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SEPTEMBER 1978 / $1.25

- Your Introduction to Traffic Nets
- Learn The Ropes of Tower Raising
- Talking to Japan

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Thank you for making a very reliable product.

Barry J. Fairfax

Barry J. Fairfax WB9KTA,
operator: KP6AL Palmyra Island
KP6BD Kingman Reef

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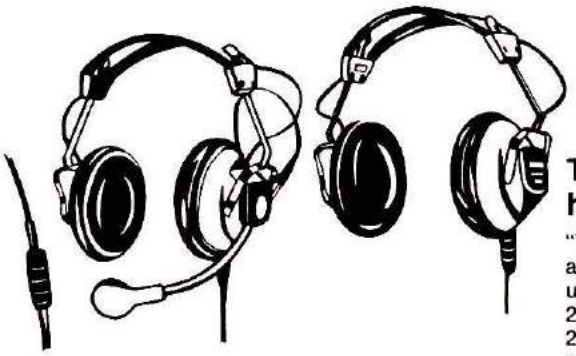

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THIS MONTHS HORIZONS

OSCAR 8 — We Did It Again

Many communications satellites are in orbit in space. It's a whole new era of technology aimed at improving the transmission of information. Among these communications satellites are the OSCAR series, built and operated by radio amateurs and intended for amateur communications. You've been missing something if you haven't yet used the OSCAR satellite system. K6PGX and WA6CAX tell what happened during the latest launch of an amateur-radio venture into space. It's the story of OSCAR 8, which is in polar orbit and operating beautifully.

Upgrading Your License Through Traffic Handling

If you're new to amateur radio you might ask, "What's traffic handling and how can it help me?" Traffic handling is as old as amateur radio. In fact, during the early days before short waves were used for radio communications, traffic (or message) handling was one of the primary activities of hams. The ARRL established networks of relay stations (hence *American Radio Relay League*) to facilitate transmission and reception of personal messages throughout the land. In his article Author Boyd, K9MX, gives some points on how to improve operating skills and how to learn some time-honored methods of radio communications.

Telegraph Keys

A radio signal must be modulated to convey intelligence. The earliest form of modulation was by the Morse-code key. Author Edwards traces the development of the key from its beginning to today's sophisticated relatives of the most common sending machine in radio circuits.

Beginner's Transmitter

You'll learn how to identify the different windings in power transformers in this final part of the Beginner's Transmitter series. W8YFB also gives you a table of resistance values which you can use to check your wiring in the transmitter. And finally, you can turn the rig on — Bill leads you through the process step by step.

Japanese Hams

Amateur radio is the hobby that lets people all around the world communicate with each other. It runs into problems, though, when a language such as English is heard by hams whose native tongue does not include many of the sounds we take for granted. Funny phonetics, signal fading, and distortion caused by ssb filters or misadjusted speech processors — all increase the difficulty and add to the frustration of the Japanese amateur who would truly like to converse with you. W8JJO describes some of the difficulties and offers a suggestion or two for your next Japanese QSO.

How To Be A Lid

There are many ways to make a name for yourself in amateur radio. W5VSR describes some operating styles that the champions use in their quest for excellence at inelegance. Before you try to earn a "lid-of-the-year" award, take a look at this tongue-in-cheek guide to see if you really want the distinction.

Raising Your Tower

That handful of pipe and a few insulators didn't weigh very much when it was all stretched out on the ground, so how come it takes three of you tugging on the rope to stand it up? It has to do with things like the angle of applied force, moment of inertia, and the multiplication of leverage. It's not as difficult as it sounds, though, and WB3DDM tells you how to determine the amount of pull you'll need to raise that tower or mast.

The Cover

Launching a satellite requires a lot of careful testing and assembly to ensure that all will go well. Artist Tom Broscius, WA2RWA, gives us his impression of some of the steps, based on photographs from WB6NOA and NASA.

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This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 1.8 thru 30 MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

NEW, IMPROVED MFJ-941B HAS . . .
- More inductance for wider matching range
- More flexible antenna switch
- More sensitive meter for SWR measurements down to 5 watts output

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Transmitter matching capacitor. 208 pf. 1000 volt spacing.

Sets power range, 300 and 30 watts. Pull for SWR.

Meter reads SWR and RF watts in 2 ranges.

Efficient airwound inductor gives more watts out and less losses.

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941B Versa Tuner II with all these features at this price:

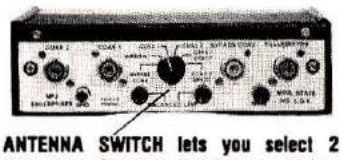
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax lines direct or thru tuner, random wire/balanced line, and tuner bypass for dummy load.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

A 1:4 balun for balanced lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your



ANTENNA SWITCH lets you select 2 coax lines direct or thru tuner, wire/balanced line, dummy load.

transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balanced line, or random wire.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

It travels well, too. Its ultra compact size 8x2x6 inches fits easily in a small corner of your suitcase.

This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balanced line inputs (2), random wire input (1), and ground (1).

NEW 300 WATT MFJ VERSA TUNER II'S: SELECT FEATURES YOU NEED.

NEW MFJ-945 HAS SWR AND DUAL RANGE WATTMETER.

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Same as MFJ-941B but less 6 position antenna switch.

NEW MFJ-944 HAS 6 POSITION ANTENNA SWITCH ON FRONT PANEL.

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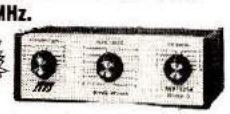
NEW MFJ-943 MATCHES ALMOST ANYTHING FROM 1.8 THRU 30 MHz.

$69.95 BRAND NEW



Same as MFJ-941B, less SWR/Wattmeter, antenna switch, mounting bracket. 7x2x6 in.

ULTRA COMPACT 200 WATT VERSA TUNERS FOR ALL YOUR NEEDS.

MFJ-901 VERSA TUNER MATCHES ANYTHING, 1.8 THRU 30 MHz.

$59.95 BRAND NEW

Efficient 12 position air inductor for more watts out. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax. 200 watts RF, 1:4 balun, 5x2x6 in.

MFJ-900 ECONO TUNER MATCHES COAX LINES/RANDOM WIRES.

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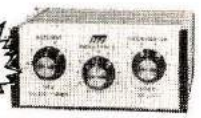

Same as MFJ-901 but less balun for balanced lines. Tunes coax lines and random lines.

MFJ-16010 RANDOM WIRE TUNER FOR LONG WIRES.

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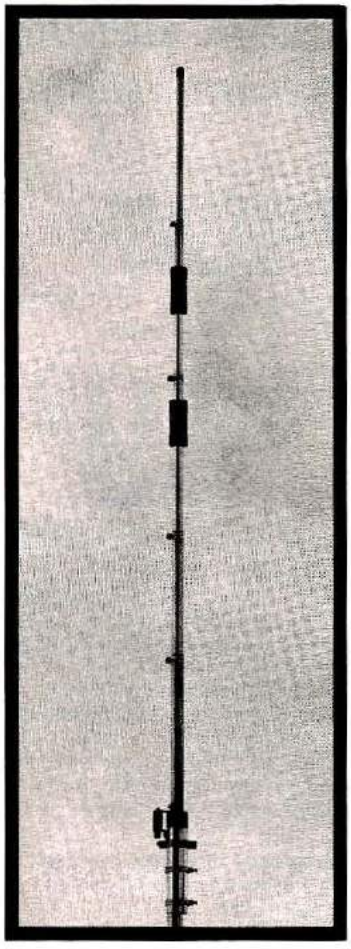
NEW HF VERTICALS BY CUSHCRAFT

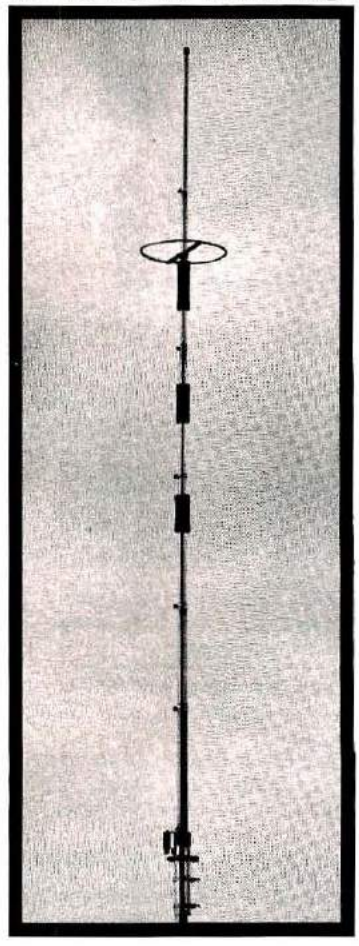
Cushcraft's new multiband vertical antenna systems have been optimized for wide operating bandwidth and provide the low angle of radiation which is essential for long-haul DX communications on the high-frequency amateur bands. The high Q traps which were designed especially for these verticals use large diameter enamelled copper wire and solid-aluminum air-dielectric capacitors; the trap forms are manufactured from filament-wound fiberglass for minimum dielectric loss and high structural strength. High strength 6063-T832 aluminum tubing with 0.058" (1.5 mm) walls is used for the vertical radiator. The massive 2 inch (50 mm) OD double-walled base section and heavy-duty phenolic base insulator ensure long life and durability. For maximum performance with limited space, choose a Cushcraft multiband vertical; all models may be roof or ground mounted on a 1¼" - 1⅞" (32 - 48 mm) mast.

10-15-20 METERS



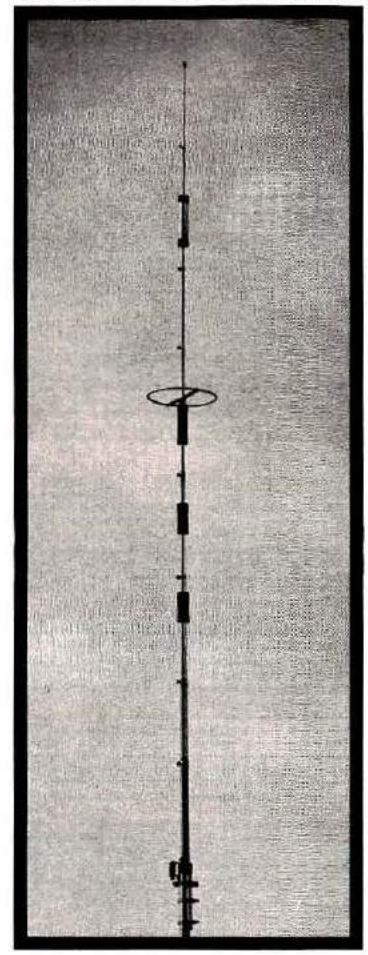
ATV-3 Cushcraft's ATV-3 multiband vertical provides low VSWR operation for both SSB and CW on 10, 15, and 20 meters. Matched to 50 ohms; built-in connector mates with standard PL-259. Stainless-steel hardware is used for all electrical connections. The ATV-3 is a compact 166 inches (4.2 meters) tall. Rated at 2000 watts PEP.

10-15-20-40 METERS

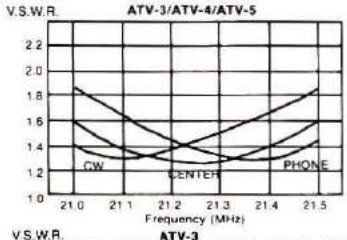


ATV-4 The Cushcraft ATV-4 four-band vertical antenna has been optimized for wide operating bandwidth on 10, 15, 20, and 40 meters. SWR is less than 2:1 over the CW and SSB segments of 10, 15, and 20. The 2:1 SWR bandwidth on 40 meters is approximately 240 kHz; may be quickly and easily adjusted to favor any part of the band. Coaxial fitting takes 50-ohm transmission line with PL-259 connector. Overall height, 233 inches (5.9 meters). Rated at 2000 watts PEP.

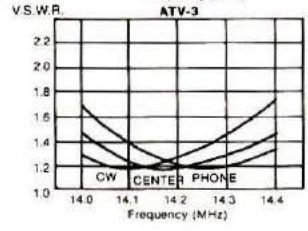
10-15-20-40-80 METERS



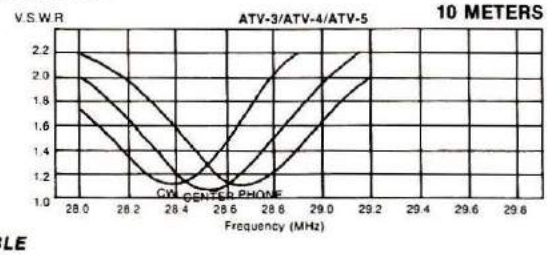
ATV-5 The ATV-5 trapped vertical antenna system has been engineered for five-band operation on 80 through 10 meters. The high Q traps are carefully optimized for wide operating bandwidth: 2:1 SWR bandwidth with 50-ohm feedline is 1 MHz on 10 meters; more than 500 kHz on 15 and 20 meters; 160 kHz on 40 meters; and 75 kHz on 80 meters. Instructions are provided for adjusting resonance to your preferred part of the band, CW or SSB. Built-in coaxial connector takes PL-259. Nominal height, 293 inches (7.4 meters). Rated at 2000 watts PEP on **all** bands.



15 METERS



20 METERS



10 METERS

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September, 1978
Volume 2, Number 9

HAM RADIO HORIZONS

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CONTENTS

The editor of an amateur radio magazine must wear several different and diverse hats. In fact, I could use up several pages describing all the details that need attention to keep the magazine running smoothly. However, I'd like to talk for a moment about one very important task that sets the tone of the magazine: selection of articles.

Most of the articles published in *Ham Radio Horizons* are contributed by readers who want to share an idea or the details of a particularly successful project. Authors range from enthusiastic hams who have never written anything more than a short story for their English teacher to fellows with engineering backgrounds who make their livings in front of a typewriter; all want to share an idea. I welcome the output of anyone who is interested in contributing something that will benefit all hams.

Budding authors often ask, "What kind of articles are you looking for?" That's a difficult question to answer because new manuscripts arrive every day, so our needs are continually changing. However, I'm looking for good articles on every facet of amateur radio from simple construction projects and human-interest stories to DXpedition travelogues, adventure tales, and articles on getting started in ham radio.

Once a month we set aside one or two days to go over all the manuscripts that have come in during the previous month. Since I seldom use more than a dozen articles in any issue, I don't accept more than that during any one-month period. This is sometimes a nearly hopeless task since there may be three-dozen or more to be considered. The first things I look for are originality and interest value. If the contribution passes this test, the next thing I look for is technical accuracy and attention to detail.

The contributed article doesn't have to be a literary masterpiece to be accepted. If you have a good idea and it's well documented, if the illustrations and technical discussion are clear and accurate — you may have a winner! On the other hand, if the article rambles from one topic to another, or presents inaccurate or misleading information, you will receive a rejection slip.

If your article has been accepted for publication, don't expect to see it published in the very next issue. The production times for a monthly magazine are probably much longer than you ever imagined. The articles for this issue, for example, were being prepared for publication during the month of May. As you are reading this we are putting together material for the December issue of *Horizons*.

In addition to writers, I am always on the lookout for new and unusual ways of *looking* at amateur radio. If you are an illustrator, painter, photographer, or sculptor, I would like to have an opportunity to review drawings, slides, or pictures of artwork for possible future consideration. Media can include airbrush, pen and ink, wash, watercolor, oils, collage, paper sculpture, *ad infinitum*; subject matter includes full-color covers and lead artwork for articles covering every aspect of amateur radio: antennas, hamshacks, satellites, vhf, fm, DXing, field day, etc. Obviously, all artwork which is submitted for publication must be of professional caliber. Artwork done on consignment involves preliminary layouts or sketches, and must follow a regimented deadline schedule. If the prospect interests you or any part-time Rembrandts you know who enjoy amateur communications, write directly to our art editor, Jim Wales, for more information.

Jim Fisk, W1HR
editor-in-chief

IC-215 FM PORTABLE/MOBILE

- 15 channels (12 on dial/3 priority)
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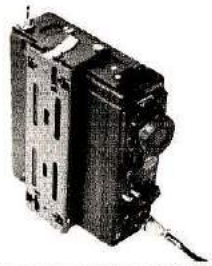

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FOCUS & COMMENT

Summertime is antenna time for many of us, in spite of the often-quoted bit of lore that says an antenna works better when it is put up in cold weather, and the colder the better. This means that many new amateurs will be putting up wires or towers for the first time, perhaps after having gotten their license at one of the many hamfest examination sessions that are becoming more prevalent.

Unfortunately, or even sadly, this also means that some will receive severe burns, injuries, or even be killed in the process. There is plenty of advice in available amateur literature on how to properly ground equipment, install lightning protection, and practice safety when working on rigs and the like. Until recently, not much has been said about the hazards of being careless around power lines outside your house.

The average consumer (TV-antenna buyer, CB enthusiast) is being warned of the danger through the installation of labels on antennas, as required by the Consumer Products Safety Commission. By-and-large, this is a good thing — the average person has absolutely no feel for the hazards involved near a power line. It's just a pair of wires that brings power to the house for his TV, lights, stove, refrigerator, and CB set. The wires stay at the top of their poles and do their job, and nobody worries about them. The modern electrical distribution system has been with us for so long that people take its presence for granted, and never give a thought to its dangers.

I can remember when electricity was brought to the part of the country where I spent my boyhood. The linemen treated this new force with such respect, and the electricians who wired the houses were so careful, that everyone just *knew* it was a thing to be wary of. *Anything* you did around those wires was flirting with sudden death, and everyone was aware of it. They didn't fully understand why, but they played it safe anyway.

How do we get the word to the new generation of amateurs that those wires are just as hazardous to their health today as they were when they were installed years ago? The obvious answer is education. Perhaps this is a chapter that is missing from our license manuals, study guides, and even the FCC exams. Surely the safety of life and limb is as precious to us as is the purity of our transmitted signal on the airwaves, or of equal importance with staying within our assigned frequency bands. Many amateur handbooks and some electronic textbooks have a page or two devoted to reviving a victim of electrical shock, but not a word about avoiding the shock (from power lines) in the first place.

Perhaps it will require warning labels on amateur antenna equipment to alert the newcomer (and the old timer who should know better) to the danger. However, this has limited effectiveness because danger signals can be ignored, and people tend to become blasé about a warning that is overused. Additionally, designing, printing, and attaching warning labels and cards adds to the price, which nobody likes to see in such inflationary times.

So, all of you radio-class instructors, equipment salesmen, and "Elmers" guiding your protégé into our great hobby — add some safety advice to your words of wisdom. If you're invited to lend a hand at a neighborhood antenna party, act like a safety officer. Don't be afraid to speak out; it's better to have a live buddy who thinks you're a square than to try to revive him after you kept your mouth shut.

Besides, we are radio amateurs; we are supposed to know about electronics and electricity, right? Let's not wait for a protection agency to give us a label about something that should be instinctive.

Thomas McMullen, W1SL
Managing Editor

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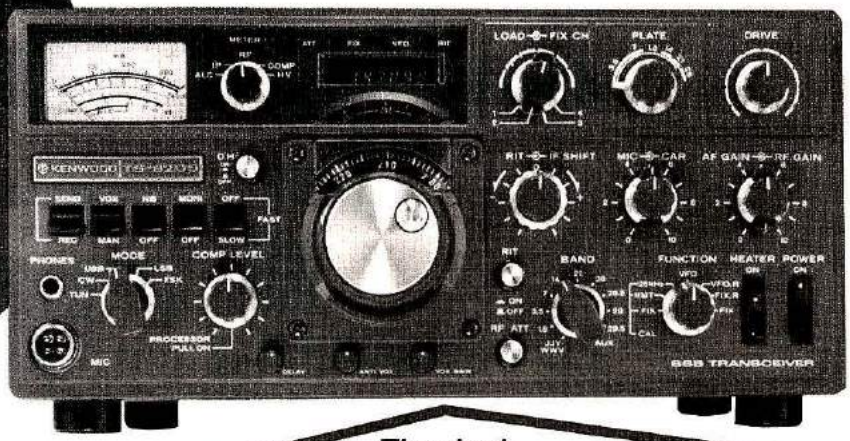

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4)-79.00 gift certificate

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3)-Plus a De luxe Remote VFO (for TS-820S) Reg. 149.00 **or ...**

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NEWSLINE

THE FCC'S BAN ON 10-METER LINEARS was upheld by the Commissioners by a 5-1 vote on June 28th, despite a significant shift in FCC staff support. This time the Safety and Special Services Bureau joined the Chief Engineer's office in opposing the ban on legitimate Amateur linears, but the Field Bureau stated they found the ban to be very effective and the Commissioners went along. Commissioner White was, as before, the lone dissenter, with Commissioner Quello not present for the hearing.

Taking A Second Amateur Exam so soon after passing the first that the first application is still being processed is causing computer headaches in Gettysburg. Always answer the Form 610 item that asks about other pending applications and provide details when appropriate to avoid unnecessary processing delays.

"Medium Bandwidth" ATV on 10 meters has been okayed by the FCC for a two-year test period. The five stations receiving the Special Temporary Authority will be permitted the use of A5 or F5 with a maximum bandwidth of 35 kHz from 29.0 to 29.3 MHz. The five involved are W9NTP, W3EFG, WØLMD, W6MXV, and WB9LVI — the STA was in response to a request from the ARRL.

420-450 MHZ BAND USERS may be in for severe interference problems when the Air Force's "PAVE PAWS" radar goes into operation in the next year or so. The very-long-range system has an average ERP of about a billion watts, and one estimate says that when it's aimed at the moon the reflected signal would illuminate an entire hemisphere of the earth with a 10-20 microvolt signal. The main beam could also burn up a receiver front end 10 miles away.

First Operational Site for PAVE PAWS is Cape Cod (Massachusetts) and a second installation is slated for Beale Air Force Base in California. Needless to say, PAVE PAWS seems to have the potential for doing real damage to the Amateur satellite program as well as other weak signal work on the 70 cm band. Both AMSAT and the ARRL are carefully studying the problem.

OSCAR 8'S ORBITAL DATA is off 0.00205 minute per orbit, a time error of two minutes, 55 seconds for orbit 1427, for example, and three minutes and 35 seconds for orbit 1748. A radar-tracking error is apparently the reason for the problem.

AMSAT Canada, Moving Forward with its plans for a transponder for possible inclusion on SYNCOM 4, has just elected VE2DNM President, VE3AAS Vice President, VE3ADZ Treasurer, and VE3ACF Secretary. VE3s FUA, KHG and BNO are all Directors of the newly revitalized organization, whose mailing address is now Box 7306, Vanier, Ontario K1L 8E4.

REPEATER DXING WAS CONDEMNED roundly by the Ohio Area Repeater Council at its July 8 meeting in Delaware, Ohio. After a long discussion, the OARC reaffirmed its previous strong stand against the practice and urged repeater operators to discourage such activities on their systems whenever they occur.

AN EMMY WENT TO DAVE BELL, W6AQ, from the Academy of Television Arts and Sciences on June 25th. Dave, who produced both "Moving Up to Amateur Radio" and "Ham's Wide World," received the prestigious award as executive producer of the documentary science and health TV series "Medix." Congratulations!

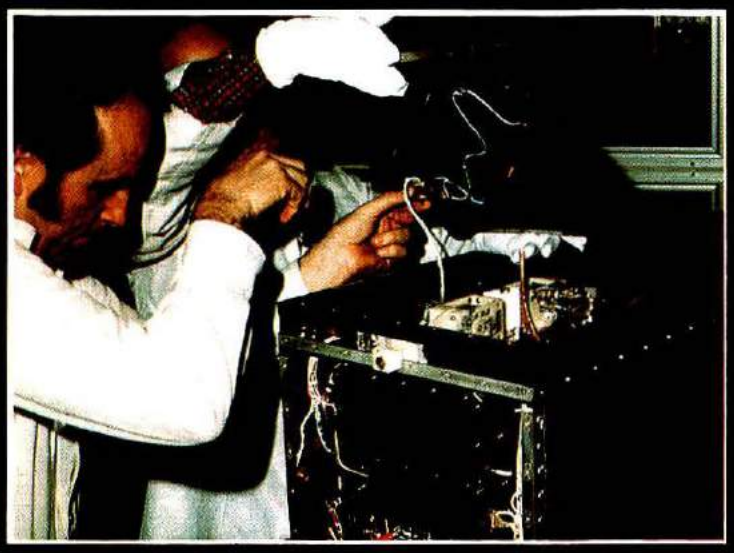
CB ANTENNA WARNING LABELS plus instructions on safe antenna installation and written warnings on installation hazards are to be required by the Consumer Products Safety Commission. The warning requirements, a result of all-too-frequent electrocutions of people installing antennas near power lines, apply to TV antennas as well, and are expected to increase retail antenna prices by about a dollar. The requirement becomes effective about October 1.

AN ALL-TIME HIGH 346,735 U.S. Amateur operator licenses were in effect at the end of June, a growth of 8½ per cent in the Amateur population since a year ago. Extra class showed the biggest percentage growth during the period, up 17.6 per cent to 20,468. Next in line was the Novice class, up to 62,812 for a 12.7 per cent increase. Totals for the other license classes are 67,096 for Technicians, 115,995 for Generals, and 80,364 for Advanced.

23,902 Amateur Applications hit Gettysburg in June, making it the fifth month in a row in which Amateur applications were at an all-time high for those calendar months. Included in that number are, of course, renewals and modifications as well as new licensees — plus, unfortunately, a good number of requests for new callsigns from Amateurs not eligible for them!

The Birth of OSCAR 8

By Norm Chalfin, K6PGX,
and Bill Alber, WA6CAX



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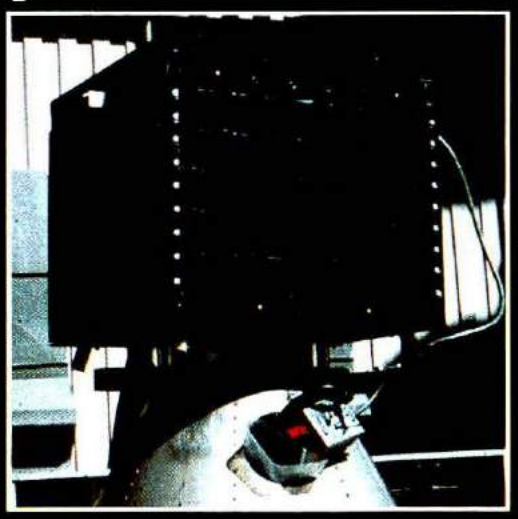


B

C

D

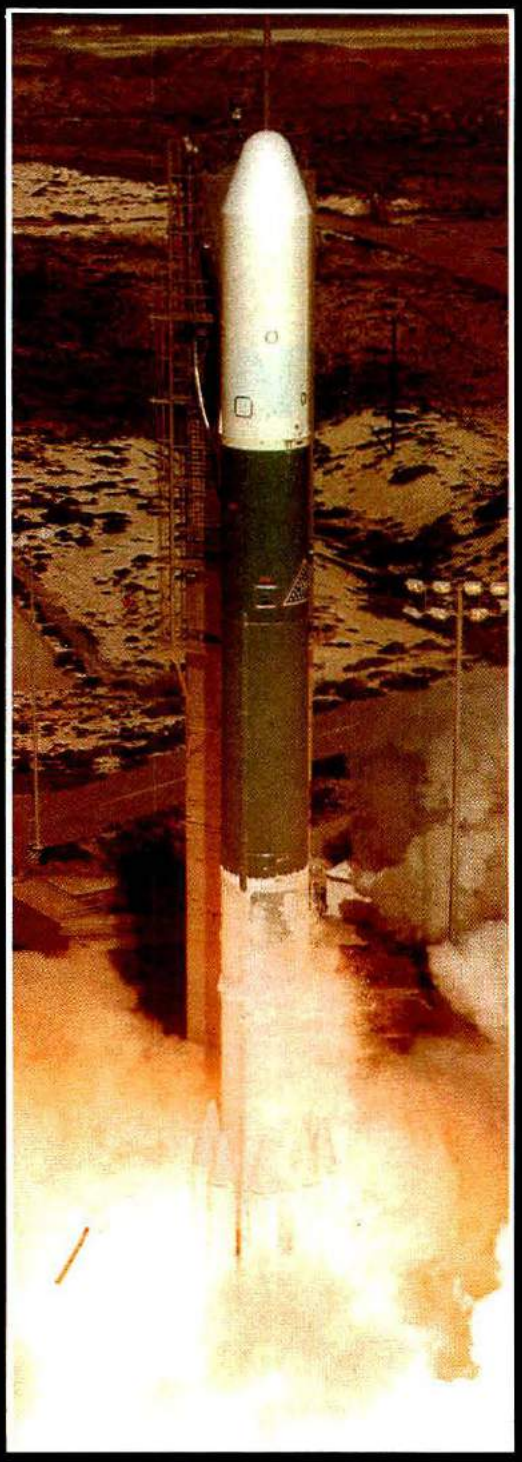
A) The OSCAR-8 bird is put through last-minute tests in the clean room at Vandenburg.

B) The solar cells are given a full-sunlight check.

C) Every speck of dust is removed in preparation for final buttoning-up.

D) The protective covering is being removed from the solar panel.

At the far right a Delta rocket heads for orbit carrying OSCAR 8 and a LANDSAT-C Earth Resources Technology satellite.



The last days before a satellite launch are marked by a series of dramatic moments, with a peak of excitement at lift-off, and another of breath-holding import when you wait for the first signals to come back from orbit. Here are some final-days highlights of who and what makes an OSCAR work.

Most hobbyists like to spend their spare time putting things together. On Sunday, March 5, 1978, amateur radio operators saw one of their own communications satellites take a piggyback ride into space. It was the eighth launching of an amateur-radio satellite, a satellite put together in basements and garages and back yards.

The new radio communications satellite, designated AMSAT OSCAR 8, now in orbit, provides two "repeaters-in-space" for use by hams all over the world. It was planned that these repeaters, or translators, would operate on alternate days.* One repeater, Mode A, receives signals in the 2-meter amateur band, which are translated into an output in the 10-meter band. The other, Mode J, translates 2-meter input signals to the 70-centimeter band.

A brief review

OSCAR is an acronym for Orbiting Satellite Carrying Amateur Radio. The program is sponsored by a dedicated group of progressive hams known as AMSAT, an acronym for the Radio **AM**ateur **SAT**ellite Corporation, a nonprofit group based in Washington, DC, that now has a worldwide membership of several thousands.

In this article we provide some insight into this fine program: how it started, what it does, and a report on the latest development — the preparation and launch of the eighth amateur-radio satellite to be put into orbit. Some interesting sidelights are presented that give an idea of the tremendous amount of work involved in such a project. It's well to remember that the OSCAR satellite was an add-on to the launch vehicle, whose main objective was to put scientific payloads into orbit. The fact that the amateur OSCAR payload met the stringent technical requirements of NASA is a tribute to the dedication and expertise of the radio amateurs who contributed their time and energy to the project.

Title page OSCAR photographs by WB6NOA and WA6CAX; launch photograph courtesy of NASA.

The launch

The launch of OSCAR 8 occurred at 9:45 AM PST on March 5, 1978, from Vandenberg Air Force Base in California. OSCAR 8 was a secondary payload on the LANDSAT-C NASA Earth Resources Satellite mission. Also carried aboard the Delta rocket was PIX, the **P**lasma **I**nteraction **X**periment from NASA's Lewis Research Center; PIX will study corona breakdown in the space environment for higher-voltage solar-cell electric generators.

It was a "textbook" launch. Despite flooding at Vandenberg and road conditions that stranded many seeking to get to the launch site, everything went exactly as planned. But a large viewing audience and wide press coverage were lacking because of the rain. Only the local press was at the site.

