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Amateur Radio

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CQ

The Frugal Fifteen:
An Outstanding 15 Meter Antenna That's Cheap
by Lew McCoy, W1ICP ... page 8

RTTY Tape Operation ... page 12

Cassette Interface For RTTY ... page 46

Cubical Quad Antenna Primer-Part I ... page 20

Antenna System Of
Vern Kaspar, W9FAM

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THE RADIO AMATEUR'S JOURNAL

Dyna-"mite."

Miniaturized, 5 memories, memory/band scan

TR-7730

The TR-7730 is an incredibly compact, reasonably priced, 25-watt, 2-meter FM mobile transceiver with five memories, memory scan, automatic band scan, UP/DOWN manual scan from the microphone, and other convenient operating features.

TR-7730 FEATURES:

- **Smallest ever Kenwood mobile**
  Measures only 5-3/4 inches wide, 2 inches high, and 7-3/4 inches deep, and weighs only 3.3 pounds. Mounts even in the smallest subcompact car, and is an ideal combination with the equally compact TR-8400 synthesized 70-cm FM mobile transceiver.
- **25 watts RF output power**
  Even though the TR-7730 is so compact, it still produces 25 watts output for reliable mobile communications. HI/LOW power switch selects 25-W or 5-W output.
- **Five memories**
  May be operated in simplex mode or repeater mode with the transmit frequency offset ±600 kHz. The fifth memory stores both receive and transmit frequency independently, to allow operation on repeaters with nonstandard splits. Memory backup terminal on rear panel.
- **Memory scan**
  Automatically locks on busy memory channel and resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **Extended frequency coverage**
  Covers 143.900-148.995 MHz in switchable 5-kHz or 10-kHz steps, allowing simplex and repeater operation on some MARS and CAP frequencies.
- **Automatic band scan**
  Scans entire band in 5-kHz or 10-kHz steps and locks on busy channel. Scan resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **UP/DOWN manual scan**
  With UP/DOWN microphone provided, manually scans entire band in 5-kHz or 10-kHz steps.
- **Offset switch**
  Allows VFO and four of five memory frequencies to be offset ±600 kHz for repeater access (or to be operated simplex) during transmit mode.
- **Four-digit LED frequency display**
  Indicates receive and transmit frequency during simplex or repeater-offset operation.
- **S/RF bar meter and LED indicators**
  Bar meter of multicolor LEDs shows. relative receive and transmit signal levels. Other LEDs indicate BUSY, ON AIR, and REPEATER offset.
- **Tone switch**
  Activates internal subaudible tone encoder (not Kenwood-supplied).

Optional accessories:

- **MC-46** 16-button autopatch (DTMF) UP/DOWN microphone
- **SP-40** compact mobile speaker
- **KPS-7** fixed-station power supply

More information on the TR-7730 and TR-8400 is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

Synthesized 70-cm FM mobile rig

TR-8400

- **Synthesized coverage of 440-450 MHz**
  Covers upper 10 MHz of 70-cm band in 25-kHz steps, with two VFOs.
- **Offset switch**
  For ±5 MHz transmit offset on both VFOs and four of five memories, as well as simplex operation. Fifth memory allows any other offset by memorizing receive and transmit frequencies independently.
- **DTMF autopatch terminal**
  On rear panel, for connecting DTMF (dual-tone multifrequency) touch pad (for accessing autopatches) or other tone-signaling device.
- **HI/LOW RF output power switch**
  Selects 10 watts or 1 watt output.
- **Virtually same size as TR-7730**
  Perfect companion for TR-7730 in a compact mobile arrangement.
- **Other features similar to TR-7730**
  Five memories, memory scan, automatic band scan (in 25-kHz steps), UP/DOWN manual scan, four-digit LED receive frequency display (also shows transmit frequency in memory 5), S/RF bar meter and LED indicators, tone switch, and same optional accessories.

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Specifications and prices are subject to change without notice or obligation.

New 2-meter direction.

A compact transceiver with FM/SSB/CW plus...

TR-9000

The exciting TR-9000 2-meter all-mode transceiver combines the convenience of FM with long-distance SSB and CW in a very compact, affordable package, ideal for mobile installation. With its fixed-station accessories it becomes the obvious choice for your ham shack.

TR-9000 FEATURES:

- **FM, USB, LSB, and CW**
  All the popular 2-meter modes.
- **Extended frequency range**
  Covers all 2-meter Amateur frequencies as well as MARS and CAP frequencies (simplex and any repeater split) between 143.9000 and 148.9999 MHz.
- **Digital dual VFOs**
  With selectable tuning steps of 100 Hz, 5 kHz, and 10 kHz, convenient for each mode of operation.
- **Digital frequency display**
  Five, four, or three digits, depending on selected tuning step.
- **Scan of entire band**
  Automatic busy stop and free scan.
- **Five memories**
  M1-M4...for simplex or ±600 kHz repeater offset. M5...for nonstandard offset (memorizes transmit and receive frequency independently).
- **SSB/CW search**
  Sweeps between 0 and 9.9 kHz around the selected frequency in 100-Hz steps, while the main knob selects in 10-kHz steps. Easy way to find SSB or CW activity.
- **UP/DOWN microphone**
  "Beep" sounds with each frequency step. (Supplied with TR-9000.)
- **Effective noise blanker**
  Suppresses pulse-type noise on SSB and CW.
- **Improved receiver front-end characteristics**
  Low-noise, dual-gate MOSFET and two-stage monolithic crystal filter.
- **RIT control**
  Receiver incremental tuning, to tune only the receiver slightly off frequency in the SSB/CW mode. Functions on memory, also.
- **RF gain control**
  Threshold-type control, permitting accurate S-meter readings on SSB/CW and FM modes.
- **CW sidetone**
  Enables monitoring of keying during CW operation.
- **Automatic AGC selection**
  AGC time constant selected automatically with MODE switch (slow for SSB and fast for CW).
- **HI/LOW power switch**
  10 watts/1 watt RF output on FM/CW. Always 10 watts on SSB. Improved power module for reliable and stable linear RF output.
- **LED indicators**
  VFO A/B, RIT, ON AIR, and BUSY.
- **Rear-panel accessory terminals**
  Key, memory back-up voltage, tone input, standby, external speaker, DC supply voltage, and antenna.
- **Compact size**
  Only 6-11/16 inches wide by 2-21/32 inches high by 9-7/32 inches deep.
- **Adjustable-angle mobile mount**
  With quick-release levers for easy removal.

More information on the TR-9000 is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

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Matching accessories for fixed-station operation:

- PS-20 power supply
- SP-120 external speaker
- BO-9 System Base...with power switch, SEND/RECEIVE switch for CW operation, backup power supply for memory retention (BC-1 backup power adaptor may also be used for this application), and headphone jack

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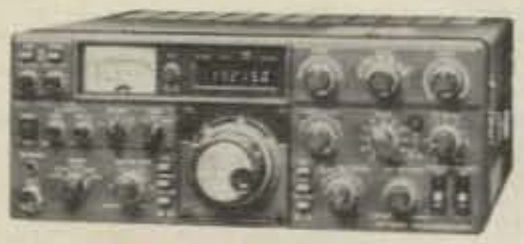
TS-130S

TR-2400



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CQ The Radio Amateur's Journal

ON THE COVER: Vern Kaspar, W9FAM of Frankfort, Indiana snapped this dramatic rainbow as background to his 4 elements on 20 meters at 111 feet and 3 elements on 40 meters at 101 feet. Vern also has a choice of 3 elements on 20, 15, and 10, 5 elements on 15 and 10, and inverted Vees at other heights when the mood strikes him.

AUGUST 1981 **VOL. 37, NO. 8**

FEATURES

DEPARTMENTS

Here's a Concept You Haven't Seen In Amateur Radio For A Long Time— Low Price.

The right design — for all the right reasons. In setting forth design parameters for ARGOSY, Ten-Tec engineers pursued the goal of giving amateurs a rig with the right features at a price that stops the amateur radio price spiral.

The result is a unique new transceiver with selectable power levels (convertible from 10 watts to 100 watts at the flick of a switch), a rig with the right bands (80 through 10 meters including the new 30 meter band), a rig with the right operational features plus the right options, and the right price for today's economy—just $549.

Low power or high power, ARGOSY has it. Now you can enjoy the sport and challenge of QRPp operating, and, when you need it, the power to stand up to the crowds in QRM and poor band conditions. Just flip a switch to move from true QRPp power with the correct bias voltages to a full 100 watt input.

New analog readout design. Fast, easy, reliable, and efficient. The modern new readout on the ARGOSY is a mechanical design that instantly gives you all significant figures of any frequency. Right down to five figures (± 2 kHz). The band switch indicates the first two figures (MHz), the linear scale with lighted red bar-pointer indicates the third figure (hundreds) and the tuning knob skirt gives you the fourth and fifth figures (tens and units). Easy. And efficient—so battery operation is easily achieved.

The right receiver features. ***Sensitivity*** of 0.3 μV for 10 dB S+N/N. ***Selectivity:*** the standard 4-pole crystal filter has 2.5 kHz bandwidth and a 2.7:1 shape factor at 6/50 dB. Other cw and ssb filters are available as options, see below. I-f frequency is 9 MHz, i-f rejection 60 dB. ***Offset tuning*** is ± 3 kHz with a detent zero position in the center. ***Built-in notch filter*** has a better than 50 dB rejection notch, tunable from 200 Hz to 3.5 kHz. An optional noise blanker of the i-f type has 50 dB blanking range. ***Built-in speaker*** is powered by low-distortion audio (less than 2% THD)

The right transmitter features. ***Frequency coverage*** from 80 through 10 meters, including the new 30 meter band, in nine 500 kHz segments (four segments for 10 meters), with approximately 40 kHz VFO overrun on each band edge. ***Convertible power:*** 100 or 10 watts input with 100% duty cycle for up to 20 minutes on all bands. ***3-function meter*** shows forward peak power on transmit, SWR, and received signal strength. ***PTT*** on ssb, ***full break-in*** on cw. PIN diode antenna switch. ***Built-in cw sidetone*** with variable pitch and volume. ***ALC control*** on "high" power only where needed, with LED indicator. ***Automatic*** normal sideband selection plus reverse. ***Normal 12-14V dc*** operation plus ac operation with optional power supply.

The right styling, the right size. Easy-to-use controls, fast-action push buttons, all located on raised front panel sections. New meter with lighted, easy-to-read scales. Rigid steel chassis, molded front panel with matching aluminum top, bottom and back. Stainless steel tilt-up bail. And it's only 4" high by 9½" wide by 12" deep (bail not extended) to go anywhere, fit anywhere at home, in the field, car, plane or boat.

The right accessories—all front-panel switchable. Model 220 2.4 kHz 8-pole ssb filter $55; Model 218 1.8 kHz 8 pole ssb filter $55; Model 217 500 Hz cw filter $55; Model 219 250 Hz cw filter $55; Model 224 Audio cw filter $34; Model 223 Noise blanker $34; Model 226 internal Calibrator $39; Model 1125 Dc circuit breaker $15; Model 225 117/230V ac power supply $129; Model 222 mobile mount, $25; Model 1126 linear switching kit, $15.

New TEN-TEC Argosy $549

Model 525 ARGOSY —— $549. Make the right choice, ARGOSY—for the right reasons ***and*** low price. See your TEN-TEC dealer or write.

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Zero Bias

AN EDITORIAL

In mid-May we flew down to Birmingham for the BirmingHamfest and sampled some true southern hospitality. Although I didn't manage to actually see the famed Vulcan atop the mountain, I was reassured that it was there. We arrived early on Friday morning and were met at the airport by Joe Veras, N4QB, Hamfest Chairman, who drove Dick and I to our hotel and made sure we were settled.

Later in the day Dick and I took a cab to pay a visit to Jimmy Long of Long's Electronics and to get the guided tour of the establishment. He does have an impressive operation in both amateur and audio sales. In fact, later that evening when Dick and I were back at the hotel watching TV prior to turning in, I noticed that the fellow doing the commercial looked familiar, but I couldn't place him right away. You guessed it—it was Jimmy himself doing an admirable job, looking and sounding quite professional.

The folks at the hamfest were very friendly and we were truly welcomed in style. Karl Thurber, W8FX, our Antenna Editor, came by to chat. He now lives about 80 miles from Birmingham and drove over to see the sights and say hello. Another author, Dave Ingram, K4TWJ, stopped by, and Dick James, W4DQU, who I've known for some time, came by to talk about a new antenna that we'll be writing up shortly. Dick also extolled a new industry for Alabama, namely the wine business. He presented me with a bottle of a very nice white wine produced in Alabama. Ernest and Julio watch out!

Dick and I managed to work out some travel arrangements to leave Birmingham on Saturday evening and arrive home late that night. We did get to the LIMARC fleamarket on Sunday and had fresh copies of *CQ* on display along with some choice gems from our respective QTH's. The weather was great for a change, and several thousand amateurs showed up to inspect and buy the goodies. It was really a great weekend.

The Living Legend Lives

This month we add another name to our Masthead, a name that I have known all of my days in amateur radio. It's not that he's so ancient, it's just that I started very young. In the early 1950's, when I began my interest in amateur radio, I used to read *QST* and *CQ* each and every month, and some of my favorite articles were written by Lew McCoy, W1ICP. He was one of my early heroes in amateur radio as a Novice, and I guess that over the years I've built just about everything he's described.

Lew "Mac" McCoy, W1ICP, in a rare photo, perhaps the last known photo of him wearing a necktie. You can find him easily at most Hamfests or Conventions by the Indian turquoise and silver jewelry he wears. In fact, he makes most, if not all, of it himself as another hobby.

I first met Lew, although to many he is known as Mac, when I began working for *CQ* in 1961. I began going to Hamfests and Conventions where I would see Lew enthrall audiences with his talks, and it was exciting just to meet and talk to him. Lew is "on" all of the time. He never talks down to someone and will spend an infinite amount of time with anyone with a question just to make sure he or she understands. He's been sort of the Pied Piper of amateur radio, instilling an enthusiasm in everyone who's met him or read his work. He is literally a living legend who has been known to drive people crazy at Conventions with his game of "Petals Around The Roses," but that's another story for another time.

The following biography outlines his history in amateur radio and his tenure at the ARRL. We are especially proud that he has joined our staff. This month we also present the first of what we expect to be many articles by Lew, and I know they will once again foster the dream of building in many of us.

Lew McCoy, W1ICP

Lew McCoy, W1ICP, was first licensed in 1946 with the call W9FHZ (in Chicago). Lew got his interest in amateur radio from his father who was an early spark experimenter. W1ICP went to work for the League in 1949, retiring from there on July 1 of this year. During his 30 years at the ARRL he was employed in many capacities. His first job was Asst. Communications Manager. His most notable accomplishment in that position was being the originator of the 10-meter W.A.S. Contest and the Novice Roundup. In 1951 he moved over to the Technical Department as a Technical Asst., working under technical greats such as George Grammar, Byron Goodman, and Don Mix. In the early 50's Lew traveled the then 48 states lecturing on TVI, demonstrating the methods for curing the problems. About that time, the Novice License was created by the FCC, and Lew wrote an article for the newcomer every month, rolling up an impressive number of articles over the years. He is the originator of circuits such as the ultimate or universal transmatch and the monimatch. Versions of both circuits can be found in nearly every ham shack in the world.

Lew did extensive traveling and lecturing over the years and completed his later years as F.M. Editor, which entailed considerable FCC contact work. He retired as Senior Asst. Technical Editor, and now lives in Silver City, New Mexico.

He is married (40-plus years) and has two daughters (one is W1HAQ) and two grandchildren. Lew says right now his proudest moment is for his older daughter's husband, Neil, who at age 44 finished in the top third classification in the Boston Marathon.

Lew was a member of the Awards Committee and holds very early WAZ and both Phone and C.W. DXCC and likes all modes of communications.

73, Alan, K2EEK

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Please send all reader inquiries directly.

Announcing

- **Micro-expedition to Forest County, PA** - On August 1st and 2nd there will be a micro-expedition to Forest County, Pennsylvania. Call is WB3IQE/3; mode is c.w. only. Frequencies are 80, 40, and 15 meters somewhere in the bottom 50 kHz of each band. QSL to WB3IQE, RD 1 Box 297, Brockway, PA 15824. Canadian and U.S. stations send s.a.s.e. DX stations send 1 IRC for QSL via ship, 2 IRC's for airmail.
- **Jacksonville Hamfest** - The Greater Jacksonville Hamfest Association will hold the Ninth Annual Jacksonville Hamfest and Northern Florida Section ARRL Convention on August 1st and 2nd at the Orange Park Kennel Club. Two-meter talk-in by W4IZ on 146.12/.76 and 146.07/.67. Advance registration is $3.50 and is available from Robert J. Cutting, W2KGI, 1249 Cape Charles Ave., Atlantic Beach, FL 32233. Registration at the door is $4. Swap tables are available from Andy Burton, Jr., WA4TUB, 5101 Younis Rd., Jacksonville, FL 32218 at $12 per table for both days.
- **Upper Peninsula Hamfest** - The 33rd Annual Upper Peninsula Hamfest, sponsored by the Delta Co. Repeater Assoc., will be held on August 1-2 in Escanaba, Michigan at the Flat Rock Township Hall. Registration will be $2. For more information, contact Aileen Gagnon, WA8DHB, Kipling Loc., Mtd. Rte., Gladstone, MI 49837.
- **Northcentral Missouri Hamfest** - The Third Annual Northcentral Missouri Hamfest will be held on Sunday, August 2nd in Moberly, Missouri at the Municipal Auditorium. Doors open at 9 a.m. Tickets are $1.50 in advance, $2 at the door. Special forum featuring Bob Heil, K9EID. Talk-in on 147.69/.09, 146.52, and 3963. For more information, contact Charles Coy, WBØENV, 601 McKinley, Moberly, MO 65270.
- **Northwest Kansas Swap Meet** - This 1st amateur radio event will take place on Sunday, August 2nd at the Community Building Colby, Kansas. Doors open at 9 a.m.; auction at 2 p.m. Admission is $1, tables $1 each. Talk-in on 146.22/82 and 52/52. TVRO demonstration. Sponsored by the Trojan ARC. For more information, contact WAØGBN or KAØFBQ.
- **1981 Northwest DX Convention** - This event, sponsored by the Willamette Valley DX Club, will be held on August 8th and 9th at the Greenwood Inn in Beaverton, Oregon. For more information, contact the Willamette Valley DX Club, P.O. Box 555, Portland, OR 97207.
- **Kansas-Nebraska Hamfest** - The Kansas-Nebraska Radio Club will host their 30th annual hamfest on August 8-9 at the Cloud County Community Junior College in Concordia, Kansas. For more information, contact Don Nulton, Rt. 3, Concordia, KS 66901.
- **VHF '81** - The combination state convention of the Texas VHF FM Society and the second annual Super Central Texas Swapfest will be held August 14, 15, and 16 at the Hilton Inn, Austin, TX. Registration is $5 in advance, $6 at the door. Talk-in on 146.19/79. For more information, contact VHF '81, P.O. Box 13473, Capitol Station, Austin, TX 78711.
- **Radio Club of Tacoma Hamfest** - This annual hamfest will be held at Pacific Lutheran University in Tacoma, Washington on August 15th and 16th. Featured will be technical seminars, large flea market and commercial displays, and more. For details, contact WB7QNS, 517 Berkeley Ave. West, Tacoma, WA 98466.
- **New Delmarva Hamfest** - The Sixth Annual New Delmarva Hamfest will be held on Sunday, August 16 at Gloryland Park, Bear, Delaware from 8 a.m. to 4 p.m. Admission is $2.25 in advance, and $2.75 at the gate. Tail-gating or table space is $3.50. Talk-in on 52 and 13/73. For more information, or tickets, contact Stephen J. Momot, K3HBP, 14 Balsam Rd., Wilmington, DE 19804.
- **Sandy River ARC/Somerset ARA Hamfest** - These clubs are sponsoring this hamfest on August 22nd at the Farmington, Maine Fairgrounds. For more information, contact Charles Stenger, W1HTG, Box 111, East Dixfield, ME 04227.
- **1981 Illinois State ARRL Convention** - The Fox River Radio League will host this event in conjunction with its annual hamfest on Sunday, August 23rd from 8 a.m. to 4 p.m. at the Kane County Fairgrounds in St. Charles, Illinois. Advance tickets are $1.50; tickets are $2 at the gate. For advance tickets send an s.a.s.e. to Jerry Frieders, W9ZGP, 1501 Molitor Road, Aurora, IL 60505. Commercial exhibitors contact Mike Pittard, KA9EVT at 312-896-7383. Talk-in on 146.94.
- **St. Charles ARC Hamfest '81** - This event will take place on August 23rd at the Wentzville Missouri Community Club. Admission is $1 per car. Tickets are $1 each in advance; $1.50 at the door. For more information, contact SCARC Hamfest '81, c/o Bill Graham, 512 Bermuda Dr., O'Fallon, MO 63366.
- **Iowa 75 Meter Net Picnic and Swapfest** -This event will be held on Sunday, August 23rd at Ewing Park, in Southeast Des Moines, Iowa. Talk-in on 34-94. For more information contact WBØJFF.
- **Bluefield Hamfest '81** - The East River ARC, Inc. will sponsor Bluefield Hamfest '81 on Sunday, August 23rd at the Bluefield Armory/Civic Center. Admission is $2 in advance; $3 at the gate. Tables are $5 each. Talk-in on 89/49 and 52/52. For more information, contact Bluefield Hamfest '81, 2113 Hemlock Hill, Bluefield, WV 24701.
- **Special Event Station WB7TBN** - The Pend Oreille ARC will be operating a special event station, call WB7TBN, from the Pend Oreille County Fairgrounds on August 27, 28, 29, and 30. Frequencies will be 14.340, 21.400, 28.700, 39.45, 37.15 c.w.; and 28.090, 21.090, 14.080, and 36.50 RTTY. They will be on the air from 1600Z to 0500Z each day. A special commemorative QSL will be available for an s.a.s.e., which may be sent to WB7SGU, Star Rt. Box 251, Spirit Lake, Idaho 83869.
- **Tioga County ARC 5th Annual Hamfest** -On Saturday, August 29th this event will take place at the Tioga County Fairgrounds just off US Route 6 between Wellsboro and Mansfield, Pennsylvania from 8 a.m. to 4 p.m. Talk-in on 146.19/79 and 52. Registration is $3. For more information, contact P.O. Box 56, Mansfield, PA 16933, or Carl Kimble, WB3EUE.
- **The Great Escape Dxpedition** - Members of the Lake County ARC are planning a DXpedition from the jail cell in Crown Point, Indiana from which John Dillinger fled in 1934 during his famous "wooden gun" escape. The operation is scheduled for 1800Z August 29th to 0300Z August 30th, and from 1400Z to 2300Z August 30th. Operators will be using the club callsign W9LJ on 14.300 s.s.b. and 7.115 c.w., plus or minus QRM. Each contact will be confirmed by a special QSL upon receipt of a card and an s.a.s.e.
- **G.C.A.R.C. Hamfest** - The Gloucester County ARC will hold their hamfest on August 30th from 8 a.m. to 3 p.m. at Gloucester County College, Tanyard Road, Sewell, New Jersey. Tickets are $2 in advance; $2.50 at the door; $6 for tailgaters and dealers. Talk-in on 146.52 and 147.78/18. FCC exams will also be given. For more information, contact G.C.A.R.C. Hamfest Committee, P.O. Box 370, Pitman, NJ 08071.
- **LaPorte County Hamfest** - This annual hamfest sponsored by the LaPorte and Michigan City ARC's will be held on Sunday, August 30th at the County Fairgrounds on Highway 2, west of LaPorte, Indiana. Flea market area. Indoor tables are $1 each. Advance tickets are $2 each with an s.a.s.e. to P.O. Box 30, LaPorte, IN 46350.
- **Amateur Radio Prep** - Amateur Radio Prep, located at 415 East 80th St., New York, NY 10021, has been operating for over five years as an experimental school developing new methods of teaching amateur radio theory and Morse code. During the fall of this year and winter-spring 1982, Amateur Radio Prep will conduct an unusual series of experimental cable telecasts. For information on participating in this experimental program, contact Larry Horne, N2NY, at the above address.

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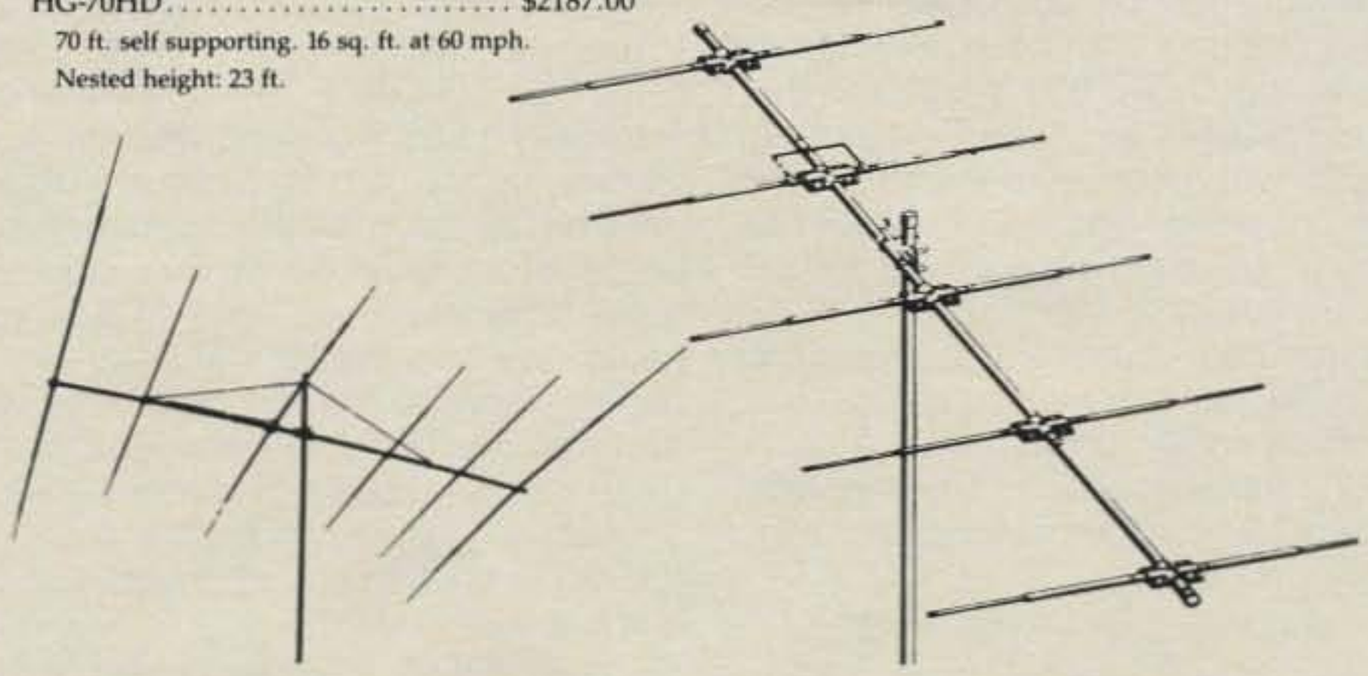

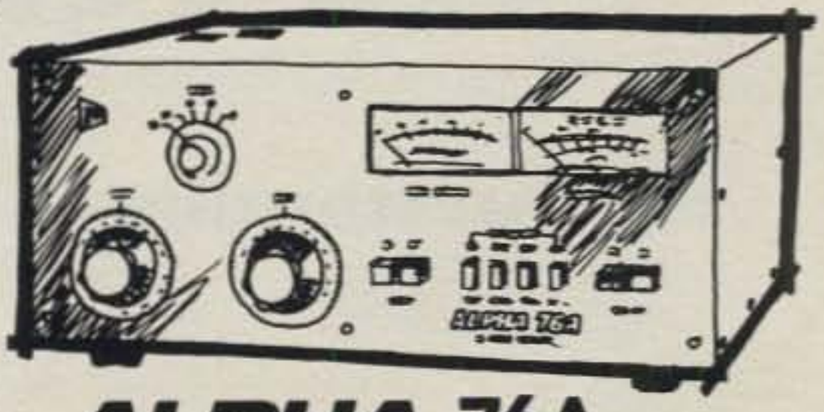

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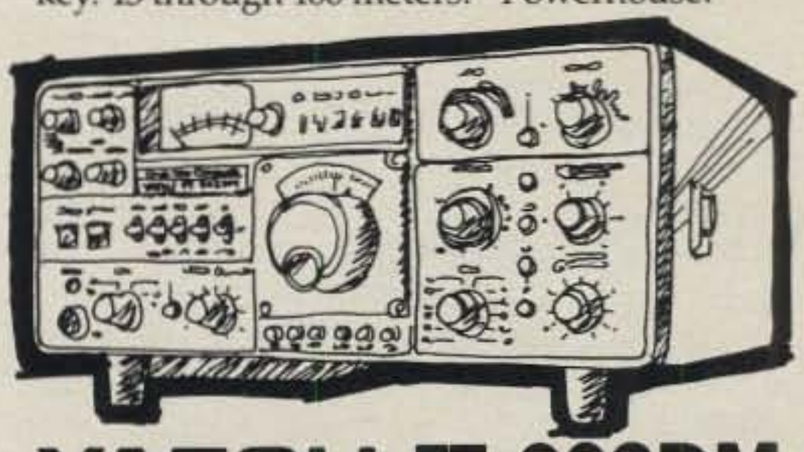

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The Frugal Fifteen

An Outstanding 15 Meter Antenna That's Cheap

BY LEW McCOY*, W1ICP

Some years ago I designed an antenna for 15 meters that was very popular and is still used by many amateurs.[1] It was a one-element rotary dipole that was extremely inexpensive to make. It was simple to build, and it *always* worked. Other amateurs added elements to make the antenna either a two- or three-element beam (we'll show you how to do that). I should add that the dipole itself, according to prices within the last month or so, could be constructed for less than $10, and with another element, say $15. For an antenna that will provide about a true 4 to 5 dB of gain, that's pretty dog-gone good.

What It Is

Let's discuss the dipole first and what you can expect from it. Electrical thin-wall tubing, ½-inch diameter, is used for the elements, and these sell for about $1.50 each at hardware discount houses. The tubing comes in 10-foot lengths. Two lengths are too short for a 15-meter dipole (a 15-meter dipole would be something over 21 feet long). However, in our case the 20-foot length is ideal. Here is why. A short antenna (dipole) will exhibit capacitive reactance at the feedpoint. By adding the correct amount of inductance (a coil) we can cancel out the reactance, and in this 15-meter case we end up with a truly perfect match for 50-ohm cable. In fact, the dipole shows a match of less than 1.2 to 1 across the entire band! It works out so well for a match that it is ridiculous.

Originally, we made the coil from copper tubing, but this is not necessary. We used some single conductor No. 12 copper wire stripped from a piece of Romex house wiring cable. It is suggested that you get a 10-foot length of Romex from Sears or wherever, strip off the outer jacket covering, and you'll have two lengths of insulated copper wire for this and other projects.

Another item you'll need is a length of ½-inch PVC plumbing tubing. This is used for what we call the primary insulators for mounting the elements to their supports. The ½-inch PVC slides easily over the ½-inch thin-wall tubing.

How It Works

We'll get back to construction details in a moment, but first let's discuss a dipole and what you can expect from one. Any of the antenna books will show you that a halfwave dipole will exhibit a figure-eight pattern of radiation if it is at least more than a half-wavelength above ground. Note that we keep saying "half wavelength" dipole. Many amateurs mistakenly assume that a dipole is always a half-wavelength long, by definition. Not so. A dipole can be any length; the term merely means two conductors of equal length. A dipole longer or shorter will exhibit different patterns. (In our case, our dipole is so close to a half-wavelength that the figure-eight pattern holds.)

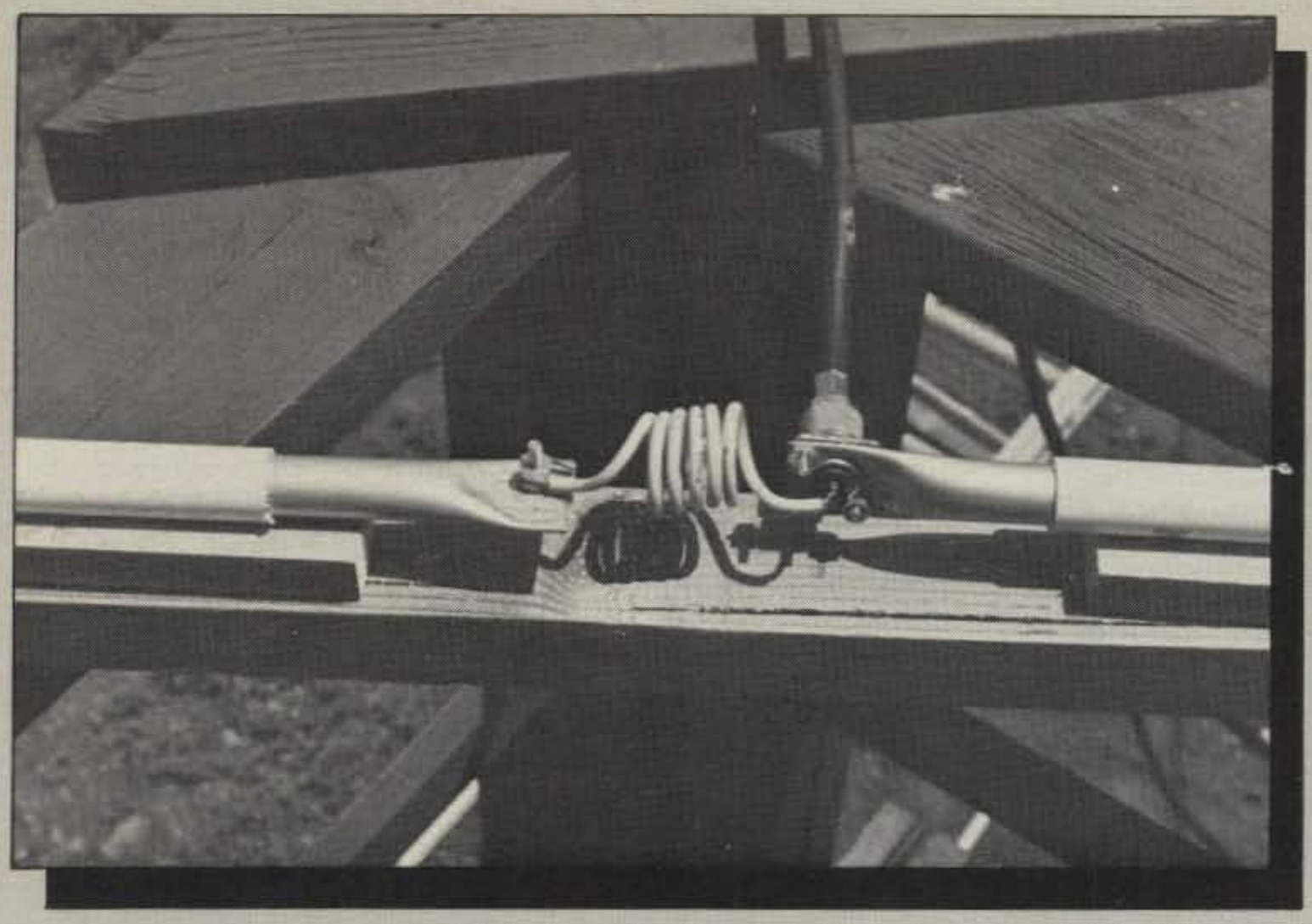
It is important to keep in mind that the figure-eight pattern shown in fig. 1 only holds true if the antenna is at least a half-wavelength above ground. We have seen literally thousands of amateurs knock themselves out orienting an 80-meter dipole in order to get directivity with an antenna 30 or so feet up, when in fact, they could have oriented the antenna in any direction because the radiation pattern at such low heights above ground is practically omnidirectional. However, on 20 through 10 meters it is fairly easy to get the dipole up high enough so we can obtain the figure eight.

If you put up this dipole, you'll only need to rotate it 180 degrees for complete coverage; if you add a reflector then you'll have to go all the way around. However, we suggest trying the dipole first. If you have never used a rotatable antenna you are going to be amazed! The front-to-side signal rejection is infinite (in theory, but not in practice). You'll see 40 over S9

*200 Idaho St., Silver City, NM 88061

[1] *McCoy, "A One-Element Rotary for 21 Mc.," QST, Jan. 1955.*

Say You Saw It In CQ



This is a close-up of the coil and feed of the dipole. L1 is wound on a piece of PVC (for a form) and then slid off. As mentioned in the text, coat the element mounting screws with paraffin to provide good insulation.

This is a close-up view of the reflector loading coil. The frequency was determined by using a grid-dip meter and counter. If a director were to be added to the beam, the element frequency would range close to 21.2 plus 1.0 MHz or 22.2 MHz. (That would be approximately 5% shorter than the driven element.)

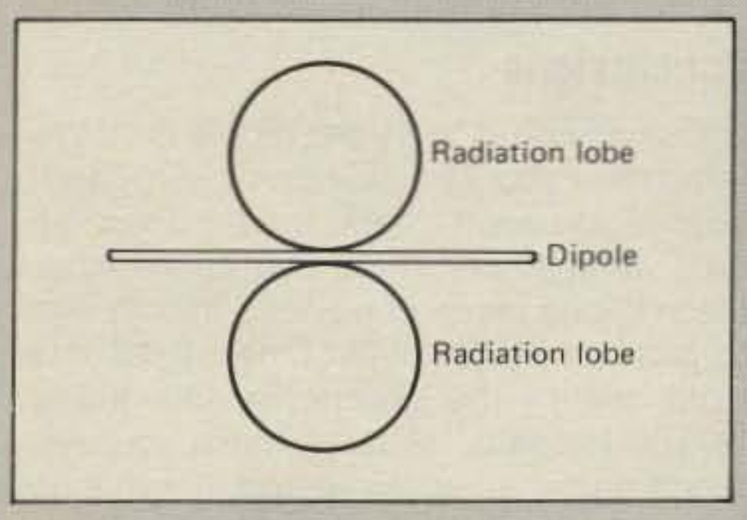


Fig. 1– This shows the typical figure-eight pattern that exists when a half-wavelength dipole is used. As one can see, the pattern needs only 180-degree rotation for complete coverage.

signals drop to an S1 or 2 (or become inaudible in some instances). In any case, that is generally how the dipole works; you rotate the figure-eight pattern to get the best signal. If you add a reflector, you can expect to add about 4.5 dB of gain and about 10 dB or so front-to-back ratio. Oh yes, one more thing: In an article on antennas in another magazine a few months back the author stated that 1 dB really didn't make any appreciable difference. In your amateur career always remember one important point: We are in a competitive hobby. You show me an amateur who says he doesn't care if his buddy beats him out on a contact, and I'll show you a guy who really needs to be educated. Always—and I mean *always*—strive to get the most efficiency out of your station. Every dB *does* count. Let that be your motto.

Dipole Construction

Figs. 2 and 3 show nearly all of the construction details needed to complete the antenna; the photos do the rest. A length of 2″ × 2″ about six feet long is needed for the dipole support. Four pieces of 1″ × 2″ × 6″ are used for the element to rest on. Either pine or fir can be used for all the wooden parts and usually, if you are a good enough scrounger, you can probably get all the wood from a construction site; usually scraps abound. But even if you have to buy the wood it is cheap enough.

Flatten one end of the thin-wall tubing in a vise or with a hammer and then drill and mount an SO-239 coax fitting on the flattened portion. Flatten the other piece of tubing and mount a screw and a nut. The coil, L1, goes between the SO-239 inner conductor and the screw and nut on the other section of the dipole.

Cut four lengths of PVC tubing 6 inches long, and slide two of them over each end of the dipole. Place the tubing on the wooden supports, and mark the support positions. The supports can be nailed to the 2″ × 2″, but drill the supports before nailing to avoid splitting them. Next, drill through the PVC and metal tubing, and using 1¼-inch screws mount the elements in place. Run the screws back out and coat them with paraffin to provide insulation. Wood isn't a bad insulator, but the paraffin will help. Originally, we used a pipe floor plate to hold the 2″ × 2″ with a length of pipe in the floor plate for the mast. The dipole can be mounted in its fixed location. TV mounting hardware is excellent for this purpose, and a TV rotator can be used to rotate the antenna, either the dipole or with a reflector. Even the "Armstrong" method can be used in-

Here is the author holding the reflector. It (the element, not the author) is very lightweight.

stead of a rotator. If you decide to use a reflector, the two pieces of tubing are mounted similar to the driven element, except a loading coil is installed at the center of the two pipe lengths. Electrical connections are made via self-tapping screws through the PVC connecting to the tubing.

The reflector is made 5% longer electrically than the driven element. The boom is a length of 2" × 4" fir, 8 feet long. This comes out to 0.2 wavelength, which does not change the feed impedance too much. One could probably use 0.15 spacing just as well (6 foot boom length). The wooden element supports are mounted to the 2" × 4" with lag bolts and the floor-flange is mounted at the balance point.

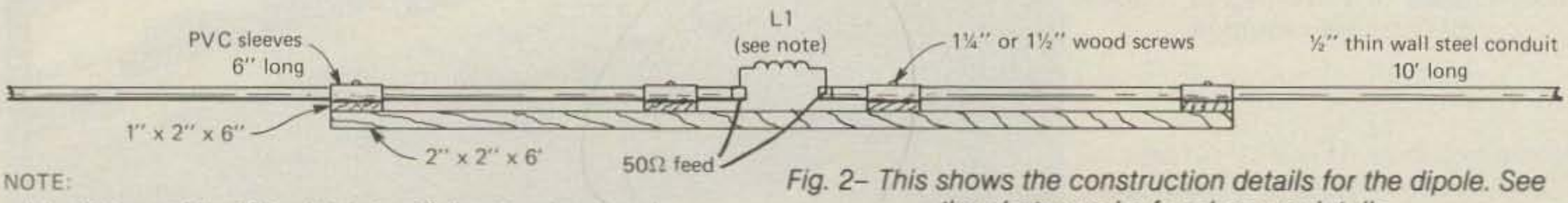
For whatever it's worth, our antenna shows about two S units or more from front to back. So, we do know it has front to back. Our location is about as good as one can find in the country. We are at 6300 feet right smack on the continental divide, and our ground conductivity is unbelievable, consisting primarily of manganese and copper. However, we knew that before buying the location, so any antenna tests have no relation to real life. Suffice it to say, using just the dipole and one kw, we couldn't find a pile-up we couldn't crack with just one or two tries. With two elements the feed impedance dropped slightly, but the s.w.r. was still less than 1.5 to 1 across the band.

Balun Or Not

There has been much fussing about whether or not a balun is required with a dipole antenna. If it makes you feel good, use one. However, with *this* antenna, we don't recommend one. About the only thing that could happen without a balun would be a slight pattern "skewing," but this would be less than a degree or so.

Conclusions

Our advice is to try the dipole first. We guarantee you'll be pleasantly surprised. Then if you want to add the reflector, so be it. With all our years of antenna work there is one piece of advice I always like to pass on to the newcomer. I got this from one of the greats, By Goodman, W1DX. He said, "Always make your antenna as big as possible and mount it as high as possible. If it stays up it is neither big enough nor high enough!" Good luck.



NOTE:
L1 = 5½ turns of No. 12 insulated wire, 1" diameter, close-spaced.

Fig. 2– This shows the construction details for the dipole. See the photographs for close-up details.

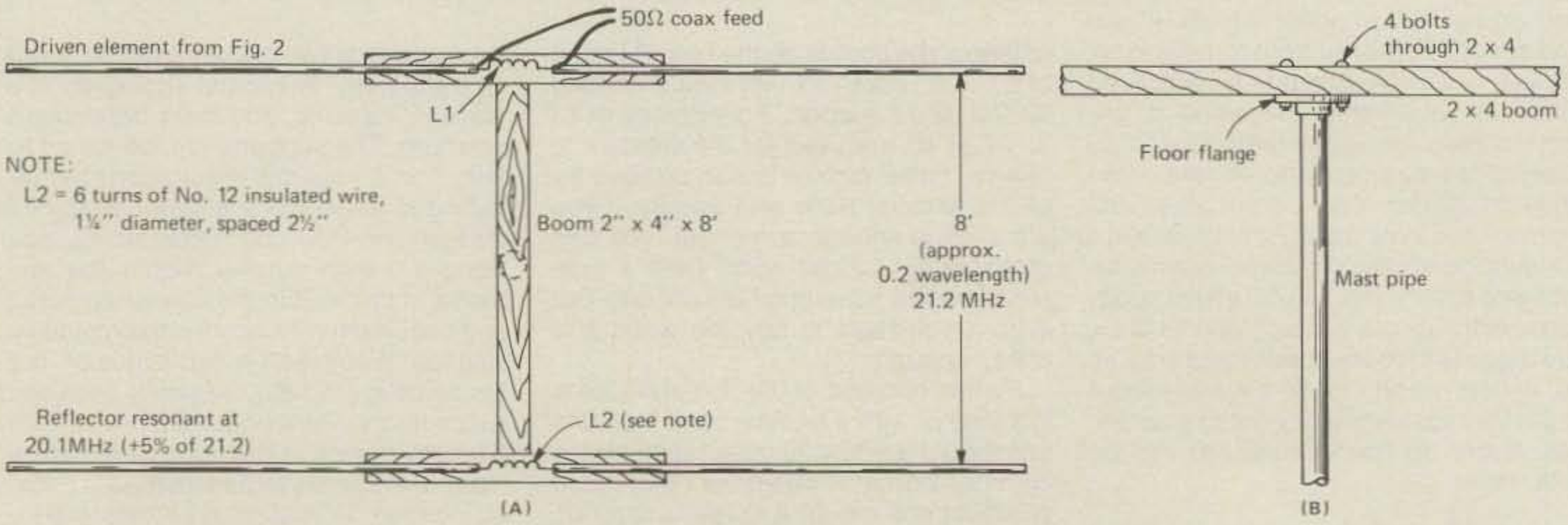


Fig. 3– At (A) are the dimensions for a two-element beam. The driven element is figured for 21.2 MHz. At this frequency the s.w.r. is low enough to cover the entire band. The boom length provides approximately 0.2 wavelength spacing. The dimension is not critical. At (B) is a detail showing the floor flange support for the boom.

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CIRCLE 10 ON READER SERVICE CARD

One of the most useful adjuncts to an RTTY station is a tape recorder. Little has been written about the considerations used in selecting and using a tape recorder for RTTY. N5AEN gives us the basics of RTTY tape operations.

RTTY Tape Operation

BY ARTHUR H. WERTZ*, N5AEN

The minimal equipment for radio-teletype or RTTY operation, of course, is a transceiver, a terminal unit (modulator and demodulator), a keyboard, and a page printer. This provides the basic capability to receive RTTY and to send manually a character at a time. Since many, if not most, RTTY operators are marginal typists at best, a method of pre-recording RTTY messages and information to permit faster and more accurate operation is the first addition to be made to the RTTY station. In message handling, such as RTTY or MARS traffic nets, a means of recording incoming messages for later retransmission is indispensible.

Paper Tape

The first, and still common, method of RTTY storage uses punched paper tape, as shown in fig. 1. A perforator or tape punch device recognizes the characters and punches a series of holes across a ¾ or ⅞ inch wide paper tape. The paper tape is contained in a reel on the tape punch and is stepped through the tape punch a character at a time as each character is received. In Baudot operation a combination of five holes are punched for each character. The punched hole represents a MARK element or bit, and the absence of a punched hole represents a SPACE element or bit. In newer tape punches that are designed for ASCII operation a combination of eight holes is punched for each character, again corresponding to the MARKs and SPACEs in the character. Some tape punches have a capability to print the character in the space on the tape between the punch holes. This makes it simple to read the information on the tape, but with a little practice, the characters can be read directly from the punched hole combinations. The perforator can be wired to the RTTY terminal unit to punch tapes of received RTTY or to the keyboard to permit punching or "poking" of tapes to be transmitted later.

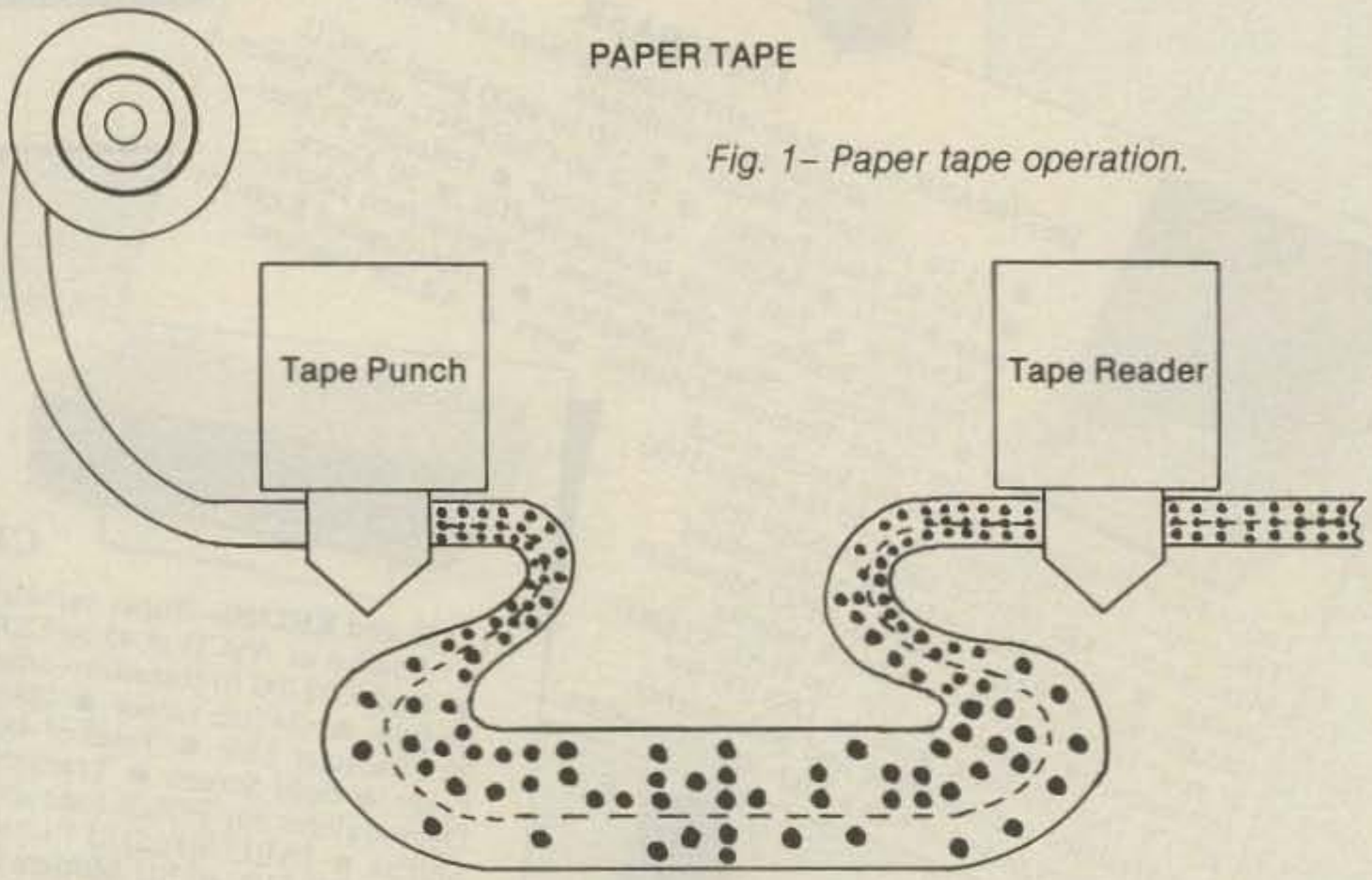

Fig. 1– Paper tape operation.

Transmission of RTTY paper tape messages is done with a transmitter-distributor or tape reader. The paper tape is fed into the tape reader and stepped through it a character at a time as the message is sent. The tape reader contains a set of sensing pins that detect the presence or absence of punched holes. These pins are mechanically connected to electrical contacts which generate the RTTY signal. The output signal will then be a MARK bit for each hole and a SPACE signal for each absence of a hole in the tape. The motor speed and gear arrangements determine the speed of transmission (60, 75, or 100 w.p.m.). The mechanical configuration of the tape reader head dictates the use of narrow tape (Baudot) or wide tape (ASCII). Later model tape readers are capable of both ASCII and Baudot operation. Some later models use lamps and photocells instead of mechanical sensing pins to "read" the tape. Although this lamp/photocell system eliminates the intermittent contact problems of the sensing pin system, the lamp/photocell system is more sensitive to the condition of the tape. If the tape has grease spots on it, these will be detected as punched holes since the lamp will shine through the grease spots. Small pieces of paper fiber and lint will collect in the area of the lamps and photocells and produce erroneous characters.

The primary advantages of paper tape are the ability to directly read the information on the tape visually and the permanent nature of the tape for retention. The data can be read from the printed characters on the tape or the punched hole combinations. The information punched on the tape cannot be changed or inadvertently erased.

In the case of tape punch operation the tape punch acts as a tape buffer. The characters will be punched directly after each other regardless of the speed of typing the characters. Even with "hunt and peck" typing, the result will be one continuous string of punched characters which will be transmitted at the full operating speed.

*8019 Riata Drive, San Antonio, TX 78227

Say You Saw It In CQ

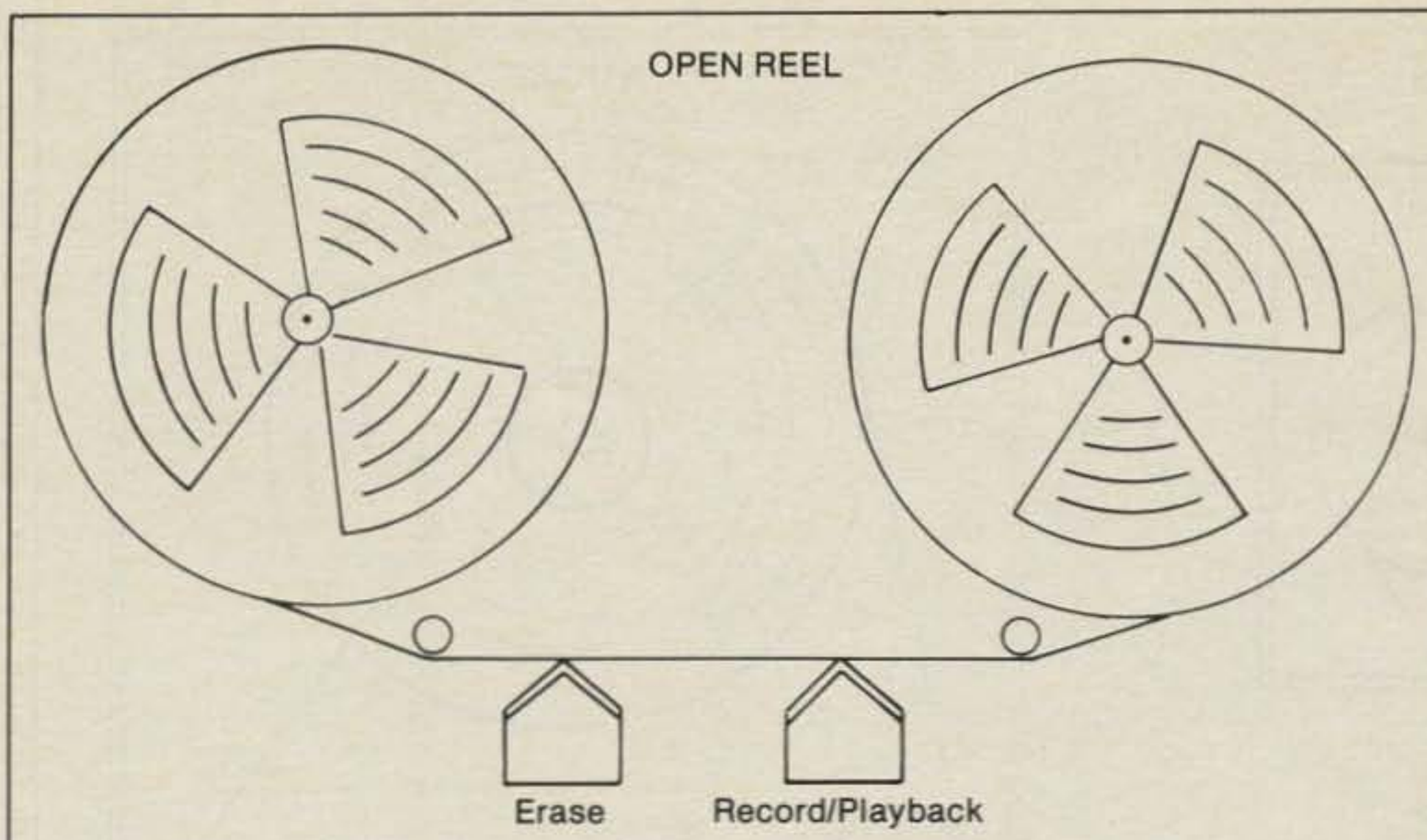

Fig. 2–Open reel or reel-to-reel recording.

