next stop. On the 2-meter band I had a long QSO with Svend OZ4SJ. Later in the night we visited Arne's place, OZ1AJ, and finally we returned to the hotel.

I recommend the Tivoli Gardens, strolling through the streets of the city, and taking one of the numerous ferry boats to Malmö, Sweden. The trip is about one hour long, costs less than a dollar and even though you travel from one country to another, you go through the same formalities as on the Manhattan-Staten Island ferry boat.

I don't recommend learning Danish just before the trip and trying to use your knowledge; you will be answered in the best Oxford English anyway.

Timisoara, Romania

From Copenhagen, flying on the Yugoslav Air Lines, with stops in Prague and Zagreb, we arrived in Belgrade. The next day, traveling by bus, we entered Romania and we arrived at my native city of Timisoara. The bus ride costs $1.50 and with all the border formalities, takes about 4 hours.

I was slightly nervous because when we left Romania in 1965, "just for a little trip," we did not tell them that we weren't coming back. Now, as American citizens we are safe, but . . . Romania could be full of surprises.

After everyone got over the shock of seeing me, I was invited by many YO2 amateurs to visit them. The first visit was to the club station of a technical school YO2KBO. The principal of the school is Pantelimon, YO2-BN; Ilie, YO2API is an engineer-teacher and Mircea, YO2QM is on the technical staff. After a few phone calls, George, YO2BB, Aurel, YO2BS, Manfred, YO2FP, Adrian, YO2BV, Tavy, YO2ABW and others arrived. We had a very pleasant *ad hoc* meeting and I was invited to a big meeting at the Country Radio Club.

Next day, I was informed by the embarrassed chief of the local radio club, that the big chief from the Central Radio Club in Bucharest gave him an order to stop "the foreigner" from coming to the meeting. "Nobody can be a prophet in his own country," says an old proverb, but who wants to be a prophet in Romania? So I limited myself visiting private amateurs and I saw the shacks of YO2BN, Boby, YO2AAG, YO2API, YO-2QM and others who dared to invite "a foreigner."

I was taken sightseeing by YO2API, YO-2QM, and YO2IZ. In the late 1950s, I used to teach radio, and Mircea, YO2QM and Paul, YO2IZ were my students. After so many years they are sometimes still accused of "Patakism." Ilie, YO2API took us to the Opera where we saw "My Fair Lady," a local interpretation of the excellent American musical.

I enjoyed meeting many friends, but after staying 10 days, it was a relief to leave for Belgrade. I think I would like to re-visit them again, but only when chiefs of the radio clubs will be real radio amateurs and the traditional Romanian hospitality will be officially reinstated.

Summarizing I would say: "Romania is a nice place to come from."

I recommend the Romanian shores of the Black Sea and the Carpathian mountains.

While there, use your eyes to see the beautiful scenery, use your ears to listen to the vivacious Romanian folk music and use your mouth to eat delicious local dishes.

Belgrade, Yugoslavia

In New York I made a list of a few radio clubs in Belgrade and once we got there we tried to locate them. At the first address we found out that YU1IOP is not there any longer. We were lucky with the second one; YU1BKL. As we entered the radio room, we saw a QSO with a Russian station in progress. The operator was Gog, YU1NWS. His English was about as good as my Serbian, so the conversation was difficult. In one moment, when Gog was trying very hard to explain something, he involuntarily started to talk in his mother tongue: Romanian. "Hurray," I said, "it is fantastic, I found a Yugoslav who speaks Romanian." "But how about an American who talks Romanian?" replied a happy Gog. Suddenly I realized that now everybody considers me an American, even in my native Romania I was called a "foreigner."

Later Bogovac, YU1NYU came and we all agreed to come back the same evening to meet more of the club members.

I could not wait till 6 P.M. when we returned to the club and we met Djure, YU1-AG, an old timer licensed in 1936, Dragan, YU1NEO who told us very proudly that his wife Lily is YU1NHV, Preda, YU1MV who works for the US Information Agency, and many more hams, some of them speaking good English.

Later, in the same evening, we went to see Milorad, YU1NGE, and we all had a very good time.

I recommend visiting Belgrade in the spring or in the summer, when you can enjoy the outdoors, and spend an evening with the YU boys.

I don't recommend tasting too much of Slivovitz, the typical local plum brandy, because you may find yourself singing and dancing, and kissing everybody on the streets.

Tunis

From Belgrade we flew to Tunis via Rome. In the eternal city I had time to call up Domenico, HV1CN and Tony, I1JX, two friends of mine, whom I visited on a previous trip.

Tunis is extremely interesting and fascinating. Medina, the old Arab city, with its numerous souks, the long, narrow streets with hundreds of bazaars, the beautiful Mosques and the people dressed in traditional Arab kachabias and safsaris, gives you a living picture of "The Thousand and One Nights."

The *Callbook* lists only 4 amateurs for the whole country and all of them are foreigners. Strangely enough, the local people are not encouraged to get amateur radio licenses.

I called up the first one on my list; Pierre, 3V8AB. He invited us over; his apartment was in the same building with my hotel. Pierre, who is also F5HZ, and ex-FF8CE, FQ8HT, TL8AC, is an active amateur, but unfortunately for the amateur fraternity, he was preparing to return to Paris.

Pierre took us to Salambo, about 10 miles from Tunis, to visit Lars, 3V8AH, who is also SM7BZD, ex-9K2BJ. Lars is with the Ericsson company, a tele-communications outfit, and he will stay in Tunis until his job is finished. So, in about one hour I met half of the amateur population of the whole country.

I strongly recommend a long walk through the souks of Medina, taking lots of photos and if you speak French or Arabic, talk with the people in the bazaars.

I do not recommend that you spend too much money on souvenirs, or offer more than 25% of the asked price or pay more than half.

Casablanca

From Tunis we flew with the Arab Lybian Airlines to Casablanca, with a short stop in Algiers. I had a strange feeling because in the tourist class of that huge plane, besides my wife and I, there was only one passenger. But we had three stewardesses, a cabin chief, a purser, etc. It was like having a private plane but sometimes I wondered if there was anything about that plane I didn't know about, and other people did. Anyway, we arrived safe and sound to Casablanca, Morocco.

From my hotel, using a list from the *Callbook* and the local telephone book, I tried to locate a CN8 amateur. Either the *Callbook*, or the phone book was not up-to-date, or the people move around too much, but I could not find anyone.

We left for a little sightseeing, and not far from the hotel, I saw a parked car with a sticker on the back window: CN8AG. "Okay," I said, "I've got the car, let's look for the owner." Eva and I were arguing what should we do; go sightseeing or camp near the car and wait for the driver. I lost the argument and while I was writing a note to leave on the car, CN8AG showed up in person. He told us about the radio club, gave us the phone number of the president and we promised to meet that evening at the club.

Finally we went to see Casablanca. Here there are two Medinas: an old one and a new one, the old one being much more picturesque. The people are dressed more colorfully than in Tunis, and the souvenirs seemed to be much cheaper.

In the evening, Hamid CN8AF, the president of the radio club, came to the hotel and after a short tour of "Casablanca by night" he took us to the club. There we met Houssein, CN8AG, Joseph, CN8BP the vice-president, Norbert, CN8AP, Paul, CN8EX and others. The club station CN8MC was not installed yet, but the amateurs seemed to be a big happy family.

I showed them my scrap book with lots of photos of amateurs I have visited in the recent years and amateurs who visited me in New York. At certain pages, they all got excited and started talking fast in Arabic. They were looking at the photos of some 4X4 amateurs. They told me they are not allowed to

[*Continued on page 96*]

F. M.

BY GLEN E. ZOOK,* K9STH/5

THE rapid growth of f.m. is beginning to catch up with us. In most major metropolitan centers 146 to 147 mc is full with repeaters and simplex operation; the top ten mc of the 450 band is full with repeaters, simplex, up links, down links, and various control functions; six meters is rapidly filling up in non-channel 2 areas; and even 220 is getting some activity. As a direct result we, the active amateur f.m. operators, must begin pulling in our skirts and tightening our technical standards. The trend must be to narrowband. This is not to say that everyone must immediately cut deviation, modify receivers, and generally upset everything in the area still using wideband.

The arguments in favor of narrowband operation are numerous. The major reason for going narrowband on the commercial channels was space. The same is rapidly becomming true on the amateur bands. The present 60 kc wideband channel spacing was based on the old commercial standards. The narrowband amateur channels with 30 kc spacing were a second following of the present commercial standards. The commercial high band has reached the point of 15 kc channel spacing! If amateur f.m. continues to grow at the present rate we will be at the 15 kc channels in just a few years. Thus, the time for planning and conversion of systems still using wideband is at hand.

One of the major arguments presented against going to narrowband is one of equipment. Of course there are still many 5V's, 30D's, and similar units in use in some areas. However, the commercial channels were split in 1957, and most equipment manufactured after that was narrowband from the factory. Also, most equipment manufactured after the early 1950's was able to be modified and thus meet commercial narrowband standards (0.0005% tolerance and ± 5 kc deviation). Thus, most of the obsolete commercial units available to the amateur for the past three or four years have been narrowband. Also, most of the older units can have audio-recovery added and the deviation of the transmitter is simple to pull in to ± 5 kc. Of course changing of receiver filters and addition of audio transmit filters will add to the technical improvement of the equipment, but just pulling in the transmit skirts and putting in audio recovery in the wideband equipment is a step in the right direction.

The amateur only f.m. units, both import and domestic, are compatable with the commercial f.m. units. The frequency tolerance on this equipment is usually 0.001% (1500 c.p.s. at two meters) which will stay well within the passband of the commercial receivers. Also, many manufacturers are setting the deviation from the factory at ± 7 kc or less. The receivers employ ceramic filters with very good adjacent channel rejection, so these units are a good start towards narrowband. The manufacturers can help the conversion to narrowband techniques by insuring that all transmit crystals supplied either as original equipment or as add-on's meet the 0.001%. Also, they can help by making sure that all preset deviation levels do not exceed ± 5 kc. Crystal manufacturers can help by pushing crystals with 0.001% or 0.0005% tolerances. Finally, new repeater owners can help by making all new repeaters on six and two meters narrowband.

The equipment now becoming available for 450 work is wideband, due to the recent splitting of the commercial 450 band. Thus, rapid conversion to the 25 kc channel spacing and ± 5 kc deviation on 450 is a little ways off. However, one must plan ahead, and when narrowband 450 equipment becomes available begin to utilize this equipment and replace older wideband units. The present 450 wideband channel spacing is 100 kc in many areas, but 50 kc spacing was used for many years commercially with the same equipment, so some areas are already beginning to use 50 kc channel spacing on 450.

Present amateur narrowband standards call for ± 5 kc deviation and 20 kc channel spacing on 10 and 6 meters and 30 kc channel spacing on 2 meters. The 2 meter channels start at 147 mc and step downward in frequency (e.g. 146.970, 146.940, etc.). The six meter channels usually start at 52.540 mc and go upward at 20 kc intervals. The national calling frequency of 52.525 mc is not presently on a good split (or for that matter wideband) frequency. Shifting of this calling frequency to 52.520 mc might be considered. However, such a major shift as this will be long in coming.

Again let me impress that the conversion to narrowband cannot be an overnight thing. The commercials had five years to get completely within specifications, and that was forced upon them. We can, however, begin to pull in the skirts and get the systems still using wideband techniques headed towards eventual narrowband. Remember, that 5V is 25 years old, and may not last much longer. It sure is a shame to

*818 Brentwood Lane, Richardson, Texas 75080

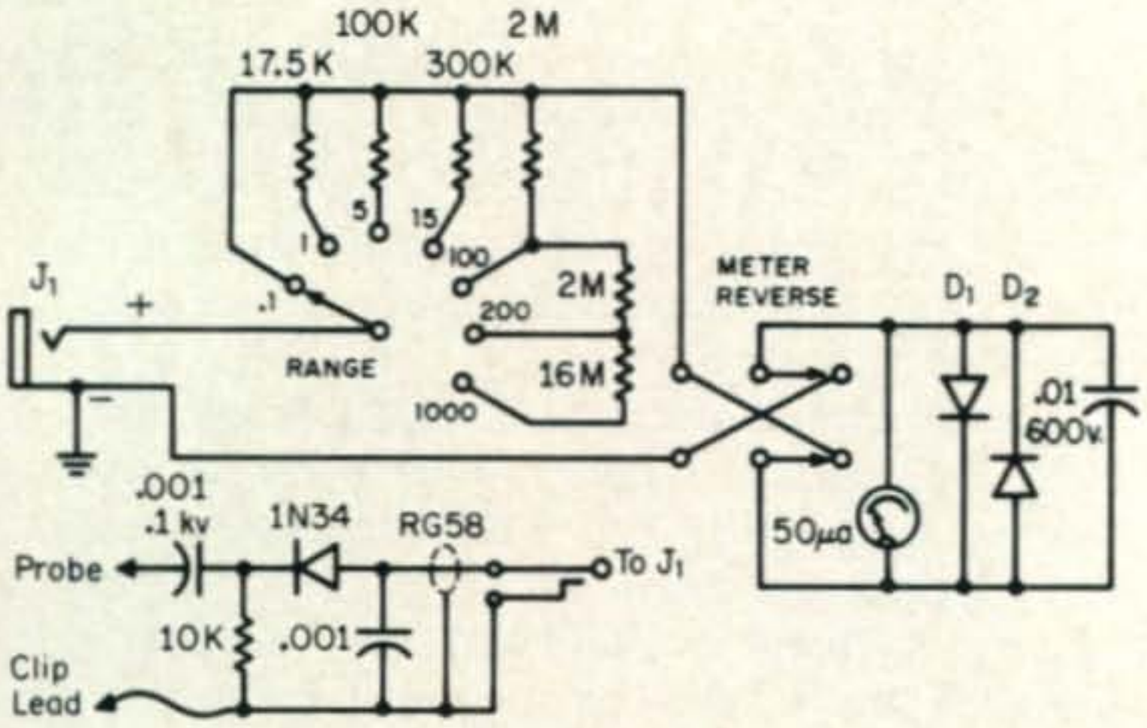

Fig. 1—A general test meter. All resistors are 1/2 watt, 5%, and may be used in series to get total value. D_1 and D_2 can be any silicon rectifier. See text for details on use.

have to dig into a good Motrac, MASTR, or similar unit to make it compatable with a few wideband systems.

Enough editorializing for now. Talk it up locally.

Technical Talk

This month's Technical Talk again is in the realm of test equipment, a multi-meter for alignment. The meter is based on the Motorola TEK-7A alignment and d.c. voltmeter. The meter can be used for r.f. as well as d.c. alignment utilizing test points (such as many General Electric units) and the r.f. and d.c. scales can be used on many brands of portable units. By attaching a short piece of wire to the r.f. probe an effective r.f. field strength (relative) is available. The 0-15 v.d.c. scale is quite handy in checking out automobile voltage. With any kind of junk-box at all the price of the unit should be well under $5.00. If all parts must be bought the price still should not run much over $10.00. Not too bad an investment for the usefulness of the tester.

The basic test meter consists of an 0-50 ua meter with proper shunts to give .1, 1, 5, 15, 100, 200, and 1000 volts d.c. full scale. By plugging in the r.f. probe the scales become approximately .5, 1, 5, and 15 volts r.f. (the higher voltage ranges are not normally used for measuring r.f.). A meter reversing switch is provided for measuring both negative and positive voltage. Remember to put the switch in the negative position when reading r.f. voltage.

The d.c. probe is just a straight connection (with internal resistance in series) so almost any type of normal meter lead may be used. The r.f. probe can be constructed in any number of ways, but a fully shielded assembly is best. The ARRL handbooks suggest making r.f. probes using tube sockets and shields. (page 548 in 1969 edition). Other probes have been made using old ball-point pen housings. A case could be constructed on perf-board, wrapped with tape, then shielded with aluminum foil. Amateur ingenuity usually prevails in cases like this. Anyway, the schematic of the basic meter and appropriate probes appears as figure 1.

The past several months' Technical Talks have concentrated primarily on test equipment. This is because test equipment knows no specific frequency or other personal preference. However, the Technical Talks for the next few months will try to diversify. Projects dealing with antennae, unit conversions, adding additional frequencies, and the like will be undertaken. Of course test equipment will not be left out in the cold. Several pieces of useful test equipment are in the planning or construction stage and will be brought up when they are ready.

Q & A

Q. I believe that I once saw a surplus advertisement with a Motorola Test Set. However, some of my friends think I'm seeing things. How about it?

A. Well, if you're seeing things, then so am I. About a year ago Fair Radio Sales Co., Lima, Ohio, had a military equivalent of the Motorola P-8501 series test set listed in their catalogue. I can't find my copy of the flyer, so therefore cannot give you the exact model number. The newer issues of the flyer do not list the test set. If anyone has the military nomenclature please forward it to me to be passed on to others. Also, when using any of the older Motorola Test Sets (portable) be very careful when the meter is in transmit position 7 (plate current). In this position the plate current is determined by the voltage drop across a small value resistor in series with the plate lead. Since one side of the meter is connected to the front panel of the older test sets, there is full plate voltage on the panel when in position 7. All other positions are made relative to ground, and the panel is at ground. This has been corrected in the newer style test sets.

Q. Although my f.m. unit works quite well on the test bench it does not function well in the car. The transmit power seems to be down and the receiver sensitivity is very poor. Any suggestions?

A. Your problem sounds very familiar, low voltage at the unit. Check the power at the input to the radio (power plug). On receive it should be in the neighborhood of 13.8 v.d.c. and on transmit it should be around 13.2 v.d.c. If the voltage is low, check the voltage at the battery with the engine running. It should be around 14.5 to 15.0 v.d.c. Most cars with alternators are in this range, but many cars equipped with generators often are set below 14 v.d.c. The solution to this is to have the voltage generator set up for the proper voltage. Another possible cause is too small a primary power cable. However, if the original manufacturer's cable is being used, then the problem may be either in the actual connections to

either the battery, fuse block, or at the radio itself. remember that a small fraction of an ohm can cause a large voltage drop at the currents drawn by many rigs. The cure for this is to carefully clean all contacts, especially around the fuse block. When using one of the amateur only rigs, make sure that the point chosen on the dash connections for power has a sufficiently large power capability. It does little good to have #10 or #12 wire going into the transistorized rig if the power take-off point is being fed with #18 wire.

News

Bethlehem, Pa., has a 146.16 mc input and 146.700 mc output machine going at 30 watts output. Plans are underway to increase the power to 150 watts from a new site near Nazareth, Pa. I hope that there is no interference either to or from RTTY'ers on the 146.700 mc frequency, for that is the national RTTY channel.

The La Porte, Indiana, .22/.82 machine is fully operational from the business location of K9LHC. This is about 3 miles from the Indiana East-West Toll road about 60 miles east of Chicago.

The British Columbia FM Communications Association is publishing a very informative newsletter both with "newsey" items and good technical articles. I would think that they would be interested in exchanging bulletins with other f.m. newsletters. The Co-Editor who added this editor to the mailing list is Dave Bennett, VE7AZG, 1034 No. 1 Road, Richmond, B.C. Canada. Send any contributions or requests to him.

CARC Meetings

On 5 June the mid-year meeting of the California Amateur Relay Council was held in Los Angeles. Several items were discussed: Among these were frequency coordination efforts in California and Nevada, including a division of responsibilities among Northern California, Southern California, and Nevada. Member and non-member organizations are encouraged to coordinate frequencies throughout the CARC. Contact Jay O'Brien (f.m. Editor of *Ham Radio*, for the record) W6GDO for coordination information. A report on the ARRL VHF Advisory Committee was presented by members of the committee W6GDO and W6MEP. It was reported that the ARRL has sent out questionnaires to all known repeaters for the purpose of directory information and to formulate plans for support of repeater users in FCC actions.

The next meeting of the CARC will be held 2 October at The Nugget in Sparks, Nevada. Contact Frank Cherne, 840 Rhode Island Drive, Reno, Nevada 89503 for dinner reserva-

[*Continued on page 92*]

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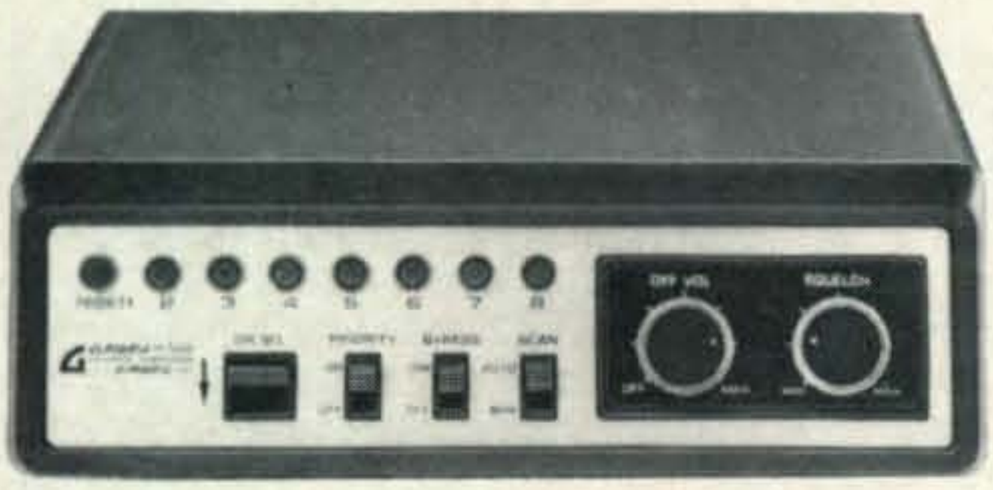

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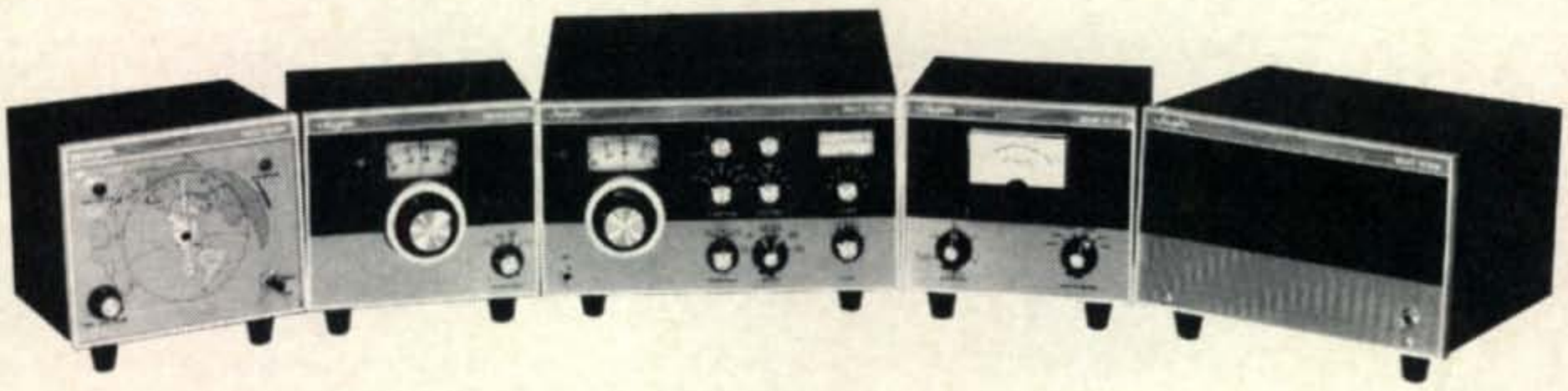

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RV550A is a solid state VFO. Function switch selects the remote unit to control Receive-Transceive-Transmit frequency independently. Order No. 856 Ham Net $95.00

SC550A Speaker Console with headphone jack. AC400 power supply will mount inside. Order No. 858 Ham Net $29.95

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Hy-Gain's *Super Thunderbird* TH6DXX

• "Hy-Q" Traps • Up to 9.5db forward gain • 25db front-to-back ratio • SWR less than 1.5:1 on all bands • Takes maximum legal power • 24-foot boom. Order No. 389
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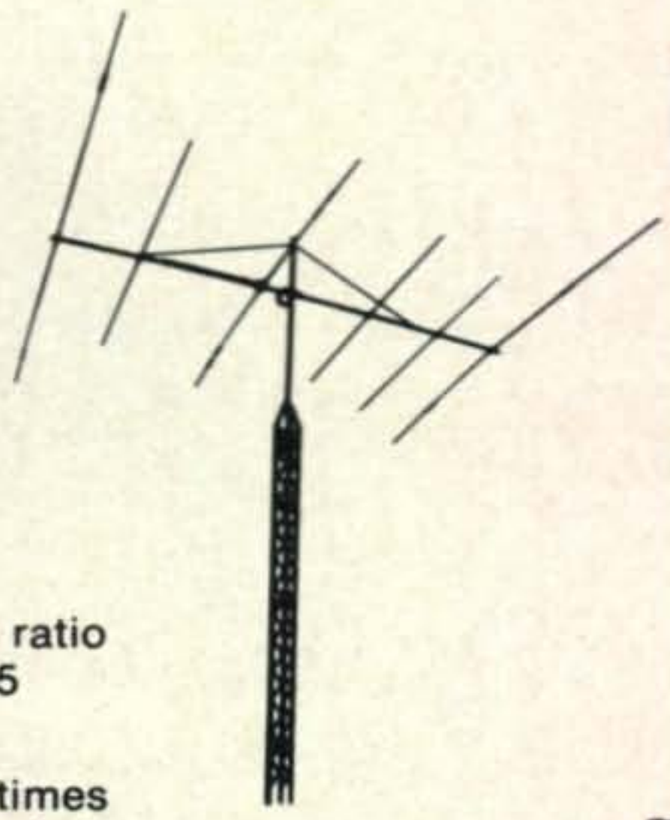

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Hy-Gain's Thunderbird TH3Mk3 (not shown)

• "Hy-Q" traps • Up to 8db forward gain • 25 front-to-back ratio • Takes maximum legal power. Order No. 388 Ham Net $144.95

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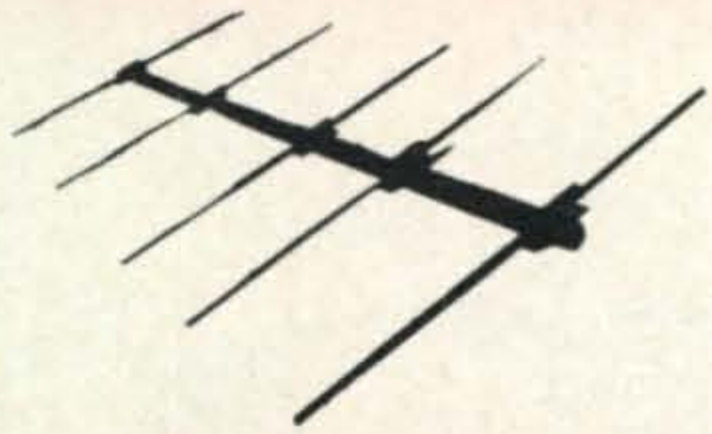

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Complete with microphone, mobile mounting tray and 2 pair of crystals, (146.94T/146.94R and 146.34T/146.94R)
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SPECIFICATIONS

Frequency Coverage: 144—148 MHz
Dimensions: 6¾"W x 2⅝"H x 9"D without tray
Weight: 5 lbs.
Microphone: Controlled Magnetic
Antenna Impedance: 50 ohms

RECEIVER
Sensitivity: At least 0.5 μV for 20 db Quieting, 0.35 μV for 12 db Sinad
Selectivity: 16 KHz @ 3 db
Freq. Tolerance: .001% from —30°C to 60°C
Spurious Rejection: At least 60 db
Audio Power: 2 W. w/less than 10% distortion
Squelch Range: 0.2—0.8 μV
Intermediate Freq.: 10.7 MHz & 455 KHz

TRANSMITTER
Emission: 16F3 (Frequency-Modulated)
Freq. Tolerance: .0005% from —30°C to 60°C
RF Power Output: 8 to 10 Watts
Spurious & Harmonic Attenuation: More than 50 db below RF carrier
Deviation: Internally adjustable 0—10 KHz

POWER REQUIREMENTS
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With all the other things amateur radio has to offer, WHY USE FM?

BY GLEN E. ZOOK,* K9STH/5

WHY use f.m.? What good it is? What can it do for me? Isn't f.m. just another Citizens Band? These are questions often asked by non-f.m. and especially non-v.h.f. amateurs. On the surface these questions seem to place the f.m. operator on the defensive, since he appears to be the scorn of the low frequency amateur. However, these are legitimate questions. Any new mode of operation presents a financial and/or time investment on the part of the interested amateur. Thus, he has a definite need to know what is in store for him when he ventures into the ranks of the f.m. amateur. Also, these questions pop into mind when one is trying to "sell" the idea of amateur f.m.

Selling VHF

At present most amateur f.m. activity is on the v.h.f. and u.h.f. bands. Of course there is activity on ten meters, but this activity does not make up a considerable part of the whole when considering the popularity and primary usefulness of f.m. Since this f.m. activity is primarily on the v.h.f. and u.h.f frequencies one must first sell the prospective f.m.'er on v.h.f.

A prime selling point is one of room. There is enough room on six or two meters to completely encompass the high frequency amateur bands from 160 through 10 meters and still have enough room for another 80 meter band.

Although most amateurs who have not used the v.h.f. frequencies think of them as good for local QSO's only, there are sufficient band openings to whet the appetite of the DX'er who wants to rely on skill rather than sheer power (like on 20 meters?). Six meters behaves much like ten meters in terms of band openings, especially during the summer months. Two meters often opens up for over a thousand miles during the passage of various weather fronts (temperature inversions). The same goes for 220 and 450 mc bands. On v.h.f. and u.h.f. the skill in operating and in developing the capabilities (especially receiving) of the station is highly dependent on the efforts of the owner/operator.

Although v.h.f. does have many band openings and DX opportunities, the v.h.f. bands produce reliable—that is, day after day—local and semi-local (150 mile radius) communications which cannot be duplicated on the 160-10 meter bands. Even during band openings the local coverage on v.h.f. remains fairly constant, thus giving reliable ragchew and emergency communication capabilities. Granted that the lower frequencies will let one talk short distances. However, this short coverage capability changes with the seasons, sun-spots, time-of-day, and similar parameters. For example, try talking hour-after-hour for 20 or 30 miles using 10 watts output on any of the lower bands. If the propagation doesn't get you your fellow amateur will. This is much less likely on the v.h.f. and u.h.f. amateur bands. Low power combined with a relative constant propagation and range gives a benefit unmatched on the frequencies up to 30 mc. Of course this reliability is only a small part of the advantages of v.h.f. and v.h.f.-f.m. in particular.

Fixed Frequency Operation

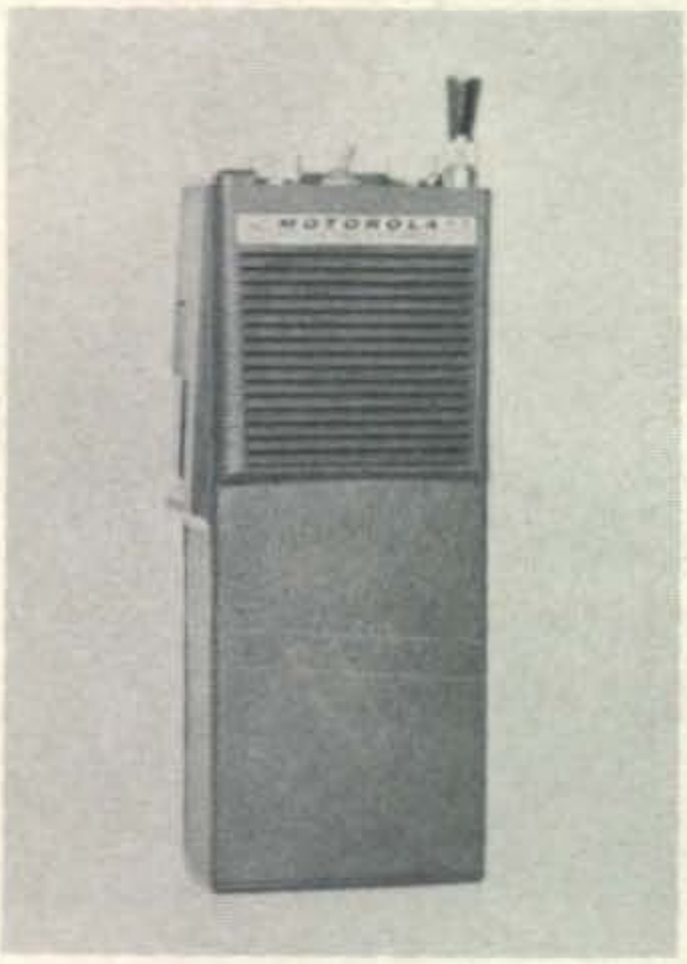
In most cities and localities the amateur fraternity likes to keep in touch. Often this is done by the use of a single frequency as a local calling and/or working frequency. In the days of a.m. this worked out quite well. Exacting frequency stability and calibration was not a problem. What if a guy was a kc or so off frequency. Everyone could hear him. Well, that just doesn't work with s.s.b. As a

*818 Brentwood Lane, Richardson, Texas 75080

result, many cities do not have a local frequency any more, unless that frequency just happens to be on v.h.f. f.m. The f.m. equipment now in use on the amateur bands comes primarily from two sources, obsolete commerical (police, taxi, etc.) gear, and units built especially for amateur f.m. In both cases the units have a crystal controlled transmitter and receiver, and the receivers employ squelch circuitry to keep down the noise except when the channel is in use.

As to what channel to use and how to use it is somewhat a local option. Many DX operators use an f.m. channel to give the location of choice DX stations on the lower frequency bands (after working it of course). Since the two meter band is the most popular of the v.h.f. bands, these nets can be placed above 147 mc (where Technician class operators cannot operate) with little possibility of either crowding or interference. This with the availability of two meter equipment makes this band a favorite spot for DX nets.

Of course DX chasing is not the only reason for establishing a local f.m. frequency or net. It is simply ridiculous to rag-chew locally using 1 kw s.s.b. to talk a short distance, especially when a few watts on v.h.f. will do the same thing with much less QRM to all concerned. The fixed frequency nature of v.h.f. f.m. makes it excellent for emergency communications. Persons do not miss a call because they were tuning up and down 20 meters looking for DX. Since the f.m. unit is completely separate from the remainder of the amateur station.



Compact portable f.m. gear originally designed for commercial applications is popular with many f.m.ers. Units like the Motorola HT-200 series are becoming available at reasonable prices.

Many name brand amateur lines are now including f.m. equipment, like this Swan FM-2X for less than $250.

Mobile Operation

There is something in the personality make-up of the American amateur radio operator which makes him crave mobile operation. This may be due largely to the extreme mobility of the amateur and because of the commuting habits of the American worker. The average amateur spends from 1/2 to 2 hours a day in the automobile just going to and from work. Because of this otherwise wasted time one can put in quite a bit of pleasurable hamming while commuting. One drawback to the mobile amateur is the maintaining of domestic tranquility. Wives just don't like big s.s.b. transceivers setting in the middle of the front seat. And, even though antennas make the car easy to find in a parking lot, wives don't ordinarily like the center loaded whips ordinarily used with the lower frequency s.s.b. gear. In this area of "wife approval" f.m. gear comes into play. For example, the control head of a commercial unit or the entire ham-only f.m. unit is smaller than a cigar box. It takes up little leg room in

A pioneer in amateur f.m. was Varitronics. This IC-2F is their latest contribution in the $350 class.

Builders of marine communications equipment—have expanded into amateur f.m. circles. This Simpson Model A falls into the under $250 class.

the front seat, and it distracts from the atmosphere very little.

Since a squelch circuit keeps the background noise cut-off, the wife doesn't have to listen to a lot of nerve wracking noise. Since f.m. is channelized, you don't have to tune around for a signal and the resulting heterodynes found on the lower frequencies just don't exist.

Antennas are small and unobtrusive. A quarter wave whip for six meters is the same size as the normal broadcast whip (55") and a ordinary car antenna can be used with a change-over switch for six meter operation. Two meter quarter-wave antennas are only about 19" long, 220 mc antennas are about a foot longer, and 450 mc antennas are slightly over 6" long. Of course there are gain antennas for two and the higher frequency bands, but these usually employ slender spring steel antenna rods with a small base loading (actually matching) coil. These antennas, even with the coil and longer length, are still shorter than the broadcast antenna. Besides, the usual f.m. antenna looks better than the short CB whips which a wife is used to seeing, and much better looking than the center loaded 75 meter whips. Thus, she usually comes around to accepting f.m. in the car.

Along with the wife approval the lack of fiddling with the equipment while underway makes it much safer for mobile operation. An f.m. unit is tuned up and installed, and thereafter only periodic checks made to make sure it's operating correctly. Thus, one has only to turn the unit on, choose a channel, and talk. Everything else has been done previously. Try this on 75 meters.

National Channels

Okay, you say, but what about when I'm mobiling on vacation? Well, the amateur f.m. fraternity has taken care of this. There are established national f.m. channels on six, two, and 450 bands. On six meters the national frequency is 52.525 mc. On two meters there are actually three frequencies, 146.940 mc for direct or "simplex" work and 146.340 mc as a repeater input with 146.940 mc or 146.760 mc as an output frequency. On u.h.f. the usual frequency is 449.100 mc simplex and 449.100 mc input and 444.100 mc output when a repeater is used. Thus, a mobile with capabilities of just one of the national frequencies can travel and have many many enjoyable QSO's on fm.

Repeaters

What did you say about a repeater? Well, a repeater is a remotely located station which

Another marine convert is Standard Radio with their line of equipment in the under $350 class.

Drake is another old-time manufacturer in the ham field who has added f.m. equipment to his line, such as this Marker Luxury base/mobile transceiver.

receives a signal from a given station (base, mobile, or portable) and retransmits it on another frequency. Such a repeater acts as a remote base station for anyone on the channel. A repeater is often placed on a high mountain top, building, tower, or similar favorable spot. It then can increase the range of portable, mobile and low-powered base stations much beyond the normal radius of communications for a given power or antenna height. All major, and most smaller metropolitan areas have at least one repeater in operation. These repeaters have been largely responsible for the tremendous growth on v.h.f. f.m. Although most operating repeaters are now on the two meter band, there are operating repeaters on the other three bands previously mentioned (50, 220, and 450 mc).

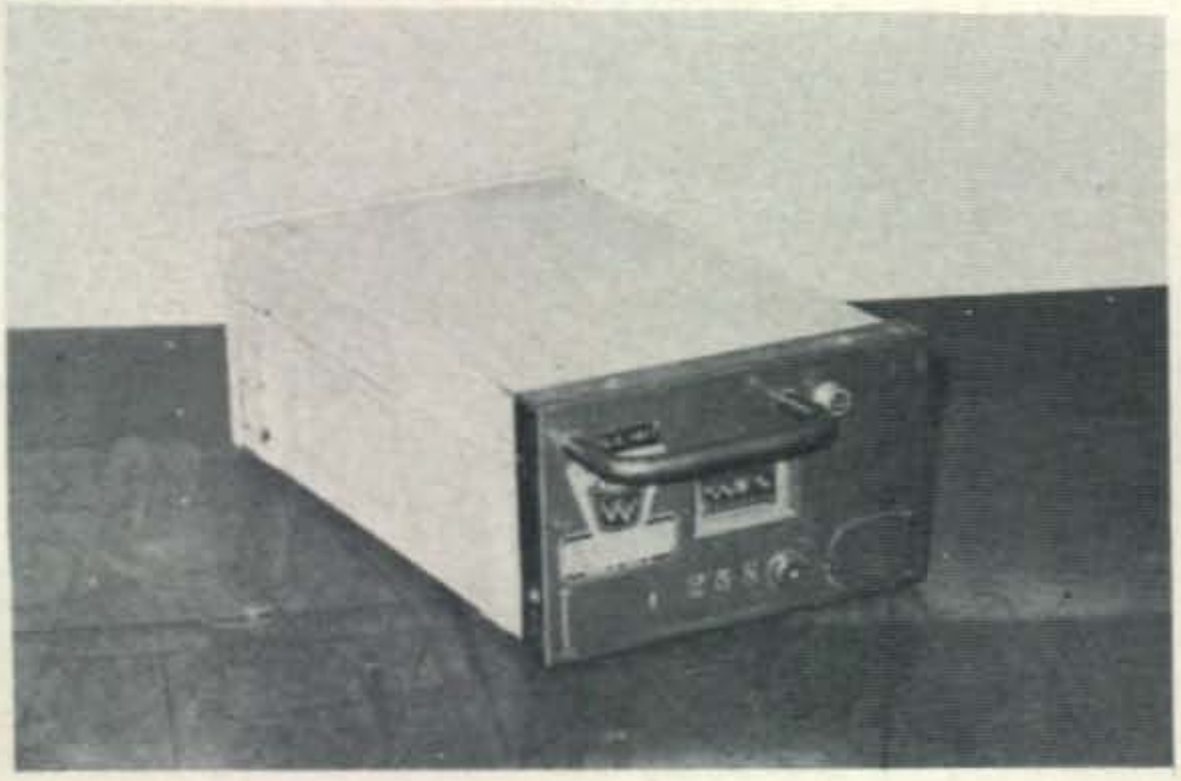
Operating Techniques

Well, and good, you say. But, my friend got on f.m. a while back and was laughed off the frequency. This happens. However, it is much less common to be treated discourteously on v.h.f. and v.h.f. f.m. than on the lower bands (again take a look at the low end of 20 phone band during a DX contest). Operating techniques on f.m. are quite different from those used on the other bands. Long CQ's are not needed because of the fixed frequency operation. When using a repeater all signal strengths received will be the same because the repeater is re-transmitting all signals on the same transmitter. Thus, "S Meter" readings are useless. Everyone is using push-to-talk, so long winded transmissions are frowned upon. In fact, most repeaters have time-out provisions to cut you off after a transmission of three minutes or less. The reasons for the difference in f.m. techniques goes on and on. A more complete set of guidelines is given in the article "Tips and Tidbits for the FM Newcomer," which begins on page 21 of the April, 1971, issue of *CQ*.