A TV crew from the Jet Propulsion Laboratory in California covered the launch and fed video back to Los Angeles. Bill Carpenter, WB6QZY, was a member of the TV crew. Norm Chalfin, K6PGX, who provided the background information for this piece of the OSCAR program, was stranded in Ventura, California, south of the Vandenberg launch site, by torrential rain and closed highways. Among the luckier fellows (who managed to get to the launch site) were Jay Holladay, W6EJJ; Skip Reyman, W6PAJ; and Randy Johnstone, WB6QWR. They were picked up at the Ventura County airport by Booth Hartley, N6BH, who "just happened" to be flying to Lompoc, California, and was talking on 223.5 MHz. It pays to listen!

*The schedule as of July 1978 was: Mode A: Monday, Tuesday, Thursday, Friday, GMT; Mode J: Saturday and Sunday GMT. On Wednesdays EXPERIMENTER Activities only are allowed. Time for experiments is scheduled by AMSAT and ARRL.

Norm Chalfin, K6PGX (with camera); Perry Klein, W3PK, OSCAR 8's guardian during the trip from Washington; and Bernard Glassmeyer, W9KDR, from the ARRL, wheel the box containing OSCAR 8 down the concourse at Los Angeles International Airport (*photo by West, WB6NOA*).

The following account is by Norm, K6PGX. It will fill you in on how the program started and bring you up to date. Then, Bill Alber, WA6CAX, presents his story of what happened from the time OSCAR 8 left Dulles airport in Washington, DC, to its arrival in Los Angeles, California, and its subsequent launch into orbit from Vandenberg Air Force Base.

The OSCAR communications satellites

The first OSCAR was launched on December 12, 1961, aboard the Discoverer 36 on an Air Force Thor Agena-B rocket. OSCAR 1 weighed only 4.5 kg (10 lb.) and was merely a beacon transmitter broadcasting the ham-radio greeting

Perry, W3PK, and co-author Bill Alber, WA6CAX, lift the precious cargo of OSCAR 8 into the waiting van belonging to Skip Reymann, W6PAJ, for its trip to Vandenberg Air Force Base and the launch site (*photo by West, WB6NOA*).

HI in Morse Code. The second OSCAR was launched June 1, 1962, and was identical to the first. Each transmitted for 18 days — until its batteries were exhausted. These satellites subsequently decayed in orbit and were consumed by the earth's atmosphere. The third OSCAR was one of seven space satellites (carried simultaneously) aboard a joint Army-Navy-Air Force Thor Agena-D launched March 9, 1965. It transmitted for 16 days.

All the first three amateur-radio communications satellites were designed and built by members of the Project OSCAR group, organized at Foothill College in Los Altos, California, and the Lockheed Amateur Radio Club, Sunnyvale, California.

The Thompson Ramo-Woolridge (TRW) Amateur Radio Club designed and built the fourth OSCAR, which was launched on an Air Force Titan 3-C, along with three other spacecraft, on December 21, 1965. It operated as a translator for about three months. A substantial number of intercontinental amateur contacts occurred, as well as contacts between U.S. amateurs on both coasts.

The fifth OSCAR was designed and built by the Australis OSCAR group operating from Latrobe University near Melbourne, Australia. OSCAR 5 was launched for the Australian group under the auspices of AMSAT on January 23, 1970, by NASA. It was a beacon, like the early OSCARs, and transmitted for 46 days.

Long-life OSCARs

The first of the long life amateur-radio satellites was AMSAT OSCAR 6, which had a design life of one year, but which continued to operate for 4-3/4 years after its launch on October 15, 1972. OSCAR 6 included a 2-meter-to-10-meter translator and a system called CODESTORE, which could be loaded with messages by the amateur ground-control network to be later retrieved by operators in another part of the world.

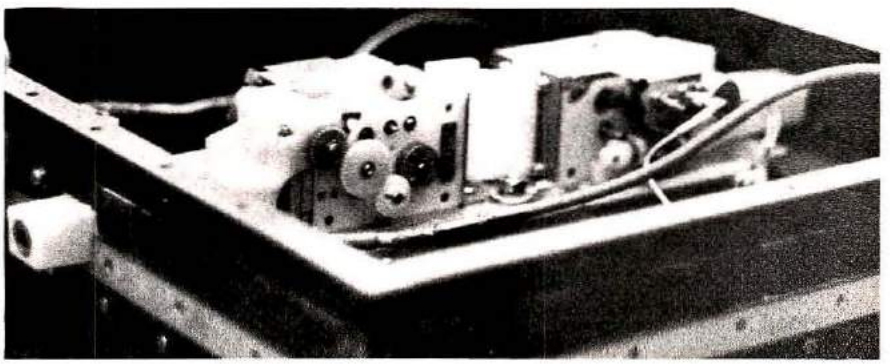
A particular application of CODESTORE is one in which a request for medical assistance by persons in remote areas could be entered into the CODESTORE system. A response could be entered, with medical advice to be received by the requester on a subsequent orbit of the OSCAR satellite. AMSAT OSCAR 8, launched March 5, 1978, is designed to replace the capability amateurs have lost with the demise of OSCAR 6. OSCAR 6 and OSCAR 7 were launched by NASA as a secondary payload with weather satellites ITOS-D and G, later identified as NOAA

Norm Chalfin, K6PGX, co-author of this article, affixes the corsage contributed by airline stewardesses to OSCAR 8's container. Perry Klein, W3PK, looking somewhat harried and tired after the long trip from Washington, DC, supervises (*photo by West, WB6NOA*).

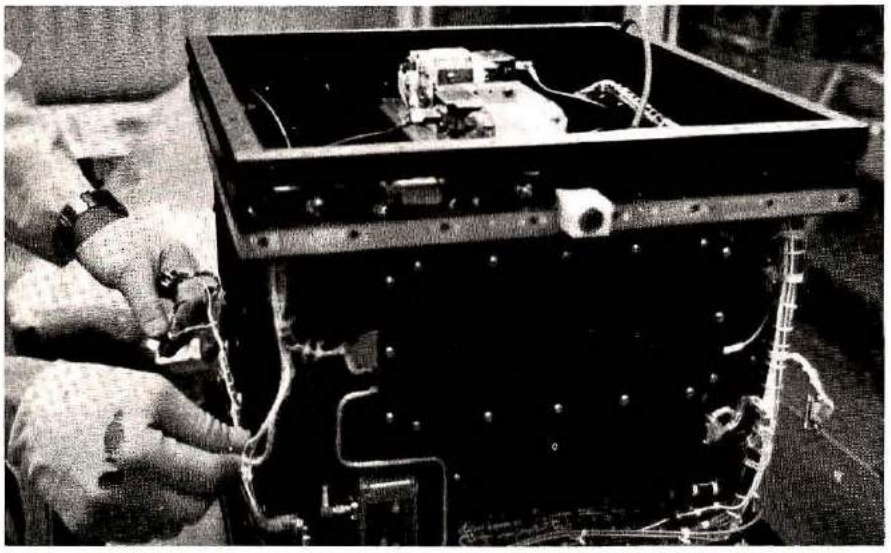
weather satellites. Amateur-built OSCAR 6 actually outlived its commercially built host, ITOS-D. ITOS-D was out of service two years after launch.

The seventh AMSAT OSCAR amateur communications satellite is still in operation. It has a 2-meter-to-10-meter translator and a 70-centimeter-to-2-meter translator. The latter translator was designed and built by members of the AMSAT Deutschland group associated with Marburg University near

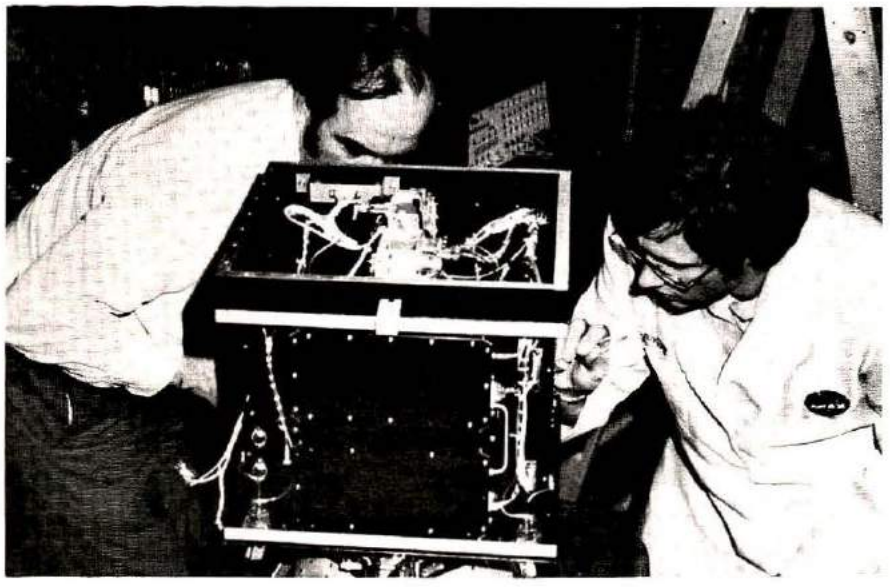
The mechanism that extends the 10-meter dipole (*photo by Alber, WA6CAX*).



OSCAR has just arrived at Vandenberg. Engineers and technicians are inspecting the hardware for obvious damage and making preparations for extensive launch-readiness tests.



Technician checking the transponder.



View of OSCAR 8 on its mating pedestal. The 10-meter dipole deployment mechanism is in the top portion of the container (*photos by Alber, WA6CAX*).

Frankfort in West Germany. They called their unit the "Umsetzer." It is in a polar orbit and circles the globe every 115 minutes. OSCAR 7 makes three passes each morning and three each evening, in view of almost all the world. With a 10-meter or 2-meter receiver, you can listen to the amateurs communicating through the spacecraft.

One of the important aspects of the amateur-radio satellite communications program is that schools can set up very simple ground stations to give students hands-on experience with space communications, satellite orbits, and all the scientific information associated with space activity. The AMSAT OSCAR 7 was the first in a series of amateur space projects involving international cooperation. In it were included Canadian-, Australian-, German-, and U.S.-designed and constructed systems. OSCAR 7 was launched November 15, 1974, and has now exceeded its design life of three years. Projections based on experience with OSCAR 6 indicate many more years of active life can be expected from OSCAR 7.

OSCAR 8 has been a project of amateurs in the U.S. (AMSAT), Japan (JAMSAT), Germany (AMSAT-Deutschland), and AMSAT-Canada. It was assembled and prepared for launch by the U.S. amateur members of AMSAT and the ARRL. Following a period of testing, the spacecraft was turned over to the ARRL for use in its ongoing space-oriented educational science programs for schools all over the country and in Canada. Curriculum materials are available from the ARRL in Newington, Connecticut

Construction costs for the amateur-radio satellites have been borne entirely by amateurs from membership dues to their AMSAT clubs throughout the world. A number of contributions of equipment and services have

come from industry. With donated amateur labor and a minimum of cash purchases, the OSCAR 7 spacecraft cost $64,000 out-of-pocket. Had the satellite been built under industrial auspices, it would have cost $2 million!

OSCAR 8 pre-launch

OSCAR 8 is now up and working. You can get all the latest information on what's going on by reading *hr report*,* a weekly newsletter that covers all amateur radio satellite activities as well as other timely topics.

But what happened between the time OSCAR 8 arrived in California and its launch into polar orbit? The following story is by Bill Alber, WA6CAX, who was there. It provides an interesting insight into the dedication and enthusiasm of amateurs and shows a little of what goes on during the launch-readiness tests of rocketborne electronic equipment. It also gives an idea of how resourceful hams can be when faced with adversity. Here's Bill's story:

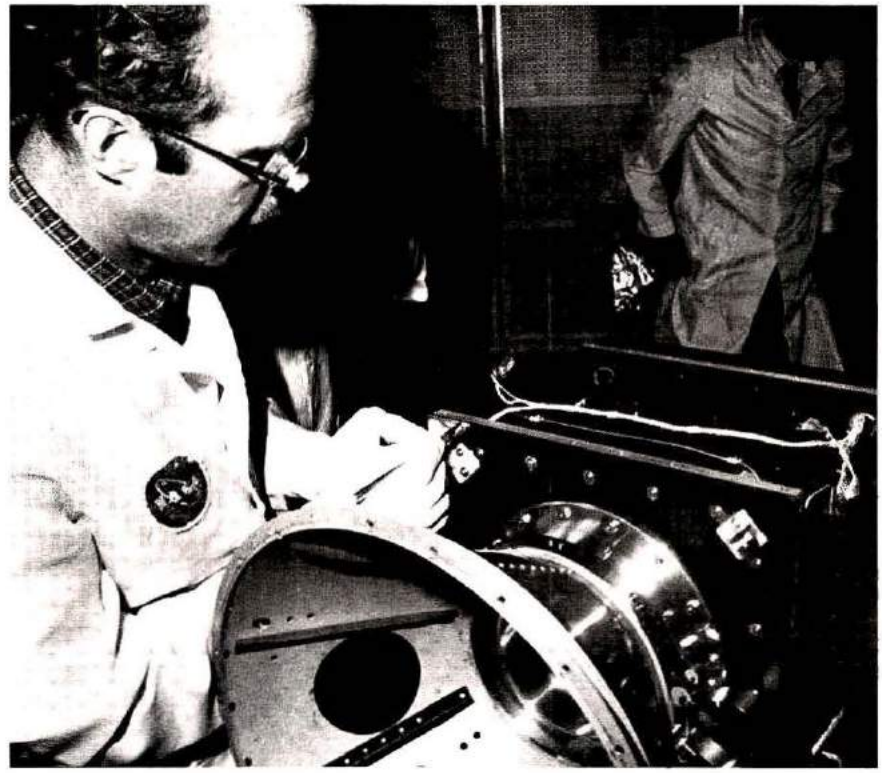
OSCAR 8 arrives in California

The crowd at Los Angeles International Airport awaiting the arrival of United Airlines flight 55 from Dulles was buzzing. Why all the photographers? Is someone special on this flight?

"Yes," I said, "it's OSCAR 8."

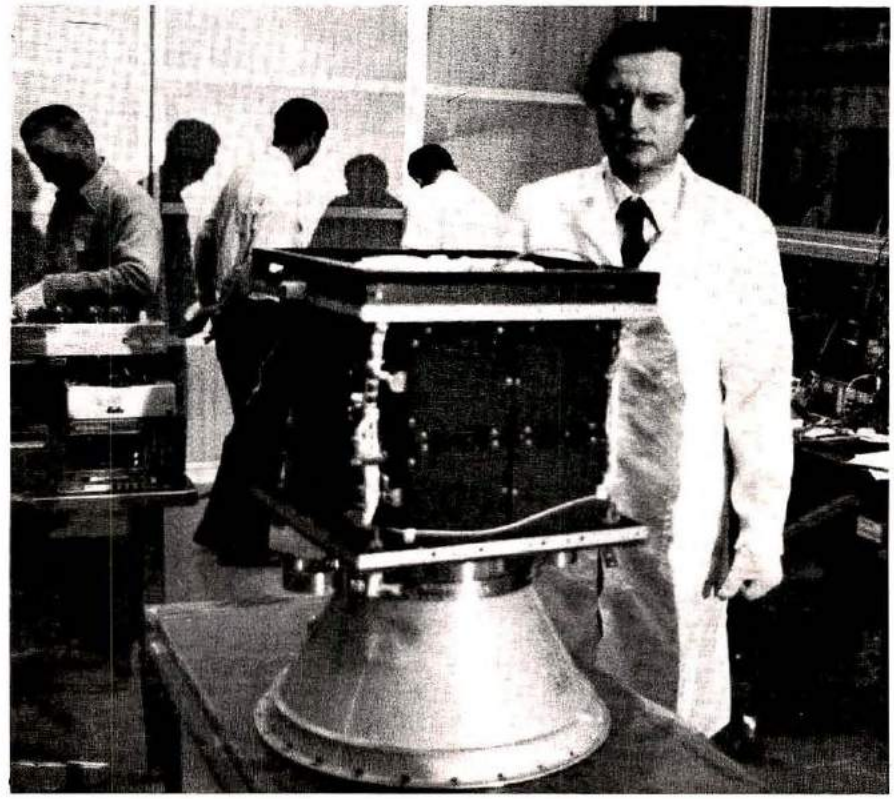
The next question was obvious, but before I could explain what OSCAR 8 stands for, I was interrupted by passengers streaming out of the jetway. They, too, were abuzz about OSCAR 8. Why had the crew wanted to put OSCAR in the *baggage* compartment? The passengers drifted away before we could explain. We hams at the gate had barely let the last passenger disembark before we charged down the jetway and into the cabin of the DC-10.

**hr report*, published by Communications Technology, Greenville, New Hampshire 03048.

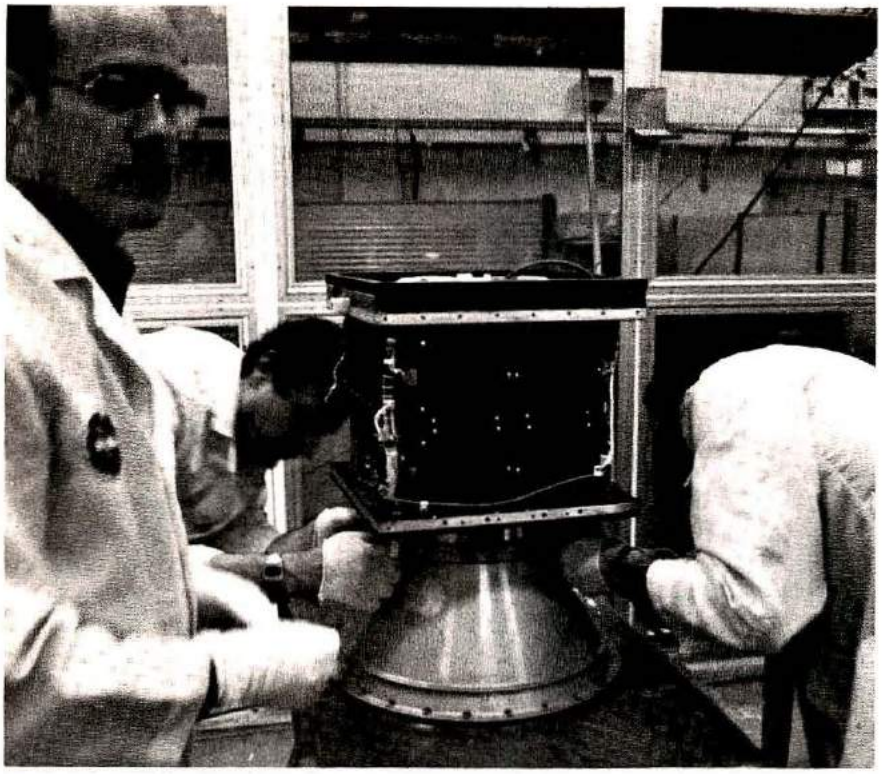


An inside glimpse of the care and thoroughness used to prepare OSCAR 8 for launch readiness. The mating shell is in the foreground.

There was OSCAR 8, in row 1, traveling first class. Dr. Perry Klein, W3PK, OSCAR 8's escort, looked tired. He had just barely made it from the East Coast. Many airports had been closed because of the weather when his flight left Dulles. The 70°



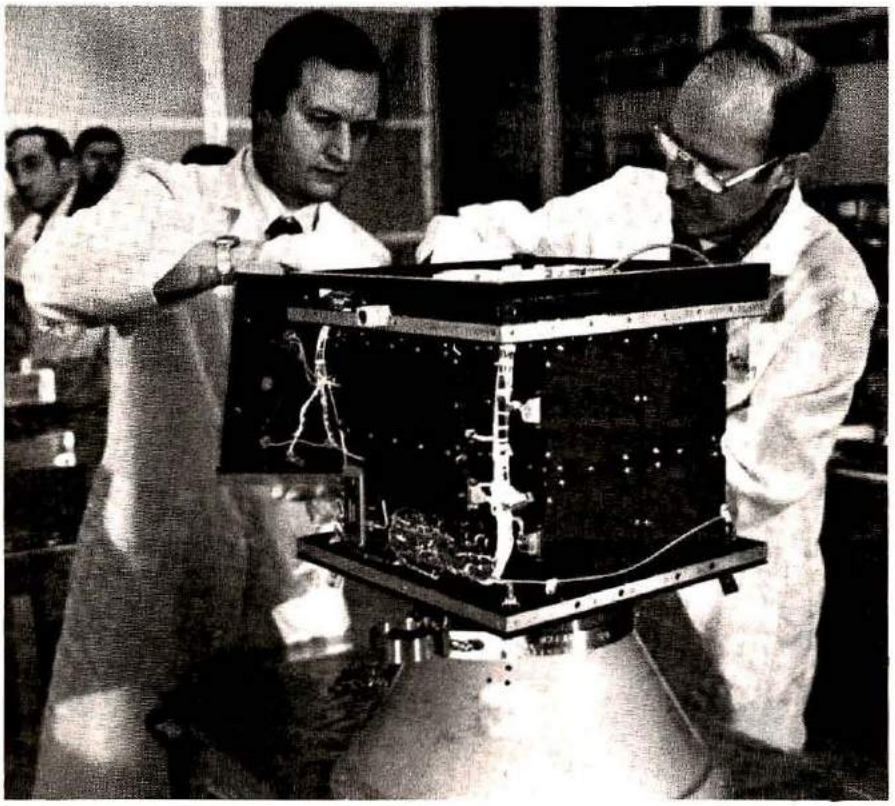
Perry, W3PK, looking on as OSCAR 8 awaits its next test (*photos by Alber, WA6CAX*).



OSCAR 8 on its launch mount. From left: Dick, WA4DGU; Perry W3PK; and Jan King, W3GEY from AMSAT (*photo by Alber, WA6CAX*).

southern-California weather must have been a welcome relief from the blizzard he left behind.

The weather was not the only obstacle. In the beginning, at Dulles, the cabin attendants had insisted that, since OSCAR 8 obviously wouldn't fit under the seat, it would have to be stowed in the baggage compartment. Horrors! OSCAR relagated to suitcase status was unthinkable! Perry and an airlines agent went to see where they planned to place OSCAR 8 and to check how they planned to secure it. Perry told us later he was almost convinced that OSCAR 8 would be safe in the baggage section, but he still wanted OSCAR 8 in the passenger cabin. Attendants were just starting to wheel OSCAR 8 toward the baggage ramp door when the captain came up to see what the commotion was all about. After Perry explained what was in the big white box, the captain took a look around and saw that only a few passengers were in the first-class section. If Perry bought OSCAR a ticket, and if OSCAR 8 would fit on the seat, and if the baggage handlers could secure OSCAR 8 in a seat, then it could remain in the passenger compartment!



Perry, W3PK, and Dick, WA4DGU, installing OSCAR 8's solar panels (*photo by K6PGX*).

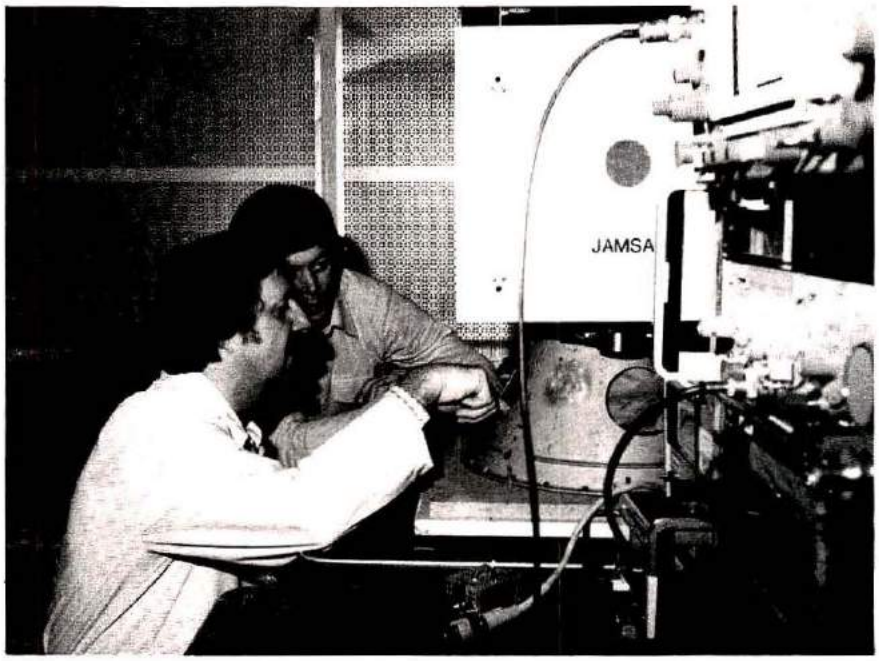
OSCAR 8 was secured in the seat. The baggage men used cargo straps that hook into the seat tracks in the cabin floor and had OSCAR 8 trussed up like a Thanksgiving bird.

At Los Angeles, Perry and I started to unhook the straps, assisted by Gordon, WB6NOA; Norm, K6PGX; and Bernie, W9KDR. With the tie-down straps removed, we all helped inch the big box down the aisle toward the door and placed it onto the dolly that Perry had brought with him.

OSCAR 8 was rolled from the gate area through the tunnel to the street. Here we met Skip, W6PAJ, who would transport OSCAR 8 to the NASA Vandenberg launch facility in his van.

Skip arrived with not only a van but with a huge Airstream trailer as well! He'd driven this rig around the entire Los Angeles airport terminal (United Airlines is in the last concourse on a one-way loop) on a very crowded Saturday night.

OSCAR 8 was placed into the van with great care. All went well except that someone let



Skip Reymann, W6PAJ, left, and Bernard Glassmeyer, W9KDR, examine the spring release nacelle beneath the base of the AMSAT OSCAR 8 spacecraft during the test phase of preparation for launch at the NASA test center in Lompoc, California (*photo by K6PGX*).

go when the box was still a short distance from the carpet. Thud! Perry frowned. (The culprit has yet to confess.) The caravan then left for NASA Vandenberg.

Pre-launch tests

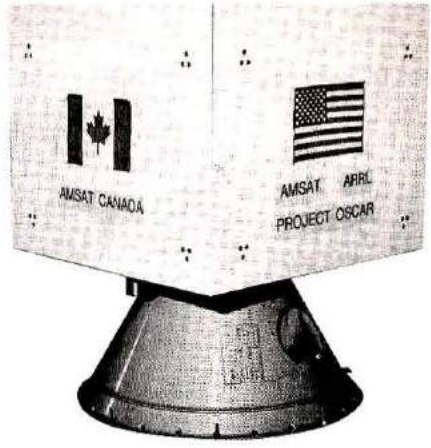
Throughout the next week OSCAR 8 was subjected to rigorous testing for reaction to heat, cold, vibration, G (gravitational) stress, and other conditions it will face during its operational lifetime. Thursday, February 23, found the spacecraft in the "clean room" in NASA's building 836 at Vandenberg. Here, all electronic systems were given a final inspection and tested. Each mode was commanded and every function checked, including the ominous one labeled "Destruct."

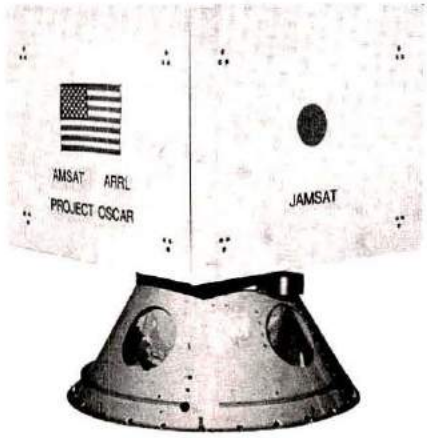
For the destruct test, special permission had to be obtained from Launch Control, just in case there was another satellite in the area on the same destruct command code. I was assured by Jan King of AMSAT that the destruct mode is disarmed after the spacecraft is safely in orbit. Jan was very kind and answered all of my questions.

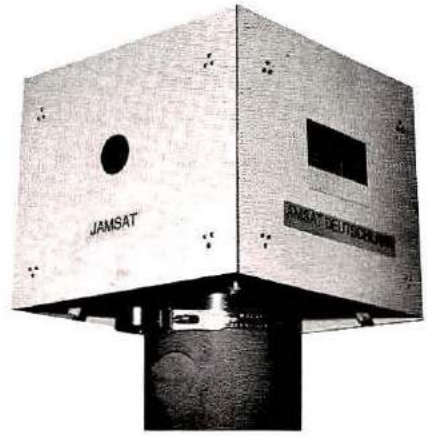
Being a pilot, I was particularly interested in the flight characteristics of the spacecraft. Jan explained that a large coil spring separates the spacecraft from the launch vehicle and sends the spacecraft spinning away. The stabilizing system is very simple. It consists of four large magnets that align the spacecraft with the earth's magnetic field. Several days are required for the spacecraft to stabilize, but the spacecraft is then *so stable* that a temperature problem arises. The side of the spacecraft facing the sun is very hot; the dark side is very cold. Ideally, the spacecraft should rotate at one revolution every few minutes.

When Jan explained the solution to the problem I couldn't believe it at first. The four 2-meter blade antennas are white on one side and black on the other. Black absorbs heat and white reflects it. This difference results in a minute pressure differential that causes the desired rotation.

With the destruct test completed, the spacecraft was moved outside to test the solar cells and regulators in actual sunlight. All systems checked







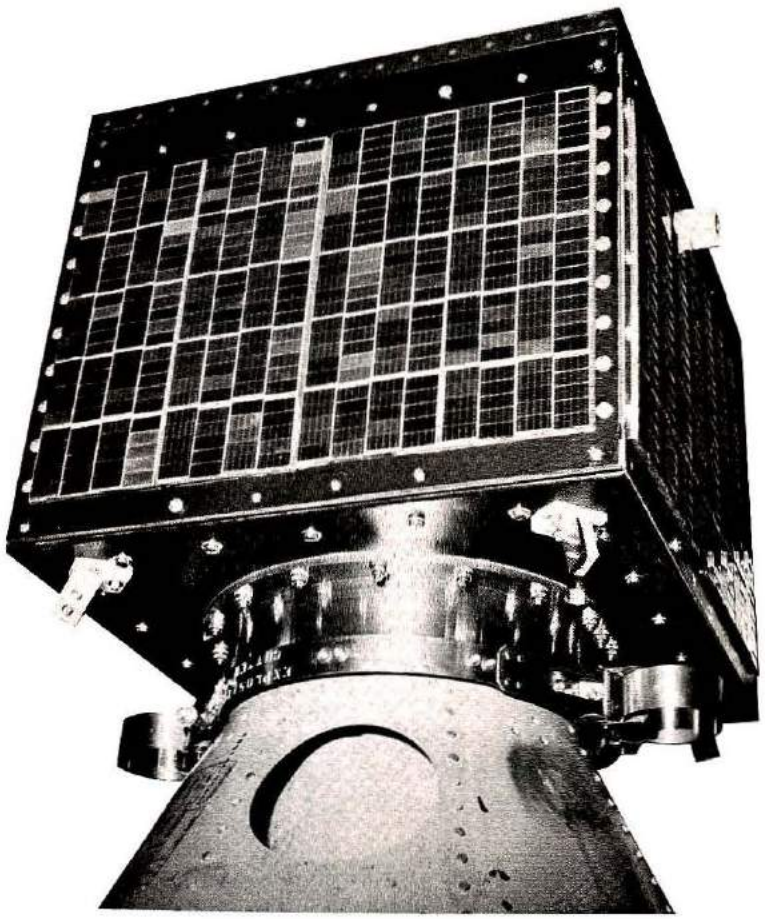
The covers that protected the solar panels during shipping and handling show the multinational background of OSCAR. Amateur individuals and groups in Canada, Germany, Japan, and the United States contributed material and skills to design and assemble this eighth satellite (*photos by K6PGX*).

out fine. Back in the clean room, it was time for what was perhaps the most delicate test, that of deploying the 10-meter dipole antenna. The dipole is stored as a metal strip on a reel. On command the reel unwinds, pushing the strip of foil through a form that rolls it into a tube as the antenna extends. With the dipole extended, Perry Klein checked radiation along its entire length. With the test completed, the electric motors were reversed and the fragile antenna retracted into the spacecraft. "The next time the dipole appears" Jan said, "the spacecraft will be more than 800 km or 500 miles above the earth's surface."