Paper tape also has some disadvantages. The paper tape is relatively fragile since it is just an exposed length of paper strip. It can easily be torn or become unusable by absorbing water or oil. The loose strip is bulky and takes a large amount of storage space. Most paper tape punches and readers are limited mechanically to operation in a single code at a single speed. The electro-mechanical equipment with a large number of moving parts is subject to wear and tear and requires frequent mechanical adjustments.

Open-Reel Magnetic Tape

An earlier substitute for paper tape was the use of an open-reel magnetic tape recorder to record the audio tones (AFSK) of the received and transmitted signals. (Somewhere back in history, some amateur probably tried using a wire recorder before tape recorders were available, but wire recorders were hardly practical for audio recording, much less RTTY.) The tape recording could then be played back through the transmitter to relay the message, or played back through the MODEM (modulator-demodulator) to produce hard copies. The open-reel recorder, as shown in fig. 2, was similar in function to the tape punch and reader. Instead of a reel of paper tape, a reel of magnetic tape was used. The use of both supply and takeup reels eliminated the problem with tape punches of having the floor covered with paper tape. The record/playback head served the same purpose as the tape punch pins and the sensing pins. Open-reel tape recorders are still commonly used in computer systems for mass data storage. The tape transport systems, though, are far beyond those used in home tape recorders. These sophisticated tape drive units permit rapid retrieval of selected information from the tape.

Open-reel recorders have the inconvenience of mounting and threading loose reels of tape, and running the tape back and forth in order to locate the desired part of the recording. Most tape recorders have a digital counter, connected to the supply or takeup reel, which can be used to roughly locate the position of information on the tape. These are fairly accurate, though not precise, but their usefulness is dependent upon your remembering to reset the digits to zero at the beginning of each tape.

If a stereo tape recorder is used, with the RTTY signal recorded on the left track and identifying voice information recorded on the right track, an easier system of finding selected data on the tape is now available. Prior to recording a message, the following could be recorded on the right track: "start of message number one." The tape can then be returned to that point after recording and stopped precisely at the beginning of message number one. If, just prior to the end of the message, "message number one ending" is recorded, you are alerted to be prepared to stop the tape. Other audio information, such as QSO information, can be added to the second track: "contact with WA5XYZ on July first 1980," or "RTTY picture, Miss Impossible, from KØARG on September seventh 1979." This allows easy identification of the data on the tape by listening to the audio track, rather than playing it into a page printer to see what is on a tape or portion of a tape. The audio information can also be used to identify the speed (60/100 w.p.m.), the code used (ASCII/Baudot), and the AFSK audio shift (170/850 Hz).

Unless the tape recording is made from some sort of buffer which will compensate for the speed of typing, the total recording and transmitting time will be the same as the total typing time. In other words, if you type at 10 w.p.m., a 150-word message will take 15 minutes to type and 15 minutes to send, even though the baud rate may be 100 w.p.m. per character. This problem can be minimiz-

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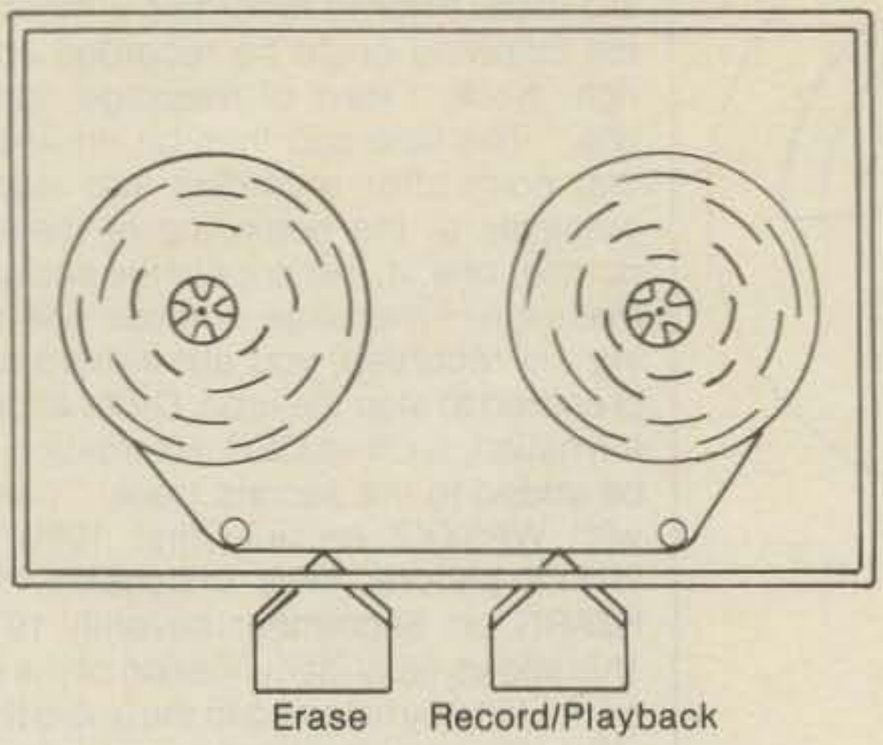

Fig. 3– The typical cassette recorder.

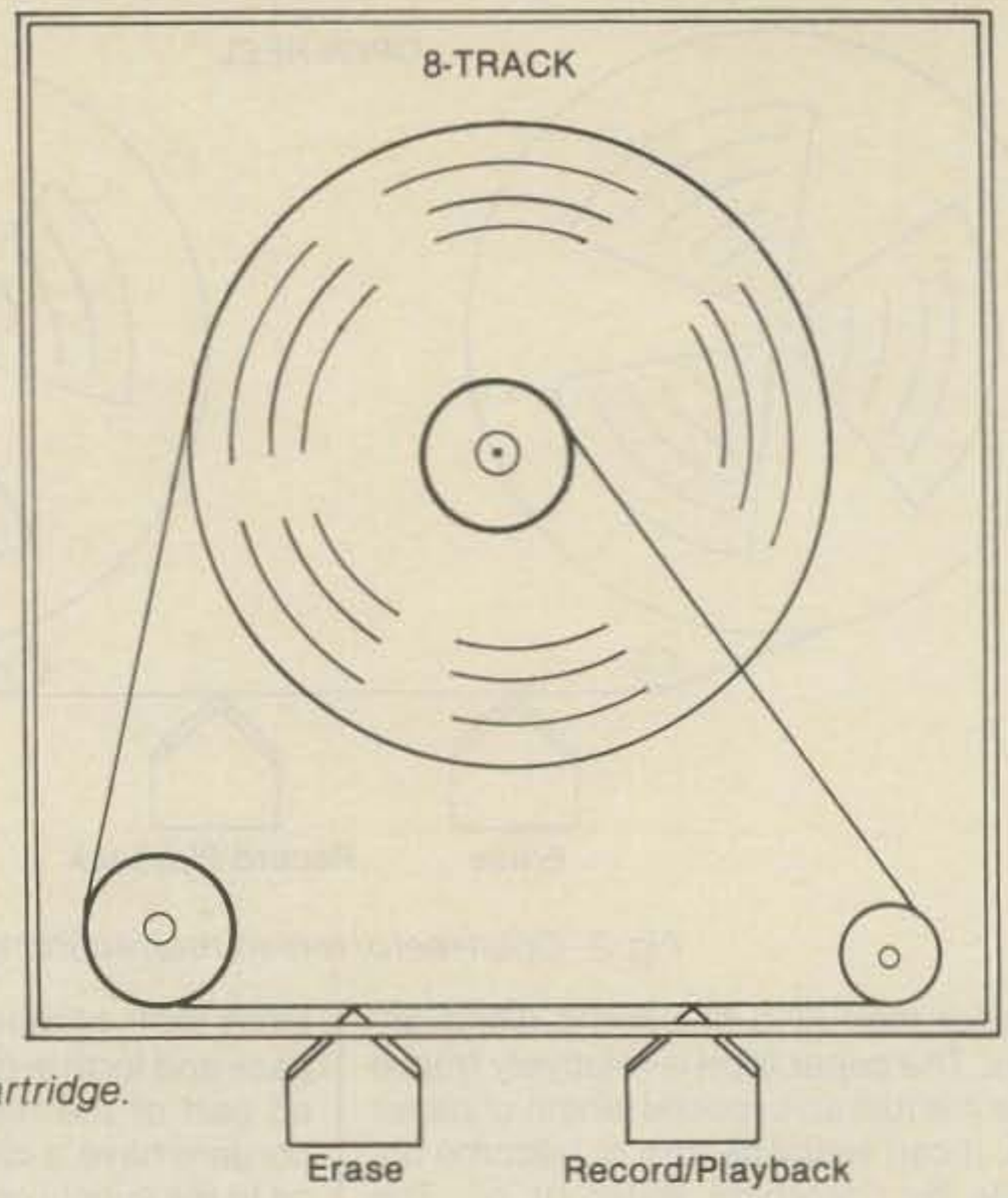

Fig. 4– The eight-track cartridge.

ed by composing and typing up a draft of the message, making all necessary corrections to it, and then retyping and recording it in one continuous session.

Cassette Recordings

The most common system of magnetic tape recording used by amateurs is the cassette tape recorder. Cassette tape recorders are similar to open-reel recorders, except that they utilize a tape container, as shown in fig. 3, which completely encloses the two tape reels. The compact tape cassettes are easy to store and load, and the tape is automatically threaded when the cassette is inserted into the tape compartment of the recorder.

Cassettes are readily available in 30, 60, and 90 minute sizes. One-half of this recording time is available on one side of the tape; the cassette is then manually turned over, and the other half of the recording is made. Cassette tape recorders specifically designed for computer data recording operate in both directions to eliminate physically reversing the tape, but this capability is not included in the tape transport mechanisms used with standard tape recorders.

Audio cassettes have several drawbacks for RTTY operation. Finding specific portions of the tape requires searching with forward and rewind functions and monitoring the output to locate certain data. The digital counter, if the recorder has one, is helpful in getting close to the desired section. The tape must be rewound after each playback to repeat the data unless the information is continually recorded on the tape. Even then, the tape must be rewound at the end of the tape. As with the open-reel recorder, the actual message recording and sending time depends on typing speed.

Most amateurs use portable-type cassette recorders, since they are low in cost and are entirely adequate in fidelity for RTTY frequencies. Their speed stability leaves much to be desired at high baud rates but is satisfactory for RTTY speeds. These are battery-operated units, which has no particular advantage in RTTY operations and is actually a hindrance, since battery chargers or eliminators must be used for extended periods of operation. Most of the recorders are two-track monaural and run at a standard speed of 1⅞ inches per second (IPS). They have an audio amplifier and speaker built-in, which is convenient for monitoring and locating information on the tape.

A better cassette tape recorder to use for RTTY is the a.c.-operated "Hi-Fi" type for home use. The a.c. operation does away with the battery problem, the speed stability is greatly improved, and most of the home cassette recorders have audio level meters to assist in maintaining the proper recording and playback levels. The home cassette recorders are also capable of stereo recording, which permits recording identifying audio information on the second track, with the advantages listed above in discussing open-reel recorders. Mechanically, the home cassette recorder is identical in operation to the portable recorder. While the audio output of the recorder (about 0.75 volts) is adequate to drive the transmitter, an external audio amplifier and speaker may be required to monitor the second audio information track. Many recorders have a headphone jack which can be used for monitoring, which will eliminate the requirement for an external amplifier.

Eight-Track Cartridges

Recent experiments with an eight-track cartridge tape recorder indicate that it may be a significant improvement over cassette recorders. While similar in operation, the eight-track recorder uses a continuous-loop cartridge with the recording separated into four sections, or programs. The eight-track cartridges are available in two common sizes with 40 and 80 minutes total recording time (10 minutes per program or 20 minutes per program). As shown in fig. 4, the tape is continually rewound on the outside of the single reel while also being fed out continuously from the center of the reel.

Each of the four programs (sections of tape) can be specifically selected for recording or playback. In essence, you have the equivalent of four tape cassettes available at one time. This ability to select programs is the greatest advantage of the eight-track system. The tape transport will stop at the end of program four in most recorders, and will stop at the end of each program in some units. The programs are recorded in four separate sets of two tracks across the width of the tape. The actual total length of the tape loop is 10 or 20 minutes, depending on which cartridge is used. Once you arrive at the end of a program, the record/playback head is moved up or down on the tape to address the next set of tracks. Since the tape is a continuous loop, the end of a program is also the beginning of the same program and also the beginning of the other three programs. Continuous recordings can be made, going from program one through program four, but there is an interruption in the recording at the end of each program while the head is moved to another position on the tape.

Say You Saw It In CQ

The same applies to cassettes when you reach the end of the tape side and have to turn the cassette over. For most RTTY applications only portions of each program will be used for recording or playback, and the interruption at the end of a program will not be significant.

In use, four separate messages can be recorded on the four separate programs. After sending the first message (program 1), the fast forward is used to reach the end of the tape. Selecting program 2 will then allow the second message to be sent, after which the fast forward is again used to reach the end of the tape. Programs 3 and 4 are selected the same way to send the third and fourth messages. If a repeat of any message is needed, the program containing that message is selected a second time, and the message will then be repeated. The same procedure can be used to record incoming messages with easy, accurate access to the messages for playback or relay. This specific ability to locate the precise starting point of recorded data is a great enhancement to RTTY tape operations and eliminates one of the biggest disadvantages of magnetic tape recording: the ability to precisely locate specific recorded information easily and as often as necessary.

All a.c.-operated home eight-track recorders are stereo types, providing the second track for audio information as discussed earlier. The audio outputs are the same as home cassette types, requiring an amplifier for speaker operation, but all are capable of driving a transmitter and most have a headphone jack for monitoring. All home eight-track recorders have audio level meters for monitoring recording and playback levels. As with the other types of magnetic tape recorders, the actual recording and sending time depends on typing speed.

Hopefully, this article has given you all the pros and cons of the various RTTY tape systems and has provided you with the information needed to choose a method of tape operation or has encouraged you to try another method. Whether you use time-tested paper tape or the newer magnetic tape systems, RTTY tape operation is a necessity for full enjoyment of this aspect of amateur radio.

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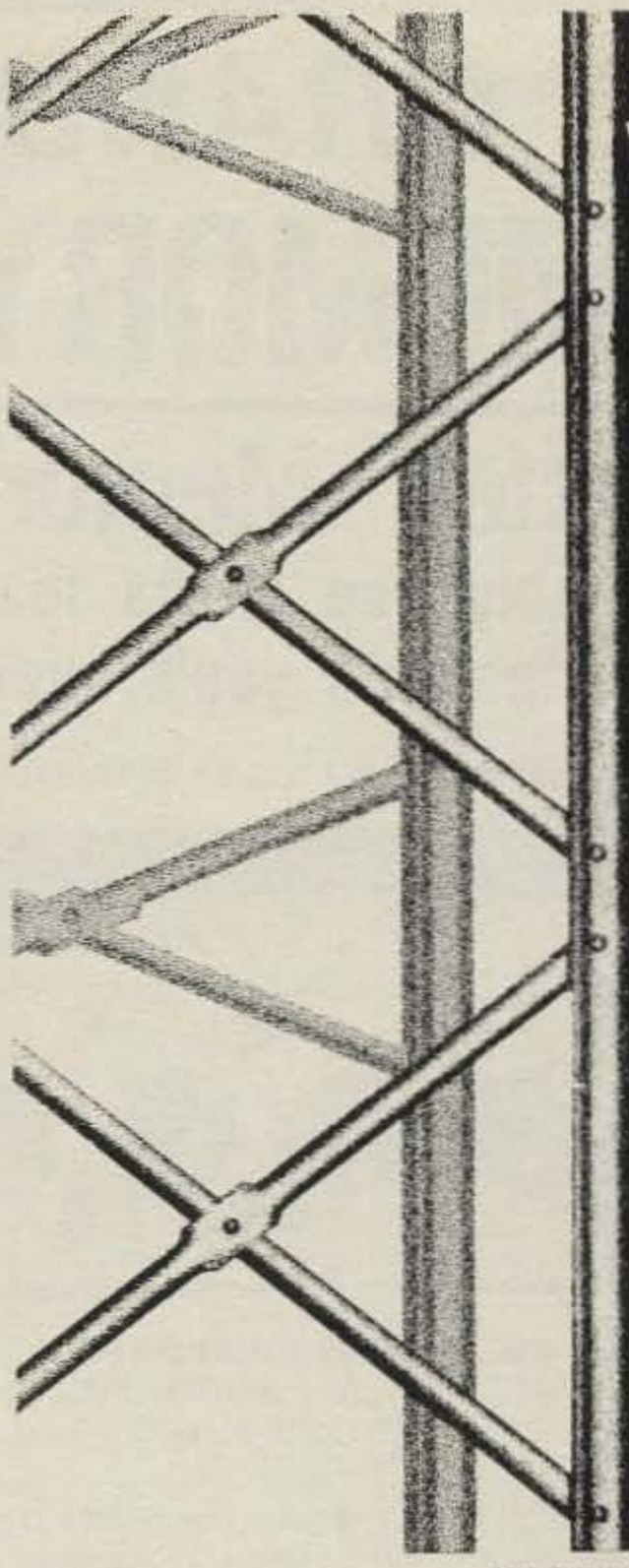

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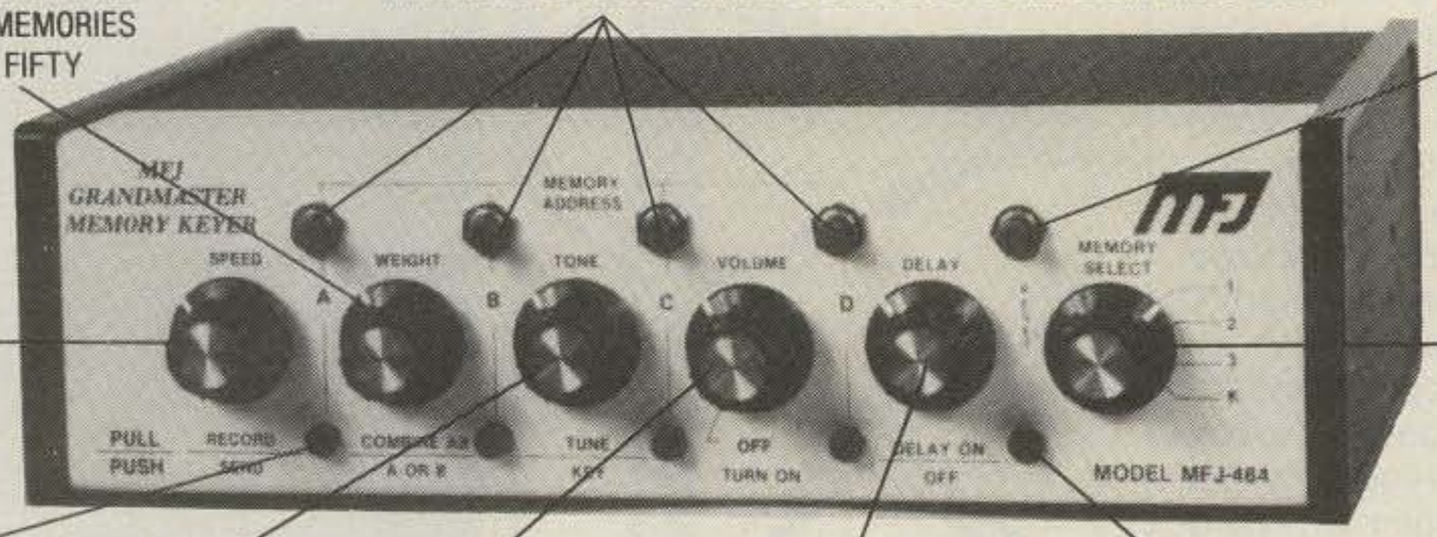

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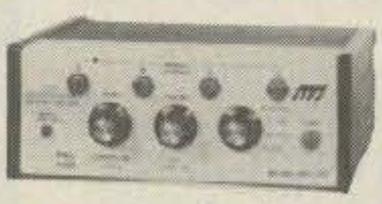

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CIRCLE 11 ON READER SERVICE CARD

In the second part of this continuing series, K4TWJ delves into the realm of slow scan television. Here is a new frontier for many to ponder and an area which greets each new pilgrim "face to face."

Amateur Radio Frontiers— Slow Scan Television

BY DAVE INGRAM*, K4TWJ

One of the most popular and exciting frontiers in amateur radio today is the visual communications world of Slow Scan Television. Transgressing a step beyond conventional amateur radio activities, SSTV is a narrow bandwidth video system which can be used in the Advanced class portions of 80, 40, 20, and 15 meters, and in the complete s.s.b. portion of 10 meters. The audio tones associated with SSTV afford direct compatibility with one's existing h.f. s.s.b. gear, the SSTV camera merely connecting to the transmitter's audio input while the SSTV monitor connects in parallel with the receiver's audio output. On the air these SSTV signals sound (to unfamiliar ears) similar to RTTY with a slightly more "musical air" and brief tone bursts every 8 seconds. The vast avenues of enjoyment and unique communication challenges relative to these tones will be the primary topics of discussion in this article. We will assume the reader is relatively well informed on the general concepts of Slow Scan TV, and thus direct our discussion towards late-breaking information and recent innovations in this exciting frontier.

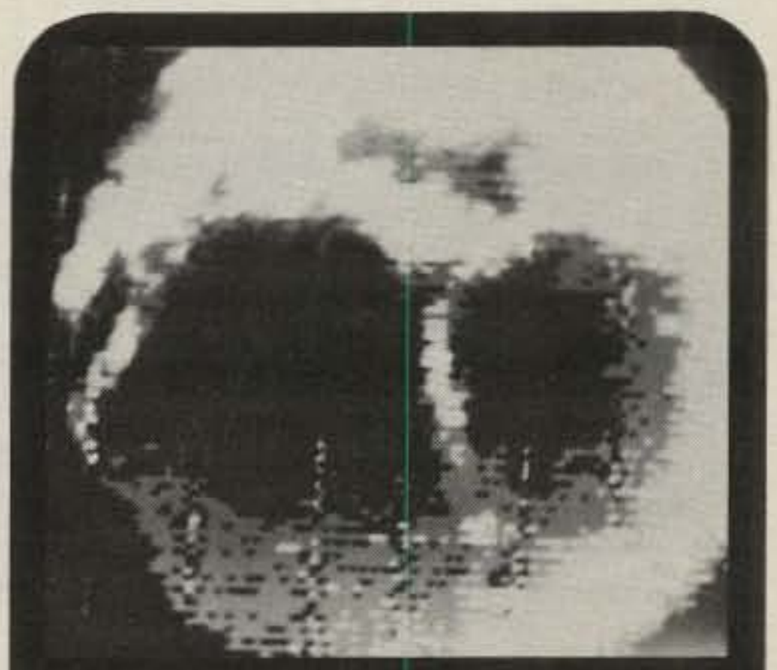
There are over 130 countries active on SSTV at the present time, and this tally continues to increase almost daily. While the majority of video activities continue to center around 14,230 and 3,845 kHz, other amateurs scattered throughout the high frequency spectrum also possess SSTV gear which stands ready for operation whenever the topic of video arises during the course of an aural QSO. In other words, don't conclude an amateur (either local or DX) isn't video equipped until you've asked him . . . our ranks are growing rapidly!

The information exchanged during SSTV communications includes everything from views of Saturn retransmitted to W6VIO, the Jet Propulsion Labs club station in Pasadena, California, to sketches of human eye operations transmitted by a doctor in Texas. Other times schematic diagrams of unique circuits or special views of distant lands will be noted rolling down the screen of various SSTV monitors around the world. The inclusion of visual capabilities definitely expands one's amateur horizons and renews the interest experienced during those early days as a radio amateur.

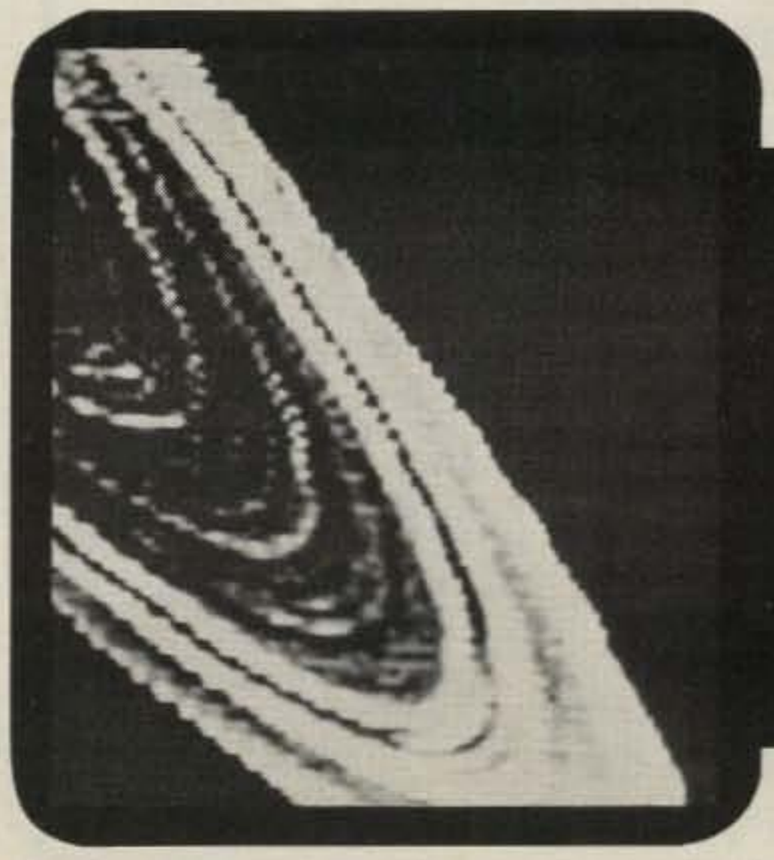
Evolutions in SSTV Gear

Digital electronics has made a strong impact on the SSTV world, with scan converters and SSTV keyboards acquiring widespread acceptance. The Robot 400 Scan Converter has become a "standard item" for serious Slow Scanners, with the Apple and SWTPC computers programmed and interfaced for SSTV following closely on its heels.

The basic Robot 400 performs exceptionally well for both transmitting and receiving SSTV pictures, with its only disadvantages relating to dedicated use of the large 65K bit memory bank. Other countries have begun joining the digital scan converter "bandwagon," with Japanese



Lurking in an almost science-fiction manner, this picture stirred many SSTVers until W6VIO explained it was Saturn's moon Tythus as viewed by Voyager I from a distance of 750,000 miles.



This exciting SSTV picture of Saturn's complex ring system was transmitted on 20 meters by W6VIO during the Voyager flyby of November 1980. Audio descriptions which followed each picture truly afforded "ringside seats" to on-frequency SSTVers and their guests. SSTV applications definitely expand amateur horizons. Our congratulations to W6VIO and its many operators on this unique operating event.

*Eastwood Village, #1201 South, Route 11, Box 499, Birmingham, AL 35210

and German scan converters being the most popular. While the Japanese converter is rumored as being similar to the Robot 400, no plans have been made to import this unit. (*CQ* recently reviewed the German addition to the field when they described the Volker Wrasse SSTV scan converter and keyboard in their April 1981 issue on page 16.) Don Miller, W9NTP, recently began producing a limited quantity of additional 65K bit memory boards for use in Robot 400's as a live color SSTV system. This concept is growing in popularity both stateside and abroad, bringing the reality of real time color SSTV into clear focus.

While the basic Apple computer contains less than 65K bits of memory, good results (with limited grey scale) have been achieved with this unit. Devoted video enthusiasts can, however, "bootstrap" additional memory onto the Apple and create a system which can function as both a home computer system and a "full blown" SSTV black and while and/or color scan converter. At the present time, only a limited number of amateurs have achieved successful results using the Radio Shack TRS 80 for SSTV. We understand massive modifications plus new interfaces are necessary for this operation.

The evolution of digital scan converters has resulted in many P-7 and analog-type SSTV units hitting the used market at relatively low prices. These units are ideal for getting started in SSTV and, if desired, they can later be converted for operation in the video frontier of Medium Scan TV.

80 meters	3,845 kHz
40 meters	7,171/7,181 kHz (depending on foreign QRM)
20 meters	14,230 kHz*
15 meters	21,340 kHz
10 meters	28,680 kHz*

Fig. 1– Popular SSTV gathering frequencies for amateur h.f. bands. Asterisks indicate maximum activity frequencies. Note all frequencies except 10 meters require an Advanced or higher class amateur license.

SSTVers are, by general nature, a technically inclined group anxious to express themselves in ideas and designs. Consequently, various sideline areas and circuit design concepts are always circulating through the ranks. A compendium of these innovations usually make their debut at the annual Dayton Hamvention during late April, with new ideas rekindling everyone's enthusiasm for another 12 months. The developments first presented at the Dayton Convention include noise-immune sync detection techniques, digital scan conversion, color SSTV, Medium Scan TV, and much more. Commercial manufacturers of SSTV equipment also join SSTV gatherings at Dayton, discussing their gear's concepts, while studying new techniques and systems for widespread applications and possibly introducing new equipment for the SSTV market. This large amateur radio convention is thus the true "melting pot" for ideas leading to future SSTV systems and gear.

Color SSTV

Soon after Slow Scan TV acquired its initial foothold in amateur circles, various color SSTV techniques came under investigation. The first and most popular technique for several years consisted of placing cellophane or glass-type color filters obtained from Christmas decorations, etc., in front of the regular SSTV monitor and shooting a triple exposure color photograph as the color separation pictures were sequentially received and displayed on the monitor screen. During recent times, however, digital scan converters with expanded memories have been used to store each color-separation picture and output the results to a regular color television set. Essentially this concept involves adding an additional 65K of memory to the scan converter system and loading red, green, and blue color-separated information into these memories (the low percentage of red and blue can be placed in a single 65K memory bank through special processing). Conventional color TV's with demodulated SSTV video directly feeding color amplifier stages can be used for displaying the resultant color SSTV pictures. Dr. Don Miller, W9NTP, has realized very good results using two memory boards with the Robot 400. Color SSTV transmission/reception time is 16 seconds: 8 seconds being used for each 65K memory. Interested parties can check with W9NTP concerning more information either during the Saturday SSTV Net (1800 GMT; 14,230 kHz) or via mail with a large s.a.s.e. Dr. Miller has been providing these boards on a non-profit (cost of producing only) basis to serious SSTV experimenters. Since the "extra memory modification" is more technically involved than merely plugging in a new board and soldering a few wires, the prospective color SSTVer should boast a good electronics background before delving into the Robot 400 modifications.

The original red, green, blue color-filter/photography concept can serve as a perfect way to begin color SSTV operations. Since digital scan converters such as the '400 begin each frame at exactly the same point, picture registration is not a problem. Simply remember to *never move the camera* until the triple exposure is complete. Later, additional memory can be added to the '400 and the unit interfaced to a color TV set via its red, green, and blue amplifiers to provide real time color Slow Scan.

The color filters can still be retained for producing color-separation pictures from the original black and white SSTV camera.

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Another technique which is being used by at least three SSTVers was outlined in July, 1980 *CQ* and November, 1980 *QST* magazines. Three Robot 400 converters are used almost "as is" to store separate red, green, and blue SSTV frames. The Fast Scan output of each Robot then drives its respective color amplifier in a color TV or monitor to reproduce full color pictures. One SSTVer, WA7WOD, uses a Fast Scan color TV camera feeding a color monitor; the monitor internally separates red, green, and blue video which is then directed to the appropriate Robot 400 scan converter. We can thus surmise that the SSTVer with visions of color activities can now be accommodated in a number of ways—the precise way being directly influenced by available time, money, and technical expertise.

Medium Scan TV

One of the recent spinoffs of SSTV innovations has been the creation of a specialized video frontier known as Medium Scan TV. Inspired by the vision of exchanging real time motion TV pictures on an intercontinental basis (without the use of wideband relay links such as TV satellites), a small group of dedicated amateurs developed a 36 kHz f.m. video system and secured special temporary authorization from the F.C.C. to conduct these communications/tests in the 29,100 to 29,300 kHz frequency range of the 10 meter band. A Medium Scan TV beacon operated by W9NTP is active on 29,150 kHz at the present time, with increased two-way video activities slated for action in the near future. This MSTV beacon is primarily active on weekends during the first 10 minutes of each hour. Information concerning late breaking MSTV news plus actual MSTV test patterns are included in these transmissions.

Medium Scan TV concepts are quite similar to accelerated Slow Scan TV except horizontal and vertical scanning frequencies are accelerated to provide motion capabilities while two interlaced fields assist this effort and increase video resolution.

Two basic items are required to receive MSTV signals: an f.m. receiver with a 36 kHz i.f. bandwidth and capable of tuning the 29 MHz band, and a video monitor capable of scanning at MSTV rates to reproduce received pictures. The receiver may consist of an f.m.-modified and realigned CB set, a modified f.m. unit previously used in the 30 MHz service, a modified h.f. amateur transceiver, etc. Swamping resistors, stagger-tuned i.f.'s, or additional i.f. strips outboarded before s.s.b. filtering stages are the easiest ways to increase bandwidth. An older P-7 SSTV monitor can be pressed into use with MSTV by reducing horizontal and vertical sweep generating capacitors (to provide the faster scanning rates) while acquiring sync pulses directly from the f.m. receiver's detector and directly coupling video information from that detector to the monitor's video amplifier stages (which have been range-extended to 36 kHz). Various discussions concerning such MSTV modifications to P-7 type SSTV gear have been aired during the Saturday SSTV network gatherings. Dr. Don Miller, W9NTP, is also spearheading this project. It should be realized that MSTV parameters have not been finalized, and that numerous concepts including pseudo random dot and digitalized video techniques are also being scrutinized for their feasibility. Several years may yet elapse before a "finished" concept is established. Now's the ideal time to join the efforts of this exciting frontier!

Another science-fiction special transmitted by W6VIO during the Voyager flyby of Saturn was this unique view of Minus, another one of Saturn's many moons. The impact crater visible in the bottom area is 80 miles across.

As mentioned during the first part of this article, the amateur frontier of video communications encompasses many avenues of experimentation open to progressive-minded individuals. Recently, for example, some West Coast amateurs began investigating a concept called Medium Definition Narrow Band TV. This "side expansion" of Medium Scan TV proposes the use of a 4:1 interlaced system to create almost commercial quality TV pictures which could, with special F.C.C. authorization, be transmitted on the high end of the 6 meter band. The parameters associated with this system consist of 56 lines per field: 4 fields equaling one frame. The field rate is thus 1/60 of a second, while 15 frames (complete pictures) are transmitted each second. A complete picture (4 frames) thus consists of 224 lines. The horizontal scanning frequency is 3,375 Hz, and overall signal bandwidth is 600 Hz. One encouraging aspect of this TV system is its compatibility with modified TV sets. A television's tuner strip for Channel 2 can be moved to 6 meters, and modifications to existing sweep circuits will permit direct operation at the lower scanning rates. Damping of the horizontal is not required; however, the flyback transformer can be retained and used for supplying high voltage to the picture tube. Additional details of this system should be available in the near future.

The Future of SSTV

While we can't accurately predict the evolutions of amateur video communications during the coming years, we can reflect on past situations and use this knowledge to consider possible situations. Although commercial television sets replaced radios as home entertainment within a decade, audio communications are destined to continue as the mainstay of amateur radio activities. Possibly this is due to the convenience of audio versus communications (!), or possibly the majority of amateurs enjoy the "casual" life. Great! There's room in our ranks for everyone, and these pleasures are the backbone of our outstanding hobby.

During future times we can expect to see new concepts and new techniques create video systems with the capabilities of antiquating commercial TV with its outdated analog parameters. Being removed from the compatibility binds of that system, amateur video enthusiasts are free to develop unlimited globe-spanning systems. Computers and microprocessors will, obviously, play a major role in these future steps.

An upcoming event which should serve a vital purpose while creating widespread video interest will be the launch of an amateur satellite which is presently being readied for launch during September 1981 and which will be known as UOSAT. Complete details on the UOSAT satellite appear in a previous *CQ* article on amateur radio frontiers by this author. The spacecraft will provide views of earth from an approximate height of 530 kilometers, its digitalized-type SSTV signals being transmitted on approximately 145.900 MHz. Additional details on this spacecraft should be available in the near future. Meanwhile, anxious parties can contact the project manager, Dr. M.N. Sweeting, at the University of Surrey in Guildford Surrey, England for late breaking UOSAT news.

Summary

While it might seem that technical advancements have overshadowed actual on-the-air SSTV operations, such is not the case. Each day's SSTV activities include a vast cross section of views consisting of basic "getting started" station ID's and operator views to unique scenes from distant lands or pictures providing information and assistance to remote or isolated areas. The frontier of SSTV is open to all radio amateurs, and an extensive electronics background isn't mandatory for enjoying the excitement and fun.

The word is out: Quads are in judging from the animated hamfest and on-the-air discussions they generate, as well as the impressive sales figures of firms who manufacture these interesting and distinctive looking antennas. Author W8FX has thoroughly surveyed the field, and he takes a highly readable approach to an oft-confusing subject.

A Primer: The Cubical Quad Antenna

Part I—In The Beginning

BY KARL T. THURBER, JR.*, W8FX

There is no use denying it: The cubical quad is one of the most popular of h.f. antennas, second only to the conventional Yagi-Uda array. Whether or not Dr. Hidetsugu Yagi, co-inventor of the famous antenna that bears his name, would approve of the now-competing quad design, we don't know. But as one can hardly knock success, it's definitely worthwhile to take a look at what's behind the "quad craze."

In this article we will examine the origins of the cubical quad. We will discuss the basic loop antenna and two-element quad, and describe multi-element and specialized h.f. quads. We'll also look at feeding, tuning, and matching considerations, and introduce some v.h.f. and u.h.f. quad applications. We will limit the math to a few simple formulas, and will leave specific construction details to the many excellent reference sources listed at the conclusion of this article.

Let's begin by going back in time some 40 years.

Early Quad Development

The cubical quad antenna is, in some respects, a "heretical off-shoot" of the classic Yagi-Uda beam antenna design. The Yagi was the result of years of detailed scientific investigation and development, with the initial work being done as far back as 1926 by two eminent Japanese engineers, Drs. Hidetsugu Yagi and Shintaro Uda, both faculty members on the staff of Japan's Tohoku University.

The Yagi takes the form of a driven dipole with *parasitic* elements—that is, elements having no direct electrical connection to the transmitter. These are electromagnetically coupled to the *driven element*, which in turn is coupled to the transmitter. The parasitic elements are known as the *reflector* and *director*, and all elements are mounted in one plane on a boom support and spaced at specific distances from one another. Normally, there is but one reflector and any number of directors. In most cases the Yagi elements are made of aluminum tubing. By the mid-1930s the Yagi had at least been experimentally adapted to amateur radio use, and by the last years of the decade—as aluminum became more readily obtainable and inexpensive—the Yagi had made its mark in ham stations across the nation.

The origins of the Quad were far removed from the engineering laboratory. The story is recounted that in about 1940, a group of American engineers were sent from the United States to Ecuador to install and maintain the new missionary station, HCJB, popularly known as "The Voice of the Andes." The group installed high-power shortwave transmitting equipment and a large Yagi array of classic design. The Yagi, though highly effective, almost resulted in the station's downfall. Because of the high altitude, high humidity, and high power used, tremendous corona discharges flowed from the tips of each of the linear elements, with deterioration of the aluminum in the tips the result. HCJB's chief engineer, the late Clarence Moore, W9LZX, developed an interim solution in the form of copper balls which he installed on the ends of each element to reduce the potential for corona formation. This approach proved only partially satisfactory, since corona discharge still made its appearance in damp weather, and the copper balls, which were of the type used in bathroom flush tanks, added hard-to-tolerate extra weight.

Engineer Moore later found a permanent solution to the corona discharge problem by shucking the idea that directional arrays *must* be assemblies of linear half-wave dipole elements. He investigated the possibilities of using a closed-circuit driven antenna: a pulled-open folded dipole, or loop, which would have no endpoints on which corona discharge could form. Moore correctly reasoned that parasitic loop elements could be used in conjunction with the driven loop to form a directional, gain-type antenna comparable

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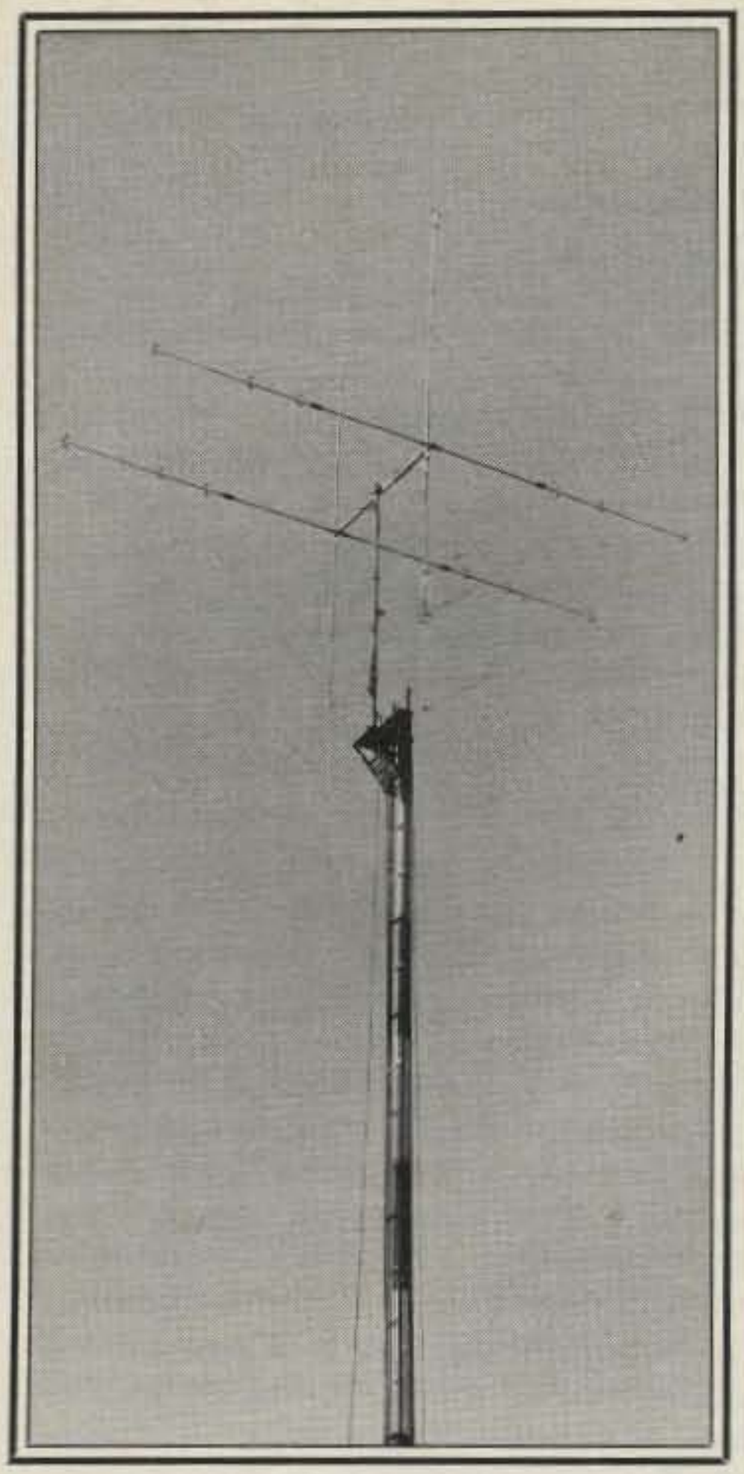


Classic 2-element cubical Quad design is evidenced in this Hy-Gain tri-band "Hy-Quad." The quad, which requires a single feedline for all three bands and provides individually tuned gamma matches on each band, incorporates full-wave element loops that require no tuning stubs, traps, loading coils, or baluns. Antenna is horizontally polarized, and its spreaders are broken up at strategic locations with a special plastic material insulator. Gain claimed is in excess of 8.5 dBd; weight is approx. 33 lbs.

to the Yagi. He soon constructed a two-element quad and erected it at the transmitter site. The antenna worked, the corona discharge problem was solved, and he later patented his invention following his return to the U.S.[1]

Despite early successes at HCJB, a few shortwave broadcasters and almost no commercial radio users have made use of the quad, even to this day. The idea of a serious competitor to the tried-and-true Yagi was slow to catch on even in amateur radio circles, despite several articles in *CQ* and *QST* as early as the late 1940s extolling the many benefits the quad could offer. In fact, until a recent spurt in popularity mainly spurred on by several companies specializing in easily assembled quad kits, quads were generally erected not because of any claim to superiority over the Yagi, but because of other factors. These include the fact that the antenna uses lightweight materials, such as bamboo; aluminum is expensive and, in many areas, unavailable; the antenna is readily suitable for home brew construction; and few tuning adjustments are required. Due, in fact, to these reasons, the quad has enjoyed a degree of popularity overseas not experienced stateside. Recently, the quad has come to be accepted on its own merits. Though its popularity still lags behind the Yagi, with its 14-year-plus headstart, you will hear many quads on the air putting forth excellent signals.

Question number one, of course, is *what makes the quad work?*

The Loop and Its Close Cousins

The dipole and its beam derivative, the Yagi, are familiar antennas whose theories of operation are fairly well known. This is not quite the case with the cubical quad; in fact, quad operation is mystifying to most amateurs. The trick in understanding the quad's principle of operation is to go back to its origins in the simple loop antenna.

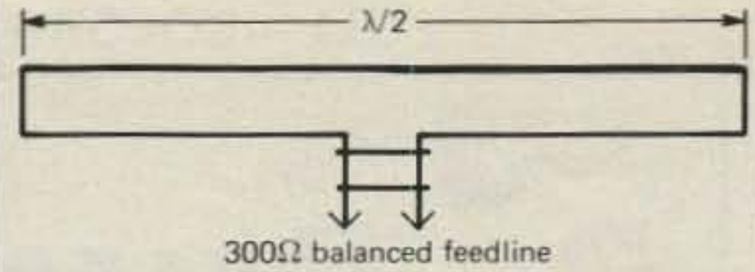
Loops of Many Kinds

The loop is a basic form of antenna that has been with us for a long time. It is simply a large radiating coil that operates much like a pulled-apart folded dipole (fig. 1). The exact form can take any of a number of shapes, such as a rectangle, hexagon, square, diamond, or circle, with little effect on performance characteristics. Small loops are often used for receiving.[2] But efficiency is low since radiation resistance is also low and contained area is small.

Large loops, on the order of one wavelength in circumference, take on the essential characteristics of the folded dipole, radiation resistance being higher than that of the single-wire dipole; bandwidth is markedly improved. The stretched-out folded dipole, or loop, produces the familiar bidirectional figure-eight radiation pattern similar to that of the dipole. Whereas the single-wire dipole exhibits a radiation resistance of about 70 ohms at moderate heights, the folded dipole shows a radiation resistance of about 280 ohms, and the loop about 125 ohms. These figures will change for different heights, and the loop impedance will depend to some extent on its shape.

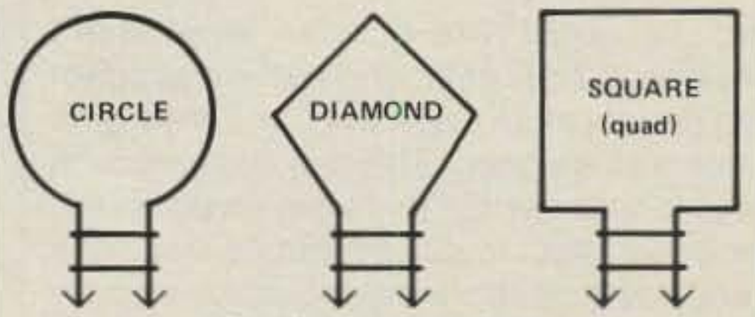
The loop is popular for a number of reasons. Foremost among these is that it's an excellent performer at low mounting heights, having a much lower angle of radiation than the dipole. At greater heights the edge narrows so that on the higher h.f. bands the loop produces an angle of radiation comparable to that of the dipole. An added plus is that when compared with the ground-mounted vertical, a DX favorite, a loop working at low heights doesn't exhibit the ground losses shown by the former.

A number of different loop configurations have produced good results. Since loops aren't too difficult to construct and tune up (consisting as they do mostly of *wire*), they can be installed in phased pairs or in larger directly-driven arrays. Two loops phased in collinear fashion are popular and provide a modest gain—not as much as a multi-element Yagi beam, but better than the dipole. The gain of phased loops changes with the spacing between them. Very close spacing produces a gain of under 2 dB over a single loop; increasing center-to-center spac-



(A) Folded Dipole

The origins of the quad lie in the folded dipole, which has a bidirectional field pattern similar to that of the basic (single-wire) dipole. In the two-wire configuration, radiation resistance is four times that of the basic dipole (70 ohms), or 280 ohms. The folded dipole may be stretched out or pulled apart to take one of the loop shapes shown below. Early loop and quad beam development is credited to the late Clarence Moore, W9LZX and dates to about 1940.



c = 1λ in all cases
Ω = 125 (nominal)

(B) Loop

The one-wavelength loop antenna, derived from the folded dipole, can take any of a number of forms, including circles, rectangles, hexagons, diamonds, or triangles; three of the more popular configurations are shown here. The loop produces a figure-eight field pattern similar to that of the folded dipole, but it yields a power gain of up to 2 dB relative to the dipole. Nominal feedpoint impedance is 125 ohms.

Fig. 1– The folded dipole and the basic loop.

---

[1]*A fascinating discussion of the early W9LZX quad development efforts appears in Bill Orr's authoritative book,* All About Cubical Quad Antennas, *listed along with other suggested references at the conclusion of this article.*

[2]*See my Antenna Column this month for a discussion of receiving loops.*

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ing to about one-quarter wavelength yields a 2.7 dB gain; and half-wave spacing results in an approximate 3.3 dB gain over a single loop. The two-element loop is bidirectional, but its radiation pattern is narrower than that of the single loop. This requires that the fixed-mounted loop be carefully oriented to favor desired directions.

We've indicated that loops can take on several shapes. One of the most popular is triangular, known as the delta loop, or delta quad in its beam form. A good performer, it is usually mounted with the feedpoint and apex at the bottom to produce a DX-favoring low angle of radiation. In other versions it is fed at one corner to produce dual horizontal and vertical polarization. It is also said to be tougher on both man-made and atmospheric noise pickup than either the dipole or vertical. The delta loop is a good beam-like antenna design, often favored since it requires less linear space than does a dipole cut for the same band—a major consideration for installation on small urban lots.

The Single-Loop Quad

A special case loop is the quad, named for the four sides of the loop, which form a square. The single-loop quad is a simple, inexpensive, and efficient bidirectional beam antenna that yields modest power gain when compared with the dipole. Lightweight, and consisting of wire and bamboo or fiberglass, the antenna can be rotated by a small TV rotator and mounted on an aluminum mast.

Thus, the quad design takes shape: a square of wire, each side one-quarter wavelength at the desired operating frequency, with overall circumference a full wavelength. The quad loop can be fed either at one side or at the bottom at a current loop (point of maximum current). If fed at the *side*, the loop will show a *vertical* polarization characteristic; if fed at the *bottom*, it will be horizontally polarized. Conventional amateur practice is to feed the quad loop at the bottom to yield horizontal polarization. This helps reduce man-made noise pickup, which is usually vertically polarized. In common with other loops, the single-loop quad tends to produce a low angle of radiation even at low mounting heights.

Though the full-wavelength loop represents the usual loop dimension, it's possible to work effectively with smaller transmitting loops. A popular variation is the mini-quad loop, a directional, loaded closed-circuit antenna that is but one-half wavelength in circumference, or one-eighth wavelength on a side. This is a particularly compact, directional antenna that's a possible choice for restricted space operation, yet is one that offers performance equivalent to a dipole with a similar radiation pattern. The mini-quad loop is usually supported in a vertical position and fed at the bottom through a matching network to produce a horizontal polarization characteristic.

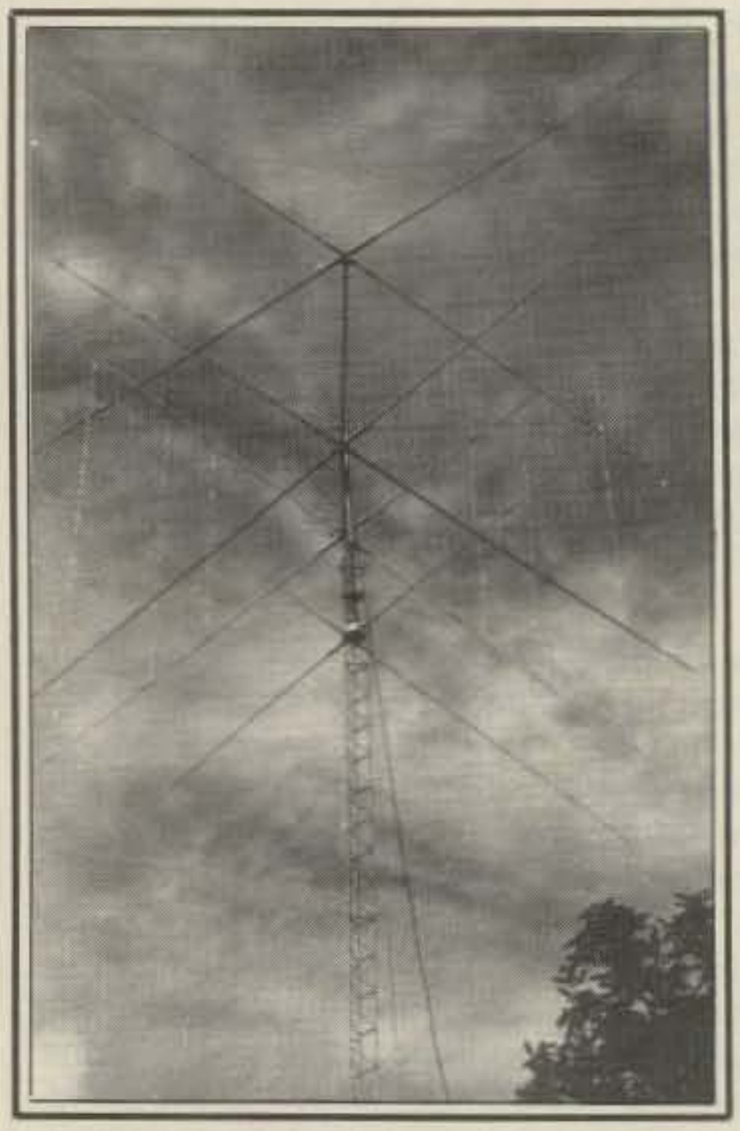
The Two-Element Quad

We have highlighted the quad loop as a very attractive and high-potential antenna. It can be made into a two-element beam, known as the cubical quad, which is named for its distinctive appearance: four sides forming a square, the two squares forming a cube. The antenna that results from the joining of the two loops can be inexpensive, lightweight, and simple. It can yield a gain of about 7 dB over that of the dipole—much more if configured in a three-or-four-element array. Front-to-back (F/B) ratios of 20–25 dB are common.