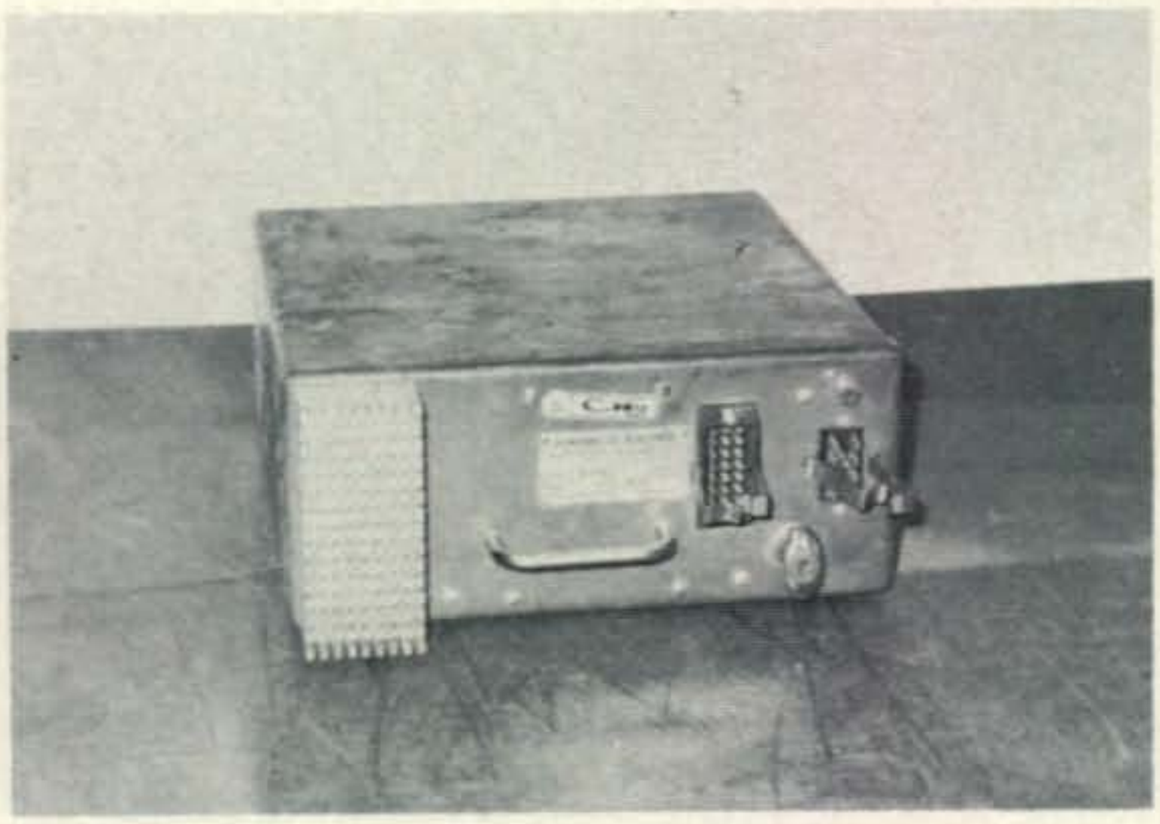
A.c.-powered base stations like this Motorola "BY" are sometimes found at attractive prices.

Cost

Well, what about cost? One can put as much into f.m. as he wants. Commercial f.m. units (obsolete commercial and industrial gear) can be bought as cheaply as $25. Allowing another $25 for a set of crystals and an antenna, one can be on v.h.f. f.m. for less than $50. Of course this requires a bit of looking and work on the part of the amateur. If ready-made equipment is desired, it can be purchased starting at around $200. As far as to the top dollar, the sky's the limit. One can purchase current production commercial f.m. units beginning around $500 and going as high as one wants to pay. Of



The older vibrator power supply units are the mainstays of f.m. in many areas. Prices are often under $100. For the record this unit is a Motorola T41GGU-1100, excellent for 6-meter f.m.



Many older f.m. units have transistorized power supplies, like this General Electric Progress Line unit.

course, most amateurs do not go to this extreme on v.h.f. f.m. The average commercial gear investment is usually less than $150 and the ham-only equipment around $250. Thus, one doesn't have to tie up anywhere near as much money as with a s.s.b. transceiver or similar low frequency station.

The cost of the antenna system is also relatively low. When using a repeater, only the simplest antennas are often used. A quarter-wave whip can either be constructed or purchased for less than $6.00. More elaborate mobile and fixed antennas seldom run over $50.00, and $25-30 is the rule. The existing low band beam and rotator can have a six or two meter antenna stacked over it with little trouble.

CB?

Well, the major criticism that is usually directed at the Class D Citizens Radio Service (CB to most people) is that it sounds like a bunch of chatter. Take a listen to 75 meter sideband some evening when many amateurs are conducting a local ragchew. Sounds like CB doesn't it. There are, in some areas, persons who abuse the f.m. channels. This is not unique to either f.m. or v.h.f. Again take a look at the 80-10 meter bands. The percentage of people abusing these frequencies is just as great if not greater than the percentage of persons abusing the f.m. channels. In fact, since most f.m. work is local, and since the same stations are often worked again and again, the tendency on f.m. is for a more congenial group with cooperation rather than a dog-eat-dog high powered pileup.

Conclusions

What does it all add up to? F.m. puts the fun back into amateur radio. The DX chasers, the traffic handlers, the contesters, the phone-patchers, and all hamdom can do their thing on the low bands, but on v.h.f. f.m.

[*Continued on page 98*]

"Open Wide, This Won't Hurt A Bit"

PERSONNEL at U.S. Naval Communication Station Morocco recently discovered that one of the power klystrons in the station's high powered tropospheric scatter transmitters had been severely damaged due to arcing. This arcing had caused heavy pitting on one of the external cavity rings. The damage was such that replacement would normally be required.

A new klystron costs $3,463, a little more than the station's over-burdened budget could absorb (especially since they were previously available at no direct cost). Therefore a better solution had to be found. The solution turned out to be a dental amalgam and the Dental Department.

The repair was effected by grinding out the pitted area to remove carbonized material followed by application of the amalgam which is made up of silver, copper, tin, zinc and of course, mercury. After the few minutes required for the material to set, it was shaved down to form a smooth surface.

Only time will tell whether the repairs will be permanent. However, the klystron had been operating satisfactorily for about three months when this report was submitted.

The cost? Twenty-two cents for material and $6.99 in wages for 30 minutes of the Dental Officer's time. Even if the unit fails soon, the savings would still be substantial.

We thank the *Naval Communications Bulletin* and its Editor, David Meir, for the above information. ■

Lieutenant Reid J. Talcott III, DC, USNR, of NAVCOMMSTA Morocco Dental Department, applies amalgam to pitted area in high powered klystron. Dr. Talcott was assisted by DN Robert R. Pierce.

THE GALAXY 550A

MORE POWER, MORE FLEXIBILITY FOR THE Fixed Station...

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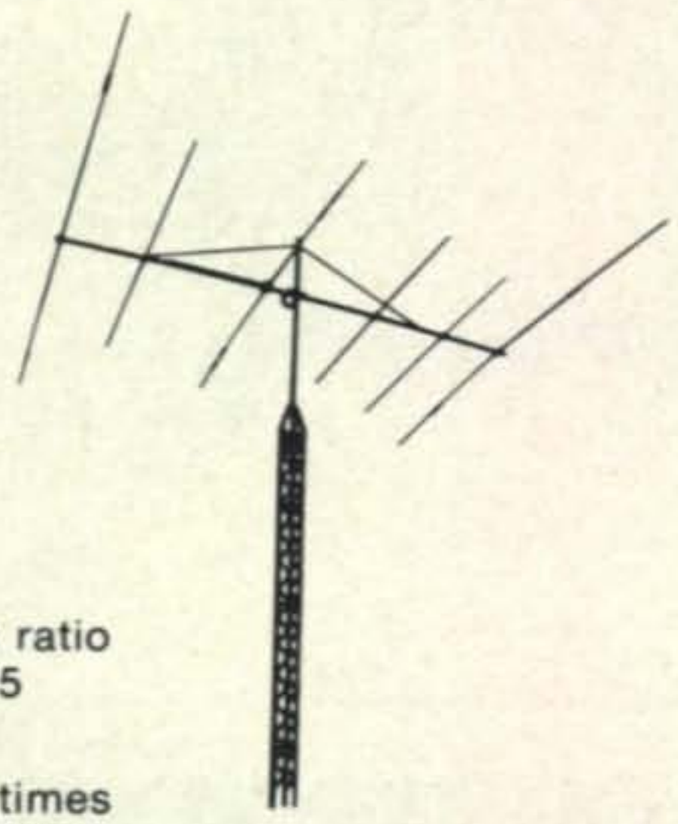

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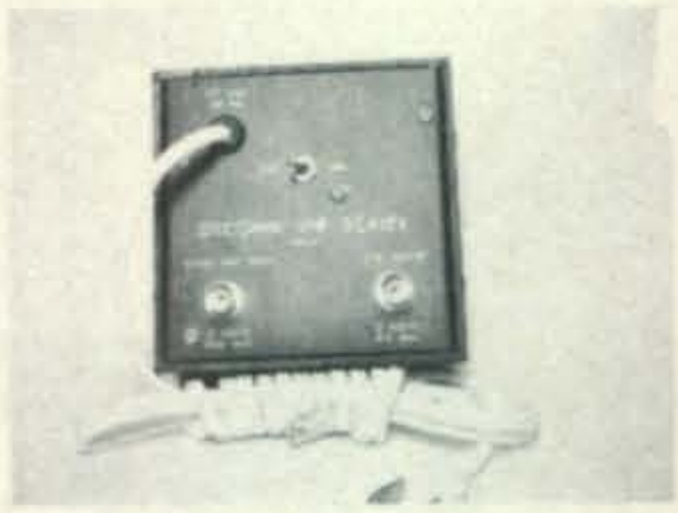

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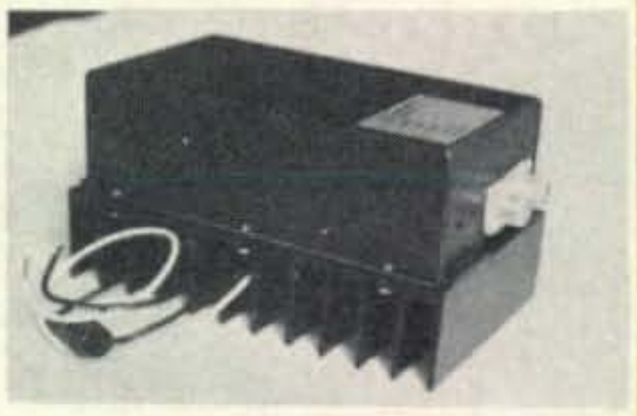

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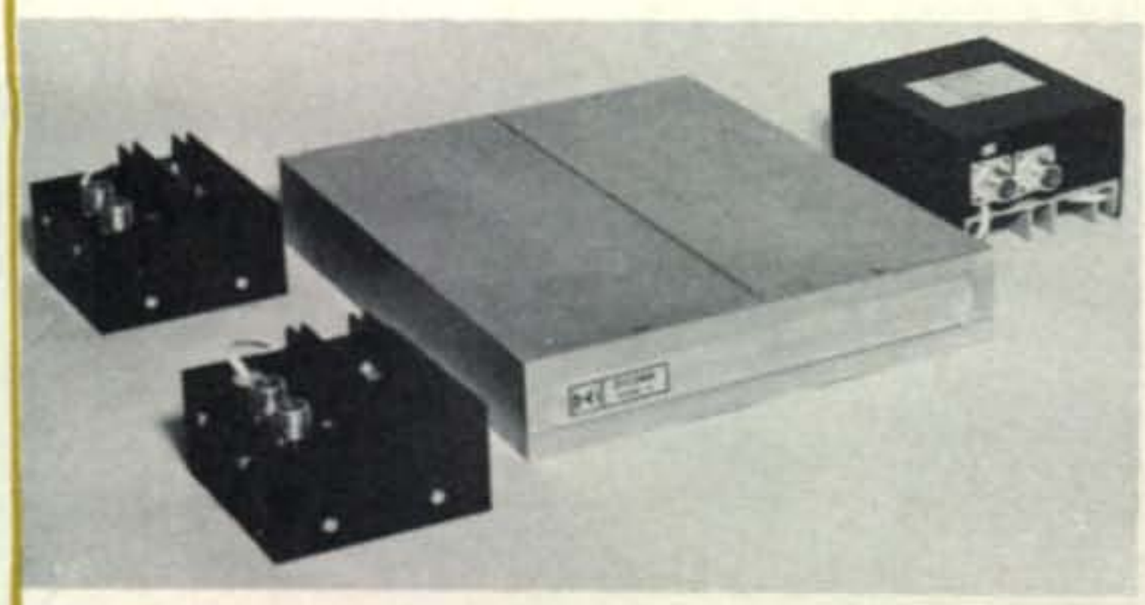

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Medical Amateur Radio Council (MARCO) Has Annual Meeting

THE Medical Amateur Radio Council (MARCO) held its fifth annual meeting this past June in Atlantic City, New Jersey, in conjunction with the annual AMA Convention. Medical electronics and medical communication highlighted an afternoon scientific session.

Dr. Earl E. Weston, M.D., W8BXO, newly elected president of MARCO chaired the scientific session which featured talks by Professor L. H. Montgomery, WA4UDB, on medical instrumentation considerations, Milton Golin, K3UAY spoke of amateur radio as a means of getting information around the world quickly, Dr. Paul Zukin, M.D., W6OBW discussed using amateur radio for health care in remote areas and the legal problems this presents. Arthur H. Griffiths spoke on AMSAT and the potential of using satellite communications, Dr. Foster Montgomery, M.D., WB9ASK, through a recorded interview from Nigeria discussed the problems of reciprocal licensing. The talks ended with Dr. Christine E. Haycock, M.D., WB2YBA describing the tribulations she encountered setting up her antennas.

MARCO is made up of members of the amateur fraternity who are also engaged in all facets of the medical profession. If you are interested in MARCO (which has membership throughout the world) please contact Mr. Joseph J. Boris, MARCO, P.O. Box 229, Manchester, Conn. 06040 or Dr. William Sprague, M.D., WA6CRN, 433 N. 4th St., Montebello, Cal. 90640, for full information on this worthwhile organization. *(K2EEK)*

Left to right: Dr. Earl E. Weston, M.D., W8BXO, President of MARCO, Dr. William L. Sprague, M.D., WA6CRN, MARCO Secretary, and Dr. Anson R. Hyde, M.D., W4CQG, Trustee for the MARCO station (WB4SVR).

The QSL card issued by MARCO for the meeting.

2-Meter F.M. Simply and Economically

BY IRWIN MATH,* WA2NDM

Faced with the desire to operate 2-meter f.m. mobile, and not wishing to invest in one of the new solid state "bricks," the author took a different approach: modify a used 2-meter a.m. rig for first-rate f.m. operation. The following article describes his conversion in terms which are applicable to all the popular used 2-meter a.m. rigs.

AFTER 3 years of 6 meter mobile operation[1], I finally decided that the bulky halo and lack of daytime activity required a different band in the mobile—at least for daytime QSO's. With the increase in activity on the 2 meter band, especially repeaters and f.m., it was quite apparent which way to go. A quick look into the magazines and current literature soon indicated, however, that about $300 or so was necessary.

Being one who firmly believes that amateur equipment should be at least partially home-brew (all of the equipment at WA2NDM is either completely home-brew, or so modified from commercial equipment that it bears little resemblance to the original), I began the investigation. The final "ideal" 2-meter station, in my opinion, should have the following features:

1. A.m. or f.m. operation in both transmit and receive modes.
2. 144-148 mc tunable receiver coverage.
3. Provisions for multiple crystals for the transmitter.
4. At least 8-10 watts of r.f. into the antenna.
5. .25 microvolt sensitivity for 20 db of quieting.
6. A compact, easy to operate piece of equipment.

In the interest of time and money, I finally decided to obtain one of the many used a.m. transceivers now available for moderate cost, such as the Gonset I, II, and III's, Clegg 22er's, etc., and rework it until it met my specifications.

I will not go into details about the unit I finally obtained, but would like to indicate that the modifications made and described here are applicable to any a.m. transceiver, not just 2-meter units, and will enable one to get on f.m. relatively inexpensively.

Transmitter

Most 2-meter gear use 8 mc crystals that are multiplied 18 times to get into the band. With this fact in mind, it is only necessary to connect a variable capacitance diode (Varicap) in parallel with the crystal. Then, by varying the voltage on, and in turn the capacitance of, this diode at an audio rate, the crystal will be "pulled" in frequency at the same audio rate. A typical 8 mc crystal can usually be pulled at least ±400-500 c.p.s., which after the multipliers, will result in a ±7-9 kc f.m. signal. This shift (or deviation

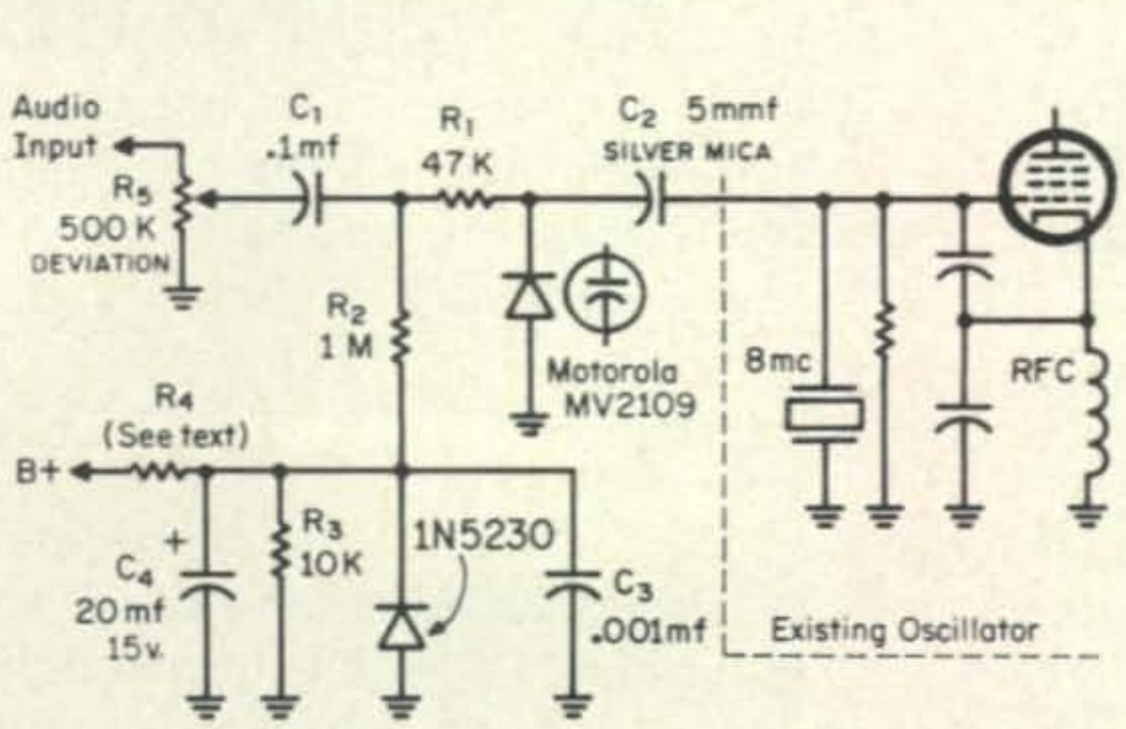


Fig. 1—Varicap installation in a standard pentode oscillator in the 8 mc region for frequency modulating the circuit.

*5 Melville Lane, Great Neck, N.Y. 11023

[1]Math, I., "Build A Complete 6 Meter Station," Part I, *CQ*, Sept. '69 p. 35. Part II, *CQ*, Oct. '69, p. 25.

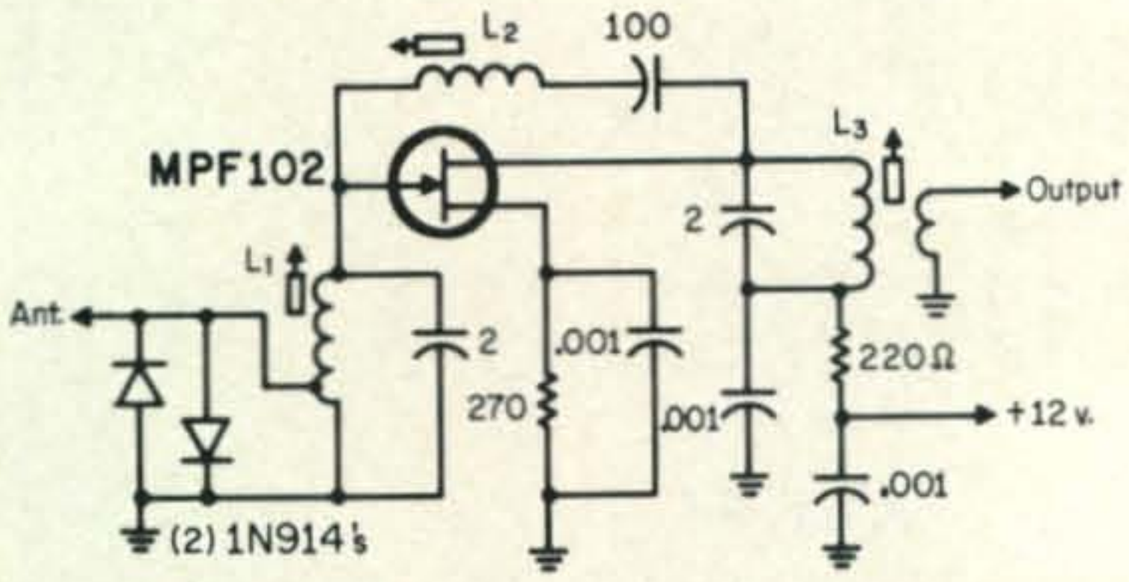


Fig. 2—Simple low noise 2-meter preamplifier suggested for use ahead of the receiver of oder-type 2-meter a.m. transceivers. L_1—5 t. #26 on 1/4" dia. slug tuned form. Top at 1¼ t. L_2—9 t. #30 on 1/4" dia. slug tuned form. L_3—Same a L_1, but no tap. 2 turn link of hookup wire.

as it is called) is satisfactory for all f.m. communications on the 2-meter band.

Figure 1 shows a typical Varicap installation in a common pentode oscillator. The Varicap is biased at 4.7 volts by means of the zener diode (1N5230), R_1, and R_2. This voltage places the Varicap in its linear voltage *vs.* capacitance region. The diode is then capacitively coupled to the crystal by C_2, a zero drift mica capacitor. When audio is fed into the Varicap, its capacitance changes at the audio rate and, as previously stated, "pulls" the crystal frequency. Since the amount of deviation is directly proportional to the amount of audio, R_5 acts as a deviation control.

When installing the circuit, be sure to keep the leads to the Varicap, C_2, and R_1 as short as possible. Also be sure to mount these components securely. The value of R_4, the B+ dropping resistor, is easily calculated by the following formula:

$$R_4 = \frac{(B+) - 4.7}{.015}$$

Use the closest higher standard RETMA value to the calculated value. For a 12-14 volt mobile installation, R_4 can be a 560 ohm, 1/2 watt 10% carbon resistor. The use of the deviation pot and the method for obtaining audio from the transceiver will be discussed in the a.m./f.m. switching section of the article.

Receiver

Before discussing the f.m. detector, I would like to indicate that unless you have the most recent a.m. equipment, it would be strongly advisable to add an r.f. preamplifier to your transceiver. The results can be simply amazing! Suitable circuits have been described in the literature and fig. 2 shows a typical amplifier that I have used employing a low noise FET transistor. The circuit is quite sensitive and well worth the time and effort.[2]

To adjust, peak L_1 and L_3 on a weak signal near 146 mc. Then adjust L_2 for the lowest amount of noise with no signal being received. Repeak L_1 and L_2 again on a signal; stagger tune them by turning the slug of L_1 1/2 turn clockwise, and the slug of L_2 1/2 turn counterclockwise. The FET amplifier will increase the overall gain of the receiver by about 3-4 times. A 1 microvolt basic receiver will then have a sensitivity of 0.2-0.3 microvolts.

Figure 3 is a schematic diagram of an f.m. detector that will give good results with the various types of f.m. signals on the air today. Integrated circuits have been used in the interest of simplicity and because of the lack of critical alignment procedures. The i.f. input for the detector is obtained from the secondary of the last i.f. transformer in the receiver and fed to a linear amplifier made up of 1 gate section of IC_1. This chip will easily handle 3-4 mc i.f. signals so there is no need to be concerned since the i.f. frequencies of most transceivers are well below that figure. The second two gates are connected as high gain amplifiers which easily "saturate," eliminating all a.m. and pulse QRM. These two stages perform the limiter function and allow only the f.m. signals to pass into the flip-flop divider chain consisting of IC_2 and IC_3. The purpose of these two chips is to lower the frequency of the i.f. signal so that it can be processed by the next stages. For proper f.m. detection, the output of the divider chains should be in the neighborhood of 100-150 kc. Because the i.f.

[2]*The Radio Amateur's Handbook,* 1971 Edition, ARRL, Newington, CT 06111.

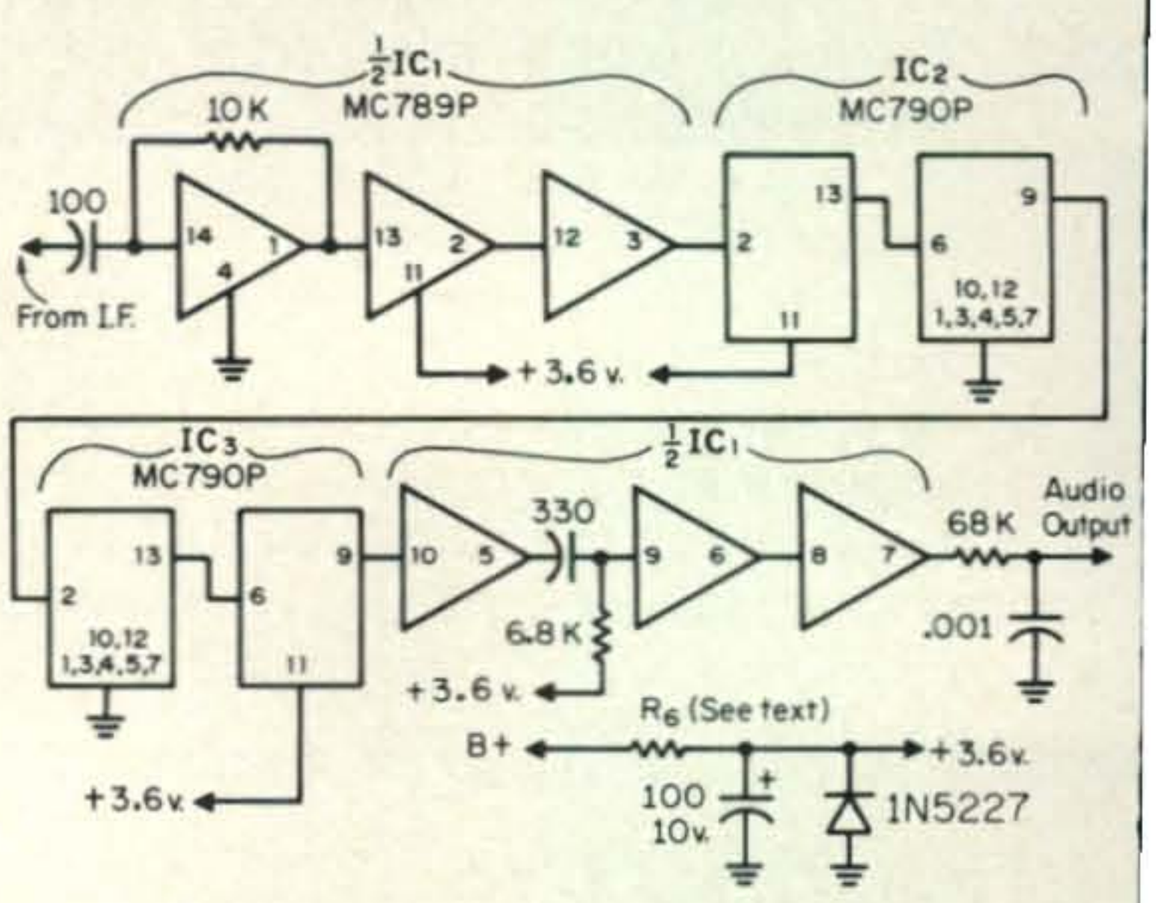


Fig. 3—Integrated circuit f.m. detector.

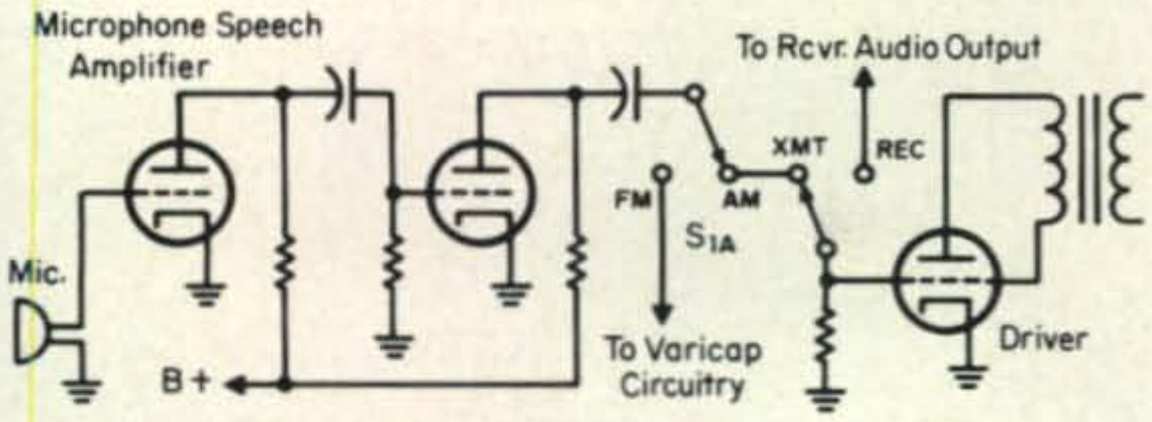


Fig. 4—Installation of Varicap modulator of fig. 1 in speech amplifier circuitry of a.m. transmitter.

of my transceiver was 2 mc, four flip flops were necessary as shown in the figure. With a 1 mc i.f., only three flip flops are needed and if the i.f. is 455-500 kc, 2 will be required.

After division, the output signal is fed to two gates which act as a monostable multivibrator who's period is set by the 330 mmf capacitor and 6.8K resistor to less than 1/2 that of the incoming signal. The output of the monostable multivibrator consists of pulses that are varying at a rate equal to the frequency variations of the input signal. The final 68K resistor and .001 mf capacitor, smooth these pulses and produce the final audio signal.

A.M./F.M. Switching

Now that we have the sub-assemblies to generate and receive f.m. signals, it is only necessary to connect them to the transceiver. Figure 4 shows the transmitter hookup. Audio for the Varicap is obtained at the last stage of the transceiver's microphone speech amplifier just prior to the transmit-receive switch. At this point, at least 3-4 volts of audio should be available. S_{1A} switches the microphone signal from the Varicap circuit back to the normal circuitry when a.m. operation is desired. Since there is no signal for the driver in the f.m. position of this switch, the balance of the modulator is inactive. In the a.m. position, there is no audio for the

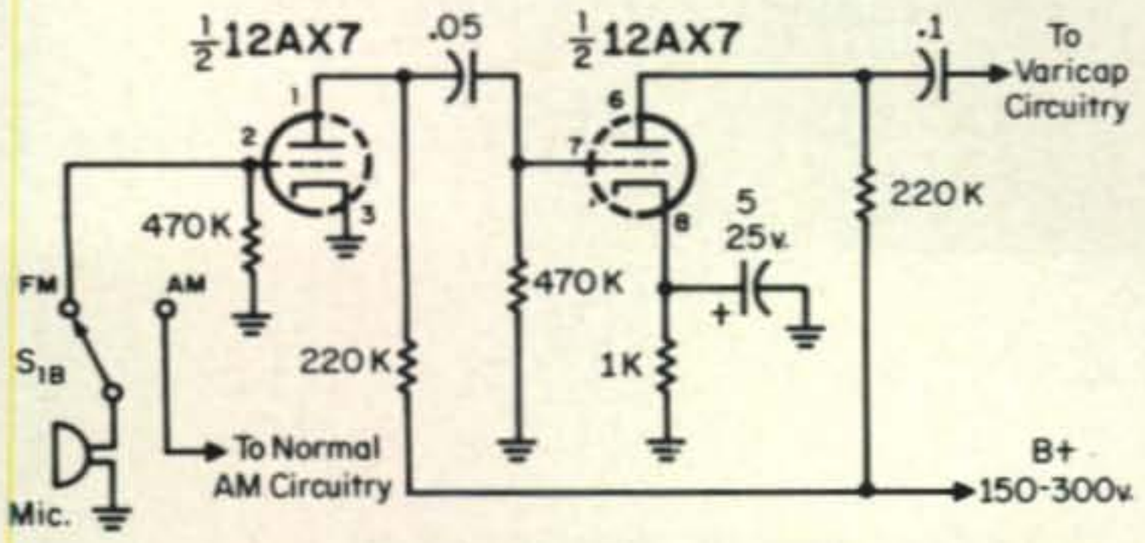


Fig. 5—In a.m. transmitters not using a separate speech amplifier, this simple speech amplifier may be installed to develop 3-4 volts of audio needed for Varicap modulator.

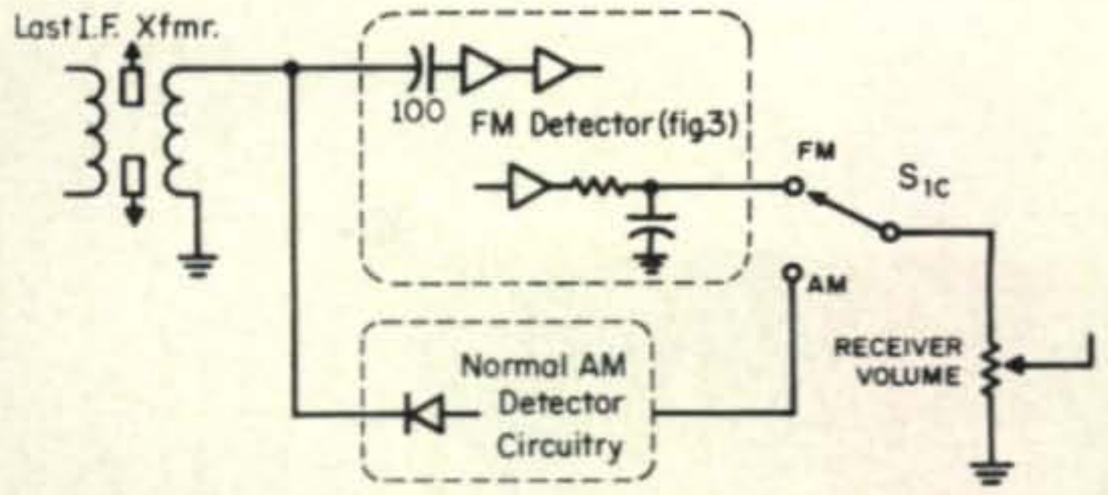


Fig. 6—Installation of f.m. detector between last i.f. transformer and receiver volume control.

Varicap and its capacitance does not vary, keeping the oscillator essentially fixed to the crystal frequency alone. For those transceivers not having a separate microphone preamplifier, the circuit shown in fig. 5 can be added to perform the same function.

In order to obtain somewhat more output (r.f.), another section of S_1 can be connected to short out the secondary of the modulation transformer when generating f.m. The additional output is not worth the effort, however, and it is only a few percent.

Once the transmitter section is completed, it is only necessary to tune it up in the normal manner for a.m. operation, switch to f.m., and then adjust the deviation control for the proper amount required. This amount can be determined by asking for a report on the air from another f.m. station. After setting the control, it will rarely need readjustment. With standard 8 mc crystals in HC6/U holders, I have been able to get ± 5-10 kc with no trouble.

Figure 6 shows the hookup of the receiver. The normal a.m. diode detector is left intact,

[*Continued on page 98*]

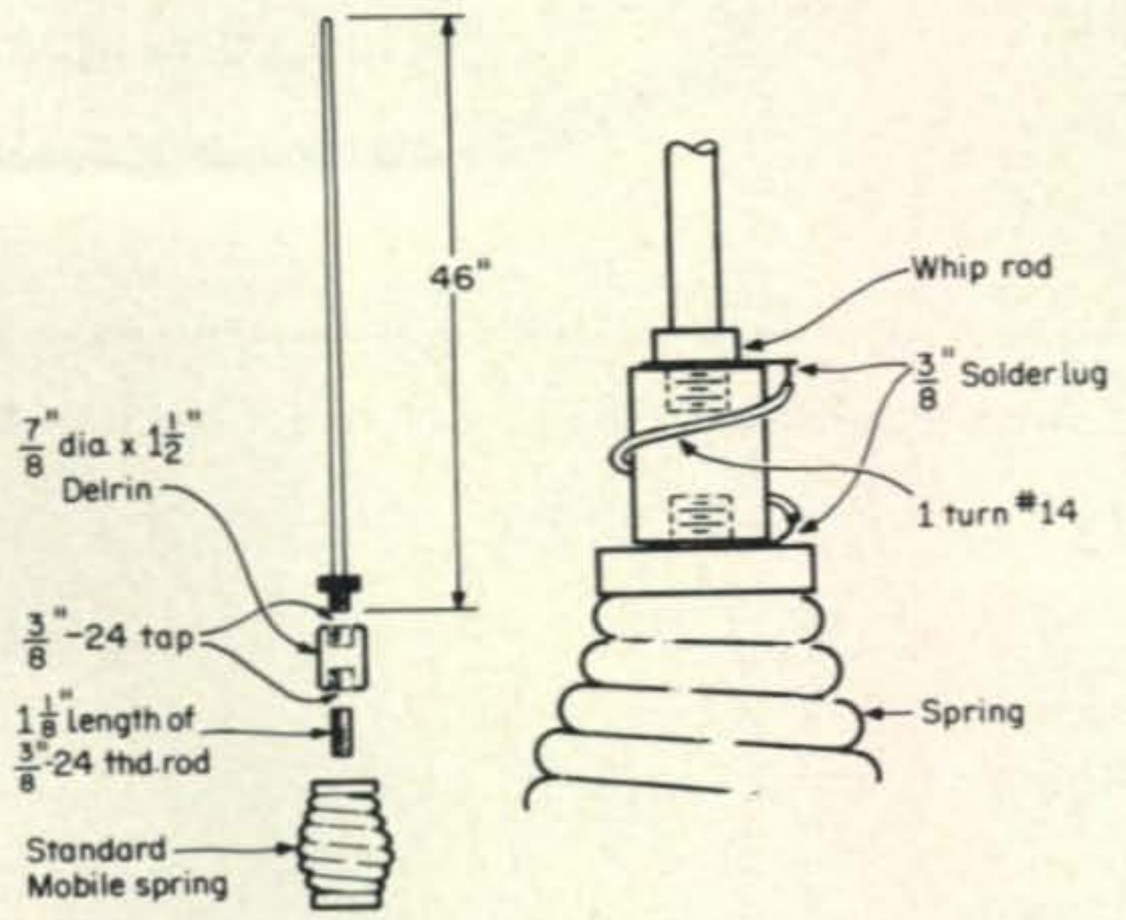
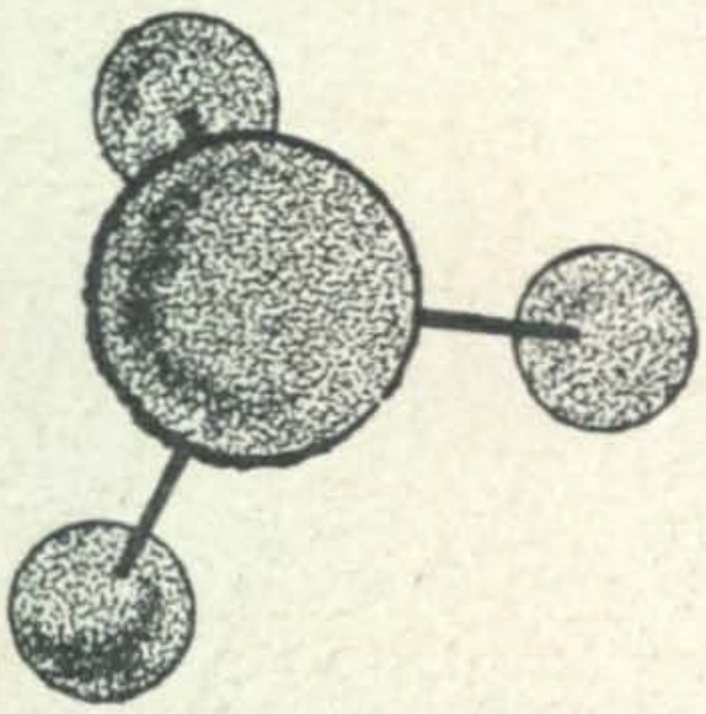
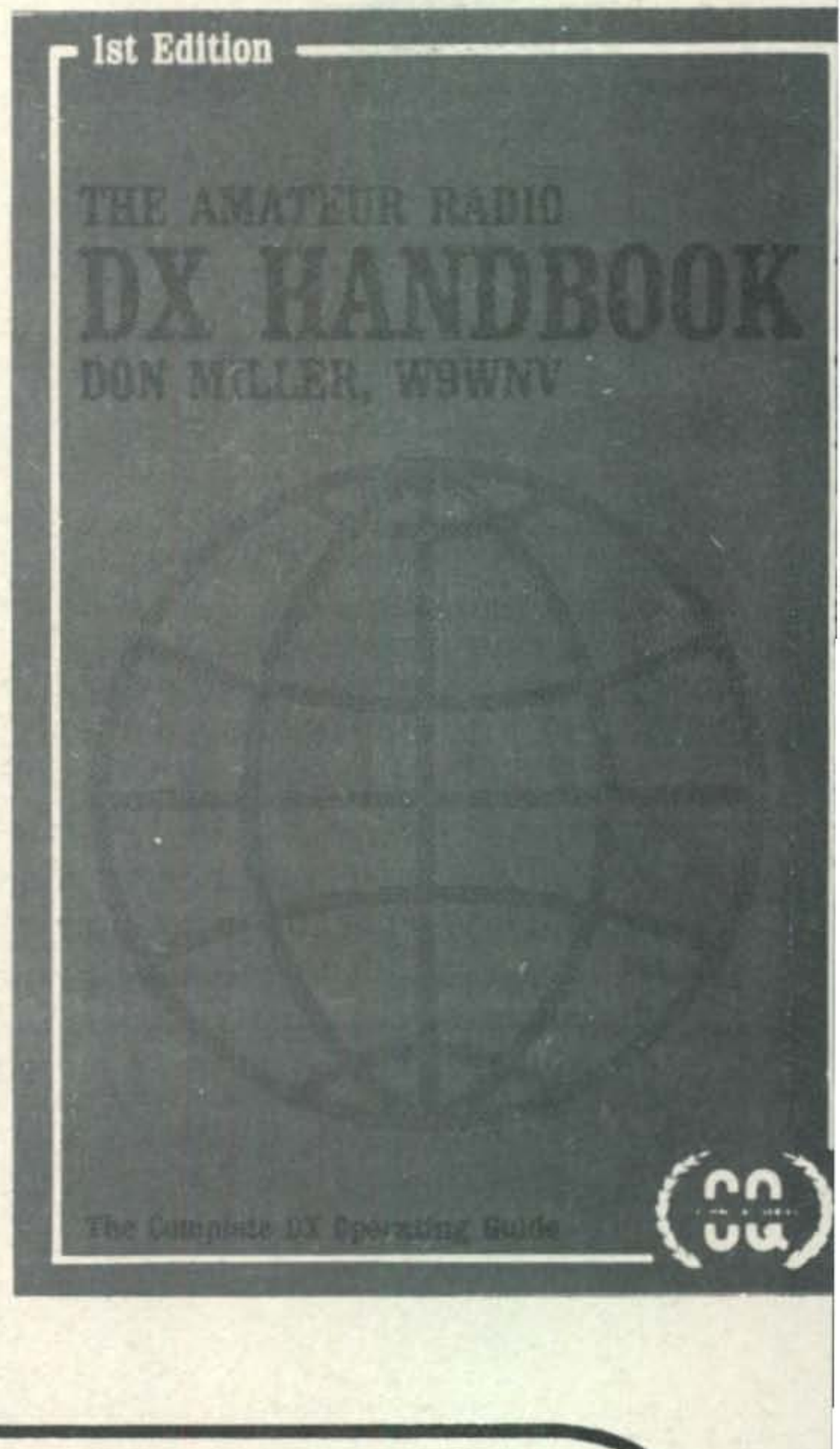


Fig. 7—Construction of a simple 5/8 wave vertical antenna for 2-meters. The whip is a 46" section of a standard stainless steel whip antenna fitted with a standard 3/8"-24 male threaded coupling.



