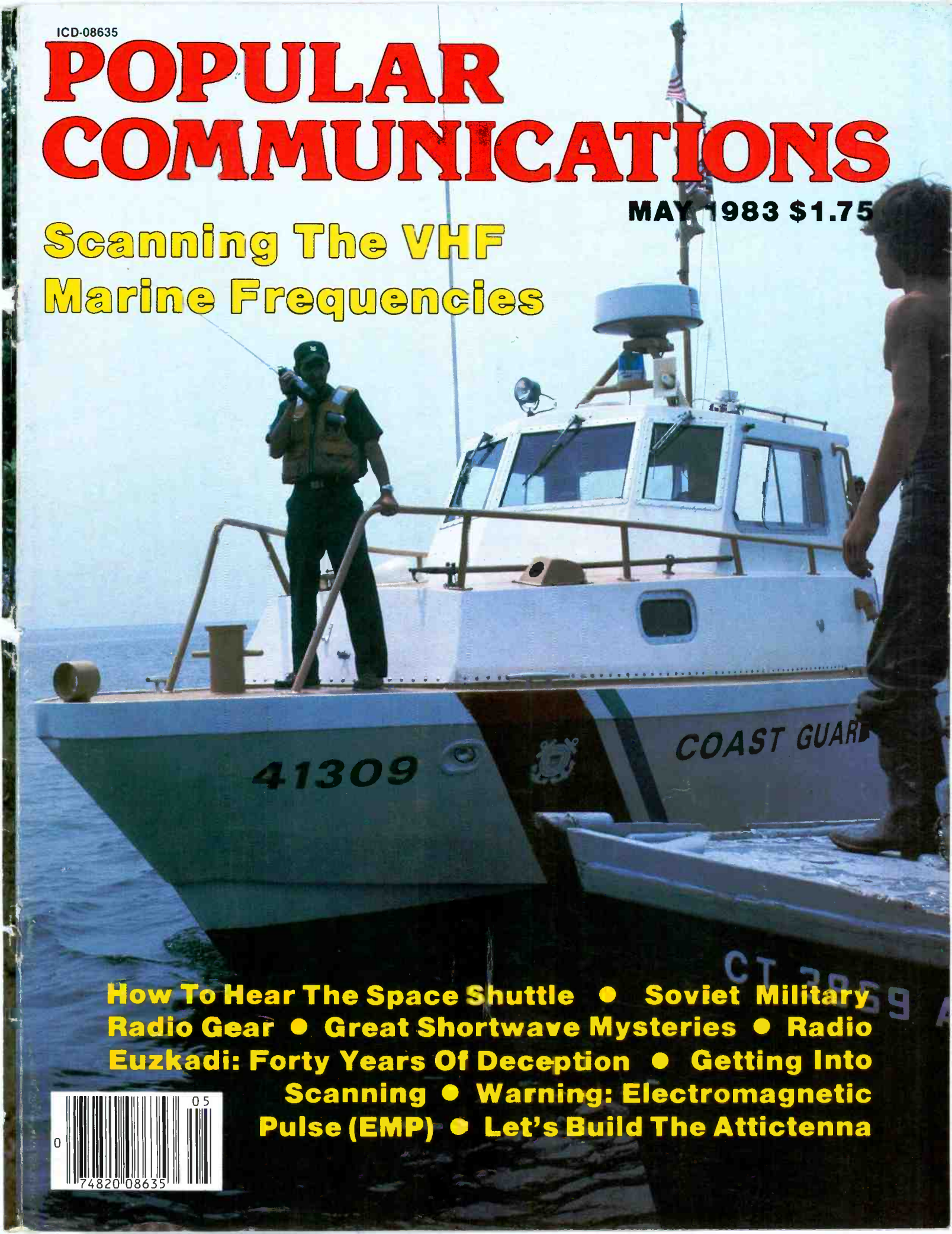
ICD-08635

POPULAR COMMUNICATIONS

MAY 1983 $1.75

Scanning The VHF Marine Frequencies



How To Hear The Space Shuttle • Soviet Military Radio Gear • Great Shortwave Mysteries • Radio Euzkadi: Forty Years Of Deception • Getting Into Scanning • Warning: Electromagnetic Pulse (EMP) • Let's Build The Attictenna

0 74820 08635 05

IC-R70

NEW!

The Commercial Grade Communications Receiver that everyone has been asking for..... at a price you can afford!

GENERAL COVERAGE RECEPTION AT ITS BEST

Listen to the world of HF with the R70, a 100KHz to 30MHz commercial grade receiver designed by ICOM Incorporated, the leader in advanced receiver design. Built from knowledge gained by designing receivers for commercial, marine, and amateur use, the R70 surpasses other receivers on the market...even receivers costing more than twice as much.

Utilizing ICOM's DFM (Direct Feed Mixer), the R70 is a receiver which in normal usage is virtually immune to intermodulation distortion or cross modulation, yet still maintains superior sensitivity. Whether you are a SWL (short wave listener), Ham (amateur radio operator), maritime operator or commercial user, the R70 provides the features you need.

DESIGN

The R70 incorporates an UP conversion system, utilizing a direct feed mixer proven to be the best design for minimizing interference from strong adjacent signals. A preamp is provided for making the weakest of signals readable. High grade filters in conjunction with the built-in PBT (pass band tuning) system and notch filter, provide the ultimate in interference rejection. Selectable AGC (fast/slow/off), noise blanker (wide or narrow), and tone control improve readability under the worst conditions. An AGC derived squelch, operative in all modes, adds to operating ease.

Dual VFO's with three tuning rates provide quick QSY (frequency change), memory for an important station, or by equalizing the VFO's (A=B), a digital RIT. 13.8 VDC operation is provided as an option, 117 VAC is standard.

HAM'ING

The R70 is an ideal general coverage receiver to complement any ham shack. Use it with your existing tramsmitter or transceiver to provide dual receiver capability.

The R70's built-in monitor system lets you listen to your own transmitted audio and a mute input automatically protects the R70's receiver from your signal.

An option for FM allows listening to the 10 meter FM activity.

As an additional plus to ICOM IC-720A owners, the R70 has an optional interface that will allow the R70 to control the transmit frequency of the 720A for the ultimate in hamming versatility.

SWL'ING

For the short wave listener, the readout section of the R70 gives all the information for logging a station to be returned to at a later time. Frequency, mode, VFO, signal strength are all displayed. A dial lock prevents accidental loss of a signal.

A front mounted speaker provides 3 watts of crisp clear audio. A record jack allows easy attachment of a tape recorder.

ICOM SYSTEM

Like all ICOM HF products, the R70 fits into the ICOM system concept of accessories allowing you to use previously purchased accessories such as the HP1 headphone, SP3 external speaker, and AH1 auto bandswitching antenna.

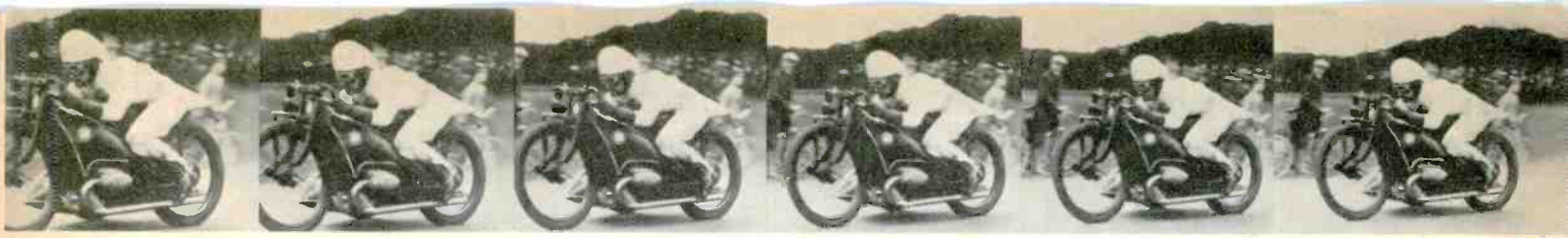
PRICE

Check with your local ICOM dealer for pricing on the R70. You will be amazed.

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155**/3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780.**



INTRODUCING THE LATEST HEIR TO 59 YEARS OF GERMAN ENGINEERING.

While the fine lines and sculpted features of most sport bikes spring from the drawing tables of stylists, those of the BMW R65LS had a different birthplace.

The drafting tables of German engineers.

As a result, they are the recipients of the same pragmatic consideration and evolutionary refinement as the legendary engine that powers this 650cc machine.

The shapely sport fairing, for example, provides much more than cosmetic appeal. It helps reduce front-wheel lift by over 30%.

The LS handlebars are low, compact, and help to provide a seating position that "is sporting in a way that Japanese bikes, even with red paint, have not discovered" (Cycle World). (High bars are also available.)

The bike's slender tail, artful as it too appears, was created in one of the most aesthetically indifferent environments known to man: the massive BMW wind tunnel in Ismaning, Germany.

Even the wheels of the LS possess a beauty that goes far deeper than their gleaming enamel. Each rim section is made of a highly rigid aluminum alloy; each hub and spoke assembly is separately cast from a far more elastic aluminum alloy to provide added flexibility. And then everything–hubs, spokes and rims–is cast as a single unit. Culminating in an exceedingly resilient "composite" wheel that not only helps increase handling prowess but decreases unsprung weight.

In the end, the BMW R65LS is one sports bike whose graceful lines do not serve as camouflage for weak engineering. For it is a machine as adept at slicing through the wind and rounding corners as it is at turning heads.

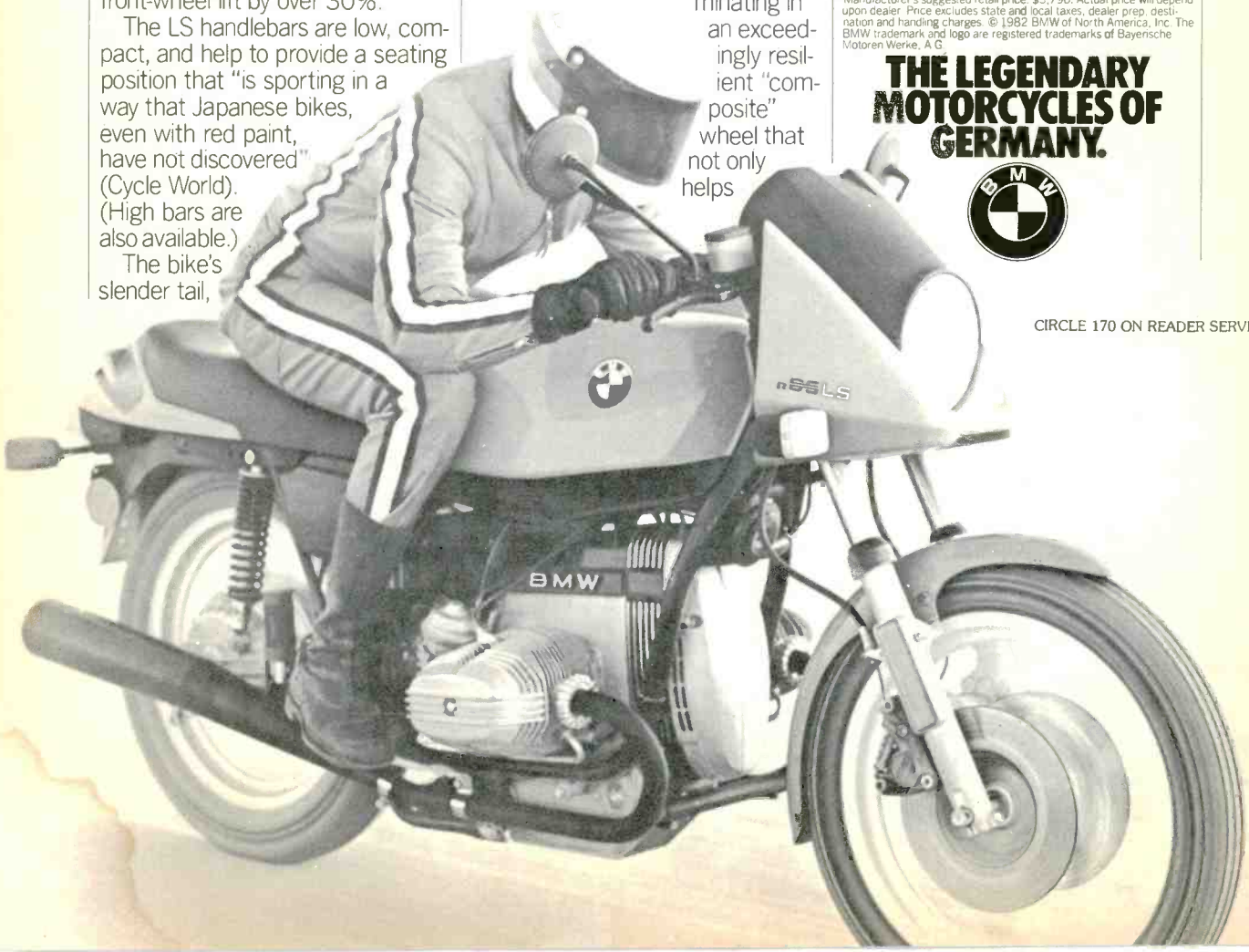
Its price? A lofty $3,790.*

But as a motorcycle columnist of AutoWeek observed, "a bad motorcycle is worthless; a good motorcycle is worth whatever it costs... By that standard, the R65LS is a bargain."

*Manufacturer's suggested retail price: $3,790. Actual price will depend upon dealer. Price excludes state and local taxes, dealer prep, destination and handling charges. © 1982 BMW of North America, Inc. The BMW trademark and logo are registered trademarks of Bayerische Motoren Werke, A.G.

THE LEGENDARY MOTORCYCLES OF GERMANY.

BMW



CIRCLE 170 ON READER SERVICE CARD

Synthesized Hand-Held Scanner!

Communications Electronics,™ the world's largest distributor of radio scanners, now has even *lower prices* on our radio scanners. Chances are the police, fire and weather emergencies you'll read about in tomorrow's paper are coming through on a scanner right now.

With your scanner, you can monitor the exciting two-way radio conversations of police and fire departments, intelligence agencies, mobile telephones, energy/oil exploration crews, and more. Some scanners can even monitor aircraft transmissions! You can actually hear the news *before* it's news. If you do not own a scanner for yourself, now's the time to buy your new scanner from **Communications Electronics**. Choose the scanner that's right for you, then call our *toll-free* number to place your order with your Visa or Master Card.

We give you excellent service because **CE** distributes more scanners worldwide than *anyone* else. Our warehouse facilities are equipped to process thousands of scanner orders every week. We also export scanners to over 300 countries and military installations. Almost all items are **in stock** for **quick shipment**, so if you're a person who prefers fact to fantasy and who needs to know what's *really* happening around you, order your scanner today from **CE**!

NEW! Bearcat®† 350

The Ultimate Synthesized Scanner!

List price $599.95/**CE price $384.00**

7-Band, 50 Channel • Alpha-Numeric • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 30-50, 118-136 AM, 144-174, 421-512 MHz.

The new *Bearcat* 350 introduces an incredible breakthrough in synthesized scanning: Alpha-Numeric Display. Push a button—and the Vacuum Fluorescent Display switches from "numeric" to word descriptions of what's being monitored. 50 channels in 5 banks. Plus, Auto & Manual Search, Search Direction, Limit & Count. Direct Channel Access. Selective Scan Delay. Dual Scan Speeds. Automatic Lockout. Automatic Squelch. Non-Volatile Memory. Order your *Bearcat* 350 today!

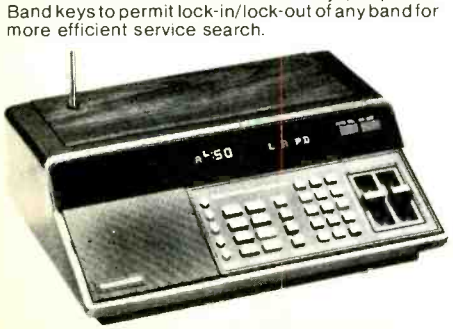
Bearcat® 300

List price $549.95/**CE price $336.00**

7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 32-50, 118-136 AM, 144-174, 421-512 MHz.

The *Bearcat* 300 is the most advanced automatic scanning radio that has ever been offered to the public. The *Bearcat* 300 uses a bright green fluorescent digital display, so it's ideal for mobile applications. The *Bearcat* 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search.



NEW! Bearcat® 350

Bearcat® Rebate Offer

Get a coupon good for a $30.00 rebate when you purchase a *Bearcat* 100; $15.00 rebate on model 210XL; $10.00 rebate on model 200. Offer valid only on purchases made between September 1, 1982 and October 15, 1982. Limit of one rebate per household. Offer good only in the U.S.A. Void where taxed or prohibited by law. Resellers, companies, clubs and organizations-both profit and non-profit, are not eligible for rebates. Employees of Electra Company, their ad agencies, distributors and retailers of *Bearcat* Scanners are also not eligible for rebates.

Bearcat® 210XL

List price $349.95/**CE price $229.00**

6-Band, 18 Channel • Crystalless • AC/DC

Frequency range 32-50, 144-174, 421-512 MHz.

The *Bearcat* 210XL scanning radio is the second generation scanner that replaces the popular *Bearcat* 210 and 211. It has almost twice the scanning capacity of the *Bearcat* 210 with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more. When you purchase the *Bearcat* 210XL between September 1, and October 15, 1982, you'll also get a factory rebate coupon good for $15.00.

NEW! Bearcat® 20/20

List price $449.95/**CE price $276.00**

7-Band, 40 Channel • Crystalless • Searches AM Aircraft and Public Service bands • AC/DC Priority Channel • Direct Channel Access • Delay

Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.

The *Bearcat* 20/20 automatic scanning radio replaces the *Bearcat* 220 and monitors 40 frequencies from 7 bands, including aircraft. A two-position switch, located on the front panel, allows monitoring of 20 channels at a time.

NEW! Bearcat® 200

List price $269.95/**CE price $179.00**

8-Band, 16 Channel • AC only • Priority Dual Scan Speeds • Direct Channel Access

Frequency range: 32-50, 138-174, 406-512 MHz.

The *Bearcat* 200 is a scanner with high performance. Sealed one-piece keyboard lets you program each channel for automatic scanning. There's automatic lockout to by-pass individual channels. Direct Channel Access to go instantly to any channel. Plus Automatic Squelch, Dual Scan Speed, Selective Scan Delay and Automatic Search to let you find hidden frequencies.

NEW! Bearcat® 100

The first no-crystal programmable handheld scanner.

List price $449.95/**CE price $284.00**

8-Band, 16 Channel • Liquid Crystal Display Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 138-174, 406-512 MHz.

The world's first no-crystal handheld scanner has compressed into a 3" x 7" x 1¼" case more scanning power than is found in many base or mobile scanners. The *Bearcat* 100 has a full 16 channels with frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the 2-Meter and 70 cm. Amateur bands, *plus* Military and Federal Government frequencies. It has chrome-plated keys for functions that are user controlled, such as lockout, manual and automatic scan. Even search is provided, both manual and automatic. Wow...what a scanner!

The *Bearcat* 100 produces audio power output of 300 milliwatts, is track-tuned and has selectivity of better than 50 dB down and sensitivity of 0.6 microvolts on VHF and 1.0 microvolts on UHF. Power consumption is kept extremely low by using a liquid crystal display and exclusive low power integrated circuits.

Included in our low **CE** price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. The *Bearcat* 100 is in stock for quick shipment, so order your scanner today.

NEW! Fanon FCT-200 Cordless Telephone

CE price $149.00

Looking for an excellent cordless telephone? We recommend the Fanon model FCT-200. This cordless phone is designed and engineered to provide many years of reliable service and put an extra measure of convenience into your home or office. It features extended range, automatic secure protection, two-way intercom between the Fanon-phone handset and a conventional phone plugged into the base. Manual secure lock override. Two-way call alert. Last number memory redial. High-low volume control and low battery indicator light. Full duplex, simultaneous conversation capability. Operates with most touch tone or rotary dial systems. FM quality – quiet operation. Rechargeable Nickel-cadmium batteries included. Under ideal conditions, the range is 700 feet. Order today!

TEST ANY SCANNER

Test any scanner purchased from **Communications Electronics**™ for 31 days before you decide to keep it. If for any reason you are not completely satisfied, return it in original condition with all parts in 31 days, for a prompt refund (less shipping/handling charges and rebate credits).

Bearcat® Four-Six ThinScan™

List price $189.95/**CE price $118.00**

Frequency range: 33-47, 152-164, 450-508 MHz.

The incredible, *Bearcat* Four-Six Thin Scan™ is like having an information center in your pocket. This four band, 6 channel crystal controlled scanner has patented Track Tuning on UHF. Scan Delay and Channel Lockout. Measures 2¾ x 6¼ x 1." Includes rubber ducky antenna. Order crystal certificate for each channel. Made in Japan.

Fanon Slimline 6-HLU

List price $169.95/**CE price $104.00**

Low cost 6-channel, 4-band scanner!

The *Fanon* Slimline 6-HLU gives you six channels of crystal controlled excitement. Unique Automatic Peak Tuning Circuit adjusts the receiver front end for maximum sensitivity across the entire UHF band. Individual channel lockout switches. Frequency range 30-50, 146-175 and 450-512 MHz. Size 2¾ x 6¼ x 1." Includes rubber ducky antenna. If you *don't* need the UHF band, get the **Fanon model 6-HL** for $94.00 each, and save money. Same high performance and features as the model HLU without the UHF band. Order crystal certificates for each channel. Made in Japan.

OTHER SCANNERS & ACCESSORIES

NEW! **Regency‡ D810 Scanner**	$259.00
NEW! **Regency‡ D300 Scanner**	$199.00
NEW! **Regency‡ D100 Scanner**	$159.00
Regency‡ M400 Scanner	$229.00
Regency‡ M100 Scanner	$195.00
SCMA-6 Fanon Mobile Adapter/Battery Charger	$49.00
CHB-6 Fanon AC Adapter/Battery Charger	$15.00
CAT-6 Fanon carrying case with belt clip	$15.00
AUC-3 Fanon auto lighter adapter/Battery Charger	$15.00
PSK-6 Base Power Supply/Bracket for SCMA-6	$20.00
SP50 *Bearcat* AC Adapter	$9.00
SP51 *Bearcat* Battery Charger	$9.00
SP58 *Bearcat* 4-6 ThinScan™ carrying case	$12.00
FB-E Frequency Directory for Eastern U.S.A.	$12.00
FB-W Frequency Directory for Western U.S.A.	$12.00
FFD Federal Frequency Directory for U.S.A.	$12.00
TSG "Top Secret" Registry of U.S. Government Freq.	$10.00
ASD Frequency Directory for Aircraft Band	$10.00
TIC Techniques for Intercepting Comm. Manual	$12.00
CIE Covert Intelligence, Elect. Eavesdropping Man.	$12.00
B-4 1.2 V AAA Ni-Cad batteries (set of four)	$9.00
A-135cc Crystal certificate	$3.00

Add $3.00 shipping for all *accessories* ordered at the same time.

INCREASED PERFORMANCE ANTENNAS

If you want the utmost in performance from your scanner, it is essential that you use an external antenna. We have a base and a mobile antenna specifically designed for receiving all bands. Order **#A60** is a magnet mount mobile antenna and order **#A70** is an all band base station antenna. Price is $35.00 each plus $3.00 for UPS shipping in the continental United States.

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To ***get the fastest delivery from CE*** of any scanner, send or phone your order directly to our Scanner Distribution Center.™ Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. Minimum *purchase order* $200.00. Minimum *prepaid* order $35.00. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. International orders are invited with a $20.00 surcharge for special handling *in addition* to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

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BEAMING IN

BY TOM KNEITEL, K2AES

AN EDITORIAL

Both Sides Now

Of all of the mail that filters in to the *POP'COMM* office, perhaps the most interesting letters come from readers who have suggestions regarding ideas for new equipment to be produced, or changes they'd like to see manufacturers make in existing equipment. I don't know whether they've ever presented these ideas to the manufacturers themselves or if they're just bouncing them off of me for an opinion. Regardless, after answering these letters, I put them all in a folder for future reference. From time to time I like to dig through my collection to see if any of the ideas are either especially outstanding or are, at the very least, commonly presented by several readers.

For instance, scanner owners seem to cry out for signal strength meters to be included in their equipment. They'd also like to see descramblers and preselectors included, ones that can be switched in and out of operation. Scanner owners would happily swap their scanner's ability to read out how many times a channel has been used for an automatic on/off timer and a built-in cassette recorder. Such an accessory or built-in feature could not only make tapes while the set's owner is present, but could be programmed to turn on the scanner and (vox controlled) tape recorder for monitoring at times when the scanner owner is away from the equipment. Or, taking an idea from the VCR industry, the device could be programmed to monitor any record communications on a secondary frequency, one to which the scanner isn't tuned.

Scanner owners say that if manufacturers are going to include digital clocks in their equipment, then let them at least show the time in a 24-hour system rather than in the 12-hour a.m./p.m. method. Of course, some folks don't see much reason to have a clock of any kind built into a scanner!

Also requested were scanners made to operate between 225 and 400 MHz, or from 406 to 410 MHz. Although there has been significant interest in these bands, manufacturers appear to be totally disinterested in producing any equipment for these portions of the communications spectrum.

Owners of communications receivers have expressed an interest in obtaining an audio output jack that would have enough *Moxie* to drive an RTTY terminal while simultaneously killing the audio in the receiver's speaker. The way most communications receivers are set up now, if you want to copy RTTY you've got to listen to the rather unappealing sound of the RTTY signal coming at you the entire time you are monitoring. Trying to use the tape output to get around this problem doesn't work because it doesn't offer enough audio drive as an RTTY terminal.

The Sony ICF 2001.

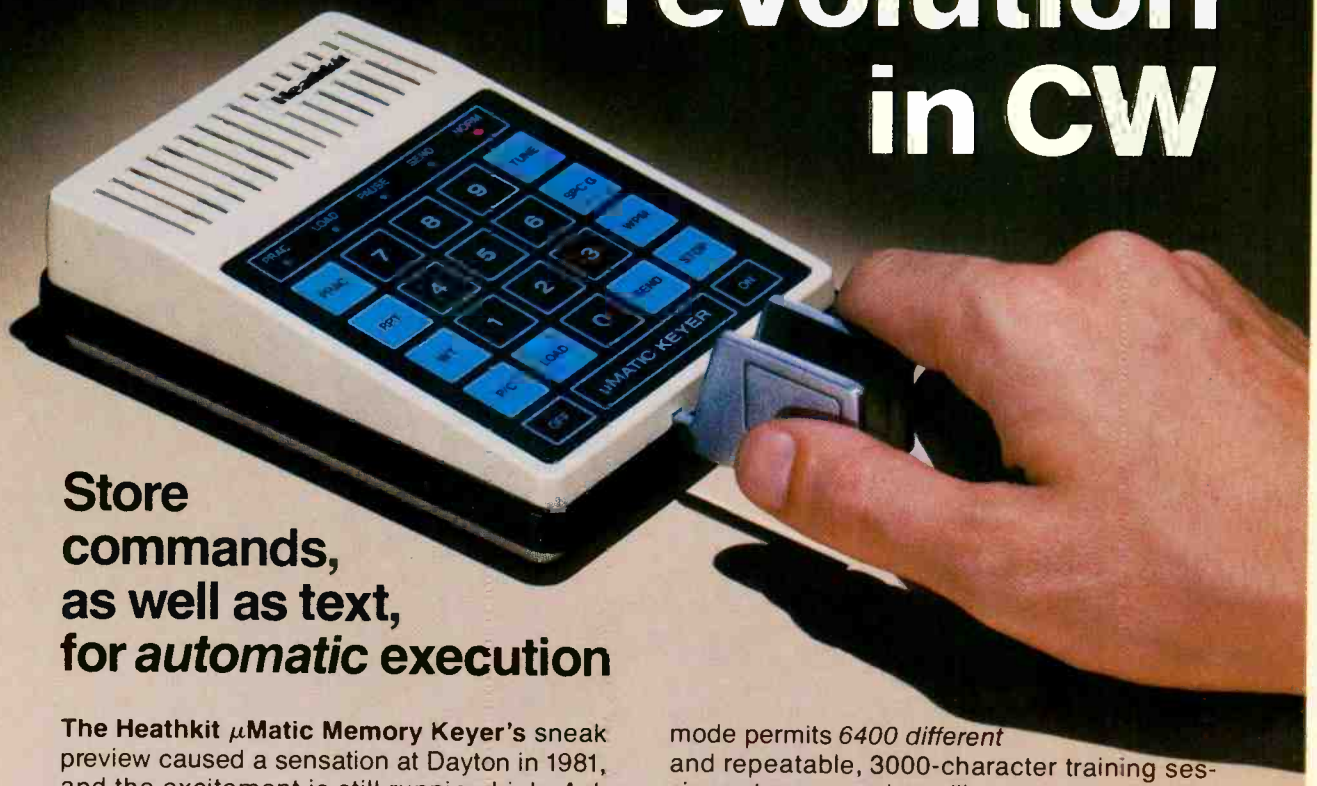
These are just a few of the more interesting comments I've received. I've filtered out the most impractical, fantastic, and utterly bizarre suggestions—like the alarm that goes off when a rare station appears on the air.

Our readers, of course, are consumers of monitoring products and, as such, are definitely very opinionated as to what they like and what they don't like, based upon their own needs and experiences. And manufacturers do often respond to consumer wants and requirements. Many times, they don't even wait for the customers to ask—they just act on their own initiative. SONY's and Kenwood's scanning HF receivers are great examples of this. Nevertheless, there's still a gap somewhere along the line and one can but wonder why some of these other ideas remain neglected, and why some good ideas that were at one time thought to be viable have been scrapped. For instance, which clever person at the scanner manufacturer decided to discontinue the installation of audio filters that screened out the IMCS "dial tones" transmitted by mobile telephone operators when the channel is available for placing a call? And why did all manufacturers stop producing tunable VHF receivers as soon as scanners became available? Scanners don't replace the need for tunable receivers.

And, whatever became of panoramic adaptors? For years, these receiver accessories were made by Hallicrafters and at least one other company. There was even a military version, plus a complete receiver incorporating the panadaptor (Navy RDC covering 28 to 140 MHz). A panoramic feature let the listener view (by means of a CRT) all of the signals active over a 100 kHz band segment (50 kHz to either side of the center frequency). A great idea that somehow got "lost."

All in all, there's still plenty of room for innovation in the area of monitoring equipment. It would be terrific if we could establish a dialogue between the monitoring public and the manufacturers that would or could benefit both "camps."

The Memory Keyer that started a revolution in CW



Store commands, as well as text, for *automatic* execution

The Heathkit μMatic Memory Keyer's sneak preview caused a sensation at Dayton in 1981, and the excitement is still running high. *Ask about it on the air.* Those who own one will tell you it revolutionized their operating practices, eased their hand fatigue, multiplied QSOs – and increased the number of incoming QSLs. In contest, you can prove it's the best every time.

Inside, a custom microprocessor stores up to 240 characters of text or commands. *Variable-length buffers* eliminate wasted memory space. *Command strings* let you sequence speed, weight and repetition alterations or text in any order you desire. Choose the speed (1-99), any of 11 weight settings, plus spacing and message repeat count, then sit back and collect contacts...

Capacitive-touch iambic paddles unplug and store inside the keyer when not in use. Left handed? A two-key function will reverse the paddles! Or a socket will connect to your favorite keyer. To boost copy, a 4-level random 'practice' mode permits *6400 different* and repeatable, 3000-character training sessions at any speed you like.

Other features include a built-in sidetone oscillator and speaker with volume/tone controls, phone jack and earphone, message editing, entry error alarm, self-diagnostics, battery back-up and a unique auto-shutoff should you forget. Complete details on the revolutionary μMatic Memory Keyer are in the new Heathkit Catalog and at your nearby Heathkit Electronic Center.*

Send for a free catalog! Write:
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AM-422R1

MAILBAG LETTERS TO THE EDITOR

The most interesting questions we receive will be answered here in each issue. Address your questions to: Tom Kneitel, Editor, Popular Communications magazine, 76 North Broadway, Hicksville, NY 11801.

Quick Henry, The Flit!

How can I monitor radio "bugs" that are placed in rooms for surveillance purposes? Can a scanner be used for this?

Henry M. Hasaan
Silver Spring, MD

Actually, they can pop up on the darndest frequencies. However, for whatever it may be worth, the frequency 167.3375 MHz has been noted as a commonly used bugging frequency. —Editor

Gone But Not Forgotten

Where do you stand in the debate as to whether Tesla beat Marconi to the punch in the development of radio? Or are you one who has written Tesla off as a crackpot?

Roger O'Mally
Haverhill, MA

Tesla was a brilliant inventor during the late 19th and early 20th Centuries. His record of accomplishments attracted men of great wealth, such as John Jacob Astor and J.P. Morgan, who provided him with funds to continue his experiments. One such project was the erection of a transmission tower capable of sending messages across the Atlantic. The site Tesla chose was Shoreham, NY, which is 35 miles northeast of the POP'COMM *offices.*

Architect Stanford White was engaged to design the principal building, while the tower itself was to rise 187 feet. In 1903, two years after the project had begun, the 55-ton mushroom-like dome on top of the tower (which could be seen from Connecticut, more than 30 miles away) was nearing completion. However, funds were running low and bills were mounting almost as high as the tower itself. Morgan balked at feeding any more money into the project and Tesla was forced to create other inventions in order to support himself. Many of these inventions were so far ahead of their time that they were commercial failures.

In 1906, Tesla and his staff departed from Shoreham, leaving behind thousands of dollars worth of intricate electronics and laboratory equipment. In 1943, the U.S. Supreme Court invalidated Marconi Radio Patents because of Tesla's prior work. In 1967, the laboratory was given landmark status. Since 1939, it's been occupied by a photographic products company, and visitors from all over the world have gone there to see Tesla's lab.

There is a Tesla Society with headquarters at 453 Martin Rd., Lackawanna, NY 14218. Many of Tesla's rather startling experiments still baffle scientists, and some still have never been fully understood or duplicated. Because he was an eccentric, many wrote him off as a crackpot. He died in 1943—broke and in relative obscurity. Unfortunately, he has never been recognized for the genius he was and for the contributions he gave to technology. —Editor

Kind Words

I thoroughly enjoy *POP'COMM* and wish you all the best. There are very few people in the world who say things the way they really are and it was therefore a pleasure reading both your "Information Please" editorial (December) and also the story "Secrets of Propaganda Broadcasting" in the same issue. Those two stories go back to back since it appears that some people won't share the knowledge they have, while others want to share knowledge but insist upon twisting it in order to mislead. Enclosed is my check for a 3 year *POP'COMM* subscription.

David D. Davidson
New York, NY

Just got my first copy of *POP'COMM* today. Boy, is it something! It's about time somebody developed a magazine just like this. Thanks for a great magazine. It really fills a gap I've had in my reading for a long time. Now I don't have to subscribe to three or four different magazines at a time; I can get everything I want in *POP'COMM*. Especially like your Survivalist column.

Mark Johnson, N7DYS/KID7AN
Fairfield, ID

We aim to please, and reader mail is a great aid in helping us to keep heading in the directions that our readers will find most interesting and useful for their needs. Every letter that comes in is carefully read and any suggestions made regarding our coverage are taken into consideration. We hope that our readers will continue to feel free to write and let us know their feelings about POP'COMM. —Editor

The Right Club

I've been looking around for several DX clubs to join. However, I note that the club scene does tend to change from time to time. How and where can I obtain a complete list of all of the DX clubs that are affiliated with the Association of North American Radio Clubs (ANARC)?

Oscar Feldman
West Allis, WI

The ANARC updates their club list twice a year and contains the most up-to-date list of all of their affiliated groups, along with information on the specialties of the groups and their dues. A copy of this list is twenty-five cents, and enclose a business size SASE in the U.S. (50¢ in mint stamps in Canada, or three IRC's elsewhere). This can be obtained from the ANARC, 1500 Bunbury Drive, Whittier, CA 90601. Individuals can also become affiliated with the ANARC and receive its interesting monthly newsletter (sample copy is fifty cents and a business size SASE in the U.S., seventy-five cents in mint stamps in Canada, or four IRC's elsewhere). —Editor

Come Out, Come Out

Many years ago, I read *Popular Electronics* magazine when it had shortwave coverage. I was even a holder of one of their "WPE" DXer identifications. About five years ago, I dropped out of the hobby, and when I decided to get back into DXing a few months ago, I found that *Popular Electronics* has a new name and is unfortunately (for me) centered more along the lines of computers than DXing. That's why I'm happy to have located *Popular Communications* on my local newsstand. I've been wondering if there are any of the old DXers with the "WPE" ID's still in the hobby. By the way, my original "WPE" certificate is signed by *POP'COMM*'s Editor, Tom Kneitel!

Fred MacWilliams
Salt Lake City, UT

I'd suspect that there are countless old "WPE" members still active in the hobby. Not long ago, some of these folks got together and formed a club called The Great Circle Shortwave Society, P.O. Box 874, Kankakee, IL 60901. They'd like to hear from those who were at one time issued WPE monitoring certificates. Membership (includes the newsletter) is $6.50 per year. President is Vern A. Weiss, WPE9GHF. I believe that it is one of their goals to construct a listing of those who were given the WPE certificates back in the 1950's and 1960's, so any readers who have those old certificates may want to contact the GCSS. —Editor

Federal Fan

Being situated near the busy St. Lawrence Seaway, I've had many enjoyable hours scanning the VHF maritime frequencies. It is my impression that I'm missing out on some of the action because I don't know *all* of the frequencies. In particular, I'm interested in monitoring the communications of the St. Lawrence Seaway Development Corporation, which is operated by the U.S. Government (Dept. of Transportation). Are these frequencies within the range of my scanner? I have a Realistic PRO-2002.

Harold Bowen
Ogdensburg, NY

From what I have been able to find out, Harold, this federal agency operates on the following frequencies (all of which should be within your scanner range): 162.59, 164.9625, 165.3125, 167.81, 415.775, and 415.925 MHz. —Editor

Introducing incredible tuning accuracy at an incredibly affordable price: The Command Series RF-3100 31-band AM/FM/SW receiver.* No other shortwave receiver brings in PLL quartz synthesized tuning and all-band digital readout for as low a price.† The tuner tracks and "locks" onto your signal, and the 5-digit display shows exactly what frequency you're on.

There are other ways the RF-3100 commands the airways: It can travel the full length of the shortwave band (that's 1.6 to 30 MHz). It eliminates interference when stations overlap by narrowing the broadcast band. It improves reception in strong signal areas with RF Gain Control. And the RF-3100 catches Morse communications accurately with BFO Pitch Control.


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The Command Series RF-3100 and RF-6300. Two more ways to roam the globe at the speed of sound. Only from Panasonic.

*Shortwave reception will vary with antenna, weather conditions, operator's geographic location and other factors. An outside antenna may be required for maximum shortwave reception.

†Based on a comparison of suggested retail prices.

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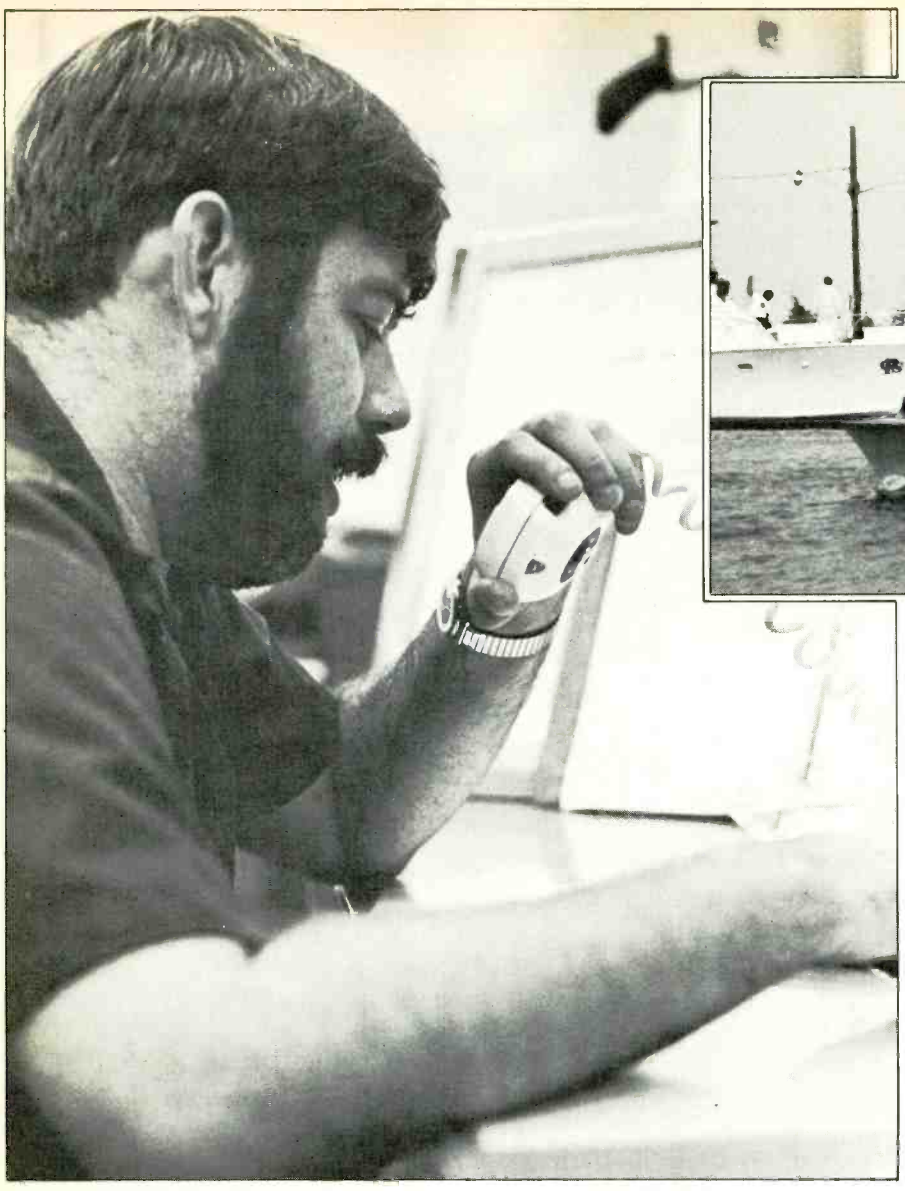
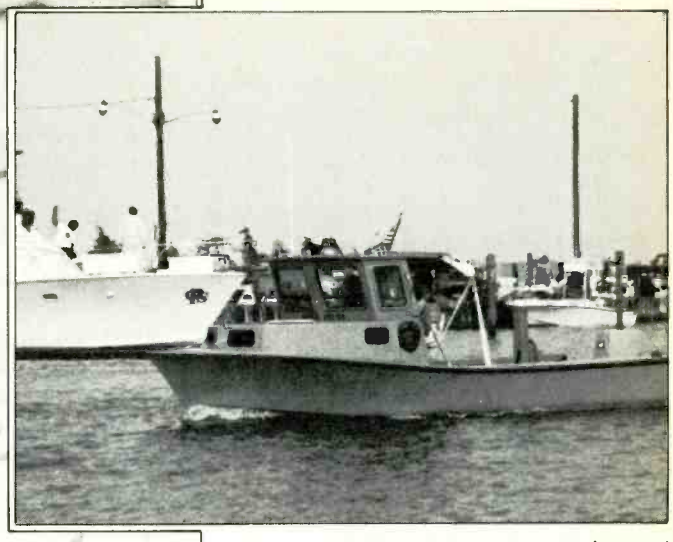


The U.S. Coast Guard maintains constant watch on certain VHF frequencies and is regularly reported by monitors throughout the nation. (U.S. Coast Guard photo)



Many coastal communities have police and harbor patrol vessels that you can hear on VHF channels.