Jan explained that the dipole would be commanded to extend several days after orbit was achieved. The spacecraft spins for that time before the bar-magnet stabilization system slows the spacecraft to its final rotation rate. Telemetered information from the banks of solar cells shows how often each bank faces the sun in a given period. In this way, the rotation speed can be calculated. Once the dipole is extended, it locks into place and can't be retracted, even accidentally.

Final preparations

The basic systems tests were completed and the spacecraft was disassembled into its major subassemblies. Each was subjected to a rigid visual examination. A solder splash or two and a frayed section of insulation on the vhf antenna feedline were discovered and corrected. Each subassembly was cleaned and given a blast of nitrogen. The cleaning continued.



Here it is — OSCAR 8 has been subjected to extensive tests and is ready to be mated to the launch vehicle. Another step forward for amateur radio! (*Photo by K6PGX.*)

I watched as Jay Holladay, W6EJJ, and Dick Daniels, WA4JUD, removed the plastic coating that covered the highly polished surface on the outside of the spacecraft. The polished surface resembles a first-surface mirror. As each portion was inspected and cleaned it was replaced in the spacecraft. All connections were checked and sealed. At each stage of assembly copious amounts of the dry nitrogen were applied to assure that dust and moisture contamination was minimized. All bolts were tightened to exacting torque specifications. The polished outer panels, containing the solar cells, were attached one at a time and the operation of each checked again.

Finally the spacecraft was ready to be mated to the launch vehicle. The 2-meter and uhf antennas would be attached at the gantry,* after the spacecraft had been mated to the launch vehicle. After a final blast of nitrogen, OSCAR 8 was sealed in a giant plastic bag and taken to the gantry.

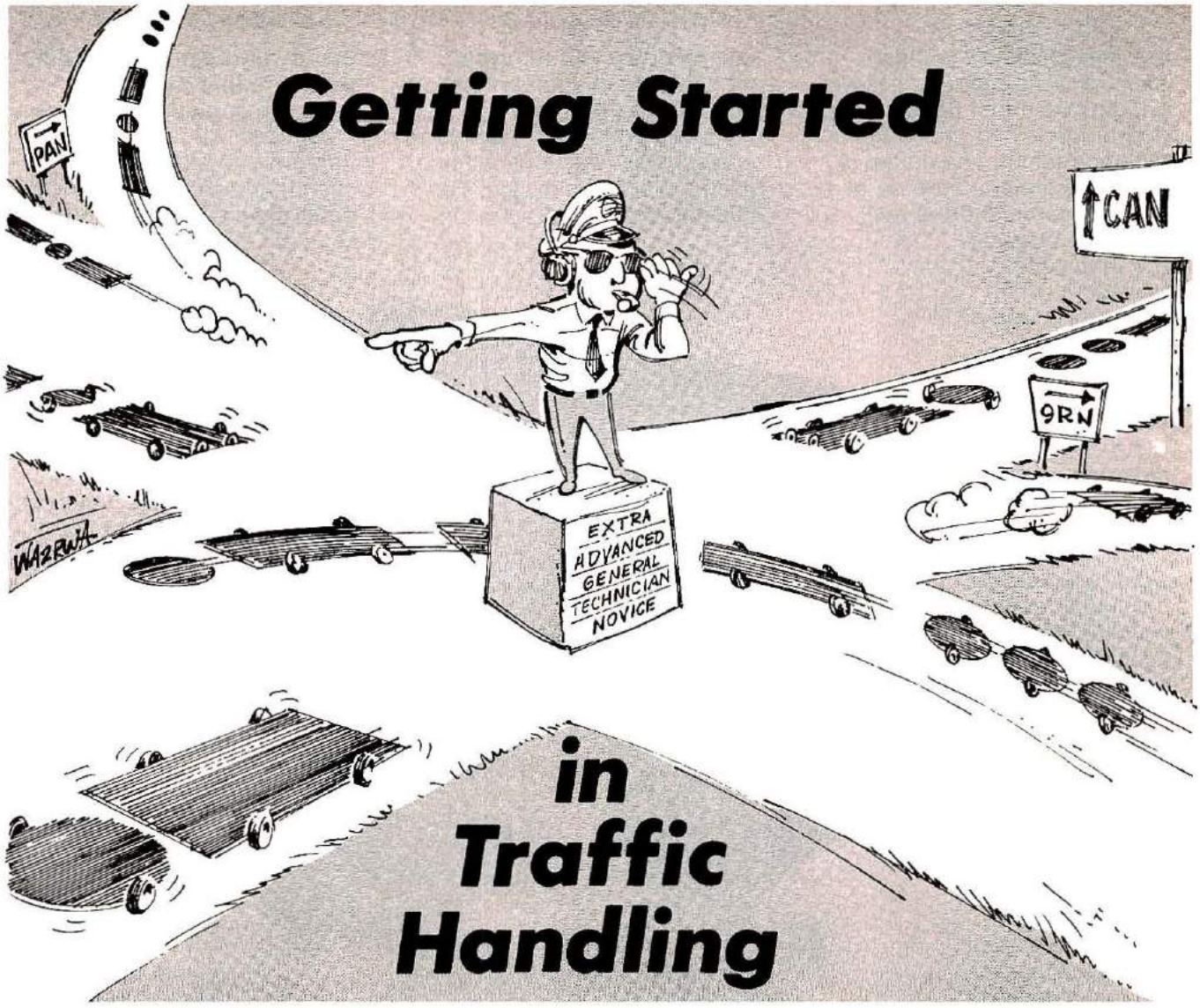
At the gantry, the spacecraft was mounted, and the coil spring that would separate it from the launch vehicle was compressed. NASA technicians installed and armed the various explosive devices, and OSCAR 8 was launch-ready. On Sunday, March 5, the storm that had been flooding California let up and at 0945 PST (1745 GCT) LANDSAT, the primary payload, OSCAR 8, and other experimental packages were rocketed to a perfect polar orbit.

Concluding observations

OSCAR 8 is up, in good working order, and waiting for *your* signal. As Norm, K6PGX, pointed out earlier, it's a "repeater in space." With very low power you can use the satellite as a geometric lever to communicate with amateurs around the world.

HRH

*A gantry is a huge, reinforced-steel structure that houses a launch vehicle at a rocket launch site. It contains all the many facilities used to put the launch vehicle into space. **Editor.**



Getting Started in Traffic Handling

BY DAVID G. BOYD, K9MX

For most amateurs, the Morse code is more of an obstacle to license upgrading than is electronic theory. But this is not true for at least one small group of amateurs (30 to 50 in each state) who seem to have no trouble at all with the code. These are the guys and gals on the CW traffic nets. If you analyze rosters of the various traffic nets — at least the one with which I do business, the Illinois Section Net (ILN), you'd find that the distribution of license classes among net members is a mirror image of the national amateur distribution. Whereas the bulk of U.S. amateurs are Generals, with a slightly smaller number of Advanced, and a far smaller percentage of Extras (55.3, 38.5, and 8.4 per cent, based on the 1977 *Amateur Callbook* and excluding Novices and Technicians), the order is exactly reversed on ILN. Only 28 per cent of ILN members are Generals, 30.7 per cent are Advanced, and the largest proportion, 41.3 per cent are Extras.

Before you jump to conclusions, let me point out that most of the members of ILN earned their Extra (and even Advanced) tickets *after* getting involved in CW traffic handling. The boys of ILN (unfortunately there are not, as yet, any girls in our net) are a fairly ordinary cross section of hams. Sure, we're a bright lot, but no more so than the rest of the amateur fraternity. We've clearly been more successful in upgrading our tickets.

"There must be something to CW traffic handling that helps," you say. And you're absolutely right. CW net operation is almost perfect, regular, high-speed code practice given in a form that's more fun and more useful than either W1AW code-practice transmissions or tapes. Furthermore, it's a public service!

Get your feet wet

If you're like most amateurs, the mysteries of traffic handling can be a bit frightening. Everyone seems to be afraid of the procedures rather than of the code itself. They seem afraid they'll look a fool on the net. But think for just a moment — the other guys on

the net are hams just like you. Each also has had a first time on the net. They were not born with scads of experience. And, like all hams, they tend to be friendly and downright generous to newcomers. I can assure you that you'll not be laughed at. Procedures are easy to learn and I'll show you just how easy.

Not all traffic is handled on CW nets, of course, and much of what I am about to tell you applies to phone traffic as well, with the usual admonition to avoid abbreviations and Q signals on ssb. But it's the CW net that will help you most in preparing for your FCC exams, so I'll concentrate on that.

Finding and joining a net

The American Radio Relay League (ARRL) publishes a list of most of the more active nets in the United States. You can get a copy by sending a self-addressed, stamped envelope with about 26 cents postage to ARRL, 225 Main Street, Newington, Connecticut 06111. Ask for the Net Directory and use a large envelope.

Once you have the directory, look for a net that appeals to you in terms of times, amateur bands, and type of traffic handled. I suggest you consider your state section net (ARRL affiliated), because it probably handles more traffic than the others. If your code speed is really slow — below 12-15 WPM — you might consider looking for a slow-speed net in your state. Many states have them and they're ideal for beginners. Most slow-speed nets, in fact, meet on the Novice bands.

Most other nets, however, exist for a specific purpose. The ARRL National Traffic System (NTS), to which the section nets belong, is devoted to preparing operators for handling traffic efficiently in an emergency. Other nets are for weather watches, disseminating OSCAR information, handling traffic for amateurs aboard ships at sea (foreign service nets), and for coordinating the handling of eye or blood donations for medical banks.

Once you've selected a net listen to it for two or three sessions to get a feel for how it works. This will do much for your confidence when you finally check in. You need not have any traffic to QNI (CW shorthand for "check in"); and once you've QNIed three or four times, you'll be considered, in most nets, as a full-fledged member. You don't have to QNI every session so don't feel you're committing yourself to untold hours of work. Many stations check in only once or twice a week, although the more often you check in, the more practice you'll get.

The first time you QNI, the Net Control Station (NCS) will probably hold you for a brief chat at QNF (when the net closes). He'll probably want your name and address so he can send you a net newsletter and roster and a few free operating aids. Few nets (none of the ARRL nets) have any dues, but once you're well established in the net, and intend to stay, you might consider contributing a little toward the cost of the net's newsletter. You'll receive it whether or not you contribute, but these publications are expensive to produce, and every little bit helps.

That first QNI

Now that you've selected a net and decided to QNI, you'll be amazed at how painless it is. You already know two of the special QN signals — QNI and QNF — and there are only a few more. You might find it helpful to have them and the regular Q signals handy when you QNI. If you're a member of the ARRL, you can obtain them free by writing ARRL and asking for *Operating an Amateur Radio Station* and *Operating Aid CD 218 1-77*. If you don't belong to the ARRL, you can still get them by sending 50 cents with your request. The first is a booklet full of traffic-handling information, and the second is a handy little card devoted entirely to traffic handling.

It will be helpful when you first start if you're there early, so you can hear the net call-up. When the NCS begins, he'll probably start with something

Author's station with equipment three layers high. The heater atop the old Hallicrafter's receiver is essential during Chicago winters (I have no heat in my hamshack).

like this:

CQ ILN CQ ILN THE ILLINOIS SECTION NET OF ARRL NTS QNZ QND K9MX QNA 9RN K

That formidable transmission translates to "Calling all Illinois Section Net Stations. Zero beat this frequency (that's QNZ). The net is directed (QND) by K9MX, and I want the station designated to be the liaison to the Ninth Region Net to check in first (QNA 9RN)." You should, of course, wait until that station checks in. Once he has, the NCS will probably send:

ILN DE K9MX QNI K

Zero beat the NCS and then send either one letter (perhaps the first letter of your call) or the last three letters of your call. If he hears you, he'll respond by repeating whatever you sent. You then make a normal call to him and list your traffic. He'll acknowledge your traffic, then either give you instructions or tell you to wait.

To illustrate, let's assume that K9MX is the NCS, and that you, the reader, are N9MX (actually, that's my father's call), and that you have one message for Moline, one for Springfield, and three that are going somewhere outside the state of Illinois. You exchange with the NCS would then go like this:

NCS:	ILN DE K9MX QNI K
YOU:	X
NCS:	X
YOU:	K9MX DE N9MX QTC MOLINE 1 SPRINGFIELD 1 THRU 3 K
NCS:	N9MX DE K9MX R $\overline{AS}$

You know, of course, that $\overline{AS}$, which means wait, is sent as one letter (that's what the bar over it means). If conditions are bad, use all three letters of your call instead of just the last letter. While some of this seems superfluous (and often is), don't take any shortcuts until you've been around a while. Otherwise, you may confuse things so much that you'll wind up having to make long explanations.

There's a minor difference between the way I've shown you to list your traffic and that in the ARRL books. ARRL books tell you to send the number of messages before the city rather than after, as I have. That is, they'll tell you to send **1 MOLINE** instead of **MOLINE 1**. As an NCS I consider my version a bit handier, but you can use either. Additionally, some nets will use the CW designation of the higher net instead of THRU. ILN, for example, generally uses 9RN, but THRU is *always* right and is thus a safe choice for any net. And finally, if you haven't any traffic when you QNI, send QRU instead of QTC and your traffic list.

Some dos and don'ts

Now that you're checked into your net, a few admonitions are in order. First, *listen*. Even when the NCS is talking to another station, the exchange may wind up involving you. You may be needed as a relay, or the NCS may suddenly ask if you agree. It's embarrassing in those cases to have to ask, "With what?" And it wastes time, because the NCS has to explain the whole thing again.

Second, don't volunteer anything unless (1) you're absolutely certain your intervention will help, or (2) you've been invited to intervene by the NCS. Things can get confusing enough for the NCS without having fifteen stations falling over each other offering to help. If he needs you, he'll ask.

Third, if you're not sure of a Q signal, abbreviation, or instruction from the NCS, *ask*. On the other hand, if you're not absolutely certain an abbreviation or Q signal will be understood, spell it out. It's unlikely that anyone on the net is familiar with some of the more exotic Q signals (like QNQ). Explaining what you meant will take more time than it would have had you not used your exotic shortcut.

When it comes time for the NCS to send you off to send or receive traffic, he'll alert you by sending only the last three letters of your call. During your first few times in the net, you may find it hard to recognize your call without the familiar prefix, so pay attention. You'll reply, when the NCS calls, with something to indicate you heard him. Some use T, C, or HR, but when conditions are bad it's usually clearer and more positive if you reply with your last three call letters. Once the NCS is sure you're listening, he'll tell you where to go and what to do.

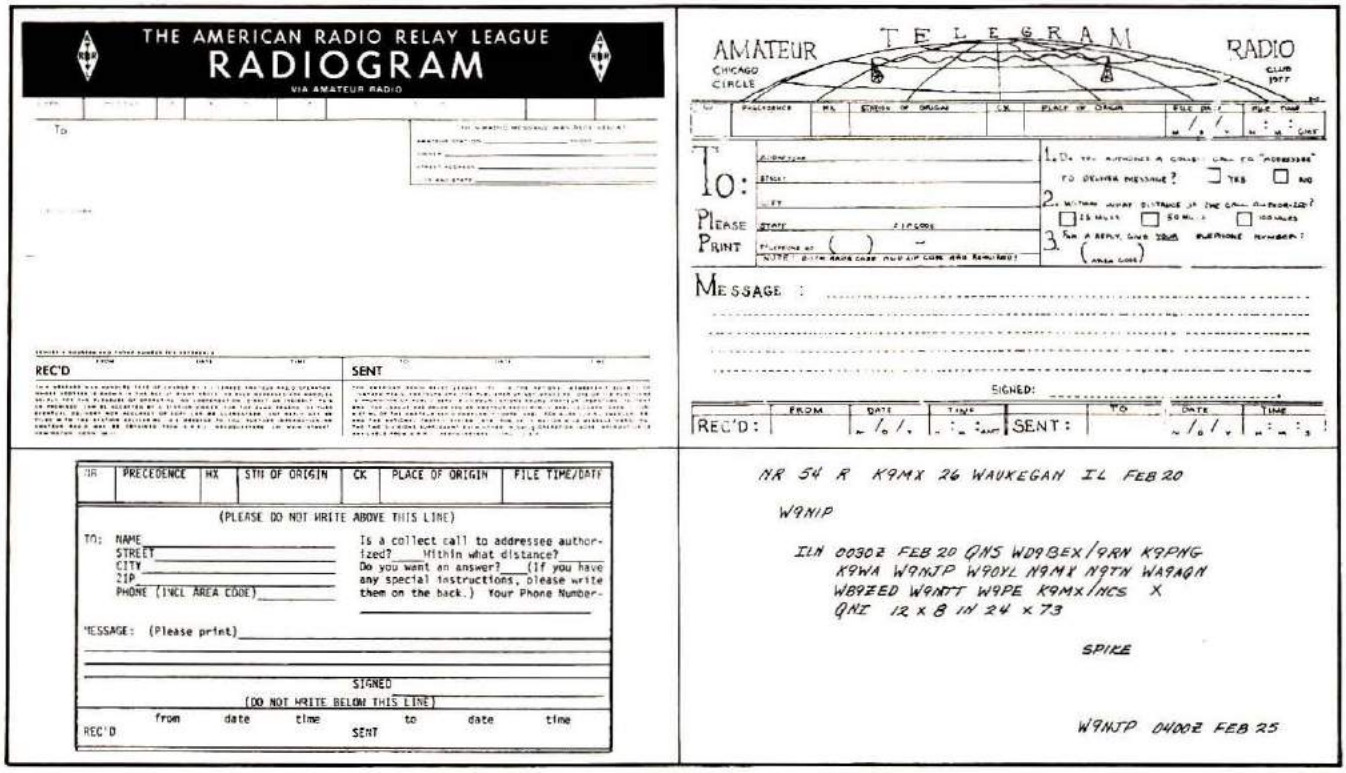
A typical exchange

Remember that you're still N9MX and the NCS is K9MX. In this case, the station with which you'll be doing business is W9NJP (who just happens, in real life, to be the Route Manager of the Illinois Section Net). Here we go:

NCS:	MX
YOU:	MX
NCS:	NJP
W9NJP:	NJP
NCS:	U4 NJP QNR MX 9RN 3
YOU:	G
W9NJP:	G

U4 means to go UP 4 kHz, while D4 would have meant to QSY DOWN 4. Since you know you're the one who has 3 for 9RN, it's logical that you would assume that you are to send them to NJP, so the NCS may shorten his instruction to U4 9RN 3 K. (QNR means, in this case, to receive 3 messages for 9RN from N9MX). The G you both sent at the end means you're "going" to the designated frequency.

Once you're arrived on the assigned frequency, the *receiving* station will make the call. He's the one who needs most to have a clear frequency so he can copy the message, so he'll select the frequency and make the call. (When the NCS sends you up 4, he doesn't mean to go up exactly 4 kHz and wipe out a QSO. That's why the receiving station looks for a hole and makes the call, but don't stray very far



Traffic-handling aids (top left to lower right): ARRL Radiogram form; special-process mimeographed form used by the University of Illinois at Chicago Circle; ordinary mimeographed form; the plain, inexpensive index card usually used by the author.

from the assigned frequency since the NCS will probably send the next pair up 7 or 8.) When you've established contact, the sending station will send QRV?, which means, "Are you ready?" The receiving station responds with QRV, meaning, "I am ready." Don't send **C**, the telegraphic equivalent of yes, to say you're ready, because it can be confusing and the extra two letters don't waste that much time. That whole exchange, then, would look like this:

W9NJP: N9MX DE W9NJP K
YOU: W9NJP DE N9MX QRV? K
W9JNP: QRV
YOU: (Send your messages)

Send only what the NCS told you to send. Since he said to QSP (relay) 9RN 3, don't try to give NJP your Moline or Springfield traffic. The NCS may choose to route that to someone else.

Once NJP sends QSL (confirming receipt) after your last message, make sure you clear by sending his call and yours. That's still an FCC requirement. Then go back to the net frequency and — at the first break — announce your return by sending MX. The NCS will acknowledge and either send you off again or tell you to wait.

Periodically, the NCS will send QNC (all stations copy) QNQ (How do I route messages for . . .), followed by a string of towns for which the net has traffic. If you can handle the traffic for any of the listed cities, send your last three, letters, QSP, and the name of the cities for which you can relay traffic. For example, I would accept Waukegan traffic by sending:

MX QSP WKGN K

Remember to *spell it out* if you're not sure of an abbreviation. The NCS will take over and, in this case, would direct me to $\overline{\text{AS}}$ or send me off to receive traffic.

The NCS may also call you and send you off to give traffic *to* (QNK) or receive traffic *from* (QNR) a station already off the frequency. For example, W9NJP may be busy receiving traffic from K9EEA. It may also be that WA9EBT is waiting to send a message to NJP. In such a case, the NCS will want you to go where NJP is (let's say, for the sake of illustration, that NJP is down 8 kHz), and wait until EBT finishes before you send your traffic. That instruction might go like this:

D8 QNK SPFD NJP AFTER EBT K

As soon as NJP finishes with EBT, he'll go back to the net frequency, since he has no way of knowing the NCS sent you down to him. He'll listen, after he clears EBT, for only 2 or 3 seconds, so jump right in with NJP. He'll acknowledge and then you can send QRV?. Of course, the NCS may send someone to do business with you, too; so always listen for 2 or 3 seconds *before* you change back to the net.

How to write that message

Now that you know how to check in and translate instructions from the NCS, you'll find it useful to know

how to write a message and what all the parts of a standard message mean.

Whether you're originating a message, or receiving, it will take one of three forms: an ordinary message, a service message, or a book. There's not much difference in the three types, since each consists of the same basic parts: a preamble, an address, a text, and a signature.

Breaking down the message

The preamble provides all the essential servicing information for the message. It gives the receiving station the information needed to make inquiries if he has problems with the message, and the information needed by the originating station to identify the message if he's asked questions about it. The preamble includes (1) a number assigned by the originating station (most hams make the first message of the calendar year number 1, then number consecutively until December 31), (2) the precedence (more on that later), (3) the callsign of the station, (4) the city and state where the message was originated, (5) the number of words in the text of the message (called the "check," or message count), and (6) the date (and perhaps the time) the message was originated. I can make all this clearer by constructing a sample message, which I will arbitrarily call number 1 and which originates from my station. My preamble then might look like this:

NR 1 R K9MX ARL 15 WAUKEGAN IL 2300Z JULY 30

This means that this is message number 1, with a routine precedence, from K9MX, with 15 words in the text (including an ARL coded message), originated in Waukegan at 2300Z July 30. Note that the place of origin is not necessarily the same as the location of the originating station. I may pick up a message in Chicago at the University of Illinois and send it from my station in Waukegan. If I did, then the place of origin would be Chicago. Since this is a routine message, the NCS will treat it like all the others, and you'll report it just the way I showed you earlier.

EMERGENCY	Any message having life and death urgency. These are normally messages transmitted in the early stages of a disaster when *only* amateur communications services are available. This precedence is *always spelled out* in the preamble: EMERGENCY.
PRIORITY	Important messages with a time value. They normally include health and welfare reports, press releases, and official messages not having life and death urgency. Abbreviated P.
INQUIRY	Messages having to do with health and welfare inquiries of individuals in a disaster area. Abbreviated Q.
ROUTINE	The normal precedence of everyday traffic. Abbreviated R.

Fig. 1. Precedences used in the message preamble. The first, EMERGENCY, is always spelled out. Priority, Inquiry, and Routine is sent in the preamble with its initial letter, as P, Q, or R.

If the message had a higher precedence, you'd report that fact along with the destination, so the NCS could give it special treatment. If, for example, you had a PRIORITY message, and a couple of routines, you might report your traffic this way:

QTC SPRINGFIELD 1 PRIORITY
MOLINE 2 K

Actually, you're required only to send P to represent priority, but to reduce confusion, spell it out. **Fig. 1** lists the precedences with their designations and interpretations.

The check is, unfortunately, a source of much confusion on nets, even though it's really quite simple. Only the text is counted in the message, and every word and every group of numbers is counted. Example:

TRAFFIC HANDLING IS FUN
365 DAYS A YEAR X ARL SEVEN

Since punctuation is not ordinarily used in traffic handling, the sentences are separated by X, and each X is counted as a word. (You don't have to separate sentences, but it usually makes it clearer if you do.) In this case, the count is 11, with the symbol ARL and the number 365 each counted as words. ARL SEVEN, by the way, means "Reply by amateur radio," and a complete list of ARL coded messages can be found in the back of most logbooks. If you use an ARL code — and they can save a lot of time — always spell out the number and count each word. ARL EIGHTY SIX, for example, counts as *three* words. The check is preceded by ARL if an ARL code is used in the text.

Now, let's put that message together. Note that every time letters appear with a bar over them (such as BT), this represents a procedural signal sent as *one letter*.

(Preamble)	NR 1 R K9MX ARL 15 WAUKEGAN IL 2300Z JUL 30
(Address)	DAVID BOYD $\overline{AA}$ 601 PIONEER CT $\overline{AA}$ WAUKEGAN IL 60085 $\overline{AA}$ TEL 312 244 8830 $\overline{BT}$
(Text)	TRAFFIC HANDLING IS FUN X TRY IT X YOU WILL $\overline{LIKE}$ IT X ARL SEVEN $\overline{BT}$
(Signature)	SPIKE $\overline{AR}$ N

It always helps to include the telephone number in any message you send, and you should also include the area code. It may be delivered by someone with a statewide toll-free (WATS) line and you'll save him time by including the area code.

That $\overline{AR}$ sent at the end means end of message. It doesn't mean the sending

operator is finished transmitting. Give him a second to see if he has anything special to add before you come back to him. If this is the last message he'll be sending to you, he'll add the letter N after the AR. If he has others to send he'll end his message with AR B. Occasionally, he may replace the B with the number of messages he still has for you.

You may find it helpful to have some message forms handy to make it easier to keep track of your traffic. You'll generally find it easier to copy each received or originated message on a separate piece of paper. You can buy ARRL forms in pads, design your own as we did for the station at the University of Illinois at Chicago Circle, mimeograph a form, or use index cards as I do. These copies are aluo helpful in keeping the FCC-required records. We'll discuss these later.

Service messages

It sometimes happens that a message you receive has a problem; perhaps an address is wrong or the people to whom it is addressed have moved. Whatever the problem, it's a courtesy that the receiving operator advise the originating station, and that's why the preamble is important. Let's assume that K9SW has been unable to deliver the message because the addressee has moved. Using information from the preamble, he'd originate a service message that would look like this:

SVC NR 101 R K9SW 15 CALUMET CITY IL AUG 1 K9MX CHICAGO IL UR NR 1 BOYD UNDLVD X NO SUCH PERSON LISTED BY MA BELL X 73 K9SW

Note that there are only two real differences between this and a regular message; the number is preceded by SVC which means "service," and the text is abbreviated. Abbreviations should *never* be used in ordinary messages.

HXA	(Followed by number) Collect landline delivery authorized by addressee within _____ miles. (If no number, authorization is unlimited.)
HXB	(Followed by a number) Cancel message if not delivered within _____ hours of filing time; service originating station.
HXC	Report date and time of delivery (TOD) to originating station.
HXD	Report to originating station the identity of station from which received, plus date and time. Report identity of station to which relayed, plus date and time; or if delivered report date, time and method of delivery.
HXE	Delivering station get reply from addressee, originate message back.
HXF	(Followed by number) Hold delivery until _____ (date).
HXG	Delivery by mail or landline toll call not required. If toll or other expense involved, cancel message and service originating station.

(If more than one HX instruction sign is used, all can be combined if no numbers are to be inserted; otherwise the HX should be repeated.)

Fig. 2. Handling-instruction code for messages (from ARRL Op Aid 9). All are preceded by the letters HX; i.e., "handling instruction."

Service messages are treated just like any others, and the precedence of a service message is always the same as that given the message to which it relates.

Book messages

Quite often you'll receive (or want to send) a message to several different addresses. If the text is the same, much effort would be saved if sent only once. To illustrate, let me use a message announcing the birth of a set of twins (mine, of course) to several members of the Illinois net. You'd ordinarily use full addresses, but in this case that's not necessary since these guys check into the net nearly every night. (WD9BEX, by the way, is my brother as well as one of my examples.) Here's a typical book message:

BOOK OF 3 R K9MX 13 WAUKEGAN IL FEB 27 TWIN BOYS NAMES TY AND TREVOR BORN TODAY X CAROL AND BOYS FINE BT SPIKE BT NR 301 W9OYL AA PEORIA IL BT NR 302 W9NXG AA EAST ALTON IL BT NR 303 WD9BEX AA GRANITE CITY IL BT AR N

When you report a book like this, report it as the number of messages the net will have to handle. For example, if some were going to 9RN and others within the state, you would report one for 9RN and as many as you would send to separate operators in Illinois.

HX and time

Two things I've not mentioned, because they seldom appear in traffic, are the handling instructions and the time of origination. If for some reason you need to have the time in the preamble of your message, just insert it before the date, and identify whether it is UTC (ZULU) time or something else (like CDST). The handling instructions, on the other hand, are quite useful. Always preceded by HX, these are single-letter codes that tell the delivering operator something important about the message. (See **Fig. 2** for a list.) For example, HXC is a request from the originating station for you to tell him the date and time you delivered his message. A preamble that included handling instructions and time would look like this:

NR 301 R HXG K9MX 21 WAUKEGAN IL 2300Z JUL 30

The G in this case means that a collect telephone call is not authorized. You may even find extra codes added, such as HXCG. To decode, just look up the meaning of C, and then of G (see **Fig. 2**).

Sending and receiving traffic

Once the NCS has sent you off frequency to handle traffic, the receiving station will make the first call. Once the contact is established, and QRV? sent and acknowledged, you can send your message. But occasionally the receiving

operator will miss something and need to ask you for a fill (something he missed). To save time, a simple shorthand has been developed to assist in obtaining fills. Generally you'll use only five fill instructions: WA, WB, BN, AA, and AB.

If the receiving operator were to send WA WILL, he'd be asking you to send the word after WILL again. You need send only the next word (LIKE in our example), but it's usually less confusing if you send

WA WILL LIKE IT

We add the additional word after LIKE because, if he missed the one word, he may also have missed the next. Of course, he'll use the word-count (check) when he gets the whole message to ensure he has missed nothing.

If the receiving operator were to send BN YOU AND IT, he'd be asking you for the text between the words YOU and IT. You'd reply with:

YOU WILL LIKE IT

If he then sends a question mark, send it again. The remaining codes are straightforward and mean:

WB	Word before
AA	All after (everything after the word he sends)
AB	All before

Common sense tells you to send unusual words or names twice if you think the receiving station may have problems. If you repeat something, a question mark (IMI) is the procedural signal for "repeat." For example, if you were to send a name like LKSDVRJ, you probably should repeat it by sending:

LKSDVRJ IMI LKSDVRJ

That question mark tells the receiving operator to follow the last word through again.

If you have break-in capability so that your receiver will recover after a very brief pause, hesitate a second or two after every few words. This will allow the other operator to break in immediately for a correction. If you use that system, he'll ask for the correction by sending the last word he received *correctly*. Simply begin again with that word and continue as though you had not been interrupted. If you don't have break-in and can't listen at all during the message, it's customary to send NO QSK before you start your first message.

Always get fills on the message you've just finished sending *before* you start the next one. And, finally, use the signal QSL to indicate you're satisfied that you've received the message completely and correctly.

Reports to the Section Communications Manager

Each month the ARRL Section Communications Manager (SCM) reports on happenings in his section in a brief paragraph in *QST*. If you report your traffic activity to him, you'll be listed in the paragraph with your traffic total. If you get an appointment as an Official Relay Station (ORS), you'll automatically receive cards to use for your reports. Otherwise, just write the SCM or send a message through your net reporting the number of messages you originated (other than from yourself), the number you received, the number you sent, the number you delivered (other than to yourself), and the grand total of all four categories added together. Note that a message you receive *and* deliver gets listed in both the received *and* the delivered categories. Your net will also get credit for each member who takes the time to make a report, so don't hesitate to do so.