WHAT'S TO KNOW ?



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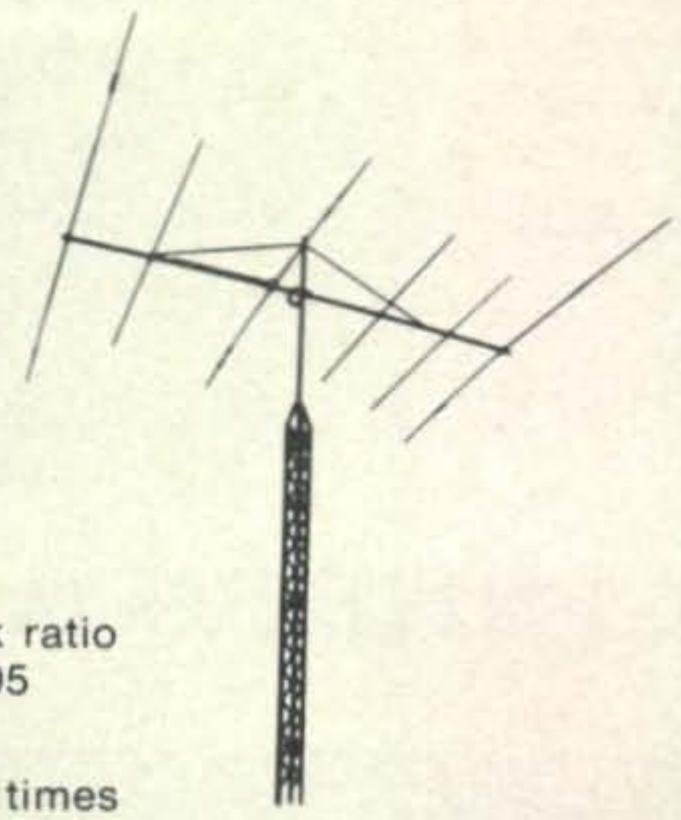

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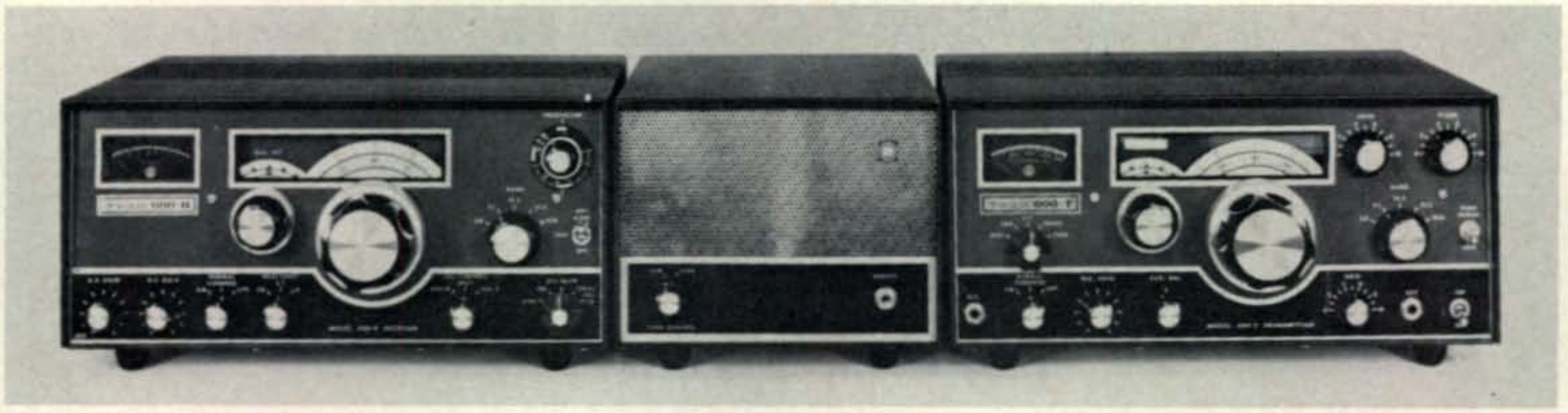


The Swan Twins shown with the standard speaker console.

CQ Reviews: The Swan Twins

BY WILFRED M. SCHERER,* W2AEF

THE Swan people have long been known for their line of s.s.b. transceivers which, starting with single-band jobs in the early '60's, has included many all-band versions up to the most recent Model 500-CX. These products have been extremely popular, but to meet the desire on the part of many amateur operators for a separate receiver-transmitter combination, Swan has at last broken with tradition by the introduction of the "Swan Twins," the Model 600-R receiver and the Model 600-T transmitter.

Such a setup has the advantages gained by the extra facilities and operating features not usually available with transceivers, plus the fact that the Twins can be instantaneously switched for either independent split-frequency or transceive-type operation.

Both units provide operation on s.s.b. (u.s.b. or l.s.b.), a.m. and c.w. They also may be used for RTTY and SSTV. Complete coverage of the amateur bands is available in 200 kc segments on all ranges, except the highest one which is split up into 500 kc portions. These ranges are: 3.4-4.4, 6.7-7.7, 13.8-14.8, 20.9-21.9 and 27.5-30.0 mc. A good deal of overlap at the amateur-band edges allows operation on many of the MARS frequencies.

In addition, by the use of an external variable-frequency oscillator, continuous coverage of 3-30 mc may be had with the receiver. Spot frequencies also may be had with either unit for network or MARS operation using an external crystal-controlled oscillator. These oscillators are available as accessories.

The transmitter and receiver each has its own built-in solid-state a.c.-operated power supply—there is no need to horse around an extra piece of heavy gear.

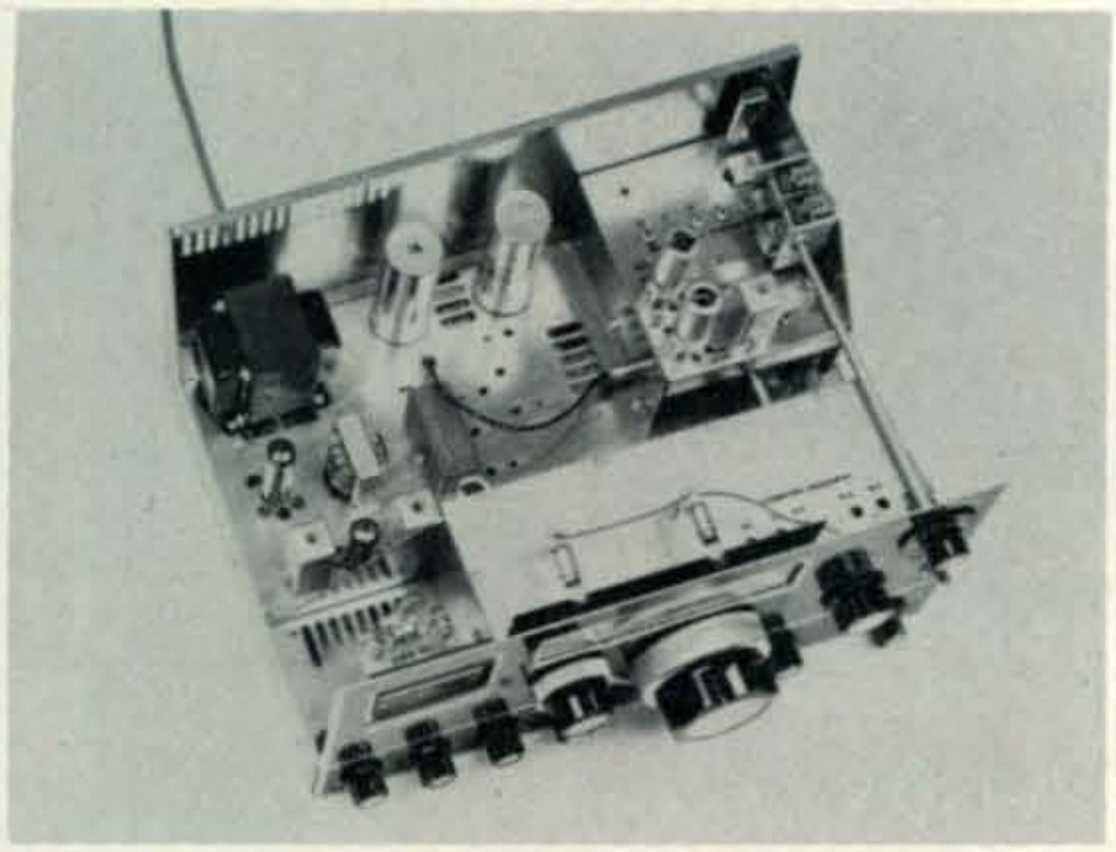
Features of the receiver include preselector tuning with high sensitivity rated at 0.25 μv for 10 db S+N/N on s.s.b. There are three selectivity positions: c.w., s.s.b. and "X." The receiver is supplied with only the standard 2.7 kc s.s.b. crystal filter that has a shape factor of 1.7:1 and an ultimate rejection of 100 db. Two additional filters are optional and provide a 0.6 kc bandpass for the c.w. position and a 6 kc bandpass for a.m. at the X position. Also optionally available is Swan's super-selective 2.7 kc filter with a 1.28:1 shape factor and an ultimate rejection of 140 db.

A built-in crystal calibrator furnishes accurate test signals at the 25 or 100 kc intervals. The a.g.c. may be turned off or be set for fast or slow a.g.c. action.

A custom version of the standard 600-R receiver includes a noise blanker and an a.f. notch/peak filter. These units also are separately available for subsequent installation in the standard receiver.

The transmitter has an input-power rating of 600 watts p.e.p. on s.s.b., 500 watts on

*Technical Director, *CQ*.



Top view of the 600-R receiver.

c.w., 150 watts carrier for a.m. and 100 watts continuous for RTTY and SSTV.

P.t.t. operation is normally provided for s.s.b. and a.m., but a plug-in v.o.x. accessory also is available. Included for s.s.b. is a.l.c. that minimizes overdrive below which the distortion products are rated at approximately 30 db down.

Manual or full break-in operation is provided for c.w. Semi-break-in may be had with the v.o.x. accessory. An a.f. sidetone monitor is a standard facility for use with c.w.

A pi-network at the p.a. output is designed for operation into 50-75-ohm loads and is adjustable. As explained later, internal provisions are included for increasing the loading range.

The transmitter also uses a 2.7 kc filter with which the unwanted-sideband suppression is rated at down more than 50 db. Carrier suppression is rated at 60 db down.

The king-size meter indicates p.a. cathode current, while relative r.f.-output is shown by a tuning eye. An advantage of this setup is that the coincidence of p.a. resonance and maximum output (indicative of proper neutralization and tuneup at full load) can be immediately seen. Furthermore, the tuning eye responds to the instantaneous peaks and thereby is an excellent output monitor for determining proper modulating levels.

Technical Highlights

Although they are independently-operated units, many of the technical aspects of the Twins are similar to those of the Swan transceivers. Referring to the block diagrams at figs. 1 and 2, each unit employs single conversion with an i.f. of 5.5 mc. Selectivity and sideband selection are obtained using a crystal lattice filter.

The v.f.o. for each unit employs the standard Swan circuitry with one transistor for the oscillator in a grounded-base circuit and another transistor as an emitter-follower output stage. Individual *L/C* circuits are switched in at the oscillator for the different bands. The overall v.f.o.-tuning frequencies for the various ranges are given at Table I; however, these are broken up into separate segments each of which is set up by a calibrated variable-padding capacitor adjusted from the panel as explained later.

5.5 Mc Oscillators

The b.f.o. for the receiver and the carrier generator for the transmitter each are transistorized and crystal-controlled. Sidebands are changed by switching between a 5500 and a 5503 kc crystal at each of these oscillators. The setup is so arranged that the proper crystal is simultaneously engaged by the r.f. bandswitch to provide *normal* sideband operation on each band; that is, l.s.b. on 40 and 80 meters, u.s.b. on 10, 15 and 20. For operation on the other sideband in each case, the sideband selector is placed at *opposite*, thus engaging the required oscillator crystal. The arrangement is quite convenient, eliminating the need for remembering to which sideband the equipment must be switched when bands are changed.

When switching between NORMAL and OPPOSITE sideband, the frequency of the v.f.o. is not compensated accordingly, thereby necessitating its being retuned 3 kc to match the change of the frequency for the b.f.o. or carrier generator.

Receiver Front-End

The receiver has a very hot front-end using a 6BZ6 at both the r.f.-input stage and the mixer. Oscillator-signal injection is to the cathode of the mixer and is obtained from an

Signal Range	*V.F.O. Range*
3.4- 4.4 mc	8.9- 9.9 mc
6.7- 7.7 mc	12.2-13.2 mc
13.8-14.8 mc	8.3- 9.3 mc
20.9-21.9 mc	15.4-16.4 mc
27.5-30.0 mc	22.0-24.5 mc

Table I—V.f.o. ranges used for each r.f.-signal range. These are split up into 200 or 500 kc segments as explained in the text.

isolation amplifier at the output of the v.f.o. section. This front-end setup provides a sensitivity *vs.* noise ratio somewhat better than in other cases where a 6BZ6 r.f. amplifier is used in conjunction with a different type mixer, as evidenced during weak-signal reception and by our measurement of 0.1 μv, or less, for 10 db S+N/N with s.s.b. and c.w. on all bands.

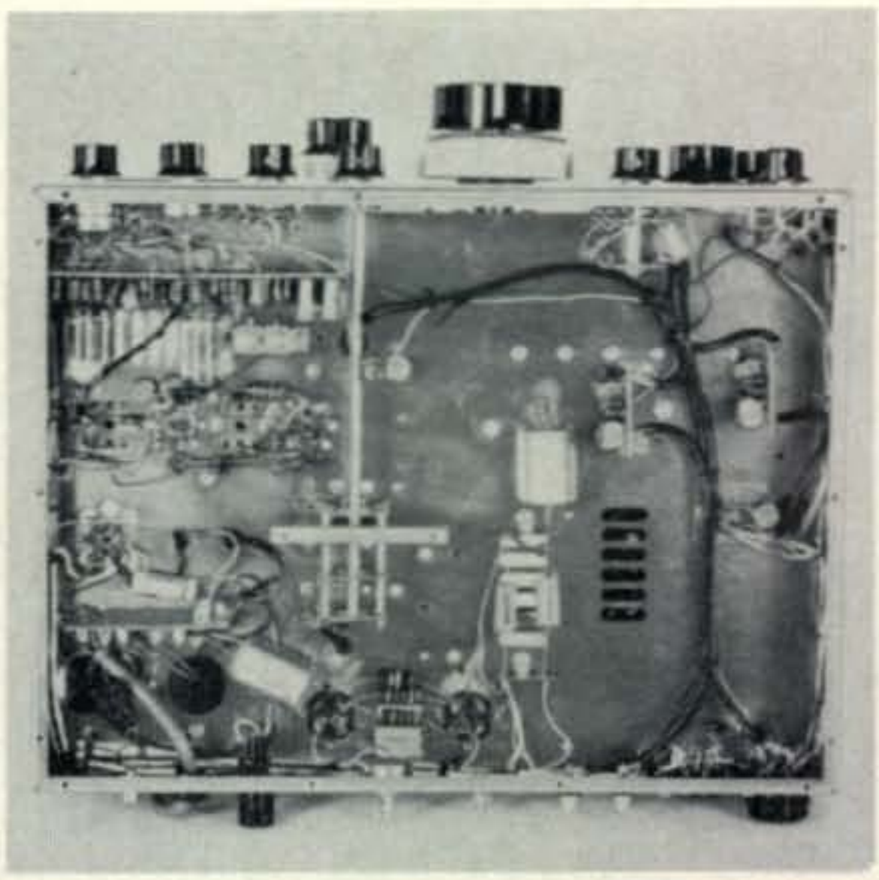
In addition, the high-*Q* preselector-tuning circuits provide good image rejection which measured 75, 66, 80, 64 and 56 db on the 3.5, 7, 14, 21 and 28 mc bands respectively. I.f.-signal rejection was 40, 40, 70, 75 and 80 db on the above respective bands.

The preselector covers the whole range of 3-30 mc to provide continuous coverage (5.4-5.6 mc coverage not recommended) when the receiver is used with external oscillators such as the Model 330 All-Band Tuner or the Model 510X 10-position crystal oscillator.

Other Sections

The product detector is a conventional triode type with the b.f.o. fed to the cathode and the i.f. signal to the grid. For a.m. reception the b.f.o. is turned off, changing the bias on the triode which now functions as a grid-leak a.m. detector.

The a.g.c. is an audio-derived type. The output of the 1st a.f. stage is amplified by the triode section of a 12AV6 and is then rectified to produce a d.c.-control voltage in proportion to the a.f.-signal level. Steering diodes provide a fast attack. Fast- or slow-release times are available by switching time-constant capacitors in the a.g.c. line. The system allows a very wide a.g.c. range that provides a relatively flat a.f. output level with varying



Underchassis view of the 600-R receiver.

r.f.-input signals, including those in the low-microvolt region. Measurements indicated a 5 db a.f.-output change with 100 db r.f.-input change (0.1-10,000 μv).

The S-meter functions in a bridge circuit between the cathode and screen grid of the a.g.c.-controlled 2nd i.f. stage. Based on the 14 mc band, 0.1, 1, 10 and 32 μv were required to produce the respective meter readings of S-4, 5, 7.5 and 9. The band-to-band gain (referred to 14 mc) was +6, −4, 0, −4, −6 on the 3.5, 7, 14, 21 and 28 mc bands respectively. Variations in the above S-meter readings are therefore to be expected accordingly.

The crystal calibrator employs four transistors two of which function as a multi-vibrator locked by the 100 kc crystal. The other two make up a 25 kc multivibrator synchronized by the 100 kc signal.

There is no headphone jack on the receiver, but one is located on the accessory

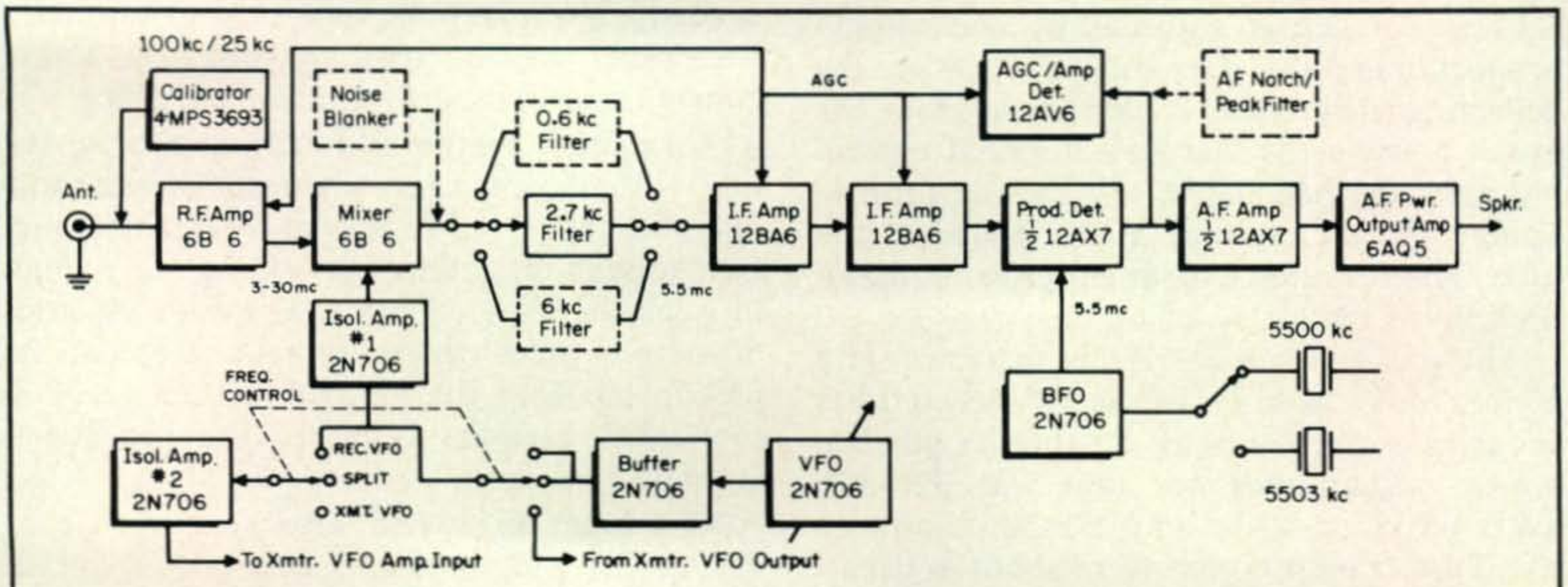
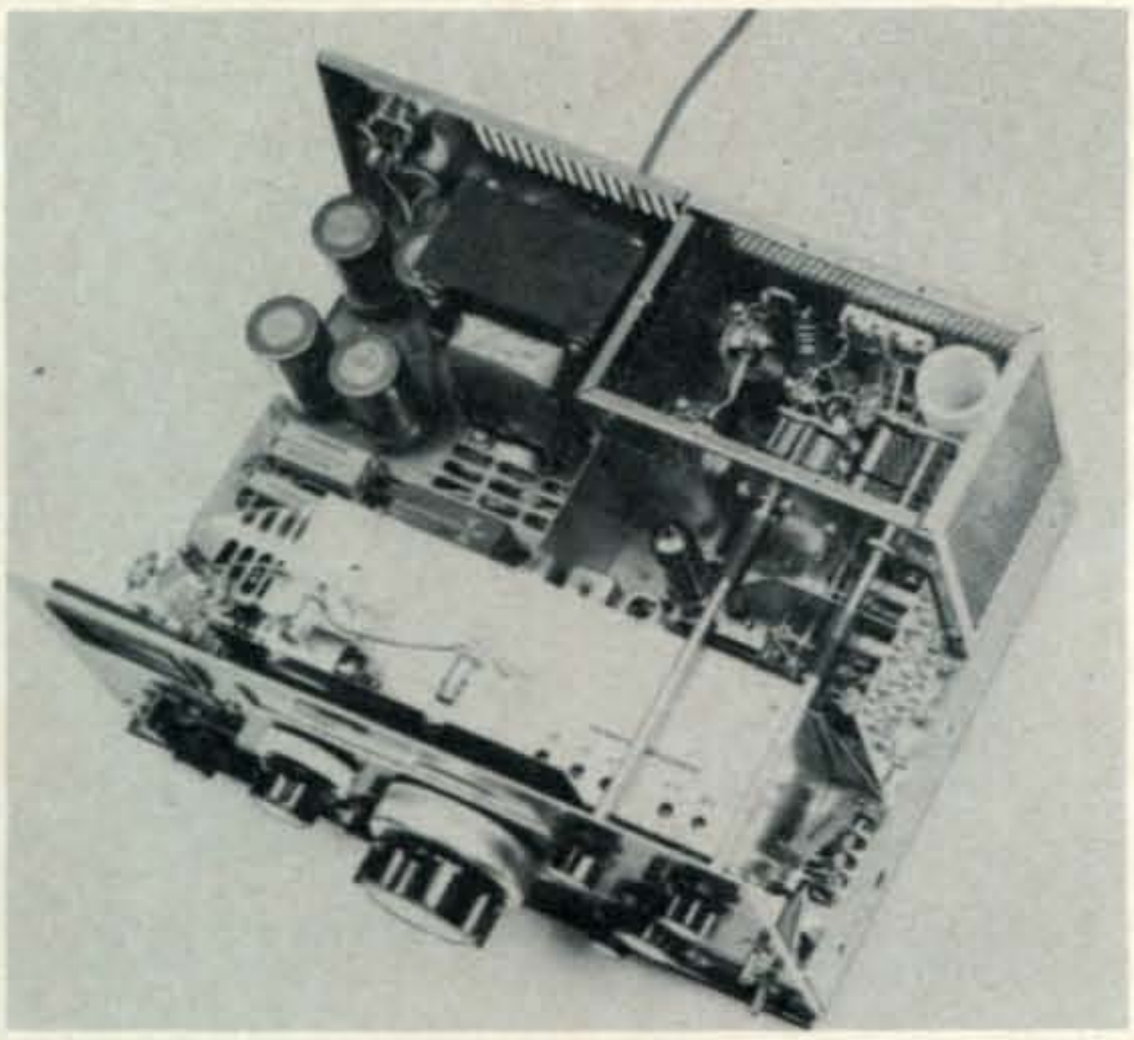


Fig. 1—Block diagram for the Swan 600-R receiver. Elements shown in dashed lines are optional, however, the noise blanker and the a.f. notch peak filter are supplied with the Custom model of the receiver.



Top view of the 600-T transmitter.

speaker console where there also is a two-position switch that provides an overall 6 db-point a.f. response (on s.s.b.) of 325-2000 c.p.s. at the LOW-TONE position or 400-2850 c.p.s. at the HIGH-TONE setting. This is a particularly good deal whereby the use of the LOW-TONE position is most helpful in minimizing background noise and for eliminating the harshness experienced with some s.s.b. signals. The a.f. response on LOW-TONE is still adequate for good voice intelligibility. Use of the tone switch has no effect on the response when the headphone jack is in use.

Transmitter Circuitry

The balanced modulator for the transmitter is a 6JH8 beam-deflection tube set up in the usual manner with the carrier-generator signal applied to grid #1 and the a.f. signal to one of the deflecting electrodes. Carrier balance is adjusted by accordingly proportioning the d.c. voltage between the deflecting electrodes. A departure from the usual, however, is that an additional control improves the balance by also ideally proportioning the d.c. voltage at the plates of the tube. The resulting carrier suppression measured up to the rating of 60 db.

The p.a. tubes are 6KD6's that currently appear to be the kings of the TV-sweep tubes as far as power-handling capabilities go. The power *output* with our unit was 325-375 watts p.e.p. on s.s.b. and 275-325 watts on c.w. Distortion products were about as usually found with sweep tubes, the 3rd-order products amounting to 23-25 db below the peak amplitude of two equal-amplitude test tones of 1000 and 1700 c.p.s. at rated input.

Also in respect to statistics, the unwanted-sideband suppression came to 35 db at 0.5 kc and 50 db at 1 kc.

Both the driver and the p.a. are neutralized. The driver input and output circuits are gang-tuned by the drive control. Besides the adjustable loading control at the p.a. pi-output circuit, there are two auxiliary variable-loading capacitors for 80- and 40-meter use where difficulties in proper matching to 50-75 ohm loads may otherwise be experienced. These are screw-driver adjustments at the rear of the transmitter. Once set for a given antenna system, the only required retouching may be handled by the front-panel loading control.

The a.l.c. is a conventional system using two diodes as a voltage-doubling rectifier at the grid return of the p.a.

A useful feature is a panel switch by which the p.a. operating power may be reduced. It does this by dropping the screen potential to about one-half value and altering the bias as needed to maintain proper operation. Separate bias-setting controls are furnished for each power-level.

Use of the low-power (or half-power) position is easier on the tubes during initial tuneup, until plate resonance is obtained. It also is handy for reducing power as needed to safely drive a linear amplifier. It might be noted, however, that the addition of a linear amplifier might hardly be worthwhile, at least in respect to a 1 kw-*input* job where the increased signal level would amount to only about 3 db.

Transmit-Receive changeover is handled with a relay that transfers the antenna as needed. No external relays are required. Provisions are included to control a relay conventionally used in a linear amplifier.

A function switch allows frequency spotting with the receiver when split-frequency operation is in use. It does so by unbalancing the modulator, thus providing a signal through the low-power stages and to the grid of the p.a. tubes which are held quiescent. A pickup tab near the p.a. tubes then feeds a low-level carrier signal to the receiver-antenna connector.

The function switch also sets up v.o.x. (using the plug-in v.o.x. accessory), p.t.t., transmit or tuneup operation. The TRANSMIT setting provides manual operation which comes in handy when the mic is not equipped with a p.t.t. switch.

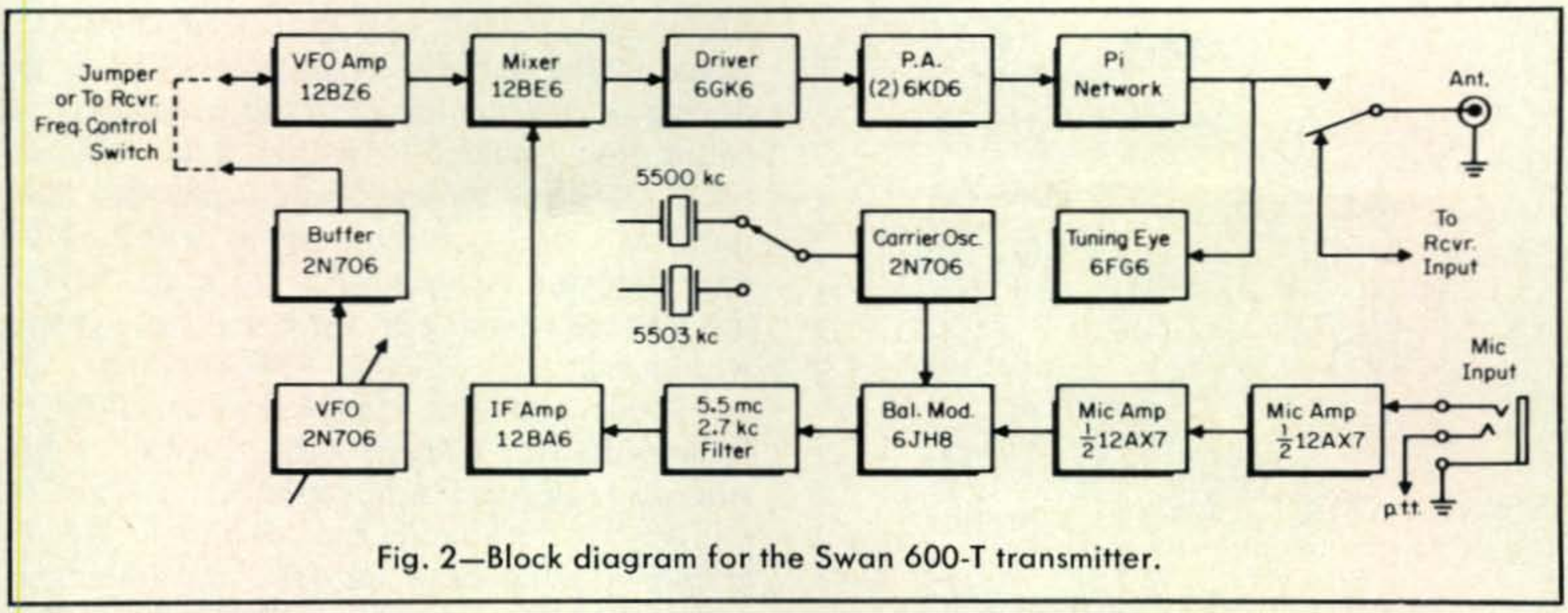


Fig. 2—Block diagram for the Swan 600-T transmitter.

C.w. (and tuneup) is set up in the customary way by unbalancing the modulator and "rubbering" the frequency of the 5500 kc carrier-generator crystal into the filter passband. Sidetone monitoring, with an 800 c.p.s. tone fed to the receiver a.f.-output circuit, is obtained by causing the 1st mic amplifier to function as an a.f. phase-shift oscillator. The sidetone level is controlled by the mic gain. Block-grid keying is employed with the key jack conveniently located on the front panel.

Manual c.w. operation is had by switching back and forth between transmit and receive with the function switch. Semi break-in or v.o.x.-type operation is available when the v.o.x. accessory is installed. Full break-in requires use of separate antennas for the transmitter and receiver *or* an electronic T/R antenna switch for use with one antenna.

A rear-apron switch on the transmitter is placed at FULL and sets up a transistor switch that instantly and quietly controls the muting of the receiver as the transmitter is keyed. With the switch at SEMI, receiver muting is handled by the transfer relay for manual or v.o.x. operation with c.w. or phone. The muting setup for full break-in is designed for use only with the Swan 600-R receiver.

Wave shaping for c.w. keying minimizes key clicks; as a matter of fact, an analyzer display during high-speed keying showed no keying transients outside of 1 kc from the carrier.

A.M. Operation

A.m. operation is set up by unbalancing the modulator with the CARRIER-BALANCE control which is conveniently located on the front panel. It is adjusted to allow a d.c. input of about 150 watts as determined by the p.a. cathode current. Operation in this mode provides a carrier output of about 30 watts and a p.e.p. output of near 275 watts, essentially resulting in a reduced-carrier s.s.b. signal suitable for demodulation by an a.m. receiver.

Transceive Operation

Transceive operation using the receiver v.f.o. to tune both the receiver and the transmitter is obtained by a v.f.o.-selector switch on the panel whereby a second isolation amplifier is bridged across the v.f.o. output. This amplifier then also feeds the v.f.o. signal to the v.f.o. amplifier in the transmitter.

At another position of the switch the second isolation amplifier is disconnected and the input to the receiver-mixer isolation amplifier is connected to the output of the v.f.o. amplifier in the transmitter. This provides transceive operation with the transmitter v.f.o. in control of both units.

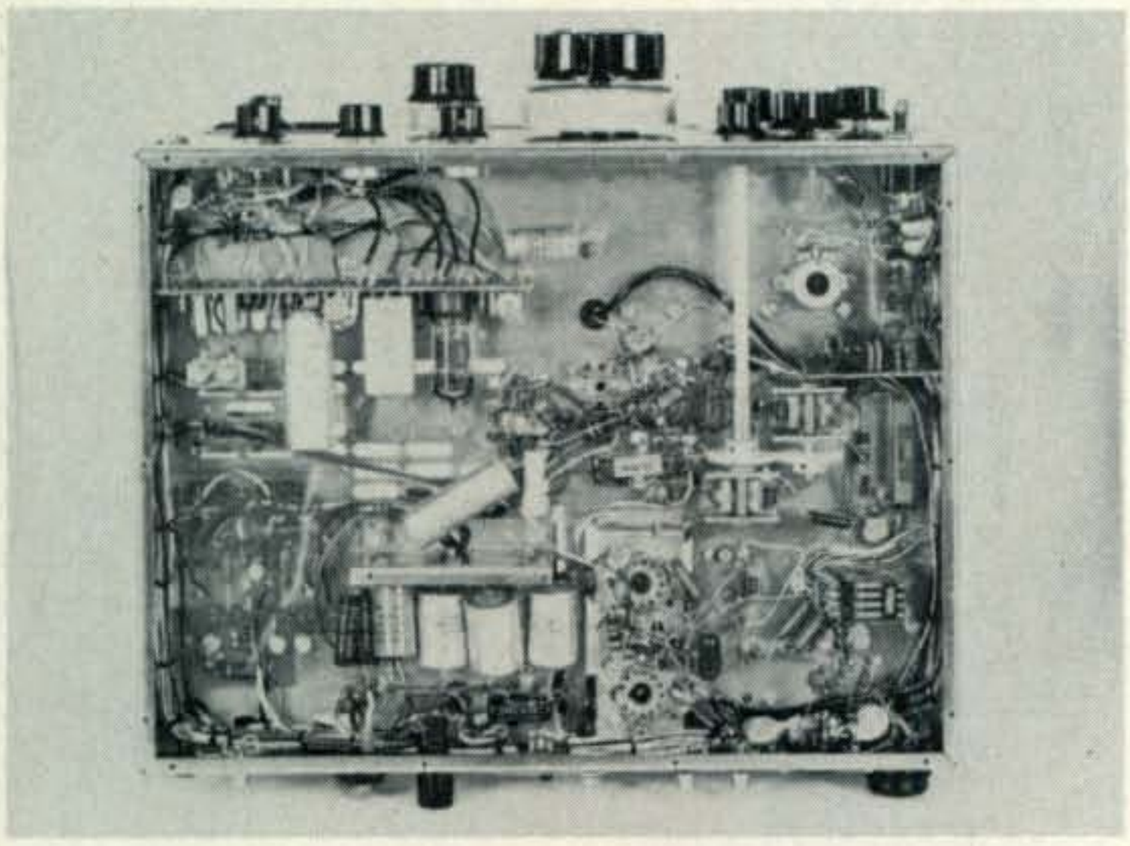
Provisions are included for synchronizing the receiver b.f.o. with the transmitter carrier generator so that the frequency of operation in either mode will be maintained the same.

For split-frequency operation, the switch returns the circuitry to normal independent-v.f.o. control. All necessary interconnecting cables are supplied with the equipment.[1]

Tuning

The main-tuning dial on each unit is controlled by the smooth two-speed drive setup for which the Swan gear is noted. This is enhanced by a larger-than-usual vernier-tuning knob which operates at a 36:1 ratio.

[1]The receiver also may be used for split-frequency or transceive operation with the Swan 270-B, 500-C or 500-CX Transceivers using an accessory cable kit, soon to be available.



Underchassis view of the Swan 600-T.

The bandsetting dial is handled by a 6:1 ratio drive and has a dial lock operated by an inner ring like the fast-speed control at the main dial.

The main dial is calibrated in 2 kc steps over an incremental range of 200 kc and with major markers at each 10 kc point. The reading in kc on this dial is then added to the frequency for the low end of the particular band segment.

Except for the 10-meter band, the bandsetting dial is calibrated in 100 kc increments from −400, through 0 and to +400. With the dial set at zero, the v.f.o. tunes over the 200 kc incremental range required for covering the amateur-band segments starting at 3.8, 7.1, 14.2, 21.3 mc and is so indicated at the bandswitch. Most of the phoneband spectrums are thus taken care of.

Other segments are obtained by rotating the bandset dial to the 100 kc calibration (checked against the crystal calibrator) which added to or subtracted from the bandswitch indication, as the case may be, is equivalent to the low end of the desired extra segment. For example: with the bandset dial at 0 and the bandswitch at 3.8, the covered segment is the normal 3.8-4.0 mc. With the bandset dial at −100, the segment is 3.8-4.0 mc minus 100 kc = 3.7-3.9 mc. Similarly with the dial at +100, the 200 kc segment starts at 3.9 mc.

On 10 meters a similar procedure is used with the bandset dial calibrated at 28, 28.5, 29 and 29.5 mc, indicating the low end of the particular 500 kc segment. The main tuning dial has a second scale calibrated in 5 kc steps over the incremental 500 kc range used for 10 meters.

The frequency readout for the normal band segments held to within 1 kc when the tuning dial was indexed against the calibrator signal at the nearest 25 kc points.[2] With indexing at the center of these segments the calibration tracked to within 2 kc. On the other segments the calibration does not hold quite as closely, amounting to within 2 kc with indexing at the nearest 25 kc point. On the 10-meter band (28.5 mc segment) it was within 3 kc.

Excellent overall frequency stability of these units was evidenced by three-hour test runs on each band on different days. The 30-minute warmup from a cold start at 72° F. ambient varied between 150 and 400 c.p.s. with a 20-150 c.p.s. drift per hour thereafter, depending on the band of operation. With line voltage variations of ±10% the maximum frequency shift noted was ±10 c.p.s., except 25 c.p.s. on 10 meters. No adverse effects were observed during vibration tests.

Two internal spurious responses with the receiver were found in the amateur bands. These were at 3660 and 14300 kc at a level equivalent to less than a 0.1 μv signal. They were evident only because of the high receiver sensitivity and under operating conditions with background noise are likely to be unnoticed.

All in all, the Swan Twins are a fine pair for good performance, ease of handling, versatility and a large amount of effective power without going to a linear amplifier. The Model 600-R Standard Receiver is priced at $395. The Custom Model, which includes the Noise Blanker and the A.F. Notch/Peak Filter, is $495. The Model 600-T Transmitter price is $535. Prices on accessories may be found in Swan's cataloguing in current issues of *CQ*, while further data may be obtained from Swan Electronics, 305 Airport Road, Oceanside, California 92054. —*W2AEF*

[2]The transmitter v.f.o. is calibrated against the calibrator signal in the receiver.

The Swan 600-T transmitter.