Scanning The VHF Marine Band

It's "That" Time Of The Year Again And The VHF Marine Channels Come Alive With A Myriad Of Interesting Stations! Here's How To Make The Most Of It!

BY JAN MAYJAC, KLA5ES

Time was when the term "marine band" conjured up images of members of the U.S. Marine Corps marching along toting drums and bugles while playing "From The Halls of Montezuma." This is no longer true, for scanner owners are aware that the marine band is also a span of communications frequencies primarily lying in the area of 156 MHz. At least *some* scanner owners are aware of it, and *some* of those are aware of how to make the most of what takes place on those frequencies.

These frequencies produce signals along coastlines, navigable rivers, and in larger inland bodies of water. Listening to those frequencies brings forth into your ears yachts, fishing boats, tankers, freighters, passenger vessels, Coast Guard Cutters, police and fire boats, ferries, tugs, pilot boats, dredges, research vessels, and just about any type of craft you can think of. They rely upon the VHF marine band for communications ranging from friendly chats to distress calls, from announcing weather and navigation information to telling where the fish are biting, from search and rescue operations to the placing of ship-to-shore telephone calls, and everything else in between.

Scanner owners living near large ports can reap a fantastic harvest of stations on the frequencies, but the fact is that there are few areas of the nation that are devoid of activity on these frequencies. Even in the colder months, these frequencies show activity, but it's during the Spring and Summer when they truly come into their own.

The Frequencies

The VHF marine band is channelized and each of the channels are not only assigned a numerical designation, each is also assigned a specific use, although they aren't always used in the manner for which they were established. While most of the channels are for

By far, the most often heard stations on these channels are pleasure craft.

simplex (all stations on the same frequency), several are duplex (transmit on one frequency, receive on another).

Stations aboard vessels are required to have a minimum of three channels upon which they can operate. These are Channels 6 and 16, along with at least one working frequency. For practical purposes, it hardly pays to install marine communications equipment on a vessel unless that equipment can communicate over at least 6 different frequencies. It is suggested that this equipment consist of Channels 6 and 16, one working frequency, two frequencies for ship-to-shore calls, and Channel 22 for communicating with the Coast Guard. More practical for recreational vessels is the use of a 12 channel transceiver equipped with Channels 6, 13, and 16, a channel for port operations, two ship-to-shore channels, 5 working channels, plus 22A for Coast Guard communications. Commercial vessels would generally be equipped for communications on Channels 6, 13, 16, 22, two port operations frequencies, two ship-to-shore frequencies, and 4 commercial working frequencies.

These days, modern VHF marine communications is readily available with built-in frequency synthesizer circuitry and many vessels simply obtain transceivers that can operate on all frequencies, including the ability to receive 1 or 2 NOAA VHF weather broadcast channels.

Frequency Usages

As mentioned, there are to be noted a number of abuses of the way the frequencies are actually used, but here is the general frequency usage plan. This will give you some indication of what you will be able to monitor on each of them; note that the channel numbering system skips over many numbers.

Calling, distress, and safety communications are carried out on Channel 16. The Coast Guard monitors this channel as do many privately operated coastal stations. Radio equipped ships are required to monitor Channel 16 when their radio is in use and not engaged in communications on another channel. Routine calls to other stations may be initiated on Channel 16. However the contact is switched over to another channel as soon as it is established.

Navigational operations take place on Channel 13. This is primarily intended for use between larger vessels and tugs. Many bridges and canal locks also use this frequency. Private yachts may monitor this channel to learn the intentions of nearby larger vessels. This channel is interesting to monitor since stations normally use very low power (1 watt) when utilizing it.

Port operations, which includes ship-to-ship and ship-to-coastal station communications can be found on Channels 1, 3, 5, 12, 14, 20, 63, 65, 66, 73, 74, and 77. All craft may use these frequencies for passing information relating to the movement and safety of ships in port areas, canal locks, or waterways. In specific areas, some of these channels are used for the Coast Guard's Vessel Traffic Service (VTS). (Channel 77 is for intership port operations only.)

Commercial vessels include all types with the exception of those used for recreational purposes. The channels reserved for commercial vessels to intercommunicate with one another include Channels 1, 3, 7, 8, 9, 10, 11, 18, 19, 63, 67, 79, 80, and 88A. Coastal stations operated by steamship lines, tug and barge dispatchers, fishing companies, ferry lines, and other commercial establishments may be heard on Channels 1, 3, 7, 9, 10, 11, 18, 19, 63, 79, and 80. Some police and fire departments also use these latter channels for dispatching their police and fire boats (usually in addition to communications facilities on regular public safety frequencies).

Intership safety communications take place on Channel 6. The frequency may include SAR (Search and Rescue) operations of the Coast Guard.

Non-commercial vessels, such as yachts and other recreational craft, may be monitored intercommunicating on Channels 9, 68, 69, 70, 71, 72, and 78. Shore stations at yacht clubs, marinas, public docking facilities, and other facilities catering to the yachting crowd can be monitored on Channels 9, 68, 69, 71, and 78. All of these channels are extremely busy during the boating season, with Channel 68 being an especially active working frequency.

Coast Guard stations monitor Channel 16, but will generally request that vessels wishing to request assistance switch over to Channel 22 (also known as Channel 22-Alpha). Coast Guard operations can be monitored on Channels 21, 23, and 81, with Coast Guard Auxiliary craft frequently

Tugs and other types of work boats are regularly heard communicating by VHF.

heard on Channels 81 and 83. All of these frequencies are especially interesting. Channel 81 has been monitored as active during oil spill cleanup operations.

Army Engineer operations have been noted on Channel 82.

State Control operations have been allocated the use of Channel 17, although this frequency has not been noted in much use.

Environmental bulletins are to be sent out on Channel 15 in a manner similar to the way NOAA broadcasts are sent out on VHF. However, this service doesn't yet seem to have been developed. Shore stations are only operable on Channel 15.

Marine Operators, also known as "Public Correspondence" stations, are usually pretty interesting, and you'll hear commercial as well as recreational craft placing and receiving ship-to-shore telephone calls here. These are duplex systems, but it's only necessary to monitor one frequency (that of the shore station) in order to hear both sides of the conversation. The places to monitor for these are Channels 24, 25, 26, 27, 28, 84, 85, 86, 87, and 88. In any given local area, only 2 or 3 channels from this assortment will be found in use, although if you've got a decent location you may well hear stations from other areas.

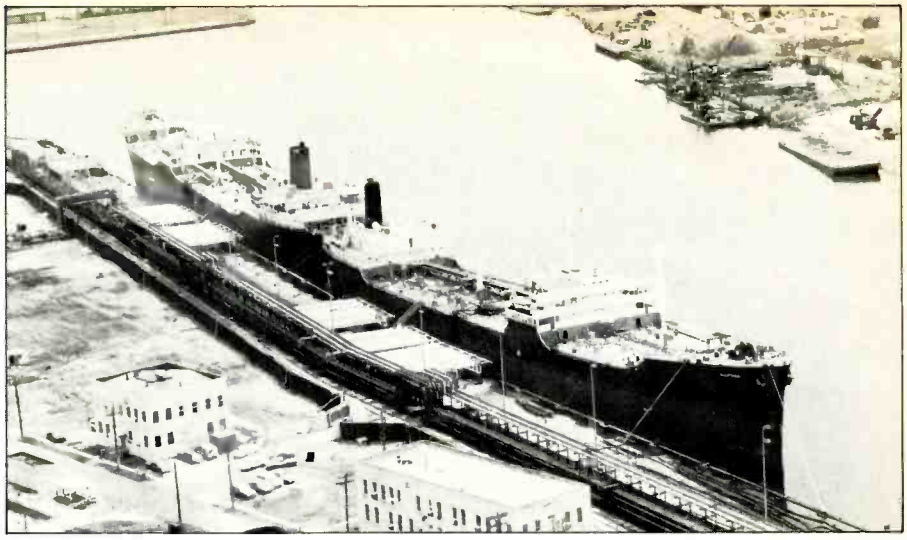
Aircraft stations can sometimes be noted operating on Channels 6, 8, 9, 16, 18, 67, 68, 69, 70, and 72. They are permitted such operation under certain conditions, which generally include flying at an altitude of 1,000 feet or less, using no more than 5 watts, and operating for a purpose that is connected with boat operations. One such typical use might be for spotting schools of fish for the benefit of a commercial fishing fleet; another would be during Search and Rescue operations.

Stations

Most shore stations use 50 watts or less, while vessels can run a maximum of 25 watts (many recreational vessels use far less than that). Contrary to the theory used at base stations, where high gain antennas used to amplify the signals are very desireable, ship stations shy away from antennas offering high gain. Ship stations have problems with severe signal fading when attempting to use high gain antennas, this as a result of the effects of the rocking of the vessel upon the signal pattern of the antenna.

Shore stations are assigned callsigns usually consisting of 3 letters followed by 3 digits (such as KLW571, WXU477, etc.), although more often than not they will actually identify by the name of the station ("Pikeville Yacht Club," "Lorain Marine Operator," etc.) rather than by the callsign.

Ship stations licensed by the FCC have callsigns of several different types. Most ocean going commercial vessels have callsigns consisting of 4 letters (WEDI, KXRF, etc.), while other vessels usually have callsigns comprised of the letter "W" followed by 2 or 3 letters and 4 digits (WH3844, WRZ4167, etc.). While larger vessels use their callsigns along with their vessel name when transmitting on VHF, smaller craft use their callsigns somewhat sparingly and tend only to identify by vessel name (although the callsign is *supposed* to be used).



Ocean going vessels, including tankers, freighters, and passenger vessels, use VHF in and around ports and harbors.

Ships having registries other than American will, of course, have callsigns from within the series of callsigns allocated by international agreement to the various nations. These may be of the four letter type or other combinations of letters and numerals.

Coast Guard shore stations normally identify by the name of the installation, such as "Coast Guard Group Rockaway" or "Fire Island Coast Guard." Larger cutters will identify by their name, while unnamed cutters will use their bow numbers for identification. Note that on Coast Guard patrol vessels using numbers for identification, the first two digits indicate the length of the vessel.

Paperwork

The best way to keep track of the merchant vessels of the United States is by obtaining a copy of the book set called *Merchant Vessels of The United States*, published by the Supt. of Documents, U.S. Government Printing Office, Washington, DC 20402. This two book set is updated periodically and contains information on the callsign, size, power, and owner of all documented American vessels, including yachts. It does *not* include information on smaller craft registered with various states under motorboat regulations. This set contains a lot of information that will be useful to those interested in monitoring any ship frequencies.

Ship Lingo

Although many small craft operators like to rely upon "radio language," which evolved from CB ("10-4," "10-36," "Gimme a

Rescues and emergency operations are usually monitored on frequencies used by the Coast Guard and Coast Guard auxiliary.

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radio check," "Have a good day today and a better day tomorrow," and that sort of thing), most of what you'll hear is in plain language, sprinkled with a dash of nautical terminology (such as "starboard," "abeam," "off my port bow," etc.). There are several key words to keep in mind, however.

The word "Security" (pronounced *say-curitay*, and said three times) indicates that a message concerning the safety of navigation is about to be sent. Most often you'll hear this being sent on Channel 16 by a Coast Guard shore station, which will also request boaters to switch to Channel 22 for the text of the safety broadcast.

The term "Pan" (pronounced *pahn*, and said three times) may also be noted on Channel 16 with instructions by the Coast Guard to switch to Channel 22 for the text. "Pan" indicates that an urgent message is to be sent. Such messages might include a severe weather warning, a notice of a ship without power or steering in a ship channel, or a request for assistance in looking for a person who has gone overboard.

"Mayday" is the international distress signal for use on a voice channel. Its use means that a ship station is in grave and imminent danger, facing loss of life and/or property. A Mayday message has priority over all other traffic on a channel, and you'd normally hear it only on Channel 16.

Remember that communications you'll hear on the VHF marine channels are covered by Section 605 of the Communications Act. That basically means that while you are entitled to listen for your own edification, you can't divulge the contents of any transmission to others, and you can't make use of such information for the benefit of yourself or others. Naturally, such stipulations don't apply to broadcasts intended for reception by the public, or to transmissions from vessels in distress.

Tune In

You've now got enough information to produce plenty of good listening via your scanner. You may hear some wealthy yacht owner buying and selling stocks via ship-to-shore, or you may hear him calling for some on-board companionship. Maybe you'll hear some of the salty language used by the commercial fishing boat captains, or the interesting maneuvers it takes to dock a large tanker. You'll hear fishing tournaments, boat races, and certainly a large helping of various vessels seeking aid after they've run out of fuel, run aground, had engine or steering problems, are taking on water, or any of a thousand other things that plague those who go down to the sea in ships.

Channel vs Frequency

Channel#	Monitor (MHz)
1	156.05
5	156.25
6	156.30
7	156.35
8	156.40
9	156.45
10	156.50
11	156.55
12	156.60
13	156.65
14	156.70
15	156.75
16	156.80
17	156.85
18	156.90
19	156.95
20	157.00*
21	157.05
22	157.10
23	157.15
24	161.80
25	161.85
26	161.90
27	161.95
28	162.00
63	156.175
65	156.275
66	156.325
67	156.375
68	156.425
69	156.475
70	156.525
71	156.575
72	156.625
73	156.675
74	156.725
77	156.875
78	156.925
79	156.975
80	157.025
81	157.075
82	157.125
83	157.175
84	161.825
85	161.875
86	161.925
87	161.975
88	162.025
88A	157.425

*Channel 20 is a duplex channel. The ship transmits on 157.00, while shore stations transmit on 161.60 MHz.

Great Shortwave Mysteries

BY GERRY L. DEXTER

If Sherlock Holmes were around today, shortwave listeners could certainly provide him and his trusted friend, Dr. Watson, with enough mysterious happenings to keep them going for a long, long time!

There are dozens of "ordinary" mysteries on shortwave, practically on a daily basis. A new Latin American station shows up on 60 meters and it's a mystery until it is identified by somebody.

A clandestine station appears and, even when an identification is heard, it's often still a mystery as to who is operating the station and from where.

And there are legions of buzzes, whistles, radioteletype, and other "utility" transmissions that, even when identified, are still not unraveled all the way.

Most of these mysteries can be solved given time, patience, and some research. But there are some shortwave mysteries that have defied positive explanation on the part of shortwave listeners over many years!

The Affair Of The Nettlesome Numbers

Imagine a secluded farmhouse, perhaps somewhere in New England. Picture an upstairs bedroom. A man sits hunched over a shortwave receiver, headphones pressed to his ears, pad and pencil in hand. He is concentrating on a rather strange transmission that is made up entirely of numbers. He jots the numbers down and later, converts them into an intelligible message. What's going on?

Well, although the above description is fictional, it may not be too far off the mark. Every day, for more than twenty years, such transmissions have been heard on the shortwave bands—and casual listeners and hobbyists have been unable to answer the question "What are they?"

Numbers stations, as they are commonly called, started being heard late in 1962. From the beginning, government agencies such as the Federal Communications Commission and other departments involved in using shortwave have either denied all knowledge of such transmissions or claimed they were coming from overseas.

That may have been a believable excuse early on, but after the passage of time, it stretches the imagination to believe the FCC, Central Intelligence Agency, or National Security Agency could not have traced the source and purpose of these broadcasts. So it becomes more realistic to believe that one or more of these agencies knows the source and purpose of the numbers.

Numbers stations have been heard in Spanish (the most common), but also in English, German, Russian, and Chinese, as well as several seldom-used languages.

Since the beginning, the number of transmissions and number of frequencies in use have mushroomed until, today, it is more likely than not that one can pick up one of these broadcasts on any given day at any given hour.

Usually the transmissions will begin with a piece of music, perhaps an entire selection; or, maybe just a few notes repeated over and over. Then an announcer may intro duce the coded message with the word "attention" or the equivalent in whatever language is being used. A couple of code words or phoneticized words, (such as "Charlie Alpha") may be announced, followed by a three digit number repeated several times before the announcer actually begins the string of numbers. The numbers are most commonly in groups of five, although four-digit or even three-digit formats are used. The broadcasts will often end with the words "final, final," followed by another number and an abrupt termination of the transmission or a return to the musical segment before closing.

Some listeners with direction finding equipment have worked to try and locate the transmitters by signal strength. While one must keep in mind that these efforts have been made with what is probably less than professional equipment, the results are nonetheless quite interesting in that they show the transmissions coming from places like Florida and the Washington, D.C. area (remember the CIA is right next door to the capital city at Langley, Virginia!). Others seem to eminate from the Canal Zone, Ohio, Oregon, and Puerto Rico—all areas where the United States government maintains military bases that would be ideal sites for secret broadcasts.

Some theories are that the English, German, and other language broadcasts come from Europe; the German broadcast, in particular, from East Germany. It is thought by many that some of the Spanish transmissions come from Cuba, although most of the broadcasts in Spanish are presumed to originate in the United States.

In addition to the spy theory, other explanations have centered on the possibility that the broadcasts involve information about bank transactions. However, it would seem logical to assume that there are other, more reliable ways of passing such important information than using shortwave radio.

Backing up the spy point of view is the story of a member of the U.S. Air Force who, some years ago, was recruited by the Russians to work for them. He was told to buy a shortwave receiver and listen on a certain frequency at a specific time for the words "Amur ya Lena", which would be followed by a list of numbers. The broadcast would indicate which sheet on a code pad

was to be used. The numbers broadcast would then be subtracted from the numbers on the code pad, with the remaining number referring to a specific letter in a given phrase that had to be arranged in a certain fashion so that each letter had its own assigned number; a message could then be read.

Early on in the numbers game, George Schnabel, a New York DXer who speaks Czech, heard a numbers transmission in that language with the woman announcer ad-libbing her "greetings to our friends in the CIA" at one point!

It may be that *some* of the numbers transmissions really are actual instructions from a spy agency to its agents in the field. Other transmissions have been thought to be fake or decoy broadcasts since many are repeated number for number over a period of days or weeks. These could also be intended for use at some secret "school for spies" to provide practice.

After twenty years, no concrete answers have been found to the mystery of the numbers stations, and the people who do know aren't talking or even admitting that they might have some answers.

Perhaps some of these broadcasts are indeed spies. Perhaps not. If you saw the movie *E.T.*, you probably wished it were real. Shortwave buffs probably hope they really are listening to "007" types on their radios, too. But we may well never know for certain. In the meantime, you can check our chart and tune one in for yourself.

The Case Of The Backward Russian

Because broadcasters are human, one can expect a mix-up in the studio or transmitter building now and then. A word fluffed, a frequency not tuned up when it should have been, a broadcast going out in the wrong time period, and so on. Occasionally, there are taping troubles that result in a program going awry.

But what of a station that does it deliberately? Regularly? At scheduled times and on scheduled frequencies over a period of years? What's the answer to that mystery?

The mysterious Orient provides the location. To be specific, Radio Peking (also sometimes known as Radio Beijing). Russia is the target.

Radio Peking transmits regular broadcasts in Russian, on tape, played backwards! Why would they do that? What possible reason could there be for intentionally broadcasting tapes backwards? That's a shortwave mystery that would leave even Sherlock Holmes puffing at his pipe overtime!

The 1982 *World Radio TV Handbook* even listed these broadcasts; at 0300 GMT on 17.533, 15.600, 15.435, 15.395, 12.450, 11.660, 11.600, and 8.260; then again at 0900 GMT on 8.620 and 5.220. Each broadcast lasts some 55 minutes.

Unfortunately, we cannot confirm the accuracy of this schedule. A recent check at the *POP'COMM* Listening Post at 0300 showed Radio Peking continuing in Chinese

The site of Radio Peking; someone inside this building knows the solution to the Russian tape mystery.

on 15.600 at that time and none of the other Radio Peking frequencies were audible at that hour. Nevertheless, we do know that the broadcasts continue as they have for about ten years.

A number of explanations have been offered for this curious practice on the part of the Chinese, several involving the possibility that it is some sort of jamming practice by the Chinese or perhaps a method to get around Russian jamming of Radio Peking's broadcasts. But there are far more effective jamming and jamming-escape methods that both sides use, so this answer doesn't seem very plausible.

One interesting explanation was offered a few years ago and seems to make a lot of sense. The Soviets do not want their populace to listen to Radio Peking's normal (forward) Russian programs, so the USSR jams these broadcasts. But, the Soviet *government authorities* do want to know what the Chinese are saying in these programs, and the Chinese want the Russian leaders to get their message. But, to do so, the monitors in the USSR would have to listen to the Radio Peking Russian programs from China through their own jamming efforts.

The backward Russian broadcasts provide a way around this problem. If the Soviet authorities assume the ordinary Russian is not equipped to handle such a technique, or may not even be aware that it's going on, they can receive the reversed broadcasts, tape them, and then play them back in regular fashion! It should be mentioned that the Russians don't seem to jam the reversed transmissions. Thus, the Kremlin can block the regular Radio Peking Russian transmissions, allow the backward transmissions through, tape them, reverse the tape, and get a clear reception of the program.

While this answer seems logical, no one outside those involved can know for sure. As the King of Siam said, "'tis a puzzlement!"

Few shortwave mysteries are around as long as those we've discussed here. As mentioned earlier, some are short-term and are, in fact, frequently solved. Others aren't on long enough for the DXer to get a good enough crack at them.

The Soviet Over the Horizon Radar (OTH) was known for what it is from the beginning, although some people had other explanations. Some believed the Russians were attempting experiments in weather control; and one fanciful theory had them attempting mind control! Nicknamed the "woodpecker," these OTH transmissions are still annoying listeners with their "putt-putt" sound over a wide band of frequencies, often within the shortwave broadcasting bands.

While, as a shortwave listener, you may never solve a "big case," you can play detective every time you run into a station you can't identify. And that is something every listener encounters.

So, grab your spyglass and come on along. The game's afoot!

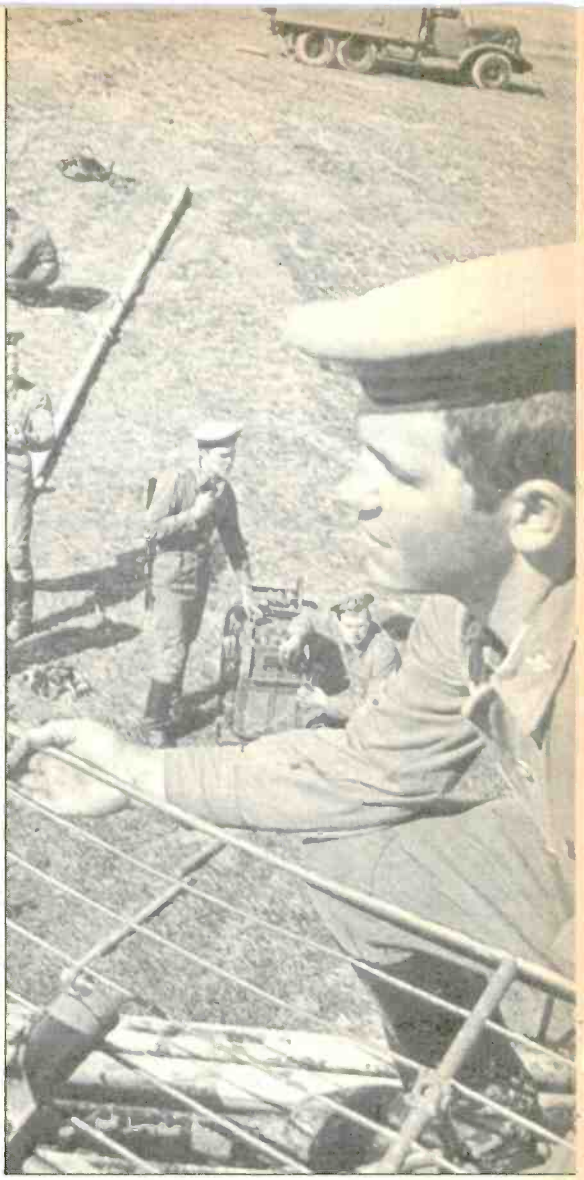
Recently Reported Numbers Stations

Frequency	Number of Digits	Language	Time (GMT)
3.217	5	German	2115
3370	5	German	2115
3810	5	German	0400
4670	4	Spanish	0230
5.710	4	Spanish	1330
5.810	4	Spanish	0200
5.925	5	Spanish	0800
6.825	5	Spanish	0500
7.375	5	German	0900
7.446	5	Spanish	2300
7.764	5	Spanish	0100
9.386	5	Spanish	0300
9.445	-	Spanish	2330
10.420	5	Spanish	0000
11.270	5	German	0800
14.419	5	Spanish	2300

Text of Spanish, 4 digit numbers transmission at 0200 GMT on 5.810 MHz. Woman announcer with "Grupo 206."

8554	3351	1298	7187	2609	5092	4644
5988	4548	3094	0387	2296	9264	0578
9282	7998	3912	7391	3489	6336	1292
6295	1931	5007	2733	1193	5525	2046
9880	8209	4054	2684	9091	9248	2524
0944	2234	4584	5743	7467	2750	9723
5634	1964	4781	7067	6728	3580	4180
0018	0197	9218	7678	7335	5832	1789
6224	9876	0482	0489	3980	8949	2018
3542	1036	9135	4731	9517	3075	8121
8530	2200	2441	3716	1613	8517	7163
5830	9376	0187	3575	9329	4893	9805
9154	8615	0453	7207	7805	0057	2313
8686	9089	1748	4302	5120	9375	0619
4278	5593	4720	5339	0534	9626	4973
8901	6034	0554	6231	3032	4133	4453
3651	1903	9399	1656	9988	7442	0850
0653	1702	9019	1360	0973	7041	8306
3329	7468	5774	2933	0445	1262	9143
8280	4981	3302	7075	0489	7076	6092
6782	1515	3245	0586	2450	1862	5186
9323	0234	7483	2913	4334	9931	7832
7820	9024	2958	9934	2373	6483	4301
9527	2987	7486	0036	8077	6689	7032
2719	0502	5742	4516	3180	8429	3136
8253	7490	7420	2186	3427	3241	1879
1458	7001	9787	4267	5103	8325	4779
1193	4691	0533	6372	4607	1560	4310
9205	8971	2343	5481	5791	7429	

This particular transmission preceeded by the words "Grupo 206" repeated in between counts in Spanish from 1 to 0 for the first 10 minutes, with message transmission beginning at 0210 and lasting for some 8 minutes before the "repeata grupo 206" (repeating group 206) began.



A POP'COMM *Intelligence Report On*

Soviet Military Communications

An Inside Look At Moscow's Radio Equipment And Strategy

BY TOM KNEITEL, K2AES

Until the 1960's, the Soviets were using patched-up radio gear left over from WWII for their tactical military communications. Some of this equipment included the bulky RAF-KW5 transceiver, which ran 500 watts and required transportation via truck, although even their 50 watt RSB-F3 HF transceiver needed to be moved around in a vehicle. Yes, they had small and more easily transportable transceivers, but even they were cumbersome—such as the 1 watt transceiver known as the RBM-1; it was built into no less than 2 portable cases!

By the late 1950's, some newer equipment began filtering through with the intention of replacing the older equipment and phasing it out. For the most part, this has been accomplished. However, much of the currently used equipment is comprised of this equipment, which was designed in the late 1960's by the NVA Signals Unit and built from the late 1960's to the present by The State Collective Electronic Communications Combine of The Soviet Union.

Only a few of the very oldest and *most* outdated of the 1950's designs have actually gone out of production, although the existing pieces of gear remain in use by the Soviets and their satellite nations. By checking over the specs of these and also the equipment in current production, one can get a pretty good idea of the communications operations of Soviet and Warsaw Pact military forces.

1 MHz & Up

It's interesting to note that Soviet tactical communications extend into frequency areas which we, in the West, assume to be areas reserved for AM broadcasting purposes. For instance, a Soviet transceiver known as the R-107 (still in production) puts out 10 watts between 1 and 15 MHz. When used with a long wire antenna, the set can cover almost 4 miles. Then there's the 50 watt R-103M transceiver, which puts out 50 watts over the same range (although it's out of production, it's still used). Also ranging down to 1 MHz is the R-118BM, which is truck mounted and puts out 200 watts (out of production but in use); its big brother, the R-118BM-3, runs 400 watts.

Another tactical communications unit that reaches down to the broadcast band (1.5 MHz) is the 20 watt R-104 unit. Some versions tune to 3.75 MHz, while others go as high as 4.25 MHz.

The speculation is that any of this equip-

ment might be suitable for use as a portable broadcast station for short term emergency use inasmuch as the USSR also recognizes frequencies below 1600 kHz (1.6 MHz) as the broadcast band. In fact, there are a number of broadcast stations in the USSR and its satellites operating on 1593 kHz.

Mid-Range HF Communications Sets

Operating between 2 and 30 MHz is a unit known as the *Yadro 2 Radio Station*, a 400 watt phone/CW rig used for air/ground communications.

The R-112 is used in military tanks, running 50 watts AM phone and 90 watts CW between 2.8 and 5 MHz. It is rated with a maximum transmitting range of 125 miles.

20 MHz to 70 MHz

Military tanks seem to be especially well equipped on frequencies commencing at 20 MHz. For instance, the R-113 transceiver runs FM with 17 watts between 20 and 22.375 MHz with an operational range of 12 miles. The same distance is covered by the R-123 FM transceiver, which is used in tanks and operates between 20 and 51.5 MHz. Shorter range tank (or manpack communications with tank company) communications can be handled by the R-114D, which operates from 20 to 26 MHz and has a maximum range of 4 miles.

Now out of production, (but still in use), are a series of manpack rigs that are part of the R-105 classification. Operating between 22 and 46 MHz, these sets all run 1 watt or slightly more and operate up to 4 miles (16 miles with a linear amplifier). This is infantry and artillery company equipment.

The frequency range 33 to 46 MHz is employed by the *Len 5* (5P21B1) transceiver. This equipment is used by military and non-military personnel when setting up duplex telephone-type operations from mobile command posts in remote areas. The transmitter puts out 8 to 15 watts and is rated with a coverage of 12 miles.

Soviet platoon and company communications take place (FM) between 48.50 and 51.50 MHz, relying upon several portable units. The R-106 transceiver (now out of production but still in use) operates on 18 different frequencies, covering 2 miles with its ½-watt output. The R-116 rig puts out a tenth of a watt and has a range of about ½-mile—it's used by platoon commanders and offers 10 frequencies installed. The most popular unit is the R-126. It has 3 channels and also continuous tuning. The maximum range is about 1¼ miles.

Communications at Division level (and higher) for command and administrative purposes take place between 60 and 70 MHz using FM mode. The primary equipment for this is the R-401 and R-403, each of which has 4 channels preselected from any of the 54 discrete channels in this band. Two of these channels are voice, two are CW. Running only 2½-watts, the equipment can cover up to 30 miles using beam (yagi) antennas mounted on vehicles. In North America, TV Channel 2 covers most of this band.

VHF Units

Soviet military air/ground communications take place between 100 and 149.975 MHz (25 kHz channel spacing). In North America, part of this band (frequencies below 108 MHz) is used for FM broadcasting.

The most popular ground equipment used for these communications consists of the Polyet transmitter and receiver. The transmitter puts out better than 5 watts, voice or data. The receiver is a single conversion superhet.

As a side note to VHF operations in the USSR, there is a transceiver known as the *Sokolniki-M*, which is used for non-military purposes by the government. Operating in the 160 MHz frequency range (two frequencies), it is used by various agencies, including the secret police (KGB). It has a memory bank that can memorize more than 30 telephone numbers for phone patching purposes, and can be made to selectively call up to 256 individual mobile units. The transmitter runs 10 watts, while the system's mobile units use only one half of a watt.

UHF Too?

The only known UHF communications system is via the R-405 FM units, which run about 2½-watts between 320 and 420 MHz. Using corner reflector antennas, the R-405 units have a maximum operational range of about 30 miles. They are used by the Soviet military for administrative and command communications at Division level (and higher).

Receiving, Etc.

The Soviets have a receiver called the R-311. This is an HF unit that tunes between 1 and 15 MHz and can be mounted in vehicles or used as a manpack. It is typical of a large number of similar receive-only units deployed in the field. In fact, it appears that the Soviet military has discovered that field units that receive but can't transmit are a sure-fire way of maintaining quick and efficient command control. As a result, most radios in the field below the company-command level either cannot transmit at all or else are set for transmitting only in the instance of a need to do so, and upon specific instructions being given for such use.

For security purposes, the Soviets keep two-way chatter to an absolute minimum, relying heavily upon the use of flares, flags, landline communications, and motorcycle couriers to get messages through whenever possible. The Soviet battle planning is done at high level (such as Regiment) and then given to commanders directly rather than discussing the plans over the air. While this system is awkward and cumbersome, it has its advantages since it prevents the Soviets from becoming so dependent upon radio communications that they would suffer lost combat effectiveness in the face of jamming or other electronics countermeasures.

The use of monitoring, radio silence, and deceptive communications techniques are perhaps as important to the Soviet military effort as the more well-known uses of communications technology. The Soviets appear to be well aware of the fact that capturing control of the radio spectrum is as important a part of emerging as the victor in a conflict as maintaining control over the sky, the seas, the land, and the people.

Soviet dedication to the techniques of electronic warfare (EW) was shown to the world during the Middle East battles of 1973. The Soviets supported the Arabs, and their contributions to EW during that conflict gave the Arabs substantial success at the beginning of the hostilities. The Soviet approach to EW differs considerably from the approach of the West.

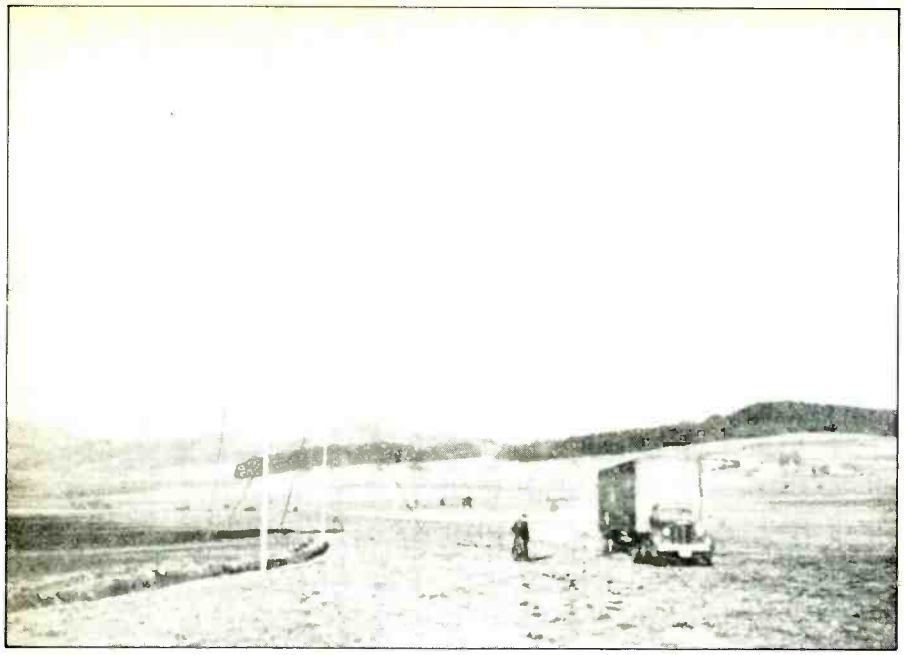
The Soviets devote much effort to using electronics to pin down the locations of potential targets, such as radar and various sources of radio signals. This includes communications stations or transmitters sending out control, navigation, telemetry, jamming or guidance transmissions. Besides giving them data for use in missile or other forms of direct attack that might be desired, locking in on the signals provides copious amounts of signal intelligence (SIGINT). This not only provides the Soviets with basic intelligence information, it also offers them the opportunity to plan and develop effective methods of *spoofing*, that is, establishing deceptive counterfeit transmissions. Those transmitters that can't be immediately pegged for possible destruction are, at the very least, considered as candidates for being jammed in order to make them useless, or at least minimize their function.

The Soviet uses of spoofing and creative radio silence are used to either suggest the absence of combat units where units are actually located in areas that are sparsely covered by combat forces. Spoofing can also include the use of bogus radio beacon signals to lure enemy aircraft off course.

Soviet radio directionfinding (RDF) units are the heart of the information gathering network that makes all of this possible, and their RDF equipment is plentiful and highly mobile. The mobile RDF stations can set up shop quickly in any desired location and feed their information to portable intelligence units for analysis and identification so that current data can be maintained on the locations, combat potentials, and even plans of the enemy. This data can then be used for planning either EW or actual combat retaliation moves.

One such RDF unit is the truck-installed SR-53-V. It has collapsible antenna elements that can be unloaded, extended, and stuck into the ground according to a precise layout—all within a relatively short time. When the SR-53-V (NATO code name: *System A*) is operational, any signal 30 seconds or longer is pinpointed, and information on its existence is fed to 9 other nearby monitoring vans operating in the mobile RDF network.

Given a typical signal from a 35 watt FM VHF low band (30 to 76 MHz) mobile trans-



Both fixed and mobile jammers are employed throughout the Soviet Union and in many of the satellite countries. The truck in this photo houses a mobile jammer, which feeds fixed antennas at left. A guard with a rifle can be seen in the center of the photo.

mitter (such as our AN/VRC-12) located within 6 miles of the RDF van, the location can be pegged to within approximately a 1750 foot circle. Even if the AN/VRC-12 operates using its reduced power (8 watts), the RDF unit has a 75% effectiveness. At 25 miles away from a low band mobile transmitter, these mobile RDF systems can obtain useful intelligence, and if aided by RDF aircraft, information from mobile units 50 miles distant can be obtained.

The vans feed their information directly to combat commands. Within only 2 to 3 minutes after an intercepted transmission is first detected, it is possible to commence launching of artillery barrage against the unit doing the transmitting. The Soviet 122 mm multiple rocket launcher can, in only one burst, send out many hundreds of rockets which will effectively eliminate the continued existence of the station doing the transmitting, and everything else located within its immediate vicinity.

When the Soviets supplied these mobile RDF units to the Egyptians in 1973, the Eqyptians used them to direct fire from their 130 mm field guns—which trained upon Israeli tanks, artillery units, and field command posts. Under this constant and precision bombardment, it was necessary for the Israeli forces to spend so much time shifting locations that their combat effectiveness was severely vexed.

The vans aren't the entire story, however. Small manpack-sized RDF units are available for deployment in scout cars, aircraft, or can even be carried behind enemy lines. These devices, mounted with directional loop antennas, can pinpoint important targets for either direct attack or for directing an attack by distant long-range weapons. No matter how well camouflaged these positions may be, as soon as their radio transmissions commence, they are on tap for being detected by the Soviets. Retaliation could be in the form of jamming or spoofing (an alternative to bombardment) should Soviet strategists decide upon that course of action. Even in Viet Nam, our long range reconnaissance patrols (LURPS) were detected by the Viet Cong using such devices.

Spoofing & Signal Intelligence

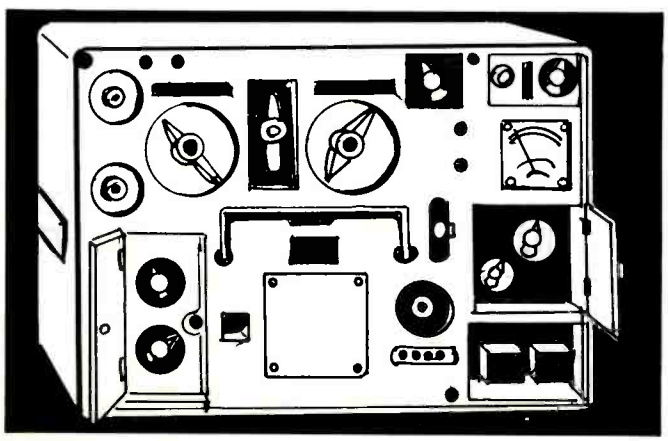
Knowing what the enemy is up to calls for interpreting what he is saying, understanding his codes and cyphers, and determining a course of action based upon this intelligence. Even if the content of encrypted or scrambled messages cannot be understood, intelligence can be gathered. It is still possible to pinpoint transmitter locations from base or mobile units. Increased activity on certain frequencies or transmissions from reconnaissance aircraft might warn of impending attacks. Certain types of radar signals or guidance transmissions, as well as increased brief radio checks, could also reveal that an assault is about to commence.