FCC logging requirements

Even though logging has been greatly simplified, several special third-party requirements remain. In addition to the ordinary logging requirements, paragraph 97.103(b)(2) of the regulations requires that you make a "notation of third-party traffic sent or received, including names of third parties, and a brief description of the traffic content." It's usually simpler to keep copies of any traffic and make the FCC-required notations directly on the message forms.

National Traffic System and awards/rewards

No doubt, now that you know how to write and handle a

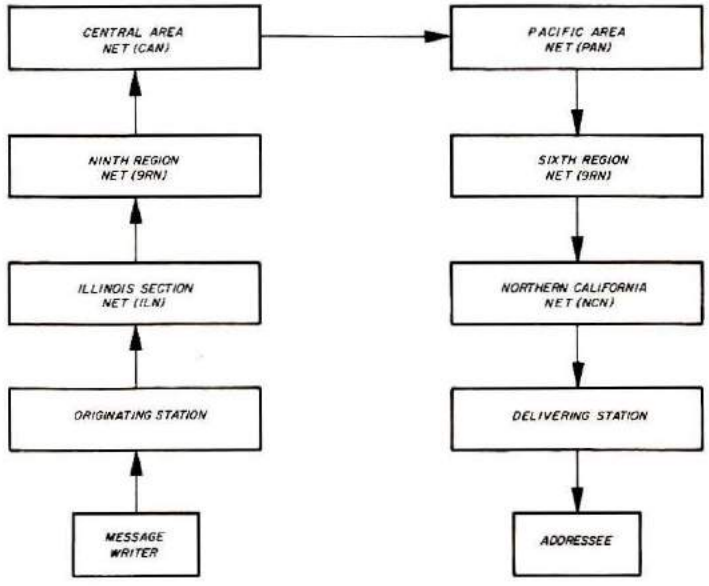


Fig. 3. Routing of a typical message over an amateur radio traffic net. The system has been developed to a high degree of proficiency over the years by dedicated hams interested in developing communications skills and in providing public service.

message, you're at least slightly curious about how the message gets from your station to its destination. If you'll look at **Fig 3**, I can make this explanation very brief.

At each level, nets appoint one or more stations to serve as representatives at the next level. Any traffic going outside a given net then goes to this representative for delivery to the next level. To illustrate, let's follow a message from Waukegan, Illinois to San Francisco, California.

First, the message goes to the region net representative. (The Ninth Region Net, the one that would be used in this example, serves Illinois, Indiana, Wisconsin, and Kentucky.) The representative then checks into 9RN and hands it off to the representative from the Central Area Net (CAN).

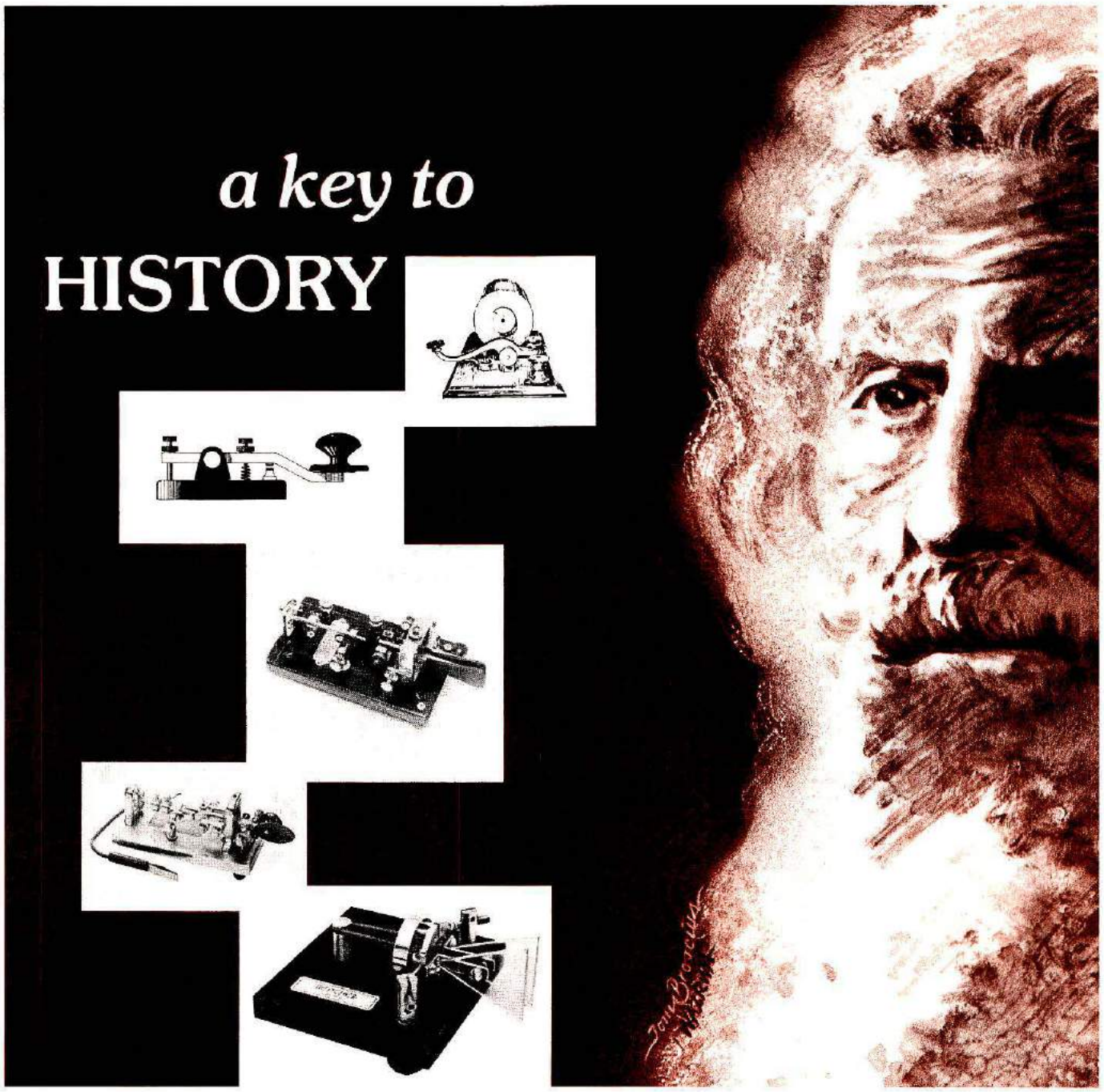
At CAN, our representative delivers the message to the representative from the appropriate net. In this case, the message would go to the representative from the Pacific Area Net (PAN). Then it would go back down the chain to Northern California and then, ideally, to an operator in San Francisco, who would telephone the addressee. All nets are scheduled so that traffic from the early session of the section nets (6:30 PM local time for ILN) can be in San Francisco for their late session, and their early traffic can be in Illinois for our late session (10:00 PM local time). ILN, by the way, meets every day of the year on 3.690 MHz.

The real reward in traffic handling is the pleasure of providing a meaningful public service with your hobby. But there are other rewards in the form of awards available primarily to members of the ARRL. I want to emphasize that you need not belong to ARRL to join a section traffic net, but you do to earn some of the awards. Those available range from the Public Service Honor Roll, given primarily for participation, to the most prestigious of the traffic awards — the Brass Pounders League (BPL). This last award is a tough one to earn, but if you qualify three times you'll receive a nice medallion engraved with your call. Most of the nets (all of the NTS nets) also give certificates for reasonably regular participation.

Now that you've been introduced to CW traffic handling, I look forward to seeing traffic with your call in the preamble. Happy brass pounding!

HRH

a key to HISTORY



BY JOHN EDWARDS, WB2IBE

The Morse-code key, an important item in the radio amateur's station, precedes radio by many years. The key began with the telegraph, which was invented by Samuel F. B. Morse in the 1840s. The first telegraph key didn't look like a key but more like a lever, a flat piece of metal pounding against another piece of metal (something like the type of key sold today by unscrupulous dealers to Novices). The basic idea, though, and even the mechanical action, was remarkably like today's key. Comfort was the main difference. With no knob attached to the sheet of metal, one either must have had small, nimble fingers or a high pain threshold!

The straight key and bug

Within the next 30 years the modern straight key was developed. It's amazing when you consider that the key you probably have in your station is almost identical to that used on telegraph lines over a century ago. This is quite a testament to a durability and design record virtually unmatched by any other piece of equipment in the communications field.

Yet, man being the way he is, wasn't satisfied with the way

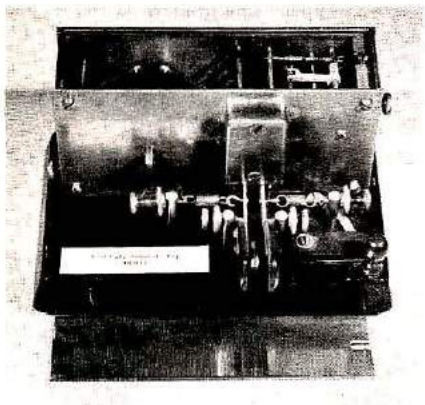
the key worked; he was always on the lookout for something better. This led to the creation of a number of labor-saving devices — some practical, some more fancy than fact.

Early history

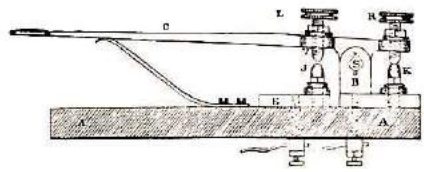
Among one of the more practical ideas was the creation of the Vibroplex semiautomatic key, or "bug", at the turn of the century by Horace G. Martin, a telegraph operator. Martin developed the bug when he and other operators realized that long hours toiling over a straight key resulted in an arm that felt as if it were cast from lead.

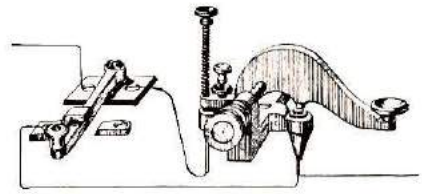
Using a pendulum that swings between two contacts, the bug sends a series of dits when the laterally mounted key (or paddle) is pushed to the right and a steady dah when pushed to the left. For this reason the bug is called semi automatic: only the dits are formed automatically; the dahs rely on good, old-fashioned muscle power.

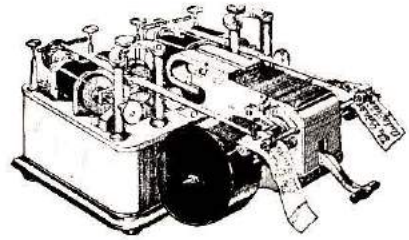
When first introduced, the bug was regarded by seasoned operators as a "sissy key" — something a lazy man would use as a shortcut. It was only after Martin convinced a number of the top operators in the country to give it a try that the bug caught on. At that point the bug bit and became very popular, being handed down from telegraph to radio operators. With the relatively recent addition of a jeweled movement for precision, the bug has remained in constant use to this day, with only the straight key giving it competition for longevity.



This is what is believed to be the first fully automatic key — a *Hulit*, patented in 1909. It has a spring-driven type of mechanism, which was wound just as you would wind a clock. Two paddles were provided to release the drives that closed contacts for either dots or dashes. The key still works (*courtesy Antique Wireless Association*).







Patent drawings of predecessors to today's radio-telegraph keying systems. At the top are early Morse-code keys (the one in the center is known as a "camel-back" key). At the bottom is one inventor's idea of how to take the drudgery out of sending code by hand. Known as the Denison Facsimile Telegraph, it just may be the grandpa of modern radioteletype.

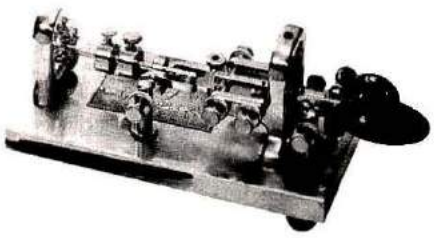
While the bug was an obvious improvement, at least as far as sending speed, many inventions were tried at about the same time which, if nothing else, at least prove the ingenuity of the industrial revolution.

One of the most fascinating early gadgets was something called the Denison Fascimile Telegraph. Imagine a writing device that encompasses many of the fine points of CW, RTTY, and FAX (fascimile). The sender sat at a console and wrote his message in script. The motions of the pen were picked up by an electromagnet then sent as varying impulses over a telegraph line and were decoded by another electromagnet. The message was written by a stylus on a long strip of paper. There was a wide margin for error in this system (the squiggles at the receiving end didn't always look like words), but its sheer ingenuity kept it going until the dawn of teletype, about 20 years later.

By 1915, telegraph, and now radio, was dominated by straight keys and bugs. Rapid transmission of information by the new teletypes eliminated most of the old sending gadgets, and sending by key was limited mostly to people who couldn't afford teletype, to applications where weak-signal work demanded CW, or to places where the bulk and noise of early teletype equipment couldn't be tolerated. Of course, there was always the ham who, to the amazement of some, actually *enjoyed* sending code.

The code he enjoyed, however, didn't sound much like the code we hear today. As a matter of fact, the present-day ham would probably have a rough time deciphering the dits and dahs of 50 years ago. On radio, code was sent using the spark transmitter. Spark didn't

An electronic programmable keyer by Autek Research. You can program it to call CQ while you relax. Designated model MK-1, it records four messages, each about 25 characters long. Features include automatic keyer with dit and dah memories and iambic operation.



Vibroplex, the old faithful of thousands of past and present telegraphers, radio operators, and amateurs. Adjustable weights, spring tension, and contact spacing allow the operator to tailor his "fist" as he sees fit. Several models are available, ranging from the standard version with its baked-on enamel finish up to the "presentation" model with a gold-plated base. Vibroplex also offers a Vibro-keyer for use with electronic keyers. 883 Broadway, New York, New York 10003.

provide the nice clean note we hear today; instead the signal was rough and broad with lots of gasping and hash. If you visit ARRL headquarters, be sure to tour station W1AW and ask someone to crank up Hiram Percy Maxim's original spark transmitter, "Old Betsy," for you — you'll swear they used the same sound in an old Frankenstein movie.

The ham's telegraphic colleagues didn't have it much better as far as sound is concerned. Since telegraph operators used only wire to link stations, they had no way to beat, or heterodyne, a signal to produce a tone. This problem was resolved by the invention of the sounder, which gave the operator an audible clicking sound. Only one company makes sounders these days (mostly as conversation pieces), the William M. Nye Company. It's the same company that's one of the largest manufacturers of straight keys. If you're unwilling to spend money on one of their sounders, a good way to hear one is to watch the Late Show on TV. The next time John Wayne and his posse force the telegraph operator to stop the train with the bad guys on it, listen to the gadget that clicks — that's a sounder.*

*If you're lucky, the sound dubbed in for the telegraph might be genuine American Morse — most likely it won't. **Editor.**

The electronic keyer

With the development of radiotelephone over the next 20 years, pundits were busily forecasting the end of code. The saying went, and still does in some quarters to this day, that phone has all the advantages, and the uses of CW in the future will be limited. To add to this problem, code had run into a technological brick wall. It seemed that mechanical ingenuity had gone as far as it could with the key. There was no real way to improve on the bug except by going to teletype and that, of course, took the human element almost entirely out of the picture. From the turn of the century onward, it seemed that all experimentation had died on CW — specialized techniques were now something for the phone boys, and CW operators would have to remain content with ragchewing and chasing DX.

By the late 1940s however, it suddenly appeared this wasn't the case. All that had happened was that code had gone *ahead* of itself, and all that was needed was a new jump in technology. The 1940 era, with its new generation of war-trained technicians and windfall of surplus equipment, made possible the first new code invention in nearly 40 years: the electronic keyer.

The electronic keyer was the first key that didn't rely on anything mechnical other than the paddles. The dits and dahs were electronically generated, with later improvements including self-completing dits and dahs, and iambic keying (squeeze the paddles together and hear *ditdahditdahditdah* — great for sending periods).

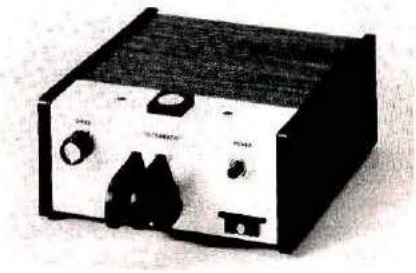
Any resemblance between the first electronic keyers and today's versions is purely accidental. The early keyers were huge tube-driven monsters rivaling the size of many of today's amateur low-band stations. Another aspect of these first electronic keyers is that virtually all were homebrew. For instance, the first paddles were usually two striaght keys attached back-to-back; one for dits, the other for dahs.

The 1950s saw a great innovation in electronic keyers. The introduction of the transistor reduced electronic keyers in size but not in price. About 20 years ago, you could expect to plunk down a few hundred dollars for the most simple commercially made electronic keyer. Homebrewing brought this price down somewhat, but the high cost of parts still kept the electronic keyer from being overwhelmingly popular in the beginning.

The late 1960 s brought the next wave of electronic keyers, those using integrated circuits. Although initially expensive, as more and more keyer chips were produced the prices dropped to the point where now you can buy a mass-produced keyer for as little as $25.00.

Programmable keyers

The story doesn't end here — not by a long shot. Today, ham radio is on the verge of a new era in code transmission. The first of these new-generation keyers is the memory, or programmable, keyer. With this keyer an operator can program the message (or messages) of his choice and send them automatically over the air at the



The model KR50 keyer from Ten-Tec. It features automatic or manual weighting, dit and dah memories with separate disable circuits, and straight-key override for slow sending or tune up.

flick of a switch. The number and length of messages vary between models, but a typical program might be CQ CQ CQ DE WD9XYZ, or even kicking off a contact with FB OM QTH CHICAGO. NAME JIM HW? K. As you can imagine, this type of keyer comes in mighty handy for contesters and DXers.

A number of companies make programmable keyers, but the two leading manufacturers are Autek Research, makers of the MK-1 memory keyer ($99.50), and Redi-Kilowatt, who has a programmable memory keyer system for $199.95. As with regular keyers and calculators, these prices will probably come down in the future.

Morse-code keyboards

You might think that this is as far as keys can go. To an extent this is true, but now there are "keys" on the market that do *all* the sending themselves; you don't even have to know code. These devices are probably more closely related to RTTY than Morse code. You type your message into a keyboard, which then sends the code over the air automatically. For receiving the code, you use a unit that decodes the Morse code and displays it on a television screen. The only real difference between this system and RTTY is that the signals are Morse code rather than Baudot, and it's possible to communicate with other stations that are sending and receiving by hand.

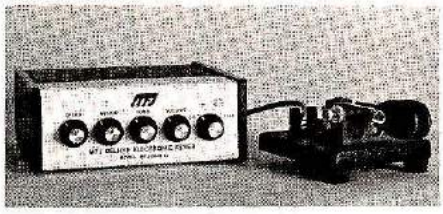
Three major companies manufacture equipment for this type of system. The first is HAL Communications, known primarily for their RTTY and computer items. HAL makes two different models of Morse-code keyboards. They also make monitors and demodulators for reception. Depending on which models you want, the HAL system can run $1000 and up. The next company is Atronics, which manufactures a code-reading kit using a readout that decodes letter-by-letter. Their kit version sells for $149 or prebuilt for $225. Atronics currently doesn't manufacture automatic code-sending units.

Last, and certainly not least in the long saga of the key, is the Microlog Corporation. For $249 they make a programmable keyer keyboard, a unit incorporating all the advantages of a programmable keyer and a Morse-code keyboard.

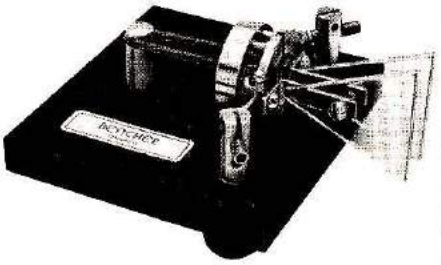
It's the closest thing yet to sending code without a human operator. What will they think of next?

As for me, my brother just dug out my first Novice key. It's made of plastic and aluminum and cost all of 75 cents a few years back. I think I'll go into my station and give it a run-through. It'll bring back lots of memories. Besides, it's a pretty good little key.

HRH



The model MFJ-8043 electronic keyer produced by MFJ Enterprises. It features the Curtis 8043 keyer IC. Operation modes include iambic, automatic, semi-automatic, or manual. You can use squeeze, single lever, or straight-key modes.



Improved versions of paddles for electronic keyers frequently appear in an effort to satisfy the amateur's quest for the best or the unique. This new item by Bencher, of Chicago, Illinois, has a split-ring mounting system for the paddles, and independent adjustment for spring tensions, contact spacing, and paddle movement. It's available in black, chromium, or gold finished bases. A handsome addition to any CW station.

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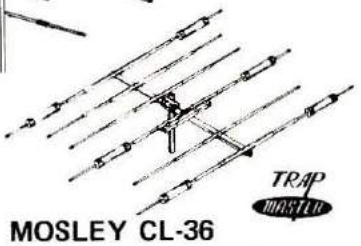

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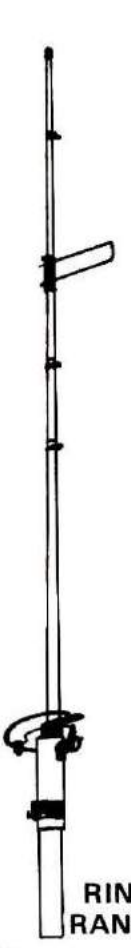

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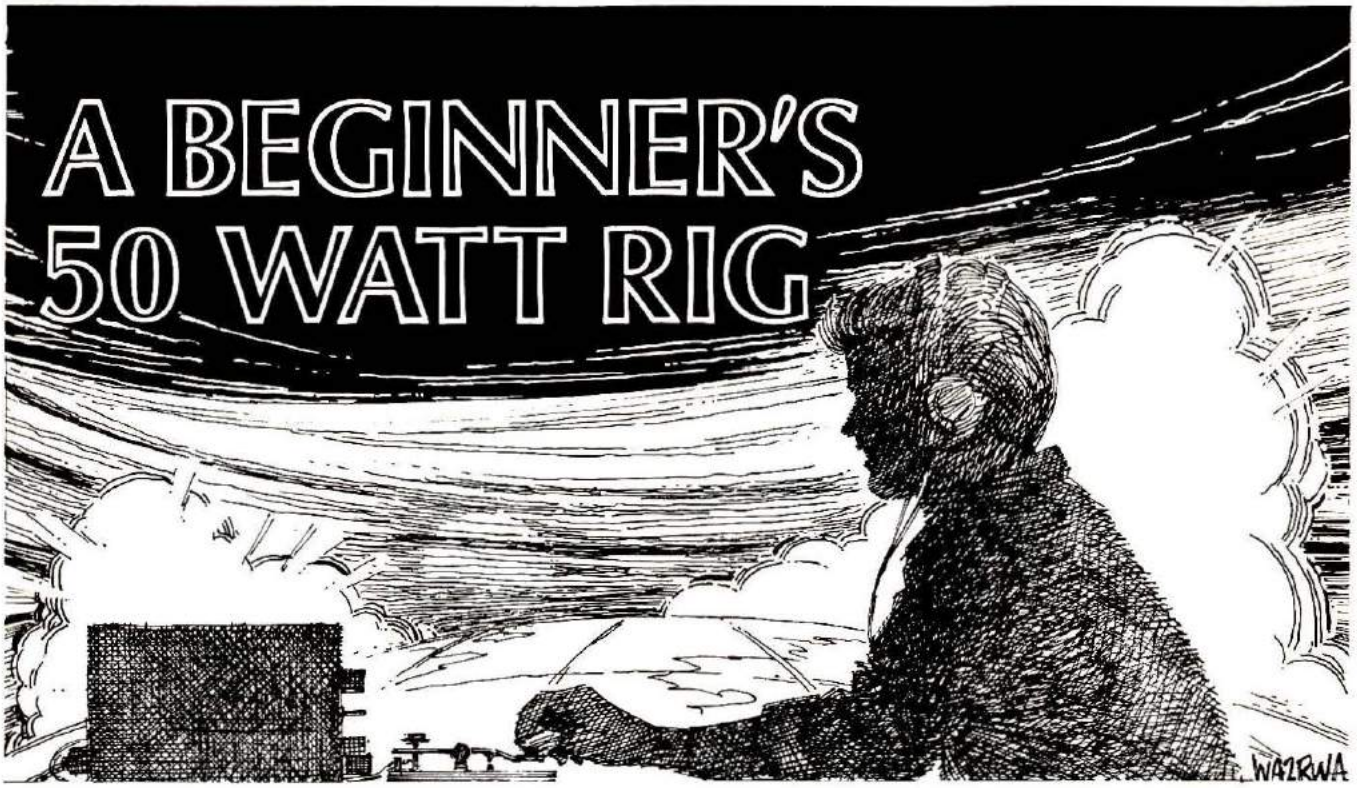

Part 3 — Power Supply, Resistance Checks, and Tuneup

BY BILL WILDENHEIN, W8YFB

In the two previous issues I've covered the general theory of designing a transmitter and shown you a few tricks to use in placing the parts on a chassis. There wasn't quite room enough to talk about all of the transmitter sections in the wiring part of the discussion, so I'll finish that up and then give you a few words about power-supply requirements. You may have a power supply handy that will give you all the voltages required, but if you don't, it's not too difficult to build one. As the final part of this article, I'll give you a resistance-check sheet to use when you want to look for wiring errors, and a list of tune-up procedures.

Tone oscillator

This little oscillator is what used to be called a *sidetone* oscillator in the commercial and military world. Its purpose is to follow the keying of the transmitter, producing a tone that you can hear as you send code. This is very useful, since it is hard to send correct code unless you know what is actually coming out of the transmitter, and most receivers are so completely overloaded with your own signal that they distort the sound into something unrecognizable.

The oscillator can be built on a small scrap of perforated board or on any similar insulating material. Mount it by means of a couple of spade lugs — either new ones or some you have scrounged from a scrap TV or broadcast set. Any NPN transistors (germanium or silicon) can be used. Transistors in the small D-shaped TO-92 plastic cases have several different lead arrangements, so be careful when using them. Be sure you have the correct base diagram. The finished oscillator can be tested by connecting a pair of earphones (preferably high impedance, 2000 ohms or greater) across the output cable that normally goes to the volume control. A 6- or 9-volt battery can be connected with its polarity as shown. The tone is determined by capacitors C21 and C22. For a higher frequency, decrease their values; for a lower frequency, increase the values. Normally, the values shown will provide a tone of about 1000 Hz.

Coils L2 and L3 can be homewound, or you can use the J.W. Miller units in the parts list. These coils are very small, and newcomers might find them a bit difficult to handle. **Fig. 21** shows the easy way to wind coils. Notice that the wire from the spool feeds over the top of the coil form so you can easily observe whether it is snug against the previous turn. If not, it can be pushed over with a thumbnail.

These coils are wound with no. 32 or 34 (0.2 or 0.16 mm) wire, but still will require some *layer winding*. For instance, to get 80 turns on such a small form, you may wind, say, 45 turns in the first layer, being careful to keep tension on the wire so as to produce a tightly wound coil. It helps to have a small square of Scotch tape already cut and handy. After the first 45 turns are on, stick the end turns to the coil form with this square of tape, then start the second layer. You can wind the second layer with 20

turns, then wind back over this layer, in the original direction, with 15 turns to make the full 80 turns. One precaution: if you get a little loop in the wire, then pull that loop tight to straighten the wire, the strength of the wire at the loop point is seriously reduced. If you get a kink in the wire, it is best to rewind the coil rather than risk an open coil later.

After all transmitter wiring is complete, you should verify that L2 and L3 will tune to the desired frequency. Install the tubes, but do not apply power to the rig. Set bandswitch S1 to the 80-meter position. Couple a grid-dip meter to L2 and find the point where it dips. If it is too high — say, 4.5 MHz — screw the slug farther into the coil. If, with the slug all the way in, it is still too high, more turns will be required. The idea is to get the tuning range from at least 3.6 to 3.8 MHz. With S1 set to 40 meters, grid dip L3 and get a tuning range of 7 to 7.3 MHz. Preset the 80-meter coil for about 3.7 MHz, and the 40-meter coil for about 7.15 MHz. The coils may have to be "tweaked" later, but they will have adequate range.

Power supply

If you had to purchase the parts new, the power supply could be the most expensive part of the transmitter. However, most of the components can be salvaged from scrap TV sets; I made my power supply of parts from an old Capehart TV. Many of these transformers are similar in the number of windings and the voltages available. You'll note in **Fig. 2** (in part 1 of this series in the July, 1978, issue of *Ham Radio Horizons*) that there is a high-voltage winding, a filament winding, an extra filament winding, and the primary or 115-volt input winding. You'll find some transformers that have more windings, most of which you can ignore (just tape up the wire ends and tie them out of the way).

Many TV transformers do not have a conventional color code on the connecting wires, or the colors may have faded away to a uniform mud color. It is not difficult to sort out the leads. Set your ohmmeter on the R × 1 scale, and connect one meter lead to any transformer lead. Connect the other meter lead to each of the remaining leads, one at a time. Tape together those leads which indicate continuity. In this way, you can sort out all the leads into groups which show continuity. Now find the group with the *highest* resistance. The high-voltage winding will probably show about 30 to 40 ohms across the entire winding.

A peculiarity of this measurement is that the ohmmeter may not respond immediately. It may take one or two seconds for the meter to start to swing. If you have a heart condition, be very careful of this measurement! If you are holding onto the two transformer leads as you remove one meter lead, you will be jolted with a very high voltage! Even if your ohmmeter uses a single 1.5-volt cell, you will still be hit with a charge of between 500 and 1000 volts! The reason is that a magnetic field has been built up because of the ohmmeter current through the winding. When the meter is disconnected there is an open circuit across the transformer winding, and at this moment the magnetic field collapses, inducing an opposite charge across the transformer winding. The speed with which the field collapses determines the peak voltage. The collapse is commonly thousands of times faster than the time it took your ohmmeter to build up the magnetic field, hence the output voltage can be higher than the rated transformer voltage! For the same reason, you who are electricians by trade, keep your battery-powered buzzers out of the ham shack! They are fine for "ringing out" power wiring but are deadly around electronics equipment. Their output is commonly in the hundreds of volts, and they can blast meters, semiconductors, capacitors, and the like.