As with the quad loop, the cubical quad consists of what are essentially two or more stretched-out folded dipoles formed into square loops. The loops are spaced at specific distances from one another and placed on a horizontal boom. The driven element lies at the heart of the array; it is directly coupled to the transmitter through a feedline, usually coaxial cable. The two-element quad has an electromagnetically (parasitically) coupled element, the reflector, which is slightly larger than the driven element. Larger quads may sport one or more directors (which are slightly smaller) to make up three- or four-element arrays. As with the quad loop, bamboo or fiberglass spreaders support the loops, holding them in position. Cubical quads can be designed either as single-band or multiband arrays. The latter usually involve the concentrically placed loops for the various bands (usually three: 20, 15, and 10 meters), with the lowest-frequency and therefore largest loop on the outside and the others inside of it.

Quad Characteristics

The most popular cubical quad is the two-element array, which uses a driven loop and one reflector. This design results in a beam which is comparable in performance to that of the three-element Yagi, with about a 7 dB gain over the dipole and a F/B ratio of 20–25 dB, depending upon element spacing and adjustment. Incidentally, using a reflector element (rather than a director) with the two-element quad produces a slightly better F/B ratio, although overall gain is the same whether a reflector or director is used. Feedpoint impedance is in the



In a class by itself, the four-element quad offers almost unparalleled performance, but at a price, in terms of massiveness and windloading. Three-band quad pictured has a boom length of 20 feet and provides a gain of approximately 12 dB over the dipole, or 14.1 dB referenced against an "isotropic radiator." This is better than the gain offered by its closest competitor in the Yagi family—the five-element wide-spaced array. (Photo courtesy Skylane Products)

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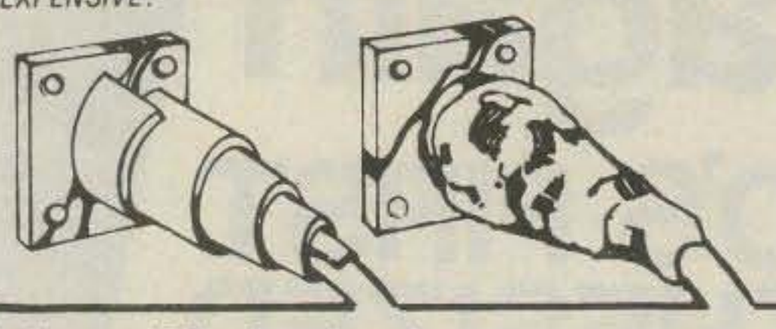

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neighborhood of 60–75 ohms for element spacings of 0.1 to 0.15 wavelength; this permits a decent match to standard 50–75 ohm transmission lines. A balun or other means of maintaining system symmetry is useful to reduce the possibility of stray transmission line pickup or a signal radiation which would distort the array's pattern.

As with the quad loop, the vertical angle of radiation of the cubical quad at practical heights is lower than that of the dipole or Yagi; the quad has a smaller high-angle of radiation lobe than either type, making it especially suited for DX work.

Quad polarization may be either horizontal or vertical but not both, sometimes wrongfully assumed to be the case because the wire elements are strung in both planes. Like the quad loop, the cubical quad is usually horizontally polarized, meaning that it is fed at the bottom of the frame. However, you will sometimes see CB and 10-meter quads that are fed at either side, resulting in vertical polarization.

Before discussing quad construction and installation details, let's make some comparisons between the Yagi and quad. The basic question is, is the quad as good as, better than, or worse than the Yagi?

Yagi vs. Quad

Asking this question is like opening up Pandora's Box without having any idea how to close it, yet it's always the first question asked. A conclusive comparison between the two antenna types is wellnigh impossible; any answer can only be given in terms of "best for whom." About the best I can do is to cull out a sampling of facts and well-considered observations from a number of sources and present them here, so that you can form your own judgments. Ready?

(1) The quad is about equivalent in power gain to a Yagi having one additional element. The quad also has more gain than the Yagi for a given boom length, weight, and turning radius.

(2) All beams work best at extended heights, but the quad is more forgiving of height deficiency than the Yagi. The quad exhibits less ground effect and ground loss.

(3) The quad generally has a lower angle of radiation than does the Yagi, often resulting in its "opening and closing" a band for long-haul work.

(4) The quad is a low-Q closed loop, and as such is a broadband antenna. End effects, prevalent with all dipole-like open elements, are greatly reduced.

(5) The quad is a relatively "quiet" antenna, less susceptible than the Yagi to precipitation static on reception.

(6) Having no sharp end points, the quad is less vulnerable to lightning strikes and static discharges (recall the HCJB story!).

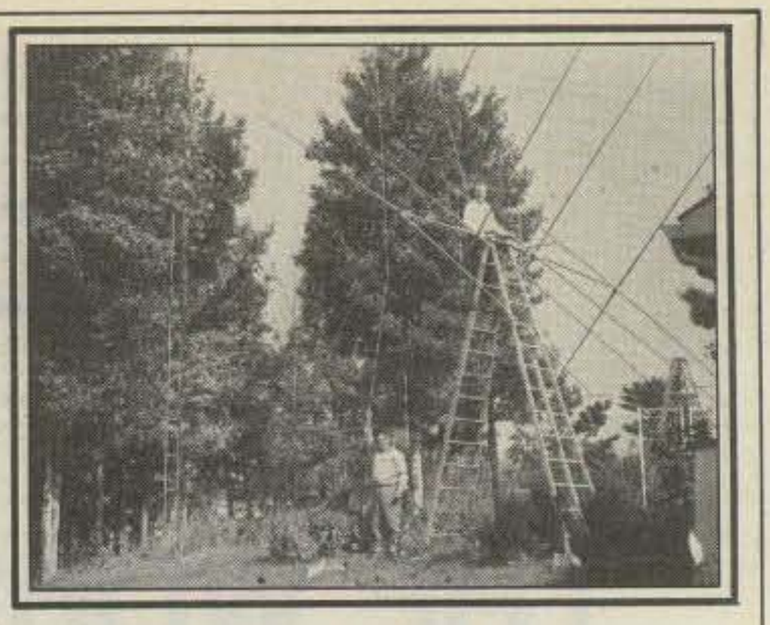
(7) The quad is easier to adjust than the Yagi due to less interaction between elements as well as less-critical element spacing.

(8) The Yagi is relatively easier to build and install, is less susceptible to damage from strong winds and ice storms, and is more aesthetically pleasing than the quad.

(9) The quad lacks greater popularity since it requires extra effort to construct, install, and maintain. As a three-dimensional, "boxy" affair, the quad is bulky and fragile to handle and hoist into position when compared with the two-dimensional Yagi.

(10) Though much less expensive than the Yagi if made of cheap, locally obtainable materials (such as copper wire and bamboo), the quad may be more expensive than the Yagi if fiberglass spreaders, specially fabricated spiders, and other costly fixtures are used in construction.

(11) No traps are required in the multiband quad, although feeding problems can become quite complicated in triband designs.



For best results, the quad should be installed at heights of 40–50 feet (higher if necessary) using a telescoping or tilt-over tower. It's much easier to install the antenna on such a tower than to climb up in the air and do the job. The tower may be backed up against the house, using it as a support, or guys (broken up with strain insulators to avoid resonance effects) may be used. Remember to match the square foot wind area of your quad with the wind load your tower will handle. A heavy duty rotor is required with all but the smallest two-element quads. (Photo courtesy L. W. Van Slyck, W4YM)

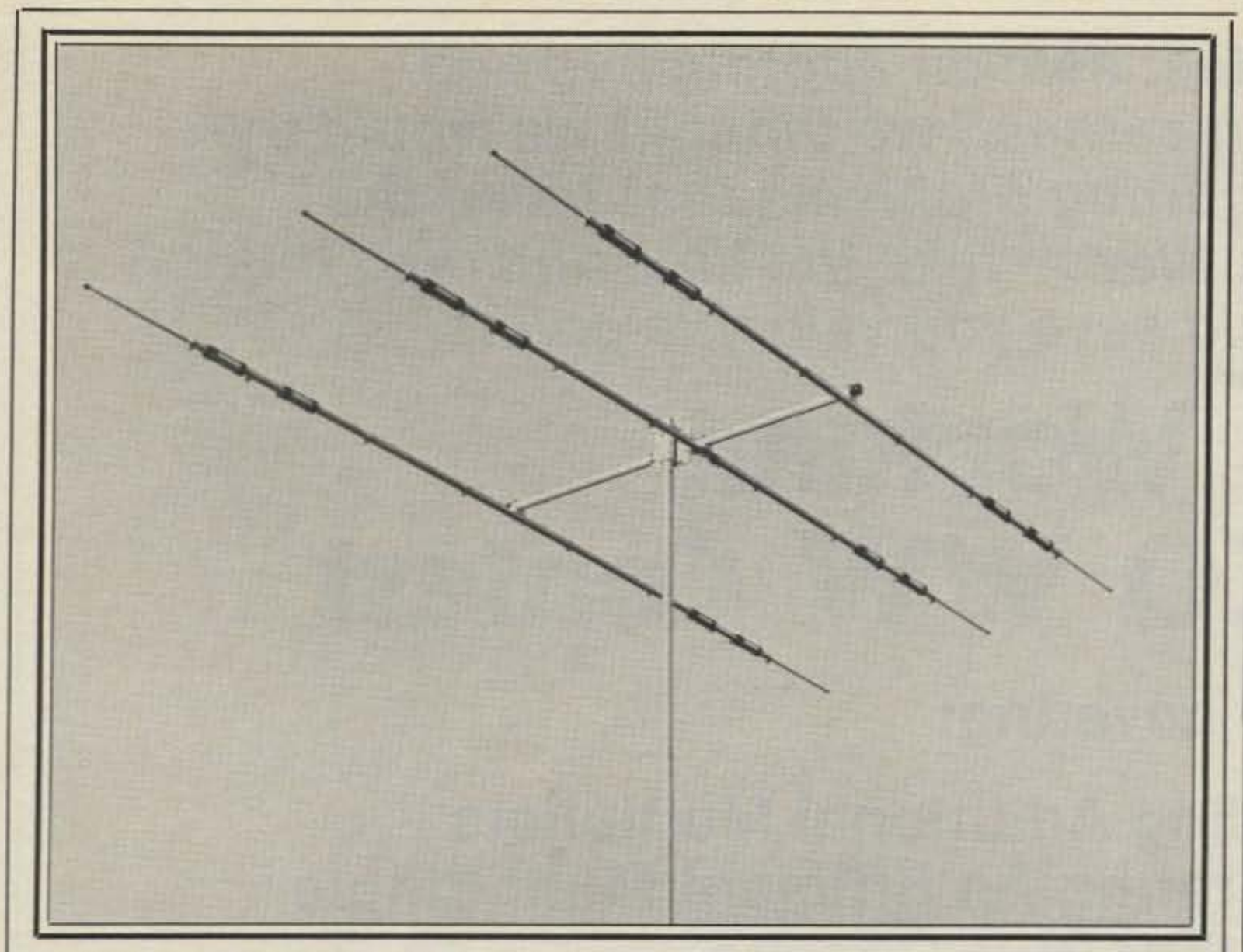
Construction and Installation

Quads are especially popular for homebrewing since essential materials may be available locally: frame wire; bamboo, fiberglass or aluminum spreaders; center-plate plywood; and the like. Cost can be particularly low if bamboo spreaders are used; for this reason, the cubical quad is especially popular in tropical countries where aluminum tubing can be hard to come by but bamboo may be found close by. Quad kits are now available for the operator who doesn't care to assemble the necessary materials or to do more than minimum experimentation in getting his or her quad to perform.

Bamboo is the classic spreader material of which most quads are made. Nevertheless, despite relatively low cost, the bamboo arms can be short-lived due to the weathering effects of the wind, sun, and rain, even if heavily shellacked and wrapped in vinyl tape or given a marine fiberglass coating. In some areas bamboo can be difficult to find, although it may be obtained from handicraft shops, import furniture stores, basket shops, and even rug stores.

Aluminum spreaders can also be used, but they cause unpredictable capacitive loading of the antenna assembly, even though they may be of short physical length. Small diameter PVC plumbing pipe can be used for small quads, such as those for 10-meter use. Fiberglass spreader arms are considered to be most satisfactory and generally superior to other materials, especially in terms of stability, strength, and minimal impact on the array's electrical characteristics.

Say You Saw It In CQ



Basic triband 3-element Yagi. Because they have been around longer and are more familiar to the amateur community, the Yagi-Uda beam remains the standard of DX reference around which other antennas, including the cubical Quad, are compared. Depending on element spacing and other construction details, the Yagi sports a typical gain over the half-wave dipole of 8 dB. A 2-element Quad has only slightly less gain, 7 dB, while a 3-element Quad boasts a 10 dB gain, and a 4-element Quad, 12 dB. Add 2.1 dB to these figures if you're evaluating specs that are stated in dBi, or referenced against an isotropic source, and be sure to know which the builder or manufacturer is using. (Photo courtesy Cushcraft Corp.)

There is little doubt that this material makes for the longest lived spreader one can buy.

About the best thing that can be said about quad materials is, "use the best available." Unless high-quality materials are employed throughout—in the spiders, quad arms, and wire frames—the array will be mechanically deficient, with a sagging appearance the result and even structural failure possible after a short period of operation or following severe weather. Quad design and construction is one place where the old maxim "you get what you pay for" clearly applies.

In terms of dimensions all h.f. quads are the same, being constructed so as to resonate as full-wave loops at a given frequency. The circumference of the reflector should be about 3% greater than that of the driven element; that of the director, 3% less. Approximate formulas for the loop lengths, in feet, are:

$$\textbf{Driven element} = \frac{1005}{f\,(MHz)}$$

$$\text{Reflector} = \frac{1030}{f\,(MHz)}$$

$$\text{Director} = \frac{975}{f\,(MHz)}$$

An element-to-element spacing of 0.12 wavelength is optimum. Since the quad has a low Q-factor, in common with other loop-derived antennas, the array exhibits broadband characteristics and so will usually cover an entire amateur band with little difficulty.

The fledgling quad should be assembled in a clear spot in your yard. It can be mounted on an 8–10 foot temporary mast for initial checkout of frame resonance and parasitic element tuning. The array should not be allowed to rest on the spreader arms, since they are usually not strong enough to take the added stress. More on tuneup later.

You'll need a tower or other support for your array. The higher the better, but a tower 40–50 feet in height is usually adequate for the quad. A telescoping tower is desirable, as is one with a tilt-over feature. This is especially important in erecting a large and bulky array, since it's a great deal easier to install the quad in this manner than it is to hoist it in the air to mount to the tower. The wind load the tower will safely handle should be matched against the wind area of the quad, and a safety factor should be added. To be effective the antenna must be rotatable, so a mechanical rotator is necessary. Very light bamboo quads can be turned by ordinary TV rotators, though heavy duty, designed-for-application, commercial-quality rotators are much preferred for long-term reliability.

(To Be Continued)

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CIRCLE 71 ON READER SERVICE CARD

As the CQ WW Contest season approaches and preparation begins in earnest, we thought we would try to head off some recurring problems that faced the committee last year. Please take the time and read this very carefully. It could save you valuable points.

Working The CQ WW Contest

A potpourri covering:

- **Finding Additional Multipliers**
- **Operating An Efficient Multi-Single**
- **Another Rule Change**
- **Insight Into Log Checking**
- **Who Is The Committee?**

BY DOUGLAS ZWEIBEL*, WB2VYA
CQ WW Contest Committee

After checking the 1980 CQ WW logs, it is all too clear that not everybody understands the CQ WW multi-operator, single transmitter category of entry. Failure to comply with the CQ WW Committee rules usually results in the log being reclassified as multi-operator, multi-transmitter (MOMT). The guidelines for multi-single are really quite simple. Take a few minutes to understand what is being said.

The Rules currently define the multi-single category of entry as (taken from *CQ*, Sept 1980):

III. Types Of Competition
1. Single Operator . . .
2. Multi-Operator (all band only)

a) Single Transmitter, only one transmitter and one band permitted during the same time period (defined as 10 minutes). **Exception:** One—and only one—other band may be used during the same period—if and only if—the station worked is a new multiplier. Logs found in violation of the 10-minute rule will be automatically reclassified as multi-multi to reflect their actual status.

Now let's talk about the rule. Multi-operator, single transmitter (MOST) was set up to provide a category between multi/multi and single op all band. It allows more flexibility than single op, but not quite as much as MOMT. The main idea to keep in mind is that you are allowed two (2) transmitted signals at once. We'll call one transmitter the **Runner** and the other the **Multiplier**.

The **Runner** will be the main mode of operation. You use it to contact the most stations possible. You don't care if you work multipliers or not, as long as you can run (work stations at a very fast rate). The only limit to the running transmitter is that it must remain on a band for *at least* 10 minutes. After 10 minutes you can QSY to any other band. Which band doesn't matter. Just be sure you stay on each band for *at least* 10 minutes.

The **Multiplier** transmitter allows you to work multipliers on any band *except* the **Runner** band. There are, however, certain important regulations governing the use of the multiplier station. First of all, you can only work *multipliers*. It can be a country multiplier or a zone multiplier. The multiplier *must be* a **new** multiplier on that band. Once you have worked that country or zone on that band, *you cannot work it again using the* **Multiplier** *transmitter*. If you do, you are violating the rules. The other important rule is the "10-minute rule" again. Therefore, the 10-minute rule not only applies to the **Runner** but also to the **Multiplier** transmitter. Or put another way, there is one 10-minute rule for the **Runner** and *another* **Separate** *10-minute rule* for the **Multiplier** station.

Let's take a real-life example. You are running on 20 meters. Ten meters is just opening and you hear a new multiplier. You call the DX station on 10 meters and work him at 0107 UTC. You have now established 10 meters as the **Multiplier** frequency. You must stay on 10 meters for at least 10 minutes (until 0116 UTC). If you hear another multiplier on 10 meters you are allowed to work it. *But if you hear another multiplier on 15 meters, you can* **not** *work him until 0117 UTC*. If you did make contact on 15 but at 0116 UTC, it will not be counted because you violated the 10-minute rule.

How about if you have been running on 20 meters for 2 hours? One of your operators says that 15 meters is opening. You change bands and run on 15 for 5 minutes. It's now 2200 UTC. You've made 7 QSO's. All of a sudden the 10-meter operator comes to you and says that 10 meters just opened and there's a tremendous band opening. Your competition is working 200 an hour! You want to QSY but *you can't*. You must stay on 15 meters for at least 10 minutes or until 2209 UTC. Your first QSO on 10 meters will be legal at 2210 UTC. If you did QSY to 10 meters

*174 Wexford Way, Basking Ridge, NJ 07920

Say You Saw It In CQ

at 2205 UTC and had 17 QSO's in 5 minutes, they would all be illegal and *not counted*!

Another common situation is this. You're running on 20 meters. You're making 60 QSO's per hour. All other bands are "dead." The 10-meter band opens up and your 10-meter op hears some good multipliers. He works them and has established the **Multiplier** frequency. It's now 1400 UTC. The 10-meter operator starts to work anybody (non-multipliers). At first it's only a few QSO's, but soon the band springs to life. He's working 150 an hour. At 1415 UTC he tells the 20-meter op to QRT because the 10-meter rate is faster. The 20-meter station stops running, and everyone is happy to have more than doubled their QSO rate. But what about the 15-minute overlap? The 20-meter op made 15 QSO's (1400–1415 UTC) that were *not* multipliers, and the 10-meter op made over 35 QSO's (1400–1415 UTC) that were *not* multipliers. There is a big problem. You are only permitted **One Runner** station. The CQ WW Contest Committee does *not* correct a log to give *best* results. They correct it by the *rules*. Since 20 meters was established as the runner first, it is assumed to continue to be the runner until it stops working stations or until it starts working *only* multipliers. The 35 QSO's on 10 meters are illegal and not counted. By working non-multipliers on 2 bands at the same time, you are operating multi-operator/multi-transmitter. You will be subject to reclassification to that category. Following are some examples of actual logs.

Look at the set of logs from G4XYZ. The contest has just started, and he picked 20 meters as the **Runner** band. The rate on 20 meters is about 80 QSO's per hour. At 0000 UTC he works 9G1RT on 15 meters. Fifteen meters is now the **Multiplier** band for at least 10 minutes. At 0007 UTC and 0009 UTC he works two multipliers on 10 meters. *Is this legal? NO!* He must work multipliers on the 15-meter band *only* until the 10 minutes are up. So FY7BC and ZZ5EG are lost as QSO's and as multipliers. At 0012 and 0014 UTC more multipliers are worked on 15. Is this legal? Yes. The rules require a minimum of 10 minutes per band; more time is okay. At 0015 G4XYZ works CX7B on 10 meters. This is legal. He has spent 14 minutes on 15 (more than the required minimum of 10 minutes) so he can now change the **Multiplier** band legally. G4XYZ is now committed to stay on 10 meters, working only multipliers for at least 10 minutes (until 0024 UTC). OA8V is also legal. At 0030 UTC he again changes the multiplier band (back to 15 meters) and works DJ1US/ST3. This is 100% legal. Again, he is now required to stay on 15 for 10 minutes (until 0039 UTC). But he works

(Top right) Runner band log sheet. (Center right) Multiplier band log sheet. (Bottom right) New multiplier band log sheet.

World Wide DX Contest

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

Page 1 of 58 Pages

Call Sign: G4XYZ | [X] Phone | [ ] CW (Use separate log for each band.) | Log for: 14 MHz Band

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Zone	New Multipliers Only	QSO POINTS
0000	W1AA	5914	5905	5	W	
	W3RJ					
	N2AA					
	W2PV					
	N3RS					
	WA2HIN					
	N3KZ					
	W3WW					
	N4CG					
05	AA6AA			3		
	K1DG					
	K2UR					
	N2SS					
	WA3LRO					
	KØRF					
	K8LX			4		
	K4VX					
	NP2AE			8	NP2	
	W3ZZ					
10	K3EST					
	N4RV					
	K2GM					
	W3GM					
	WB1ANT					
	K1KI					
	W9BG					
	W9RN					
	WB8EUN					
	K9DX					
13	K6SSS					
	K7JA					
	K2SS					
	K2TT					
	N1XX					
	K1CC					
	W1ZM					
	K1VTM					
	K1RQ					
	W2SQ					
17	K7RI					

40 QSO's minus duplicates — TOTALS: 4 2 120

Note: Duplicate QSO's can mean disqualification!

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Zone	New Multipliers Only	QSO POINTS
0019	N6AA					
	N6SV					
	N6CW					
	XE1LLS		06	06	XE	
	K5RC					
	W5AO					
	WB5LST					
	K6RR/7					
	W7RM					
27	K6UA					
	KC6I					
	KJ6S					
	AIØS					
	KH6XX		31	31	KH6	
	NØAZ					
	K2UR					
	W2GD					
	WB7AAF					
	N7VV					
37	W7DD					
	K6MPQ					
	WA6MVQ					
	W5RB					
	W5EO					
	VE7ZZZ					
	VE7BWG					
	K7ZC					
	KØDUQ					
	WØFL					
49	KØTOM					
	W2PH/Ø					
	N7MM					
	N7AZ					
	WAØBLQ					
	WBØLIZ					
	WØQA					
	WB7ANO					
	N7ZZ					
	K6SS					
0101	KH6BZF					

40 QSO's minus duplicates — TOTALS: 2 12 120

TOTALS THIS PAGE: 6 6 240

World Wide DX Contest

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

Page 1 of 47 Pages

Call Sign: G4XYZ | [X] Phone | [ ] CW (Use separate log for each band.) | Log for: 21 MHz Band

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Zone	New Multipliers Only	QSO POINTS
0000	9G1RT		35	35	9G	3
03	ZS6ABO		38	38	ZS	
04	AZ2CB		38		A2	
07	ZD7BW		36	36	ZD7	
09	ZD8RH		36		ZD8	
12	CN8BO		33	33	CN	
14	EA9GT		33		EA9	
30	DJ1US/ST3		34	34	ST	
0118	W3FA		05	05	W	
	N3RS		05			
0138	W1HX		05			3
	WA4OVV		05			
	N8ATR		04			
	W7IVX		03			
	K7ZA		03			
	AJ7S		03			
	W1WLW		05			
40	N4BXC		05			
	W5DV		04			
	W7MG		03			

World Wide DX Contest

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

Page 1 of 62 Pages

Call Sign: G4XYZ | [X] Phone | [ ] CW (Use separate log for each band.) | Log for: 28 MHz Band

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Zone	New Multipliers Only	QSO POINTS
0007	FY7BC	5914 X	9	9	FY	3
0009	ZZ5EG	X	11	11	PY	
0015	CX7B		13		CX	
0020	LU8DQ		13	13	LU	
0023	ZP5CLG		11		ZP	
0029	OA8V		10	10	OA	
0031	HP1XRT	X	7	7	HP	
0032	CO2FRC	X	8	8	CO	
0033	FM7AV	X	4		FM	
0038	WB4EYX	X	5	05	W	
1112	K4VYU	5914	05			3
	W9DCB		04			
	KV4P		05			
	WB9TYT		04			
	WD4CRG		05			
	AE3Y		05			
	WA2MBM		05			
	KA4FMO		05			
	N3AKX		05			
	N3BB		57 05			

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CIRCLE 30 ON READER SERVICE CARD

CQ **World Wide DX Contest** CQ

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

Page 9 of 31 Pages

Call Sign: NP2ZZ | [x] Phone | [ ] CW (Use separate log for each band.) | Log for: 21 | Mults: None

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only: Zone	New Multipliers Only: # of Countries	QSO POINTS
1001	N4WW		59 4			2
02	I4OJT		15			
03	W3GG		5			
04	N1TZ		5			
05	WA4WQH		5			
06	N3LR		5			
07	WD9CUG		4			
08	K4Pi		5			
10	N1ARP		5			
12	N3RL		5			
13	K3ND		5			
14	W1QJR		5			
17	WB1BVQ		5			
18	W4JVN		5			
19	K3KHL					
20	KB4UX					
20	K4RPK					
22	K1UTI					
24	KB4YT					
1025	K4IQH					
26	K3KG					
29	WBCCi		4			
30	W5AC					
31	KA9HRi					
32	W8TPA					
33	W8TWA					
36	W2P4T		5			
37	W3URI					
38	K8NA		4			
41	LA3EX		14			
41	AJ1i		5			
42	AI8S		4			
43	K8SS		4			
46	WB2YOF		5			
48	WA9WGT		4			
51	W4GiO		5			
52	K8BX		4			
1053	N4CiD		5			
1527	W1QUS		5			
28	KE2M		5			
	40		TOTALS		— —	80

QSO's (times doubled)

Note: Duplicate QSO's are non-deductible.

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only: Zone	New Multipliers Only: # of Countries	QSO POINTS
1529	WA4IVL		59 5			2
30	KA1CVM		5			
	AI2C		5			
	WA3UEV		5			
31	K1LS		5			
	W5GN		4			
	AI9F		4			
31	KØVUW		4			
	K3ON		5			
32	WB2iXS		5			
	AD3V		5			
33	K9SH		4			
	K3UC		5			
	K3KA		5			
	W1YN		5			
1535	W1YY		5			
	WB2PXA		5			
	K.B4YG		5			
	K1CC		5			
	KB8PK		4			
	DL8UI/W4		5			
	WBTNO		4			
	W1TN		5			
41	W2SDO		5			
	N4NX		5			
	KØVM		5			
	K4YT		5			
	KB5AS		4			
46	WD4NCD		5			
	W3MM		5			
	KA5ETS		4			
	WA1JGK		5			
	K9iMX		4			
50	K3iVO		5			
	N3RD		5			
	KA1iM		5			
	WB1FLA		5			
	WA4SOH		5			
	W2TE		5			
53	K1iKE		5			
	40		TOTALS		— —	80

QSO's (times doubled)

TOTALS THIS PAGE — — 160

Running log sheet.

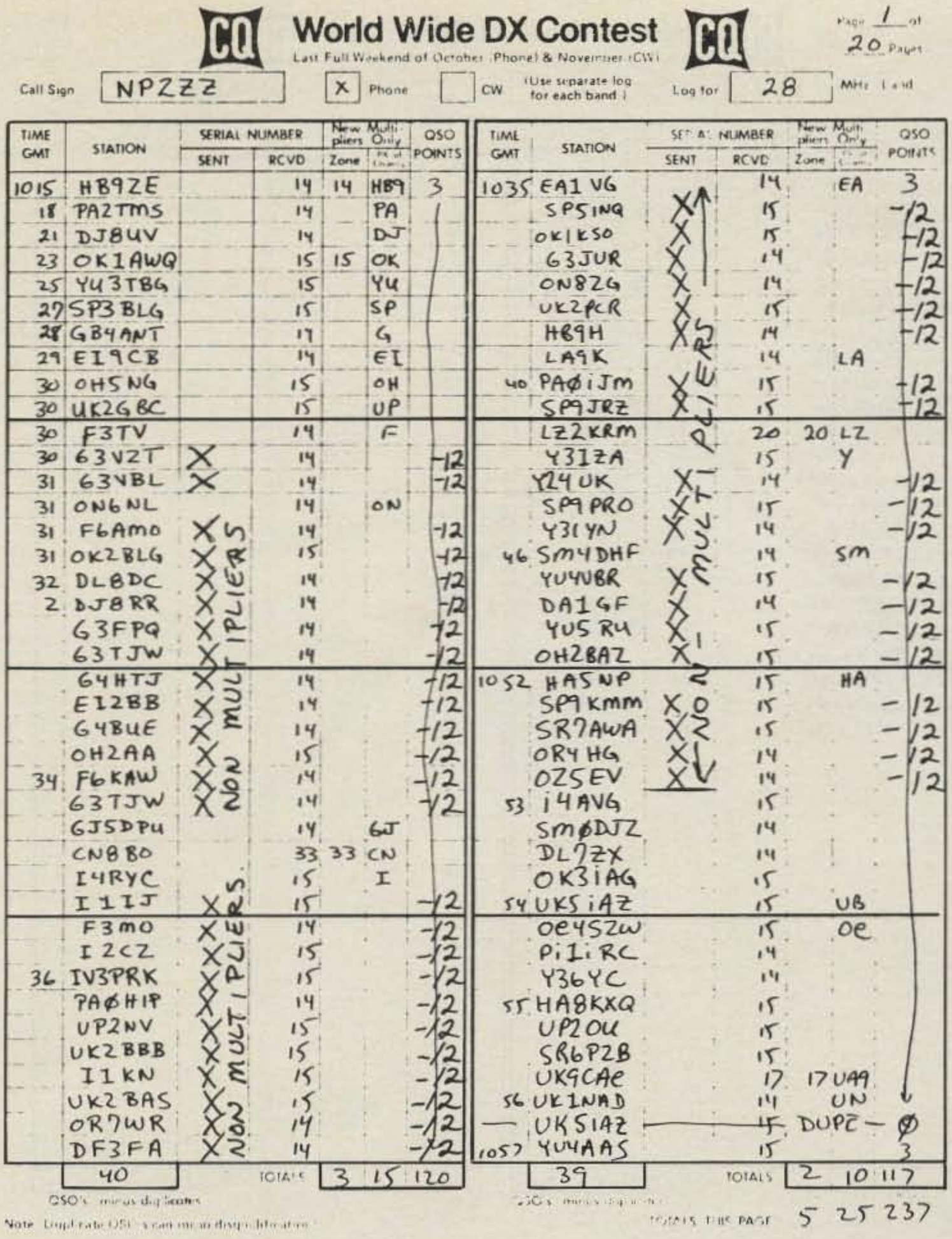
HP1, CO2, FM7, and WB4 on 10 meters all *before* 0039 UTC! These are all *illegal* QSO's and will be deducted. He has lost a total of 6 QSO's, 5 Zones, and 6 Countries.

Now look at NP2ZZ's set of logs. He is on page 9 of 15 meters and is running. We know that he is **Running** because of the high QSO rate and the absence of "only multiplier" QSO's. He runs up to 1053 UTC, then starts running again on that band at 1527 UTC. His logs for 160, 80, 40, and 20 meters show no activity from 1000 UTC until 1200 UTC. We know that 10 meters is the **Multiplier** band because he is working *only* new multipliers from 1015 to 1030 UTC (up to F3TV). But also at 1030 UTC he works G3VZT and G3VBL, which are *not* new multipliers. These are illegal QSO's; they are **Non-Multipliers**! Looking at his log, we see many non-multiplier QSO's. Remember, he is running on 15 meters until 1053 UTC. Even though his QSO rate on 10 meters is faster than 15, it does not matter. Fifteen meters was established as the **Runner** at some time before 1001 UTC, and it will not change until 1053 UTC when he stops working. The log-checker has "X-ed" every bad QSO. Working non-multipliers will have a penalty of 3 additional QSO's per deduction. If the violation is very large, such as is shown in NP2ZZ's log, he will be subject to **Reclassification** to the multi-multi category. This page has the following deductions:

(44 bad QSO's) × (−12 points each)
= −528 points.
Claimed points = 120 + 117 = 237
Total of page 1: 28 MHz = 237 + (−528) = −291!!!

If at the end of the contest he had a multiplier of 350, he has lost a total of 101,850 points on only one page!!! As you now see, it pays to follow the rules.

The last log (YU7XYZ) is an example of a perfect log. It's really easy to organize yourself so that you can have such a log. Here are some tips:



CQ **World Wide DX Contest** CQ

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

Page 1 of 20 Pages

Call Sign NPZZZ | [X] Phone | [ ] CW (Use separate log for each band) | Log for 28 MHz Band

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only Zone	New Multipliers Only (Name of Country)	QSO POINTS
1015	HB9ZE		14	14	HB9	3
18	PA2TMS		14		PA	
21	DJ8UV		14		DJ	
23	OK1AWQ		15	15	OK	
25	YU3TBG		15		YU	
29	SP3BLG		15		SP	
28	GB4ANT		17		G	
29	EI9CB		14		EI	
30	OH5NG		15		OH	
30	UK2GBC		15		UP	
30	F3TV		14		F	
30	63V2T	X	14			-12
31	63VBL	X	14			-12
31	ON6NL		14		ON	
31	F6AMO	X	14			-12
31	OK2BLG	X	15			-12
32	DL8DC	X	14			-12
2	DJ8RR	X	14			-12
	G3FPQ	X	14			-12
	G3TJW	X	14			-12
	G4HTJ	X	14			-12
	E12BB	X	14			-12
	G4BUE	X	14			-12
	OH2AA	X	15			-12
34	F6KAW	X	14			-12
	G3TJW	X	14			-12
	GJ5DPU		14		GJ	
	CN8BO		33	33	CN	
	I4RYC		15		I	
	I1IJ	X	15			-12
	F3MO	X	14			-12
	I2CZ	X	15			-12
36	IV3PRK	X	15			-12
	PA0HIP	X	14			-12
	UP2NV	X	15			-12
	UK2BBB	X	15			-12
	I1KN	X	15			-12
	UK2BAS	X	15			-12
	OR7WR	X	14			-12
	DF3FA	X	14			-12

NON MULTIPLIERS

MULTIPLIERS

1035	EA1VG	X	14		EA	3
	SP5INQ	X	15			-12
	OK1KSO	X	15			-12
	G3JUR	X	14			-12
	ON8ZG	X	14			-12
	UK2PCR	X	15			-12
	HB9H	X	14			-12
	LA9K	X	14		LA	
40	PA0IJM	X	15			-12
	SP9JRZ	X	15			-12
	LZ2KRM		20	20	LZ	
	Y31ZA		15		Y	
	Y24UK	X	14			-12
	SP9PRO	X	15			-12
	Y31YN	X	14			-12
46	SM4DHF	X	14		SM	
	YU4UBR	X	15			-12
	DA1GF	X	14			-12
	YU5RH	X	15			-12
	OH2BAZ	X	15			-12
1052	HA5NP	X	15		HA	
	SP9KMM	X	15			-12
	SR7AWA	X	15			-12
	OR4HG	X	14			-12
	OZ5EV	X	14			-12
53	I4AVG		15			
	SM0DJZ		14			
	DL7ZX		14			
	OK3IAG		15			
54	UK5IAZ		15		UB	
	OE4SZW		15		OE	
	PI1IRC		14			
	Y36YC		14			
55	HA8KXQ		15			
	UP2OU		15			
	SR6P2B		15			
	UK9CAE		17	17	UA9	
56	UK1NAD		14		UN	
—	UK5IAZ		15		DUPE	-0
1057	YU4AAS		15			3

40	TOTALS	3 15	120
39	TOTALS	2 10	117

QSO's minus duplicates

QSO's minus duplicates

Note: Duplicate QSO's can mean disqualification

TOTALS THIS PAGE 5 25 237

Multiplier log sheet.

1. Be sure that everyone in your group knows at all times which band is the **Runner** and which is the **Multiplier**.

2. Find the multipliers ahead of time! If you're running on 20 and both 15 and 10 are open, alternate back and forth from 10 to 15 to 10 to 15, etc. Be sure to stay on each band 10 minutes. While the 10-meter station is using up their 10-minute period, the 15-meter operator should be *finding* multipliers and *noting* the frequency of each. When 10 meters finishes and 15 meters starts their turn, they will know exactly on what frequency to find each multiplier. There is no time wasted *looking* for multipliers. Use the 10-minute period to *work multipliers*. Remember, the 10-minute rule applies to the transmitted signal only. And while 15 is working multipliers, the 10-meter op should be finding his next multipliers and writing down their frequencies. In fact, you can search on as many bands as you like at any one time. Just be sure to transmit only *one* **Runner** and only *one* **Multiplier** signal and each for at least 10 minutes per band of operation.

Of course you don't have to use the above method for *most* operation. The category is also for those stations with only one rig but more than one operator. You can still have lots of fun operating like that; it's just not very likely that you will take first place.

How closely does the Committee check your multi-single score? Suffice it to say that every minute of every band of operation is logged on a huge cross-check sheet. Yes, every single minute! If you've made a time violation, you can bet your last penny that it will be found and corrected. But take heart; F3TV and TF3IRA are just two of the 1980 entrants who had their scores *increased*.

More Tips On The Contest

I hope that most of you have read the article in the February 1981 edition of *CQ* about dupe sheets. Several reasons were

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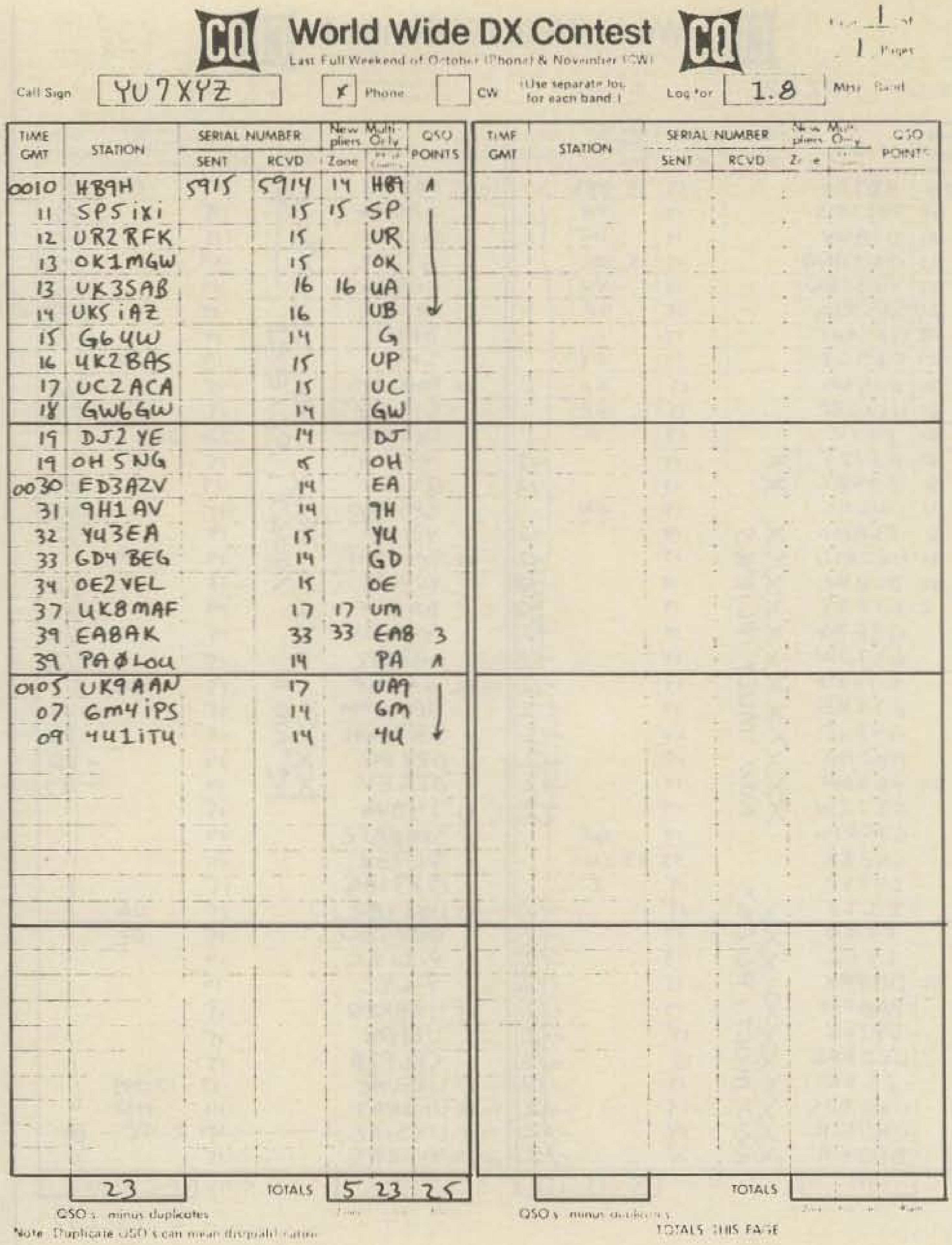
given for submitting a dupe sheet. Well, here's another reason. One purpose of the *CQ* WW Committee is to check and correct logs. When we correct a log, we do so in both directions. If we see a country counted as a multiplier that isn't a multiplier, we delete it. We also **Add In** multipliers that you forgot about. Almost everyone (even the first place scores) forgets that the *CQ* multiplier list is composed of the ARRL DXCC country list *plus* the DARC WAE list. This means that UK1NAD (or any UN1 station) counts as another multiplier! So does GM3RFR (Shetland), European Turkey (TA1), Sicily (IT9), and Bear Island (JW)! Do you know which SVØ is on Crete? Or which Italian station is in zone 33? We do! One of the first steps I do when checking a log is to count up the multipliers. I always go to the dupe sheets to check for these "extra" countries. If there isn't a dupe sheet, it's much less likely that the committee will find these stations by simply reading every line of the log. This is also a *good* reason to keep your dupe sheets sorted by a **Prefix** key. A lot of you use the "backward" method of duping and enter calls by the last letter of the call. This is 100% legal, but it makes life tough when we try to help find you more multipliers. Remember, we want your log to be correct!

Beginning with the 1980 *CQ* WW contest, entrants submitting a computer typed, or re-copied log were required to also submit the original hand-written log. For many various reasons the committee has decided to *delete* this requirement. But we still require dupe sheets!



CQ World Wide DX Contest

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

Page 1 of 1 Pages

Call Sign: YU7XYZ — [x] Phone [ ] CW (Use separate log for each band) — Log for 1.8 MHz Band

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only: Zone	New Multipliers Only: Country	QSO POINTS
0010	HB9H	5915	5914	14	HB9	1
11	SP5IXI		15	15	SP	↓
12	UR2RFK		15		UR	
13	OK1MGW		15		OK	
13	UK3SAB		16	16	UA	
14	UK5IAZ		16		UB	
15	G6UW		14		G	
16	UK2BAS		15		UP	
17	UC2ACA		15		UC	
18	GW6GW		14		GW	
19	DJ2YE		14		DJ	
19	OH5NG		15		OH	
0030	ED3AZV		14		EA	
31	9H1AV		14		9H	
32	YU3EA		15		YU	
33	GD4BEG		14		GD	
34	OE2VEL		15		OE	
37	UK8MAF		17	17	UM	
39	EA8AK		33	33	EA8	3
39	PAØLOU		14		PA	1
0105	UK9AAN		17		UA9	↓
07	GM4IPS		14		GM	
09	4U1ITU		14		4U	
23			TOTALS	5	23	25

QSOs minus duplicates

Note: Duplicate QSO's can mean disqualification

TOTALS THIS PAGE

(Right and opposite page) These logs from YU7XYZ are examples of perfect logs.

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CQ World Wide DX Contest

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

Page 1 of 5 Pages

Call Sign: 4U7XYZ | [Y] Phone | [ ] CW | (Use separate log for each band.) | Log for: 3.7 MHz Band

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only: Zone	New Multipliers Only: Power Country	QSO POINTS
0000	4U1iTU	5915	5914	14	4U	1
01	LZ2KKZ		20	20	LZ	
02	GB4ANT		14		G	
03	OZ5EV		14		OZ	
04	ED3AZV		14		EA	
05	HZ1HZ		21	21	HZ	
06	UK5iAZ		16	16	UB	
07	UK9SAD		17	17	UA9	
08	SR7AWA		15	15	SP	
09	OK2BLG		15		OK	
0020	UK3AAC		16		UA3	
21	OE4SZW		15		OE	
22	UP2OU		15		UP	
23	OH2YY		15		OH	
24	K1VTM		05	05	K	3
25	LA1K		14		LA	1
26	SM5BLA		14		SM	
27	HA7KLC		15		HA	
28	DK8NG		14		DL	
29	TF3iRA		40	40	TF	
0052	OR7KA		14		ON	
53	Pi1PT		14		PA	
54	Y31ZA		14		Y	
55	FSVU		14		F	
57	UQ2GAG		15		UQ	
59	I4RYC		15		I	
0100	YO6KEB		20		YO	
02	LX1AA		14		LX	
05	UK2iAJ		15		UC	
0400	N2AA		05			3

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only: Zone	New Multipliers Only: Power Country	QSO POINTS
0410	LZ7A	5915	5920			1
	HA8KAE		15			
	DK6GK		14			
	HA5KFL		15			
	OK3YCL		15			
	SP5PBE		15			
	SR8H22		15			
	SP5XM		15			
	OK2PBM		15			
	N2LT		05			3
	SMØGMZ		14			1
	HA5NP		15			
	EE1QH		14			
	EA3BJF		14			
	OR7KA		14		ON	
	EA5AFC		14			
	K1XA		05			3
	K3ND		5			
	N3ii		5			
	K3RP		5			
	w1ZM		5			
	YO8DBA		20			1
	UK5MAG		16			
	Y35YE		14			
	UK1ABM		16			
	HA3KNA		15			
	HA3KHC		15			
	UR2RQ		15			
	OH2TQ		15			
	UB5FDR		16			

CQ World Wide DX Contest

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

Page 1 of 6 Pages

Call Sign: YU7XYZ | [X] Phone | [ ] CW | (Use separate log for each band.) | Log for: 7 MHz Band

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only: Zone	New Multipliers Only: Power Country	QSO POINTS
0000	I2JSB	5915	5915	15	I	1
	SPØPBW		15		SP	
	K1RX		05	5	W	3
	K1VTM		5			
	N4HB		5			
	K3UTE		5			
	K9XR		4			
	K3UC		5			
	K2VV		5			
10	K1EA		5			
	K4CT		5			
	K4LSP		5			
	AK3Z		5			
	W3LPL		5			
	N2LT		5			
	W3EWL		5			
	W4ZMM		5			
	N3ii		5			
	WB2CEi		5			
20	K3UU		5			
	KP4EQF		8	8	KP4	
	WB5NBY		5			
	N4AK		5			
	K4VT		5			
	K3ND		5			
	ABØi		4			
	K3GYD		5			
	UK6CHD		16	16	UA3	1
	W9EP		4			3
29	K2VV		5			
	K1CC		5			
	K4JEX		5			
	W3FA		5			
	K2SVP		5			
	W4DR		5			
	K2UA		5			
	W1ZK		5			
	W3GRF		5			
	WB2STY		5			
39	WB4NLH		5			

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only: Zone	New Multipliers Only: Power Country	QSO POINTS
0039	AD8C	5915	5904			3
	K2RD		5			
	K2IGW		5			
	N2AA		5			
	K4ISV		5			
	KM4K		5			
	K1RX		5			
	K3ZJ		5			
	N4ZC		5			
45	K1iK		5			
	K1XA		5			
	W3FA		5			
	VE1DXA		5		VE	
	K2SWP		5			
	W3mm		5			
	W4PRO		5			
	N4RJ		5			
	W1GNR		5			
	K3GYD		5			
59	K4JRB		5			
0100	N4BAA		5			
	WB3AVN		5			
	K3RX		5			
	K4CEB		5			
	K4KZZ		5			
	AA4KA		5			
	W2PV		5			
	VE1UNB		5			
	W1XK		5			
09	N1TZ		5			
	K8LX		4	5		
	K9XR		4			
	AG8Z13		5			
	N5AU		4			
	W5XX		5			
	K4HHL		5			
	W1HSB		5			
	K4LTA		5			
	KC4M		5			
0120	WA2IFS		5			

	QSO's (minus dupes)	TOTALS			
		4	5	44	
		~	1	120	

Note: Duplicate QSO's can mean disqualification.

TOTALS THIS PAGE: 4 6 ~~9~~234

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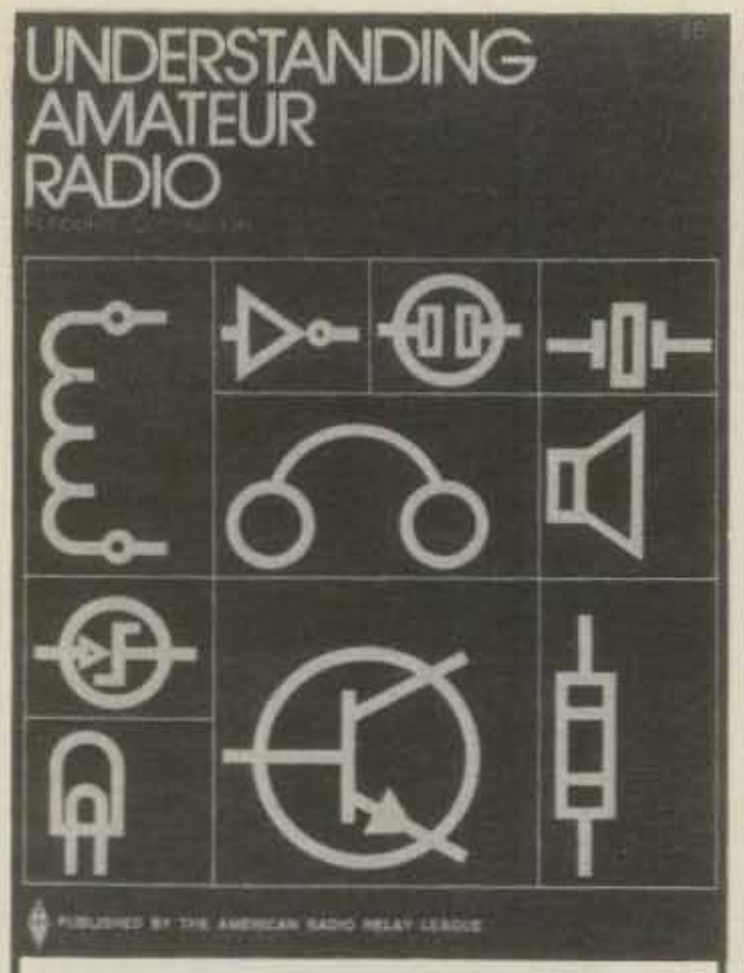

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CQ **World Wide DX Contest** CQ

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

Page 1 of 39 Pages

Call Sign YU7XYZ | Y Phone | CW (Use separate log for each band.) | Log for 14 MHz Band

TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RCVD	New Multipliers Only Zone	New Multipliers Only Prefix or Country	QSO POINTS
0040	K1LO	5915	5905	05	K	3
41	6D7LCH		06	6	XE	
42	YV2iF		9	9	YV	
45	FM7AV		8	8	FM	
47	CT2QN		14	14	CT2	1
48	HK3AXT		9		HK	3
49	VP9TCi		8		VP5	
49	ZS6BPL		38	38	ZS	
50	HI8GB		8		Hi	
51	XL3LON		5		VE	
0130	W9EP	5915	5905			3
	K2WW		5			
	K1CC		5			
	K4JEX		5			
	W9DUB		4			
	N8ANC		4			
	N2AA		5			
	W2iQD		5			
	WA3FWA		5			
	N3NWi		5			

Another example of a perfect log from YU7XYZ.

A Final Word

The *CQ* WW Contest Committee does indeed scrutinize your log. Every member is a *very* active contester, knows the bands, knows who else is active, and knows what is and what isn't possible in a log. We like to see big scores and we like to see records broken. Believe me, we're out to help you improve your score. Just be sure that you do it within the limits of the rules. I hope that any gray areas have been cleared up. If you have any questions about any phase of the contest, please write me or any committee member. We'll be happy to help.

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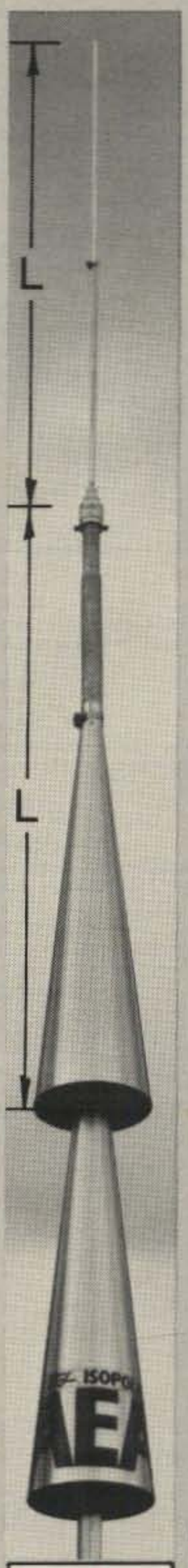

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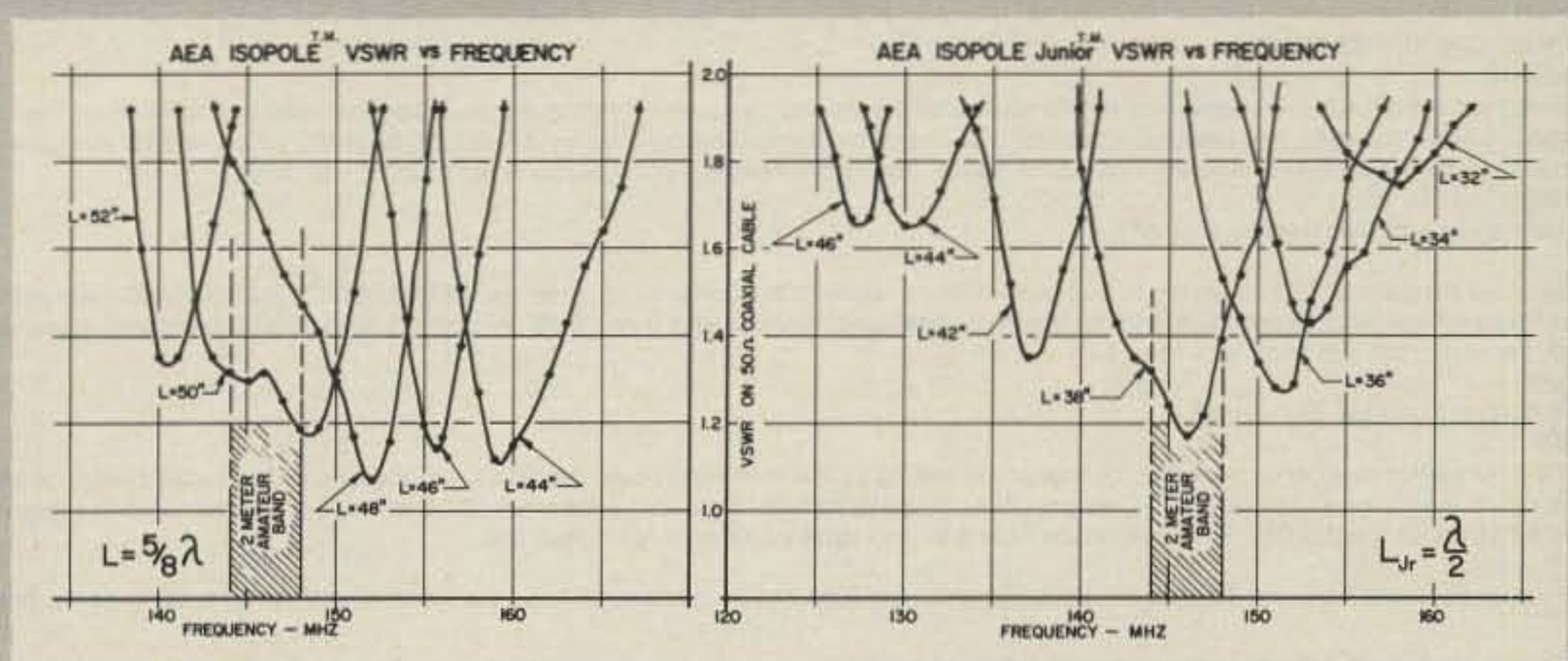

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CIRCLE 75 ON READER SERVICE CARD

MHz electronics

Toll Free Number
800-528-0180
(For orders only)

1900 MHz to 2500 MHz DOWN CONVERTER
This receiver is tunable a range of 1900 to 2500 mc and is intended for amateur radio use. The local oscillator is voltage controlled (i.e) making the i-f range approximately 54 to 88 mc (Channels 2 to 7).