Establishing bogus transmitting stations within enemy networks is an effective (although not necessarily new) trick. The RAF, during World War II, had spoofing transmitters set up on Luftwaffe frequencies. It was possible for the RAF to misinform and misdirect a number of Luftwaffe fighter and bomber pilots using this method, as well as to cause night fighter pilots to attack.

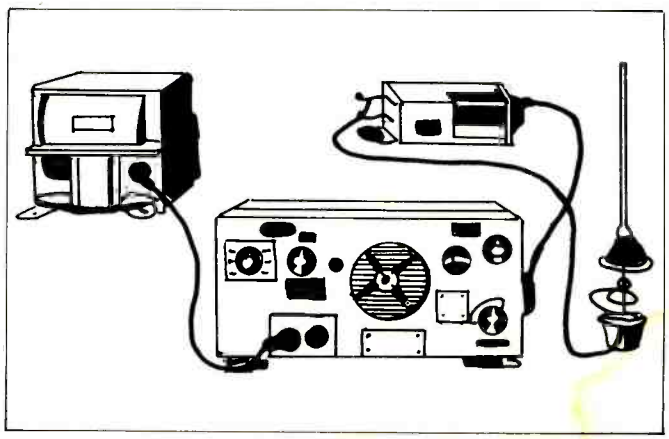
Today, American forces have established an authentication ritual, which tactical stations can use to detect any spoofers who may have crept into our networks. Those who have monitored our military networks know, however, that these methods aren't used all of the time and, in the case of actual combat conditions, it may not be convenient to utilize these methods in many instances. Changing methods of voice scrambling (including frequency hopping techniques) would appear to be an effective way of eliminating spoofing within the communications systems of our own forces.

One fly in the salve here is that the intercommunications between our own forces and those of our allies might easily be spoofed since their communications methods, procedures, and equipment don't always match up to ours. Messages that are exchanged between our forces and various NATO forces might have to be sent by methods that are vulnerable to Soviet spoofing.

The R-112 shown here is a 50 watt rig used in armored vehicles.



The R-113 runs FM from 20 and 22.375 MHz.



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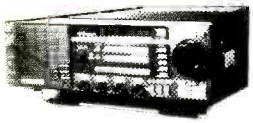

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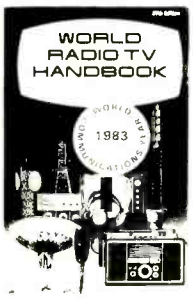

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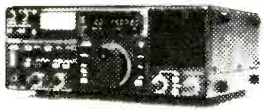

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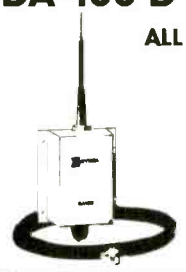

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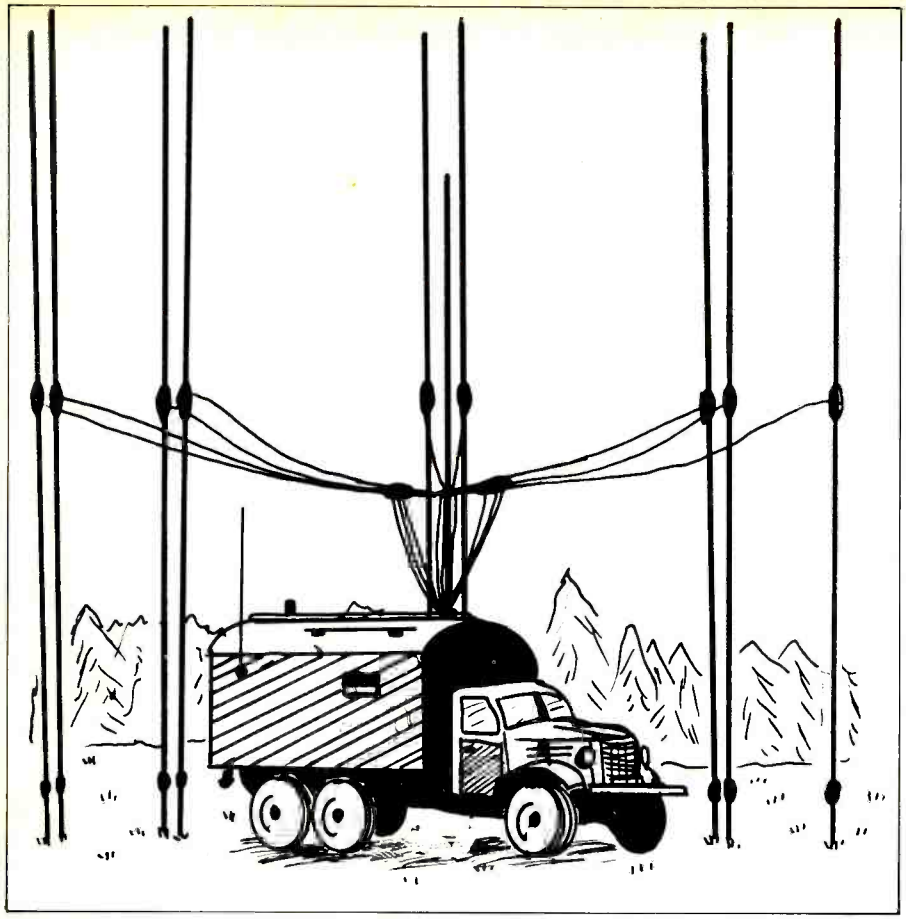
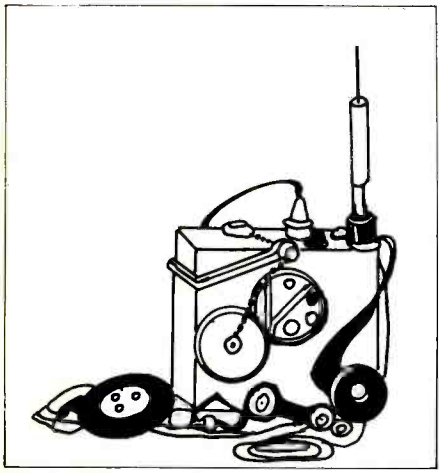


The Soviet SR-53-V is a truck-installed radio direction finder deployed in many areas.



The R-126 is a cumbersome manpack transceiver with a range of just over one mile.

Signal Destruction

The Soviet tactics call for the electronic destruction of any signal that cannot be effectively silenced by other methods. This propensity for electronic silencing of the communications of others is perhaps best known in the field of broadcasting, where jamming transmitters readily blanket the frequencies used by various nations sending transmissions to Warsaw Pact nations. When it comes to the military potentials of jamming, the Soviets are also well versed in the finer points of the art.

Whereas our own military jamming techniques call for precision spot jamming of specific frequencies, with the Soviets it's a different story. Great numbers of high powered mobile jamming units can be placed as close to the enemy lines as possible, wiping out large segments of communications and other bands on a blanket basis. Fully understanding Western reliance on radar-directed artillery, the Soviets also jam frequencies used by the radars of the enemy. While the Soviet jamming signals are not too difficult to locate with RDF, their abilities to jam the radar systems that could direct artillery at the jammers offers them some protection.

Jammers are located not only in trucks, but at fixed sites and in aircraft. Jamming is directed at ground and aircraft communications, and guidance and navigation systems. Scarcely is a frequency, band, or type of electromagnetic radiation, regardless of its source on the land, sea, or in the air, not taken into account by the Soviets.

Radar that cannot be easily jammed by signals are often given a generous helping of *chaff*. Chaff consists of long ribbons of aluminum foil deployed by aircraft. Chaff causes radars to become useless, generating false images, echoes, and non-existent targets. If enough of it is tossed out, it creates a solid wall that cannot be broached by radar. In August of 1968, when the Russian, East German, Polish, Bulgarian, and Hungarian forces invaded Czechoslovakia to neutralize the short-lived anti-Soviet regime of Oldrich Cermik, there was an effort to conceal the full extent of the invasion from the world. So much chaff was dumped out of transport aircraft that it was drifting down for days and it took months to clean up the tons of litter it left throughout the Czech countryside.

Radio Silence

As mentioned previously, the Soviets use radio silence as a weapon. They are well aware of the dependence upon radio by the enemy and they have made serious efforts to avoid (as much as possible) falling into the position of the enemy by letting that dependence become one of their weak links. An American company requires the use of no less than five nets (one connected to battalion HQ and four for internal use). The Soviets need only one net for the entire battalion, and communications are held to an absolute minimum.

Those communications that are sent out are brief and (as much as possible) used with minimum power in conjunction with highly directional and/or remote antennas. Callsigns are changed often, as well as various and varied frequencies. Backup communications systems are used to insure that whatever messages are sent out are received in good order. Another method used by the Soviets is the utilization of lengthy messages being transcribed on to tapes and then fired out in high-speed bursts. These bursts don't last long enough to be zeroed in by our RDF.

Another effective Soviet stunt is to deploy large radar reflectors in conjunction with the generation of large amounts of misleading radio traffic from insignificant areas. This gives the impression that combat forces are located in areas where none really exist, offering them the opportunity to move the actual forces to strategic locations while the enemy's attention is diverted. These tactics have been employed by the Soviets for at least 40 years now. The use of such deceptive techniques appears to be almost mandatory as part of the Soviet battle concept.

Unsophisticated, cumbersome, and not of modern design is the hallmark of Soviet military equipment. Much of it is designed around vacuum tubes and has to be transported by truck. Yet it is serviceable and rugged. This may at first seem incongruous with the Soviet realization that it is communications which ties fighting forces to one another. They have taken considerable effort to attempt to turn the enemy's reliance upon communications to their own advantage while, simultaneously, they have attempted to insure that the enemy cannot effectively or easily utilize the same tactics against their own forces. They feel that if they can disrupt the communications of the enemy, the enemy's fighting potential will be cut in half.

It's a simple logic, as unsophisticated as their antiquated communications equipment. Yet, turning the weapons of one's enemy against himself is quite a valid strategy—especially when the enemy (that's us) appears to be making giant strides in developing more sophisticated communications systems. In the Soviet concept, the more dependent we become upon those systems, the more vulnerable we become.

Scanning The:

Ohio State Highway Patrol

For this month's listings, we must thank the All Ohio Scanner Club (10 Avalon Road, Mt. Vernon, OH 43050), who passed them along to share with *POP'COMM* readers. We invite our readers to forward any signals and codes used by law enforcement agencies—state, major cities, larger metropolitan counties.

The OSP is divided into 10 Districts, each of which incorporates several counties. These are:

DISTRICT 1 Counties: Allen, Defiance, Fulton, Hancock, Hardin, Henry, Lucas, Paulding, Putnam, Van Wert, Williams, Wood.

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DISTRICT 5 Counties: Auglaize, Champaign, Clark, Darke, Logan, Mercer, Miami, Preble, Shelby.

DISTRICT 6 Counties: Delaware, Fairfield, Franklin, Knox, Licking, Madison, Perry, Pickaway, Union.

DISTRICT 7 Counties: Belmont, Carroll, Coshocton, Guernsey, Harrison, Jefferson, Monroe, Morgan, Muskingum, Noble, Tuscarawas, Washington.

DISTRICT 8 Counties: Adams, Brown, Butler, Clermont, Clinton, Fayette, Greene, Hamilton, Highland, Warren.

DISTRICT 9 Counties: Athens, Gallia, Hocking, Jackson, Lawrence, Meigs, Pike, Ross, Scioto, Vinto.

DISTRICT 10 County: Cuyahoga.

The Districts are established as follows:

District#	Base	Mobile	Intersystem
1	44.94	45.26	42.56
2	44.98	44.82	45.86
3	44.74	44.86	45.14
4	44.98	44.82	45.86
5	44.74	44.86	42.08, 45.14
6	44.94	45.26	42.42
7	44.94	45.26	42.42
8	44.98	44.82	45.86
9	44.74	44.86	42.56
10	44.74	44.86	

Other Statewide frequencies of interest:

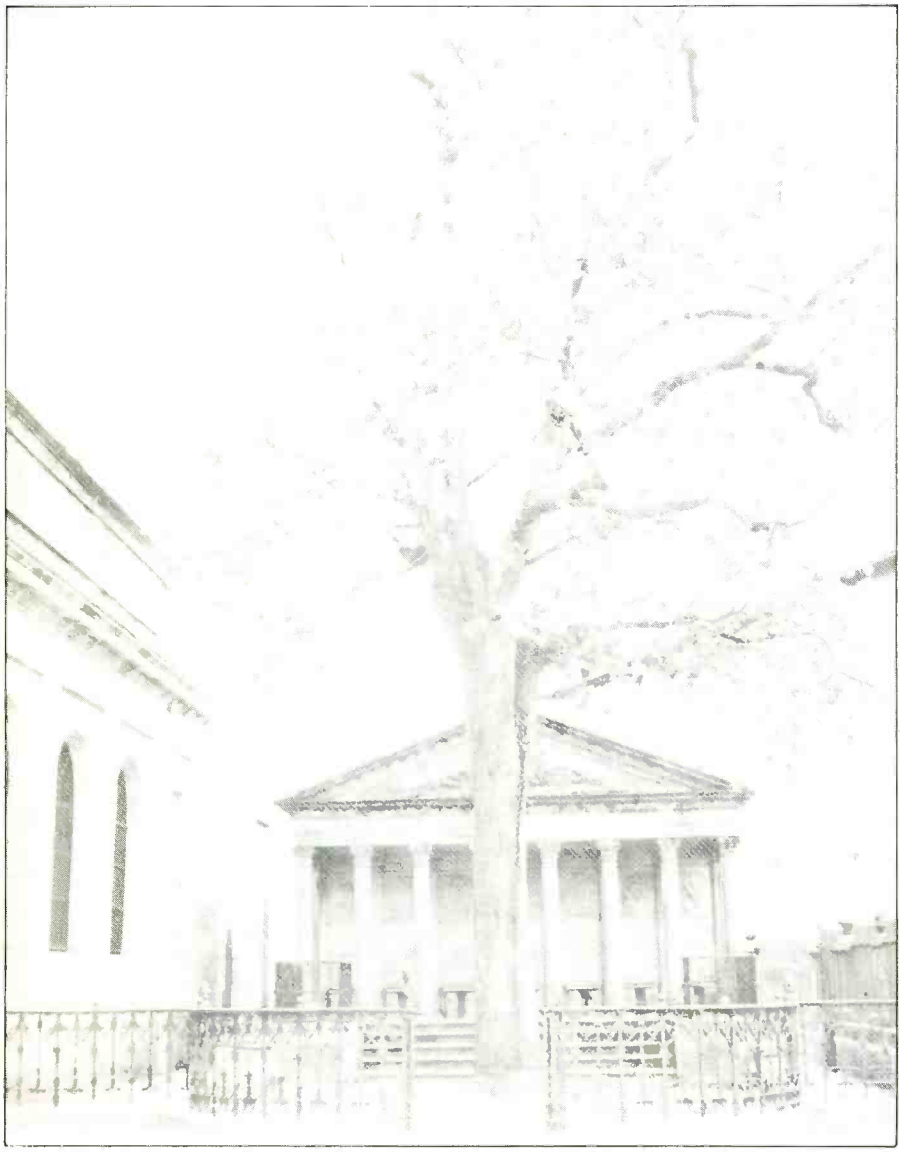
45.02	Intersystem; aircraft/radar
45.10	Backup Intersystem; Special Operations
154.68	Ohio State Law Enforcement Emergency Radio Network
154.935	Ohio State Law Enforcement Emergency Radio Network
155.37	Intercity Network
155.475	National Police Emergency Channel

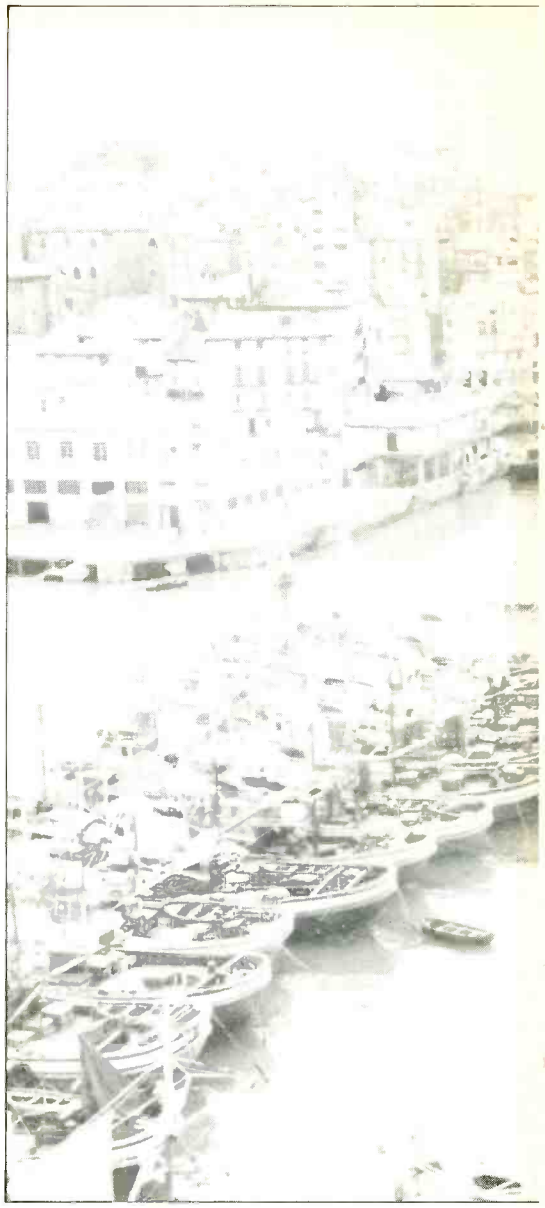
OSP Signals:

1	Out of service
2	In service
3	Out of service, subject to call
4	Out of service, equipment failure
5	Rush
6	Reference previous traffic
7	At your convenience
8	Unable to read, change location
9	Unable to answer at this time
10	Call given point by phone
11	Call GHQ by phone
12	Call DHQ by phone
13	Call your post by phone
14	Call radio by phone
15	Call home by phone
16	Technical problems with computer
16A	Technical problem with functional portion of leads
17	Accident report number
18	Have traffic; relay
19	Relay by phone
20	Contact given place in person
21	Contact GHQ in person
22	Contact DHQ in person
23	Contact your post in person
24	Contact radio in person
25	Contact home in person
27	Improper procedure
29	Relay in person
30	Accident reported—fatal
31	Accident reported—property damage
31A	Accident reported—personal injury
32	Traffic jam or road blocked
33	Drowning
34	Fire: motor vehicle
36	Fire: other than motor vehicle
37	Disabled vehicle
38	Eating
39	Location
40	Emergency
41	Immediately
42	Be on station
43	All units: call your post
44	All units: report to your post
45	Resume regular patrol
46	FCC inspector on station
47	Traffic preference
48	Stand-in examinee
49	Forced landing
50	Unidentified plane
51	Plane crash
52	Radioactive material shipment
53	Hazardous load
54	Wrecked truck hauling explosives
55	Explosion
56	Train accident
57	Bomb scare
58	Suspect can hear radio traffic
59	Permits
60	Convoy or reference convoy
75	Wanted person(s) and/or property—felony
76	Wanted person(s) and/or property—misdemeanor
77	Wanted and warrants check
79	Mentally disturbed person
88	Officer in trouble—needs assistance

The Mysterious Radio Euzkadi

40 Years Of Deception! BY DON JENSEN





Port of Bermeo in Basque province of Vizcaya. (Photo courtesy of Spanish National Tourist Office)

The Oak of Guernica, showing the Casa de Juntas. (Photo courtesy of Spanish National Tourist Office)

What and where was Radio Euzkadi? And why did it broadcast—off and on for 40 years—as the secret station of an invisible government of a non-existent nation?

Radio Euzkadi, until it closed down in 1977, was one of the most persistent of the clandestine stations that seem to flourish on the shortwave bands whenever and wherever there is political turmoil. The mysterious station had shortwave listeners baffled for years. And when the truth was finally known, it was a fascinating tale of intrigue and deception, with a million-dollar twist and, at least peripherally, involved kidnapping, torture, and murder.

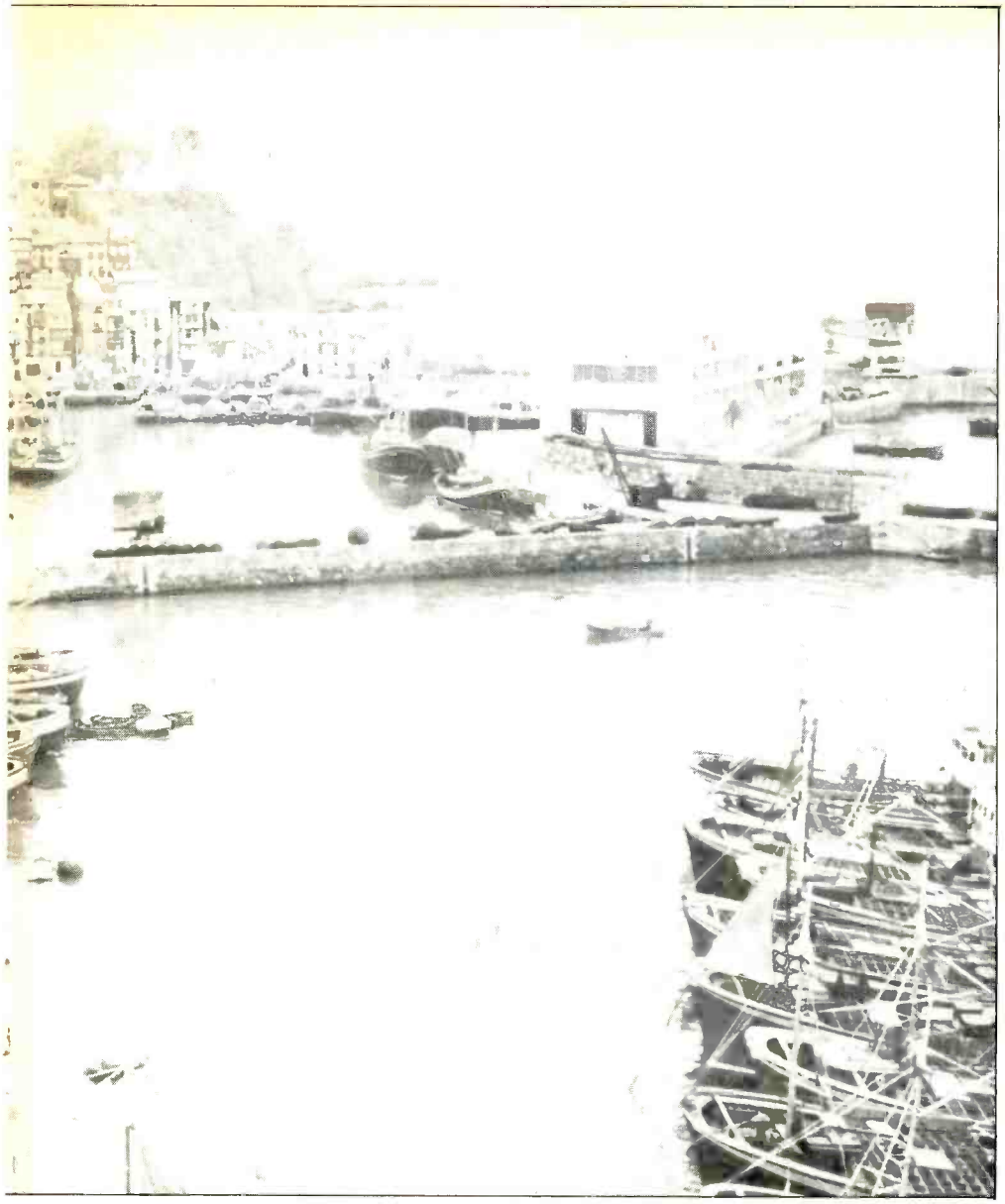
Radio Euzkadi operated from at least three locations during its long history, including an old fishing boat in a French harbor. In its final years, it pretended to operate from the mountains of northern Spain, while it was actually on another continent 5,000 miles away.

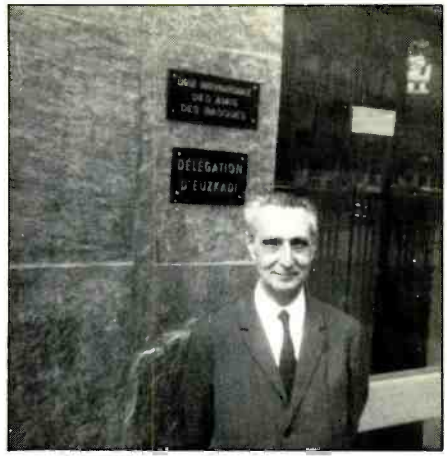
Radio Euzkadi broadcast to the Basques, a strange people with an even stranger language, whose traditional homeland straddles the Spanish/French frontier. Some people claim the 2.5 million Basques are descendants of the last survivors of legendary Atlantis. Most scholars, however, now believe their distant ancestors were a Bronze Age people who migrated westward from Asia Minor some 4,000 years ago.

The origins of their language, mostly X's, K's, and Z's, are also uncertain. It is probably the oldest language still spoken by man. There are those who claim it was spoken by Adam and Eve, and was the only language to escape the Tower of Babel.

During the reign of Julius Caesar, the Basques settled in the green valleys and fir-covered Pyrenees Mountains of northern Spain. For a thousand years, they fiercely fought off waves of invaders—Phoenicians, Visigoths, Arabs, and the armies of Charlemagne. In time, they accepted the sovereignty of the Spanish kings, but only in return for solemn pledges, regularly given beneath the sacred oak of Guernica, to respect their rights of self-government.

But a little more than a century ago, the





Jesus Maria de Laizaola in early 1970 at the age of 74. He was the president of the Basque government while in exile in Paris.

Modern apartment building at 48 rue Singer in Paris. In the 1970's, the Basque exile government was headquartered on the ground floor of this building.

Basques chose the wrong side of an internal Spanish squabble and their ancient laws and privileges were suspended. Since then, they have struggled with a succession of governments, trying to regain semi-autonomy.

In 1936, they were briefly successful. In a bid for Basque loyalty in the Spanish Civil War, the Republican government restored self-government. Under Guernica's tree, a young lawyer, Jose Antonia de Aguirre y Lecube, was sworn in as Basque president.

But ten months later, the short-lived republic was crushed by the armies of Franco and his German and Italian allies. It was during that embattled period that Radio Euzkadi first went on the air. Little is known about its early operations, except that it was located in Bilbao, near Spain's northern coast. When Bilbao was captured by the fascists, the station was silenced for the first time.

Aguirre and his cabinet fled first to Paris; when WWII began and the Nazis entered the French capital, they moved to New York, where the exiled president took a university teaching post. After the war, the Basque government-in-exile returned to Paris, although a number of the members of the shadow government settled in the French fishing port of Bayonne, and its neighboring town of St. Jean-de-Luz, not far from the Spanish border.

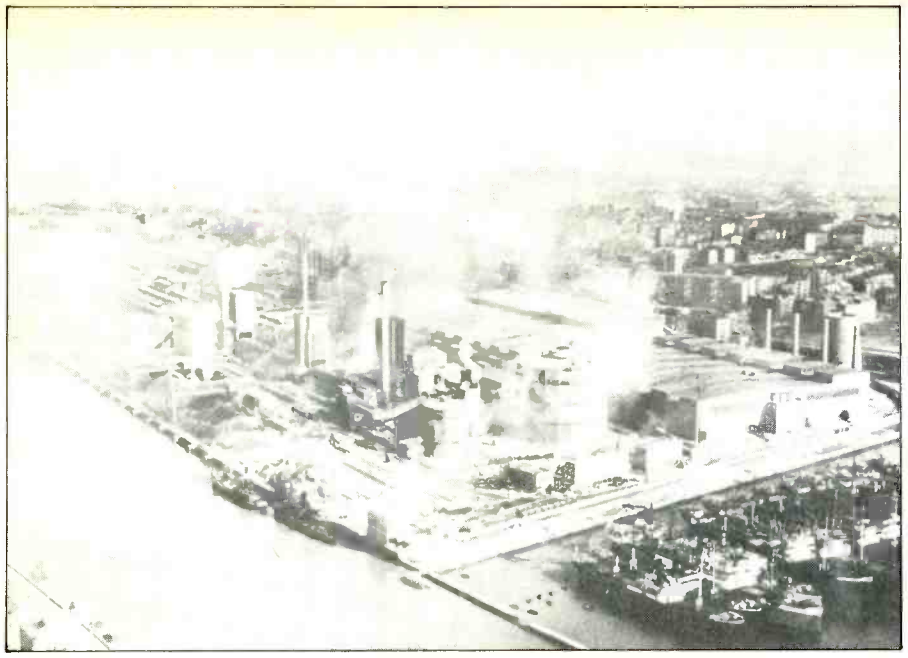
In December 1946, a reborn Radio Euzkadi began broadcasting clandestinely from an old, weatherbeaten fishing trawler tied up in Bayonne's harbor. Its signals apparently were not regular nor strong enough to be heard in the U.S., but some European SWLs caught a few shortwave transmissions on 6,300 and 7,000 kHz. Most of the broadcasts, however, were aired by a medium wave station just powerful enough to be heard by the Basque audience across the line in Spain.

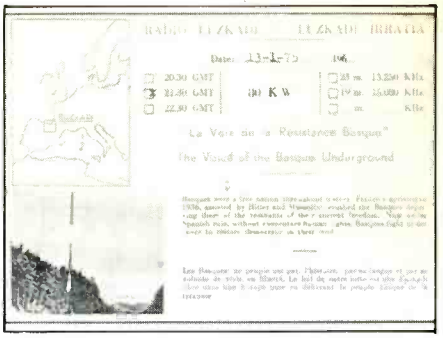
The French government must have known of Euzkadi's broadcasts, for a clandestine station cannot operate without at least the tacit consent of its host country. The French seemed willing to look the other way as long as the station didn't spark an international incident. In the early 1950's, though, two such incidents struck sparks, which ignited a diplomatic "4-11" blaze!

The first incident involved a Basque priest named Onaindia who was hired by the official Radiodiffusion-Television Francaise to broadcast during a daily 45 minute European Service transmission in Spanish. The priest's talks were more theological than political, but they did point up the problems of the Basque minority and that made Madrid decidedly unhappy.

More provocative was an incident involving a Spanish medium wave radio station in the northern city of San Sebastian. One night, the Basque underground, operating from French soil, somehow managed to cut the electric power circuit to station EAJ8. For half an hour, the silenced Spanish station was replaced on its usual 1068 kHz frequency by Radio Euzkadi. That broadcast was heard throughout the Basque provinces and embarrassed the Franco regime.

Under diplomatic pressure, France cracked down on the Basque exiles. Father Onaindia was fired and, in August 1954, Radio





QSL received from Radio Euzkadi in 1975, just two years before its final broadcast.

Industrial area of Bilboa. (Photo courtesy of Spanish National Tourist Office)

Euzkadi was shut down for the second time. Its medium wave transmitter was dismantled and shipped to the exiled government's headquarters in Paris, where is was stored for at least two decades in the basement.

In those days, the Basque government operated from a "chilly baronial mansion" in the French capital, according to a prominent visitor, author Irving Wallace. Within a few years, however, the headquarters was moved to the ground floor of a modern glass and stone apartment building at 48 rue Singer in the pleasant Passy District of Paris' 16th Arrondissement. Led by Aguirre and, after his death in 1960, by Jesus Maria de Leizaola, the aging band of exiles kept the torch of hope aglow.

In the summer of 1964, Radio Euzkadi began its third and longest period of operation, beaming a message of resistance into Basque Spain.

A few years earlier, however, another Basque organization, ETA (Euzkadi ta Askatasuna: Basque Homeland and Liberty) had begun to challenge the old men of the exile government in Paris. Soon ETA would be making headlines with a campaign of terror and assassination in Spain, overshadowing the old guard's more passive approach.

Still, through the new Radio Euzkadi, the exile government spoke to the Basques and to the world. In the 1960's and 70's, the station, with two moderately powerful shortwave transmitters (the station claimed they were 80 kilowatts each), broadcast three times daily, half hour repeated programs in the Basque language, Eukaera, Spanish, and English. To dodge the Spanish jamming stations, its frequencies varied, but generally it could be found near 12,100 and 13,250 (briefly around 15,100) kHz.

Probably because of past experiences, the Basques were tight-lipped about the station's location, though they implied it operated from within Spain itself. When I got too inquisitive about the whereabouts of its transmitters, a touchy exile official snapped: "If the word clandestine means secret, why should you be the exception?"

DXers took logs on the Radio Euzkadi programs they monitored. The broadcasts began with an eight note tuning signal, the opening bars of the Basque anthem. The identification announcements followed in Euzkera and Spanish: "Enmen Euzkadi Irratia . . . Radio Euzkadi, la Voz de la Resistencia Vasca." The station even responded to SWLs with QSL cards, which showed a photo of an antenna with a background of snowcapped mountains, implying a secret transmitter site high in the Pyrenees.

In reality, though, the station broadcast from Venezuela, not far from Caracas. Direction finding experiments indicated Radio Euzkadi was not in Europe, but along the northern coast of South America. The more precise location came from an off-hand remark by a Basque official, during an unguarded moment while being interviewed at the Paris headquarters.

The station was tolerated by the Venezuelan government, which surely was aware of its operations, and was supported by a large and active group of Basque immigrants living in Caracas.

Some SWLs assumed, incorrectly, that Radio Euzkadi was another Red clandestine, like the Soviet-backed longtime Radio Espana Independiente. But most Basques, devout Roman Catholics, are staunchly anti-communist.

"Radio Euzkadi does not harm any true democrat," a Basque spokesman told me.

Other listeners suspected the behind-the-scenes string-pulling of the U.S. Central Intelligence Agency. But there was no evidence of that either.

How then did the Basques do it? Equipping and operating a major clandestine broadcaster takes money!

A clue to the mystery was suggested by an incident that began in Manhattan on the night of March 12, 1956, involving Dr. Jesus de Galindez, a 42-year-old professor of Hispanic-American civilization at Columbia University. He also happened to be the Basque exiled government's chief fund raiser in the U.S. Shortly before 10 p.m., a student gave the professor a ride to the subway station at 57th Street and 7th Avenue. Galindez walked down the steps to the platform and disappeared!

There was another side to the professor's life. Also a Basque exile, he had fled Spain and found his way to the Dominican Republic, where he took a job with the dictatorship of the late Rafael Leonidas Trujillo. But he was soon shocked by the Caribbean strongman's terror tactics and, in 1946, left for New York. There, he met a fellow instructor at Columbia University, Basque president Aguirre. When Aguirre returned to Paris, he named Galindez the official Basque representative in the U.S.

Galindez continued his fight against the oppressive Dominican regime as well, and at the time of his disappearance had completed a book manuscript that painted a highly unflattering portrait of the dictator Trujillo, who was then trying to lure American tourists to his island country. Rumors that the book would contain personal slurs on his manly honor were too much for the fiery strongman to endure.

Eventually, evidence was unearthed indicating Professor Galindez was kidnapped by Trujillo agents, drugged and smuggled unconscious aboard a chartered plane. He was flown to the Dominican Republic and, presumably, tortured and slain!

When the hired American pilot, who thought his passenger was only an invalid, began asking too many questions, he was pushed into the shark-infested sea behind a Ciudad Trujillo slaughterhouse.

Trujillo himself was assassinated a few years later during a coup d'etat allegedly encouraged by the U.S. government.

The grisly story bears on the Radio Euzkadi mystery because of newspaper articles published shortly after Galindez disappeared. They told of reports the professor had filed, as a foreign agent, with the U.S. Department of Justice. The reports showed he had collected $1,023,004 over several years, but the newspapers said only half that amount had found its way into the coffers of the Basque government-in-exile.

President Aguirre denied any shortage, insisting "every cent was accounted for."

But, as *Time* magazine put it, how could an "obscure exile . . . pass the hat for a nonrecognized government of a nonexistent country—and take in a cool million?"

The money, in fact, came from a voluntary head tax paid by Basques living outside of Spain, most of them in the western hemisphere. Each year, these emigrants contributed to the exiled government as a show of solidarity with their compatriots back home, and to maintain a dual "citizenship" in the Basque "nation." Overseas Basques were reminded annually to renew their "citizenship card" by sending in their contributions.

There was ample money to finance the clandestine station. Its programs were produced in studios in Caracas, although its daily "News of Spain and the World" were culled, in part, from newspapers in the Paris headquarters and scripts were airmailed to a blind postal drop in Venezuela.

The Spanish answer to Radio Euzkadi was jamming and more jamming. The technique was to bracket the clandestine's frequency with a pair of rapidly beeping signals. But the jammers seemed to have trouble following Euzkadi's frequency shifting. Because of the sloppy jammer operation, the station was heard with relative ease in the Basque provinces.

This went on until 1975, when Francisco Franco, Spain's longtime foe of Basque autonomy, died. It was Franco who had, since Spanish Civil War days, considered the Basques traitors and treated the northern provinces accordingly.

A more liberal, democratic regime followed. In early 1977, the political association law was reformed and most political parties were legalized. The way was open for a return to democracy.

The Basques were promised their own justice system, taxation, education, and police force. They were to have a local parliament and be permitted to speak their ancient language and fly the red, white, and green Basque flag. By 1980, much of the old autonomy was restored. There no longer was a need for a clandestine radio "voice of the Basque resistance."

After four decades, Radio Euzkadi announced it was shutting down. At 2208 GMT, April 30, 1977, the station signed off for the last time, saying:

"Since the Basque national flag is once again flying proudly from all mastheads in the Basque country, Radio Euzkadi can withdraw from the air with honor!"

SCANNER SCENE

BY RICK MASLAU, KNY2GL

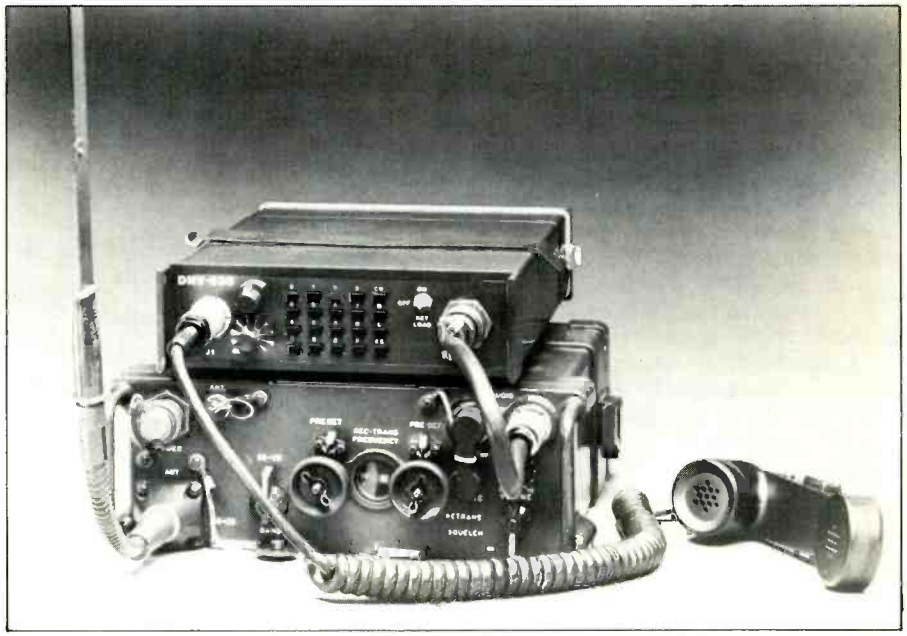
MONITORING THE 30 TO 512 MHz "ACTION" BANDS

I once built a communications security system for an experimental project with which I was tinkering. This was simplicity itself because all I did was superimpose a modulated tone into the transmitter along with the voice modulation. At the receiving end of the system, the modulated tone was screened out by an active audio filter. My experiments in this "masking" type voice security system used tones that I could vary between 850 and 1500 Hz and the ratio of tone level (versus voice level) to see the most effective way of ensuring message security.

With the audio filter operational in the receiver, the thing actually did a pretty good job and the amount of recovered voice quality was quite high. Those who might have attempted to tune in on this system without the audio filter were able to copy the transmissions only with great effort, inconvenience, and annoyance. Frankly, it was virtually impossible to monitor this awful sounding mess for more than a few minutes without developing a miserable headache. All that would have been needed to achieve good copy would have been a humble audio notch filter. This was just an experiment and I had no intention of actually using it during regular communications, although such masking systems are (in fact) sometimes used.

Communications privacy and voice security have always interested those of us who like to monitor the airwaves, and, with the use of various types of privacy systems on the rise, I thought that we would spend a little time going over some of the ways it is being done. Some federal agencies (such as the FBI) are prone to using scrambling, or as they say, "switching to papa." There are also police systems that are scrambled, and recent changes in the FCC regulations have opened the door for scrambling in business and industrial radio services. Power utilities (such as those that operate nukes) are pro-scrambling and have been authorized to jumble their voice messages.

Federal stations that might wish to have secure voice traffic include military stations as well as civilian agencies performing enforcement duties; it might well be for reasons that go beyond simply having "outsiders" listen to their traffic. Secure communications could possibly be a way of avoiding jamming or detection by direction finding (DF) equipment. Secure transmissions is actually a very wide-ranging series of techniques and it doesn't always have to include complex electronics hardware. A very simple non-electronic method is by the use of certain codes and code words. To an uninformed person, the use of a message such as "10-31" has no meaning whatsoever, as does a message that advises to "follow the blue box to where he makes a Romeo."



Here's a manpack rig with a scrambler accessory module.

The AN/PRC-117 has a built-in scrambler.

Messages such as "Code 3," "Signal 2," "Switch to F-3," or "File 4" fit into this category. While it's true that they may serve a secondary function of being a vocal type of shorthand (it's quicker to ask "10-20?" than "What is your location?"), they also confine the meaning of the message to those who have an understanding of the codes, buzzwords, or signals.

