

ICD-08635

POPULAR COMMUNICATIONS

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**How To Eavesdrop On
Toxic Gas Storage Sites!**



- Selected English Language Shortwave Broadcasts
- Low Power Broadcasting
- Tuning In On Eastern Europe
- Unpacking The "Code" Knapsack
- Flight Of The China Clipper
- Tesla: Bizarre Genius



KENWOOD

pacesetter in amateur radio

R-11 portable receiver

R-11

Kenwood's R-11 is the perfect "go anywhere" portable receiver. It covers the standard AM and FM Broadcast bands, plus nine additional short wave bands. The R-11's selectivity is greatly enhanced by the use of double-conversion on short wave frequencies above 5.95-MHz. High sensitivity coupled with a dual antenna system (telescopic and ferrite core) allow it to

reach out and bring in those distant stations from all over the world.

Simplicity of operation is enhanced by a band-spread type tuning control. Electronic band switching, with LED band indicator, along with a tuning meter to indicate received signal strength, combine to provide you with superior listening capability. Safety Hold-Release switch prevents accidental station loss. Large front mounted speaker provides excellent sound quality. Tone switch adjusts for high, low and voice transmission.

Optional HS-7 micro-head phones allow for private listening pleasure.

All this along with a record output jack, external antenna terminal and a rugged and attractive carrying case make the R-11 portable receiver the perfect travel companion!

More information on the Kenwood receivers is available from authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, CA 90220.

CIRCLE 77 ON READER SERVICE CARD



R-2000 Top-of-the-line general coverage receiver • 150 kHz to 30 MHz • Ten memories • Dual 24-hr clock with timer • Scanning • 100-240 VAC (Opt. 13.8 VDC) • Opt. VHF (118-174 MHz converter).

R-1000 High performance receiver • 200 kHz-30 MHz • digital display/clock/timer • 3 IF filters • PLL UP conversion • noise blanker • RF step attenuator • 120-240 VAC (Optional 13.8 VDC).

R-600 General coverage receiver • 150 kHz-30 MHz • digital display • 2 IF filters • PLL UP conversion • noise blanker • RF attenuator • front speaker • 100-240 VAC (Optional 13.8 VDC).



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WORLD CLASS RECEIVER

ICOM introduces the **IC-R71A** 100KHz-30MHz superior-grade general coverage receiver with innovative features including keyboard frequency entry and wireless remote control (optional).

This easy-to-use and versatile receiver is ideal for anyone wanting to listen in to world-wide communications. Demanding no previous shortwave receiver experience, the **IC-R71A** will accommodate an SWL (shortwave listener), Ham (amateur radio operator), maritime operator or commercial operator.

With 32 programmable memory channels, SSB/AM/RTTY/CW/FM (optional), dual VFO's, scanning, selectable AGC and noise blanker, the **IC-R71A's** versatility is unmatched by any other commercial grade unit in its price range.

Utilizing ICOM's DFM (Direct Feed Mixer), the **IC-R71A** is virtually immune to interference from strong adjacent signals, and has a 100dB dynamic range.

ICOM introduces a unique feature to shortwave receivers... direct keyboard entry for simplified operation. Precise frequencies can be selected by pushing the digit keys in sequence of frequency. The frequency will be automatically entered without changing the main tuning control. Memory channels may be called up by pressing the VFO/M (memory) switch, then keying in the memory channel number from 1 to 32.

Thirty-two tunable memories offer instant recall of your favorite frequency. Each memory stores frequency, operating mode, and a backup battery maintains the memories for up to five years.

Specifications.

- **Frequency Coverage:** 0.1 MHz-30.0 MHz
- **Frequency Control:** CPU based 10 Hz step Digital PLL synthesizer with dual VFO system. Direct frequency entry through keyboard or RC-11 remote unit.
- **Memories:** 32 tunable memories store frequency and mode.
- **Scanning:** Memory and band scan with auto-stop.
- **Frequency Readout:** 6 digit 100 Hz fluorescent readout.
- **Frequency Stability:** Less than 250 Hz after switch on 1 min to 60 mins, and less than 50 Hz after 1 hour. With option CR-64 high stability crystal: Less than ± 50 Hz after switch on 1 min to 60 mins, and less than ± 10 Hz after 1 hour at normal room temperature. Less than ± 100 Hz in the range of -10°C to +60°C.
- **Receiving Mode:** A¹, A²J (USB, LSB), F¹ (Output FSK audio signal), A³, F².
- **IF Frequencies:** 1st: 70.4515 MHz, 2nd: 9.0115 MHz, 3rd: 455KHz, 4th: 9.0115MHz (except F²); with continuous Passband Tuning (except F²).
- **2nd IF Center Frequency:** SSB (A²J) FM¹(F¹)—9.0115 MHz, CW (A¹) RTTY (F¹)—9.0106 MHz, AM (A¹)—9.0100 MHz.
- **Sensitivity (when preamplifier is ON):** SSB, CW, RTTY: Less than 0.15 microvolts (0.1—1.6 MHz: 1 microvolt) for 10 dB S/N; AM: Less than 0.5 microvolts (0.1—1.6 MHz: 3 microvolts); FM¹: Less than 0.3 microvolts for 12dB SINAD (1.6—30MHz).
- **Selectivity:** SSB, CW, RTTY: 2.3 KHz at -6dB (Adjustable to 500 Hz min), 4.2KHz at -60dB; CW-N, RTTY-N: 500 Hz at -6dB, 1.5KHz at -60dB; AM: 6KHz at -6dB (Adjustable to 2.7KHz min), 15KHz at -50dB; FM¹: 15KHz at -6dB, 25KHz at -60dB.
- **Antenna Impedance:** 50 ohms Unbalanced (Single wire can be used on 0.1—1.6MHz).
- **Weight:** 7.5kg (16.5 lbs.)
- **Dimensions:** 111mm(H)x286mm(W)x276mm(D)(4 1/4 in. x 11 1/4 in. x 10 7/8 in.)
- **Power Supply Requirements:** 117V or 235V ± 10% 50-60Hz 30VA, (100V/200V/220V use requires internal modification).

ICOM R71A OPTIONS

CK-70 12 Volt DC Kit	\$9.95
CR-64 High Stability Osc.	\$56.00
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EX-257 FM unit (10M Ham)	\$38.00
FL-32 CW filter, 500Hz 9MHz	\$59.50
FL-44 2.4KHz 455KHz SSB Crystal Filter	\$159.00
FL-63 CW filter 250Hz 9MHz	\$48.50
RC-11 Remote Control	\$59.95

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- 1-3 options \$35
- 4 and up \$45

ICOM ICR71A with full factory warranty but without **EEB's** extra service/no installed options

SALE \$659

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- **4KHz filter** replaces stock 6KHz wide filter. Improves AM selectivity **\$50**

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Communications Electronics,™ the world's largest distributor of radio scanners, celebrates 1985 with big savings on Bearcat scanners. Uniden Corporation of America, the manufacturers of Bearcat scanners is offering huge consumer rebates on their great line of scanners, when purchased from CE between February 1 and March 31, 1985.

Bearcat® 300-G

List price \$549.95/CE price \$344.00/\$10.00 rebate
Your final cost is a low \$334.00

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.

Bearcat® 20/20-G

List price \$449.95/CE price \$274.00/\$5.00 rebate
Your final cost is a low \$269.00

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. Find an easy chair. Turn on your Bearcat 20/20 and you're in an airplane cockpit. Listening to all the air-to-ground conversations. Maybe you'll pick up an exciting search and rescue mission on the Coast Guard channel. In a flash, you're back on the ground listening as news crews report a fast breaking story. Or hearing police and fire calls in your own neighborhood, in plenty of time so you can take precautions. You can even hear ham radio transmission, business phone calls and government intelligence agencies. Without leaving your easy chair. Because you've got a Bearcat 20/20 right beside it.

The Bearcat 20/20 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.

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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.

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List price \$399.95/CE price \$274.00/\$5.00 rebate
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Get a coupon good for a \$35.00 rebate when you purchase a Bearcat 210XL; \$30 rebate on model 201; \$20 rebate on models 180 and 100; \$10 rebate on models DX1000 or 300; \$5 rebate on models 20/20 or 260. To get your rebate, mail rebate coupon with your original dated sales receipt from Communications Electronics and the Bearcat model number from the carton to Uniden. You'll receive your rebate in six to eight weeks. Offer valid only on purchases made between February 1, 1985 and March 31, 1985. All requests must be postmarked by April 15, 1985. Limit of one rebate per household. Special rebate coupon must accompany all rebate requests and may not be reproduced. Offer good only in the U.S.A. Void where taxed or prohibited by law. Resellers, companies and employees of Uniden, their advertising agencies, distributors and retailers are not eligible for this rebate. Please be sure to send in the correct amount for your scanner. Pay the listed CE price in this ad. Do not deduct the rebate amount since your rebate will be sent directly to you from Uniden. Orders received with insufficient payments will not be processed and will be returned. Offer subject to change without notice.

NEW! Bearcat® 201-G

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9-Band, 16 Channel • Crystalless • AC only Priority • Scan Delay • One Key Weather Frequency range 30-50, 118-136 AM, 146-174, 420-512 MHz. The Bearcat 201 performs any scanning function you could possibly want. With push button ease, you can program up to 16 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear.

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Your final cost is a low \$144.00

8-Band, 16 Channel • Priority • AC only Frequency range: 30-50, 138-174, 406-512 MHz. Police and fire calls. Ham radio transmissions. Business and government undercover operations. You can hear it all on a Bearcat 180 scanner radio. Imagine the thrill of hearing a major news event unfold even before the news organizations can report it. There's nothing like scanning to keep you in-the-know, and no better way to get scanner radio performance at a value price than with the Bearcat 180.

Bearcat® 100-G

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List price \$449.95/CE price \$229.00/\$20.00 rebate
Your final cost is a low \$209.00

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 1 1/4" 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. 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. Order your scanner now.

Bearcat® DX1000-G

List price \$649.95/CE price \$499.00/\$10.00 rebate
Your final cost is a low \$489.00

Frequency range 10 kHz to 30 MHz. The Bearcat DX1000 shortwave radio makes tuning in London as easy as dialing a phone. It features PLL synthesized accuracy, two time zone 24-hour digital quartz clock and a built-in timer to wake you to your favorite shortwave station. It can be programmed to activate peripheral equipment like a tape recorder to record up to five different broadcasts, any frequency, any mode, while you are asleep or at work. It will receive AM, LSB, USB, CW and FM broadcasts.

There's never been an easier way to hear what the world has to say. With the Bearcat DX1000 shortwave receiver, you now have direct access to the world.

Uniden® PC22-G

List price \$159.95/CE price \$99.00

The Uniden PC22 is a 40 channel AM remote mobile CB radio. It's the answer for today's smaller cars which don't always provide adequate space for mounting. Since all the controls are on the microphone, you can stash the "guts" in the trunk. The microphone has up/down channel selector, digital display, TX/RX indicator and external speaker jack. Dimensions: 5 3/4" W x 7 7/8" D x 1 1/2" H. 13.8 VDC, positive or negative ground.

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CIRCLE 28 ON READER SERVICE CARD

Uniden® PC55-G

List price \$89.95/CE price \$59.00

The Uniden PC55 40 Channel CB radio is a full featured transceiver that boasts a super-compact case and a front-panel mike. It has ANL, PA-CB, Channel 9 and RF Gain switches. LED "S"/RF meter, TX lite, PA & external speaker jacks. Dimensions: 6" W x 6" D x 1 1/4" H. ±13.8 VDC. The Uniden PC55...now at a special low price.



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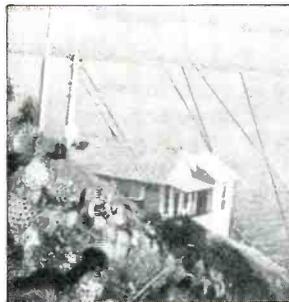
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POPULAR COMMUNICATIONS

APRIL 1985

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Eavesdropping on toxic gas sites around the U.S. Our cover story! Better save the information in this story in case an ill wind blows you no good! *by R. L. Slattery**This month's cover: Toxic gases are being manufactured and stored throughout the nation. Being able to monitor the communications at these facilities could be a definite advantage. (Photo courtesy U.S. Army)***DEPARTMENTS**

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BEAMING IN

BY TOM KNEITEL, K2AES

AN EDITORIAL

Hieronymous And Other Machines

Last August in *Beaming In* I shared with you information on an amazing new communications device called the "Godbox." This was a product being brought on to the world market. It consisted of no more (or less) than an empty plastic box (not unlike a storage box for keeping floppy discs or VCR cassettes). The main purpose and function was to enable its owner to make "heavenly" contacts by means of written messages placed within the box. A very revolutionary design concept in communications, to say the very least. And it brought in a ton of mail.

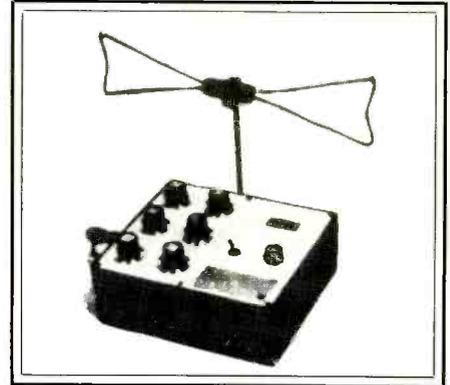
We received letters, not only from the general readership, but also from clergymen, and even from broadcasting stations. A number of readers were kind enough to offer information on experiments they had made with the device, per our suggestions. Other readers brought to my attention even more fascinating unorthodox communications equipment no less unusual than the Godbox.

Just such a letter arrived from Marty Spradlin of Wyoming. He pointed me in the general direction of a company called Herbert Scott and Associates, P.O. Box 156, Hancock, WI 54943, promising that they had communications equipment that made the Godbox look like "piffle" by comparison. My interest was peaked.

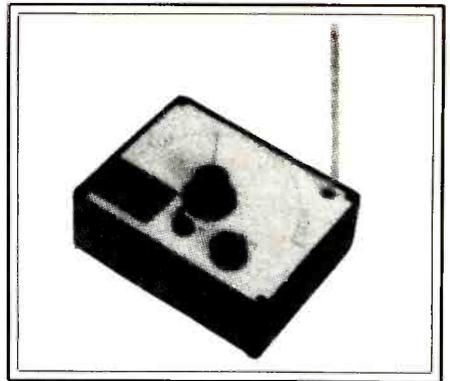
I was immediately intrigued by the fact that they were offering a genuine Hieronymous Machine, which they call their "Alpha III" device. I couldn't believe my eyes!

Maybe you've never heard of a Hieronymous Machine. If not, you're missing a lot. I've been fascinated by this gadget for years, in fact ever since I came across instructions for building one which appeared in the June 1956 issue of *Astounding Science Fiction Magazine*. The device is based upon the invention of one Thomas C. Hieronymous who, in 1949, had it assigned U.S. Patent No. 2,482,773. Hieronymous came up with this invention in order to study what he called "eloptic radiation" from minerals. Ever since the patent was issued, copies of it have been passed around among electronic engineers as a goof.

In his interesting book, *Fads and Fallacies In The Name of Science* (Dover Publications, 1957), Martin Gardner describes a lecture on the Hieronymous Machine given at the 1956 New York Science Fiction Convention. He recalled that the lecturer noted that it works well, with or without the power supply turned on! Gardner said, "The device is beautifully subjective. You turn a dial with one hand while you stroke a plastic



The Alpha III "all purpose unit" is a practical application of the Hieronymous circuit.



The ominous Omega Device lets you hold a "solo seance."

plate with the other. The plate is supposed to feel sticky when the dial reaches a certain setting, the setting varying with each individual. Some people get the proper tactile sensation the first time they try it. Willy Ley and others at the convention couldn't feel a thing."

The lecturer advised his audience that the machine didn't operate very well with either scientists or mystics. His claims, however, were far more conservative than those of Hieronymous himself, who claimed that his device would also work with photographs of the minerals!

In the October, 1956 issue of *Astounding*, Editor John Campbell, Jr. (who was also the lecturer at the sci-fi convention) noted "there is a reality-field other than, and different in nature from, that we know as science." This is to describe the hunch that the Hieronymous Machine could receive signals from "beyond space and time."

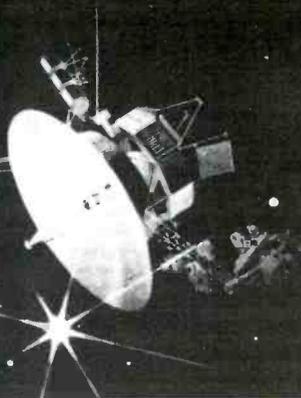
(Continued on page 72)

UNINTERRUPTED FREQUENCY COVERAGE

100 KHz ~ 1.4 GHz with RF CONVERTERS for

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RF-8014 DOWN CONVERTER

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● Bands: MAIN (to cover 26-520 MHz with SX-400) • 800 MHz ~ 1.0 GHz • 1.0 GHz ~ 1.2 GHz • 1.2 GHz ~ 1.4 GHz • AUTO (Automatic control of RF-8014 with an external computer, etc.) ● Frequencies shown in SX-400 display: 500 MHz lower between 800 MHz ~ 1.0 GHz, 700 MHz lower between 1 ~ 1.2 GHz, 900 MHz lower between 1.2 ~ 1.4 GHz. ● Individual Band Switches and LED Indicators. ● Current Drain: 250 mA (approx.) ● Accessories: 1 BNC/M-adaptor, 1 Cable with BNC terminals ● Dimensions: W. 148 x H. 51 x D. 225 (mm)

RF-5080 DOWN CONVERTER

500 ~ 800 MHz RF converter for SX-400

● Bands: MAIN (to cover 26-520 MHz with SX-400) • 500 ~ 600 MHz • 600 ~ 700 MHz • 700 ~ 800 MHz • AUTO (Automatic control of RF-5080 with an external computer, etc.) ● Frequencies shown in SX-400 display: 300 MHz lower between 500 ~ 600 MHz, 400 MHz lower between 600 ~ 700 MHz, 500 MHz lower between 700 ~ 800 MHz. ● Individual Band Switches and LED Indicators. ● Current Drain: 250 mA (approx.) ● Accessories: 1 BNC/M-adaptor, 1 Cable with BNC terminals, ● Dimensions: W. 148 x H. 51 x D. 225 (mm)

RF-1030 UP CONVERTER

100 KHz ~ 30 MHz RF converter for SX-400

● Bands: (1) 100 KHz ~ 1 MHz, (2) 1 ~ 2 MHz, (3) 2 ~ 4 MHz, (4) 4 ~ 8 MHz, (5) 8 ~ 17 MHz, (6) 17 ~ 30 MHz • AUTO (Automatic control of 6 bands of RF-1030 with an external computer, etc.) ● Frequencies shown in SX-400 display: 50 MHz higher on all bands than the frequencies received. ● Individual Mode Switches and LED Indicators: AM, USB, LSB, CW, AUTO • CW filter (optional) required for CW reception • AUTO—Automatic Control of modes of RF-1030 with an external computer, etc. ● Band Switch and LED Band Indicators, Squelch Control, RF Att., AF Gain Control, Delta Tuning, IF ON/OFF Switch, NB (Noise Blanker) Switch. ● Current Drain: 1 A (approx.)

* Power Supply Unit P-1A (optional) required for RF-1030 ● Accessories: 1 BNC-M-adaptor, 2 Cable with BNC terminals ● Dimensions: W. 300 x H. 90 x D. 233 (mm)

ACB-300 ANTENNA CONTROL BOX

Manual and Automatic antenna control system for SX-400 series RF converters

● Individual Band Switches and LED Indicators: 1030, 5080, 8014, 1.4 GHz UP (for reception of 1.4 GHz above) AUTO (Automatic control of antennas for RF-1030, RF-5080, RF-8014 and for MAIN scanner) ● Current Drain: 50 mA (approx.) ● Accessories: 1 Cable with BNC terminals ● Dimensions: W. 148 x H. 51 x D. 225 (mm)

SX-400

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CIRCLE 13 ON READER SERVICE CARD

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.

Hidden FM

It seems to me that monitoring the "hidden" subcarriers of FM broadcast stations would be a new aspect of the hobby. The problem is, it appears that the only receivers that will pick up these "SCA" transmissions are those leased to customers of the SCA services, and they will pick up only a single pre-set frequency. How can an FM receiver be modified to receive these stations?

Ken Lessing
Keokuk, IA

SCA transmissions contain all sorts of interesting programming such as background music, medical discussions, sports, paging, talking books, X-rated drama, closed-circuit material from networks not intended for the general public, and even data and RTTY. Of course, in each area the programming available will vary, but there are usually several stations carrying SCA within range of most listeners. In metropolitan areas, the FM band is loaded with stations offering SCA material on 67 or 92 kHz channels. You hear this by means of an SCA adapter connected to a standard FM receiver; this gizmo blots out the main FM signal and permits the hidden programming to emerge so you can hear it. A company called FM Atlas (Adolph, MN 55701-0024) sells SCA adapters (\$13 to \$20) that you can hook up yourself (or they'll install them in your radio for you). They also sell popular brand FM receivers that they have modified to receive SCA channels. Write for their free catalog. And you're right, this is becoming a new aspect of monitoring. — Editor

Leave This Old Salt Alone

I have obtained 4 military surplus handheld transceivers marked AN/CRC-7 but have been unable to obtain any information on them. Are these suitable for use in the Business Radio Service? They appear to be in like-new condition and have been stored for a very long time. Most likely these are for the VHF "high band."

J. Tyree
Alamogordo, NM

This is a WWII veteran that was part of a USN survival kit. The unit is hermetically sealed and consists of a 50 milliwatt AM/MCW transmitter matched up with a super-regen receiver. The AN/CRC-7 is crystal controlled on 140.58 MHz, which was the WWII frequency for air/sea rescue communications. The unit requires 1.5 VDC for the filaments and 97.5 VDC for the plates. One "G" cell and an Eveready 479 can be used to

power this set and will fit into the battery compartment, although suitable leads will have to be connected to the pins for proper connections.

Inside the rig there are three type 3A5 tubes and a 3Q4. The frequency can be changed by opening the hermetically sealed portion and replacing the crystal with one in the 18 MHz band (multiplication factor of 8 times). The coils would have to be trimmed and the stages would have to be re-trimmed with the antenna fully extended. The feeble power output of the transmitter and rather poor receiver (sensitivity of 2 μ V), coupled with the AM/MCW design, and necessary conversion to change its frequency, make the AN/CRC-7 rather totally impractical for any modern communications applications. The FCC will not allow their operation in the Business Radio Service, although they might be converted to the 2-meter ham band and used by persons holding a ham ticket, perhaps offering a chance at some short-distance communications tests just for kicks—but it's not worth the effort. Personally, I'd recommend leaving them unmodified and keeping them as war relics. In their present good condition, they will certainly be worth more as war souvenirs than anything else. Once you modify them, they'll be as worthless as war souvenirs as they are as communications devices. — Editor.

An Amazing Discovery

I have found that by making a minor wiring modification and adding a toggle switch to my TV receiver, I can listen to the audio without having to run the picture tube. At times when I'm working around the house where I can't see the TV, this saves electric costs while still permitting me to hear what's going on. This was such a simple and inexpensive modification that I wonder why manufacturers haven't added this feature to TV receivers.

H. R. Amengual
Arlington, TX

Congratulations, you've just re-invented radio broadcasting! — Editor

Code Mode

Who needs Playboy? We've got Alice Brannigan. Please keep running her articles and especially her photo. This is one author who looks as super as the stories. When you start the Alice Brannigan fan club, I'll be the first to join and order a T-shirt.

"El Lobo"
Lancaster, PA

The story on 5-digit codes in the December issue that was written by Alice Brannigan; it was well done and showed a considerable amount of insight. At the end of the story, the author noted that she was just a "nice gal in a barn." I wish to point out that the author may well have a few more codes

up her sleeve than she discussed in the December issue. Her name is an anagram for "nice gal in a barn"! This can't be just a coincidence. Whatever, I enjoyed the story and look forward to more information. I'm an ex-Army cryptographer.

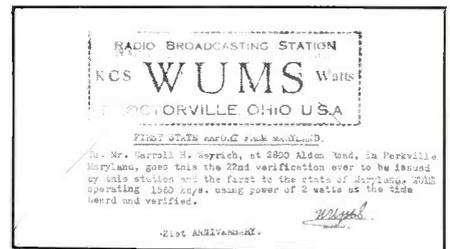
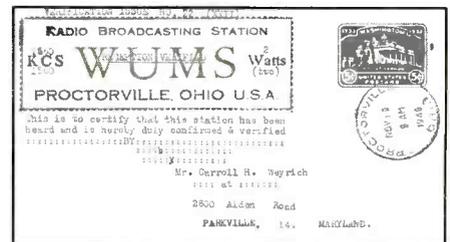
R. E. W.
Steubenville, OH

I think the story on codes in the December issue hit the nail on the head. Before we get too carried away with how esoteric these numbers stations are, or might be, and how complex their codes are to crack, let us not forget that they may be so simple that we are digging too deep to figure them out. Bravo to POP'COMM for making this point.

Ed Cooper
Los Angeles, CA

If the codes from the numbers stations were as basic as Alice Brannigan described in the December issue, they would have been unraveled long ago.

Morris Jackson
Washington, DC



Remember WUMS

I noted in your article (December '84) regarding WUMS that Dave Thomas issued only 30 QSLs. I was very fortunate to have QSL No. 22 and the first one issued to Maryland. I am enclosing a copy of this QSL, which I am very proud to have. I have just subscribed to POP'COMM and must say that I am quite pleased with it in its entirety. In fact I liked the copy that was given to me so much that I sent for all of the issues from Vol. 1, No. 1. This magazine is one that is very informative to the listener of all bands.

Carroll H. Weyrich
Baltimore, MD

Veteran DXers amongst our readership will recognize Carroll's name as being a familiar sight in virtually every issue of the late Newark News Radio Club Bulletin. Welcome aboard, Carroll. — Editor

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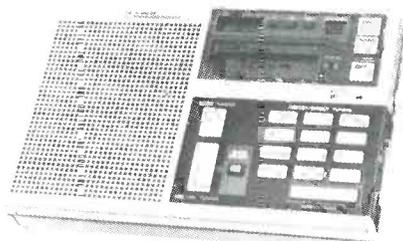
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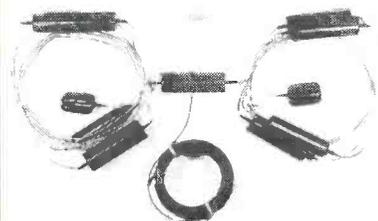


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CIRCLE 32 ON READER SERVICE CARD

Low Power Broadcasting

You Don't Need A License. Many Stations Are Already On the Air!

BY TOM KNEITEL, K2AES, EDITOR



Kris, proprietor and chief operator at WQNR.



Two of the WQNR tape decks.

Radio station WQNR, 640 kHz in Selden, New York, operates every day of the week from morning until sunset. It has an audience that may be as large as 7,000. Its signal area covers about 20 square miles. WQNR broadcasts today's latest rock and roll sounds; it also sends out programming from the Westwood One Radio Network as well as the Radio International "Rock Over London" program. WQNR is also a reporting station to C.M.J.'s (College Music Journal) New Music Report, and is also listed in Sparrow Records' news updates.

The station is on the promotional mailing lists of most major record companies and frequently offers its listeners free tickets to rock concerts.

While the station presently runs 20 watts, it has plans to increase its power soon. WQNR is also getting set to erect a dish antenna on its roof in order to receive additional programming from networks with which it has made arrangements. Yet, while WQNR has no FCC license, its operator bristles at any suggestion that WQNR is a pirate station. WQNR's operator, Kris Holtegaard, refers to the station as a "community broadcaster" and points out that the

FCC has seen his station and given it a "clean bill of health."

WQNR and other similar limited area broadcasters have learned that there are legal ways to commence broadcasting without having to take out a broadcasting license; this by means of the provisions of FCC Rules Part 15. WQNR's approach is by the section of Part 15 which allows broadcasting by carrier current methods—sending the signals out via power lines. There are other approaches that can be taken, according to Part 15, and there is a rapidly growing industry supplying hardware and services to low power and limited area broadcasters. And yet, it's practically a well kept secret. Most folks have scarcely heard of any of these goings-on!

Part 15

Under Part 15 of the FCC Rules (these are the same regulations which permit hands-free FM transceivers and CB walkie-talkies), a person can establish a low-powered radio station anywhere between 510 and 1600 kHz. However, for practical purposes, it wouldn't make much sense to consider fre-

quencies below 530 kHz since broadcast receivers don't tune below 535 kHz.

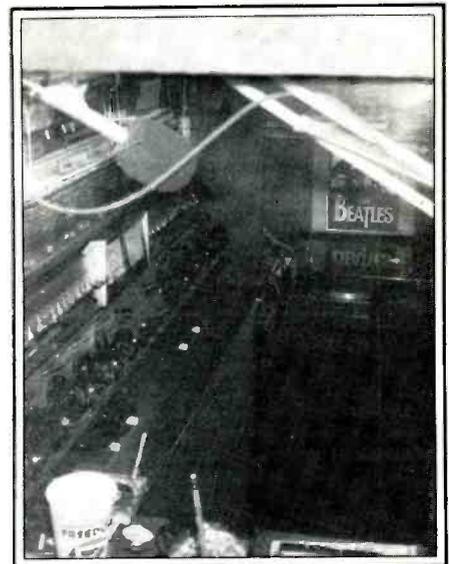
On the conditions that the station not cause interference to licensed broadcasters, a Part 15 sanctioned transmitter can be established within the FCC's technical guidelines within this band. Carrier current (as used by WQNR) is one way of doing it. Another way of doing it is by sending the signal out through a conventional antenna system.

Stations have already been established under Part 15 on college campuses, military bases, in hospitals, nursing homes, sports stadiums, Indian reservations, churches and synagogues (to assist the hard-of-hearing), schools, convention halls, drive-in churches and theatres, at airports, along highways and at construction areas and entrances to parks, and for community broadcasting. Of course, not all of the radio facilities at such places are unlicensed and operating under Part 15, but many are legally unlicensed and operated within the provisions of that section of the FCC regulations.

Part 15 is quite liberal as to what one might do with such a radio station and there are no restrictions against setting up a broadcasting station, even as a hobby effort.



The entire studio portion of WQNR fits into a room the size of a walk-in closet.



A bird's eye view of WQNR.

Low Power – How Low?