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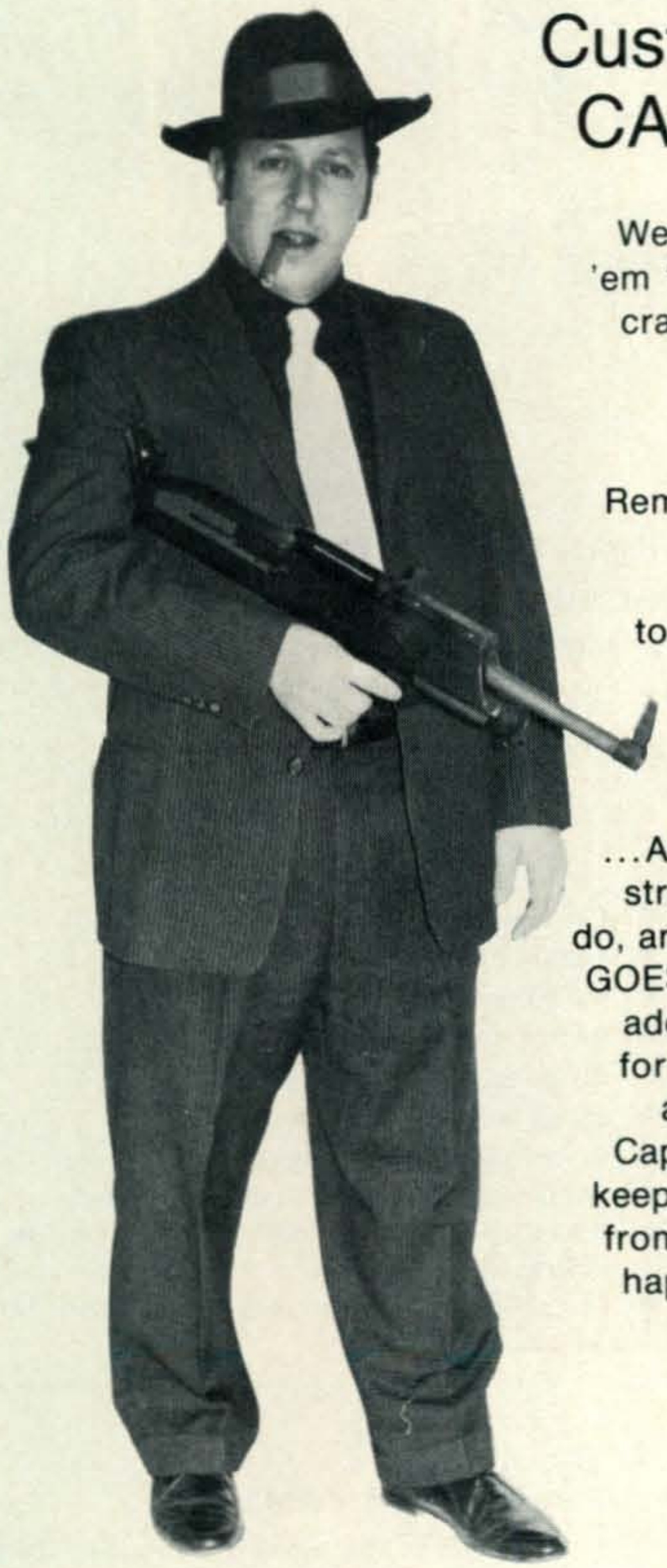

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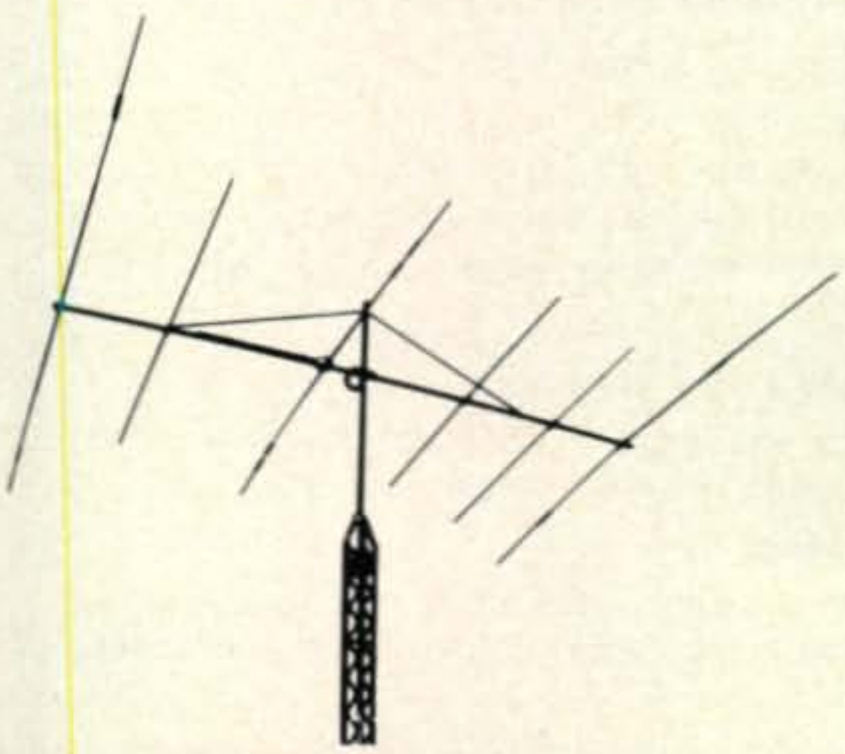

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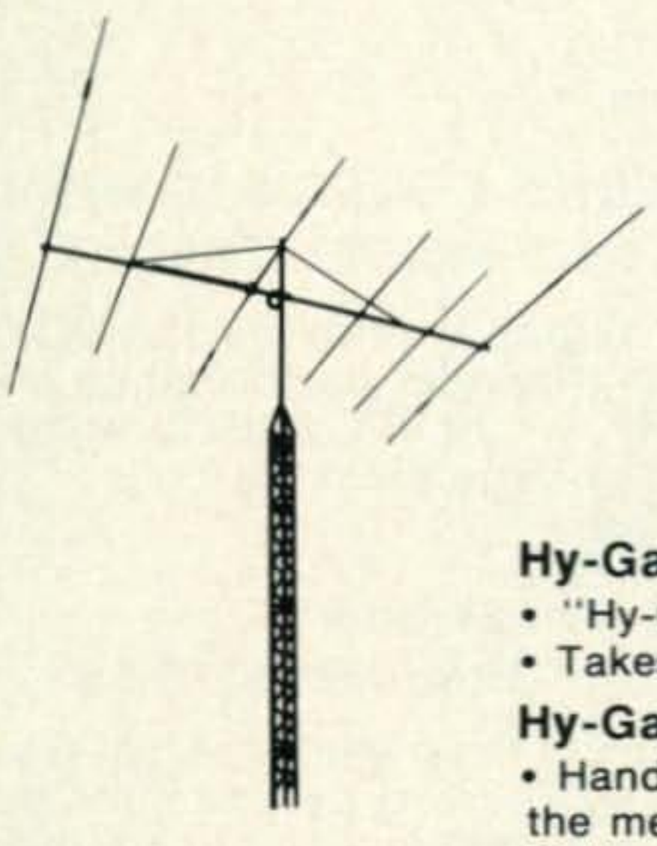

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Starts 0000 GMT Sat. Ends 2400 GMT Sun.

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many different zones and countries as they can in the contest.

II. BANDS: All bands, 1.8 thru 28 mc.

III. TYPE OF COMPETITION: 1 Single Operator. Single Band & All Band.

2. Multi-Operator (all band operation only).

a. Single Transmitter (only one transmitter and one band permitted during the same time period).

b. Multi Transmitter (no limit to transmitters but only one signal per band permitted).

IV. NUMBER EXCHANGE: PHONE: RS report plus zone (i.e.: 5705). C.W.: RST report plus zone (i.e.: 57905).

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The *CQ* Zone Map, DXCC country list, WAE country list and WAC boundaries are standards.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. (*Exception*: For North American stations *only*, contacts between stations within the North American continental boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: The final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VIII. AWARDS: First place certificates will be awarded in each category listed under Sec. III in every participating country and in each call area of the United States, Canada, Australia and Asiatic USSR.

All scores will be published. To be eligible for an award a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only*. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates will be issued to the licensee of the station used.

IX. TROPHIES & PLAQUES: Handsome trophy awards will be made to the highest scoring stations in the following categories.

Single Operator, Single Band Trophy Donors

1. World—Phone *(Dr. Harold Megibow, K2-HLB Memorial—North Jersey DX Assoc.)*
2. World—C.W. *(Earl Lucas, W2JT Memorial —North Jersey DX Assoc.)*
3. Canada—Phone *(Gene Krehbiel, VE6TP)*
4. Carib./C.A.—Phone *(G. Kuether, HR2GK)*
5. So. America—Phone *(Brazil DXers)*

Single Operator, All Band Trophy Donors

6. World—Phone *(Bill Leonard, W2SKE)*
7. World—C.W. *(Larry LeKashman, W9IOP)*
8. USA—Phone *(Potomac Valley Radio Club)*
9. USA—C.W. *(Frankford Radio Club)*
10. Canada—Phone *(Jack Baldwin, VE3BS)*
11. Europe—Phone *(W4BVV Operators)*
12. Europe—C.W. *(W3AU Operators)*
13. Carib./C.A.—Phone *(Harold Fox, W3AA)*
14. Carib./C.A.—C.W. *(Harold Fox, W3AA)*
15. Africa—Phone *(Gordon Marshall, W6RR)*
16. Africa—C.W. *(Gordon Marshall, W6RR)*
17. Asia—Phone *(Japan CQ Magazine)*
18. Asia—C.W. *(Japan CQ Magazine)*
19. Oceania—Phone *(No. Calif. DX Club)*
20. Oceania—C.W. *(Maui A.R.C.)*

Multi-Operator, Single Trans. Trophy Donors

21. World—Phone *(John Knight, W6YY)*
22. World—C.W. *(Anthony Susen, W3AOH)*
23. Canada—Phone *(Calgary A.R.A.)*

Multi-Operator, Multi Trans. Trophy Donors

24. World—Phone *(Radio Club Venezolano)*
25. World—C.W. *(Hazard Reeves, K2GL)*

Contest Expedition Trophy Donors

26. World—Phone *(Stuart Meyer, W2GHK)*
27. World—C.W. *(Donald Miller, W9WNV)*

CQ will award championship plaques to stations ineligible for a trophy.

Trophy winners may win the same trophy

CQ **World Wide DX Contest** CQ

Last Full Weekend of October (Phone) & November (CW)

Page 4 of 15 Pages

Call Sign G3HCT ☐ Phone ☒ CW Log for 21 MC Band

(use separate log for each band)

DATE GMT	TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RECEIVED	INDICATE MULTIPLIERS ONLY ZONE	INDICATE MULTIPLIERS ONLY COUNTRY	QSO POINTS
Nov. 27, 1971	0611	DL8AN	579 14	599 14	14	GERMANY	1
	19	UB5EM	579	579 16	16	UKRAINE	1
	23	ZS6AYU	599	579 38	38	SO. AFRICA	3
	28	UB5EC	589	599 16			1
	30	UD6AM	599	559 21	21	AZERBAIJAN	3
	35	4Z4HF	599	599 20	20	ISRAEL	3
	45	LZ2PG	578	589 20		BULGARIA	1
	49	UK8IAA	579	569 17	17	UZBEK	3
	52	DL6EN	579	579 14			1
	58	UH8CS	599	559 17		TURKOMAN	3
	1203	YN1AA	579	559 07	7	NICARAGUA	3
	04	W1MDO	599	599 05	5	USA	3
	05	W1WY	579	579 05			3
	06	G3FKB	559	559 14		ENGLAND	—
	08	VO1AW	579	579 05		CANADA	3
	10	W9IOP	579	579 04	4		3
	12	VP9BI	579	569 05		BERMUDA	3
	13	VE2UN	579	579 05			3
	15	PJ8CW	599	599 09	9	NETH. ANTILLES	3
	18	W3QQL	579	579 05			
	0700	~~4Z4HF~~	~~599~~	~~599 20~~		—DUPLICATE—	0
	02	ZE1BL	579	579 39		RHODESIA	3
	03	UA1DZ	569	569 16		EU. USSR	1
	04	VK9ABA	579	579 17		ASIAN USSR	3
	06	LZ1KVV	579	579 20			1
	07	HP9FC/MM	599	599 53			3
	10	EL2CB	579	579 35	35	LIBERIA	3
	12	GM3KLA	559	559 14		SHETLANDS IS	1
	13	~~PE6EN~~	~~569~~	~~569 14~~		—DUPLICATE—	0
	12	OK3BG	579	579 15	15	CZECH.	1
NOV. 28	1310	W1CNU	579	579 05			3
	11	~~W1WY~~	~~569~~	~~569 05~~		—DUPLICATE—	0
	13	KV4FZ	599	599 09	8	US VIRGIN IS	3
	15	W4BJ	579	579 05			3
	17	W3AU	599	599 05			3
	18	W4BVV	579	599 05			3
	20	OX3WG	579	579 40	40	GREENLAND	3
	22	TF2WLW	579	579 46		ICELAND	1
	25	VE8BB	559	579 01	1		3
	25	W7RM	559	459 03	3		3
(This Page)			37	TOTALS	16	23	88
			QSO's (minus duplicates)		(Zones)	(Countries)	(Points)

Mail to: CQ Contest Committee
14 Vanderventer Ave
Port Washington N.Y. U.S.A. 11050

Note: Duplicate QSO's can mean disqualification!

A sample log page—40 QSO's to a page. You may work your own country for multiplier credit, but receive NO QSO points. Logs must be checked for correct point credit and duplicate QSO's.

Year 1971

CQ **World Wide DX Contest** CQ

Last Full Weekend of October (Phone) & November (CW)

Call Sign W81MZ U.S.A. Country

Single Operator: X Phone CW — Single Band X All Band

Multi-Operator (All Band Only): Single Transmitter — Multi-Transmitter

	QSO's (minus duplicates)	QSO Points		Zone Multiplier		Country Multiplier		Score	
1.8 mc	2	4	×	2	+	2	=		1.8 mc
3.5 mc	18	50	×	9	+	12	=		3.5 mc
7.0 mc	44	121	×	22	+	28	=		7.0 mc
14 mc	128	361	×	26	+	53	=		14 mc
21 mc	61	169	×	16	+	33	=		21 mc
28 mc	3	9	×	3	+	3	=		28 mc
All Bands	256	714	×	78	+	131	=	149,226	All Bands

How to score: QSO Points × (Zones + Countries) = FINAL SCORE

EXAMPLE: 1000 QSO Points × (30 Zones + 70 Countries) = 100,000 points

Station Description

Antenna(s)

Operators

Remarks (Biggest thrill in Contest, funniest story, comments, etc.) Working W1WY on 1.8 and 28 mc

Club Competition (Minimum 3 logs)

This is to certify that in this contest I have operated my transmitter within the limitations of my license and have observed fully the rules and regulations of the contest.

Type or Print (Signature) Bernie Welch

Name BURNELL W. WELCH Call W81MZ

Address 5420 ACCESS ROAD

City DAYTON

State or Country OHIO (Zip) 45431

Logs must be postmarked no later than December 1st for PHONE and January 15th for CW. Indicate PHONE or CW on envelope.

Mail to: CQ Contest Committee
14 Vanderventer Ave.
Port Washington, N.Y., U.S.A. 11050

Note: Duplicate QSO's can mean disqualification!

CQ Form 1057A 1969

A sample summary sheet. Free summary sheets, log pages and zone maps may be obtained upon receipt of a large s.a.s.e. or, if outside the U.S., sufficient IRC's. When you send in your score... include photos.

only once within a three year period. (This does not apply to any of the *CQ* plaque awards).

The Canadian, Carib./C.A. and the African awards are for native residents *only*.

X. CLUB COMPETITION: *CQ* will award a handsome plaque to the club submitting the highest aggregate score of the phone and c.w. scores submitted by its members.

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area, (except for DX-peditions especially organized for operation in the contest and manned by members.

3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and c.w.

4. Participating members must indicate the name of their club on their Summary Sheets.

XI. LOG INSTRUCTIONS: 1. All times must be in GMT.

2. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

3. Logs must be checked for duplicate contacts, correct QSO points and multipliers, and recopied logs must be in their original form with corrections clearly shown.

4. Use a separate sheet for each band.

5. Each entry must be accompanied by a Summary Sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS and a signed declaration that all contest rules and regulations for amateur radio in the country have been observed.

6. Official log and summary sheets and zone maps are available from *CQ*. A *large* self-addressed envelope with sufficient postage or IRCs must accompany your request.

If official forms are not available, make up your own by following the samples shown, 40 contacts to the page on 8½" × 11" paper.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest; unsportsmanlike conduct; taking credit for duplicate contacts in excess of 3% of the total made, incorrect QSOs or incorrect multipliers will be deemed sufficient cause for disqualification.

Actions and decisions of the *CQ* Contest Committee are official and final.

XIII. DEADLINE: All entries must be postmarked NO LATER than December 1, 1971 for the Phone section and January 15, 1972 for the C.W. section. In rare isolated areas the deadline will be made more flexible. Indicate phone or c.w. on envelope. Logs go to:

CQ WW Contest Committee
14 Vanderventer Avenue,
Port Washington, L.I., N.Y. USA 11050

(Please circulate this information to your DX friends and radio clubs)

CQ Reviews:

The Swan FM-2X Meter FM Transceiver

BY GLEN E ZOOK.* K9STH

ANOTHER major amateur equipment manufacturer has joined the ranks of those sporting f.m. equipment, namely, Swan Electronics. Swan's contribution to the amateur f.m. world is a fully solid-state, 10-watt-output, 12-channel two meter f.m. transceiver. The receiver is dual conversion and the transmitter employs phase modulation. The unit may be operated from a 12 volt negative ground automobile system or from 117 v.a.c. with a snap-on power supply (included). Front panel controls include channel selector, off-on-volume, squelch, microphone pack, and tuning meter. The FM-2X comes equipped with 146.94 mc simplex, 146.34/146.94 mc repeater, and 146.34/146.76 mc repeater crystals.

Technical Details

The unit is fully solid state. Special features include relative-output/signal-strength meter, external speaker jack, and removable a.c. power supply pack. The construction is on good quality phenolic circuit boards.

TRANSMITTER: The transmitter section of the Swan FM-2X is a 12 channel system using 12 mc crystals (a multiplication factor of 3 × 2 ×2). The r.f. circuitry in the transmitter is straightforward. The audio is supplied by a dynamic (600 ohm impedance) microphone, is amplified by two stages, limited in a diode combination, and applied to the Varactor phase modulator. The power output transistor is protected from overload by an "APC" or automatic protection circuit. This circuit consists of a reflected power (actually voltage) pickup similar in workings to the old Monimatch type of pickup. When the reflected voltage reaches a pre-determined level, the 1st amplifier and tripler stages of the transmitter are biased off, thus shutting down the transmitter. The sensitivity of this circuit is adjustable, and instructions are included in the owner's manual. A low-pass filter and antenna change-over relay complete the transmitter section of the Swan FM-2X.

RECEIVER: The receiver section of the FM-2X is a fully solid-state dual-conversion superhet. The 1st r.f. transistor is a JFET for high gain and low noise. The output of this stage is applied to a second r.f. amplifier (bipolar). The r.f. stages are stagger-tuned to provide a more uniform response across the entire 2-meter band. The 2-meter signal is then applied to a bipolar first mixer. 135 mc injection energy is obtained from a crystal oscillator in the 45 mc range (with warping capacitors supplied on all crystal positions), and a transistor tripler. The resultant 10.7 mc high i.f. then amplified in a single stage and applied to the second mixer. An 11.155 mc signal is injected from a second crystal controlled oscillator and the resultant 455 kc low i.f. signal is passed through

*FM Editor, *CQ*, 818 Brentwood Lane, Richardson, Texas 75080

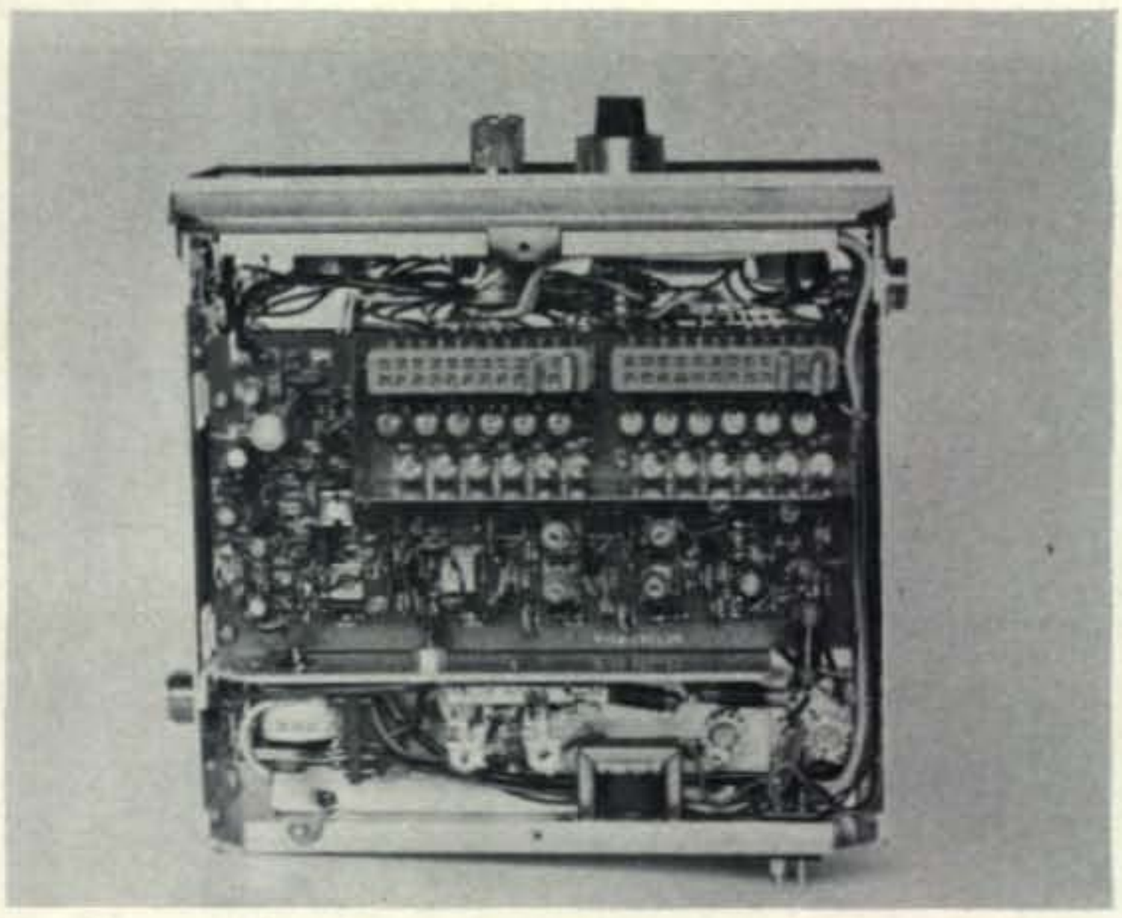
The Swan FM-2X is a 12-channel solid state 2-meter f.m. transceiver designed for amateur use.

a ceramic filter for increased selectivity. A single integrated circuit contains the remaining low i.f. amplification and limiting stages. The signal is then demodulated by a discriminator, and applied through two stages of amplification to the complimentary pair audio output stage. This stage then drives either the built-in speaker or an external 8 ohm speaker which may be plugged into a jack. The squelch for the Swan FM-2X is derived from the low i.f. signal before limiting. Part of this circuit is also used for the relative signal strength metering circuits. This type of squelch depending on signal strength is effective, but much more touchy in terms of squelch.

POWER SUPPLY: The a.c. power supply of the FM-2X can be snapped on the rear of the unit with two attached locking mechanisms. This power supply consists of a transformer, full-wave bridge rectifier, and a two transistor voltage regulation circuit to provide 13.8 v.d.c. on which the unit actually operates. For ease in servicing a short jumper cable is provided which allows the FM-2X to be operated using the power supply in a detached position.

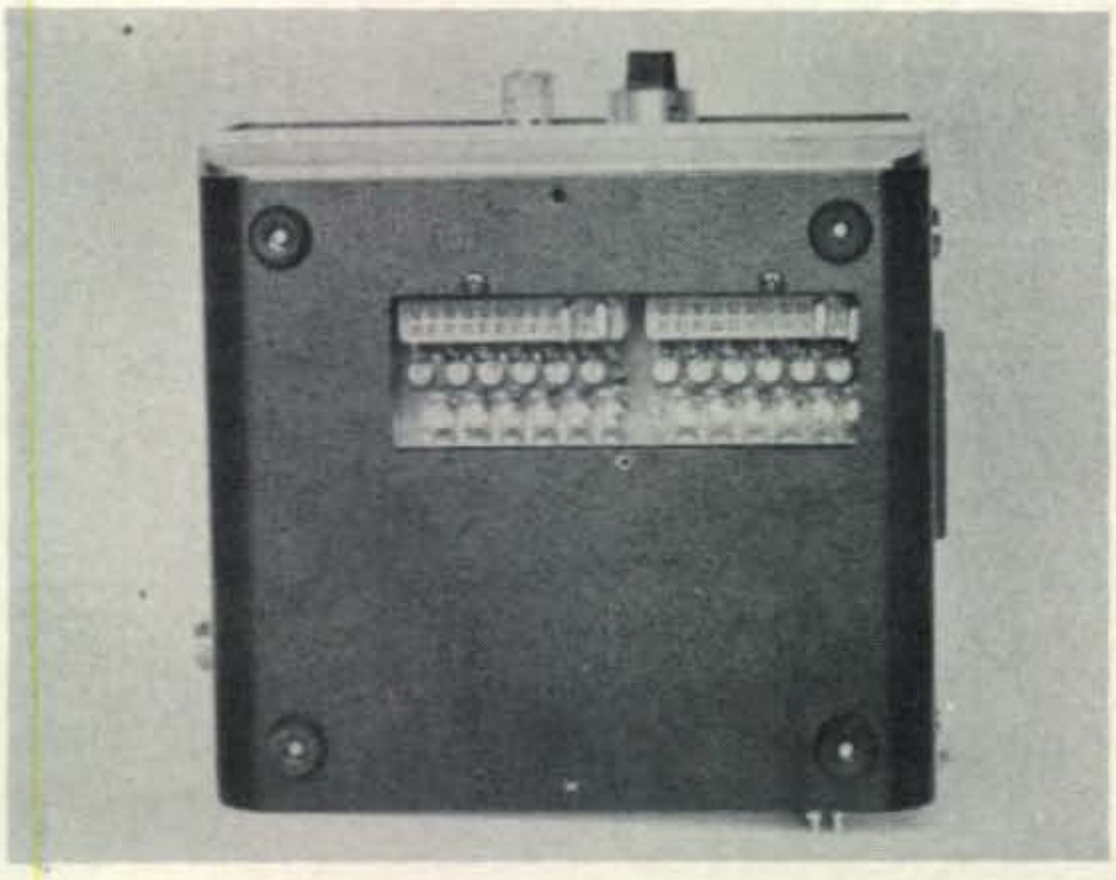
Specifications and Performance

After unpacking the test Swan FM-2X was put through its paces under controlled circumstances. In most cases the test unit met or exceeded the published specifications. The transmitter power output from both a d.c. supply and the Swan a.c. supply was in excess of 10 watts. The audio quality of the transmitter was excellent, but the preset deviation was about ±9 kc, well in excess of the specified ±5 kc. The deviation adjust potentiometer and the limiting adjust potentiometer are the inexpensive printed circuit board types which, if adjusted very often, may fail. They are, however, fairly easy to adjust because of the wide open spaces around them. The transmitter functioned well into a good, matched two meter antenna, but the "APC" went into operation when a simple quarter wave whip was attached directly to the unit. This could be overcome, if desired, by a slight adjustment of "APC" controls.



Construction and layout of the FM-2X is excellent. Note that all components on the circuit boards are identified.

The receiver was then run through an exhaustive test. The basic sensitivity for 20 db quieting was 0.25 microvolts on 146.94 mc and 0.20 microvolts on 146.76 mc. The bandpass of the crystal filter appears to be relatively flat with very steep skirts. Swan rates the adjacent selectivity as 50 db down at ±25 kc from desired frequency. The tested unit had about 20 db down at ±20 kc from center frequency, but at the next narrowband channel 30 kc away on either side the signal was down over 80 db (as checked with 146 mc signals with new Motorola Service Monitor). This would put the 25 kc points around the 50 db points as specified. Needless to say, selectivity and adjacent channel signal rejection is excellent. All spurious responses were at least 60 db down, well within the 60 db minimum set by Swan. Audio quality was good, but an external speaker with 8 ohms impedance helps the quality greatly. The small internal speaker just cannot compete with a good external speaker. That is why Swan provides an external speaker jack.



The Swan FM-2X employs a small access door for ease in crystal changing and warping. Also note the rubber feet to protect the desk or table top.

Swan Model FM-2X

GENERAL SPECIFICATIONS

Size: 8¼" × 7" × 3"; 8¼ lbs.

Power Requirements: 13.5 v.d.c. @ 0.2a.stdby., 2.5a. transmit†; 117 v.a.c. @ 5 watts stdby., 30 watts trans†

Accessories Furnished: Microphone, a.c. power supply, mobile installation hardware and cable, service power cable.

TECHNICAL SPECIFICATIONS

Receiver	*Claimed*	*Achieved*
Sensitivity (20 db quiet)	0.5 μv	0.2 μv
Adjacent Channel rejection		
30 kc	50 db‡	80 db‡
60 kc	none	86 db
Audio Recovery (full quieting signal)		
± 5 kc dev.	1.0 w.	1.2 w.
± 7.5 kc dev.	none	1.4 w.
± 15 kc dev.	none	1.4 w.
Number of Channels	12	
Frequency Stability	0.001% §	
Transmitter:		
Power Output		
a.c. Supply	10 w.	15 w.
d.c. Supply 13.5 v.	10 w.	14.5 w.
Deviation:		
Preset	±5 kc	±9 kc
Maximum	±15 kc	20 kc
Number of Channels	12	—
Frequency Stability	0.001%§	0.0005%

Construction

Construction of the Swan FM-2X was excellent. The circuit boards are of good quality phenolic, and the workmanship was supurb. Plenty of test points are provided and marked on the circuit boards for service, and all components are also identified on the boards.

Special Note

The FM-2X includes a feature not seen on any other unit reviewed to date: an access cover for transmit and receive crystals and warping capacitors. This cover, on the bottom of the unit may be removed, and just the crystals and associated warping capacitors are revealed. This makes replacement and "zeroing" of channels very easy, for the unit does not have to be disassembled.

† Estimated, not specified by Swan

‡ Swan specifies 50 db at ±25 kc

§ See text for comments on crystal stability

General Comments

In general the Swan FM-2X has a lot going for it. However, there is an apparent discrepancy between the owner's manual and published specifications concerning frequency stability. The published specifications call for 0.001% temperature stability and the owner's manual states a 0.005% temperature for crystal temperature stability. Swan informed the author that this is not actually discrepancy. The oscillator circuitry in the FM-2X employs temperature compensation which keeps the frequency stability within the 0.001% limit even though the crystal itself is only good for 0.005% when uncompensated. The Swan engineering people informed the author that when 0.001% crystals are used in the oscillators that the frequency versus stability is much better than 0.001%. Thus, usage of 0.005% crystals with the built-in compensation network will meet current amateur standards of 0.001% total frequency versus temperature stability. As a personal preference, the better the crystal the better the stability, and the author would personally use the 0.001% crystals. This, however, would not be required for most applications.

Speaking of the manual; the instruction manual supplied with the Swan FM-2X is the bare minimum for operation. Although the instructions for alignment of the final transistor protective circuit ("APC") is included, no other alignment information is supplied. The test points are indicated on the circuit boards, and with a little help from the instruction manual, alignment could be accomplished and servicing made easy for the average f.m.'er. Also, along these lines, although an access cover is provided for the changing and zeroing of crystals, no receiver metering point is indicated. Such a point is within reach of the access hole, but it is not indicated. The discriminator output can be metered at the high side of the volume control (which is located on the front of the unit at the center of the transmit crystal sockets). Adjustment of the appropriate receiver warp capacitor while watching a v.o.m. or v.t.v.m. for a zero voltage reading will result in an on-frequency receiver.

Of minor difficulty is the fact that the channel markers are backlighted and are somewhat difficult to read in direct sunlight. These channel numbers are green on a *black background*. Possibly by making the background

[*Continued on page 100*]

MORE GREAT BUYS FROM ARROW—

BARKER & WILLIAMSON COMPREAMP

The Compreamp Audio Preamplifier/Limiter increases the effective speech power output of a transmitter up to four times. Self-contained and battery powered, the two-stage transistorized Compreamp is designed to be used with all types of transmitters.

Amateur net. . . **$31.50**

SPECIFICATIONS

Input Impedance ..... 100K ohms, nominal
Input Level ..... .005 to .020 volts
Voltage Gain ..... 10 db, nominal
Output Level ..... .060 volts
Output Impedance ..... 50K ohms, nominal
Power ..... 9-volt Burgess 2U6 or equivalent
Size ..... 2¾" x 3" x 4½"
Weight ..... 6½ oz.

UNIVERSAL HYBRID COUPLER PHONE PATCHES

An excellent phone patch that connects receiver and transmitter to the phone line for remote voice operation. Provision to connect tape recorder. Hybrid circuit provides effortless VOX operation of phone patch. Built-in "Compreamp" speech preamplifier/limiter increases the level of weak phone signals and avoids over-modulation when the local telephone serves as station microphone. "Compreamp" also functions as a preamplifier/limiter with station microphone.

Amateur net. . . **$75.00**

OUTPUT IMPEDANCES

Transmitter .. 50K ohms, nominal
RX Speaker ..... 4 ohms, nominal
Tape Recorder ..... ½ meg. ohm

SPECIFICATIONS

Line ..... 600 ohms nominal
Receiver Output .. 4 ohms nominal
Microphone ..... High impedance crystal or dynamic (50K ohms)
Tape Recorder ... Speaker: 4 ohms nominal.

PROTAX T.M. ANTENNA SWITCHES WITH AUTOMATIC GROUNDING

Model 375

Price **$18.00** ea.

Model 376

Waters "Protax" Coaxial Switches function as regular selector switches with the additional feature of automatically grounding the entire antenna system when the rig is not in use. Built to the same exacting standards that escalated our entire coaxial switch line to its present foremost position in the field.

SPECIFICATIONS

Internal Construction Ceramic switch with silver plated conductors
Power Carrying Capacity 1000 watts
Insertion Loss Negligible
VSWR Less than 1.2 up to 150 MHz
Mounting ..... Behind panel

Hardware

Escutcheon plate with provision for erasable markings, mounting screws and knob (Mounting brackets with radial switches).

COAXIAL TYPE SWITCH MODEL 550-A

Single Gang, single pole, 5 position switch with UHF-type connectors.

Amateur net. . . **$11.25**

Rockland County Hams - Visit our Nanuet Store for great Local Service Dept. D

ARROW ELECTRONICS, INC.

NEW YORK CITY, N.Y. 10007, 97 Chambers Street, 212-349-4411, Between Broadway and Church Street
BAYSIDE, QUEENS, N.Y. 11361 207-02 Northern Blvd., 212-423-0910, Half Block East of Clearview Expressway
NANUET, N.Y. 10954 195 West Route 59, Half Mile East of Thruway Exit 14
FARMINGDALE, L.I., N.Y. 11735 900 Route 110, One Mile South of Republic Aviation
MINEOLA, N.Y. 11501 525 Jericho Turnpike, One Half Block East of Herricks Road
TOTOWA, N.J. 07511 225 Route 46, 201-256-8555
NORWALK, CONN. 06850 18 Isaac Street, Shopping Pl., 203-838-4877

CQ World-Wide DX Contest
ALL-TIME PHONE RECORDS

BY FRED CAPOSSELA, JR., W2IWC

In the records listed below, boldface listings denote world records. Number groups after calls are: year of operation, total score, contacts,

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	**VE3BS ('69)**	**1,947**	**74**	**6**	**5**
3.5	**LAØAD ('70)**	**80,754**	**757**	**20**	**66**
7.0	**YV1B1 ('70)**	**142,496**	**660**	**20**	**53**
14	**YV1LA ('70)**	**1,012,000**	**2162**	**35**	**125**
21	**CW4CR ('70)**	**1,196,085**	**2462**	**39**	**126**
28	**YV1LA ('68)**	**664,560**	**1898**	**33**	**87**

AFRICA

1.8	No Entrant				
3.5	No Entrant				
7.0	ZS6DW ('69)	1,144	20	12	14
14	CR6IK ('70)	961,625	1869	38	137
21	ZD8WZ ('66)	378,200	1076	31	91
28	EL2J ('68)	275,296	829	31	80

ASIA

1.8	No Entrant				
3.5	4X4AS ('64)	29,392	227	11	33
7.0	JA2BTV ('67)	46,620	196	29	55
14	UA9DN ('69)	699,105	1478	39	126
21	JA1RJW ('69)	379,136	1197	37	91
28	4X4JU ('69)	570,836	1522	34	99

EUROPE

1.8	GM3YCB ('70)	1,204	87	2	12
3.5	**LAØAD ('70)**	**80,754**	**757**	**20**	**66**
7.0	SM5BPJ ('69)	138,061	622	30	91
14	G5AAM ('67)	824,344	1634	39	144
21	G3HCT ('69)	832,016	2124	37	112
28	DL4PM ('68)	614,544	1858	34	84

NORTH AMERICA

1.8	**VE3BS ('69)**	**1,947**	**74**	**6**	**5**
3.5	W1FZJ/KP4 ('68)	50,410	297	18	35
7.0	VE3KZ ('69)	92,442	610	20	57
14	KP4AST ('69)	619,714	1760	36	116
21	VE3MH ('69)	550,212	1292	39	117
28	KP4AST ('70)	630,180	2010	31	104

OCEANIA

1.8	No Entrant				
3.5	KH6EPW ('66)	5,040	82	10	11
7.0	KH6GLU ('70)	64,437	475	17	30
14	AX2APK ('70)	607,128	1281	37	127
21	KG6AQY ('70)	749,529	2353	32	72
28	KH6GMP ('70)	454,181	1697	32	59

SOUTH AMERICA

1.8	No Entrant				
3.5	YV5BTS ('66)	69,471	296	21	62
7.0	**YV1BI ('70)**	**142,496**	**660**	**20**	**53**
14	**YV1LA ('70)**	**1,012,000**	**2162**	**35**	**125**
21	**CW4CR ('70)**	**1,196,085**	**2462**	**39**	**126**
28	**YV1LA ('68)**	**664,560**	**1898**	**33**	**87**

Single Operator/All Bands

AF	ZD8Z ('68)	4,184,680	3210	122	327
AS	VS6DR ('70)	2,095,415	2594	134	303
EU	LAØAD ('69)	2,512,692	2425	110	271
NA	KV4FZ ('70)	4,961,551	4362	128	369
O	**VK2ADY/9 ('67)**	**5,045,115**	**3310**	**153**	**384**
SA	9Y4AA ('69)	4,318,925	3056	130	355

WORLD RECORD

Station	Band	Contacts	Zones	Countries
VK2ADY/9 (1967) 5,045,115	1.8	—	—	—
	3.5	29	15	20
	7.0	118	25	37
	14.0	949	38	110
	21.0	1084	38	104
	28.0	1130	37	113
	Total	3310	153	384

Multi-Operator/Single Trans.

AF	CR6GA ('70)	2,982,980	2806	106	258
AS	UA9KAX ('69)	3,673,969	2378	131	402
EU	**ON4UN ('69)**	**5,117,716**	**3339**	**149**	**408**
NA	HH9DL ('70)	3,302,640	4138	97	263
O	KH6SP ('70)	2,088,870	2424	100	194
SA	PJ9AF ('70)	4,536,780	4598	102	230

WORLD RECORD

Station	Band	Contacts	Zones	Countries
ON4UN (1969) 5,117,716	1 8	—	—	—
	3.5	143	18	55
	7.0	208	23	54
	14.0	1177	39	129
	21.0	1138	35	95
	28.0	673	34	75
	Total	3339	149	408

Multi-Operator/Multi-Trans.

AF	ZS5JY ('69)	3,979,346	3126	127	307
AS	4Z4HF ('70)	5,683,200	4091	121	359
EU	OH5SM ('69)	11,593,925	6771	153	526
NA	PJØMM ('68)	7,037,658	6406	134	343
O	W7UXP/KH6 ('70)	2,424,552	3312	97	150
SA	**PJØDX ('69)**	**17,613,400**	**9270**	**156**	**488**

WORLD RECORD

Station	Band	Contacts	Zones	Countries
PJØDX (1969) 17,613,400	1.8	36	4	8
	3.5	452	22	60
	7.0	929	24	70
	14.0	2739	39	146
	21.0	2699	35	116
	28.0	2415	32	88
	Total	9270	156	488

CQ World-Wide DX Contest
ALL-TIME C.W. RECORDS

MEMBER, *CQ*, CONTEST COMMITTEE

zones, and countries. All-band and Multi-Operator records include a band-by-band breakdown of the world leader in each category.