Then there are the voice security systems, which consist of interchanging one letter for another (or one digit for another) to garble the message to outsiders. A license plate given over the air as "467-GNRX" could actually be a coded way of describing the license plate "RGT-2793." A word spelled "UNRSTNS" might be a concealed way of spelling the name "Johnson." The so-called "spy-numbers" stations widely reported on the HF frequencies use forms of this type of voice security, and on the scanner frequencies it has been noted in use by several federal agencies.

Other ways of making it difficult for outsiders to listen in include some other basically straighforward methods, such as running a two-channel system or using CW, or RTTY, or microwaves, or satellites, low powered transmitters coupled into highly directional transmitters, light beams, spread spectrum, oddball frequencies, and any of several methods or modes that aren't specifically "scrambling" but which are, nonetheless, not immediately going to let the entire monitoring world hear what messages are being passed. Until a few years ago, when communications receivers started incorporating SSB detectors, even SSB offered some degree of voice security!

Scramblers are different. These are devices that are a blatant and deliberate attempt to make it impossible for unwanted listeners to hear all of the action on a voice circuit. The most basic way of achieving scrambled speech is to feed it into a balanced modulator and mix it with a "coding" signal. What results is a wild mixture of speech and the coding signal, neither of which will have any meaning to the person trying to monitor without some extra hardware. Those who

are included in the system will hear the message clearly since this mixture of odd sounds goes into another balanced modulator where an identical coding signal is applied and results in unscrambled messages.

The single-phase scrambling method is the type most often encountered with civilian agencies and in business and industrial communications systems. These systems are easily monitored by anyone who elects to hook a commercially made descrambler to their scanner. This takes only a few minutes of work and requires no special tools or skills. Such units are made by companies that are well known to scanner owners, including DNE and Capri.

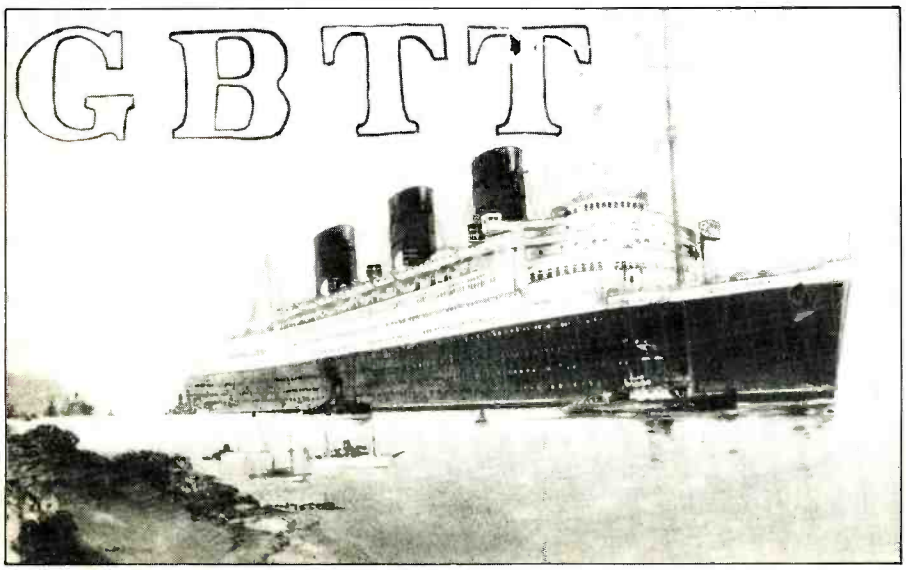
The use of scrambling with those federal agencies who are into this type of communications is a different matter altogether. Those who use scrambling do not appear to use it for all messages, reserving it only for certain transmissions considered too revealing for the public to monitor. The system(s) used for the scrambling are far more exotic than the simple (and less expensive) ones used by local police agencies and others. These agencies opt for complex scrambling methods not readily descrambled by outsiders, although there are obviously ways of descrambling the messages or else they would be without any ability to be understood. Some of the more complex scrambling methods used by federal agencies utilize systems that break up the voice into its component parts and convert those parts to digital bits of data. What goes out over the air doesn't consist of any voice components at all, only coded data! The Motorola DVP system is one type of highly sophisticated voice scrambling method in use by federal agencies. According to the scuttlebutt one hears in scanner circles, there are those who are feverishly at work in an attempt to develop methods of monitoring various types of digital scrambling systems.

There are all sorts of other scrambling systems also available, and chances are that they are virtually impossible to descramble by the hobby enthusiast. One such system is the USAF air/ground system, which is impervious to both monitoring and jamming. This system, called *Seek-Talk,* is small and nearly ready to go into full production.

Another method of secure voice transmission is mentioned in Tom Kneitel's *Top Secret Registry of U.S. Government Radio Frequencies.* This is known as "frequency hopping," which means that the transceivers at both ends of the communication rapidly and constantly hop from one frequency to another. There are, for instance, 16 frequencies in use and the transmitter will send out a 1/12th of a second burst of voice on each of the frequencies in a specific pattern. Many different frequencies can be punched up into one of these sets so the user has a wide variety (about 50 billion, give or take) of choices so that the frequency hopping pattern may be varied at random.

Those who don't know the frequencies in use at a given time cannot possibly monitor one of these systems; they cannot be located by DF and they cannot be jammed, either. Those who might happen to tune one of the frequencies will not even know that communications are taking place since it sounds like interference. This disguise (sounding like interference) is a point in the system's favor. Despite the system's natural ability to cloak itself in secrecy, think what its secrecy potential is when it's used in conjunction with a digital type voice scrambling system.

Such units are actually in use at this time and they can be used in mobile units, base stations, and repeaters or relays. They can even be carried as manpacks. One unit in particular, which operates in the frequency hopping mode, is the AN/PRC-117, made for the military by Harris Corporation. This transceiver operates with FM (1 and 10 watts output, but can also be made up in a 1/10 watt version on special order) in the 30 to 90 MHz band. It can be programmed to operate in a pseudo-random hopping pattern over no less than 200 frequencies, giving it 1×10^7 different patterns. It can operate in the standard (non frequency hopping) mode, either simplex or half-duplex.



A QSL from the Queen Mary when it was an ocean going passenger vessel.

Another frequency hopping transceiver is called the SC/16 and is made by Transcrypt/International of Lincoln, Nebraska. It operates from 145 to 166 MHz and has 6 privacy levels, including:

1. None
2. Basic
3. General or Industrial
4. Non-Tactical or Paramilitary
5. Tactical
6. Strategic

It should be noted that frequency hopping is so totally effective that persons using it could operate without detection to the point where they could appropriate frequencies used by others and could operate without any licenses. Best thing about frequency hopping is that there are no nations that could come up with either the equipment or the smarts to break this system.

These are only a few of the voice security systems available to those who wish to have their say without unwanted ears listening in. There are other systems, to be sure, and most are not only highly complex but also highly classified! It was only three years ago that a couple of communications hobbyists developed what *they* felt was a simple voice scrambling system that might be used by CB'ers or Hams. When they tried to obtain a patent on the system, the government promptly told them that their idea wasn't as simple as they had thought it was and it was just too good to be revealed to or used by the general public. They were told that it had many military applications, and that the government had decided to consider their invention *classified.* It has not been heard of since, at least not outside of the military!

There is some possibility that there are those within the halls of government who consider scanner owners' interests in descrambling to be beyond the bounds of acceptable activities. For whatever it may be worth, we have one reader in one of the Central states who claims to have spent enough time and money to succeed in unscrambling some federal communications stations. I don't know exactly by what process word of his success got out, but he claims to have been set upon by the minions of the federal government to the extent that he was forbidden to reveal details of his experiments. He further claims to have had enough of these people poking around and investigating him within his small community that it has caused him severe loss of business. You can take this story on whatever level you like; we have no more information about it than what this chap told us, and we didn't ask him to prove his claims. But we have heard that there are a number of scanner enthusiasts and communication service shops who are also experimenting with unscrambling digital communications.

I haven't made any attempt here to delve into the non-technical aspects of scrambling, such as the rationale behind its use and the many moral and ethical questions that have always been raised concerning the use of scrambling and the efforts to descram-

ble such transmissions. Perhaps this is a topic for future exploration.

Mailbag

A letter from Bill Mahler, KCA6PK, who resides in southern California, states that there is a large white elephant of a ship called the Queen Mary currently residing in Long Beach, California. He asks if we could tell about the ship, and also advise him of any frequencies upon which the ship operates.

I presume that Bill is refering to the old RMS Queen Mary, former famous luxury liner, which was purchased by Long Beach for $3.45 million as a tourist attraction and is now costing the city millions of dollars in maintenance. In 1930, when it was built, it cost $30 million. When Long Beach bought it in 1967 (and better it should have been sold to someone else), it had to be renovated for $50 million. Actually, there were 17 others who wanted the ship, but Long Beach bid $50,000 higher than the next highest bidder, which was Philadelphia (it wanted to use it as a hotel). Incidentally, the Hyatt Hotels operate the First Class staterooms aboard the ship as the Queen Mary Hyatt Hotel. There are 406 guest staterooms restored to their former splendor, including original furnishings; they've added color televisions, telephones, and air conditioning. Other bidders were New York City, which wanted it for a school; an Atlanta exporter who saw possibilities for the Queen Mary as a floating trade exhibition; scrap dealers wanting the tons of metal the large ship would yield; Liverpool (England) hoped to convert it to a student's hostel; and the Japanese wanted it for a floating maritime museum. The grand ballroom of the ship was the setting for the scene in the film, *The Poseidon Adventure,* just before calamity struck.

Sharp eared scanner owners in the area of Long Beach may be able to monitor this ship, not on the VHF marine band, but on the Business Radio Service frequency of 465.00, where Hyatt Hotels there is licensed under the callsign WSR-948.

As a separate piece of trivia on the monitoring of large former ships, the former U.S. Navy battleship USS ALABAMA, now on exhibit in Mobile, Alabama, is also licensed in the Business Radio Service as WSO-319 on 151.655.

Next Month

Surprise! You may have noted that for this month's column, yours truly has been filling in as an interim columnist in connection with a change in the regular authorship of Scanner Scene. Beginning next month, and henceforth, the new and regular columnist for Scanner Scene will be Chuck Gysi, N2DUP. Chuck is an active scanner enthusiast whose byline has long appeared atop monitoring stories, articles, editorials, and features concerning monitoring. We're happy to welcome Chuck aboard and we hope that our readers will send Chuck information on frequencies and stations they're monitoring. Write to Chuck at *POP'COMM.*

Please send all reader inquiries directly.

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SURVIVAL

BY R.L. SLATTERY

ESTABLISHING SURVIVALIST COMMUNICATIONS SYSTEMS

That EMP-ty Feeling

One of the considerations that will have to be taken into account when dealing with field radio equipment is the possible effects of EMP. (U.S. Army photo)

It's about the right time in our consideration of the potentials of survival communications to mention a little something called electromagnetic pulse, better know as EMP.

As rugged as various pieces of electronics may be built—in break resistant cabinets and with shock mounted installed—they are nevertheless innately vulnerable to a rather insidious enemy. Surprisingly enough, it's the more modern gear that is more prone to falling victim to this problem than the older equipment. This enemy consists of fluctuations in voltage, often called peaks, spikes, glitches, or surges. A rapid or sudden variation in the operating voltage of a transmitter, receiver, electric motor, TV, scanner, stereo, or other device can wreak havoc. A voltage that becomes overly high or drops to a particularly low level can simply burn out the equipment. Modern equipment containing IC's (chips), transistors, and other solid state devices are particularly delicate when it comes to these EMP's.

What can cause EMP's? Arcing power lines, defective or blown electric company transformers, lightning near the equipment, a problem at the electric generating plant (yours or theirs) and—*pffft*—there goes your communications, refrigerator, water pump, and most of the other marvels of technology you've assembled to maintain your comforts and fulfill your needs.

Since 1962 it has been known that, in addition to those EMP sources I've already mentioned, nuclear detonations also cause violent EMP's. The U.S. military detonated a 1.4 megaton nuclear blast about 250 miles above Johnston Island (in the Pacific). Some 800 miles away, 300 streetlights in Oahu (Hawaii) promptly flickered out, while countless burglar alarms began clanging and buzzing. EMP was the culprit!

EMP is generated when the gamma rays radiated within the first few billionths of a second after a high altitude blast smash into the electrons in the upper atmosphere. The electrons are sent into wild gyrations and accelerate towards the planet's magnetic field, where they become deflected. The result is a very high voltage which establishes a series of electromagnetic pulses that head for the surface of the earth. Earthbound objects are sitting ducks for these EMP's. All pipelines, fences, antennas, electrical lines, telephone and other cables, and metallic structures drink their fill of these pulses and then pass them out to do whatever damage they can to unprotected equipment.

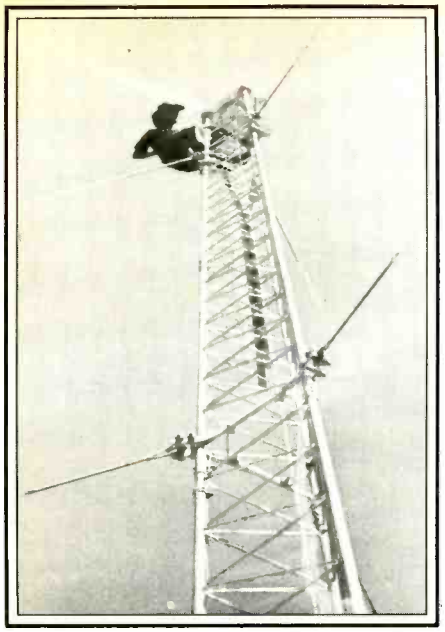
This is not a massive dose of electricity by the time it arrives at the equipment—it doesn't need to be in order to do its damage. It is a very short-lived pulse, lasting only one hundredth of the length of the lightning and containing only one millionth of the energy of the nuclear blast. It isn't even harmful to humans! But it is enough to wipe out communications gear, industrial equipment, military control circuits, broadcast stations, computers, and vehicle ignitions. It has the potential to zonk out the controls of a nuke and send it tailspinning into a meltdown!

Only one atmospheric detonation of a nuclear bomb (intentional or accidental) would be sufficient to traumatize every unprotected electronic circuit in North America. A Soviet EMP device set off between 400 and 1000 miles above Kansas City would adversely affect such devices from Mexico City to the Yukon, and from Miami to Seattle, taking with it satellites, electric power plants, water utilities, sewage treatment plant equipment, medical devices, and telephones, along with firefighting and emergency equipment.

The military has been keenly aware of the threat of EMP to their own equipment and has been taking steps to protect it from being damaged. One of the ways this is being done is by replacing metal wiring with fiber-optic cables between stations in its ground communications systems. The fiber-optic replacements aren't affected by EMP. Extensive testing of materials is also being done to help determine the best ways for existing within the potential threat of EMP. Because the Limited Test Ban Treaty (1963) doesn't allow nuclear weapons to be tested in the atmosphere, EMP simulators have been employed to check out how well military equipment is able to survive EMP's. One such simulator is the Trestle simulator located at Kirtland AFB in New Mexico. It is housed in a 12 story wooden building (held together with 250,000 wooden bolts) and can send out five million volt EMP's.

EMP And You

By now you may have gotten the message that EMP's could wipe out many of your own communications capabilities as well as many non-communications devices upon which you depend. It is, however, possible to provide your equipment with protection against EMP and it is less expensive and complicated than you might have assumed. Once you've done the job, it is operative for an indefinite period and it's maintenance-free. The basic idea is adequate grounding, a way of diverting potentially harmful EMP's to ground before they can do their dirty work. The principle is simple; the EMP isn't hell bent on destroying your equipment, it's just looking for the fastest path to ground. If your equipment happens to be in its path to ground, well, so much for your equipment. If you divert the EMP to ground so it isn't routed through your equipment, then you've given the EMP what it wants and you'll escape its devastation.



A wind generator at the U.S. Army Electronic Proving Ground (EPG), Fort Huachuca, AZ, is tested as part of an unattended power facility to be used at Defense Communications System radio sites. The tests at EPG will determine the feasibility of using commercially available solar cells, thermo electric and wind generators, batteries, fuel cells, and control logic equipment as an integrated power generator system. EPG is one of nine test sites under the U.S. Army Test and Evaluation Command, which checks the developmental quality of proposed Army material. (U.S. Army photo)

The Overall Picture

The old fashioned lightning rod can be a start in giving your home or survival camp some overall protection. This is certainly not the complete solution to the problem, but it is a good start. A lightning rod won't do anything to stop an EMP from sneaking in via the power lines, but it will offer protection against a direct hit by lightning and an airborne EMP.

The lightning rod must be mounted firmly on the highest point of the structure. A heavy duty lightning rod kit can usually be obtained from a well equipped hardware or farm supply store. It should consist of heavy copper wire at least 8-gauge in thickness. The instructions for installing the lightning rod will be included when you purchase the kit, so there's no need to go deeply into them here—except to add that the ground stake or rod should be copper, bronze, or galvanized steel and should be mounted a minimum of 25 feet from any tree or structure, and away from anything combustable. You can also use this ground rod to ground antenna towers, masts, guy wires, and (via a lightning arrestor such as a Cushcraft *Blitz Bug*) the antenna cable itself. Don't forget, the TV antenna and its masting also require grounding.

Some homes have grounding rods already installed in connection with the regular household wiring and/or telephones. Don't figure on using this rod for your lightning rod as it is too short and located too near the structure. You want a rod that's about 7 or 8 feet into the ground and makes contact with wet or damp soil.

Utility Lines

We then turn our attention to shutting off the possible EMP entry route through the power lines. This is intended to eliminate EMP's at the circuit breaker panel or fuse box, although it doesn't protect any individual devices.

Your best bet here is to pick up a device made by GE called *The Lightning Protector*. This isn't a lightning rod (nor a substitute for one), but it does give any surges moving along the power lines a chance to become grounded into the household grounding system before they do any damage on their journey through the house wiring.

Let me say that the instructions for connecting this device specify that the entire house *must* be completely disconnected from the main power lines before it is installed, although the actual installation is not at all difficult. You can install it yourself if you're the slightest bid handy, or you can get a professional electrician to do the job. In any event, the local power utility company will *have* to be called and asked to disconnect the power *before* the job is done, and then hook it back up again after the job is done. This is important since you're dealing with a 240 volt line and any attempt to work on it while the line is *hot* will give you a fatal demonstration of the dangers of electricity.

Specific Equipment

After the other two steps previously described have been completed, you can address your efforts to protecting individual pieces of equipment. This step is optional for those seeking an extra edge of protection.

GE also makes a device called the *Voltage Spike Protector*, which you will find handy. Installation requires no more than plugging the equipment into the small unit and then plugging the unit into the wall outlet. This device contains a varistor that sops up any excess energy passing through it and holds the voltage at the proper level. A *big* surge of juice *may* burn out the varistor, but it will protect the equipment you are using. You can use the GE Voltage Spike Protector with any communications device or household appliance; you'll probably want to obtain separate devices for each individual piece of portable for fixed location equipment. The GE units are only about $12 each.

Another approach for protecting larger appliances such as washers, refrigerators, microwave ovens, etc., is intended for installation right in the regular wall outlet housing and sells for around $5. This approach replaces the standard double receptacle with a single one, which is connected to a glass fuse. In order to install the device, the current must be shut off at the household circuit breaker box in order to avoid the dangers of electric shock. You may want to get a professional electrician to do this job for safety's sake.

These fused outlets can be obtained at electrical supply shops and they should be used only with the quick-burn type fuses instead of the fancier slow-burn types (which they will try to sell you). The slow-burn fuses will not work fast enough to offer any protection whatsoever from an EMP.

It may have occurred to you that I haven't mentioned protecting portable radios and tape recorders. All such units have a receptacle for an external microphone or loudspeaker and that's your key to protection while the set is stored and not in use.

Obtain a (male) plug designed to fit into the set (the set's external speaker receptacle may be easier than the one for the mic); this will probably be a simple miniature sized plug. Note that the part that gets plugged into the equipment consists of a long shaft, an insulator ring, and then a small metal tip. The long shaft portion is the ground side of the plug; that's the part in which you are interested. In fact, cut off the tip portion on the other side of the insulator ring. Attach a wire to the ground connection of the plug and then ground the wire. With the modified plug inserted into the equipment, the unit is thus grounded. Unless you are walking around with the unit while it is in use, you can even leave the ground wire connected while you're using the equipment; it should not adversely affect the operation of the equipment.

These steps should offer you as much protection from EMP as might be available to the general public.

A Reader Asks

Reader Mike Winslow of Oregon writes to say that this column has peaked his interest, not only in survival communications but in the entire concept of survival in all of its many facets. He asks if we can suggest any reading materials that relate to topics such as survival, paramilitary operations, and other similar topics.

This is a big order and Mike (who is only one of many readers who have written in with questions along these lines) is really asking about information on what amounts to many dozens of books. My advice to those interested in learning more about all of these things is to obtain a catalog from one or more of the several companies offering a wide range of such books and then select those that have the highest appeal. A recently released catalog along these lines from a well-established supplier came in to the office from Lancer Militaria, P.O. Box 100, Sims, AR 71969. Their illustrated catalog runs more than 60 pages and is chock full of fantastic books, insignia, survival clothing, and all sorts of other stuff that will turn on anyone interested in survival. Write and ask for the Lancer Militaria catalog and be sure to tell them that you read about it in *Popular Communications*. By the way, I've done business with Lancer in the past and their service is excellent!

Strolling Down

Radio's Memory Lane

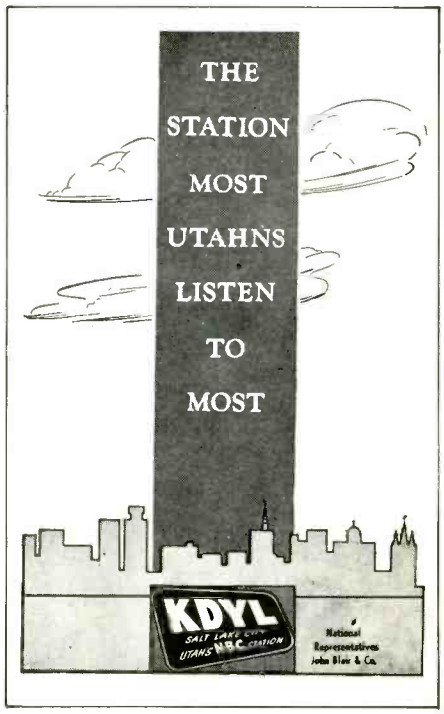
BY KURT RICHTER, KWI9EV

While browsing at a library, I came across a dusty and long forgotten book for reference use within the radio broadcasting industry. I thought it might be interesting to check out some of the stations listed in this book to see how the years have treated them.

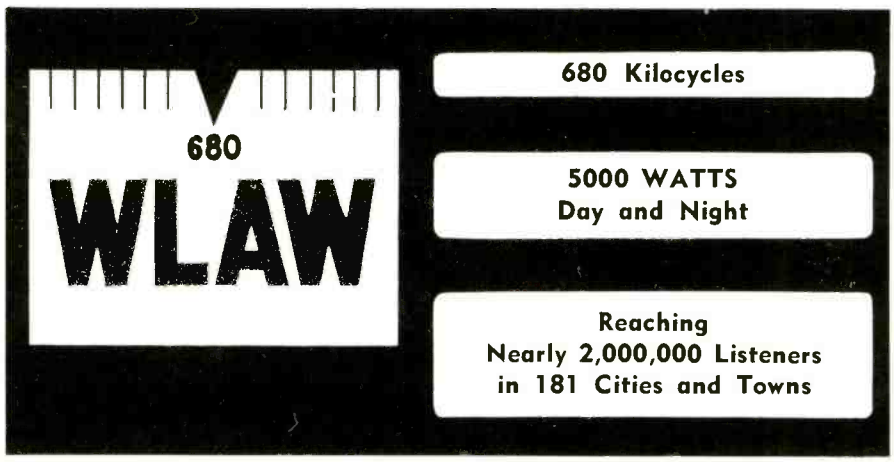
It didn't take me very long to learn that the wheels of time had, indeed, rolled a long way down the pike in the 37 years since the publication was current. While there were many major broadcasters still active and in not too different a status as they were in 1946, the changes affecting the status of many of the smaller and independent (non-network affiliated) broadcasters were monumental. Callsigns have been reassigned to other stations, frequencies have been changed, locations modified; stations that had (in 1946) been operating since the pioneer days of broadcasting somehow managed to become lost in the years that followed.

Here are examples of several of the stations that I checked out—and what, it seems, became of them!

In 1946, KROW was crowing that it was the leading station in Oakland, California. The 1 kW station had been operating since 1925 and was occupying 960 kHz. Studios were at 464 19th Street with the transmitter at 1522 8th Ave. Presently, KROW is only a memory and the 960 kHz frequency is used by Oakland's KABL, which runs 5 kW.



After starting out in 1922, station KDYL in Salt Lake City became "the station Utahns listen to most." With studios located in the Tribune-Telegram Building and 5 kW transmitter operating on 1320 kHz from 11th West and 33rd South, KDYL was Utah's NBC affiliate. In 1983, KDYL is a station on 990 kHz to Tooele, Utah, and the old KDYL frequency of 1320 kHz is now assigned to 5 kW KCPX in Salt Lake City.



WLAW, 680 kHz at 278 Essex Street, Lowell, Massachusetts, used to be an ABC affiliate. The station's 5,000 watt transmitter was located on River Road. That callsign is presently assigned to a broadcaster in Lawrenceville, GA (1230 kHz), and if you tune to 680 kHz in Massachusetts, you'll hear 50 kW WRKO in Boston.

Ask anybody in Erlanger, Kentucky, about WHKK and they'll tell you it's an FM broadcaster operating on 100.9 MHz. Some 37 years ago, WHKK was an AM station operating from 51 West State Street in Akron, Ohio. Its 1 kW transmitter was situated on Akron-Peninsula Road. These days, the WHKK's 640 kHz frequency in Akron is occupied by 1 kW WHLO. WHKK's sister station, WHK in Cleveland, is still operating, but WHKC's callsign has long since been reassigned to an FM station in Henderson, KY.

News came first at Buffalo's WBNY. This station, which had been operated since 1935 from 485 Main St., was part of the Associated Broadcasting System. The 250 watt transmitter was located at 154 East Eagle Street. Today, if you go to Buffalo, New York, and tune to WBNY's old 1400 kHz channel, you'll hear Buffalo's 1 kW station WYSL.

In 1924, a pioneer broadcaster was KFDM in Beaumont, Texas. Running 1 kW, the station operated from the corner of Doucette and Grove Streets. It held down the fort on 560 kHz. KFDM-TV is presently the callsign of Beaumont's TV Channel 6, while 560 kHz is the home of 5 kW KLVI.

CIRCLE 144 ON READER SERVICE CARD

ON THE LINE

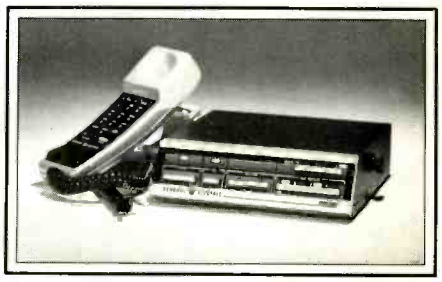
BY GORDON WEST, WB6NOA

NEW AND EXCITING TELEPHONE TECHNOLOGY

Super Cordless Phones Next

How would you like your cordless telephone to transmit and receive phone calls up to five miles away? We have received many letters from readers asking how to modify their present cordless telephone equipment for extra long range. Is there any way to add special antennas to make a cordless phone transmit further?

The answer is yes, but never as far as five miles. However, don't despair—a new General Electric type telephone system may give us this five mile range, plus some! More about this in a few minutes.



General Electric's proposed Personal Radio Communications Service (PRCS) mobile unit. To be installed in motor vehicles, the unit, in conjunction with a base station, will provide private, addressable communications at consumer-oriented prices.

The Winn-Tenna cordless phone "Range Extendo" antenna.

External Antennas

The Federal Communications Commission is not overly pleased with modifications to the present cordless telephone sets. Anything that extends their basic range is probably illegal. At a recent consumer electronics show, an FCC staff member was taking notes on external antennas designed expressly for extending the range of your present cordless telephone system.

Several companies produce top quality antennas that enhance the range of the 49 MHz and 1.7 MHz flea-power signals. The people at Pal Firestick have an antenna setup for a good extension of range on cordless phone systems.

Winn-Tenna Inc. also has a cordless phone range extension kit consisting of a 49 MHz antenna for outside mounting. The 1.7 MHz antenna is coupled into your AC wiring. It, too, works like a champ.

Of course, the folks at Rovafone International have a complete set of outside antennas, but these antennas are designed on frequencies for their superlong range export model cordless telephone equipment.

Long Range With Exports?

Yes, up to five miles. Some export models can actually deliver up to 20 miles range from their cordless phone handset. These export models are used in European countries and also in South America. Each country has its own channel scheme, but some export models seem to pick some favorite channel pairs.

For instance, one export model operates at 26 MHz and 49 MHz. These frequencies are not allocated for cordless phones in the United States, so their use is strictly illegal. However, in researching 26 MHz, the frequency is only used by a megawatt foreign broadcasting station that pounds through loud and clear during the day. At nighttime, 26 MHz is wide open.

At 49 MHz, the export model transmits on U.S. government frequencies or agriculture frequencies. The frequencies are in between our present U.S. channels.

Another popular export cordless telephone operates on a set of frequencies at 49 MHz and 70 MHz. Once again, the 49 MHz side of the conversation is on channels between our present U.S. agricultural channels. The 70 MHz signal is nestled among frequencies used by the government, as well as for one-way remote control.

There are also export units that broadcast on VHF high band (130-140 MHz), as well as units that also operate on the UHF band for cordless telephone operation.

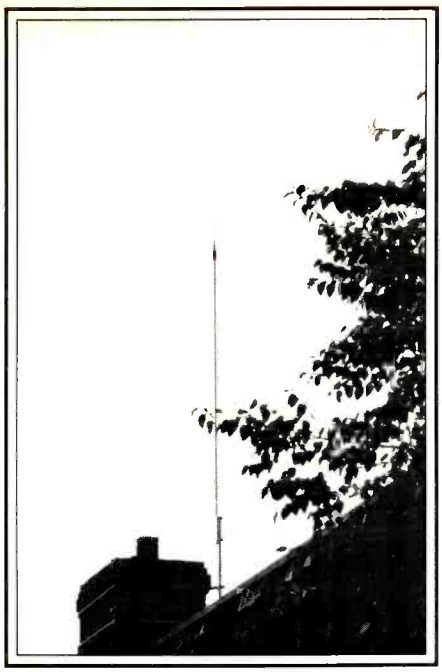
Warning! The FCC hopes that you won't even *think* about operating an export cordless telephone in the United States! It is illegal, unlawful, and could cause harmful interference to FCC authorized radio services that have been assigned the same frequency as your export cordless telephone.

Yes, distributors do sell export cordless telephones that are easily plugged in and operated on non-authorized U.S. frequencies. However, I might warn you that the FCC knows which frequencies to monitor to trace your export phone system. They simply dial up these export frequencies, turn on their squelch, and wait for your phone call to come popping through. It's then an easy job for them to DF your signal down.

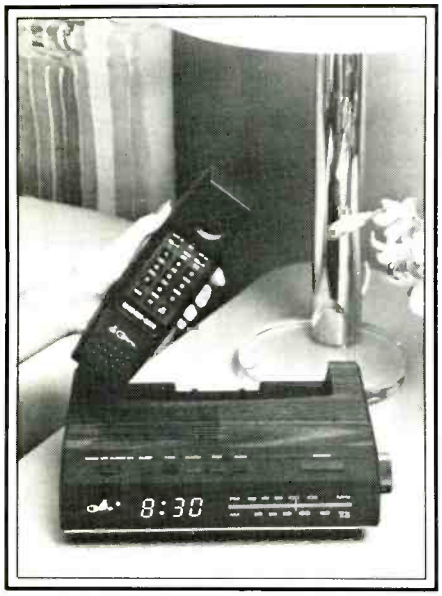
One very real problem with extending the range of some cordless phones, I might note, is causing interference to operations in the 160 meter amateur radio band. Some cordless phones operate on 1825 kHz, which is within the amateur band. By souping-up a cordless phone that operates on 1825 kHz, serious disruption of amateur radio communications on 160 meters could ensue—most definitely illegal and to be avoided. Obviously, the FCC has to restructure the frequencies used by cordless phones. The FCC will most likely remove the authorization for cordless phones to operate within the 160 meter amateur band (which begins on 1800 kHz).

Future Cordless Phones

Our present flea-power cordless telephones are working on only five channels.



New Shakespeare cordless phone antenna.



Here's the Cobraphone RF-740S combination cordless telephone and clock radio.

The channels are crowded, and the expected sales of new cordless telephones spell complete chaos on the existing frequencies. Several petitions for additional frequencies could help ease the cordless telephone channel problem.

If the FCC creates new channels for cordless telephones, I anticipate prices on existing equipment to fall just as rapidly as they did when the FCC went from 23 channels to 40 channels on CB. If you are waiting for a bargain, stand by! A hint of new cordless frequencies will cause a dump of present products that you haven't seen since CB!

New frequencies will still yield the 700 foot range now available on most cordless telephones. Want more range? General Electric may have the answer.

G.E. Super Phones

The proposed General Electric system was demonstrated to me recently in Las Vegas, Nevada. Their proposed service is called "Personal Radio Communications Service" (PRCS). Operating at 900 MHz, our Las Vegas tests gave us ultra-clear range to our mobile unit.

The G.E. system is designed to take up the communications when you step out of the house and into your car. You could drive up to 30 miles away and still stay in touch with your own personal telephone at home or in the office.

Unlike car telephone systems, the G.E. plan calls for a base transmitter (similar to your present cordless telephone transmitter) that is plugged into your home phone. A small antenna goes to your roof or attic. The installation for your car is a small two-way radio and a tiny antenna on your car top.

When your telephone rings at home, your car telephone rings. There is no operator. There is no exchange service to handle your calls. You answer it and it answers your telephone simultaneously! You can drive up to five miles away from your base and talk *direct* to your telephone.

If you want more range, you switch to a booster channel and automatically both your base, as well as your mobile unit, are interconnected up to 25 to 30 miles away. You would pay only a small "repeater" charge to stay in touch with your home or office phone. Again, no operators nor intermediate agencies are between you in your car and your home phone.

Our General Electric field test involved driving among buildings as well as out on the open road. At all times, clarity was superb. There was very little "picket posting" at this frequency because the wave lengths are so short. Of course, it features full duplex, talk and listen. There are no annoying echoes, and certainly no interference at 900 MHz.

Another plus for the G.E. system is that they anticipate users will do their own installation of the equipment. All you have to do is plug it in and run up the antennas. The expected cost is also well below anticipated—would you believe under $500 for both a transmitter and receiver for this new phone system? That's right! Over 150 radio channels have been suggested by G.E. for their system. Each PRCS unit will have a unique identification number for security and privacy. This means you won't receive any calls not placed by your unit. This system will operate over 9 MHz in the 900 MHz band, divided into 4.5 MHz, separated by 45 MHz for full duplex operation. This would provide 150 channels, each 30 kHz apiece.

In case you should travel out of town, emergency services will be encouraged to adopt a common PRCS number nationwide so that drivers will be able to place emergency calls when away from their home telephone unit. There is also the provision that allows one unit to interconnect and communicate with another unit direct, without going through the phone.

Although all of this G.E. system may sound like wishful thinking, it indeed works. We heard it work in Las Vegas, and the range was fantastic.

In Conclusion

There is not much you can do to extend the range of your present cordless telephone. Outside antennas may help a bit, but the FCC probably won't be happy. It's possible that some cordless phones will cause harmful interference to radio services (such as amateur) if their range is increased.

Outside antennas will also lead to increased interference from other base stations with the same type of antenna system on the same channel. You may end up going back to your old telescopic antenna that came with the phone system.

Using export only cordless telephones is strictly illegal. You will also probably get caught. Most export phones operate on similar type channels, and you may be assured the FCC is guarding those frequencies.

Expect a decrease in cordless telephone prices if new channels are announced. In fact, consider a cordless telephone "dump" imminent, even though manufacturers may not admit it. More channels are just over the horizon.

Finally, the G.E. proposed PRCS system has been well thought out and indeed works. We listened to the system in operation in Las Vegas, and the range and clarity are superb. No, I doubt that you will find hand-held units at 900 MHz for this system. I imagine there is a hesitancy due to the proximity of the antenna next to your eyes at 900 MHz that may eliminate hand-helds at this frequency range.

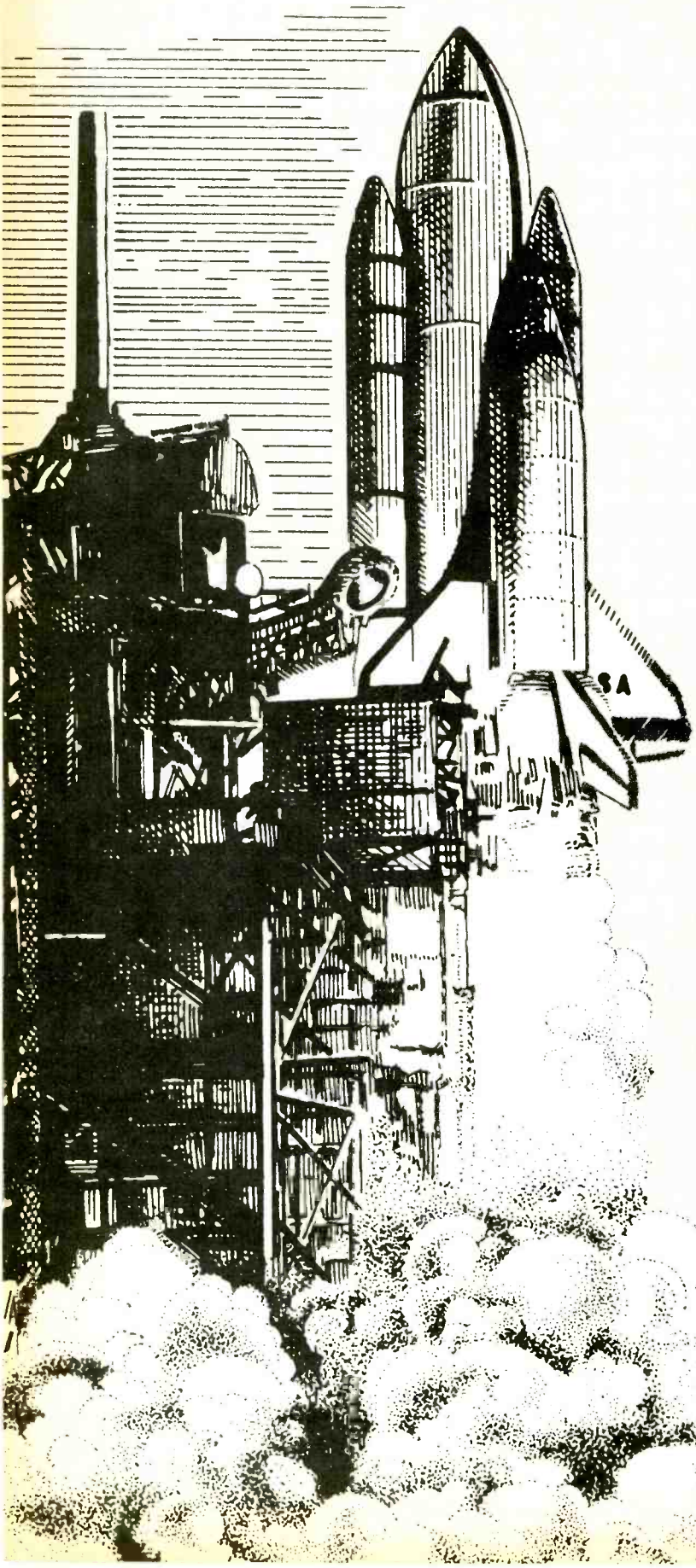
Yes, super phones are coming, and we are just now beginning to come up with the perfect "Dick Tracy" two-way radio telephone worn on your wrist.

The Freedom Phone 3050 featured here has a 700 foot range.

Here's A Roundup Of The Best Space Shuttle Frequencies!

Space Shuttle Monitoring

BY J. HOTCHKISS, KFL4HZ



The five flights of the Space Shuttle Columbia are history now, but it certainly seems that the Space Shuttle program itself will be with us for many years to come. Some persons having communications equipment have had a close-up look at this program since it requires a lot of frequencies for both the orbiter and ground support.

We have compiled a listing of the most relevant frequencies so that those who are trying to put an ear to these operations can try their luck at listening to the communications concerned with this program. Not included are assigned but seldom used and unused frequencies.

Space Shuttle communications are basically from aboard the orbiter itself; from the ships and aircraft concerned with support of its launch, component recovery, and landing; and from the ground facilities used for launch, tracking, and landing. The orbiting Space Shuttle itself has no HF operating capabilities, although HF is used during launches from the Kennedy Space Center in Florida. These communications can be heard throughout the nation.

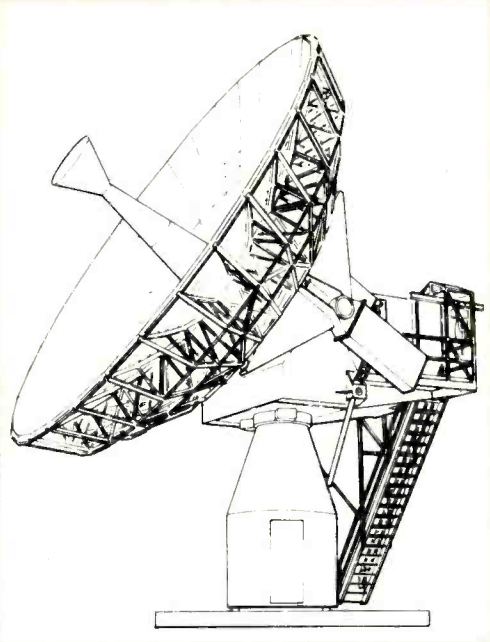
If you happen to be located near the Kennedy Space Center or nearby Patrick Air Force Base, you'll probably be able to pick up lots of additional communications between 118 and 410 MHz. Listeners in the area of Edwards Air Force Base in California can also tune in on Space Shuttle landings when the orbiter is landed at that facility.