Now that you've found the highest resistance winding, connect that winding to the 115-volt line. You can use an ac voltmeter to find the true 115 Vac winding. Due to its very low resistance, it may sometimes be difficult to identify with only an ohmmeter check. However, with the transformer connected backward (ac line connected to the high-voltage

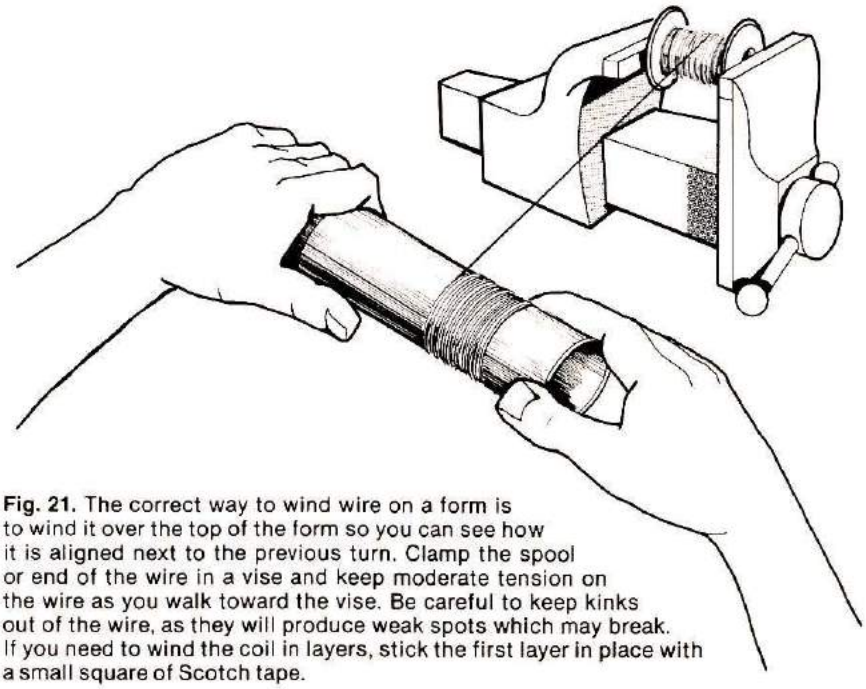

Fig. 21. The correct way to wind wire on a form is to wind it over the top of the form so you can see how it is aligned next to the previous turn. Clamp the spool or end of the wire in a vise and keep moderate tension on the wire as you walk toward the vise. Be careful to keep kinks out of the wire, as they will produce weak spots which may break. If you need to wind the coil in layers, stick the first layer in place with a small square of Scotch tape.

winding), the transformer is now a *step down* transformer. For instance, assume that the transformer was originally 115 volts and 690 volts center-tapped. If you divide 690 by 115 you'll find the ratio is 6. Now, if you feed 115 volts into the 690-volt winding, the 115-volt winding will show an output of 115 divided by 6, or about 19.1 volts. This is a safe way to locate the "real" 115-volt winding. Many modern VOMs indicate only up to 500 volts, so a mistake in sorting out a transformer could blow the poor meter. Connected backward, you always read a fairly reasonable voltage.

Fig. 22 shows a common situation in TV transformers — a dual-voltage secondary with some typical ohmmeter readings. Some transformers have two separate high-voltage windings, each with its own center tap. I have found at least one set with the circuit of **Fig. 23**; two high-voltage windings with a common center tap. Since the winding resistances can be quite similar, it would be possible to make connection to leads no. 2 and 3, along with the center tap, for your high-voltage winding. Unfortunately, on one side of the center tap you would have 250

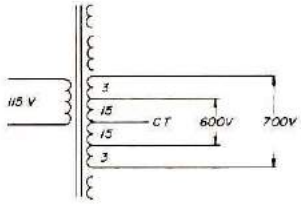

Fig. 22. The high-voltage windings on most transformers from scrap TV sets will have similar characteristics and resistances. Other windings, such as the filament and 115-volt input, will have much lower resistances. See text for instructions on determining what voltages are present.

volts, and the other side would show 350 volts. Such an unbalanced setup would produce too much hum.

In such cases it would be best to first find the real 115-volt winding, then very carefully determine which wire is the high-voltage center tap. In **Fig. 23**, the measurement from lead 2 to 3 would be 29 ohms; from lead 3 to 4 it would be 30 ohms. Notice that the resistance is cut in half from either high-voltage lead to center tap. This is how you locate the center tap. Now you can put your VOM on the 500-Vac scale, connect one lead to the center tap, *and leave it there*! Feed 115 volts to the normal 115-volt winding, and use the other meter lead to measure the voltage from each of the other high-voltage leads. In this way you can determine which leads are actually a pair.

Another type of TV transformer is illustrated in **Fig. 24.** The rectifier tube socket (or sockets) is built into the top of the transformer. The transformer includes the circuitry shown inside the dashed lines. Obviously, this one will save you a fair amount of wiring.

In all of these transformers, use great care in removing them from the old TV chassis. Over the years the insulation on the leads becomes brittle. Very carefully slide the transformer out of the set so you don't put any strain on the leads. If the leads do have cracked insulation, they can often be repaired by sliding lengths of thin insulating tubing over the old leads where they bunch up in the hole at the transformer case. If there isn't room to put short lengths of tubing on all the leads, at least try to insulate the high-voltage leads, the 115-volt leads, and the high-voltage center tap.

Filtering

The filter chokes for the power supply can be from old TV sets. These usually run between 2 and 4 henries. You can tie two in series for better filtering if you wish. For minimum power-supply hum, here is an old, nearly forgotten trick: mount the power transformer, but connect only the 115-volt winding. Before you mount the choke, connect its leads to a pair of earphones. Rotate the choke around to find the point of minimum hum in the earphones with 115-volts feeding the power transformer; mount it in that location. What you are doing is minimizing the coupling to the power trans-

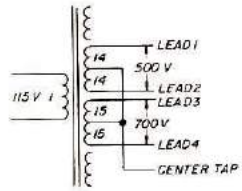

Fig. 23. Some transformers will have more than one secondary high-voltage winding. You have to be careful to use the right set of windings or else your power supply will have too much hum in the output. For instance, if you connected to leads 1 and 4, the voltage unbalance would cause excessive ripple, which your filter capacitors could not remove.

former's magnetic field. Many very expensive commercial power supplies can be significantly improved by merely using this trick to relocate a filter choke!

Used filter capacitors can be selected by using the ohmmeter technique described earlier. They may take some time to charge, but the resistance reading should reach 10 megohms; otherwise they may be leaky, and may overload the rectifier tube. If you aren't trying for the most compact layout, surplus oil-filled capacitors are extremely reliable. Some are motor starting capacitors, and have an ac rating. If the rating is 330 volts ac, it is actually a 1000-volt dc capacitor (this is true only of the oil-filled types). A couple of 10-μF, 600-volt, oil-filled capacitors on the input and output side of the choke will make a hefty, permanent power supply. I have some oil-filled capacitors in power supply service here which were bought in the late 1930s and are still as good as ever.

Your approximate no-load voltage out of the power supply will be 1.4 times one-half the total secondary voltage. For instance, if you measured from

the center tap to one of the high voltage leads and found 350 volts, the no-load voltage may be as high as 490. This should be taken into consideration when you buy or select filter capacitors.

Resistance check

Now you can make a preliminary resistance check of the rig before applying power. You will measure from the power-supply end of the cable (but the cable is not plugged into the power supply) to the points listed in **Table 1**. All tubes should be installed in the transmitter, but no power applied. Controls can be in any position except as noted in the CONDITIONS column. Set up each separate condition, then make an ohmmeter check. If any check is not as shown in the RESISTANCE column, it indicates a wiring error or faulty component (most likely a defective capacitor). This chart helps you check the wiring of the station-control switch and all interconnecting wiring right to the tube elements. When all points measure correctly, you are ready to begin tuning up your rig.

Tuneup

Start by first checking out the crystal oscillator:

1. Connect cable to power supply.

2. Plug in an 80-meter crystal (3.5 - 3.7 MHz).

3. Switch S1 to 80 meters.

4. Plug in the key (leave key "open," or unkeyed).

Table 1. Resistance checks you should make before you apply power to the transmitter. To make the tests, first set the switches or follow other instructions as given in the CONDITIONS column, then make the measurement between the two points indicated. If a discrepancy is noted, check all parts of the circuit that connect to the points measured.

Conditions	From	To	Ohmmeter range	Reading should be
S5 on TRANSMIT	Amp. plate	+ 375V Cable pin	Low	20 - 50
		Ground	High	Infinity
	Amp. screen grid	+ 165V Cable pin	Low	100
		Ground	High	Infinity
	Osc. plate	+ 250V Cable pin	Low	20 - 50
		Ground	High	R3 + R4 + R5
	Osc. screen grid	+ 250V Cable pin	High	R3 to R3 + R4
		Ground	High	R5 to R4 + R5
	Osc. control grid	Ground	High	Same as R1
S4 on SCREEN GRID	Amp. control grid	Ground	High	Same as R6 + R7
S4 on CONTROL GRID		Ground	High	Somewhat lower
S5 on TRANSMIT	Rcvr. disable	Other rcvr. disable	High	Infinity
	Antenna jack	L8	Low	Zero
	Antenna jack	Ground	High	R11 + R10
	Rcvr. ant. jack	Ground	Low	Zero
Unsolder R11	Rcvr. ant. jack	Antenna jack	High	Infinity
Replace R11				
S5 on RECEIVE	Rcvr. ant. jack	Antenna jack	Low	Zero
	Amp. screen grid	Ground	High	Infinity
		+ 165V Cable pin	Low	100
	Osc. plate	+ 250V Cable pin	High	Infinity
	Rcvr. disable	Other rcvr. disable	Low	Zero
S5 on SPOT	Rcvr. disable	Other rcvr. disable	Low	Zero
	Osc. plate	+ 250V Cable pin	Low	20 - 50
	Amp. screen grid	Ground	Low	100
	Rcvr. ant. jack	Antenna jack	High	Infinity
S5 on RECEIVE	Rcvr. ant. jack	L8	High	Infinity
S5 on SPOT	Rcvr. ant. jack	L8	High	Infinity
Key in jack, key open, S3 KEYED	Red ohmmeter lead on amp. cath.	Ground	High	Slow rise to several megs.
	Red ohmmeter lead on osc. cath.	Ground	High	Slow rise to several megs.
Key in jack, key closed	Amp. cath.	Ground	Low	Same as R9 + R2
S3 in UNKEYED	Osc. cathode	Ground	Low	R2 + 20 to 40
	6.3V Cable pin	Hot amp. heater pin	Low	Zero
		Hot osc. heater pin	Low	Zero
Tubes removed	Ground	Hot osc. heater pin	High	Infinity

5. Switch S5 to SPOT.

6. Switch S3 to KEYED position.

7. Switch S4 to SCREEN GRID position. All other controls can be in any position. The first concern will be whether plate and screen-grid currents are at, or very nearly at, zero.

8. Turn on the power supply and watch the plate and screen-grid meters. If either one rises sharply, turn off the power supply immediately. However, if, after a minute or two, both are at or near zero, you know that S5 is keeping the amplifier turned off.

9. Close the key and turn on the power supply. Again watch the meters. If they still remain at or near zero, you can proceed. If, in steps 8 or 9, the meters read full scale, C12 or C10 could be shorted, causing high plate current. A wiring error could cause screen current to be high. Other causes could be incorrectly calibrated meters, or meters incorrectly hooked up, or a gassy or shorted amplifier tube. Although most of these conditions should show up in the resistance check, incorrect meter calibration or a gassy tube wouldn't, and a capacitor that checked normal can blow the first time high voltage is applied.

10. Assuming that the meters behave, switch S4 to the CONTROL GRID position and again key the oscillator. You may or may not get a grid-current indication. If you do, it is merely necessary to peak up L2 and verify that the drive control (R4) will bring the grid current down to 1.0 mA. If it doesn't, measure the plate voltage of the oscillator (with a VOM connected across C6). If it is over 250 volts, add more resistance in series with the 10K resistor in the power supply.

11. If you get no grid-current indication, close the key and adjust L2; the oscillator may pop into oscillation suddenly. Do not try to set L2 for maximum output. Instead, as you approach the point where it starts oscillating, continue tuning in the same direction and you will notice that grid-current reading falls off more slowly. If the oscillator is deliberately detuned toward the side where grid current is slowly falling, the crystal will start dependably. The real test

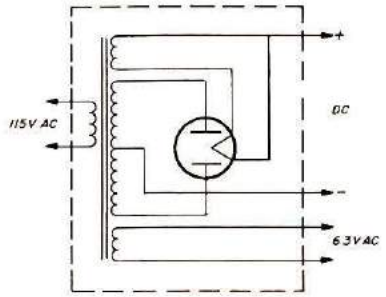

Fig. 24. If you find a transformer with the rectifier tube built into the top of the case, you're in luck. Some may have more than one tube, but the schematic diagram should be close to this one. Again, resistance checks will tell you which is the filament and which is the 115-volt input winding.

is whether all your crystals will start without readjustment of L2. In the transmitter in the photographs it was possible to set L2 so crystals from 3.5 to 4.0 MHz would all start with a single adjustment of L2. If you have just one crystal, and find it impossible to get grid current at any setting of L2, it could be that your crystal is dead, C1 is too small, C2 is too large, R1 is too small, the oscillator screen voltage is too low (decrease the value of R3 and increase the value of R5 to maintain about the same total resistance value), or you have a wiring error. Be very sure of the values of C1 and C2. The wrong combination could increase the feedback to the point where you fracture a good crystal.

12. Assuming you have the oscillator set up on 80 meters, have good control with R4, and have adequate grid-current capability, then put S1 in the 40-meter position, close the key, and peak L3 for maximum grid current. This should be done while using an 80-meter crystal capable of doubling to the desired frequency on 40 meters. For instance, a 3570-kHz crystal will double to 7140 kHz. You don't have to use 80-meter crystals on 40, but I mention it as a possibility. Also, this check will serve to pre-set L3.

13. Check the oscillator with 40-meter crystals. Again, set L3 the same way you set L2, by observing the sudden start of oscillation, then detune the coil in the direction that shows a slow drop in grid current.

14. When the oscillator is tuned up on both 80 and 40, listen to the oscillator with a receiver. Put S3 in the KEYED position and listen to the signal. If it is chirpy it means that that crystal will have to be used with S3 in the UNKEYED position, where only the amplifier is keyed.

15. Now you can check out the amplifier. The first step is to set up the oscillator as before for operation on 40 meters, and set the drive control for about 1.5 mA of grid current.

16. Connect a good dummy load, such as a Heath Cantenna or a DenTron Big Dummy, to the antenna jack (a light bulb is a very poor load). A very simple, inexpensive dummy load you can build is described in October, 1977, *Ham Radio Horizons*, page 60.

17. Set S2 to 40 meters.

18. Set C14 to maximum capacitance (plates fully meshed). This is the minimum-loading position, and will allow you to best see the plate-current dip.

19. With a grid dipper coupled to L7, set C13 to get a dip on 40 meters. You will find this circuit will also tune to 20, and possibly 15, meters merely by resetting C13. The transmitter will tune to 20 meters quite nicely, although plate dissipation in the amplifier may be excessive, so you want to be sure the network is tuned to the fundamental frequency — not a harmonic! Note the 40-

meter dial-setting for future reference.

20. Set S5 to TRANSMIT.

21. Be sure the key is open.

22. Set S4 to CONTROL GRID.

23. Set S3 to either position.

24. Turn on the power supply and allow the rig to warm up for a minute or two. You are now ready for the final steps; these must be done quickly to avoid damage to the amplifier tube.

25. Key the rig and rock C13 through the 40-meter dial setting to get a pronounced dip in plate current. Off-resonance plate current may peg the meter, while the current at the dip-point may be as low as 50 mA. If you fail to get a dip as you tune C13, take a quick look at the control-grid current. It may be zero, or very low. If so, open the key and let the rig cool for 10-15 seconds. Increase the drive control and again key the rig. You should have grid current and be able to get the plate current dip. Some crystals may be marginal and require more screen voltage to sustain oscillation. One crystal I have refuses to maintain oscillation below 1.5 mA control-grid current, although all others will work nicely with currents as low as 0.8 mA or less.

26. After obtaining a dip in plate current near the 40-meter setting of C13, open the key and set S4 to SCREEN CURRENT position.

27. On this step you will alternately tune C13 for dip, then C14 for an increase in plate current, then C13 again for a dip, and so on, until the lowest point of the dip occurs at 125 to 140 mA. At the same time, keep your eye on the screen-grid current. In the theory article you determined how to obtain the maximum screen-grid current value; for this tube it was 16 mA. As loading increases, screen-grid current decreases coincidentally with the plate-current dip. At a point where the bottom of the dip occurs at about 125 or 130 mA plate current, your screen-grid current should be about 7 to 11 mA.

Now you can go on to neutralize the transmitter. Again, key the rig in this loaded condition, and, with S4 set to CONTROL GRID, watch the change in control grid current as you swing C13 through resonance. If capacitor C8 is set too low in value (screw too loose), control-grid current will swing quite widely and erratically as you tune C13 through plate-current dip. As you tighten C8, the variations in control grid current should become smaller and smaller as you move C13 through the dip point. At the correct setting, there will be little or no variation in grid current. One possible problem here is that if the homemade capacitor, C10, is too long (capacitance too great), C8 may be too small to reach the neutralization point. In that case, solder a 100 to 150 pF mica capacitor across C8 and try the neutralization adjustment again. After the rig is neutralized, you will find that screen current is not nearly as wild during tuning as it was before. Control grid current will hardly vary (you may have to readjust L3 slightly to get all your 40-meter crystals to operate dependably), and screen current will change smoothly while tuning. It will be much easier to get a plate current dip to about 130 mA while at the same time holding screen current below 16 mA. Once set, this neutralization adjustment need not be touched unless you change amplifier tubes, or perform major surgery on the rf wiring. The normal practice is to make this adjustment on the highest frequency band a rig is capable of reaching. Incidentally, in the operation of the rig, the LAST adjustment should always be to tune C13 for a dip in plate current.

28. Go back to Step 16 and repeat the tuneup for 80 meters, but disregard the neutralization adjustments. On 80, you set S2 to the position that gives you maximum capacitance (minimum loading) at the start. If you cannot get the loading up to 130 mA or so, drop S2 back one position, fully mesh C14, and try again.

29. Determine the best operating point. You can't do this without a proper dummy load, and you must have some means of measuring rf output. This could be a VTVM with a probe connected through a T fitting to the antenna jack (the other side of the T going to the dummy load), or, it could be an swr bridge connected between the antenna jack and the dummy load. Another possibility is a 0-10 volt dc meter (a VOM is okay) connected with the plus lead to the junction of CR1 and C18, and the other lead to ground. In my prototype rig, shown in the photographs, you will see a BNC-type coaxial connector on the rear panel. This is labeled RF TEST, and serves as a place to connect an AC VTVM for measuring the rf voltage. You may wish to install a similar jack in the transmitter you build. You are going to measure the rf voltage out of the rig. A VTVM set to measure ac volts will normally do very nicely, but a VOM will not. That is why you use the built-in CR1 and C18 to do the same job a VTVM probe does — rectify the rf voltage. In any case, the actual voltage will not usually be accurate enough to compute the power output, but it will enable you to see what tuning conditions result in greatest output.

Tune up the rig on either band, set R4 to give a specific value of control grid current, and watch the rf voltmeter as you tune C13 through plate current dip. Perhaps the dip went down to 100 mA. Increase the loading and dip C13. Again observe the rf voltmeter. Be sure the grid current remained the same. Repeat this until the bottom of the dip is at about 150 mA. In all cases, make note of the current at the bottom of the dip, the rf voltmeter

reading, and the control-grid current. Also, be sure screen current remains below 16 mA at each data point. Now, slightly change the grid current. If you started with 1 mA, try 1.25 mA next. Again, go through the loading range to find a series of plate-current dips from about 100 mA to 150 mA. If you work slowly and carefully you will find that maximum output — as indicated by the rf voltmeter — occurs with one specific control-grid current, and at one specific plate current at the bottom of the dip. If you go higher or lower with either value, power will drop off. You will probably be shocked to find maximum output at, say, 50 watts input, but if you increase to 60 watts input your output actually drops! Now you have proved to yourself the fallacy of pushing a rig beyond the manufacturer's rated specifications! Often, such an act merely increases splatter and TVI, without increasing the signal strength at the distant receiver.

Finally, when you use the rig on the air, if your antenna has appreciable standing waves, it is best to use an antenna tuner or matching network to bring the swr down to as near unity as possible so that the transmitter operates into the same value of load resistance you used to find the maximum output. In this way you can assume that transmitter power output is at maximum.

Conclusion

Having successfully completed the transmitter, you can see that if you develop a good junkbox of parts, you can build useful equipment at a very low price, and can learn a great deal as you build. If your junkbox lacks some of the more difficult parts, the parts list and a list of known, reliable suppliers will help you obtain the missing items.

My final message is this: NEVER DO ANY WORK ON THE RIG UNLESS YOU FIRST MAKE SURE THE POWER SUPPLY VOLTAGE IS BLED OFF. With the power supply turned off, the capacitors often hold a charge for a long time. Be sure to include a bleeder resistor from the positive 375 volts to ground in the power supply! As mentioned before, this can be a 220k, 2-watt, resistor. Even with this resistor, don't rely on it! Short the 375-volt and 165-volt lines to ground in the power supply. Do not short the plate or screen-grid pins to ground because you will probably blow the meters!

Happy QSOing with your new 50-watter!

HRH

Japanese Hams and the English Language

BY BRADFORD S. FIELD, JR., W8JJO

Whenever the band is open from the United States to Japan, there's never a lack of Japanese hams who want to work American stations. But most of the QSOs are very brief — location, name, signal report, and 73. That is ironic, because most Japanese hams are eager to chew the rag with Americans; but they are shy about using their English.

Their spoken English is not the entire problem; the interference is often ear-splitting. Hams with a first-class license run high power, but those with a second-class license can run only 100 watts, and ninety per cent of Japanese hams have only a ten-watt license, and are not permitted to operate on twenty meters.

Naturally, neither the level of license nor the strength of the transmitted signal has any correlation with the operator's ability in English. Many Japanese, of course, speak English very well. As I write this, I am living in Matsue, Japan, a city facing the Japan Sea near the western end of the main island, Honshu.

I've had a lot of help from several Japanese hams, including Atsumi Kawaguchi, JA4CX, and Hirotachi Ono, JA4ZU. Both hold first-class licenses, and both run high

power to big antennas. They are relaxed and confident speakers of English. Kumiko Fujihara, JH4MVN, also speaks well; she teaches English. However, she has only the ten-watt ticket, and rather than fight the mobs on 15 meters, she does her hamming locally on VHF, using a mobile rig. These hams, and several others, helped me to get on the air under the call of the club station, JA4YFV/4.

Almost all the other Japanese hams I have met have real problems with spoken English. They want to work Stateside stations, and they would enjoy a ragchew, but they are shy. They are confused by Americans who talk too fast, and by complicated English sentences. Most confusing of all are the friendly efforts of some American hams to put them at their ease by speaking to them in a familiar fashion. They recognize the friendliness but none of the words.

Sounds

And then there are the notorious problems with pronunciation. The Japanese language has a pure and simple system of sounds — there are only five vowel sounds. The English language uses an alphabet with only five or six letters to assign to our vowel sounds, but most of us speak with twelve or fifteen different vowel sounds. Almost none of these sounds are pure, but are a sliding combination of one or more. The word "caught," for instance, is easy for a Japanese to understand when he sees it written on a page. But when he hears it pronounced, the vowel sound in the middle seems, to his ear, to chirp and wobble back and forth in the audio spectrum between the vowel of "cot" and that of "coat."

The Japanese language has no words wlith an "L" sound. In pronouncing foreign words that contain the "L" sound, the Japanese have made it legitimate to substitute the Japanese "R" sound. Thus we hear the phrase, "dobberue sigh-doe band-oh," for *double side-band*, or "goo-reed dippue ah-so-rate-ah," for *grid-dip oscillator*. Those pronunciations sound a little comical to us, but they are Japanese words, now, and spelled out in the Japanese phonetic writing system to be pronounced in just those ways.

The problem is made more complicated because the English "R" sound and the Japanese "R" sound are not the same. The Japanese "R" sound has a tongue click in it. (I sometimes mistake it for a "D" sound.) To a Japanese ear, the English "R" does not sound like a Japanese "R." Instead it sounds just about the same as the "L" sound! Thus even when a Japanese student of English has learned *how* to make the "L" sound, he is still unsure about *when* to use it. He can read it aloud off a page correctly, but when he is chewing the rag on the air, he has no text in front of him. So we hear *grid-drive* pronounced like "goo-lid-oh doe-lie-boo."

Did you notice that last sound, "boo"? Japanese language has no "V" sound. The Japanese have always substituted their "B" in foreign words containing the "V" sound. Thus we often cannot tell whether a Japanese ham is talking about his BFO or his VFO. He is baffled too, because his ear tells him that the two sounds are exactly alike. During a phone contact, of course, he cannot see the American ham's mouth to notice that the "V" sound involves touching the teeth on the lip. I once heard a Japanese ham with a JR prefix and a B, an L, and a V in his suffix trying to get his call across on the air. What a nightmare!

Other sounds cause problems, as well. All the Japanese words that use an "F" sound follow it with a vowel, "oooh." So the Japanese speaker of English has an automatic tendency to pronounce the word *free*, for instance , as "foo-ree," and *fire* as "foo-ire." The English word *filter* has become the Japanese word pronounced "foo-ree-tah." Furthermore, in English, we make a marked difference between the stressed and the

The interference on the high-frequency bands can get pretty rough at times, so Kumiko Fujihara, JH4MVN, does most of her hamming on vhf, using a two-meter rig in her car.

Horotachi Ono, JA4ZU, enjoys working 80-meter DX from this well-equipped station.

unstressed syllables. But Japanese is spoken with the stress roughly equal on all the syllables. So, when I say "America," the Japanese hears "Mara-ka;" when he says the same word, it sounds to me like "Om-reek."

There are a lot of other problems, too, and the Japanese are well aware of all of them — they can give examples by the hour. There is no immediate solution, either; as in any tongue, the peculiarities of the language are deeply rooted in the culture. But it is possible to isolate clear, if unsolvable, problems.

A university degree in Japan is much more the passport to "success" in later life than it ever has been in the United States. There are many universities in Japan — and big ones too — but they have room for only about a quarter or a third of the people who want to attend. The competition surrounding entrance exams is intense, and the students work harder in high school preparing for those exams than they will ever have to again. They start getting ready in junior high, at the latest.

They study English for three years in junior high, then take three more years of English in senior high. But all that study is directed toward success on the university entrance exam. *That exam is a written test.* So it is no surprise to meet a college freshman who scored well on the entrance exam in English but who has never spoken a single word of the language!

The consequences for the Japanese ham are awkward. He understands almost no spoken English and speaks none at all. And yet he "knows" English. He can read this magazine. He knows very well that speaking a language is like riding a bicycle: You can't do it if you don't try it. So he would like to try.

You can help

What can an American ham do to help him? The interference, the fading, and the distortions of sideband filters make it impossible to "teach" English pronunciation on the air. But an American can make himself easier to understand. The Japanese ham will be encouraged to overcome his shyness about his English by even the simplest exchange of information beyond location, report, and name.

Most of us are happy to be patient as we listen. The Japanese are trained to be good at hiding their emotions. As the Japanese struggles merely to tell us about the weather, he is sweating blood with the effort of speaking the words. When it's our turn to speak, we would do well to keep his problems in mind. First, I never use long, complicated sentences that include a dependent clause (like this one that you're reading now) when I talk to a Japanese ham on the air. Short simple sentences are better. But even those can be difficult. To an American ham, I might say, "In the car I've got a rig, but it only runs a hundred watts." To someone who is not a native speaker of English, I'd say it differently: "I have equipment in my car. That equipment has a power of only one hundred watts."

You'll find Atsumi Kawaguchi, JA4CX, working both CW and phone from his Matsue home. SSTV is another of his interests.

Of course, an American who wants to be understood will speak slowly, and will not yell at his microphone. If the Japanese ham asks for a repeat, the American ham will repeat *exactly* the same phrasing that he used the first time. When we are confused by a phrase in a foreign language, we cannot even tell, the first time we hear it, what word confused us. The second time that we hear a phrase, we can isolate the problem, and maybe solve it. But if the speaker, on a repeat, gives us different words, even if the meaning is the same, he only gives the listener a second problem to decipher instead of helping him solve the first one.

The best QSOs I have had were chatty ones. Fading and interference permitting, it is possible to chew the rag with Japanese hams who do not comfortably speak English. It is often easier on the second contact. On the second contact with you, a Japanese ham will get his courage up to speak more. He will be more ready to gamble on his own pronunciation, and on yours. The short contacts to exchange name, location, and report are preliminaries for second contacts which can be enlivened by conversation.

I've been here in Matsue only six months now. The local hams, not only JA4CX, JA4ZU, and JH4MVN, but many others too, have all pitched in to help me get on the air. There is no way that I can repay them all for what they have done. But if some of you remember this article the next time you talk to a Japanese amateur, then I'll have passed the favor on to someone else. **HRH**

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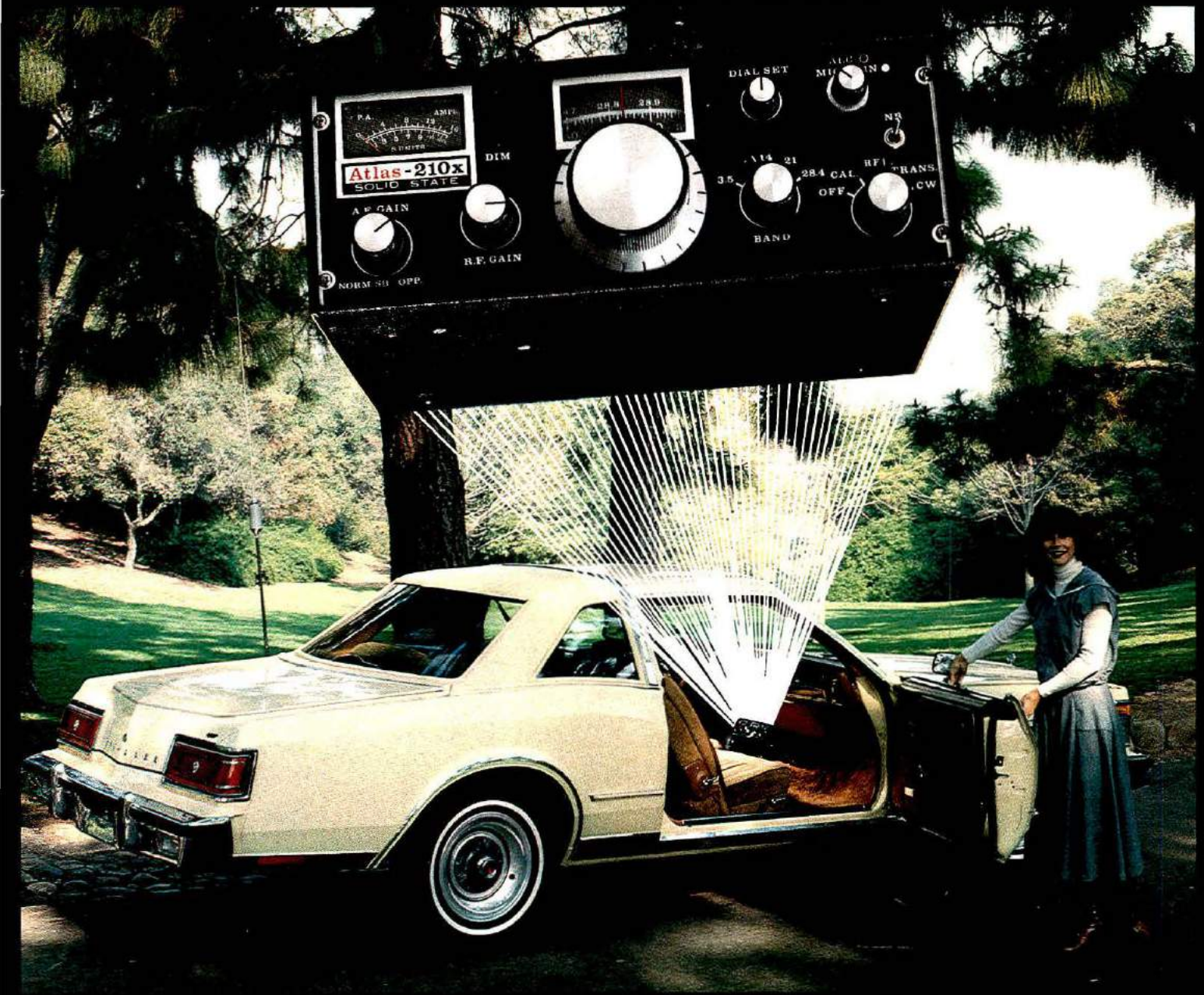

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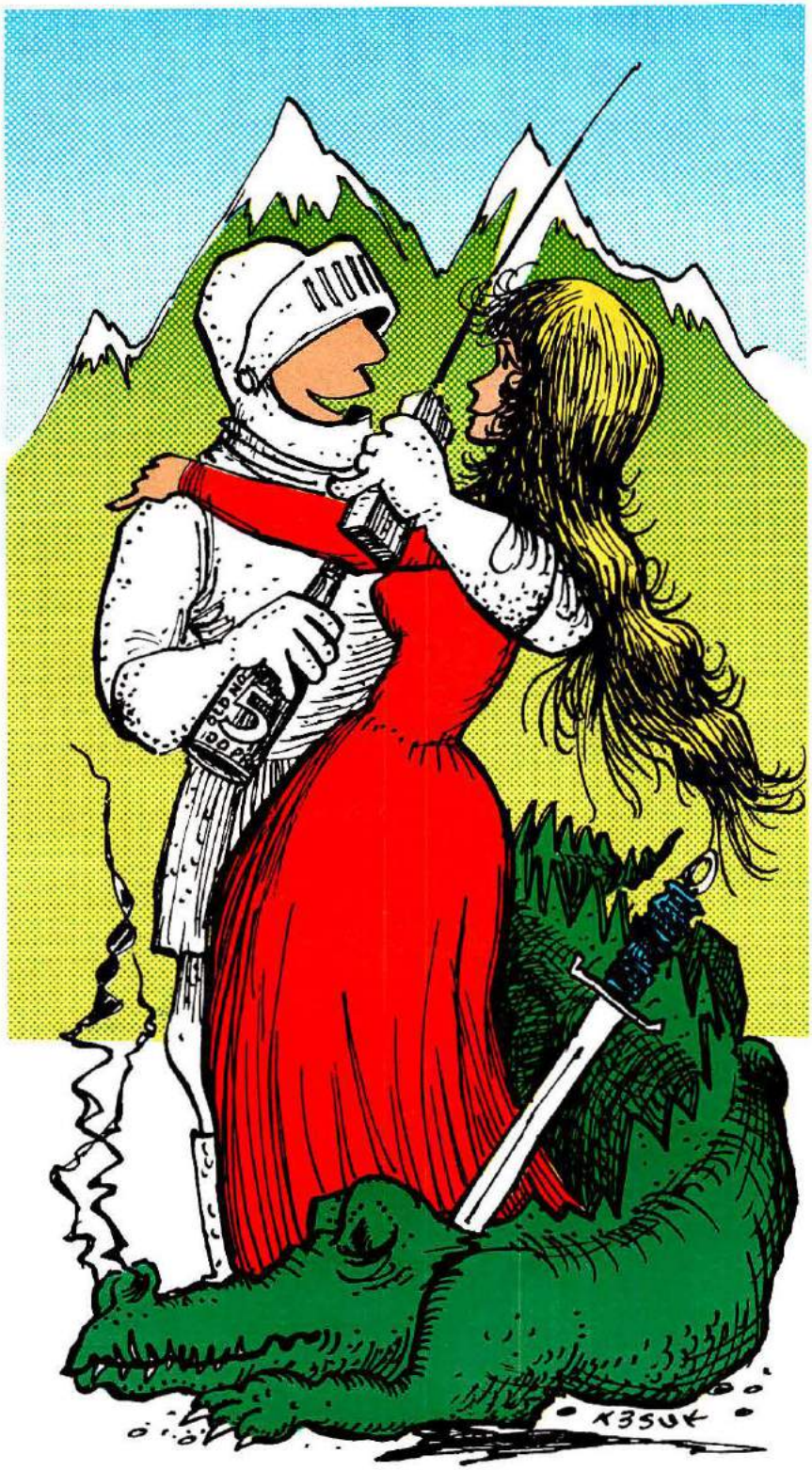

SO YOU WANT TO BE A LID!