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	**DL1CF ('70)**	**5,206**	**295**	**3**	**16**
3.5	**UC2AA ('66)**	**83,496**	**714**	**20**	**64**
7.0	**5A1TW ('64)**	**227,814**	**918**	**22**	**64**
14	**KV4FZ ('70)**	**908,514**	**2315**	**36**	**117**
21	**IJ1AW ('70)**	**549,888**	**1447**	**35**	**93**
28	**CX1AAC ('70)**	**681,636**	**1711**	**36**	**93**

AFRICA

1.8	No Entrant				
3.5	CN8DW ('70)	15,759	153	9	26
7.0	**5A1TW ('64)**	**227,814**	**918**	**22**	**64**
14	1G5A ('66)	792,370	1594	37	133
21	**TJ1AW ('70)**	**549,888**	**1447**	**35**	**93**
28	CR6IK ('69)	498,800	1439	36	80

ASIA

1.8	ZC4RB ('67)	4,335	86	3	14
3.5	UG6AD ('70)	76,012	436	13	49
7.0	4X4FA ('64)	174,505	781	25	60
14	HL9KH ('63)	339,920	910	37	103
21	JA1XGI ('70)	211,850	767	33	62
28	HZ1AB ('68)	132,390	578	21	55

EUROPE

1.8	**DL1CF ('70)**	**5,206**	**295**	**3**	**16**
3.5	**UC2AA ('66)**	**83,496**	**714**	**20**	**64**
7.0	SM5BLA ('69)	168,590	550	32	83
14	SM4CMG ('69)	254,600	831	37	97
21	G3HCT ('70)	317,312	924	38	96
28	DL4AAP ('57)	253,680	728	36	84

NORTH AMERICA

1.8	VO1FB ('66)	4,165	92	4	13
3.5	W3MFW ('70)	58,186	216	27	67
7.0	W6AM ('64)	161,991	468	37	86
14	**KV4FZ ('70)**	**908,514**	**2315**	**36**	**117**
21	WA8LYF ('70)	286,767	756	35	94
28	K1JGD ('68)	158,510	520	28	82

OCEANIA

1.8	VK5KO ('64)	6	1	1	1
3.5	KH6HCM ('70)	11,286	200	10	6
7.0	VK5NO ('69)	87,542	411	26	48
14	VK3APJ ('67)	422,240	1150	35	95
21	K1FNA/KG6 ('68)	380,064	1157	32	79
28	VK8UG ('67)	320,008	1048	32	72

SOUTH AMERICA

1.8	YV1OB ('70)	1,656	63	4	5
3.5	PZ1AH ('70)	34,914	256	13	33
7.0	YV5AW ('70)	87,730	476	17	45
14	PY4OD ('68)	747,410	1621	39	116
21	PY4SO ('68)	479,385	1211	38	97
28	CX1AAC ('70)	681,636	1711	36	93

Single Operator/All Bands

AF	ZS3AW ('70)	2,098,466	2467	91	202
AS	UK9ABA ('70)	1,719,663	1366	124	327
EU	OH5SE ('69)	1,419,186	1374	124	298
NA	KV4FZ ('69)	2,719,152	2867	127	287
O	VR2EW ('65)	2,499,536	2215	126	268
SA	**9Y4AA ('69)**	**3,088,968**	**2623**	**123**	**279**

WORLD RECORD

Station	Band	Contacts	Zones	Countries
9Y4AA (1969) 3,088,968	1.8	—	—	—
	3.5	128	12	23
	7.0	373	23	44
	14.0	603	30	77
	21.0	819	32	74
	28.0	700	25	61
	Total	2623	123	279

Multi-Operator/Single Trans.

AF	ZS5QU ('67)	1,615,350	2005	94	181
AS	**4L3A ('67)**	**3,084,536**	**2376**	**116**	**330**
EU	DLØKF ('68)	1,969,830	2329	128	302
NA	ZF1AN ('70)	2,343,665	2804	110	255
O	AX2BKM ('70)	949,750	1121	108	182
SA	4M5ANT ('70)	2,657,892	2423	108	258

WORLD RECORD

Station	Band	Contacts	Zones	Countries
4L3A (1967) 3,084,536	1.8	—	—	—
	3.5	306	13	49
	7.0	472	23	64
	14.0	604	31	88
	21.0	425	26	63
	28.0	569	23	66
	Total	2376	116	330

Multi-Operator/Multi-Trans.

AF	ET3FMA ('67)	1,387,680	1476	105	231
AS	VU2IRA ('70)	2,273,616	2128	125	307
EU	OH2AM ('68)	4,118,688	3277	155	412
NA	W4BVV ('70)	5,552,352	3056	158	456
O	KG6FAE ('57)	691,601	1321	76	105
SA	PJØFC ('70)	11,586,428	7090	150	401

WORLD RECORD

Station	Band	Contacts	Zones	Countries
PJØFC (1970) 11,586,428	1.8	92	8	8
	3.5	668	17	46
	7.0	1338	26	75
	14.0	1974	34	109
	21.0	1641	34	84
	28.0	1377	31	79
	Total	7090	150	401

DX

BY JOHN A. ATTAWAY, K4IIF

Silent Key—W6WX

The DX world mourns the passing of Dave Baker, W6WX, one of the great gentlemen of amateur radio, who passed away at his home in Menlo Park, California on July 21, 1971. Dave was an outstanding leader in the Northern California DX Club and had been a member of the *CQ* DX Awards Advisory Committee for 3 years. His advice was always solid and down to earth. He will be missed.

De Extra

Our guest editorial this month is by Dr. Jim Maxwell, W6CUF, who had the distinction of serving as first Chairman of the ARRL Contest Advisory Committee when it was originally organized. Jim's editorial first appeared in the April, 1971 issue of *The DXer*.

Operating Events—And Non-Events: Recently *QST* initiated a monthly Operating Events column compiled by Ellen White, W1YYM. This nifty column, found on pg. 104 of April *QST*, collects together a variety of operating events such as contests, code practice runs, FMT's, etc. It's a pleasure to scan through the column after years of paging the entire magazine to get the news.

"A few events, however, don't make it. The *CQ* WPX Contest, for example, wasn't mentioned. An oversight? Unfortunately, no. Rather, it was omitted because *QST* has a general policy not to assist in the promotion of an amateur operating activity unless it is sponsored by a bona fide national society or local club.

"At first blush this appears to be a praiseworthy policy, for it avoids any overt entanglement of *QST* or the League with what might be construed to be a commercial venture. The *CQ* contests undoubtedly help build and maintain circulation.

"Yet one might wonder if the League has confused the actions of 'reporting' and 'pro-

*P.O. Box 205, Winter Haven, FL 33880

The WPX Program

S.S.B. WPX

619.....UV3DN
620.....UW6LC
621.....UK3DAA
622.....UK2AAB
623.....I1ZV
624.....LA5RL
625.....K2DNL
626.....WA3GNW
627.....JA1BA

C.W. WPX

1110.....UB5VK
1111.....UK2FAS
1112.....UB5MN
1113.....UO5AP
1114.....UK5KAA
1115.....UWØIX
1116.....UW3IO
1117.....UA1ZX
1118.....K2DNL
1119.....KX6GD

Mixed WPX

290.....WA2EAH
291.....JA2HNP
292.....K2DNL
293.....WA7IRD
294.....K6SSN
295.....K7NHG

WPNX

35.....WN3NQJ

VPX (SSB)

35.....HE9GQF, Peter Zbinden

WPX Endorsements

S.S.B.: K2POA—750, HP1JC—750, WØYDB—650, I1BGJ—650, DL1MD—650, I1ZV—600, WA6AHF—550, WB6DXU—500, K6SSN—400, YN1HSM—350, and JA1-BA—250.

C.W.: OK2DB—700, VU2MD—600, UK5-KAA—600, K6SDR—550, UB5WN—550, UB5LS—500, WA6JVD—500, UA1ZX—400, UK4WAB—400, UA4LN—400, K2-DNL—400, and UW3IO—350.

Mixed: DL1MD—800, W3PVZ—800, W4-CRW—700, WA6MWG—700, KS6DR—650, W4WSF—650, K4CIA—600, JA2-HNP—500, K7NHG—500, and K2DNL—450.

Phone: CT1HF—900.

160 Meters: K4IEX

80 Meters: YU1SF and I1BGJ

40 Meters: W4CRW and VO1AW

20 Meters: W4CRW, VO1AW, UA4LN and W9EVD

15 Meters: VO1AW, OK2DB, and I1BGJ

10 Meters: W4CRW

Europe: W2EHB, UK2AAB, and WA2EAH

North America: K4CIA, CX2CN, and W4WSF

Oceania: K4CIA

South America: W4WSF

VPX (SSB): W4-10646—300

Complete rules for WPX, WPNX, and VPX may be found on pgs. 66-67 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, CA 91722, or to the DX Editor.

moting.' The League has for years presented technical reports in *QST* on commercially manufactured products as a service to the League membership, while reporting regularly the Russian DX Contest and the U.S. Armed Forces Day. Only the crankiest of cranks would contend that the League is promoting Communism, militarism or specific commercial products by the act of such reporting. Why then worry about certain contests?

"What hath *QST's* policy wrought?

"Well, the February, 1971 issue of *QST* devoted 2½ column inches to announcing the Colonie H.S. annual Operations Day, a VE2 contest open to VE2's only, and the TRW Systems QSO Party. Certainly these events deserve to be reported, but after weighing the limited activity these events must generate against the enormous worldwide activity during the WPX and *CQ* Worldwide DX Contests, it is hard to see just who is benefiting from the policy!

"Certainly the vast majority of the *QST* reading audience is sophisticated enough to make a distinction between the act of *reporting* an operating event and its *promotion*.

"The new Operating Events column in *QST* is useful, well-done, and satisfies a real need. But let's hope that *QST* will, in the near future, provide an even greater service by giving us some of the material they now file under 'operating non-events.'!"

CQ readers will be pleased to learn that action has been taken since this editorial was rector of the Southeastern Division. Both of ARRL Board of Directors, Larry Shima, WØPAN, Director of the Dakota Division, moved that the *CQ* events be reported in *QST*'s Operating Events column. The motion was seconded by Dale Strieter, W4DQS, Director of the Southeastern Division. oBth of these Directors have distinguished records as DX and contest operators. However, in the ensuing discussion some expressed the fear that if *QST* listed the dates of the *CQ* contests, the League might lose its tax exempt status. Consequently a motion was made by J. A. Gmelin, W6ZRJ, Director of the Pacific Division, to refer the matter to the League's General Counsel for study and a report at the next Board meeting in January. Mr. Gmelin's motion passed.

Meanwhile, in reply to W6CUF's question, the only party benefiting from the *QST* policy is *CQ*. As several readers have mentioned, the fine CONTEST CALENDAR column by Frank Anzalone, W1WY, in this magazine, is still the only place the contest oriented amateur can go to get the complete news of contests worldwide.

The WAZ Program

S.S.B. WAZ

890.....VE5KG
891.....JA1BA
892.....JA8ZO
893.....ZL2QK
894.....EA8GZ
895.....UF6CR
896.....UW3IN
897.....W6CUF
898.....W9KXK
899.....VE2DCY
900.....HS1ABU

C.W.—Phone WAZ

3196.....F6AHL
3197.....WA3GJZ
3198.....JA1OMH
3199.....WA5RXT
3200.....OK1IQ
3201.....UC2CS
3202.....W4DCW
3203.....K6LOM
3204.....W3AXW
3205.....WAØKTA
3206.....K2LQQ/TF
3207.....JA3BTR
3208.....DL8RE
3209.....F3MS
3210.....JA4ELC
3211.....JA3SL
3212.....UY5CW
3213.....UA3GO
3214.....K2DNL
3215.....WA3DFV

Phone WAZ

463.....VK4FH

Complete WAZ rules are shown on pgs. 64-66 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, FL 33880.

Outstanding DXers†—K2GL

The record of station K2GL is almost as outstanding as the personal record of Hazard E. "Buzz" Reeves, its owner. In recent years K2GL has more than once been world champion in the multi-operator, multi-transmitter category of the *CQ* Worldwide DX Contests, and until 1968 the station was annually among the top six worldwide for both the phone and the c.w. weekends. Winning a world championship from a stateside location is a phenomenal achievement as you must compete against stations who receive 3 points for every contact with a U.S. station.

The antenna systems at K2GL are a very important factor. On 10 meters, two 10 element beams on 46 foot booms are mounted on 80 foot towers. The 15 meter array consists of two 8 element beams on 46 foot booms at 60 ft. and 80 ft., while on 20 the station uses a phased array employing two 6

†This is the 2nd in our series on stations with unusual records in *CQ* sponsored events. The first was devoted to KV4FZ and appeared on pg. 100 of the June, 1971 issue.

WPX Honor Roll

The WPX Honor Roll is based on confirmed current prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix List. Scores are based on the current prefix total regardless of an operators all-time prefix count. Effective with this issue the minimum HR requirement is 650 for Mixed and 600 for CW, SSB & Phone.

MIXED

W4ØPM	Joe Hiller	1100
VE3GCO	Garry V. Hammond	825
W8LY	Michael A. Bakos	822
W9WHM	John R. Leary	811
DL1MD	Heribert Rechl	794
K1SHN	Chuck Banta	783
W8ROC	Frederick W. Riecks	781
W3PVZ	Joseph M. Olnick	779
ON4QX	Bob Berge	778
G3DO	D. A. G. Edwards	773
W4IC	George A. Mack	757
WØAUB	Bill Bergmann	752
DJ7CX	Leonhard Poelt	734
KØBLT	Frank Cahoy	733
YU1AG	Djura Borosic	729
W4BQY	G. B. Fisher	723
I1SF	Serafino Franchi	720
WA6MWG	John P. Billon	708
W4CRW	Robert C. Sommer	701
WA5LOB	James Edwards	699
CT1LN	Paulo J. S. Coelho Vieira	693
SM7TV	Boris Goransson	674
WA6EPQ	Larry Brockman	650

SSB

W4OPM	Joe Hiller	1000
W4NJF	Gay E. Milius	882
DL9OH	Karl Muller	757
HP1JC	Juan Chen	750
W9DWQ	Edward Goodbout	741
K2POA	Arthur Johnson	733
WA5LOB	James Edwards	692
G3DO	D. A. G. Edwards	680
WØYDB	Bill Higgins	669
I8KDB	Giampaolo Nucciotti	665
IØAMU	Alfonso Porretta	657
K1SHN	Chuck Banta	654
W4IC	George Mack	652
F2MO	Michel Dort	632
W3DJZ	Arden Hopple	620

CW

W4OPM	Joe Hiller	900
W8LY	Michael Bakos	837
W8KPL	William Simpson	816
VK3AHQ	Henry Denver	809
DL1QT	Helmut Baumert	780
W2AIW	Charles Rogers	776
ON4QX	Bob Berge	750
W2HO	W. Vollkommer	720
OK2DB	Jaroslav Dufka	693
WB2FMK	Robert Rasche	680
W9FD	W. W. Johler	680
G2GM	F. D. Cawley	647
K1SHN	Chuck Banta	636
YU1AG	Djura Borosic	630
W4IC	George Mack	609
VE4OX	D. E. McVittie	600

PHONE

CT1PK	Manoel DeAlmeida	894
W9WHM	John Leary	813
G3DO	D. A. G. Edwards	761
PAØSNG	Gerrit Mulder	754
CX2CN	Samuel Barreiro	666
CT1LN	Paulo J. S. Coelho Vieira	657
W3DJZ	Arden B. Hopple	654
OE2GL	Eugene Goffriller	601

element beams switchable to either low or high angle.

The 40 meter antennas include two 3 element beams, one at 80 ft. and one at 20 ft., while 80 and 160 are covered by dipoles. The 80 meter dipoles are at 160 ft. running NE-SW, 100 ft. running N-S, and 80 ft. running E-W. Collins exciters are used with Henry Radio finals.

Buzz's record in other endeavors includes a hand in many things from the Waring Blendor to Cinerama. He is President of Reeves Broadcasting Co., and has interests in radio and TV stations, CATV systems, and real estate developments.

Here and There

Japanese Amateur Radio—The JA and JH prefixes are all assigned and the JR series is almost complete, so look for a new set of J prefixes soon. Japan is said to be adding 5000 new hams each month, and according to *QST*, the July issue, page 91, now has 236,000 amateurs and may pass the US total during this year. The secret seems to be that Japan has attracted its youth to amateur radio, while it is becoming an older man's hobby in the U.S. Those interested in knowing more about the JA situation should read "Amateur Radio in Japan" on pgs. 68-69 of the April, 1970 issue of *CQ*.

KF4SJ—The Puerto Rico Amateur Radio Society will operate this station through Dec. 31, 1971 to commemorate the 450th anniversary of San Juan. Everyone should be able to work this rare prefix as all band operation is being carried out. QSL to P.O. Box 626, Ponce, Puerto Rico 00731.

160 Meter News: A number of 160 meter firsts were racked up by Charlie, W2EQS, during various DXpeditions during 1969-70. At PJØCW, where Charlie was the only operator on 160 during the *CQ* Worldwide C.W. Contest in 1969, he made the first 160 meter

QSO's ever between PJ and Puerto Rico (KP-4AST), Venezuela (4M5ANT), Virgin Is. (KV4FZ), Bermuda (VP9GJ), Honduras (HR2HH), and Canada (VE3EK). In the 1970 contest he added two more firsts, PJ to Europe (DL9KRA) and Brazil (PY1MGF). As PJ2CC he made several other 160 firsts in non-contest operation. These included the first PJ—Cayman Is. (ZF1BA), PJ to England (G3SED3, PJ to Scotland (GM3YCB), PJ to Trinidad (9Y4NN), PJ to Ireland (EI9J), PJ to Czechoslovakia (OK1ATP), and PJ to Oceania (KH6HCM). Charlie has now worked 74 countries on 160 from his home station, including 132 prefixes worked and 131 confirmed.

Gus Browning's *DXers Magazine* plans a big boost to 160 through a special Top Band DX Column. The 160 columnist will be our old friend Jimmy, WA4PXP, one of the world's most distinguished DXers. This column heartily applauds both the choice of the subject and the new columnist.

Countries for the Low Band Endorsement

In the *CQ* C.W. and *CQ* S.S.B. DX Award programs, a low Band Endorsement sticker is issued to stations contacting 100 or more countries using any combination of the 7 and 3.5 mc bands. After the basic award is received, only a listing of confirmed QSO's is required. However, specific QSL's may be requested by Award Manager, Jerry Hagen, WA6GLD. Some good ones recently reported on 40 and 80 are as follows, with approximate geographical location of the reporting station shown in parentheses:

CT2, Azores—CT2AK, 7090 kc, 0215Z (East Coast).

EA8, Canary Is.—EA8FF, 7015 kc, 0010Z (East Coast).

FO8, French Oceania—FO8BJ, 7008 kc, 0731Z (West Coast).

HKØ, San Andres—HKØBKX, 3845 kc, 0316Z (East Coast).

KG4, Guantanamo—KG4CS, 3815 kc, 10-14Z (West Coast).

KG6, Mariana Is.—KG6SI, 3805 kc, 1043Z (West Coast).

KV4, U.S. Virgin Is.—KV4AM, 3805 kc, 1000Z (West Coast).

KW6, Wake Is.—KW6AA, 3805 kc, 0928Z (West Coast).

KX6, Marshall Is.—KX6BU, 3805 kc, 09-14Z (West Coast).

PX1, Brazil—PX1JQ, 3510 kc, 2140Z (Europe).

The CQ DX Award Program

C.W. DX

53.....K2LQQ/TF	56.....K6OZL
54.....W9EVD	57.....VK3AHQ
55.....WØSQD	58.....DL7LV

S.S.B. DX

126.....K9LUI	134.....DL7LV
127.....LZ1KAA	135.....W6YVK
128.....G3UKH	136.....K6LOM
129.....UA4RZ	137.....G3WRD
130.....UK3DAA	138.....W9YGN
131.....K2LQQ/TF	139.....K8GQG
132.....LA9DL	140.....W3SDV
133.....WA6ESB	

CQ DX Endorsements

C.W.: W40PM—300, VK3AHQ—300, K6-OZL—200, DL7LV—150, W4WSF—150, and DL7LV—28 Mc.

S.S.B.: W2TP—320, W4IC—310, WA6ESB—200, W9YGN—200, LA9DL—150, DL-7LV—150, and DL7LV—28 Mc.

Complete rules for the CQ DX Award Program may be found on pg. 58 of the January, 1971 issue. Application blanks and copies of the rules may be obtained by sending a self-addressed, stamped envelope to the Award Manager, P.O. Box 1271, Covina, CA 91722, or to the DX Editor.

PZ1, Surinam—PZ1AX, 3845 kc, 0410Z and 7205 kc, 0140Z (East Coast).

TY1, Dahomey—TY1ACD, 3520 kc, 1330Z (West Coast).

UL7, Kazakh—UL7ND, 7014 kc, 0015Z (Europe).

VP2, Antigua—VP2AA, 3805 kc, 1010Z (West Coast).

VP2, St. Vincent—VP2SF, 3845 kc, 0413 and 7209 kc, 0257Z (East Coast).

ZD8, Ascension Is.—ZD8CW, 7003 kc, 00-45Z (East Coast).

ZF1, Grand Cayman—ZF1GC, 7205 kc, 01-10Z (East Coast).

ZM7, Tokelaus—ZM7AG, 3812 kc, 0734Z (West Coast).

ZP3, Paraguay—ZP3AQ, 3805 kc, 1020Z (West Coast).

ZS1, South Africa—ZS1MH, 7090 kc, 01-50Z (East Coast) and ZS6ALL, 7007 kc, 1418Z (West Coast).

5R8, Malagasy—5R8AB, 7004 kc, 1301Z (West Coast).

8P6, Barbados—8P6DR, 3507 kc, 0110Z (West Coast) and 7007 kc, 0500Z (East Coast).

9H1, Malta—9H1DL, 7005 kc, 0015Z (East Coast).

[*Continued on page 100*]

Propagation

BY GEORGE JACOBS,* W3ASK

Contest Special

THE 1971 *CQ* World Wide DX Contest will be held on the following dates:

Phone section: 0000 GMT October 30—2400 GMT October 31.

C.W. section: 0000 GMT November 27—2400 GMT November 28.

Continuing the practice of the past 21 years, this month's PROPAGATION column contains a special forecast for use during the contest sections.

The solar cycle is declining at a fairly rapid pace and solar activity is expected to be at a lower level during the 1971 contest sections than during any previous *CQ* DX contest period since 1965. Barring the development of any sudden radio storms, therefore, DX propagation conditions during this year's contest are expected to range between *fair* and *good*, but scores should be considerably *below* the record breaking levels of the past five years.

Sunspot Cycle

As mentioned in the previous paragraph, the news concerning the level of solar activity expected during the 1971 contest period is not too good.

*11307 Clara Street, Silver Spring, Md. 20902

Year	Smoothed Sunspot Number Range
1960	93-88
1961	51
1962	31-30
1963	26-24
1964	10
1965	20-22
1966	68-70
1967	95-97
1968	110-111
1969	105
1970	92-88
1971 (Est.)	57-53

Table 1—Solar Activity During *CQ* DX Contest Periods

LAST MINUTE FORECAST

October, 1971

Days	*Rating & Forecast Quality* (4)	(3)	(2)	(1)
Above Normal: 1, 3, 17-18, 27, 30			B-C	C
Normal: 2, 4-7, 10-12, 15-16, 19-20, 22-23, 26, 28-29, 31	A-B	B-C	C-D	D-E
Below Normal: 8-9, 13-14, 21, 24-25	C	D	D	E
Disturbed: None	D	E	E	E

How To Use These Charts

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parenthese at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meaning: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4—This month's DX Propogation Charts are based upon a transmitter power of 250 watts c.w.; 1 kw p.e.p. s.s.b., or 1000 watts d.s.b., into a dipole antenna a quarter-wave above ground on 160 and 80 meters a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9, and 0 areas, and the Western USA Chart in the 6 and 7 areas. The charts are valid from Oct. 15, 1971 through Dec. 15, 1971 and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado.

The Swiss Federal Solar Observatory, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 47 for June, 1971. This was the lowest mean level reported for any month since March, 1966 and drops the sunspot cycle to a smoothed 12-month running number of 82, centered on December, 1970.

Extrapolating this declining trend results in a forecast of a smoothed sunspot number approxi-

mately in the *mid-50's* for October and November, 1971. As can be seen from the Activity Table, this is considerably below the level observed during the *CQ* DX contests of the past five years.

In short, solar conditions and corresponding DX propagation conditions during the 1971 *CQ* DX contest period are expected to be similar to conditions that last occurred during the contest period of 1961, and fairly close to those that occurred during the 1966 contest.

General Forecast

The following is a band-by-band summary of general DX propagation conditions that can be expected during the 1971 contest period.

10 Meters: Some fairly good openings should be possible to many areas of the world during the daylight and early evening hours. Openings to Europe and those in a generally easterly direction should peak an hour or two before noon, while those to South America and Africa are expected to peak during the early afternoon hours. Openings to the Far East, Australasia, Southeast Asia, etc., are most likely to occur during the later afternoon hours and the early evening. Due to the decline in solar activity considerably fewer openings are expected on this band than during the past five years.

15 Meters: Good-to-excellent DX propagation conditions are expected from shortly after sunrise through the early evening hours. Despite declining solar activity, openings are forecast to almost all areas of the world, and exceptionally strong signal levels may occur during many of them. For each geographical area of the world, conditions on 15 meters are expected to peak about an hour or two after they have peaked on 10 meters. During most of the daylight hours, this should be the optimum band for DX openings to most areas of the world.

20 Meters: Generally good-to-excellent DX openings are forecast to one area of the world or another on this band, almost around-the-clock. DX conditions should peak an hour or two following sunrise, and again during the late afternoon and early evening hours in the USA. Excellent openings are also forecast to many southern and tropical areas well into the hours of darkness. The decline in solar activity, however, is expected to result in fewer nighttime openings on this band than during the past several years.

40 Meters: DX openings to Europe and in an easterly direction should begin during the late afternoon hours and steadily improve towards darkness. Openings in almost all directions are forecast during the hours of darkness, with signal levels exceptionally strong at times. Openings in a westerly direction are expected to peak shortly after sunrise, just before the band closes for DX propagation. During most of the hours of darkness, 40 meters should be the optimum band for DX propagation to most areas of the world.

80 Meters: Some fairly good DX openings are forecast to several areas of the world during the hours of darkness and the sunrise period. Peak conditions are expected around midnight on paths to the east, shortly before sunrise for paths to the north or south, and shortly after sunrise for paths in a westerly direction.

160 Meters: DX openings to some areas of the world should be possible during the hours of darkness and the sunrise period. Signals tend to peak at local sunrise at the more *easterly* terminal of a path. Because of the relatively high signal absorption on this band, and the low power levels used, openings at best are expected to be weak and noisy.

For a more detailed circuit-by-circuit forecast refer to the *DX Propagation Charts* appearing on the following pages. Instructions for the use of these *Charts* are given in the box following the "Last Minute Forecast" at the beginning of this column.

Contest Work Plans

The *Charts* on the following pages show the times that each amateur band from 10 through 160 meters is expected to open for DX from the United States to the major areas of the world. This information can be easily reorganized into operational work plans, or schedules, to serve as propagation guides during the contest sections. Experience gained during previous contests has shown that such plans can be extremely useful in piling up a large number of points with a minimum of wasted time.

The following is an example of one of the many type of plans that can be devised. It shows, for each three hour period throughout the day, the areas of the world for which, in this example, 20 meter propagation conditions are epected to be optimum (a rating of 3 or higher in the charts[1]). An eastern USA QTH has been chosen for this example, but similar plans can be devised for central or western locations, and for other bands.

Sample 20 Meter Operating Schedule for Eastern USA QTH

(EST) Time	Areas to which openings should be optimum
00-03	Some northern and central South American openings, and perhaps to Antarctica, but not much else. Good time for some sleep.
03-06	Still not much except for some weak openings to the south. If you didn't get some sleep in before, get it in now!

[1]In some cases a rating of (2) or (1) was selected when no higher rating was expected on the particular path.

06-09 Excellent period. Good openings in many directions: Europe, North and West Africa, Far East, Asia, New Zealand, South Pacific, Australasia and South America.

09-12 Fairly good period. Openings to most of Europe, the Middle East, Northern South America and Pacific area.

12-15 Fairly good period. Openings to most of Europe, the Middle East, some parts of Africa, northern areas of South America. Take some time out for lunch.

15-18 Fair openings to western and central Europe and the Middle East. Catch them now or you might miss them. Good openings to most of Africa and South America.

18-21 Good period to pile up points. Openings to most of Africa and South America. Some also to the Far East and other Asiatic areas. Fairly good openings to the Pacific Islands, New Zealand, Australasia and Antarctica.

21-00 Fairly good period. Openings to the Pacific and Australasia, South America, the Far East and Antarctica.

The following is a typical *multi-band* operational work plan devised from the propagation *Charts* for an Eastern USA QTH. The plan shows the times and bands when propagation conditions are expected to be optimum to various areas of the world, for each two hour period throughout the day.

Sample Multi-Band Work Plan
Eastern USA QTH

(EST) Time	Optimum Band (Meters)	Areas To Which Band Expected To Be Open
00-02	40	Most of Europe and Middle East; most of South America; a few Africans and possibly Antarctica.
02-04	40	Not too much on any band. A good time to eat and catch up on some sleep. Some possible openings to the South Pacific, Australasia, Far East and other Asian areas but generally not too good. Some fairly good openings to South America.
04-06	40	Still a good time to catch up on sleep. Some openings to South Pacific, New Zealand, Australasia. Some also to northern and central areas of South America. A few Far Eastern and Asian, and perhaps Antarctica.
06-08	20	Good openings to most of Europe, Pacific area, Australasia, Asia and the Far East. Also to most of South America and parts of Africa.
08-10	15	Good openings to all of Europe and the Middle East, and most of South America. A possible opening to the Pacific, Australasia, and parts of Asia.
10-12	10	Good openings to most of Europe, most of Africa, and most of South America. Catch them during this period or you miss them!
12-14	15	Good openings to most of Africa and most of South America and to the western and southern areas of Europe.
14-16	20	Good openings to most of Europe, the Middle East, most of Africa, northern and central South America, and possibly some long-path openings to Australasia.
16-18	20	Good openings to most of Africa and South America, with some also possible to western and southern areas of Europe.
18-20	15	Fair-to-good openings to the Pacific area, Australasia, Far East and other Asiatic areas. Good openings to central and southern South America, and a possible opening to Antarctica.
20-22	20	Openings to most of Africa, Pacific area, Australasia, Antarctica and all of South America.
22-00	40	Most of Europe should be possible, as well as the Middle East; most of South America, and some openings to the Pacific and Australasia.

Radio Storms

The forecasts discussed in this column are based on *normal* propagation conditions expected with a sunspot level in the mid-50's. If actual conditions during the contest sections turn out to be *above normal*, DX openings on 10, 15 and 20 meters are likely to be somewhat better than shown in the *Charts*. On the other hand, if a radio storm should develop, with accompanying *below normal* or *disturbed* h.f. propagation conditions, fewer openings will take place on these bands. During radio storms, propagation conditions on 40, 80 and 160 meters generally also becomes erratic, with poorer openings during certain type storms and im-

proved openings during other types.

If a radio storm should develop during the contest sections, circuits passing through or near polar regions will probably become weak, fade considerably, or may even black out entirely, depending upon the severity and duration of the storm. During certain storms, while east-west propagation may become poorer, north-south openings may improve.

If a storm should occur, concentrate on working the higher frequency bands and the paths to the northeast, north and northwest during the daylight hours, and the lower bands and the paths to the east, south and west during the evening and early morning hours. A "Last Minute Forecast" for the Phone section of the contest, made at press time, appears at the beginning of this column. A similar forecast for the c.w. section will appear in next month's column.

For a more complete discussion of radio storms, and what can or cannot be done about them on the amateur bands, see "Don't Be Afraid Of The Big Bad Blackout", by John J. Schultz in the November, 1969 issue of *CQ* (page 31).

New WWV Forecasts

On July 1, 1971 WWV inaugurated a completely new format for its radio propagation data transmissions. C.w. has been discontinued, and all data is now given in *voice*.

More easily than ever before, up-dated propagation data and forecasts can now be obtained directly from WWV transmissions during the contest sections. Now located at Fort Collins, Colorado, WWV transmits continuously on the following frequencies: 2.5, 5, 10, 15, 20 and 25 mc.

Propagation data is transmitted hourly, following the 14th minute time announcement. The transmission consists of a letter:

N (November)
U (Uniform)
W (Whiskey)

followed by a number between 1 and 9.

The letter designates propagation conditions expected during the *present* six hour period, as follows:

N—Normal propagation conditions
U—Conditions unstable or erratic, signals subject to increased fading and noise
W—Radio storm in progress, conditions below normal or disturbed

The number designates propagation conditions expected for the *following* six hour forecast period, as follows:

1—Useless; 2—Very Poor; 3—Poor; 4—Poor-to-Fair; 5—Fair; 6—Fair-to-Good; 7—Good; 8—Very Good; 9—Excellent

For example, the announcement "November —7", repeated once, would mean propagation conditions are normal, and are expected to be good during the next six hour forecast period.

While WWV forecasts apply primarily to h.f. trans-Atlantic circuits, they are also a good indication of general conditions on a world-wide basis.

Detailed data and forecasts concerning a wide range of solar and geomagnetic activity are also given hourly from WWV following the time announcement for the 18th minute, and hourly from WWVH following the 45th minute announcement. These announcements contain a description of current solar and geomagnetic activity and a forecast for the remainder of the day.

Solar data is assessed in terms of *very low, low, moderate, high,* and *very high*. Similar data for geomagnetic activity is given in terms of *quite, unsettled, or active*.

If a storm is in progress or expected, the transmission will assess its severity in terms of *minor* or *major*, and give the time it began or is expected to begin, and when it ended or is expected to end. All times are given in U.T., which is the same as GMT. This information is revised daily at 0400 GMT, with provision to provide immediate storm alerts if it becomes necessary to do so.

WWVH incidently, is located at Kawai in Hawaii, and transmits continuously on 2.5, 5, 10, 15 and 20 mc. All announcements are in voice, in this case a pleasant female one, ending with a friendly Aloha!

V.H.F. Ionospheric Openings

While the *CQ* DX contest does not include the v.h.f. bands, some ionospheric activity may be possible on these bands during October. There is a fairly good possibility for some 6 meter DX openings between the southern half of the United States and central and southern areas of South America, by means of trans-equatorial or TE propagation. These openings generally occur during the evening hours, peaking between 8 and 11 P.M. local time, and the path must cross the magnetic equator at an approximate right angle.

Some meteor-scatter openings are likely to occur on the v.h.f. bands during the two-day Orionids meteor shower, which should peak during the early evening hours of October 21st.

Auroral activity is generally on the upswing during October, and some auroral-scatter type v.h.f. openings are expected during the month, especially during periods when h.f. propagation is either below normal or disturbed. Check the "Last Minute Forecast" appearing at the beginning of this column for the days that are expected to be in these categories during October.

1970 Contest Critique

According to my good friend Frank Anzalone, *CQ's* Contest Editor, last year's special contest propagation forecasts were "right on the button".

Normal conditions were predicted for both

days of the Phone section, October 24 and 25. According to ionospheric measurements made throughout the world and results of the contest itself, the 24th began slightly below normal, rose rapidly to normal, and by the end of the day received a rating of 7 by WWV, or good. Conditions were reported to be normal throughout the 25th, with quality ranging between fair and good (WWV 5-to-7).

Normal conditions were also forecast for both days of the 1970 c.w. section, November 28 and 29. Conditions were observed to be normal on both days, with WWV rating quality between 5 and 7, or fair-to-good.

For those interested in boxscores, this raises the 20 year tally for *CQ* contest period predictions to 31 highly accurate, 6 partially accurate, and only 3 completely wrong.

Post Mortem

CQ DX contests generate a very large amount of radio amateur operating activity throughout the world. For this reason, these contest offer an excellent opportunity to check the accuracy (or inaccuracy) of the *CQ* propagation predictions. Reports received from previous contests have contributed considerably in improving these forecasts over the years. Any comments or observations concerning this year's contest forecast would be appreciated. Comments of this nature may be sent directly to W3ASK, the Editor of this column.

C.W. Contest Forecast

This month's forecast is valid for *both* the Phone and C.W. sections of the 1971 contest. *Be sure to keep the Charts appearing in this month's column for use during next month's c.w. section.* Next month's column will contain Short-Skip Charts for November and December, 1971. Short-Skip propagation forecasts for October appeared in last month's column.

Good luck in the Contest!

73 George, W3ASK.

October 15-December 15, 1971

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-11 (4) 11-12 (3) 12-13 (2) 13-15 (1)	04-05 (1) 05-06 (2) 06-07 (3) 07-09 (4) 09-10 (3) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-20 (2) 20-22 (1)	16-17 (1) 17-18 (2) 18-20 (3) 20-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-23 (2)* 23-01 (3)* 01-02 (2)* 02-03 (1)*
Northern Europe & European USSR	08-11(1)	07-08 (1) 08-10 (3) 10-11 (2) 11-12 (1)	04-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	17-19 (1) 19-02 (2) 02-04 (1) 20-03 (1)*
Eastern Mediterranean & Middle East	08-09 (1) 09-10 (2) 10-12 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	06-10 (1) 10-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-20 (2) 20-23 (1) 23-01 (2) 01-02 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-00 (1)*
West & Central Africa	08-10 (1) 10-12 (2) 12-14 (3) 15-15 (2) 15-16 (1)	07-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	04-05 (1) 05-07 (2) 07-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-20 (3) 20-22 (2) 22-01 (1)	18-22 (1) 22-01 (2) 01-03 (1) 00-03 (1)*
East Africa	09-11 (1) 11-13 (2) 13-15 (1)	07-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	07-14 (1) 14-16 (2) 16-20 (3) 20-00 (2) 00-01 (1)	19-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
South Africa	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	07-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	07-13 (1) 13-15 (2) 15-18 (3) 18-20 (2) 20-22 (1) 22-01 (2) 01-02 (1)	18-19 (1) 19-22 (2) 22-23 (1) 19-21 (1)*
Central & South Asia	08-10 (1) 17-19 (1)	07-10 (1) 17-20 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-22 (1)	18-21 (1) 06-08 (1)
Southeast Asia	09-12 (1) 17-20 (1)	08-12 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-13 (1) 18-22 (1)	18-20 (1) 05-07 (1)
Far East	08-10 (1) 17-20 (1)	08-10 (1) 16-17 (1) 17-19 (2) 19-20 (1)	05-07 (1) 07-09 (2) 09-11 (1) 16-19 (1) 19-23 (2) 23-00 (1)	04-08 (1) 05-07 (1)*
South Pacific & New Zealand	11-13 (1) 13-15 (2) 15-17 (1) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	04-06 (1) 06-07 (2) 07-09 (4) 09-11 (2) 11-13 (1) 17-18 (1) 18-19 (2) 19-22 (4) 22-23 (3) 23-00 (2) 00-02 (1)	00-03 (1) 03-05 (3) 05-07 (2) 07-09 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	09-12 (1) 14-16 (1) 16-17 (2) 17-18 (1)	08-10 (1) 10-13 (2) 13-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	05-06 (1) 06-07 (2) 07-09 (3) 09-10 (2) 10-15 (1) 15-17 (2) 17-19 (1) 19-20 (2) 20-22 (3) 22-00 (2) 09-03 (1)	03-05 (1) 05-07 (2) 07-08 (1) 05-07 (1)*
Northern & Central South America	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	07-09 (4) 09-11 (3) 11-14 (2) 14-16 (3) 16-20 (4) 20-00 (3) 00-02 (2) 02-06 (1) 06-07 (2)	18-19 (1) 19-21 (3) 21-03 (4) 03-05 (2) 05-06 (1) 19-21 (1) 21-03 (2)* 03-05 (1)*

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2) or higher.

[*Continued on page 91*]

Q AND A

BY WILFRED M. SCHERER,* W2AEF

SB-640 V.F.O. With DX-60B

QUESTION: I should like to know if the Heath SB-640 v.f.o. can be used with the DX-60B transmitter.

ANSWER: The Heath SB-640 v.f.o. (LMO) cannot be directly used with the DX-60B, because its frequency range does not cover that required for such operation. What would be needed is a mixer/amplifier combination between the SB-640 and the v.f.o. input to the DX-60B as shown at fig. 1.

Equipment Feet

For those desiring simple and neat mounting feet for equipment, those supplied with some types of Heath gear should be of interest. These are made of a brown rubber-like material and have an adhesive backing which eliminates the need for installation holes. Their height is about ¼" and they are available in two sizes—½" or ¾" square. These feet may be obtained from the Heath Company at a cost of 5¢ each for the ½" ones (Part No. 261-29) and 10¢ each for the ¾" ones (Part No. 261-34). —*W2AEF*

Stabilizing HT-41 Amplifier

Some time ago Adolph Uryniak, W2RJL, had a problem with an HT-41 amplifier that took off with no excitation when the 175-volt cutoff bias (required during receiving) was removed when the amplifier was actuated by the v.o.x. The plate current went sky-high and the parasitic chokes burned up. Replaced chokes were of no help. Adolph's solution to the problem was a good one, the general procedure of which might be well to follow in similar cases (of instability) even with different equipment.

The solution is quoted from Adolph's letter as follows:

"I took out and replaced the two .005 mf disc capacitors from grid to ground, even though they checked okay on a capacitance bridge. I reflowed all the soldered ground connections some of which seemed to have too much flux around them. I then replaced the parasitic chokes with 47-ohm 2 watt resistors that had 3 turns of #16-18 wire around them. Now the amplifier is tame as a kitten and rests at 80 ma with the cutoff bias removed. Hope the above information will help someone else."

Good work OM, and many thanks for the dope.

SX-117 Selectivity Change

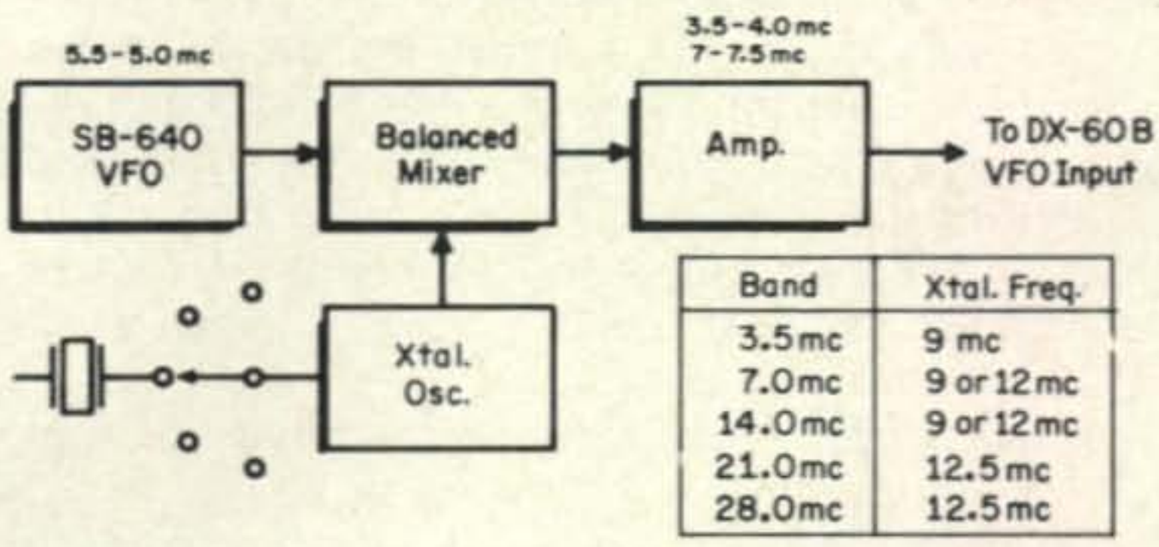
QUESTION: How can the 0.5 kc selectivity position of the SX-117 receiver be broadened to about 1.5 kc?