The orbiter itself can be monitored only on 296.8 MHz or, secondarily, on 259.7 MHz, and by those having receiving equipment capable of tuning the UHF aero band. The uplink microwave frequencies going to the orbiter and the downlink microwave frequencies from the orbiter are outside the receiving capabilities of all but a very few monitors other than NASA or the military. Unfortunately, the two 200 MHz-band frequencies are about the only way you'd really ever be able to pick up direct transmissions from the orbiter, and those frequencies are not covered by scanners. Even with a 225 to 400 MHz UHF aero band receiver, you'd be able to pick up signals only when the Shuttle was orbiting over North America—and only with a decent antenna for that band. However, a number of monitors have gotten these factors working for themselves and were rewarded with direct reception of the orbiter.

We have compiled a chart to help *you* get more from the Space Shuttle program with your equipment. The following frequencies are all MHz.

So maybe you didn't qualify as an astronaut. This could be the next best way of participating in this exciting space program!

Space Shuttle Communications



HF Operations (SSB)

2.622	NASA booster rocket recovery
3.385	NASA tracking
3.395	NASA tracking
5.190	NASA tracking vessels
5.810	NASA booster recovery vessels
6.708	NASA aircraft
6.896	NASA aircraft
6.983	NASA tracking
7.461	NASA aircraft
7.675	NASA Kennedy operations
7.765	NASA aircraft
10.780	USAF "Cape Radio" (primary)
11.205	NASA Pacific opns.
11.407	NASA booster rocket recovery
14.456	NASA tracking
20.186	NASA tracking (Ascension Isl.)
20.191	NASA tracking (Ascension Isl.)
20.390	USAF "Cape Radio" (secondary)

VHF Aero Band

116.4	Edwards ATIS
117.8	Kennedy Shuttle Control
118.4	Patrick approach/departure cntrl.
120.7	Edwards control tower
121.5	Emergency
121.7	Patrick ground control
121.75	Kennedy ground control
121.8	Edwards ground control
125.1	Patrick approach control
126.1	Edwards departure control
126.2	Patrick control tower
126.3	Kennedy ground control
126.65	Kennedy weather
127.8	Edwards approach control
128.8	Patrick dispatcher
133.65	Edwards approach/departure cntrl.

VHF Band

138.30	Patrick Command Post
138.45	Edwards Command Post
142.50	Kennedy cranes
143.04	Kennedy cranes
148.455	NASA booster rocket recovery
148.485	Launch countdown/status
149.175	Kennedy crawler
149.925	Edwards security
162.0125	NASA vessels
162.6125	NASA operations (Edwards/Kennedy)
163.4625	Kennedy security
163.4875	Kennedy security
163.5125	Kennedy security
163.5625	Kennedy fire (primary)
164.00	Kennedy radiation checks
164.10	NASA (Edwards)
165.1875	Kennedy check points
170.15	Kennedy base opns.
170.175	Kennedy transportation
170.35	Kennedy public relations
170.40	Kennedy Gen. Svcs. Admin.
171.15	Kennedy maintenance/fuel
171.2625	Kennedy camera tracking
173.175	Kennedy security (gates)
173.4375	Kennedy medics
173.5625	Kennedy fire/rescue
173.5875	Edwards fire
173.6625	Kennedy safety units
173.6875	Kennedy security (vans)
173.7875	Kennedy fire (secondary)

UHF Aero Band

236.6	Edwards control tower
243.0	Emergency
259.7	Shuttle (secondary)
269.9	Edwards ATIS
273.5	Patrick ATIS
279.0	Shuttle (space suits)
284.0	Kennedy ground control
290.3	Edwards departure cntrl.
296.8	Shuttle (primary)
318.1	Edwards control tower
335.8	Patrick ground cntrl.
340.9	Patrick approach/departure cntrl.
344.6	Patrick weather
348.4	Patrick control tower
348.7	Edwards approach control
358.3	Patrick approach control
372.2	Patrick/Edwards dispatchers
390.1	Edwards ground control

Microwave

1775.7	USAF uplink, phase modulation (secondary)
1831.8	USAF uplink, phase modulation (primary)
2041.9	NASA uplink, phase modulation (secondary)
2106.4	NASA uplink, phase modulation (primary)
2205.0	NASA downlink, FM
2217.5	NASA downlink, phase mod. (secondary voice)
2250.0	NASA downlink, FM
2287.5	NASA downlink, phase mod. (primary voice)

Misc. Contractors

2.9955	Rockwell (Edwards)
3.2825	Rockwell (Edwards)
3.4755	Rockwell (Edwards)
5.5975	Rockwell (Edwards)
10.0105	Rockwell (Edwards)
17.9665	Rockwell (Edwards)
122.8	Rockwell (Edwards)
123.05	Rockwell (Edwards)
123.30	McDonnell Douglas (Edwards)
123.35	Rockwell (Edwards)
123.475	Rockwell (Edwards/Kennedy)
123.525	Rockwell (Edwards)
123.55	McDonnell Douglas (Edwards)
151.955	Com-Tech Associates (Kennedy)
152.48	IBM & Harris Corp. (Kennedy)
153.20	Lockheed (Kennedy)
154.515	TWA (Kennedy)
462.925	Rockwell (Edwards)

RADAR REFLECTIONS

RADAR DETECTORS AND THEIR USE

BY JANICE LEE

Eisenberg Posts Bail To Spring Speeder

"The man and I are kindred spirits and I was not going to let him sit in jail another second longer."

Milwaukee attorney Alan Eisenberg gave that as his reason for paying a $43.60 fine so an East Troy Town man could get out of jail.

Darryl R. Manka, 32, was brought into court only hours after he was arrested by sheriff's deputies for driving 59 mph in a 45 mph zone.

Manka refused to pay the fine, saying the traffic laws were only enforced to generate revenue for the state. Manka told Judge Ness Flores he would rather take the two-day jail sentence instead; Flores obliged.

Eisenberg, who has clashed repeatedly with state patrol officers over speeding violations, posted Manka's bond after he read a news story over his plight.

"We are kindred spirits, although with different economic brackets," Eisenberg said. "I bill at $150 an hour and he is unemployed." Eisenberg figured that the fine was equal to 20 minutes of his time.

"He said Wisconsin enforces the law only to generate revenue," Eisenberg stated. "I agree with that and add that it is also so that policemen can fill their quotas."

Eisenberg contends that the State Patrol orders its troopers to issue a certain number of traffic tickets each day, but state officials deny that allegation.

Manka said he was taken directly to court because he told the deputy he would not come to court on a future court date and wanted to serve the jail time rather than pay the fine. He has been out of work from the Crane Manufacturing Co. in Cudahy, WI since June, 1982.

But it wasn't the money, Manka commented. "It's more the idea. I don't think they should have so many (officers) out there with radar. They're not doing anything to help the public."

District Attorney Jerome H. Cahill dropped the charge to 10 mph over the speed limit because of the circumstances and the location and the fact that no one was really endangered. That did not reduce the fine but saved Manka from getting an additional two points off his driving record.

When Eisenberg learned that Cahill had reduced the speed, he joked: "What, is Cahill getting soft on crime?"

Board Offers To Pay For CHP Radar

The Sacramento County Board of Supervisors has done what the State Legislature has refused to do and offered to pay $23,000 to equip local California Highway Patrol officers with four new radar guns.

In a unanimous vote, the supervisors endorsed a one-year experiment, similar to one done last year in Contra Costa County, to determine if speeders can be convinced to obey traffic laws on neighborhood streets.

"The intent is not to saturate four-lane streets or small, seldom-traveled streets. People are most concerned about the middle kind of streets through neighborhoods," said Dusty Rhoades of the county highways department.

The CHP has been stymied in attempts to use radar guns on freeways because the State Legislature has repeatedly refused to pay for the equipment. The CHP is one of the few highway patrols in the country to be restricted.

Rear Sonar Is Showing Up On Some Japanese Made Cars

Little by little, computerized devices are showing up on the dashboards of cars, especially Japanese made models. *Discover* magazine reports that such innovations in the Far East so far include an electronic navigation system that displays a car's position on a map; a computer-directed anti-skid system; and a device that remembers where to adjust the seat for different drivers.

The latest breakthrough, from Toyota, which has already introduced a radar speed-control device to keep drivers at safe distances behind other moving cars, is rear sonar. It's not quite as good as having eyes in the back of your head, but it's probably the next best thing.

As the driver backs up, beams of ultrasound waves are projected to the rear, where they bounce off any object within 6½ feet of the bumper and are detected by a sonar sensor. A tiny computer measures the distance by calculating how long it takes the sound to travel from the bumper to the object and back again and sets off a series of warning alarms at different points. At 6 feet away, lights begin flashing and beepers sound. As the distance gets shorter and shorter, the warnings get more insistent.

Of course, it will be a kind of loud and flashy nuisance for those times when you're inching your way out of a tight spot, but it is being credited with preventing a lot of unnecessary fender benders.

The sonar isn't foolproof; it wouldn't detect a small animal or a child crawling beneath the level of the bumper, so you still have to pay attention to what you're doing. The feature has been available in Japan since January, but there aren't any plans to export the cars for the time being.

Engineer Takes On Radar, Beats Speeding Ticket

Lucjan Zlotnicki, 31, of the Spring Grove, PA area, not only represented himself without legal counsel, but qualified as an expert in the field of radar to testify in his own behalf in asking that the guilty verdict on the speeding count be overturned.

Zlotnick appeared in York County Common Pleas Court. The court's decision cleared him of a $53 fine and $15 in costs imposed at the magisterial level.

State Trooper G.B. Smith issued the citation to Zlotnicki February 21, 1982 when his car was clocked at 69 mph on a hand-held radar gun along Interstate 83 north of the Shrewsbury exit. Zlotnicki appealed the initial decision of District Justice James W. Reedy, who found him guilty of speeding at a hearing in March of '82.

Zlotnicki, who holds three engineering degrees and came to the United States four years ago to work on his doctorate, said it was not his vast knowledge in the field that reversed the guilty verdict, but rather "the laws of geometry learned in high school." His argument to the court was the speed readings taken by radar equipment at other than a frontal direction will not be accurate.

Assistant District Attorney Clyde Vedder, who prosecuted the case in the appeal, commented, "The court ruled the arresting officer had not established beyond reasonable doubt that Zlotnicki was traveling at the 69 mph rate of speed."

Commenting on the use of radar by state police, Zlotnicki said, "I've seen officers using radar in places where they don't get anything close to an accurate reading. And", he added, "the Pennsylvania state trooper is not being instructed properly in the use of radar to measure speed. Radar is excellent for the intended purpose, but they're using it incorrectly to avoid errors in speed readings."

Speed Trap Illegal; PA To Return Fines

Fines paid to the state by motorists caught in an illegal speed trap in Freemansburg, PA are expected to be refunded according to state Rep. Leonard Q. Gruppo.

The county and Freemansburg borough have returned their shares of the fines to the 126 drivers involved, but the state has not. After receiving numerous complaints, Gruppo said he contacted the Department of Revenue and has been assured that the state would make payment soon.

The motorists were cited before it was learned that the 25 mph zone in which the trap was placed had not been authorized by the state transportation department.

Gruppo called the mistake by borough police an "honest error" made in "an attempt to improve traffic safety in the community."

Poetic Farmer Uses Verse To Slow Down Speeders

Burma Shave once waged a witty advertising campaign along the roadways of America to speed up purchases. Now a farmer in Tewksbury, NJ is using the same technique to slow down cars.

Sixty-three year old Harris Smith said he began posting signs—written in verse—several months ago. He said the signs both amused motorists and got them to drive slower. Smith said he tried the unusual technique because he was fed up with the cars that whizzed by his northwest New Jersey farm at breakneck speeds.

"The verse makes them more safety conscious, and gives them a smile, which is why they slow down," Smith thoughtfully remarked. "It is a nice way of giving drivers the message to slow down."

Smith hangs his verse—one line of verse per tree—on four trees near his home. The trees are about a hundred yards apart and the verse is changed once a month.

In one verse, posted for the benefit of motorists headed east, there is this:

"Skid marks leave—a telltale trace—just how fast—you lost the race"

Smith, a retired chemical manufacturer and, now, a fulltime farmer, said he has written light verse throughout his life, but rarely with the effect of his current efforts.

Fewer Ships Being Tabbed For Speeding

The St. Lawrence Seaway's version of a traffic cop has ticketed only two ships for speeding in 1982. Another 35 ships got warnings for excessive speed.

Seaway General Counsel Frederick Bush said "willful and gross violations" of speed limits can result in a fine of up to $25,000 and revocation of transit privileges.

On May 26, 1982 the Seaway's mobile radar unit spotted the Yugoslav vessel, Danilov-grad, doing 13.5 knots in an 11.3 knot zone near Blind Bay. The ship was fined $500. The second violator was the Norwegian vessel, Brunto, clocked at 12.8 knots in a 10.4 knot zone east of the Seaway International Bridge June 14, 1982 Bush stated. The ship was also fined $500.

In 1981, eight ships were bagged by radar. The lower 1982 figure may reflect reduction in patrols caused by federal budget cuts, Bush commented.

Potholes Did The Job

Are potholes more effective than traffic signs? That was the question raised in Harleysville, PA, where Route 63 carries a great deal of through traffic.

The Lower Salford Township supervisors learned that the repair of the potholes on the town's main business street has brought a new attitude on the part of some motorists. When they were dodging potholes, motorists observed the 35 mph speed limit.

Now that Route 63 is in good shape, the reports are that some motorists are traveling through Harleysville at speeds as high as 55 mph. This has happened on many other roads after repairs were made.

Janice Lee is the Editor of Monday, A.M., *the newsletter of Electrolert, Inc.*

PRODUCTS

REVIEW OF NEW AND INTERESTING PRODUCTS

High Quality, Low Price Home Satellite TV System

Futuresat, Inc., unveiled a home satellite television system combining high quality with low price.

Priced at $1,995 suggested retail, Futuresat's System 1000 allows consumers to receive over 70 channels of satellite TV, with the latest movies, sporting events, and other entertainment events previously only available to cable TV subscribers or with satellite systems costing over $5000.

Futuresat's System 1000 includes a ten foot fiberglass or aircraft aluminum parabolic antenna, high quality 24 channel receiver, remote polarization switch, 120 degree low noice amplifier and all cables and accessories necessary to plug directly into an ordinary television set.

The system 1000 is available immediately nationwide at any Futuresat dealers.

For further information, contact Futuresat, Inc., 315 Larkfield Road, East Northport, NY 11731, (516) 266-1121, or circle number 108 on the reader service card.

Railroad Monitoring Guide

The joys and rewards of scanner monitoring the railroad industry have taken a quantum leap with the publication of a new scanner frequency guide by Tom Kneitel. The guide, *RAIL-SCAN*, is by far the largest and most comprehensive compilation of railroad and mass transit rail system frequencies ever published in a single volume. Many of these frequencies are being disclosed to monitoring enthusiasts for the very first time.

RAIL-SCAN covers 863 companies, disclosing more than 4,200 frequencies in a multitude of radio services. These listings include large ("Class 1") railroads, short line railroads (some operating with less than two miles of track!), narrow gauge RR's, scenic and tourist railroads, railroad museums, industrial and mining RR's, traction and municipal transit rail systems, locomotive and rail car builders and service companies, private railway car owner frequencies, motion picture railroads, frequencies used during wrecks and accidents, logging RR's, federal railroads, frequencies used by all manner of regulatory agencies, and miscellaneous companies associated with railroading. In addition to the frequencies themselves, addresses are given, as well as the Reporting Marks and Uniform Alphabetic Codes used to identify the owners of RR cars, track mileage information, data as to the number of cars owned by private operators, plus specific usage data (such as Railroad Police) for many frequencies shown. *RAIL-SCAN* covers RR's in the United States and Canada.

Now, here in one handy reference guide, is more railroad frequency monitoring information than has ever before been made available in any single source.

The new *RAIL-SCAN* is $7.95 and is available at many scanner dealers and hobby shops. It may also be ordered by mail directly from its publisher, CRB Research, P.O. Box 56, Commack, NY 11725. If First Class Mailing is wanted, add $1 (total price with optional First Class mailing is $8.95).

New HF Transceivers

Yaesu Electronics has announced two additions to its line of HF transceivers.

The FT-980 is a full-featured 160-10 meter transceiver that also includes a general coverage receiver section. Providing a nominal 100 watts RF output from a low-distortion, high-voltage final amplifier, the FT-980 is set up for full QSK with silent solid-state switching. The receiver section is designed for wide dynamic range and versatility in filter selection. An audio peak filter, IF notch filter, variable pulse width noise blanker, variable IF bandwidth with IF shift (passband tuning), and an audio shaping control round out the receiver features. The FT-980 is controlled by an 8-bit microprocessor, which allows storage of frequency and mode into memory, while also allowing the programming of sub-band limits for Novice, Technician, General, or Advanced Class operators. Direct keyboard entry of frequencies provides instant QSY without the need to rotate the main tuning dial.

The FT-77 is an extremely compact HF transceiver for active mobile or space-conscious operators. Utilizing computer-aided design and automated insertion techniques, the FT-77 represents a new advance in manufacturing efficiency and reliability. Equipped for SSB and CW operation (FM optional), the FT-77 includes digital frequency display, CW Wide/Narrow selection, selectable AGC, RIT, and highly effective noise blanker.

Accessories are available for both the FT-980 and the FT-77. For further information, contact: Yaesu Electronics Corp., P.O. Box 49, Paramount, CA 90723, or circle 101 on the reader service card.

CCTV Security/ Surveillance System

GBC announces the introduction of the RF-2200 Sentry Closed Circuit TV System, the miniature security/surveillance system that lets you see who is at the front door right on your own TV. It can also be used to observe the nursery, sick room, pool, or play area; and it's ideal for helping to maintain office, factory, or store security.

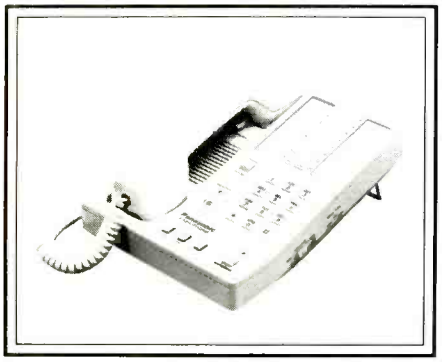
With the GBC Sentry, families will feel secure knowing that they can see on their own TV set who is outside their door . . . while the door is still tightly locked.

The RF-2200 system consists of a miniature space-age TV camera that is engineered with all the most advanced security/surveillance innovations. It operates on your TV's channel 3 or 4. Also included is a three-way wall, ceiling, or table top mounting bracket and 50 ft. of plug-in cable that connects the camera to the TV.

The TV Sentry can also be used for home broadcasting fun. By simply connecting the camera to your TV, a picture can be seen on the home TV. The RF-2200 can even be connected to a video recorder to make your own tapes.

Additional accessories available for the system include: wide angle, super wide angle, and telephoto lenses: all-weather indoor/outdoor protective housing; multi-camera switcher; and extension cable.

The TV Sentry retails for under $300. For additional information, contact John Gray at GBC Closed Circuit TV Corp., 315 Hudson Street, New York, NY 10013, or circle number 102 on the reader service card.



Integrated Telephone System Incorporates Electronic Phone And Automatic Dialer

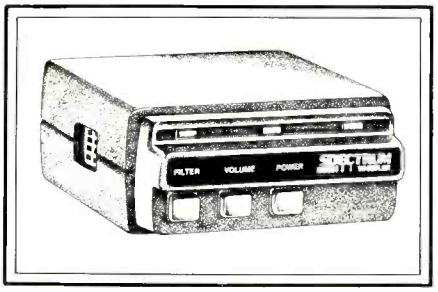
Panasonic's newest addition to its EasaPhone line is an integrated telephone system incorporating electronic phone and automatic dialing functions in a single unit. The new system, Model KX-T2220, was designed for home or small business use and is suitable for desk top use or may be mounted directly to a wall mount jack.

Model KX-T2220 utilizes advanced microprocessor controlled circuitry for instant, accurate dialing at the touch of a button. It works with any phone line, touch tone or pulse, and is compatible with alternate long distance dial systems like MCI or Sprint. It automatically dials with the phone receiver on- or off-hook. When dialed with the receiver on-hook, the unit's built-in speaker monitor sounds the ring, answering voice or busy signal. Once the answering voice is heard through the monitor, the receiver can be lifted for conversation.

Panasonic's Model KX-T2220 dials 16 stations, with up to 16 digits each, at the touch of a single button, and it allows for combining two or more stations in any order to dial a multitude of numbers to accommodate alternate long distance dialing requiring codes. Its dial speed is 10pps/tone, and it automatically redials a busy number 10 times in a 10 minute period.

The automatic dialer/phone unit permits manual dialing or a combination of automatic and manual dialing, for use with frequently used area codes or portions of numbers stored in its memory. Powered through the phone line, Model KX-T2220 protects its memory in the event of a power failure through 3 "AA" batteries (included).

Model KX-T2220 is available with a suggested retail price of $139.95 and is covered by a warranty for one year. For more information, see your local Panasonic dealer.



New Radar Detector Challenges Competitors

Spectrum, a new compact, automatic speed radar detector for cars, has been especially designed for today's mix of city/suburban/turnpike driving.

Whistler is best know for its more than 300,000 detectors currently in use by truckers. Three out of four truckers purchase a Whistler whenever they buy a new model, according to marketing research. However, Spectrum will be offered to motorists through automotive dealers, CB shops, auto parts and electronics stores rather than to truckers through truck stop outlets.

"In our advertising, we are taking the bold step of challenging editors of car buff publications to prove that Spectrum is not the best speed radar detector on today's market," Dodge Morgan, President, said. "Our engineers state that nobody can disprove our claim with any technically accurate, unbiased test. We've seen so many ads touting alleged results of blatantly phony tests that we doubt astute consumers believe in any comparison except those by the most respected publications. Those editors are tough to convince but we're willing to let their technical people test Spectrum against any other unit on the market."

Morgan said that the Whistler engineers base their Spectrum superiority claims on the following facts:

- Whistler claims *measurable* sensitivity four times greater than any other detector now available, hence giving longer range warning of speed radar traps operating on either X or K bands.
- Even with the increased sensitivity, motorists will not be annoyed by constant signals from non-police devices (burglar alarms, door openers, traffic signal controllers) operating on police radar frequencies because Whistler has built in a unique filter to virtually eliminate those nuisances.
- Spectrum has been designed for driver convenience and automatic operation and is a finely-styled instrument that compliments the inside of any automobile.

There are only three controls: a pushbutton on/off, the burglar alarm filter push-button (which can be left on under most circumstances), and a push volume control. Sensitivity is controlled automatically. And a green LED lets the motorist know that the unit is on, even when there are no radar signals in the air.

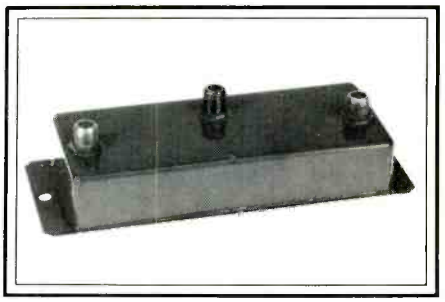
Spectrum features both audible and visual alarms, as well as two alarm levels. A burglar alarm will trigger only the lower alarm level with the audible alarm beeping only once and the LED flashing amber for 20 seconds as the car goes past the alarm.

If the sound and light signals persist for a longer period, then the driver knows it's a police radar at long range. As the car gets nearer to a radar trap, Spectrum automatically switches to a distinctly different, more urgent audible tone while a red LED flashes.

"Spectrum has been designed for real world driving," Morgan said. "The maximum sensitivity provides long-range protection. But in cities and in built-up suburban areas, selectivity must also be at its maximum or the motorist will go crazy from the in-band non-police device signals in use today. All detectors decrease sensitivity in order to gain more selectivity or vice versa. But we found another solution—Spectrum's filter which is a Whistler exclusive."

Spectrum mounts on either the dash or visor. A handsome carrying case and a 5 ft. power cord are standard accessories. A dual volume is offered as an option.

For a free brochure containing all technical specifications, write to: Whistler, c/o Controlonics Corporation, 5 Lyberty Way, Westford, MA 01866, or circle number 103 on the reader service card.

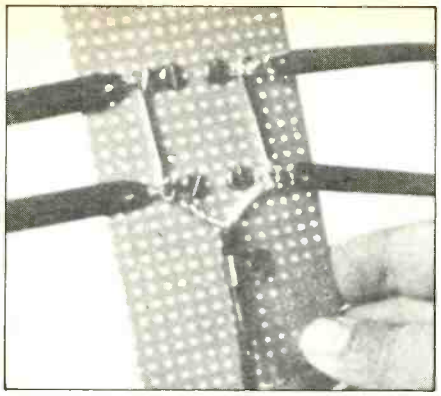


Bandsplitter Separates TV IF Band From TV Channels

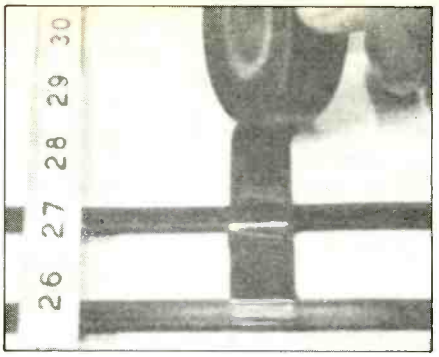
The model #3329-57 bandsplitter separates the entire sub-band plus TV-IF from the rest of the VHF spectrum Channels 3 thru W. It also combines these bands.

Passband loss is 1.5 db (maximum) and mutual isolation is 45 db (minimum). The #3329-57 comes with 75 ohm type F connectors in a 5⅛" × 2⅛" × 1" case.

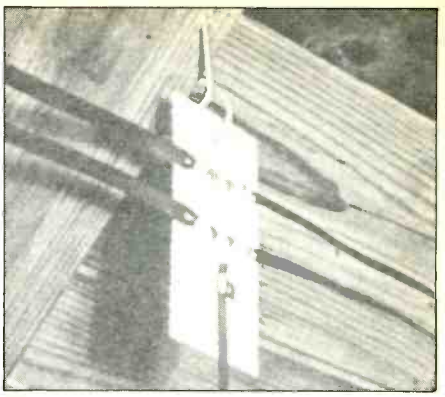
Price and delivery are $125 and 10 days, respectively. For more information, contact Emily Bostick, Microwave Filter Co., Inc., 6743 Kinne Street, East Syracuse, NY 13057, or circle number 105 on the reader service card.



Board at center where twinlead and coax join. Dipoles can be added for other bands as long as dimensions in the schematic are adhered to.



Tape wrapped between twinleads provides support and 1 inch spacing between each pair of dipoles. Space the twinlead with tape every 2 feet.



We suspended our board from the rafter, which just happend to be in the center of the roof, with a screw-in TV standoff. A home-brew hook will work well, too.

BUILD THE ATTICTENNA

An All-Band DX Antenna—A Space Saver That Is Weather Resistant And Invisible!

BY TONY EARLL, KNY2AE

There aren't too many things that can sit out alternating installments of summer heat and winter ice, interspersed with secondary treatments of wind and rain, without taking it on the chin after a while. When it comes to antennas, this is especially true. If it doesn't begin to weaken physically, then the inevitable electrical problems will certainly find a way to irk you. As Emily Latella used to say, "it's always something."

Here's a way out—that is, if you've got an attic you can use. Putting an antenna there keeps it invisible, removes it from the ravages of the weather, and also saves you the expense and possible inconvenience of putting an antenna on a tower (this also brings about a measure of safety). It's easy to get to this antenna if it requires any work after it's installed and, best of all, it can really pull in DX on the shortwave bands.

Unlike your basic random length long wire SWL antenna, the Attictenna actually tunes the bands along with your receiver. This gives you the jump on the type of antenna the instruction book that came with your receiver suggested you use, such as a long wire or a half-wave dipole. Sure, those antennas are fine if all you want to hear are the powerhouse stations like the BBC, Radio Moscow, or Deutsche Welle, but the Attictenna will give you a shot at tuning in some of those weaker stations normally "down in the mud." Besides improving signals at the higher frequencies (where signals always seem to require all the help they can get), this antenna can change into a standard long wire antenna by throwing a switch!

Are you concerned that because the antenna is located in your attic that the signals won't be able to get through to it? Forget it! Radio signals go through tile or asbestos shingles, fir studs, and plywood as if they weren't there. As long as you don't have a metal roof, have foil wrapped insulation *above* the antenna, or tons of electrical wiring in the attic, this antenna will do the job you want it to do. The major factor you'll want to take into consideration is working within the space available in the attic. But, the dimensions of the antenna can be varied to enable this to fit into almost any attic area or even into a shed, barn, or silo!

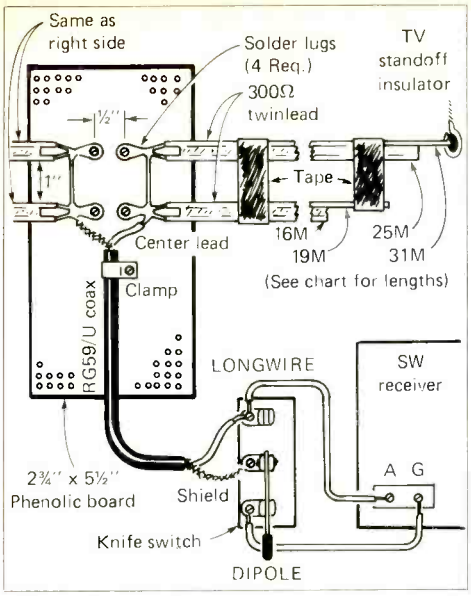
The Attictenna is actually a multi-dipole consisting of separate tuned dipoles for no less than four shortwave bands. You select the bands you want the most. The chart shows the various bands and their frequencies along with the half-wave dipole antenna measurements.

One of the features of the Attictenna is that the elements of the antenna are tied together in the middle. This lets you use only one feedline and removes you from the chore of bandswitching as you tune. The proper elements come into use as you tune to the frequency for which they are cut. The "unwanted" elements are automatically decoupled from your antenna system when you are tuned to frequencies other than those for which they are cut. The antenna, as a whole, presents your receiver with a 70 ohm impedance. This permits the use of popular and inexpensive RG-59/U coaxial cable as your feedline. This is the type of cable used in many TV installations. The elements themselves are made up from 300-ohm TV twinlead for each pair of dipoles—that is, *two* bands. In other words, both the 13 and 19 meter band dipoles are made up from one single 31 foot length of twinlead.

Let's Do It!

Start by selecting your most wanted bands—for instance, the 19 and 16 meter bands. Cut a length of twinlead for the band with the longer wavelength, that being the 19 meter band (30′6″); then trim one wire of the twinlead to the 16 meter band wavelength (26′4″), making it evenly deducted from both ends. That means you'll take 25 inches from each end of the *one* wire of the 30′6″ length, the other wire being left at the longer length. Let's say that the other two bands you want are for the 31 and 25 meter bands. Cut a length of twinlead 48′6″ for the 31 meter band, and one wire of that twin lead down to 39′6″ for the 25 meter band. These measurements, of course, would be different if you want other bands than the ones in this example.

If you have a roomy ranch type home with a long attic, you'll have plenty of space to string out a 65-footer for 41 meters. If you have a really large pad, you may have room



Center-board dimensions. Each piece of twinlead contains two dipole antennas. Slit wire on the long dimension, then cut off the shorter antenna.

SHORT WAVE BANDS and HALF WAVE DIPOLE LENGTHS		
SW BAND (meters)	FREQUENCY (MHz)	LENGTH (ft-in.)
11	26.10–26.60	17-9
13	21.45–21.75	21-8
16	17.70–17.90	26-4
19	15.10–15.45	30-8
25	11.70–11.975	39-6
31	9.50–9.775	48-7
41	7.10–7.300	65-0
49	5.95–6.200	77-0
60	4.75–5.060	95-5

for a lengthy 60 meter band Attictenna at 95 feet. Most likely, you'll have to use the long wire feature of this antenna for those lower frequency bands.

Switching back and forth from dipoles to long wire is accomplished by the knife switch installed near your operating position. Putting it into the long wire position causes the coax shield to be removed from ground and hooked up to the antenna terminal of the receiver. This turns the whole deal into a long wire antenna, which receives signals over the entire antenna system—including the coaxial lead-in! Using the long wire feature on lower frequencies will not result in any significant loss in signal; we have found that the antenna did well in this mode on the 49 meter band. The main idea is to use dipoles on the higher frequency bands where most receivers seem to like to have stronger signals coming through. This is the main advantage of the Attictenna.

The longest attic dimension on our chart is 95 feet for the 60 meter band. If you haven't got enough room for something along those lines, here are some thoughts based upon the idea that a dipole antenna receives most of the signals near its center (the ends of the dipole are primarily for resonating it at the frequency for which it is cut). It's not going to make a lot of difference if both ends of the dipole hang straight down for about 20% of the total length of the dipole. For the 31 meter band, this is about 10 feet—that is, 5 feet at each end. You could fudge this by doing a bit of zigzagging at the ends if you don't overdo things; if you wrap the ends up like a pretzel, it's going to cause a mismatch and cause the antenna to operate with some type of bizarre pickup pattern.

Another fudging method is to let the ends of an especially long dipole go through attic vents and hang down outside of the house.

Keep in mind that dipoles are bidirectional and their two main directions are broadside to the antenna. That's either a blessing or a curse. If the stations you want to hear most are broadside to your house, you've got it made. If not, you can shop around to see if someone markets a house rotor. Don't laugh—Thomas Edison had his lab on a revolving turntable!

For the most part, it is a compromise. If Europe or the Orient is east or west of your location, an attic running north/south would have the optimum orientation. Since shortwave signals like to pop over the poles, even an east/west antenna will nevertheless pick up European or Asian signals.

TV standoffs and electrical tape should be dandy for supporting the elements and reducing sag. Be sure to keep the antenna as far away as possible from electrical wiring or any large masses of metal (such as vent fans or air conditioners), as they will adversely affect the Attictenna. Even rain gutters on the outside of the structure could cause reception problems if they are too close.

POP'COMM *Scans The*

BAKER PROTECTIVE SERVICES

BY RICK MASLAU, KNY2GL

Baker Protective Services (affiliated with Wells Fargo Alarm Services) is a major national central alarm service with offices in many major cities. Here is their communications system:

Baker Protective Services

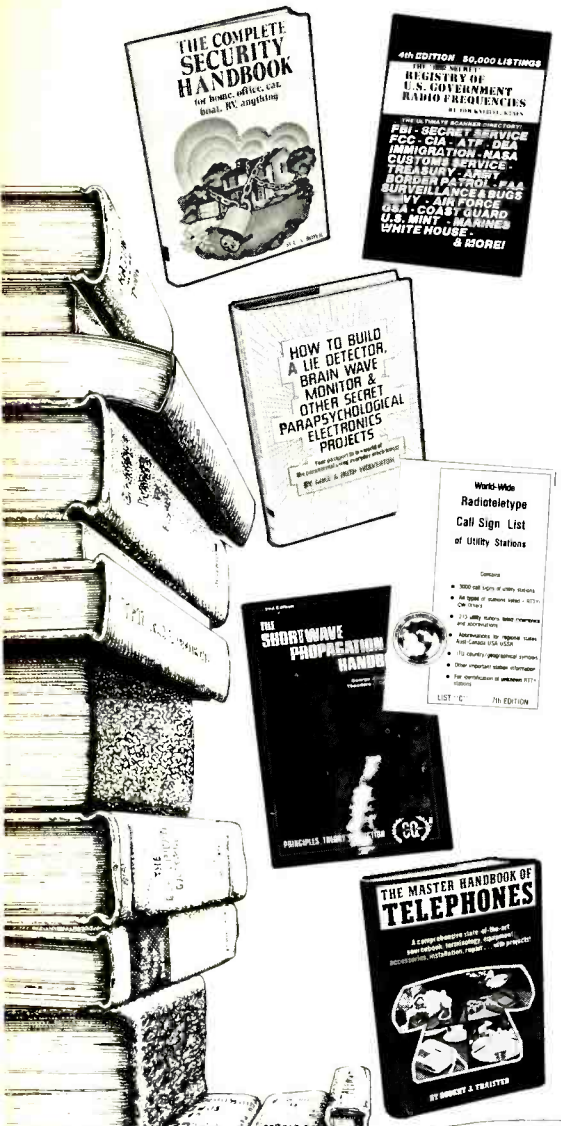
CA	hand-held units	KA43530	461.3625
	Downey	KML284	460.90
	Los Angeles	KBO417	35.10
		KCI903	151.715
		KML284	460.90
	Milpitas	KLJ857	461.475
	New Almaden	KRN304	460.90
	San Jose	KSR607	30.88
		KOG49	460.90
DC	Washington	WCH26	460.975
FL	Miami	KIA956	152.15
	N. Miami Beach	KZF296	460.975
GA	Atlanta	KRE818	460.90
		WBB21	460.90
		KTH982	463.525
HI	Waiphau	KUA399	460.90
IL	Chicago	KLK790	460.90
		KRM358	460.90
		KMI77	460.90
		KAA8929	462.725
		KAA8930	462.725
		KAA8931	462.725
		KRL888	463.575
LA	New Orleans	WKH92	460.975
MA	Boston	WFD899	461.325
	Chelsea	KCG302	460.925
	Waltham	KCG302	460.925
MD	Baltimore	KYT696	460.975
NJ	hand-held units	KP9964	467.8875
	Clarksburg	KUB467	460.975
	Malaga	WYL607	460.975
	Newark	KTV37	460.975
	Princeton	WFJ736	460.975
		WKX46	460.975
	Trenton	WFJ737	460.975
NY	New York	KGK326	460.975
		KUX71	460.975
	Plainview	KRT259	460.975
		WCS68	460.975
PA	Philadelphia	KDL594	460.975
	Reading	KLQ796	460.975
		KMB82	460.975
TN	Memphis	KTF554	460.975
		WII76	460.975
TX	Houston	KYS368	460.975
VA	Arlington	KAR525	460.975

Aeronautical Radio Incorporated

As an added bonus this month, we are presenting information per a suggestion made by E.K. Wilkinson, Sr., of Irving, Texas. E.K. said that those interested in aero communications might be interested to know that Aeronautical Radio Inc. (ARINC), which provides ground station enroute communications for airlines in the 128.825 to 132.0 MHz segment of the VHF aero band, also has a few little known additional frequencies. These channels are used for communications concerning the general operations of ARINC itself. Per E.K.'s suggestion, here are those stations:

CA	San Francisco	WSJ605	461.90
HI	Mauna Loa	KBU226	151.805
MA	hand-held units	KY5925	461.90
NY	New York	KRP548	464.325
		WXC474	464.325
		KRP547	464.375
		KGJ918	464.475
PR	San Juan	KJX598	463.30
TX	Hurst	KVE306	464.525
US	portable	KJH440	464.55
VA	Chantilly	WQU552	464.325

POPULAR COMMUNICATIONS BOOK SHOP



"Top Secret" Registry of U.S. Government Radio Frequencies 30 to 420 MHz, 4th ed.
by Tom Kneitel, K2AES
Your complete guide to 50,000 scanner frequencies used by FBI, Customs, Secret Service, Immigration, Border Patrol, FCC, Treasury, surveillance, "bugs," military, etc. 120 pages, paperback, $9.95. Order #C152A.

Air-Scan, Directory of VHF Aero Band (108 to 136 MHz) Stations, 3rd ed.
by Tom Kneitel, K2AES
More than 30,000 listings in U.S., Canada, and Mexico—Control Towers, Unicoms, Multicoms, Approach/Departure frequencies, Flight Service Stations, Air Route Traffic Control Centers, airline frequencies, search/rescue, etc. 80 pages, paperback, $7.95. Order #C152B.

World Radio TV Handbook 1983
The world's only complete directory of international broadcasting and TV stations—the established, authoritative guide endorsed by the world's leading broadcasting organizations. A comprehensive listing of short-, medium-, and long-wave stations revised and updated to reflect actual conditions. Also includes special features on listening gear, how to adapt older receivers for use today, and DX club activities. 560 pages, paperback, $17.50. Order #B097.

The Shortwave Propagation Handbook, 2nd ed.
by George Jacobs, W3ASK,
and Theodore J. Cohen, N4XX
A new, revised edition of the popular guide to all your propagation needs. Contains up-to-the-minute information and charts, and guides you through producing your own propagation data. 154 pages, paperback, $8.95. Order #C137.

How to Build a Lie Detector, Brain Wave Monitor & Other Secret Parapsychological Electronics Projects
by Mike and Ruth Wolverton
Your passport to a new world of electronic adventure . . . a unique collection of electronic projects that deal with the paranormal. Eavesdrop on telepathic messages, monitor brain waves, or "measure" emotions and hangups. Step-by-step instructions and plenty of diagrams and illustrations show you how to do it all. 308 pages, 101 illustrations, paperback, $12.95. Order #T193.