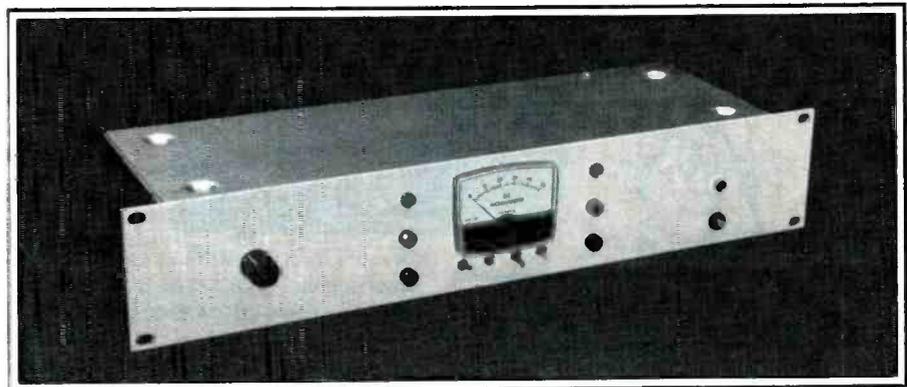
FCC Regulation 15.111 specifies that the broadcast band (535 to 1600 kHz) is okay to use for such operations as long as the signals are within certain limits.

One way of staying within the limits is by making certain that the power input to the final stage of the transmitter doesn't exceed 100 milliwatts and (simultaneously) the total length of the transmission line, plus the antenna and any ground lead doesn't exceed 3 meters (about 10 feet) in length, regardless of the station's operating frequency in the authorized frequency band. Any emissions outside of the authorized band must be suppressed 20 dB or more below the unmodulated carrier. And (FCC Part 15.113 states that) any RF radiated back into the power lines must be 200 μ V or less. As a general rule of thumb, the FCC says that if the broadcasts can be received more than 300 feet away from the antenna, then the station is probably putting out more power than they permit under Part 15.

Carrier Current

The FCC's carrier current regulations permit the radio signals to piggyback along the power lines and therefore the signals can be received by all AM broadcast receivers powered from the same line, and all battery operated portables being operated near the power lines. Such broadcasts are limited by FCC regulations, which restrict the amount of signal which might leak off the power lines; also the signals will generally not go past any power company sub-stations. The rules spelling all of this out are expressed in FCC Regulation 15.7.

While carrier current has its advantages, hobbyists must also keep in mind that attempting to feed a signal into a power line could turn out to be dangerous, if not altogether fatal, for persons working with insufficient knowledge of the art, or with unsafe



Front view of the Macromod compressor offered by Panaxis. It has front panel controls for input/output levels, limiting level, AM or FM mode, limiter in/out, bypass, stereo/mono mode. (Photo by Jim Brown)

equipment. In addition, some power utility companies may have restrictions regarding the use of their lines for such purposes and it would probably be wise to check in advance of the commencement of broadcasting operations via their lines.

General Operations

The FCC isn't especially concerned with the type of programming that goes out over a Part 15 station as long as the station itself doesn't cause interference to licensed stations. There is, of course, a general FCC prohibition against the use of what the agency defines as "obscene, indecent or profane language." The interpretation of which words or phrases might fit into those categories is left to the broadcaster, however there are penalties for those who figure out how to overstep the boundaries of good taste and who get caught as a result. Typical programming might include general entertainment consisting of live or recorded music, commentary, local news, public service announcements, possibly even commercials from area merchants.

A station can make up its own call sign providing it won't be confused with the call sign of a licensed station.

The hours of operation, as well as the frequency used, is a matter of one's own preference. While pirate stations like to operate around 1620 kHz, stations trying to operate legally aren't going to be able to locate above 1600 kHz. This puts them right into the thick of the AM broadcast band and forces the low-powered signal to compete with licensed stations running as much as 50 kW. It may be possible to set up shop with a Part 15 station on a frequency located between the standard 10 kHz AM broadcast channel spacing intervals, however there are drawbacks. It might be possible for a station on an adjacent frequency to cause a heterodyne whistle on your signal, even if the other station's signal is not especially strong in your area. Also, persons having digital receivers won't be able to pick up the station's 5 kHz offset frequency.

Best bet would be to try to locate a standard frequency that isn't used in your area, at least one that is quiet during daylight

hours—such as 1200 kHz, which may be suitable everywhere except in Texas. WQNR, for instance, finds 640 kHz to be perfect for their purposes until sunset. After sunset, WQNR can't compete with the signal from 50 kW station CMBB (Radio Progreso) in Guanabacoa, Cuba.

Station operators would have to make signal surveys to see the status of their signals within the listening area. Even after a good frequency is discovered, its status could change due to seasonal conditions.

On The Air

Despite the restrictions and competition with more powerful AM broadcasters, many stations are on the air—for instance, KOAG at a KOA campground in Kansas. It's operated by Roy Baum, who says, "This is leading me into an occupation that I can have fun at and that challenges me."

In Fond du Lac, Wisconsin, station WFDL has been operational since last June under the direction of Jan A. Starks. He has branched out into a mini-network of stations

in several states and is forming the Direct Area Broadcasting Association (DABA) in order to promote low power broadcasting.

Like WQNR, WFDL is a most serious undertaking. It even sells commercial time to advertisers. The station has two Gates turntables, two Tapecaster decks, a Russco console, an Ampex RTR deck, plus 3,000 record albums and other miscellaneous equipment.

One low power station in Southern California was so professional sounding that it recently had two of its air personalities hired by commercial broadcasters in the area!

Equipment

In order for equipment to be sold commercially for low power broadcast use it must be FCC type accepted, although kits may be sold without type acceptance.

A major force in the manufacture and sale of professional grade low power broadcast equipment is LPB, Inc., 28 Bacton Hill Rd, Frazer, PA 19355. This company, which is headed by Richard Crompton, W3JUD, of-

fers everything from professional consulting services to FCC type accepted equipment which is presently in wide use. This is a company that has been in business for 25 years and whose equipment has made a fine reputation for itself. The prices for their transmitters run between \$600 for the 1 to 25 watt carrier current unit to \$4,995 for the 75 to 165 watt carrier current gear.

A more hobbyist-oriented line is offered by a company known as Panaxis Productions, P.O. Box 130, Paradise, CA 95969. Panaxis is run by Ernie Wilson, K6SQN, and it offers a large variety of services and products to the low power broadcasting enthusiast. The company will shortly introduce an all-new, 100-milliwatt transmitter kit for the AM broadcast band. A catalog is available showing their products, books, and other services.

Other Useful Information

In order to help those interested in low power broadcasting get as much information as possible, here is some information on sources that will be of use.

Of course, FCC Part 15 is the basis for all of the operations described here, so you'll want to have a copy on hand to get the full impact of what is and isn't permitted. Copies are available from the Supt. of Documents, Government Printing Office, Washington, DC 20402. Their catalog number for the FCC Rules Volume II (which contains Part 15) is 004-000-00411-6. The price is \$5.50.

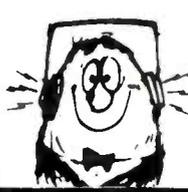
The FCC has two useful bulletins that can be obtained from the Office of Chief Scientist, Federal Communications Commission, Washington, DC 20554. One bulletin is called OCE-11 "Does My Transmitter Need A License?" and the other is OCE-12 "Operation In the Band 535-1600 kHz Without An Individual License." These are sent at no cost upon request, however a few months ago the FCC advised me that they were working on a new bulletin to replace these two older ones—so if you write to them, better ask for OCE-11 and OCE-12 or any subsequent replacement publications for them.

Panaxis Productions (address given previously) publishes an extremely useful *Experimental Broadcasters' Newsletter* for a subscription price of \$18 per year. Every issue is a goldmine of information for low power broadcasters, including stories about stations (with photos), information about techniques, networks, and all sorts of other good stuff. It even has ads from persons selling used equipment, such as turntables, transmitters, tape decks, etc. Panaxis' Ernie Wilson has also written a really good book called *Carrier-Current Techniques*, which tell you how to get on the air with as little grief as possible. This 64-page book is actually part of a series of books called the *Broadcaster's Library*, available from Panaxis. Look for these in the Panaxis catalog.

LPB Inc. (address given previously) publishes their LPB Tech Note #1A entitled "Limited Area Broadcasting," which is a 33-page overview of low power operation within the broadcast band, especially its

IC-R71A

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many uses and applications. Many technical and non-technical points are touched upon in this exceptionally well thought-out and presented publication.

There is a Low Power Broadcasting Network that does not charge any membership fees for affiliation. Probably best to include a self-addressed stamped #10 (business sized) envelope if you write to them. Write to John J. Dutton, LPBN, 514 Vincil, Moberly, MO 65270.

Kris, who operates station WQNR, is an extremely informed and informative person on the topic of low power community broadcasting. Those wishing to get in contact with him can write to Radio Station WQNR, P.O. Box 533, Selden, NY 11784. Include a self-addressed stamped return envelope if you are seeking an answer to a question. The station's telephone number is (516) 736-6448.

Jan A. Starks, operator of WFDL in Wisconsin, and the founder of DABA, can be reached at the WFDL Radio Network, 107 1/2 Main St., Fond du Lac, WI 54935.

Cable TV Broadcasting

No discussion of legal unlicensed broadcasting would be complete without mentioning Cable FM broadcasting.

Many (if not most) cable TV systems offer some form of Cable FM to their customers. This might be sent out over the audio portion of a "Swap 'n Shop" TV channel, or possibly it goes out on the cable on a frequency within the regular FM broadcast band (as with the stereo channels for MTV and other TV services). My own local TV cable system actually does both of these functions.

It is possible to make arrangements with a cable TV system operator to feed the output of your broadcasting station to the cable TV system for transmission in this manner. No FCC license is required!

The cable TV operator may be offered a percentage of any monies you take in by selling ads to local merchants within his service area. If you promise (and can substantiate) reliable and professional service to his customers, he might be willing to put your station on the air over his facilities. This has been done in a number of areas and seems to hold a lot of potential for the future.

We here at POP'COMM are interested in efforts by our readers in establishing low power and limited area broadcasting stations, so if you embark upon a venture of this nature, be sure to let us know about it. Send photos, station schedules, your frequency, equipment roster, programming information, and any other information you would like to share with our readers. You might even wish to swap tapes with other broadcasters. Got a QSL? Send it along!

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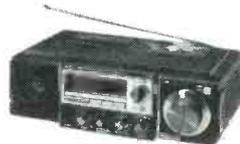


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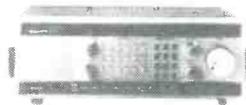
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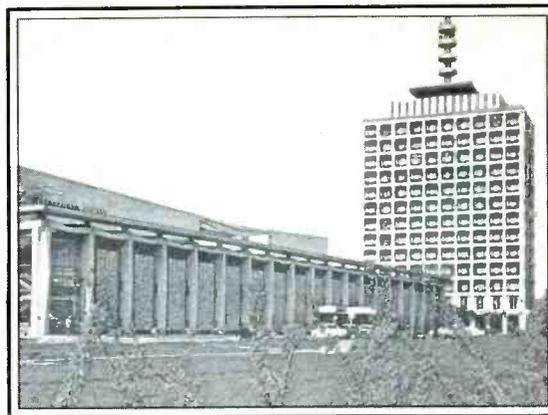
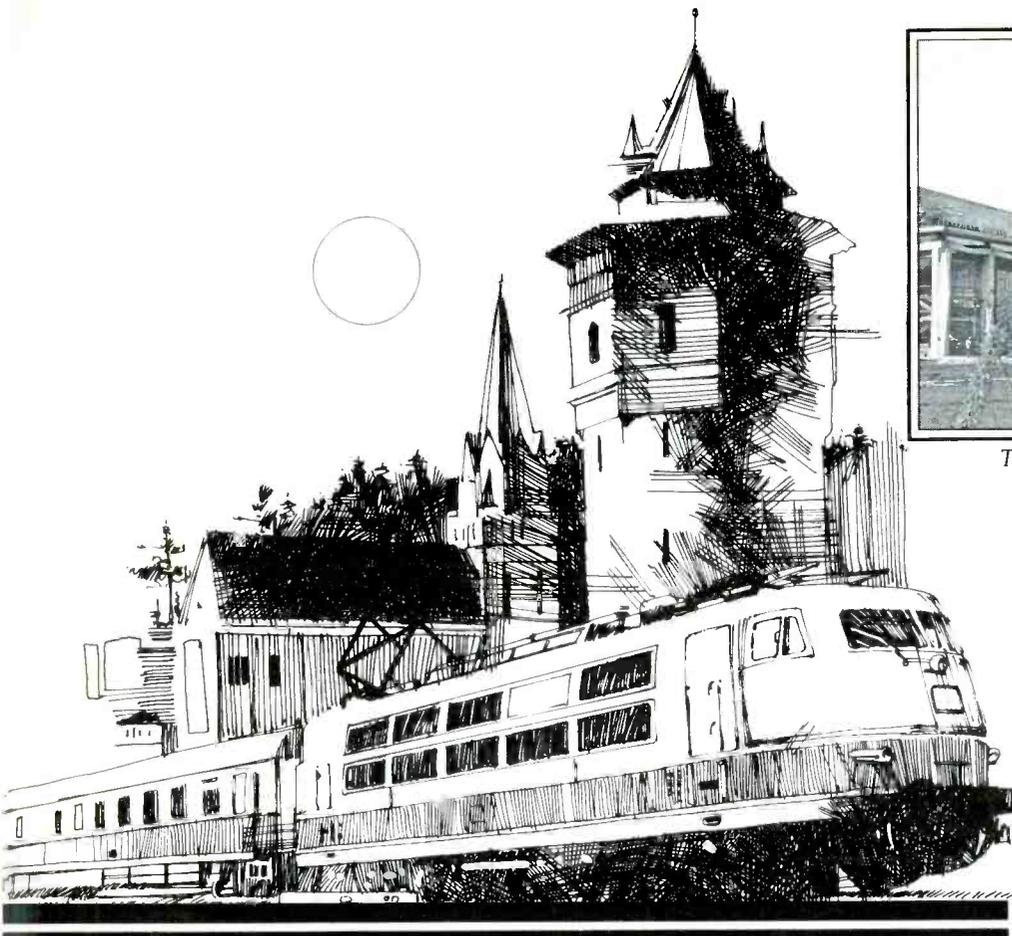
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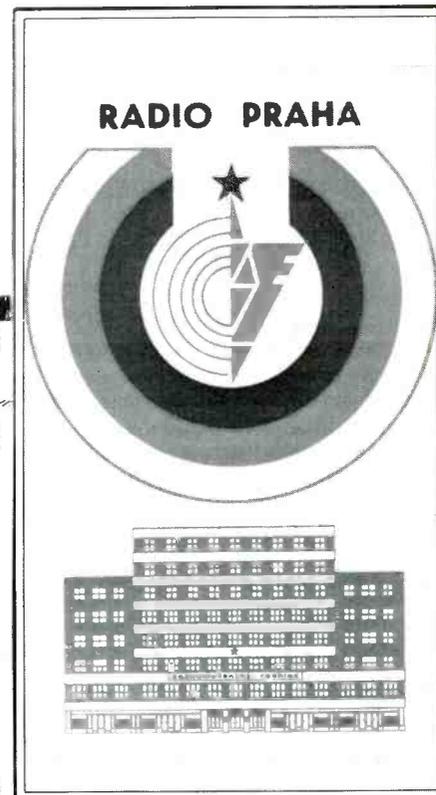
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The broadcast center in Bucharest.



Tuning In On Eastern Europe

BY GERRY L. DEXTER

It wouldn't be surprising to learn that the lamps frequently burn late in the Kremlin these days, especially in those offices concerned with Moscow's relationship with its East European bloc. It has been 40 years since much of Eastern Europe fell under Soviet domination, and, like wallpaper, time is taking its toll. Parts are beginning—just—to come loose.

East Germany's Erich Honnecker wants to visit West Germany's Helmut Kohl. There's been no handshake as of this writing (it almost happened once), but Honnecker may very well make it eventually. If so, it will be one more step toward bringing the two Germans closer together. That's just one indicator, one sign that, however slowly and tentatively, the times they are a-changing.

Moscow's propaganda campaign to stop the deployment of new U.S. missiles in Europe backfired in one sense. Citizens in the countries behind the curtain not only

protested the increased U.S. buildup, they began to question the continued buildup in Soviet missile strength as well. Some even went so far as to call for a nuclear-free zone in Eastern Europe. Like their cousins in Western Europe, the Easterners feel they would be the biggest losers in any nuclear conflict between the two great powers.

Economic woes are another element helping to loosen the ties to Moscow. In order to improve living standards, several countries in the Eastern bloc are making adjustments in their economic mechanisms; moving toward a more capitalistic outlook, decentralizing economic control, and installing a profit motive. There's a desire to achieve more trade with the West and a hunger for the new technologies the West continues to develop.

Although these countries are by no stretch of the imagination ready to proclaim their independence of Moscow's line, there is a

stirring and a restlessness underway that, one day, may grow into something more concrete.

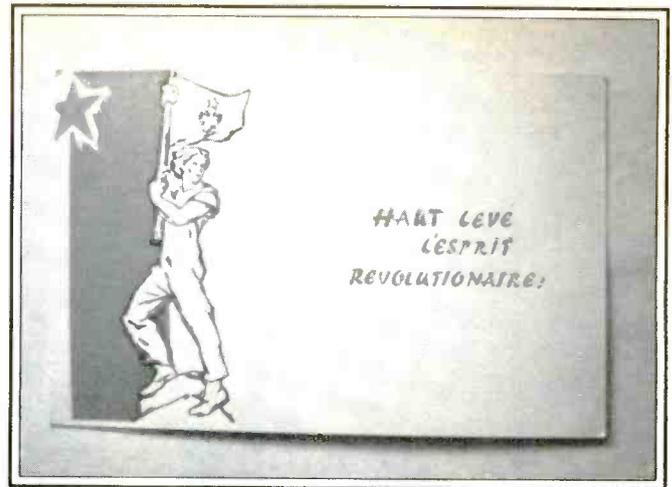
As the wait for such development continues, the shortwave listener can try to spot the moves in this game by tuning in to the broadcasts from the Eastern European countries. To help, we've put together a survey, including the two "bad boys" (from Moscow's viewpoint): Albania and Yugoslavia. Times given are GMT.

Albania

Radio Tirana seems to get everybody's vote for the dullest programming on the air, much of it given over to praising the works and writings of leader Enver Hoxha, whose health may have him near the end of his long reign. Albania lost its one good friend in 1977 in a falling out with the People's Republic of China. So, Tirana carries on alone, maintaining an isolationist stance and claim-



This QSL card from Radio Berlin International shows views of Leipzig.



Radio Tirana's QSL card. (Courtesy Charles Ames of Arizona.)

ing to be the only true Marxist-Leninist state in the world.

Radio Tirana beams English at us from 0000-0030 on 7.065 and 9.750; 0130-0200 and 0230-0300 on 7.120 and 9.750; 0330-0400 on 6.200 and 7.300; and 1230-1300 on 9.515 and 11.960. High power transmitters of Chinese manufacture were one of the benefits the Albanians received from their ties with Beijing.

QSLs from Radio Tirana can take a while to arrive and the word is that reports won't be answered unless they cover the entire 30 minute broadcasts. That's one way to get you to listen. Address: Radiotelevisione Shqiptar, Rruga Ismail Qemali, Tirana.

Bulgaria

It maintains the closest ties to Moscow of any of the Eastern European countries. Industry and tourism are being developed as companions to a heavy concentration in agriculture, particularly tobacco.

Radio Sofia has transmitters ranging in power from 100 to 500 kilowatts, located at Kostinbrod and Plovdiv, the latter also used by Radio Moscow for some of its broadcasts. Programs are broadcast in about a dozen languages and cover science, sports, culture, youth, and Bulgarian music, along with the usual DX program and listeners letters show. "Aspects of Cooperation" and "The Socialist World Today," both aired on Wednesdays, may be the source of clues involving any inching away from Moscow.

English to North America is scheduled at 0000 to 0100 on 9.700, 11.720, and 11.750; 0400-0500 on 11.750; and 2230-2300 on 9.700, 11.720, and 11.750.

Those who like transmitter sites on their QSLs can forget it here. Radio Sofia won't acknowledge the existence of Plovdiv, nor will they QSL their home service transmitter at Stolnik on 7.670. Reports should go to 4 Boulevard Dragan Tsankov, Sofia.

Czechoslovakia

This country has been independent since 1918 and has ethnic and cultural differences within the population. The high cost of So-

viet oil weighs heavily on the Czech economy as well.

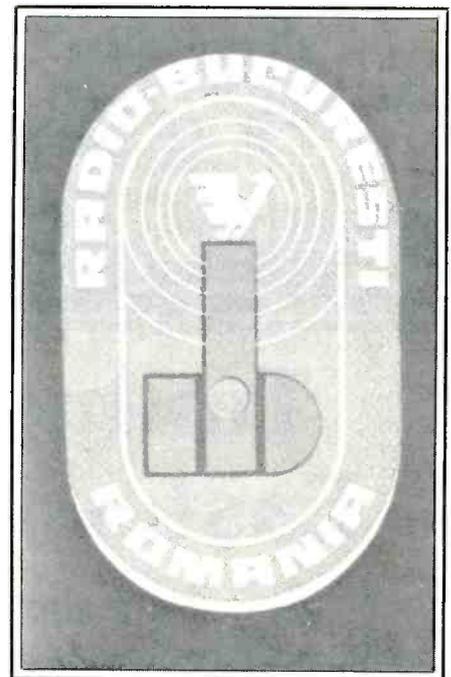
Radio Prague has been on the air since 1923 with shortwave in use since 1934, making it one of the earliest broadcasters in Eastern Europe. The station's Czech-made transmitters are located east of Prague near Pobebrady, with another site in the Slovakian town of Velke Kostolany.

Radio Prague's 1984 slogan was "Peace for you and me" used mainly in their youth magazine program. North American broadcasts are from 0100 to 0157, with a repeat at 0300, on 5.930, 7.345, 9.540, 9.630, 9.740, and 11.990.

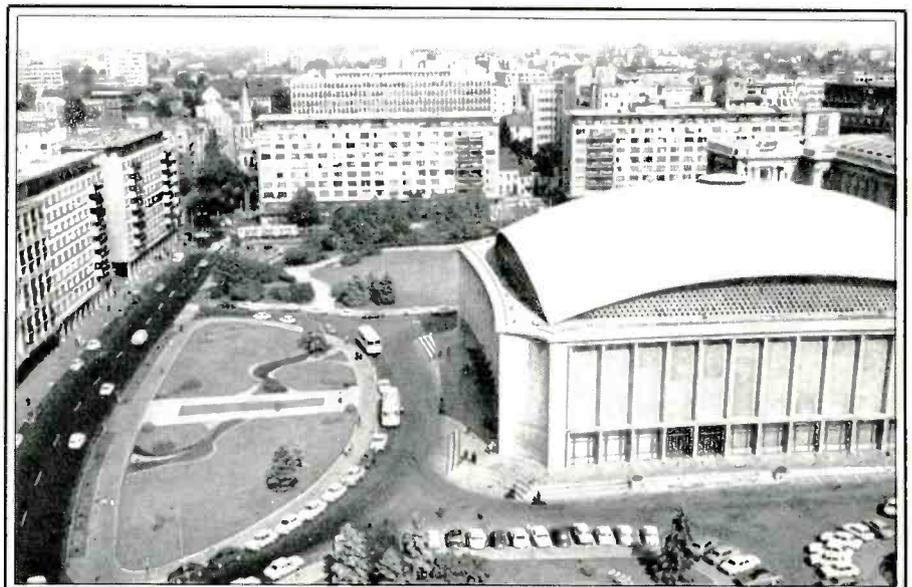
Reception reports are welcome at 120 99, Prague.

East Germany

Highly industrialized with a burning but often suppressed desire for closer ties with its other half, East Germany fields a flourishing peace movement that has shown concern over military growth by both major powers. The loosening of regulations regarding visits



Bucharest.

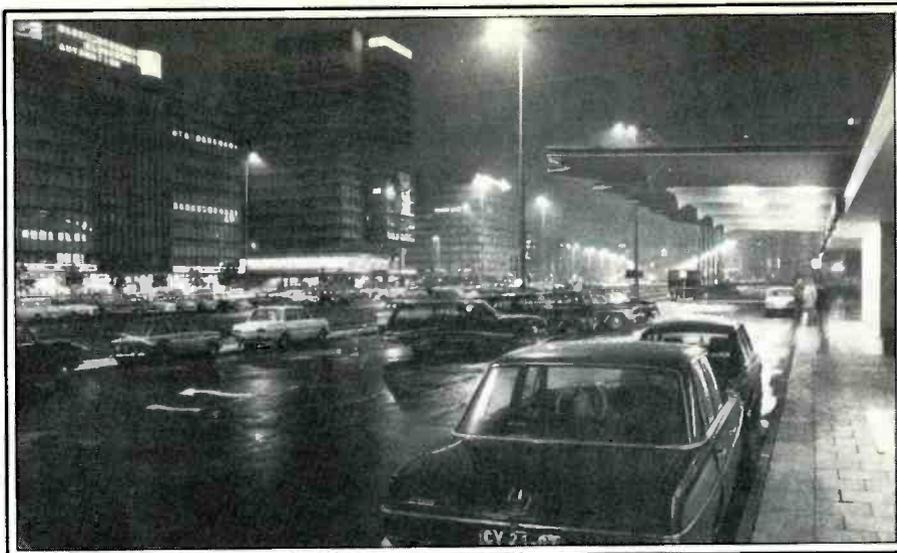


by West German citizens has further exposed (along with reception of West German television) the East Germans to the better lifestyles of Westerners. Trade with the West is among the highest in Eastern Europe.

Radio Berlin International went on the air in 1955 as the radio of the G.D.R.'s Foreign Information Department. It's now on daily in 11 languages totalling some 50 hours of broadcasting per day. RBI's DX Club produces a number of information pamphlets for shortwave listeners.

North American broadcasts are aired daily at 0015-0100 and 0100-0145 on 6.080 and 9.730; also at 0230-0315 on the same frequencies and to the west coast at 0330-0415 on 6.010, 6.080, 9.560, and 0630-0715 on 6.010 and 6.080. Transmitter powers range from 50 to 500 kilowatts and are located at Konigswusterhausen, Nauen, and Leipzig.

RBI's address is 1160, Berlin, GDR.



East Berlin.

Hungary

Private companies having less than 30 employees are now allowed in Hungary. But a heavy debt to foreign banks, inflation, and trade deficits have contributed to a stagnant economy.

Experimental broadcasts from Hungary began way back in 1925. After World War II, transmitting equipment had to be completely rebuilt because the Germans destroyed everything before their retreat. Ten years ago, new 250 kilowatt transmitters went on the air from a site near Jaszbereny. Other sites are at Diosd and Szekesfehevar.

Half-hour broadcasts to North America are at 0200, 0300, and 0400 on 6.025, 6.110, 9.520, 9.835, 11.910, and 12.000.

Reception reports and information about the station's DX club can be sent to: Brody Sander 5-7, H-1800 Budapest.

Poland

Of all the East European countries, Poland has been most in the news in recent years thanks to the questions and demands of the Solidarity organization and the countermoves by the government. Some freedoms were won along the way, some were won and then lost again. Poland's economy, like the others, teeters on the brink of real trouble and the Polish government must try to satisfy a population that seems permanently unhappy.

Radio Polonia adopted that name just two or three years ago. The station is on the air to North America with three 55-minute to 1 hour transmissions per day; at 0200 and 0300 on 6.095, 6.135, 7.145, 7.270, 9.525, 11.815, and 15.120; also at 1130-1225 on 9.525, 11.840, and 17.865.

Radio Polonia broadcasts in about a dozen languages using transmitters of 100 kilowatts. It is often something of a struggle to hear this one well, but check the "Panorama" feature and opening newscasts for clues as to what's happening in Poland.

Reception reports go to the English Section, P.O. Box 46, 00-950 Warsaw.



Radio Polonia's program schedule.

Romania

Head of State Nicolae Ceausescu works at keeping the country on a Stalinist line. Economic growth has slowed in the 80's and there has been at least one purge of intellectuals and party leaders in recent years. While Romania maintains a more independent foreign policy line, economically it is still pretty much business as usual.

Broadcasting began around 1925 and had to be rebuilt and reorganized following World War II. Nearly 11,000 program hours were aired in 1982 in over a dozen languages. Programs entitled "Youth Club," "Let's Talk It Over," and "Focus On Topical Questions" along with "Romanian Meridian" should provide a good insight into how the Romanian government sees things.

Transmitter powers are 120 and 240 kilowatts. North American services go on at 0200 and 0400 for an hour each time on

5.990, 6.155, 9.510, 9.570, 11.810, and 11.940. Also at 2300 to 0000 on those same frequencies.

Reception reports go to P.O. Box 1-111, Bucharest.

Yugoslavia

This country, under Marshall Tito, was able to steer a course independent of Moscow for many years. His successors continue to do so, and to take things a step further in recognizing the need for changes and refinements in the system. Nationalism is more important than communism. Pragmatism ascends. Ideology declines. Potential trouble hides in the patchwork of nationalities that make up the country.

Foreign broadcasting from Yugoslavia began in 1936. Construction of a new high-power broadcasting center for overseas programming is nearly complete and should improve reception over the 10 and 100 kilowatt units now in use.

English to North America does not occupy as important a place in the list of priorities here as it does in the other countries of Eastern Europe. It's limited to 15 minutes per day, from 2115 to 2130 on 6.100, 7.240, and 9.620—not the best choice of frequencies for that time of the day for reception in North America. Things may improve with the inauguration of new facilities.

Radio Yugoslavia's address is Hilendarska 2, 1100 Belgrade.

Monitoring the government broadcasters of Eastern Europe, picking out those programs that may deal with current trends and situations, is an excellent way to keep an eye on the wallpaper and discover just how much the ravages of time are pulling away from the wall.

The months and years to come will tell us whether the current trends were simply a brief flirtation or whether a more permanent change in the destinies of Bulgaria, Czechoslovakia, East Germany, Hungary, and Romania lies ahead. The clues are there if you wish to devote the time to discover them on your own.

PC

Selected English Language Broadcasts

Spring 1985

BY GERRY L. DEXTER

Note: The following list of English language broadcasts was accurate at the time of compilation. Hundreds of English language broadcasts are to be found on shortwave every day. This is a representative sampling and not intended as a complete reference. Some stations air only part of their broadcasts in English during a given hour. Others will run English segments into the following hour or for several hours continuously and are not necessarily carried over in this listing. Some major broadcasters such as Radio Moscow, The Voice of America, and the British Broadcasting Corporation, maintain virtual 24-hour English services. All times are GMT. Numbers in parenthesis indicate the starting time for English within the hour. Some will be difficult to hear.