PC BOARD WITH DATA $19.99
PC BOARD WITH CHIP CAPACITORS 13 ..... $44.99
PC BOARD WITH ALL PARTS FOR ASSEMBLY $69.95
PC BOARD WITH ALL PARTS FOR ASSEMBLY PLUS 2N6603 ..... $89.99
PC BOARD ASSEMBLED AND TESTED $79.99
PC BOARD WITH ALL PARTS FOR ASSEMBLY, POWER SUPPLY AND ANTENNA $159.99
POWER SUPPLY ASSEMBLED AND TESTED $49.99
YAGI ANTENNA 4' LONG APPROX. 20 TO 23 dB GAIN $39.99
YAGI ANTENNA 4' WITH TYPE (N, BNC, SMA Connector) $64.99
2300 MHz DOWN CONVERTER HMRII, WITH DISH ANTENNA 6 MONTH WARRANTY $200.00
2300 MHz DOWN CONVERTER
Includes converter mounted in antenna, power supply, Plus 90 DAY WARRANTY $200.00
OPTION #1 MRF902 in front end. (7 dB noise figure) $299.99
OPTION #2 2N6603 in front end. (5 dB noise figure) $359.99
2300 MHz DOWN CONVERTER ONLY
10 dB Noise Figure 23 dB gain in box with N conn. Input F conn. Output $149.99
7 dB Noise Figure 23 dB gain in box with N conn. Input F conn. Output $169.99
5 dB Noise Figure 23 dB gain in box with SMA conn. Input F conn. Output $189 99
PC BOARD FOR 5 dB UNIT WITH DATA $35.00
PC BOARD FOR 5 dB UNIT WITH ALL PARTS FOR ASSEMBLY $139.99

DATA IS INCLUDED WITH KITS OR MAY BE PURCHASED SEPARATELY $15.00

Shipping and Handling Cost:
Receiver Kits and $1.50, Power Supply add $2.00, Antenna add $5.00, Option 1/2 add $3.00, For complete system add $7.50.

HOWARD/COLEMAN TVRO CIRCUIT BOARDS

DUAL CONVERSION BOARD $25.00
This board provides conversion from the 3.7-4.2 band first to 900 MHz where gain and bandpass filtering are provided and, second, to 70 MHz. The board contains both local oscillators, one fixed and the other variable, and the second mixer. Construction is greatly simplified by the use of Hybrid IC amplifiers for the gain stages. Bare boards cost $25 and it is estimated that parts for construction will cost $270. (Note: The two Avantek VTO's account for $225 of this cost.)

47 pF CHIP CAPACITORS $6.00
For use with dual conversion board. Consists of 6-47 pF.

70 MHz IF BOARD $25.00
This circuit provides about 43 dB gain with 50 ohm input and output impedance. It is designed to drive the HOWARD/COLEMAN TVRO Demodulator. The on-board band pass filter can be tuned for bandwidths between 20 and 35 MHz with a passband ripple of less than ½ dB. Hybrid ICs are used for the gain stages. Bare boards cost $25. It is estimated that parts for construction will cost less than $40.

.01 pF CHIP CAPACITORS $7.00
For use with 70 MHz IF Board. Consists of 7-.01 pF.

DEMODULATOR BOARD $40.00
This circuit takes the 70 MHz center frequency satellite TV signals in the 10 to 200 millivolt range, detects them using a phase locked loop, deemphasizes and filters the result and amplifies the result to produce standard NTSC video. Other outputs include the audio subcarrier, a DC voltage proportional to the strength of the 70 MHz signal, and AFC voltage centered at about 2 volts DC. The bare board cost $40 and total parts cost less than $30.

SINGLE AUDIO $15.00
This circuit recovers the audio signals from the 6.8 MHz frequency. The Miller 9051 coils are tuned to pass the 6.8 MHz subcarrier and the Miller 9052 coil tunes for recovery of the audio.

DUAL AUDIO $25.00
Duplicate of the single audio but also covers the 6.2 range.

DC CONTROL $15.00
This circuit controls the VTO's, AFC and the S Meter.

TERMS:
WE REGRET WE NO LONGER ACCEPT BANK CARDS.

PLEASE SEND POSTAL MONEY ORDER, CERTIFIED CHECK, CASHIER'S CHECK OR MONEY ORDER.
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ALL ORDERS SENT FIRST CLASS OR UPS.

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WE ALSO SWAP OR TRADE.

FOR CATALOG SEE JANUARY, 1980, *73 Magazine*, 10 Pages.

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2111 W. Camelback
Phoenix, Arizona 85015

CIRCLE 80 ON READER SERVICE CARD

MHz electronics

Toll Free Number
800-528-0180
(For orders only)

FAIRCHILD VHF AND UHF PRESCALER CHIPS

95H90DC	350 MHz Prescaler Divide by 10/11	$9.50
95H91DC	350 MHz Prescaler Divide by 5/6	9.50
11C90DC	650 MHz Prescaler Divide by 10/11	16.50
11C91DC	650 MHz Prescaler Divide by 5/6	16.50
11C83DC	1 GHz Divide by 248/256 Prescaler	29.90
11C70DC	600 MHz Flip/Flop with reset	12.30
11C58DC	ECL VCM	4.53
11C44DC/MC4044	Phase Frequency Detector	3.82
11C24DC/MC4024	Dual TTL VCM	3.82
11C06DC	UHF Prescaler 750 MHz D Type Flip/Flop	12.30
11C05DC	1 GHz Counter Divide by 4	50.00
11C01FC	High Speed Dual 5-4 input NO/NOR Gate	15.40

MUFFIN FANS

Size 4.68" × 4.68" × 1.50" — $8.99

TRW BROADBAND AMPLIFIER MODEL CA615B

Frequency response 40 MHz to 300 MHz
Gain: 300 MHz 16 dB Min., 17.5 dB Max.
50 MHz 0 to − 1 dB from 300 MHz
Voltage: 24 volts dc at 220 ma max. — $19.99

CARBIDE — CIRCUIT BOARD DRILL BITS FOR PC BOARDS

Size: 35, 42, 47, 49, 51, 52	$2.15
Size: 53, 54, 55, 56, 57, 58, 59, 61, 63, 64, 65	1.85
Size: 66	1.90
Size: 1.25 mm, 1.45 mm	2.00
Size: 3.20 mm	3.58

CRYSTAL FILTERS: TYCO 001-19880 same as 2194F

10.7 MHz Narrow Band Crystal Filter
3 dB bandwidth 15 kHz min. 20 dB bandwidth 60 kHz min. 40 dB bandwidth 150 kHz min.
Ultimate 50 dB: Insertion loss 1.0 dB max. Ripple 1.0 dB max. Ct. 0 + / − 5 pf 3600 ohms. — $5.95

MURATA CERAMIC FILTERS

Models:	SFD-455D 455 kHz	$3.00
	SFB-455D 455 kHz	2.00
	CFM-455E 455 kHz	7.95
	SFE-10.7 10.7 MHz	5.95

TEST EQUIPMENT — HEWLETT PACKARD — TEKTRONIX — ETC.

Hewlett Packard:

491C	TWT Amplifier 2 to 4 Gc 1 watt 30 dB gain	$1150.00
608C	10 mc to 480 mc .1 uV to.5V into 50 ohms Signal Generator	500.00
608D	10 to 420 mc .1 uV to.5V into 50 ohms Signal Generator	500.00
612A	450 to 1230 mc .1 uV to .5V into 50 ohms Signal Generator	750.00
614A	900 to 2100 mc. Signal Generator	500.00
616A	1.8 to 4.2 Gc Signal Generator	400.00
616B	1.8 to 4.2 Gc Signal Generator	500.00
618A	3.8 to 7.2 Gc Signal Generator	400.00
618B	3.8 to 7.2 Gc Signal Generator	500.00
620A	7 to 11 Gc Signal Generator	500.00
623B	Microwave Test Set	900.00
626A	10 Gc to 15 Gc Signal Generator	2500.00
695A	12.4 to 18 Gc Sweep Generator	900.00

Alltech:

473	225 to 400 mc AM/FM Signal Generator	750.00

Singer:

MF5/VR-4	Universal Spectrum Analyzer with 1 kHz to 27.5 mc Plug In	1200.00

Keltek:

XR630-100	TWT Amplifier 8 to 12.4 Gc 100 watts 40 dB gain	9200.00

Polarad:

2038/2436/1102A
Calibrated Display with an SSB Analysis Module and a 10 to 40 mc Single Tone Synthesizer — 1500.00

RF TRANSISTORS

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2N1561	$15.00	2N5590	$8.15	MM1550	$10.00
2N1562	15.00	2N5591	11.85	MM1552	50.00
2N1692	15.00	2N5637	22.15	MM1553	56.50
2N1693	15.00	2N5641	6.00	MM1601	5.50
2N2632	45.00	2N5642	10.05	MM1602/2N5842	7.50
2N2857JAN	2.52	2N5643	15.82	MM1607	8.65
2N2876	12.35	2N6545	12.38	MM1661	15.00
2N2880	25.00	2N5764	27.00	MM1669	17.50
2N2927	7.00	2N5842	8.78	MM1943	3.00
2N2947	18.35	2N5849	21.29	MM2605	3.00
2N2948	15.50	2N5862	51.91	MM2608	5.00
2N2949	3.90	2N5913	3.25	MM8006	2.23
2N2950	5.00	2N5922	10.00	MMCM918	20.00
2N3287	4.30	2N5942	46.00	MMT72	1.17
2N3294	1.15	2N5944	8.92	MMT74	1.17
2N3301	1.04	2N5945	12.38	MMT2857	2.63
2N3302	1.05	2N5946	14.69	MRF237	2.95
2N3304	1.48	2N6080	7.74	MRF245	33.30
2N3307	12.60	2N6081	10.05	MRF247	33.30
2N3309	3.90	2N6082	11.30	MRF304	43.45
2N3375	9.32	2N6083	13.23	MRF420	20.00
2N3553	1.57	2N6084	14.66	MRF421	31.38
2N3755	7.20	2N6094	7.15	MRF422	44.14
2N3818	6.00	2N6095	11.77	MRF426	10.24
2N3866	1.09	2N6096	20.77	MRF450	11.85
2N3866JAN	2.80	2N6097	29.54	MRF450A	11.85
2N3866JANTX	4.49	2N6136	20.15	MRF454	21.83
2N3924	3.34	2N6166	38.60	MRF458	20.68
2N3927	12.10	2N6439	45.77	MRF472	2.50
2N3950	26.86	2N6459/PT9795	18.00	MRF502	1.08
2N4072	1.80	2N6603	12.00	MRF504	6.95
2N4135	2.00	2N6604	12.00	MRF509	4.90
2N4261	14.60	A50-12	25.00	MRF511	8.15
2N4427	1.20	BFR90	5.00	MRF901	5.00
2N4957	3.62	BLY568C	25.00	MRF5177	21.62
2N4958	2.92	BLY568CF	25.00	MRF8004	1.60
2N4959	2.23	CD3495	15.00	PT4186B	3.00
2N4976	19.00	HEP76/S3014	4.95	PT4571A	1.50
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2N5108	4.03	HEPS3003	29.88	PT4628	5.00
2N5109	1.66	HEPS3005	9.95	PT4640	5.00
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2N5179	1.05	HEPS3007	24.95	PT9784	24.30
2N5184	2.00	HEPS3010	11.34	PT9790	41.70
2N5216	47.50	HEPS5026	2.56	SD1043	5.00
2N5583	4.55	HP35831E/		SD1116	3.00
2N5589	6.82	HXTR5104	50.00	SD1118	5.00
		MM1500	32.20	SD1119	3.00
				TRWMRA2023-1.5	42.50
				40281	10.90
				40282	11.90
				40290	2.48

CHIP CAPACITORS

We can supply any value chip capacitors you may need.

PRICES

1 to 10	$1.49
11 - 50	1.29
51 - 100	.89
101 - 1,000	.69
1,001 up	.49

1pf	27pf	220pf	1200pf
1.5pf	33pf	240pf	1500pf
2.2pf	39pf	270pf	1800pf
2.7pf	47pf	300pf	2200pf
3.3pf	56pf	330pf	2700pf
3.9pf	68pf	360pf	3300pf
4.7pf	82pf	390pf	3900pf
5.6pf	100pf	430pf	4700pf
6.8pf	110pf	470pf	5600pf
8.2pf	120pf	510pf	6800pf
10pf	130pf	560pf	8200pf
12pf	150pf	620pf	.010mf
15pf	160pf	680pf	.012mf
18pf	180pf	820pf	.015mf
22pf	200pf	1000pf	.018mf

HAMLIN SOLID STATE RELAYS:

120vac at 40 Amps.
Input Voltage 3 to 32vdc.
240 vac at 40 Amps.
Input Voltage 3 to 32 vdc.

YOUR CHOICE $4.99

ATLAS CRYSTAL FILTERS FOR ATLAS HAM GEAR

5.52-2.7/8
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5.595-2.7LSB
5.595-2.7USB
5.645-2.7/8
9.OUSB/CW

YOUR CHOICE $24.95

CIRCLE 87 ON READER SERVICE COUPON

MHz electronics

Toll Free Number
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MOTOROLA Semiconductor

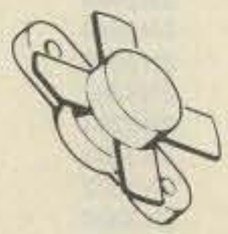
The RF Line

MRF454 $21.83

NPN SILICON RF POWER TRANSISTORS

. . . designed for power amplifier applications in industrial, commercial and amateur radio equipment to 30 MHz.

- Specified 12.5 Volt, 30 MHz Characteristics –
  Output Power = 80 Watts
  Minimum Gain = 12 dB
  Efficiency = 50%



MRF458 $20.68

NPN SILICON RF POWER TRANSISTOR

. . . designed for power amplifier applications in industrial, commerical and amateur radio equipment to 30 MHz.

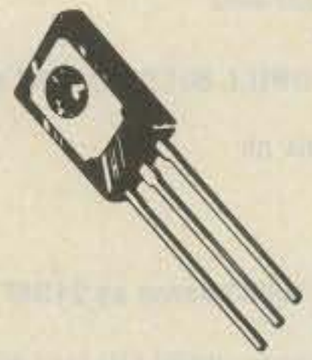
- Specified 12.5 Volt, 30 MHz Characteristics –
  Output Power = 80 Watts
  Minimum Gain = 12 dB
  Efficiency = 50%
- Capable of Withstanding 30:1 Load VSWR @ Rated P_{out} and V_{CC}

MRF472 $2.50

NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for use in large-signal output amplifier stages. Intended for use in Citizen-Band communications equipment operating at 27 MHz. High breakdown voltages allow a high percentage of up-modulation in AM circuits.

- Specified 12.5 V, 27 MHz Characteristics –
  Power Output = 4.0 Watts
  Power Gain = 10 dB Minimum
  Efficiency = 65% Typical



MRF475 $5.00

NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for use in single sideband linear amplifier output applications in citizens band and other communications equipment operating to 30 MHz.

- Characterized for Single Sideband and Large-Signal Amplifier Applications Utilizing Low-Level Modulation.
- Specified 13.6 V, 30 MHz Characteristics –
  Output Power = 12 W (PEP)
  Minimum Efficiency = 40% (SSB)
  Output Power = 4.0 W (CW)
  Minimum Efficiency = 50% (CW)
  Minimum Power Gain = 10 dB (PEP & CW)
- Common Collector Characterization

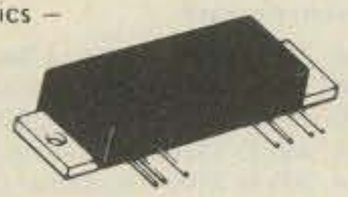
MHW710 - 2 $46.45

440 to 470MC

UHF POWER AMPLIFIER MODULE

. . . designed for 12.5 volt UHF power amplifier applications in industrial and commercial FM equipment operating from 400 to 512 MHz.

- Specified 12.5 Volt, UHF Characteristics –
  Output Power = 13 Watts
  Minimum Gain = 19.4 dB
  Harmonics = 40 dB



- 50 Ω Input/Output Impedance
- Guaranteed Stability and Ruggedness
- Gain Control Pin for Manual or Automatic Output Level Control
- Thin Film Hybrid Construction Gives Consistent Performance and Reliability

Tektronix Test Equipment

B	Wideband High Gain Plug In	$ 51.00
CA	Dual Trace Plug In	120.00
K	Fast Rise DC Plug In	63.00
N	Sampling Plug In	200.00
R	Transistor Risetime Plug In	116.00
W	High Gain Differential Comparator Plug In	283.00
TU-2	Test Load Plug In for 530/540/550 Main Frames	50.00
1A2	Wideband Dual Trace Plug In	216.00
1S1	Sampling Unit With 350PS Risetime DC to 1GHZ	730.00
2A61	AC Differential Plug In	133.00
3S3	Dual Trace Sampling DC to 1GHZ Plug In	250.00
3S76	Dual Trace Sampling DC to 875MHZ Plug IN	250.00
3T77A	Sampling Sweep Plug In	250.00
3L10	Spectrum Analyzer 1 to 36MHZ Plug IN	1000.00
50	Amplifier Plug In	50.00
51	Sweep Plug In	50.00
53/54B	Wideband High Gain Plug In	45.00
53/54C	Dual Trace Plug In	112.50
53/54D	High Gain DC Differential Plug In	38.00
53/54G	Wideband DC Differential Plug In	68.00
84	Test Plug In For 580/581 Main Frames	75.00
107	Square Wave Generator .4 to 1MHZ	48.00
RM122	Preamplifier 2Hz to 40KHZ	63.00
123	AC Coupled Preamplifier	25.00
131	Current Probe Amplifier	50.00
184	Time Mark Generator	363.00
R240	Program Control Unit	150.00
280	Trigger Countdown Unit	84.00
535A	DC to 15MHZ Scope Rack Mount	263.00
543	DC to 33MHZ Scope	300.00
561	DC to 10MHZ Scope Rack Mount	150.00
561A	DC to 10MHZ Scope Rack Mount	200.00

Scopes with Plug-in's

491	Spectrum Analyzer 10MC to 40 GHZ like new	9000.00
561A	DC to 10MHZ Scope with a 3S76 Dual Trace DC to 875MHZ Sampling Plug In and a 3T77A Sweep Plug In, Rack Mount	600.00
565	DC to 10MHZ Dual Beam Scope with a 2A63 Diff. and a 2A61 Diff. Plug In's	900.00
581	DC to 80MHZ Scope with a 82 Dual Trace High Gain Plug In	650.00

Tubes

2E26	$ 5.00	4CX350FJ	$116.00	6146W	12.00
3-500Z	102.00	4CX1000A	300.00	6159	10.60
3-1000Z	268.00	4CX1500B	350.00	6161	75.00
3B28/866A	5.00	4CX15000A	750.00	6293	18.50
3X2500A3	150.00	4E27	50.00	6360	6.95
4-65A	45.00	4X150A	41.00	6907	40.00
4-125A	58.50	4X150D	52.00	6939	14.75
4-250A	68.50	4X150G	74.00	7360	12.00
4-400A	71.00	572B/T160L	39.00	7984	10.40
4-1000A	184.00	6LF6	5.00	8072	49.00
5-500A	145.00	6LQ6	5.00	8106	2.00
4CX250B	65.00	811A	12.95	8156	7.85
4CX250F/G	55.00	813	29.00	8226	127.70
4CX250K	113.00	5894/A	42.00	8295/PL172	328.00
4CX250R	92.00	6146	5.00	8458	25.75
4CX300A	147.00	6146A	6.00	8560A/A5	50.00
4CX350A	107.00	6146B/8298A	7.00	8908	9.00
				8950	9.00

CIRCLE 82 ON READER SERVICE COUPON

Say You Saw It In CQ

MICROWAVE COMPONENTS

ARRA

2416	Variable Attenuator	$ 50.00
3614-60	Variable Attenuator 0 to 60dB	75.00
KU520A	Variable Attenuator 18 to 26.5 GHz	100.00
4684-20C	Variable Attenuator 0 to 180dB	100.00
6684-20F	Variable Attenuator 0 to 180dB	100.00

General Microwave

Directional Coupler 2 to 4GHz 20dB Type N		75.00

Hewlett Packard

H487B	100 ohms Neg. Thermistor Mount (NEW)	150.00
H487B	100 ohms Neg. Thermistor Mount (USED)	100.00
477B	200 ohms Neg. Thermistor Mount (USED)	100.00
X487A	100 ohms Neg. Thermistor Mount (USED)	100.00
X487B	100 ohms Neg. Thermistor Mount (USED)	125.00
J468A	100 ohms Neg. Thermistor Mount (USED)	150.00
478A	200 ohms Neg. Thermistor Mount (USED)	150.00
J382	5.85 to 8.2 GHz Variable Attenuator 0 to 50dB	250.00
X382A	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	250.00
NK292A	Waveguide Adapter	65.00
8436A	Bandpass Filter 8 to 12.4 GHz	75.00
8471A	RF Detector	50.00
H532A	7.05 to 10 GHz Frequency Meter	300.00
G532A	3.95 to 5.85 GHz Frequency Meter	300.00
J532A	5.85 to 8.2 GHz Frequency Meter	300.00
809A	Carriage with a 444A Slotted Line Untuned Detector Probe and 809B Coaxial Slotted Section 2.6 to 18 GHz	175.00
X347A	8.2 to 12.4 GHz Noise Source	500.00
S347A	2.6 to 3.95 GHz Noise Source	600.00
G347A	3.95 to 5.85 GHz Noise Source	500.00
J347A	5.85 to 8.2 GHz Noise Source	500.00
H347A	7.05 to 10 GHz Noise Source	540.00
349A	400 to 4000 MHz Noise Source	310.00
P532A	12.4 to 18 GHz Frequency Meter	400.00
M532A	Frequency Meter	500.00
P382A	0-50dB Attenuator	520.00
355C	.5 watts 50 DC to 1000 Mc Attenuator	132.50
NK292A	Adapter	100.00
3503	Microwave Switch	100.00
33001C	PIN Absorption Modulator	295.00
11660A	Tracking Generator Shunt	50.00
11048C	Feed Thru Termination	25.00
10100B	Feed Thru Termination	25.00
H421A	7.05 to 10 GHz Crystal Detector	75.00
H421A	7.05 to 10 GHz Crystal Detector Matched Pair	200.00

Merrimac

AU-26A/	801162 Variable Attenuator	100.00

Microlab/FXR

X638S	Horn 8.2 - 12.4 GHz	60.00
601-B18	X to N Adapter 8.2 - 12.4 GHz	35.00
Y610D	Coupler	75.00

Narda

4013C-10/	22540A Directional Coupler 2 to 4 GHz 10db Type SMA	90.00
4014-10/	22538 Directional Coupler 3.85 to 8 GHz 10dB Type SMA	90.00
4014C-6/	22876 Directional Coupler 3.85 to 8 GHz 6dB Type SMA	90.00
4015C-10/	22539 Directional Coupler 7.4 to 12 GHz 10dB Type SMA	95.00
4015C-30/	23105 Directional Coupler 7 to 12.4 GHz 30dB Type SMA	95.00
3044-20	Directional Coupler 4 to 8 GHz 20dB Type N	125.00
3040-20	Direcitonal Coupler 240 to 500 MC 20dB Type N	125.00
3043-20/	22006 Directional Coupler 1.7 to 4 GHz 20dB Type N	125.00
3003-10/	22011 Directional Coupler 2 to 4 GHz 10dB Type N	75.00
3003-30/	22012 Directional Coupler 2 to 4 GHz 30dB Type N	75.00
3043-30/	22007 Directional Coupler 1.7 to 3.5 GHz 30dB Type N	125.00
22574	Directional Coupler 2 to 4 GHz 10dB Type N	125.00
3033	Coaxial Hybrid 2 to 4 GHz 3dB Type N	125.00
3032	Coaxial Hybrid 950 to 2 GHz 3 dB Type N	125.00
784/	22380 Variable Attenuator 1 to 90dB 2 to 2.5 GHz Type SMA	550.00
22377	Waveguide to Type N Adapter	35.00
720-6	Fixed Attenuator 8.2 to 14.4 GHz 6 dB	50.00
3503	Waveguide	25.00

PRD

U101	12.4 to 18 GHz Variable Attenuator 0 to 60dB	300.00
X101	8.2 to 12.4 GHz Variable Attenuator 0 to 60dB	200.00
C101	Variable Attenuator 0 to 60dB	200.00
205A/367	Slotted Line with Type N Adapter	100.00
195B	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	100.00
185BS1	7.05 to 10 GHz Variable Attenuator 0 to 40dB	100.00
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CIRCLE 83 ON READER SERVICE COUPON

a monthly feature by
KARL T. THURBER, JR., W8FX

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

More On Antennas For The Listener

Last month, our columnist W8FX concluded a two-part discussion of receiving antennas. He reviewed common antenna types and their use in specific receiving applications. This month, in response to reader mail, he continues with a discussion of some specialized antennas you're sure to find interesting. Who knows, if the ham bands become frustrating, you may want to take a break for some old-fashioned Dx'ing!

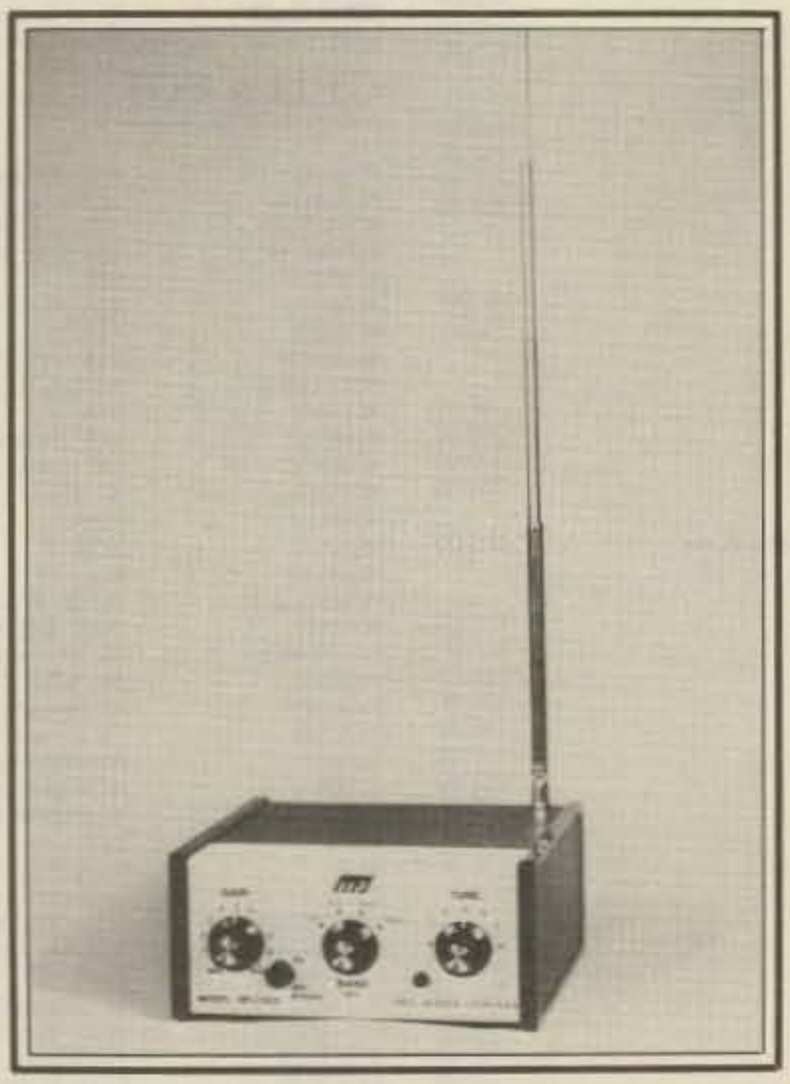
When it comes to receiving antennas, the old adage "simplest is best" usually holds forth. This saying especially applies to the antenna designs we have discussed in previous months: the randomwire, dipole, and vertical. However, in certain situations regular antennas are too noisy for practical use, or they are too long and cumbersome to meet limited space or portability requirements. In this treatment of antennas for the listener, we will discuss receiving loops, highlight some interesting and unique space-saving antennas, and mention some performance-enhancing accessories designed to improve your listening results.

Let's first talk about low-noise receiving loops.

Receiving Loops

Long singlewire antennas, especially at the lower frequencies, develop a good deal of signal but are likely to drive one nuts from the high noise levels that are commonly associated with most urban and suburban locations. Loops, on the other hand, are good antennas for v.l.f. through at least the lower h.f. ranges in that they can be used to null out interference—whether it be from undesired co-channel or adjacent channel stations, or from man-made sources.

Most loops boast a figure-eight reception pattern, somewhat similar to that of the half-wave dipole. The basic loop is a coil or wire whose diameter is small in relation to the wavelength (frequency) to which it is tuned. However, the actual configuration can be in the form of a diamond, octagon, triangle, or other shapes.



Indoor tuned active antenna is designed for desktop use and covers 300 kHz to 30 MHz in five bands. Tuned, adjustable telescopic antenna minimizes intermodulation effects, provides a degree of r.f. selectivity, and reduces detected noise outside the tuned band of interest. Boasting bipolar solid-state circuitry, the unit can also be used as a preselector for an outside antenna. System works off of 110 v.a.c., 9–12 v.d.c., or 9 V battery for portable use. (Photo courtesy MFJ Enterprises)

There are many advantages in using loops, especially in space-restricted situations. They can work well yet be physically small, they can be rotated in both horizontal and vertical planes to take advantage of their directionality, and they can be peaked to a given frequency. Loops that are enclosed in a special, non-magnetic shield for noise reduction are frequently much quieter than outdoor antennas. The bottom line can be a significant increase in the signal-to-noise ratio—very desirable for DX work. Because they are directional and can be rotated, loops suffer a lot less from swamping and intermodulation effects from strong local stations than their wire counterparts.

Loops are not—at least yet—staples at your local discount radio store. You may have to build one yourself if you want to check out loop antenna characteristics. Few commercial loops are available for the listener market, though Radio West, 3417 Purer Rd., Escondido, CA 92025, has marketed several preamp loops that cover the l.f., m.f., and h.f. ranges; McKay Dymek, P.O. Box 2100, Pomona, CA 91766 sells the model DA5, a preamplified broadcast band (BCB) directional loop, as well as the DA7, a shielded ferrite rod antenna for the long-wave and medium-wave bands. Palomar Engineers sells a neat loop/amplifier system for v.l.f. through h.f. that uses several interchangeable plug-in coils.

This month, it's our pleasure to review the Palomar loop (specifications are described in the insert photo).

I had the opportunity to do a "hands-on" check of the compact Palomar unit. Never having worked with receiving loops before, I was pleasantly surprised at the little unit's excellent performance. The loop did all it was advertised to do in reducing man-made noise and nulling out local ground-wave interference, and it produced good signal levels as well.

I was able to check out both the BCB and 160/80 meter loops; it was an interesting experience. On the broadcast band, using the antenna with a Clegg AB-144 up-converter feeding a Kenwood TS-700SP, it was surprising to find that, almost without exception, signals were stronger on the indoor loop than on the outdoor 30-foot randomwire. The elevation and azimuth adjustments allowed co-channel BCB signals to be very nicely nulled out, or desired signals peaked. It was found that in the author's former northwest Florida QTH, where Central American and Caribbean BC stations compete with domestic broadcasters for channel supremacy, it was often possible to receive two separate signals, one U.S. and the other Latin, on the same channel with little or no interference simply by rotating the loop accordingly. Very deep nulls could be obtained on local BC stations by "working" the loop in azimuth

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Say You Saw It In CQ

Many SWLs and amateurs too got their start in electronics by listening for distant stations on the medium-wave or standard broadcast band. The difficulties of digging down for rare, transoceanic DX on the medium waves presents a real challenge, one that's said to equal that of DXCC or WAZ on the ham bands. Some requirements for success include a highly selective receiver for split-frequency operation, a good outside antenna, and possibly a directional loop, as well as a low-noise location. Lots of midnight oil and a good deal of patience help, too. If you want to get your feet wet in BCB DX'ing, the following should keep you busy:

Callsign	Freq. (kHz)	Location	Station power (KW)
XEWA	540	San Luis Potosi, Mexico	150
CMW	600	Holguin, Cuba	150
CMQ	640	Havana, Cuba	50
KORL	650	Honolulu, Hawaii	10
YSS	655	San Salvador, El Salvador	10
—	657	Kangnam, North Korea	1500
—	665	Lisbon, Portugal	135
—	738	Tel Aviv, Israel	1200
JOIB	747	Sapporo, Japan	500
—	765	Dakar, Senegal	400
JOUB	774	Akita, Japan	500
PJB	800	Bonaire, Netherlands Antilles	500
—	834	Belize City, Belize	20
—	846	Rome, Italy	540
XEW	900	Mexico City, Mexico	250
KHVH	990	Honolulu, Hawaii	10
—	1017	Istanbul, Turkey	1200
—	1017	Wolfsheim, W. Germany	600
4VEC	1035	Cap Haitien, Haiti	10
—	1044	Shanghai, Peoples Rep. of China	300
YVOZ	1200	Caracas, Venezuela	10
—	1395	Durres, Albania	500
4QD	1548	Queensland, Australia	50
—	1557	Nice, France	300
XERF	1570	Ciudad Acuna, Mexico	250
—	1593	Langenberg, W. Germany	800

Table I– DX'ing the broadcast band. There are many books available listing all the foreign broadcast stations. Check the CQ Bookshop and elsewhere in this issue.

and elevation so that weak adjacent-channel signals, previously obliterated, could easily be received through the local splatter and overloading. This also allowed reception of some off-channel split frequency stations previously buried in the QRM. The 160/80 meter loop, which actually covers 1600–5000 kHz, worked nicely and was especially effective in minimizing Loran QRM on 160.

If you'd like to try your hand at medium-wave DX'ing, refer to Table I for a listing of some not-so-hard targets for late-night listening. Table II shows some of the major listener organizations you may wish to contact.

Space-Saving Designs

There are a number of interesting commercial antennas available for specialized DX'ing in addition to compact units you can easily build yourself.

Gilfer Shortwave distributes two restricted-space h.f. antennas in their "RAK series," the RAK-1 and RAK-3. Both are designed for outdoor installation. The RAK-1 is a mini-dipole that requires less than 22 feet of horizontal space. It uses a loading coil and folded-back section which also forms a part of the lead-in. The RAK-3 is a double dipole consisting of two separately resonant segments fed by a single coaxial cable. The lengths of the two dipoles and the angular spacing between them are said by the manufacturer to hold the impedance reasonably constant between 50 and 100 ohms, from 3 to 30 MHz.

Another small-space portable antenna that reportedly works well is the coiled-spring Slinky dipole, a variable-length, electrically shortened h.f. antenna that is available in both amateur and s.w.l. versions. The s.w.l. model can be used in any of two modes: tuned or untuned. To be used in the *untuned* mode, it is simply stretched out in any direction to cover as great an area as possible of your attic, yard, motel room, apartment, or whatever. The antenna is connected to the receiver through a length of coaxial cable; it's usable from about 500 kHz to 54 MHz, or from 600 meters to 6 meters. Used in the *tuned* mode for optimum performance on a particular band, the antenna is simply set to the length specified in the instructions. When in use, the coiled arms

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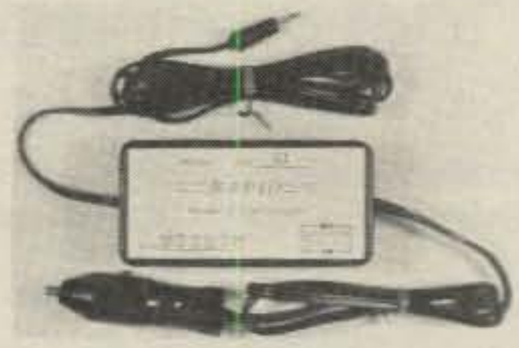

The DEB-TED Rapid Mobile Charger is a constant voltage charger that will charge your batteries off a 12 Volt source in 4-6 hours. You may use the charger at all times, this includes transmit and receive periods. It is equipped with a cigarette lighter plug on the input side and the appropriate charging plug on the output side. Models available now for the Kenwood TR2400, Yaesu 207R, Tempo S1, S2, S5, the Wilson Mark II and IV, and the Santec HT-1200. Other models available also please call or write for info $34.95

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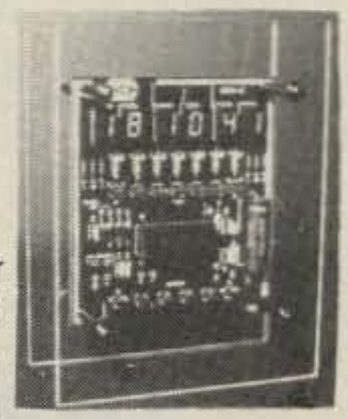

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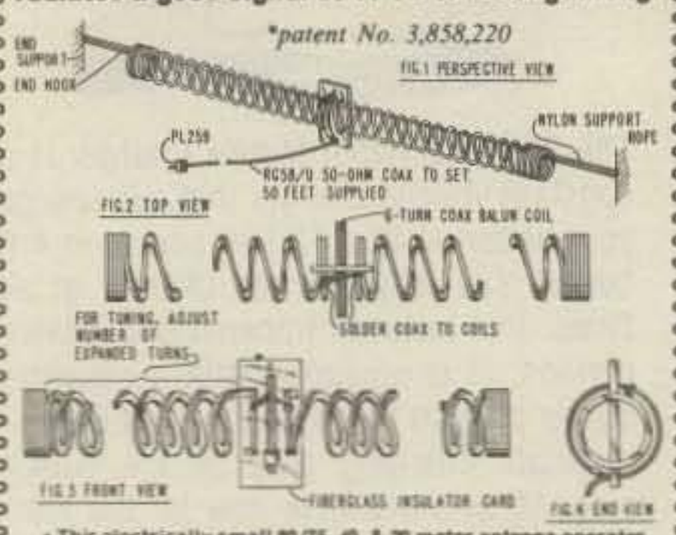

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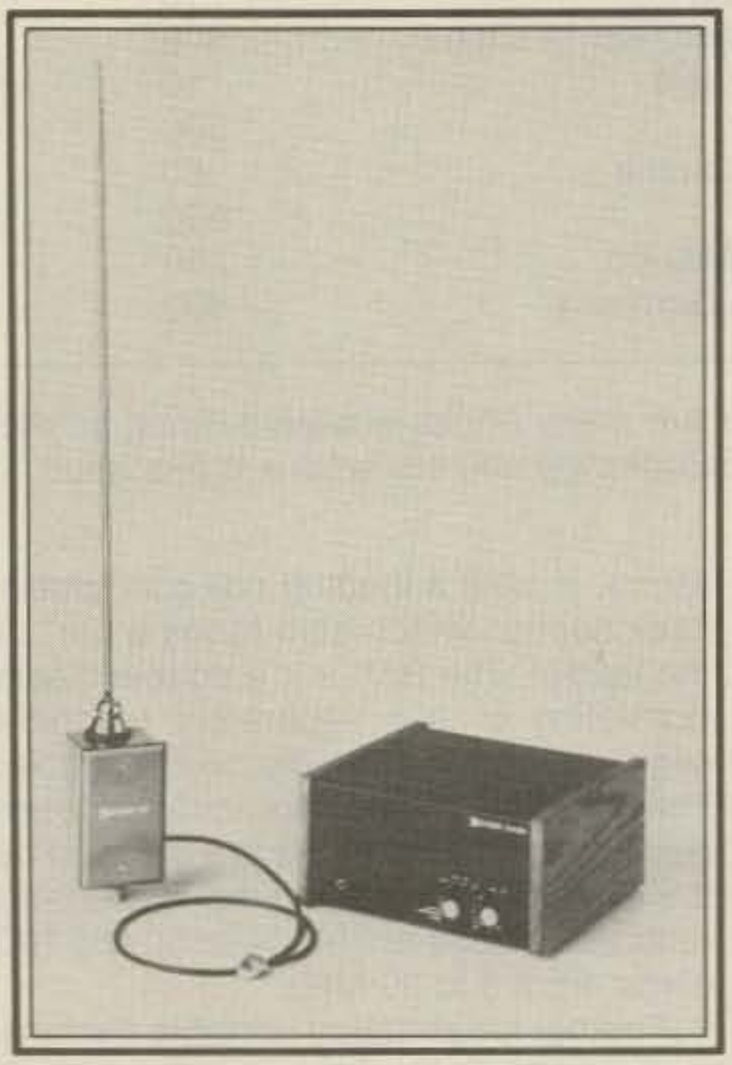
Contact these organizations for information on their programs and publications. In most cases, a large s.a.s.e. or a nominal fee is requested to cover the cost of mailing a sample bulletin and other literature:

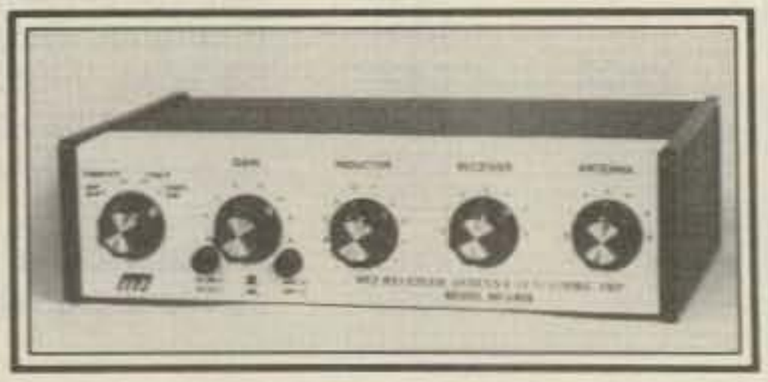
- National Radio Club, Box 118, Poquonock, CT 06064. Publishes the *DX News* 30 times a year. Also distributes an extensive listing of technical reprints. Specializes in broadcast band monitoring.
- International Radio Clubs of America, Box 21462, Seattle, WA 98111. Publishes the *DX Monitor* 34 times a year, as well as several specialized publications. Devoted primarily to DX'ing on the AM broadcast band.
- Longwave Club of America, P.O. Box 33188, Granada Hills, CA 93144. Publishes *The Low Down* on a monthly basis. Longwave only.
- Newark News Radio Club, P.O. Box 539, Newark, NJ 07101. Publishes the *NNRC Bulletin*. Mediumwave/shortwave.
- Speedx, P.O. Box E, Elsinore, CA 92330. Publishes *Speedx* each month. Focus is on shortwave broadcast and utility station DX'ing.
- Miami Valley DX Association, 4666 Larkhill Lane, Columbus, OH 43229. Issues the *DX World* monthly. A general interest club.
- American Shortwave Listener's Club, 16182 Ballard Lane, Huntington Beach, CA 92649. General interest, including utility DX'ing.

In addition to these, the umbrella organization of domestic listeners' clubs is the Association of North America Radio Clubs (ANARC), 557 North Madison Avenue, Pasadena, CA 91101. For an s.a.s.e. ANARC will send you information and listings of all its accredited member clubs.

Table II– Major listener club and organization sampler.



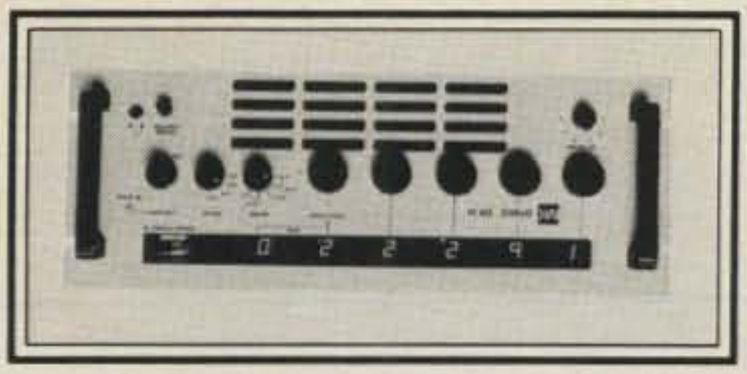
Four-and-one-half-foot whip at the heart of the McKay Dymek DA-100 is directly coupled to a base-mounted preamplifier for high performance over the range of 50 kHz to 30 MHz. Fed through 50-ohm coaxial cable from a control module located at the operating position, the control box includes a combination attenuator/impedance matching switch used to match receiver impedances from 50 to 500 ohms or to introduce up to 20 dB of signal attenuation when required. The antenna can be installed outdoors in either a horizontal or vertical configuration; the weatherproof housing can be mounted atop a TV mast or placed on a flat surface, such as a balcony or window ledge. (Photo courtesy McKay Dymek)



MFJ antenna tuner/preamp allows matching of the antenna to the receiver and up to 20 dB preamplification for weak-signal work. Usable over the range 1.6 to 30 MHz and capable of handling two antennas and two receivers, the operator can select tuner-only, tuner with preamp, tuner with 20 dB preamp, or bypass functions. Unit includes an adjustable gain control and has both coax and phono jacks. (Photo courtesy MFJ Enterprises)

of the dipole (which contain a total of 335 feet of conductor) act like distributed inductances to enable the Slinky's effective electrical length to be as much as five times the physical length. The antenna is made by Teletron Data Corp., Kings Park, NY 11754.

The Partridge Joystick is a British import first introduced in 1960 by G3CED. Separate versions are available for high-power amateur and low-power or SWL use. The Joystick system consists of three main elements: the eight-foot-long metal-tubing VFA (variable frequency antenna) radiator with built-in center loading coil, the singlewire transmission line, and the antenna tuning unit (ATU). The Joystick is an omni-directional antenna when mounted vertically; it can also be mounted horizontally or at the odd angles sometimes required for difficult apart-



For the amateur whose attention has focused on ham-band gear in recent years, there is a good deal of sophisticated communications gear that has been introduced to fill military, industrial, and maritime needs. A good example of such equipment is this McKay Dymek DR 44, a "professional" receiver covering 50 kHz to 29.7 MHz continuously. Set features PLL digital synthesis, special a.m. envelope detector, crystal and mechanical i.f. filters, high level r.f. front end, and independent selection of reception mode and i.f. filter. The unit also boasts a double balanced diode ring mixer, which is said to provide freedom from intermodulation interference and overload in strong-signal areas while eliminating the need for a manually adjusted antenna preselector in many installations. Note the unusual five-knob "dial-in" frequency selection scheme. (Photo courtesy McKay Dymek)

ment window or balcony installations. For receiving, many DX'ers have reported good results indoors when the antenna is simply leaned against an exterior wall—just be sure to keep the antenna away from large objects. Essentially a short, loaded singlewire system, the Joystick depends to a large extent on the quality of its ground system, especially when used to transmit. The antenna, which covers 500 kHz to 30 MHz continuously, is distributed directly by the manufacturer, Partridge Electronics, Ltd., Broadstairs, Kent, CT10 1LD, England.

McKay Dymek manufactures the DA100, a small-space unit designed for outdoor use, which is directly coupled to a preamplifier located indoors near the receiver. The antenna (whose auto-style whip is only 4½ feet tall) is designed to provide good performance over the range 50 kHz to 30 MHz. It is fed with 50-ohm coaxial cable routed to a control module at the receiving position. Antenna polarization can be set horizontally or vertically; the watertight housing can be mounted on a flat surface, such as a window ledge or balcony, or installed atop a TV mast. The unit will match receiver input impedances over the range 50 to 500 ohms. The control box can introduce up to 20 dB of signal attenuation when required to reduce intermodulation interference in r.f.-dense urban areas.

For the traveler, the Datong AD-170 and MFJ Model 1020 indoor active antennas are attractive. We described the AD-170 dipole last time as our "antenna of the month" feature, so we won't go into it again. The MFJ device is an interesting unit designed for easy portability and desktop use. It covers the major l.w., m.w., and s.w. bands from 300 kHz to 30 MHz in five ranges. The unit has its own telescopic antenna, but the bipolar solid state preamp circuit can perform double duty as a preselector for an outside antenna.

For the builder, there are a number of compact receiving systems described in the popular literature. Perhaps one of the best of these is the intriguing 12-inch-long homebrew active antenna described by Douglas Blakeslee, N1RM, in the June 1979 issue of *Ham Radio Horizons*. N1RM's broadband antenna covers 160 through 10 meters, including all the shortwave space between.

(To Be Continued)

Antenna of the Month: Palomar Engineers Loop Antenna

Palomar Engineers amplified loop antenna is of interest to serious l.w., m.w., and s.w. hobbyists who find that noise and interference are wiping out their listening enjoyment. A well-known fact that loops pick up less noise than conventional antennas, the difference is especially noticeable on the lower frequency ranges where vertical antennas are often used for DX work. On transmit the vertical usually gets out well, but on receive it is very susceptible to noise pickup. Thus, in a very noisy location the loop is apt to be far superior for reception. In addition, the loop can be used to null out specific interfering stations, especially those received on groundwave from local sources.

There are two components to the Palomar system. (1) The loop amplifier, built into a small die-cast aluminum case that has as its heart a 20 dB gain FET amplifier working over the range 10–5000 kHz, and powered by a 9 v.d.c. battery; and (2) the loop antenna itself, measuring 8" × 6" × 1½", a balanced Litz winding with a Faraday shield over a ferrite rod. There are actually provisions for five or more antennas, covering the ranges 10–40 kHz, 40–150 kHz, 150–550 kHz, 550–1600 kHz, and 1600–5000 kHz; the loops are variable over an azimuth scale of 0–360 degrees and an elevation scale of ±90 degrees, both in 5-degree increments. The loop amplifier serves as the mounting base for the antenna.

After being installed on or near your set and connected to it through a short length of coax, the unit is operated by peaking the loop response using the loop tuning control. If there is local interference, the loop is rotated for minimum signal and the loop then tilted as necessary to produce the best null. Photo courtesy Palomar Engineers.

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Dr. T. Gary Banks, N9ER
All Counties #286, 6-16-80

"I began Amateur Radio as a Novice in 1962 when I was a sophomore in high school. I enjoyed Morse code work in Boy Scouts, but never got serious about radio until my Dad pushed me towards it. He enjoyed tinkering and building radios all his life and always wanted to become a ham.

"In 1963 I passed the Conditional examination and became WA9CZI. Shortly after I obtained my license, Dad passed his, and years later Mom passed hers. At the present time Dad has upgraded to Extra and Mom to Advanced; calls are K9IS and WB9SAV.

"During those first years my station consisted of a Viking Adventurer, SB40 receiver, and a 44-foot homebrew vertical antenna, and the rig ran about 50 watts. I managed to work WAS and got several QRP awards all on c.w. Guess I changed equipment three or four times until the present setup.

"Dental school from 1966–1970 and then two years in the Army severely limited my radio operating. In the service I spent one year at Ft. Carson, Colorado where I met Jan, who was an Army nurse.

"We decided to get married in June of 1971, but Uncle Sam changed our minds. I was ordered to be in Vietnam by May 28th, and all our announcements had already been sent out. So, I asked for a 30 day extension, moved the wedding to May 1, and re-sent announcements.

"I spent 10½ months in Vietnam at such places as Phu Bai, Danang, Saigon, Ben Hoa, and Con Son Island. Managed to meet Jan for R & R in Hawaii and sure hope to visit the Islands again someday.

"In 1976 I got back into c.w. DX alot. K9DAF and W90P introduced me to County Hunting and the bug took over. Without the help of WA6MAR and K6BWD I think those first months would have ended it for me. I didn't own a microphone, and the HX2O and Drake 2B combination were hard to zero beat. The HX20 was calibrated in 5 Hz segments; that worked ok for c.w. but not s.s.b. It didn't take many months of frustration for me to change my radio shack to the present Drake C line, SB220 linear, and the TH6DX beam.

Dr. Gary Banks, N9ER, and his nice array of equipment and awards.

The Banks Family: Gary, Jan, Philys, Allen, and Kevin.

"In 1978 I upgraded to Extra and obtained the call N9ER.

"Jan and I have 3 sons. By the time you read this Kevin will be 7, Allen will be 6, and Philys will be 18 months old. All their birthdays are in March *(mine also—W2GT)*. The three of them present quite a high static level when I go mobile, but I've managed a couple of successful long trips, especially the Denver MARAC Convention of '80.

"Some of my other hobbies include fishing, stamp collecting, remodeling, gardening, and camping. In about three years we hope to build outside of Neenah on 5½ acres of land so Jan can have her horse there and I can get away from the TVI problems at the present location.

"I hope to chase Cliff Corne numbers (All Counties Holders) and give out counties mobiling, but at the present time I do not have a desire to catch them All a second time. I enjoy DX and have 3 band DXCC, but will wait on the other two bands until we move.

"Let me say that your efforts, Ed, on behalf of the County Hunters are much appreciated and your decisions are respected. Also many many thanks to *all* the others for *all* their help."

P.O. Box 73, Rochelle Park, NJ 07662

Awards Issued

Keith Wiese, WA3UQR, got back into the swing of things to catch USA-CA-1500 through All Counties endorsed Mixed.

Dorothy Johnson, WB9RCY, took time out from being NCS, helping NCS, Mobiling, helping the CTs with their QSLs, etc., to get her paperwork in shape for USA-CA-2500 through All Counties endorsed Mixed.

Marge Moore, WA5ZDZ, straightened out her records to make All Counties endorsed All S.S.B.

Roland Nothdorf, WBØAXN, waited until he had them all to apply for USA-CA-500 through USA-CA-3000 endorsed All S.S.B., All Mobiles, and All Counties endorsed All S.S.B.

Paul Welles, W4LQF, added to his fine collection USA-CA-3000 and All Counties endorsed All S.S.B.

Bob Craig, K6XZ (ex-WA2GMO), was issued All Counties endorsed Mixed.

Edward Szudy, W9VEN (c.w. is *not* dead), picked up USA-CA-500 through USA-CA-3000 endorsed All A-1.

Steven Hand, VE7AIO, tried his "hand" at claiming USA-CA-500 through USA-CA-3000 endorsed All S.S.B.

Rolf Arvidsson, SM4BNZ, won USA-CA-2000 #4 to Sweden and USA-CA-2500 #3 to Sweden, both endorsed Mixed.

Miro Santos, CT1UA, picked up USA-CA-2500 endorsed All S.S.B., #2 to Portugal.

Harry Daley, VE1AIG, acquired USA-CA-2000 endorsed All S.S.B.

John Sebastian, N8BGF, obtained USA-CA-2000 endorsed All S.S.B., All Mobiles, All 20.

Charlie Jacobsson, SMØCHA, claimed USA-CA-1000 endorsed All S.S.B.

Say You Saw It In CQ

Jan van der Rijt, NL-4276, qualified for USA-CA-1000 endorsed All S.S.B., #1 to s.w.l. in The Netherlands.

USA-CA-500 certificates endorsed Mixed went to:

Shizuka Minakawa, JH1EIG.
Keith Retzer, W7KEU.
Thomas Emison, WA0IAM.
Eric Lund, EA8TY, #2 to EA8.

USA-CA-500 certificates endorsed All S.S.B. were sent to:

Bill Hatcher, N5BDY, also endorsed All 20.
Carlo Monti, I0MBX, also endorsed All 14 MHz.

USA-CA-500 certificates, endorsed All A-1, gained by:

Bob Halprin, K1XA.
Jan Dobejval, OK1AOR.
John Martin, WB8WRY, also endorsed All Novice Bands.