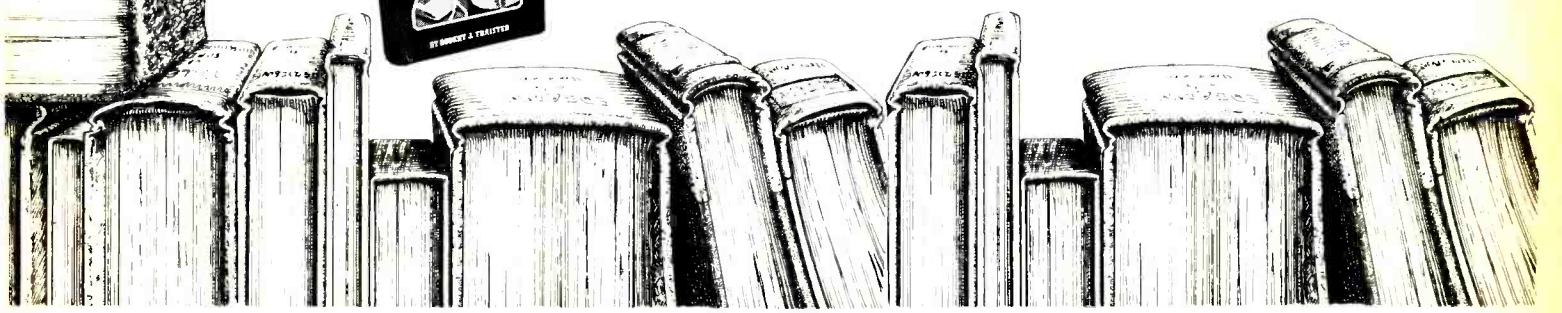
The Complete Security Handbook—for home, office, car, boat, RV, anything
by C.A. Roper
If you've ever worried about your home or vehicle being burglarized . . . this book has the answers you need. An all-inclusive source on how to determine your security needs, buy the right systems and devices, and install them. Includes alarm systems to protect your home, vehicles, and other property against fire, smoke, lightning, vandalism, theft, gas, water leaks, and more. 540 pages, 681 illustrations, paperback, $13.95. Order #T194.

The Master Handbook of Telephones
by Robert J. Traister
An info-packed manual of modern telephone communications, covering literally every aspect from terminology and equipment to accessories and repair . . . with projects! Covers standard telephones, decorator models, answering devices, electronic telephones, a multitude of accessories, scramblers, and security devices . . . makes it easy for anyone to install, use, and repair almost any kind of phone equipment imaginable! 360 pages, 250 illustrations, with 8 pages color section, paperback, $10.95. Order #T195.

World-Wide Radioteletype Call Sign List.
Some 3000 callsigns of RTTY and CW stations located in all parts of the world. Starts out at AAA3USA and goes to ZYK and beyond—through the numerical prefixes from 3AC to 9YM. Handy directory for identifying unknown RTTY and CW transmitters on international frequencies. $6.00. Order #U201.

25 Easy-To-Build One-Night & Weekend Electronics Projects
ARC soft Publishers Series
Ready-to-run programs by Jim Cole for the TRS-80 Pocket Computer. Each program will run on any BASIC microcomputer with only minor modifications to program lines. 96 pages, paperback, $4.95. Order #C179.

Amateur Radio, Super Hobby
by Vince Luciani, K2VJ
A complete source of information on what amateur radio is. How to get started in amateur radio, some of the theory behind the hobby, plus exclusives on the lives of some members of the amateur radio community. 144 pages, paperback, $8.95. Order #C168.



POPULAR COMMUNICATIONS

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THE MONITORING MAGAZINE

Getting Into Scanning

BY GORDON WEST, WB6NOA

Scanning emergency channels with a monitor radio is fast becoming one of the most favorite hobby radio sports today. Each year, over half a million scanner sets are sold to beginners.

Why is listening to a scanner monitor radio so much fun and so intriguing? It is simply *live drama* unfolding before your ears, at its best. Nothing is censored. You hear everything the split second it is occuring.

"This is engine nine, and I am on scene. The house is completely engulfed, and I hear screams from within the structure. I'm going in" crackles your scanner receiver.

Your monitor radio jumps to the next active channel. "I have the suspects stopped, and both occupants are out of the vehicle with their hands up" radios the police officer with a calm voice. As soon as he stops transmitting, the red scanner light jumps to another active channel.

"I am on my way home now, and I think your vacation idea is a good one. Let's tell the kids that we are leaving tomorrow morning." Mobile telephone calls are easily received, and usually no one ever suspects that you are listening.

" . . . a faint pulse, and the color is now turning pink. I think we've saved him, and await your instructions" radios a paramedic at the scene of an infant drowning. Your scanner jumps to the next channel that carries medical telemetry data. You are now tuning in to the heartbeat of the tiny infant snatched back from death by drowning. The heartbeat sounds strong.

What You Can Hear

Unlike a shortwave receiver that tunes in the world, your scanner receiver tunes in your *local community*. Almost everything that is radio dispatched can be tuned in with a scanner. The following are some of the most exciting frequencies to tune into: police, fire, paramedics, FBI, mobile telephones, marine channels, ambulances, lifeguards, news media, airplanes, 24 hour weather broadcasts, cordless telephones, wireless microphones, undercover security, tow trucks, business radio calls, forestry service, and taxi cab calls.

The list would go on, but there is not enough room to print it! Almost everyone uses two-way radio, and a scanner will pick up these calls loud and clear.

A whole new technology in scanner receivers makes frequency selection a snap. If you wish to monitor many different channels, you do not need to buy individual crystal sets. You simply purchase a scanner that is "synthesized." More about that later in this issue.

Regency produces one of the better nationally sold scanners.

Electra's Bearcat 20/20 covers standard public service and VHF aero bands.

Scanner prices are also at an all time low. Most scanner manufacturers run rebates, and the price you pay is sometimes just about as low as what the dealer can buy it for once you have received your rebate from the manufacturer.

Scanner radios simply plug in, and you are on the air. Sure, an outside antenna is nice, but not necessary for local calls.

Many scanners have built-in preprogrammed frequencies in case you do not know what to listen to at first. This allows you to sample the hottest frequencies around town. Then you can decide which ones you want to specifically program in later.

So sit back and think about a scanner. Our special scanner feature brings you the very latest in the fun and fascinating world of monitoring with a scanner receiver.

Scanning Scanner Specs

Be a scanner expert and know the meaning of scanner specifications. You can use this valuable information to assist you in selecting a new scanner receiver. Let's look at the easy-to-understand specifications.

Frequency Ranges This specification indicates what bands and what frequencies within the band the scanner will cover at maximum sensitivity. If you are selecting a programmable scanner, the bands that it may cover may be similar to the chart in this article. The aircraft band is always a popular one to listen to. Same thing with the FM broadcast band—your scanner will also double as a very nice FM receiver, too, if it has this band on it.

Search Frequency Increments On low band, it is desirable to search every 5 kHz. On the aircraft band, you will search in 25 kHz increments. On the UHF band, you may wish to search every 12.5 kHz.

Sensitivity Sensitivity figures are always listed in microvolts. The smaller the number, the greater the sensitivity. For instance, .7 microvolts is better than 1 microvolt; .5 microvolts is better than .7 microvolts. Anything less than 1.0 microvolts is considered very good.

Selectivity Here, you are looking for a higher dB figure for better selectivity. Selectivity is the ability to hear one channel, yet cancel out radio calls on adjacent channels. Accordingly, 60 dB selectivity is better than 50 dB selectivity at a given channel frequency response; 70 dB at + or − 25 kHz is about tops for any scanner. Always look for the highest dB figure between two scanners.

Search Scanning Rate This figure indicates how fast the scanner will search unknown frequencies for activity. A good figure is between 15 and 20 seconds per MHz on VHF and low band frequencies. On UHF frequencies, where there may not be as much activity on lower frequencies, the search rate is about 5 seconds per MHz.

Scan Delay This is a handy feature if you can find it in the scanner you are selecting. Scan delay allows the set to automatically remain on the active channel for a few seconds after the station stops transmitting. This will allow you to hear the other side of the conversation without interruption. An adjustable scan delay is nice. Scan delay on user selected channels in any order is a superb feature, but not found in many scanner sets. Usually you either create scan delay for all channels, or for no channels.

Priority The priority feature is handy if you wish to continuously guard one channel, but scan a bunch of other channels. Your receiver will automatically sample the priority channel approximately once each second for activity. Regardless of what the scanner is doing, as soon as there is traffic on the priority channel, the set will jump back to that traffic.

Audio Output This is the amount of volume that your scanner will deliver to the speaker. Anything less than 1 W for a base or mobile unit is inadequate. 1 W to 3 W is

Radio Shack's Pro-2002 is a high quality keyboard programmable scanner.

Keyboard programmables permit you to set your scanner for many types of functions.

fine. The higher the figure, the better and louder your set.

For portable scanners, this rating usually is in milliwatts (mW). Five hundred mW is adequate for most portables. Some portables, such as the Bearcat 100, have a built in level control that may be adjusted to raise or lower the maximum volume. The louder the volume on a portable set, the faster your batteries will be depleted.

Power Requirement Most scanners operate from a 12 V car battery as well as 110 V AC house power. If you plan to use your scanner in both locations, make sure you have a built-in dual-voltage power supply.

Memory This feature keeps your channels alive when you disconnect the power from your scanner to move it from house to car. Some scanners utilize a small battery to keep the memory alive. Check the specs and see how long the battery will survive once the scanner is unplugged. Three days would be a minimum. There are many batteries that will keep the memory alive up to a year. Some scanners feature a "non-Volatile" memory that requires no batteries! This memory circuit will keep track of all the frequencies you have programmed into your programmable scanner without ever relying on a battery that might go dead.

Display This specification indicates what type of readout your scanner will give you. LCD is a liquid crystal display, and is used for portable sets. It is easy to see, and requires almost no battery power at all. LED is the abbreviation for light emitting diodes, and these are red in color and are used by many scanner manufacturers. The red LED display is very hard to see in the daylight.

The Gas Discharge Tube display is a brilliant blue that is quite easy to see during the day. It provides a very clear readout of the frequency, but sometimes may create small amounts of hum in the receiver.

Check over the scanner you are thinking of buying, and make note of the type of display. Is it easily seen in the car? Can you read it in the daylight? Is it bright enough?

Summary Most specifications are quite accurate as they pertain to a certain type of scanner. I might caution that you check out the scanner in person before buying one just from the specs. It has been said that many scanner manufacturers will simply follow the normal specs when they write up their ads. The scanner might not necessarily duplicate the exact specs listed.

Check it out for yourself, and listen to the scanner in person before buying one. Specifications are a handy way to double check its performance.

Scanner Band Limits

The term "band" classifies a group of frequencies within a certain range. Scanner receivers are capable of picking up a total of eight scanner bands. Not every scanner set has all eight bands on it. Some of the bands may be of no interest to you, so you may not choose a set with everything on it.

Following are the bands and the individual frequencies associated with those bands.

VHF low band	30-50 MHz
VHF aircraft band	118-136 MHz
VHF amateur band	144-148 MHz
VHF high band	148-174 MHz
UHF amateur band	440-450 MHz
UHF standard band	450-470 MHz
UHF extended band	470-512 MHz

Out Of Band Frequencies

Some police agencies throughout the United States are switching to the new 900 MHz band. There is no scanner equipment manufacturer that will cover this new band.

The FBI band is just below the amateur radio VHF band. FBI frequencies extend from 138 MHz to 144 MHz. Some scanner sets may program "out of band" frequencies by some fancy keyboard techniques.

The 220 MHz ham band is also another area that scanners miss. There are no scanner receivers that routinely cover these frequencies. To receive the amateur radio 220 MHz band, you need a scanner converter. MFJ Corporation, Mississippi State, MS has converters for out of band frequency scanning to include FBI channels, the satellite band, and the 220 MHz ham band.

You can easily spot which band mobile police units and fire units are using by the antenna they use. A 54 inch whip antenna indicates operation on the VHF low band. A yard long whip with a base loading coil indicates VHF high band operation. A yard long antenna with a loading coil in the center of the antenna almost always indicates UHF standard or UHF extended band operation. Take a look at the antenna to determine which band of frequencies the public service agency is operating.

Selecting Your First Scanner

Scanners range in price from $100 to $600. The quality of all scanners is very good; the price only influences the amount of features that you will find on each set.

In other words, a crystal scanner that may listen in on a set frequency will sound just as good as a programmable scanner on that same frequency with a price difference of $400! The more money you spend, the more features you will receive, but the sensitivity and selectivity and the ability to pick up distant stations will be about the same.

Crystal vs. PLL Crystal scanners are the least expensive. They require small metal crystals to be inserted into channel sockets. The crystal will determine the frequency that the scanner will tune in. Local dealers usually carry the more popular crystals in stock so that they may insert the crystals when you buy the scanner. If you buy the scanner by mail, you will need to buy the crystals separately and install them yourself.

It is an easy job to install the crystals. Some scanners require you to shift some wires around for the proper band selection. Crystal scanners are a good buy when you wish to monitor one or two set frequencies.

Most crystal scanners are found in the hand-held variety. They sell for around $100. There are also mobile crystal scanners that sell for about the same price.

For just a few more dollars, you can jump into scanning in a big way and choose a crystal-less scanner. Using Phase Locked Loop Synthesis, this type of scanner does not utilize crystals. Frequencies are programmed into the scanner via a keyboard. You can add, change, erase, and scan any frequencies you would like with a programmable scanner. Programmable scanners will also cover all the different scanner bands.

Programmable scanners are quite reliable, and offer no more service problems than would a normal crystal scanner. They are compact in size, and draw no more current than a crystal scanner.

Most newcomers to scanner monitoring will now select a programmable scanner because of the low cost. A first-time scanner buy may be no more expensive than $170 with a programmable set!

Antenna Requirements Scanners are all sold with small telescopic antennas. Simply plug the antenna into the scanner set, fully extend it, and you will hear plenty of excitement. These small antennas will give good coverage, but not necessarily the best for distant stations.

Take, for instance, the local fire department you wish to monitor. You can hear the fire station dispatcher loud and clear, but on your inside antenna, the individual engines at the scene of the fire come in fuzzy. An outside antenna will do the trick.

Outside scanner antennas are available from a host of antenna manufacturers. They are sold as a package with the antenna, coaxial cable, and scanner antenna plug already preassembled. Remember, your scan-

POP'COMM Tests The Fox BMP-10/60

Popular Communications is performing lab tests on the new Fox keyboard synthesized scanner. Fox is a well-known manufacturer of top quality superhet remote and passive radar detectors. Fox radar detectors have all passed stringent reviews, and the Fox radar detectors line-all units are tops in their class.

The Fox scanner is extremely unique because it may be operated either mobile, base, or portable. Its basic power need is 12V DC. When used in a vehicle, you simply plug it into any 12V source. When used at home, a small power convertor plugs into the wall and supplies 12V DC to the scanner. When used portable, batteries inside a portable battery pack keep the unit on the air all day. Battery pack holders and a mobile mounting bracket makes the unit ideal for quick changes in its operation.

The Fox BMP-10/60 covers all public service frequencies in 5 or 12.5 kHz steps. This includes the 32 to 50 MHz low band, 140 through 170 MHz high band, and the 430 through 512 MHz UHF band. The frequencies are keyboard entered randomly into any one of the ten channels.

The unit was also tested for its "seek" capability, and it works great. Just push the button and it will automatically scan through its memories to find all of the action. You may then enter "found" exciting channels into the memory circuit by simply pressing a button.

The keyboard contains pressure sensitive switches that automatically beep when accessed. Entering ten channels of your choice is a breeze. It takes less than three minutes once you get the hang of it. Frequencies and a channel number are automatically displayed in bright red LEDs.

You skip any one of the ten channels program by simply "locking" them out electronically.

We found the volume exceptionally strong for such a compact unit. Squelch action was just good. Sensitivity was equalled that of any other scanner we have lab tested throughout all bands. Adjacent channel selectivity was also rated good.

The new Fox BMP-10/60 scanner offers many unique features.

- LED read-out for frequency display.
- 60 pre-programmed "hot" action-packed frequencies.
- 10 channels to store frequencies *you* choose.
- Completely programmable. (no crystals necessary).
- Skip, pause and action capabilities, even on pre-programmed frequencies.
  - SKIP — allows you to skip over channels that you don't want to listen to.
  - PAUSE — delays the scanning process 2 seconds after each broadcast.
  - ACTION — constantly monitors your favorite frequency and interrupts all other scanner operations when it broadcasts.
- Touch keyboard with audio response.
- Smallest and lightest Base unit on the market today! 6½"(W) x 1-5/8"(H) x 9"(D) - 1.5 lbs.
- Optional Porta-Pac carrying case.
- Optional Mobile mounting bracket.

Electronically, the package is quite sound. Mechanically, it resembles no other scanners that are synthesized. This unique shape of the Fox allows it to be installed in places where others may not go. The portable aspect of this unit—although quite bulky—is also good in an emergency situation. It has more audio output than any other portable scanner produced today.

We are pleased to see a newcomer in the synthesized scanner market. This set has some exciting features that other scanners lack.

If you had not had a chance to try out the new Fox scanner at your local dealer, do so today. We believe that Fox marketing has an exceptional product at a competitive price that is bound to satisfy the most discriminate scanner owner.

ner set takes a different type of antenna plug than your CB set. Your scanner takes the same type of plug that your AM/FM automobile radio uses.

An omnidirectional scanner antenna will dramatically increase your reception range. With an outside antenna mounted on some TV mast—or even on the same antenna mast as your television antenna—you can increase your reception 8 to 10 times! With an outside antenna, it is possible to hear distant mobile stations up to 30 miles away. With an inside antenna, you might only hear these mobile stations 3 miles away.

If you wish to scan in only one certain direction, you may wish to consider an outside beam antenna. The beam antenna concentrates the antenna in one direction to pick up distant cities.

This outside antenna should give you something to think about. Increase your normal scanner reception by 20 times that of the telescopic whip by going to a scanner beam. Increase your scanner reception 10 times over your telescopic whip by going to an outside omnidirectional antenna. For those of your reading this that already have a scanner, consider an outside antenna!

More on scanner antennas next month!

Where To Buy Your Scanner There are two basic ways to purchase a scanner. One way is to buy a scanner through your local scanner dealer. Most dealers have a complete display of scanners that are turned on so that you may listen to them and try out the controls. Your local scanner dealer may also be participating in a factory rebate program, and can save you some additional dollars on your purchase.

Local scanner dealers also carry a complete stock of crystals for your local area. If you are buying a crystal scanner, it is nice to be able to have the crystals installed by this dealer when he sells you the equipment.

Local dealers always carry scanner accessories, scanner frequency directory books, scanner antennas, and other scanner aids. This allows you to shop at one spot for all your scanner radio needs. Some dealers also provide custom installation of your scanner equipment in your vehicle or at your house.

Most newcomers prefer to purchase their first scanner through local dealerships because of the assistance the dealer may give the scanner user. A dealer may assist the first time scanner buyer in selecting the right scanner for his particular needs. The dealer may also recommend popular frequencies to tune in for a local area.

Mail Order Seasoned scanner owners who know what they want to buy next many times choose mail order houses. Mail order facilities generally offer lower scanner prices than regular dealerships. Mail order houses work on volume, and will often sell at lower prices than most scanner dealers.

In order for mail order companies to make a profit when selling at lower prices, each sale must be made quickly. Seldom does the mail order house have time to discuss pros and cons about certain scanning equipment. Mail order houses seldom take the time to discuss who is on the air in your particular area, and seldom will they ever go into any great detail on how to install a scanner in your house or in your car.

They have an incoming telephone number for orders, and all you have to do is order. Nothing else. For this straightforward approach, they reward you with low prices.

So there are your choices—mail order or local dealer. Both are excellent ways to go, depending on your knowledge of scanners and the frequencies in use in your area. There are over 50 different types of scanners available today that are synthesized, and we wish you the best of scanning with whichever set you decide to choose and where you decide to buy it.

RTTY

BY JOSEPH JESSON

THE EXCITING WORLD OF RADIOTELETYPE MONITORING

We've come a long way in the field of radioteletype, from mechanical marvels to sleek digital, all electronic terminal units with a gain in reliability, quietness, and overall ease of use. This month, I'd like to review—in straightforward terms—the internal operations of the demodulator, commonly called the terminal unit.

Of course, we must start with the transmitter source—a form of modulation known as frequency shift keying, or FSK. As we can see from Figure 1, a specific carrier is generated that is defined as a 2125 Hz tone, also known as a mark. During transmission, we go from a mark to a space which is actually shifting the carrier by a certain value—commonly by 170 Hz, 425 Hz, or 800 Hz and, of course, rarely used but 600 Hz and 800 Hz.

Figure 1 also shows the carrier shift in the frequency domain. When a stable receiver detects this carrier, and one's receiver BFO is on, the resultant audio output correlates to the 2125 Hz tone. What we are actually doing is using our beat frequency oscillator (BFO) to inject or beat against the carrier in order to generate this very specific mark tone. The transmitted carrier mark tone that is being generated into an audio signal represents binary one. As we rapidly shift the transmitter carrier, this results in rapidly shifting receiver audio tones, and finally recreating in the terminal unit a Baudot binary serial sequence representing characters.

Since we are only shifting the carrier when we are transmitting FSK signals, the obvious question is, "Why don't we simply transmit audio directly rather than forcing us to use the beat frequency oscillator in our receiver to recreate the audio tones from the changing carrier?" Well, the answer to this has to do with what is demonstrated in Figure 2.

Figure 2 shows an audio frequency shift keying signal, or AFSK—again, in the frequency domain. One can quickly see the resulting extra sideband signals that result from the sum and difference of the audio tones (M) that are used to modulate the carrier. FSK only has two signals generated in the frequency domain rather than a multitude that is created when using audio frequency shift keying. In order to minimize the bandwidth required by each signal, FSK is the modulation of choice on HF as opposed to AFSK. Minimization of bandwidth is a priority concern, since spectrum space is a very scarce resource. On the other hand, audio frequency shift keying is much easier to tune, since careful adjustment of the injected BFO and center frequency is not required because the tones are defined only by the transmitter.

When tuning in FSK, the BFO stability is critical. On HF, the world news networks, weather, and marine RTTY are most often sent as FSK.

Another form of modulation, known as frequency division multiplexing, often uses audio frequency shift keying. On VHF, audio frequency keying is definitely the most practical, since receiver stability (drift less than 100 Hz) is needed for low error rates and is often difficult to obtain at VHF frequencies. Assuming our mark frequency is 2125 Hz, a 170 Hz shift would put the space or higher tone at 2295 Hz; a 425 Hz at 2550 Hz; and an 850 Hz shift at 2975 Hz. Now we have the correct audio tone and have some way of coupling these tones into our terminal unit, usually by the receiver's audio level output, RCA phono jacks, or by a direct tap on the receiver's speaker.

Next, let's take a glimpse of the functions within the terminal unit as we have audio directly on the input of the terminal unit with the proper mark/space tones.

Figure 3 is a block diagram representation of a demodulator. The audio input is passed to an amplitude limiter, which removes any changes in signal level or volume and "fixes," or sets, an even level in spite of conditions due to fading. We are only concerned with the frequency changes—*not* any signal strength variations. The limiter works with the automatic gain control, or AGC, in order to minimize variations in level. Impulse noise is generated by motors, electronic dimmer controls for lights, automotive ignition, power distribution lines, computers, etc. These impulse noises show up as an amplitude variation, since noise will amplitude modulate the RF carrier.

What is needed is to recognize the proper frequency variation, rather than any amplitude or noisy signal changes, in order to minimize any errors. FSK was developed to replace amplitude modulation where better performance in the presence of impulse noise and voltage level changes was needed. The signal is transmitted at constant amplitude, and as a result, is resistant to changes in amplitude. As frequency modulation for data transmission has replaced amplitude modulation because of its better resilience, so phase modulation is now being experimented with on HF.

Phase modulation, although popular on satellite links, has problems on HF due to large phase errors created by the uncertain changing ionospheric conditions. (More on phase modulation later in *POP'COMM*.) After the amplitude is held to a fixed value, the output of this limiter then goes to mark and space filters. Each filter allows only the frequency to which it is centered on, and only that frequency, to be allowed to pass through. The mark frequency filter will allow only 2125 Hz to be passed through the filter. Usually, the filter width is very narrow and departing to only 2175 Hz will prevent any mark signal from being sent through. One can now appreciate the stability requirements needed for good RTTY copy, since a

Figure 1. FSK

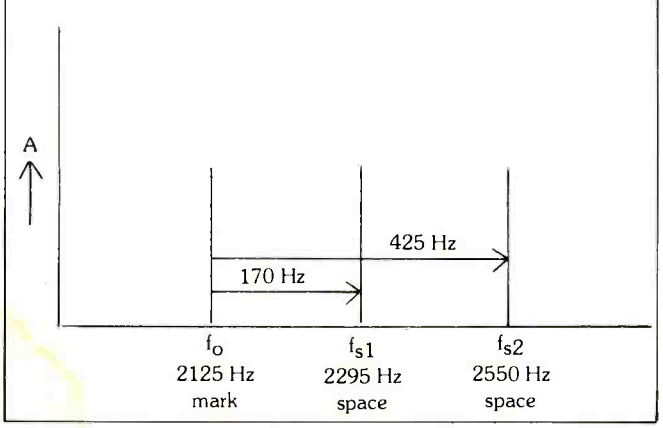


Figure 2. AFSK

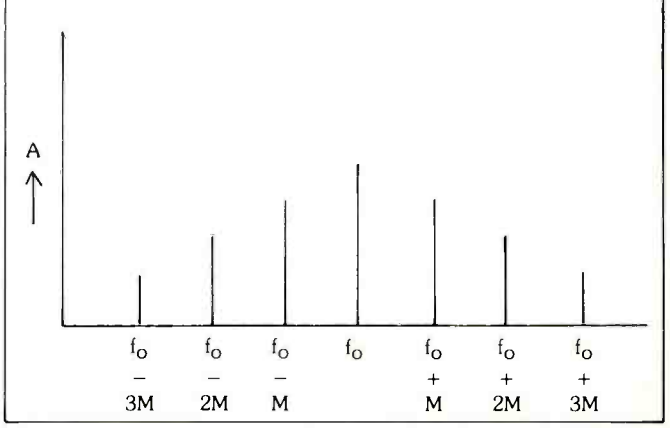
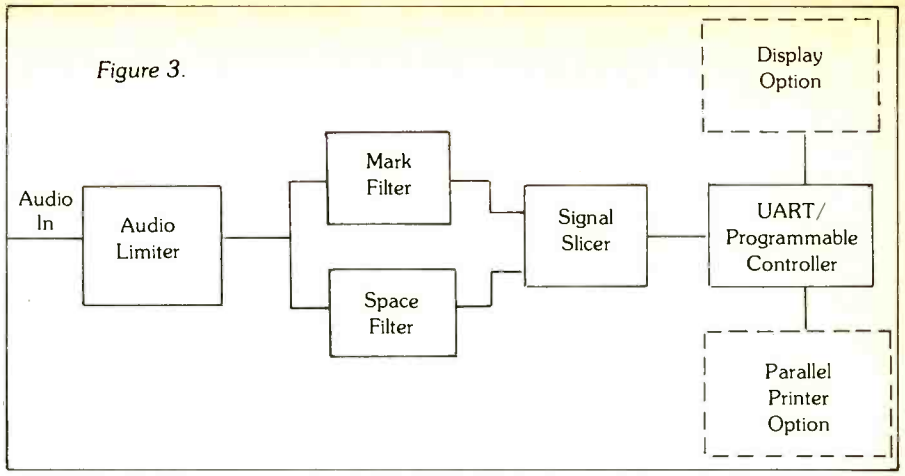


Figure 3.



mere drift of 100 Hz presents an out of filter passband signal. An exception to the narrow passband of a mark/space filter typically used in today's demodulator is the phase lock loop.

A phase lock loop tracks the specific tone to allow detection within a capture range. This range is designed by selecting appropriate resistors connected to the phase lock loop. A phase lock loop will make a suitable demodulator for an inexpensive receiver known to drift, although noise tends to false lock the phase lock loop unless prefiltering is used. One of the phase lock loop's greatest assets is the simplicity in which one can be built and aligned since the center frequency adjustment is made with a single potentiometer control. The lowest cost demodulator is also the phase lock loop.

Another way of reducing the cost of a demodulator is to use a single mark frequency, rather than the use of both tones—mark and space. One filter often reduces the weak signal performance; both mark and space filter demodulator will outperform the single filter demodulator under normal conditions. Even when two filters are used, an automatic decision threshold control will determine if a single tone is needed to reconstitute the binary Baudot data. Under abnormal conditions, where selective fading occurs (mark or space only fading), it is important to make a threshold change rapidly to compensate for the faded tone. This function of an automatic decision threshold takes place by the signal slicer.

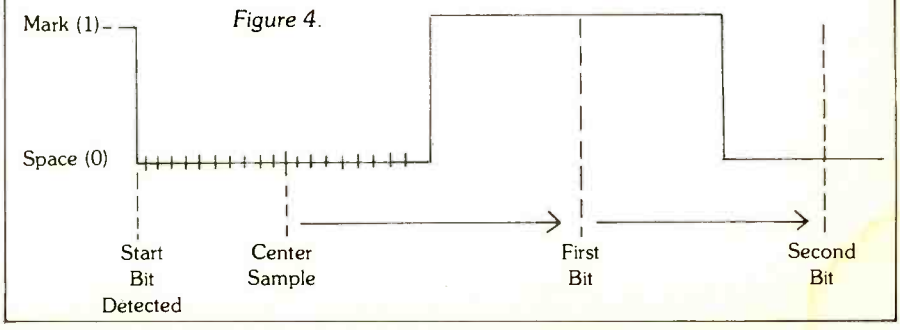
The signal slicer monitors the output of the mark/space filters and determines the correct voltages sensed, even though noise and changing filter voltage would normally cause many "hits" or errors.

Finally, we have correct binary serial data present from the demodulator. The correct binary data is 5 level Baudot, one start bit, five data bits, and one stop bit. Five data bits can represent 32 alpha characters and a "Figures" shift allows another 32 numeric characters, including machine control codes, such as "bell" and "Figures." Baudot is an asynchronous data sequence and thus the start bit has to be sensed and each data bit is then read in serially.

An interesting history of asynchronous transmission stems from the lack of precise synchronism between transmitting station and receiving station. In countries where power grid networks do not keep the voltages and frequencies of the power lines in relative agreement, some form of on-the-fly synchronizing is necessary. This problem is solved by retiming the reception of each character from the end of the start bit. Once the end of the start bit is detected, the timing process starts. Figure 4 demonstrates graphically the conversion process. Remember, the goal is to convert the serial data stream into characters that may be displayed by a CRT, vacuum fluorescent, or serial printer—detecting the edge of the start bit and by reading each successive data bit carefully during the timed bit center. After all five bits are read sequentially, a character is "recognized" and displayed. Changing the sampling time will permit different baud rates to be correctly displayed.

For example, each bit of a 50 baud data transmission has a width of 20 milliseconds time duration. A 45 baud signal is comprised

Figure 4.



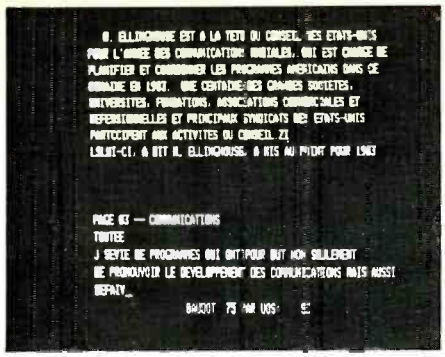


Figure 5. The Voice of America French RTTY transmission.

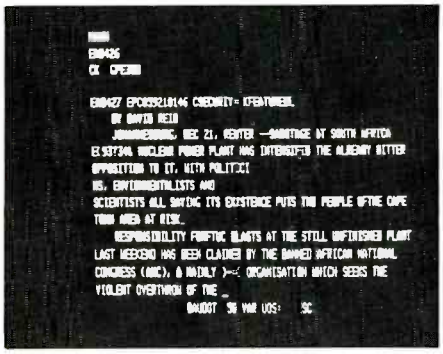


Figure 6. A news bulletin from South Africa.

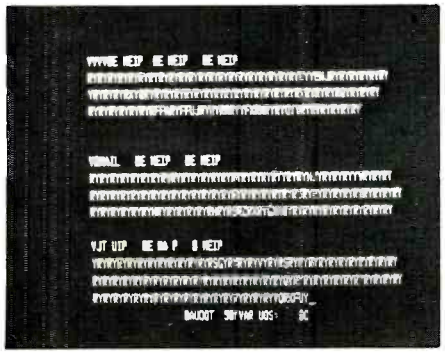


Figure 7. Can anyone identify this mystery RTTY signal?

of 22 millesecond-wide data pulses. This data width is simply measured as the inverse of the data rate in baud. The goal is to convert each 5 bit serial data stream into displayable characters. In order to convert Baudot serial data, an internal counter, set up within the microcomputer or Universal Asynchronous Receiver Transmitter (UART), starts counting upon detecting a mark to space transition. The internal counter, or timer, times out from the mark to space transition (start bit) to the center of the data bit. Each bit is then consecutively read until a stop bit is verified, creating the entire Baudot character to be output.

Noting Figure 4, the state of each bit is read by sampling as close to the center as possible. A common sample rate is 16 times the bit rate. This means that a count of 8 cycles define the center of each bit, plus or minus one count. If a stop bit is not detected after reading in 5 data bits, an error indication is given, since a correct stop bit or mark is necessary to verify a proper character frame. Now that a complete character is recognized, it can be displayed on a CRT, vacuum fluorescent display printer, or other output device.

Figure 5 shows the VOA French FSK news transmission at 0200 GMT on 10880.0 kHz. The Voice of America stands out as a unique news service since 75 baud is used rather than the more commonly used 50 baud data rate. Loggings this month include the VOA's schedule. Interestingly enough, the VOA's "official" frequency schedule (available from the Frequency Division, Voice of America, Washington, DC 20547) does not include their RTTY data frequencies. But we uncovered the frequencies through actual monitoring.

A good example of a resultant higher error rate as the transmission baud rate increases is noted when comparing VOA's copy versus Prensa Latina, a relatively strong 50 baud signal. Usual fare on the VOA's daily broadcast includes speeches given by Ronald Reagan and other eminent U.S. politicians. Also included are extensive book lists and the latest best sellers listed by author and subject. A common reader comment—"My only available time to monitor RTTY transmissions is in the evening and on weekends. Please list any available news transmissions during this time frame."

Unfortunately, many RTTY news transmissions are not operating in the early evening or weekends, and from 1400 to 1900 GMT seem to be the most popular schedules used. In fact, the Voice of America RTTY schedule, as noted in this month's listing, does not transmit at all during the weekend. Only a five day Monday through Friday schedule is valid. GHANA news is another example of a non seven day schedule. However, during Saturday and Sunday, one can log Prensa Latina, Kuwait (KUNA), Polish News (PAP), all in English, and a Spanish UPI Caribbean transmission. Prensa Latina can be found at 16348.0 kHz starting at 1742 GMT; Kuwait at 14831.1 kHz during 1630 GMT; and PAP an hour earlier at 16210.0 kHz. Try your Spanish reading capability by tuning in UPI—10805.4 kHz, 0015 GMT. These weekend loggings noted above seem to be consistently monitored on Sundays during the last two years. A timer, programmed to turn on a tape recorder, is a solution to the problem of not being home during the day. Careful pre-adjustment of the receiver is necessary to ensure correct audio frequency.

Lastly, I would like to know if any reader can identify the RTTY signal on 15497.6 kHz at 0150 GMT, as shown on Figure 7. Keep me informed of your RTTY catches!

Frequency	*Location*	*Time (GMT)*	*Language*	*Shift*	*Baudot Rate*	*Normal/Reverse Phase*
VOA - Voice of America - International Communication Agency						
10880.0 kHz	Monrovia, Liberia	0200	French	425 Hz	75 baud	Reverse
13995.0 kHz	Monrovia, Liberia	0400	English	425 Hz	75 baud	Reverse
15875.0 kHz	Monrovia, Liberia	0300	French	425 Hz	75 baud	Reverse
9855.0 kHz	Tanger, Morocco	2300	English	425 Hz	75 baud	Reverse
10972.0 kHz	Tanger, Morocco	2230	English	425 Hz	75 baud	Reverse
12223.5 kHz	Tanger, Morocco	1000	English	425 Hz	75 baud	Reverse
13770.0 kHz	Tanger, Morocco	0900	Arabic	425 Hz	75 baud	Reverse
6942.0 kHz	Kavala, Greece	2300	English	425 Hz	75 baud	Reverse
10410.2 kHz	Kavala, Greece	2230	Arabic	425 Hz	75 baud	Reverse
19915.0 kHz	Greenville, USA	0800	English	425 Hz	75 baud	Reverse
25705.0 kHz	Malolos, Philippines	0800	English	425 Hz	75 baud	Reverse

May We Recommend . . . .

The American SWL Club, 16182 Ballad Lane, Huntington Beach, CA 92649. This club has been operating since 1959. It publishes an excellent 60 page monthly DX publication covering shortwave and broadcast band DX, utility stations, QSL reports, and more. The club co-sponsors three annual DX meetings per year held in southern California. Dues in North America are $16 per year (includes First Class Mailing of monthly publication). Students (located in North America and 16 years old or younger) can join for $13 per year. A sample bulletin is available from the club for $1 (in North America).

The Longwave Club of America, 45 Wildflower Rd., Levittown, PA 19057. Here's a club for those rugged enthusiasts interested in knowing what's happening below 540 kHz! Their monthly publication, *The Lowdown*, not only covers listings of stations operating between 10 and 540 kHz, but also has interesting coverage of the 1750 Meter (no license) low power communications band as conducted by Ken Cornell (W2IMB—well known "Lowfer" authority. Membership includes mailing of the publication by First Class Mail and costs $10 per year (anywhere in the world).

When writing to the above, please mention that you saw it in POP' COMM!

FREE RADIO FOCUS

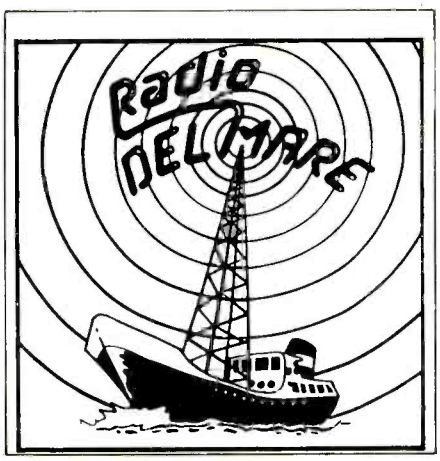
BY AL MUICK

ACTIVITIES OF UNDERGROUND BROADCASTERS

This month, we have some rather sad news for those people in Greenwich, Connecticut, who had been enjoying Free Radio Station WQRK. At 11:20 p.m. on November 24, 1982, they were officially shut down by Federal Communications Commission agents Daniel Noel and William Suffa. WQRK operated on the standard pirate frequency of 1620 kHz. The station had been on the air since the summer of 1981 and had sent out a very clean 30 watt signal. This was guaranteed by a UREI BL-40 modulimiter. Although the station had never been received outside of Greenwich, on that fateful night, the Belfast, Maine FCC monitoring station not only picked them up, but also took bearings, which led the agents to WQRK the very next evening.

According to the operator, Clark Burgard, the agents didn't have a search warrant, but he let them in anyway, figuring that "the jig was up." According to Burgard, he answered all the agents' questions truthfully, and, when asked if he knew it was illegal to operate a pirate station, his truthful "yes" earned him a double fine (so much for honesty being the best policy—Al). The next day, he received a registered letter with a request to pay $750 or write a letter to the FCC containing some darn good reasons why the fine should be reduced or waived. In the entire history of the station, not one complaint was filed, according to Burgard, although listeners were always given opportunities to express compliments or complaints. On the nights WQRK was on the air, a wide variety of programming was presented to the listeners. The primary shows alternated between contemporary rock and reggae music. Obscene language was forbidden, and although they had a delay loop for their phones, they never had to use it.

WQRK used a microphone, two cassette decks, a turntable, a cassette dictating machine used for ID's and special effects, a reel-to-reel tape deck, and a homemade phone patch. Those items were fed into two Radio Shack 4-channel microphone mixers and then into a ten-band equalizer, a DBX-160 compressor, a UREI BL-40 limiter, and then a Dynakit monaural amplifier used as a modulator. The modulation was checked every week with an oscilloscope and adjusted accordingly. The transmitter was homemade and consisted of a solid state, crystal-controlled oscillator, which led to a 6V6 buffer that drove an 807 final tube. Plate modulation was used and they ran 40 watts input (500 volts at 80 ma.) for an approximate output of 30 watts. The antenna was about 60 feet long and ran up one side of the house and down the other. And so another good station has disappeared from the airwaves. The operator has mobilized several campaigns in his neighborhood hoping to alleviate his fine.



From someone with the initials "KJT" (that's all they wrote on the letter!) comes this report of the Voice of the Purple Pumpkin Resurrection Radio, which was heard in October of 1982 at 0500 GMT on or about 7400 kHz. The signal was strong in Louisiana. I guess this is the big comeback of the Voice of the Purple Pumpkin that was heard by ye editor many moons ago.

Another letter was received in my box from Mr. Blue Sky of Radio USA, who disclosed the following information to me. Radio USA has made several test transmissions with a makeshift antenna and no transmission wire. That all came to an end and, in December, their signal was as good as it was going to get. Radio USA will operate sporadically for the time being on 4000 kHz and maybe in the 40 meter band in SSB using about 200 watts peak envelope power. Radio USA is a rock music station, but their music collection is, at present, quite small (only about 50 LP's). Thanks a lot for the information guys and we'll we looking for you in the future!

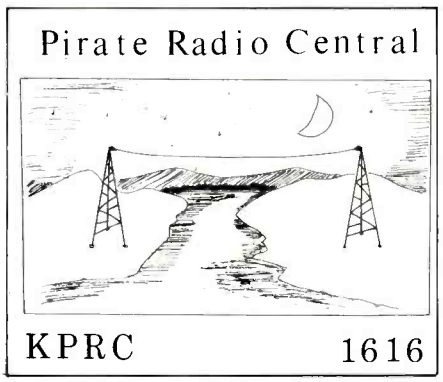
POP'COMM columnist Harry Helms sent me a note the other day informing me of one of his pirate logs, and I'd like to share it with you now. Harry reports WFUN on the air from New York City on 1613 kHz around 0500 GMT, taking phone calls and talking. Harry states that some of the callers were from New Jersey, Connecticut, and Staten Island. He says he has done some rough direction-finding and he places them east of Manhattan, in Queens or Brooklyn. They appear on the weekends only and have really nice audio. Thanks a lot for the info, OM! How about some more of you readers letting me know what you hear. Remember, this is your column, and in order to make it successful, your participation is required! If you have any suggestions, questions, or technical tips to share with the readers, by all means, *send them in!* I'll answer all letters as long as an SASE is enclosed. My address is: Al Muick, 3rd Opns Bn USAFSA, CMR Box 1912, APO NY 09458.