Time	Country	Frequencies
	Japan	15.195
	Albania	7.120, 9.760
	Netherlands (0230)	6.165, 9.590, 9.895
0300	Portugal	6.060, 11.925
	Austria (0330)	5.945, 9.770
	Honduras	4.820
	Czechoslovakia	5.930, 7.345, 9.540, 9.630, 9.740, 11.990
	France (0315, 0345)	6.175, 7.135, 9.545, 9.790, 11.670
	E. Germany (0330)	6.010, 6.080, 9.560
	Kenya	4.915
	Malawi	3.380
	Poland	6.095, 6.135, 7.145, 7.270, 9.525, 11.815, 15.220
	Greece (0330)	6.205, 9.420, 11.645
	Sweden (0330)	6.105
	Transkei, S. Af.	3.930
	China	9.860, 11.860, 11.970
	New Zealand (0345)	17.705
	Namibia	3.295
	Costa Rica	5.055
	Guatemala	3.300
	Turkey	9.560, 9.730
0400	Botswana	4.820, 7.255
	Cuba	6.140, 11.725, 11.760
	Austria (0430)	5.945, 9.635
	Bulgaria	11.750
	France (0415, 0445)	7.135, 9.535, 9.545, 9.550, 9.790, 11.880
	Nicaragua	6.015
	Uganda	5.026
	Zambia	4.910
	Switzerland (0430)	9.725, 12.035
	Hungary	6.025, 6.110, 9.520, 9.835, 12.000
	Romania	5.990, 6.155, 9.510, 9.550, 9.570, 11.810
0500	Portugal (0530)	6.075, 9.575
	W. Germany	5.960, 6.120, 9.545, 9.690, 11.705
	Nigeria	7.255
	Spain	6.065, 9.630, 11.880
	Ecuador	6.095, 11.910
	Ireland	6.910
	Netherlands (0530)	6.165, 9.715, 9.895
	Cameroon	4.795, 4.850, 5.010
	Costa Rica	5.954
0600	Cuba	9.525
	Ghana	4.915
	Taiwan (0610)	5.985
	Liberia	4.760
	Cook Islands	11.760
	Solomon Is.	5.020, 9.545
	Malaysia	6.175, 9.750
0700	Alaska	6.170
	New Caledonia	7.170
	England	5.975, 6.175, 9.510
0000	Belgium (0030)	5.910
	Bulgaria	9.700, 11.880
	Cambodia	11.938
	Canada	5.960, 9.755
	China	9.880, 11.860
	E. Germany	6.080, 9.730
	Israel	7.412, 9.440, 9.815
	Spain	9.630, 11.880
	Vatican (0050)	6.015, 9.605, 11.845
	Japan	9.645, 11.710
	Albania	7.065, 9.760
	England	5.975, 6.120, 6.175, 7.325, 9.590, 9.915, 11.750
0100	Cuba	6.140, 11.725
	Australia	15.165, 15.240, 15.395, 17.715, 17.725, 17.750
	Austria	5.945, 9.770
	Czechoslovakia	5.930, 7.345, 9.540, 9.630, 9.740, 11.990
	W. Germany	6.040, 6.085, 6.145, 9.545, 9.565, 11.785
	Italy	9.575, 11.800
	Nicaragua	6.015
	Greece (0130)	6.205, 9.420, 11.645
	Ecuador	9.745, 15.155, 15.250
	Switzerland (0145)	6.135, 9.725, 9.885, 12.035
	China	11.860
	Hungary	6.025, 6.110, 9.520, 9.835, 11.910
	Luxembourg	6.090
0200	S. Korea	11.810, 15.585
	Egypt	9.475, 9.675
	Hungary	6.025, 6.110, 9.520, 9.835, 11.910
	Belize	3.285
	Brazil	15.290
	Canada	5.960, 9.755
	Romania	5.990, 6.155, 9.510, 9.570, 11.810
	China	9.880
	Israel	7.412, 9.440, 9.815
	Poland	6.095, 6.135, 7.145, 7.270, 9.525, 11.815, 15.120
	South Africa	5.980, 6.020, 9.615
	Taiwan	5.985
	Ukraine SSR	9.800, 11.720, 11.770, 15.180
	Sweden (0230)	6.105, 9.695

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Selectable AM-FM modes • LCD display
World's first continuous coverage scanner
Frequency range: 25-550 MHz, continuous coverage.
Never before have so many features come in such a small package. The Regency MX5000 mobile or home scanner has continuous coverage from 25 to 550 MHz. That means you can hear CB, Television audio, FM broadcast stations, all aircraft bands including military and the normal scanner bands, all on your choice of 20 programmable channels.

NEW! Regency[®] MX4000-G

List price \$629.95/CE price \$394.00
Multi-Band, 20 Channel • No-crystal scanner
Search • Lockout • Priority • AC/DC
Selectable AM-FM modes • LCD display
Bands: 30-50, 118-136, 144-174, 440-512, 800-950 MHz.
The Regency MX4000 is gives coverage in the standard VHF and UHF ranges with the important addition of the 800 MHz, and aircraft bands. It features keyboard entry, multifunction liquid crystal display and variable search increments.

Regency[®] MX3000-G

List price \$319.95/CE price \$182.00
6-Band, 30 Channel • No-crystal scanner
Search • Lockout • Priority • AC/DC
Bands: 30-50, 144-174, 440-512 MHz.
The Regency Touch MX3000 provides the ease of computer controlled, touch-entry programming in a compact-sized scanner for use at home or on the road. Enter your favorite public service frequencies by simply touching the numbered pressure pads. You'll even hear a "beep" tone that lets you know you've made contact.

Regency[®] Z30-G

List price \$279.95/CE price \$166.00
6-Band, 30 Channel • No-crystal scanner
Bands: 30-50, 144-174, 440-512 MHz.
Cover your choice of over 15,000 frequencies on 30 channels at the touch of your finger.

Regency[®] C403-G

List price \$99.95/CE price \$62.00
5-Band, 4 Channel • Crystal scanner
Channel indicator LED • AC only • Low cost
Bands: 30-50, 148-174, 450-470 MHz.
Regency's basic scanner, the C403 gives you the excitement of police, fire and emergency calls at a budget price. It can tune in to any of five public service bands and brings the signal in loud and clear...on any of four possible channels. It comes with detachable telescope antenna and AC power cord. Order one crystal certificate for each channel you want to receive.

Regency[®] HX1000-G

List price \$329.95/CE price \$209.00
6-Band, 30 Channel • No Crystal scanner
Search • Lockout • Priority • Scan delay
Sidelit liquid crystal display • Digital Clock
Frequency range: 30-50, 144-174, 440-512 MHz.
The new handheld Regency HX1000 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 30 channels at the same time. When you activate the priority control, you automatically override all other calls to listen to your favorite frequency. The LCD display is even sidelit for night use. A die-cast aluminum chassis makes this the most rugged and durable hand-held scanner available. There is even a backup lithium battery to maintain memory for two years. Includes wall charger, carrying case, belt clip, flexible antenna and nicad battery. Order your Regency HX1000 now.

Regency[®] R106-G

List price \$159.95/CE price \$92.00
5-Band, 10 Channel • Crystal scanner • AC/DC
Frequency range: 30-50, 146-174, 450-512 MHz.
A versatile scanner, The Regency R-106 is built to provide maximum reception at home or on the road. Rugged cabinet protects the advanced design circuitry allowing you years of dependable listening.

NEW! Regency[®] R1050-G

List price \$179.95/CE price \$109.00
6-Band, 10 Channel • Crystalless • AC only
Frequency range: 30-50, 144-174, 440-512 MHz.
Now you can enjoy computerized scanner versatility at a price that's less than some crystal units. The Regency R1050 lets you in on all the action of police, fire, weather, and emergency calls. You'll even hear mobile telephones.

Programming the R1050 is easy. Merely touch the keyboard and enter any of over 15,000 frequencies on your choice of 10 channels.

Regency[®] HX650-G

List price \$129.95/CE price \$79.00
5-Band, 6 Channel • Handheld crystal scanner
Bands: 30-50, 146-174, 450-512 MHz.
Now you can tune in any emergency around town, from wherever you are, the second it happens. Advanced circuitry gives you the world's smallest scanner. Our low CE price includes battery charger/A.C. adapter.

NEW! Regency[®] HX-650P-G

List Price \$189.95/CE price \$104.00
Now, Communications Electronics offers a special packaged price on the Regency HX-650 scanner and the following items for only \$104.00. You get the Regency HX-650 scanner, a set of 4 AAA ni-cad batteries, the MA-506 carrying case, six crystal certificates, AC adapter/charger and flexible rubber antenna for only \$104.00 per package plus \$10.00 shipping/handling. To order this special package, use CE special order number HX-650P-E.

QUANTITY DISCOUNTS AVAILABLE
Order two scanners at the same time and deduct 1%, for three scanners deduct 2%, four scanners deduct 3%, five scanners deduct 4% and six or more scanners purchased at the same time earns you a 5% discount off our super low single unit price.

NEW! Regency[®] HX2000-G

The World's First 800 MHz, Handheld Scanner
List price \$569.95/CE price \$359.00
7-Band, 20 Channel • No-crystal scanner
Priority control • Search/Scan • AC/DC
Sidelit liquid crystal display • Memory backup
Bands: 118-136, 144-174, 440-512, 800-950 MHz.
The new Regency HX2000, handheld scanner covers thousands of frequencies including the new 800 MHz band. Selectable AM/FM reception modes on all channels. With the included AC/DC transformer, the HX2000 can be operated on either 120V AC or 6 VDC. Scans 15 channels per second. Size 3" x 7" x 1 1/2". Includes wall charger, carrying case, belt clip, flexible antenna and nicad batteries.

NEW! Regency[®] RH250B-G

List price \$699.95/CE price \$379.00
10 Channel VHF synthesized transceiver
Built-in scanner with programmable priority
Fully programmable CTCSS on every channel
Frequency range: 150-162 MHz, transmit & receive.
If you're a fireman, policeman or a person on the go and it's essential that you stay in touch with headquarters, you need the Regency RH250 transceiver. You can program simplex or semi-duplex frequencies including CTCSS tones on all channels. 25 Watts output on VHF. If you need a UHF version of this radio with 15 Watts output and frequency coverage of 450-482 MHz, order model number RU150B-G for \$449.00 each.

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 - Z45-G Scanner \$199.00
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 - EC10-G Programming tool for Regency RP410 \$20.00
 - SMRH250-G Service man. for Regency RH250 \$20.00
 - SMRU150-G Service man. for Regency RU150 \$20.00
 - SMRPH10-G Service man. for Regency RP410 \$20.00
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 - A-135C-G Crystal certificate \$3.00
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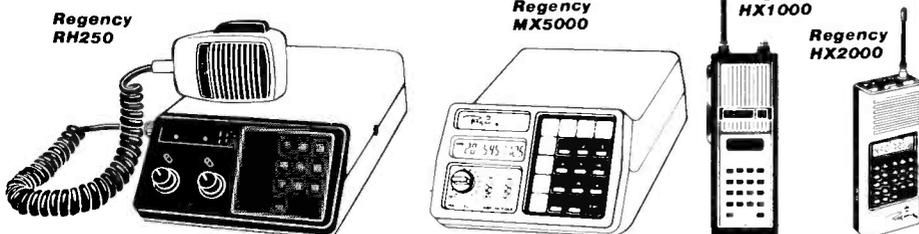
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CIRCLE 36 ON READER SERVICE CARD

Time	Country	Frequencies	Time	Country	Frequencies
	Kiribati	16.435 (SSB)		Norway	15.205, 17.800 (Sun)
	Cuba	9.525		UAE	11.995, 15.300, 15.320
0800	Belgium	9.880		Pakistan (1645)	9.485, 12.015
	Australia	9.580, 11.720, 11.910, 15.165, 15.240, 15.395		Singapore	11.940
	Solomon Islands	5.020, 9.545		Vietnam	10.040, 12.020
	Cook Islands	11.760		Canada	11.955, 17.820
	Alaska	6.170	1700	Argentina	15.345
0900	Falklands	3.958		New Zealand (1745)	15.485, 17.705
	Papua New Guinea	4.890		Japan	9.505, 11.815
	Japan	9.505		Norway	9.565, 11.865, 15.220
	New Zealand (0930)	15.485		England	9.515, 9.740, 15.070, 15.260
	Guam	11.840		Pakistan	11.670
	Australia	6.045, 9.580		Nigeria	11.770, 15.120
	N. Korea	9.765		Saudi Arabia	11.855
1000	Saudi Arabia	11.855	1800	Saudi Arabia	11.855
	Australia	6.045, 9.580		Bangladesh (1815)	5.915, 7.355
	Singapore	5.052		Brazil	15.270, 17.755
	Vietnam	9.840, 12.035		Israel	9.385, 9.920, 11.585
	Monaco	4.495		Kuwait	11.675
	Afghanistan (1030)	4.450, 6.230, 15.255		Pakistan	9.485, 12.015
1100	N. Korea	9.745, 9.977		Guinea	15.312
	Thailand (1130)	9.650		Nigeria	15.120
	China	9.820	1900	Dominican Rep.	11.700
	Papua New Guinea	4.890		Afghanistan	5.905, 7.320
	England	5.965, 6.195, 11.775, 15.070, 15.215		Iran	9.022
	Israel	11.655, 15.585		India	11.820
1200	Saudi Arabia	11.855		Canada	15.260, 17.820
	Australia	5.955, 6.045, 6.060, 6.080, 9.580, 9.770, 11.800		Ecuador	17.790
	Bangladesh (1230)	15.180, 17.670		Ivory Coast	11.920
	Finland	15.400, 17.800		Libya	15.450
	Greece (1235)	11.645, 15.630, 17.565	2000	Saudi Arabia	11.855
	Ecuador (1215)	11.740, 15.115, 17.890		Kuwait	11.675
	Mongolia	9.615, 12.015		Algeria	9.640, 15.215, 17.745
	Albania (1230)	9.515, 11.960		Malta (2030)	9.545
	India	11.810, 15.335		England	11.750, 15.260
	Netherlands Ant.	11.815		Israel	9.009, 9.425, 9.440, 9.815
	N. Korea	9.745, 9.977		Yugoslavia	9.620
1300	Belgium	9.880, 17.610	2100	Dominican Republic	11.700
	Canada	9.650, 11.855, 11.955, 15.440, 17.820 (weekdays)		Cuba	15.300, 17.750
	Norway	15.175, 15.225 (Sun)		Australia	9.580, 9.620, 15.160, 17.795
	Philippines	15.445		Cameroon	9.745
	Sri Lanka	15.425		Iraq (2130)	9.745
	Vietnam (1330)	10.040, 12.020		Nigeria	15.120
	Japan	9.505		Yugoslavia (2115)	6.100, 7.240, 9.620
	Switzerland (1315)	17.765		Egypt (2115)	9.805
	UAE	15.320, 17.775, 21.605	2200	Israel (2230)	9.425, 9.440, 9.815, 11.700, 12.025, 12.080
1400	S. Korea	9.570, 9.750, 15.575		Lithuanian SSR	11.720, 11.960, 15.180, 15.230, 15.405
	Finland	15.400, 17.800		New Zealand (2245)	15.485, 17.705
	Yugoslavia (1430)	15.240		Bulgaria (2230)	9.700, 11.720, 11.870
	Mongolia (1445)	9.615, 12.015		Libya	11.815
	Ecuador	11.740, 15.115, 17.890		Turkey	5.960, 9.560, 9.730, 9.755
	Sweden	17.860		Norway	9.520 (Sun)
	Australia	9.680, 9.770		Taiwan	11.825, 15.345, 17.800
	India	11.810, 15.335		England	5.975, 6.175, 7.325, 9.915, 11.750, 15.260
1500	Australia	5.995, 6.045, 6.060, 9.580, 9.710, 9.770, 11.800		Australia	15.320, 15.395, 17.795
	Finland	15.400, 21.475	2300	N. Korea	9.745, 15.230
	Indonesia	11.790, 15.150		Malta	6.110
	Seychelles	11.895, 15.325		Ukraine SSR (2330)	9.800, 11.720, 11.790, 15.180, 15.320, 15.405, 17.860
	Nepal	5.005, 7.165		Sweden	6.045, 11.960
	Greece (1535)	11.645, 15.630, 17.565		Japan	17.755
	Ethiopia	9.560		Bulgaria	9.700
1600	Saudi Arabia	11.855		England	5.975, 6.120, 6.175, 7.325, 9.590, 9.915, 11.750
	Dominican Rep.	11.700		Haiti	4.930
	France (1605)	11.705, 15.315, 15.345, 17.620, 17.795		Vietnam	9.840, 12.035
				Greece (2330)	9.420, 9.865, 11.645

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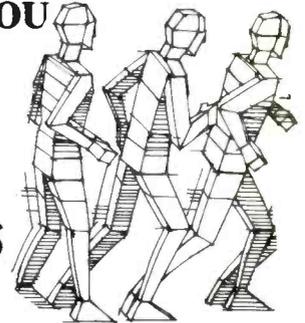
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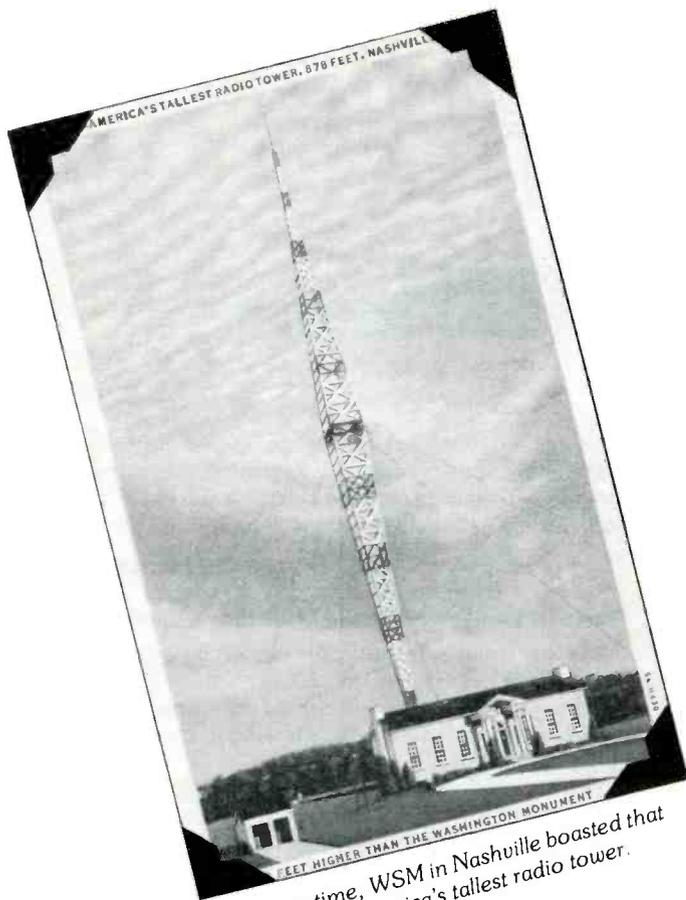
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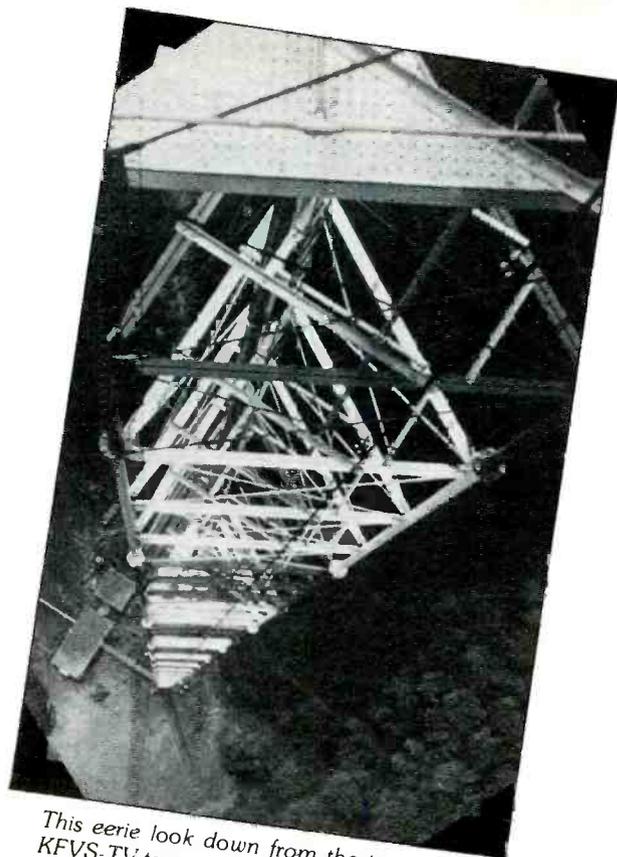
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CIRCLE 115 ON READER SERVICE CARD



At one time, WSM in Nashville boasted that it had America's tallest radio tower.



This eerie look down from the top of the KFVS-TV tower offers a view of the ground from 1960's tallest radio tower.

Pictures Worth 1,000 Words

The Way It Was – According To Picture Postcards

BY ALICE BRANNIGAN

It has always been, since the day the first fisherman hooked the first trout, that tall tales have been a part of the scene. And speaking of tall, tell me about broadcast towers! It has always been something to brag about if a station was able to pile up enough steel to claim that its tower beat out all others.

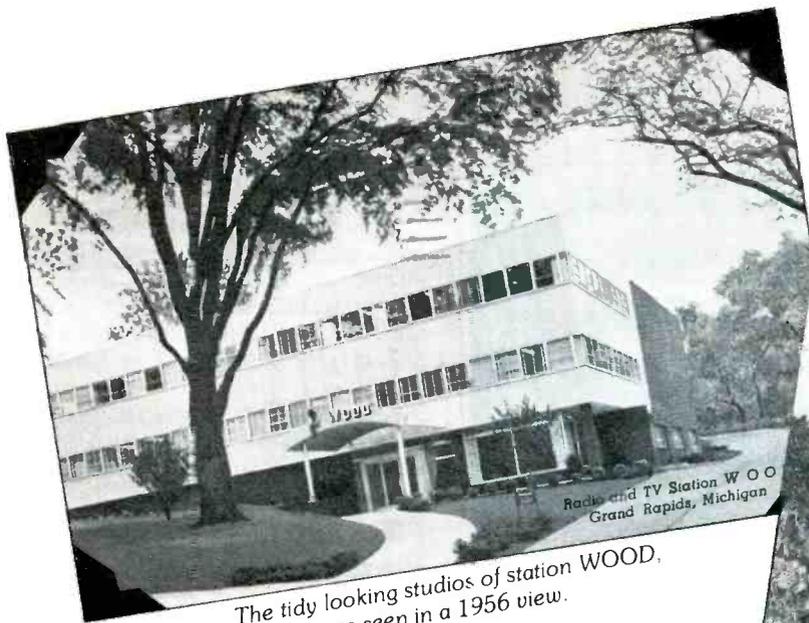
In looking through old picture postcards, I came across one dated 1938 which boldly claimed the title of "America's tallest radio tower," for the structure depicted thereon. This card shows famed broadcaster WSM in Nashville, Tennessee and its 878 foot antenna. The card also noted that the tower happened to be 323 feet taller than the Washington Monument—neglecting to point out that the Washington Monument has been sinking into the ground at a rate of 5 inches

per year since 1884! Since 1938, when WSM claimed that their tower was 323 feet taller than the Washington Monument, the Monument has shrunk at least 19 feet!

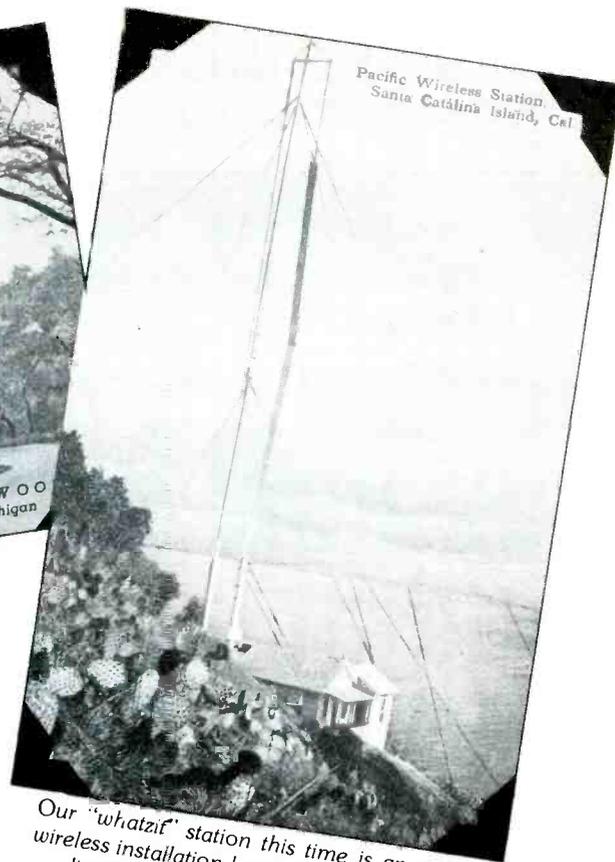
WSM went on the air in 1925, being owned at that time by the National Life and Accident Insurance Company. From its studios at 301 Seventh Avenue North, the station ran 5 kW on 650 kHz. Although the station eventually upped its power to 50 kW, by the late 1940's it was still on its original frequency, still had the same owner, and the studio was still at the same address. The transmitter, by that time, was located at Calender Road, Williamson County, Tennessee (RFD Franklin). Presently, WSM is owned by the MLT Corporation and running 50 kW on 650 kHz.

The next card boasting of a larger-than-life antenna tower is from KFVS-TV in Cape Girardeau, Missouri. This card notes that the tower is 1675.55 feet and is "one of the world's tallest man-made structures." The tower, located on County Highway V-Y, is 12 miles south of Cape Girardeau. Although the card is undated, this tower was constructed in June of 1960 and was, at the time of its construction, just as claimed by its owners. The tower held that title for almost two years, until the 1749-foot tower of WTVM/WRBL-TV (Columbus, Georgia) went up in May of 1962.

These days, neither of these gigantic towers hold any records for being the tallest. The tower used by KTHI-TV in Fargo, North Dakota, was erected in November of 1963.



The tidy looking studios of station WOOD, as seen in a 1956 view.



Our "whatzif" station this time is an early wireless installation located on Santa Catalina Island, off the California coast.

It's 2063 feet tall. Another tall tower is proposed by station WAVE-TV at LaGrange, Kentucky. That one is going to be 1944 feet tall and located near the local airport, Bowman Field. At press time, the Aircraft Owners and Pilots Association (AOPA) was opposing construction of the WAVE-TV tower, citing a possible "safety threat to inexperienced student pilots and to other VFR operations, especially under conditions of marginal visibility and low ceilings."

The tallest broadcasting tower in the world is the one erected by Warsaw Radio in Poland. That giant is 2120 feet, 8 inches tall and took four years to complete. It is held in place by 15 steel guy wires. This tower is more than twice as tall as the tower shown on the 1938 WSM card!

Now we want to get a look at station WOOD in Grand Rapids, Michigan as it appeared on a postcard dated 1956. This station went on the air in 1930, with studios in the Watson Building and transmitter at Fumwood, Michigan. It was running 500 watts on 1270 kHz and owned by Walter B. Stiles, Inc. After WWII it was a different story; it was running 5 kW on 1300 kHz and was located on the 14th floor of the Grand Rapids National Bank Building. At that time, it was owned by the King Trendle Broadcasting Company, with transmitter at

633 60th Street. By the time the view on the postcard was made, WOOD had moved to its own attractive 3-story building. Presently the station remains on 1300 kHz with 5 kW. It is owned by WOOD Broadcasting Inc., at 180 North Division Street in Grand Rapids.

Our mystery postcard this time around shows a scene described only as "Pacific Wireless Station, Santa Catalina Island,



"Thanks to POP'COMM readers for offering information on mystery cards displaying unknown scenes," says the author.

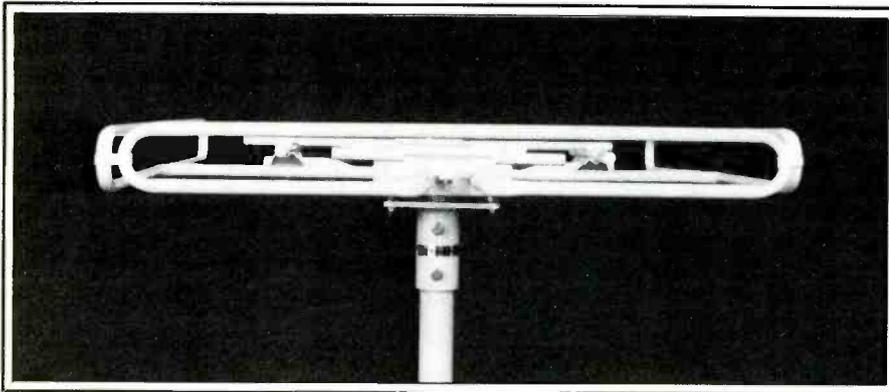
Cal." Although this is a very old (color) card, it is undated and has no further descriptive information to offer. From the odd antenna hanging from the mast, it certainly appears to date from the early days of wireless. The antenna looks to be a multi-wire vertical supported by a heavily guyed wooden mast. The transmitter building appears to be nothing more than a small wooden beach bungalow sitting on the side of a hill overlooking the ocean. Most likely, this was a station used for communicating with ships at sea. In looking back through old records, I located a few early wireless stations on Santa Catalina, namely a U.S. Navy station with the call sign NZL which was there before 1920 but long gone by 1924. In 1924, however, there was a radio experimenter on the island who held the call signs 6XAD and 6ZW; his name was Lawrence Mott. It is speculative if the card relates to this information and perhaps readers can offer some more definite information on this station by the shores of the Pacific.

Next time, as a Mother's Day Special, a photo postcard from the early days of broadcasting. Not only a tribute to Mom, but certainly one of the most unusual and (perhaps) bizarre looking stations we have ever come across. You will definitely not want to miss this one! You've never seen anything quite like it.

PC

PRODUCTS

REVIEW OF NEW AND INTERESTING PRODUCTS



Marine Long-Range TV Antenna

The need for an omnidirectional TV antenna is paramount aboard any type of recreational or commercial ship. Yagi TV antennas must be rotated manually or electronically to stay locked on to the TV station—the omniantenna offers 360 degree reception as the vessel turns, swings, or rolls.

A popular long-range VHF/UHF television antenna in Europe is now available here in the United States. The DANTRONICS-360 is a complete marine VHF/UHF television reception system covering all channels between 2 to 80 (40 MHz-840 MHz).

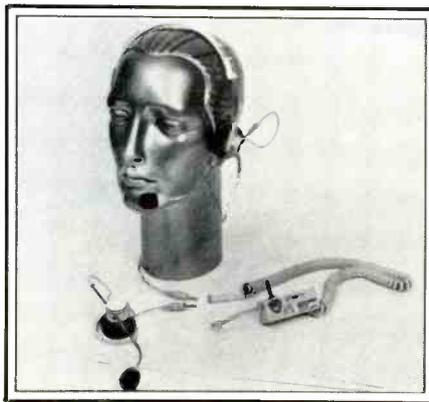
The antenna system also features a low noise, HF-100 hybrid VHF/UHF wide-band preamplifier that boosts incoming signals by as much as 22 dB. The preamplifier is built into the antenna feedline connector, at the antenna, for maximum gain with minimum noise. The antenna feedline is 72-ohm coaxial cable to minimize interference from onboard electronics or ghosting. The coaxial cable is then terminated into a power supply distribution amplifier that provides voltage for the preamp and outputs to one or multiple TV sets. The output may also be fed to drive an FM stereo receiver since the antenna is broadbanded throughout the VHF and UHF spectrum.