Special Honor Roll
All Counties

#319 Keith I. Wiese, WA3UQR 4-6-81.
#320 Dorothy H. Johnson, WB9RCY 4-9-81.
#321 Marge Moore, WA5ZDZ 4-17-81.
#322 Roland A. Nothdorf, WB0AXN 4-18-81.
#323 Paul I. Wells, W4LQF 4-22-81.
#324 Robert G. Craig, K6XZ 4-25-81.

Awards

Worked All Tok, Alaska Award.

Worked All Tok (Alaska): The Cabin Fever Radio Club of Tok, Alaska, offers this Award for contacting three amateurs in Tok. There are no band or mode restrictions, but contacts must be made after December 15, 1980. Send list, in order by callsign, include name of the operator, date and time in GMT, and the mode and band of operation. QSLs not required. Enclose $2.00 or 10 IRCs with your application and mail to: Cabin Fever Radio Club, Box 451, Tok, Alaska 99780. At this time the active hams in Tok include AL7O, AL7BO, AL7BV, and WL7APG.

Worked All Milford Award: The Milford Amateur Radio Club (MARC) of Milford, Ohio offers this Award under these conditions/rules:

1. Applicants must submit proof of QSOs with five different MARC stations on h.f. bands (160 through 10). Also available for working ten different MARC stations on frequencies above 50 MHz. DX stations (non-U.S. and Canada) need work only three different MARC stations. Repeater contacts do NOT count for the Award.

Worked All Milford Ohio.

2. General certification rules apply. Submission of QSL cards is NOT required. Applications may be certified by an officer of any recognized amateur radio club. DX stations may have applications certified by one other amateur.

3. A list of stations worked should be submitted in alphabetical order with date, time in UTC (GMT/Z), band, and mode of QSO.

4. Only QSOs after January 1, 1980 count.

5. The Award is available free to non U.S. stations. U.S. stations must include $1.00. *If* QSL cards are submitted for checking, sufficient postage for the return of the cards via first class mail must be included.

6. Apply to: Awards Chairman, Milford Amateur Radio Club, P.O. Box 100, Milford, Ohio 45150.

Some of the most active members are: KY4N, WD8EDY, WD8MCH, KB8EI, K8MN, WB8ZJY, W8CEF, K4VYU, WB8RRR, WD8DEL, and K8CMO. Thanks to Dave, K8CMO, for this data.

WDT-Finland Award.

Worked District of Tampere Award (Finland): This WDT Award will be issued under the following rules:

1. Two-way communications must be established on any of the approved amateur bands with 5 members of the Tampere club after May 1, 1955, and the club member must have received your QSL.

2. Communications with active repeaters are not accepted.

3. Communications entitling one to an Award can be regarded as extra when applying for extra stickers.

4. H.f. 30 stickers are available for 2-way communications on amateur bands 3–30 MHz with 30 club members.

5. V.h.f. 20 stickers are available for 2-way QSOs on amateur bands 30–300 MHz with 20 members.

6. U.h.f. 5 stickers are available for 2-way QSOs on amateur bands 300–3000 MHz with 5 members.

7. S.h.f. 1 sticker available for 2-way QSO on amateur bands 3–30 GHz with one member.

8. The WDT Award is available to all radio amateurs.

9. The S.W.L. WDT is available to all s.w.l.'s.

10. Applications must be sent to: Tampereen Radioamatooritry, P.O. Box 179, SF 33101 Tampere 10, Finland. Include 6 IRCs or the corresponding amount of currency (10 FIM) for each Award or sticker. Thanks to Alpo, OH3NM, for this data.

USA-CA Honor Roll

3000		2000		1000	
WA3UQR	346	SM4BNZ	466	W9VEN	663
WB9RCY	347	WA3UQR	467	SM0CHA	664
W9VEN	348	VE1AIG	468	WB0AXN	665
WB0AXN	349	W9VEN	469	NL-4276	666
W4LQF	350	N8BGF	470	VE7AIO	667
VE7AIO	351	WB0AXN	471		
		VE7AIO	472	500	
2500				JH1EIG	1603
SM4BNZ	409	1500		W7KEU	1604
WA3UQR	410	WA3UQR	526	WA0IAM	1605
WB9RCY	411	W9VEN	527	N5BDY	1606
W9VEN	412	WB0AXN	528	K1XA	1607
WB0AXN	413	VE7AIO	529	W9VEN	1608
CT1UA	414			WB0AXN	1609
VE7AIO	415			EA8TY	1610
				OK1AOR	1611
				I0MBX	1612
				VE7AIO	1613
				WB8WRY	1614

Notes

I apologize for the long delay some of you had in receiving your USA-CA certificates. First I ran out of Awards and then there were some problems with the artwork. I finally received 500 new Awards and shortly found myself out of mailing tubes. Finally this was cleared up and I hope you are all happy again.

Sorry to record the loss of another County Hunter, Jack Prichard, W9CNG, All Counties #174 8-20-77. His story and photo were in *CQ* of May 1978.

A *strong* reminder for you about the 13th annual MARAC/ICHN International convention. This year it will be held in Des Moines, Iowa from 8 July until 12 July 1981. There will be much fun, good meals, entertainment, prizes, etc. You do *not* have to be a member of MARAC or ICHN to enjoy the convention. Write at once to Roland Nothdorf, WB0AXN, 33 Constitution Boulevard, Des Moines, Iowa 50317 for full details. Please don't wait until it is too late to make reservations.

Thanks for All your help.

73, Ed, W2GT

Steeped in the information from N5AEN's article on RTTY tape operation we now go one better. We enlisted the aid of Jim Bartlett, K1TX of HAL Communications and gave him the assignment to show us simply how to actually use some of this information. We present a hands-on plug-to-plug description of how to connect and use a tape system for RTTY work.

A Simple Audio Cassette Interface For RTTY

BY JAMES D. BARTLETT*, K1TX

If you're a newcomer to radioteletype (RTTY), you may never have seen one of the original "brag" tapes used during the days when an RTTY station consisted of a treasured surplus teleprinter machine, such as the model 15, and a home-brewed demodulator. These brag tapes were *paper* tapes punched full of holes with each row of holes representing a character to be sent. RTTY buffs proudly recorded the list of station apparatus on one of these tapes so that the entire inventory could be sent to other "ops" at full speed upon request. The tape was used over and over, saving the operator from having to type out the list more than once.

Today's influx of video RTTY systems has changed the mode quite a bit, and most of the changes have made operating radioteletype a more enjoyable experience. But the tape punch and tape reader don't fit into the electronic motif of a totally solid-state amateur station. As model 28s and 19s have made way for video RTTY equipment, amateurs have suddenly realized the absence of a long-term brag-tape storage medium. An easy way to add "brag tape" storage capability to solid-state RTTY systems is to build a simple cassette tape interface.

The "interface" described in this article is nothing more than a simple switchbox. It allows a number of "patches" to be made between audio inputs and outputs on the station transceiver, demodulator, and cassette machine. With such a switching arrangement you can pre-record brag tapes (or other long messages to be sent repeatedly), or record any received signal, either directly "off air," or via regeneration through the demodulator. Taped messages can be played back to the transmitter directly or can be regenerated by the demodulator. The degree of flexibility will depend a good deal upon demodulator design.

Fig. 1 shows the necessary connections for the simple cassette interface. The only parts required are six "RCA" phono jacks and four S.P.D.T. toggle switches. The switching arrangement should be built in a metal enclosure to shield the audio lines from r.f. Table I lists the switch positions for various "patches" between the tape recorder, demodulator, and transceiver.

A two-wafer rotary switch could be substituted for the four toggle switches, making it easier to select the desired function. Such an arrangement is detailed in fig. 2. Of course, exotic items as such six-position four-pole rotary switches are expensive when purchased new in small quantities. Thus, it may be worth the trouble to ferret out one at the next hamfest fleamarket, or remove one from an old piece of homebrew equipment that's currently gathering dust.

This switchbox certainly isn't anything new or exciting, but it has helped a number of RTTY'ers add an inexpensive long-term storage capability to their video RTTY systems.

Standard audio cassette tapes of the C-15, C-30, or C-45 length work the best for storing messages with the cassette interface. The longer C-60s, C-90s, and C-180s usually have much thinner polyester base material, which is more likely to stretch with continued use. Leaderless cassettes are also available in most standard lengths. Using these will reduce the possibility of accidentally trying to record at the beginning of the tape—on the nonferrous leader material.

The easiest way to keep track of a number of separate messages is to store each one on a different cassette and label the tapes accordingly. Be sure to take advantage of the knock-out tabs on the rear of the cassette tapes. By removing these, you can protect your message tapes from accidental erasure.

If you want a "brag tape" that will automatically "cue" itself to the beginning of the message after each time it is played, simply use an endless-loop cassette (available at audiovisual supply stores) that is slightly longer than the message. By stopping the tape at the end of each transmission, you will pre-set it to start at the beginning of the message the next time the tape machine is started. An even fancier arrangement could be rigged where a non-standard tone placed at the

*2109 Branch Rd., Champaign, IL 61820

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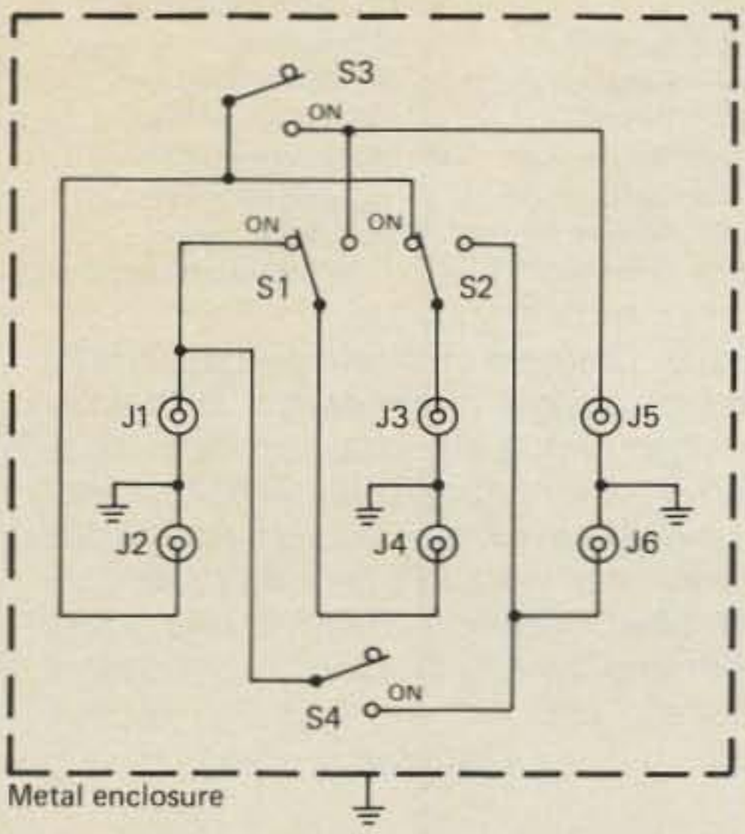

Fig. 1– Schematic diagram of a simple switchbox for connecting a cassette tape recorder to demodulator and transceiver. Input/output jacks are listed below.

Jacks:

- *J1 = tape recorder input (mic or aux line input)*
- *J2 = tape recorder output (spkr or monitor)*
- *J3 = demodulator audio input*
- *J4 = demodulator audio output*
- *J5 = transmitter audio input (mic or phone patch in)*
- *J6 = receiver audio output (spkr or phone patch out)*
- *S1–S4: S.P.D.T. toggle switch (Radio Shack P/N 275-613)*
- *J1–J6: "RCA" type phone jacks (RS P/N 274-346)*
- *Enclosure: metal box (RS P/N 270-239)*

end of the message (cue tone) would trigger a PLL tone decoder, which would then be used to stop the tape machine via the remote jack connections.

"Auto-Cue," It's Not So Hard

The circuit shown in fig. 3 is suggested as a possible gadget for automatically "cueing up" endless-loop cassette tapes. It consists of two separate circuits, one for recording the cue tone and another for "demodulating" the tone and stopping the tape deck in preparation for the next *play*.

The tone recording circuit consists of a single 556-type dual-timer integrated circuit, which is equivalent to two of the common 555 timers. The first section of the 556 is used as a 1-second "one shot" to turn on the second section, which is configured as an astable multivibrator. The one shot debounces the momentary contact tone-record switch. When the switch is depressed, the output of the one shot goes high. This enables the oscillator, which outputs an 800 Hz tone for the duration of the one-shot timing cycle (1 sec.). The audio tone (actually a square wave as it leaves the 556) is capacitively coupled to the audio input of the tape deck so that it is recorded at the end of the tape loop just before the start of the message.

Function	SW 1	SW 2	SW 3	SW 4
Normal operation	OFF	OFF	OFF	OFF
Record via regeneration	ON	OFF	OFF	OFF
Playback via regen.	OFF	ON	OFF	OFF
Record direct (off-air)	OFF	OFF	OFF	ON
Playback direct	OFF	OFF	ON	OFF

Table I-Switch positions for various "patches" between the tape recorder, demodulator, and transceiver for fig. 1.

When a message that has been recorded on an endless-loop cassette is played back, the audio is routed both to the demodulator for regeneration and to the tape-transport controller circuit shown in the top of fig. 3. The heart of the controller circuit is a type 567 phase-locked-loop (PLL) integrated circuit. This device is tuned with external components to sense an audio input of 800 Hz. When the message has finished and the 800 Hz cue tone is played back by the tape machine, the PLL clocks the 7473, which is configured as a "T" flip-flop. This changes the state of the "Q" output of the 7473 to a logical low (Ø V), turning *off* the 2N5655 transistor. The transistor is used to key the "remote" line on the tape transport; when the transistor is turned *on*, the tape machine is enabled.

A manual *on/off* switch is necessary for turning on and off the tape transport or setting the initial state when the system is first turned on. Since a momentary-contact switch would generate glitches or "contact bounce," we need to debounce the manual control. A one shot would be ideal for this, so we use the push-button switch and one shot already used in the cue-tone generator circuit. When the button is used to start the tape transport (in PLAY position), an 800 Hz tone will of course also be generated. However, this shouldn't cause a problem, as the tone will not be recorded.

None of the values in the circuit are very critical. The astable should be wired

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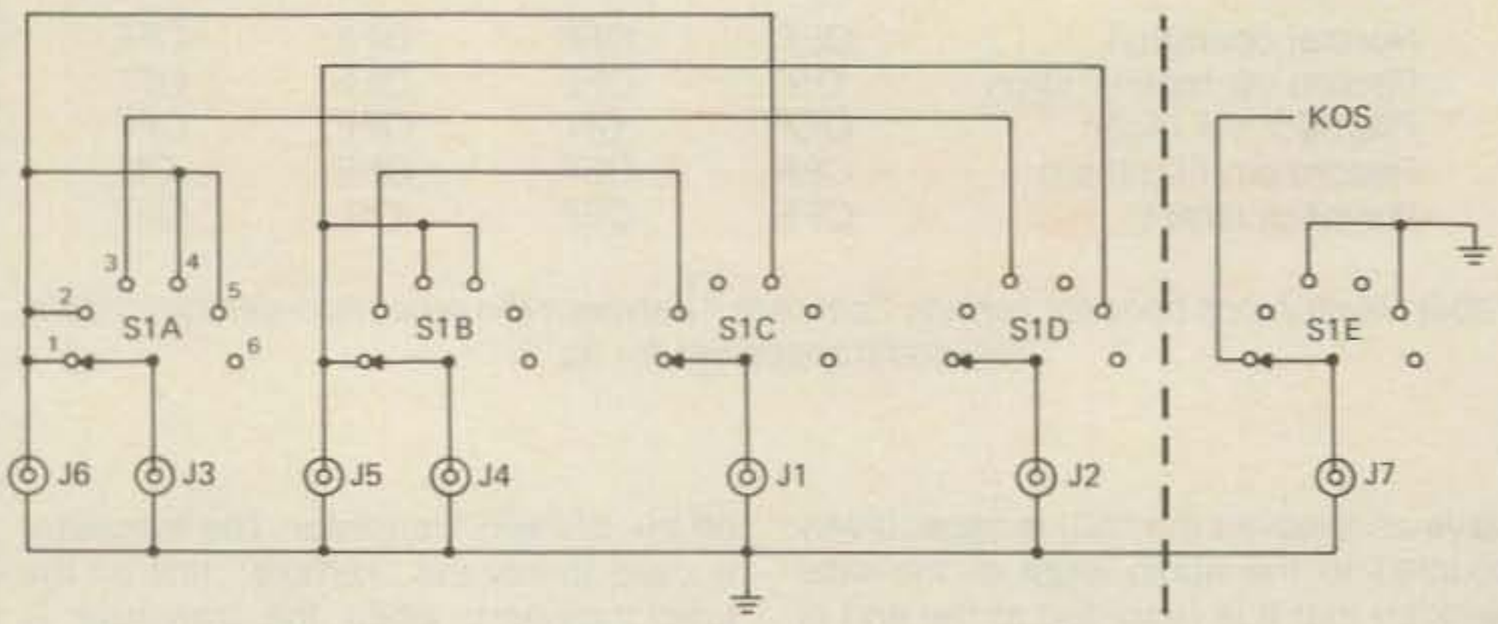

JACKS:
J1 = Tape in
J2 = Tape out
J3 = Demod in
J4 = Demod out
J5 = Transmit AF in
J6 = Receive AF out
J7 = Transmit PTT

SWITCH POSITIONS:
1 = Normal
2 = Record regular
3 = Playback regular
4 = Record Off-Air
5 = Playback direct
6 = Auxiliary (for future expansion)

Fig. 2– Diagram of the simple cassette interface using a rotary switch. With a six-position switch, an extra "auxiliary" position is left for future expansion. If another pole were available, the PTT line on the transmitter could be automatically switched to demodulator KOS (keyboard operated switch) or ground for transmit modes, and left floating for receive modes.

up first. Then the audio output (approximately 800 Hz) can be used to feed into the PLL so that it can be tuned to the same frequency. Set the sensitivity control on the PLL circuit to a low setting when tuning so that there is just enough signal to trigger the PLL. This will result in more accurate tuning. Once the PLL has been tuned to the same frequency as the astable, disconnect the oscillator output from the PLL input. Then record a tone on a blank tape, and adjust the sensitivity of the PLL to trigger reliably on the tape deck output.

I'm sure there is room for improvement on this circuit, but the basic cue-tone generator and demodulator shown, along with the RTTY switchbox in figs. 1 and 2, should add versatility to most video-RTTY stations that lack long-term storage capability. The possibilities go on and on, limited only by your pocketbook, patience, and degree of insanity in achieving the ultimate.

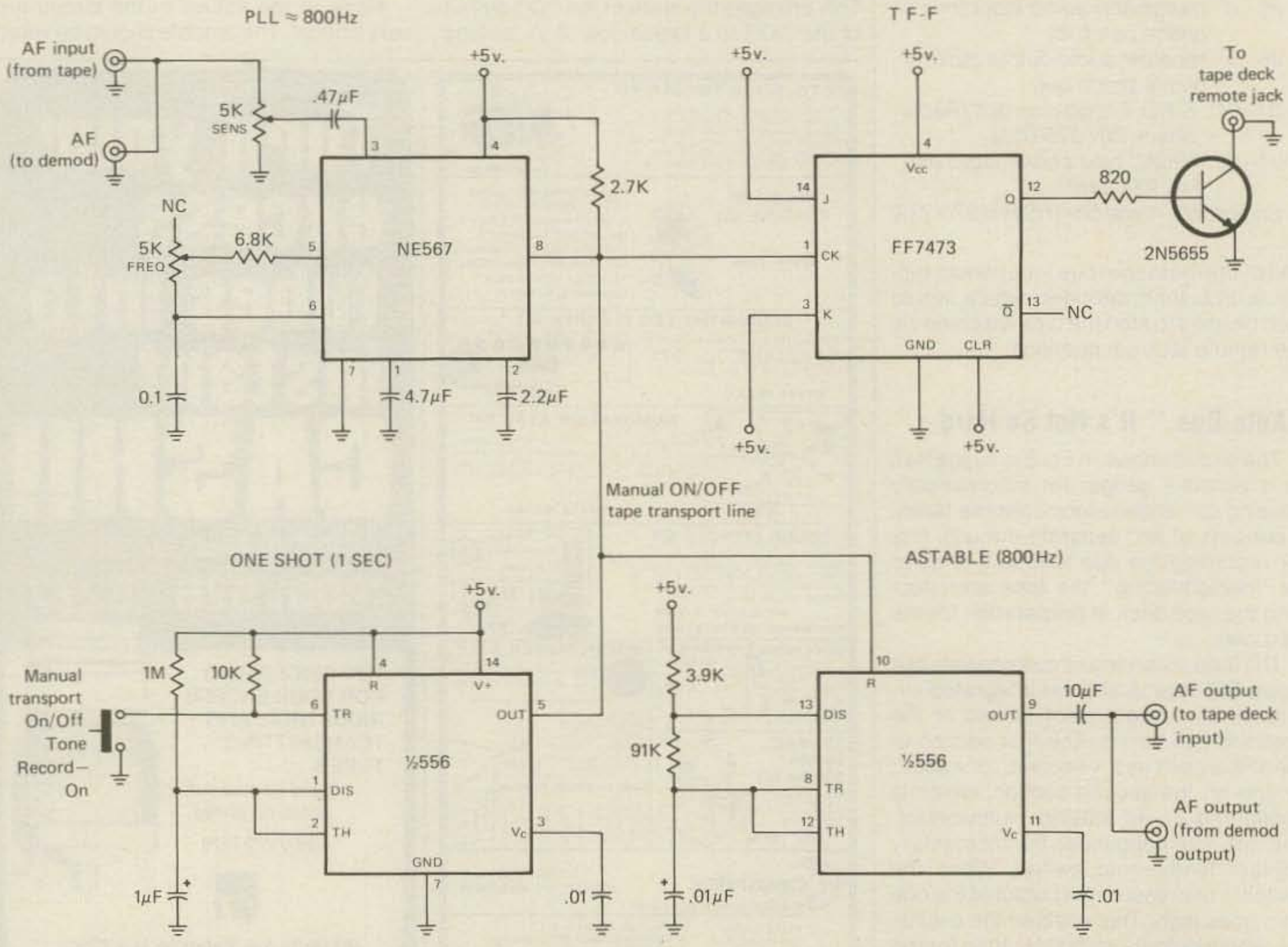

Fig. 3– Circuit of a tape-cue tone generator and demodulator. Parts values are not too critical and parts should be readily available.

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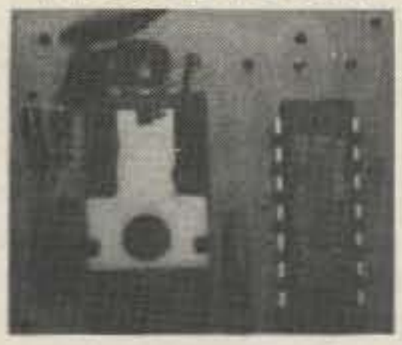

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a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

As this is being written, Frank is out in Dayton playing hooky, and he has asked me once again to write the Contest Calendar as "guest editor." I am waiting for him to ask me to represent him in Dayton, but so far no dice!

In looking through some previous issues of *CQ*, in particular old contest results and Contest Calendars, it struck me that in this world of contests that we live in there is truly something for everyone. By this I do not merely mean a contest for everyone, but truly a chance for everyone to be a winner in a contest.

Let me cite some recent examples to illustrate what I mean. The 1980 CQ WPX CW Contest results showed no station from W1 or W4 land with enough points to be declared a winner, and there were *no entrants* from W2, W3, W4, W7, and W0 land in the 28 MHz category. Similar conditions can be found in other parts of the world; for example, in Europe there was only one entrant from HB9 land in the single operator category.

Many countries in addition to the U.S.A. sponsor their own contests, each one offering us all a chance to be a winner. The CAN-AM Contest, which offers a winning certificate to the top scorer in each of the 50 states, issued 1980 phone winners certificates to stations in only 27 states and 1980 CW winners certificates to stations in only 29 states.

The list of contests such as SAC, French REF, Helvetia, SP, All-Asian, etc., goes on and on with similar patterns of unentered categories with the attendant chances for you or I to win.

In closing, I would like to reflect on the feeling of being in the winner's circle. Having been a part of the multi-multi N2AA winning team from time to time, I remember equally as well the thrill of winning the REF and OZ-CCA contests with my modest tri-bander from the home QTH.

So dig out your old *CQ*'s, analyze the previous years' contest results, carve out the contest and category you think you can handle, and dive in. You may come up with a winner!

73's, Bob, N1XX

Calendar of Events

	Aug. 1-2	Illinois QSO Party
†	Aug. 1-2	Romanian Contest
	Aug. 8-9	European C.W. Contest
*	Aug. 15-16	SEANET Phone Contest
	Aug. 15-16	S.A.R.T.G. RTTY Contest
	Aug. 15-17	New Jersey QSO Party
	Aug. 15-17	Rhode Island QSO Party
	Aug. 22-23	Ohio QSO Party
**	Aug. 22-23	All Asian C.W. Contest
	Aug. 29-30	Occupation Contest
	Sep. 5-6	Alabama QSO Party
	Sep. 5-7	Four Land QSO Party
	Sep. 6	North America Sprint
	Sep. 9-11	YLRL "Howdy Days"
	Sep. 12-13	European Phone Contest
	Sep. 12-13	New Mexico QSO Party
	Sep. 12-14	Wash. State QSO Party
	Sep. 19-20	Maryland/DC QSO Party
	Sep. 26-27	Delta QSO Party
	Oct. 3-4	California QSO Party
	Oct. 3-4	VK/ZL Phone Contest
	Oct. 10-11	VK/ZL C.W. Contest
	Oct. 11	RSGB 21/28 MHz Phone
	Oct. 18	RSGB 21 MHz C.W. Contest
	Oct. 17-18	Minnesota QSO Party
	Oct. 17-18	Scouts Jamboree on Air
	Oct. 21-22	YLRL Anniv. C.W. Party
	Oct. 24-25	**CQ WW DX Phone Contest**
	Nov. 4-5	YLRL Anniv. Phone Party
	Nov. 8	Czechoslovakian Contest
	Nov. 14-15	European RTTY Contest
	Nov. 28-29	**CQ WW DX C.W. Contest**

† Not Official.
* Covered last month.
** See June 1981 issue.

This year's Dayton affair, like past Hamventions, was a big success, especially Bernie Welch, W8IMZ's Contest Forum where I had the privilege of presenting about 10 Plaques to World Wide and WPX contest winners.

However, one sad note put a damper on the proceedings. Pedro Piza, Sr., KP4ES, father of Pedro Jr., NP4A, suffered a heart attack and succumbed on the second day of the Convention. He was a gentle man loved by all of us who knew him. We always looked forward to meeting him at Dayton. May he Rest in Peace.

Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Illinois QSO Party

1800Z Sat. Aug. 1 to 0500 Sun. Aug. 2
1200Z Sun. Aug. 2 to 2300 Sun. Aug. 2

This is the 19th annual party sponsored by the Radio Amateur Megacycle Society. The same station may be worked on each band and each mode.

Exchange: RS(T) and QTH. County for Illinois stations; state, province, or country for others.

Scoring: One point per contact, 2 points if it's with a Novice or Technician.

Illinois stations multiply total QSO points by the sum of states (max. 50), VE/VO call areas (max. 10), and no more than 5 DX countries worked. (Max. multiplier of 65.)

Out-of-state stations multiply total QSO points by Illinois counties worked (max. of 102).

Illinois mobiles or portables operating away from normal QTH may add 200 points to final score for each county of operation from which 10 or more contacts were made.

There is a bonus for out-of-state stations, a multiplier of one for each group of 8 contacts with the same county.

Frequencies: C.W.—About 60 kHz from low end of each c.w. band. Phone—3975, 7275, 14275, 21375, 28675. And 25 kHz from low end of each Novice band on the hour and the half hour.

Awards: Certificates to the top scorers in the following categories: Single operator, multi-operator, both single and multi-transmitter, mobile, portable, Novice, and Technician. In each state, VE/VO province, DX country, and first 3 places in Illinois. There are also club awards.

A summary sheet is requested showing the scoring and other essential information. Include a large s.a.s.e. for copy of the results.

Mailing deadline is Sept. 15th to: RAMS, K9CJU, 3620 N. Oleander Ave., Chicago, IL 60634.

Romanian Contest

Starts: 1800 GMT Sat. August 1
Ends: 1800 GMT Sun. August 2

This one is sponsored each year by the Romanian Amateur Radio Federation.

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Dr. Crosby Pulliam

4230 N. 15th AVENUE • PHOENIX, ARIZONA 85015

April 30, 1981

Dick Bash
Bash Educational Services
P.O. Box 2115
San Leandro, CA 94577

Dear Dick:

You said "trust me", so I did. I read your dumb "General Class Test Guide" thru the 10 times you recommended. I got up at 6 am the morning of the exam. I ate a "good" breakfast. I re-read the damn book again and wrote down all the formulas and frequencies a minimum of ten times each. I even remembered to write everything down on the scratch paper before openning the exam, just like you said. You know what happened? I got six wrong out of seventy. Six!

I only missed six questions because you didn't do your job right! It's your fault that I passed the stupid exam. If it weren't for you and that book of yours I would have had the pleasure of retaking the exam about five wonderful times like guy sitting next to me did. But Noooo!! I read the "Final Exam", followed your advice to the letter and look what happened. I passed the written test the first time!

Because of you I'll probably get ulcers while I impatiently wait for my "ticket". If I had failed the test, like I was supposed to, I could be leisurely be re-reading an inaccurate and outdated study guide and looking foward to seeing the same FCC test three or four more times. Damn!

Oh well, there's nothing I can do about it now. Maybe I'll kill the time by reading this new book I just purchased "Advanced Class Test Guide - New For 1981", "New For 1981" that's got to be a joke. They probably mean the covers new. With any luck I should be able to fail the advanced exam at least five times. That ought to be fun.

Sincerely,

Crosby Pulliam

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Some of the principals at this year's Dayton Contest Forum. Back row: Al Dorhoffer, K2EEK; John Kanode, N4MM; Jeff Clarke, WD8ALG, and Jeff Maass, K8ND, of the VP2E WPX Contest Expedition crew. Front row: Ted Pauck, K8NA; W1WY (still with folded, empty hands); and Jay Gerber, N3AW, President of the Frankford Radio Club, who accepted the Club's Championship Plaque for the 1979 World Wide Contest. (Photo courtesy WB4VQO)

You may work other European countries as well as the Romanian stations on each band and mode, 3.5 through 28 MHz. The same station may be worked only once per band, either on c.w. or on phone.

Classes: Both single and multi-operator, single and all band for both divisions.

Exchange: RS(T) and a QSO number starting with 001. YO stations will also include two letters denoting their county (569001/SJ).

Scoring: *For Europeans*—Two points for DX contacts, six points if it's with a YO station.

For others: Two points for European QSO's, 10 points if its with a YO station.

Multiplier: DX countries worked on each band for the Europeans. Others will use European countries and YO counties worked on each band. (There are approximately 40 YO counties.)

Mark Millman, N2ME, picked up a couple of 1980 WPX Contest Awards—The Kansas City DX Club's U.S.A. C.W. on 14 MHz and the Richardson Wireless Klub's U.S.A. 28 MHz for his operation at N2RM—while K2EEK looks on. (Photo courtesy W8IMZ)

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

Awards: Certificates to the top scorers in each country in each class, and a Crystal Cup to the overall champion.

Include a summary sheet and a signed declaration with your entry. (Inquire about the several YO awards. No details were given.)

Mailing deadline is September 1st to: Romanian Amateur Radio Federation, P.O. Box 1395, 7000 Bucuresti 5, Romania.

European DX Contest

C.W.: Aug. 8–9 Phone: Sept. 12–13
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is the 26th annual contest sponsored by the DARC. The activity will be between European countries and the rest of the world. Use all bands, 3.5 through 28 MHz.

Classes: Single operator and multi-operator single transmitter, both all band. Multi-operator stations are allowed to change bands one time only within a 15 minute period, except for working a new multiplier.

Only 36 hours out of the 48 hour contest period may be used by single operator stations. The 12 hour off period may be taken in one but not more than three periods any time in the contest.

Exchange: RS(T) plus a QSO number starting with 001.

Scoring: One point per QSO and one point for each QTC reported.

Multiplier: For non-Europeans, number of European countries worked on each band. Europeans will use the ARRL country list and following call areas: JA, PY, VE/VO, W/K, ZL, ZS, UA9/UA0.

In addition the multiplier on 3.5 MHz may be multiplied by 4, on 7 MHz by 3, and on 14/21/28 by 2.

Final Score: Total QSO points, plus QTC points, times the sum total multiplier from all bands.

QTC Traffic: Additional QSO points may be realized by reporting a QTC. This is a report of a QSO you made earlier in the contest and later sent it back to a European station.

The general idea is that after a number of EU statons have been worked, a list of these can be sent back to another EU station. One point is earned for each QSO reported. A QTC can only be sent from a non-European to a European station.

A QTC contains the time, call, and QSO number of the station being reported, i.e., 1300/DL2DN/134. This means that at 1300 you worked DL2DN and received his number 134. It may be reported only once and not back to the originating station.

A maximum of 10 QTC's to the same station are permitted, and the same station may be worked several times to complete this quota. Only the original contact, however, has QSO point value.

Keep a uniform list of QTC's sent. QTC 3/8 indicates that this is the 3rd series and that 8 QSO's are now being sent.

Awards: Certificates to the highest scoring stations in each country and each call area listed in the multiplier. Continental leaders and stations having at least half the score of the continental leaders will also be awarded.

Disqualification: Violation of the rules of the contest, or unsportsmanlike conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed cause for disqualification.

It is suggested that you use the official log and summary forms. A s.a.e. with sufficient IRC's to the DARC will get you a supply. Figure 40 contacts to the page; use a separate sheet for each band.

North American residents may send their requests and their logs to: Hartwin E. Weiss, W3OG, P.O. Box 440, Halifax, PA 17032.

Mailing deadline for logs is Sept. 15th for C.W. and Oct. 15th for Phone.

WAEDC Committee, P.O. Box 1328, D-895 Kaufbeuren, Fed. Rep. of GERMANY.

DARC Country List: C31, CT1, CT2, DL, DM, EA, EA6, EI, F, FC, G, GC Jer., GC Guer., GD, GI, GM, GM Shet., GW, HA, HB9, HB0, HV, I, IS, IT, JW Bear, JW, JX, LA, LX, LZ, M1, OE, OH, OH0, OJ0, OK, ON, OY, OZ, PA, SM, SP, SV, SV Crete, SV Rhodes, SV Athos, TA, TF, UA 1346, UA2, UB5, UC2, UN1, UO5, UP2, UQ2, UR2, UA Franz Josef Land, YO, YU, ZA, ZB2, 3A, 4UI, 9H1.

S.A.R.T.G. RTTY Contest

Three Periods GMT
0000–0800 & 1600–2400 Sat., Aug. 15
0800–1600 Sunday, August 16

This is the 11th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group. Use all bands 3.5 through 28 MHz. The same station may be worked on each band for QSO and multiplier credit.

Classes: Single operator, Multi-operator Single transmitter and s.w.l.

Exchange: QSO no., signal report.

Points: QSOs with own country, 5 points. With other countries on same continent, 10 points. With other continents, 15 points. The U.S., Canada, and Australia call areas count as separate countries for scoring.

Multiplier: Each DXCC country and each W/K, VE/VO, and VK call area. A multiplier will not be considered unless the claimed station appears in at least 5 logs, or a log is received from that station.

Final Score: Sum of QSO points from all bands times the sum of the multiplier from each band.

S.w.l.'s use same scoring but based on sum of stations and messages copied.

Awards: Certificates to the top scoring stations in each class in each country

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and each call area of the U.S., Canada, and Australia.

Use a separate sheet for each band and include a summary sheet showing the scoring, comments, and other essential information, and your name and address in block letters.

Logs must be received by October 10th and go to: S.A.R.T.G. Contest Manager, P.O. Box 717, DK 8600 Silkeborg, Denmark.

New Jersey QSO Party

Two Periods UTC
2000 Sat. to 0700 Sun. Aug. 15–16
1300 Sun. to 0200 Mon. Aug. 16–17

This is the 22nd annual party sponsored by the Englewood A.R.A. Phone and c.w. are part of the same contest, the same station may be worked on each band and mode, and NJ may work in-state stations for QSO and multiplier credit.

Exchange: QSO no., RS(T), and QTH. County for NJ, ARRL section or country for others.

Scoring: NJ stations score 1 point for W/K and VE/VO contacts, 3 points for DX. Multiply total by ARRL sections worked (max. of 74). KP4, KH6, KL7, etc., are 3 point contacts and also section multipliers.

Out-of-state stations multiply total NJ QSO's by total of NJ counties worked (max. of 21).

Frequecies: 1810, 3535, 3900, 7035, 7135, 7235, 14035, 14280, 21100, 21355, 28100, 28610, 50–50.5, 144–146. Try phone on even hours, 15 on odd hours, and 160 at 0500 GMT.

Awards: Certificates to the top scorers in each NJ county, ARRL section, and DX country. Second place awards if 4 or more logs are received from that section. Also Novice and Tech awards.

Use UTC, indicate the multiplier only the first time it is worked, include a QSO check sheet and a summary sheet showing the scoring, etc. Also include a large s.a.s.e. if you wish a copy of the results.

Stations planning activity in NJ are requested to advise the E.A.R.A. by August 1st so that coverage of all counties may be planned.

Logs must be received no later than Sept. 12th and go to: Englewood A.R.A., P.O. Box 528, Englewood, NJ 07631.

Rhode Island QSO Party

1700Z Sat. to 0500Z Sun. Aug.15–16
1300Z Sun. to 0100Z Mon. Aug. 16–17

The East Bay Amateur Wireless Association is again sponsoring this one. The same station may be worked on each band and mode and RI stations may contact other in-state stations.

Exchange: RS(T) and QTH. City or town for RI, state, province, or country for others.

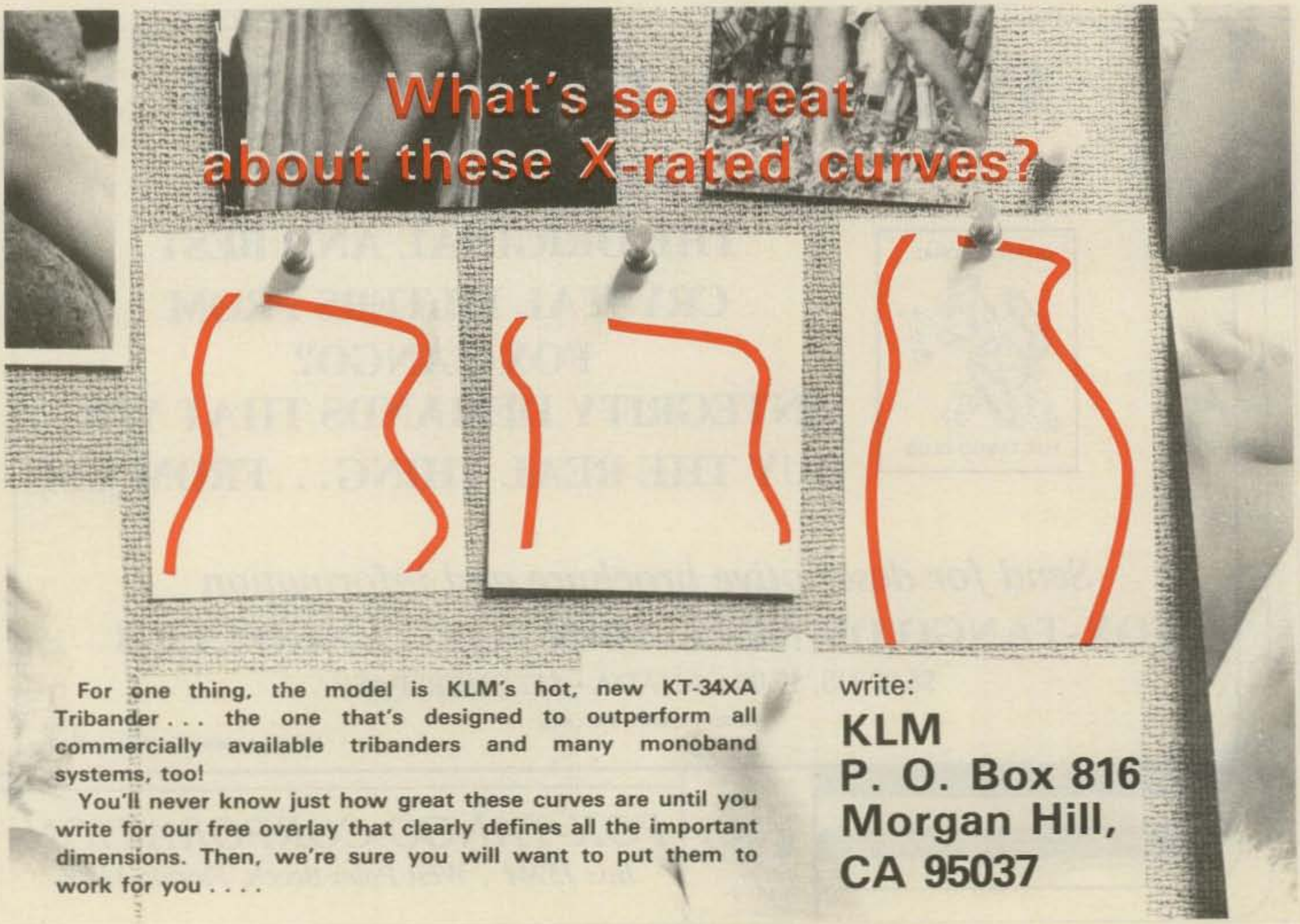
Scoring: All stations score two points for phone contacts, three points if on c.w. Novice and Techs score five points.

RI multiply total QSO points by the number of states, provinces, and DX countries worked.

Others multiply total QSO points by the

U.S.A. 1980 OK Contest Results

AK1A	AB	43,194
K9BG	AB	25,364
KC4OV	AB	16,660
W3ARK	AB	15,938
WB3JRU	AB	10,720
K4BAI	AB	9,612
WB5YMS	AB	5,292
AB2E	AB	4,770
N8BJQ	AB	4,416
W1CNU	AB	3,648
K9GDF	AB	1,235
AA6EE	AB	1,176
W3ICM	AB	1,173
K7NW	AB	1,066
N4TZ	AB	504
K2SCU/5	AB	115
W4VQ	7 MHz	2,717
W2XQ	7 MHz	792
K7UR	7 MHz	737
KB8EC	14 MHz	7,452
W1END	14 MHz	1,908
WB0GOB	14 MHz	880
W4YN	14 MHz	322
WB1HIH	21 MHz	3,523
N2IT	28 MHz	4,302
WA4QMQ	28 MHz	564
W6ISQ	28 MHz	459
N4OL	Multi.	171,522



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CA 95037

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1980 Phone WAE Contest Results

U.S.A.

W2YV	**1,404,480 (Opr. N2NT)**
W1ZM	**1,237,950**
K1VTM	**1,216,440**
K1AR	**1,133,179**
W2DKM	**361,036**
AB8K	**280,388**
KB8JF	228,400
W4LVM	**156,156**
AK1B	109,500
AK1A	97,416
K6SVL	**91,200**
N2VW	84,597
WB5DDI	**80,964**
WA4QMQ	73,428
W3MR	**65,155**
DL7KX/W2	59,724
K2QF	56,350
WA3DMH	43,440
WA1JGK	28,600
K5ZD	16,576
N3RL	12,675
W3ICM	9,744
N6AA	7,475
W3IKJ	5,562
W1YNE	5,096
WA5IYX	2,600
W2FCR	2,120
WB3GDE	1,008
W5EIJ	360
N6JM	330

Multi-Opr.

K@UK	**161,684**
W2RQ	**97,845**
W4CUE	**85,272**
WB3CZK	**54,696**
KB9OK	**43,670**

Canada

VE1AJJ	**26,452**
VE4RP	**22,570**
VO1AW	6,804
VE3CWW	4,370

number of different RI cities and towns worked. (There are 39 cities and towns in RI.)

Frequencies: C.W.—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110. Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, 146.52. Simplex no repeaters.

Awards: Certificates to the top scorers in each RI county, each state, province, and DX country; to the top scoring Novice and Tech in each RI county and each state; also to the Club in each state, province, and country submitting the highest aggregate score (min. of 3 logs).

Include a summary sheet with your entry showing the scoring, club affiliations, and other information.

Mailing deadline is September 15th to: East Bay A.W.A., P.O. Box 392, Warren, RI 02885. Include an s.a.s.e. for copy of results.

Ohio QSO Party

Starts: 0000Z Sat. August 22
Ends: 2400Z Sun. August 23

This year's party has been picked up by a new group, The Cuyahoga Falls A.R.C., with new rules and scoring system.

The same station may be contacted on each band and mode on all bands, 160 through 2 meters. (No repeater or Oscar contacts, however.)

Exchange: RS(T) and QTH. County for Ohio; ARRL section or country for others.

Scoring: Two points for each contact with an Ohio station. Contacts with a Falls member are worth 10 points. Work W8VPV, the club station, and earn 25 points. (It is suggested that Club members identify themselves.)

Ohio stations score 5 points for out of state contacts, plus the member and club bonuses.

Multiplier: For Ohio, ARRL sections (max. 74), and DXCC countries on each band. For all others, Ohio counties (max. 88) on each band.

Final Score: Total QSO points times above multiplier from each band.

Frequencies: 5 kHz up from low end of each General Class band, both on s.s.b. and c.w. The Club station, W8VPV, will be found near these frequencies.

Awards: Plaques to the top single operator in Ohio and out of state station. Certificates to the winning single operator, multi-operator, both single and multi-transmitter stations in each ARRL section, Ohio county, and DX country.

Dupe sheets are required for stations with more than 300 contacts. A summary sheet showing the scoring and the usual signed declaration are also requested. Include a large s.a.s.e. for a copy of the results. (Official forms are available from the Club by sending an s.a.s.e.)

Mailing deadline for logs is Sept. 21st to: The Cuyahoga Falls A.R.C., P.O. Box 6, Cuyahoga Falls, OH 44222.

All Asian C.W. Contest

Starts: 0000 GMT Sat., August 22
Ends: 2400 GMT Sun., August 23

Detailed rules were given in the June Calendar covering the Phone section of the contest.

There are a few modifications in this year's rules. Briefly they are as follows:

The operating period has been extended to the full 48 hour weekend.

QSO point values are now as follows: Contacts on 160 have a 3 QSO point value, 2 points if on 80, and 1 point for the rest of the bands.

Awards will now be given in each U.S. call area, not only for all band competition but also on each single band. This should make it more interesting for stateside stations.

Your c.w. entries must be in the hands of the committee no later than November 30th. The phone deadline is September 30th.

They go to: J.A.R.L. Contest Committee, P.O. Box 377, Tokyo Central, Japan.

Dr. Rick Dorsch, Jr., WB8ABN/HC1MD/HC9A, etc., spoke about his Galapagos Island operation at the Contest Forum. His QSL manager, John Kroll, K8LJG, seemed to have enjoyed the occasion. (Photo courtesy W8IMZ)

Occupation Contest

Starts: 1800Z Sat., August 29
Ends: 2400Z Sun., August 30

The Radio Association of Erie, Pennsylvania has come up with a new idea of what should be an interesting contest. It will give us an idea of what we do besides "hamming."

Exchange: RS(T), your Occupation, and State, province, or country.

Scoring: One point for each QSO. The multiplier will be determined by the number of similar occupations you contact. A multiplier of one for every 5 similar occupations worked. Also a multiplier of one for every 3 retirees worked. (10 QSOs with farmers equal 2 multipliers.)

Frequencies: C.W.—50 kHz up from bottom of each band. Phone—50 kHz down from top of each band. (Simplex contacts only, no repeaters.)

Awards: A Plaque to the Top scoring station. Certificates to the winner in each state, province, and DX country.

Mailing deadline is October 1st to: Chris Robson, KB3A, 6950 Kreider Road, Fairview, PA 16415. (Include a large s.a.s.e. for a copy of the results.)

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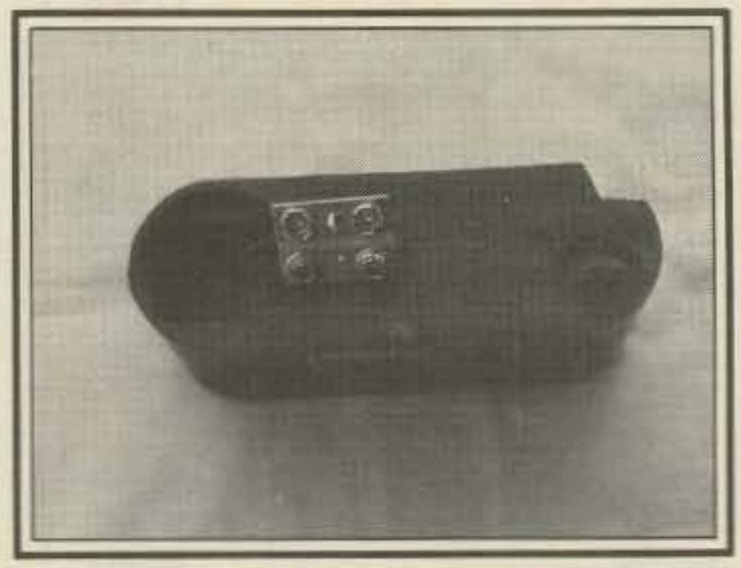
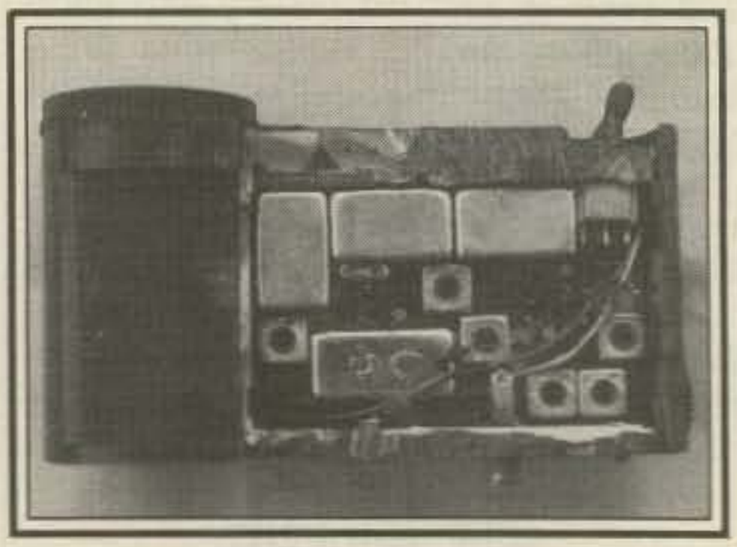


Battery compartment exposed; guard ring broken off switch for easier activation.

Foil side of PC board after cover sawed away.



Major component side of board after front of case sawed away.

BY ROBERT GROVE*, WA4PYQ

It has been many years since amateurs profited from the electronics surplus bonanza which followed World War II. Many dealers claim that although surplus depots still burgeon with goodies, the market has dried up.

Add to this paucity of paraphernalia the fact that most surplus newcomers have been spoiled by low-cost, solid-state, miniaturized consumer electronics.

So What's New?

Occasionally an item surfaces on the surplus market which is worthy of attention. One of these is the little RC-3A fixed frequency v.h.f. receiver shown in the Fair Radio Sales Company catalog.[1] It was manufactured under government contract by Dorsett Electronics (no longer in business) of Tulsa, Oklahoma.

The receiver was apparently designed to receive signals from remote sensors, possibly seismic intrusion detectors to sense enemy movements. Its high sensitivity would allow reception at considerable distance from a low-power transmitter.

As shown in the accompanying photographs, the RC-3A is a miniature solid-state unit sealed in a molded plastic cabinet. Its nominal operating frequency is 127.4 MHz. Since this is in the middle of the aircraft band, detection mode is a.m.

With the crystal changed and the r.f. stages realigned, this inexpensive, high-performance receiver should make an ideal 121.5 MHz ELT (Emergency Locating Transmitter) beacon receiver for downed aircraft. Or, you may choose your favorite aircraft tower frequency. Other frequency options might include 122.8 MHz (UNICOM), 126.2 (military), or 123.1 (search and rescue).

Inside

Seven transistors and a CA3018 IC (v.h.f. transistor array) complement the compact circuitry. Operating current is about 10–20 ma (depending upon audio output level) supplied by two standard 9-volt batteries. Since the battery connectors are in parallel, one battery will operate the unit.

The receiver is a straightforward superheterodyne with an i.f. of 20 MHz. An overtone crystal oscillator injects a frequency of 107.40 MHz into the mixer stage.

Low impedance audio is available through the miniature bayonet-type connector (Amphenol 45975). The connector should be wiped with cleaning fluid to remove the anti-corrosion dope.

The receiver is activated by throwing a miniature toggle switch which is environmentally protected by a weather boot. Signals are captured by a metal ribbon antenna which is wrapped around the set for storage, snapping into an erect posture when a small retaining bracket is removed. An adjacent screw allows attachment of an external antenna.

*Route 1, Box 156, Brasstown, NC 28902

[1]*Fair Radio Sales, 1016 E. Eureka, Box 1105, Lima, OH 45802*

Say You Saw It In CQ

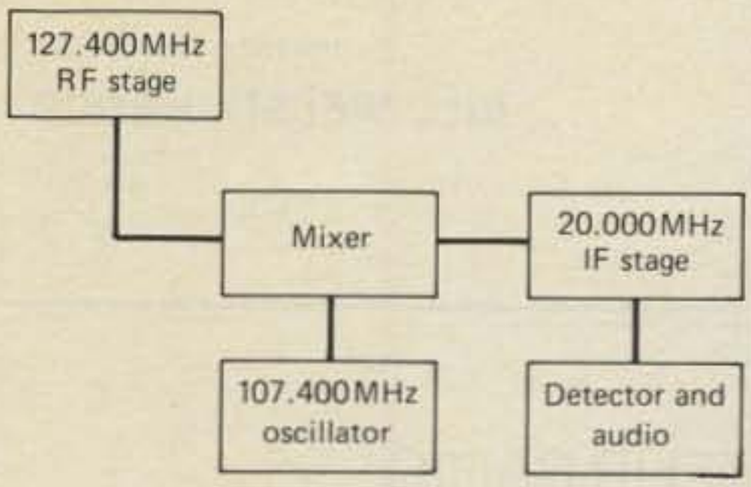


Fig. 1– Functional diagram of the RC-3A.

Getting Inside

Because of the hermetically-sealed case, access to the circuit board must be made by surgery. Some judicious measuring will prevent damage to the delicate innards of this receiver.

The printed circuit occupies a 2" × 3¼" area outlined by a rectangular plastic inset on the rear of the case. The foil side of the PC board may be revealed by hacksawing through the rounded edge of the case just beneath that plastic cover and prying it up.

To accomplish this task first remove the ribbon antenna by unscrewing the Phillips screw which secures it to the cabinet. Then measure ⅛" below the solvent-sealed edge of the plastic cover and begin sawing parallel with the front of the case (the RC-3A may be safely held in a vise).

After cutting approximately 3/16", the cavity of the case will be exposed. The plastic cover may now be pried off with a screwdriver. Be careful not to damage internal components with the screwdriver blade.

To gain access to the major component side of the board the entire front surface of the case will have to be sawed away clear down to the battery compartment. Begin at the same depth as you did for the rear side. You may use the spacing from the antenna screws as a guide.

As you cut away the side there will be two points at which the battery leads have been glued down to the plastic front. These will have to be peeled off as you proceed.

With the covers removed, all components are accessible. Although modifications are necessary to operate the receiver, you may wish to replace the earphone connector with a more convenient miniature jack. The internal trimpot is an audio gain control.

According to the Federal Frequency Directory, 127.4 MHz is in use in Arkansas, California, Florida, Georgia, Idaho, Illinois, Missouri, New Mexico, New York, Oregon, South Carolina, West Virginia, and Wyoming. With the propagation of signals at aircraft altitudes, reception on that frequency should be possible over most of the United States.

At only $14.95 including shipping, the little RC-3A receiver is quite a bargain.