KMJC will be a new pirate station running on 1620 or 1640 kHz from the southern U.S. area. From the operator, B.N., I have received permission to print the following information. The station slogan will be KMJC, Magic 1620 and will be the *first* urban contemporary-formatted pirate station. Rock 'n 'Roll, Top-40 crossover, plus 50's, 60's, and 70's oldies will be heard. B.N. says he works at a radio station and has access to mountains of reels of PSA's (Public Service Announcements) that he'll be able to run. He hopes that if he gets caught and the FCC has

heard the PSA's, the fine will be lessened (those *are* rather high hopes B.N.—Al). He informs me that the first test broadcast was on March 3, 1983, at midnight central time on 1620 kHz for those of you who might be interested. Anyone who wishes to contact B.N. or send a reception report to KMJC can write to: P.O. Box 31023, Lafayette, LA 70503. The transmitter is a Johnson-Viking Ranger into a dipole antenna (468 divided by frequency).

B.N. has also asked me for some advice on his dipole. Since this may pertain to everybody, I will answer this question in my column. Your best bet is to use RG-8U coax as your feed-line to your dipole and the dipole antenna should be constructed using the famous (or infamous, HI) cobra-head military center-connector. Your center lead of the coax gets connected to the one half of the dipole, and your ground braid from the coax to the other end of the dipole, thus giving you a reflective side. This is, in fact, the most effective way of constructing a dipole antenna. Unfortunately, B.N., at the frequency you plan to use, a half-wave dipole would be simply *humongous*, and although I am not aware of how much space you have at your disposal, I suggest that you make your antenna a quarter-wave dipole or an inverted Vee at one-half or quarter-wave to make everything a bit more discreet.

It really seems like all the world reads *POP'COMM!!!!* I just received a letter from Pirate Joe from Pirate Radio Central, and he writes the following: "After reading your column, we decided to drop you a line and tell you a little about Pirate Radio Central. Pirate Radio Central operates KPRC AM 1616 kHz and we broadcast whenever we can. Our broadcasts are a blend of music (mostly rock) and talk. We always bring up topics of concern and invite our listeners to call in (we have a phone number available) and express their viewpoints. The mailing address for written replies is P.O. Box 747, Exeter, NH 03833.



"KPRC broadcasts from the heart of New York City and we feel Free Radio or pirate radio must have a purpose other than just playing music; the risks are just too great! Our broadcasts are geared toward involving our listeners in the timely topics of today. Our programming is dedicated to several purposes, including: Peace throughout the world, non-violence, a nuclear freeze, the elimination of dangerous nuclear power, and other ways to promote economic health than arming ourselves to the teeth, i.e. space exploration. In closing, may I say that pirate radio seems to be growing into a truly needed alternative voice and your column in *POP'COMM* is a welcomed addition to the Free Radio effort."

Well, thanks for the information and for the kudos there, Pirate Joe. I'm sure that you will have a lot more listeners tuning in to you now. It's always nice to receive compliments from readers and I must admit that I've received quite a few in the last months from readers too numerous to mention.

A few lines stolen for myself, if I may. Can anyone help me find a replacement transformer (high voltage) for a Johnson Viking II transmitter. It should be 660 volts at about 350 ma. I am also interested in anyone who has hard rock or heavy metal music to sell or trade. It should be preferably from a local group in your area, but I'm open to almost anything. Please contact me at the APO address listed earlier in this column.

LISTENING POST

BY GERRY L. DEXTER

WHAT'S HAPPENING: INTERNATIONAL SHORTWAVE BROADCASTING BANDS

Welcome to the world of shortwave broadcast listening and DXing. It's good to have you in The Listening Post again!

There has been some interesting activity recently involving both new and old shortwave broadcast stations.

Shortwave's newest country, Saipan in the Marianas Islands, came on the air in mid-December. The station is operated by MARCOM of California and beams rock 'n' roll to Japan 24 hours a day. The call letters are KYOI. "YOI" is supposedly a Japanese word which, loosely translated, means "good." KYOI uses a variety of slogans and station identifications including "You've found music radio, rock 'n' roll 24 hours a day from the USA," "All hits music radio 24 hours a day," "Super Rock, yoi, KYOI Saipan," and others. Programs are produced in California.

The current KYOI schedule is 1500 to 2200 on 9670, 2200 to 0100 on 15415, 0100 to 0700 on 15190, 0700 to 1500 on 11.900. Like all shortwave station schedules though, it's subject to change at any time. Reception reports on KYOI can be sent to P. O. Box 795, Saipan, CM 96950. A 20 cent U.S. stamp enclosed with your report would be appreciated.

In South America, the military coup in Surinam has affected that country's broadcasting. According to Radio Netherland's Media Network program, employees of the government station, SRS (Stichting Radio Omroep Suriname) went out on strike in protest against the military takeover of the government. With the regular station staff sitting at home, the government sent in the military to take over operation of the station. Some reports say that some rather odd Station identification announcements have been heard over SRS since, including "Radio Venceremos"—which is the name of the anti-El Salvador government clandestine. Apparently too, the new workers at SRS are going through the reception reports file and re-verifying all the old reports received over the past years, although I haven't found one in my mailbox, at least not yet. New verification signers at SRS are Naidy Tajib and Baiwa Sampat.

Several private, medium wave stations in Surinam have been burned down and the other shortwave station, Radio Apinte, which operated on 5.005 or, at times, 4.995, has been put off the air.

Deutsche Welle, The Voice of Germany, had something of a shock when the government of Malta ordered the closedown of the DW relay station there, taking several other program services from other producers and groups off as well. The flap was over interpretation of the Malta government's "Foreign Interference Act." The Malta House of

Robert Brossell of Pewaukee, Wisconsin with his NRD-505 receiver.

Representatives eventually passed an amendment to the act which allowed the transmitting facility to resume operations after about a month of silence.

A brand new station has come on the air from Colombia—Emisora Armonias del Caqueta at Florencia in Caqueta state. The station is a religious/cultural operation and officially began broadcasting on November 23, 1982. The call letters HJVK are apparently used for both medium and shortwave. The station's shortwave outlet operates with 3,000 watts on 4.915 and has been widely heard in the United States. Reception reports can be addressed to Emisora Armonias del Caqueta, Florencia, Caqueta, Colombia.

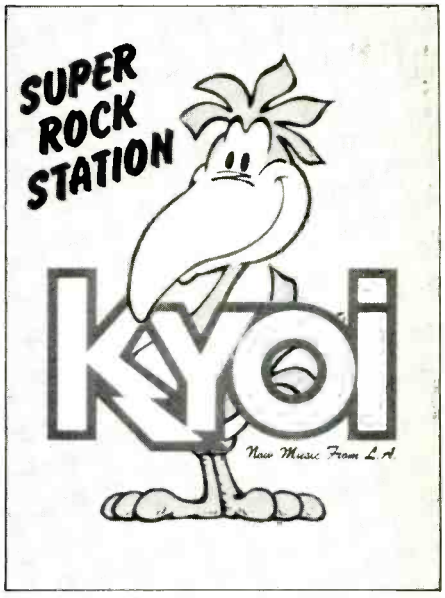
Now, let's pause for a moment of silence to mourn the passing of the shortwave service of the Voice of the Maldives. The station closed its shortwave service last year in what most DXers assumed to be a temporary move as part of the station's overall modernization and improvement plans, especially the expansion of medium wave and move of studios. Apparently, it was just wishful thinking. In a letter to John Moritz Jr. in Ohio, a station spokesman said that adequate service was being provided by the medium wave network and that the shortwave transmitter would remain off the air. For most of us, the Maldive Islands represent another potential good DX catch that just got away.

The Mailbag

Mike Martin of Monroe, Iowa checks in to say he'd like to see something on the subject of writing reception reports. Well, that's on our list of "things to do," Mike, so watch for it in a future issue.

Gary Hickerson of Ft. Smith, Arkansas wants to know what sort of equipment we employ in The Listening Post. There are two receivers in use, Gary—an NRD 515 with 24 channel memory and a Drake R4B. Three longwire antennas of various lengths are in use. Gary notes that he's been a short-

Gary Hickerson does his listening from this post in Ft. Smith, Arkansas.



A QSL from KYOI, the 24 hour super station beaming rock 'n' roll to Japan.

wave listener since 1977 and uses a Yaesu FRG-7 with an RAK-3 double dipole and 225 foot longwire antenna with a Gilfer Q-5 antenna tuner and Mizuho SX-59 preselector. Gary has logged 122 countries.

It won't hurt to point out again that Radio "Peking" has changed the spelling of its name to "Beijing," notes Larry Rempala of Lisle, Illinois. Keep the spelling change in mind when writing to the station.

Michael Miller of Kelso, Washington uses a Radio Shack DX-200 with a couple of different antennas. Mike has bagged 69 countries to date and is especially interested in the Pacific Ocean stations. Good to hear from you, Mike, and thanks for the interesting suggestion for an article—it will be explored.

Radio SRS in Surinam is now under military government control after a coup.

Gary Dobis has been an SWL for some 20 years and is a Chief Petty Officer in the U.S. Navy, based at Orlando, Florida.

William P. Muzyka notes that low-power station hunters may want to try HCJB's 100 watt outlet on 26.020 from Quito, Ecuador. He hears it best from 1200 to 1530, although it's on the air 24 hours a day.

Kevin Culbertson of Spokane, Washington has tallied 92 countries heard and 70 verified and uses a Yaesu FRG-7700. Kevin's a ham, too, with call letters WA7ZNB.

Robert Brossell of Pewaukee, Wisconsin runs an NRD505 receiver with a 50 foot antenna. He's been a DXer for 20 years and has 109 countries heard with 102 verified.

Good to hear from all of you! Remember, we're interested in your loggings, station schedules, pictures of you in your shack and good, high contrast copies of your more interesting QSLs for inclusion in The Listening Post. So, let's hear from you next month!

Time to flip on the receiver and see what's on. Remember, all times are GMT. And keep in mind the changeability of shortwave station schedules as well as propagation effects, which can leave a channel empty one day where a signal existed the day before.

Albania Radio Tirana was noted in English at 0350 on 6.200 by Dementiuk, VA. Heard at 0431 in English on 7.280 by Miller in Washington, and on 9.800 with strong signals at 0200 by Rempala, Illinois.

Antarctica Radio Nacional Archangel San Gabriel from Argentine Antarctica noted on variable 15.474 from 2300 to 0030. (Hickerson, AK)

Argentina Radiodifusion Argentina al Exterior (RAE) on 9.690 in English from 0235 to 0300 with news and cultural notes. Into Spanish at 0300. (MacKenzie, CA)

Austria Austrian Radio is scheduled to North America from 0100 to 0157 on 5.945 and 9.770 and from 1200 to 1257 on 21.615. (Fraser in SPEEDX). The Austrian Radio now has its new curtain antenna system in use. (Editor)

Australia Radio Australia with English programming at 0833 on 9.760 (Dementiuk, VA)

Bangladesh The Overseas Service schedule for Radio Bangladesh has Arabic from 1645 to 1715, and Bengali from 1715 to 1815 on 7.280 and 9.540. English is scheduled from 1230 to 1300 on 15.280 and 17.800 and also from 1815 to 1900 and 1900 to 1915 (slows speed transmission) on 7.280 and 9.540. It is heard in Hindi from 1600 to 1630 on 9.540 and 11.765, Nepali from 1315 to 1345 on 7.200 and 9.620, and in Urdu from 1400 to 1500 on 11.945 and 15.510. (WRTH Newsletter via DSWCI)

Belgium BRT Radio heard in English at 0105 on 15.474. (Dementiuk, VA)

Brazil Radio Nacional do Brasil (Radio-Bras), heard with a very strong signal in English at 0220 on 15.290. (Dementiuk, VA) The Radio Nacional Amazonia service noted in Portuguese from Brasilia on 15.445 at 0002, good signal reported by Miller, Washington, who notes "watch for their soccer games!"

Bulgaria Radio Sofia in English on 15.740 at 0054 and on 9.770 at 0033. (Dementiuk, VA)

Canada The CBC Northern Service was caught with an English program at 0432 on 6.195. (Miller, WA)

China Radio Beijing's current schedule to North America runs from 0000 to 0059 on 17.870, 15.240, 15.100, 11.790, and 9.685; from 0300 to 0359 on the same frequencies, except that 9.685 is replaced by 9.710. There is a DX program in the Wednesday night transmission. (Dobis, FL) Noted with English to North America at 0025 on 15.120 and at 0028 on 15.520. (Dementiuk, VA)

Clandestine Radio Quince de Septiembre (anti-Nicaraguan government) heard in Spanish with occasional English as well at 0339 on 5.500. (Miller, WA)

Colombia Radio Super in Cali noted in Spanish at 0513 on 6.120. (Miller, WA) There are two other stations in the "Super Network" on shortwave—Radio Super de Medellin on 4.875 and Radio Super de Bogota on 6.065. (Editor) Radio Sutatenza from Bogota in Spanish at 0150 on 5.095. (Miller, WA) On 6.115 La Voz del Llano heard at 0413 in Spanish. (Miller, WA) This station is in Villavicencio. (Editor) La Voz de Huila on 6.150 heard at 0415 in Spanish. (Miller, WA)

Costa Rica Radio Reloj de Costa Rica on 4.832 in Spanish with music and some Bible broadcasts. (Miller, WA)

Denmark Radio Denmark heard at 1730 on 15.165. (Rempala, IL)

The QSL card from the new Colombian station Emisora Armonias del Caqueta in Florencia.

East Germany Radio Berlin International in English to North America noted at 0250 on 11.990. (Miller, WA)

Egypt Radio Cairo with English in its North American Service on 12.000 at 0240. (Miller, WA)

Greece Radio Station Macedonia at Thessiloniki observed in Greek at 1835 on 9.900 with classical music to past 1940. (MacKenzie, CA)

Italy RAI, Rome heard with an English newscast at 0103 on 9.575 and 11.800. (Dementiuk, VA)

Iran Voice of the Islamic Republic of Iran heard in Farsi—martial music and chanting crowds at 1635 on 15.074. (Miller, WA)

Israel Here is the latest schedule for Kol Israel: 0500 to 0515 on 17.630, 11.637, 11.610, 9.815, and 9.420; from 1200 to 1230 on 21.760, 21.625, 21.495, 17.630, and 15.585; from 2000 to 2030 on 13.745, 11.637, 9.815, and 9.420; 2230 to 2300 on 15.585, 13.745, 11.655, and 9.815; and 0000 to 0030, 0100 to 0130, and 0200 to 0230 on 11.655, 9.815, and 7.410. (Nadav, NY) Heard with news in English from Jerusalem at 2000 on 15.584. (Miller, WA)

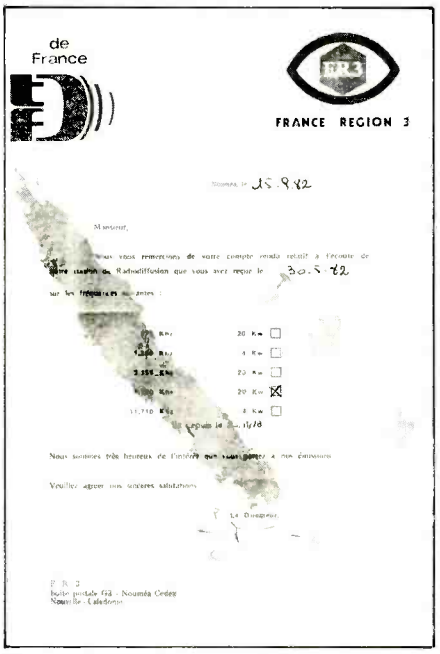
Kenya The Voice of Kenya heard at 0530 on 4.915 (Hickerson, AK)

Kuwait Radio Kuwait's English service noted with a weak signal on 15.490 from 0530 tune in. (Rempala, IL)

Lebanon Radio Lebanon's English service is scheduled to Africa from 1830 to 1900 on 11.705 and to North America from 0230 to 0300 on 11.780. (WRTH Newsletter via SCDX)

Libya Radio Jamahiriyah was heard on 11.850 in English from 2234 to 2337. (Roman Dementiuk, VA)

This attractive card from Radio Belize in Central America belongs to Kevin Culbertson of Spokane, Washington.



Robert Brossell's nice QSL from France Region 3—Radio Noumea in New Caledonia heard on their 7.170 frequency.

Madagascar Radio Netherlands Relay Station was heard with the Happy Station Program at 2030 to 2130 sign off on 15.220. (MacKenzie, CA)

Malaysia Radio Malaysia at Kuala Lumpur heard in Malay at 1333 on 4.850. The Kuching, Sarawak outlet of Radio Malaysia was heard on 4.950 at 1445. (Miller, WA)

Monaco Trans World Radio Monaco noted at 0725 on 4.995. (Dementiuk, VA)

Morocco Radiodiffusion Television Morocaine from Rabat with all Arabic programming on 15.335 from 0020 to 0100 sign off. Identifies as "Huna Rabat." (Brossell, WI)

New Caledonia Radio Noumea has dropped its Saturday English broadcast at 1100 on 3.355 and 7.170. Sign off time extended to 1300. (Cushen, via WDXC)

Netherlands Antilles Radio Netherlands Relay from Bonaire was heard on 21.685 from 2030 to 2130 sign off with the "Happy Station Show." (MacKenzie, CA)

Nicaragua The Voice of Nicaragua on 5.955 noted with Latin music and propaganda at 0545. (Miller, WA) Heard with an English broadcast on this frequency at 0215. (Dementiuk, VA) Noted from 0500 to 0600 sign off with Spanish programs and news in English on the hour and half hour. The station is requesting reception reports to P. O. Box 248 in Managua. (Martin, IA)

Nigeria The Voice of Nigeria heard at 0457 with station identification and African music on 7.255. (Miller, WA) Heard in English at 0532 on 17.795. (Dementiuk, VA)

Norway Radio Norway noted at 2000 in English on 11.870 and at 1659 in English on 25.730. (Dementiuk, VA) Probably just the station identification was in English, unless you heard the Sunday program. (Editor)

Oman Radio Oman runs from 0130 to 0600 on 9.510, from 1800 to 2100 also on 9.510, on 9.735 from 0600 to 1500, from 1500 to 1800 on 9.655, and 0130 to 2200 on 11.890. (Warner, WDXC)

Paraguay Radio Nacional de Paraguay heard at excellent level at 0005 on 11.915. (Miller, WA) Noted recently at The Listening Post on 9.735 as well. (Editor)

Poland Radio Polonia's English schedule is from 0630 to 0700 on 9.675, 7.270, and 6.135; from 1200 to 1225 and 1400 to 1430 on 7.285 and 6.095; from 1600 to 1630 and 1730 to 1800 on 9.540 and 6.135; 1830 to 1855 on 7.285, 6.135, 5.995, and 3.955; from 2030 to 2055 on 7.285 and 6.095; from 2230 to 2300 on 7.270, 7.125, 6.135, and 5.995. (Oliver, WDXC) Radio Polonia heard in English at 0207 on 15.110. (Miller, WA)

Portugal Radio Portugal is scheduled for English broadcasts from 1600 to 1630, except Sundays, on 2.1685; Sundays from 1700 to 1730 on 17.880. Mondays through Fridays, it can be heard from 1800 to 1830 on 15.245, 21.530; from 2030 to 2100 on 6.025, 9.605, and 11.775; from 0300 to 0330 on 9.520 and 11.925; and from 0530 to 0600 on 6.075 and 9.520. (WRTH Newsletter via DSWCI)

Qatar The Qatar Broadcasting Service was noted on 15.505 at 2100 GMT. (Hickerson, AK)

Seychelles The Far East Broadcasting Association (FEBA) was logged on 15.300 at 1743 GMT with an interval signal tune "What A Friend We Have in Jesus," followed by religious programming. (Miller, WA)

Sierra Leone The Sierra Leone Broadcasting Service heard on 5.980 from 0640 with English announcements and advertisements, national news at 0700, and local dialects after each English segment. Good signal but bothered by the Voice of Free China on 5.985, via Florida. (Brossell, WI)

Solomon Islands 5.020 is one frequency used by the Solomon Islands Broadcasting Commission. Noted at 0734 in English featuring Pidgin English, as well as country-

western tunes. Noted also at 0704 on 9.550 with an excellent signal. (Miller, WA)

South Africa Radio RSA heard with news in English at 0208 on 11.730. (Dementiuk, VA)

South Korea This schedule for Radio Korea was recently monitored off the air: To Europe at 0530 on 11.820 and 15.575, at 1900 on 9.780, and 2130 on 15.575. To North America at 0200 and 0530 on 11.810, at 1000 and 1300 on 9.570. To the Middle East at 1130 on 15.575 and 1500 on 7.550. The General Service runs at 0200 on 15.575, 0400 on 9.640, 1300 on 6.135, 2130 on 15.350, and 0000 on 7.275. (Sill, MD) Heard on 11.795 at 0600 to 0630 in English. (Rempala, IL)

Surinam Stichting Radio Omroep Suriname (SRS) heard at 0400 on 4.850. (Hickerson, AK)

Sweden Radio Sweden heard best on 21.615 daily from 1400 to 1430 with moderate strength but with no interference. (Dimick, Washington, DC)

Swaziland Trans World Radio's Swaziland station found on 4.790 at 0255 with identification preceeding the actual sign on at 0300. (Hickerson, AK)

Tahiti Radio Tahiti noted with continuous songs from 0502 tune in on 15.170. (Dementiuk VA) Excellent level on this frequency at 0507 with mostly music programs. (Miller, WA)

Taiwan The Voice of Free China, relayed by WYFR, Florida, in English at 0410 on 5.980. (Dementiuk, VA)

Turkey Radio Ankara was heard on 15.220 at 1614 in Turkish with a fairly good signal. (Miller, WA)

Uganda Radio Uganda's external service to North America runs from 0300 to 0425 on 15.325. (WRTH Newsletter via SCDX)

United Arab Emirates UAE Radio heard in English on 11.950 at 0333. (Dementiuk, VA) Radio Color TV Dubai noted on 15.320 at 1701 in Arabic. (Miller, WA)

United States United Nations Radio, via Voice of America facilities heard with identification in English, then news in Portuguese, Arabic, and French from 1836—tune in on 15.120. (Dementiuk, VA) Armed Forces Radio & TV Service was heard in English at 1930 on 15.330 over VOA transmitters. (Dementiuk, VA)

USSR Radio Yerevan, via Radio Moscow's transmitter at Khabarovsk, heard in English at 0353 to 0400 sign off on 15.100. (Mackenzie, CA) Time station RWM noted with identification in morse code at 0740 on 10.000. (Dementiuk, VA)

Vatican State Vatican Radio noted from 0058 on 6.015 with interval signal, woman announcer at sign on, followed by man with commentary. (Mackenzie, CA)

Venezuela Radio Rumbos in Caracas with programs in Spanish on 9.660 at 0904. (Dementiuk, VA) At 0900 in Spanish on both 9.660 and 4.970. (Martin, IA) Time station on 6.100 at 0233, time announcements in Spanish each minute. (Miller, WA) This is YVTO from Caracas. (Editor)

West Germany Radio Free Europe, possibly in Bulgarian at 1744 on 21.875, and Radio Liberty on 21.540 at 1800 in Russian. (Dementiuk, VA)

Deutsche Welle, The Voice of Germany, is scheduled in English to North America from 0100 to 0150 on 6.040, 6.085, 6.145, 9.545, 9.565, 9.640, 11.785, and 11.865; and again from 0500 to 0550 on 5.960, 6.185, 9.545, 9.690, and 11.705. (Bach, CA)

Yemen Arab Republic Radio San'a heard with excellent signals on 9.780 from 2035 to 2100 sign off with singing and talking in Arabic. "Min San'a" (from San'a) was mentioned several times. (Brossell, WI)

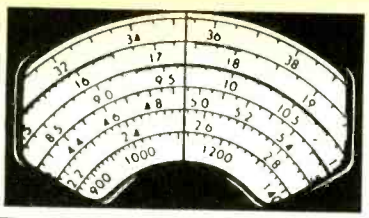
Zimbabwe Zimbabwe Broadcasting Corporation heard at 0410 on 3.396. (Hickerson, AK)

With thanks to: Larry Rempala, Lisle, Illinois; Gary Hickerson, Ft. Smith, Arkansas; Stewart MacKenzie, Huntington Beach, California; SPEEDX, Lake Elsinore, California; Roman Dementiuk, Newport News, Virginia; Danish Shortwave Club International, Greve Strand, Denmark; Michael J. Miller, Kelso, Washington; Gary Dobis, Orlando, Florida; Amnon Nadav, Bayside, New York; Sweden Calling DXers, Radio Sweden, Stockholm; Robert Brossell, Pewaukee, Wisconsin; World DX Club, Northampton, England; Mike Martin, Monroe, Iowa; John A. Sill, Swampscott, Maryland; Dennis Dimick, Washington, D.C.; E. A. Bach, Palm Desert, California.

All of your reports are appreciated. We look forward to hearing from you again as well as from those of you who haven't yet done so. You'll help others if you include some details about the programming you've noted. And don't forget to include things like the frequency!

As we mentioned earlier, photos of you and your listening post are welcome for inclusion in future columns. Be sure to add a note describing the equipment line-up, too.

That does it for this time. Good listening!



COMMUNICATIONS CONFIDENTIAL

BY HARRY HELMS, KR2H

YOUR GUIDE TO SHORTWAVE "UTILITY" STATIONS

As the late Jack Webb used to say, the following story is true. Only the names have been changed to protect the innocent.

I once worked in the technical publications department of a major electronics company. It so happened that the technical publications department was located on the same floor as the product evaluation lab. This was convenient, since I had to refer to the actual product often when writing a manual for it. I also frequently spoke with the various engineers when I had a question regarding a product.

One day, the person responsible for keeping track of the items being evaluated asked me if I had seen one of the tiny FM wireless microphones being tested. Five units had been submitted for evaluation, but only four could be found.

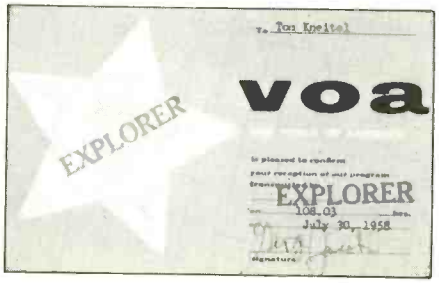
The solution to the mystery of the missing FM mike was told to me confidentially by one of the engineers working in the evaluation lab. The engineers had discovered the FM mike could be tuned to transmit as low as 85 MHz, and that some of the FM radios in the lab could tune as low as 86 MHz.

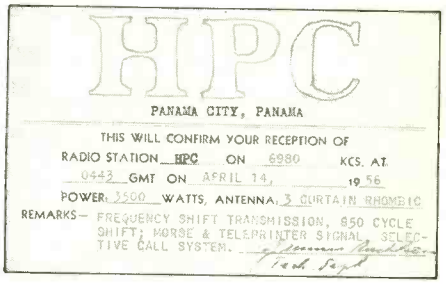
The boss of the evaluation lab was not very popular with the engineering staff. And—yes, you guessed it—the FM wireless mike was hidden away in the boss's office and the engineers were merrily listening in on him. Over the next several weeks, this particular boss went slowly crazy as all the things he said in "private" quickly became public knowledge.

This little story points out a very interesting fact: there is a great deal of eavesdropping activity taking place in or near the FM broadcast band. (The bug the Watergate burglars were trying to install operated on the FM broadcast band!) As you might guess, the popularity of FM for eavesdropping stems more from the availability of suitable equipment rather than technical factors.

Now *POP'COMM* isn't advocating that you make use of FM wireless mikes for eavesdropping. However, it is challenging (and perhaps prudent) to try to hear such devices. The most obvious spots for such devices are empty spots on your local FM dial and the frequencies immediately above and below the limits of the FM broadcast band. Reception range will almost always be quite short (usually less than 100 feet). Thus, if you detect a "bug," chances are that it is very near you.

If you are in a "sensitive" position at your job, or others (such as a maid, etc.) have access to your living quarters, it might be a good idea to check for the presence of FM wireless bugs from time to time. A portable FM radio will do nicely. If there is an FM mike planted, you'll hear a squeal when you tune across its frequency (this squeal is called *feedback*). Most FM mikes used for unauthorized eavesdropping are placed in very mundane locations. A favorite hiding place is under a desk or table, usually taped in place. Another common place is behind paintings or pictures.





One reader (who asks that we not use his name) has sent along a list of U.S. Navy stations that operate on CW with broadcasts and messages in CW. Sending speeds range from 5 to 30 wpm, and sometimes there will be encoded traffic directed toward U.S. Navy ships. The stations, frequencies, and times of operation are as follows:

Stations	Frequency	Time (GMT)
NAM, Norfolk, VA	8090	Continuously
	12135	Continuously
	16180	Continuously
	20225	1200-0000
NAR, Key West, FL	5870	Continuously
	25590	Continuously
GHX, Thurso, England	7504.5	Continuously
	12691	0800-1900
	3724	1900-0800
NRK, Keflavik, Iceland	5167	1900-0800
AOK, Rota, Spain	5917.5	Continuously
	7705	Continuously
NGR, Nea Marki, Greece	4623	Continuously
	13372.5	0800-1900
NPN, Guam	8150	Continuously
NPO, Subic Bay, Philippines	4445	Continously

Listening Reports

Here are this month's listening reports. Your support of this column has been gratifying—many thanks and keep those reports coming! If you haven't yet shared your catches with your fellow *POP'COMM* read-

ers, why not do so now? Describe what you heard in as much detail as possible, using the format we use in this column, and remember that all times are GMT (that's Eastern time plus five hours). And be sure to print your name and location on each page; this way we can give you credit for your reports. Send your reports to: Harry L. Helms, P. O. Box 157, Rockefeller Center Station, New York, NY 10185.

Several reports this month have been contributed by members of the American Shortwave Listeners Club (ASWLC). If you are seriously interested in the topics covered in this column, you should consider joining ASWLC. You can get a sample copy of their bulletin by sending $1 to ASWLC, 16182 Ballad Lane, Huntington Beach, CA, 92649. Now, to this month's loggings.

2050: Japanese language traffic net in SSB around 0830; possibly ship to ship. (Spence Naylor, CA/ASWLC)

3240: Five-digit Spanish "numbers" station with female announcer 0500. (Thad Adamaszek, OH/ASWLC)

3450: Five-digit Spanish "numbers" station with female announcer 0109. (Thad Adamaszek, OH/ASWLC)

4044: Five-digit Spanish "numbers" station with female announcer 0100. (Lani Pettit, IA and Spence Naylor, CA/ASWLC)

4125: This is an active frequency for ship to shore activity. Among the stations heard here recently in SSB are KGW, Galliano Base, LA, and WFE, Houston, TX. (Brent Levit, TX/ASWLC)

4281: "Seven Yankee" asking other stations to go to "Tango Tango," in SSB at 0603. I have deduced that "Tango Tango" is a reference to RTTY, since sometimes RTTY follows when this code is given. (Dan Mulford, IN)

4333: FUX, Le Port Reunion, V marker in CW sometime around 0140. (Glenn Thompson, NM/ASWLC)

4427: Man reading list of numerous call signs, advising stations to stand by, in SSB at 0633. (Dan Mulford, IN)

4413: Slow CW followed by man reading coded message in SSB 0639. (Dan Mulford, IN) Three excellent loggings, Dan: I suspect all are military operations. (Editor)

5135: Five-digit Spanish numbers station with woman's voice 0028. (Thad Adamaszek, OH/ASWLC)

5400: GZU, Royal Navy, Portsmouth, England, "DE GZU" CW marker 0330. (Spence Naylor, CA/ASWLC)

5810: This frequency has been used by NASA for SSB communications during rocket launches at Cape Canaveral, 0950 with call signs "501" and "Peapod 01." (Spence Naylor, CA/ASWLC)

6218.6: This is a frequency that hums with activity from ship to shore during the evening. Among those heard—KBL, Edmonds, WA; KDL, Houston, TX; KHT, Cedar Rapids, IA; KPL, Seattle, WA; WRN, Jackson, MS; KXQ70, Homer, AK; WXZ293, San Diego, CA; KUZ452, Astoria, OR; KWS666, Port Hueneme, CA; KVY752, Newport, CA; and WQA877, Tacoma, WA. (Spence Naylor, CA/ASWLC)

6428.5: VHP3, Canberra, Australia, V marker in CW 1215. (Glenn Thompson, NM/ASWLC)

6440.9: DZG, Manila, Philippines, CQ marker in CW 1210. (Glenn Thompson, NM/ASWLC)

6491.5: TAH, Istanbul, Turkey, CW traffic at 0258. (Spence Naylor, CA/ASWLC)

6560: "WL" beacon in CW repeating continuously 1347. (Spence Naylor, CA/ASWLC)

6575: Five-digit Spanish language "numbers" station using woman's voice 0400. (Thad Adamaszek, OH/ASWLC)

6723: "One Uniform November" working "Four Uniform Romeo" in SSB around 1400, probably military. (Dan Mulford, IN)

6727: Strategic Air Command (SAC) coded message, five digit groups of letters and numbers, to bombers aloft at 0500 in SSB. (Lester Robison, NV)

6762: SAC coded messages, like 6727 kHz, at 0400-0500. (Lester Robison, NV)

6840: EBC, Cadiz, Spain, CW time signals 0330 (Terry Provance, OH/ASWLC)

6844.5: Unidentified Spanish language traffic net in SSB around 0130. (Spence Naylor, CA/ASWLC)

7340: Five-digit Spanish numbers station with female announcer 0600. (Lani Pettit, IA/ASWLC)

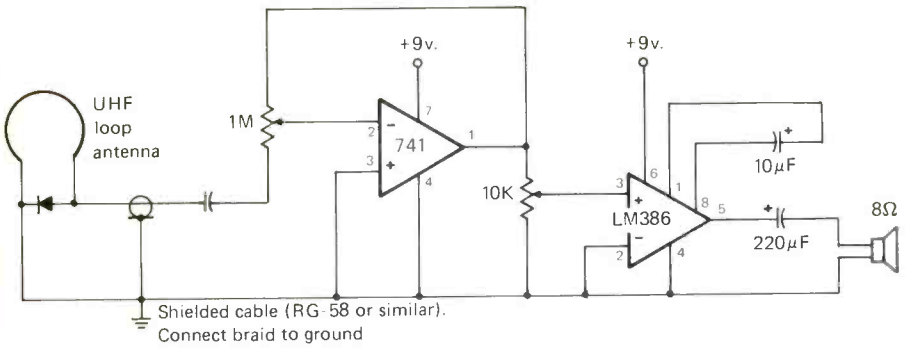
7839: "DT4" repeated continuously in CW 0200. (Stephen Haupt, LA/ASWLC)
7845: Five-digit Spanish numbers station with woman's voice noted at 0600 and 0700. (Spence Naylor, CA/ASWLC)
7918: Woman reading phonetic message, random letters (no groups) in SSB at 1440. (Spence Naylor, CA/ASWLC)
8090: NAM, U.S. Navy, Portsmouth, VA, calling other USN stations in CW 2350 (Stephen Haupt, LA/ASWLC)
8615.5: WPD, Tampa, FL, CQ marker in CW 2217. (Joe Woodllock, IL/ASWLC)
8874: Five-digit Spanish numbers station with female announcer 0500. (Lani Pettit, IA/ASWLC)
8973: "November Three Charlie" working "Alpha Four Romeo" in SSB during 0300 to 0700 period, passing coded messages. (Lester Robison, NV)
8993: "Gull 17" (a hurricane tracker) working MacDill AFB in SSB 2345. (Tom Lewandowski, NY)
9027: SAC coded message in SSB 0400. (Lester Robison, NV)
9052: Five-digit German language numbers station with female announcer 0300, followed by continuously repeating "N" beacon. (Lani Pettit, IA/ASWLC)
9072: Four-digit Spanish numbers station with female announcer 0322. (Lani Pettit, IA/ASWLC)
9370: Five-digit English language numbers station with woman's voice 0300. (Thad Adamaszek, OH/ASWLC)
9960: Modulated CW signal consisting of strings of numbers with an occasional letter (ratio of about five to one); sent about ten words per minute, extremely strong signal occupied about 10 kHz of space; 0300. (Steven Kidd, CA) Any ideas, readers? Your Editor is stumped! (Editor)
10005: Five-digit Spanish numbers station with female announcer heard at 0740 and 0800. (Mike Martin, IA)
10570: "K" repeated continuously in CW 0405. (Stewart MacKenzie, CA/ASWLC)
10780: During the last Space Shuttle mission, AFE71, Patrick AFB, was heard in SSB identifying as "Cape Radio." One station it was in contact with was "Boom Control," a ship involved in a sonic boom experiment during launch. (Tom Lewandowski, NY) Nice catch, Tom! (Editor)
11030: Four-digit English numbers station with female announcer 0603. (Lani Pettit, IA/ASWLC)
11054: Five-digit Spanish numbers station with female announcer 0409; distorted audio. (George Osier, NY)
11158: "K" repeated continuously in CW 0500. (Stewart MacKenzie, CA/ASWLC)
11220: SAC appears to be using this frequency now instead of 11243 kHz. (Tom Lewandowski, NY)
11533: This frequency has been the site of some interesting Spanish numbers station activity lately. Five-digit transmissions using a woman's voice have been noted at 1430 and 2035, sometimes with a hum in the background. At 0409, five-digit groups were read and then the female announcer counted from 1 to 9 in Spanish at 0417. Four-digit groups then began and were repeated. The transmission ended at 0424 and was followed by rapid CW. (George Osier, NY)
11545: Five-digit German language numbers station, female announcer, *in SSB*, 0147. (Harold Frodge, MI/ASWLC)
12415: Female announcer repeating "Kilo Delta Alpha Two" in SSB at 0113. (Thad Adamaszek, OH/ASWLC)
12693: URD, Leningrad, USSR, V marker in CW 0115. (Glenn Thompson, NM/ASWLC)
13054: JDC, Choshi, Japan, CQ marker in CW 0800. (Arch Dawson, CA/ASWLC)
13214: Andrews AFB working SAM1 in SSB 2000. "SAM" standards for "special air mission," frequently used for VIP travel. During this transmission, reference was made to "the President's daughter." (Lester Robison, NV) Excellent! (Editor)
15075: Four-digit Spanish numbers station with female announcer 0035. (Roger Sievers, FL)
16200: 8BB39, Jakarta, Indonesia, V CQ marker in CW 0823. (Spence Naylor, CA/ASWLC)
16902: XSC, Fangshan, China, CQ marker in CW 0045. (Glenn Thompson, NM/ASWLC)
19917: Five-digit Spanish numbers station *with male announcer* (very unusual) repeating each group twice, message ended with two three-digit groups repeated twice, then "cero" (zero) repeated five times, ending 1513. (Dan Mulford, IN)
20956: Unidentified Spanish language traffic 1824. (Spence Naylor, CA/ASWLC) Probably using amateur radio gear, since 21000 marks the beginning of the 15 meter ham band. (Editor)
22618: Spanish numbers station with male announcer in similar format to 19917 kHz at 1535, message was five groups of 30 digits! (Dan Mulford, IN)
25060: Unidentified traffic net, possibly in southwestern USA, using FM 1509. (Robert Marsh, TX/ASWLC)

That's it—see you next month!

Build The

UHF/SHF "Super Snooper"

BY HARRY L. HELMS, KR2H



Receivers capable of covering frequencies of up to several gigahertz (that's several thousand MHz!) are hard to find, especially if you're short of bucks. But it is possible to build a receiver capable of tuning such high frequencies simply and cheaply.

Even if you've never built an electronic circuit before, this project should pose no major challenge to you. The parts can be found from numerous sources, including the advertisers in magazines such as *CQ* and local Radio Shack outlets. There's no need to solder during construction, either—a solderless circuit breadboard (such as the ones available from Radio Shack, Global Specialties, etc.) will work fine. The important thing to remember is to keep all connecting wires between the various parts as short as possible. All resistors can be ¼-watt types, and tolerance is not critical. Both ICs are common varieties, the 741 and LM386. The loop antenna can be a UHF-TV antenna (the one that attaches directly to the UHF terminals on the rear of a television). For best results, experiment with several different types of diodes. Among those you should try are 1N21, 1N34, 1N54, and 1N78.

Needless to say, this simple a circuit does have its drawbacks. The major one is that there is no way for you to determine the frequency of any signals you might happen to receive. Also, it is almost completely nonselective. The most powerful signal in its receiving range will simply "capture" the receiver. However, the loop antenna is somewhat directional and will enable you to cut down on some interfering stations.

And what is there to hear above 1000 MHz? Radars of various types are the most common transmitters, along with radio direction finders, beacons, data and telemetry transmissions to and from satellites, and radio amateurs. It is also quite likely that various other transmitters unknown to the DX-ing public are also operating there. Why not try your hand at building this circuit and see? Good snooping, and be sure to report the results of your listening to Communications Confidential here in *POP'COMM!*

Can you spot the communications equipment amidst the array of hardware in this large aircraft?

The Low Down On Signals From Up High

Understanding The Lingo of Aviation Radio

BY DAVID VINE

Have you ever wondered what those cryptic radio transmissions from aircraft in flight mean? Well, read on and you'll get the inside story on aviation communications.

Without radio, we would never have progressed from the mostly-for-fun barnstorming days of early aviation. Radios are very important to today's flying, especially in controlled airspace around the bigger cities.

The cost of a deluxe "avionics" package, including a variety of advanced navigational gear and weather radar, can almost equal the price of a small single-engine aircraft, about $35,000.

Today's modern navigation (NAV) and communication (COM) radios can be found in almost all of our nations' 211,000 general aviation private planes, 3,805 airliners, and 19,000 military aircraft; from two-place Piper Cubs to giant B-747's winging 400 passengers over oceans at altitudes up to 37,000 feet, they all use basically the same kinds of radios.