The approximately 2-foot square antenna measures 630 x 630 x 260 millimeters and weighs 4 Kg (8½ lbs). A variety of voltage systems are available to feed the preamplifier circuit.

For more information on this innovative antenna, write or contact, DANTRONICS/MEMAC Co., Box 204, Boca Raton, FL 33429, or circle number 101 on the reader service card.

Telephone Headset Leaves User's Hands Free

Nady System's new EasyTalk™ telephone headsets are affordable by small offices and people who work at home. Suggested retail is \$49.95, yet the EasyTalk™



headsets have more features than units costing several times as much.

"People are amazed at how much more they get done when they use one of our headsets," says Nady spokesman Leon Brenner. "Large companies realized the value of hands-free phone use years ago. Now we've made it available for everyone."

The EasyTalk™ headsets are available in two models. The TH-15H unit is a lightweight, full headband headset with a foam padded speaker and an adjustable boom microphone. The TH-15E headset is an ultralight over-the-ear mount headset with foam padded speaker and adjustable boom mic. The mic is of a noise-cancelling design, so they work well even in high noise level rooms. Both models include the TH-15 phone headset amplifier which operates off phone line voltage. Sophisticated surge voltage circuitry protects the unit.

Volume is adjustable with a dial on the side of the amplifier. EasyTalk™ headsets deliver audio up to 6 dB louder than conventional headsets, so they're also ideal for the hearing impaired. The amp unit mounts with double-sided tape on the telephone body and connects to the phone with a standard snap-in plug. A coil cord with quick-disconnect fitting comes out from the unit and either headset is attached. A switch allows quick easy switchover from headset to handset. EasyTalk™ phone headsets also

come with a "mute" switch for private conversation asides.

Nady Systems, Inc. is an Oakland, California electronic manufacturer. Nady pioneered high quality, low-cost communication systems for industrial and recreational uses. The TH-15 telephone headset is part of Nady's expanded line of consumer electronics items.

For more information contact: Nady Systems, Inc., 1145 65th Street, Oakland, CA 94608, or circle number 105 on the reader service card.

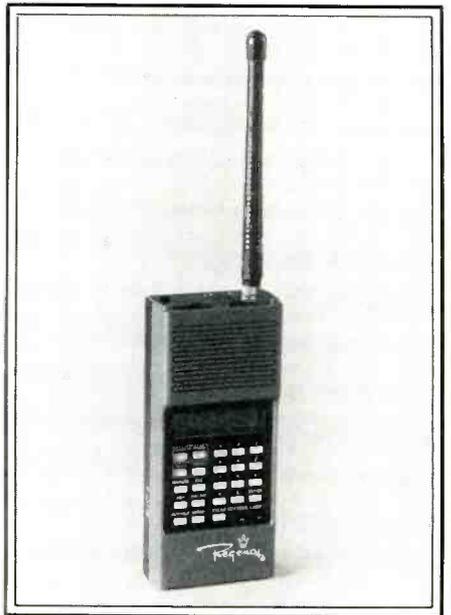
First 800 MHz Range Portable Scanner

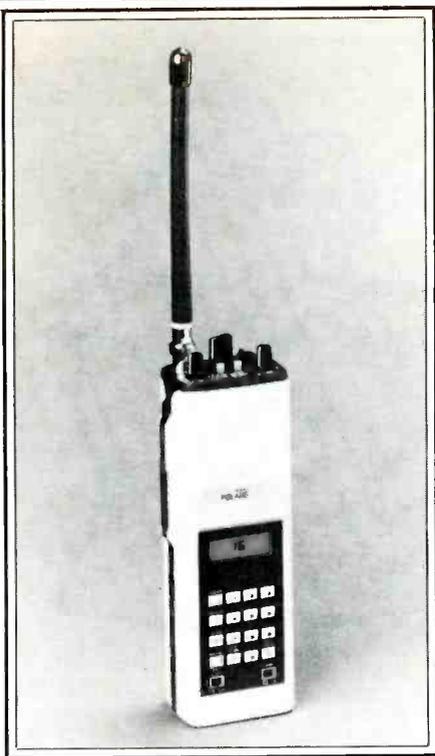
Regency Electronics, Inc., announces the introduction of model HX2000, a 20 channel hand-held scanner.

The HX2000 covers the 800 MHz range (800-950 MHz), Aircraft (118-136 MHz), two VHF ranges (144-148 MHz and 148-174 MHz), two UHF ranges (440-450 MHz and 450-470 MHz), and the UHF "T" Band (470-512 MHz). All frequencies are programmed on the numbered keyboard and appear in the liquid crystal display along with channel numbers and prompting messages. No crystals are necessary.

Additional features include search or scan delay, selectable search frequency increments in some bands, priority control, dual scan speed, channel lockout, and an internal memory battery. A wall charger, two antennas, belt clip, and a NiCad rechargeable battery pack are included.

The suggested retail price is \$569.95. For more information, contact Regency Electronics, 7707 Records St., Indianapolis, IN 46226 or circle number 10 on the reader service card.





Hand-Held Portable Transceiver Boasts Pushbutton Channel Selection

Regency Electronics, Inc. uses a built-in microcomputer "brain" to bring astounding capabilities into a small hand-held portable two-way marine radio (transceiver). It features a pushbutton keyboard for fast, easy access to all available U.S. and international marine channels *plus* ten weather channels; automatic scanning of any or all channels; a special "call waiting" (programmable priority) feature to prevent interruptions during conversations; a side-lighted liquid crystal display that's fully legible even in direct sunlight; and more. The "smart" Regency Polaris MT 1000 is available for \$549 (suggested U.S. resale) at participating Regency Polaris dealers.

The Polaris MT 1000 also offers a key lock and transmitter lock to prevent unintentional operation; a special backup battery that maintains its in-memory programming for up to two years even when its rechargeable batteries have been depleted; a sealed rubber keypad to keep its circuitry safe even in inclement weather or continued salt-spray exposure; and still more.

Either of two transmit power levels (1 or 3 watts) can be selected. Three watt operation offers more dependable communications over a greater range; 1 watt operation helps conserve batteries. Its NiCad batteries provide up to eight hours of use on a charge.

The Polaris MT 1000 measures 7.75" x 2.75" x 1.9" and comes with a wall charger, carrying case, belt clip, flexible antenna, and NiCad batteries.

With one addition, the Polaris MT 1000 gains the power and range of fullsize 25 watt

marine radios. The Polaris power pack is available for \$219 (suggested U.S. resale) at participating Regency Polaris dealers. It includes a 25 watt power booster, a remote speaker-microphone, an external antenna adapter, a mounting bracket (that mounts to the bulkhead to allow operation of the MT 1000 as a fixed mount unit) and a carry-all. The carry-all is a handsome, durable canvas kit with waterproof lining, custom pockets, built-in handles and dual zippers: everything fits inside for portability and easy stowage.

Optional accessories available include a cigarette lighter DC adaptor and a portable battery pack.

For additional information, contact Regency Electronics, Inc., 7707 Records St., Indianapolis, IN 46226-9986, or circle number 102 on the reader service card.

Outstanding, 150-Watt Microprocessor-Controlled SSB Radiotelephone

Raytheon Marine Company has introduced a 150-watt, microprocessor-controlled SSB radiotelephone, providing the ultimate in offshore communication for ships, commercial vessels, and trans-oceanic yachts. Raytheon's RAY-1285 SSB Marine Radiotelephone is preprogrammed for all of the 192 ITU channels, and provides memory capability for 44 user-programmed channels or frequencies.

The user-oriented RAY-1285 transceiver provides digital-display monitoring and keyboard channel/frequency and mode selection. LCD readout on a backlit panel shows channel/frequency selected and operating condition. The unit's remote antenna-coupler provides fully-automatic tuning. Last station used is automatically called up when the unit is turned on.

In addition to ready coverage of worldwide marine-band channels and frequencies, the fully-synthesized RAY-1285 pro-

vides a number of features making it the most outstanding single-sideband radiotelephone available. The RAY-1285 has a sea-watch automatic scanning mode which allows the operator to monitor up to ten selected channels or frequencies, including the International Emergency Frequency, 2182 kHz. Quick-select of the International Emergency Frequency is available with a built-in, two-tone distress alarm. A unique "force-transmit" control will provide communication even under emergency broken-antenna conditions.

Unlike many SSB transceivers, the compact RAY-1285 operates on 12 Vdc.

For optional manual tuning, the RAY-1285 transmits (1.6 to 25.999 MHz) and receives (100 kHz to 30 MHz) in fast or slow steps. Selectable modulation modes available are: standard SSB (A3), modified SSB (A3A), and AM compatible (A3H). Push-button listening to other vessel transmissions is available on duplex or user-programmed channels. An optional push-to-talk telephone handset is available.

The RAY-1285 transceiver is supplied with antenna coupler, mounting hardware, interconnecting cables, and complete installation instructions. It meets FCC requirements and has passed Raytheon's tough environmental tests for shock, vibration, temperature extremes, and resistance to corrosion and fungus. Transceiver size is only 14³/₄" (37.5 cm) (W) by 5¹/₄" (13.3 cm) (H) by 16¹/₄" (41.3 cm) (D), weighing 25 pounds (17.5 kg).

Raytheon offers a two-year limited parts warranty with one-year free onboard service within 50 miles of Raytheon's U.S. dealers and worldwide service network in major ports everywhere. Manufacturer's suggested retail price \$5,995.

For information on the RAY-1285 SSB or other products, contact the nearest Raytheon representative, or: Raytheon Marine Company, 676 Island Pond Road, Manchester, NH 03103 USA; (603) 668-1600.



The Unpacking Of A Knapsack

Schemes For Encrypting Messages Based On A Mathematical Puzzle Known As The 'Knapsack Problem' Turn Out To Be Less Secure Than Cryptologists Had Hoped



BY IVARS PETERSON

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It shouldn't take very long for anyone to figure out what the secret message PZFBKZB KBTP says. Each letter of the original message is replaced by a letter that is a fixed number of places away; for example, an A by a C, a B by a D, and so on. Julius Caesar used this kind of simple cipher more than 2,000 years ago to hide military information. Today, encryption is widely used in places like the Department of Defense, where sensitive data must be protected from eavesdroppers and spies. An increasing number of bankers and others concerned about computer security are also turning to cryptography.

Modern encryption schemes are much more elaborate and mathematically complex than Caesar's simple cipher. But are they unbreakable? These cryptosystems are the central figures in a sophisticated mathematical game played by a small group of researchers—mainly mathematicians and computer scientists—who are adept at inventing and solving puzzles. They gleefully pursue the fatal flaws that may lie hidden in rival encryption schemes while trying to come up with new methods that resist such determined attacks.

The latest victim is a group of schemes called "knapsack cryptosystems." They are based on a puzzle known as the "knapsack problem," which goes something like this: Given the total weight of a knapsack and its contents and the weights of the individual items that may be in the knapsack, determine which items are likely to be packed inside so that the total weight adds up to the given amount. Mathematically, the more general problem involves deciding whether some members of a particular collection of positive integers add up to another given integer. If the collection of numbers contains 1, 2, 4, 8, 16, and 32 and the given total is

37, the answer is "yes" because $1 + 4 + 32 = 37$.

Last summer, at the Crypto '84 meeting in Santa Barbara, California, Ernest F. Brickell of the Sandia National Laboratories in Albuquerque, New Mexico, presented an outline of his attack on "iterated knapsacks." Brickell's work eliminates the most important branch of knapsack-based cryptosystems discovered so far.

"I think the traditional approach, which is based on a simple knapsack that is scrambled by iterative multiplication, is for all practical purposes dead," says Adi Shamir of the Weizmann Institute of Science of Israel and co-inventor of several cryptosystems. "It started crumbling some time ago; people were hesitant about using it. But I believe that Ernie Brickell has the last word on his particular scheme, and I don't think it will revive again."

Knapsack cryptosystems are important because they belong to one of only two classes of practical encryption methods that have been proposed as "public-key" cryptosystems. In conventional cryptography, the sender must have a secret key for encrypting messages and the receiver a secret key for decrypting messages. The problem with this method is that the sender must also transmit the secret decrypting key to the receiver in a secure way before any encrypted messages can be sent.

In 1976, Martin E. Hellman of Stanford University and Whitfield Diffie, now at BNR Inc. in Mountain View, California, proposed the notion of public-key cryptography to avoid the key exchange problem. In this system, the encryption key is public and available to all senders, while the decryption key is kept secret. The security of this system rests on finding a mathematical way of generating two related keys such that knowing

just one of the keys and the encryption method is not enough to recover the second key.

In 1978, two candidate public-key cryptosystems surfaced. One was the RSA scheme, based on the difficulty of factoring large numbers and named for its inventors, Shamir, Ronald L. Rivest, and Leonard M. Adleman, all at the Massachusetts Institute of Technology at the time. The other was the knapsack scheme devised by Hellman and Ralph C. Merkle, now with ELXSI in San Jose, California. Initially, knapsack cryptosystems were favored because they offered faster encryption and decryption than the RSA system. At least two companies seriously considered designing special integrated circuit chips to implement a knapsack cryptosystem.

In a knapsack public-key cryptosystem, the public key is an ordered set of n "knapsack weights." To encrypt a message consisting of a sequence of 0s and 1s (for example, data stored in a computer), the message is broken into blocks of n bits. Each bit in a block is multiplied by each corresponding number in the public key, and then all these products are added together. The answer is the encrypted message. Whether the method works depends on the proper selection of the "weights" in the knapsack.

Merkle and Hellman's idea was to take an "easy" knapsack problem for which a fast method of solution was known and to disguise it by running it through a "trapdoor" to produce a knapsack that masquerades as a "hard" knapsack, or one that takes an incredibly long time to solve. One simple example of an easy knapsack is the special set of numbers 1, 2, 4, 8, 16, and 32. Each number is one larger than the sum of all the previous numbers. If the encrypted message is 37, it isn't difficult to discover that the actu-

al message is 101001, because the first, third, and sixth numbers in the knapsack (or public key) add up to 37.

Merkle and Hellman used a generalization of this example, called a superincreasing knapsack, as their set of "weights." As a trapdoor, they used a "modular multiplication" pair. For the pair of numbers (28, 71), for instance, each original "weight" is multiplied by 28 and then divided by 71. Only the remainders are written down. This turns the key into the numbers 11, 41, 22, 56, 28, and 44. To disguise the knapsack further, the items can also be rearranged into another order. Decryption involves finding another modular multiplication pair (in this case, 33 and 71) that converts the public key back into its original form, and the message is again easy to solve. There happens to be a fast way of finding this reverse modular multiplication pair. More complicated schemes—iterated knapsacks—involve performing several modular multiplications.

"What was apparent early was that it seemed that there might be an attack," says Brickell. "Nobody really knew of one, but we thought there might be one." Somewhere in the patterns of digits in the encrypted messages and public keys were subtle clues that would make it possible to decrypt any message.

Merkle compares the process of determining whether an encryption scheme is breakable with finding one's way out of a maze. "It's like being in the middle of a maze, and you're wandering around in some small piece of it," he says. If someone asks you whether you can get out of the maze, unless you're godlike and can look down on the maze from above, it's very difficult to say either there is or there is not an exit.

In 1982, Shamir made the first successful attack on the simplest form of the knapsack cryptosystem. He found that certain information about superincreasing sequences is not well disguised by a modular multiplication trapdoor. In addition, that information could be recovered rapidly by solving a special kind of mathematics problem (finding a short vector in a lattice). Shamir's method became practical with the invention in the same year of an algorithm for solving this problem quickly. Soon after, using a similar approach, Adleman broke another form of the knapsack cryptosystems known as the Graham-Shamir knapsack.

Meanwhile, Shamir collected \$100 from Merkle, who had offered that sum as a prize for anyone who could break his basic scheme. But Merkle, reacting to the publicity surrounding Shamir's feat and the incorrect assertion in *Time* magazine and elsewhere that all knapsack cryptosystems were no longer secure, offered a new \$1,000 prize for breaking the iterated knapsack. In October, 1984, Merkle conceded that Brickell had won the prize, and Brickell received his check. "The result is very impressive," Merkle wrote.

Says Merkle, "I think the breaking of iterated knapsacks is quite surprising and indicates a degree of insecurity that had not

been suspected at all."

Brickell's technique depends on the fact that modular multiplication is the only method being used to hide the knapsack. "With my technique, it doesn't matter how many times you do this (modular multiplication)," says Brickell. "What's really significant is that it's the only technique being used to hide the information."

Almost everyone working in cryptology agrees that Brickell's approach works. "It's a beautiful piece of work," says Shamir. Brickell is now trying to make his mathematical result more rigorous. "I made some assumptions and wrote a computer program to implement it to make sure it worked," he says. "Now, I'm trying to prove those assumptions." In computer tests, his scheme has broken knapsack cryptosystems with up to 100 weights and 20 iterations. The decryption process takes about an hour on a Cray supercomputer.

However, this doesn't rule out the possibility that a secure knapsack cryptosystem exists, Brickell adds. "What this says is that if you use one, you have to use something other than modular arithmetic for hiding it."

Jeffrey C. Lagarias of AT&T Bell Laboratories in Murray Hill, New Jersey, agrees. "These various attacks do not totally close the door on there being a secure knapsack cryptosystem," he says. "But I would say they cast extremely grave doubts on it." Lagarias, together with Andrew Odlyzko, helped establish some of the basic ideas that led to Brickell's successful attack.

Of course, cryptologists can't resist the challenge of coming up with a cryptosystem that circumvents the flaws pinpointed by Brickell's decryption technique. At Crypto '84, Rivest and Benny Chor were ready with a new knapsack public-key cryptosystem based on arithmetic in mathematical structures called "finite fields."

"This one avoids the dangers that have been revealed (in earlier systems)," says Rivest. "We're hopeful that it'll survive, but we can't tell."

"The jury is still out about the security of the (Chor-Rivest) scheme," says Shamir. "It's based on deep mathematical structures, and you have to give mathematicians a chance to look at it." He adds, "You have to be extremely cautious when claiming that a cryptosystem is strong. The history of cryptography is essentially a history of failures. Lots of cryptosystems, which were invented and then used, proved to be insecure, sometimes with disastrous results."

"The thing that interests me most is that only two serious public-key cryptosystems have been proposed," says Merkle. "One of them has been broken; the other has a complexity that appears to depend on the complexity of factoring, which is still an open question at this time. I think it's surprising that no other fundamentally new techniques have popped up."

"Apparently, it's very difficult to come up with a new scheme," says Shamir. "I think everyone in the field of cryptography has been looking for a new variant, especially

when knapsacks seem to be going down the drain. People are quite worried about being left with just one cryptosystem, RSA, and they are frantically looking for new bases for systems."

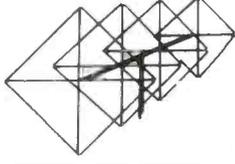
Even in the case of RSA, some people have their doubts. Says mathematician Ronald L. Graham of AT&T Bell Laboratories, "There is a general feeling in the air, although it's not solid, that factoring may not be as hard as people thought." Adds Merkle, "I think it's the uncertainty that fascinates people and draws them to the problem."

"You can never prove that something is secure," says Brickell. "All you can say is that a lot of people have looked at this for several years, and nobody's figured out a way to attack it."

"The most intriguing question is whether you can develop proof techniques that will show the security of cryptosystems," says Shamir. "If you could do this, it would be the biggest breakthrough in cryptography because at last you would be able to show that concrete cryptosystems just will not be broken in the future unless there is a certain amount of time."

Current mathematical techniques are good enough to put a fence around a problem to show where security lies, says Shamir. They can show that the only way in is through a particular gate. "But how strong is the lock on that gate?" he asks. "We still do not have good techniques for answering that remaining question." **PC**

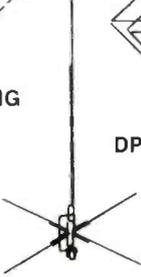
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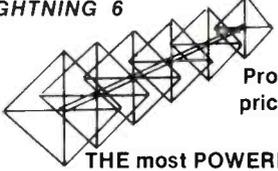
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By the time the first regularly scheduled transpacific runs began (Nov. 1935/mail & freight) (Oct. 1936/passengers), three Martin M-130 flying boats had replaced the Sikorsky S-42s, which had been used to pioneer the route. The three M-130's were called China Clipper, Hawaii Clipper and Philippine Clipper.



Yesteryear Radio

The Flight Of The China Clipper

BY DON JENSEN

“China Clipper, are you ready?”

“Pan American Airways China Clipper, Capt. Musick, standing by for orders, sir!” the pilot responded.

Pan Am’s amphibian base at Alameda, California was jammed with 25,000 excited spectators the afternoon of November 22, 1935. It was an important day, the newspapers insisted. Headlines screamed: “Save this newspaper! It records really important history made here today!”

California’s governor proclaimed it “Pan American Day.” From Washington, FDR had dispatched Jim Farley, his Postmaster General and political right-hand man, to speak at the ceremony marking the first scheduled airline crossing of the Pacific.

“Stand by, Capt. Musick, for station reports,” instructed airline president Juan T. Trippe. The recently constructed aeronautical radio stations along the Clipper’s route checked in. First, Honolulu, then Midway and Wake Islands, Guam and Manila.

Farley stepped forward to speak.

“It is an honor and a privilege for me, as Postmaster General of . . .”

Folks at the back of the crowd strained to hear Farley’s words.

“ . . . order the inauguration of the first

scheduled service on Foreign Air Mail Route No. 14, at 3:28 p.m., Pacific Standard . . .”

A gust of wind swallowed up his words and carried them out across the blue of San Francisco Bay.

“ . . . forever mark a new chapter in the glorious history of our nation, a new era in world transportation, a new and binding bond that will link, for the first time in history, the peoples of the East and West!”

With a solemn nod, acknowledging the historic moment, Trippe turned to the crew of his Martin M-130 flying boat. In nautical parlance he ordered: “Capt. Musick, you have your sailing orders. Cast off and depart for Manila in accordance therewith!”

Glorious history? New eras? All that talk seems a bit overblown to those of us who, a half century later, have seen men on the moon, satellite pictures from space, and tiny chips replacing racks of electronic gear.

But this was 1935, the depths of the Great Depression. It was a time when Americans needed heroes and thrilling real-life adventures to make us feel good about our country.

And, for its day, the technology really was rather impressive. Imagine: A four-motored behemoth with interior space and luxurious accommodations not rivaled until the 747.

This airliner could carry 32—count ‘em, 32—passengers into a golden sunset at a cruising speed of over two-miles-per-minute, delivering them safe and sound, 8,000 miles away in the Philippines just five days later! The flight cut a full 16 days from the fastest shipboard journey to the Orient!

To accomplish that, the Clipper crew would have to rely on radio navigation beacons to guide them unerringly across the open sea to a series of tiny island stopovers. And along the way, the aircraft would remain in contact with ground stations by two-way shortwave radio.

It’s not surprising, therefore, that Americans in general, and radio fans in particular, were caught up in the odyssey of the China Clipper.

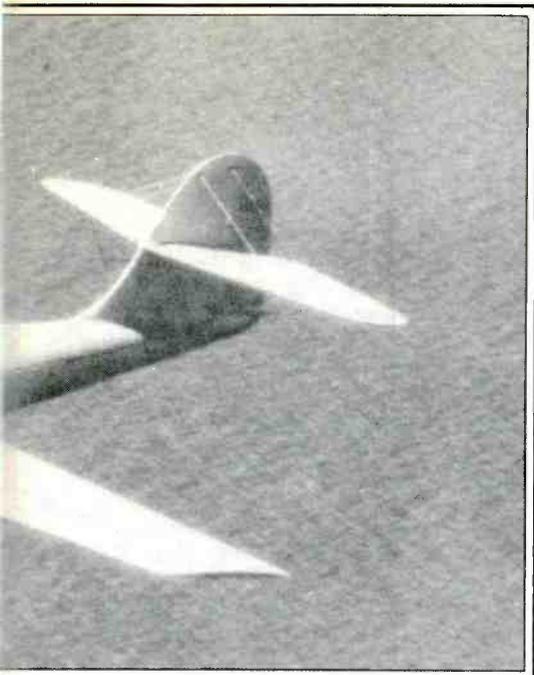
The story really begins in 1927, when a brand new airline began carrying passengers and mail on a 110-mile route from Key West to Havana. Under Trippe’s canny direction, and greatly aided by federal subsidies for totting the mail and, not incidentally, showing the flag overseas, the company grew rapidly. Within two years, Pan American controlled Caribbean air transportation; the following year it encircled South America.

But Trippe’s plans for airliner service across the Atlantic were thwarted by rival British aviation interests. Pan Am Yankee and Dixie Clippers didn’t fly passengers on a transatlantic route until 1939.

So the airline looked westward to the Pacific as a target.

One day in 1930, three men met in a New York skyscraper office: Trippe; his chief engineer, A. A. Priestler; and Col. Charles A. Lindbergh, the world’s most famous flyer and Pan Am’s technical advisor.

Together, they selected a route: California to Hawaii, then on to virtually uninhabited Midway and Wake, Guam and the Philippines—in those days, American territory every step of the way. It would be 1937 be-



fore China Clipper flights actually reached the Asian mainland, and even then, Hong Kong would be the end of the line.

In the '30s—and until WWII aircraft design and experience proved it wrong—conventional aviation wisdom was that long haul air passenger and freight service required huge flying boats.

The reasoning had nothing to do with the ability to ditch at sea in case of emergency. It was just that long distance planes were slow, lumbering and needed tons of fuel. Burdened by their own gasoline, they took an incredibly long time to get airborne. Runways on land just weren't long enough for the 30 seconds or more of taxiing needed for takeoff. The answer seemed to be the quiet harbors and bays, natural runways a mile or two in length, and flying boats—half airplane, half schooner.

Pan American drew up specifications for the flying boats it would need to cross the Pacific. Two manufacturers accepted the challenge. Russian-born Igor Sikorsky was the first to deliver his new S-42 planes to Pan Am in 1934. They would be used to test the

Pacific route, but in the end were used mostly on other flights.

Soon afterward, Glenn L. Martin's firm delivered, for \$1.2 million, three newly designed M-130s, which would become famous as the China, Hawaii, and Philippine Clippers.

Training personnel and setting up a series of bases on the islands cost Pan American Airways twice as much as the planes. There were supply and repair facilities to establish, 45-room hotels to build (Clipper flights were made in five daily stages, with overnight stops), landing docks and radio navigation and communications stations to construct.

Radio navigation wasn't new, of course. It was first tried on an overseas flight in June 1927, when Army Lts. Lester Maitland and Albert Hegenberger tried to "ride" a radio beam from Oakland to Honolulu. When the plane's radio receiver failed, the pilots had to resort to celestial navigation, dead reckoning and luck to find the Hawaiian Islands.

Round-the-world pilot Wiley Post proved in 1933 that he could circle the globe without a navigator, using only the beacon signals from a series of so-called localizer beam antennas.

But for scheduled flights with paying passengers, Pan Am had to have a fully reliable radio navigation system. They invested heavily in longwave equipment as advanced as the technology of the time permitted.

Even so, Pacific flying was not without danger. Two years after the Clipper's first flight, aviatrix Amelia Earhart and veteran navigator, Fred Noonan (a member of the first China Clipper crew) were lost on a Pacific crossing and were never heard of again.

For two-way communication, the Clippers relied on shortwave radio, ruggedly built but relatively low powered, 50 watt transmitters. In the radio compartment, just behind the flight deck were aluminum alloy racks, grooved benches into which transmitter and receivers slid easily, connecting with fixed, rear-mounted plugs. A typical installation weighed about 145 pounds and the quick-in, quick-out mounting permitted easy inspection, repair, or replacement of radio gear.

A rotatable longwave loop antenna was used for radio direction finding and naviga-

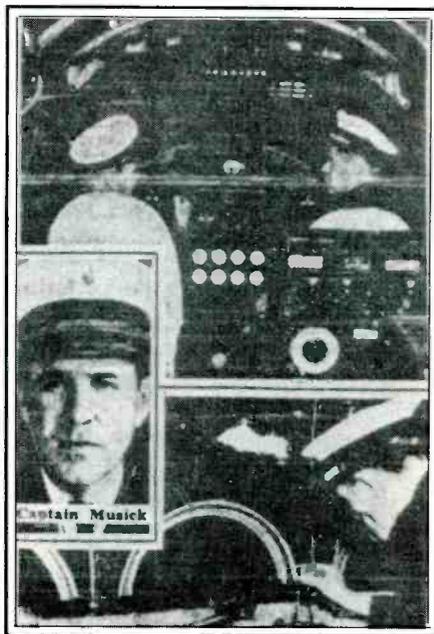
tion. The communications receiver and transmitter used a wire antenna, stretched between the tail of the plane and a six-foot, streamlined duralumin mast projecting above the fuselage near the front of the aircraft.

So that November afternoon, the first China Clipper, with Capt. Edwin Musick at the controls, roared off toward Hawaii with a crew of seven, 3,200 gallons of gasoline, two tons of mail—110,000 letters, most of them sent by stamp collectors—but no passengers. The airline was taking no chances. The first paying passenger would not get a seat on a Clipper flight for nearly a year.

During the long night that followed, radio messages from the outbound flying boat came back to the Alameda terminal's communications room. Most were routine—Musick's reports of changes in altitude and fuel consumption.

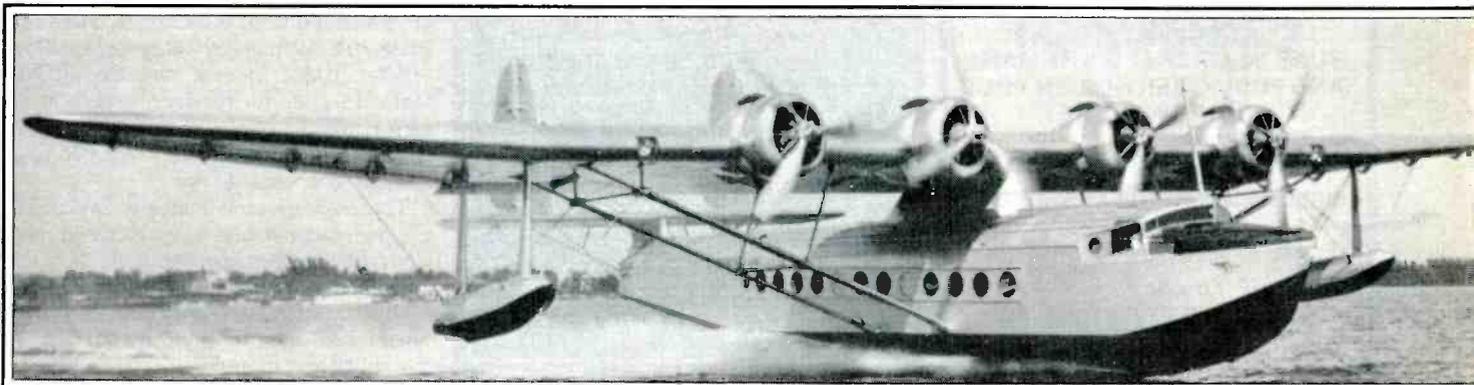
The broken clouds became a solid bank below, reflecting the silvery moonlight.