ANSWER: In the SX-117, the 0.5 kc position of the 50 kc i.f. can be made broader by decreasing the value of C_{108} and C_{110} (each by the same amount) and increasing R_{84} and R_{86} (each by the same amount). Exact values would be subject to experimentation, but our guess would be 270 or 330 ohms and 2700 or 2200 mmf (.027 or .022 mf). The change should not have any effect on the selectivity at the other positions. A similar procedure could be applied to the SX-115 receiver by altering the coupling capacitors and associated load resistors.

SB-303 Noise

QUESTION: I have a Heath SB-303 receiver. On some places on each band I get a hissing- or regeneration-like noise. Can this be corrected and if so, how?

[*Continued on page 96*]



Band	Xtal. Freq.
3.5 mc	9 mc
7.0 mc	9 or 12 mc
14.0 mc	9 or 12 mc
21.0 mc	12.5 mc
28.0 mc	12.5 mc

Fig. 1—Block diagram of setup for using SB-640 v.f.o. with DX-60B. Use 9 mc crystal for 3.5 mc operation, 9 or 12.5 mc crystal for 7 and 14 mc operation and 12.5 mc crystal for 21 and 28 mc operation.

*Technical Director, *CQ*.

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Sept.	25-26	Guatemala Contest
Oct.	2-4	California QSO Party
Oct.	2-3	VK/ZL/Oceania DX Phone
Oct.	9-10	VK/ZL/Oceania DX C.W.
Oct.	9-10	RSGB 21/28 mc Phone
Oct.	9-10	Space Net VHF Contest
Oct.	9-10	FIFTH District QSO Party
Oct.	16-17	WADM C.W. Contest
Oct.	16-17	Boy Scouts Jamboree
Oct.	16-18	CARTG RTTY Sweepstakes
Oct.	20-21	YL Anniv. C.W. Contest
Oct.	23-24	RSGB 7 mc C.W. Contest
Oct.	**30-31**	**CQ WW DX Phone Contest**
Nov.	3-4	YL Anniv. Phone Contest
Nov.	5-8	CHC/FHC/HTH QSO Party
Nov.	6-7	Illinois QSO Party
Nov.	6-7	RSGB 7 mc Phone Contest
Nov.	14	Czechoslovakia Contest
Nov.	12-14	QRP C.W. Contest
Nov.	13-14	ARRL SS Phone Contest
Nov.	20-21	ARRL SS C.W. Contest
Nov.	**27-28**	**CQ WW DX C.W. Contest**
Dec.	11-12	Spanish C.W. Contest

Guatemala Contest

Starts: 0000 GMT Saturday, September 25
Ends: 2400 GMT Sunday, September 26

The Radio Club of Guatemala has organized this world wide contest to celebrate the 150th anniversary of the country's independence.

Operation will be on all bands, s.s.b. and a.m., both single and multi-operator categories.

Exchange: RS report plus a three figure contact number starting with 001.

Scoring: Each TG contact counts 5 points, with other Central America countries 3 points, and 1 point with all others.

Multiplier: Sum of TG call areas and countries worked on each band. A bonus of 1 extra multiplier and 20 QSO points if you work TGØAA the club station.

Final Score: Total QSO points times the sum of the multiplier.

Awards: There are contest certificates for each category and section plus a gold Quetzal (nation bird) and Plaque for the Top scorers. Minimum requirements for stations on the American continent are 10 TG contacts, or 1 TG on each band plus 7 American countries. Outside the continent its 5 TG's and 5 American countries.

A remittance of $1.00 or 10 IRC's is requested with each application.

Mailing deadline is October 26th to: CRAG Contest Committee, P.O. Box 115, Guatemala City, Guatemala, C.A.

California QSO Party

Starts: 2000 GMT Saturday, October 2
Ends: 0200 GMT Monday, October 4

This is the 6th annual QSO Party sponsored by the North Hills R.C. The same station may be worked on each band and each mode for QSO points but multiplier is counted once only.

Exchange: QSO nr., RS/RST and QTH. County for Cal., ARRL section for others.

Scoring: Cal. stations multiply total QSOs by ARRL sections and DX countries worked. All others QSOs by Cal. counties, (max. of 58) Cal. may work in-state stations for QSO points but not for section multiplier.

Frequencies: 3560, 3735, 7060, 7175, 14060, 21060, 21110, 28060 on c.w. And 3880, 3980, 7280, 14280, 21280, 21380, 28580 on phone.

Awards: Certificates to top scores in each of the 74 ARRL sections and each DX country. Additional awards where justified.

Novice activity is encouraged. Stations planning rare county activity notify W6KYA.

Mailing deadline for logs is November 13th to: John Minke, W6KYA, 6230 Rio Bonito Drive, Carmichael, Calif. 95608. Include a large s.a.s.e. for copy of results.

VK/ZL/Oceania DX Contest

Phone: Oct. 2-3 **C.W.:** Oct. 9-10
Starts: 1000 GMT Saturday
Ends: 1000 GMT Sunday

Rules apply to stations other than VK/ZL.

Exchange: Five and six figures, RS/RST plus a progressive QSO nr., starting with 001.

Scoring: *Oceania stations*: 2 points for VK/ZL contacts, 1 point for rest of world. *Outside Oceania*: 2 points for VK/ZL contacts, 1 point for Oceania. *Final Score*: Total QSO points multiplied by sum total of VK/ZL call areas worked on each band. Single band scores are also acceptable.

Logs: Date/time in GMT, station worked, number sent/rec'd, band and QSO points. Underline

*14 Sherwood Road, Stamford, Conn. 06905

each new VK/ZL call area worked on each band. And use separate log sheet for each band.

A summary sheet showing the scoring, your name and address in BLOCK LETTERS and a signed declaration that rules and regulations have been observed is also requested.

Awards: An attractive colored pictorial certificate goes to the top scorer in each country and call areas of W/K, JA and UA on all bands. Single band awards will also be made determined by conditions and activity.

There is also a s.w.l. section. Only VK/ZL stations are to be logged, include call of station being worked and serial number sent.

Logs must be in the hands of the committee before Jan. 30, 1972 and go to: W.I.A., Federal Contest Committee, Box N1002, G.P.O., Perth 6001, Western Australia.

RSGB 21/28 MC Phone Contest

Starts: 0700 GMT Saturday, Oct. 9
Ends: 1900 GMT Sunday, Oct. 10

It's the world working the British Isles on 21 and 28 mc only. This year 21 mc has been reintroduced because of the possible loss of activity on 28 mc due to the lower sunspot cycle. However in order to maintain interest on 10 meters the final score obtained on 28 mc may be multiplied by *five* before adding it to the final overall score.

Exchange: The RS report plcs a progressive contact number starting with 001.

Scoring: Each complete QSO with a British Isle station counts 5 points. In addition a bonus of 50 points may be claimed for each B.I. country/prefix worked. i.e. G2, GC3, GD4, GI5, GM6, GW8 and etc. a max. of 36. (no bonus for GB) There is no multiplier, just total the QSO and bonus points, and multiply your 28 mc score by five before adding it to final score.

Awards: Certificates to the three leading overseas stations. (Rather meager pickings).

There is also a s.w.l. section. Only British Isle stations are to be logged, and the scoring is same as above.

The usual summary sheet showing the scoring, a signed declaration and your name and address in BLOCK LETTERS is also requested.

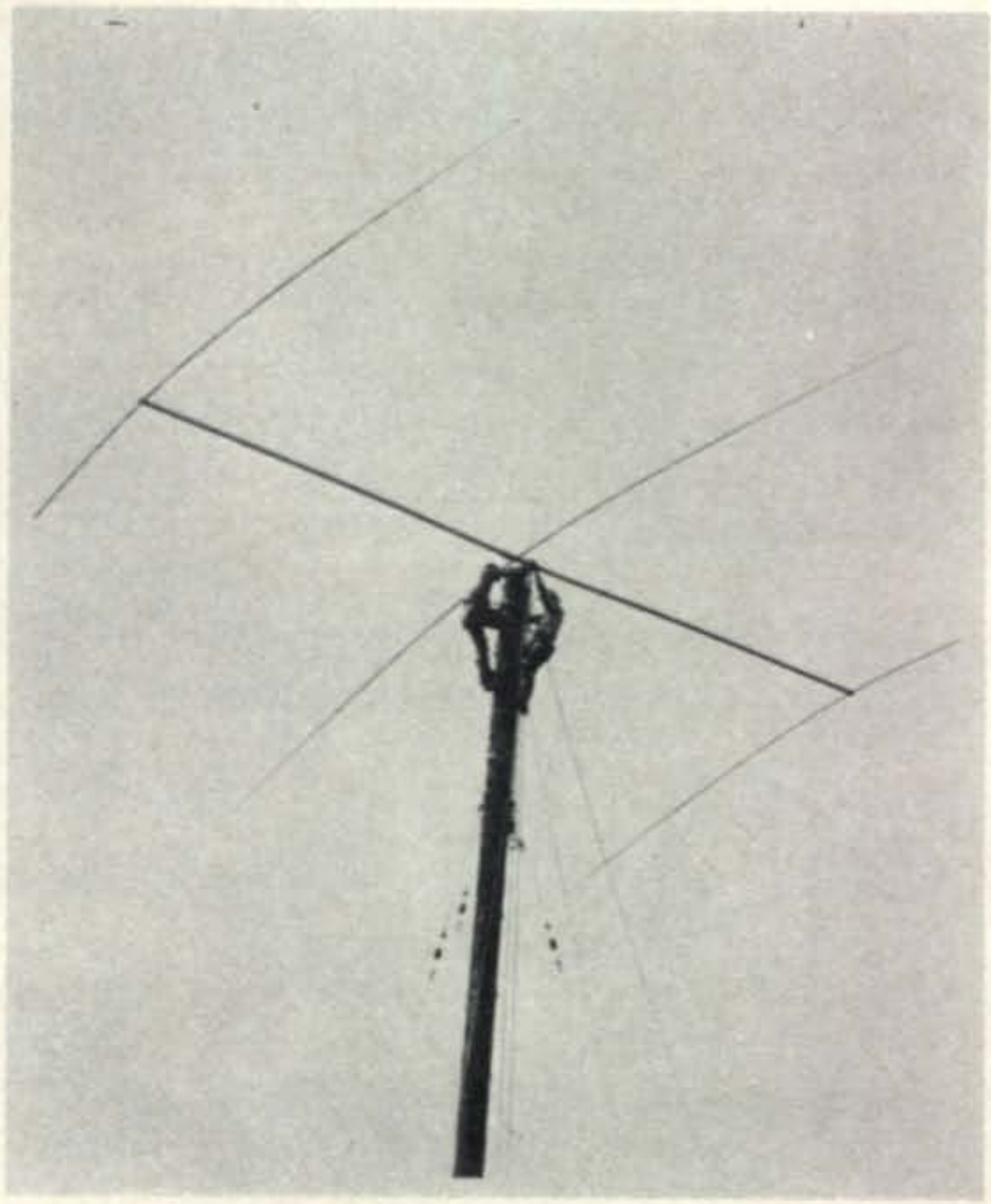
Logs go to the RSGB HF Contest Committee, c/o M. Harrington, 123 Clensham Lane, Sutton, Surrey, England.

Space Net VHF Contest

Starts: 600 p.m. Saturday, October 9
Ends: 6:00 p.m. Sunday, October 10

This contest is being held on the anniversary date of Apollo 7, the first manned flight. Activity will be during the 24 hour contest period (local time) on any of the v.h.f. bands; 50, 144, 220 and 432 mc bands. All modes may be used but not repeaters.

Exchange: QSO nr., RS/RST and Zip Code number. (non-US use P.O. name)



This is what you're going to be bucking on 40 meters in the Contest this year. That's a Kirk 3 element 40 meter helicoidal job at the top of an 80 ft. pole. The gang at K4CG believe in being prepared for the contest, but also stay in one piece, so they got a couple of non-ham "volunteers" to act as steeple-jacks.

Scoring: Two points per QSO. Multiplier is sum of different Zip Code numbers worked. There is also a bonus of 10 you add to your multiplier. Total score: Zip Codes + 10, times QSO points. The same station may be worked on different bands for QSO points but multiplier is counted only once.

Awards: Will be made for 1st and 2nd place winners in three classes, based on power used. 1 - 25 watts, 25 - 100 watts and 100 to 1 kw. (The certificate is attractive and colorful and worth trying for.)

Mailing deadline is Nov. 5th and go to: Space Net VHF Contest, Att: A. W. Slapkowski, WB2MTU, Box 909, Sicklerville, N.J. 08081.

Fifth District QSO Party

Starts: 0000 GMT Saturday, October 9
Ends: 2400 GMT Sunday, October 10

This is the first annual QSO Party sponsored by the 5th District Chapter 26 CHC. The same station may be worked on each band and mode, fixed and mobile. Mobiles may be worked again if in different counties.

Exchange: Signal report plus a 3 figure QSO number starting with 001, state or province, county .and country.

Scoring: 5th District—Number of QSO's multiplied by states, times countries, and times continents.

Other Stations: Number of QSO's times 5th District states, times 5th District counties.

Frequencies: 3575, 3940, 7060, 7150, 7260, 14075, 14343, 21090, 21100, 21360, 28600, 50.1-50.2 s.s.b., 50.2-50.5 a.m. and 145-147.

Awards: Certificates to high scoring station in each state, province or country. Trophy to the Top station in the contest and highest scoring 5th District station.

Mailing deadline is Nov. 1st to: Pat Pattee, W5POH, Rte. 3, Mountain Home, Ark. 72653

WADM C.W. Contest

Starts: 1500 GMT Saturday, October 16
Ends: 1500 GMT Sunday, October 17

This is a c.w. only contest, all bands 3.5 thru 28 mc. There are three classifications, single operator, multi-operator and s.w.l.

Exchange: RST plus QSO nr. starting 001.

Scoring: Three points for each DM contact, multiplied by total DM districts worked on each band. A district is identified by the last letter in the call, *not* by the number. (A thru O, a total maximum multiplier of 75 is possible from all bands.)

Awards: Will be in the form of certificates. Contest QSOs may be applied for the many DM awards, WADM, DMCA, DMDXC, DMKK. More information available from the GDR.

Logs go to: Radioclub of the GDR, Att: DM2ATL, DDR 1055 Berlin, P.O. Box 30, German Democratic Republic.

Boy Scouts Jamboree

Starts: 12 Midnight Saturday, October 16
Ends: 12 Midnight Sunday, October 17

This is the Scouts 14th Jamboree-on-the-Air and has been given extensive coverage in many languages in Scout magazines around the world.

This is not a contest but participating certificates will be issued to all reporting. Send in your report to your National Organizer.

Note that the contest period is from midnight to midnight Local Time, *not* GMT as in previous years.

The World Bureau stations HB9S and T12CIE will be on for the full 48 hour period.

More information may be obtained from the Boy Scouts World Bureau, att: L. F. Jarrett, P.O. Box 78, Geneva 4, Switzerland.

RTTY Sweepstakes

Starts: 0200 GMT Saturday, October 16
Ends: 0200 GMT Monday, October 18

This year's contest, the 11th sponsored by the CARTG, is in commemoration of the British Columbia Centennial. Operation is limited to 36 hours out of the 48 hour contest period. The 12 hour non-operating period may be taken any time during the contest.

Use all bands, 3.5 thru 28 mc, the ARRL country list and CPR Zone chart.

Exchange: QSO nr., time, zone, country.

Scoring: Two points for QSOs with stations in one's own zone, other contacts according to points listed in CPR zone chart.

Multiplier: Each country worked, including one's own on each band, plus KL7, KH6, VO.

Bonus points of 100 for every VE/VO QSO. Total bonus points to be multiplied by the number of VE7 stations contacted. This total to be added to final score.

Final Score: QSO points × country multiplier × continents plus bonus total.

Awards: Certificates to top scorers in each USA and Canadian districts and in each country. There are also 20 plaques and medallions in many different catagories.

Log sheets and CPR map/exchange table are available from CARTG, s.a.s.e. or IRC's.

Logs must be received no later than Dec. 1st and go to: C.A.R.T.G. 85 Fifeshire Road, Willowdale, Ontario, Canada.

YL Anniversary Party

C. W.: Oct. 20-21 **Phone:** Nov. 3-4
Starts: 1800 GMT Wednesday
Ends: 1800 GMT Thursday

This is the 32nd anual YLRL contest open to all YLs around the world. OMs not eligible.

All bands may be used but avoid contacts on net frequencies. Phone and c.w. are separate, with separate scoring and awards.

Exchange: QSO nr. RS/RST, ARRL section or country.

Scoring: One point per QSO between stations within an ARRL section, or between DX stations outside ARRL territory. However contacts between DX and ARRL sections count 2 points. The same station may be contacted only once.

Multiply total QSO points by sum of ARRL sections and countries worked for final score.

There is a low power multiplier of 1.25 if input power is 150 watts or less on c.w. or a.m., 350 watts p.e.p. on s.s.b.

Awards: 1st, 2nd and 3rd place certificates to winners in each district and DX country. And two Gold Cups, c.w. and phone, to the top YLRL member in the world. There are three special awards, the Corcoran to the YLRL member with the highest combined c.w./phone score in an ARRL area, and the Hager Plaque to the highest combined score from North and Central America areas, and one for the rest of the world.

Compute your score, sign your log and mail no later than November 20th to: Mae Hipp K7QGO, 5655 Yukon Drive, Sparks, Nevada 89431

[*Continued on page 90*]

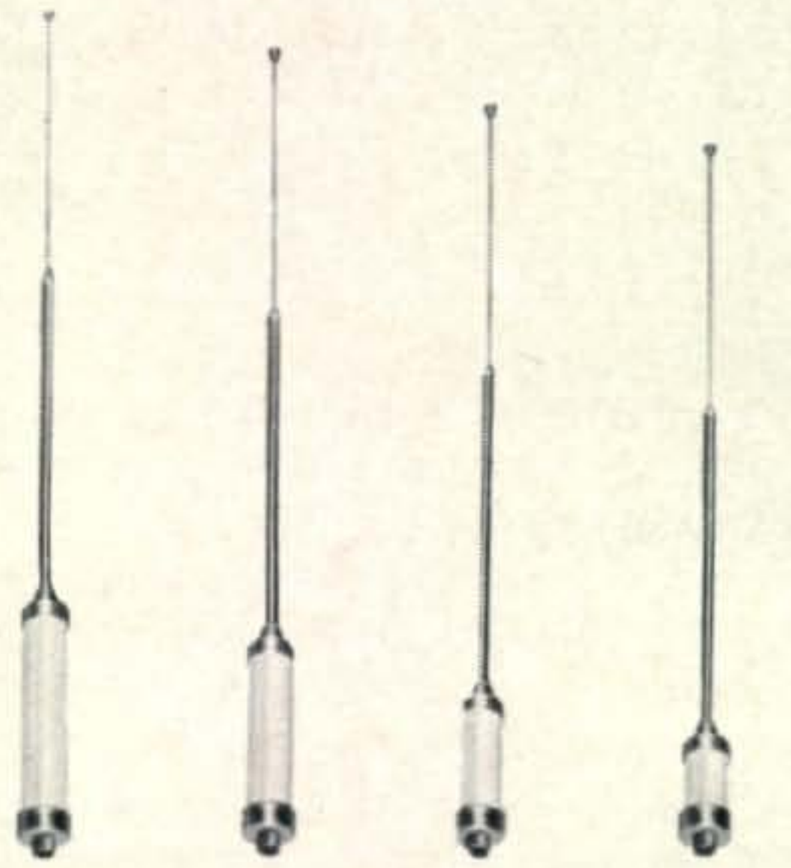
The most powerful antennas under the sun!

Hy-Gain's ALL NEW HAMCAT

Now The Best Is Even Better!

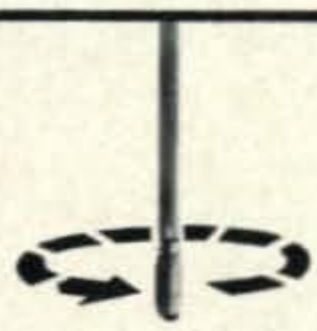
- More power capability with lower VSWR
- Higher Q plus broad band performance
- Higher radiation effectiveness
- Lightweight, super strength construction
- Shake-proof sleeve lock folds over for garaging
- Lightweight precision wound coils sealed in an indestructible epoxy-fiberglass sleeve
- Swivel base for quick change from band to band
- Nominal 52 ohm impedance on all bands—no special matching (any length coax will work)
- Coil sleeve is distinctive white with heavy chrome plated brass fittings
- Turn-over mast is hefty ⅝" dia. heavy wall tubing of highly polished heat-treated brite dipped aluminum
- All connections are standard ⅜ x 24 thread
- Mast folds over, swivels, turns over—mount it on bumper or deck
- Swivel lock base is stainless steel
- Coil and tip rods are a one-piece assembly. Coil diameters are constant, only lengths change

Order No. 257	All new design 5' long heavy duty mast of high strength heavy wall tubing	**$16.95**
Order No. 252	75 meter mobile coil	**$19.95**
Order No. 256	40 meter mobile coil	**$17.95**
Order No. 255	20 meter mobile coil	**$15.95**
Order No. 254	15 meter mobile coil	**$12.95**
Order No. 253	10 meter mobile coil	**$10.95**



No. 256 No. 255 No. 254 No. 253

Shake-proof SLEEVE LOCK releases fold-over hinge.



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Price $2.80

Coil and tip rod SPRING also available. Shpg. Wt. 0.2 lbs.

COIL ASSEMBLY CUT-AWAY
A. Chrome plated brass fittings.
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All permanently assembled and completely impregnated with special moisture-proof compound.

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- Rugged stainless steel construction • Handles full size heavy whip
- Clamps to most car bumpers

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THE dwards PROGRAM

BY ED HOPPER.* W2GT

Special Honor Roll
All Counties
#60 Richard J. Diehn, W8MJG, 6-30-71.

THE "Story of the Month" for October is:

Ed J. Alston, W4LXI

(All Counties #57, 5-29-71)

Born April 19, 1900 in Franklin County, N.C., 16 miles from the nearest town of Louisburg, where he moved at an early age.

After finishing high school, American Morse was learned and Ed went to work with the Western Union Telegraph Company. He operated morse until 1929 when simplex (teletype) operation replaced morse. Ed was manager of offices in the Homestead Hotel, Hot Springs, Va.; Carolina Hotel at Pinehurst, N.C.; and at Salisburgy, N.C. After being manager at Wison, N.C. for 27 years, he retired due to an eye disability.

Ed has been a member of the Masonic Lodge since 1928 and was Master of the Wilson Lodge in 1936.

An old time amateur and very good friend, W4ED, started Ed in amateur radio in 1947, during one of his bouts with eye trouble and Ed says, "It has been a life saver for me."

Operation was on a.m. and c.w., all bands, with a Ranger until about 5 years ago when an HW12A was obtained for s.s.b. work. The present rig is a Swan 270.

Ed was pleased to get #2 Award from Carl, WØKZZ for working him in *All North Dakota* and also one for working Floyd, K7WQJ in *All Oregon*.

On March 13, 1971 he qualified for USA-CA-500 through USA-CA-3000 and "All Counties" #57 was obtained on May 29, 1971.

As this is being written, July 14th, Ed and his XYL, Nancy, are celebrating their 47th Wedding Anniversary *(Congratulations, may you celebrate many more)*. They have one son, Ed Jr. (WA4VIB) and 5 Grandchildren. Ed Jr., is with IBM in Raleigh, N.C.

Ed and Nancy now live on Pungo Creek, 3 miles west of Belhaven, N.C., just a short distance off Highway 17. They would be glad to have any of the County Hunters who may be traveling that area or from the "outer banks" of N.C., to drop by and see them.

Ed wishes it could be possible to thank "in person" each member who has helped him during the approximately 2½ years he has been on the Net. Thanks to a *wonderful bunch* of *gals* and *guys* from Ed, W4LXI, and also from Ed, W2GT.

*P.O. Box 73, Rochelle Park, N.J. 07662.

Ed Alston, W4LXI.

USA-CA HONOR ROLL

3000		1500		500	
W8MJG	79	WA8ZBA	167	WØSQD	856
		W8MJG	168	DL1ES	857
2500				WA8ZBA	858
WA8ZBA	110	**1000**		W8MJG	859
W8MJG	111	WA8ZBA	242	WA0AGN	860
		W8MJG	243	W7DNO	861
2000					
WA8ZBA	134				
W8MJG	135				

Awards Issued

Dick Diehn, W8MJG sprung them *all* on me and received USA-CA-500 through 2500 endorsed All 14 mc Phone; USA-CA-3000-All Phone; and All Counties, Mixed.

Willard Sommers, WA8ZBA also did a lot of paper work and got USA-CA-500 through USA-CA-2500.

Stan Zvolanek, WØSQD; and Ralph Asbury,

W7DNO (exWØVDY) were issued mixed 500 Awards.

Paul Maisel, DL1ES won a USA-CA-500 Award endorsed All A-1.

An apology to Mike Crabtree, WAØAGN who earned USA-CA-500 August 26, 1970 but due to an error he received a duplicate number and was never mentioned in *CQ*, so he finally brought it to my attention and now he has #860 but dated 8-26-70.

Awards

WHDH Award: WHDH AM-FM-TV of Boston, Mass. is pleased to offer a free certificate to all amateur radio operators in recogntion of the contributions amateurs have made to the arts of communications and technical developements. This certificate will first be available on June 13, 1971 in honor of Massachusetts Amateur Radio Week and will be available *any* time after that date. There are no date or time limits on the contacts. The certificate will be issued for having established two way communications with 5 employees (or former employees) of WHDH AM-FM-TV. QSL cards are not required and there is no charge. Certificates will be endorsed for band and mode if requested. The certificate may be earned additional times if new contacts are submitted. Send log data to: Robert W. Jennings, W1DKD, 15 Cliff Ave., Scituate, Mass. 02066.

Look For

K1AKT	WN1GDM	W1RSS
K1AVW	W1KBO	W1SR
W1BAG	WA1KEY	W1TOP
W1BGW	K1KJC	K1UDP
K1BPM	W1LHJ	W1UOP
W1CHA	W1LHZ	K1UHH
W1DIL	W1LMS	K1UHZ
K1DJX	W1LOT	KN1UWD
W1DKD	W1MRQ	KN1UXV
W1DVI	W1NFC	K1VSI
W1EDI	K1NMU	K1ZGH
W1GF	W1NW	W1ZUB
W1GVV	WA1OAE	W1ZW
W1GVX	K1ODC	W2JW
KN1IRP	W1OMP	W2ORK
W1JFK	W1OMR	K3QNT
W1JN	W1ORV	WN4SOW
W1JRQ	W1PZR	

Worked All Kansas: The Wichita Amateur Radio Club, Inc. of Wichita, Kansas (WØSOE) has for years sponsored this Worked All Kansas Counties Award. The award is available to any amateur in the world who will send a GCR list of 50, 65, 80, 95 or all 105 Kansas Counties, 25¢ and s.a.s.e. (or s.a.e. & IRC) to Wichita Amateur Radio Club, Inc., Attention: Clarence Penn, WNØDUX, 1847 North Spruce, Wichita, Kansas 67214. The GCR (signed by 2 amateur radio operators of General/Conditional or higher) must list the worked stations call, city, county, date, time and mode. Stations must have been contacted under the same call.

WHDH Award.

Persian Empire Award: The 25th Centenary of the Founding of the Persian Empire Award will be issued to any licensed amateur for contacts with five *different* amateur radio stations in Iran during the period 21 March 1971 through 21 March 1972 (Persian year 1350). Unusual prefixes used by Iranian stations are *NOT* considered as different stations—example EP2DX and 9C9DX are the same station and count as one contact for the award. Any authorized amateur band and mode are OK. Send list of contacts with QSO data certified by two other licensed amateurs and 5 IRCs to cover postage to: Amateur Radio Society of Iran, Box 1000, APO, New York, N.Y. 09205, U.S.A.

Worked All Kansas Award.

Missouri State Capital Award: Issued in celebration of Missouri's 150th year of statehood. Requirements are to work 5 (or more) Jefferson City (Missouri) or Mid-Mo Amateur Radio Club stations. Send 25¢ and full log data to Thomas S. Hammond, KØRPH, 707 Ihler Road, Jefferson City, Missouri 65101. QSL cards are not required.

Atlantic Award: Also known as the EP-AA, is sponsored by the amateur radio department "CQ Radioamadores" of the Brazilian magazine.

Atlantic Award (EP-AA.)

First 3 DIG Trophies Awarded.

Eletronica Popular. Issued to amateurs of any country who send proof of contacts with 60 countries that border on the Atlantic Ocean, one of them must be with a Brazilian Island (PY∅). 1. Contacts must have been made after March 31, 1967. 2. All authorized amateur bands and modes are valid, with a minimum report of 3-3 for phone and 3-3-8 for c.w. 3. Applications enclosing a log certified by a recognized amateur radio Association should be addressed to: EP-AA Manager, PY1HX, *Electronica Popular* Caixa Postal 1131, ZC-00, Rio de Jeaneiro, Brazil. 4. To cover postage, 8 IRCs should be sent, do not send currency. 5. The official list of the DXCC will be used, but only countries that border the Atlantic proper are valid—those of interier seas such as Baltic or Meditterranean do not count. For the current EP-AA list, send 1 IRC and s.a.e. to EP-AA Manager.

DIG Award Program: The German Group called "Diplom interessen Gruppe" DIG have developed a very fine program and have 7 nice awards and a trophy for having obtained at least 4 DIG Awards. The Awards Manager is Karl-Heinz Kummerle, DL2JB, 694 Weinheim, Postfach 23, West Germany. These awards are also available to s.w.l.s., and if there are any questions about them, send s.a.e. and 1 IRC to DL2JB. Here is some brief data on them:

Worked German Large Cities: This WGLC Award issued in three classes: Class 3-DX-stations 10, EU-stations 20 cities. Class 2-DX-stations 20, EU-stations 40 cities. Class 1-DX-stations 30, EU-stations 60 cities. No restrictions as to mode, no band endorsements. Contacts must be made using more than one band, each listed only once, contacts on or after 1-1-62 are valid. No QSLs, send only a certified list. Free DM 5.00 or 10 IRCs.

Worked German Large Cities on VHF: The WGLC-VHF issued under same basic requirements as the WGLC, except all QSOs must have been on the v.h.f./u.h.f. bands. Each 144mc QSO counts 1 point; on 432 mc 3 points. Class 3: 20 City-points. Class 2: 30 City-points. Class 1: 40 City-points. Starting date and fee same as WGLC.

Missouri State Capital Award.

Worked DIG Members: The W-DIG-M certificate also issued in 3 classes. Class 3-DX stations work 15 Dig Members, EU-stations work 50 DIG Members. Class 2-DX work 30, EU work 75. Class 1-DX work 50, EU work 100 DIG Members. Cost same as WGLC.

European Prefixes Award: This EU-PX-A award also issued by DIG for contacts with 100 different European prefixes on or after 1-1-69. There are no band or mode restrictions. Endorsement stickers are available for 150, 200, 250 and 300 prefixes. Fee same as WGLC and endorsement stickers are 3 IRCs.

Two Modes Award: Issued by DIG for working 50 different countries on c.w., including Germany and all 6 continents and again the *SAME* 50 countries on Phone. Contacts on or after 1-1-62. Fee same as WGLC but address application to: Werner Katte, DJ4OP, 8 Munich 80, Buschingstrasse 55/III, West Germany.

Worked DX-Stations: Issued by DIG and accepted by D.A.R.C. Class 4: DX stations work 200EU stations, 10 must be on 80/40; EU stations work 200 DX stations & 20 of these must be on 80/40. Class 3: DX stations work 500 EU stations, 25 must be on 80/40; EU stations work 500 DX stations and 50 must be on 80/40. Class 2: DX stations work 1000 EU stations, 50 must be on 80/40; EU stations work 1000 DX stations and 50 must be on 80/40. Class 1: DX stations must work 2000 EU stations 100 of these on 40 and 20 on 80; EU stations work 2000 DX stations, 100 of these on 40 and 20 on 80. Contacts on or after 1-1-64 count. Fee same as WGLC and application to DL2JB.

The One Million Award: Also issued by DIG. All QSLs of German stations with printed indication of the postal code number are valid. The same postal code number may be used only once, there are no restrictions as to operating modes and no date limits. For the award, the postal code numbers are added together, and a minimum of 1,000,000 is required for the final sum. The application should show: Call worked, date, band, QTH (City), Postal code number and this list must be in numerical order of the postal code number. Postal code numbers with one, two or three figures are considered as four-digit numbers so add the number of 0s after the number to make a four-digit number, so 4 would be 4000, 44 would be 4400. Fee same as WGLC and appli-

[*Continued on page 89*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

With all the talk about "leaked" secret papers, compromised codes and communications security, it is only natural for those of us who hear unintelligible signals on the air to wonder a bit what's going on, what's really being said in the signals that clutter up the bands with so much government QRM. I gather that a number of readers of this column wonder about crypto communications, and a few, at least, are employed in the government agencies that make-and break—secure communications.

Cryptography is an old science indeed, going back into antiquity at least as far as Babylonian Cuniform writing and Egyptian Heiroglyphics. The subject is rather out of the realm of a surplus column, but for a thorough yet readable discussion of the art, readers might want to see David Kahn's recent book *The Codebreakers.*

But radio amateurs, particularly the RTTY crowd, have seen considerable security equipment in surplus in recent years, and may see more, as the older mechanical and tube type code equipment is phased out for solid-state designs.

Even though it is designated to produce intelligible signals, crypto surplus often offers good value for ordinary amateur operations, chiefly in RTTY, if properly converted. Some gear, particularly Teletype, can be used rather simply for amateur communications. Other, well, remain puzzling.

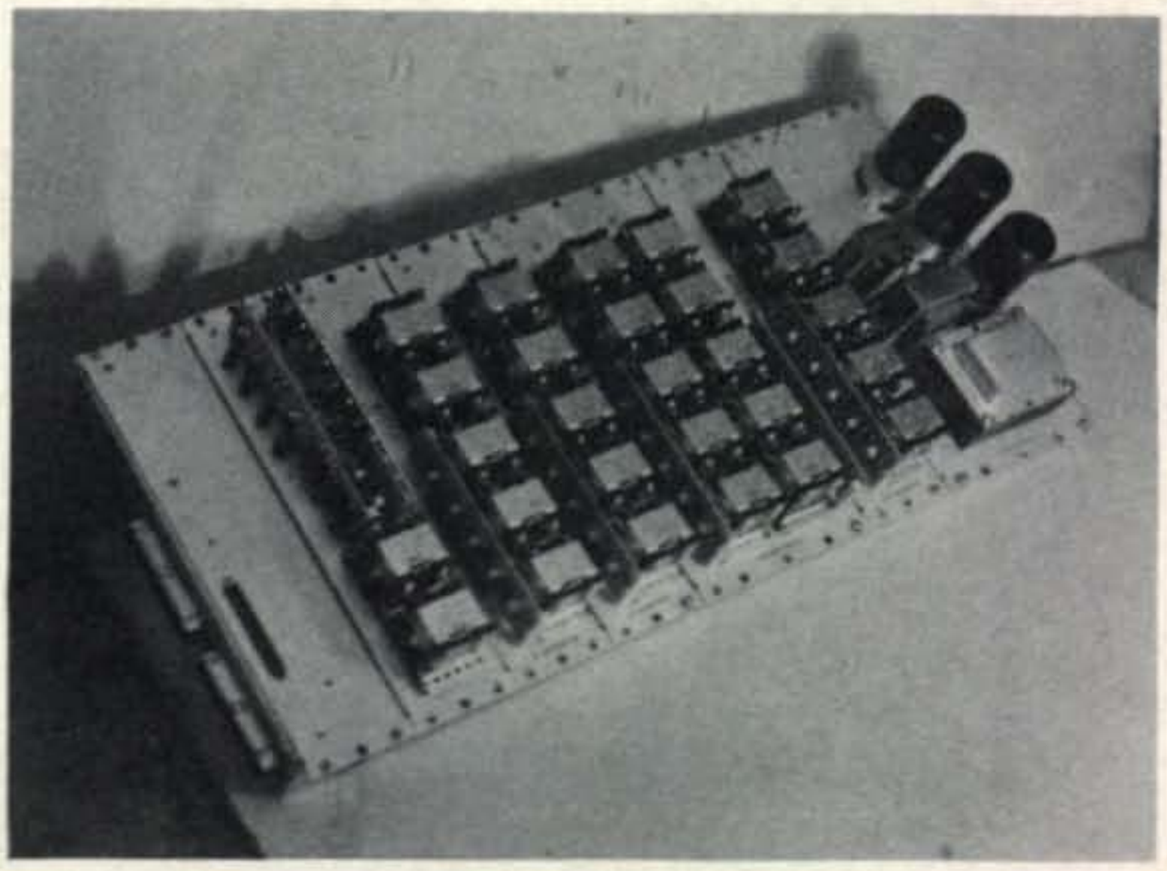
The surplus item we turned up this month is one of the still-unintelligible ones. Not that we don't know what it is, it's just that we are still trying to figure out how to put it to non-secure use. This is the tape-mixing "guts" of a TOTEM crypto system. The panel shown was mounted in the base of a model 28 ASR Teletype terminal. In essence, the unit used two sets of 5-level punched tapes, one the "clear text" message, the other a "key" tape. The signals were read on dual transmitter-distributor heads and fed into the mixer, where they were combined into an encoded message that was either transmitted directly or re-perforated onto a coded tape for use later.

All this is common knowledge to anyone with any familiarity in crypto communications, and is spelled out in several freely-available books, including Kahn's. Few of the books however said much about the actual machines used, and none, to my knowledge, have shown photos of the equipment. Since neither the secret message nor the manner of preparation of the "key" tape is involved, these code machines themselves are not very secret, but many people who see such equipment don't realize what they're looking at.

The only possible security data involved in the hardware itself might be the method of combining the clear text and "key" tapes, but since the technique is used by all nations that send the most rudimentary form of coded cable messages, selling code machines surplus risks very little compromise to communications. In fact, several electronics manufacturers are now building commercial crypto gear for oil companies who want to protect valuable drilling information, and others who have corporate secrets to protect.

The now-obsolescent TOTEM equipment used costly IBM multi-contact wire relays to mix the mark and space output of the clear and key tapes, through W and X converters, and a binary adder. Clear text was produced from encoded tapes received on the machine, through the adder and a recombiner, in a flexible system that made up a complete crypto terminal. The 28 ASR set contains, in addition to the two reader heads, a keyboard, page printer, perforator and reperforator, allowing preparation of clear and coded messages and decoding of traffic received. Virtually the same sort of system is still in use, though new equipment is being built with integrated circuits.

Many RTTY operators have seen the World War II version of the TOTEM set, based upon a model 14 transmitter-distributor with two tape "heads." These units were mounted on special tables in which were mounted the mixing relays. These heavy wooden tables have been around in surplus a long time, and are chiefly of value as a source of 255A polar



TOTEM crypto tape mixing unit, used with standard #28 Teletype equipment.

*5716 N. King's Hgwy., Alexandria. Vir. 22303

relays, now an obsolete item even for amateur work.

The two-headed TD itself might be useful if re-wired for standard RTTY speeds, with a standard distributor plate for 7.42 code, and with the read heads arranged so that a CQ tape might be run in one while the QSO tape was readied in the other.

The relay system of both the older mixer units, and the TOTEM, might be useful in building speed converters, parallel-to-serial changers, or even 5-level Baudot to 8-level ASCII converters for amateurs working with computer applications as many are.

Other useful items from the security area, now in surplus, include the variable-speed motor setup, used for monitoring other people's odd-speed traffic. The variable LMU-10 was described in this column in the August issue, along with a discussion of gear shifts and speed changers. The AFSAV-133C is another "security" area unit, an update of the DEN-35 Twinplex demodulator, that could be usefully employed by the amateur. These units were used by the Army Security Agency and the National Security Agency to monitor Communist Bloc traffic. I described the DEN-35 in July, 1967 p. 96, with further information in the October, 1967, column. Both sets will copy regular single-channel RTTY very nicely. The keyer unit for the two sets was known as AFSAV-39C, and is widely available. ■

USA-CA [*from page 86*]

cation to DL2JB.

The DIG Trophy: Available to all licensed amateurs and s.w.l.s who have obtained at least 4 different DIG awards and who have worked (or heard by s.w.l.) at least 80% (for European applicants) or 70% (for DX applicants) of the licensed members of the latest DIG Member List on the h.f. bands (160-10). All contacts must have been QSLed both ways. The DIG Member List is issued during the first quarter of each year, and is available from DJ8OT, Eberhard Warnecke, 562 VELBERT, Postbox 1244, West Germany for 1 IRC. No restrictions as to operating modes, bands or time. Cost of this Trophy (wall plaque of brass, weight about 400 grams) is DM 20.00, or 40 IRCs. No QSLs, only a certified list of DL2JB.

Notes

Preliminary reports have indicated that the Independent County Hunters convention in Kansas City, July 4th week-end, was well attended, well organized and everyone enjoyed themselves. Much time spent figuring ways to improve the NET operation (apparently the letter from Ben Harris, K5DRF had some constructive criticism). The 3X3 Award is no more, the next convention will be in Peoria, Illinois. Had hoped for a photograph and more data but Clyde, WØYLN and Skip, WAØWOB are away on some trips. Thanks to Bill, WB2FVO and Mike, WAØAGN for some data, and Mike said most of the gang were nicer in person than on the air, if that is possible.

Sorry to be late but still have to report the death of K4EO, Clarence Blalock, see Story/Foto January 1970 *CQ*.

Many thanks to Frank Gerratana, WA1CXE for coming to the rescue in a hurry, at the last minute, with a duplicate foto of the group at W2KXL (Sept. 71 *CQ*), when my copy got lost in transit.