Aero Radio Basics

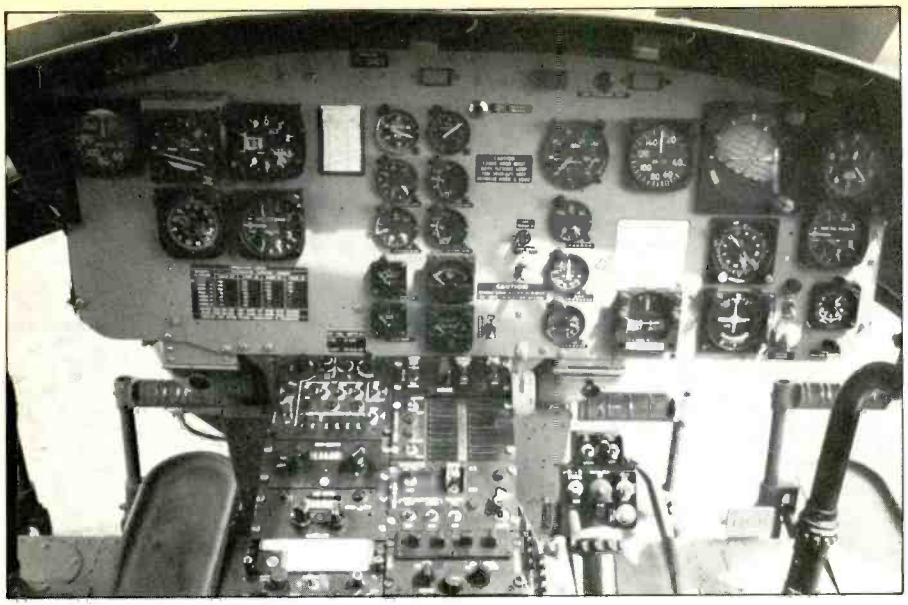
But let's begin with the basics. About 95 percent of the time, pilots talk to ground stations. They transmit AM voice signals in the 118 to 136 MHz range.

Inexpensive, tuneable radios that pick up this band can be purchased for under $25. These work if you're within ten miles of an airport or are content to receive transmissions only from aircraft flying at altitude.

More expensive crystal controlled receivers or programable scanners with outside antennas should be able to receive VHF transmissions from ground stations up to 25 miles distant.

At small airports without a control tower, pilots will voluntarily use specified aeronautical advisory frequencies, commonly referred to as unicom, to keep themselves and others flying in the local area abreast of their whereabouts in order to avoid "traffic conflicts," a euphemism for mid-air collision.

At these small airports, the businesses that sell fuel, rent and maintain airplanes, give flight instruction, and repair avionics may also give airport advisories on unicom. They'll tell pilots who are approaching the



Communications gear in this small private plane is centrally located.

High flying Cessna Citation II business jet generally cruises at altitude between 30,000 and 40,000 feet. That high, communications signals travel to the far horizon, up to 300 miles distant. Most business jets carry airborne radiotelephone gear, generally transmitting on channels in the 459.700 to 459.975 MHz range and receiving on channels from 454.675 to 454.975 MHz.

airport which way the wind is blowing and how fast (so the pilot can land into the wind) and whether there is any reported traffic in the landing pattern.

Unicom frequencies are 122.8, 122.7, and 123.0 MHz. The frequency in use at a given airport is listed beside the airport symbol on sectional charts published by the U.S. Dept. of Commerce.

Aeronautical multicom is a mobile service used to provide communications essential to activities being performed by or directed from private aircraft. Allowable transmissions can be air to air or air to ground for such purposes as agriculture, ranching, forest-fire fighting, aerial advertising, or parachute jumping.

Typical transmissions would include conversation of a coordinating nature. For instance, in air to air photography of aircraft, the pilots will coordinate via multicom. Frequencies assigned are 122.850, 122.900, and 122.925 MHz.

At busy airports, control towers have been established to provide for a "safe, orderly, and expeditious flow of traffic on and in the vicinity of the airport." Surprisingly though, only 435 of the 15,000 U.S. airports (about 5,000 of these have paved runways) have control towers.

Pilots operating into and out of "controlled fields" are required by Federal Aviation Regulations to communicate on appropriate frequencies with controllers before they can even taxi their aircraft onto a taxiway.

All towers have a ground control position where pilots can set their wind and weather information and clearance to taxi. Pilots who are on instrument flight plans usually copy their flight routing and clearance from the ground controller. The majority of ground control frequencies are 121.6, 121.7, 121.8, and 121.9 MHz.

At busier airports, there's an automatic terminal information service (ATIS). ATIS is a continuous broadcast of recorded information (changed as weather or traffic conditions warrant) to improve controller effectiveness and reduce frequency congestion.

ATIS broadcasts are superimposed on radio navigational stations located at or near the airport, in the range of 108 to 117.95 MHz. A separate "discrete" frequency may be utilized for ATIS transmissions.

Weather Information, Too

These broadcasts are easy to tune because they are continuous. They're interesting to listen to because ATIS information includes the latest cloud heights above ground level, visibility, temperature and dew point, wind direction and velocity, barometric pressure (altimeter setting) in inches of mercury, and local traffic information.

After a pilot has copied his ATIS information, gotten clearance to taxi from the ground controller, and has taxied to the active runway, he talks to the "tower" controller. This is a misleading name, since both ground and "tower" controllers are inside the glass-windowed control tower.

Holding short of the runway, the pilot switches to the appropriate tower frequency, usually in the range of 118 to 121 MHz, but possibly around 126 MHz, and gets clearance to take off, traffic permitting.

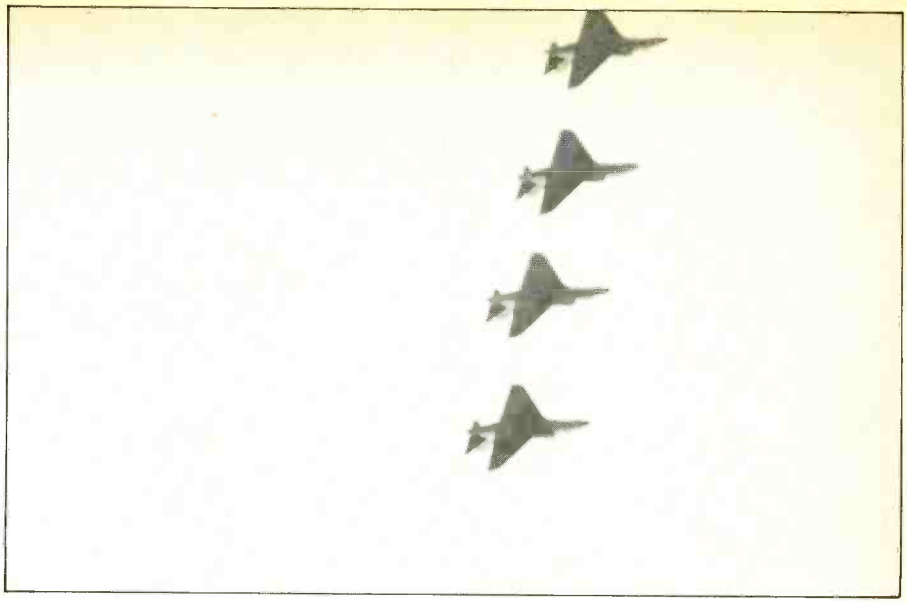
A pilot must stay tuned to the tower until he is outside the airport traffic area (ATA), which extends out for a five mile radius and up to 3,000 feet above ground level. On approach to a tower controlled airport, the pilot is required to contact the tower before entering this area.

Outside the ATA, pilots operating under visual flight rules (VFR) simply watch out for and avoid other airplanes. They don't have to communicate with anyone. Generally, pilots on VFR flights must stay 500 feet below, 1000 feet above, and 2000 feet from the sides of clouds, and they must have three miles visibility.

But what if the weather conditions are not that ideal? What is there's fog or low ceilings? Well, then it gets interesting.

Instrument Flying

To use an airplane for serious transportations purposes, pilots agree that an instrument rating is necessary. An additional 40



hours of instruction in flying an aircraft by reference to flight instruments and radio navigation aids is needed for the instrument ticket. About 260,000 of this nation's 600,000 licensed pilots have instrument ratings.

Under instrument flight rules (IFR), the FAA assumes the responsibility for separating air traffic, whether the aircraft are in clouds or low visibility. Usually, they track aircraft on air traffic control radar and separate them according to established spacing criteria.

Pilots on IFR flights must maintain continuous radio contact with the appropriate controller. The sequence, from takeoff to landing, goes like this.

The tower controller will clear the IFR flight to take off. Climbing out, the pilot is instructed to "contact departure." The pilot then switches to the assigned frequency and checks in with the departure controller who is watching a radar screen. Departure frequencies are scattered throughout the spectrum from 118 to 136 MHz.

When the radar controller identifies the aircraft, he issues directions for the pilot to fly. Radar identification is most often accomplished through the aircraft's transponder—an airborne receiver/transmitter (pulse type emissions around 1000 MHz) that is interrogated by the ground radar and transmits a preselected identifying code assigned to that flight. The departure controller will "vector" the pilot to his assigned route.

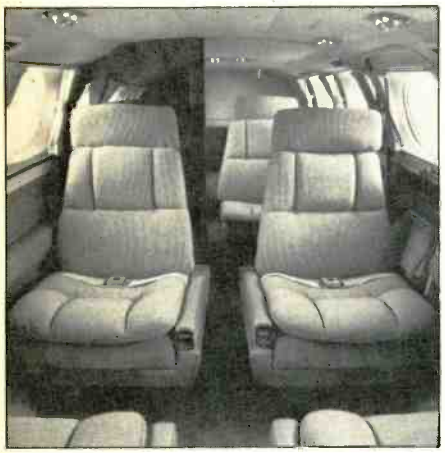
Spread throughout the U.S. is a network of about 1,000 VHF omni-directional range (VOR) stations transmitting on frequencies from 108 to 117.95 MHz. Occasionally, these signals can be received by tuning to the upper portion of the band on your car's FM radio while in the vicinity of a VOR. A VOR's range is line of sight, up to 240 miles, depending upon the transmitting power of the station and the aircraft's altitude.

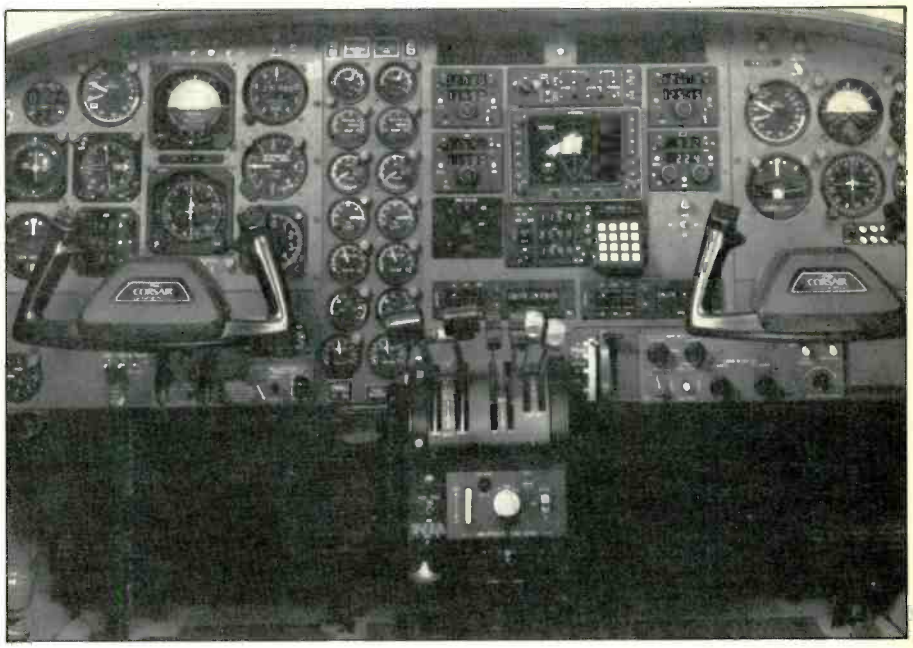
All VOR's transmit a morse code three-letter identifier corresponding to the station name. VOR's are often named for the airport or city they are located in. Some have a voice identifier, too. Increasingly, transcribed weather broadcasts for the region are superimposed on the VOR's identifier making them interesting reception targets for the aviation band listener.

During the flight, pilots will move through various sectors of the air traffic control system. As they do so, they will change NAV frequencies for the VOR stations on the route and COM frequencies, appropriate to the sector. Usually, they will keep the same transponder code throughout the flight.

Radio transmissions during this enroute period are usually very brief and might consist of something like "New York Center, this is Cessna 123 with you, level at 12,000 feet" when a pilot contacts a new sector controller on a frequency assigned by the previous controller. Since these transmissions are made from aircraft flying at high altitudes, they will be the ones most likely received by the casual aviation band listener.

Basic NAV/COM package carried aboard many general aviation aircraft consists of two 360 channel (720 with newer 25 kHz spacing) communications radios, and two VOR receivers. One VOR receiver usually includes additional equipment to display ILS signals. An LF automatic direction finder, ATC radar beacon transponser, and audio switching panel rounds out the basic package. More sophisticated twin-engine aircraft also carry advanced navigation gear coupled to an autopilot system and airborne color weather radar. (Photos courtesy of Cessna Aircraft Co.)





The Landing Approach

When the pilot begins to approach the destination airport, he will listen for the ATIS and then will be instructed to contact approach control. This controller vectors the pilot onto the landing approach. This is an instrument landing system (ILS) or other radio navigational facility that the approach is based on.

ILS's transmit only a morse code identifier on frequencies from 108.10 to 111.95 MHz. The instrument approach can be based on a VOR or a non-directional radio beacon, too. The beacons operate in the low frequency range from 190 to 535 kHz and have a three-letter morse code identifier. Occasionally, transcribed weather broadcasts are made over a beacon.

The ability to receive a variety of interesting aeronautical transmissions is largely dependent upon the size of the local airport. Commonly used frequencies can range from just one at a small, non-tower field to dozens of frequencies at a hub airport in cities like New York, Chicago, and Los Angeles. Even medium-sized airports in cities of say, 75,000 population, should have at least a few frequencies.

Serious listeners can purchase the same charts that pilots use. For about $2.50, the sectional chart for VFR flying provides hundreds of items of information, including frequencies for most navaids, towers, and unicom. A series of 37 sectional charts cover the entire continental U.S.

A very thorough publication that explains basic flight information and air traffic control procedures is the 270 page *Airman's Information Manual*. This FAA publication explains all the technical and operational aspects of radio communication and navigation. AIM costs about $5.

Both publications can usually be purchased from the local FBO. Occasionally, FBO's dispose of outdated charts that are still good for determining frequencies.

A call to the local FAA Flight Service Station or airport control tower (listed in the telephone book under U.S. Government—Federal Aviation Administration) will net a few local frequencies that are commonly used. You might even pay them a visit. During off-peak hours, they are usually happy to show you around the explain their duties, especially at the smaller facilities.

While many aeronautical radio transmissions are brief, the avid listener who monitors specific frequencies will be rewarded.

If you have a scanner, you may want to guard 121.5 MHz, the aviation distress frequency, where occasional drama will surface in the form of a lost pilot seeking help from a ground station. Yes, there is some drama on this band and the dedicated listener will find quite a bit of useful weather information, too.

The *Air-Scan Directory of VHF Aero Band (108 to 136 MHz) Stations, 3rd ed.* for aeronautical radio frequencies, published by CRB Research, Box 56, Commack, NY 11725, covers frequencies in the U.S. and Canada. The price is $7.95.

David Vine is a certified flight instructor and president of Aviation Marketing Communications, an advertising and public relations agency specializing in aviation and computer clientele. This Wilmington, DE based writer has written articles for many aviation publications and is a former general class amateur radio operator.

WASHINGTON PULSE

FCC ACTIONS AFFECTING COMMUNICATIONS

FCC Moves To Consider Personal Radio Communications Service Proposal

General Electric Company praised the FCC for issuing a (January) Notice of Proposed Rulemaking (NPRM) to implement a new personal radio communications service operating within the 900 MHz frequency band. The action was in response to General Electric's May 1982 Petition to Expedite Rulemaking Proceedings on its proposed Personal Radio Communications Service (PRCS).

The NPRM proposes rules and regulations under which the PRCS would operate after final FCC approval. A public comment period will begin and GE expects it will last approximately 90-120 days. GE expressed the hope that the FCC will issue its final Report and Order on the proposed PRCS several months following the close of the comment period.

"The FCC has recognized with the issuance on this NPRM that the mobile communications needs of the American driving public are not being and will not be met with current services," commented John M. Trani, general manager of GE's Audio Electronics Products Department. "We are convinced that PRCS will meet the needs of motorists seeking affordable, quality mobile communications," Trani said.

The FCC's proposal for PRCS is specifically designed to augment the limited communications capabilities that currently exist for consumers to make mobile and car to home communications. "Our consumer research has shown clearly that consumers frequently need to communicate while on the move. Too often that need goes unmet," Trani stated. "We feel that the PRCS is the answer for many drivers."

The PRCS system proposed by GE will consist of a "base" station connected to the telephone network and one or more "mobile" units that can be installed by consumers in their motor vehicles. Each PRCS unit will have a unique identification number for security and privacy.

The PRCS system offers a communication feature not generally available to the consumer today—automatic interconnection to the public telephone network through the home base station. This will allow mobile consumers, within the system's range, to place calls to any telephone or to be reached while in the car from any telephone.

The FCC NPRM proposes to set aside eight MHz of frequency spectrum in the 900 MHz band. General Electric had originally requested a total of nine MHz, divided into two 4.5 MHz bands separated by 45 MHz.

"We are confident that the frequencies proposed by the FCC, although not all that we originally proposed, are sufficient to provide the necessary channels of communication to operate a Personal Radio Communications Service," Trani said. The FCC allocation would permit 133 channels of 30 kHz for PRCS communications.

The expected range of the base station with roof- or window-mounted antenna communicating with a mobile station would be up to five miles. That range, however, can be extended to approximately 15 miles by the use of a strategically located repeater station. As proposed by the FCC in the NPRM, the repeater stations may be licensed to anyone meeting minimal licensing requirements and will provide service to millions of PRCS users. Consumers would incur a nominal monthly service charge to access the repeater. The repeater stations would not be interconnected.

"PRCS is an important step toward meeting consumer demand for quality, affordable, private mobile communication, augmenting CB, general mobile radio services, and cellular mobile radio systems," Trani remarked. "We intend to make mobile communications for Americans a reality once the FCC issues its Report and Order."

Station Takes License With Call Letters

Officials at WTCO-FM, a struggling station in the Chicago suburb of Arlington Heights, Illinois, said they have what they need to boost the outlet's popularity: SEX.

With a go-ahead from the Federal Communications Commission, executives changed their call letters to WSEX-FM—a transformation in name only, they promise.

"We're not going to do anything blue, off-color, or suggestive," said Chuck Mitchell, general manager for the newly-named station. "We offer a mellow mix of the contemporary adult sound, music from the 60's and 70's, and the top hits of the 80's. We're a class operation."

Others are not so sure. While Mitchell claims listeners and advertisers seem to support the name change, the executive director of the Planned Parenthood Association-Chicago said the move was another example of how America uses sex as a marketing tool—often to the detriment of adolescents.

"We know how sexuality [in the media] is used in a way that moves young people to be sexually active before it seems appropriate. In that light would be most of my discomfort" regarding the station's call letters, Norman Levine said. In the Chicago area, Levine said, there are 27,000 teenage pregnancies a year. The director described the phenomenon as an "epidemic."

Station officials say they are not trying to tear down public morals—just build their audience among the 18-44 age group. "Our whole bag is to give a little notoriety to a station lying dormant in a viable market," Mitchell said.

Mitchell said the station owner, Darrel Peters, bought WTCO-FM last September. The outlet had gone off the air in August, Mitchell said, because the previous operators couldn't pay their electric bill. By December 30, the station was broadcasting again although officials knew they needed a device for improving listenership.

In the fall, Peters, who also owns a classical music station in Wisconsin, asked the government for permission to rename the station WSEX but the request was denied. "It was rejected within 48 hours," said James Weitzman, a communications lawyer in Washington who represented Peters.

Weitzman reapplied, arguing that rejection amounted to a denial of due process—in short, that it was unconstitutional. "We also offered a list of two dozen call letters [of existing stations] that we felt someone might have a beef with," the attorney said. Among the stations he listed were: WGAY, WLAY, KOKE, KSYN, WPOT and KKKK. "As dirty as your mind is, you can read into call letters whatever you want."

Laurence Harris, chief of the FCC's mass media bureau, authorized the request this week after discussing the case with his staff. "There was no legal or statutory reason to deny the change," he said.

Perhaps not, but the new name still doesn't sound right to some people in the WSEX listening area. "With all the letters in the alphabet," said Jean King, secretary at the First United Methodist Church, "I don't know why they had to choose those three."

Elimination Of Unnecessary Reporting, Record Keeping, And Record Retention Requirements In Maritime Services Proposed

The FCC proposed eliminating unnecessary reporting, record keeping, and record retention requirements for stations in the Maritime Services, with the exception of public coast stations and those aboard ships required by statute or treaty to be radio equipped.

In essence, the proposed changes consist of eliminating station log requirements and reducing mandated documentation for

many maritime stations governed by Parts 81 and 83 of the FCC's rules. Additionally, the elimination or simplification of notification requirements concerning changes in station location, operation, and cooperative use of facilities are proposed.

The proposed changes would make it unnecessary for recreational boaters to keep a radio station log and Part 83 of the rules.

Commission Affirms Review Board Revocation Of Mount Vernon, WA, Firm's Business Radio Licenses

The Commission denied Barnett Implement Company, Mount Vernon, WA, review of the March 23, 1982 decision of the FCC Review Board revoking Barnett's licenses for Business Radio Stations KDY-897 and WXW-541.

In its decision, the Board affirmed the initial decision of FCC Chief Administrative Law Judge Lenore G. Ehrig, who found that Barnett willfully and repeatedly violated FCC rules by transmitting base-to-base communications which were not of immediate importance to the mobile units and could have been communicated by telephone; that an unauthorized identification was used in an attempt to mask those transmissions; and that Barnett's owner, Jerald Rindal, was less than candid and deliberately tried to mislead the FCC concerning the violations.

Unnecessary Aviation Services Report And Record Requirements Eliminated

The FCC has eliminated five provisions from rules governing the Aviation Services (Part 87), finding that they impose unnecessary reporting and record-keeping requirements on the aviation community.

Requirements of the specific rules, which the Commission proposed to delete in action taken June 10, 1982 were:

- Signed entries in an aeronautical station's records at specified times showing that frequency measurements are within prescribed tolerances or that an automatic frequency monitor is in use. The Commission said the records are rarely used. Transmitter measurements still will be required at installation and when adjustments are made.
- Maintenance of files of record communications by aeronautical public service stations and files of radiotelephone contacts by ground stations. The FCC said the rule is partly obsolete and partly redundant.
- Notification to the FCC of the precise offset from authorized frequencies used by interconnected aeronautical enroute stations, which provide air-ground communications for flight management. Since the interconnected stations are licensed to a single entity, the Commission said, and the offset parameters are prescribed in other rule provisions, the rule is unnecessary.
- Notification and reporting requirements for stations sharing facilities under rules prescribing conditions for cooperative use of operational stations. The rule is unnecessary, since it affects only a small, specialized group of licensees, no problems have been reported with sharing arrangements and no use is made of the information.
- Submission of applications on prescribed forms. Other rule sections specify the form to be used for each class of stations.

Temporary Licensing For Aircraft Radio Stations

The Commission approved a temporary licensing procedure for aircraft radio station applicants, similar to that available in a number of other private radio services.

This procedure will permit applicants to begin radio operations sooner and reduce the need for FCC staff to process requests for special temporary operating authorizations. The procedure will become effective June 1, 1983.

To obtain a temporary aircraft station authorization, applicants will complete FCC Form 404 for an aircraft radio station license, plus a new Form 404-A certifying certain legal and technical qualifications. The applicant will post the completed Form 404-A on board the aircraft and may use this document as a temporary aircraft station license for 90 days from the date the Form 404 is mailed to the Commission. The applicant will use the Federal Aviation Administration aircraft registration number as a temporary call sign.

Additional Frequencies Made Available To Aviation Services; Log Requirements Removed

The FCC made available additional frequencies for the Aviation Services and removed station log requirements, except where required by the Convention on International Civil Aviation.

At the request of the FAA, the Commission made 122.050 MHz available to air carrier aircraft stations, as well as to private aircraft stations, for enroute flight advisory service (EFAS). EFAS allows flights to communicate directly with a meteorologist at an FAA ground station.

Additionally, the Commission designated 122.775 and 122.850 MHz for communications between aircraft on the airport ramp areas and aviation service organizations.

Quarterly Transponder Loading Report Issued

The "Quarterly Transponder Loading Report," dated October 1, 1982, detailing off-the-air observations of geostationary satellite transponder occupancy is available.

The report, compiled at the Field Operations Bureau's satellite monitoring facility at the Laurel, MD, Monitoring Station, is a transponder-by-transponder listing of occupancy and usage at the time of observation. Emission type, multiplexing scheme, and extent of loading are given where determination by rf spectrum analysis is possible. The report covers all active North American domestic communications satellites in the 3.7-4.2 GHz band visible from the Laurel, MD, location.

Copies of the report may be purchased from Downtown Copy Center, 1114 21st Street, NW, Washington, DC 20037.

Comments Sought On Rulemaking To Implement Final Acts Of 1979 WARC

The Commission issued a notice of proposed rulemaking in the matter of amending Part 2 of its rules (Frequency Allocations and Radio Treaty Matters, General Rules and Regulations) to implement the Final Acts of the 1979 World Administrative Radio Conference (WARC).

The Commission began the rulemaking in anticipation of the U.S. Congress' ratification of the Final Acts; the Acts became effective internationally last January for administrations that have ratified the treaty. The 1979 WARC, sponsored by the International Telecommunication Union, was the broadest attempt since 1959 to modify international radio regulations in light of changes by individual nations and technical advances. The conference considered more than 15,000 proposals dealing with numerous aspects of world telecommunications. The U.S. presented some 900 proposals, most of which were attained entirely or in substantial part. Those proposals are reflected in this rulemaking.

Due to the broad scope of this proceeding, the Commission previously issued five notices of inquiry soliciting comment on proposed modifications to Part 2. The notices presented proposals intended to make Part 2 allocations as consistent as possible with international allocations in light of foreseen domestic needs and U.S. proposals to accommodate those needs going into the WARC. This rulemaking notice will be limited in scope to the issues of the first four notices, but will exclude the emission designators discussed in the fourth notice. Further rulemaking notices will be issued to cover implementation of the remaining issues.

Generally, the proposals involve a change in format for the Table of Frequency Allocations, Section 2.106, and a "clean-up" of Part 2 to eliminate redundancy, remove obsolete rules, and update others to make them current and consistent with other parts of the rules.

For reference, the four notices that form the basis of this rulemaking are:

- First Notice (FCC 80-695), released December 30, 1980. Proposed modifications to sections 2.100-2.105, Section 2.106 (Table of Frequency Allocations) up through 28 MHz, and the addition of Section 2.107.
- Second Notice (FCC 81-247), released June 15, 1981. Proposed modifications have been made to Section 2.106 from 28 MHz through 1215 MHz.
- Third Notice (FCC 81-323), released August 7, 1981. Proposed modifications to Section 2.1 (Definitions) and to Section 2.106 from 1215 MHz through 40.5 GHz.
- Fourth Notice (FCC 81-457), released October 16, 1981. Proposed modifications to Section 2.106 from 40.5 GHz through 400 GHz, and to Subpart C of Part 2, Emission Designators. (Emission designators not covered in this phase of the rulemaking.)

FCC Reconsiders Regulatory Procedures For 900 MHz Non-Network Paging Applications

The Commission has reconsidered previously adopted regulatory procedures for 900 MHz non-network paging applications in the Domestic Public Land Mobile Radio Service.

Specifically, in amendments to Parts 2 and 22 of the rules, the Commission retained need showing requirements for incumbent carriers in a market and adopted a fixed 40-mile separation criterion to determine whether an applicant is requesting a new or additional channel in an area; waived requirements of Section 22.115 for one-way paging applicants requesting a 900 MHz paging frequency; ordered that applications for 900 MHz network paging frequencies will be accepted 30 days after the order resolving certain issues dealing with network paging is published in the *Federal Register*; and ordered that applications for 900 MHz non-network paging frequencies will be ac-

cepted on December 1, 1982, for an initial period of 60 days.

Issuance of Commercial Operator Licenses To Qualified Resident Aliens Authorized

The FCC conformed its rules to legislation which authorized issuance of commercial radio operator licenses to resident aliens who are legally eligible for employment in the United States and are found qualified according to established FCC standards.

Public Law 97-259 (H.R. 3239, signed by President Reagan September 13, 1982), which amended the Communications Act to put into effect a number of the Commission's legislative proposals, included an amendment eliminating the Act's restriction of commercial operator licenses to citizens, U.S. nationals, and citizens of the Trust Territory of the Pacific Islands. The Commission's action amended FCC rules to reflect the change and authorize issuance of any class of commercial operator license to qualified persons legally eligible for employment.

The principal beneficiaries of the change are eligible resident aliens who are seeking employment in broadcasting or who are employed or seeking jobs in aircraft maintenance, though other fields also are affected.

Licensing may be a condition of employment in broadcasting, since transmitter operators are required to be licensed. Similarly, aircraft maintenance personnel may be required to hold licenses, since their duties may call for them to operate aircraft radios during taxiing and other ground operations.

The FCC Field Operations Bureau's FOB Bulletin No. 31, explaining to eligible aliens how to complete existing application forms, is available on request at the FCC Washington, DC headquarters and Field Offices.

The Commission's action also made certain editorial changes in FCC rules (Part 13) to improve their clarity and readability.

Reconsideration Of Deletion Of Requirement That Personal Radio Licensees Have Copies Of Rules Denied

The Commission has affirmed its April 14, 1982, action deleting the requirement that licensees in the Personal Radio Services possess current copies of the rules.

In doing so, the FCC denied a request by the Personal Radio Steering Group, Corwin D. Moore, Jr., Administrative Coordinator, seeking reversal of that action and also seeking oral argument on the matter.

Moore contended that the Commission failed to afford an opportunity for public comment before deleting the rule, its conclusion was unsupported, it did not consider the long-term implications of its action on the Personal Radio Services, and users would be adversely affected in their use and enjoyment of the benefits of the service.

The Commission said that a notice and comment period to adoption of the amendments was not required since the changes were not substantive, adding that the changes relieved licensees of a burden in not requiring them to have personal copies of the rules. In both the near-term and long-term, Personal Radio Services licensees will not be adversely affected in their use of radio, the FCC concluded.

The Commission said that since it had addressed this petition on its merits, no useful purpose would be served by holding an oral argument.

Private Radio Bureau Establishes Washington Office For Land Mobile And Microwave Inquiries

In response to increased public interest in private land mobile and operational-fixed (microwave) services, the Private Radio Bureau reorganized last summer to give greater attention to those services. It created the Land Mobile & Microwave Division to handle the growing load of rulemakings in Parts 90 and 94 of FCC Regulations, and established a new Operations Review Branch within it to be a liaison between the public and the Bureau for land mobile and microwave matters.

Within the branch, all staff positions have responsibilities which include answering public inquiries. The Branch Chief, Charles Turner, and a staff of three specialists—Jerry Franz, Tom Johnson, and Rick Kenney—are prepared to respond to questions or to supply information about rules and licensing requirements in any of the land mobile and fixed services.

For example, they can explain how rules in Parts 90 and 94 may be applied to practical situations, or how various types of operations may be affected by rule changes. They can also help prospective radio users understand what is required for licensing. Persons who are unsure which private service is appropriate for their communications needs, for example, may call the Operations Review Branch for guidance. Anyone in the branch may be reached at (202) 632-6497.

The branch shares its liaison function with the Bureau's Licensing Division, in Gettysburg, PA, where the central point of contact is the Consumer Assistance Branch at (717) 337-1212 for all questions concerning routine application procedures, forms, eligibility criteria, frequencies, licensing records, etc. The Licensing Division also has a status desk, at (717) 337-1511, to answer inquiries about pending applications. Callers should specify name and zip code (and call sign, if any) of the person whose application is pending.

The Bureau urges individuals with complex questions, detailed suggestions, or complaints to write to the contacts mentioned above. The address for the Licensing Division is FCC, Gettysburg, PA 17325. The address for the Operations Review Branch is FCC, Private Radio Bureau (RM. 5114), Washington, DC 20554.

SATELLITE VIEW

INSIDE THE WORLD OF TVRO EARTH STATIONS

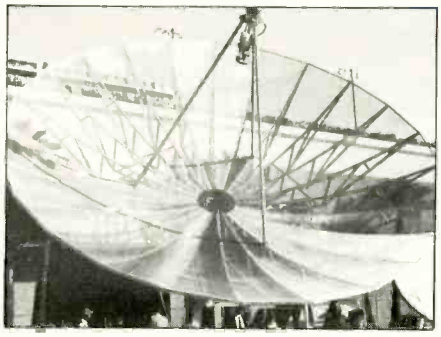
BY MARK LONG, WA4LXC

This year's Consumer Electronics Show, held at the Hilton Hotel in Las Vegas, featured a dazzling array of electronic products, ranging from powerful, inexpensive microcomputers to robots equipped with artificial intelligence. For many people, the most exciting segment of the world's largest trade show was in the area of home satellite TV systems. Most of the 75,000 attendees of the Winter CES Show found themselves wandering through a parking lot that was jam-packed with dish antennas and TVRO receiver electronics. The skyrocketing demand for home video products has propelled satellite TVRO systems out from the realm of the backyard experimenter into the forefront of the communications industry, with projected sales of over 100,000 systems in 1983 alone.

The explosion in sales of home TVRO equipment has encouraged several manufacturers to develop imaginative features that vastly simplify the operation of home earth stations. KLM of Morgan Hill, California presented a new TVRO system at CES. KLM's antenna actuator and "Memory Track" remote control features an LED alphanumeric readout of the name of the satellite being viewed. The KLM wire mesh antenna comes equipped with a direct-drive motor that provides uninterrupted access to all satellites from the eastern to the western horizons; this system should be especially attractive to radio amateurs and experimenters who wish to try their hand at DXing the international as well as the domestic birds.

The Sky Eye VI receiver and Stereo Processor components complete KLM's modular earth station approach, providing excellent quality video and stereo audio. KLM is also pioneering the development of multiple channel receivers for Satellite Master Antenna TV (SMATV) systems, which can simultaneously receive any four satellite transponders and send them as regular TV channels to multiple locations via a coaxial cable.

Several TVRO receivers at CES came equipped with wireless remote control. Infra-red light beams are used to carry command signals from a small hand-held pad to the TVRO receiver. A plastic window on the front panel of the receiver allows the infrared signal to pass through to an electronic sensing circuit. The selection of the desired video transponder, audio subcarrier, and audio volume can now be obtained from any location that is within view of the earth station receiver. I was particularly impressed with the precision quality of the Wilson Microwave Systems YM-1000 receiver, which is manufactured by the Yaesu Musen Co. Ltd. of Japan. The General Instrument Corporation is also manufacturing a receiver which, in addition to the above described remote control features, allows selection of the antenna's direction via its wireless keypad.



Hero Communicatons 5 meter antenna. (Photo by Richard McKinney)

Janiel wire mesh antenna. (Photo by Richard McKinney)

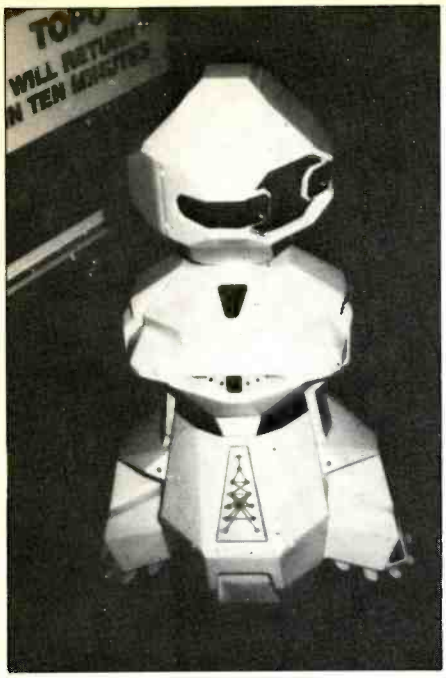
Solar Electronics 8 foot spun aluminum dish. (Photo by Richard McKinney)

Wilson petal aluminum antenna with Hilton Hotel in background. (Photo by Richard McKinney)

Breakthroughs in LNA prices are making TVRO systems less expensive. (Photo by Richard McKinney)

Another receiver that generated considerable interest at CES is manufactured in Sweden. The Luxor receiver is distributed in the U.S. by Trans Vision Corporation of Greenbrae, California. The overall design of the Luxor is quite attractive. It has an infrared remote control pad that resembles the styling used on today's European sports car dashboards. The Luxor comes with both direct and matrix stereo processors, as well as Dolby noise reduction for superb reception of satellite audio and video services that broadcast in stereo.

The producers of *Sat-Scene, The Satellite TV Magazine on the Air*, were also present at the CES show. *Sat-Scene* is a news program that is especially produced for satellite dealers, distributors, and manufacturers. This half-hour video magazine can be received by TVRO owners once a week, providing them with current information on satellite technology, with commentary from top industry "gurus." *Sat-Scene* uses the Bonnyville Uplink facilities in Utah to access Satcom IIIR, TR18 Saturday afternoon between 2:00 and 2:30 p.m. EST.



The entry of robotics into the consumer electronics industry attracted considerable attention. (Photo by Richard McKinney)

Every year, thousands of foreign visitors travel from Europe, Asia, Africa, Australia, and South America to Las Vegas for The Consumer Electronics Show. These distributors and retailers were intensely interested in what satellite television programming would be available from locations within their home countries. Companies like Hero Communications and Solar Electronics International provided extensive information on TVRO systems for the growing foreign satellite TV market.

American DOMSAT Programming Available In The Caribbean And Central And South America

When a large enough dish is used, the following transponders are available throughout the Caribbean (5 meter dish), Central America (5 to 6 meter dish), and the northern portion of South America (6 to 7.5 meter dish).

SATCOM IV:
3 Satellite Program Network
7 The Playboy Channel
15 Biznet
19 Galavision

SATCOM IIIR:
3 WGN
7 ESPN
11 The Music Channel
15 CNN Headline News
19 C-Span
23 Cinemax

4 Spotlight
8 Christian Broadcasting Network
12 Showtime

A KLM Sky Eye VI receiver and Stereo Processor.

The KLM wire mesh antenna.

16 ASCN: The Learning Channel
20 Cinemax East
24 HBO East

WESTAR IV:
6 XEW-TV, Mexico City
18 SelecTV

WESTAR V:
10 and 12 The Disney Channel
24 Black Entertainment Television

Although many overseas buyers were initially put off by the large size of the dish antennas displayed by the international TVRO companies, others realized the vast potential they could offer. Overseas TV services are usually limited to only a few channels at best, with the scope of news and entertainment programming severely restricted. Several imaginative entrepreneurs left CES with plans to offer international television to hotels and other commercial concerns within their home countries.

Many CES attendees were also intrigued by smaller dishes. There were several six, seven, and eight foot dish antennas at the show, with one 8-footer displaying excellent video from most of the North American Domsat transponders. Several TVRO manufacturers are investigating the feasability of the small dish antenna with an eye towards the urban and suburban marketplace.

Further decreases in system pricing have made the sale of home TVRO equipment even more attractive for the retailer, who can now offer good-quality earth stations for approximately $2000 to $3000. The recent sanctioning of home TVRO reception by cable programmers like Turner Broadcasting, C-Span, and others has also helped to reassure buyers who had been concerned about legal questions surrounding home TVRO reception. This year marks the entry of satellite earth stations into the mainstream of the world's home entertainment market.

In next month's column, I will examine future satellite systems for North America. Within the next two years, a whole new generation of satellites will be carrying a multitude of new video services. These advanced satellites will be viewable throughout most of the Western Hemisphere.

If you want to learn more about satellite TV, *The World of Satellite Television* by Mark Long and Jeffrey Keating is available for $8.95 from The Book Publishing Co., 156 Drakes Lane, Summertown, TN 38483. Also available: International Satellite Coordiantes Computer Printout for $3.95. Please include site latitude and longitude.

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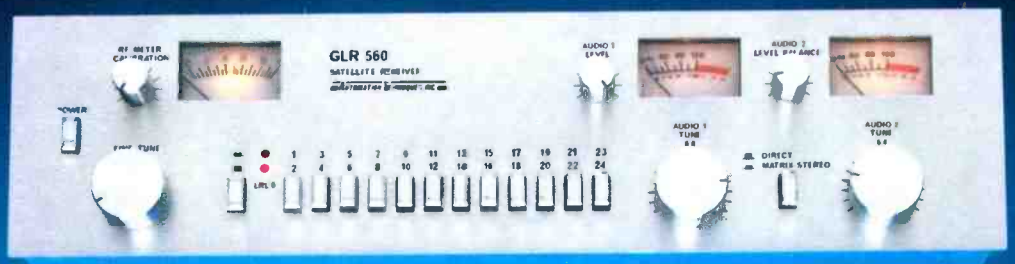

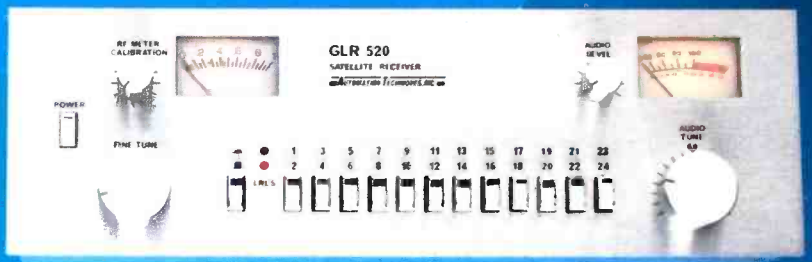

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