"We haven't seen the water since 7



On the Clipper's "bridge," top photo, are the two pilots who handle the flight controls with the aid of the navigator, lower photo, who sets the course. Capt. Edwin Musick, (insert), the ship's chief.

SIKORSKY S-42 "Clipper" flying boat. The first test hops across Pacific were in this craft.



p.m.," Radio Officer W. Turner Jarboe told the Alameda radioman.

Messages told of headwinds of 20 mph, but otherwise favorable flying conditions and good visibility. The longwave system was locked on the navigational station at Kaneohe Bay, Hawaii.

Less than 18 hours after departure, the Clipper crossed Diamond Head, circled briefly over cane and pineapple fields and settled in at Pearl Harbor to a cheering throng.

The next morning, the China Clipper took off on the second leg, 1,300 miles to lonely Midway, only about half the distance of the first day's flight. Its cargo then included jars of cranberries and six Thanksgiving turkeys for Pan Am employees at the isolated mid-ocean stations.

Then, on the following day, it was on to Wake, where frigate birds and terns flapped and screamed as the strange new conqueror of the air set down after an eight-and-a-half-hour daylight flight. En route, the Clipper crossed the International Date Line, turning Monday to Tuesday. At 8:30 that morning, the skyliner flew over the S.S. President Lincoln and exchanged radio greetings with the ship far below.

The fourth lap of the 8,000 mile trip took the flying boat to Guam in just over 10 hours, with a 24 mph tailwind boosting the average speed to 154 mph.

The original schedule had an extra day built in as a hedge against possible mechanical troubles, which never occurred. Musick decided to stick to the original plan and ordered an extra day's layover at Guam.

It was Friday morning when the aircraft left Shumay Point for the final leg of the journey to Manila.

The Philippine capital was caught up in a carnival-like atmosphere. Thousands lined the shore of Manila Bay for hours before the scheduled arrival of the China Clipper. The flagship *Augusta* and several destroyers of the U.S. Asiatic Fleet, riding at anchor in the harbor, were decked in flags and bunting. The silver-hulled plane glinted in the sun as it swept out of a cloud-banked sky, circled low over the city and slipped to a smooth landing on the tranquil water.

California was 59 hours and 48 minutes of actual flying time behind. Capt. Musick, the cool, competent chief pilot, had brought it off without a hitch, forging the last link in the aerial chain across the Pacific. Until his death in a plane explosion off Pago Pago a

few years later, he would be the world's most famous airline pilot and the prototype for all the captains to follow him.

Thereafter, until the start of WWII, Pan American Clippers, one eastbound, the other, west, would cross the vast ocean every two weeks. A half million miles were logged by the three Clippers before the first passenger run was made the following October.

That first year of mail-and-freight-only operation attracted a lot of attention from shortwave listeners. The 1936 radio magazines featured the reports of SWLs lucky enough to tune in the Clipper signals.

The China Clipper's call, K HABZ, was heard often by Stateside listeners on the various aero frequencies used by the huge flying boat: 2,670, 4,797, 6,425, 8,655, and 12,862.5 kHz.

San Francisco DXer George Sholin and other west coast radio fans of the mid-1930's were able to hear the 50-watt airborne station aboard the China Clipper up to several thousands of miles out from the Alameda home terminal.

Other listeners of the era report a Clipper call of KHABV. Maybe they just heard the final letter in the call sign incorrectly, or perhaps it belonged to a sister ship, the Hawaii Clipper.

SWL W. G. Graham, also from California, reported that he heard the Philippine Clipper working various ground stations using the call WOEH.

Radio magazines reported that WOEH was assigned to a National Broadcasting Co. transmitter aboard the flying boat. Perhaps that meant merely that the communications gear was made by NBC's parent company, RCA. Or, possibly, the young broadcasting network intended to broadcast some type of special program from the plane for pickup and relay to the American audience.

That sort of remote broadcast wasn't exactly unknown in the 1930's. CBS, a year earlier, received the shortwave programs from Admiral Byrd's Antarctic expedition and rebroadcast them over its nationwide radio network.

Radio producer Phillips H. Lord, later of "Gangbusters" fame, broadcast regular programs, which were picked up and rebroadcast nationally by NBC, from his four-masted schooner, *Seth Parker*, during a 1934 world cruise. Lord's programs, sponsored by Frigidaire, originated from his shipboard 1,000 watt shortwave station, KNRA.

If NBC had any similar plans for airborne programming from the Clipper, there's no evidence today that any were ever broadcast.

After 1936, interest dwindled. SWLs seemed to pay no special attention to the aero communications of the Clipper fleet. Even the most thrilling feat, repeated often enough, becomes old hat.

That feeling wasn't unique to SWLs. The Clipper's skipper said as much when interviewed by a newspaper reporter.

"At first I used to look down every once in a while to be sure the Pacific was still there," Musick said. "But it always was, so I don't do that much any more."

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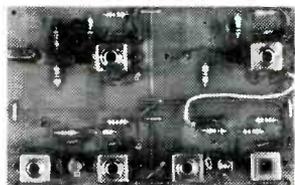
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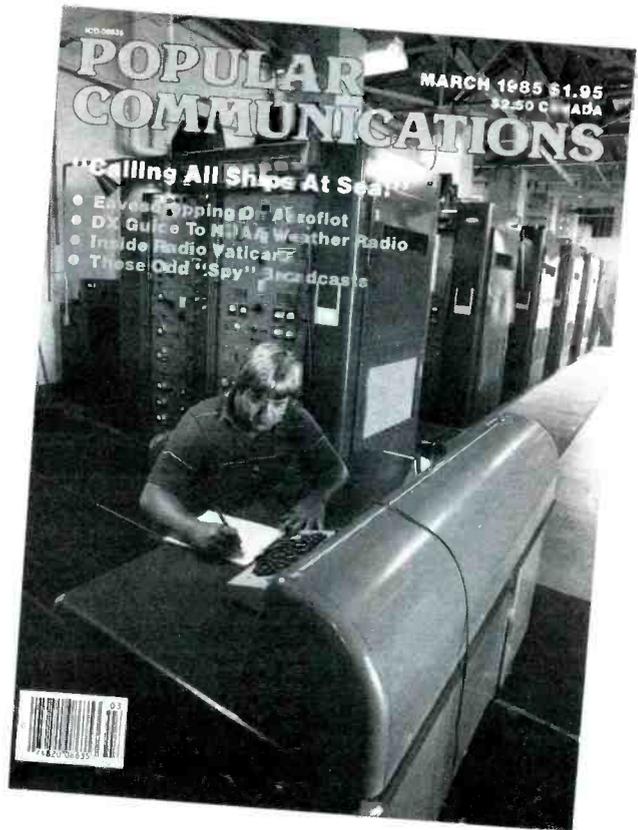
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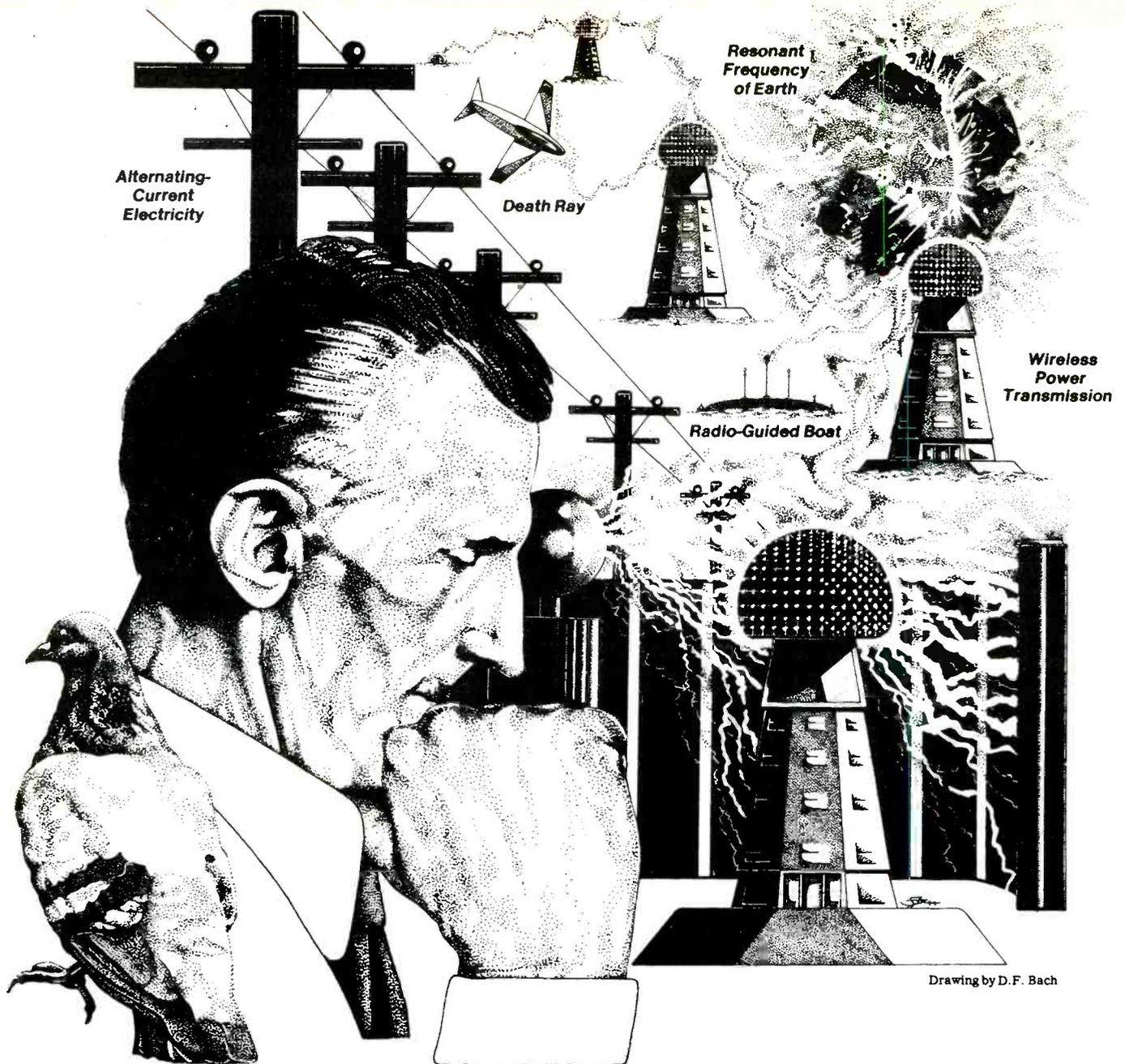
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Tesla, A Bizarre Genius

Tesla Shaped The Country's Course Through Radio, Power Transmission, And Other Inventions

BY WILLIAM J. BROAD

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The world of science is belatedly recognizing the genius of one of its most important, eccentric and enigmatic inventors, Nikola Tesla.

A century after he arrived penniless on the docks of New York City, Tesla is receiving credit for brilliant achievements that outdid those of his contemporaries, Edison and Marconi. And more than 40 years after the recluse died in a Manhattan hotel room, in

the company of the pigeons who were his favorite companions in the final years of his life, he is at last being elevated to the pantheon of the world's great inventors.

It was Nikola Tesla, not Marconi, who invented the first radio; it was Tesla, not Edison, who devised the system of electric power distribution now used throughout the world. Working in small laboratories in midtown Manhattan and Greenwich Village,

Tesla invented the polyphase electric motor, the bladeless steam turbine and the radio-guided torpedo. Some scientists say it was Tesla who first conceived ideas for a "Star Wars" type of military shield in space.

To help analyze and publicize the accomplishments of the reclusive genius, a group of scientists and engineers have formed the Tesla Centennial Committee and recently held a symposium, organized a museum ex-

hibition and persuaded the Governor of Colorado to dedicate the month of August to Tesla.

"He helped spawn the industrial revolution," said Toby Grotz, chairman of the Tesla Centennial Committee and an engineer at Martin Marietta Aerospace in Denver. "It couldn't have happened without him. He came from a period when a single individual could still change the course of history."

The centennial events have largely taken place in Colorado, where the inventor had built a laboratory to create huge bolts of artificial lightning.

"We're trying to bring his name to its rightful prominence," said William H. Terbo, who is Tesla's great-nephew and honorary chairman of the Tesla Memorial Society.

The proceedings of the symposium will be published by the New York-based Institute of Electrical and Electronics Engineers, the world's largest such society.

The committee says conventional histories all too often dismiss Tesla in a few paragraphs. Indeed, the usual story is quite short.

Tesla was born in 1856 in Croatia, then part of the Austro-Hungarian Empire, and soon showed a talent for invention and tinkering. In 1884, he took a ship to New York and immediately went to work for Thomas Alva Edison. But the two quickly parted ways after a dispute over an invention.

Going into business for himself, Tesla soon developed the basis for the alternating-current system in worldwide use today. He realized that direct current can be transported over wires for only a few miles, whereas high-voltage alternating current can go on almost forever without sustaining great losses of power. To make the new system practical, he invented and patented a variety of alternating-current generators, transformers and motors.

Edison backed direct current as the perfect electrical source of the future, and the two men fought a heated battle over the best system. It went down in science history as the "war of the currents"—a contest Tesla won.

Conceived Futuristic Devices

So much for Tesla's conventional history. The Centennial Committee says he went on to do much more than just spark the age of electricity—envisioning and inventing a dazzling array of futuristic devices.

"All the literature says Marconi invented the radio," Mr. Grotz said in an interview. "But long before Marconi had a patent, Tesla was demonstrating a radio-controlled model boat and talking about transmitting electrical power across the Atlantic. Compare that to Marconi's S-O-S."

Indeed, in 1943 the Justices of the Supreme Court of the United States overturned Marconi's patent because they found it had been preceded by Tesla's practical achievements in radio transmission.

Another example is radar, which employs short wavelength radio signals that can be reflected back from solid objects. As early as 1900, members of the centennial committee note, Tesla suggested that these wavelengths could be used for locating ships at sea.

Many of the 27 speakers at the Tesla symposium, held . . . at The Colorado College in Colorado Springs, put their emphasis on Tesla's most spectacular experiments of all, which occurred at a laboratory not far from the symposium site. There, at the turn of the century, Tesla built enormous coils that generated 10 million to 12 million volts of electricity and sent bolts of artificial lightning flashing 135 feet through the air, a feat that has never been equaled.

Work Shrouded In Mystery

To this day, scientists debate what Tesla accomplished in Colorado, for much of the work was shrouded in mystery. Dr. Robert W. Bass, an electrical engineer with Litton Industries, said at the symposium that one of Tesla's more controversial claims—that he had created ball lightning—was probably true and he cited contemporary theories of physics to explain how Tesla could reproduce such a rare natural phenomenon.

Tesla's laboratory in Colorado Springs was a barn-like structure that sat atop a hill on the prairie and was crowned by an 80-foot tower and beyond that a 122-foot mast. The tall fence surrounding it carried signs reading: "Keep Out—Great Danger." The claps of thunder from his bolts of artificial lightning could be heard for miles.

According to Charles Wright, a retired engineer formerly with the Public Service Company of Colorado, the laboratory was filled with a host of inventions including high-voltage transformers, dynamos, coils, capacitor-discharge devices, oil-insulated capacitors and a large metered control panel.

In Colorado Tesla hit upon what he thought was a revolutionary way to send electricity through the air. "Not only was it practicable to send telegraphic messages to any distance without wires," he wrote of the insight, "but also to impress upon the entire globe the faint modulations of the human

voice, far more still, to transmit power, in unlimited amounts, to any terrestrial distance and almost without any loss."

Financed By J.P. Morgan

With the financial backing of J.P. Morgan, Tesla embarked upon a plan to commercialize the discovery, building a 200-foot tower at Shoreham on Long Island. By 1905, however, Morgan had abandoned the project and the tower was never completed.

Tesla, especially in later years, was a man of extraordinary idiosyncrasies and boastful declarations that sometimes sent his science peers into a rage. His ideas for power transmission through air were dismissed by many as pure fantasy.

With a pocket-size vibrator, he once told reporters, he could generate resonant tremors that would split the earth in two. He gave its resonant frequency as one hour and 49 minutes. Whatever the plausibility of his earth-splitting scheme, the rather precise estimate of the earth's frequency turned out to be close to the mark, as was demonstrated during the great Chilean earthquake of 1960, when geophysicists were able to measure the time it took waves to travel back and forth through the Earth.

At the symposium some of Tesla's advocates seemed to try to outdo the master's knack for hyperbole as they conjured visions of death rays and futuristic weapons. In a paper entitled "Star Wars Now!" Thomas E. Bearden, a retired nuclear engineer and Army war games analyst, noted what he said were a number of designs for making weapons based on Tesla's more exotic ideas. The hypothetical devices included what he termed a Tesla howitzer and a Tesla shield that could allegedly stop Soviet missiles.

Proposed Death Rays

Tesla suggested in 1940 that the United States military could build a system of death

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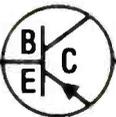
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rays that would melt enemy airplanes at a distance of 250 miles. The War Department looked into the idea and said politely, no thanks.

"With Tesla you're always going to get the fringe," said Robert K. Golka, a physicist who spoke at the symposium. "It's hard to tell what is real and what is not. Tesla will always attract guys with ideas about perpetual motion."

Indeed, Tesla himself was something of a character, according to Margaret Cheney, whose book, "Tesla, Man Out of Time," details some of the eccentricities. At the height of his fame, while eating dinner in the Palm Room of the Waldorf-Astoria Hotel, he would polish the already sparkling silver and crystal using exactly 18 napkins. He had a phobia about germs and a love of numbers divisible by three.

The New York Times reported in a front-page article in 1915 that Tesla was to share that year's Nobel Prize in physics with Edison. But he never got the award. One biographer said that Tesla had refused to share it with his old rival. Another version has it that Tesla rejected the prize because it had been given in 1909 to Marconi.

After the death of his mother, Tesla became increasingly eccentric and withdrawn. He vigorously disagreed with theories put forward by great scientists of his day including James Clerk Maxwell and Albert Einstein. He never married. Nearly every day he would go to Bryant Park behind the New York Public Library and feed his friends, the pigeons. Late in life he announced that he had received signals from distant planets, a claim that was greeted with some skepticism.

Attracts Following Of Fanatics

Waldemar B. Kaempffert, a science editor of *The New York Times* in the first half of the century, once described Tesla as "an intellectual boa constrictor" and a "medieval practitioner of black arts."

Tesla's closest living relative, Mr. Terbo, says that four basic types of people are attracted to Tesla—serious scientists, Yugoslavs proud of his achievements, pseudoscientists who pursue some of his wackier ideas and cultists who worship him as an extra-terrestrial.

"There are religious fanatics in Pasadena who say he came down on a space ship from Venus," said Dr. Terbo, adding, "It's no small group."

Although Tesla is only belatedly being recognized for the wide-ranging brilliance of his achievements, one testimonial to his genius did come in 1917 from B. A. Behrend, an engineer who had an inkling of the mark Tesla would make on Western civilization.

"Were we to eliminate from our industrial world the results of his work," he told a banquet in Tesla's honor, "the wheels of industry would cease to turn, our electric cars and trains would stop, our towns would be dark, our mills would be dead and idle. His name marks an epoch in the advance of electrical science. From his work has sprung a revolution."
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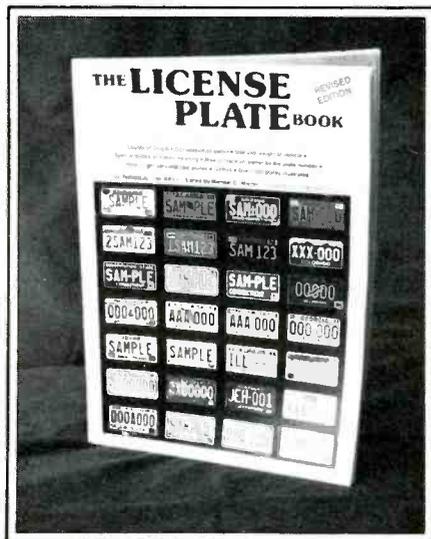
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BOOKS YOU'LL LIKE!

A license plate is to a vehicle what a call sign is to a radio transmitter, and those who monitor police communications frequencies are used to hearing an endless barrage of vehicle plate numbers radioed to headquarters for various checks. The license plate is, in fact, a high profile item in law enforcement circles and police officers try to be knowledgeable on the plates issued by states, provinces, and even the federal government. This involves keeping abreast of color combinations used and also knowing what the special codes and alpha-numeric combinations mean on the plates assigned by all of those who issue such plates.

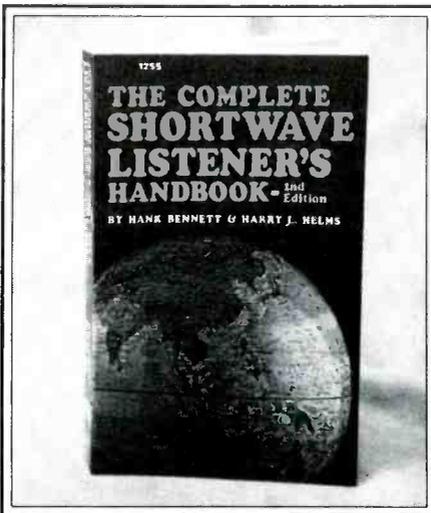
Some states will issue ham plates, others issue CB plates, and such plates are easily identifiable. But others are baffling, although no less interesting. For instance, did you know that an Alaska plate with the letters "XXG" in the alpha- numerics was actually a government vehicle? Similarly, a California plate with the letter "E" inside of an octagon might be a city or county owned vehicle—but it might also be a federal agency car or van. If you were listening on your scanner and they called in a Michigan plate with a "90-Y" prefix, would you know what that meant? What would the letters "RST" on a South Dakota plate tell you about its owner, or "NYP" on a New York plate?

We have seen directories providing information on the license plate codes used by the various states selling for upwards of \$50, however the same vital information is available in a very inexpensive book called simply *The License Plate Book* (Revised Edition) by Thomson C. Murray. Murray's well researched book is an 8½" x 11", 112-page directory containing all of the codes used by each state, each Canadian province, and the U.S. Government. The book contains 1,070 illustrations showing many different types of plates.



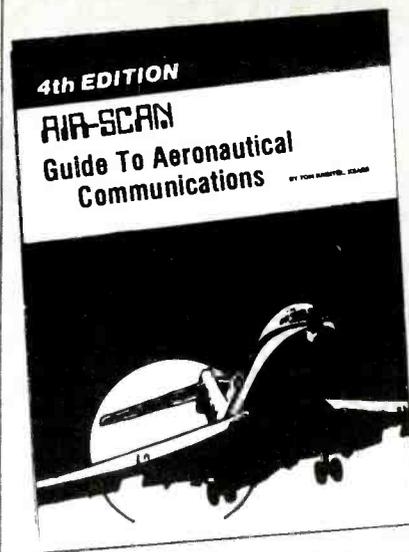
This book covers a lot of ground, including all of the color combinations (many states use 6 to 8 color combinations) authorized, information on the types of vehicles issued different series of plates, special county codes, police and fire plates, etc. There is even information advising how you can trace the name and address of a vehicle owner once you have the plate number.

The License Plate Book is only \$3.95, plus \$1 postage/handling, from The Interstate Directory Publishing Co., Cleft Road, Mill Neck, NY 11765. A natural for those who like to listen to scanners, and handy enough to keep in your glove compartment just so you'll know who's tailing you (or who you're tailing)! By the way, the author, Tom Murray, is a scanner enthusiast who got the idea for the book because of his monitoring activities—and he's a *POP'COMM* reader!



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INSIDE THE WORLD OF TVRO EARTH STATIONS

The Effect Of Satellite Spacing On Home Satellite TV

The question of how satellite spacing could affect the quality of television reception from outer space has wrinkled the brows of owners, prospective buyers, and manufacturers of satellite equipment for years. As is almost always the case in such issues, resolution involves a trade-off. Decreasing the spacing between satellites would allow for use of more transponders, which would relay more programming to our homes. But this action may cause technical difficulties in receiving these broadcasts. Many have worried that their expensive equipment will not work properly when the FCC finally implements its May 1983 decision to reduce the spacing of C-band satellites from 4 to 2 degrees.

The issue of satellite spacing did not receive much attention in the earlier days of our industry. Until 1980 only eight American owned satellites occupied the American portion of the orbital arc: RCA Americom's Satcom I and II at 135 and 119 degrees west; Western Union's fleet of Westars at 91, 99, and 123.5 degrees west; and Comstar I, II, and III at 128, 95, and 87 degrees west. However, by late 1980 the FCC was being bombarded with requests by many parties to operate domestic communication satellites. The business was becoming very profitable. It took its first action by expanding the allowed arc in which communication vehicles were positioned from 70 to 135 to a larger area of 55 to 143 degrees west. Finally, in October 1981, the FCC responded to this rapidly increasing demand by requesting public comment on the possibility of authorizing spacing of satellites at 2 instead of at 4 degree intervals in the geosynchronous arc 22,247 miles above the equator.

Clearly, if satellites were positioned too closely together, a receiving station on the earth below would detect both signals at once and garble both broadcasts. But how close is too close? And what remedies can be taken to allow satellites to be edged ever closer and closer together?

Antenna size is a prime factor in the spacing issue. Just like a horse with blinders on sees only in one direction, so should an antenna detect signals from only a pinpoint in the southern sky. And physics dictates that as dish size is increased this field of view or "beamwidth" increases. For example, a 15-foot antenna has a beamwidth of less than one degree, while a 2-foot dish has one in excess of 5 degrees and can therefore see up to five satellites positioned 2 degrees apart. Today, antennas having sizes much

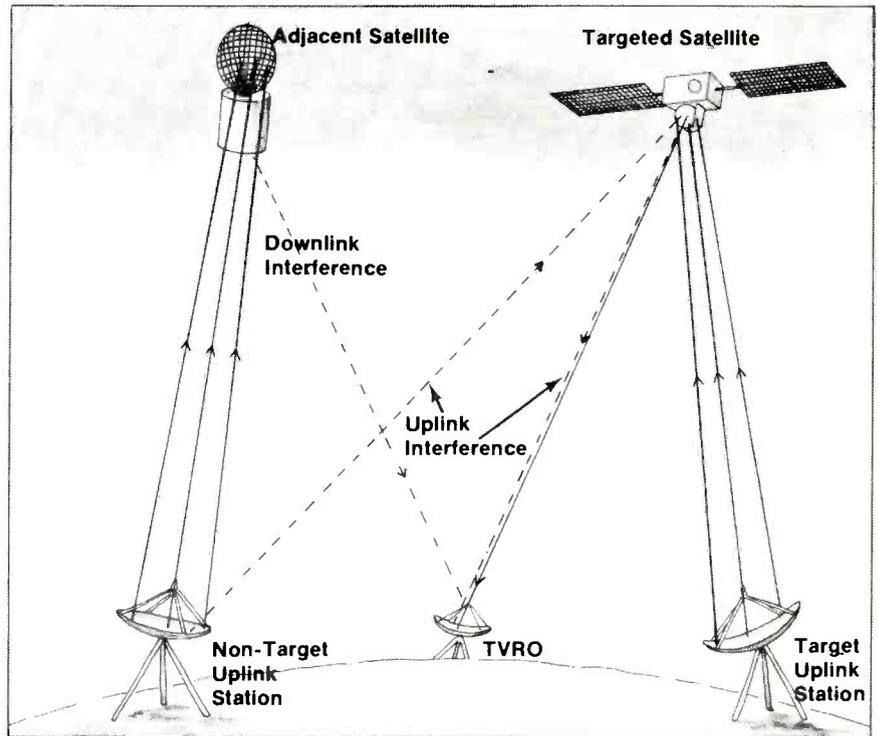


Figure 1: Adjacent Satellite Interference. Closely spacing satellites can cause interference at earth stations below. (Reproduced from *Satellites Today, The Complete Guide to Satellite Television*)

less than 8 feet in diameter will often see too broad a region of the sky to easily separate video signals from satellites only 2 degrees apart. But remedies do exist to improve reception and perhaps in the future to allow use of even smaller dishes.

The first one is simple. If two adjacent satellites have their signal polarizations interwoven, reception can be substantially improved. What does this mean? An example can make this technical point clear. If Channel 4 on satellite A is horizontally polarized and Channel 4 (which occupies the same frequency band) is vertically polarized, an earth station tuned for Channel 4 on A will hardly "see" any stray signal from the oppositely polarized Channel 4 on B. This cross-polarization discrimination should be used as effectively as possible to increase the use of scarce orbital space.

A second remedy lies in allocating adjacent C-band satellites to different types of communicators. So, for example, a broadcast and a telephone satellite may be positioned only 2 degrees apart in space, and an earth station below tuned for satellite TV will

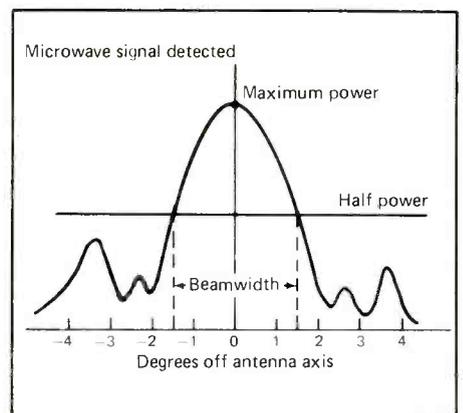


Figure 2

be hardly bothered by some minimal signals bleeding over from the telephone relay. (Carrying this logic further leads us to the idea of using co-located satellites operating in different frequency bands to "reuse" the orbital space.)