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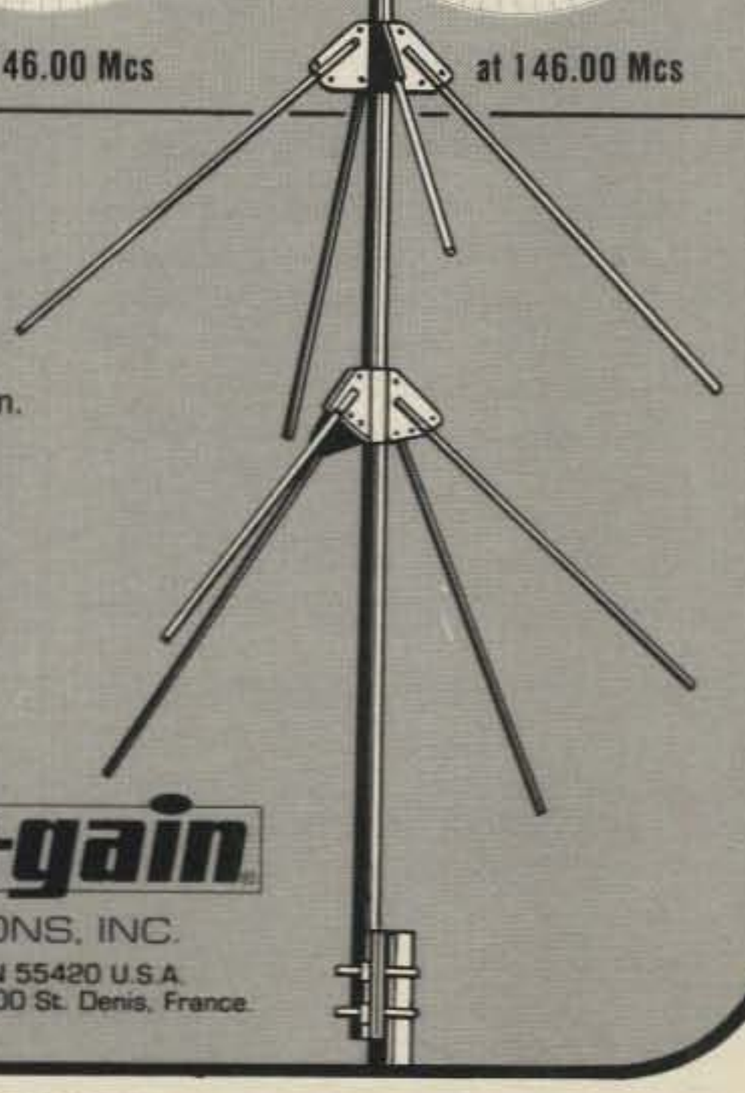

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CIRCLE 140 ON READER SERVICE CARD

a monthly feature by
BILL WELSH, W6DDB

Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Operating Tips—Part 1

I receive about 30 letters per month from Novice column readers. Fortunately, most of them can be answered by putting a requested printed aid in the s.a.s.e. (self-addressed and stamped envelope) they supply. I avoid writing individual responses to most letters since it is too time consuming and only helps one person at a time. However, I carefully read each letter I get, and the predominant subject is poor operating procedures noted in the Novice bands. Previous Novice columns have covered this subject in bits and pieces, but it is obvious to me that it warrants detailed coverage in a single article, so that is what this short series of Novice columns will do. I realize that many of the amateurs who read this column are General, Advanced, or Amateur Extra class licensees. I hope that you higher class licensees will send suggested additions and changes to my attention for possible inclusion in future Novice columns. This column is intended to help prospective and new amateurs. There is no way to avoid repeating basic information, since I cannot assume that newcomers know about coverage in previous Novice columns. The material in this article is separated into general categories to make it easier to find.

Band and Frequency Selection

The 10 and 15 meter bands provide optimum long-range (DX) contact possibilities during the daytime, but communications range drops to about 15 miles (ground wave only) during the night. The 15 meter band opens (becomes useful) earlier in the day than the 10 meter band, and 15 closes later than 10. It is advisable to use the 10 meter band while it is open during the day and to switch to 15 when 10 dies.

The 40 and 80 meter bands provide optimum DX contact possibilities during the night, but daytime communications range is much shorter. However, these two bands provide better range during the day than 10 and 15 permit at night. Interference is often worse on the 40 meter Novice band than on any other band. There are often layers of signals covering most of 40, and it can be almost impossible to find a reasonably clear frequency. This bad situation becomes much worse in the evening when powerful international shortwave broadcast stations are heard every 5 kHz (7105, 7110, etc.) throughout this Novice band. Despite these adverse conditions, good operators do everything possible to avoid causing unnecessary interference to other stations. One way to do this is to answer stations already calling CQ (general call to all stations) instead of sending CQ. If nothing else, at least avoid using a frequency already being used by a strong local station.

Meet John Rouse, KA3DBN, the Editor of the Bowie Blade News *in Bowie, Maryland. He holds about 20 operating certificates, including DXCC, HAROAA DX, RCC, TAD, WAC, WAS, and WPNX awards. He worked 113 countries during his first 18 months on the air, and he strongly urges Novices to give DX a try, particularly on 10 and 15 meters. John uses a Ten Tec Omni-D Transceiver with a TA-33 triband Yagi that is up about 45 feet. He is a member of the ARRL Public Relations Advisory Committee, a member of the Radio Society of Great Britain, and secretary of the Bowie Amateur Radio Club in this suburb of Washington, D.C. John expects to hold his General ticket and hopes to operate with a GM5 callsign from Edinburgh, Scotland each summer. I recently enjoyed a nice chat with John on 10 meters.*

It is generally good practice to operate on 10 and/or 15 meters during the day and to shift to 40 and/or 80 meters at night. This requires equipment and antennas capable of being operated satisfactorily on all four Novice bands.

Activity tends to be more concentrated at the low ends of each Novice band. This is particularly noticeable on the 10 and 15 meter bands. One of the reasons for this condition is that DX (foreign) stations are more likely to be heard at the low end of these bands. If you are primarily interested in contacting DX stations, stay in the lower 15 kHz. If you are not particularly interested in working DX, you can avoid a lot of interference from other stations by using frequencies towards the top ends of the bands. Avoiding low-end band congestion is very important when one uses QRP (low power).

Do not allow yourself to become frustrated to the point where you create malicious interference. I do not believe there is anyone of less use to our amateur radio service than someone who intentionally causes interference. When conditions are bad, use your head and help make things better for others. Top amateurs take pride in not interfering with other stations. Courteous behavior on the air has long been a strong point in favor of amateurs, and I hope you will continue this essential tradition. Most apparent cases of malicious interference are unintentional, and they are usually caused by operating mistakes such as not transmitting on the same frequency as the other station, as is detailed later in this article under calling and answering.

Speed

Unless one has some physical impairment, they can send code faster than they can copy it. This is normal, but it can cause trouble for new operators. If an amateur sends code at his or her top sending speed, he or she is in trouble if the other operator answers at that speed. It is smart to slow down a little bit and to send at a rate that you can copy without

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Say You Saw It In CQ

too many errors. One way to reduce your sending speed is to concentrate on sending perfect code symbols. Another way to do it is to slightly lengthen spaces between letters and words. It is natural for new operators to send fast since they are usually trying to increase their code speed. However, accuracy is much more important than speed, and code speed proficiency naturally improves as long as one continues to operate frequently.

Good code sounds great no matter how slowly it is being sent. Do not rush your sending. Even the most proficient code operators will slow down to work a beginner in a Novice band. Do not hesitate to ask a faster operator to QRS (send slower), since no good operator intentionally sends faster than the other one can copy. If the other amateur sounds proficient, match his or her speed as closely as possible (within your own capabilities). When working an amateur who does not sound proficient, answer at a slower speed than you are receiving. Amateurs seldom send more than three to five words per minute above their receiving speed and this speed differential should be considered when sending code to a less capable code operator.

Sending

As previously stated, properly sent code sounds good at all speeds. However, improperly sent code sounds bad at all speeds. One cannot make up for quality by sending a greater quantity of dits and dahs. Make an effort to send each code symbol perfectly. Leave extra space between words and sentences to avoid the initial problem wherein new operators run everything together. When an amateur first starts operating on the air, it is common to temporarily forget certain difficult symbols. This problem is most easily overcome by posting a copy of the code where it can be easily read while one is operating. One quickly becomes so familiar with the code symbols that this visual aid can be put away. The problem that remains is usually improper spacing. Dits may be sent so long that they are hard to distinguish from dahs being sent too short. Inadequate spacing between letters produces incorrect resultant symbols, such as when the symbols for A and N are run together, producing the symbol for the letter P. Inadequate spacing between words produces incorrect words, such as when "the irreversible" is spaced to produce "their reversible." At the least, improper spacing causes increased copying difficulty and unnecessary confusion. Inexperienced code operators have enough trouble copying good code; most of them just make up some excuse (meal time, telephone call, visitor, etc.) and quit the contact when the other amateur sends bad code. Similarly, it is very important to send perfect code when you transmit a general call to all stations (CQ) in a Novice band. Beginning

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operators do not readily overlook sending errors of any type, and they frequently do not respond to a stations when an error is heard in the CQ call. They seem to think that if the other station makes mistakes in the CQ call, the contact would be a mess. This attitude is understandable to me. Take pride in your sending and minimize errors.

Errors do occur and they should be properly corrected to improve the contact. If the mistake happens on the first letter of a word (or a single letter word such as A or I), send an error sign and repeat from the first letter of the previous word/group. If the error occurs on anything other than the first letter of the word, send an error sign and just repeat from the first letter of the word/group you were sending when you made the mistake. In other words, give the other operator a chance to associate your correction with the material you had sent properly before you erred. There are two error symbols; one is a series of seven or more dits, and the other is the question mark. I prefer the question mark for two reasons. First, inexperienced operators are apt to send four or five dits instead of the seven (or more) dits required for an error signal; this can cause additional confusion because the receiving operator will probably copy an H or 5, since that is what was sent. Another reason I like the question mark in this application is because a question mark sent out of context (not at the end of a question) is accepted to mean that the word or group is going to be repeated, whether or not an error occurred. Consequently, even if you did not make an obvious error, you can send the question mark and repeat any word or group you want to send better or that you want to be sure the other amateur copies correctly (such as your name and location, plus his signal report). Operators are people and people make mistakes. When you make a code-sending error, correct it properly and efficiently. Bursts of dits (machine-gun fire) do nothing to bolster the confidence of the receiving operator.

There is disagreement among code instructors regarding the best way for students to develop good sending ability. This difference of opinion is basically related to when the student should start using a semi-automatic key (bug) or an automatic keyer (paddle with electronic keyer). It is my conviction that anyone who masters correct use of the handkey (also called a straight key and a manual telegraph key) develops into a better code operator than others who use an automatic keyer from the start. One has to manually send each dit and dah when using a handkey, and it takes a lot of practice to develop the technique of using one's wrist (instead of the fingers) to send correctly. The wrist moves up and down the same distance for dits as for dahs. It is the time required to move the wrist the same distance every time that produces the even spacing between each part of code symbols; this is called rhythm. It requires a concerted effort for a code student to use the wrist to send, since one uses the fingers much more naturally. However, it quickly feels natural, and wrist senders easily develop the ability to send good code. The most proficient of the finger tappers (and they far outnumber wrist senders) sound uneven and disjointed in their sending. The beginner can more quickly develop good wrist-sending technique by following a few simple rules. Open the gap between the keying contacts at least one sixteenth of an inch, adjust the tension spring to where it takes reasonable pressure to close the key contacts, secure the handkey where it is in line with your forearm, sit close to the table/desk with your elbow on its surface, grasp the handkey knob between your thumb and middle finger, and position your forefinger on the knob with your knuckle always bent outward to absorb the extra wrist pressure that occurs as one sends.

When you have mastered the correct use of a handkey, developed good sending rhythm, and increased your code sending speed to about 15 wpm, I advise you to get either an automatic or a semi-automatic key to allow you to send code faster and with less effort than is possible with a handkey.

The semi-automatic key is better known as a bug because Vibroplex is the best known manufacturer of semi-automatic keys and their trademark is a bug. The bug has two sets of contacts; one is for dits and the other is for dahs. When the knob is pushed in one direction, a pendulum action causes a series of evenly spaced dits to occur. When the knob is moved in the opposite direction, a continuing dah is generated as long as the operator holds that contact closed. In other words, the bug operator manually sends each dah, but just has to hold the knob in the other direction to have dits sent automatically. Since the dahs are sent manually and the dits are sent automatically, the bug is a semi-automatic telegraph key. It takes more effort to master the correct use of a bug than an electronic keyer.

Electronic keyers are sometimes built with the paddle (key) built in; other types are used with a separate paddle. This system provides a perfectly spaced series of dits or dahs when the paddle knob is moved in one direction or the other, which means that it is a fully automatic telegraph keying device. However, electronic keyers do not automatically provide the required spaces between letters and words/groups. Consequently, it is common to hear a string of perfect dits and dahs being used to transmit code garbage by someone using an electronic keyer.

If you have developed good spacing sense with a handkey, it stays with you when you switch to a bug or an electronic keyer. If you plan to use all three types of keys, I advise you to use one hand for the bug and the other hand for the electronic keyer; this seems to preclude timing problems that otherwise occur if the same hand is used with both the bug and the electronic keyer. I am naturally right-handed, and I used bugs for many years before electronic keyers existed. I send righty with handkeys and bugs, whereas I send lefty with electronic keyers. Since electronic keyers are easier to master and offer so much more than bugs (automatic repetitive transmissions, etc.), I advise new operators to master the handkey and the electronic keyer with their "natural" hand and (if they wish to do so) to use their other hand with the bug.

Before we leave the subject of spacing, the matter of dah-to-dit time relationship must be covered. The dah is not always three times the length of a dit, as many books state. The 3-to-1 relationship is just true at about 15 wpm. When sending at about 2 wpm, code sounds much better using a ratio of about 7-to-1. Conversely, when sent at about 50 wpm, code is best at a ratio of about 1.5-to-1. Another advantage newer operators derive from using longer dahs is that it automatically forces one to prefer sending with the wrist than the fingers. The fingers have to work to hold the key contacts closed, whereas the wrist is just relaxed in the down position.

Part One Conclusion

This completes the first part of the Operating Tips article. The concluding parts will be printed in the next issues, and they will cover listening, zero beating, two-way contacts, emergency operation, practice, codes/signals, contests/DX, clubs, cross band/mode, violation notices, and printed data. Each part provides useful information if read by itself; however, it is hoped that all parts of this article will be read to provide a better overall understanding of this subject.

73, Bill, W6DDB

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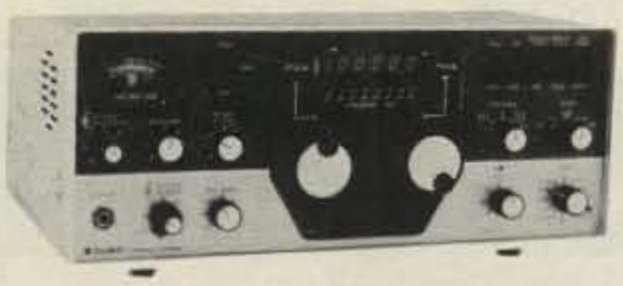

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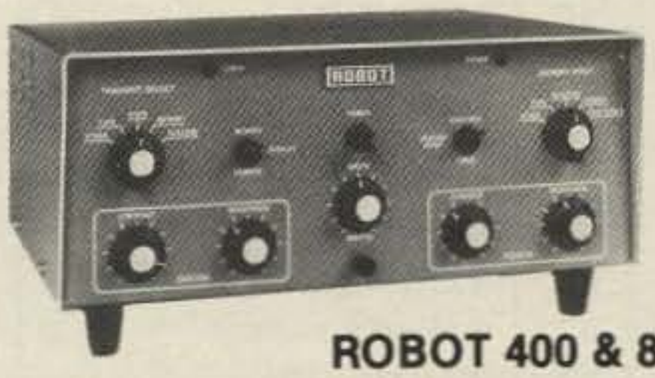

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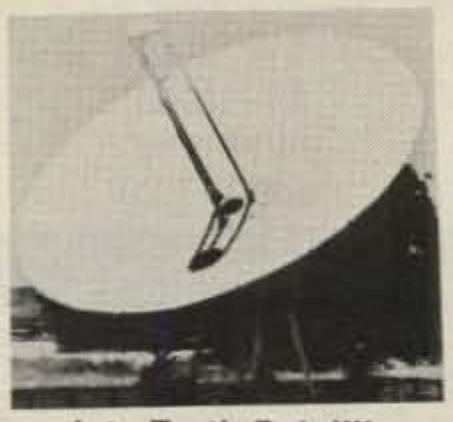

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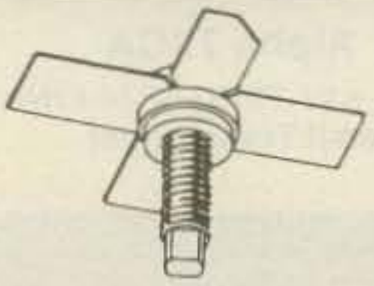

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Phenolic type..... 6/$1.00

NEW SIMPSON 260-7 $99.99

RG174/U - $15.00 per 100 ft.
Factory new

PL259 TERMINATION
52 Ohm 5 Watts $1.50 each

TORIN TA700 FANS NEW $29.99 each
Model A30340
230 VAC @ .78 Amps
Will also work on 115 VAC

CRYSTAL FILTERS

EFCL455K13E	3.99
EFCL455K40B2	2.99
FX-07800L, 7.8 MHz	12.99
FHA103-4, 10.7 MHz	12.99

CB type crystals

$4.95 each

51-T

T1	T15	T28
T2	T16	T29
T3	T17	T30
T4	T18	T31
T5	T19	T32
T6	T20	T33
T7	T21	T34
T8	T22	T35
T9	T23	T36
T10	T24	T37
T11	T25	T38
T12	T26	T39
T13	T27	T40
T14		

51-R

R1	R15	R28
R2	R16	R29
R3	R17	R30
R4	R18	R31
R5	R19	R32
R6	R20	R33
R7	R21	R34
R8	R22	R35
R9	R23	R36
R10	R24	R37
R11	R25	R38
R12	R26	R39
R13	R27	R40
R14		

NEW CHERRY BCD SWITCH
New end plates
Type T-20..... 1.29 each

Johnson AIR Variables

$1.00 each

T-3-5	1 to 5 pF
T-6-5	1.7 to 11 pF
T-9-5	2 to 15 pF
189-6-1	.1 to 10 pF
189-502-Y	1.3 to 6.7pF
189-503-105	1.4 to 9.2pF
189-504-5	1.5 to 11.6pF
189-505-5	1.7 to 14.1pF
189-505-107	1.7 to 14.1pF
189-506-103	1.8 to 16.7pF
189-507-105	2 to 19.3pF
189-508-5	2.1 to 22.9pF
189-509-5	2.4 to 24.5pF
545-043	1.8 to 11.4pF

CIRCLE 141 ON READER SERVICE CARD

Say You Saw It In CQ

Johnson AIR Variables

1/4 x 2 1/2" shaft
$2.50 each

193-10-6	2.2 to 34 pF
193-	1.5 to 27.5pF
193-	.6 to 6.4pF

$1.00 each

160-107-16	.5 to 12 pF
193-10-9	2.2 to 34 pF
193-10-104	2.2 to 34 pF
193-4-5	3 to 30 pF

RF Power Device

MRF454 Same as MRF458
12.5 VDC, 3-30 MHz
80Watts output, 12dB gain
$17.95 ea.

E.F. JOHNSON TUBE SOCKETS

#124-0311-100 ..... 6.99 each
For 8072 etc.

#124-0107-001 ..... 13.99 each
For 4CX250B/R, 4X150A etc.

#124-0111-001 ..... 4.99 each
Chimney for 4CX250B/R and 4X150

#124-0113-001 and 124-0113-021
$12.99 each
Capacitor for #124-0107-001

#123-209-33 Sockets....6.99 each
For 811A, 572B, 866, etc.

UNELCO CAPS

6.8pF	47pF	
8.2pF	62pF	
10pF	100pF	
12pF	160pF	
13pF	180pF	
14pF	200pF	
20pF	240pF	
24pF	380pF	
33pF	470pF	
36pF	1000pF	
43pF	350V	$1.00 each

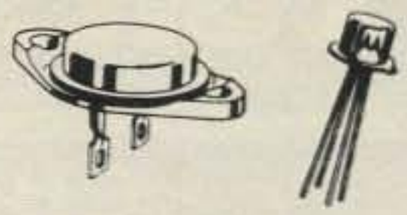
86 Pin Motorola Bus Edge Connectors

Gold plated contacts
Dual 43/86 pin .156 spacing
Soldertail for PCB.....$3.00 each

110VAC MUFFIN FANS

New $11.95
Used $5.95

Transistors



2N2857JAN	2.50	2N3960JANTX	10.00	2N5645	10.00
2N2949	3.60	2N4072	1.60	2N5842	8.00
2N2947	15.00	2N4427	1.10	2N5849	20.00
2N2950	4.60	2N4429	7.00	2N5942	40.00
2N3375	8.00	2N4877	1.00	2N5946	14.00
2N3553	1.57	2N4959	2.00	2N5862	50.00
2N3818	5.00	2N4976	15.00	2N6080	7.00
2N3866	1.00	2N5070	8.00	2N6081	10.00
2N3866JAN	2.50	2N5071	15.00	2N6082	11.00
2N3866JANTX	4.00	2N5108	4.00	2N6083	13.00
2N3925	10.00	2N5109	1.50	2N6084	14.00
2N3948	2.00	2N5179	1.00	2N6095	11.00
2N3950	25.00	2N5583	4.00	2N6096	20.00
2N3959	3.00	2N5589	6.00	2N6097	28.00
		2N5590	8.00	2N6166	38.00
		2N5591	11.00	2N6368	22.99
		2N5635	5.44	A210/MRF517	2.00
		2N5636	11.60	BLY38	5.00
		2N5637	20.00	40280/2N4427	1.10
		2N5641	5.00	40281/2N3920	7.00
		2N5643	14.00	40282/2N3927	10.48

CRYSTALS

$4.95 each

5.120	7.4825	9.565	10.150	11.155	11.905	17.315
7.3435	7.4865	9.575	10.160	11.275	11.955	17.355
7.4585	7.4925	9.585	10.170	11.700	12.000	17.365
7.4615	7.4985	10.000	10.180	11.705	12.050	37.600
7.4625	7.5015	10.010	10.240	11.730	12.100	37.650
7.4665	7.5025	10.020	10.245	11.750	16.965	37.700
7.4685	7.5065	10.030	10.595	11.755	17.015	37.750
7.4715	7.7985	10.040	10.605	11.800	17.065	37.800
7.4725	7.8025	10.0525	10.615	11.850	17.165	37.850
7.4765	9.545	10.130	10.625	11.855	17.215	37.900
7.4785	9.555	10.140	10.635	11.900	17.265	37.950
7.4815						38.000

High Voltage Caps

30 MFD @ 500 VDC	1.69
22 MFD @ 500 VDC	1.69
100 MFD @ 450 VDC	2.29
150 MFD @ 450 VDC	3.29
225 MFD @ 450 VDC	4.29
.001/1000pF @ 10 KV	.89
.001 @ 3 KV	4/1.00
.0015 @ 3 KV	3/1.00
.01 @ 4 KV	.79
.01 @ 1.6KV	4/1.00
.02 @ 8 KV	2.00
.01 @ 1 KV	6/1.00

NEW 2" ROUND SPEAKERS
100 Ohm coil $.99 each

PLASTIC TO-3 SOCKETS
4/$1.00

CRYSTAL FILTERS
Tyco 001-19880 Same as 2194F
10.7 MHz narrow band
3 dB bandwidth 15 KHz min.
20 dB bandwidth 60 KHz min.
40 dB bandwidth 150 KHz min.
Ultimate 50 dB insertion loss 1 dB max.
Ripple 1 dB max. Ct. 0+/-5 pF 3600 Ohms
$3.99 each

78MO5
Same as 7805 but only 1/2 Amp
5 VDC .49 each or 10/$3.00

TRIMMER CAPS

Sprague. Stable Polypropylene.
.50 each or 10/4.00
not sold mixed
1.2 to 13pF
2 to 30pF
3.9 to 18pF
3.9 to 40pF
3.9 to 55pF

Carbide Circuit Board Drill Bits
for PCB Boards
5 mix for $5.00

J-Fet

J310 N-CHANNEL J-FET 450 MHz
Good for VHF/UHF Amplifier,
Oscillator and Mixers 3/$1.00

MURATA CERAMIC FILTERS

SFD 455D	455 KHz	2.00
SFB 455D	455 KHz	1.60
CFM455E	455 KHz	5.50
CFU455H	455 KHz	3.00
SFE 10.7MA	10.7 MHz	2.99

TEXAS INSTRUMENT TIL-305P
5 x 7 array alphanumeric display
$3.85 each

SEMICONDUCTORS SURPLUS

ATLAS FILTERS

ATLAS CRYSTAL FILTERS FOR
ATLAS HAM GEAR
Your Choice

$15.95 ea.

5.645 - 2.7/8
5.595 - 2.7 USB
5.595 - 2.7/8/L
5.595 - 2.7 LSB
5.595 - .500/4
9.0 - USB/CW

Soldering Kit

New Weller Soldering Iron Kit
#SP-23F..... 9.99 each
Kit includes:
1 - 25 Watt soldering iron, develops 750° of tip temperature
3 - tips (screwdriver, chisel, cone)
1 - soldering aid tool
1 - coil 60/40 rosin core solder

CERAMIC PLATE CAPS

$1.09 each
#1 type for 3/8 plate cap
#2 type for 5/8 plate cap

Used NiCads

Used C Nickel Cadmium Batteries
1.8 amp hour
Pack of ten $8.99 per pack

CERAMIC COIL FORMS
$1.99 each

#1	3/16" x 4/8"
#2	3/16" x 1/4"
#3	1/4 " x 3/4"
#4	3/8 " x 7/8"
#5	3/8 " x 5/8"

All of the above have powdered iron cores.

#6	1/2"x 2 3/4"

NEW BOGNER DOWNCONVERTER
Industrial version.
1 year guarantee..... $225.00

UHF/VHF RF POWER TRANSISTORS
CD2867/2N6439
60 Watts output
Reg. Price $45.77
SALE PRICE $19.99

CHOKES

.1-3 uH	2.99
VIV .15 .15 uH	2.99
VIV 150 150 uH	2.99
5-20 uH	1.69
Variable coil 10-80 uH	2.99
Transformer dual 8.8 uH	1.00
.47 uH	1.00 ea. or 10/7.50
.68 uH	1.00 ea. or 10/7.50
1 uH	1.00 ea. or 10/7.50
1.2 uH	1.00 ea. or 10/7.50
1.5 uH	1.00 ea. or 10/7.50
2.2 uH	1.00 ea. or 10/7.50
2.7 uH	1.00 ea. or 10/7.50
3.3 uH	1.00 ea. or 10/7.50
6.5 uH	1.00 ea. or 10/7.50
7.5 uH	1.00 ea. or 10/7.50
10 uH	1.00 ea. or 10/7.50
15 uH	1.00 ea. or 10/7.50
20 uH	1.00 ea. or 10/7.50
22 uH	1.00 ea. or 10/7.50
33 uH	1.00 ea. or 10/7.50
39 uH	1.00 ea. or 10/7.50
47 uH	1.00 ea. or 10/7.50
50 uH	2.99
56 uH	1.69
62 uH	1.00 ea. or 10/7.50
68 uH	1.00 ea. or 10/7.50
100 uH	2.99
120 uH	1.69
185 uH	1.00 ea. or 10/7.50
538 uH	1.00 ea. or 10/7.50
680 uH	1.00 ea. or 10/7.50
1000 uH	1.00 ea. or 10/7.50
1630 uH	1.50
.1 mH	2.99
.2 mH	2.99
.22 mH	2.99
.27 mH	2.99
.33 mH	2.99
.39 mH	2.99
.240 mH	2.99
1.2 mH	2.99
1.5 mH	2.99
1.65 mH	2.99
1.75 mH	2.99
1.9 mH	2.99
1 mH	1.69
1.88 mH	3.99
2 mH	2.99
2.4 mH	2.99
2.5 mH	1.00 ea. or 10/7.50
2.7 mH	2.99
3.0 mH	2.99
3.6 mH	2.99
4.3 mH	2.99
4.7 mH	2.99
5 mH	2.99
5.11 mH	2.99
6 mH	2.99
7.2 mH	2.99
8.25 mH	2.99
8.28 mH	2.99
8.6 mH	2.99
10 mH	2.99
12 mH	2.99
15 mH	2.99
17 mH	2.99
19.6 mH	2.99
20 mH	2.99
20.5 mH	2.99
22.6 mH	2.99
24 mH	2.99
27.4 mH	2.99
28.7 mH	2.99
29.9 mH	2.99
30 mH	2.99
36 mH	2.99
36.5 mH	2.99
40 mH	2.99
40.2 mH	2.99
43 mH	2.99
47 mH	2.99
50 mH	2.99
59 mH	2.99
60 mH	2.99
71.5 mH	2.99
78.7 mH	2.99
86 mH	2.99
100 mH	2.99
120 mH	2.99
150 mH	2.99
175 mH	2.99
200 mH	2.99
205 mH	2.99
237 mH	2.99
240 mH	2.99
300 mH	2.99
360 mH	2.99
390 mH	2.99
430 mH	2.99
500 mH	1.50
600 mH	2.99
1000 mH	2.99
1.5 Hy	2.99
2.0 Hy	2.99
2.5 Hy	2.99
3.0 Hy	2.99
5.0 Hy	2.99
10 Hy	2.99

HIGH VOLTAGE CAPS

420 MFD @ 400 VDC	3.99 each
600 MFD @ 400 VDC	3.99 each

New Fairchild Prescaler Chip

95H90DCQM..... 6.50 each
350 MHz prescaler divide by 10/11

CIRCLE 143 ON READER SERVICE CARD

1.9-2.5G CONVERTERS

1900 MHz to 2500 MHz DOWNCONVERTERS
Intended for amateur radio use.
Tunable from channel 2 thru 6.
34 dB gain 2.5 to 3 dB noise.
Warranty for 6 months Model HMR 11
Complete Receiver and Power Supply
(does not include coax)..... $225.00

4 foot Yagi antenna only..... $39.99
Downconverter Kit - PCB and parts.. $69.95
Power Supply Kit -
Box, PCB and parts..... $49.99
Downconverter assembled..... $79.99
Power Supply assembled..... $59.99
Complete Kit form $109.99
(includes Yagi antenna and instructions)

REPLACEMENT PARTS

MRF901	$ 3.99
MBD101	1.29
.001 Chip Caps	1.00
Power Supply PCB	4.99
Downconverter PCB	19.99
Instructions for any separate item	10.00

NEW TRANSFORMERS

		Price each
F-18X	6.3 VCT @ 6Amps	6.99
F-46X	24V @ 1Amp	5.99
F41X	25.2VCT @ 2Amps	6.99
P-8380	10VCT @ 3Amps	7.99
P-8604	20VCT @ 1Amp	4.99
K-32B	28VCT @ 100 MA	4.99
E30554	Dual 17V @ 1Amp	6.99

DIODES

HEP 170
3.5 A, 1000 PIV
.20 ea., 100 for $15.00

D61005
1.5 A, 1000 PIV
.15 ea., 100 for $12.00

HVK 1153
25 mA, 20,000 PIV
$1.00 ea., 10 for $8.00

Fairchild LEDs
FLV 5007 & 5009 red.
Case type TO-92.
6/$1.00

SCMS 10K
15 mA, 10,000 PIV
$1.69 ea., 10 for $12.50

High-voltage diode EK500
5000 Volts, 50 mA
.99 each

Motorola SCR
TO-92 Case, 0.8 Amp, 30 V.
Igt 0.2 Vgt 0.8.
Same as #N5060.
4/$1.00 or 100/$15.00

Dialco Type 555-2003
LED 5 VDC with built-in resistor.
.69 each

Motorola MA 752 Rectifier
6 Amps, 200 PIV
4/$1.29

NEW BCD SWITCH
8 switch with end plates
Model TSM200-1011 (CDI) $16.87

CONTINUOUS TONE BUZZERS
12VDC..... $2.00 each

EIMAC FINGER STOCK #Y-302
36 in. long x 1/2 in. $4.99 each

MAGNET WIRE
$22.50 per spool

#24	A.W.G.	9 lb.
#26	A.W.G.	9 lb.
#25	A.W.G.	9 lb.
#30	A.W.G.	8 3/4 lb.
#31	A.W.G.	6 lb.

CORES
4/1.00

T20-12	T30-6	T37-6
T25-6	T30-12	T37-10
T30-2	T37-2	T44-6

CABLE TIES
#/T-18R 100 per bag
mil. spec. #MS-3368S, 4"
Made by Tyton Corp.
$2.50 per bag
100 bags - $20.00

Miniature Ceramic Trimmers
.50 each or 10/$4.00

CV31D350	2 to 8 pF
HM00-4075-03	3.5 to 11 pF
300425	3.5 to 13 pF
E5-25A	5 to 25 pF
	5.1 to 40 pF
	3.5 to 15 pF
	5.2 to 40 pF
	2.5 to 6 pF

CERAMIC STAND OFFS

#CNP-5	3/8 x 5/8"	.29 each
	7/16 x 1 1/4"	.39 each
#N54W0112	3/8 x 1 1/2"	.49 each
#NL523W03-010	3/4 x 1 1/4"	.79 each

CORES AND BEADS

#43	Shield Bead	4/1.00
#61	Toroid	3/1.00
#43	Balun	10/1.00
#61	Balun	8/1.00
#61	Balun	6/1.00
#61	Balun	4/1.00
#61	Beads	10/1.00
Ferrite Rod 1/4 x 7 1/2		2.99
Ferrite Beads 1/8" long		12/1.00
Ferrite Beads 3/8" long		6/1.00
Ferrite Beads 1/16" long		12/1.00

DOOR KNOB CAPS

470 pF @ 15 KV	$3.99 each
Dual 500 pF @ 15 KV	5.99 each
680 pF @ 6 KV	3.99 each
800 pF @ 15 KV	3.99 each
2700 pF @ 40 KV	5.99 each

TRANSFORMERS
$9.99 each
#2899652-01
26.8 VCT @ 660 MA
21.9 VCT @ 1.1 Amps
$1.99 each
#18000711P
24 V @ 100 MA
$12.99 each
#2099459-00
28 V @ 1.5 Amps
9.6 V @ 9 Amps
16.8 V @ 300 MA

JUMBO LED'S

Red	8/$1.00
Clear	6/$1.00
Yellow	6/$1.00
Green	6/$1.00
Amber	6/$1.00

MEDIUM LED'S

Red	6/$1.00
Green	6/$1.00

NE555V TIMERS
.39 each or 10/$5.00

NEW DUAL COLON LED
.69 each or 10/$5.00

PLATE CHOKES

75 uH	3.00
.94 mH	3.99

TRANSISTORS/IC'S

Motorola MHW 252 VHF power amplifier.
Frequency range: 144-148 MHz.
Output power: 25W.
Minimum gain: 19.2 dB.
$29.67 each

Motorola MC 1316P.
House no. same as HEP C6073 & EC9814.
2-W audio amplifier.
$1.29 ea., 10 for $9.50

Fairchild 007-03 IC.
ECG no. 707 Chroma demodulator.
$1.29 ea., 10 for $8.50

Motorola rf transistors.
Selection Guide & Cross-Reference Catalog.
43 pgs.
$1.99 each

RCA Triacs.
Type T2310A.
TO-5 Case with heat sinks.
1.6 Amp, 100 VDC, Igt 3mA.
Sensitive gate.
$1.00 each

RCA power transistors.
NPN RCS 258.
Vceo 60 NFE 5mA.
IC 20 Amps Vce 4V.
250 Watts, Ft 2 MHz.
$3.00 each

RCA Triacs.
Type T4121B/40799.
200 VDC 10 Amps.
Stud type.
$3.69 each

RCA Triacs.
Type 40805/T6421D.
30 Amps, 400 VDC.
$5.00 each

Motorola rf amplifier.
544-4001-002, similar to type MHW 401-2.
1.5 Watts output. 440-512 MHz.
15 dB gain min. $19.99 each

ORDERING INSTRUCTIONS

Check, money order, or credit cards welcome. (Master Charge and VISA only.) No personal checks or certified personal checks for foreign countries accepted. Money order or cashiers check in U.S. funds only. Letters of credit are not acceptable.

Minimum shipping by UPS is $2.35 with insurance. Please allow extra shipping charges for heavy or long items.

All parts returned due to customer error or decision will be subject to a 15% restock charge. If we are out of an item ordered, we will try to replace it with an equal or better part unless you specify not to, or we will back order the item, or refund your money.

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Prices supersede all previously published. Some items offered are limited to small quantities and are subject to prior sale.

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a regular feature by
THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

Congress To Monitor FCC More Closely

Congress, in a move to exert more control over the Federal Communications Commission, is considering two bills which would increase the frequency of congressional review. The House Telecommunications Subcommittee proposes to review the agency's activities annually before approving a one-year budget. The Senate Commerce Committee, on the other hand, appears satisfied to authorize the FCC's budget on a three-year cycle.

Both bills would permit the Commission to charge private industry for its services, and such fees could eventually generate up to 50% of the agency's annual budget. The Commission has attempted to charge for services twice in the past, but such activities were overruled both times by the courts. Now, however, a fee schedule would be written into the bills in the hope that a statutory schedule would better survive a court challenge.

Also taken under consideration by the Congress was the President's proposed budget for the FCC. In this matter, the House and Senate both approved budgets which are slightly less than President Reagan's proposed FCC FY82 budget of $78 million (note than President Carter had proposed an FY82 budget of $82 million for the Commission).

While differences between the House and Senate bills will be resolved in a conference committee, it is clear that the FCC's closure plan will have to move forward if the Commission is to live within its new budget. Thus, according to James McKinney, Chief, Field Operations Bureau (FOB), FCC, the Commission is moving ahead with its plans to close selected offices around the country by 1 October 1981 (see Dateline . . . Washington, D.C., July 1981 for details). A final decision is yet to be made, however, regarding the closure of FOB offices in Cincinnati, Ohio and Pittsburgh, Pennsylvania, as well as the monitoring station in Anchorage, Alaska. These facilities could be closed as early as December 1981.

8603 Conover Place, Alexandria, VA 22308

Goldwater and Dannemeyer Introduce Legislation To Amend The Communications Act

In a bill (S. 929) co-sponsored by all members of the Senate Subcommittee on Communications, Senator Goldwater proposes to amend the Communications Act of 1934 so as "to provide the Federal Communications Commission (FCC) with the authority to implement various programs which will result in improvements in the administration of the Amateur Radio Service . . ."

Specifically, the bill:

- would allow the FCC to require that radio frequency interference suppression techniques be incorporated into electronic home entertainment devices by the manufacturers.
- would permit the FCC to prohibit delivery of radio transmitters or amplifiers to any person unless that person first exhibits a valid license.
- would exempt amateurs from the secrecy provisions of the Communications Act (Section 605), thereby permitting amateurs to disclose among themselves the content of transmissions heard on the amateur bands (this, in turn, would permit amateurs to work together in identifying and locating stations who violate the Commission's Rules and Regulations).
- would extend the amateur license term to ten years.

The Dannemeyer bill (H.R. 2203) also addresses the matter of a voluntary monitoring program on the part of amateurs. In addition, the bill would clarify the use of volunteers by the FCC in the preparation and administration of Novice Class amateur radio licenses.

U.S. amateurs are encouraged to write their congressmen and senators, and to request that they support the measures set forth in the two bills.

Fowler Named To Head FCC

The Senate Commerce Committee in May confirmed the nomination of Mark Fowler for the position of Chairman of the Federal Communications Commission. Fowler, whose term will extend into 1986, is a Washington-based private broadcasting lawyer who previously had served as a Reagan administration transition official.

At his Senate hearing, the Commerce Committee encouraged Fowler to make substantial changes in Commission management. Fowler, according to *The Washington Post*, responded by emphasizing that he "would stress industry deregulation, cooperation with Congress, and improved FCC management."

The new Chairman is taking office at a time when the Commission faces the impact of major technological changes in the field of telecommunications and when equally significant changes in the laws the agency administers loom on the horizon.

R.F.I. Complaints To Commission Remain High

According to Jeffrey Young, Enforcement Division, Field Operations Bureau (FOB), FCC, r.f.i. complaints to the Commission in the period January through March, 1981, inclusive, totaled 20,255. This is down slightly from the 20,851 r.f.i. complaints reported during the first quarter of FY81 (October through December 1980, inclusive), but is still high enough to cause the Commission concern.

Of the complaints received, 14,437 were related to the operations of CB stations; almost all of these complaints (13,050) involved cases of alleged television interference (t.v.i.).

Amateurs were cited in 1,020 r.f.i. complaints, with only 519 of these being for alleged t.v.i. Most worrisome, however, was the fact that amateur-to-amateur interference (intentional interference) was cited in 469 r.f.i. cases, about the same number of such cases reported in the previous quarter.

Say You Saw It In CQ

R.F.I. Almost Scuttles Coverage Of Shuttle Landing

According to the Associated Press, the FCC ordered four field engineers to Edwards Air Force Base after it was learned that the equipment used by TV news crews was interfering with communications on frequencies which were to be used by the Columbia space shuttle on landing. The problem was traced to the ENG cameras set up at Edwards. These units use a small transmitter operating in the TV auxiliary bands (1990–2110) MHz and around 2450 MHz) to relay pictures to a nearby control center. Unfortunately, spurious emissions from the cameras produced interference on the frequencies to be used by Columbia in landing (2200–2290 MHz).

According to James McKinney, Chief, FOB, FCC, everyone cooperated with the Commission, and the problem was quickly traced to at least six of the fourteen ENG cameras on hand. Replacements for the defective units were flown to the landing site and were operational two hours before Columbia landed. Had the problem not been resolved, however, there is little question that network coverage of the landing would have been curtailed.

AMRAD Proposes Continental Network For Packet Radio

The Amateur Radio Research and Development Corporation (AMRAD), already investigating spread-spectrum modulation techniques, is now active in the development of a packet radio network (AMNET).

According to David Borden, K8MMO, a packet radio specialist with AMRAD, "packetizing data is the process of breaking up a logical block of data into smaller units called packets. This smaller unit (data block) can be sent from source to destination efficiently and error free" through the use of small microcomputers. "The packet travels across the country passing from station node to station node until it arrives at the destination terminal node." The entire operation is fully automated and promises orders of magnitude improvement in the cross-country transmission of messages.

For more information on AMNET and packet radio in general, contact AMRAD, 1524 Springvale Avenue, McLean, VA 22101.

Use Of TVRO Terminals On The Increase

The use of television receive-only terminals is growing rapidly, with over 5,000 satellite television buffs in the U.S. now "going to the source" for their entertainment. And while the cost of a typical TVRO installation (complete with a 10-foot dish antenna) typically exceeds $3500, new satellite TV hobbyists join the ranks every day. So popular is the TVRO "fad" becoming that over 2,000 people recently attended the fifth annual convention of TV satellite viewers in Washington, D.C., during April 1981.

The argument as to whether or not the use of TVROs by the public is legal, however, remains unresolved. According to Fritz E. Attaway, vice president of the Motion Picture Association of America (a powerful Washington lobbying group in the Capital): "Nothing is free. If enough people buy TVROs and watch our shows without paying . . . the economics of TV programming may well be destroyed" (*The Washington Post Magazine*, 22 March 1981).

Other legal and ethical questions are also being raised about the use of TVROs. At present, 20 satellite applications are pending before the FCC. These satellites will be used for everything from inventory surveys by large corporations to credit reference checks and fund transfers. These private transactions cannot go onto satellites until the matter of secrecy is addressed by the Commission. Such deliberations will necessarily examine the legality of home TVRO stations.

Scrambling, of course, remains the one obvious way for satellite TV broadcasters to prevent theft of service. To this end, the communications Satellite Corporation (Comsat) has already indicated that it will scramble the signals it intends to beam to Earth in the home satellite subscription TV service that corporation will inaugurate in the mid 1980s.

Oppositon To Woodpecker Grows

Since 1976, the Soviet Union has disrupted communications on the h.f. band throughout the world with a long-range military radar system known as the "woodpecker." The system is so named because of the rapid, pulse-like noise it generates in communication receivers. All radio services operating in the h.f. band have been affected by the Soviet emissions . . . emissions which clearly violate the ITU treaty to which the USSR is a signatory. While the Woodpecker is a nuisance, for the most part, it poses a threat to human life in that the interference it generates could cover up a Mayday call from a ship in distress.

Given the above, it is not unexpected that opposition to the Woodpecker is growing on an international scale. So incensed are the Australians, in fact, that amateurs there named 1 May 1981 as International 'W' Day. On that day, letters and telephone calls were made to Australian officials as well as to the Soviet Ambassador to Australia.

Whether the idea for International 'W' Day catches on is yet to be seen. But amateurs everywhere join their counterparts in Australia in condemning the Soviet Union for its continuing violations of the ITU Rules and Regulations.

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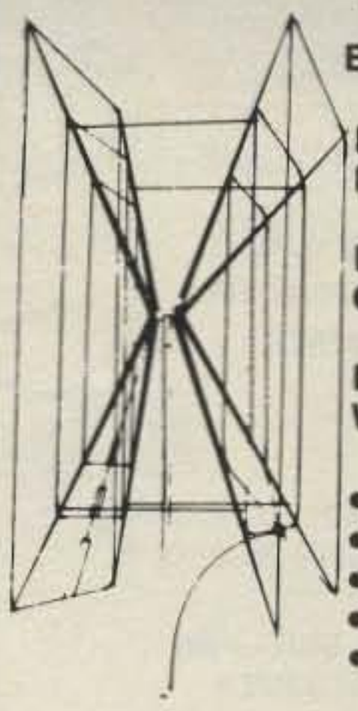

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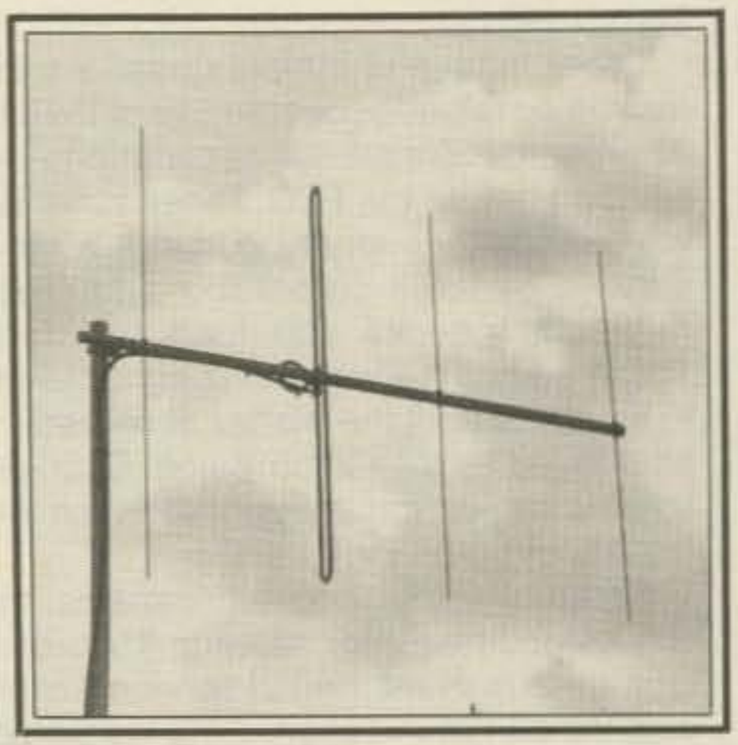

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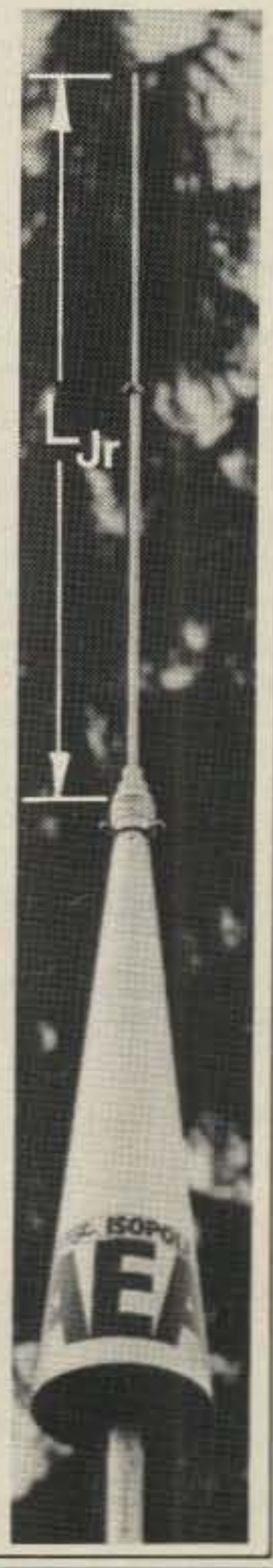

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CIRCLE 21 ON READER SERVICE CARD

At last, for all those who have written asking for the next installment, we have the last of our four-part series on German WW II communications equipment.

German World War II Communications Receivers

Technical Perfection From A Nearby Past

Part IV

BY DICK ROLLEMA*, PA0SE

Part IV concludes the series with a discussion of the E 52a Köln receiver. This receiver is unique in that it uses a modular construction technique and an early form of printed circuit. The frequency readout system is a projection technique reminiscent of early TV sets. At 94 pounds, this too would be a little heavy to tote on your shoulder while strolling down the street.

—K2EEK

Short Wave Receiver E 52 "Köln"

Some of the communication equipment and related pieces of gear, like radar, were called after well known German towns. The E 52 is an example of this, because "Köln" is the name of a famous German town, in English speaking countries known as Cologne. We will use both E 52 and Köln when referring to the receiver we are going to discuss now.

There can be no doubt that the E 52 is the ultimate of German receiver design of WW II days. It is another Telefunken design and became available around 1943. The instruction manual that PA0AOB put to my disposal for writing this article carries the date August 1943. The book says the E 52 was meant for short wave communications in the army and for governmental organizations.

You get a first impression from it by looking at photograph 12. The two hinging lids that are lifted to show some of the gadgets under them are normally closed, of course. You probably notice the clean layout of the front panel and the functional shape of the controls. And that was done in the days that "ergonomics" was an unknown word. . . .

The dimensions of the radio are 24.1 cm high, 44.6 cm wide and 36.9 cm deep. Its mass is a massive 42.8 kg (94 lbs.). The set can be run from 110-230 v.a.c., from which 60-96 watts are consumed, or from a 12 v. battery. A vibrator power supply is built in. There are five frequency ranges, as follows:

Range I: 1.5–3 MHz, white scale on the dial
Range II: 3–6 MHz, red scale
Range III: 6–10 MHz, yellow scale
Range IV: 10–17.6 MHz, blue scale
Range V: 17.6–25 MHz, green scale

The ranges are selected by the oblong control to the left of the indication "Frequenzeinstellung" (frequency adjustment). The frequency the radio is tuned to can be read from the semicircular dial. To avoid reading the wrong scale the frequency ranges are tabulated to the left of the dial and the table also shows the color of the scale to be read.

A dial like this only provides limited capability to read the exact frequency. Obviously the engineers who were responsible for the design of the E 52 didn't think this good enough and they added a projection system to display the frequency with great resolution. To achieve this the shaft of the tuning capacitor carries a glass disc on which the calibration for each frequency range has been deposited by photographic means, like on a microfilm. A small lamp illuminates the disc from behind and the frequency the radio is tuned to is projected by means of a lens system onto a ground glass screen that you see above the semicircular dial in photograph 12. As only the figures that belong to the selected frequency range are displayed the reading is unambiguous. In this ingenius way a "dial" is achieved with an effective length of several meters. The glass discs were individually calibrated for each receiver! A spare disc is included as standard.

If the lamp fails the projection system can no longer be used. No problem; the designers already provided a built-in spare lamp and it can be brought into operation by turning the slotted screw you see below the ground glass screen. These lamps are rather unusual as the filament is off-

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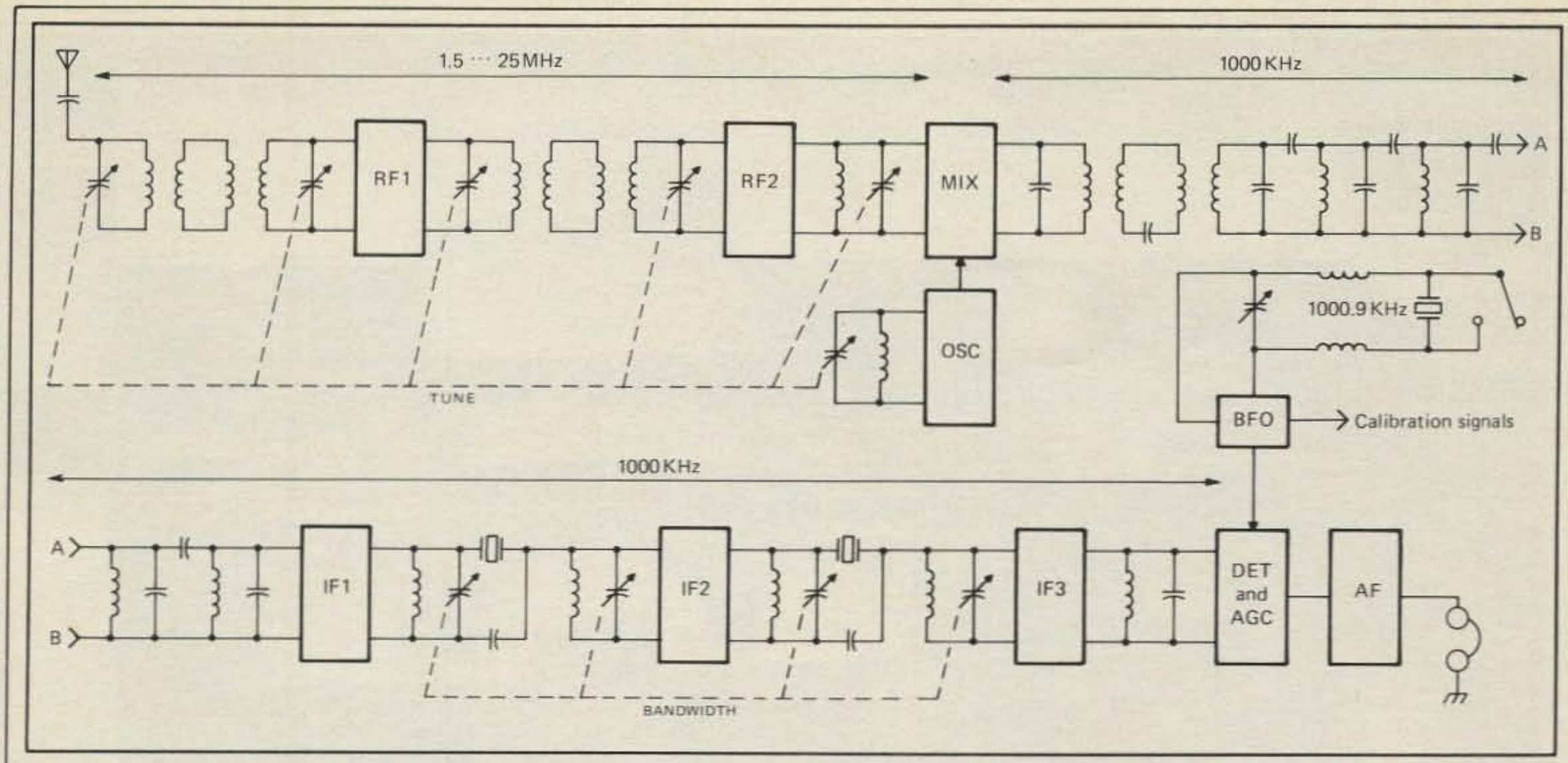

Fig. 9– This block schematic diagram shows the line-up of the "Köln," a short wave superheterodyne receiver with the factory designation E 52.

centered from the middle of the bulb. This makes it almost impossible to obtain one nowadays. But a determined collector is not to be deterred by such a simple fact. An Austrian collector of German WW II equipment gave an order to a factory to manufacture a couple of hundred of these special light bulbs. And so he and his fellow collectors can go ahead for many years to come with their Kölns. At what price we will not mention. . . .