If any of you are waiting for a QSL from K4LIX/M from some Kentucky counties, forget it, you surely worked K4LRX/M (see Story/Photo Feb. '70 *CQ*). A letter from K4LIX informs me that he has been receiving cards for mobile operations in Kentucky and he was afraid that some one was pirating his call.

Thanks for the FB letters/cards, I try hard to answer all and dig up answers for all the questions. One letter from Alden, W5DPI suggests that an All Counties Award without any prior schedules, etc. would be real tough and have great merit. Also some complain about getting them via mobiles—well doing without either of those would seem to me like opening a big new store but failing to put any sign on the front and failing to ever advertise.

How was your month? 73, Ed., W2GT.

Contest Calendar [*from page 82*]

Western Electric "CQ" Party

The Indian Hill ARC at Bell Lab. Indian Hill facilities are hosting the 12th annual QSO Party. Its open to all amateur radio operators employed by or retired from Bell Labs., W.E., A.T.&T. and Teletype and Sandia Corp.

The contest will be held on the first three weekends in October with each devoted to a different mode. The 1st weekend will be c.w., the 2nd is phone and the 3rd is r.t.t.y. and v.h.f.

There will be awards for top scores in various categories and a traveling Trophy to the club with the highest score.

Detailed rules may be obtained from the radio club at each base location or from the Indian Hill A.R.C., Bell Telephone Labs., Naperville, Illinois 60540

Editor's Notes

Complete rules and a list of 27 Trophies and Plaques for this year's contest appear on page 61. There are no changes from last year.

Be sure to check George Jacob's PROPAGATION Column for his special contest forcast. Hope George picks a good one for us again.

In preparing your score keep in mind that we use the ARRL country list, plus the WAE list for European contacts. The WAE list may be found on page 92 of the July issue. And that the North American boundries extend all the way from Greenland to the Canal Zone.

You are expected to score your log and check it for duplicate contacts and correct multipliers. Re-copied logs must be in their original form with duplicates included but crossed out and scoring corrections made. Also be sure to indicate the number of QSOs made but less duplicates.

Official log and summary sheets are available from *CQ*. (a large s.a.s.e. please) Or you can make up your own, 40 contacts to the page. Use a separate sheet for each band, and enter the Zone and Country multiplier only the first time it is worked. We do insist on a summary sheet showing the scoring, name and address in BLOCK LETTERS, and the usual signed declaration.

Club secretaries are reminded to send in a list of their participating members and their claimed scores. And if you want your score to be credited to your Club, indicate same on your Summary Sheet.

The usual gremlins sneaked in the listing of the Phone Results. I picked out a couple, there are probably more. In the Top Scores that's PJ9AF of course, not PA9. And W3AU's score is 5 million plus, not 4 million as listed. Sorry about any others we did not discover.

Good luck, see you in the pile-ups.

73 for now, Frank, WIWY

Propagation [*from page 78*]

Brazil, Argentina, Chile & Uruguay	08-09 (1) 09-13 (2) 13-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (3) 10-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	14-16 (1) 16-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-02 (2) 02-06 (1) 06-09 (2) 09-11 (1)	20-23 (1) 23-04 (2) 04-06 (1) 23-04 (1)*
McMurdo Sound, Antarctica	14-17 (1)	06-09 (1) 15-17 (1) 17-19 (2) 19-20 (1)	16-18 (1) 18-20 (2) 20-00 (3) 00-02 (2) 02-06 (1) 06-08 (2) 08-09 (1)	00-06 (1)

Time Zones: CST & MST (24-Hour Time)

CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	08-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-10 (2) 10-11 (3) 11-12 (2) 12-14 (1)	05-06 (1) 06-08 (3) 08-12 (2) 12-15 (3) 15-19 (2) 19-21 (1)	17-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-02 (1) 19-20 (1)* 20-22 (2)* 22-00 (1)*
Northern & Central Europe & European	08-10 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-10 (2) 10-12 (1)	06-07 (1) 07-09 (2) 09-11 (3) 11-13 (2) 13-16 (1)	18-20 (1) 20-23 (2) 23-01 (1) 20-23 (1)*
Eastern Mediter-ranean & Middle	07-08 (1) 08-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-12 (1)	06-08 (1) 08-11 (2) 11-13 (3) 13-15 (2) 15-17 (1) 17-19 (2) 19-22 (1)	17-19 (1) 19-22 (2) 22-23 (1) 20-22 (1)*
West & Central Africa	08-09 (1) 09-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-10 (1) 10-12 (2) 12-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-20 (3) 20-22 (2) 22-02 (1)	17-19 (1) 19-21 (2) 21-22 (1) 19-21 (1)*
East Africa	09-10 (1) 10-12 (2) 12-14 (1)	08-10 (1) 10-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	06-14 (1) 14-17 (2) 17-20 (3) 20-21 (2) 21-22 (1)	20-00 (1) 21-23 (1)*
South Africa	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	06-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-20 (2) 20-22 (1) 22-00 (2) 00-02 (1)	18-19 (1) 19-21 (2) 21-22 (1) 19-21 (1)*
Central & South Asia	07-10 (1) 18-20 (1)	07-10 (1) 17-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-21 (2) 21-22 (1)	06-08 (1) 18-20 (1)
Southeast Asia	09-12 (1) 16-18 (1)	09-12 (1) 14-16 (1) 16-18 (2) 18-20 (1)	06-08 (1) 08-11 (2) 11-14 (1) 18-19 (1) 19-21 (2) 21-22 (1)	04-07 (1)
Far East	16-17 (1) 17-19 (2) 19-20 (1)	08-10 (1) 15-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (1) 16-18 (1) 18-20 (2) 20-22 (1)	02-03 (1) 03-06 (2) 06-09 (1) 02-04 (1)*
South Pacific & New Zealand	11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	08-09 (1) 09-11 (2) 11-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-02 (1)	23-01 (1) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-06 (2)* 06-07 (1)*
Australasia	09-12 (1) 14-15 (1) 15-17 (2) 17-18 (1)	08-09 (1) 09-11 (2) 11-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-04 (3) 04-05 (2) 05-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-14 (1)	02-04 (1) 04-07 (2) 07-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Northern & Central South America	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-13 (2) 13-15 (3) 15-19 (4) 19-22 (3) 22-01 (2) 01-06 (1)	18-19 (1) 19-21 (2) 21-02 (3) 02-04 (1) 04-05 (2) 05-06 (1) 19-21 (1)* 21-02 (2)* 02-05 (1)*
Brazil, Argentina Chile & Uruguay	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	02-06 (1) 06-08 (2) 08-14 (1) 14-16 (2) 16-17 (3) 17-20 (4) 20-22 (3) 22-02 (2)	19-21 (1) 21-01 (2) 01-03 (1) 03-04 (2) 04-05 (1) 21-04 (1)*
McMurdo Sound, Antarctica	13-16 (1)	07-10 (1) 15-17 (1) 17-19 (2) 19-20 (1)	16-18 (1) 18-20 (2) 20-00 (3) 00-02 (2) 02-06 (1) 06-08 (2) 08-10 (1)	23-05 (1)

Time Zone: PST (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	07-08 (1) 08-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	05-06 (1) 06-08 (2) 08-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-20 (1) 00-02 (1)	18-20 (1) 20-22 (2) 22-00 (1) 19-23 (1)*
Central & Northern Europe & European USSR	07-09 (1)	07-08 (1) 08-09 (2) 09-11 (1)	06-07 (1) 07-11 (2) 11-16 (1) 23-02 (1)	21-00 (1)
Eastern Mediter-ranean & Middle East	07-10 (1)	07-08 (1) 08-10 (2) 10-11 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 20-22 (1)	18-22 (1) 06-08 (1)
West & Central Africa	08-09 (1) 09-12 (2) 12-14 (1)	06-10 (1) 10-12 (2) 12-15 (3) 15-17 (2) 17-18 (1)	06-10 (1) 10-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-23 (1)
South Africa	08-09 (1) 09-11 (2) 11-12 (1)	06-10 (1) 10-11 (2) 11-12 (3) 12-14 (4) 14-15 (2) 15-16 (1)	06-12 (1) 12-15 (2) 15-18 (3) 18-21 (2) 21-22 (1) 00-02 (1)	18-19 (1) 19-20 (2) 20-21 (1) 06-08 (1) 18-19 (1)*

East Africa	08-11 (1)	08-12 (1) 12-15 (2) 15-17 (1)	08-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-21 (1)	18-21 (1) 06-08 (1)
Central & South Asia	07-09 (1) 17-19 (1)	16-17 (1) 17-19 (2) 19-20 (1) 07-09 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	04-09 (1) 17-19 (1)
Southeast Asia	14-15 (1) 15-17 (2) 17-18 (1)	09-11 (1) 13-15 (1) 15-18 (2) 18-19 (1)	06-07 (1) 07-10 (2) 10-12 (1) 17-19 (1) 19-20 (2) 20-22 (1)	02-03 (1) 03-05 (2) 05-08 (1) 03-05 (1)*
Far East	14-15 (1) 15-17 (2) 17-18 (1)	12-14 (1) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	23-02 (1) 02-05 (2) 05-08 (1) 01-03 (1)*
South Pacific & New Zealand	10-12 (1) 12-13 (2) 13-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-16 (2) 16-18 (4) 18-19 (2) 19-20 (1)	05-07 (1) 07-09 (4) 09-11 (2) 11-17 (1) 17-18 (2) 18-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-03 (1) 03-05 (2)	21-22 (1) 22-05 (3) 05-07 (2) 07-08 (1) 22-00 (1)* 00-05 (2)* 05-06 (1)*
Australasia	08-10 (1) 12-13 (1) 13-14 (2) 14-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-16 (3) 16-18 (4) 18-19 (2) 19-21 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-04 (3) 04-06 (2) 06-07 (3) 07-09 (4) 09-10 (3) 10-12 (2) 12-14 (1)	02-03 (1) 03-04 (2) 04-06 (3) 06-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Northern & Central South America	07-08 (1) 08-09 (2) 09-10 (4) 10-12 (3) 12-14 (4) 14-15 (2) 15-16 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-13 (2) 13-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	07-09 (4) 09-13 (2) 13-15 (3) 15-18 (4) 18-20 (3) 20-00 (2) 00-05 (1) 05-06 (2) 06-07 (3)	18-19 (1) 19-01 (3) 01-04 (2) 04-05 (1) 19-22 (1)* 22-01 (2)* 01-04 (1)*
Brazil, Argentina, Chile & Uruguay	07-08 (1) 08-11 (2) 11-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-23 (3) 23-02 (2) 02-04 (1) 04-07 (2)	20-22 (1) 22-00 (2) 00-02 (1) 22-00 (1)*
McMurdo Sound, Antarctica	12-15 (1)	07-14 (1) 14-18 (2) 18-20 (1)	16-18 (1) 18-20 (2) 20-00 (3) 00-02 (2) 02-06 (1) 06-08 (2) 08-10 (1)	00-05 (1)

F.M. [*from page 29*]

tions. Although not specifically spelled out in the announcement, it appears that room reservations should be sent directly to the Nugget. Talk-in will be via K7UGT repeater with 146.34/146.94 2400 c.p.s. tone burst.

Finale'

It seems that a good part of the news

items concerning state f.m. groups appearing in this column are from Texas, California, and Florida. This is due largely from the fact that most other state groups (if existing) have not sent in information. The relatively new North Carolina f.m. Repeater Association has sent copies of all available information, as has the British Columbia group. Many local newsletters are now being received, and usable information is being gleaned from them. However, the larger state organizations can benefit from the large readership of *CQ* and utilize the free publicity. The five groups named are benefitting, so lets be fair and give everyone a chance.

If you haven't filled out your repeater card please do so. If, for some reason you haven't received a card let me know immediately and one will be forwarded. The card is post-paid, so all the effort required is a little time with pen or pencil. I want to have the directory ready for publication early in 1972 (it would make a fine 1st anniversary item for the January issue).

Well, enough for this issue. Keep up the good work, and keep the news coming in. ■

80D on 220 mc [*from page 19*]

the PA balancing switch S_2 unnecessary. As said above, it may be removed; we left it in because it would have been extra work to rewire that circuit more completely. The tune-operate (HI-LO) switch S_1 remains connected as it was originally, reducing the driver and PA screen voltage in the LO position.

Tuning and Loading

The tuning procedure on 225 mc is essentially the same as it was for the unmodified 80D transmitter. The metering socket can be used with the usual test set[2] but it should be remembered that in the PA Plate position the actual plate current (both sections of the AX-9903/5894) is twice that indicated. The added 17 mmf antenna link variable capacitor, mounted underneath on the antenna relay, can be set at half-capacitance and left alone. Resonance of the link circuit then is achieved with the ANT TRIMMER C_{27} exactly as before. Antenna COUPLING is varied to load the PA. Plate tuning, reached through the same cage cover hole marked PA PLATE, should be checked whenever the coupling is changed. A through-line watt meter or antenna bridge is recommended to set the highest output consistent with loading. A

[2]Kretzman, B. H., "A Test Set for FM," *CQ*, Nov. 1963, p. 74.

CQ BOOK SHOP

Ham's Interpreter

This valuable book is imported from Germany and written by DL1CU. It contains a collection of phrases and expressions designed to assist those amateurs who wish to enlarge their knowledge of various languages for use on amateur radio. It is a must for every DX'er. $1.50

CQ Binders

Convenient and economical are the words for CQ's beautiful maroon and gold binders. Individual issues can be removed quickly and easily without damage to the magazine. Save precious time as reference copies are within immediate reach in this handy binder. $5.00

The New RTTY Handbook

A treasury of vital and "hard-to-get" information, this book is loaded with valuable equipment schematics, adjustment procedures, etc. A boon to beginner and pro. A special section on getting started, written by Byron Kretzman, W2JTP, a well-known authority in the field. $3.95

Surplus Schematics

Ken Grayson has loaded this book with schematics for currently popular pieces of conversion gear, making it invaluable to amateurs as a guide to surplus gear. $2.50

Antenna Roundup I

Edited by Art Seidman, a 160 page mass of antenna information directed at answering a multitude of questions surrounding the mysterious antenna. $3.00

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Ten big theory articles backed up by 82 detailed and illustrated construction projects from VLF to microwave, long wires to 17 element beams and Sterba Curtain arrays. $4.00

Shop & Shack Shortcuts

A volume packed with hundreds of hints & shortcuts collected by Don Stoner, this will help anyone to dress up his shack, improve shop techniques and increase efficiency and equipment. $3.95

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Electronic Circuit Handbook I

Written by Tom Kneitel, WB2AAI, this details 150 of the most often needed circuits in 11 great chapters. Invaluable for beginners and old-timers alike. $3.00

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Antenna Handbook I

All new information on transmission line theory, Attenuation, Impedance, Standing waves, Resonant and nonresonant lines, current distribution, free space 3 dimensional patterns of long wires of all practical length and much, much more by Ken Glanzer. $4.00

The New DX Handbook

Don Miller's 200 pages of valuable technical information and operating aids, most of which has never been published before and can be found in no other volume contains Great Circle Bearing Charts. $5.00

RTTY From A To Z

This new RTTY Classic has been produced to fill the gaps in RTTY knowledge among amateurs and professionals alike. 16 chapters and 224 pages. This book is a must in your technical library. $5.00

103 - Simple Transistor Projects

The aim of this book is to familiarize the beginner and advanced experimenter with the handy source of reference circuits. **$3.45**

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☐	Ham's Interpreter $1.50	☐	Electronic Circuits Handbook I $3.00
☐	CQ Binders $5.00	☐	Electronic Circuits Handbook II $3.00
☐	New RTTY Handbook $3.95	☐	Surplus Conversion Handbook $3.00
☐	Surplus Schematics $2.50	☐	Antenna Handbook I $4.00
☐	Antenna Roundup I $3.00	☐	New DX Handbook $5.00
☐	Antenna Roundup II $4.00	☐	RTTY From A To Z $5.00

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measured output of 30 watts can be obtained with a loading of less than 180 ma (true). More loading for more output will only shorten the PA tube life.

Receiving on 220-225 mc f.m. with the 80D will be covered in the next part of this three-part series. Watch for it. ■

Q&A [*from page 79*]

ANSWER: The above effect evidently is due to the failure to install the dummy load for the LMO. This plugs into the LMO output jack at the rear of the set and must be in place to avoid the above situation. It is not needed when transceive operation with an external transmitter is employed using the receiver LMO. See 1st paragraph, page 132 in the SB-303 instruction manual.

HW-16 on 20 Meters

QUESTION: Have you any information on a 20-meter modification for the Heath HW-16 C.W. Transceiver?

ANSWER: This is a question that crops up quite frequently, even though it was touched upon some time ago (Q & A Column, *CQ*, November 1968, page 114). In general, what would have to be done for 20-meter operation of the HW-16 is to sacrifice the 15-meter band in favor of 20 meters by padding the 15-meter inductors for the transmitter-driver and the receiver r.f. and mixer stages, moving the plate-tank tap and changing the 15-meter-band heterodyning crystal for the receiver to 19.545 mc.

One of the other bands may be sacrificed instead, this time substituting new tuned circuits instead of padding existing ones. The tank tap would also still have to be changed as would the crystal as per the above.

Doing the job without sacrificing an existing band would require a new bandswitch (with special type switch decks) and finding a location for the new inductors and crystal that will be needed.

Scandinavia [*from page 26*]

work with 4X4 stations. I told them that many years ago, in the 1950s, as YO2BO, I was in the ridiculous situation that I was not allowed to work the YU stations and the EA amateurs could not work us.

Later in the evening, we went with the whole group to visit Moktar, CN8MD, so we had a chance to see a typical Moroccan living quarter.

WHAT DO THESE COMPANIES ALL HAVE IN COMMON ?

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HY-GAIN ELECTRONICS CORPORATION
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a Schlumberger company

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Henry Radio
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ARROW ELECTRONICS, INC.
St. Norwalk, Conn
525 Jericho Tpke. Mineola, N
516 Pioneer 2-2290
225 Rte 46. Totowa. N J
201 256 8555
Farmingdale. N Y

WORLD RADIO---
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Council Bluffs, Iowa 51501

NEW-TRONICS CORPORATION
15800 Commerce Park Drive
Brook Park, Ohio 44142

AMRAD SUPPLY
Oakland, California. 94607
15/451-7755

SINCE 1921 telrex
Communications and TV Antennas
LABORATORIES
Asbury Park, New Jersey 07712 201-775-7252

Just one thing. They all buy more pages of advertising in CQ than in any other ham magazine. In fact, more than half the companies listed above will buy more ad pages in CQ this year than in *all the other hams mags combined!*

These companies have found over the years that CQ is the best ad buy in the marketplace. And dozens of other companies are beginning to follow the leaders.

SO..

if you want to sell a product or service to your fellow hams, advertise where most of the pros advertise most consistently --

CQ -- the best ad buy in any size budget.

When in Casablanca, I recommend visiting the old Medina.

If the taxi driver is asking 5 times more than the meter shows, don't argue with him. Give him what the meter reads, plus a 20% tip and walk away calmly.

Back to New York

Everywhere is good, but the best is at home. I enjoy traveling, seeing interesting places, meeting new friends, but I love to get home; back to my job at WCBS-TV and back to my rig. This time was different; 2 days after our return, we flew to Puerto Rico to catch a ship for a Caribbean cruise but about that trip I shall write later. ■

2 m. F.M. Simply [*from page 45*]

and the f.m. detector connected to the secondary of the i.f. transformer. Only the "hot" lead to the volume control is broken and switched between a.m. and f.m. Power for the f.m. detector is obtained from the B+ line in the receiver. R_6 is chosen in the same manner as R_4 in the transmitter, by the following formula:

$$R_6 = \frac{(B+) - 3.6}{.05}$$

For a 12-14 volt mobile supply, R_6 can be a 180 ohm, 2 watt 10% carbon resistor.

Operation is quite simple. Since the a.m. circuitry is left intact, the S-meter (or tuning eye) is used to peak the received signal—that is all!

Results to date, 3 weeks after the conversion, have been quite gratifying. With only 10 watts of r.f. into a 46" base loaded 5/8 wave whip (particulars given in fig. 7) mobile to mobile contacts have been made over a 20 mile path easily while the local repeater has been heard perfectly 50 miles away from its QTH. ■

Why Use F.M.? [*from page 38*]

they can forget their troubles and competitions and ragchew and just plain have fun. More and more old-timers are coming up. Even the most rabid DX hound forgets his DX for a while. Why? These amateurs are putting a little enjoyment back into their hobby. A hobby serves no useful purpose when it becomes a rat-race. Such a happening ceases to be a hobby and becomes a second or third job, and even more tiring than the primary employment. So forget your troubles, and come on up. You'll have a ball! ■

CQ to announce major subscription price increase

$$$ave $$$AVE

$$$ave $$$ave

$$$ave

The newly announced postal rate increases, coupled with rising costs for printing and labor, will force us to announce a major subscription price increase in the very near future.

In order to protect our regular subscribers, we're making this information known in advance to allow you to order long-term subscriptions and save $$$$. Newsstand prices are already up to $1.00 per month or $12.00 per year. The savings on these long-term subs will be substantial. And when we say long-term, we really mean it. These rates are offered for a limited time only and may be withdrawn at any time.

1 year	$6.00	10 years	$40.00
2 years	$11.00	15 years	$55.00
3 years	$15.00		
5 years	$23.00	Life Subscription	$75.00

As you can see, we've offered a variety of choices that enable every reader, regardless of age, to select the best choice for his own needs. And believe us when we say that the savings will be substantial over future rates. **So don't delay. This offer may be withdrawn very soon.**

CQ Reviews Swan FM-2X [*from page 66*]

white and the numbers dark colored the problem could be eliminated.

Now, on the plus side, the workmanship on the sample unit was excellent. Resin had been cleaned from the joints, wires were wrapped around terminals, and the general look was one of excellence.

Again on the positive, the ability to operate from either a.c. or d.c. is a definite plus. The removable power supply makes for a smaller and lighter mobile rig (which may be of interest to flying f.m.'ers) and rubber feet are provided on the unit to protect the desk or operating table.

The access cover for crystal changing and warping is an excellent idea which other f.m. units could use. This makes simple crystal changing and warping a snap, and eliminates any excuse for off frequency operation.

The adjacent channel rejection of the receiver section makes the FM-2X of interest to the amateur in congested areas. Although intermod was not checked out in an "optimum" intermod test chamber (downtown Dallas or Atlanta) it was operated for one day with all types and frequency equipment up to 110 watts output within 10 feet. No intermod was noted from any of the equipment.

One thing should be watched. The squelch control of the FM-2X should be set right at threshold (the point at which the noise just stops). Advancing it beyond that point reduces effective receiver sensitivity greatly. The test unit squelch would open at .12 microvolts when set at threshold, at .275 microvolts when moved 5° beyond threshold point, and at 1.15 microvolts when moved 1 dial mark beyond thershold.

The Swan FM-2X is of Japanese manufacture, but is imported and backed by Swan. The unit comes with crystals for 146.94 mc simplex, 146.34/.94 duplex, and 146.34/.76 duplex; microphone; installation hardware and mobile bracket. The cost is $229.00 direct from Swan at either P.O. Box 151, Freehold, N.J. 07728, or at 305 Airport Road, Oceanside, California 92054. Or see it at one of the Authorized Swan Distributors.

—K9STH/5

DX [*from page 73*]

9M8, Malaysia—9M8RB, 7028 kc, 0750Z (West Coast).

9Y4, Trinidad—9Y4VU, 7004 kc, 0130Z (East Coast).

QSL Information

EA6BH—Via DL7FT.
EL2BZ—To K4FMC.
FØWJ—No. Americans via W5QNY, Box 305, Los Alamos, N.M., others to R.E.F.
FØWV/FC—c/o ON4TJ.
FB8ZZ—Via F8US.
FM7WU—To WA5HUR.
FM7WW—c/o K3RLY.
FP8CS—Via W3GNM.
FY7TD—To WB8ABN.
GD8CW—c/o W2MUM.
HL9TY—Via K7YHQ.
IBØKDB—To I1KDB.
JA3IG—c/o WB4SPG.
JW5NM—Via LA7RB
KC4USV—To K2BPP.
KF4SJ—c/o W2GHK, P.O. Box 7388 Newark, N. J. 07107.
KG6SI—Via WA6AHF.
KG6SW—To W7YBX.
KR6AY—c/o KØVXU.
LX3AA—Via ON4QX.
LX3QX—To ON4OX.
OJØSUF—c/o OH2BHU.
OX4AE—Via W9LHN.
MP4BIX—To MP4BBA.
MP4TDT—c/o DJ9WY.
PA9QX—Via ON4QX.
PYØATG—To PY4ATG.
SVØWLL—c/o SVØWT.
TT8AC—Via W4SPX.
TU2DD—To K2QHT.
VK9NP/W (Wallis Island)—c/o K3RLY.
VKØTM—Via K3RLY.
VP2AZ—To WA5UHR.
VP2MO—c/o WA3HGV, 2102 Weatherton Drive, Wilmington, Del. 19810.
VP8HL—Via G3PNY.
VR2CC—To VE6ACK.
VS5CB—c/o WA6AHP.
XT2AA—Via WA5REU.
YB5AAQ—To W5ADZ.
YB8AAP—c/o WB6IZF.
YB9AAT—Via W4YUU.
YBØAAP—To WB6IZF.
ZD5F—c/o KP4DKY.
ZD8JK—Via WA3FNK.
ZK1MA—To KH6GW.
ZL4OA/A—c/o ZL2GX.
3A2CZ—Via ON4QX.
3AØFP—To WA6GDS.
3B8DK—c/o VE6AKV.
3B9DK—Via VE6AKV.
3C1EG—To OH2NB.
3F1JC—c/o HP1JC.
5H3JR—Via W2SNM.
5X5NA—To G3LQP.
7Z3AB—c/o W5NOP.
9A1QX—Via ON4QX.
9H1CD—To W2LGU.
9L9ITU—c/o GW3AX.
9N1MM—Via W3KVQ.
9Q5MG—To DJ4PS.
9V1QJ—c/o WA5UHR.
9X5AA—Via W1YRC.

73, John, K4IIF

WHAT'S A CLASSIFIED AD IN CQ WORTH?

NOTHING!

Unless, of course, you happen to have something to sell . . . or buy . . . or swap . . . Then you can only measure the value in satisfaction, time saved, etc. Of course, a typical classified ad in the other major ham magazine costs between $2.50 and $3.00, so maybe that's a way to measure.

Now—What does a classified ad in CQ cost?

NOT A RED CENT ! ! !

That's right, you read us loud and clear. CQ subscribers can run non-commercial classified ads any and every month absolutely free of charge. All you have to do is send us your mailing label, on a post-card, as proof that you're a subscriber, with your ad neatly typed or printed. There's a limit to three lines in any single month to make space for everybody to get in that needs to.

SO—What's a subscription to CQ worth? Well, maybe twelve months of great reading, maybe twelve months of free classified ads, maybe both. That's up to you. In any case, at $6.00 a year, CQ is a steal. Do we have your sub yet? If not, why not?

Ham Shop

Advertising Rates: Non-commercial ads 10¢ per word including abbreviations and addresses. Commercial and organization ads, 35¢ per word. Minimum Charge $1.00. No ad will be printed unless accompanied by full remittance. **Closing Date:** The 10th day in the second month preceding date of publication.

Because the advertisers and equipment contained in Ham Shop have not been investigated, the publishers of CQ cannot vouch for the merchandise listed therein.

Direct all Correspondence & Copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, L. I., New York. 11050.**

LOOK INTO RADIO YEARS and send a dollar to W2ADC for an old copy of QST or CQ. The money will go to Viet-Nam Gift Pac. An organization that sends ditty bags of hard-to-get items to boys on the Front in Viet-Nam. Address: W2ADC, Box 201, Elmont, N. Y. 11003.

QSLS. SECOND TO NONE. Same day service. Samples 25 cents. Ray, K7HLR, Box 331, Clearfield, Utah. 84015.

BANDIT 2000 AMPLIFIER. A1. $290? Ralph Gebhard, 27W211 Sunnyside, Winfield, Il. 60190.

250 TH TUBE SOCKET WANTED. Also, a schematic for any linear employing the 250 TH tube. Send to: T. A. Behrens, WB6MDP, 6664 Lake Park Dr., Sacramento, Calif. 95831.

FINDLAY, OHIO HAMFEST will be September 12th at Riverside Park. Flea Market, Swap-Shop, Door Prizes, Manufacturers' Display, Net Conferences, etc. Donation $1.00 in advance, $1.50 at park. Tickets and details from Dan Jernigan, K8VXD, Route 2, Findlay, Ohio. 45840.

1971 GENERAL OR TECHNICIAN CLASS EXAMINATION ANSWERS. $2.00 — You can't lose. CRD ASSOCIATES, P. O. Box 291 Western Springs, Illinois. 60558.

ALL NEW, no junk: 200V6A RCA Triacs 80 cents trans $1.00 will buy 1—2n2016 type, 3—2N1483, Type 6—2N3261 Type 12—2N1300 type 4—2N4861 type JFCT, 20-2N404 type 4—Dialco Pilot Lights hardware with power type, some surplus. Douglas Craton, 5625 Balfrey Dr., W. Palm Beach, Florida. 33406.

DRAKE 2B, 2AC, 2BQ Q-Mult., Speaker. Excellent. HT-37 SSB Xmtr and HT-41 Linear Amplifier. All original owner with instructions. Make offer. WB2-FJX, Gerry Skloot, 158-14 85th Street, Howard Beach, L. I., New York. 11414. (212) 641-4573.

JOIN QRP ARC Int.: Send SASE for info. Corresponding Secretary, Earl R. Lawler, W5JLY, Rt. 2, Box 24K, Burnet, Tx. 78611.

"1971 TESTS-ANSWERS" for FCC First and Second Class License -plus- "Self-Study Ability Test." Proven! $9.95. Satisfaction guaranteed. Command, Box 26348—H, San Francisco, Ca. 94126.

CE 20A $60.00, Aertron 35 FM $150.00, Heath HP20 $18.00; 41V FM rig with Crystals, $45.00, W5SYB, 5000 Hall, Amarillo, Texas. 79109.

HOOSIER ELECTRONICS Your ham headquarters in the heart of the Midwest where only the finest amateur equipment is sold. Authorized dealers for Drake, Hy-Gain, Regency, Ten-Tec, Galaxy and Shure. All equipment new and fully guaranteed. Write today for our low quote and try our personal friendly Hoosier service. Hoosier Electronics, Dept. E, R.R. 25, Box 403, Terre Haute, Indiana. 47802.

160M Receiver APN-9 Loran $15; Nice TS-186D Freq. Meter w/orig. charts, xtal oven, 100-10—000MC $49, trade VHF/UHF 50-10,000MC SASE, W4API, Box 4095, Arlington, Va. 22204.

FOR SALE OR TRADE for two meter transceiver — Complete Novice Station— Heath HR-10B with 100kc calibrator, Ameco TX-86 Transmitter with power supply & TR switch, plus 11 crystals. John, WB4QID, 1450 Galloway Rd., Lakeland, Fla. Ph. 682-5692.

WANTED: SBE34 code adapter and/or microphone. Must be originals—no modifications. W6YQS, P. O. Box 22022 San Francisco, Ca. 94122.

RUBBER STAMPS: All types, address stamps: $1.50; K2STV, 30 Eleanor Lane, Plainview, New York. 11803.

CANADIANS: Complete amateur equipment service by fully equipped lic'd technician, kits wired-serviced. Bob Fransen, VE6TW, 227 Cottonwood, Sherwood Park, Alberta, Canada.

SALE: SB301, SB401, SB200, SB600. Package $685.00 or best offer. M.O. or Certified Check. A. Zarker, 11814 Indianhead, Austin, Tx. 78763.

ENVELOPES: 60 white — 3 line imprint, back flap, $2.00. JOYCE'S CHOICES, Department A-27, 2908 Columbia Avenue, Lancaster, Pa. 17603.

ATTENTION: The Independent Contest Operators of Indiana request all stations working W9FB/9 during the ARRL Field Day to QSL to K9KLR, P. O. Box 1816, Gary, Indiana. 46409.

RUBBER ADDRESS STAMPS, $2.00. Signature, $3.50. Free catalog. Jackson's, Box 443F, Franklin Park, Illinois. 60131.

FOR SALE: Heathkit Mohawk Receiver 85.00 SB-10 $50.00. Apache $50.00. Lafayette six meter transceiver HE45B with VFO and mike, $70.00. Original owner. Perfectly maintained. David Cohen (WA2WAW) 1841 Central Park Ave. Number 2F, Yonkers, N. Y. 10710. Tel (914) 779-5018.

KWM-2, AC & DC PS, 30L-1, all vy good. $9.00— OR HW-100 & $$. WA6GZZ, (916) 331-2185.

WANTED: Heathkit 2 or 6 meter transceiver. Extras included, if available. WB6ERH, 420 S. 7th St., Alhambra, California. 91801.

SELL: SR150 HBAC, Factory DC and mobile mount real good $280. HW100, HP23 with Swan dial like new $270. Swan 500CX and 117XC almost new, $475. Galaxy 300 with AC console $165 nice. HW12A, HP23 sharp, $125. Motorola HT200 walkie talkie on 94-94 and 34-94 with charger $250. Also other 2 meter gear FM. You name it. Richard Schark, 417 No. Ferry, Ottumwa, Iowa. 52501.

YOUR CALL, name and address on quality rubber stamp. Ideal for QSL'ing and correspondence. Introductory offer, $2.00 postpaid. Economy Rubber Stamps, 214 Albert, North Orlando, Fla. 32707.

FOR SALE: Local buyer 750 watt 4-400A amplifier and pwr supply as described in March and April 1964 CQ Magazine. $75 — W6BLZ, 528 Colima St., La Jolla, California. 92037.

WANTED: 9 MHz. SSB Xtal Filter. $15 — suitable xtals for my active filter acceptable. W2ISL, A. Porterfield, 41 Winnebago Rd., Yonkers, N. Y. 10710.

WANT: Oil-filled Capacitors. At least 5 KV. rating. T. Hoitenga, K8NGV, 26496 W. Six Mile, Detroit, Michigan. 48240.

WANTED: CQ Magazines from about 1950 or 1970. State lowest cash price. Can pick up within a couple of hundred miles. W. Pilon, 1 Hemans Court, Worcester, Mass. 01605.

FOR SALE: Swan 250. Power Supply 117XC; Clegg 99'er; HB 2-4CX 250B Linear Amplifier 6 meters. Misc. items. H. G. Wicks, 17 Howard St., Enfield, Conn. 06030. (203) 749-2041.

5RK DELTA TRI-BANDER, proven DX Antenna, 2 element, 10-15-20 delta loop, 30 lbs., brochure SASE, $95, Order ISLAND ELECTRONICS, 4103 Ave. S, Galveston, Texas. 77550.

FOR SALE: 753 SSB Transceiver & AC PS — $110 DC PS $25; HQ110C Receiver (Inc cal & spkr) — $100. GSB-201 Linear — $150. Jerry Hagen, WA6-GLD, P. O. Box 1271, Covina, Ca. 91722. Tel. (213) 332-9542.

SIX METER CLEGG THOR, mint, 60 watts, VFO $125. Also, Lafayette HA-460, mint— $85. K2-RPZ, Box 412, Rocky Point, New York. 11778.

QSL Card Problems? We mail QSL Cards anyplace. Send us your cards in alphabetical order, 30 for $1.10 or 4 cents each. International QSL Bureau, 1213 Bellamah Drive, Alamogordo, N. M. 88310.

SELL: YAESU FT DX400 XCUR, Excl. cond. $475.00. FR DX400 Rcvr, 160-2 mtrs, SSB/AM/CW/FM/WWV Excl cond. $295.00. Gene Reisner, 2875 Nautilus Rd., Phila., Pa. 19154. Phone: 215-677-3526.

MOHAWK (RX-1) spotless & perfect. $100. Asst. Test Equipment. T. Hoitenga, K8NGV, 26496 W. Six Mile, Detroit, Michigan. 48240.

ACTION TRADER: The Action Trader can sell your equipment without emptying your wallet— Sell your Ham, CB, HI-FI & Misc. electronic gear. Write for free issue or send $2.00 for eight issues. Action Trader, P. O. Box 27315, Columbus, Oh. 43227.

DXCC Certificate holders are invited to attend the W9DXCC annual meeting September 18, 1971. Holiday Inn (Eden's Expressway) Chicago, Illinois. Registration and Program until 5:00 P.M. Dinner at 6:00 P.M. Advance PAID Registration $10.00, (includes dinner), Eligible for EARLY BIRD PRIZES! at door $11.00. W9GIL, Chairman, 910 East Calumet Road, Milwaukee, Wisconsin. 53217.

HEATHKITS Wired, 15% of cost. Price References, on Request. S.A.S.E. P. O. Box 6144, Linglestown, Pennsylvania. 17112.

GERTSCH FM7/DM3 Frequency, Modulation Meter, 560FM Generator, all excellent, will sacrifice. Home Service Center, Carroll, Iowa. 51401. Ph. 712-792-9684.

AUDIO FILTERS: Knock down that background noise. KOJO SSB, AM, and CW filters do the job. Write for free brochure and see how serious DX boys hear them. KOJO, Box 7774, 741 E. Highland Avenue, Phoenix, Arizona. 85011.

SELL: Johnson Thunderbolt Linear, exc. cond. with manual, legal limit, all modes. $225 or best offer. Edward H. Dauphin, 143 White St., So. Burlington, Vermont. 05401.

CINCY STAG HAMFEST: The 34th Annual STAG Hamfest will be held on September 26, 1971 at Stricker's Grove, Compton Road, Mt. Healthy, Cincinnati, Ohio. Door prizes each hour, raffle, lots of food, flea market, model aircraft flying, and contests. Identify Mr. Hamfest and win prize. $5.00 cost covers everything. For further info, contact: Mr. John Bruning, W8DSR, 6307 Fairhurst Avenue, Cincinnati, Ohio. 45213.

EXCITING LISTENING: Police — Fire — Emergency calls on your broadcast radio, $19.95 up. Also receivers, scanners, dual/band, crystals. Salch Company, Woodsboro 3, Texas. 78393.

QSL PHOTO STAMPS: Glossy free samples. B & C ENTERPRISES, P. O. Box 49C, Luray, Va. 22835.

GREENE.. guaranteed water-tight center insulator, with or without BALUN.. a tough item to beat.. flier free... Greene Insulator, Box 423, Wakefield, Rhode Island. 02880.

REGENCY HR-2, $229, Hi-band or Low-band monitor $139, Hi/Lo-band $169. Large stock of crystals-WE SHIP THE DAY YOUR ORDER REACHES US! Ed Juge Electronics, Inc., 3850 South Freeway, Fort Worth, Texas. 76110. Phone (817) 926-5221.

WANT: SS-IR Rcvr. Must be exc. phy. cndx. Elect. cndx not critical. T. Hoitenga, K8NGV, 26496 W. Six Mile, Detroit, Michigan. 48240.

COLLINS KWS-1, 75A4 (No. 2935) w/CW filter TA-33 Sr, WW II SX-28A, Manuals. Mint condx. $800 cash. WA8SMW/2, 188 Oakwood, West Long Branch, N. J. 07764. 222-1097.

SWAN 350—117XC Extra Finals, Keyer, 5" scope, Hustler Ant. with 20M Resonator, Turner 454C mike, all in exc. condx. $400.00. Allan Rabinowitz, 575 East 79th St., Brooklyn, New York. 11236. WA2AOT.

WANTED: SW-3, 1930-36 Handbook, homebrew rig 47x-46-10 other 1930-36 tubes, equipment. W7JI, 235 E. 15th St., Tempe, Az. 85281.

160 METERS BC-456 surplus xmtr 2.1 to 3 mc with pwr sply unconverted retuned in 5 mins. to 160. Pwr sply: 500 VDC 200 VDC or other with dropping resistor at about 100 ma 6.3 VAC 6A, 12.6 VAC 3A 5VAC 3A. Also BC-459 40 mtrs att. conv. by novice, failed experienced ham should be able to get it working. Xtal oscillator for BC-459. Highest offer for any combination or separate. You pay shipping. Bill Hughes, WN9FKX, RFD 6, Box 174, Bloomington, Ind. 47401.

WANTED: RME 20 Preselector or later model. Private collection. W5PM RFD 1, Box 399, Covington, La. 70433.

ONE-DAY SHIPMENT on Regency, Swan, and Drake 2-meter rig and crystals. Crystals $3.95 each, all popular frequencies and some "off-channels" in stock. Ed Juge Electronics, Inc., 3850 South Freeway, Fort Worth, Texas. 76110. Phone (817) 926-5221.

FOR SALE: Old CQ and QST magazines 25 cents each. Send SASE for list. W0BK, 1022 N. Rockhill Road, St. Louis, Missouri. 63119.

ELEXCO: We carry a complete line of Amateur Equipment. Hallicrafters, Galaxy, Hy-Gain, National, Varitronics, Regency, Ten-Tec, Kirk, Cushcraft, Hustler, Tristao, and many more. Before you buy or trade, write us for our low prices and high trades. Bankamericard, Mastercharge, and financing. ELEXCO, Suite B, 608 Papworth, Metairie, Louisiana. 70005.

SAROC Seventh Anniversary January 6-9, 1972. Advance Registration $9.00 per person entitles registrant to SAROC Special room rate $12.00 per night plus room rax, single or double occupancy, effective January 4 thru 12, 1972; tickets for admission to technical seminars, HAM RADIO MAGAZINE and SAROC Happy Hour Thursday, SWAN ELECTRONICS and SAROC Social Hour Friday, HY-GAIN/GALAXY ELECTRONICS and SAROC Champagne Party Saturday, Buffet Hunt Breakfast, Sunday. Ladies who register will receive transportation for shopping tour, luncheon and Crazy Hat program at the New Union Plaza Hotel downtown Las Vegas, Saturday. Advance Registration, with Flamingo Hotel mid-night show two drinks, $14.50. Advance Registration, with Flamingo Hotel Dinner Show (entrees Brisket of Beef or Turkey) no drinks, $17.50. Tax and Gratuity included except for room. Frontier Airlines SAROC group flight package planned from Chicago, St. Louis, Omaha, Denver, send for details. Fifth National FM Conference, ARRL, WCARS-7255, WPSS-3952, MARS, meetings & tech. sessions scheduled. Accommodations request to Flamingo Hotel, Las Vegas, Nev. before 15th Dec. Adv. Registration to SAROC, Southern Nev. ARC, INC., Box 73, Boulder City, Nevada. 89005, before 31st December.