BY A. J. MASSA, W5VSR

LID — "A term used in amateur radio to denote a poor operator; one who is inept at the practice of the art."[1]

It seems to me that the ratio of "lids" to good operators is increasing at a logarithmic rate. And why not? It's easy to be a lid. It must be — there are so many of them, and they can be found on phone and CW in great numbers. I imagine that RTTY and ATV have their share as well. If you are already a lid, read on. You may find some new and interesting "lid-isms." If you are not yet a full-fledged lid, here are some examples to follow. They have been collected after thousands of hours of listening on the ham bands.

First, go into the phone portion of the band and call CQ on CW. As most of us operated on CW before gaining phone privileges, this one is a natural. Equally good is to call a phone station, using your CW rig. But don't zero-beat the phone station, because he probably won't hear you. If you find him on USB (upper sideband), put your vfo about 1 kHz above him. If he is on LSB (lower sideband), your vfo should be about 1 kHz below him. Remember, if he wanted to be working a CW station, he would be in the CW portion of the band; so don't be too disappointed if you have to call him many, many times. Persevere!

Next, when working CW, always send faster than you are able to copy. This will use up lots of extra time when you send QRS over and over, trying to get the other fellow to slow down to a speed at which you can copy. After all, the whole point of CW is to take time. Most of us can waggle our tongues faster than we can wiggle our fingers. With CW, we really don't have to say much of any significance, and we can spend hours doing it.

I'd like to offer you more CW lid-isms, but I haven't really spent enough time listening for them. If I ever get the urge to try for the Extra class license and have to build up my code speed to 20 wpm, I guess I'll have to learn some more. Your suggestions will be appreciated.

Phone-isms

My collection of phone lid-isms is much more plentiful. It is necessary to have many phone lid-isms at your disposal (really, not a bad place to put them!), because they are used up very quickly. Here's one that is probably the most popular these days: "QRZ the frequency." I'm not sure if I should put "?" or "!" or even "." after it. You see, I'm not at all sure of what it means. The *ARRL Handbook* lists QRZ as a CW signal meaning "Who is calling me?" Actually, "QRZ?" means "Who is calling me?" That's what *The Book* says. On phone it may mean something else, although I can't imagine a frequency calling someone. It could be that the lid-ism "QRZ the frequency" is intended to mean "Is anyone on this frequency?" I'm reluctant to answer someone who says "QRZ the frequency" because 1) I'm not the frequency, and 2) I didn't call the fellow anyway. I even heard a W4 — not to denigrate 4s, some of my best friends are 4s — I heard a W4 utter "QRZ the channel." Now, there's a *real lid*. When he said that, someone responded, "This is the channel and I wasn't calling you."

I think that "QRZ the frequency" and "QRZ the channel" are real winners. Use them a lot. You'll drive experienced hams out of their gourds.

Actually, the use of "Q" signals on phone is a lid-ism in itself. They were intended to speed up CW transmissions. You will hear phone operators say that QRM is heavy — or that QRN is high. Sometimes they will clarify the situation by saying QRM-Mary, or QRN-Nancy. Of course, it might be simpler to say "interference" instead of QRM, and "static" instead of QRN, but plain language won't help you to be a lid.

So, if you want to be a lid, use Q signals on phone.

Here's one you must have ready at a moment's notice: "HI." Never, ever, laugh if you find something funny. Say, "HI," or, "HI, HI." It doesn't

"... Dog X-ray?"

really take the place of laughter, but it tells the other operator that you know how to laugh on CW — in case you ever run into him on CW and he says something funny to you then.

Always give your call phonetically when operating on phone, especially when conditions are good and signals are clear. It's another small way to take up time on the air without saying anything. I'm not sure if the FCC knows this yet, but to identify your station by saying, "This is Whiskey Five Victor Sierra Romeo," isn't legal. If your call sign is W5VSR, your phone identification quite properly should be, "This is W5VSR." If signals aren't very good, then, "This is W5VSR, Whiskey Five Victor Sierra Romeo." So, always use phonetics; and, if you can, invent new ones. Show how clever and cute you can be. A good friend of mine is W5BS; he has a lot of self-restraint.

Are you interested in DX? Put these on your DX lid-ism list. "CQ Dog X-Ray." Jazz it up a little by saying, impressively, "CQ Dog X-RAY, beaming Asia." Not only does that improve your antenna's directivity, but it lets everyone who can hear you think that you have a beam, whether you have one or not. Another one for DX enthusiasts is to put your vfo on any old frequency in the phone band and call DX to answer you on a different frequency, *without first listening on your transmitting frequency to see if it is clear.* Then crank up your mike gain, preamp, clipper, processor, and furnace, and beller forth "CQ Dog X-Ray" for five minutes without a break. Talk about attracting attention — you bet you will.

Speaking of breaking, you won't want to miss these popular lid-isms. I think we have inherited them from former CBers and CB bootleggers. Find a comfortable roundtable in progress, and say "break" — better, "breaker" — or best, "breaker, breaker." But don't give any calls; neither the station you hear nor your own. Don't listen for a few minutes first to find out if you can hear all the stations in the roundtable. Just break in and disrupt everything. If that doesn't work, start tuning up your rig on their frequency. Put your kilowatt heterodyne smack in the middle of everything. After all, the frequency is there to be enjoyed.

Here are some quickies: Say "go," or "come back," or "C'mon, good buddy," instead of "over" if you think you must say anything at all to let the other operator know you are ready to listen to him. Clear your throat, cough, sneeze, yawn, or belch with your transmitter on the air. Instead of a simple "yes," say "that's a roger," or "that's a big 10-4," or some combination thereof. When asked how much power you're using, just give a figure, like "500 watts." Don't say

whether it's PEP input or output, or voice average input or output. Keep 'em guessing. Too bad the FCC no longer requires us to indicate portable operation when identifying. They've taken away another opportunity for lid-isms — "this is Whiskey Five Very Strong Radio, port Five." I just typed that on my port typewriter.

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Did you ever hear a phone operator who sounds like he's operating from a dungeon? Maybe he is, but even without a dungeon you can get the same effect by turning up the mike gain and holding your Golden Eagle (HI!) a foot or two from your face. Never close-talk a mike. Disc jockeys don't. If you close-talk a mike and keep the gain at a reasonable level, nobody will be able to hear what your wife is doing in the kitchen, how heavy the local traffic is, or how much hum is possible from your mike amplifier. And do use a "power mike." Everybody knows that the engineers who designed your transmitter or transceiver purposely made it short on mike gain.

There are some liddy ways to give signal reports, and these should not be overlooked. The *ARRL Handbook* describes a signal reporting system which has been around for a long, long time. It's about time for a change. Principle: give the other fellow a flattering report no matter how weak or rotten his signal is. He'll like you better. For example, if you can barely make out what he's saying — actually, you're not sure of his call — say something like, "Whiskey Five Victor Sierra Romeo, or maybe it's King Three Foxtrot Zulu Underwear. I'm not sure of your call, good buddy, but you're five by nine. What did you say your handle is? And where did you say you're located? Go." After he has made it clear who and where he is, tell him how fine his signal sounds, even if it's distorted, broad, and off frequency. He'll think you're a good guy.

Just a few more; after all, I don't want to give away all my secrets in one fell swoop.

"Ever hear a phone operator who sounds like he's operating from a dungeon?"

When calling CQ, mystify everyone by saying, "CQ twenty meter phone." Of course, you should be on twenty meters when you do this, and you should be in the phone portion and using voice transmission. Otherwise, those people out there will have no way of knowing how or where to answer. When giving your name, refer to it as your "handle." It's folksy. And say, "The handle here is ____." That's liddier than, "My name is ____." Don't forget to punctuate your remarks with "by golly" whenever possible. When you're in a large group or roundtable, give every call in the group every time you identify and use phonetics for sure.

There are many more ways to be a lid. If you have notable ones, send them to me for my collection. "We" will be seeing you down the ole log.

HRH

Reference

1. T. O. Wallis, WA5DEL, "How To Be A First Class Lid On Phone," *73*, February, 1966.

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MECHANICS OF RAISING YOUR TOWER

BY JOHN A. CICIARELLI, WB3DDM

If the pounds don't get you, the newtons will

One of the more important factors in the performance of any antenna system is its height above the ground, and every ham at one time or another has been faced with the prospect of raising a tower, mast, or some other antenna support in the search for better performance. Some hams are lucky enough to afford the crank-up or tilt-over towers that are on the market, but the great majority of inflation-pinched hams rely on home brewed towers, wooden masts, utility poles, or steel-pipe masts for antenna supports. Occasionally some difficulty is encountered in getting the mast and antenna into the air.

The aim of this article is twofold: the first is to make you, the unsuspecting ham, aware of the magnitude of some of the weights, forces, and rope tensions that you may likely encounter in raising a mast. The second is to provide some insight into alternatives you can use to safely handle these forces. I'll try to avoid unusual mechanical and rope linkages, while relying on simple rope and pulley arrangements which are readily available to most hams. While the arrangements described here are by no means exhaustive, they apply to the situations most hams will encounter.

The first step is to calculate the tension on the hoisting line. The tension (T) on the line is equal to the force needed to hold the mast in a static condition, that is, neither being raised nor lowered. Any force on the line greater than the calculated tension will raise it, any lesser force will lower it. I'll show a simple example first, then a more complex and more realistic one.

Suppose you want to raise a mast which is 15 meters (50 feet) long and weighs 90 kg (200 lbs). For this example I'll assume that the weight is constant through the entire length, so the center of gravity will be 7.5 meters (25 feet) from the base. Surrounding structures or trees are in the way which means that an angle of only 20° can be attained between the mast and the line, see **Fig. 1**. The line is attached 9 meters (30 feet) from the base of the mast. The static tension (T) on the rope in kilograms (pounds) can be calculated as follows:

$$Tension = \frac{(90\ kg)\ (7.5\ m)}{(9\ m)\ (Sin\ 20°)}$$

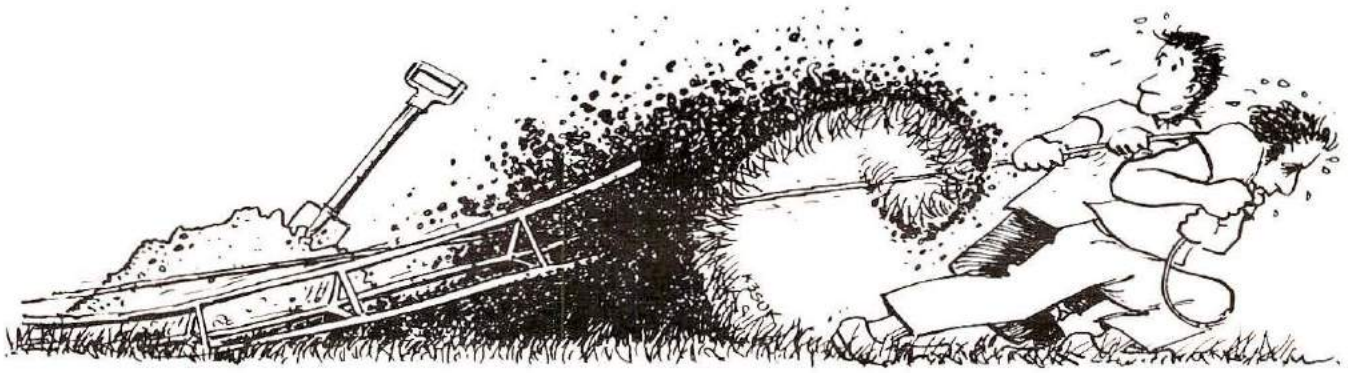
$$= \frac{675}{3.08} = 219.6\ kg$$

or, in English measurement:

$$Tension = \frac{(200\ lb)\ (25\ ft)}{(30\ ft)\ (Sin\ 20°)}$$

$$= \frac{5000}{10.26} = 487.3\ pounds$$

These figures are the dead weight that is being supported by the rope in **Fig. 1**.* Any force applied must be enough



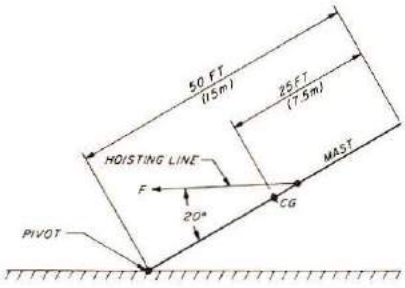


Fig. 1. The mast, hoisting line, and center-of-gravity arrangement used in example 1.

to overcome that weight in order to raise the mast. As the mast approaches the vertical, and the angle between it and the line increases, the tension becomes smaller. Therefore you are ahead of the game to "walk" the mast up as much as possible before beginning the pull on the line.

Example 2

My second example is a more realistic one. Here the mast to be raised is approximately 15 meters (50 feet) long

Table 1. Weight of pipe sections used in example 2. These are actual weights of standard steel pipe.

Pipe diameter		Weight per section	
mm	(inches)	kg	(pounds)
38	(1-1/2)	12.3	(27.3)
50	(2)	16.7	(36.8)
63	(2-1/2)	26.4	(58.2)
76	(3)	34.5	(76.2)
88	(3-1/2)	41.7	(92.0)

and is constructed from five sections of steel pipe. Starting with a pipe diameter of 88 mm (3-1/2 inches) as the base section, each of the four succeeding lengths is smaller than the one below by 12.7 mm (1/2 inch), see **Table 1**. Again, the line is attached 9 meters (30 feet) from the base and strikes an angle of 20° with the mast itself; see **Fig. 2.**

The formula for calculating T is essentially the same as in the first example. However, the weight differences of the 3-meter (10-foot) lengths of pipe must be considered here. The center of gravity of each is considered to be at the midpoint along each section. For example, the center of gravity of section 1 is 1.5 meters (5 feet) from the base (CG_1), for section 2, it is 4.5 meters (15 feet) from the base (CG_2), and 7.5 meters (25 feet) for section 3 (CG_3) and so on. Therefore, the formula for calculating T is modified to:

$$\begin{aligned} Tension &= [(41.7\ kg)(1.5\ m) \\ &+ (34.5\ kg)(4.5\ m) \\ &+ (26.3\ kg)(7.5\ m) \\ &+ (16.6\ kg)(10.6\ m) \\ &+ (12.3\ kg)(13.7\ m)] \\ &\div [(9\ m)(Sin\ 20°)] \end{aligned}$$

$$= \frac{62.5 + 155.2 + 197.2 + 168.5}{3.08}$$

$$= \frac{759.3}{3.08} = 246.5\ kg$$

In English measurement it works out to be:

$$\begin{aligned} &T(30\ ft)(Sin\ 20°) \\ &= [(92.0\ lb)(5\ ft) \\ &+ (76.2\ lb)(15\ ft) \\ &+ (58.2\ lb)(25\ ft) \\ &+ (36.8\ lb)(35\ ft) \\ &+ (27.3\ lb)(45\ ft)] \\ &\div [(30\ ft)(Sin\ 20°)] \end{aligned}$$

$$= \frac{5574.5}{10.26}$$

$$= 543.3\ pounds$$

If any antenna wire, lead-in wire, insulators or beams are at the top, their weight, multiplied by the distance from the base, would be added to the right side of the equation and included in the solution.

*Static weights are measured in kilograms or pounds. However, the *force* that must be applied to move the weight is expressed in *newtons* in the metric system. One newton is the force necessary to accelerate one kilogram one meter per second. To convert pounds to newtons, multiply by 4.448. In the first example, a force greater than 2167.5 newtons would be required to move the mast in an upward direction. **Editor**

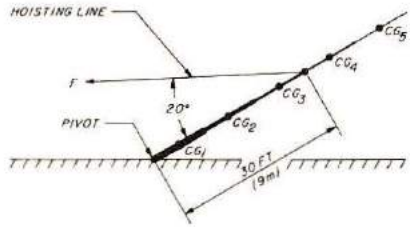


Fig. 2. Example 2 uses this arrangement. Note the distances of the centers of gravity from the base of the mast.

Hoisting

Once the magnitude of the force required to raise a mast is known, a reasonable choice of hoisting arrangements can be made. It is reasonable to assume that any raising technique which is used should

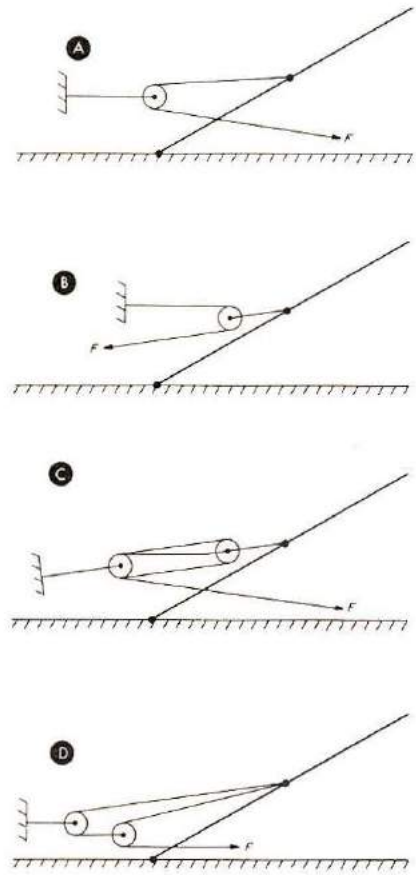


Fig. 3. Mechanical arrangements for hoisting the mast in example 2. At **A** the mechanical advantage is 0, so the force required equals the weight. The advantage at **B** is 2, requiring a force of half the weight. For **C** and **D** the advantage is 3, which would require a force of 1/3 the weight. Note that the "weight" is not just that of the tower or mast, but represents the dead weight being supported by the hoisting line, as calculated.

not require excessive force, and should not require complex rope and pulley arrangements. Therefore, simple blocks and tackle should handle all but the most massive towers and masts. The following block and tackle arrangements are readily available to most hams and can be put together very inexpensively. They also may be rented at a reasonable price. I checked several tool rental establishments and found that a 3-pulley block and tackle with 30 meters (100 feet) of heavy rope rents for about 5 or 6 dollars per day.

Fig. 3 shows the forces required to raise the mast to the vertical, using the data from example 2. In all examples friction is ignored. I would like to point out here that by combining these basic arrangements in series, you can obtain even higher mechanical advantages (see

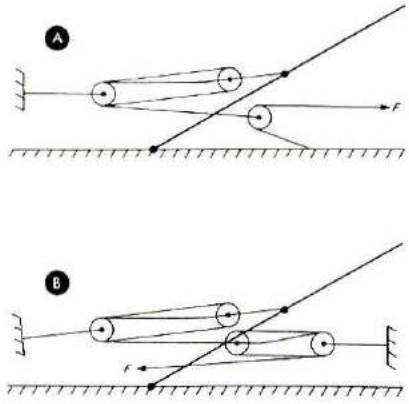


Fig. 4. Other combinations of blocks and tackle provide a mechanical advantage of 6, as in **A**, or 9 as in **B**. Using the weight given in example 2 of 246.5 kg (543.3 lb), you could raise the mast by applying a force of greater than 400 newtons (90 lb) at **A**, or greater than 266 newtons (60 lb) with the arrangement of **B**.

Fig. 4). To calculate the total mechanical advantage, simply multiply the mechanical advantages of the components.

While this material is not new, its presentation here serves several purposes. First, because many hams, particularly younger ones, have had little contact with the advantages of these block and tackle arrangements, this article may help you. Second, in the interest of safety, foreknowledge of the forces involved in raising a several-hundred-pound mast is a necessity. Third, with techniques such as these at your disposal you may have the resources to erect a taller support than you would otherwise consider.

Bibliography

1. Edwin P. Anderson, *Audel's Millwrights and Mechanics Guide*, Theodore Audel & Company, New York, 1963.

2. Eugene George Key, *Elementary Engineering Mechanics*, John Wiley & Sons, New York, 1960.

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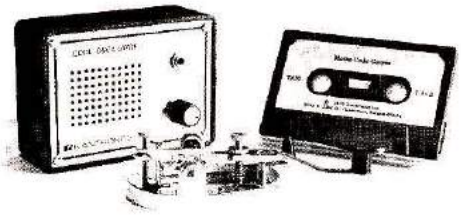

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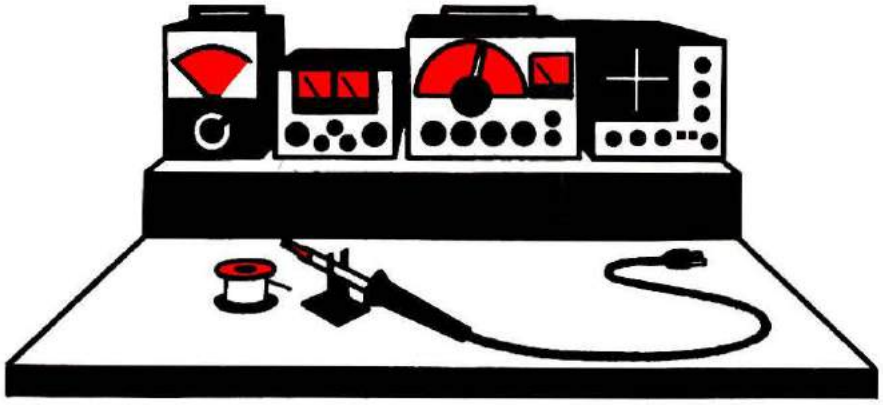


BENCHMARKS

Inexpensive Console

Like many new hams, I set up my station on an old desk I ran across on one of my brief trips to a destination other than the mailbox (while I was awaiting my Novice ticket). And, like most of us who set up the station on a table or an old desk, I discovered that the surface area of the desk top was rapidly shrinking. The day came that I had to move to the dining table to make my log entries for lack of writing space.

Acutely aware that the financial situation around my QTH wasn't prepared to withstand the construction of a separate radio shack, I sat down to plan something that would expand my station space. Here is the product of that think session.

The console shown in **Fig. 1** is the basic form. It can be modified or customized with ease. It is basically an open-sided box, constructed of 1 x 10 fir shelving. Fir was chosen because of its straight grain and ease of handling and sawing.

The top and bottom pieces are identical. They are the same length as the width of the desk or table top. The uprights or partitions are all the same size. Ten inches was chosen in my case because it allows enough space for any equipment I have and still doesn't put the equipment on the top of the console at a neck-craning height. You can make the dimensions suit your particular needs.

The two partitions in the center house a speaker on my console. It can be left open and used for a vfo or power supply or what have you. I do suggest at least one partition in the center for structural support.

I used two-inch-long finishing nails and white glue to secure the joints. Some stain to match your desk and a coat of varnish should complete the basic console. I attached an aluminum bar across the back of the top, raised sufficiently to produce a half-inch lip. This keeps lighter pieces of equipment from sliding off the top and presents a surface that can be drilled, and bolts inserted, to take ground connections from the rig and accessories. A piece of aluminum angle-stock will do just as well.

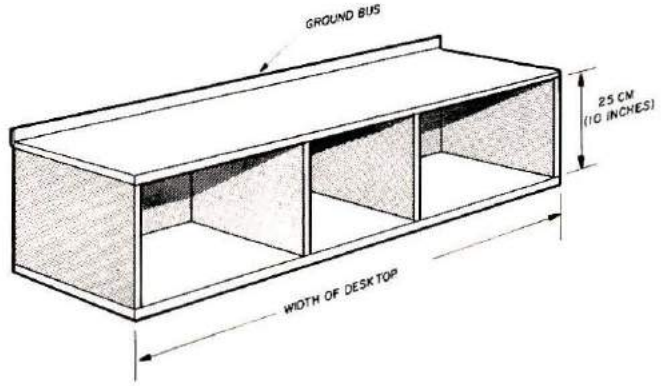


Fig. 1. A simple console-top for your operating desk can be made from two long boards and several inserts for vertical support. You can space the vertical members as needed for various equipment, but be sure that at least one is near the center to support heavy equipment on top.

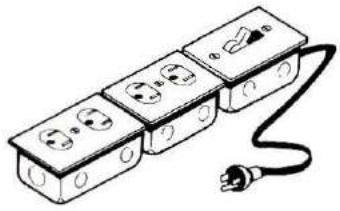


Fig. 2. Several electrical-outlet boxes can be connected together and wired to provide multiple outlets for your station equipment. The switch can be wired to shut off all power to the station, or to only part of it, as desired.

The little do-dad in **Fig. 2** was something I came up with when I discovered the price of commercially produced power strips. It is just several metal boxes of the type used for wall outlets or switches. The grounded outlets are wired in parallel, using at least No. 12 wire. The switch is a regular light switch, wired in series with the outlets, giving you one switch to turn off all your equipment. This is an absolute necessity, at least for my station.

The power strip, with six outlets, switch, and wire, cost me less than five dollars. I attached it with wood screws across the back edge of the top of the console. The boxes can be painted, and cover plates as plain or as fancy as you wish can be added. It could even be enclosed in a box made of plywood strips, and finished to match the console.

There you have it — the poor man's console and power strip. Before you drag out the saw and

hammer, think about the project and modify or customize it for your particular station. It should give you at least half again as much equipment space on the old table or desk top.

Joe Davidson, WD4CXG

Speedy Test Jig

If you occasionally have the need to test resistors, diodes, or small capacitors in large quantities (a Poly Paks "barrel kit," for example), then you know the problem: You pick up a diode, connect an alligator cliplead to one side and another clip to the other, then set the diode down and make the test. Then you pick it up, reverse the connections, and do it again. Should you try to simply touch test prods to the leads, the little diode or resistor generally tends to move away, and you have to reverse the prods in your hands after the first test anyway.

These were my experiences until I built a test jig. It cost me only 20 minutes of time, since I had a piece of scrap wood and some short lengths of No. 12 copper wire. Coat-hanger wire, with lacquer, paint, or other insulation sanded off, would work as well. The wood base should be at least 3/4-inch thick in order to provide reasonable rigidity, and of course it should be dry to minimize leakage. The reason for the configuration of the wires is to allow for both long and short leads, and to allow for both polarity tests on diodes without having to reverse the diode in your hand. I have found the arrangement of **Fig. 4** useful in testing for PIV breakdown of both ordinary and Zener type diodes. If you have a test voltage of over 50 volts, you should probably use a rubber glove to hold the component, or be prepared for a shock if you are careless!

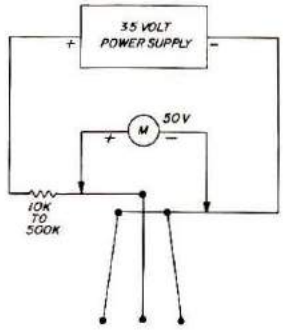


Fig. 4. The power supply and meter can be connected as shown. Although only one resistor is shown here, two are used in the actual test jig. The higher value permits the use of higher voltage power supplies. Observe the usual cautions to prevent electrical shock when you test a component.

The resistor values I used were simply a matter of personal preference. I chose values that would limit maximum current to about 3.5 mA with a low-voltage supply, and to 1 mA maximum at higher voltages.

After the PIV or Zener voltage is identified (it is the higher of the two values which the voltmeter shows under both polarity tests), I use a small piece of masking tape folded about one lead of the diode, and marked as to the voltage, as a way of later selecting the one I need.

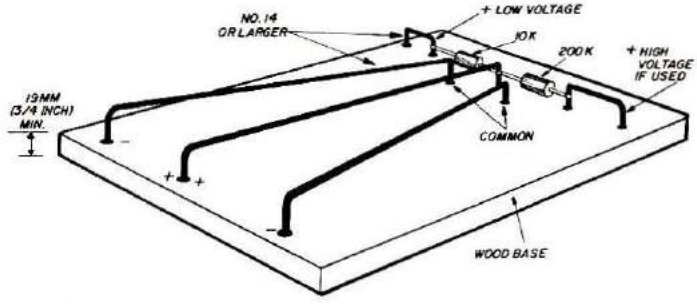


Fig. 3. The test jig is simply three pieces of wire arranged on a base of wood or other insulating material. The two outside wires are connected together for a common minus (−) terminal. The center wire is connected to the plus (+) supply through dropping resistors. The resistors provide protection for the device being tested and make a convenient metering point.

For testing capacitors or resistors, the series resistors are not used and the ohmmeter or capacitance meter is connected directly to the center and outside jig wires.

I thought about building this gadget for some time before finally getting around to it, and wish I had built it much sooner. It is a real time saver.

W. O. Enderle, W7IZR

Temperature Compensation of Slug-Tuned Coils

The stability of temperature-sensitive tuned circuits often may be improved by simply repositioning the tuning slug. A choice of either positive or negative temperature compensation is available by adjusting the slug for resonance at either position **A** or **B** of **Fig. 5**.