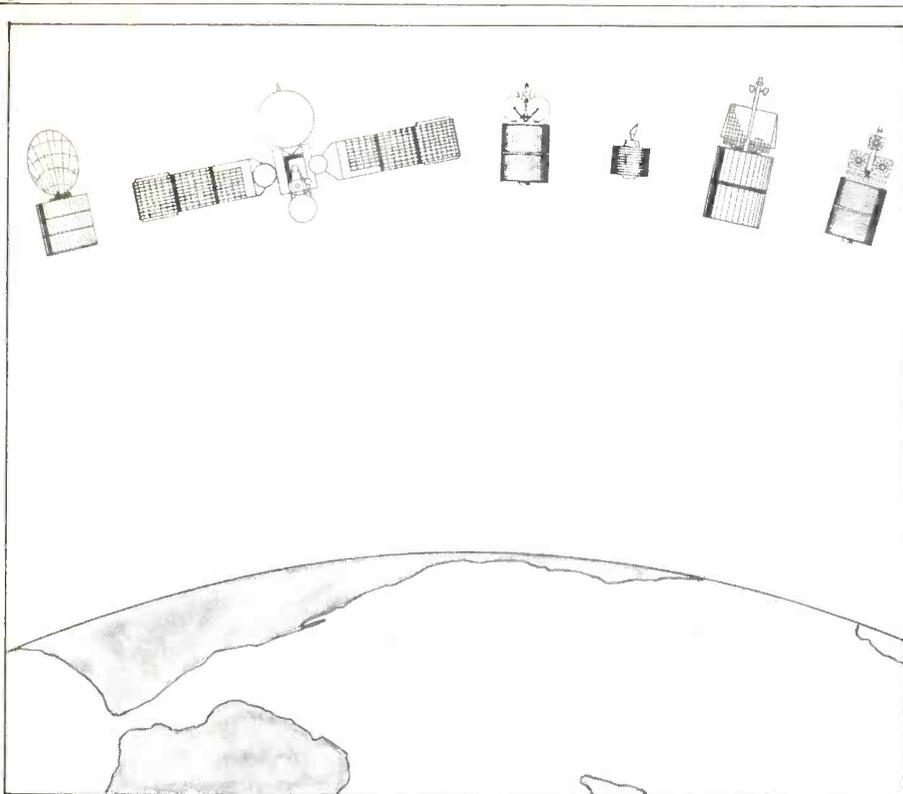


Figure 3: Geosynchronous Satellites encircle our globe above the equator.

A third very effective method for reducing antenna size was discussed last month when examining spread spectrum technologies. If the message coming from a particular satellite is altered in identity and if the earth station electronics is specifically "tuned" to this signal, other interfering messages will be ignored. This method is presently being used to allow transmissions of data to and from very small dishes operating in the conventional C-band (4 to 6 GigaHertz) range. Such a strategy has not yet been considered for C-band video broadcasts.

A fourth approach to reducing dish size may evolve with improving methods for processing the signals being detected from space. Some interesting concepts for tricking a small dish into ignoring unwanted signals have been discussed the past few years.

Antenna size also is determined by the power levels of satellite signals. In the early days of satellite TV, 30 or 40 foot antennas were not uncommon sights as scientists and engineers on earth below struggled to detect the very low energy signals. Today, satellites are being produced having ever stronger downlinked signals. This, coupled with improved feedhorn and low noise amplifier design, allows use of smaller dishes.

As satellite spacing decreases, should consumers be overly concerned? The response of the National Cable Television Association, the trade representative for the cable television industry, to the FCC request for responses to the spacing question in 1983 is an instructive example. They claimed that without polarization interweaving and

spacing of high powered satellites a minimum of 3 degrees apart, the then existing fleet of 15-foot antennas would have to be replaced by at least 23-foot diameter dishes. But today 8-foot dishes can clearly discriminate between Spacenet and Westar V which are already only 2.5 degrees apart.

This issue clearly includes a judgment of what picture quality is good enough. Consumers living in rural areas who have received difficult to see pictures over-the-air from distant cities will certainly be more satisfied with 100 channels of somewhat sparklie television than would engineers familiar to monitoring studio quality broadcasts at cable TV headends. In fact, some companies are marketing dishes as small as 4-feet in diameter, which can detect marginal to adequate quality television broadcasts. These systems are judged perfectly appropriate by some consumers.

Also, even though the FCC did adapt the 2 degrees spacing rule in 1983, this regulatory body is now following a go-slow policy in implementation. This fact, coupled with ongoing technical developments, should allow consumers who purchase sufficiently large dishes a comfortable margin of safety for some time to come. So, for the time being, satellite spacing does not have to be a major concern to owners of most home satellite receiving stations.

Frank Baylin is the author of *Satellites Today, The Complete Guide to Satellite Television*. It is available for \$9.95 from ConSol Network, Suite B, 1905 Mariposa, Boulder, CO 80302. **PC**

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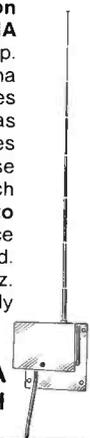
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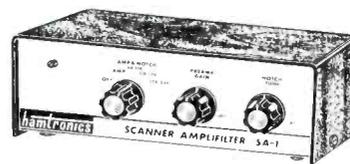
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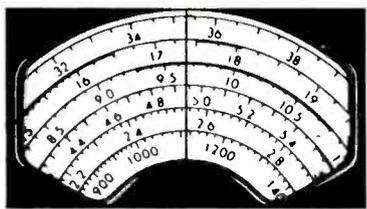
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BY MIKE CHABAK

YOUR GUIDE TO SHORTWAVE "UTILITY" STATIONS

Let me bid you welcome. Here we will explore and examine all aspects of utility communications, as well as subjects related to the world of utility monitoring.

Some of you might be familiar with my name. For those who are not, I recently spent four years editing the utility column for the SW hobby club, Speedx. This plus my involvement in utility monitoring since 1958 has given me a somewhat broad-based knowledge on the subject. An expert I am not, but via this column, both you and I will learn and be informed about aspects concerning the fascinating world of the utilities.

Exactly what this column will cover will, to a large degree, depend on your comments, questions, and information input. I want this column to be of interest and benefit to you, so you in turn will have to clue me in on what you want examined. Since there is a time lag, for the present, I'll be playing it by ear.

Who Are You?

In respect to this, I'd like to know who you are, where you live, the equipment you use, and your utility areas of interest. I have no idea of what topics you want to see covered, nor the specific types of hard data. Knowing something about you and your interests will be an asset to me, as I evolve this column into what you want and expect to see each issue. So take a few minutes to jot down the info and send it to me (via POP'COMM.)

What I especially want is comprehensive logging data on any rare, unusual, clandestine, or otherwise mysterious transmission. These will be printed out, and those of a tactical, clandestine, or unknown nature will be examined and analyzed in this column.

Monitoring something you can't make heads or tails of is frustrating. Being able to uncover some basic answers about them will be our goal, along with informing your fellow readers of where the rare birds abide. Routine loggings should be sent to our "Intercepts Editor" at Popular Communications, 76 North Broadway, Hicksville, NY 11801.

D/Fing Utility Transmissions

What follows is an example of a topic discussion/examination concerning a non-hard data subject. Stirring up controversy is not my objective, but some aspects of the utilities must be tackled head on.

In various publications there has been a call for utilities to band together, form a D/Fing network, and RDF some of the more mysterious types, such as number transmissions.



Gerry Dexter's recent story on UN Radio reminded reader Al Quaglieri (Albany, NY) that he had an interesting photo in his files. This photo shows the old UN ham station, K2UN at Lake Success, NY, on its first day on the air, May 18, 1948. Chief Engineer Frank Stoner is shown at the microphone of one of K2UN's two "full gallon" (1,000 watt) transmitters. On his first "CQ" call, he made contact with a station in Italy.



Rob, KD7SG, sent along a photo of himself seated at the controls of the current UN Amateur Radio station, 4U1UN at the UN Building. Rob comments, "Can you believe they let this guy in?" Rob hails from Scottsdale, Arizona.

Let's not beat around the bush on this: It is impossible for the average SW monitor to accomplish any accurate D/Fing. (I bet that invoked a howl out of some of you.)

D/Fing is easy, as long as you're working with a line of sight transmission. D/Fing off of a skywave propagated signal is much like trying to pick the short straw from a haystack. It is not to say that accurate HF D/Fing is not possible. It is accomplished every day. All you need is a big backyard, an electronics background, and X-thousands of dollars.

If you live near an FCC monitoring station, pay them a visit and see their layout. The Douglas (Arizona) facility has a 600-foot diameter WULLENWEBER wide

aperture array. This looks like a circular picket fence made up of individual vertical antenna elements. In simple terms, each antenna feeds into a central apparatus. Within it is a contact arm attached to an electric motor. Called a Goniometer, when it is spun up, it travels in a circle, making a momentary contact with each antenna feed in. The received impulses are then line fed into a computer, which analyzes the component signals, then prints out or displays via a cathode ray tube the bi-directional bearing. Simple, yet very expensive.

On the other hand, the average SWL is equipped with a dipole, active antenna, or one of the variety of random length long wires. Some may have a loop or horizontal bar D/F type antenna.

Loop/bar antennas, be they surplus, homebrewed, or commercially manufactured, are designed to operate in the long wave through 2 MHz marine band. Yes it will work on say 9 MHz, but for that matter, a straightened coat hanger will also work as an antenna. Forget about what the manufacturers claim. The loop/bar is not D/F capable on HF frequencies, except at point blank/very short ranges.

The major advantage of a loop/bar is its small physical size, allowing it to be rotated to either enhance or null out the target signal. Its prime application is on an airborne platform or a vessel in coastal waters. Its optimum scope of operation is line of sight or the unobstructed ground wave propagated signal. The loop/bar was never designed to D/F skywave propagated signals because they are incapable of doing this.

Dipoles, like the loop/bar, are bi-directional, forming a receptive figure-8 pattern at a right angle to its length. But this two-lobe pattern only occurs for the frequency area to which the dipole antenna has been cut. If you have a half-wave dipole of an overall length of 52 feet, you are centered on 9 MHz. It still will retain its figure-8 directional characteristics as you go down to 8 MHz or upwards toward 10 MHz. But if you use it on 5 MHz, its receptive pattern will be a four leaf clover type, at 45 degree angles to its length.

Long wires do have directional characteristics. Cut to one-full wavelength dimensions, it displays a 30 degree cloverleaf, off of its ends, at the frequency for which it is cut to. But to accomplish this, the wire must be on a straight line. If your long wire type is laid out on a box or "L" configuration, then it has omni-directional pickup characteristics... and needless to say, when used on frequen-

cies other than its optimum, pickup is basically omni-directional.

Active antennas are for all practical purposes, omni-directional.

Some hams use yagi or quad antennas. These are excellent directional antennas, but perform this task only within the meter band that they were constructed for.

Other items to take into consideration are the location of your antenna (indoor/outdoor) height above obstructions, proximity of metallic structures, physical size, and configuration.

As such, the average SWLer doesn't have the proper antenna equipment to even attempt long range D/Fing.

The other component to D/Fing is distance. Within line of sight or up to 50 miles away (this distance depends on frequency, output power, and intervening obstructions), you will work either a line of sight or ground wave propagated signal. Accurate D/Fing is most probable, especially under distances of 10 miles on land.

Beyond that range you have the silent zone, wherein groundwave cannot reach and skywave down bounce angles are too extreme (except for stray signals). So, in essence, once you are roughly 125 miles away from the transmitter, you are working its signal off of the skywave path.

For simplicity, let us assume a nighttime condition. The upper atmosphere signal refractor is the F2 layer. This is composed of stable atomic molecules that may or may not be ionized.

During the daytime, the sun pumps out a stream of high energy particles, which reach our upper atmosphere and collide with stable atomic molecules. They knock off an electron, and when this occurs, the atomic molecule is said to be in a state of ionization. Nature doesn't like this cosmic shooting gallery, so the free electrons try to recombine with an electron shy atom. Unfortunately, the sun has a lot of ammunition and the individual F2 layer atoms are spread out very far from one another. Only when that portion of the ionosphere is in darkness can the free electrons quietly rejoin the ionized parent. This process goes on all night, and the F2 layer reaches its most stable condition just before local dawn. After that, the cosmic shooting match resumes.

Some of you are saying, "so what?" Collisions and splittings result in molecular motion, and this motion is in 3-dimensions. Hence the F2 layer is not a smooth concave refractor, but much like the surface of the ocean, with waves, swells and ripples.

A radio wave strikes the F2 layer at a glancing angle and is refracted back down to earth. When the F2 layer's ionized versus stable state is in favor of the stable condition, the refractive angles are fairly consistent. When more unstable than stable, the signal is refracted down at varying angles to its line of directional movement. But the layer is in multi-axis motion, so a radio wave can also be deflected at tangent angles off of its directional movement. We are all familiar with the results of these conditions—fading in



"Eb" Long, K4GEW, of Tampa, FL has been an active ham for more than 50 years. He's also an ardent SWL and avid reader of POP'COMM. His equipment lineup includes a Yaesu 757-GX, SONY ICF-2002, Uniden Bearcat 300 scanner, and Realistic PRO-30. Thanks for your photo, Eb!

and out of the signal (wave polarization is another component to this phenomenon). As you can see, long range HF D/Fing with simple equipment can be much like trying to snare water with a fish net (the trick is to have the right kind of net).

In the mid-1970's, I experimented with a surplus loop antenna. It was mounted on a 25-foot mast and TV rotor equipped. It worked great for BCB DXing, but not so for accurate D/Fing. I also tried it out on HF stations, like VOLMETs out of Tokyo, Honolulu, and New York, plus the CG high seas weather broadcasts from Portsmouth and Honolulu. Over a period of time, I found compass bearing variances of between 15 to 30 degrees, plus or minus the known bearing, to be normal when the signal could be nulled out at all.

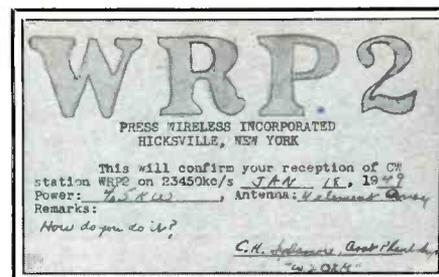
You can now understand the problem. Draw lines to represent a 30 or 60 degree arc, and the farther you go from its apex, the wider a geographical area is encompassed within the arc. For example: with a 30 degree arc, 1,000 miles away the arc is 550 miles wide. To make matters even more confusing, there were a handful of nulls that were as much as 60 degrees (plus or minus) from the actual.

Averaging out the bearings, or taking the extremes and deducing the mid-point between them, did not help matters. The Honolulu VOLMET had an average bearing that ran towards Taiwan. Even the average for CG Portsmouth placed it in North Carolina. In fact, only a very small handful of individual D/F bearings were within 5 degrees of actual.

Of course, those proposed D/Fing ventures would be made up of many utes widely scattered throughout North America. But if my observations are typical (and the experts likewise say so), then the venture is going to be most confusing and speculative.

The unpredictable nature of the F2 layer, the physical layout and conditions surrounding the individual's expertise in using the equipment and evaluating the data all add up to a very frustrating adventure.

D/Fing mysterious transmissions is a very



At one time, Hicksville, NY (home of POP'COMM) was the site of a vast commercial "antenna farm" operated by Press Wireless Inc. (PREWI). Stations at this facility were engaged in voice, CW, and RTTY communications with stations around the world. This facility is only a memory, but here is a QSL card from station WRP2 dated 1949 representing PREWI in Hicksville. Courtesy Tom Kneitel.

laudable enterprise. I would be the last not to wish to see these locations uncovered, but reality is reality. The SWL, with average equipment, no matter how gung-ho he or she may be, cannot compensate for the reality of the situation. Under these parameters, D/Fing a skywave propagated signal coming from an unknown location, with a loop, dipole, or long wire antenna, is not going to meet with any degree of success.

At best, all you will accomplish is to narrow down the geographical area, and this could encompass quite a large area. Then you would have to have people go into that area and conduct more D/Fing with the hope that one of them will accidentally end up D/Fing from eyeball range.

Just setting up a coordinated D/Fing project is tough enough. Getting people to run around to check out a suspected area is a lot to ask of any average SWL.

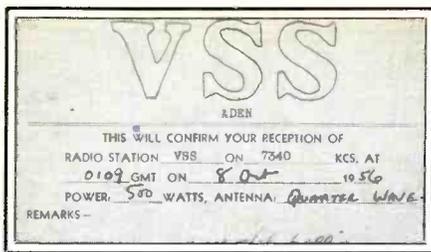
Even if you buck the odds and succeed, you may still end up with an answer that doesn't totally satisfy the effort expended.

Case in point: For the past several years the SS/YL 4-digit number transmissions were known to be originating from within the United States. Recently, an individual tracked them down to a transmitter location just outside of Remington, Virginia. This site is part of a large national communications complex, for which there are several known agency users, plus for security reasons, several others not identified as such. The suspicions were verified, but not who is behind the transmissions (except of course that it is a U.S. government agency).

In all probability, the Remington site is not even the originating source. It is the point of transmission, but the signal itself could be coming from a facility several hundred miles away—being sent via secure landline or microwave to the Remington transmitter.

So, in other words, don't expect to get the brass ring on the first try.

While we are on the subject of number transmissions, it is a money bet that the Cuban SS/YL 5-digit originates from the multi-purpose communications complex at Bauta, near Havana. Likewise, it has al-



The British ruled the ancient area of Aden from 1839 until 1967. After a prolonged guerrilla war ousted the British, Aden eventually became the People's Democratic Republic of Yemen (also known as South Yemen). Located at the southern entrance to the Red Sea, South Yemen has close ties with the USSR. This QSL from RAF station VSS (7340 kHz) is dated 1956 and is probably one of the few "ute" QSLs from Aden. Courtesy Tom Kneitel.

ready been verified that the German numbers (at least a majority of them) come from the multi-purpose complex at Nauen, East Germany. Just as with the Remington findings, specifically who is behind these transmissions remains a mystery (just as the actual purpose).

This is an example of what will be tackled in this column. Each issue, hopefully, will address several topics, and where frequencies, callsigns, station IDs and monitoring times are required, so they shall be included.

In a future column we can examine how to track down military/tactical callsigns. Even wonder how these have been identified? They didn't fall out of a tree, but were the results of communication analysis and good old detective work by a handful of mil-

tac buffs. You, too, can do the same—with practice.

How good are active antennas for utility DXing? . . . What about the crop of current SW rigs? What are their good/bad points for utility usage? . . . What are some currently "hot" frequencies to watch for tactical/clandestine/rare communications? . . . Where and when can one monitor the Pacific Trust Territory stations like Ponape, Truk, Kusaie, Majuro? . . . What about station mailing addresses? We could run a monthly run-down on those that are sent in . . .

The subjects examined will be as varied as the utilities themselves, and your comments and information input will make it all work. If I do this alone, then I will fail many of you, so your participation is vital.

This column has a potential, but if this initial discourse has not impressed you, bear in mind that I'm picking subjects of my own choosing. It won't be until several issues from now that your input and desires will begin to take effect.

As for correspondence, I'd like to personally answer all of them. The problem is that I have no idea of the size of the readership. If only six of you read this column, then I have no letter writing problems. But I suspect that a somewhat larger audience will be the reality. As such, the time required would eventually put me in a rubber room. Most questions will be compiled, and hopefully answered via topic discussions or a column mailbag approach.

The utilities are a broad and diverse subject. Much of the hard data can only be presented in an accurate and concise manner. But learning about new things doesn't have to be in a cut and dry textbook style. Certain

topics, presented in an easygoing manner, can be both entertaining as well as educational. Just as long as you can understand and benefit from what is aired, the method of delivery is of secondary importance.

I've said my piece, now get those letters off to me, via POP'COMM. Where we go from here will be in large measure, up to you.

Intercepts

Send your routine loggings to our "Intercepts Editor."

515: YWA, Petawawa, Ont., Canada. RCAF radiobeacon at 0520.

2291: IDQ/2/3/6, Rome, Italy running CW marker at 0321.

2325: 72JKL mystery station mentioned in the December '84 column heard here in CW at 0325 calling 68EAL and 13RG.

2706.5: German YL announcing 5-digit coded groups in AM at 0340.

2788: 72JKL mystery station noted here at 0347 in RTTY (850/100R) calling 78EAL and 12RG then into crypto.

2800: 4XZ, Haifa, Israel (Israeli Navy) running CW marker at 0348.

3039: IDR8, Rome, Italy, sending "VVV" marker in CW at 0251.

5870.1: 5-digit groups in CW at 0536.

6697: Echo 8-India working Romeo-8-Quebec, Quebec-9-Golf, and November-3-Tango in USB at 0402. Military comms.

6698.9: G1N calling 6WI in CW at 0508 then sending traffic in crypto.

6957.7: "526" in CW with marker tape at 0221 "QTC2 GR17."

7460: Spanish network using LSB at 0406.

7752.5: WFA57, New York, RTTY (850/50N) with "foxes" at 0120.

8332: Papa-7-India net control in USB at 2244 working Papa-7-Foxtro-Tango, Xray-3-Sierra, 3-Xray-Foxtro-Tango, and 4-Papa-Foxtro. Military traffic.

8442: SXA36/37, Spata Attikis, Greece (Greek Navy) with V marker in CW at 2336.

9223: 4-digit groups read by Spanish YL at 0434.

10125: Charlie India Oscar in USB at 2147

10418: Strange 2-tone signal repeated over and over at 2150.

11635.5: KRH51, U.S. Embassy, London, England, RTTY (850/100N) at 2125

13062: CLA32, Havana, Cuba, at 1955 in CW sending the news in Spanish.

13527: CCS, Santiago, Chile (Chilean Navy) in CW with marker at 2154.

14468: "Negrito" working "Napoleon" in USB at 2210. Spanish language; appeared to be up to no good—possibly drug smugglers. One operator asked the other to "send the usual signal when everything is clear."

14887: Very slow 5-letter groups sent in CW at 2140.

15738.2: AYA26, Buenos Aires, Argentina. INTERPOL bulletins in Spanish. Heard in CW at 2139.

15950: "Colco Uruguay to Asuncion" hand typed RTTY (850/100R) at 2110. Testing and sending traffic.

16106.5: FPQ, Paris, France, heard in RTTY (425/67N) with bulletins and news in French at 1913 then news in English at 2100.

16137: CML47, Havana, Cuba in RTTY (425/67R) testing to ITT Worldcom, NY with "foxes" at 2122. Announced itself as "RCC Havana/Cuba."

16185.6: FPQ8/43, Paris, France, in RTTY (425/67N) at 2111 calling WEY35 and WFG83 (New York).

16460: Russian language stations using USB at 1315.

16871.3: CWA, Cerrito, Uruguay calling CQ in CW at 2135.

17389: 3VA74, Tunis, Tunisia, with TAP news at 1520 in French. RTTY (425/67R).

17410: CLN, Manzanillo, Cuba, in CW at 1325 calling UJY2 in Kaliningrad, USSR.

18318: SAM-2600 aircraft using LSB for a phone patch to Andrews AFB at 1808.

18455.4: CLP1 calling CLP18 in CW at 1803.

19068.4: CNM83/X9, Rabat, Morocco, in RTTY (425/67R) with MAP news in English at 1343.

20140: CNM91, Tangier, Morocco. MAP news in English at 1349 with 425/67R RTTY.

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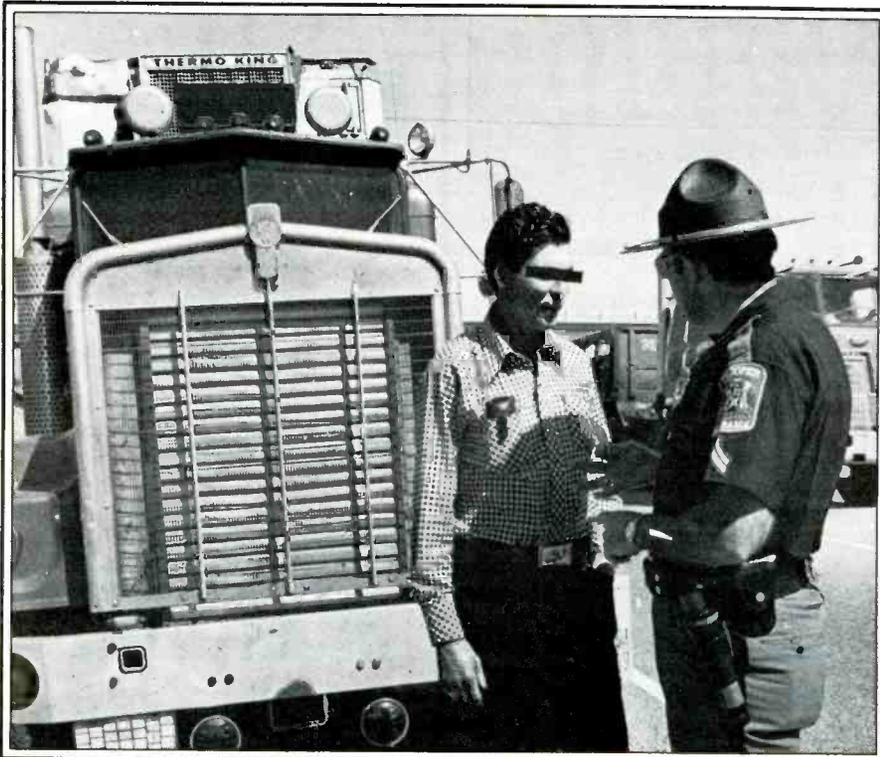
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RADAR REFLECTIONS

RADAR DETECTORS AND THEIR USE

BY JANICE LEE



Louisiana Speed Decoys

If you're driving down the Clyde Fank Parkway and you see a police car parked in the median, Shreveport police believe the natural thing for you to do is slow down.

That's the reason the selective enforcement division has recently placed empty police cars in strategic locations around the city. The empty cars "decoy speeding motorists into slowing down," police said.

"There have been some problems and some bad accidents down on the parkway," a police spokesman said. "Motorcycles were having drag races down there on the weekends—that's why (the patrol cars) have been out there."

The cars also have been placed on the interstate and several other locations around town. Police said they seem to be slowing motorists down—and they free an officer for other duties.

Police said the cars "are likely to be placed anywhere."

Texas Cities Seek Federal Aid For "Speed Traps"

Dallas and eight suburban cities are seeking more than \$1 million in federal grants to set up "speed traps" in 26 areas where police say the 55 mph speed limit is frequently ignored.

Applying for the grants in addition to Dallas were departments in Allen, Balch Springs,

Carrollton, Flower Mound, Garland, Grand Prairie, Lancaster, and Rockwall.

Preliminary approval of the grants has been made by the Texas department of Highways and Public Transportation.

Jim Petzold, a traffic safety manager for the highway department, said the grants will be given out after the speed studies are completely finished.

Funding for the grants is provided by the federal Selective Traffic Enforcement Program (STEP). And the cities will have to share in the costs of the program. Cities in the Dallas area have applied for about \$1.1 million and the same amount is earmarked for the Houston area, Petzold said. He said an additional \$200,000 will go to the Texas Department of Public Safety.

The program will be the first large-scale federally funded effort by Texas cities to enforce the 55 mph speed limit on highways in their cities. In past years, most speed enforcement money went to the Texas Department of Public Safety.

"We do hope that we can change some folks' behavior with this program," Petzold said. "I don't know how long the halo effect will last. We hope it will last real long."

Connecticut Lawmaker Would Get Tougher On Truckers

State Rep. Edith Prague said she would introduce legislation providing for on-the-

spot suspension of drivers' licenses of truckers arrested for speeding, tailgating, and other moving violations.

She proposed the measure recently in the wake of an accident on the Connecticut Turnpike, which left four people dead.

"A speeding truck is a terrible engine of destruction," she said in a prepared statement. "I myself have been in deadly fear of trucks that speed, tailgate, and swerve in and out of lanes they should be in."

Her proposal calls for:

- Immediate suspension of the license of truckers arrested for speeding, reckless driving, tailgating, and failure to stay in the proper lane.
- Immediate revocation of licenses of truckers convicted of those violations.
- Requiring trucks to have signs on the back of trailers telling motorists where to call to report misconduct by the driver.

Her proposal could run into opposition from legislators concerned about suspending a license before a trucker is proven guilty of anything. Similar bills have been debated in the past, including bills that would allow police officers to seize the license of anyone whose blood-alcohol level registers a certain amount in a field test.

Washington's Supreme Court To Hear Traffic Radar Case

John Orwick of Auburn, Washington, has been on a crusade since a Seattle police officer using radar ticketed him for speeding more than four years ago and his fight will reach the state Supreme Court soon.

Orwick was ticketed for traveling 43 mph in a 30 mph zone. He fought the citation, and argued he was going 28 mph because he knew the area was a radar speed trap.

Eventually, the city dropped the case because the ticketing officer couldn't prove that he knew how to operate the radar unit properly.

But Orwick still sued the Seattle Police Department and the Seattle Municipal Court. The suit was dismissed from the King County Superior Court and the state Court of Appeals. The Supreme Court will hear Orwick's appeal of those dismissals.

He claims there is more to the case than just his \$57 speeding ticket. His argument is that the police department has been irresponsible in its use of traffic radar. Orwick also says the court system has not informed drivers about their right to contest speeding tickets resulting from radar stops.

In a two-part attack, Orwick's suit contends that inadequately trained officers use faulty radar equipment to issue speeding tickets. He also charges that when a ticketed motorist tries to contest their citation in

court, the system doesn't inform motorists of their legal options.

Orwick is asking for compensation for lost wages, court costs and other damages, and also asking the court to bar the city from using radar readings as evidence in speeding cases until the city can show the operator was trained properly and the unit was in line with national standards.

Motorists are informed of their right to a contest hearing before a judge in Seattle Municipal Court through instructions on the back of a speeding ticket. If accused speeders inform the court they intend to contest the ticket, they are channeled through an informal hearing before a magistrate.

But Orwick claims that the court fails to tell motorists that the hearing before the magistrate is not the final contested hearing.

He also argues that since cited motorists are not allowed to subpoena witnesses, it is, in effect, drivers trying to prove their innocence. Orwick says that places an unfair burden of proof on the motorists rather than the city.

He claims he surveyed 300 motorists leaving informal hearings and found that 42 percent of them thought their magistrate appearance was the contested hearing. That, he says, is because the magistrate had not advised the motorists of their rights. Orwick says another 11 percent knew they could go in front of a judge, but could not afford to lose another day's wages.

Assistant city attorney Doug Whalley, chief of the office's criminal division, called Orwick's charges a "bunch of baloney" and denied the system forces motorists to prove their innocence before a magistrate. He said the magistrate system is popular.

"Our experience has been that people do not want to wait for a trial, where they have to go in and wait with 12 prostitutes and thieves and wait to contest their speeding ticket," Whalley stated emphatically. "Most appreciate the chance to talk informally with the magistrate."

In addition to battling the court system, Orwick has spent three years investigating traffic radar devices. The probe has turned up many questions surrounding the Seattle Police Department's radar units and the way officers are trained to use them.

He says that in 1981, Puget Sound Instruments, Inc., a company that tests radar equipment for a number of Northwest law enforcement agencies, advised its clients it could no longer certify the accuracy of some CMI radar gun models—one of which was used to clock Orwick in January 1981.

Al Nelson of Puget Sound Instruments said the company stopped endorsing the CMI products because of poor performance in testing. "They definitely are not up to the standards of the top manufacturers in the industry," said Nelson. In testing, CMI models gave inaccurate readings and didn't have the built-in technology to correct its mistakes in gathering those readings, Nelson said.

Orwick says Nelson's assertions about problems with the CMI guns are supported by trends in the caseload of the Driver's De-

fense Fund, a non-profit company he founded which assists motorists in efforts to beat speeding tickets.

The fund handled 18 cases a week until July 1982, when SPD switched models of radar guns, and the fund's caseload dropped to about three a week.