NOVICES: Need help for general ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. AMATEUR LICENSE, Box 6015, Norfolk, Virginia. 23508.

CASH FOR BARGAIN IN 3 OR 5 BAND TRANSCEIVER. Quote details and price first letter. K5ENL, Ed Block, Grandview, Texas. 76050.

WANTED: Good quality, modern tube checker. Give details and price first letter. K5ENL, Ed Block, Grandview, Texas. 76050.

DOCTORS' DIRECTORY: Lists over 1,500. M.D.; D.D.S., D.V.M. & D.O. who are also "Hams." Published by International Doctors' C.H.C. Chpt. No. 24. Send $2.00 to Sec./Treas. Bill Fulcher, 105 Freshrun Dr., Hendersonville, Tenn. 37075.

WANTED: KTV Tower Sections. Model No. 165-OXX (one serial) or 1600XX Series. R. E. Ahrens, W3WJC, 3404 Reading Crest Ave., Reading, Pa. 19605.

SEND S.A.S.E. for my list of panel meters, antiques, books, ham gear. Gerald Samkofsky, 201 Eastern Parkway, Brooklyn, N. Y. 11238.

DRAKE MN-4 Matching Network. $50. You pick up. $55, I ship. First Cashier's Check. Bill Bradshaw, K6LQA, 4732 Stratford Ave., Fremont, Ca. 94538.

SELL: VFO for 80 meters described in Dec. 1967 CQ Magazine, $15.00. W6BLZ, 528 Colima St., La Jolla, Calif. 92037.

FOR SALE: Frequency meter Bailey Zero Beat w/ 5KC Modulation Checking option. $250.00. G. W. Swartzlander, P. O. Box 666, Fremont, Oh. 43420.

WANTED: Johnson KW Matchbox. State price & condition. Will pay cash or trade. Extensive collection of CQ/QST. Al Brogdon, K3KMO, 2956 Hewitt, Silver Spring, Md. 20906.

NOVICE STATION Complete: Heathkit HR-10B, Knight Kit T-60 T/R Switch, Filter, Openline ant., $115.00. K. J. Clatanoff, WA0YCC, 1302 Englewood Dr., Bellevue, Nebraska. 68005.

SELL: NC300, paint scratched, works fine. $80, you pay shipping. K4TIG, J. L. Cross, Rt. 2, Box 57, Hawthorne, Fla. 32640.

FOR SALE: 32S-3, No. 10094, 516F-2, $625. 75S3—B No. 15857 (0.5 khz, 2.1 khz), $525. 75S-3 No. 14164 (0.2 khz xtal, 2.1 mech filters), $425. Much more to offer. J. W. Craig, 29 Sherburne Ave., Portsmouth, N. H. 03801. (603) 436-9062.

FOR SALE: Gonset Communicator III in good condition. $75.00. R. L. Scott, 371 Claymore Blvd., Cleveland, Ohio. 44143. (531-9160).

WANTED: Young Amateur Desperately needs socket for 4—1000A Transmitting tube. Brad Petersen, 412 Robin Ln., Vestal, N. Y. 13850.

WANT: New 4CX1000A and socket. Cash, if price is right. Also 350 vvtd var. vacuum with drive. W4AIS, 300 Thornwood, Taylors, S. C. 29687.

WANTED: Wheatstone tape equipment. Write: WA2VLS, Box 471, Chappaqua, N. Y. 10514.

INTERNATIONAL MARITIME MOBILE OPERATORS join world club with awards program. Write to Secretary. G3VOM, David Lane, 26 Iona Way, Urmston, Manchester M312EY., England.

SELL: NCX-500, AC-500 Excellent condition. Taubin, W2GCW, 192-15A 69th Ave., Flushing, N. Y. (212) 454-2775.

WANT: Ham Band Crystals, Henry final 2 mp, and insulator spreaders for open-wire line. J. M. Hoffer, W1DL, 24 Cherry Road, Framingham, Ma. 01701. (617) 872-5084.

SB200. Excellent. First certified or cashier's check for $175 takes it. Will ship collect. Berk Davis, Box 16005, Jackson, Miss. 39206.

WANTED: EICO 730 PS and MODULATOR in good operating condition. John Connell, WA1GLY, 390 Franklin St., Mansfield, Mass. 02048.

WANT: B & W 850 tank coil. Will pay up to $25 if in A-1 condition. Also need RF Choke. W4AIS, 300 Thornwood Dr., Taylors, So. Car. 29687.

SB-610 SIGNAL MONITOR $55 incl. shipping. W3KAB, 213 Newtown St. Rd., Newtown Square, Pa. 19073.

WANTED: AR22 Indicator Box. Need not be operational. State condition and price. Keith O'Brien, 8401 N. Atlantic Number L15, Cape Canaveral, Florida. 32920.

CANADIANS: Equipment repair and alignment. Fully-equipped lic'd technician, kits wired-serviced. Bob Fransen, VE6TW, 227 Cottonwood, Sherwood Park, Alberta.

TRADE: Tektronix 545 Scope & Plug-in units, for 75A4 and 32V3 or woodworking tools. J. R. Hughes, 2278 W. 236 Place, Torrance, Ca. 90501.

WANTED: Collins 30L-1, 399C1, 312B5, mint condition only. Please give age, condition and price. Ted Chartradd, W8PRL, 3504 Snowglen Ln., Lansing, Mich. 48917. (517-372-3116).

MECHANICAL FILTERS: 455 khz. 2.1 khz. $18.95. 300 Hz. $22.95. J. A. Fredricks, 314 South 13th Avenue, Yakima, Wash. 98902.

NEW SIGNAL-ONE, unopened carton, latest model, warranty, KWM-2, AC, $695; R4B $325; Want S/Line, T4X(B); FT560, Don Payne, K4ID, Box 525, Springfield, Tenn. Nites (615) 384-5643.

ARC-3 2 meter xtal/VFO $20.00 SX99 w/calibrator $65.00. DX-100 $65.00. All excellent. J. Kramer, 5631 S. Oak Pk. Ave., Chicago, Il. 60638.

WANTED: Gearshift for Model 28 ASR, Larry Kleber, K9LKA/W9CPD, Belvidere, Il. 61008.

WANTED: Information on Novice Equip. and Ant. Jeff Doran, 213-19th St., Brigantine, N. J. 08203.

FOR SALE: AMPLIFIERS — Pair of 4-1000A in 5 foot case, $300. Four 4X150 in Collins Case, $150. Both with full spare tubes. Both 80-10. D. N. Roden, Jr., WA4NPL, P. O. Box 684, Scottsboro, Al. 35768.

FOR SALE: Heath Calibrator $10; Lafayette KT-320 SWL receiver $25; CW filter (QST design) $10; Copies of CQ, QST, etc. from '62. 25 cents ea., Deve Logan, WB2FBF, 21 Judith, Nanuet, New York. 10954.

32S-3 $495; PM-2 $90; 75S-1 2.1 & .5 $295; 136B-2 $75, 351D-2 & cables $75, L4-B $575; HT-33A $225. Don Burns, 4410 Reading Rd., Dayton, Ohio. 45420.

WANTED: AVT-112A, TA-12C Xmtrs. AVR-20 RCVR. 51SB SSB Gen., ART-13 Components. W3BRX, 247 W. Maple, York, Penna. 17403.

FOR SALE: DX100 in excellent condx. QST Mod for good keying. $50.00. No shipping. Tel. 262-6051, 3505 Mullin Ln., Bowie, Md. 20715.

SELL: Heath SB-200 Amplifier, $150.00. Heath "Q" Meter, $20.00. Joseph Marshall, 147 Middleville Road, Northport, N. Y. 11768.

TRADE: Ham gear and test equipment for old battery radios, iron toys, or lead figure toy casting sets. McKenzie, 1200 W. Euclid, Indianola, Ind. 50125.

FOR SALE: DC-3 Drake Power Supply. New in box. $100.00. J. G. Warlick, 1801 Alaska Dr., Richmond, Va. 23224.

SB301 RECEIVER excellent condition with manual. Prefer Phila. area. Otherwise F.O.B. $235.00. F. J. Kern, W3KJ, 50 Shelburne Rd., Springfield, Penna. 19064.

SELL: Slide Rule & Study Course. List $29. Take $15 & postage. BRAND NEW. WA4KCN, 4921 Edenshire, Memphis, Tennessee. 38117.

GONSET 3024A 2M VFO—preamp, $30; Instructograph 4 tapes $20; Heath antenna Bridge $12; Vibroplex Bug, $5; Dow-Key Relay, $12; Want Matchbox, Box 241, Calimesa, Calif. 92320.

SELL: FR4/U $48; Hycon Digital VTVM $48; Electrolytics 1000 MFD at 325 VDC, $1; like new DX120 Gen. Cov. Rcvr $48; Polaroid 110B with case, winklite, view finder, $48. Trammell, 1507 White Oak Ct., Martinsville, Va. 24112.

LINEAR BUILDERS Send SASE for low-priced list HiPower Parts — W6RW, 8600 Skyline Drive, Hollywood, Ca. 90046.

SELL: NCX-500, AC-500. Excellent condition. $325. W2GCW, 192-15A 69th Ave., Flushing, New York. 11365. (212) 454-2775.

ANTENNA INSULATORS: Military IN86 small extremely strong. 10 for $3.50 100 for $30. Postpaid. W. R. Hempkins, 100 Main St., Denison, Texas. 75020.

FOR SALE: KWM-2, 516F2, $625. GR-1800-A, $35. Collins F455Y-60 (new) $18. Sola Constant-Voltage supply, 24 VDC/6 amps (new), $15. Lambda C-281, 125-325 VDC/200 ma, 6.5 VCT/10 amp, $20; C-880, 0-200 VDC/800 ma, 6.5 VCT-20 amp, $20; Number 28, 200-325 VDC/100 ma, 6.5 VCT/3 amp, $15. Drake Hy-Patch, $20. URM 25-C, $200. Choke, 10 hy/600 ma, $5. James W. Craig, 29 Sherburne Avenue, Portsmouth, N. H. 03801.

NEEDED DESPERATELY. Cavities and/or diplexor for 2 meter repeater. Jack, 353 Meadowbrook, Ballwin, Mo. 63011.

Free Drinks for one hour if you can elbow to the bar at SWAN Electronic and SAROC Social Hour, Friday, Jan. 7th. SAROC Convention, Flamingo Hotel Convention Center, Las Vegas, Nevada.

SELL: TA-33 Triband beam, $70. Alliance C225 rotor. $15. Will ship. WA7EMM, 79 Newcomer, Richland, Wa. 99352.

SELL: Loctal tubes for 2-way radio equipment. $1.00 ea., W4JGO, 643 Diamond Rd., Salem, Va. 24153.

CLEANING HOUSE— Large stock of receivers, transmitters, transceivers, VHF gear, test equipment, misc. items. Send stamp for list. J. R. Shank, 21 Terrace Lane, Elizabethtown, Penna. 17022.

INT. NOVICES ARA sponsors programs to assist the novice operator. For info., write to WB9AHJ, Winkel, 607 East Street, Madison, In. 47250.

BUY OR SWAP FOR SIGNAL-ONE, KWM2, Drake, Heath, or Yaesu. W0BNF, Box 105, Kearney, Nebraska. 68847.

SELL OR SWAP 535 ISSUES CQ—QST—73. Full and broken years 1936 thru 1970. Make reasonable offer. SASE for list. Henry Taylor, K7NHG, Box 1030, Eastsound, Wash. 98245.

HEATH SSB—CW Station. HX20, HR20, HP20, 80—10 meters, 90 watts FB shape. $175. Terry Zivney, WB9BXX14, Box 482, Bldg. 403, Ft. Myer, Va. 22211.

MODEL 15 Page Printer w/table. Reconditioned. Auto CR/LF. Missing 6 key tops. $50 FOB. WA7-HJR, 4819 So. Fife, Tacoma, Washington. 98409.

FOR SALE: B & W 515B sideband generator, $80; James Permaflux Key, $15; Fisher 400CX Master Stereo Control, $95. W8IIT, 281 Jenny Lane, Dayton, Ohio. 45459.

FOR SALE: Pick up only, Hammarlund HQ-110 80 thru 6 mtr dual conversion rcvr, perfect cndx, $85; Heath DX-100B xmtr, 80 thru 11 mtrs, AM/CW, 180 WTS, as is, $45. 3904 San Juan Street, Tampa, Florida. AC 813—837-4155.

FOR SALE: Cleaning out shack, including SX-101A and HX-10. SASE for list. WA8CKT, Caro, Mi. 48723.

MODEL 19 TELETYPE, facsimile machines. Lots of other things — Write for list. Jim Romain, 408-51st, Western Springs, Ill. 60558.

FOR SALE: Knight Kit Star Roamer Shortwave Recvr. 2 years old. Excellent condx. $35. Write: J. Richter, Watertown, Minn. 55388.

SALE: Hammarlund 180 AC General Radio Receiver, with clock and S200 speaker, $300. Telefon 457-0768. Emry Suhan, 3743 Montford Dr., Chamblee, Ga. 30341.

RTTY INFORMATION for the amateur interested in RTTY. F. DeMotte, P. O. Box 6047, Daytona Beach, Florida. 32022.

HEATH SB-301, CW filter. Mint condition, expertly wired. $230. Brad Malt, 10 Woodridge, Wellesley, Mass. 02181.

VHF STATION FOR SALE: Tapetone Skysweep plus 144 and 220 MHz converters and Johnson 6N2 Transmitter with xtals $160. W1BPW, 3 Elizabeth Drive, Merrimack, N. H.

SELL/TRADE HRO-60/speaker Xtal, A-B-C-D-G—coils. Mechanically gd, recently checked out and retubed. Cabinet shows wear marks. Want Hallicrafters SX-62B or Hammarlund VLF receiver in same condition as HRO. Each to ship F.O.B. his QTH. Carl L. Horton, 3753 Kanawha St. NW. Washington, D. C. 20015. Tel. 244-6942.

FREQUENCY COUNTERS—2 Berkeley units, one model 7160 up to 1MHz and one model with Heterodyne unit up to 43 MHz. Excellent working condition. Make offers. R. Mendelson, 27 Somerset Pl., Murray Hill, N. J. 07974.

WANTED: to buy or borrow for copying. HQ110A. VHF Manual. G. Walton, 3469 Major Drive, Wantagh, N. Y. 11793.

SELL: Drake SPR-4, 0.5 — 30MHz solid state Rcvr. with three Xtra Xtals — 3 mo. old, excellent — $375.00. W9CO, 604 Wyatt, Lincoln, Ill. 62656.

FOR SALE: Valiant $175, 75A4 Spkr $15, Wheatstone Perf $50, Port Typewriter, $45. Write W2-CVW, 13 Robt. Circle, S. Amboy, N. J. 08879.

WANTED: Old Telegraph Instruments and books about same. Goodman, 5826 S. Western, Chicago, Illinois. 60636.

SB-12a Panalyzer $50., Counter ERIE No. 740 $50., Link F.M. test set $10., Wanted: Millen 90932 Mod Scope K6KZT, 4434 Josie Avenue, Lakewood, California. 90713.

WANTED: Auto C/R and L/F kit for Mod. 15 teletype. OD5GQ, Box 2300, Beirut, Lebanon.

WANTED: Capacity checker. C—D — Heath or similar. Must be reasonable. Older models acceptable. W5HSO, 6 Damon St., RGE, Belen, N. M. 87002.

BARGAINS: Pocket multitester $2.50, 3API $2.50—unused 4X150A $6.00, 829B $4.00, antique Radiotron UX-200 tubes $1.35, cartoned Simpson 4 1/2" sq. 150 V. AC meter $4.50 add shipping. Samkofsky 201 Eastern Parkway, Brooklyn, N. Y. 11238.

40 MTR. QUAD, New, $350; 32S-3, 516F-2, $550; SB-301, CW, $250; SB-102, $340; EICO 753, $95; S-38-E, $25. K1VTM, 23 Sunrise, Saybrook, Ct. 06475. (203) 388-0372.

SELL: Mint condx HT44 TX w/PS-Spkr—$230. HA350 RX $90.66 mobile — Doug, WA7IGV, Box 1081 Sequim, Washington. 98382.

FOR SALE: HA-1 "T.O." Keyer $35.00, or will trade for U.C.S.—300 Vac. Var with turning head. W6FET, 1475 Sta. Margarita, Fallbrook, Ca. 92028.

NCX-5 w/NXA Power and mike. Original cartons and manuals. $350 or best offer. W2HWH, H. Lowenstein, 747 Valley St., &N, Maplewood, N. J. 07040.

SELL: Heath SB-610 Scope, good. Bought Industrial Scope. WANT: Small Metal Lathe & Drill Press. Geo. Robinson, K9PKG, R. 2, Box 484, Newburgh, In. 47630.

EICO 753 w/AC & DC, $130; Poly. 304 Freq. Mtr. w/scope, $50; Simpson Beta Adapt., $20. H. Brown, 643 W. Val. Forge, King of Prussia, Pa. 19406.

SWAP: MO-2 Mount for MO-1 new condition. HWM-1 Mount $7.00 includes wide bumper mount FOB here. WA9EXZ, 533 S. Spring, La Grange, Illinois. 60525.

HMBRW XMTR-4 band, CW, 50W input, w/sidetone, meter, and fan. $30. WN2RXV, Ken Newman, 38 Rolling Ridge Rd., Saddle River, N. J. 07458.

HAM BARGAINS: Cleaning House. SASE for list. K3GEO, 4229 Estates Ct., Allison Park, Pa. 15101.

SELL: Swan 350, Remote 420 VFO, Switch, AC Supply, recent factory overhaul, $325. 7104 Deveron Ridge, Canoga Pk., Ca. (213) 346-5871.

PAIR 4CX350A — unused — $20. Each postpaid. Bob Davis, K0FPC, 1406 Winona, Salina, Ks. 67401.

KWM-2/REJ Tuning/HP-23 $575.00; HW-32/HP-13A $95.00; EUW 20 v $125.00; IG-57A $120.00. W8KFR, Dionne, 5736 Deerfield, Kalamazoo, Mi. 49002. (616) 429-8451.

SELL: HQ129X, $65. Johnson T.R. SW; $15. WA-2HPB, Mark, 1801 S. Clinton, Trenton, New Jersey. 08610.

BC-342, excellent 1.5—18. mhz rcvr with manual and matching LS-3 loudspeaker. $95. S. N. Silbert, White Sulphur Springs, N. Y. 12787.

WANTED: HA-5, R-48A. Halli 5X-62. Mimeographs of Halli. Catalog section of 1945 to 1949. ARRL Handbook. Make offer. D. Setliff, WB8-IMA. Culloden, W. Va. 25510.

SELL: G.R. 631-B STROBOTAC Stroboscope. Perfect condition. 600-14500 flashes/min. $75— WB6CPE, Loyola School, L.A., Cal. 90006.

KWM-2, AC & DC Manual. Best offer over $650. TSGT C.A. Bower, 7th ACCS, Box 47-5451, APO S.F., California. 96237.

WANTED: Swan 14C Module: Swan 35 or 45 mobile antenna; Buy, or trade BC221T or Model 14 Reperf. Basham, Cave Junction, Ore. 97523.

SELL: Thousands of tubes, resisters, grommets, capaciters, transformers, mikes, ear phones and others all new. Cleaning shack. WA1GLJ, 246 Yale Ave., Meriden, Conn. 06450.

OLD RADIO MAGAZINES WANTED: Modern electrics, Electric-ian & Mech, Electrical Experimenter, Radio News, Popular Radio, Radio Broadcast & RADIO. Erv Rasmussen, W6YPM, 164 Lowell Street, Redwood City, Calif. 94062.

160 METER AND NOVICE GEAR FOR SALE. Have a nice selection, send stamp for list. Want: Central Electronics 600L and Signal One CX-7. James Shank, W3CNS, 21 Terrace Lane, Elizabethtown, Pa. 17022.

WANTED: British KW-2000B transceiver, Hy Gain HY Tower Vertical, HRO 15 meter coil, phone patch. Mosley CM-1 receiver, CW Codaptor for SB-34 and mobile mount for the SB-34. James Shank, 21 Terrace Lane, Elizabethtown, Pa. 17022.

WANT: Globe Sidebander DSB-100, CQ and QST binders. Lorenson, Hillsdale, N. Y. 12529.

COLLINS 62S. VHF Converter, $550.00. Very clean condition. Bruce Bouvier, 2609 Finlaw Ave., Pennsauken, N. J. 08110.

DX STATIONS: Let W2KF be your QSL Manager. QSL cards provided at no monetary cost. Write for details to W2KF, Miller, 309 Cherry Hill Blvd., Cherry Hill, N. J. 08034.

1970-71 QSTs, CQs, & 73 Mags 25 cents ea. plus postage. One copy each month; min. 3 mags. W2-JBL, 123 Davis Avenue, Hackensack, N. J. 07601.

SALE: HX50A with 160M Band — $250; HXL-1 latest model, 20 hours — $250; Perfect HQ-170-C, $165. All $600. K8CCV, 5471 Norquest, Youngstown, Ohio. 44515.

WANTED: National SW-3 coils. W2NX. 29-29 213th Street, Bayside, New York. 11360.

FOR SALE: SB-301, all filters, 6M converter. $225. Good condition. G. Ritter, 607 Shaker Drive, Medina, Ohio. 44256. (216) 723-5391.

WANTED: Panoramic manual for Panadaptor, Model PCA-2T-200. H. Bartlett, WB6USF, 4548 Obispo Avenue, Lakewood, Ca. 90712.

HT-37 SSB Xmtr, HT-41 Linear Amplifier. Both original owner, with instructions and boxes. Make reasonable offer. Gerry, WB2FJX, 158-14 85th Street, Howard Beach, L. I., N. Y. 11414. (212) 641-4573.

WANTED: Tower, Beam, Rotor, Xtal Calibrator for NCX500, Phone Patch, Wattmeter. Tom Dornback, K9MKX, 2515 College Road, Downers Grove, Illinois. 60515.

SELL: Eico 214 VTVM, $20; RCP657 VTVM & Cap. Mtr. $35; BC221, $40; Vib. bug, $10. K8-AGO, 15030 Bradner, Plymouth, Mi. 48170.

TESTED SURPLUS TUBES: 12AT7, 12AX7, 12A-U7, 6AU6, 6BR8A. 3/$1.40. P. P. Ken Maas, Burlington, Wisconsin. 53105.

FOUR KW AMPLIFIER FOR SALE. 4—1000 pair with two spare tubes. $300. Want 30L-1 Amp. Roden, Jr., WA4NPL, P. O. Box 684, Scottsboro, Al. 35768.

DRAKE R-4A, perfect condition. Must sell, college expenses, $265. Brad Young, Oakwood Estates, Route 2, Stanford, Ky. 40484.

WANTED: ARC-5 and Power Supply or Similar xmtr for use in broadcast band. Write: Jak Brewer, 2223 Stockton Loop SE, Kirtland AFB, New Mexico. 87118.

CRYSTAL FILTERS: Heath SB-201/310 CW and SSB filters, $15 and $25, respectively. WA4ROV, 39-45 NW 39th Ave., Gainesville, Fla. 32601.

SELL: B & W — FC 15 grounded grid fil choke, $9.00. B & W550-A & 551-A Coax Switches—$5.00 each. W2FXA, 72 South Pierce St., Buffalo, New York. 14206.

FOR SALE: KWM-2 — BTI LK-2000— TA36— TR44, excl. condx.— $1100.00. Jim, W4EFB, 7453 Greenway Dr., Jacksonville, Fla. 32210. Tel. (904) 387-7140.

FIFTH DISTRICT QSO PARTY invites all hams and SWLs to participate second weekend in October. See Contest Calendar for times and freqs. W5POH., RR 3, Mountain Home, Ark. 72653.

SELL: Hallett Shielded Ignition System for GM V-8. Make offer. WA5KZE, 101 Georgia Dyess AFB, Texas. 79607.

SELLING: Hammarlund HX-50 xmtr, needs work. Drake 2c rcvr and 2cq.2ac. perfect. Make offer— Richard Levy, WB2MAN, 30 Arleigh Rd., Great Neck, N. Y. 11021.

SALE: 75A4, ser. No. 1503 with one filter. Good condx. Number 325. Burt Weidenhamer, 3761 18th Ave. N., St. Petersburg, Fla. 33713.

2 METERS— HW-17, used once SCR522 and extra rcvr. EICO 625 Tube Tester, All excellent. Make offer. WB2OBO, (516) FL 4-7152.

HALLICRAFTERS TRANSCEIVER SR-500 with AC supply, 500 watts 80-40@20 mtrs. Mike and calib. Mint condx. $200.00 FOB K6PUU, 2368 No. Cameron, Covina, Ca. 91722.

WANT: Henry 2K2/2 or equivalent and light-weight tower. J. M. Hoffer, W1DL, 24 Cherry Road, Framingham, Mass. 01701. (617) 872-5084.

SELLING: CQ, QST, HR, PE, WW, EW, RE & PS. Some from 1950. W8ACG, 1036 24th, Portsmouth, Ohio. 45662.

INSTRUCTOGRAPH. Excellent, $40. Kraco 8-track car stereo. $25; Needs adjustment. Both postpaid. WA2GMD, 8 Hollis Place, Huntington Station, New York. 11746.

WANT TO TRY 20? Will swap HW32A mint cond. for HW12A or HW22A. John Chapman, WA3GAA, 1031 Ferry Rd., Doylestown, Pa. 215-345-0415.

WANTED: Vernier Dial Conversion for 75A-4 Recr. H. Ruble, K4RC4, 2634 South Drive, Clearwater, Florida. 33515.

SWAN: 350-C and 117-XC, 550 watts SSB/CW/AM with xtal calib — $300 FOB Denver. WB0-ERW, 7185 So. Birch Way, Littleton, Colo. 80122.

SALE: Gonset Communicator IV 6 meters with 12 and 110V cord, manual and squalo antenna. Good condition. $125. C. F. Summerall, Route 5, Box 495, Gadsden, Alabama. 35903.

SELL: Loktal tubes for 2-way radio. Most types @ $1.00 each. W4JGO, 643 Diamond Road, Salem, Virginia. 24153.

FOR SALE: Marker Luxury 2-meter FM transceiver $100 under Drake Price. Accessories. Crystals for 34/94. Ship express or bus COD. $230. No Trades. W5PEK, P. O. Box 86, Von Ormy, Tex. 78073.

SALE OR TRADE: National Velvet "B" type 3580 Power Supply. V. J. Schorn, W4RAL, Route 1, Florence, Alabama. 35630.

NEED OLD T-1000 Eimac Triode trans tube open fil OK. W9LGH, 610 Monroe Ave., River Forest, Illinois. 60305.

SWAP: New, never used, Heath HW-12A for good, clean HW-100—101 or other 5-band AC/DC Xcvr. WB9DWG, R. O. Lust, Box 314, Whitewater, Wis. 53190.

CDR AR22 Indicator wanted. Need not be operational. State price and condition. Keith O'Brien, 8401 N. Atlantic Ave. L15 Cape Canaveral, Fla. 32920.

FOR SALE: Heathkit Two'er, mint condx, $35. You ship. Lloyd Westbrook, K4HQI, 125 Cherry St., Commerce, Georgia. 30529.

FANTASTIC BARGAIN

SAVE $40.00

on the COBRA PF-1 professional Police/Fire Monitor NOW $79.95

This fabulous top-performing monitor radio regularly sells for $119.95. But House of Power has acquired a fine lot of PF-1s, brand new in factory-sealed cartons with full manufacturer's warranty, and we're passing the savings on to our customers.

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It's amazing! The new Cobra PF-1 monitors government AM and FM VHF channels and lots more. Does it better than any other radio. All at a price you can afford.

Unlike other monitors, you receive all frequencies on both high and low bands as easy as tuning a radio. And in addition to manual tuning, push button crystal control is available at a preselected frequency of your choice on each band — a feature usually offered only in the most expensive radios. Crystals available from all electronics distributors.

So why settle for less? Exclusive noise limiting circuits reduce ignition interference and insure quiet operation. And the ultimate in new solid state circuit design gives you top reach, selectivity and dependability.

Even the exterior is modern . . . perfect for any decor or auto interior.

NO DEALERS OR DISTRIBUTORS, PLEASE!

Order Today.

The supply is limited.

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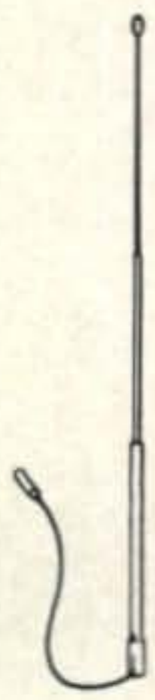
And here's an added bargain. A beautiful Cobra telescoping whip antenna that regularly sells for $8.95 yours for just $4.95 with your PF-1 monitor. This antenna is designed to mount directly on the PF-1 antenna terminal.



SALE: Jones Micro-Match Model 263, brand new $45.00. W2ASI, 15 Kensington Oval, New Rochelle, New York. 10805. (914) NE 3-7077.

SWAN 350C 550W CW/SSB Xceiver, 117-XC supply, calib., $350 F.O.B. Denver, Jordan, 7185 S. Birch Way, Littleton, Color. 80122.

WANTED: Collins and Drake gear. State condition and lowest price prepaid to my QTH. WA7-PPN, 13615 N. 17th Drive, Phoenix, Arizona 85029.

WANT: B & W 850 KW Tank Coil and 350-400 VVT variable Vacuums with drives at reasonable price. W4AIS, 300 Thornwood Dr., Taylors, S. C. 29687.

SELL: Hustler 4BTV Vertical. 3EL. 15 Meter Beam. Only local sale on beam. B. D. Berryhill, WA-6JJB, 820 Orizaba Ave., Long Beach, Ca. 90804.

HA-2 Two Meter Transverter with AC Power. Very good condition. $150. Chuck Secrest, WA8ASV, 1211 Milbourne, Flint, Michigan. 48504.

WANTED: Heath HD-10 Keyer, Hustler RM-20 Resonator. SSB conversion info: for older Hallicrafter Rec's. T. Coddington, WB6AWC, 7825 Scotts Valley Rd., Lakeport, Calif. 95453.

FOR SALE: PL-172 Tube, new in factory sealed carton, $100. W6NKP, 3415 Crestline Way, Soquel, California. 95073.

WANTED: Power xfmr for AN/USM-32 scope Federal No. FTC-154-1171 or Dumont No. 20007-101 (all one serial) B. Nicklin 1018 Sept. Dr., Cupertino, California. 95014.

APR-5A 1000-6000Mc. receiver gud condx, 110 volt ac, $150.00. You pay shipping or trade for gud telescope. K9BUG, 2004 W. Purdue Ave., Muncie, Indiana. 47304.

CRYSTALS WANTED: Send me any type/freq./quan. novice crystals. I'll send you 50 cents each by return mail. Chuck Morrison, WN3QJP, 803 Forston Dr., Takoma Park, Md. 20012.

RTTY INFORMATION: for the Amateur interested in RTTY. F. DeMotte, P. O. Box 6047, Daytona Beach, Florida. 32022.

FOR SALE: Mayfair Model 1844 Port. Trans. Tape Recorder 5"—1/4" Reel to Reel. Details. Robert Haase, 417 Old Jesup Road, Brunswick, Georgia. 31520.

FOR SALE: 75S-1, 32S-1, 516F-2, $700. 30L-1, cables, manual, $350. 32S-3, 516F-2, $650. Much more. Send list. J. W. Craig, W1FBG, 29 Sherburne Ave., Portsmouth, N. H. 03801.

SELL: New Swan 117XC AC Supply, $50.00. Swan 250 w/117XC, $265. Meissner Signal Shifter, $20. HE-45 Six Meter Xcvr, $35.00. Abbott, WA3-HMQ, 301 Blacksmith Rd., Camphill, Pa. 17011

HEATH TWOER. HP23 supply, with manuals, $35 each postpaid. Adinolf, 5113 Arvada, Torrance, California. 90503.

WANTED: Used type, cuts, printing and rubber stamp equipment. Particularly Kelsey, 3X5. W4PN, Box 8324, Orlando, Florida. 32806.

SWAP: Tecraft 20 watt two meter xmtr, with AM-ECO Nuvistor cnvtr. 14-18 MHz I.F. WANT: good Motorola two meter FM Rig with Head, 12 volt supply. WA1KMR, (203) 227-7517.

WANTED: Drake TR-4 SSB transceiver also Vertical Antenna. R. Dorough, 801 N. Catherine St. Terrell, Texas. 75160.

SELL: SX111 with speaker, $100. Viking II with VFO, $85, Lafayette hi-low VHF receiver $40 Washington D.C. area. 780-3762. J. D. Moore K4ASJ, 9306 Allwood Ct., Alexandria, Va. 22309

NOVICE TRAINING NET. Eastern area slow net meets nightly 7:30 est, 3726 kHz. Write Joe Stratton, WA2OGM, Box 185, RD 1, Glen Mills, Pa.

NCX-500, $250. HT37, $125. HW32 SB600. HP-23 Cal. Mint. $125 or best. Bob, KYLKA, 60-29 56th Drive, Maspeth, N. Y. 11378.

KRACO KS800 Car Stereo Tape Player. $40 I ship. WA2GMD, Bob, 8 Hollis Pl., Huntington Station, N. Y. 11746. 516-HA1-9286.

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HT-46 Xmtr., $170, excellent. Dr. W. Karl, 24 Mill Street, Cooperstown, N. Y. 13326.

SALE: Tempo 2000 Linear/w. 220v supply cable, $285; Eico 717 keyer w/James Research Paddle, $55; Drake MN2000 Match Box never used, $140. EV729 SR Mike, $10. Heath HD 20 Xtal Calibrator, w/crystal. $6.00. F.M. Wood, WB4NRI, Box 278, Seneca, S. C. 29678. (803) 882-3279 evenings.

THANK YOU W1DIU K1PZL W3OEL W5TB W7ZMG for your response to my July CQ ad. Dick, W3WIY.

WANTED: Globe HG-303 CW Xmtr in FB condx. R. Voelker, 101-23 Lefferts Blvd., Richmond Hill, New York. 11419.

LINEAR BUILDERS: 30 Amp Filament Chokes for Grounded Grid Linear Amplifiers. Bifilar wound. Not surplus. $5.00 ea. Postpaid USA. Vonn R. Murrell, K4HHA, 712C Rich Rd., Newport, Tn. 37821.

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SALE: Globe V-10 VFO — $23.00, Astatic JT-30 mike — $6.50. F. Strickhausen, WA0NLR, 715 Tyler, Apt. 36, Topeka, Kansas. 66603.

WANTED: Taylor — 3106/3107 Wind and Speed Direction Indicators. Quote condition and price. O. J. Supliski, 53 Hayward St., Yonkers, New York. 10704.

FOR SALE: HQ-110 Rcvr. 160 thru 6 mtrs. AM-CW-SSB. Gud condx. $125. K0PFV, 8200 Hadley, Overland Park, Kansas. 66204.

SELL: SB10 Adapter, $55, 40M ARC 5 Recvr w/ built-in AF & RF amp & PS in Metal Cabinet, WE 316A UHF Doorknobs. K2STV, 30 Eleanor Ln., Plainview, New York. 11803.

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SB-200 Mint 199-95. (W6RQZ) 1330 Curtis 57 Berkeley, Ca. 94702. Tel. (415) 526-7345.

FOR SALE: 255A Polar Relays, $1.95, Sockets, 75 cents used. BC-604 xmtr $10. New. All, plus postage. W4LRR, 234 Elden Dr N.E. Atlanta, Ga. 30342.

FOR SALE: Drake R4-B rcvr. Henry 2K2 Linear. Crank-up Tristao tower and TH6DXX antenna and Ham-M Rotator. W0KRU, (319-363-6692) 513 Longwood Dr. N.E., Cedar Rapids, Iowa. 52402.

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SELL OR SWAP: Simpson VOM, Scopes, Rcvr's, SASE for list. T. Gosman, 143 Roxton Rd., Plainview, New York. 11803.

SELL: Johnson VIK ad 50 Wts, HG-10B, Knight Star Roamer. All good condition. S-40A needs wrk, but in op. cond. WA2GIE, 72 Parker, Fair Haven, N. J. 07701.

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SELL: Mint Swan 500CX, 117XC, VOX, 800 Cycle Filter—Mark II Linear—Swan 250, 6 meter Xcvr. WA2RJV, Box 2775, Harrisburg, Pa. 17105.

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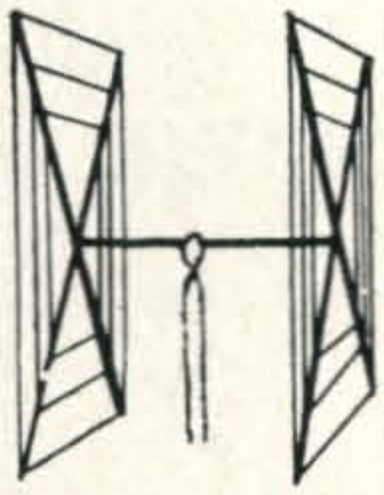
Worked 42 countries in two weeks with my Gotham Quad and only 75 watts...



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings.

Feedline (not furnished); 52 ohm coaxial cable

Now check these startling prices—note that they are *much lower* than even the bamboo-type:

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10-15 CUBICAL QUAD	32.00
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(all use single coax feedline)

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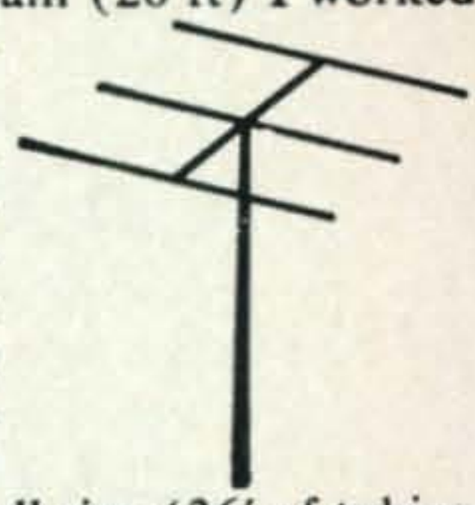
The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

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***20' Boom**

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"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!

FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
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TEMPO/fmp

Truly mobile, the Tempo fmp-3 watt portable gives amateurs 3 watts, or a battery saving ½ watt, FM talk power anyplace at anytime. With a leather carrying case included, this little transceiver will operate in the field, in a car, or at home with an accessory AC power supply. The battery pack is of course included with every unit. This handsome, versatile little package is available only from Tempo. The Tempo fmp . . . $225.00

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Tempo also offers a full line of 2 meter FM amplifiers for mobile or base station operation. Output ranges from 45 to 100 watts for drive power of 1, 5, or 10 watts. Blends state-of-the-art technology with Tempo reliability. Tempo CT1002 10/100 VHF Amplifier $220. Tempo CT602 10/60 VHF Amplifier $145. Tempo CT252A 1/25 VHF Amplifier $85. Plus six other amplifiers for use with all current FM transceivers.

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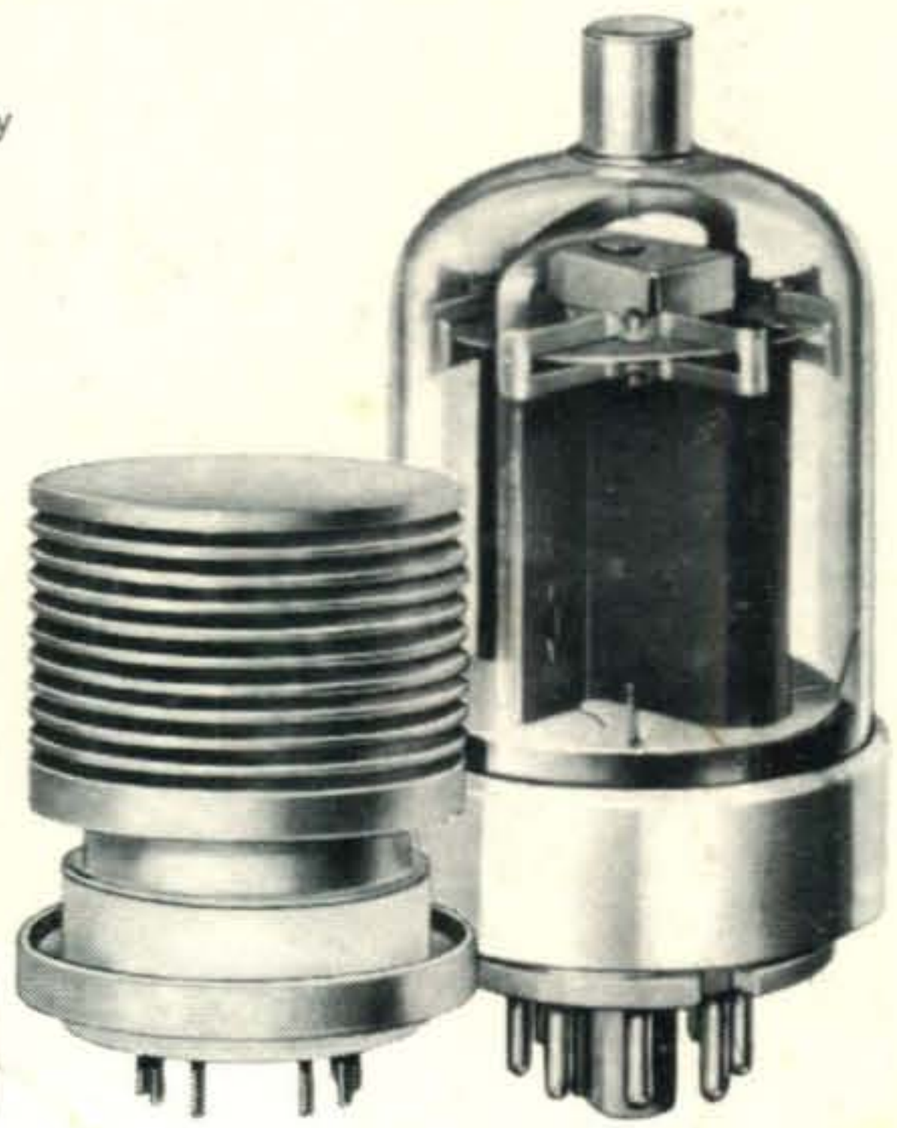

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