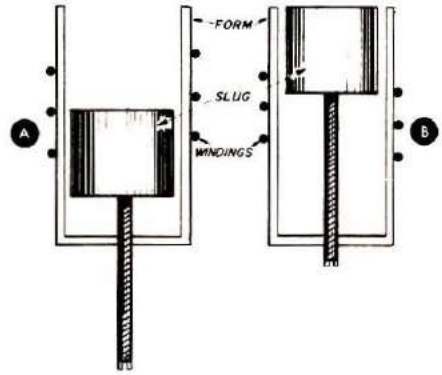


Fig. 5. Coil slug positions for positive or negative temperature compensation.

The metal screw used to adjust coil slugs changes length slightly as equipment temperature changes. This results in either an increase or decrease in resonant frequency, depending upon whether the slug advances into or retreats from the coil with a temperature increase. The amount of frequency change depends upon the coefficient of the metal screw.

The slug position which produces the least frequency drift may be determined experimentally.

Gene Brizendine, W4ATE

Improved Tuning for the Heath GR-78 Receiver

Here's an easy modification you can make to your GR-78 general-coverage receiver to add a vernier control to the tuning dials. After building and using the Heath GR-78 receiver, I felt that the tuning was too fast. I wanted to retain the direct tuning incorporated in the design, but I also wanted to add an 8:1 tuning ratio to the main tuning dial.

Clutch and vernier dial assembly for the main tuning control.

My solution was to add a vernier dial to the tuning shafts. This was done by using a plexiglass disk to act as a friction clutch so that the added vernier dial could be tuned to the desired frequency, then the receiver could be fine tuned using the vernier. The friction of the plexiglass-disk clutch and the vernier dial is greater than the torque of the vernier mechanism, which allows this scheme to work.

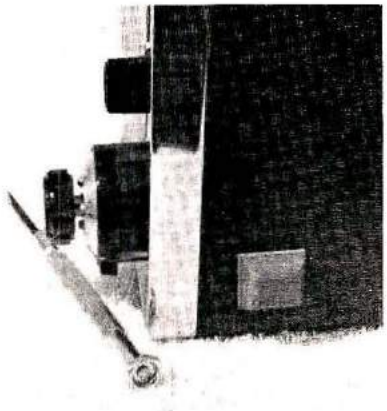
Construction

You'll need two vernier dials, a piece of plexiglass, and some double-sided tape. I obtained my dials from the local Radio Shack store (these dials are also in the Burstein-Applebee catalog). Double-sided tape or foam can be used to mount the plexiglass disks to the front panel.

Start by cutting off the mounting holes (ears) of the vernier dial then attach the vernier dial to the receiver tuning shaft. Measure the distance from the dial to the front panel; this is the minimum thickness of the plexiglass disk. It won't hurt to add a few millimeters to the thickness of the plexiglass disk in case you have to sand it. Next, drill a hole in the center of the plexiglass disk, which should be large enough to clear the vernier-dial shaft.

Locate the setscrew on the vernier dial, and drill a hole in the side of the plexiglass disk to allow this setscrew to be tightened. Apply the double-sided tape to the plexiglass disk. Center the disk on the tuning shaft. Now place the vernier dial on the tuning shaft and tighten the setscrew. Make sure the vernier dial is snug against the plexiglass disk. You might have to play around with this assembly until you get the right amount of friction.

Set the vernier knob to mid position and tune the receiver by turning the entire vernier dial. (This is the same tuning ratio that the receiver originally had.) Now turn the vernier knob, which will give you an added 8:1 tuning ratio. This makes for better tuning of the GR-78. No measurements are given, since this scheme can be applied to many different receivers and vernier dials. The plexiglass disk can be mounted with screws for a more permanent installation. I didn't want to drill holes in my receiver cabinet, and the double-sided tape has worked well.



Bottom view of the receiver showing setscrew access hole.

The plexiglass clutch can be painted to match the cabinet or, as in my case, black vinyl tape can be used to make the disk match the vernier dial. I saved the original tuning knobs so that I can use them to restore the GR-78 to its former condition since it's just a matter of removing the vernier dial and clutch and reinstalling the original knobs.

John Burton, WB9QZE

A Word of Warning

One amateur rather carelessly announced his location at one of the shopping malls while talking over the local 2-meter repeater, much to his sorrow. He had also announced that he would be back in his car after doing a few hours' shopping. Of course, some thieves also did some shopping in his absence, and when the unlucky ham returned to his vehicle, he found that all ham-radio equipment and the stereo-tape-deck had been removed.

Obviously, there is widespread use of scanning receivers which often manage to copy more than one station at a time. As a result, the burglary rings can now not only be alerted to approaching police, but can also pick out new targets. Many radio distributors state that callbook sales are on the rise, but the sales aren't all made to hams; it is easy for the monitoring groups to find your basement and radio shack when vacation time is due and you discuss it on the air. Be careful what you say!

Harry J. Miller

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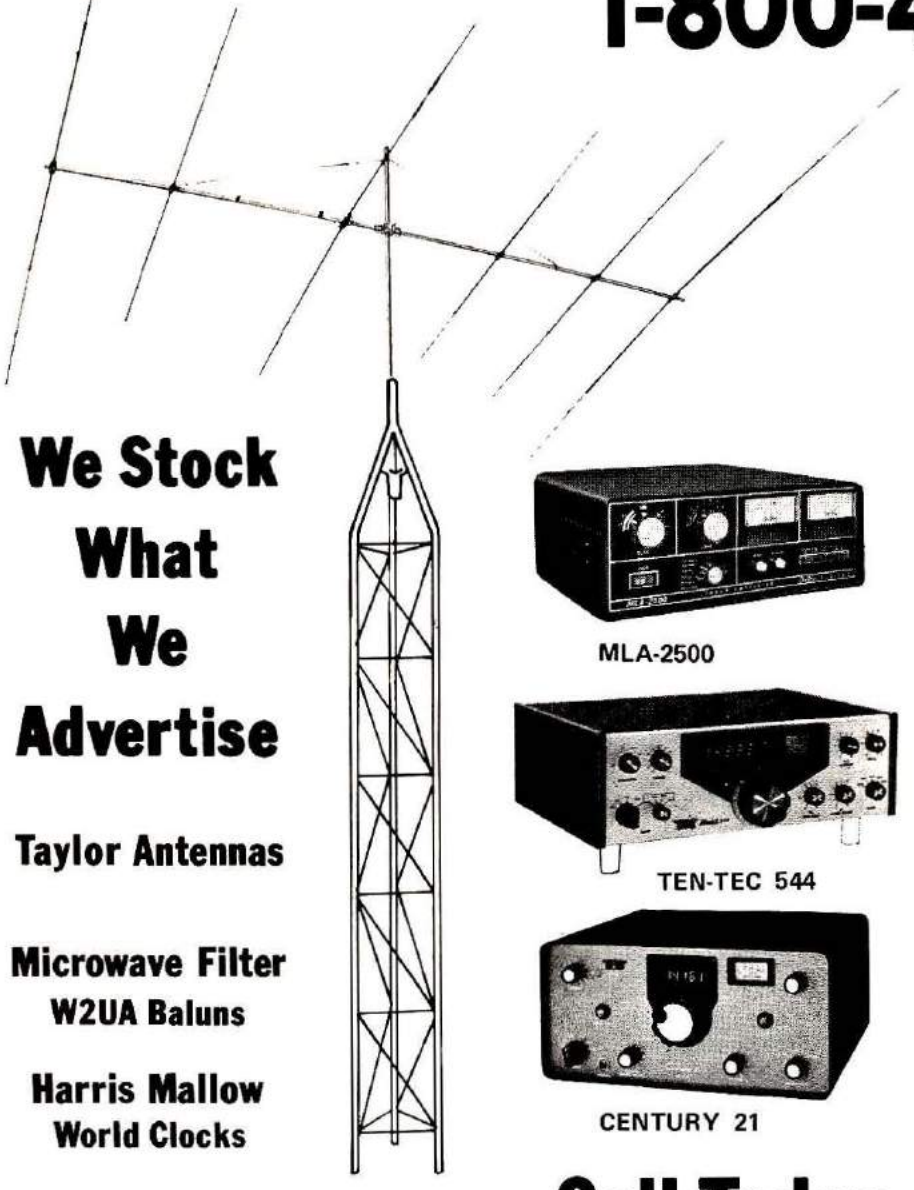

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Dear Horizons:

As recently licensed amateurs, we have been taught many new things. However, we would now like collectively to add: "Things my Elmer didn't teach me." For example:

When hunting DX . . .

. . . If you pull out a really rare one, you will immediately lose the frequency to zero beats, swooping in like buzzards.

. . . They send at only two speeds, too slow or too fast.

. . . If the S-meter moves, he's too close.

. . . My signals are communication, yours are QRM.

. . . Anything not yet logged is rare.

. . . If you get up in the wee hours, you always copy "Yeah, but you should have been here last night."

Accordingly, we have concluded that there is only one way to successfully snag DX:

"Work only stations which are too weak to be heard, are sending too fast to copy, and which can be found in pileups only when you're not there."

Otherwise, follow these simple rules:

1. Get up last night.
2. Tune up only on pileup frequencies.
3. Transmit anytime you don't hear the DX sending.
4. Send CW faster than you can copy.
5. If the prefix matches, he's calling you.
6. Never repeat anything.
7. Never use 100 watts when 1000 will do.
8. When all else fails, send him a QSL card anyway.

If there's any doubt that these procedures are in vogue, listen to 20 meters sometime.

Walt Colquitt, WD5FDV
Friendswood, Texas
Bob Jackson, WD5FYB
Houston, Texas

W9KNI take note — these guys may have something. Also, I would like to congratulate you for writing the first letter to cross my desk wherein the term "we" is properly used. ***Editor.***

Dear Horizons:

I took a trial subscription on your magazine just recently and I want to say that I read it from cover to cover. I think it is a very fine magazine for the ham field — not too technical. I was a ham years ago but let my ticket expire. Now that I get your magazine I am getting interested in going for my license again. I like the large, readable print. The question-and-answer section made clear some of the circuits that I had trouble understanding — and you are detailed with your answers. Keep up the good work.

Ted Hinkel
Shoals, Indiana

Dear Horizons:

Just a few lines to let you know I think you have the best magazine for the ham-to-be. I have held an amateur license since 1932 with the same call. I've read lots of amateur radio magazines but yours is the best I have seen. It explains things in a way that is easy to understand for the Novice or the Old Timer.

Glen Winger, W9KXG
Robinson, Illinois

Dear Horizons:

I have just read your June item in "The View From Here," and I must say that I think as you do. To date I have had 10,414 Novice QSOs. But for the last year I have worked only a few Novices, and I have found it almost impossible to make a novice QSO. With the new calls I cannot tell who is a Novice. If I call CQ very slowly, three out of four answers are from Generals and Advanced — and sometimes I get called by another Extra.

I have worked many Novices from Grand Cayman Island as ZF1AG and ZF2AG. As a DX station it is a real mess. One or two QSOs and soon all of the higher class guys are calling at 20/30 wpm (I work at 8 to 10). Maybe in your next "View From Here" you might give a few lines to this.

Thanks for a fine magazine for the new and old ham.

Arthur Geyer,
K8SWW, W8JSW, FP8AG,
ZF1AG, ZF2AG, N8AG
Milford, Michigan

Dear Horizons:

As the non-ham wife of an avid ham operator, WB8LOO, I want to tell you how very much I appreciate your magazine. I enjoy the humorous articles and get a chuckle from the cartoons. How much more must the amateurs appreciate HRH! I have found the series "Questions and Answers" by Thomas McMullen especially helpful and interesting, enabling me to understand enough to occasionally ask an intelligent question. I plan to have them around where I can study at leisure.

Now, I'd like to inquire if back copies containing these articles are available and, if so, the price. I'm considering obtaining them, if possible, for a daughter and son-in-law in Maine who are interested in becoming amateur operators. I believe the material presented in this series is as clear and easy to understand as anything available.

I'll be awaiting your reply.

Ethelyn M. Irvine
Detroit, Michigan

P.S. John loves your magazine, too, but he figures you already know that — he wouldn't have renewed his subscription if he didn't like it.

Ethelyn, your letter really made my day! I'm sending to you a brochure about Horizons *back issues. You'll note a special price of three for $4.95, or a complete set of twelve for $12.95. When you order them for your daughter and son-in-law, enclose a reminder and we'll include an "I want to become a ham" package that will provide more information to help them. Incidentally, we are planning to add more material to the Questions and Answers series and to reprint it as a booklet. When it's ready this fall, we'll let you know in* Horizons *and in our catalog.* ***Editor***

Dear Horizons:

I thought I would pass along some comments I have been receiving on my QSL cards. In your article on QSL cards you mentioned the labels from Samco. Although they are expensive, I ordered them. At this point about half of the replies mention how nice my cards are. I use scenic New Hampshire cards with the labels. Thanks for your help.

I have just gotten my General-class license, thanks to your magazine. You recommended that new operators not use electronic keys, but should become good with a regular key first; this was a tremendous help. The more I *try* to copy some operators, the more sense you make! Keep up the good work.

Richard Norton, WB1GSE
Nashua, New Hampshire

Dear Horizons:

I am writing about your January and February issues of *Ham Radio Horizons*. Never before have I read two more motivating issues of any magazine. Your articles on learning the International Code made me feel like dusting off my old code books and getting right down to learning (which I eventually did).

I find that *Horizons* is the leader when it comes to helping non-hams like me (I am fifteen) get that elusive ham ticket.

The article written by Doug Stivison, WA1KWJ, presented the CW side of the amateur's world. This article made me realize that there are amateurs out there who use CW most of the time, not because their license does not allow them to use anything else, but because they find CW more enjoyable and more challenging than phone or any other type of emission.

Although I do not have my amateur license yet (it is harder to get in Canada), I am well on my way.

I have only one complaint — your lack of construction articles. Although your technical articles are very good, I would really like to see more electronic construction projects in your magazine.

Nevertheless, I must compliment you on your fine magazine. Keep up the very good work.

Peter Knazko
Alliston, Ontario

I am glad that we have inspired you to go after the code and theory for your amateur license. That's what we've been trying to accomplish.

We'll do what we can about the construction articles, within the technical limitations of the newcomer, keeping in mind the difficulties in obtaining parts for any project, no matter how simple. I'm sure that many of our readers have been in radio for many years, but there are many others who are completely new to amateur radio, so the soldering iron and schematic diagram are just as strange to them as the Morse code was before they started learning it. If they like the easy projects, perhaps it will whet their appetites for more, such as what we present in ham radio *magazine. Thanks for the encouragement, Peter.* **Editor.**

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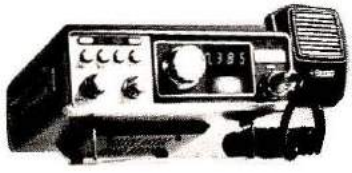

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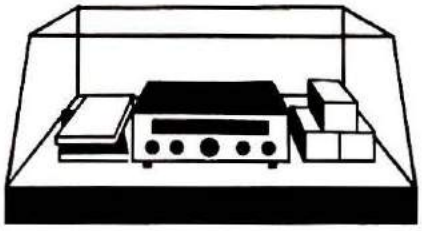


Feather Touch Keyer

The new Kantronics Feather Touch Keyer is the world's first commercially available keyer with no moving parts. The Feather Touch responds to your lightest touch, not to mechanical connections or switches. No moving parts means the end of slapping and bouncing. There are no adjustments to be made before each contact, and no mechanical parts to wear out.

Feather Touch sends self-completing dots and dashes, with a speed range of 7-1/2 to 50 words per minute. The keyer operation is semi-iambic, with dot priority. This keyer is great for portable or field-day use, where it can be powered by a single 9-volt internal battery. An extra-life battery can provide 24 hours of reliable keying under average conditions. At home, the unit can operate from any 5- to 15-volt dc power source.

The attractive design and compact size make the Feather Touch a professional addition to any ham station. Price is $69.95 from Kantronics, Inc., 1202 East 23rd St., Lawrence, Kansas 66044. For more information, write to them, or use *ad check* on page 86.

Fox-Tango Club Newsletters

The second edition of the 1977 *FT Newsletters* is now available to hams interested in technical improvements, maintenance tips, and operating hints about Yaesu equipment. The *FT Newsletters* are published and edited by Milton Lowens, N4ML (WA2OAQ), ten times a year, and mailed to a worldwide club membership of better than 2000. The International Fox-Tango club is an association of individuals who own, or have an interest in, amateur radio equipment manufactured by Yaesu Musen Company of Tokyo. The club was organized in 1971 by Milt, and the first newsletter appeared in 1972. Most of the information published is contributed by the membership. The material may tell about improvements, modifications, service notes, trouble-

shooting techniques, and announcement or reviews of new accessories or equipment.

A collection of the 1977 *FT Newsletters* is now off the presses and ready for any who would like to have this information in one bound publication. Additionally, this 60-page booklet includes information about the International Fox-Tango Club organization, membership requirements, and benefits. This paper-backed Volume 2, with its distinctive IFT Club logo, is available from Fox-Tango Corporation, Box 15944, West Palm Beach, Florida 33406, or from Ham Radio's Communications Bookstore, Greenville, New Hampshire 03048; order FTN; price is $5.00.

Frequency Counter Brochure Available

The people at Continental Specialties Corporation have done a remarkable job of packing 8-digit, 100-MHz, performance into a totally portable 44 x 143 x 197 mm (1.75 x 5.63 x 7.75-inch) counter with a suggested resale price of just $134.95. And they have also developed an extensive line of accessories to make this sensitive, responsive counter even more versatile. Now they're offering a full-color four-page brochure, aptly entitled "*Freq Out*" detailing the features and performance of this exceptional test instrument. *Freq Out* is available at most CSC dealers and distributors; contact Continental Specialties Corporation, 70 Fulton Terrace, New Haven, Connecticut 06509; phone (203) 624-3103; or use *ad check* on page 86.

Two-meter transverter

Hamtronics has announced the VX2, a new 2-meter ssb transverter which you can use for Oscar mode J operation. Of course, it may be used for Mode A and simplex activity as well. The new model VX2 transverter is constructed on a pc board, as shown in the photo. The kit is easy to build and align, with convenient test points at each stage.

The kit is intended for use with 10-meter ssb exciters, but some have been used with recycled 11-meter ssb units for in-

expensive Oscar operation. Various frequency schemes are available to accommodate different types of exciters. The transverter requires only 5 mW of drive to provide 2W PEP output. Many of the newer exciters have a low power output connection, and older ones can either be modified or used with an attenuator to provide the required drive. Perhaps the best feature of this new transverter kit is the economical price — only $59.59.

Two linear power amplifiers are available for higher power output: A model LPA2-15 provides 15 watt PEP; and model LPA2-70 provides 70 watt PEP output. A Cycolac case is also available for the transverter and PA as an option.

For more information write for a free catalog on these and other vhf and uhf kits, including preamps and converters for Oscar frequencies. Hamtronics, Inc., 182-F Belmont Road, Rochester, New York 14612, or use *ad check* on page 86.

Improved Binaural Filter/Synthesizer

The Hildreth Engineering Company has improved their Binaural Synthesizer/Filter.

Their new model 1500 offers several advantages over the previous 1100 version.

The diode modulators have been replaced by a balanced bipolar system that incorporates a dual op-amp and four transistors. Level-sensitivity adjustments are not needed as often with the new circuitry, especially when inpulse and atmospheric noise is present. Additionally, the binaural synthesizer function now uses a 1-dB Chebychev design.

The functions of the 1500 remain the same as the 1100: it synthesizes binaural audio from a single audio channel; it generates a "Tone-Tag" on any CW signal tuned to a narrow range of 700 to 800 Hz; and it includes a 150-Hz bandwidth filter, with continuously adjustable skirts, centered at 750 Hz. Output power is 1/2 watt peak into 8-ohm speakers. A separate jack provides reduced power output for low-impedance stereo headsets.

For more information, write to Hildreth Engineering, Box 60003, Sunnyvale, California 94088; phone (408) 245-3279; or use *ad check* on page 86.

Amateur Antenna Catalog

A new catalog covering their comprehensive line of mobile and base station antennas for amateur radio applications has just been issued by Antenna Incorporated, Cleveland, Ohio. The 8-page catalog provides detailed descriptions and complete electrical and mechanical specifications on some 4 dozen ham antennas, including 10 meter, 6 meter, 2 meter, 3/4 meter, and 1-1/4 meter types. Thirteen types of mountings are available, according to Randall J. Friedberg, vice president and sales manager. The antennas are designed for 100, 150, and 200-watt power ranges. The mobile units are designed for temporary or permanent installation on all types of vehicles, Friedberg said.

All of the antennas and accessories described in the 8-page booklet are manufactured in the United States and of highest quality materials to assure dependable performance.

Copies of the catalog are available free on request from Antenna Incorporated, 26301 Richmond Road, Cleveland, Ohio 44146; or use *ad check* on page 86.

RF Test Set

A *Thruline* (registered trade name) directional rf wattmeter and a Bird 100-watt dry load constitute the core of the new model 4300-064 Test Set. Selected especially for convenience in servicing mobile communications equipment, accessories include an rf sampler with variable level control for signal frequency, spectrum, and envelope analysis, two UHF connectors, two N connectors (on the model 43 Wattmeter), and a laminated VSWR chart.

The test set is cushion-fit assembled in a durable, MIL-spec polyethylene case with space for seven plug-in elements, which determine power and frequency ranges. The carrying case and VSWR chart are complimentary with the kit.

A customized luggage-style transit case has also been announced. The model 4300-070 (shown at the top of the photo) has space for a model 43 Wattmeter, 15 plug-in elements, and additional accessories. Cushion inserts for other configurations can be designed for quantity requirements. Price for the model 4300-064 test set is $298; plug-in elements $36 to $75. Delivery is 4 weeks after receipt

of order from Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon), Ohio 44129; for more information use *ad check* on page 86.

Frequency Counter Kit

A versatile, high-quality, 600-MHz frequency counter which features accuracy, sensitivity, reliability, and low cost has been introduced by Davis Electronics. The counter is designed for 115 Vac or 12 Vdc operation, and is available either factory-assembled or in kit form. The Davis 7208 frequency counter incorporates the latest LSI (large-scale integration) technology in a wide-range, portable instrument measuring only 14 × 15 × 5 cm (5-1/2 × 6 × 2 inches) and weighing a mere 0.79 kg (1-3/4 lbs).

Superior features of the Davis 7208 include a durable, all-metal cabinet for rf shielding, large 8-digit LED display, push-button switches, built-in prescaler, gate light, crystal time-base, and automatic decimal-point placement. Options available include a crystal oven, a rechargeable battery for total portability, and a built-in vhf-uhf preamplifier for direct measurement of low-level rf signals.

The Davis 7208 has a frequency range of from 10 Hz to 600 MHz, with 0.1 and 1.0 second gate time; resolution is 1 Hz with the 1.0 second gate, 10 Hz with the 0.1 second gate, and sensitivity is 10 mV at 60 MHz and 100 mV at 600 MHz. Input impedance is 1 megohm and 20 pF to 60 MHz; 50 ohms above 60 MHz. Time base accuracy is ±1 part-per-million for the standard package or ±0.5 parts-per-million with the crystal oven.

The 600-MHz kit (model 7208K), which costs $149.95,

comes complete with all parts, drilled and plated through glass printed-circuit boards, cabinet, switches, hardware, plus a detailed assembly manual and calibrating instructions. Assembly time is about 4 hours. All parts are guaranteed for 90 days and factory service is available, if needed. A factory-assembled 600 MHz unit (model 7208A) costs $199.95 (plus $2.00 shipping); it is calibrated to specifications and guaranteed for one year. Optional (01) crystal oven is priced at $39.95; (02) rechargeable Ni-Cad batteries are $39.95; (03) carrying handle costs $5.00; and (04) built-in vhf-uhf preamplifier is $10.00. For further information contact Davis Electronics, 636 Sheridan Drive, Dept. 805, Tonawanda, New York 14150; or use *ad check* on page 86.

Micro Duster Cleaning Gas

Chemtronics Inc., a major manufacturer of chemical products, recently introduced Micro Duster, a new product that permits compressed-gas dusting of delicate instruments and assemblies. The product contains pure, moisture-free nonflammable and nontoxic filtered gas, providing controlled removal of dust, lint, oxide particles, and the like without depositing harmful contaminants. Micro Duster has a broad range of applications, including mechanical and electrical miniature assemblies, audio components, computer tapes and heads, clean-room areas, timepieces, business machines, camera lenses and other optics, plus film, negatives, and slides.

A single 425-gram (15-oz.) can of Micro Duster produces over 1800 one-second compressed-gas bursts, or 25 to 30 minutes of continuous dusting. Spraying in short bursts until contaminants are dislodged is recommended for most efficient use. The product comes with an extension tube for pin-

point applications. For precision application in harder-to-reach areas, Micro Duster may be used with Chemtronics' Vibra-Jet attachment which provides extended range with a 30-cm (12-inch) rigid probe on the end of a 66-cm (26-inch) flexible tube.

The product, which contains 100 per cent laboratory controlled, guaranteed pure, inert gas, is available in 425-gram (15-oz.) cans with a suggested retail value of $2.50. It is sold only through Chemtronics distributors. For more information, including the location of local distributors, contact Chemtronics Inc., 45 Hoffman Avenue, Hauppauge, New York 11787; or use *ad check* on page 86.

Velcro Mike Mount

An innovative microphone holding system has been developed by R&D Products, of Grass Valley, California. MIKE MOUNT holds a microphone in place with a space-age *Velcro* contact fastener, providing an easy-on, easy-off, keep-your-eyes-on-the-road mounting device. It can be installed in seconds and there are no holes to drill. A precision-molded backing plate with a loop-pile *Velcro* disk is attached to the microphone by pressure-sensitive adhesive. A matching *Velcro* hook disk, also backed by pressure-sensitive adhesive, is positioned in the most convenient spot for the user. The holding quality has been thoroughly tested under severe conditions by R&D Products. Contact is instantaneous and it won't disconnect unintentionally. MIKE MOUNT works with all types of microphones, when-

ever and wherever there is a need to hang up a microphone. The price is $2.95. Additional hook disks are available. Write to R&D Products, Box 1879, Grass Valley, California 95945; or use *ad check* on page 86.

TVI Filters

Telco Products Corporation announces two new additions to its line of low-pass TVI filters: the **XLP-150** and the **XLP-500**. The new XLP-150 handles more than 150 watts of a-m output, or 300 watts PEP ssb. It suppresses all harmonics above 41 MHz by more than 75 dB. The new XLP-500 handles more than 500 watts a-m, or 1000 watts PEP ssb. Harmonic suppression above 38 MHz is more than 95 dB.

XLP filters are manufactured in the United States, using computer-designed technology. They are assembled from the highest quality components available. The filters are furnished with standard PL-259 connectors attached.

User price for the XLP-150 is $14.50; for the XLP-500 is $24.50. For additional information, contact Telco Products Corporation, 44 Seacliff Avenue, Glen Cove, New York 11542, or use *ad check* on page 86.

Channel Programmer for Icom

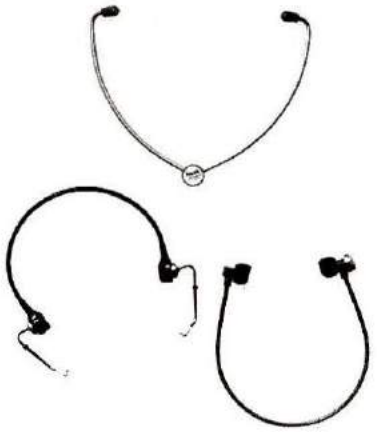
Cleng Electronics is pleased to announce the model **CRP-22** programmer for use with the ICOM IC-22S. The CRP-22 has two 16-position switches that are used to program the IC-22S to any of the 133 channels the

transceiver covers. To use the programmer, you simply refer to the look-up table, a 3 x5 card, for the correct switch settings for the desired frequency.

The CRP-22 can be installed in 20 minutes by connecting the flat ribbon cable in place of the diodes for any one channel of the radio, leaving the other 21 channels available for fixed programming. Adhesive-backed Velcro is furnished for mounting the programmer to either the radio or an automobile dashboard. Mounting of the unit is facilitated by its small size, 50 x 68 x 15 mm (2.0 x 2.7 x 0.6 inches).

The price, complete with Velcro, look-up table, and installation instructions, is $39.95. Dealer and club discounts are available. Write to Cleng Electronics, Post Office Box 12171, Dallas, Texas 75225, or use *ad check* on page 86.

Lightweight Headphones from Telex



To overcome extraneous noise, and at the same time provide extra comfort and performance, Telex Communications, one of the world's leading manufacturers of professional communications equipment, offers the radio amateur three lightweight headphone models. All three models have magnetic transducers with rising frequency response, making them particularly well suited for communications-quality audio use.

Headphones concentrate the signal at the ear, overcoming ambient noise and room acoustics. Also, they allow the operator to work without disturbing others, which is not possible with a conventional speaker. Additionally, the operator is able to more easily hear and understand weak signals than when using a speaker.

The **HTC-2** is an over-the-head unit. This is Telex's lightest twin receiver unit that is widely favored by pilots, broadcasters, and hams. The dual magnetic receivers rest on the operator's temples with the sound fed to the ears through adjustable, ball-and-socket-mounted tubular arms. This system permits either or both sound arms to be turned away for conversation without removing the entire headphone.

Two of the Telex units are under-the-chin style: the Model **HMC-2** featherweight offers a magnetic driver-element positioned between the adjustable anodized-aluminum tone arms for optimum sound reproduction. The plastic eartips are removable. The Model **HFC-91** provides a millisecond delay between ears by means of a magnetic element that channels the signal through the acoustic tubes, resulting in greater depth and clarity of the signal. The comfortable foam ear cushions are easily removed for cleaning and replacement. For single-ear use, the driver element snaps onto the Nylon earloop.

For more information and a catalog of the Telex line of equipment contact Otto Janssen at Telex Communications, 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420; or use *ad check* on page 86.

New Hamtronics Catalog

Hamtronics, Inc. has announced publication of a new 1978 catalog crammed with goodies for vhf/uhf and OSCAR enthusiasts and two-way radio

shops. The 40-page catalog features a new line of vhf transmitting converters and linear power amplifiers, new 2-watt fm transmitters, vhf and uhf receiver converters, vhf and uhf fm receiver kits, receiver preamps, test-probe kits, power supplies, tone pads and tone-encoder microphones, antennas, and many more items of interest to the active ham.

For your copy of the new 10 × 14 cm (4 × 5-1/2 in.) catalog, send a self-addressed, stamped envelope to Hamtronics, Inc., 182-F Belmont Road, Rochester, New York 14612; or use *ad check* on page 86.

Antenna Center Insulator from Hy-Gain

The engineering group at Hy-Gain Electronics has introduced a new center insulator unit for multi-band doublet antennas such as the Hy-Gain Model 380 (2BDQ). The new insulator, Model 157, has a built-in SO-239 for easy hook-up to a PL-259 on attaching coaxial cable. The insulator is molded from high-impact ABS plastic and all internal connections are fully weatherproofed and insulated with silicone for complete reliability under all environmental conditions.

All hardware is iridited to resist corrosion. Hardware is provided on each end for positive antenna attachment and an eyescrew is attached to the top of the insulator for stringing support wires for the antenna. The Model 157 will handle 1 kW average power and 2 kW PEP.

For further information on the new Hy-Gain doublet antenna center insulator or other Hy-Gain amateur products write: Hy-Gain Electronics Corp., 8601 Northeast Highway Six, Lincoln, Nebraska 68505; or use *ad check* on page 86.