After SPD sent most of its traffic officers—about 30—to the state's radar training program at the Criminal Justice Training Center in Burien in March 1983, the defense fund didn't handle a single case involving a Seattle speeding ticket until February, 1984.

But since then, a month after the department began using another CMI model, the caseload has begun to pick up again, according to Orwick.

Capt. Clark Elster of the SPD traffic section stood by both the radar guns and the training officers get before using them.

"We do not use any radar units that are not approved by federal standards, and our officers are trained, certified by the state and given in-service training once a year," remarked Elster.

Woman Fights City Hall

As far as Jean Stribel is concerned, she kept her principles even though it meant nearly two days in jail.

The 43-year-old farm wife, substitute teacher, and president of a church altar society, chose jail rather than pay what she thought was a wrong \$44 traffic fine.

She was cited for going 49 mph in a 35 mph zone while driving a load of wheat through Hennessey, Oklahoma, a town of 3,500 about 18 miles south of Enid.

"There's just no way I could have been going that fast through the middle of town," she said. "I don't understand radar."

And while she said she isn't angry at Judge Vincent Messis, Jr., who imposed the fine or the jail term, "I'm supposed to tell 'the whole truth and nothing but the truth'—and then he didn't listen to what I said."

"He told me that was 'irrelevant' and all those things lawyers seem to say."

Mesis told Mrs. Stribel she didn't have to go to jail, that she could appeal the City Court fine to Kingfisher County District Court. But she checked into the jail. Mesis suspended seven days of her original nine-day sentence.

"It definitely wasn't like home," Mrs. Stribel said of the jail. "I was treated very well, but . . . I guess it was like a jail is supposed to be."

"We've made her as comfortable as possible," said police chief Roy Spears. He said Mrs. Stribel had a steady stream of visitors, who were allowed to go back to the cells to see her.

"I have to admit," she said, "I didn't sleep hardly at all while I was there. There were voices and phones squawking and things like that."

But she says her stand would be the same if she felt the city wronged her again.

"I think I just couldn't walk around kicking myself for doing something I didn't want to do. I would be saying, 'Why did I back down when I knew I was right?'"

Judge Mesis said that the early release should satisfy the city and her principle too.

Pennsylvania Introduces Bill To Restrict Speed Traps

Legislation to prohibit speed traps for 1,000 feet after a posted drop in the legal speed limit was approved recently by a panel of lawmakers in Pennsylvania.

Some municipalities have been padding their coffers by stopping drivers before they've had a chance to reduce speed to comply with a new posted speed limit, said members of the Transportation Committee of the House of Representatives.

The bill, which was sent to the full House, would prohibit mechanical or electronic speed timing devices for a 1,000 foot zone after a reduced speed limit is posted, except in school zones.

PC

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

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BROADCAST TOPIX

BY MARK J. MANUCY, W3GMG

DX, NEWS AND VIEWS OF AM AND FM BROADCASTING

Probably the most popular broadcast antenna over the years has been the end fed Hertz or "long wire." However, "long wire" may not be a very good term to use since we cannot make a wire "very long" at BC frequencies. In recent years, the loop antenna has made a comeback. Today the loop is a small loop, not the large wire cage of yesterday. The small ferrite loops use a transistor preamp to boost the received signal to a useable level. These loops are compact enough to be desk-top and work very well, but they also tend to be a bit expensive. Do not confuse the ferrite loops with the "active antennas" which also use a preamp. The active antenna has a whip or telescoping rod for the antenna and does not have any noise rejection capability or any directional characteristics at BC frequencies. These may be okay for casual listening if you have a quiet location, but for the serious BCB DXer, they cannot be a substitute for a good directional loop antenna.

Although the loop antennas of yesterday are very large compared to the ferrite type, the wire loop is inexpensive to build and performs in an outstanding manner. Some of the wire loops bring in sufficient signals so they don't need preamps.

All loops have advantages over the Hertz wire type antennas, which should be of interest to the BC band DXer. First, the wire antenna is more or less non-directional... that is it picks up signals from all directions. The loop antenna has a direction to it so that a signal can be peaked or nulled. The depth of the null depends on the type of loop and where it is used.

Second, with today's sensitive receivers, the wire antenna puts so much signal into the receiver that it may be overloaded. With too much signal, intermod becomes a problem and strong local stations are heard everywhere on the dial. An antenna tuner may help, but it may not! On the other hand, the loop is a tuned antenna and will deliver plenty of signal to the receiver, but has to be tuned for the frequency being received. The loops to be described here need to be peaked about every 10 kHz on the AM band. This means you hear only the frequency to which you are tuned; the rest are rejected.

Third, the wire antenna receives noise as well as anything else. However, the loop will reject noise of several types. Shielded loops, both ferrite and open types, reduce electrical noise pickup and can be used successfully in radio shacks located in the basement of your home. All loops can be used to reduce noise from electrical storms by nulling the storm with a twist of the wrist (loop).

Fourth, unlike the wire, the loop is a portable antenna. I will admit, my larger loop



POP'COMM reader Bud Sunkel, WA9HLP, is the early morning radio personality on station WVWV (FM 103.1 MHz) in Covington, Indiana. His "Bud In The Morning" program attracts the lion's share of the listeners in the WVWV coverage area. Here's Bud eagerly awaiting the finish of a recording.



WVNR in Poultney, Vermont runs 1 kW during the day and 250 watts at night. As shown on their wall, they operate on 1340 kHz. Photo by Tony Earll. (Readers—send in photos of local broadcasters.)

crowds the kids in my Toyota mini-van, but it is portable!

Last, but not least, there is no lightning problem with a loop antenna. It's already inside! So, you may take a second look at the ads in POP'COMM for the ferrite loops, most of which are battery powered and are truly portable. However, to learn more about the wire loops, tune back after reading the commercials!

The open loop can be designed to be used with any type of radio, whether or not there is an antenna connection on the back. The larger shielded loop gives a tremendous boost to my Panasonic RF-1170 and Sony SRF-A100. These portable radios have near 20 μ v sensitivity, and although there is no physical connection to the radio, the loop is still tunable. On occasion, I have tuned the loop to a station causing interference on an adjacent channel, then nulled

the station by turning the loop; then retuning the desired station and finding that I am then able to get an ID on the desired station.

The descriptions forthcoming are of three different loops I have built. The shielded loops use coaxial cable and the unshielded loop uses regular insulated stranded wire.

Within reason, the larger the loop the better the reception and the sharper and deeper the nulls. Also, the shielded loop picks up less electrical noise, so it is a better basement or inside antenna.

The shielded loops described here use RG-59 coaxial cable (the TV type) and tune the BC band (540-1600 kHz), one of them presenting a 50 ohm match to the receiver at all frequencies. This is one of the loops mentioned in the ICOM R-70 article in the December, 1983, POP'COMM. The loop was built to work with a Collins 51S-1 receiver, which had to see a 50 ohm match or the intermod was unbelievable on the BC band.

It is not necessary to include the 50 ohm matching section if you don't need it. Actually, there are three options in building this antenna:

1. Plain loop using no cable to the receiver. (Note: receiver must have a built-in loop).
2. Loop with pickup for use with a receiver having antenna connection terminals.
3. Loop with 50 ohm matching section for receivers requiring 50 ohms input. (Un-tuned front end).

A fourth option would be the addition of a preamp (to be described at a later time).

Construction

For years I have been calling this a 4-foot loop, but actually it is only 32 inches on a side. It just seems 4 feet when carrying it down basement steps or trying to squeeze it into a car! The supports are 46 inches.

Two 1" x 4" boards 46 inches long provide the "X" frame for the loop. The base is about 12" x 24". Cut a slot the size of the width of each 1" x 4" board halfway through at the center to fit the two 1" x 4"s together forming the "X" or "+" . I used brass screws to keep ferris materials to a minimum, although it probably won't make any difference if you use steel screws. The screws are used to strengthen the cross members and to fasten the base to the cross. The front panel also provides stability for the structure. I had a thin sheet of plywood (1/8"), but a metal panel could be used successfully. Before mounting the cross members, drill five 1/4" holes at the ends so that the coax may be held in place. Also drill a 1/8" hole about 1 inch in from the end of each board centered. This will be for the pickup loop. Even if you do not plan to use



Alex Hagerty logged CKLW and PJB in the same half hour and received these QSL's to prove it!

the loop with a receiver that has antenna connections, drill these holes now. If you want to add this feature later, it will be difficult to drill the holes later.

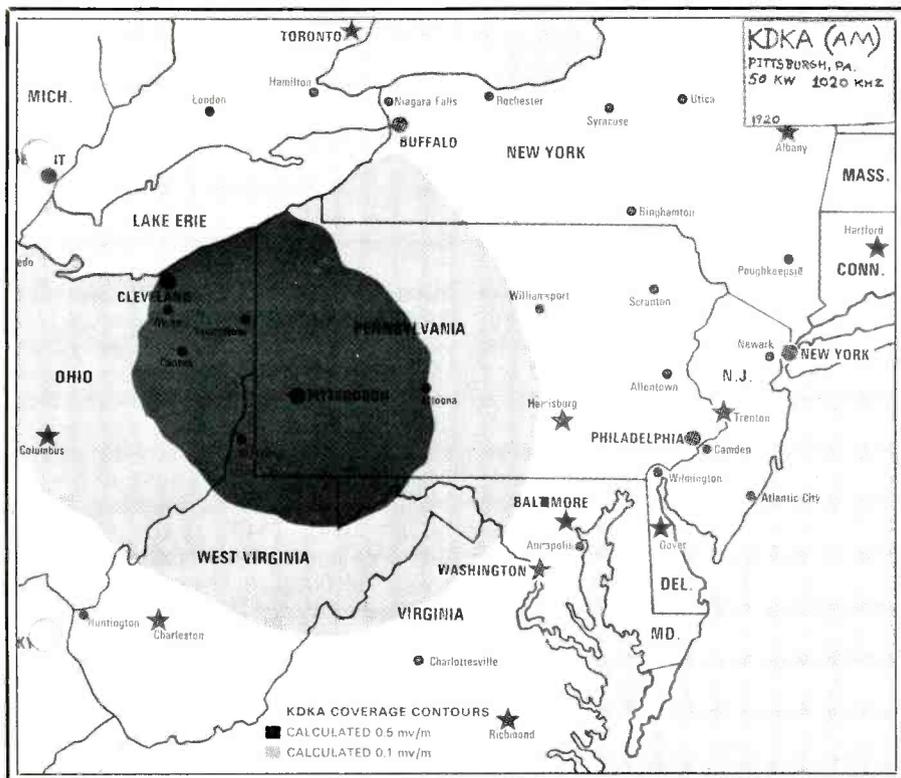
The loop itself is made from a 64-foot piece of RG-59 cable, tuned with a junk box variable capacitor using a switch to add additional capacitors to make the antenna tune the entire broadcast band. At the center of the 64-foot piece of cable, cut no more than 1 inch of the shield and remove it from the cable. Do not cut the center conductor or the insulation around it. Thus, we keep the shield from completely covering the antenna and therefore making it useless.

If the 50 ohm matching section is added, so is a second variable capacitor with more fixed capacitors to obtain a 50 ohm match across the entire band. I suggest this option be added only if intermod is still a problem after having built and used the basic loop—or if you own a Collins 51S-1 without the low-band tuner! The matching section was adjusted with an antenna bridge. Although

tuning may seem quite broad, the receiver needing a 50 ohm input can certainly "see" the difference.

Just how successful is a loop when it is not connected physically to a radio? Using my Sony SRF-A100, which has a small LED for a signal lamp, I can hear WNBC, WOR, and WABC in New York. These stations are some 200 miles from Baltimore and do not light the signal lamp at all during the daytime. When the 4 foot loop is tuned to these stations and the Sony brought next to the loop, the signal lamp will light to almost full brilliance. The WNBC stereo signal, which is very noisy, becomes quiet with the loop. WCBM (680) falls in the null of the loop at my QTH when I peak WNBC, so interference is reduced. The discussion on loops and their building will continue next month. If you absolutely can't wait or want more detailed plans that I can present here, then send me photo-copy costs and I'll return plans to you. For the coax loops send \$2.00 each (4 foot and/or 2 foot) or \$5.00 for all

KDKA has a big daytime "footprint" into parts of six states and Canada. Map from Alan Corduff collection of the mid-70's.



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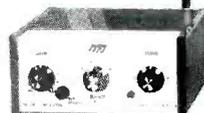
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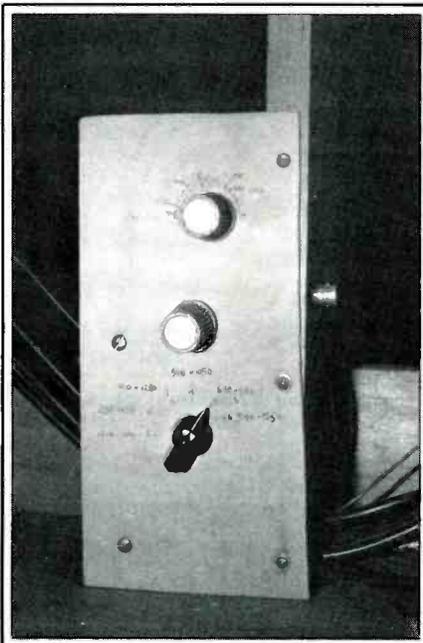
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Close up of the front panel of the 4-foot loop. The top knob adjusts the output impedance to 50 ohms. The center knob tunes the loop and the bottom switch selects the tuning range.

three plus 50 cents for postage. The third loop is an open, unshielded loop whose only saving grace is that it tunes from 270 kHz to 1700 kHz.

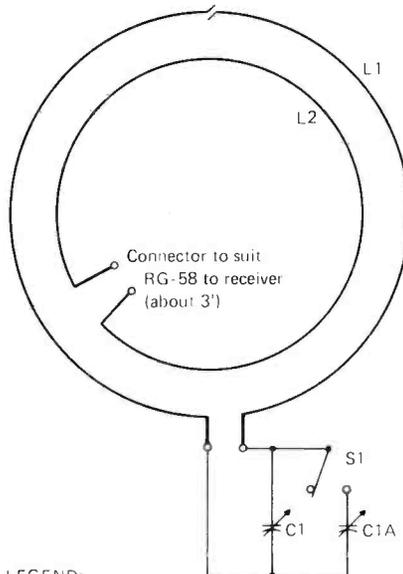
AM Stereo

The nighttime AM dial continues to be alive with stereo, especially after midnight. Keep your eye out for a future *POP'COMM* as we will list all the current AM Stereo stations and tell you how the different systems work, and give you some more information on stereo adapters for existing radios. Motorola recently told me that they now have almost 200 stations using their system. This is about half of the total number of stations.

KPF-941

From Yonkers, New York, a broadcaster who owns commercial stations in Maine is

Construction Details For 4-Foot Loop



LEGEND:

L1 = 6 turns of RG-59 (64")

L2 = 1 turn #18

C1, C1A = Dual 365µF variable capacitor. My unit was a unit with a 3:1 reduction to give additional spread.

S1 = Two position switch.

Range C1 is 1000-1600KHz

Range C1 + C1A is 540-1000KHz

Figure 1

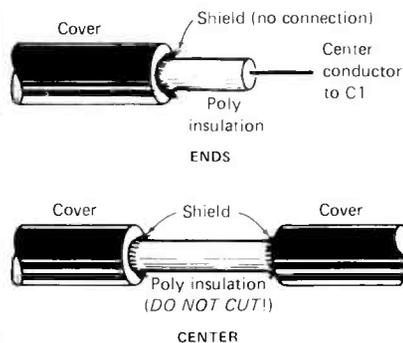


Figure 2: Coax details

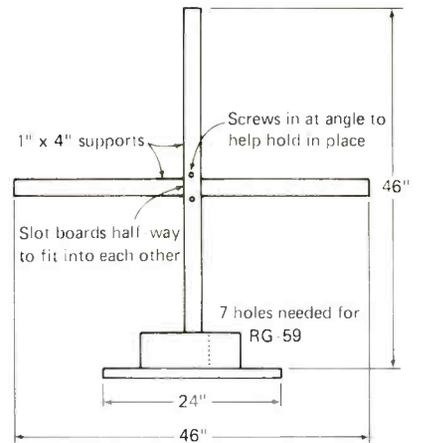


Figure 3

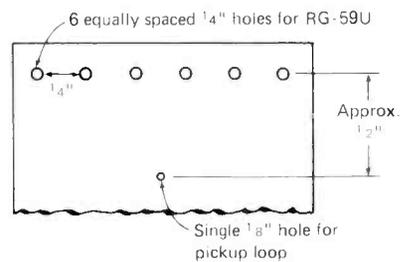


Figure 4: End of each support

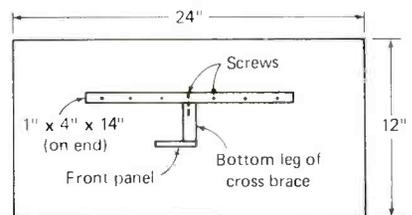


Figure 5: Top of base

operating a licensed station for purposes other than it is intended. This is according to FCC reports, although it may no longer be on the air. The station was using a 100 watt antique transmitter on 1622 kHz with a 40-foot antenna. Reception north to Hastings-on-the-Hudson and east to New Rochelle was reported. At night, reports came from as far as Detroit. Did you hear KPF-941? Normally, 1622 kHz is used from stations broadcasting remotely to send the signal to the studio for transmission on their main frequency (RPU). The 1622 kHz frequency is not allocated for direct transmission to the general public.

How have the local channels been in your area for the past few months? This past December 15, the FCC allowed almost all Class IV stations to increase their nighttime

power to 1,000 watts from 250 watts. Stan Morss and Jerry Starr took time to write me and explain the few stations that will not be increasing to 1,000 watts are those operating near the Mexican border and currently using directional antennas in the daytime to protect the signals of other stations. The Mexican government feels the stations in Mexico operating on the local frequencies (1230, 1240, 1340, 1400, 1450, and 1490) do not have sufficient capital to increase to 1,000 watts at this time. Thus, the U.S. stations near them can only increase to 500 watts now and then by July to the full 1,000 watts. All but a very few U.S. stations on local channels currently use 1,000 watts daytime now, so it was a matter of "not" flipping the switch at sundown to operate with a kilowatt at night.

Mail Call

What is the best BCB DX frequency? Let's hear it for 800 kHz! I get more reports for stations on this frequency than any other. This month, Alex Hagerty of Arlington, Virginia not only heard CKLW and PJB in the same half hour on the same night, but received QSLs to prove it!

Paul Plumly of Silver Spring, Maryland, lives in the shadow of a 50 kW Washington station which he says limits his DX. I can imagine, Paul, but considering the list in your letter, I still see hours spent beside the

dial! Nothing keeps a good DXer down!

Patrick Martin of Seaside, Oregon sent me a list of his TIS stations. The master list I'm compiling is growing. If you have any TIS operations near you, send a list to me to add to our master list. These are Travel & Information Stations usually operating on 530 kHz or 1610 kHz, but they do use other frequencies, such as the ones at Disney World.

Bob Jones of Franklin, Tennessee tells me WMC-FM of Memphis operates with 300 kW at 910 feet, which would be more power than WOOD-FM, and he's right!

Station Updates

Call	Location	Freq	Pwr	Ant
AM				
new	Clewiston, FL	590	1/0	0
new	Ridgeland, MS	660	50/1	0
new	Westland, MI	690	.5/0	0
WTNE	Trenton, TN	890	2.5/0	D
WKCW	Dorchester, SC	910	.5/.5	N
WKGM	Smithfield, VA	940	10/5	2
new	Leeds, AL	1030	10/1	0
WJJD	Chicago, IL	1160	50/10	2
WLBI	Denham Spgs, LA	1210	10/1	N
WXRQ	Mt. Pleasant, TN	1460	1/0	0
KDFN	Doniphan, MO	1500	2.5/0	D
new	Burbank, CA	1500	10/1	2
WRSL	Stanford, KY	1520	1/0	0
WARR	Warrenton, NC	1520	5/0	0
WARD	Pittston, PA	1550	5/.5	2
WZKY	Albemarle, NC	1580	1/0	0
KWXX	Springdale, AR	1590	2.5/0	0
FM				
new	Port Huron, MI	88.3	2	227'
KWGS	Tulsa, OK	89.5	50	1073'
KMSU-FM	Mankato, MN	89.7	20	400'
WKCR-FM	New York, NY	89.9	.63	1418'
new	Lebanon, MO	89.9	38	158'
new	Warm Spgs, OR	90.1	3	1032'
KXPR-FM	Sacramento, CA	90.9	50	500'
new	Santa Rosa, CA	91.1	.5	730'
WRVU	Nashville, TN	91.1	14.6	457'
new	Youngstown, OH	91.7	3	300'
KSOZ	Pt. Lookout, MO	91.7	22.7	787'
new	St. Paul Island, AK	91.9	15.1	40'
KMPS-FM	Seattle, WA	94.1	N/C	1194'
WROQ-FM	Charlotte, NC	95.1	N/C	996'
WGSS	Lumberton, NC	95.7	100	754'
WFID	Rio Piedras, PR	95.7	32	1994'
new	Coudersport, PA	96.7	.47	665'
WCOS-FM	Columbia, SC	97.9	100	1000'
KLUC	Las Vegas, NV	98.5	100	1195'
KQXX	McAllen, TX	98.5	100	N/C
WKMV	Princeton, WV	100.9	N/C	685'
WEAZ	Philadelphia, PA	101.1	14	941'
new	Salamanca, NY	101.3	3	1594'
new	Emporia, KS	101.7	3	300'
WMGK	Philadelphia, PA	102.9	8.5	1010'
WQEQ	Freeland, PA	103.1	.725	N/C
new	Chatom, AL	103.1	3	300'
WIGL-FM	Orangeburg, SC	106.7	N/C	1924'
new	Bastrop, TX	107.1	3	300'

Key: D = Daytime N = Nighttime DA = Directional Antenna DA1 = Same Pattern Day & Night DA2 = Different Pattern/Power Day/Night O = Omni Antenna Day and/or Night.

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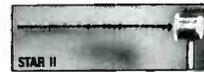
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STAR II



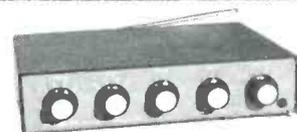
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Call Letter Changes

Old	New	Location	Old	New	Location
AM Stations					
WATM	WSKR	Atmore, AL	WOUG	WJCH	Joliet, IL
new	KSSU	St. Johns, AZ	WPOK-FM	WJEZ	Pontiac, IL
KDJQ	KNTS	Mesa, AZ	WRTL-FM	WRBZ-FM	Rantoul, IL
KPRZ	KISS	Los Angeles, CA	WXMG	WZZP	South Bend, IN
KJJZ	KPPL	Denver, CO	new	KSKB	Brooklyn, IA
new	WTIW	Hialeah, FL	new	KEGS	Emporia, KS
new	WAFC	Clewiston, FL	KSPG	KSPF-FM	El Dorado, KS
WVSI	WFXI	Jupiter, FL	new	KRUE	Lindsborg, KS
WDGL	WSPZ	Douglasville, GA	WCBR-FM	WMCQ-FM	Richmond, KY
WVFJ	WFDR	Manchester, GA	KJBQ	KTOC-FM	Jonesboro, LA
KAYT	KBBK	Rupert, ID	WLBS	WKSG	Mt. Clemens, MI
WOKZ	WBGZ	Alton, IL	KSCG	KGAC	St. Peters, MN
KOYY	KSPG	El Dorado, KS	WJWF	WMBC	Columbus, MS
new	WNZK	Westland, MI	new	KCVO-FM	Camdenton, MO
WMBC	WJWF	Columbus, MS	new	KJAB-FM	Mexico, MO
new	WGGD	Champlain, NY	new	KCWA-FM	Arnold, MO
new	WSSP	Springfield, NY	new	KPBW	Piedmont, MO
new	KKWC	Watford City, ND	new	KPBT	Webb City, MO
WKSD	WHHT	Orangeburg, SC	new	KMON-FM	Great Falls, MT
KRBC	KFQX	Abilene, TX	KSRN	KSRN-FM	Reno, NV
KWKC	KORQ	Abilene, TX	new	WBFR	Buffalo, NY
WNWZ	WENZ	Highland Spgs, VA	WIUE	WFRW	Webster, NY
WNRB	WFNR	Christiansburg, VA	new	WDFM	Defiance, OH
WISM	WTDY	Madison, WI	new	WTBL	McConnelsville, OH
			new	KCJC	Shawnee, OK
			new	WQJU	Mifflintown, PA
FM Stations			new	KCTL	Aberdeen, SD
new	WDAL	Chatom, AL	new	KJOB	Borger, TX
WSKR	WIZD	Atmore, AL	new	KAGN	Abilene, TX
new	KNBZ	Wasilla, AK	new	KDUV	Kingsville, TX
new	KAYM	Yuma, AZ	KINE-FM	KRVL	Kerrville, TX
new	KHIM	Flagstaff, AZ	KERV-FM	KYKR	Pt. Arthur, TX
new	KEPT	Prescott, AZ	KYKR-FM	KDCY	Cotulla, TX
new	KTTD	Claypool, AZ	new	KDXR	Borger, TX
new	KHAP	Chico, CA	KDKQ	KFQX-FM	Abilene, TX
new	KCRN	Santa Rosa, CA	KFQX	KTON-FM	Belton, TX
KKSS	KROR	Yucca Valley, CA	KTON-FM	KORQ-FM	Abilene, TX
KISS	KISS-FM	Los Angeles, CA	KORQ	KCCG-FM	Seminole, TX
KSQU	KWHO	Weed, CA	KIKZ-FM	WWWH	Fredericksburg, VA
new	KERP	Pueblo, CO	new	WYQC	Charleston, WV
new	WNLE	Fernandina Bch, FL	new	WGNV	Milladore, WI
WAFC	WAFC-FM	Clewiston, FL	new	WVCX	Tomah, WI
WVSI-FM	WKTQ	Jupiter, FL	WTMB-FM	KHRS	Rock Spgs, WY
new	WPQO	Waycross, GA	new	KLEB	Casper, WY
new	KETB	Coeur d'Alene, ID	new	KYCN-FM	Wheatland, WY
KBBK-FM	KIYS	Boise, ID	KWEP		

Thanks Bob. However, it seems somehow I missed two! Richard Ferch points out WJFM also in Grand Rapids operates with 320 kW at 780 feet. POP'COMM has some sharp readers and I think they're great!

Reception of WOWO in Ft. Wayne ranged from Michigan to Massachusetts and I know I used to hear them in Florida. WOWO is running tests with an SCA frequency as of October last year using PMX equipment. I'm trying to get more information on this to help you decode the message "Fun with WOWO 1190." KSL is supposed to be testing an SCA by now also. Although the systems of the two stations are different, they are both to use a home computer for information retrieval. Stay tuned. WOWO reception reports came from: Dave White, Ken Rohrer, David Bridger, Bernie Punt, Stan Morss, Bob Talbert, Bernard Wimmers, Jr., Willard

Dermeyer, Jr., Nicholas Favata, and Claude DePrine, who sent a cassette tape of his reception. Thanks to all. Let's tune up 10 kHz this month to 1200 and listen for WOAI in San Antonio, Texas. I'll be waiting to hear from you.

Alan Corduff, the morning personality at 98 Rock in Baltimore, gave me a whole stack of maps and other stuff the other day. I'll be sharing them with you over the next few months. Alan is an avid BCB Dxr. He's on the air from 6-10 a.m. Monday through Friday.

I also got an interesting letter from Kevin Hayes of WKJN in Baton Rouge, Louisiana. He wants to know if there is any interest in swapping air checks on cassettes among BCB DXers and maybe small stations. There are services that deal in this on a professional basis, but they are quite expensive

and out of reach for the hobbyist in general. I have a bunch of different types of air checks, including some of my own from the stone age! I know other guys who like to collect jingles. Drop a line to me and we'll see if there is any interest or what you might have to contribute.

Remember, if you're interested in the computer programs used for the updates (and for logging), write me for more details. They are for the Commodore 64 and some for the TI 99/4A. Send me some photos and DX reports. This month should be good for FM openings, as well as May. The rapid heating and cooling of the spring atmosphere really excites those FM and TV signals! Thanks for all the nice comments on the column. With your help, we can make it better. Send all mail to P.O. Box 5624, Baltimore, MD 21210. **PC**

WASHINGTON PULSE

FCC ACTIONS AFFECTING COMMUNICATIONS

New Experimental Licenses

The Commission, by its Office of Science and Technology, Frequency Liaison Branch, took the following actions:

KE2XOM, KE2XON, KE2XOO, KE2XOP, University of Alaska, Within State of Alaska. To operate on 401.7655 MHz for data collection for fire weather forecasting and prediction of water runoff using GOES Satellite.

KE2XOQ, State of Colorado, Within States of Colorado, Kansas, and Utah. On 401.8075 and 401.8765 MHz for collection of water resources data throughout area using GOES-WEST Satellite.

KE2XOR, Gulf Oil Exploration and Production Company, North Slope, Alaska and 35 mile radius. For operation on 401.7205 MHz to support sea ice movement project using GOES Satellite.

KE2XOT, ARA Technology Institute For Maritime Electronics, Linthicum Heights, Maryland. For station to operate on 1636.5-1645 MHz band to perform training courses for operation and maintenance of satellite communication equipment.

KO2XHA, Exploratorium, San Francisco, California. For station to operate on 9410 MHz for technical demonstration of equipment and techniques to marine radar.

KO2XHL, McGraw-Edison Company, 10 mile radius Carson, California. For station to operate on 154.46375 MHz to develop a utility load and distribution management system.

KO2XID, FMC Corporation, in the vicinity of Camp Roberts, California. For station to operate on 2200-2300 MHz band; 410.000; 416.600; and 154.600 MHz to provide a video link from a military armored vehicle under U.S. Govt. contract.

KO2XIJ, LTV Aerospace and Defense Company, 50 mile radius of Buffalo, New York. For station to operate on 1240 MHz for design, building, and testing a relative navigation system that will provide range and bearing information using an artificial apparatus (non-rotating) antenna.

KO2XIM, University of Alaska, Poker Flat, Alaska and Chena Valley, Alaska. For station to operate on 219 MHz for atmospheric physics research program.

KO2XIN, McDonnell Douglas Radio Services Corp., Airborne within Continental United States. Station to operate on 9000-9600 MHz band for demonstration of Quiet Radar Altimeter.

KO2XIQ, Lockheed Electronics, Co., Inc., Plainfield, New Jersey. For station to operate on 5250-5350 and 8500-9000 MHz bands for development of an Electronic Identification System.

KO2XIR, Lockheed Electronics Company, Inc., Plainfield, New Jersey. For station to operate on 1250 MHz for develop-

ment of an Electronic Identification System under U.S. Govt. Contract.

KO2XIS, Eaton Corp., Airborne, New York and New Jersey. For station to operate on 960-1215 MHz band for use in development and testing of a more accurate DME.