The E 52 was made in several models. The one you see in the photographs is in the possession of PA0AOB and is the most sophisticated model, designated E 52 a. This variety has the possibility to preselect four different frequencies that can subsequently be recalled by motor drive of both frequency range selector and fine tuning. The frequencies are indicated by different symbols you see on the table to the right of the dial. The frequencies that are preselected are entered in this table by pencil. The frequency actually selected is displayed by its symbol in the little circular window above the table.

The motor driven system operates marvelously. PA0AOB gave me a striking demonstration of it. He tuned an s.s.b. station in on one of the amateur bands. This was "stored" as one of the preselected frequencies. He then started the selector mechanism upon which the motors rotated the range selector through all five ranges. The same happened with the tuning capacitor. When finally the stored "channel" reappeared the s.s.b. station could be read without any retuning! And that for a design from a time when s.s.b. was unheard of for mobile communications.

The receiver has been so designed that one type of tube can be used in all stages. The tube is the miniature pentode RV12P2000 we encountered before in the Lo 6 K 39 a and ten of them are used in all. Only the rectifier tubes in the power supply are of a different type. All tubes can be reached by lifting the two lids at the front top of the receiver. This is shown in more detail in photograph 13, and there you see how PA0AOB's hand has just retracted one of the tubes by means of a special tool that is screwed into the bottom of the tube. In photograph 12 some of the tubes have this grip fitted and some do not. You also notice that the tubes disappear completely in their holders.

The set is constructed completely in modular form as we would call it nowadays. This is shown in photograph 14, where one of the modules has been set apart. All connections are made with plugs and sockets as can be clearly seen in the photograph.

The connections between the modules are made through a "motherboard" in modern terminology that can be seen at the left of the assembly in photograph 14. Some of the wiring on this motherboard closely resembles printed circuit wiring. It was not made in the way we know it now but it certainly used a similar technique. Nothing new under the sun!

The coil turret we met in the three previous sets is not used in the E 52; probably it was too difficult to split it over different modules. Instead bandswitches are employed. The switch decks can be found in different modules and the same goes for the sec-

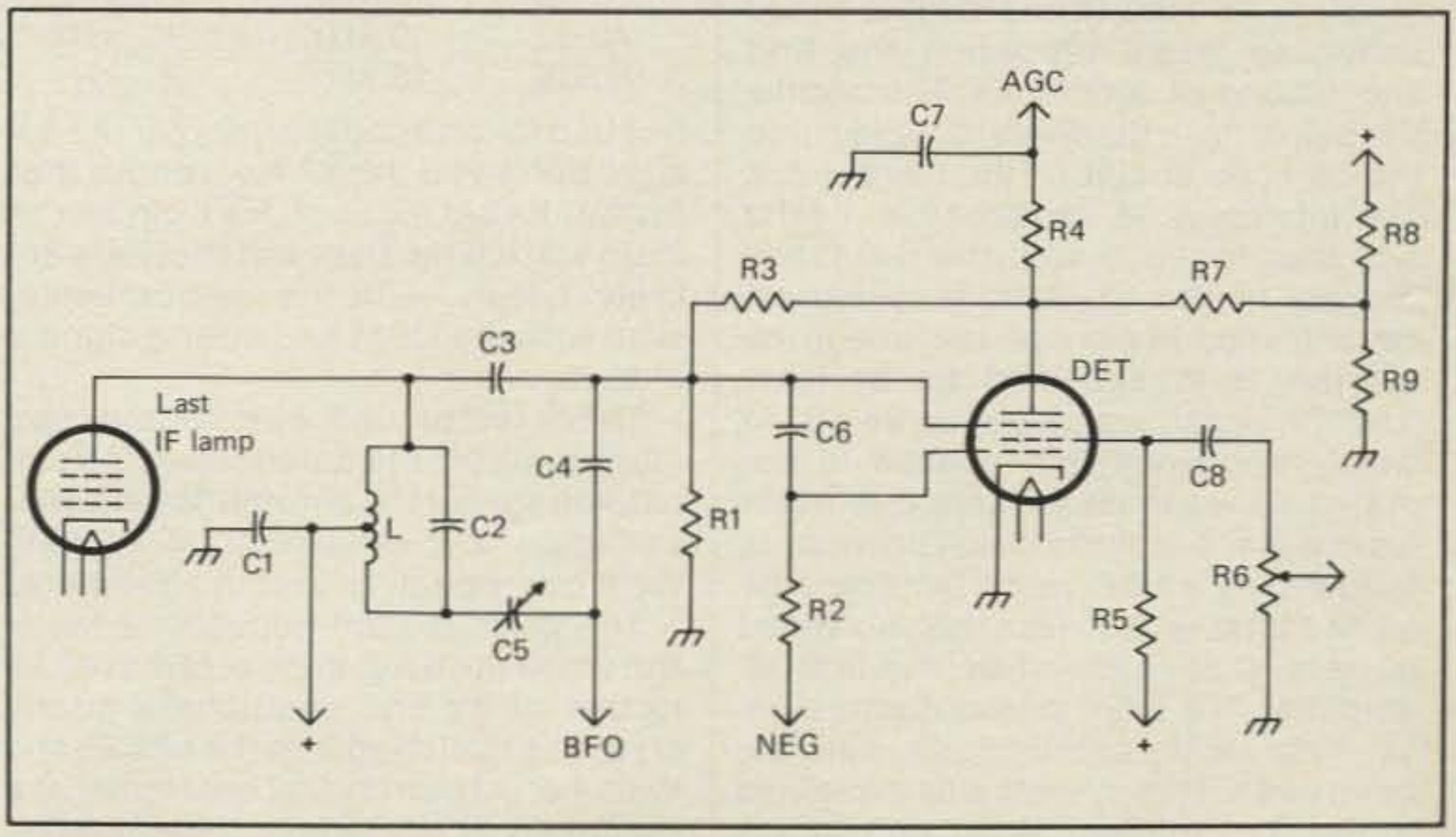

Fig. 10– This simplified diagram shows the essentials of the detector stage in the E 52 receiver.

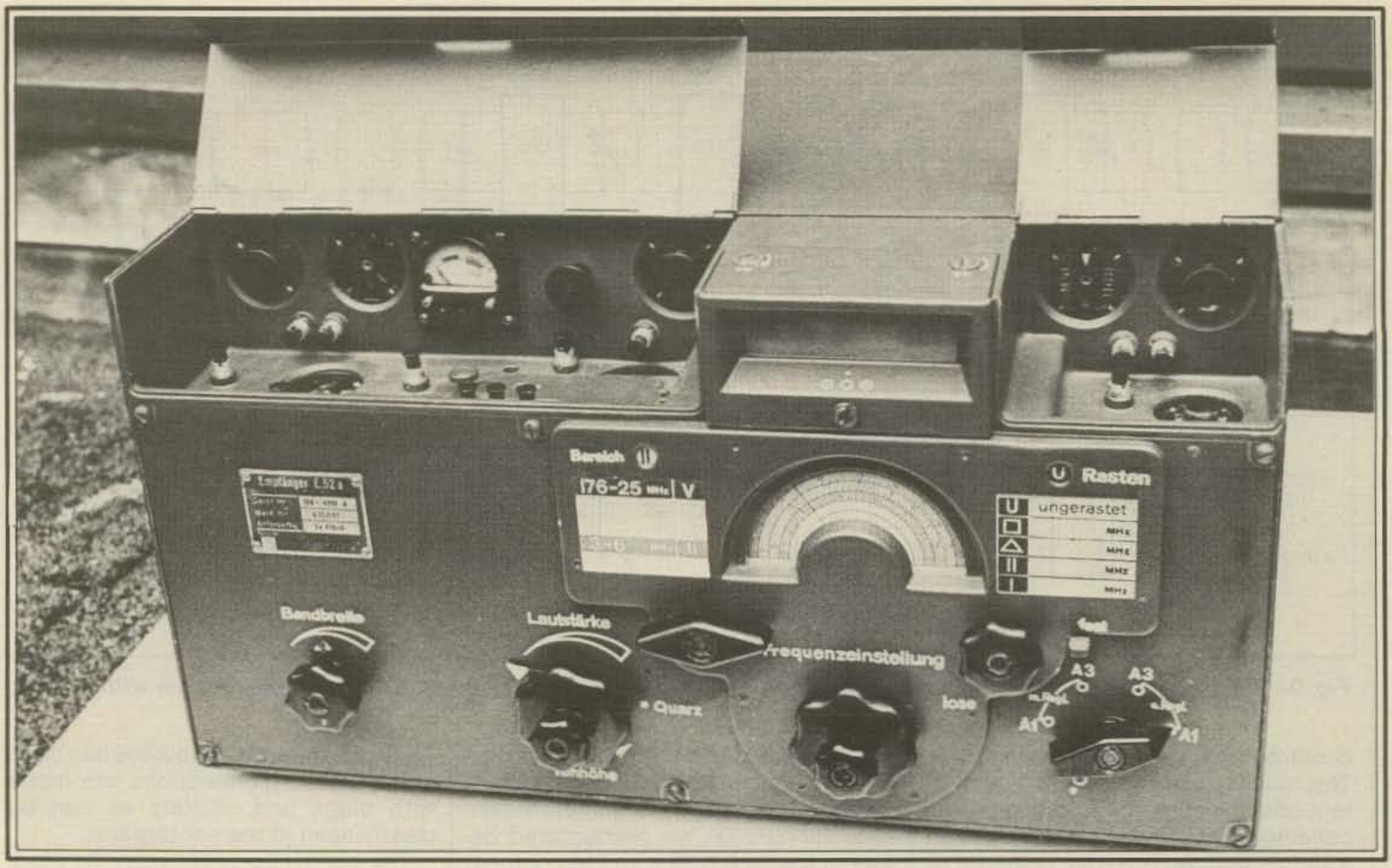

Photo 12– Superheterodyne receiver type E 52 a, also known as the "Köln." The frequency the receiver is tuned to is projected on the ground glass screen at the top. The opened hinging lids disclose the tubes and the metering facilities. Note also the clean layout of the front panel and the functionally shaped controls.

tions of the capacitor gang. A nice mechanical interface problem.

But it's getting time to take a look at the electrical line-up of the Köln. Fig. 9 shows it in the form of a block schematic diagram. The mixer is preceded by two radio frequency amplifying stages and five tuned circuits. The sixth section of the six-gang variable tuning capacitor tunes the local oscillator. As in most German receivers the input is protected by a neon bulb. Link coupling is used in the double tuned bandpass filters preceding the first and second r.f. amplifiers. The oscillator signal is inductively coupled into the cathode circuit of the mixer tube. The intermediate frequency is 1 MHz and that, together with the five tuned circuits in the r.f. part, provides excellent suppression of the image response. It is specified as at least 1:50000, which works out as 94 dB. At which frequency this applies is not stated so we must assume it is never less than the stated value. The mixer is followed by a fixed tuned bandpass filter at 1 MHz with no less than six tuned circuits. It is followed by the first i.f. amplifier. The tube drives a quartz crystal filter with continuously variable bandwidth. This system was explained in Part I of this article so we will say nothing more about it here. A second i.f. amplifier follows and another crystal filter section. Then comes the final i.f. amplifier that drives the detector via a single tuned circuit at 1 MHz. It may be interesting to quote what the specification of the E 52 states about the i.f. selectivity: The bandwidth is continuously variable between 0.2 and 10 kHz. Further details are given in the following table:

Attenuation	Detuning at bandwidth wide	narrow
3 dB	5 kHz	0.2 kHz
40 dB	10 kHz	1 kHz
60 dB	13 kHz	2 kHz

Not bad for an almost forty year old design, don't you think? No wonder that Arthur, PA0AOB, uses his Köln as the main station receiver and that he is entirely happy with its performance, even with the QRM and strong signals of today.

The detector tube, a pentode, as you may recall, proves detection of the signal, voltage for the automatic gain control and audio amplification as well. We'll come back to that in a moment.

The b.f.o. is continuously variable. But when the b.f.o. control is moved into one of its end positions a quartz crystal is switched into the circuit and the b.f.o. is then crystal controlled at a frequency of 1000.9 kHz, thereby causing a beat note of 900 Hz with the 1000 kHz i.f.

The detector tube drives the final a.f. amplifier that gives output for headphones. An extra winding on the output transformer that is in series with the cathode circuit provides negative feedback. At the beginning of this article we mentioned that the designers were compelled to use one type of tube for all stages of a receiver, which fact must have caused them many headaches. The detector stage of the E 52 is a good example of the unconventional circuitry they had to resort to. The actual circuit of the detector stage in the Köln is very complicated. I have therefore drawn fig. 10 in which only the essentials are shown.

The final i.f. amplifier drives the detector via a tuned circuit with L and C2. The anode voltage for the tube is fed to a tap on the coil and is decoupled by C1. The suppressor grid of the tube, together with the cathode, functions as the diode for the i.f. signal. This is fed to the suppressor grid via C3. R1 is the load resistor over which the audio voltage is developed. This is fed to the control grid via blocking capacitor C6. The tube now acts as an audio frequency amplifier. Because the cathode is grounded the tube receives its proper negative grid bias voltage from a negative supply via R2. The screen grid is the anode for the a.f. signal, so the pentode functions as a

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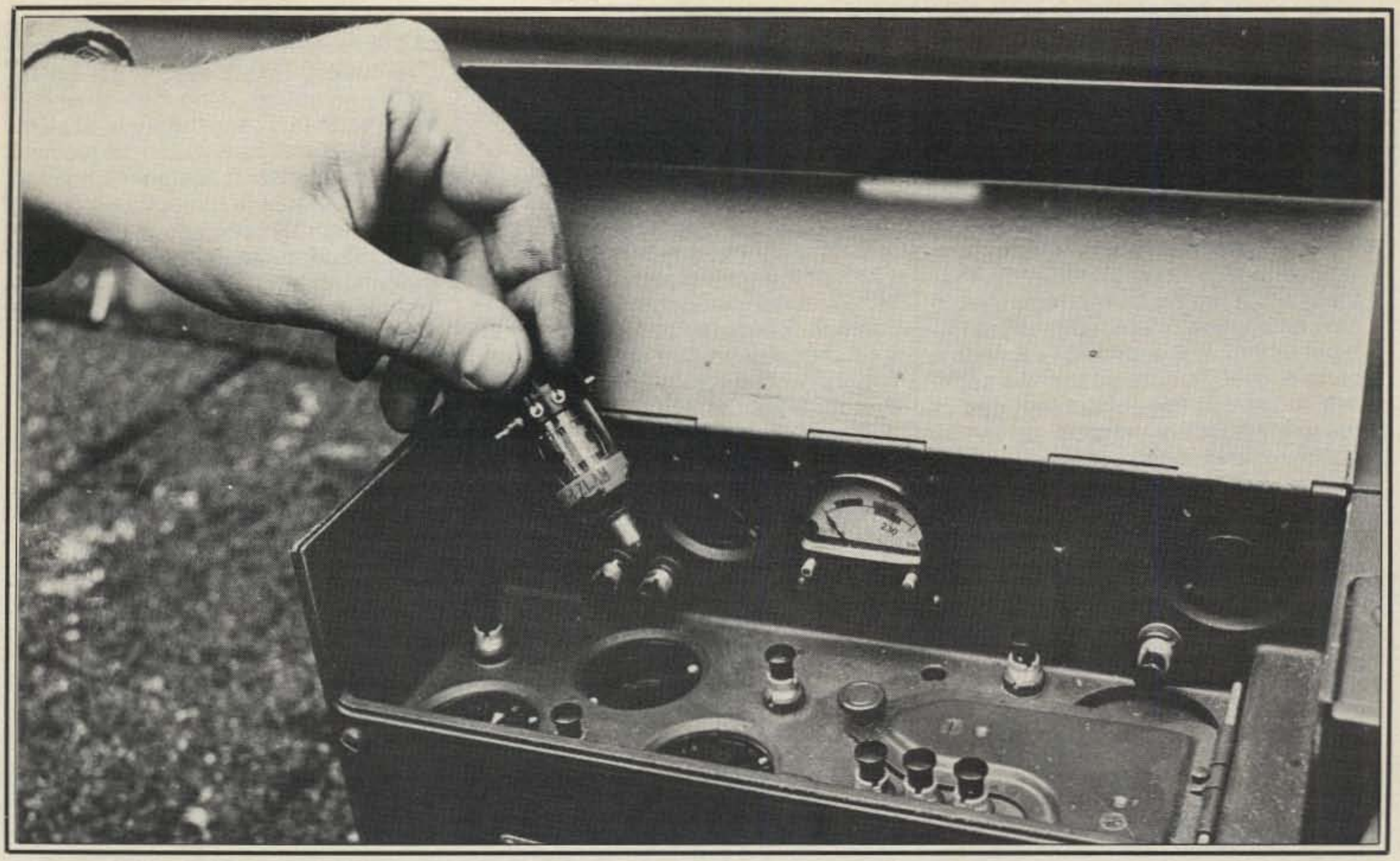

Photo 13- PA0AOB's hand has just pulled one of the tubes out of its socket. The tube is a pentode type RV12P2000 and it is used in all ten stages of the receiver.

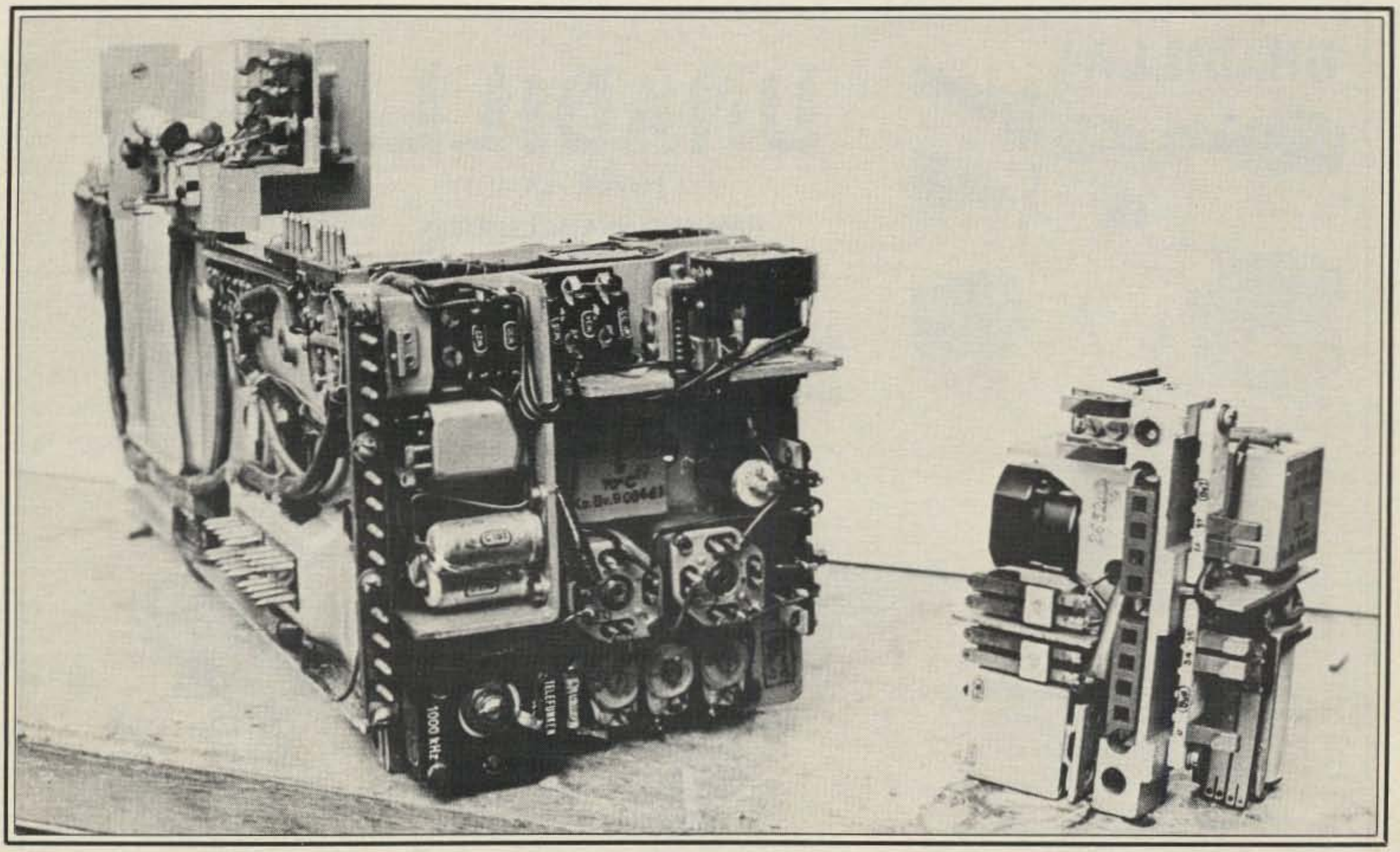

Photo 14- The E 52 receiver is constructed from easily interchangeable modules. The module at the right has just been removed. All modules plug into a motherboard that carries the intermodule wiring. Some of this wiring is in the form of a kind of early printed circuit!

triode at a.f. The amplified signal appears over R5 and via blocking capacitor C8 the a.f. signal reaches the volume control. From the slider of this pot the signal is fed to the grid of the final amplifier tube.

The negative voltage that is developed at the suppressor grid as the result of rectification of the i.f. signal is used for automatic gain control. But the control must be delayed. That means that the control voltage should only be applied to the tubes when the input signal at the receiver exceeds a certain level. To achieve this the negative voltage at the suppressor grid is fed to the anode of the tube via R3. The anode functions as a second diode, together with the cathode. Via R4 and decoupling capacitor C7 the control voltage is fed to the controlled stages: the two r.f. amplifiers and the three i.f. amplifiers. How is the delay action obtained? The anode of the detector tube at first cannot become negative because a positive current is flowing towards it via R7, a resistor of 6 megohms that is connected at the right to a voltage divider over the h.t. As long as this current exceeds the "negative" current through R3 the anode is held slightly positive and the "diode" conducts. At a certain moment the suppressor grid becomes so negative that the diode (anode) current becomes zero and when the negative voltage increases further the anode and the a.g.c. line go negative and control starts.

There is one more interesting aspect around the detector. The b.f.o. signal is also fed to the suppressor grid via C4. This has an unwanted effect that the b.f.o. becomes rather strongly coupled to the last i.f. amplifier. This means that b.f.o. voltage can find its way back into the i.f. amplifier whilst on the other end i.f. signal can get into the b.f.o. circuit and could tend to synchronize the b.f.o. frequency when strong. To avoid these effects a bridge circuit is formed that includes the center tapped coil L and capacitors C3, C4 and C5. The latter is a trimmer capacitor and by proper adjustment the bridge is balanced and a very effective decoupling of final i.f. tube and b.f.o. has been achieved.

The gain control consists of two potentiometers on one shaft. On positions "A1 ungeregelt" and "A3 ungeregelt" of the mode control selector (A1 without a.g.c. and A3 without a.g.c.) one pot controls the screen grid voltage of the two r.f. tubes and the first and second i.f. tube and the second pot the audio gain. In positions "A1 geregelt" and "A3 geregelt" (A1 with a.g.c. and A3 with a.g.c.) of the mode selector, only the audio gain control is active and the screen grid voltage remains fixed.

The automatic gain control voltage of the receiver is also made available on a socket. This is used in case of diversity reception using more than one receiver. In this case the a.g.c. of all receivers is paralleled and so the receiver with the highest input signal automatically dominates in the output signal.

Although the power supply part of the E 52 features several interesting aspects we will not go into detail here. Instead we end the discussion of this fine set by looking at some of the built-in checking facilities.

By opening the two lids at the front the by now familiar test meter is disclosed, as can be clearly seen in photographs 12 and 13. The instrument carries two pushbuttoms for checking the heater and anode voltage of the tubes. The correct readings are indicated by a red resp. blue sector on the meter face. The pushbuttons carry the same colors. The cathode current of the ten tubes in the receiver can also be individually measured. For this purpose there is a pushbutton adjacent to each tube.

It is also possible to check the a.f. output level. This is done on set noise in the position A1 of the mode switch at a frequency of 2900 kHz and with the bandwidth control at position "wide."

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check on the proper performance of the receiver. For this test the pushbutton for measuring the output level is depressed so the meter indicates the noise level at the output. The bandwidth control is now rotated so that the bandwidth is decreased. The output noise decreases as well and the bandwidth is adjusted such that the meter reads the right edge of a black segment on the meter face. Now a second pushbutton is depressed together with the one for output level. This button shortcircuits the input circuit of the receiver. So the noise that is generated in this input circuit is removed from the grid of the first tube. The meter reading should now decrease to the left edge of the black segment. If this is not the case the radio is not in optimum condition and the tubes should be checked. If these seem to be ok then the receiver must be turned into the repair shop.

Finally there is a pushbutton for checking the frequency calibration. This uses harmonics of the quartz crystal in the b.f.o. on 1000.9 kHz. A special circuit is provided that equalizes the signal strength of these harmonics over the whole frequency range of the set. In each of the five ranges a single check point is indicated on the projection dial in red. When the radio is tuned to zero beat on the proper harmonic the reading on the dial should not deviate more than a specific amount from the red mark. The acceptable deviation varies from less than 2 kHz in range I to less than 15 kHz in range V.

And with this we end the discussion of the E 52.

Conclusion

The author imagines that some readers might like to know more about the four receivers we have described or about German WW II radio equipment in general. For instance, where these sets can be found (not easy!). Your scribe is not a collector himself and he is therefore not in a position to answer these questions properly. The only thing he did was to describe the radios for which the material was kindly provided by Arthur, PA0AOB. The author has therefore agreed with PA0AOB that any letters should be addressed to him, because Arthur is the expert in these matters. His full name and address is as follows:

Arthur O. Bauer, PA0AOB
Pater Pirestraat 29
DIEMEN
Netherlands

Acknowledgement

The author thanks PA0AOB for providing the material that made this article possible and Peter Meijers, PE0PME and Jaap Stolp, PA0JSU for their photography.

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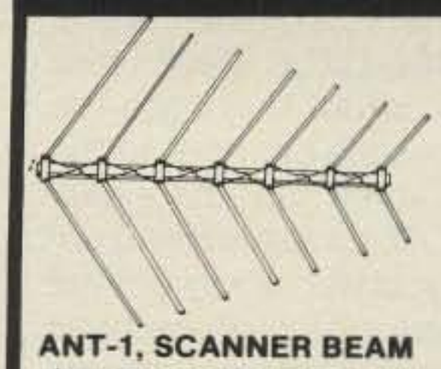

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DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

DX comes slowly up this way,
Slowly, slowly!
A little slower every day . . .

Perhaps in the newer DXer we again see our youth'ul endeavors. Or, on the other hand, we start to realize that perhaps we have been around the bands for a long time. Last week one of the newer, ever-enthusiastic DX types was by to discuss the state of the art and the need for DXers. We listened attentively—one always should where DX is concerned.

"This has been a great year," this QRP type advised us. "I made the ARRL National Convention, the Division Convention, and two DX gatherings. Each was a swell time. I really enjoyed it. I really did."

At this point we were not hearing anything startling and new. DXers always enjoy the better things. Good conversation, good food, good times, and good tall towers! And wherever DXers gather the times are good. But we had to know more. We urged the QRPer to talk, wishing to know why he had enjoyed himself. We had to know the highlights. It was not what we expected.

"It was the grand banquets, of course," advised the QRP-type, "all those people, the long speeches, the big names that were introduced, the heat and the cold food. Maybe things were not always going just right but just to be there was something. Really something." We were beginning to wonder.

"The DX Forum?" he continued in answer to our probing. "Well, I met these fellows from the mid-west and we got to talking . . . that was at the National . . . so I missed that DX Forum, missed the ARRL Forum also. At the Division meeting I think I was talking with some fellow about the new tower he was putting up and never made that one. Come to think of it, I didn't make the others either. But I don't think I missed anything, did I?" Perhaps the weight of the years was heavy on us, and we fought hard to suppress a groan. This shining-faced DXer, long in need, strong in desire, but weak in DX background, had wandered through the wrong doors.

What could one say? One usually attends the grand banquets because there is seldom anything else doing. But all those names of the semi-celebrities are quickly forgotten, thankfully. The forced jokes, the awards, the self-stimulating laudatory remarks all will eventually appear to be programmed. But the DX Forum! That is where truth is unveiled, where passions rage, and cold facts, or altered versions thereof, prevail. There always is a shining moment in time, soon gone and never to be found again. A true-blue DXer can miss anything but the DX Forum! A true-blue DXer never does. Never!

All DX Forums are good; some are even better. This is where the demand is voiced as to why the DXCC Desk is so slow in processing cards. There are the trial balloons for possible changes in the DXCC rules. There you'll hear the explanations why some QSLs are not being accepted. And there you will luckily get the word on new country status or, perhaps even better, the eternal attempts to explain the inconsistencies or contradictions in the DXCC Country Criteria.

All true-blue DXers know that the DX Forum has no comparison. In moments of confidence, they will acknowledge that the DX Forums are far superior to the big double-program days at the Roman Coliseum, the drum-rolls at Place de la Concorde, or the third day at Gettysburg. How could it be otherwise at a moment of truth?

One must listen carefully. The moment is fleeting and the flash of DX insight is quickly gone, possibly not even noted but by the most acute. But listen and watch, it is often there.

The depths of DX insight, on further calm reflection, are deep! We learned that Transkei and Bophuthatswana are not considered as meeting the DXCC criteria because they have not been issued a block of call signs by the ITU. Amazing! Another time we learned that 4U1ITU became a country because someone wanted to do someone else a favor. Startling! And some efforts are memorable because of a stout defense of the undefendable. This was true when W1RU took to the boards to defend the Okino-Torishima decision. You might still disagree, but he met every charge head-on and was still standing there undominated at the final bell.

Sometimes there is fear and confusion at the DX Forum. The charge of the righteous DXers is a terrible sight to see. And should the defender of the faith and the DXCC Country Criteria stand fast and repel the assault, there is always the rallying cry, "Why didn't you answer that letter I wrote back a couple of months? And never mind the explanations, just tell me why!!!"

It was sad to think that our visiting QRPer had missed, not once but several times, the golden chance for DX knowledge, for no two DX Forums are ever the same. Each is new and bright and unique unto itself. And should one wonder, perhaps even take time to stop and question, whether all of this is true and to be fully embraced by all DXers, just note where W6AM is at the DX Forums—always in the front row right in front of the speaker. One does not get to the top by gassing about how high the tower in Boone County is. One gets there by knowing the DX word! And you get it at the DX Forums., Always!

Perhaps the word might be confusing. This is not to be a matter of worry. Top DXers are always aware of when to be confused, when to worry. But DX Forums are there to be enjoyed. True-blue DXers are always there because of joy and nothing else. Never miss a chance to join them . . .

DXCC Notes

As summer neared, there were indications that the DX Advisory Committee might come to a decision on country status for the Sovereign Military Order of Malta. Those who managed to get by the opening paragraphs a few months back

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may recall that the possibility was discussed at some length then.

The word was that the DXAC was divided on the matter but with a possible slight edge towards affirmation. Probably this was included in the DXAC report to the ARRL Board of Directors for their mid-year meeting, and the final word should be out, possibly within recent weeks. Check earlier copies of *CQ* for this year for further information on SMOM and why it is considered a DXCC country.

Out in the Western Carolines Palau will go independent, or is going independent, and this changes things a bit yet changes nothing at all. Presently you are cognizant of there being Eastern and Western Carolines. Years back, almost thirty years ago or so, there were the Carolines and Palau. Then they changed things so there were the two Carolines. Any changes are expected to put things back just the way they were in the early fifties, Palau and Caroline. No gain, no loss.

All of this involves U.S. Trust Territories in the Pacific, and any changes in status are subject to review and approval by the United Nations and the U.S. Senate. Speedy action is not expected. All of this reverts to what the situation is reported to have been back in 1954, but a check of *QSTs* for that year did not turn up any reference. Anyhow, that is the story on Palau, give or take a few sharp edges.

On the CW DXCC, there may be a change on this award one of these days, but there probably will also be a lot of rear-guard skirmishing. A matter of continuing controversy has been the acceptance of credits for this award when one station is on c.w. and the other is on s.s.b. As repelling as this may be to DXCC purists, it gets even more so when cases are cited of a c.w. counter for this award involving a DX station that knows little or no c.w., but merely responds to a rattle of noise on his receiver, he being only on s.s.b. From inception many have fought to make only two-way c.w. contacts valid counters; from inception some who were aware of the aberration worked c.w. to s.s.b. to gain some rare and coveted country.

At the Visalia International DX meeting a few weeks back a show of hands on the topic showed the feeling to be almost unanimous for a change to c.w. to c.w. only. Although there might have been a few more, a quick count of those in favor of the present system showed only four hands up. Not quite unanimous was the point made later.

Dave Gardner, K6LPL

Last Spring you heard Dave from Juan Fernandez/CE0. This October Dave says that you will hear him from either Kermedec or from San Felix/CE0X.

There has been no activity from San Felix for a number of years, and this undoubtedly will bring a few into the pile-up for this increasingly needed country. In recent years a number of efforts were aimed but never quite made it all the way. In May Dave said that he has the necessary operating permits and papers and is confident that this one will come off.

One of the reasons given for San Felix not being heard has been reports that the island has been used as a detention point by Chilean authorities in connection with the unsettled political situation which has plagued Chile for some years. However, recently Chile has been able to stabilize the various matters which sparked the unrest.

Dave was at the Visalia International

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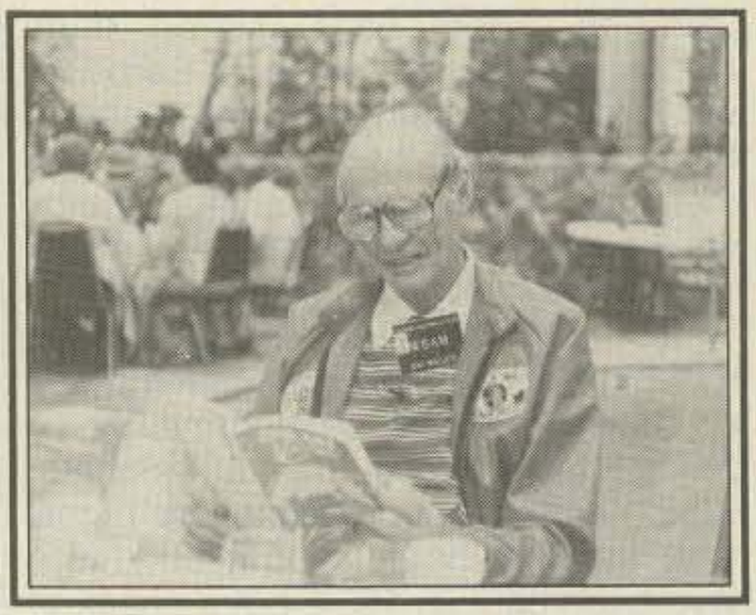
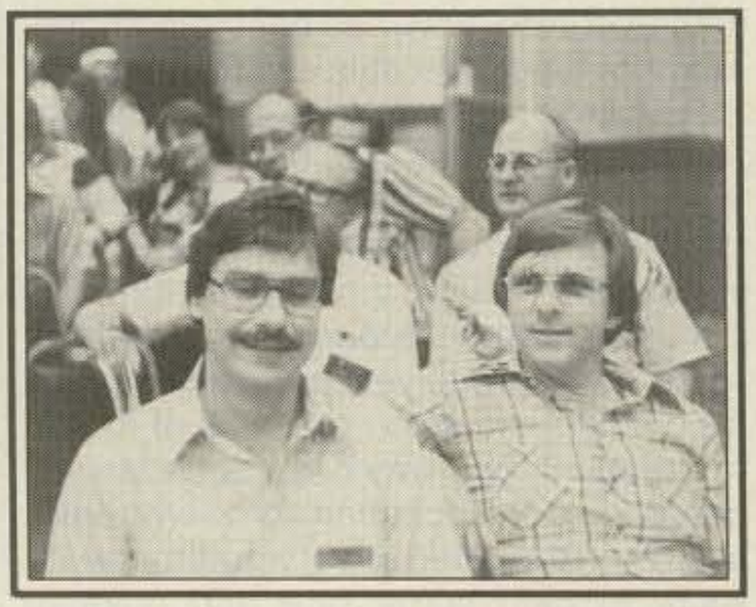
CIRCLE 2 ON READER SERVICE COUPON

A couple of European DX types. Frank Turek, DL7FT, an Honor Roll type well-known for his efforts over the years. On the right is DJ0UJ, Bahri Kacan, now living in Munich, but whose family is from Albania.



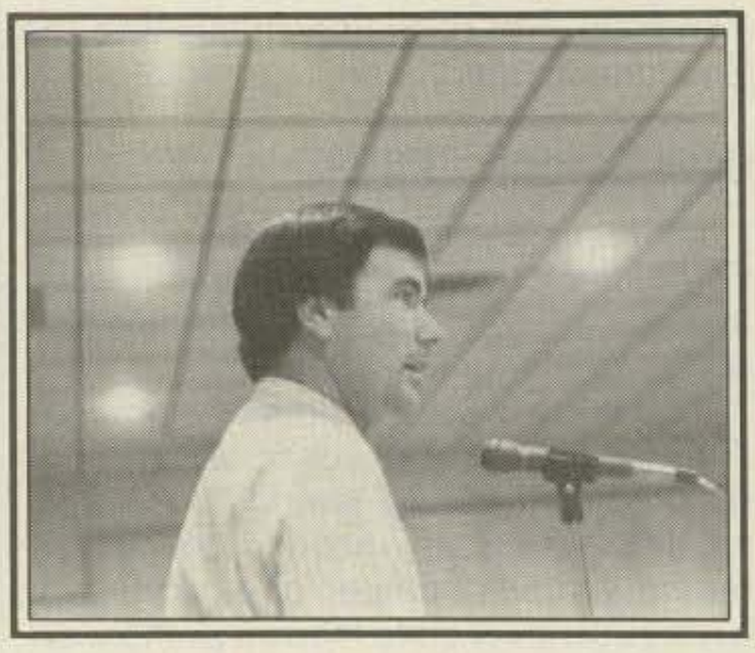
What do Big Gun, Top 'O the Heap DXers do at the Visalia DX Meet? They read DX IS!, *the bible of all true-blue DXers. And Don says that on page 140 you will get the whole story—what the rock paintings in the Palo Verde canyons tell.*

Don Search, W3AZD, of the ARRL DXCC Desk runs the gauntlet of questions at the Visalia DX meeting. "Will Palau be a new one?" "When will Transkei and Bopthuaswana count?" "Why won't my 7Z2AP QSL be accepted?" If a DXer had a complaint, Don heard it!



Don Busick, K5AAD. Don had to have a flying wedge break the way into his room. Why? It was the site of Madison Electronics hospitality hour. When Don arrived the suite was wall-to-wall with DXers. True-blue DX types generally are found where the action is!

If you are an old-timer, or even a newcomer, you should recognize one or both of this happy pair. Tom Taormina on the left will be recalled by subscribers to the old West Gulf DX Bulletin; *he was an editor. On the right is the* W6TI DX Bulletin *operator, Bob Vallio, W6RGG, who has put out the Sunday night word for more than 12 years running.*



Jim Rafferty, N6RJ, of the ARRL DX Advisory Committee catches some questions at the Visalia DX Forum. Some suspected that Jim was saying what Custer did at the Little Big Horn. "Where did all those Indians come from?"

The accompanying photos were taken at the Visalia International DX Meeting. There were hospitality rooms that never ran dry, warm weather, the snow-capped Sierras in the background, and Sequoia National Park just an hour away.

DX Meet this year making a slide presentation of the Juan Fernandez effort. It was good, fast-paced, good photography, and well presented. Then at the prize drawing Dave picked up the first prize, a Kenwood TS-830 which he loaded into the trunk of his Rolls Royce and headed down the road to Los Angeles.

Whatever one may think about the DX-ers in the western reaches, it must be acknowledged that they have something. Anyhow, listen for Dave this October. One way or another he'll probably attract a crowd. If you need one or the other, San Felix or Kermedec, he may have something for you.

Some Hot DX Notes In Short Pants

At the Visalia International DX gathering DL7FT was asked about possible Albania reunions. Frank just shook his head, acknowledging that it was time for a reunion in ZA-land, but cautioning that while they continue to look and hope for another opportunity, nothing is certain. "Tell the fellows to be patient," Frank said.

On the 7Z2AP QSL questions the word was given that queries during WARC 79 and a list from the Saudi government indicated that 7Z2AP was not among the stations authorized to operate.

All of this might have been conclusive had not Alfred Flipos, 7Z2AP, come running to the rostrum waving documents and asking for the microphone. Al pointed, both in pride and indignation, to the signature of the PT&T Minister there in Saudi, all this putting the whole matter at sixes and sevens. On one side the DXCC Desk is trying hard to ensure the validity of operations and receives official communications from a foreign government. Then the station in question produces what appears to be valid documentation. And further, as was noted by some speakers, the station operated for a considerable period of time, and did so quite openly and with some expectation that any illegal or non-authorized operation would have been quickly and firmly quashed.

What could one do? As one said, or we think he said, "I am only one of the seven Solomons on the Awards Committee!" Eventually the matter will be straightened out.

W1BB is out with another of his fine 160-meter bulletins. Stu does this as a personal effort and will supply you with the bulletin when you send him a self-stamped, self-addressed envelope. With the sunspot cycle slipping, the lower frequencies will be showing more life, and it can be interesting to find what DX there is on 160. Not only DX but sometimes a surprising amount of action.

ARI, the Accociazione Radioamatori Italiani, was on from the Cheradi Islands in the Gulf of Taranto in late June with the special call IJ7. That was the call expected to be used. This is an Italian naval

Say You Saw It In CQ

base. It qualifies for the IOTA (Islands on the Air) Award handled by Geoff Watts/ *RSGB DX News* in England, and there was a chance for a new prefix for the prefix hunters, and they are numerous. Just check the WPX report elsewhere in these columns.

Early this month, around August 3rd to pinpoint things, Michael Harodecki, WB2TKD, and Bob Hazelton, WB2IVX, will be in Labrador and signing VO2. They will operate for a week, 80 through 10 meters, a QRP operation, keeping in mind that QRP is a relative term, and will be on both c.w. and s.s.b. They will be in Zone 2 for WAZ, and if you think that because it is close that Zone 2 is easy to catch, some have found otherwise. QSL to their home calls in the CB. S.a.s.e. or s.a.e./IRC needed.

Some with long memories will recall Rockall and speculation on possible country status, but your memory will have to be back about ten years. The final blow was a claim that the rock out in the Atlantic was really a part of Scotland. There are some disclaimers, Ireland saying that Rockall was always considered part of the ancestral lands. Hugh Vandegrift, now WA4WME, some years back was in Europe and scouting a possible Rockall effort. The problems in landing from a boat were always considered formidable, the swell at times running 10 to 15 feet. In storms waves are said to break right over the crest of the rock, 80 or so feet above sea level. Anyhow, WA4WME says that back when country status was a possibility, he made some scouting runs

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924	I5HOR	927	K2EYJ
925	W1BWS	928	W2IBZ
926	SM7CQY		

S.S.B.

1399	GW4IQA	1401	IN3VZE
1400	TG4NX	1402	IT9WPO

C. W.

2078	I3MLD	2080	JA7AZJ
2079	OK2PFN	2081	N0ZA

VPX

222	WDX7DER	223	DL-G 27/1830850

Endorsements

Mixed: 400 SM7CQY, K2EYJ, W2IBZ. 500 K2EK, I5HOR. 550 K9JS. 600 I5JFG, AF7M. 650 DK8KC. 700 W1BWS, I1ZEU. 750 N4IB, YU4VBR. 800 OK3IF. 900 ONL-4003, AE5B. 1100 YU1OBA, K9BG. 1150 YU2CBM. 1450 N2AC.

S.S.B: 300 GW4IQA, IN3VZE, IT9WPO. 350 KA2CLQ. 400 KB9UG, W9JR/M. 500 WA2SRM. 550 N4IB, XE1OX. 650 I0WDX, DF7QD. 800 TG4NX. 850 AE5B. 900 W2NC. 1000 JH1VRQ. 1050 F6DZU. 1700 K2POA.

C.W.: 300 I3MLD, OK2PFN, JA7AZJ. 400 K2EK, PA0LUS. 450 WD0AVG, VE1ANU. 500 SM6DEC, N0ZA. 550 JA7ARM. 650 KL7AF, OE1KJW. 700 OK3BT. 850 N4YB, DL7MQ. 1100 OK1TA. 1400 N6JV.

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15 meters:	AI6Z.
20 meters:	WD8KKF.
40 meters:	OK3CEE.
80 meters:	WD8KKF.
Asia:	OK3CEE, I5JFG, WD9IIC.
Europe:	K5PR, XE1OX, WA2SRM, OK2PFN.
No. America:	OK3CEE, K5PR, AG0A, K9JS, WD8KKF.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, 5014 Mindora Dr., Torrance, Calif. 90505 U.S.A.

Erik, SM0AGD, shows the QSLs from several of his many DXpeditions. (Photo via K4IIF)

at the rock, actually being lowered via helicopter to the top. There is about a 10' × 9' space atop the rock, enough for some thin operators, but hardly enough for any square dancing. One of these days there will be a decision about who owns it. The mileage from the mainland is the question. As one questioner demanded one time when the DXCC criteria was discussed, "Do you at the ARRL use Great Circle or Mercator mileage?" An excellent point!

WA4WME mentioned in the foregoing still has that program of "25 Great DXpeditions." If you are looking for something to liven up a DX forum or program, drop him a line.

We would also like to report the following newly elected officers in several of the numerous DX associations. For the Southern New England DX Association: Bill Poellmitz, K1MM, President; Jim Dionne, K1MEM, Vice President/Secretary; Dick Hughes, W1KG, Treasurer; Dave Fisk, KA1CY, Activities Chairman. For the Long Island DX Association: Jack M. Gutzeit, W2LZX, President; Tom B. Arciero, WA2OHD, Vice President; Arthur R. Bernstein, N2KA, Secretary; Peggy C. Arciero, WB2OHD, Treasurer. Congratulations one and all!

DX Hall Of Fame
Erik Sjolund, SM0AGD

At the Visalia International DX Meeting in May, Erik Sjolund, SM0AGD, was inducted into the CQ DX Hall of Fame, Erik being but the nineteenth to be so honored since what is probably the top DX award was instituted back in 1967. It has often been described as the ultimate honor in DXing.

SM0AGD has been known over the years as a DXer who shows from the rarer DX countries, operates with a high level of skill and efficiency, and continues to seek ways to bring rare and sometimes long-unheard countries onto the amateur bands.

First licensed in 1951 as SM3AGD, Erik has been employed in technical work for the Swedish government. A DXer from way back, Erik gained DXCC in 1958. It was not until 1972 that his work took him to foreign countries. Erik showed from East Island that year signing CE3AOF/0 and SM2AGD/CE0. The next year he was in the Falklands signing VP8NI, and in 1974 he was in the Caribbean signing SM2AGD/HK0 from San Andres and HK0AB from Serrana Bank.

In 1975 Erik was in Turkey signing SM0AGD/TA2 and in Equatorial Guinea giving our 3C1AGD QSOs. His most active year was in 1976 when he showed from five countries on three continents. Erik started with A2CGD from Botswana, then 7P8AG from Lesotho. He had always regretted not being able to put Bajo Nuevo on the air back in 1974, and a return was made to the Caribbean for another Serrana Bank operation signing HK0AA/S and then a successful Bajo Nuevo operation signing HK0AA. Before the year was out, Erik was in Bangladesh signing SM2AGD/S2.

In 1977 Erik was again in Africa signing CR3AGD from Guinea-Bissau, was heard as a guest operator at 3C1X in Equatorial Guinea, and made a second trip to Bangladesh to again sign SM2AGD/S2. There was no special activity in 1978, but in 1979 Erik was in Laos signing SM0AGD/XW8 plus a good handful of African operations which included Guinea-Bissau again as J5AG, Swaziland as SM0AGD/

The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. No fee required for additions to Honor Roll totals.

MIXED

2100	YU2DX	1550	N6CW	1245	PA2TMS	1018	SM3EVR	750	I2MQP
2031	F9RM	1538	PA0SNG	1236	YU1AG	1001	YU3APR	710	WB8ZRL
1945	K6XP	1525	DJ7CX	1205	DL1MD	1000	K8LJG	700	W6YMH
1942	K6JG	1514	W9DWQ	1190	N6FX	968	W7CB	661	K2QF
1801	VE3GCO	1467	N6JV	1186	K6ZDL	920	W0IUB	650	KA3A
1797	W2NC	1434	YU2RTW	1181	W0SFU	914	N6JM	644	DK7XX
1773	K2VV	1411	N4NO	1168	I6SF	902	K6DT	623	W0JIE
1693	W3PVZ	1405	N2AC	1155	W8CNL	859	UA3FT	603	WD4IHV
1635	W7LLC	1403	N9AF	1151	UK3AAO	851	K8CH		
1613	W4BQY	1368	YU1ODS	1148	JH1VRQ	850	KL7AF		
1604	N4MM	1350	KE4I	1115	IN3ANE	836	LA7JO		
1582	K5UR	1332	W9FD	1114	WA1JMP	775	WB8YQX		
1577	YU7BCD	1300	N6AV	1108	KF2O	775	K7AGJ		
1575	W2NUT	1260	I2PHN	1019	PY4OD	753	N3RL		

S.S.B.

1941	F9RM	1331	I4ZSQ	1072	DL1MD	909	PY3BXW	710	I6NOA
1833	I0ZV	1300	PA0SNG	1049	W0YDB	893	YU1AG	702	KL7AF
1764	I0AMU	1268	YU7BCD	1023	WA4QMQ	892	W2NC	699	I0RIZ
1722	K6XP	1262	N4UU	1010	N4NO	867	I6ZJC	657	I5AFC
1682	K2POA	1250	I0MBX	1002	W4BQY	850	ZP5RS	633	N3RL
1672	K6JG	1207	W9DWQ	996	JH1VRQ	840	CT1UA	629	YU3APR
1500	I8YRK	1181	OZ5EV	989	DJ7CX	802	I4LCK	605	WB8ZRL
1465	I8KDB	1163	AA4A	989	OE2EGL	800	N2AC	600	AC2J
1450	K2VV	1127	YU7ODS	967	PA2TMS	770	WA2FKF		
1428	N4MM	1121	DJ6VM	938	N6FX	750	I2MQP		
1422	ZL3NS	1105	WB2NYM	932	W6YMV	743	WB8YQX		
1336	K5UR	1100	N2SS	912	WA2AUB	716	EA3KW		

C.W.

1623	W8KPL	1291	G2GM	1126	VO1AW	854	PY4OD	750	N4YB
1572	W2NC	1288	YU7BCD	1066	YU7ODS	851	KH6HC	735	DL1MD
1550	ON4QX	1256	N2AC	1031	K6ZDL	834	VK4SS	703	K2FO
1471	K6JG	1235	W3ARK	1016	W1WLW	827	JE1JKL	700	K8LJG
1454	DL1QT	1235	K5UR	1002	YU1AG	813	YU3APR	679	I1YRL
1440	WA2HZR	1234	W9FD	989	LZ1XL	808	I5IZ	662	AA4A
1428	N6JV	1220	N4NO	964	N6FX	802	DJ3LR	601	KL7AF
1415	N4UU	1205	W4BQY	928	I6SF	756	SM0GMG		
1305	K2VV	1175	DJ7CX	900	VE7CNE	750	JH1VRQ		

Say You Saw It In CQ

5 Band WAZ

Standings as of April 30, 1981

Plaques have been won by the following stations:

Plaque No. 1, ON4UN, John Devoldere (Belgium)
Plaque No. 2, K4MQG, Gary Dixon (U.S.A.)
Plaque No. 3, SM4CAN, Kent Svensson (Sweden)
Plaque No. 4, AA6AA, Steve Orland (U.S.A.)
Plaque No. 5, W8AH, Albert Hix (U.S.A.)
Plaque No. 6, W6KUT, E. A. Andress (U.S.A.)
Plaque No. 7, EA8AK, Fernando Fernande (Spain)

The top 10 contenders for 5 Band WAZ:

1. EA3SF, 199 zones
2. LA7JO, 199 zones
3. W8GT, 195 zones
4. LA9GV, 191 zones
5. N6DX, 191 zones
6. DL3RK, 190 zones
7. WA4JTI, 190 zones
8. W8UVZ, 190 zones
9. OK1AWZ, 190 zones
10. W1NG, 190 zones

As of May 1, 1981 84 amateurs have submitted QSL cards for the first Plateau of the 5 Band WAZ Award (150 Zones).

3D6, Botswanna as A22GD, and again as a guest operator at 9L5LE in Rwanda.

This year of 1981 Erik was heard with the Sundsvall DX Group in a strong, 5-band operation from J5AG. Erik also indicated that he might not be traveling as much in the future as he had in the past, but late word has been received that due to more changes Erik expects the opportunity to again travel in some of the more remote spots of the world, some not so remote but difficult for DXers to work.

Not mentioned in the foregoing was the Iraq activity back when Iraq was the impossible DX spot. Erik made a demonstration during one of his stops in Baghdad, showing the Iraqi authorities just what amateur radio was, and making about fifty quick QSOs before they indicated that they had seen and heard enough. No immediate action came at that time, but before much time passed YI1BGD was on the air.

Erik's travels often take him through a country at regular intervals. He often uses his visits to make queries on the possibilities of amateur radio and sometimes makes application for permission to operate at a later date when he is next to visit the area. In many cases this has been successful; in some it has not.

For years when publishing a weekly DX bulletin, it would distress and puzzle us when we found many neither recognizing Erik nor his callsign, though quick to recall some of the operations he had staged. He was in our books as among the small handful of top DXers in the world, and his recognition is felt to be well merited.

As to the DX Hall of Fame, the list of those receiving the award certainly is a list of those who have significantly influenced DX and DXing over the years. For those who may wish to know, or even those curious to learn, the following is the full list of the DX Hall of Fame members.

Gus M. Browning, W4BPD
November 1, 1967
John M. Cummings, W2CTN
March 23, 1968
Stewart S. Perry, W1BB
August 16, 1968
Richard C. Spenceley, KV4AA
March 1, 1969
Danny Weil, VE2VB
September 15, 1969
H. Dale Strieter, W4DQS
May 23, 1970
Marty Laine, OH2BH
January 22, 1972
Ted Thorpe, ZL2AWJ/
Chuck Swain, K7LMU
August 6, 1972
C. Joe Hiller, W4OPM
March 30, 1973
Ernst Krenkel, RAEM
April 14, 1974
Frank Anzalone, W1WY
June 19, 1976
Lloyd Colvin, W6KG/Iris Colvin, W6QL
November 12, 1976
Geoff Watts
June 11, 1977
Don Wallace, W6AM
September 23, 1978
Joe Acure, Jr., W3HNK
December 1, 1979
Hugh Cassidy, WA6AUD
April 26, 1980
Erik Sjolund, SMØAGD
April 25, 1981

CQ DX Awards Program

S.S.B.

1017	IV3IOX	1022	W2KI
1018	W9IGK	1023	YU5XAF
1019	VE6PW	1024	JY4MB
1020	K8HF	1025	AG3S
1021	KE4E	1026	K9SM

C.W.

496	KA3R	499	VE2FOU
497	K8HF	500	WA4YCI
498	W2KI		

S.S.B. Endorsements

310	WØSD/312	275	K9QVB/275
300	K9SM/301	250	VE6PW/269
275	W4BQY/286	250	DJ2UU/250
275	WB3HAZ/286	150	JY4MB/174
275	WA4DAN/285	SSTV	VE6PW
275	WB1DQC/282	QRPp	GM3ELV
275	IV3YRN/280	28 MHz	K9SM
275	KB8KW/276	28 MHz	JA5PUL

C.W. Endorsements

310	W3GRS/316	310	W4BQY/310

The total number of active countries is 318. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement fee for stickers is $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, 911 Rio St. Johns Dr., Jacksonville, Fla. 32211 U.S.A. Foreign stations should include extra postage for air mail reply.