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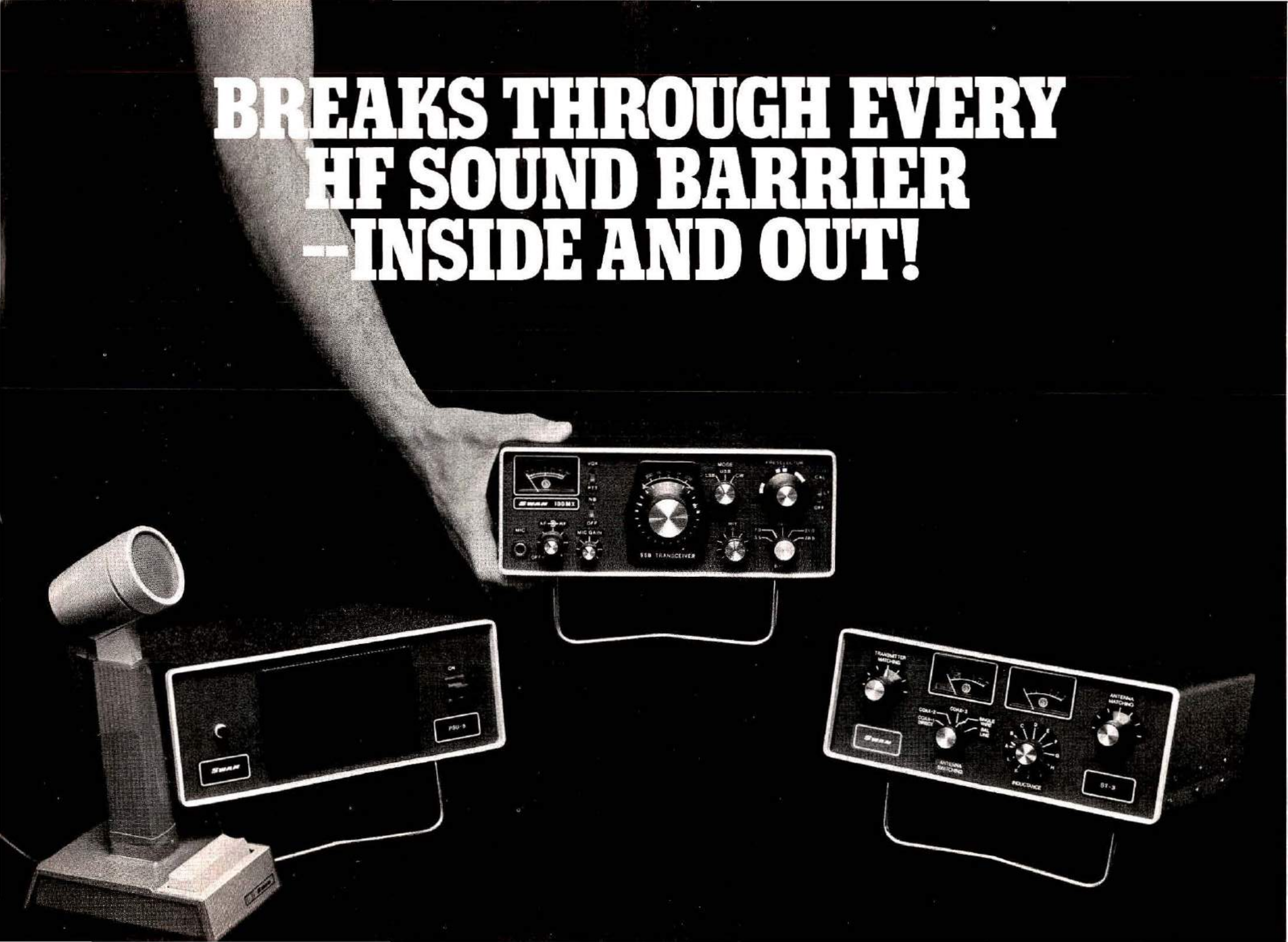

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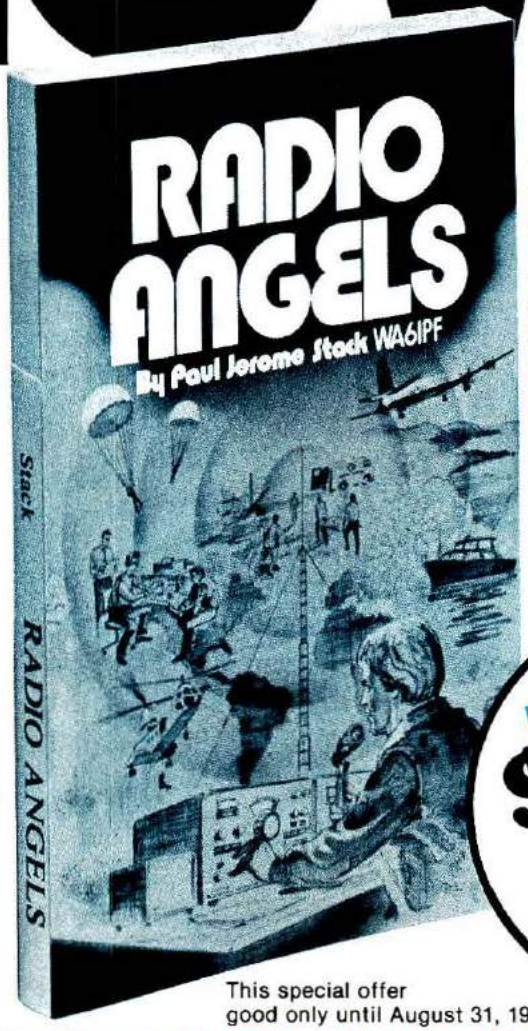

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ELECTRONIC EQUIPMENT HOTLINE is a new classified advertising newsletter for buying and selling professional, industrial, and surplus electronic equipment. Subscriptions $6/year, ads 50¢/word. Prepublication offer: $1 off subscriptions and 20% off all ads postmarked before October 1, 1978. Electronic Equipment Hotline, P.O. Box 4768, Panorama City, CA 91402.

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Award for Public Service or Emergency Communications Award. Send 2.00 each, event, name and address. FREE Information. 49'er RADIO CLUB, Box 1400-HH, Downey, Calif. 90240.

"HAM RADIO OPERATOR" NAMETAGS!! Call, handle, $1.00. WA5CYR, Box 188, Bruce, MS 38915.

CODE PRACTICE OSCILLATORS, hand keys, electronics keyers, other products. Free catalog. Globalman (W6PHA) Products, Box 246, El Toro, CA 92630. 714-533-4400.

THE "CADILLAC" of QSL's! — New! Samples: $1.00 (Refundable) — MAC'S SHACK, Box #1171-G, Garland, Texas 75040.

UPGRADE NOW — to Ham Radio Magazine, the technical journal for all radio amateurs that brings you the latest ideas, construction projects, new circuits, and state-of-the-art advances in electronic communication. You can't afford to miss it at only $12 per year. Ham Radio, Greenville, New Hampshire 03048.

BYTE, Drink and be merry at the Tidewater Hamfest, Flea Market and Computer Show, Norfolk, Virginia. September 23-24. Over 60,000 sq. ft. of exhibit and flea market space. All indoors. All air-conditioned. Write TRCI, P.O. Box 9371, Norfolk, Virginia 23505.

RADIO EXPO '78 Special late dates for this year only are September 30, October 1. Lake County IL Fairgrounds between Chicago and Milwaukee. Over 4000 attended last year's Expo. Dozens of manufacturers and distributor exhibits will be on display. Indoor/outdoor flea market, open Friday for set-up. Seminars scheduled all weekend. Free camping. Thousands of dollars in door prizes. The convention center is the Holiday Inn, Mundelein, IL. Tickets are $2 in advance, $3 at the gate. The Lake County IL Fairgrounds are at Routes 45 and 120 in Grayslake, IL. For info or tickets, write the Chicago FM Club, P.O. Box 305, Maywood, IL 60135.

COMPUTER GENERATED CODE TAPES
New FCC type code test format with 25 different Ham QSO's on each cassette! **General/Advanced** — 15 WPM, 80 minutes of actual copy. **Extra Class** — 22.5 WPM, 50 minutes of actual copy. **$4.95** ea. or both tapes **$8.95** ppd. Free printout of copy included to check your copy. Write COMPU-CODE, 113 Starlite Dr., Plano, TX 75074.

ENGRAVED NAMETAGS 1½" x 2½" — $3.00. QTH added $0.50. Door plates, key tags available. Black, blue, red, walnut with white letters. Other colors available. Tag-it Co., Box 2062, Indianapolis, IN 46206.

NEW JERSEY — SOUTH JERSEY RADIO ASSN. Hamfest is Sept. 10, 1978 rain or shine at Ellisburg Shopping Center, Cherry Hill, N. J. at intersection of routes 41 and 70. Family registration $2.00. Tailgating $3.00. Flea Market, Auction & Activities. Many prizes. Talk in 52. Contact K2KA, Box 2736, Cherry Hill, N. J. 08002. Tel: (609) 429-6032 for info.

FREE CATALOG of new merchandise. Resistors, capacitors, IC's, semiconductors, and more. Send to: Key Electronics, Box 3506HH, Schenectady, New York 12303.

NEW CONCEPT — Novice instructional package, theory tape & study material. Complete license study package, $17.95. General study package, $19.95. MARI, 1320 Canary Drive, West Columbia, SC 29169.

REPAIRS BY N2MB, NEW YORK AREA, First Class Commercial license, Amateur extra, in business 20 years — Radio Clinic, N2MB (formerly WA2BIT). 212-327-4952.

SPECIAL EVENT: Miss America Pageant, Atlantic City, N. J. Dates: Sept. 1 to 10, 1978. Approx. Frequencies: CW 3555 7055 14055 21055; Phone 3935 7235 14280 21380; Novice 3730 7130 21130. QSL to K2BR. Operation will be from the Atlantic City Convention Hall and Traffic to and from the Contestants of the Miss America Pageant will be welcome. This Station is sponsored by the Southern Counties Amateur Radio Association.

YOUR DRAKE has built-in speech compression and you never knew it. Details: $2 and S.A.S.E. WB2IWH, 213 Dayton Ave., Clifton, N.J. 07011.

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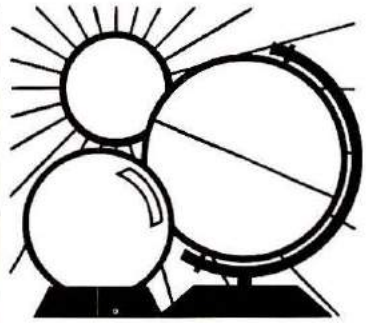

DX FORECASTER

Last-minute forecast — a look at disturbances

Minor ionospheric disturbances are expected during the first week of this month, with September 3rd and 4th likely to show the greatest effects on the geomagnetic field. An eight-day period between September 10th and 18th is likely to be very disturbed, with ionospheric and geomagnetic activity giving rise to unusual propagation conditions, as well as atmospheric disturbances. The most likely times to observe unusual conditions will be toward the beginning and at the end of this time. Then, again, between September 21st and 27th there are likely to be additional disturbances, with the greatest upsets occurring between the 23rd and 25th. The autumnal equinox takes place on September 23rd, new moon is between the 2nd and 3rd, perigee on the 14th, and full moon on the 17th. A lunar eclipse will take place on the 16th, but will be visible as a total eclipse only in Australasia, part of Antarctica, Asia, Africa, Europe, and the extreme northeast sections of South America. No major meteor showers are expected this month.

Band-by-band Predictions

As you can see from the table, maximum usable frequencies are definitely higher, for longer periods of time, than they were last fall or even this spring. This means that the high-frequency bands will be open more often to various areas of the world than they have been in many years.

Good news for DXers! A general increase in solar activity and rapidly rising sunspot numbers are the main cause of improved DX opportunities, but the autumnal equinox also favors DX activity.

Ten meters will become a good DX band, but not a main choice, this month. Openings from western United States to the Pacific and to South America will be frequent, as will openings into Europe and Africa from midwest and eastern United States locations.

Fifteen meters is rapidly becoming *the* DX band because of its generally less-crowded conditions, ability to propagate low-power signals with surprising strength, and the fact that it's open to one area or another of the world almost all of the time. Use the chart carefully to exploit fifteen to its fullest potential.

Twenty meters, at last, will have to share top honors with fifteen as the prime DX band. The main virtue of twenty is its consistency, while its main drawback is the crowded conditions you'll find there.

Forty, Eighty, and One-sixty meters will gradually improve during the evening hours. Start listening about dusk on forty, and a bit later on eighty and one-sixty. There'll be plenty to work with just a dipole and two hundred watts; more if you have higher power and a beam. Again, remember to practice grey-line DXing at sunset and dawn for those stations lying along the darkness path.

HRH

GMT	PDT	WESTERN USA N	NE	E	SE	S	SW	W	NW	MDT	MID USA N	NE	E	SE	S	SW	W	NW	CDT	EDT	EASTERN USA N	NE	E	SE	S	SW	W	NW
0000	5:00	15	15	15	15	10	15	15*	15	6:00	20*	20*	20	15	—	15	15	15	7:00	8:00	15	20	15	15	15	15	15	15
0100	6:00	15	15	15	15	10	15	10	15	7:00	15	20	20	15	—	15	15	15	8:00	9:00	20	20	15	15	20	15	15	15
0200	7:00	15	15	15	15	15	10	10	15	8:00	15	20	20	20	20	20	15	20	9:00	10:00	20	20	20	20	20	15	15	15
0300	8:00	15	20	20	15	15	10	10	15	9:00	15	20	—	20	20	20	20	20	10:00	11:00	20	20	40	40	20	20	20	20
0400	9:00	15	20	20	15	15	15	15	15	10:00	20*	—	—	20	—	20	20	20	11:00	12:00	20	20	40	40	20	20	20	20
0500	10:00	15	20	20	20	20	15	15	20	11:00	20	20	—	20	—	40*	20	20	12:00	1:00	20	20	20	20	20	20	20	20
0600	11:00	20	15	20	20	20	15	15	20	12:00	—	20	—	20	—	40	20	20	1:00	2:00	—	20	20	20	20	20	20	20
0700	12:00	20	15	—	20	—	20	20	20	1:00	—	20*	—	20	—	40	20	40	2:00	3:00	—	15*	—	—	20	20	40	40
0800	1:00	—	20	—	20	—	20	20	20	2:00	—	15	—	20	40	40*	40*	40*	3:00	4:00	—	—	—	—	20	40	40	40
0900	2:00	—	—	—	20	—	20	20	20	3:00	—	15*	—	20	40	40	40	40	4:00	5:00	—	—	—	—	20	40	40	40
1000	3:00	—	—	—	20	40	20	20	20	4:00	—	20*	—	20	40	40	40	40	5:00	6:00	—	—	20	20	20	40	40	40
1100	4:00	—	—	—	20	40	20	20	20	5:00	20	20	—	20	—	20	20	40	6:00	7:00	—	—	20	20	20	40	40*	40*
1200	5:00	—	20	—	20	—	20	20	20	6:00	20	20	20	20	—	20*	20	40	7:00	8:00	—	15	20	20	20	20	20	20
1300	6:00	—	20	—	20	—	—	20	20	7:00	20	20	15	20	—	15	20	20	8:00	9:00	20	15	15	15	15	20	20	20
1400	7:00	20	15	15	20	—	20*	—	20	8:00	15	20	15	15	—	20	20*	20	9:00	10:00	20	15	15	15	15	20	—	—
1500	8:00	15	15	15	15	—	15	—	20*	9:00	15	20	15	15	—	20	—	—	10:00	11:00	20	15	15	15	15	20	—	—
1600	9:00	15	15	20	15	20	20	—	20	10:00	15*	20	15	15	—	20	—	—	11:00	12:00	—	15	15	15	15*	20	—	—
1700	10:00	15	15	15	15	20	—	20	20	11:00	15	20	15	15	—	—	—	—	12:00	1:00	—	20*	15	15	10	20	—	—
1800	11:00	15	15	15	10	—	—	15	20	12:00	15	15	15	15	—	—	—	—	1:00	2:00	—	20*	15	15	10	15	—	—
1900	12:00	20	15	15	10	—	—	15	20	1:00	15	15	15	15	—	—	—	—	2:00	3:00	—	20*	15*	15	15	15	20	20
2000	1:00	20	15	10	10	—	15	15	20	2:00	20	15	15	10	—	20	20	20	3:00	4:00	—	20*	10	10	10	15	20	20
2100	2:00	20	15	10	10	—	15	15	15	3:00	20	15	15	10	—	15	20*	15	4:00	5:00	—	20*	10	10	10	15	15	20
2200	3:00	—	15	15	10	—	15	15	15	4:00	20	15	15	10	—	15	15	15	5:00	6:00	15	20	15*	15	10	15	15	15
2300	4:00	20	15	15	10	—	15	15*	15	5:00	20	15	15	15	—	15	15	15	6:00	7:00	15	20	15	15	15	15	15	15
	SEPTEMBER	CENTRAL ASIA	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	NEW ZEALAND	W. AUSTRALIA OCEANIA	FAR EAST		CENTRAL ASIA	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	NEW ZEALAND	AUSTRALIA	FAR EAST			FAR EAST	EUROPE	CENTRAL AFRICA	S. AFRICA	S. AMERICA	OCEANIA	W. AUSTRALIA NEW ZEALAND	AUSTRALIA

HAM CALENDAR

September 1978

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
*All international events such as contests are shown on the GMT days on which they take place even though they may actually begin on the evening of the preceding day in North America.	K2BR will be operating from the Miss America Pageant, from September 1st to the 10th. Operation will be from the Atlantic City Convention Hall in New Jersey. Traffic to and from the Contestants of the Miss America Pageant will be welcome. Approximate frequencies: CW — 3555, 7055, 14055, 21055; Phone — 3935, 7235, 14280, 21380; Novice — 3730, 7130, 21130 — QSL to K2BR. This station is sponsored by the Southern Counties Amateur Radio Association.		See September 1-10, 12, 16, 18, 19, 23 	1978 Region 6 AFCS MARS Conference — Mansion Inn, Sacramento, CA — 9/29-10/1 Info: Jack Bayha AFW6RZQ SMD CA, Conference Chairman 1978, 23009 Vanowen Street, Canoga Park, CA 91304 (213) 887-4568 evenings	ARRL West Gulf Division Convention — El Paso, TX — 1-3 1	Four-Land QSO Party — 2-3 2
Five Flags ARA Ham-A-Rama — University of West Florida Field House Pensacola, FL Second Annual Mon-Ham-Gala — Westover Park — Morgantown, W VA York County Pennsylvania Hamfest — Dragway at Thomasville Airport — 10 miles W. of York on US 30 3	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB WEST COAST BULLETIN Edited & transmitted by W6ZF 9PM PDST 3540 kHz, A-1, 22 WPM 4	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) 5	West Coast Qualifying Run 0400Z 6	7	8	ARRL VHF QSO Party — 9-10 Cleveland Hamfest — County Fairgrounds — Berea, OH — Info: Cleveland Hamfest Assoc., P.O. Box 27211, Cleveland, OH 44127 Cochise ARA Amateur Radio Round-Up — Sierra Vista Community Center Sierra Vista, AZ Melbourne Hamfest — Melbourne Civic Auditorium — Melbourne, FL 9-10 Pennsylvania QSO Party — 9-10 9
ARRL Illinois State Convention — Rockford, IL Butler County ARA Hamfest — Butler County Farm Show Grounds — Butler, PA — K3HJH or WB3CDA Findlay Hamfest — Riverside Park — Findlay, OH — WB0JN North American CW Sprint South Jersey Radio Assn. Hamfest — Ellisburg Shopping Center — Cherry Hill, NJ — K2KA 10	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB 11	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) W1AW Qualifying Run 0200Z* 12	13	14	Evans Radio Inc., Open House and Trade Show — 15-16 Open House — Evans Radio Rt. 3A Bow Junction, Concord NH 03301 Trade Show — New Hampshire Highway Hotel, Concord, NH 15	DXPO '78 — By the National Capitol DX Assoc., Tyson's Corner Ramada Inn — Tyson's Corner, VA — K3AD — 16-17 ARRL Technical Symposium — Tyson's Corner Ramada Inn — managed by the Amateur Radio Research and Development Corp. (AMRAD) and sponsored by the Northern Virginia Amateur Radio Council (NCVARC) Hamburg International Hamfest — Erie County Fairgrounds — Hamburg, NY Scandinavian Activity Contest — CW — 16-18 Washington State QSO Party — 16-18 16
Central Pennsylvania Repeater Assoc. Electronic Swapfest — Park-N-Shop Garage — 200 Block Walnut Street — Harrisburg, PA — WB3HXH Cincinnati Hamfest — Sticker's Grove — State Route 128 — Venice, OH Frequency Measuring Test L'Anse Creuse Swap Shop — L'Anse Creuse High School — Mt. Clemens, MI Peoria Area ARC Hamfest — Exposition Gardens — Peoria, IL WB9BJJ Sky Views Swap & Shop — New location of Sokol Camp — Lower Burrell, PA — K3VRU 17	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB WEST COAST BULLETIN Edited & transmitted by W6ZF 9PM PDST 3540 kHz, A-1, 22 WPM 18	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) W1AW Qualifying Run 1300Z 19	20	21	ARRL National Convention — San Diego, CA — 22-24 22	Delta QSO Party — 1800Z 9/23 - 2400Z 9/24 Scandinavian Activity Contest — Phone — 23-24 Tidewater Hamfest/Flea market/Computer Show — Norfolk VA — Info: TRCI, P.O. Box 9371, Norfolk, VA 23505 — 23-24 23
Adrian ARC, Inc., Hamfest — Lenawee County Fairgrounds — Adrian, MI Greater Genesee Valley ARC Swap & Shop — Info: SASE to Gordon, K8ZIS, P.O. Box 7671, Flint, MI 48507 Lanierland ARC HAMNIC — Lanier Islands Dogwood Pavilion — Gainesville, GA — W4DNX Radio Assoc. of Erie's Ham-Jam '78 — Waldameer Park — Rainbow Gardens — Erie, PA 24	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB 25	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) 26	27	28	29	ARRL Greater Louisville Hamfest — West Hall of the Kentucky Fair and Exposition Center — Louisville, KY Corpus Christi ARC & So. Texas Amateur Repeater Club Swapfest — National Guard Armory, 1430 Horne Road — Corpus Christi, TX — W5KNZ Elmira NY Hamfest — Info: John Breese, WA2FJM, 340 West Avenue, Horseheads, NY 14845 Mid-Atlantic VHF Conference — Treadway Inn on Easton Road — Willow Grove, PA — WA3AXV Radio Expo '78 — Lake County Fairgrounds — Lake County, IL — Info: Chicago FM Club, P.O. Box 305, Maywood, IL 60135 30

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30W	80W	80A30	$159

UHF (400 to 512 MHz)

Drive Power	Output	Model No.	Price
2W	70W	70D02	$270
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30W	70W	70D30	$210
2W	40W	40D02	$180
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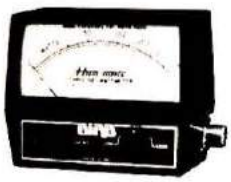

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SEPTEMBER 1978

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Have You Thought . . .
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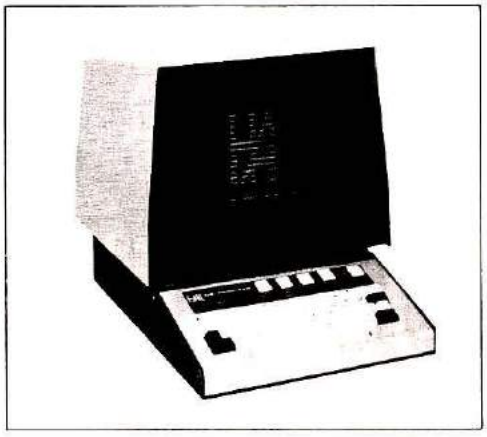

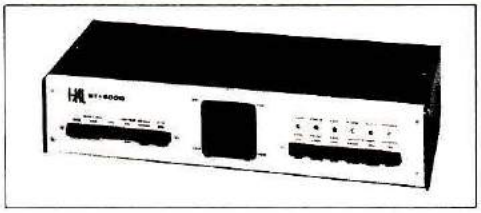

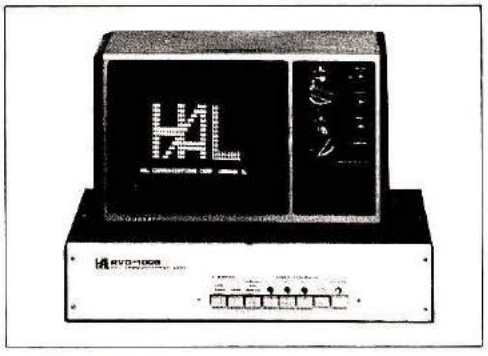

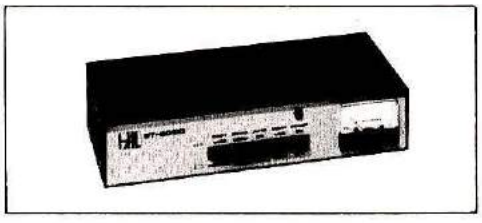

ASK THE GUYS AT HAL!

Our sales and service staff will be happy to assist you in your choice of RTTY equipment, answer questions about RTTY, and provide assistance if problems do arise. In addition, all HAL amateur RTTY equipment manuals can be purchased for $10.00 each for an advance look (applicable to future purchase of that unit).

Answers to common RTTY questions are featured in the center-fold of our new amateur radio catalog. Such questions as "What do I need?", "How do I hook it up?", and "What frequencies do I use?" are discussed. Technical points concerning RTTY pulses, FSK and AFSK, and high-tones vs low-tones are covered.

Write today for HAL'S new catalog and RTTY guide and discover how much fun RTTY can be.

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KENWOOD

...pacesetter in amateur radio

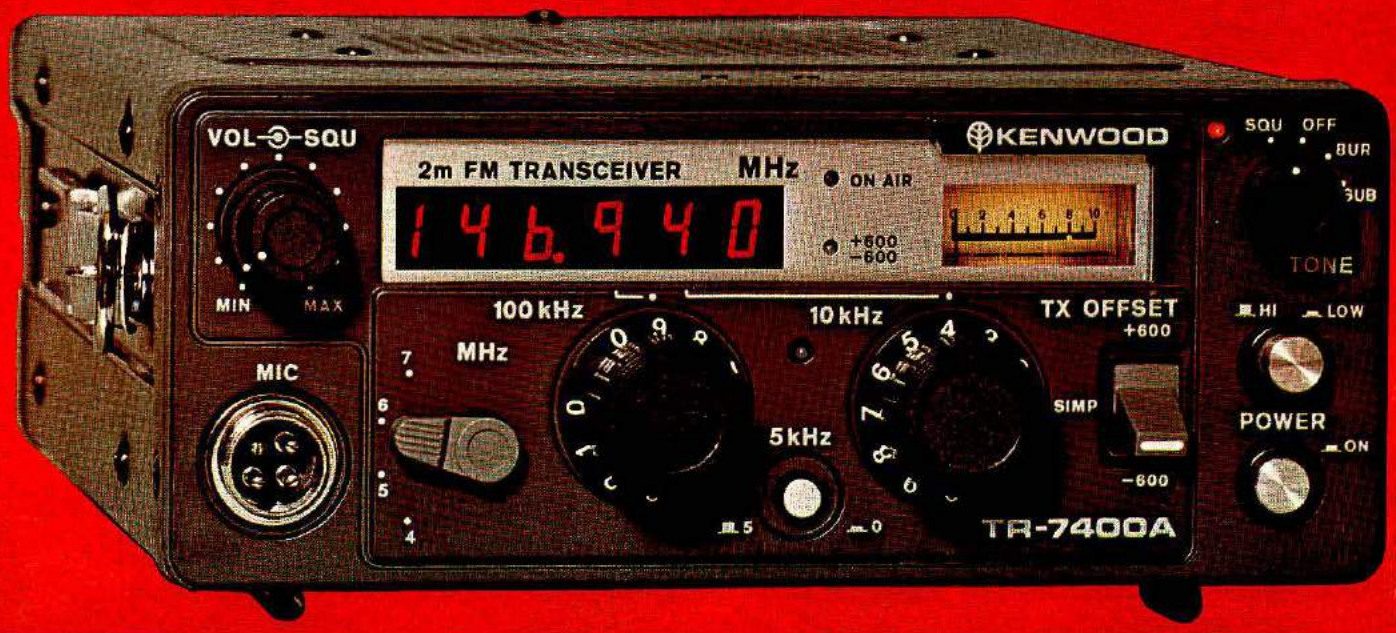
The TR-7400A lets you go anyplace on the 2-meter band . . . covers the entire band without compromise. It exceeds all FCC emission requirements for amateur transceivers. Its RF output is factory spec'd at 25 watts . . . but is typically over 30! It offers a dual frequency readout with large easy to read 6 digit LED display plus a functional dial readout system, fully synthesized 800 channel operation and repeater offset over all 4 MHz (144-148 MHz). The unique Continuous Tone Coded Squelch system is a Kenwood exclusive.

Outstanding sensitivity, large-sized helical resonators with High Q to minimize undesirable out-of-band interferance, and give a 2-pole 10.7 MHz monolithic crystal filter combine to give your TR-7400A outstanding receiver performance. Intermodulation characteristics (Better than 66dB), spurious (Better than −60dB), image rejection (Better than −70dB), and a versatile squelch system make the TR-7400A tops in its class.

(Active filters and Tone Burst Modules optional)

Kenwood's exciting 2-meter transceiver . . . still the most powerful. 800 channels, repeater offset over all 4 MHz (144-148 MHz), dual frequency readout, easy to read 6 digit display, Kenwood's unique continuous tone coded squelch system and outstanding receiver performance. All in a rugged, compact package.

TR-7400A



The TR-7400A is shown with its furnished hand mike and the PS-8 DC power supply (optional). Take your TR-7400A out of the car and you can use it as a powerful base station. The PS-8 is rated at 8 Amps and is among the most rugged, well-regulated supplies available for VHF transceivers requiring 12V DC.

Specifications TR-7400A

Range: 144.00 MHz to 147.995 MHz
Mode: FM
800 Channels: 5 KHz spaced
Sensitivity: Better than 0.4 uV for 20 dB quieting Better than 1 uV for 30 dB S/N
Squelch Sensitivity: Better than 0.25 uV
Selectivity: 12 KHz at −6 dB down 40 KHz at −70 dB down
Image Rejection: Better than −70 dB
Spurious Interference: Better than −60 dB
Intermodulation: Better than 66 dB
Receive System: Double conversion
First IF: 10.7 MHz
Second IF: 455 KHz
Audio Output: More than 1.5 Watts (8 ohm load)
RF Output Power: 25 Watts (High) 5-15 Watts (Low-adjustable)
Antenna Impedance: 50 ohms
Frequency Deviation: ±5 KHz
Spurious Response: Better than −60 dB
Microphone: Dynamic, with PTT switch, 500 ohms
Current Drain: Less than 1A in receive (no input signal)
Current Drain: Less than 8A in transmit

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The HEATHKIT SB-104A

The Head of the Class

Our top-of-the-line Heathkit SB-104A is the culmination of Heath's engineering excellence and expertise in Amateur Radio design. It's the transceiver the serious Radio Amateur aspires to – totally broadbanded, fully solid-state, true digital readout and much more – a truly superior performer that should be the "heart" of any first-class operating station.

That same engineering excellence goes into every piece of Heathkit Amateur Radio equipment – it's part of the reason Heath has been the start, and standby, of Amateur Radio hobbyists the world over. Heathkit equipment gives you superior performance, day-in, day-out reliability and more VALUE for your money. And because Heathkit Amateur equipment comes to you in easy-to-build kit form, you learn more about your hobby as you put the kits together, you SAVE money over comparable assembled units, and you can service the equipment and keep it in top operating condition.

So whether you intend to work the world on a couple of watts CW, or "go-the-limit" with state-of-the-art SSB, you'll find Heath is the place with quality good enough to measure up...to you!

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