QSL Information

This month we straighten out the VK9/VKØ and the HH QSL queries. Maybe not altogether, but as Jan and Jay often say, "What good is a QSO if you don't know how to QSL?" An excellent question!

VK9BS to W3HNK
VK9CCT to VK5QX
VK9CGR to VK5QX
VK9DIK to DJ5CQ
VK9JJ to K9IL
VK9KK to WA3HUP
VK9MR to K9IL
VK9NA to Norfolk Is.
VK9NI to Bx 27 Norfolk Is.
VK9NC to Norfolk Is.
VK9NK to W6EDN
VK9NL to Bx 103 Norfolk Is.
VK9NM to DJ5CQ
VK9NNW to Norfolk Is.
VK9NNI to Bx 27 Woolgoolga 2450
VK9NS to Box 103 Norfolk Is.
VK9NV to OTC La Perouse, NSW
VK9NK (Silent Key)
VK9TR to N2IT
VK9XI to VK6RU
VK9XW to VK6RU
VK9XT to VK3OT
VK9YJ to K9IL
VK9YK to WA3HUP
VK9YN to WA3HUP
VK9YR to K9IL

VKØAB to VK2BRN
VKØAC to VK3ZQK
VKØAS to VK3ZAT
VKØBA to VK2ACI
VKØBC to VK8VV
VKØCC to VK2BCC
VKØDB to 568 St. Kilda Rd Melbourne
VKØDM to WA4NRE
VKØGS to VK2AOZ
VKØGM to VK6-Bureau
VKØGW to VK5GW
VKØHM to W7PHO
VKØJC to OZ8AE
VKØJM to VK3BAF
VKØKC to VK4-Bureau
VKØKH to VK5WV

HH2A to AJ9D
HH2B to KA4MRE
HH2W to WA2DFR
HH2BX to N5JC
HH2BM to W6RP
HH2CR to KA4MRE

VK9YS to VK9NS
VK9XS to VK9NS
VK9YT to VK3OT
VK9ZM to VK4ABW
VK9ZR to VK2BJL
VK9ZG to VK6-Bureau
VK9NYG to VK6NE

VKØKS to VK3-Bureau
VKØLD to VK2RS
VKØPK to VK5-Bureau
VKØRN to VK3AKK
VKØRP to VK3YAP
VKØSF to VK3SF
VKØSJ to 568 St. Kila Rd. Melbourne
VKØSW to VK4ATS
VKØTB to VK3ADD
VKØWR to W7ZFY
VKØWW to VK5XX
VKØVL to VK3-Bureau
VKØXX to WA7ABK
VKØAP to VK3VPJ
All this from Neil, VK6NE

HH2FH to N5AJW
HH2PW to WD9GSO
HH2MC to KB4IT
HH2VP to N4XR
4V2B to Bx 38 Port-au-Prince
4V2BM to KA4MRE
All this from Jan-Bernard, HH2BM

On the list for QSLing to the various governmental departments in France, F6FNA notes that the correct route for 91 is none other than he, F6FNA, and not F6FNZ. Not in the Call Book, F6FNA goes to Lehembre J. Pierre, 9 rue de l'esperance, Epinay sous senart, 91800 Brunoy, France. There are 95 Departments in France. The first two letters in the address code indicate the department—75020 would be in the 75th.

More QSLs

WP2ABZ/C6A to NP2AF
KA8KRM/HP1 to WA4TWS
HP1XOG to WA4TWS
N3BLS/HP2 to WA4TWS
NP2AI to NP2AF
VP2MIX to WØIJN
VP2VGF to NP2AF
VP5GM to NP2AF
HS1BV to N2BQL
4X6BL to N2BQL

Volunteers For QSL Manager Duty

Ed Wilush, K8NJA, 1109 Marcus Ct., Winter Springs, FL 32708
James Wood, WØIJN, Box 549, Montevideo, MN 56265

73, and Believe, WA6AUD

CQ DX Tip

—Ninety-nine times out of a hundred, the station that tells you your signal is bad is correct. Stop and see what's wrong. *—W4MB*

CQ Reviews:
The Triplett Model 7000 Universal Counter

BY ADRIAN WEISS*, K8EEG/W0RSP

The Triplett brandname will probably be unfamiliar to amateurs whose exposure to various lines of test equipment is limited to reading the amateur radio magazine advertisements. In the non-amateur sector of the electronics world, Triplett has been a long-established brand of bench and portable test equipment known for high-quality production and long, reliable performance. Given a world which sees the birth of "yet another" frequency counter just about every month, the reader may well wonder why *CQ* is devoting space to the Model 7000. A fundamental distinction must be made at the outset: *the Model 7000 is not to be confused with instruments whose sole function is to measure frequency*. The Model 7000 is a state-of-the-art type of counter—a "universal" counter—designed to perform several different counting operations that can be of great value in dealing with both sinusoidal and non-sinusoidal waveforms. The versatility, performance, and price of the Model 7000 promise to make it a direct and favorable competitor with standard high-quality frequency counters in the amateur market.

The Triplett Model 7000 universal counter which features microprocessor programming.

Actually, the Model 7000 is in part a frequency counter in that it counts the number of cycles of input signal which elapse during a selected sampling period, displaying the accumulated result on the fairly typical six-digit numeric LED display (.43 inch LED's). In this frequency-counting function, the Model 7000 has a specified range of 5 Hz–80 MHz with 1 Hz resolution. With the **Function** switch in the **HZ** position, the display exhibits the six "least significant" digits of the count (digits to the right of the decimal point), while switching to the **Auto Range** position permits readout of the "most significant" six digits. Readout is effectively the full eight digits (*i.e.*, 79.637802 MHz). The frequency counting function is split among three modes—**HZ, Auto Range,** and **Period.** Only in the **HZ** mode does the operator manually select the type of counting procedure to be followed by the instrument. In that mode, a 1-second gate time permits maximum resulution. With regard to the **Auto Range** and **Period** modes, however, the Model 7000 departs from the company of typical frequency counters, because it is actually a microprocessor-based minicomputer programmed to perform measurements upon input signals in the manner which will produce the optimum resolution and accuracy.

83 Suburban Estates, Vermillion, SD 57069

Model 7000 Computer System

A detailed discussion of the circuitry of the Model 7000 is beyond the scope of a short review, but a very generalized summary should provide some insight into what goes on behind the front panel of this machine. A simplified block diagram of the Model 7000 circuit is given in fig. 1, and accounts for the 33 IC's and 7 transistors which are combined into a functional minicomputer. The heart of the circuit is the 2650A microprocessor chip which, with the aid of peripheral software devices, performs the basic functions of the central processing unit **(CPU)** of a computer system. A microprocessor chip should not be confused with a microcomputer chip, since the latter has all required peripheral devices included on a single chip—it is a fully functional minicomputer.

The various peripheral support devices in the Model 7000 system can be seen in fig. 1. Each has a crucial function to perform in relation to the microprocessor chip, which, in itself, is capable of a complex array of functions. The chip subsystems are built around the core of the chip, the arithmetic/logic unit **(ALU)** which is capable of performing simple math functions ($+ \ - \ \times \ \div$) upon inputed data, as well as making logical decisions about what to do with the input data upon the basis of programmed instructions "burned into" the chip (*i.e.*, logic tests such as: "is input equal to N, if so execute instructions held at A1 address, if not, execute instructions held at A3," etc.). The processor has two reserves of program instructions: those stored in its own *program register*, and those stored in the much larger memory registers of the preprogrammed *read-only memory* **(PROM)**. The program register of the processor, for example, can tell the processor where to find a complete set of instructions which detail the proper response for an initiating signal received from one of the peripheral devices. The processor's *address register* just keeps track of where

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all the input/output data, intermediate counts, program instructions, and the like are stored within the system. A second peripheral memory is essential to the processor's data-processing function. The processor is able to maintain two-way communication with the *random access memory* **(RAM)**, transferring input data from its own data register, or results of calculations performed by the ALU, into the RAM in the "write" mode. In the "read" mode, it recalls stored data for handling by the ALU, for display, or whatever the situation requires. A great deal of data exchange must go on between the RAM and the processor's internal data register, for the ALU can operate only on data in the processor's data register. The communication between the ROM and processor, on the other hand, is one-way—the processor can only "read" contents of the PROM, but it cannot "write" instructions into its memory registers. All instructions contained in the PROM are put there by the designer/programmer, and indeed, the PROM is the key to the processor's performance of functions.

The processor communicates with the remaining peripheral devices through the **Control Logic** section which serves primarily as a "translator" of the processor code language into languages understood by remaining peripheral devices. Everything happening inside the system consists of binary digit encoded data or instructions, and different peripheral devices require different codes—the *Control Logic* provides the proper encoded signals. Of the peripheral devices shown in fig. 1, the *6-digit LED Display* and **Display Control** will be familiar to frequency counter buffs, and the Model 7000 uses a typical circuit. The **Function** switch, likewise, needs little explanation, other than to note that it informs the *Control Logic* section of the counting function desired by the operator—the machine does the rest. The actual counting operation is done in the **Gate/Accumulator** section in typical fashion, but its function in the system is more flexible than in the typical counter, where the **Time Base** provides the timing signals to the **Gate** for initiation and cessation of **Accumulator** counting periods. In the Model 7000 several options are present: internally, the processor can use either the Time Base or the input signal for gating purposes, depending either upon *Function* switch setting or processor judgments about the frequency of the input signal; or, the Gate may be controlled externally through an external time base signal, an external gate-triggering signal suitable for the desired measurement of the input signal, or finally, through external electronic or manual switching of the Gate. These options are executed by the **Steering Circuit** under the direction of the processor and the proper signals are routed by the *Steering Circuit* to the proper points for the performance of the selected function.

The "Smart Counting" Feature

If the system described above sounds complex, that is because it is complex! That is why the Model 7000 can do so much more than an ordinary counter. Perhaps a simple example regarding the two frequency counting modes—*HZ* and *Auto Range*—will place the system performance in a practical context. In the *HZ* mode, the Model 7000 performs a straight-through frequency counting operation. However, in the *Auto Range* mode, the microprocessor is programmed to select the best counting method for the frequency of an input signal. This program functions for signals of under 1 MHz, where noise pulses on the input signal can lead to erroneous counts in a typical frequency counter. For example, a 10 kHz input signal may carry random noise pulses which peak at an amplitude sufficient to actuate the *Input* section Schmidt Trigger circuit 800 times during a 1 second sampling period.

In a typical counter the *Accumulator*

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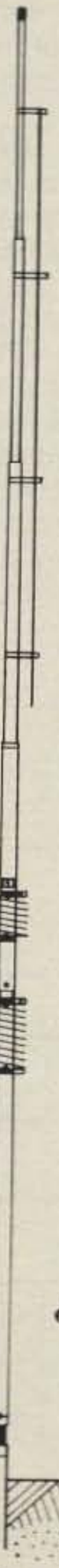

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will count 10,000 input signal pulses plus the 800 noise pulses, registering a readout of 10,800 Hz as the frequency of the signal. Obviously, the error between input signal frequency and readout is considerable. The Model 7000 minimizes this problem by relying upon its memory capacity and ALU to perform a period-averaging computation of frequency. In this approach the processor monitors the input signal for 0.1 second and quickly estimates its frequency. The ALU is programmed to select the appropriate sampling period duration (*Gate time*) for the input signal frequency. With respect to our 10 kHz input signal, it makes the logical decision to divide the 1 second *Gate* time into 1000 sampling periods, and during each of these 1000 sampling periods the count gathered in the *Accumulator* is read and calculated in the ALU and temporarily stored in the memory (RAM). At the end of the 1000 sampling periods, the processor is instructed by the program in the ROM to recall all 1000 counts from the RAM and average them to produce a single result to be displayed as frequency. Since the signal pulses are regular, with the exact same number of cycles occurring in each sampling period, and since the 800 noise pulses occur at random, with none in some sampling periods and several in another, the averaging process minimizes the impact of the noise pulses on the final count. This is what is meant by "smart counting." When the input signal passes the 1 MHz level, the counter goes into a straight frequency count, since noise pulses are considerably below 1 MHz in frequency and hence become very insignificant with respect to the number of signal cycles per sampling period.

"How Long Does One Take?"

The **Period** mode provides a readout of the time required for the completion of a single cycle of the input signal. As in the *Auto Range* mode, the processor monitors the input signal and makes the above logical decisions. However, in the *Period* mode the processor also instructs the *Steering Circuit* to redirect the input signal to the *Gate* where it enables the *Accumulator* for a specified number of input cycles. The 10 MHz *Time Base* signal is re-routed to the *Accumulator* which counts the number of *Time Base* cycles occurring during the specified number of input signal cycles. The processor ALU then calculates the amount of time required for the completion of one input signal cycle, and displays the results. The *Period* function is useful for measuring strings of pulses which occur with periodic regularity.

The flexibility of the Model 7000 becomes most apparent in the **Events** and **Timer** modes, especially with regard to the measurements of strings of non-periodic pulses. As noted earlier, external control of both *Gate* and *Time Base* is possible with the unit. Pulse measurement capability is greatly enhanced by the TTL compatibility of the **External Gate Control**. In conjunction with one of several simple TTL switching circuits shown in the manual, the unit can measure a single pulse in a high-frequency pulse string. In the *Timer* mode maximum resolution is 100 μs, while in the *Events* mode a 10 MHz *Time Base* signal permits resolution of 100 ns. Total *Events* count capability is 1 billion events. The *Timer* and *Events* functions make the instrument useful for a wide range of tasks. In fact, an ambitious high school physics teacher could convince the track coach to purchase a unit as a super-stopwatch for track events! The *Timer* has a range of 24 hours, then reverts back to a new count beginning at zero. Both *Events* and *Timer* counts can be stopped and resumed via the *External Gate Control*.

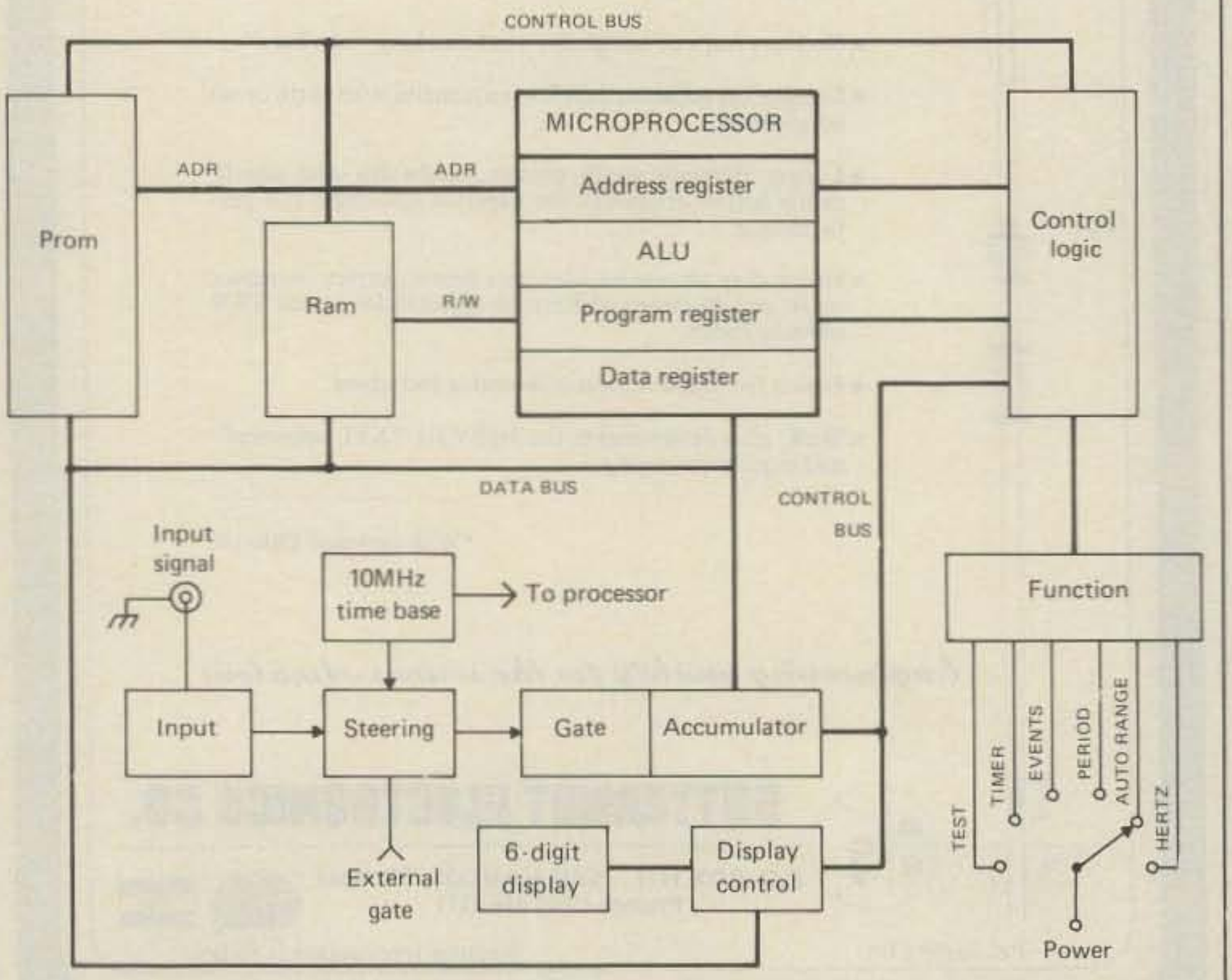

Fig. 1– A simplified block diagram of the Model 7000 circuit. The circuit utilizes 33 IC's and 7 transistors including a 2650A microprocessor chip.

General Comments

The Model 7000 is semi-portable in as much as it includes a carrying handle (carrying case optional) and a detachable 3-wire power-cord. The built-in a.c. power supply (120 or 240 v.a.c.) requires access to a.c. mains for operation of the unit. While the *Timer* and *Events* counts are reset to zero via a momentary contact switch mounted on the front panel of the stock model, an easily added kit from Triplett, requiring at best a half-hour installation, renders the unit **Reset** control compatible with an external TTL logic switch. The standard *Time Base* is a 10 MHz oscillator with setability of ± .1 ppm, ± 10 ppm stability from 0°–40°C, with maximum aging rate ± 10 ppm/yr. An optional TCXO can be substituted for temperature stability of less than ± 1 ppm from 0°–40°C, and aging rate of ± 1.0 ppm/yr. The minicomputer is programmed to conduct a complete series of tests verifying correct operation of circuitry in response to the **Test** function switch position. The unit comes with a full parts, labor, or replacement warranty for one year from the date of purchase. I suspect that few will have need to collect on the warranty.

Performance

The Model 7000 is not one of those instruments which has difficulty meeting factory specifications. While the amateur interested only in measuring the output frequency of his QRO transmitter need not concern himself with counter sensitivity, the experimenter who works with various types of oscillators requires sensitivities on the order of about 30 mv r.m.s. minimum across the spectrum to at least 30 MHz. While the manufacturer guarantees a minimum sensitivity of 30 mv to 40 MHz, the manual includes a "typical" instrument sensitivity of under 15 mv to 1 MHz, under 20 mv to 40 MHz, and 30 mv at 80 MHz. The test unit exceeded this "typical" sensitivity curve across the spectrum, exhibiting sensitivities of better than 10 mv to 30 MHz, 18 mv at 40 MHz, 25 mv at 50 MHz, 35 mv at 80 MHz, 105 mv at 100 MHz, and 140 mv at 104 MHz.

The signal capture-threshold of the

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unit was tested by coupling a pair of signal generators to the unit through a 6 dB hybrid. With generator A output set at the minimum sensitivity level, and generator B set at about 8 dB above that level, A output was increased until the counter latched onto the A signal. Several A-B separations were tried at 10/15 MHz, 14/15 MHz, and 14.5/15 MHz. In all cases, an A-B output differential of 6 dB produced complete capture. Another brand of counter was submitted to the same test, and latch-on required a 10 dB differential.

The unit experienced difficulty in providing a stable readout at under 100 kHz when input signal levels were at the minimum sensitivity level and up to about 20 dB above minimum sensitivity. The problem was easily solved with the insertion of a simple filter consisting of a 0.1 mf capacitor and 1K ohm resistor in series with the cable input signal lead; the lead clip was connected to the resistor, while the free end of the capacitor served as a probe tip. The unit then provided stable readouts down to the minimum sensitivity level.

Curiosity about the effectiveness of the period averaging technique used in the Model 7000 led to a rather unconventional test of the *Auto Range* and *Period* functions. A sweep generator was set to center frequency in the several ranges between 350 Hz–10 kHz, a count was taken, and then the sweep range increased in order to determine the Model 7000 response. Sure enough, the Model 7000 averaged the signal periods, and the count remained within a few percent of the center frequency—the count shift, I suspect, represents an actual sweep oscillator shift. When the center frequency was set toward the low end of a given range, effectively imbalancing the upper and lower sweep range, the counter moved its average count upward. Smart counter!

Conclusions

No defects were discovered in the performance of the unit. In most respects it exceeded manufacturer specifications. In a word, this is a professional unit priced within the reach of the amateur experimenter. The only limitation arises from the upper design limit of 80 MHz, requiring that the v.h.f./u.h.f. experimenter add a prescaler to the unit. But even adding in the cost of a prescaler, the total price for the combination is still very competitive with top-quality frequency counters on the amateur market. After putting the Model 7000 through its paces, I can't imagine ever purchasing another "just a frequency" counter. I am thoroughly impressed with the Model 7000 and its design concept, versatility, performance, and price.

The Model 7000 sells for $300.00. For further information write: Triplett Corp., One Triplett Drive, Bluffton, Ohio 45817 or circle number 100 on the reader service card.

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a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The *Royal Observatory of Belgium*, the recently appointed official keeper of sunspot data, reports a monthly mean sunspot number of 156.2 for April 1981. This is based upon daily solar observations made at Locarno, Switzerland and complemented by an international network of observatories.

The mean level for April results in a 12-month running smoothed sunspot number of 150 centered on October 1980. The sunspot cycle is measured by the level of the smoothed sunspot number. The level for October is the same as the levels reported for August and September 1980. There has been no significant change in the present sunspot cycle over the three-month period.

Although the present solar cycle has declined somewhat from its peak value of 165.5 recorded during December 1979, the level of sunspot activity continues to remain in the high range. A smoothed sunspot number of 127 is forecast for August 1981.

Record April Storm

The strongest geomagnetic disturbance recorded during the past nine years took place during mid-April. The storm began on April 11th with moderate strength, subsided somewhat on the 12th, and then erupted in full glory on the 13th. The storm appears to be related to a massive flare which broke out on the sun's surface on April 11th. On April 13th, instruments measuring the geomagnetic field at observatories throughout the world were "pinned" during the most intense period of the storm. This was the highest level of storminess observed since August 1972. Conditions slowly began to return to normal by April 14th.

The geomagnetic storm had a corresponding effect on the ionosphere. Long-distance h.f. communications were almost totally disrupted on April 13th, with most bands blacked-out. Some sporadic short-skip openings did take place, but for the most part the h.f. bands were dead. On the other hand, aurora borealis was seen extensively across the United States from Maine to Alaska, and as far south as Arizona and the Gulf states. A great deal of unusual auroral-scatter and sporadic-E short-ship openings took place on the v.h.f. bands.

The geomagnetic-ionospheric disturbance of mid-April is of special interest to scientific researchers. NOAA has requested that radio amateurs who experienced or observed adverse or unusual effects on either h.f. or v.h.f. communications during the period of storminess should report these to: NOAA/SESC, 325 Broadway, R 43 (CQ), Boulder, CO 80303.

August Propagation

Late August and early September are difficult times for accurately forecasting DX conditions on the h.f. bands, because conditions can change considerably from day to day. On some days, conditions will be much like they have been during June and July. On other days, they will sound more typically fall-like, with somewhat higher daytime frequencies and somewhat lower nighttime frequencies.

Since this is a period of transition, this month's *DX Propagation Charts* cover only the *one-month* period from August 15th through September 15th, rather than the usual two-month period. *Short-skip Charts* for use during this period appeared in last month's column.

Expect good DX conditions during the hours of daylight on three bands—*10, 15* and *20* meters. Of the three, the best conditions should take place on *15* meters, with the band peaking to most areas of the world during the afternoon hours. On an increasing number of days, *15* meters should open as early as an hour or two after sunrise, mainly towards the east and the south. Improving world-wide DX conditions are also expected for *10* meters during this period. Look for peak conditions during the afternoon, particularly along an arc extending from central Africa, through Latin America, and into the Far Pacific area. Pre-noon openings into Europe should also become more numerous. While *20* meters should remain open for DX throughout the entire daylight period, peak signals to most areas of the world are expected during an approximate two-hour period following local sunrise, and again during the late afternoon.

Between sundown and sunrise look for *20* meters as the optimum band for DX, with improving conditions on *40* and *80* meters as well. Openings on *20* meters should be possible to all areas of the world, with openings towards the east and south favored before Midnight, and openings towards the north and west favored after Midnight. Expect pretty much the same pattern on *40* meters, but signal levels may not be as strong as on *20* meters, and openings not as numerous.

Some fairly good *15* meter DX openings should be possible *after* sundown, and to as late as Midnight. Paths favored for these openings are Latin America, the Far Pacific, and Asia. An improvement should be noticeable for nighttime DX openings on *80* meters. Despite continu-

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for August 1981

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 4, 21	A	A	B	C
High Normal: 3, 9-11, 16-17, 22-23, 30-31	A	B	C	C-D
Low Normal: 1-2, 5, 7-8, 12-14 20, 24-25, 28-29	A-B	B-C	C-D	D-E
Below Normal: 6, 15, 18-19, 26-27	B-C	C-D	D-E	E
Disturbed: None	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good-to-fair (B-C) on August 1st-2nd, good (B) on the 3rd, excellent (A) on the 4th, etc.

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11307 Clara St., Silver Spring, MD 20902

ing high seasonal static levels, some fairly good *80* meter openings should be possible towards Europe, Africa, and Latin America before Midnight, and to Latin America, the Far Pacific, and Asia after Midnight and into the sunrise period.

By late August, it should be possible to work some DX on *160* meters during the hours of darkness. Conditions on this band, as well as on *40* and *80* meters, will tend to peak just as the sun begins to *rise* on the *light*, or *easternmost* terminal of the path. Conditions will be noisy and signals often very weak, but *160* meters should be worth a look!

For short-skip openings during August and early September, try *80* meters during the day for distances less than 250 miles, with *40* meters as an alternate. During the hours of darkness, try both *80* and *160* meters over this distance. For distances between approximately 250 and 750 miles, *40* meters should be best during the day for openings up to 500 miles, and *20* meters optimum between 500 and 750 miles. After sundown, try *40* meters over this distance until Midnight, with *80* meters best from Midnight to sunrise. For openings between distances of 750 and 1300 miles, expect *20* meters to provide the strongest signals during the day and into the evening hours until Midnight. Between Midnight and sundown, the best band over this distance should be *40* meters, with *80* meters as a backup. For openings between 1300 miles and the one-hop short-skip limit of approximately 2300 miles, try *20* meters during the day, with *15* meters as an alternate. After sundown, *40* meters should be optimum over this distance, with *20* meters a backup until Midnight. The *80* meter band should also provide fairly good openings over most of this range during the hours of darkness.

Frequent short-skip openings, due primarily to sporadic-E propagaton, should be possible on *10* and *15* meters between distances of approximately 400 and 1300 miles. While most of these openings are expected to take place during the daylight and early evening hours, it is possible for them to occur at any time. Longer skip on both these bands, up to 2300 miles, should be possible during the late afternoon and early evening hours.

V.h.f. Ionospheric Openings

Increasing daytime usable frequencies during August and September, along with continuing high levels of solar activity, could make possible some F-2 layer DX openings on 6 meters. They may not happen very often until later this fall, but occasional openings should be possible. The best times for 6 meter DX openings are shown in this month's *DX Propagation Charts*. Look for these openings when conditions are expected to be High or Above Normal.

While a seasonal decrease is expect-

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location, The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. wetc. Appropriate *daylight* time is used, *not* GMT. T convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

6. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado, 80302.

August 15 - September 15, 1981
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

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

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	10-13 (1)	09-10 (1) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	08-13 (1) 13-16 (2) 16-17 (3) 17-21 (4) 21-23 (2) 23-01 (1) 04-06 (1) 06-08 (2)	19-21 (1) 21-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 20-22 (1)* 22-00 (2)* 00-02 (1)*
Northern & Central Euorpe & European USSR	11-13 (1)	09-10 (1) 10-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	01-06 (1) 06-09 (2) 09-12 (1) 12-15 (2) 15-18 (3) 18-19 (2) 19-22 (1) 22-01 (2)	19-20 (1) 20-00 (2) 00-02 (1) 21-00 (1)*
Eastern Mediterranean & Middle East	11-13 (1) 15-17 (1)	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-16 (1) 16-18 (2) 18-22 (3) 22-00 (2) 00-02 (1)	20-23 (1) 21-22 (1)*
Western Africa	10-14 (1) 14-17 (2) 17-18 (1) 10-15 (1)**	07-10 (1) 10-13 (2) 13-15 (3) 15-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-00 (4) 00-02 (3) 02-04 (2) 04-06 (1)	19-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Eastern & Central Africa	14-16 (1) 16-18 (2) 18-19 (1)	10-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-15 (1) 15-18 (2) 18-19 (3) 19-21 (4) 21-23 (3) 23-00 (2) 00-02 (1)	20-00 (1)

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

Time Zone: PDT (24-Hour Time) WESTERN USA TO:

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

* Indicates best times to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a propagation index of (2), or higher.

** Indicates best times to listen for F-2 layer openings on 6 Meters.

ed in sporadic-E propagation, some short-skip openings on 6 meters should be possible through mid-September. Such openings generally range between 1000 and 1300 miles in distance. While sporadic-E propagation can occur at any time, there is a tendency for it to peak on 6 meters between 8 a.m. and Noon local time, and again between 6 and 9 p.m. Don't expect these short skip openings every day. However, when they do occur, signals can be quite strong.

This should be a good period for meteor-scatter-type v.h.f. ionospheric propagation. Five periods of meteor activity are expected during August, including a major meteor shower called *Perseids*. This shower is expected to begin by August 9th, peak around the 11th, and continue through the 14th. Other periods of meteor activity are expected on August 5, 12, 18, and 20. Ionization produced by the thousands of meteors expected to enter the earth's atmosphere during these periods is expected to make possible numerous meteor-type ionospheric openings over several hundreds of miles on the *10, 6,* and *2* meter bands.

Seasonal conditions are improving for trans-equatorial (TE) openings between the southern half of the United States and South America on *6* meters. The best time to check for TE openings is during the early evening hours, shortly before and just after sundown, although they may occur later as well. At best, however, TE openings will be very infrequent, and signals will be weak, noisy, and often affected with severe flutter fading.

Some auroral activity is possible during August, and the days on which it is likely to occur are those expected to be Below Normal or Disturbed. Check the "Last Minute Forecast" appearing at the beginning of this column for those days which are expected to be in these categories during August. Ionized patches during auroral activity can reflect v.h.f. signals over distances upwards of 1000 miles or so.

Shortwave Propagation Handbook

The *Shortwave Propagation Handbook* by George Jacobs, W3ASK and Theodore J. Cohen, N4XX is a definitive work on the fascinating subject of shortwave propagation. It is written in simple, understandable language and is intended to be *read and used* by radio amateurs, shortwave listeners and all others who make use of the shortwave radio spectrum. The book stresses do-it-yourself forecasting, and literally contains propagation "road maps" to world-wide shortwave propagation conditions, which eliminate much of the mystery and complexity usually encountered in making such determinations.

Contents of the book include: principals of ionospheric propagation; sunspots and the sunspot cycle; sunspot cycle predictions; do-it-yourself propagation predictions and master propagation charts; ionospheric forecasting; unusual h.f. and v.h.f. ionospheric propagation.

The *Handbook* is out of print and the remaining number of copies are dwindling rapidly. Only a few dozen personalized copies signed by both authors remain available. Personalized copies can be obtained from George Jacobs, W3ASK, P.O. Box 1714, Silver Spring, MD 20902. Copies are $8.50 each in U.S. funds, postpaid world-wide. Add $3.50 for airmail delivery outside the USA, Canada, and Mexico.

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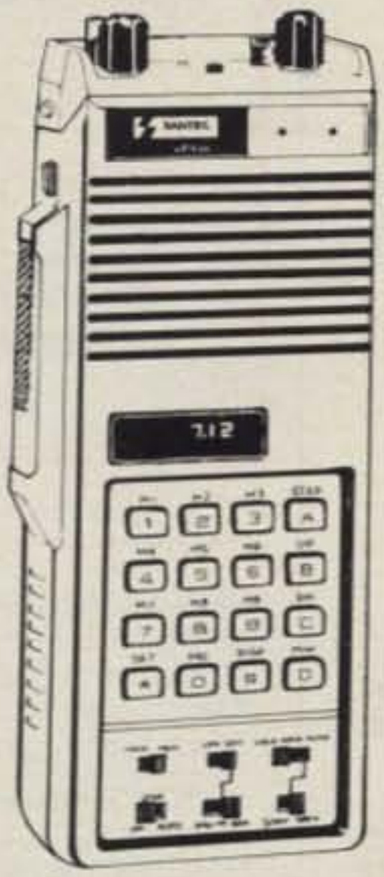

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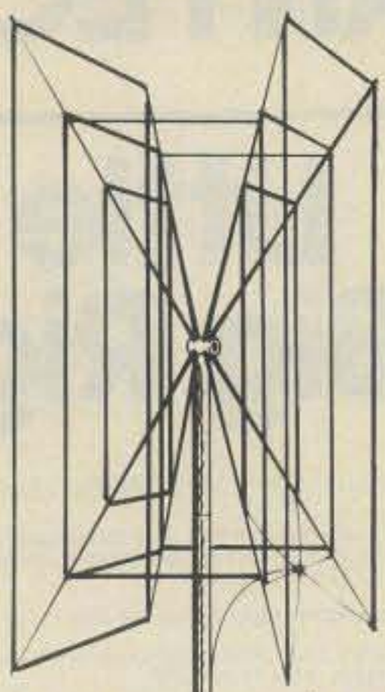

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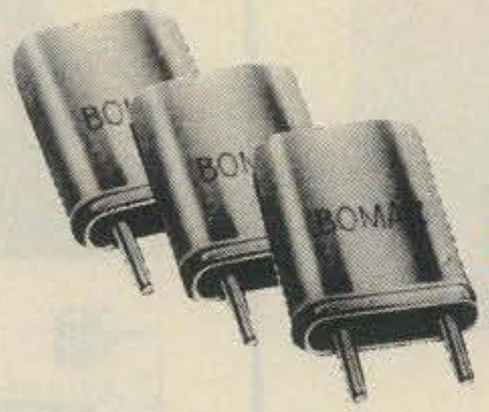

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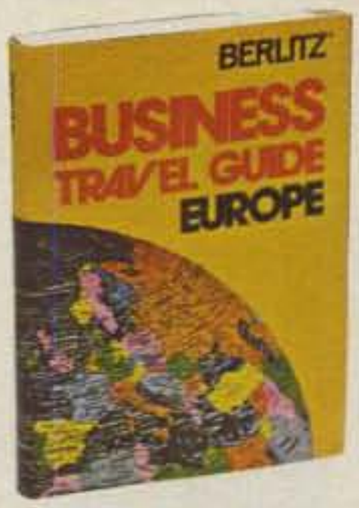

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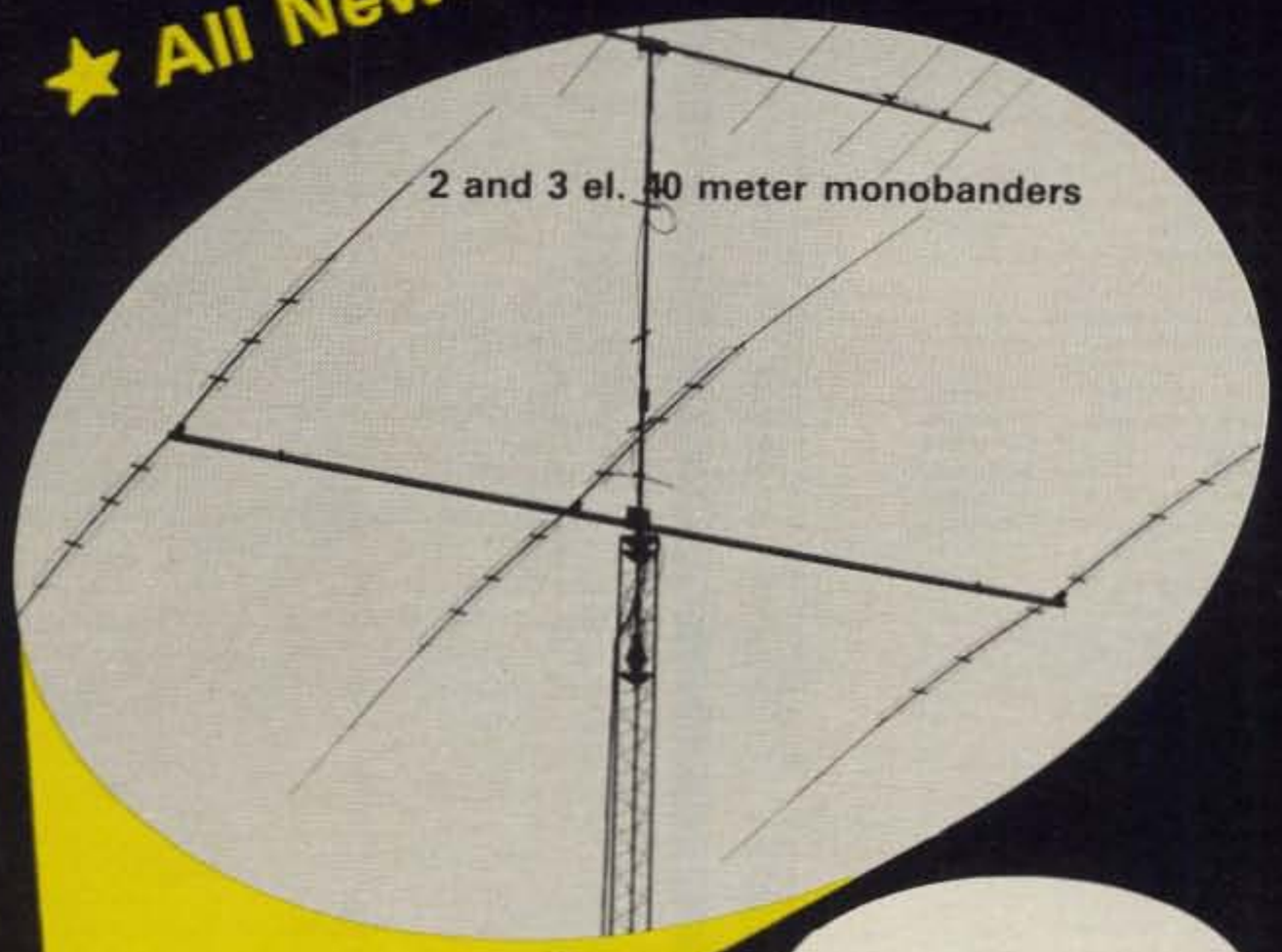

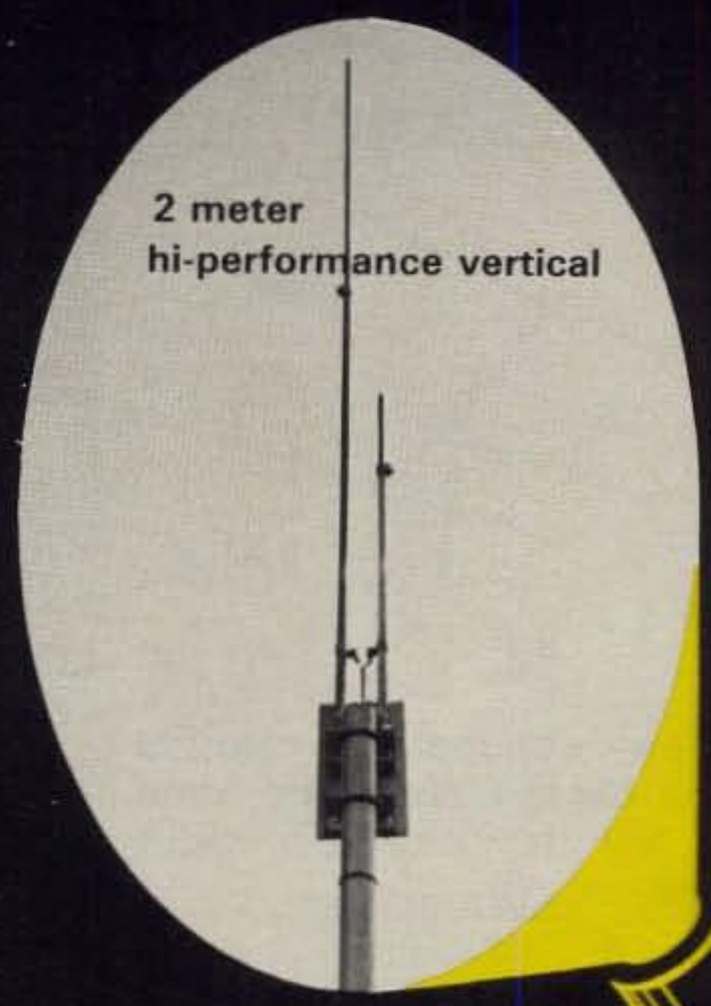

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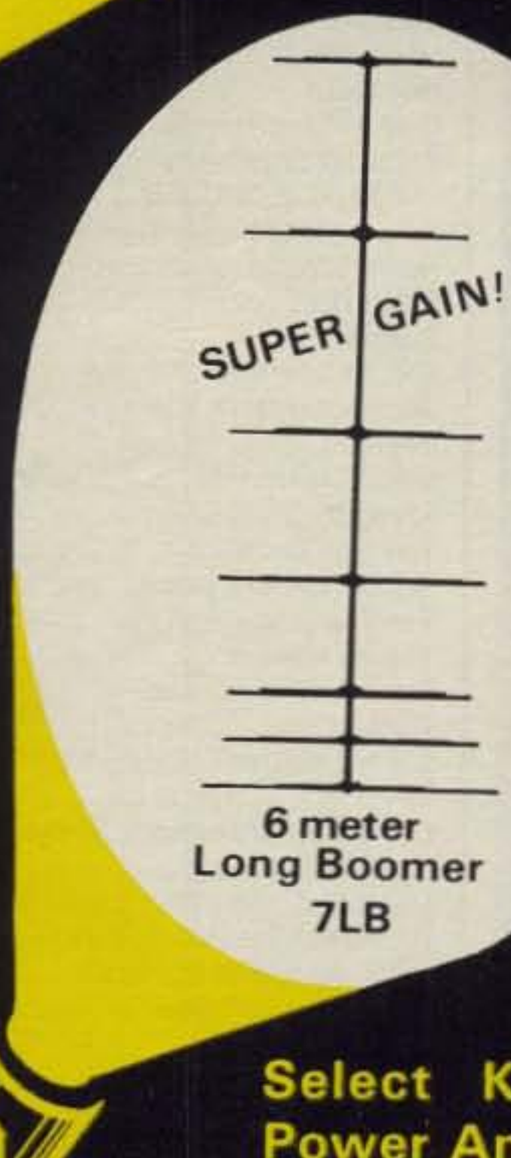

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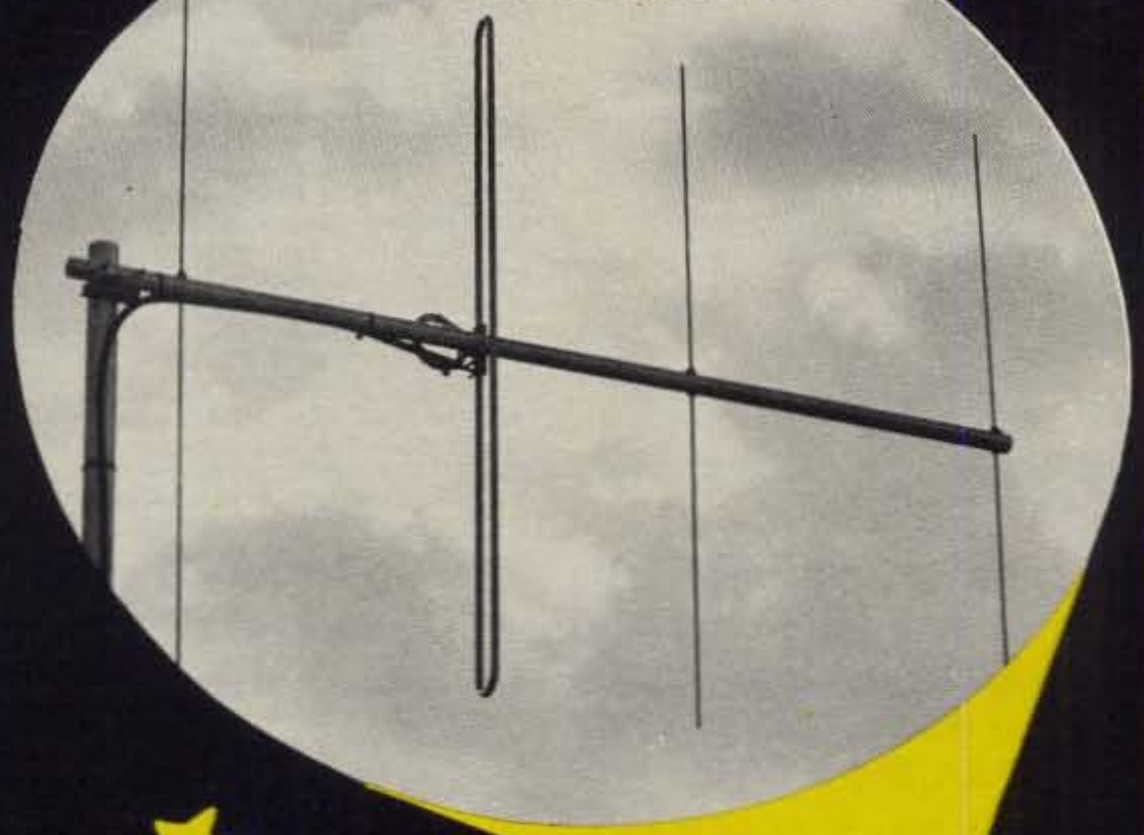
7LB

Broadband 2 meter 4 el.



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Select KLM performance-oriented UHF/VHF Power Amplifiers, and antennas, 1.8 to 520 MHz: monobanders, tribanders, log-periodics, verticals, dipoles, circulars and stacked arrays.

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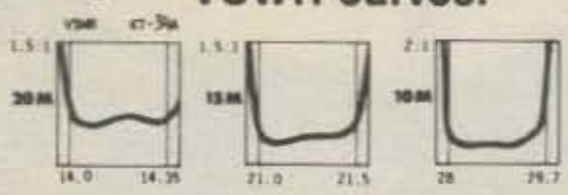
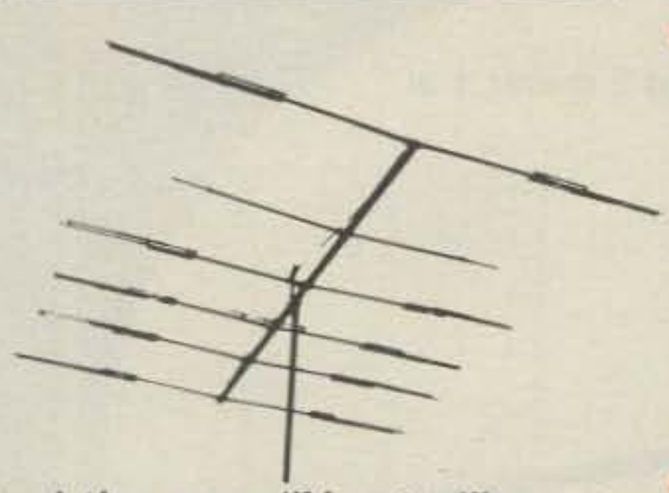
KLM's KT-34A

The new concept in triband antenna design. Gain and band width all in one compact package. VSWR curves.



List Price 389.95 SALE PRICE $319



And the new "X-rated"

KT34XA

Out performs all commercially available triband antennas and many monoband systems too! 6 elements on 32 ft. boom. 2-4db more gain than the KT-34.

List Price 569.95 SALE PRICE $479

HYGAIN ANTENNAS

TH5DX	New 5-Element Triband Beam	$209
TH6DXX	6-Element Triband Beam	$239
TH3MK3	3-Element Triband Beam	$179
HY-QUAD	2 Element Triband Quad	$209
402BA	2-Element 40-mtr Beam	$179
205BA	5-Element 20-mtr "Long John"	$239
155BA	5-Element 15-mtr "Long John"	$149
105BA	5-Element 10-mtr "Long John"	$ 99
204BA	4-Element 20-mtr Beam	$189
153BA	3-Element 15-mtr Beam	$ 69
103BA	3-Element 10-mtr Beam	$ 59
DB1015A	3-Element 10/15-mtr Beam	$129
18HT	Hy-Tower 80-10 mtr Vertical	$279

CUSHCRAFT ANTENNAS

A3	New 3-Element Tribander	$169
A4	New 4-Element Tribander	$209
AV5	80-10 mtr Vertical	$ 90
20-3CD	3-Element 20 mtr "Skywalker"	$165
20-4CD	4-Element 20 mtr "Skywalker"	$239
15-3CD	3-Element 15 mtr "Skywalker"	$ 82
15-4CD	4-Element 15 mtr "Skywalker"	$ 98
10-3CD	3-Element 10 mtr "Skywalker"	$ 59
10-4CD	4-Element 10 mtr "Skywalker"	$ 75

ROTORS/CABLES

Hy-Gain HDR-300 (25 sq. ft)	$399
Alliance HD-73 (10.7 sq. ft)	$ 99
Alliance U-100 (Elevation Rotor)	$ 39
CDE CD-45-2 (9 sq. ft)	$ 99
CDE HAM 4 (15 sq. ft)	$169
CDE TAILTWISTER (30 sq. ft)	$239
8 Conductor Rotor Cable	$0.18/ft.
Heavy Duty 8 Conductor Rotor Cable	$0.36/ft.

ROHN TOWERS

20G $29.50 25G $38.50 45G $83.60

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HDBX48	Free-standing 48' (18 sq. ft)	$305
HBX-56	Free-standing 56' (10 sq. ft)	$335
FK2548	48' 25G Foldover Tower	$699
FK2558	58' 25G Foldover Tower	$779
FK2568	68' 25G Foldover Tower	$849
FK4544	48' 45G Foldover Tower	$979
FK4554	58' 45G Foldover Tower	$1089
FK4564	68' 45G Foldover Tower	$1179

(Freight paid on all foldover towers. Prices 10% higher west of Rocky Mountain states.)

GALVANIZED STEEL TOWER HARDWARE

3/16" EHS Guywire	$11/100 ft. $99/1000 ft.
1/4" EHS Guywire	$14/100 ft. $129/1000 ft.
5/32" 7 x 7 Aircraft Cable	$10/100
3/16 CCM cable clamps (3/16" or 5/32" cable)	$0.30
1/4 CCM cable clamps (1/4" cable)	$0.40
1/4 TH Thimble (fits all sizes)	$0.25
3/8 EE (3/8" Eye and eye turnbuckle)	$5.50
3/8 EJ (3/8" Eye and jaw turnbuckle)	$6.00
1/2 EE (1/2" Eye and eye turnbuckle)	$8.50
1/2 EJ (1/2" Eye and jaw turnbuckle)	$9.50
3/16" Preformed guy deadend	$1.65
1/4" Preformed guy deadend	$1.85
6"-dai. 4-ft long earth screw	$12.50
2"-dai. 10-ft long heavy duty mast	$39.00
500D Guy insulator (5/32" or 3/16" cable)	$0.95
502 Guy insulator (1/4" cable)	$1.95

COAXIAL CABLE AND CONNECTORS

RG213/U (Mil spec RG-8/U—Brand New)	$0.29 ft.
RG-8X (New 1/4" Diameter Low Loss Foam)	$0.15/ft.
RG-58C/U (MIL SPEC 95% SHIELD)	0.12¢ per/ft.
1/2" 50 OHM Poly Jacketed Copper Hardline	$1.10/ft.
UHF, N-Male or Female 1/2" Copper Hardline Connectors	$22.00
1/2" 50 OHM Poly Jacketed Aluminum Hardline	$0.69/ft.
UHF, N-Male or Female 1/2" Aluminum Hardline Connectors	$15.00
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THE EVOLUTION OF A CHAMPION!

FT-101ZD Mk III

The FT-101ZD Mk III is the latest chapter in the success story of the FT-101 line. Armed with new audio filtering for even better selectivity, the FT-101ZD now includes provision for an optional FM or AM unit. Compare features and you'll see why active operators everywhere are upgrading to Yaesu!

Variable IF Bandwidth

Using two 8-pole filters in the IF, Yaesu's pioneering variable bandwidth system provides continuous control over the width of the IF passband — from 2.4 kHz down to 300 Hz — without the shortcomings of single-filter IF shift schemes. No need to buy separate filters for 1.8 kHz, 1.5 kHz, etc.

Improved Receiver Selectivity

New on the FT-101ZD Mk III is a high-performance audio peak/notch filter. Use the peak filter for single-signal CW reception, or choose the notch filter for nulling out annoying carriers or interfering CW signals. In the CW mode, you can choose between the 2.4 kHz SSB filter and an optional CW filter (600 or 350 Hz) from the mode switch.

Diode Ring Front End

The FT-101ZD now sports a high-level diode ring mixer in the front end. This type of mixer, well known for its strong signal performance, is your assurance of maximum protection from intermod problems on today's crowded bands.

WARC Bands Factory Installed

The FT-101ZD Mk III comes equipped with factory installation of the new 10, 18, and 24 MHz bands recently assigned to the Amateur Service at WARC. In the meantime, use the 10 MHz band for monitoring of WWV!

RF Speech Processor

Not an additional-cost option, the FT-101ZD RF speech processor provides a significant increase in average SSB power output, for added punch in those heavy DX pile-ups. The optimum processor level is easily set via a front panel control.

Worldwide Power Capability

Every FT-101ZD comes equipped with a multi-tap power transformer, which can be easily modified from the stock 117 VAC to 100/110/200/220/234 VAC in minutes. A DC-DC converter is available as an option for mobile or battery operation.

Convenience Features

Designed fundamentally as a high-performance SSB and CW transceiver, the FT-101ZD includes built-in VOX, CW sidetone, semi-break-in T/R control on CW, slow-fast-off AGC selection, level controls for the noise blanker and speech processor, and offset tuning for both transmit and receive. The Mk III optional FM unit may be used for 10 meter FM operation, or choose the optional AM unit for WWV reception or VHF AM work through a transverter (AM and FM units may not both be installed in a single transceiver).

Full Line of Accessories

See your Yaesu dealer for a demonstration of the top performance accessories for the FT-101ZD, such as the FV-101Z External VFO, SP-901P Speaker/Patch, YR-901 CW/RTTY Reader, FC-902 Antenna Tuner, and the FTV-901R VHF/UHF Transverter. Watch for the upcoming FV-101DM Digital Memory VFO, with keyboard frequency entry and scanning in 10 Hz steps!

Nationwide Service Network

During the warranty period, the Authorized Yaesu Dealer from whom you purchased your equipment provides prompt attention to your warranty needs. For long-term servicing after the warranty period, Yaesu is proud to maintain two fully-equipped service centers, one in Cincinnati for our Eastern customers and one in the Los Angeles area for those on the West Coast.

Note: A limited quantity of the earlier FT-101ZD (with AM as standard feature) is still available. See your Yaesu dealer. FT-101ZD Mk III designates transceivers bearing serial #240001 and up, with APF/Notch filter built in and AM/FM units optional.

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CIRCLE 48 ON READER SERVICE CARD

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The radio.

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- 200 watt PEP input...all solidstate.
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- 2 VFO's built-in standard.
- Memories...one frequency per band.
- Compact size...only 3.7 in(H) x 9.5 in(W) x
- 10.8 in(D).

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IC-730 - 8 Band Mobile/Base Xcvr

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