Motorola, Inc., Within Continental U.S. License for station to operate every 25 kHz beginning 914.0125 ending 914.9875 MHz and every 25 kHz beginning 959.0125 and ending with 959.9875 MHz for development of cordless telephones to meet European standards.

Private Radio Bureau To Issue Lottery Orders In Private Land Services

The Commission authorized the Chief of the Private Radio Bureau to issue lottery orders in the Private Land Mobile Services.

On May 27, 1983, the Commission amended its rules to allow the use of random selections or lotteries in place of comparative hearings where it is determined this would be the most efficient method of granting applications and where there are few material differences between applicants.

Under this procedure, when there are more applicants than available channels, a Public Notice is issued listing all timely filed applications. After evaluating the applications received, the Bureau presents an agenda item to the Commission listing the applicants that would participate in the lottery and those whose applications were dismissed. The Commission then decides whether to order a lottery, and if so, issues an order to that effect.

With this new procedure, the Private Radio Bureau can issue lottery orders, instead of sending them to the Commission for adoption. The Commission estimates that over a month of processing time will be saved.

Applicants For SMR 800 MHz Channels To Be Chosen By Lotteries

The Commission has decided to conduct lotteries to select licensees from among 451 competing applicants for Specialized Mobile Radio (SMR) 800 MHz channels in the Buffalo, NY, San Diego, CA, and Los Angeles-San Francisco areas.

The Los Angeles and San Francisco areas were consolidated because spacing rules preclude co-channel grants at proposed transmitter sites which are within 70 miles of each other.

In 1983, the Commission announced that applicants would be awarded two comparative points for expanding an existing loaded trunked system, one point for a new trunked system, and no points for a conven-

tional system. Applications with the highest number of comparative points would be granted without a lottery if there were sufficient channels available.

Of the 342 applications received for the Los Angeles-San Francisco areas, 32 were dismissed. The Commission granted the applications of Mijac Enterprises, Inc., to add 5 channels to existing loaded 5 channel SMR system WYA-655 at Pomona, CA, and the application of PMRS, to add 5 channels to its existing loaded 5 channel SMR system WZN-630 at Corona, CA. Since there is no spectrum available, the FCC dismissed the applications of Touch Communications Co. for its proposed conventional systems at Orange and Los Angeles, CA.

Of the 137 applications received for the San Diego area, 11 were dismissed. Since there was no spectrum available for conventional systems, the FCC dismissed the application of Pflueger Enterprises for its proposed conventional system at Escondido, California.

The remaining 410 applications (306 for Los Angeles-San Francisco, 125 for San Diego, and the 20 received for Buffalo) for new trunked systems are all tied with one comparative point each. Since there are not enough channels available, the FCC said it would select the applicants via lotteries.

FCC Seizes Over 2700 Pieces Of Electronic Equipment

On November 30 and December 3, 1984, Electronic Engineers from the New York District Office of the Federal Communications Commission with Special Agents of the U.S. Customs Service conducted a search and seizure of over 2700 pieces of electronic equipment, including CB transceivers, walkie-talkies, and FM receivers with a total estimated value of \$500,000. The search warrant was executed against Granada Electronics, 485 Kent Avenue, Brooklyn, New York.

The seized items were manufactured in the Far East, and were imported into the United States for illegal sale. The CB radios were capable of operating on unauthorized frequency channels with transmitter power in excess of that permitted by the Commission's Regulations. These radios do not have the Commission's required type acceptance which would permit their marketing in the United States and are a potential source of interference to essential radio services, and to home electronic entertainment equipment. Also seized were Grenada's business records, which reflected the illicit importation and sale of electronic items all over the country.

In addition, U.S. Customs Agents ar-

rested Lawrence Wallach of L.W. Sales, 8 Freer Street, Lynbrook, New York for the unlawful sale of non-type accepted CB transceivers which were illegally brought into the United States.

Wallach and Granada were subjects of a two year Commission investigation into the importation and marketing of non-type accepted CB transceivers and other non-type approved home electronic entertainment equipment. Following the arrest and seizure, the Commission identified Granada as a major distributor of this type of illegal merchandise. The Commission Engineers worked with the cooperation of the U.S. Customs Service, and the U.S. Attorney, Eastern District of New York.

Wallach, age 27, appeared before the U.S. Magistrate in the Eastern District of New York on December 3, 1984. He was released on a \$10,000 personal recognizance bond. If convicted, he faces up to 5 years imprisonment, and \$5,000 in fines.

FCC Forms 501 And 502 (Application For Ship Radio Station License) No Longer Accepted By Private Radio Bureau

The FCC's Private Radio Bureau is updating the computerized ship license files in preparation for conversion to a redesigned application processing system. The Bureau has determined that it is necessary to stop accepting FCC Form 501 and FCC Form

502 from applicants for radio station licenses in the ship radio services. These application forms do not contain enough information to permit the application processing staff to enter the required data into the computerized license files presently being constructed. Accordingly, the Bureau must require applicants who file for new or modified ship station licenses to fill out the FCC Form 506. In the event that an applicant does not submit Form 506, the Bureau will have to return the form to the applicant and advise him or her to fill out Form 506. Hence, applicants can save both themselves and the processing staff extra time and effort by filing Form 506 initially rather than Form 501 or Form 502.

Ship radio station licensees receive a computer-generated license renewal form (FCC Form 405-B), one hundred and twenty days prior to the expiration date of the license. Those licensees whose station license was granted subsequent to filing a Form 501 or Form 502 will not be sent the computer-generated renewal form (Form 405-B). Rather, these licensees will receive a Form 506 one hundred and twenty days prior to expiration which must be completed and filed for renewal of their station license.

FCC Proposes Additional Spectrum For Private Land Mobile Use

In response to a request by the Land Mobile Communications Council (LMCC), the Commission proposed additional spectrum

in the 896-902 and 935-941 MHz bands for Private Land Mobile use.

It also proposed a narrowband channelization plan for this spectrum. Under the proposal, these new channels would be apportioned among four pools as follows: 30 percent for Public Safety, 20 percent for Industrial/Land Transportation, 20 percent for Business Radio, and 30 percent for Specialized Mobile Radio Systems (SMRS). A regulatory structure would be established for this spectrum similar to that set forth in Subpart S, Part 90, of the rules and currently applied to applicants and licensees of frequencies in the 806-821/851-866 MHz bands.

Since the late 1960's, the Commission has recognized that without additional allocations there would be a serious shortage of land mobile spectrum before the end of this century. In Docket 18262, it determined that the increasing use of land mobile telecommunications systems required allocation of federal government and broadcast spectrum in the 806-947 MHz band. Seventy MHz was released immediately and divided into 40 MHz for the Common Carrier Cellular Radio Service and 30 MHz for private conventional and trunked operations. The remaining 45 MHz was set aside specifically for future land mobile growth. Of this 45 MHz, 41 MHz remains in reserve. Numerous requests totalling more than 80 MHz have been made for this spectrum.

Of the 41 MHz of reserve spectrum available in the 900 MHz band, the Commission noted, 32 MHz is readily pairable for land mobile operation. Recognizing the high priority of the Private Land Mobile Services, it proposed making 12 MHz available for their use, and, in separate proceedings, proposed allocations of 12 MHz for cellular operations, and 8 MHz for a land mobile satellite service.

While most private land mobile services in the United States use 25 kHz channels, the Commission said in view of the limited spectrum available it was proposing a 12.5 kHz channeling plan for this new spectrum. It will also consider channel spacings other than 12.5 kHz or 125 kHz—e.g., 5, 6.25, 7.5, 10, and 15 kHz. Comments are requested on the feasibility of some of the various channeling plans.

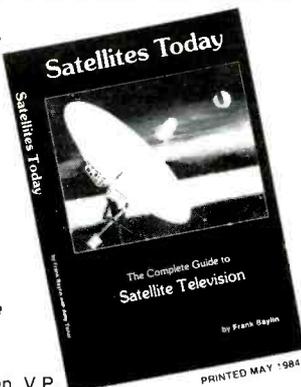
The Commission said while it felt Public Safety and SMRS should be given priority in distributing spectrum among the various private land mobile users, adequate allocations also must be made to accommodate Special Industrial, Land Transportation, and Business users to find their needs can best be met by establishing their own communications systems. LMCC indicated that the presently available 800 MHz frequencies are at or near full utilization in several urban areas and that further allocations are necessary for additional users. Comments are requested on whether the Public Safety pool should be larger than proposed.

Utilization Plan For 41 MHz Reserve Spectrum Between 806-947 MHz

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the Commission set forth a plan for the future use of the 41 MegaHertz of reserve spectrum between 806-947 MHz.

In arriving at this plan, the Commission had to consider numerous requests for this spectrum totalling more than 80 MegaHertz.

Unable to satisfy all of these requests with the available spectrum, the Commission placed high priority in satisfying land mobile requirements for which the reserve was originally intended.

The radio services that could be provided through additional spectrum are private land mobile, common carrier cellular and mobile satellite. Since only 32 MHz of the 41 MHz in reserve is pairable for conventional land mobile uses, the proposed allocations for these services reflect full use of that portion of the reserve spectrum.

With the remaining 9 MegaHertz of the reserve spectrum and the outstanding demands for fixed services not requiring similar separations, the Commission decided to make allocations for a government/non-government fixed service and for continued operation of auxiliary broadcasting services.

The items adopted are as follows:

General Item No. 1: 6 MegaHertz (932-935 and 941-944 MHz) has been allocated for government/non-government fixed operations. Whereas this spectrum would not have been feasible for traditional mobile operations, fixed operations can readily make use of frequencies with a separation as small as the 9 MegaHertz provided. An additional benefit obtained with this allocation is the ability to grandfather auxiliary broadcasting stations now operating in the 942-944 MHz band, since government and non-government fixed operations can share spectrum through appropriate coordination.

General Item No. 2: 3 MegaHertz (944-947 MHz) has been allocated to accommodate existing as well as future auxiliary broadcasting requirements, specifically Studio Transmitter Links and Intercity Relay Stations (STL/ICR). Although the Commission had originally proposed use of spectrum at 2 GHz for STL/ICR growth, the Commission determined that continued access to the 944-947 MHz band would be more favorable in view of the current use of 2 GHz and the expected future use by displaced licensees from the Direct Broadcast Satellite spectrum at 12 GHz. However, access to the 2 GHz band by STL/ICR stations will be considered on a case-by-case, waiver basis, if appropriate.

As a separate part of this item, the Commission allocated the 942-947 MHz band for primary STL/ICR use in Puerto Rico only.

General Item No. 3: 12 MegaHertz (896-902 and 935-941 MHz) is proposed for private land mobile services. Service rules would be similar to those for current 800 MHz licenses with one major exception—in order to reach a level of spectrum efficiency which will be essential to meet projected private land mobile requirements, a narrow-band channeling plan is proposed.

General Item No. 4: 12 MegaHertz (845-851 and 890-896 MHz) is proposed for common carrier cellular services. This spec-

trum would contribute to the satisfaction of continued demand for cellular services with cost benefits accruing to users. Several issues are also discussed, such as, use of narrowband technologies, sharing of the spectrum with other land mobile services and alternative allocations/assignment schemes (involving not only the spectrum proposed for cellular services but also spectrum mentioned above for private services).

General Item No. 5: 8 MegaHertz (821-825 and 866-870) for a land mobile satellite service. Spectrum in the 1.5 GHz range is expected to increase the capacity and offerings of such service either in the initial system or future generations. A mobile satellite service would have a unique value in providing nationwide land mobile communications, since a satellite service would provide the most practical way of covering all of the non-urban areas of the country.

General Item No. 6: The Commission declined to allocate spectrum or adopt final rules that would establish a new Personal Radio Communications Service (PRCS). The Commission stated that given the demands for the reserve spectrum, the high priority to accommodate future growth of traditional land mobile services, and the limited value of the proposed PRCS, the proposal could not be granted. However, in the above-mentioned items concerning allocations to private land mobile and cellular services, comments are solicited on the feasibility of providing a PRCS using these allocations outside of urban areas.

General Item No. 7: The Commission has declined to allocate spectrum at 900 MHz for the provision of an air-ground telephone service (896-898 and 941-943 MHz). As in the item regarding PRCS, the Commission noted the pressing requirements of traditional land mobile services and the relative utility of an air-ground service compared to that of other services. The FCC was not convinced that the public need was great enough to justify the reallocation of 4 MHz of spectrum from land mobile to an air-ground service. It contrasted the land mobile services as providing service to a broad segment of the public with an air-ground service accessible to only a small segment of the public. Possible alternatives to providing an

air-ground radiotelephone service were mentioned, including the use of higher frequency bands or consolidation with a mobile satellite service such as that proposed in a companion item (see item 5 above).

Additional Frequencies For Cellular Radio Proposed

The Commission tentatively proposed to allocate 12 MHz of spectrum in the 845-851 and 890-896 MHz bands to the Domestic Public Land Mobile Service for use by cellular radio systems.

In 1981, the Commission concluded that 40 MHz (20 MHz for wireline systems and 20 for non-wireline systems) of spectrum would be adequate to meet public demand. At the same time, it placed 20 MHz of reserve spectrum in proximity to the cellular allocation.

Ameritech Mobile Communications, Inc., operator of the Chicago wireline system and other wireline carrier systems in Midwest cities, requested additional spectrum to reduce costly cell-splitting.

Ameritech argued that its experience in the Chicago market, the first operational commercial cellular system (initiated on October 13, 1983), had far exceeded the projections on which the Commission's initial spectrum decision was based. During the first seven months of operation, it had 7,500 subscribers, and it estimates that by the end of 1984 it will have had more than 15,000 subscribers. It projects that by 1990 the cellular carriers in Chicago will each serve more than 60,000 subscribers.

With the rapid growth in the number of people using cellular and the need projected for all urban mobile radio services, the Commission concluded that some additional allocation for cellular services may be required. Although some have argued that as much as 20 MHz is needed to fully meet cellular needs, the FCC said it believed that an additional 12 MHz allocation (6 MHz for wireline and 6 MHz for non-wireline) would achieve substantial cost savings for cellular subscribers, while preserving the remaining reserve spectrum for other services.

In considering Ameritech's request, the FCC took into account several companion

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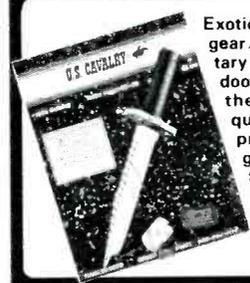
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items being considered today: (1) a proposal to reallocate the 821-825 MHz and 866-870 MHz land mobile reserve bands to a land mobile satellite service; (2) a proposal to use the 896-902 MHz and 935-941 MHz land mobile reserve bands for private land mobile services; (3) reallocation of the 932-935 MHz and 941-944 MHz land mobile reserve bands for a government and non-government fixed service; and (4) reallocation of the 944-947 MHz land mobile reserve band for broadcast auxiliary service use.

The FCC said the 12 MHz of spectrum proposed for cellular expansion is 8 MHz less than desired by some cellular proponents, but, as is the case with the mobile satellite and private land mobile proposals, it represented a balance among the competing demands for the 41 MHz of spectrum remaining in the 900 MHz band reserve.

The FCC proposed to authorize additional spectrum only to those cellular licensees who have actually placed into operation cellular systems that exceed a specified level of frequency reuse.

Reserve Spectrum Reallocated

The Commission reallocated 6 Megahertz of spectrum in the 932-935 and 941-944 MHz bands for use by government and non-government fixed services.

The action amending Part 2 of the rules came in response to a request by the National Telecommunications and Information Administration (NTIA) for spectrum in the 900 MHz range to be used by federal government low-capacity fixed systems. In making the allocation, the FCC also provided for similar private systems and for continued operations of existing broadcast auxiliary stations at 942-944 MHz.

NTIA had considered several bands outside the upper land mobile reserve range for fixed systems, but rejected them because they are being used or will be used by other communications services. The 23 GHz band also was rejected because of its limited coverage range and because its channel capacities are much greater than required for the foreseen applications.

The Commission noted that the 932-935 and 941-944 MHz bands are not particularly useful for private and common carrier two-way mobile services. With current technology, such services require 30-45 MHz of frequency separation, rather than the 9 MHz recommended for the fixed service. Thus, the 6 MHz of spectrum being reallocated from land mobile to fixed services could not be used productively in mobile applications.

Furthermore, broadcast auxiliary users currently are operating in the 942-944 MHz band, the Commission pointed out. Since they are point-to-point systems, even if this band is reallocated for fixed use, they can be grandfathered without degrading the quality of service to fixed users. To allow mobile use of this band, broadcast auxiliary users would have to relocate so as not to degrade the mobile service.

A number of low-capacity, fixed systems

are interspersed throughout the 406.1-420 MHz government land mobile band. NTIA intends to remove these fixed operations to 900 MHz and restrict the 400 MHz band to land mobile operations exclusively. Therefore, the Commission said, continued fixed operations in this band would result in inefficient spectrum use because protecting fixed stations would limit mobile use and detract from the gains promised by narrowband technology.

For these reasons, the Commission concluded that reallocating the 932-935 and 941-944 MHz band to government and non-government fixed service is in the public interest. The lower band is not utilized, and fears that compatibility problems could arise in Canadian border areas have been allayed by Canada's current plans not to proceed with a general mobile radio service in the 933-935.5 MHz band.

However, due to the diversified type of use contemplated, the Commission said it would be premature to issue procedural and technical rules at this time. Therefore, a further proceeding would be initiated to explore these rules, and comments are invited. Neither government nor non-government users will be allowed access to the bands until final rules have been issued.

Guidelines For Uniform Filings

To enable the staff of the Office of the FCC Secretary to provide faster and more efficient service, follow guidelines in preparing and submitting "uniform" filings.

•First, your filing package should consist of an original document, one which contains an original signature, and the proper number of copies.

—The original and each copy should be individually stapled.

—The package should be held together by a rubber band or paper clip, depending on the bulk of the package.

—Multiple copies should not be stapled together nor bound by a binder clip or Acco-type fastener.

•Second, if your filing is "self-explanatory," no cover letter is required.

—Self-explanatory filings usually include a subject, docket, or file number, and title on the first page, or begin with a properly completed FCC application form.

—If you must provide information to the Commission which is not included in the filing and tells us something more than, for example, you have "filed an original and 5 copies of Comments in the above-captioned proceeding," then only one transmittal letter is necessary.

—There is no need to include a cover letter with each copy of your filing. If a transmittal is included, it should be signed in the original.

•Third, to obtain a receipt, place a copy of either the cover letter or the filing (first page will do) on top of your package, but included within the rubber band or the paper clip.

—Please note that one and only one receipt stamp will be issued per filing.

—There is no need to provide an "extra" stamped receipt copy to Commission staff members to show that you have officially filed a document with the Secretary.

—If you use a service to deliver your package, please make arrangements to obviate the need for an FCC staff person's signature on a messenger receipt form. We will either sign for receipt of a filing or provide a stamped receipt copy.

•Finally, bring your filing to the Secretary's office, Room 222, 1919 M Street, during the hours 8:00 a.m. to 5:30 p.m., Monday through Friday, except legal holidays as defined in Section 1.4 of the Commission's Rules. When approaching the counter, please have your filing package ready for submission.

—"Ready for submission" means that your filing is collated in sequential order, signed in the appropriate places, and properly fastened.

—"Ready for submission" also means that your filing is not enclosed in an envelope. We cannot reuse envelopes and removing the contents from one diminishes our ability to quickly process filings. Please remove the filing(s) from the envelope before approaching the counter.

—Remember, too, that the hour between 4:30 and 5:30 p.m. is the busiest part of the day. If possible, file early in the day. If you file numerous documents after 4:30 p.m. you may have to wait until the following day to receive your receipt copies.

•To Summarize:

—Each filing should include the correct number of copies beneath the required signed original;

—Under a single signed transmittal letter (if absolutely necessary);

—Topped by one copy of either the filing or covering letter to be used as a receipt;

—All enclosed within a rubber band or paper clip.

Number Of Copies To Be Filed With The Commission

Except as otherwise specifically provided in the Commission's Rules (see Section 1.51), the number of documents to be filed is as follows:

Hearing Proceedings

Documents to be acted upon by:

Administrative Law Judges	Original & 6
Review Board	Original & 11
Full Commission	Original & 14
Notices of Appearance	Original & 2
Depositions	Original & 3
Interrogatories	Original & 3

Rule-Making Proceedings

Petitions, Comments, Replies:

Regular Distribution	Original & 5
To include Commissioners	Original & 9
Informal	Original & 1
Table of Assignments	Original & 4
Ex Parte Presentations	Original & 1

Non-Hearing And Non-Rule-Making Cases

Pleadings, Briefs, Petitions, etc. Original & 4

NOTE: An original should always have original signatures.





Scanning South Dakota

VHF Low-Band Is The Way To Go In South Dakota

BY RICK MASLAU, KNY2GL

Who says the 30 to 50 MHz "low band" is a thing of the past? Don't tell that one to law enforcement officials in South Dakota, because the majority of their communications are on 39 MHz! In fact, the whole package seems to take up a mere handful of channels that covers federal, state, and local agencies of all types—state patrol, sheriffs, local police, highway departments, fish and game, prisons, and everything else!

The basic channel layout for South Dakota consists of the following channels:

Channel 1	Gov't.	39.10 MHz
Channel 2	Local	
Channel 3	Law	39.32 MHz
Channel 4A	State	39.16 (39.24 receive)
Channel 4B	State	39.16 (39.28 receive)

All non-law enforcement agencies use Channel 1. This frequency may also be utilized as a "local" working frequency for law enforcement agencies not having their own designated channel.

Channel 2 is usually established as a regional frequency for departmental use. Many sheriffs in South Dakota use 39.36, for example.

Channel 3 is used for inter-agency communications base/base for the most part.

Channels 4A/B are the base/mobile channels used by the State Highway Patrol, also used to communicate with mobile units of other agencies. Western counties and counties in the extreme northeast and southeast use Channel 4A, other counties use 4B.

By listening on these channels you can hear everything from the State Drug Enforcement people to the State Bee Inspector, from the Railroad Inspector to Tribal Police, plus Capitol Security, Civil Defense, the Motor Vehicle Department, and even the Governor himself! It's all there!

Having the radio signals and codes is a great help, so here they are:

The South Dakota State 10-Codes

10-1	Receiving poorly
10-2	Receiving well

10-4	O.K., will do, granted
10-5	Relay (J-1 Personnel, J-2 Property)
10-6	Busy/Standby
10-7	Out of service
10-8	In service
10-9	Repeat
10-10	Out of service/Subject to call
10-12	Visitors/Officials present
10-13	Weather/Road conditions
10-14	Convoy or escort
10-15	Prisoner in custody
10-16	NCIC check
10-16H	Hit on NCIC
10-19	Return to your station
10-20	What is your location?
10-21	Call this station by telephone
10-22	Take no further action last information
10-24	Make personnel contact (time/place)
10-25	Do you have contact with (name)
10-28	Check full registration
10-29	Check for record/wanted
10-29W	Wanted check only
10-30	Does not conform to rules/regulations
10-31	Send wrecker to _____
10-32	Send ambulance to _____
10-33	STANDBY, Emergency traffic at this station
10-35	Confidential information
10-36	Correct time
10-38	Information needed at once
10-39	Your message delivered
10-40	Clear for local dispatch
10-41	Permission granted for 10-40
10-42	Officer now at his residence
10-44	Stopping car at _____ (give description of car)
10-45	Patrol with 2 men
10-58	Check for drivers license & record
10-59	Drivers license status only
10-60	Next case number (specify)
10-70	Is there traffic for this unit/station?
10-71	Send coroner
10-80	Any narcotics information?
10-82	Request for room reservation



10-88	What number shall I call for station/station contact?
10-89	Unit is off the air. Need service
10-90	Civil disturbance
10-97	Arrived at scene
10-98	Assignment completed
10-99	EMERGENCY, all units copy
Signal 1	Accident at _____ Personal injury
Signal 2	Accident at _____ Property damage only
Signal 6	Drowning at _____
Signal 7	Drunk at _____
Signal 8	Drunk driver at _____
Signal 11	Fire at _____
Signal 15	Murder at _____
Signal 16	Death at _____ (unknown cause)
Signal 20	Suicide at _____

The dispatching locations for the Highway Patrol are located at Huron, Kimball, Parker, Pierre, Rapid City, and Webster. Remote stations are used to extend the communications range of these stations. Rapid City has remote stations in Terry and Coolidge. Pierre has remote stations in Isabel and White River. Webster has remote stations in Bowdle and Webster. Platte has a remote station in Kimball. Huron has remote stations in Vayland and Hetland. Parker has no remote stations. **PC**

NEW AND EXCITING TELEPHONE TECHNOLOGY

Wiring Up For Security

Read this. It's going to save you from a really disappointing day when you come home and find that all of your shortwave and scanner equipment has been removed from your bedroom or your den. If you have a scanner, CB, or any other type of radio in your car, don't go any further in this magazine until you read this month's column. It will save you from a big disappointment.

It's only a matter of time before someone spots your gear and takes it. Police statistics throughout the country indicate that residential and automotive burglaries are on the climb. This makes sense because there are more sophisticated and truly portable pieces of electronics being produced that can easily be lifted. As radios and electronics get smaller and smaller, the temptation to quickly snatch them increases.

It goes without saying that locking your home and locking your car will certainly cut down on the risk of getting ripped off. However, let's face it, getting into your house is a cinch—there are just too many openings that can be accessed by a burglar when you are away.

It's interesting to note that police statistics indicate that most burglars will run as soon as they trip an alarm. It's also comforting to know that almost any type of alarm will cause the burglar to hightail it away from your car or house.

This is a good point to know. You won't necessarily need to buy one of those \$3,000 alarm systems to simply scare away a burglar that pries open your back window.

Zone Alarms . . . Cheap Security That Works

Zone alarm systems cover a specific area in your home or office that might be susceptible for intruders to enter. This would include your living room, garage, kitchen, side bathroom, office entry level, as well as the area where you keep your radio gear.

There are two familiar types of zone systems available, and they both work great and neither is expensive.

The ultrasonic alarm system consists of an ultrasonic transmitter and receiver. These may be in the same box or two separate boxes. The ultrasonic transmitter sends out acoustic audio waves at 23,000 cycles (23 kHz). They are driven with a 2-watt amplifier from the transmitter section of the alarm system. Most folks can't hear this sub-audible frequency and will not be bothered by the sound. Most dogs and cats are also insensitive to ultrasonic sound waves that will fill your home or office room.



This radar alarm detects movement up to 50 feet away.

This alarm will fill up an entire room or storage area with ultrasonic waves. These waves will not penetrate through walls, so you are only protecting a certain area of your home or office. When someone enters the protected area, the ultrasonic receiver detects a variable of the intensity of the sound, as well as a slight Doppler shift in the audio frequency. This Doppler shift occurs when someone approaches or walks away from the ultrasonic transmitter. The receiver will analyze this disturbance and then trigger an alarm system that may sound a loud horn or activate lights, sirens, or any other audio/visual means to attract attention.

While the ultrasonic system is usually an inexpensive one and can be immediately smashed by the persistent burglar, most vandals will exit before trying to find out where the noise is coming from. These same systems have an entry delay option that will allow you to go over and safely switch it off before the whole system wakes up your entire neighborhood. Ultrasonic systems are available almost anywhere, and they sell for under \$100.

Some disadvantages of the ultrasonic alarms would be their susceptibility to sound off when no burglar is indeed present because of wind currents coming in from an open window. The moving curtains in your room may also set off the alarm. Hot air coming out of a furnace can cause enough disturbances to set off the alarm. Finally, outside high frequency noise, such as emergency vehicle sirens, squeaky disk brakes, and tinkling keys, may cause your inexpensive ultrasonic setup to sound off when no burglar is present.

Another type of alarm gets around this—the radar alarm. These are about three times as expensive as ultrasonic alarms, but they are immune to thermals, noises, and moving curtains. They sell for about \$300.

Radar alarms transmit electromagnetic radio waves at a frequency of 10.525 GHz



Many home alarms can be user installed.

—that's 10,525 MHz in the radar-X band. This is the same frequency used by police for their radar equipment in most cities.

The power output of a typical radar intrusion alarm is only 5 milliwatts. This will let you protect a room up to 40 feet long. You can also purchase larger 20 milliwatt radar transmitters that may cover an entire warehouse up to 100 feet long.

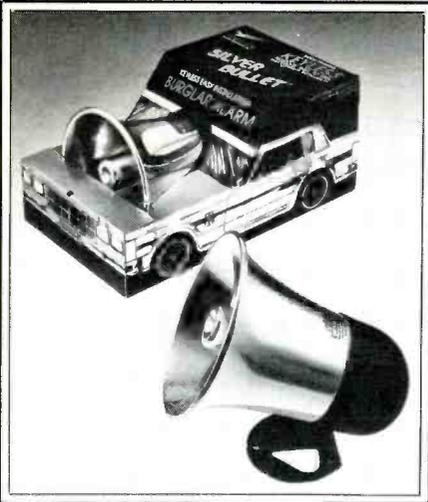
The radar waves operate off of Doppler principle—as soon as they are disturbed by something moving, the receiver picks up this change in frequency and will cause the radar alarm to sound off. Since radar waves transmit through non-conductors, you can protect several rooms by sounding through the walls of the room.

Most radar systems feature an adjustable sensitivity control that allows you to set up the minimum and maximum amount of range you want covered. You can even protect outside areas of your home or office with radar-type alarms. I prefer the radar alarms over ultrasonic alarms because of less falsing, better range, and more predictable results that can be adjusted with the radar sensitivity control.

Wire Alarms

An alarm system least susceptible to falsing is the open or closed loop wire alarms. In security language, the loop is the circuit into which various sensors are wired in your house, in your car, or at the office. A closed loop system strings sensors like Christmas tree lights—all in series. Open any one of the series connections, and the alarm will sound.

It will take about a day to string out all the wire to protect windows, doors, and other entryways with a series loop system. Quality sensors may use magnetic components that will break a connection just as soon as the magnet moves a few inches away from the sensor contacts. You put the magnets on doors, windows, as well as on the inside hood of your car. Just as soon as anything is



A vehicle alarm has few components.



A vehicle alarm can be triggered by the car's ignition, a door, hood, or trunk being opened, or just if the car is jostled.

opened up, the magnet will no longer keep the sensor closed—and presto, the alarm sounds off.

Series closed loop systems also feature a status light that lets you know that the entire loop is secured when you turn the alarm on. If one of the doors is left ajar, the alarm will not set and you will need to locate which sensor is still activated.

Open loop systems have no current flowing through them during their normal protected state. All sensors are wired in parallel, and just as soon as one sensor picks up a movement of the magnet, it will sound off the alarm. One advantage of an open loop system is that you can have a sensor go bad and it won't affect the overall operation of your alarm system—except for that one spot. A shortcoming is that you must test each open loop sensor periodically to insure that it is indeed doing its job.

Like the closed loop sensor system, the open loop system also requires a day's worth of wiring. You can use up to No. 16 or No. 18 wire for this job because almost no current is flowing. You can also wire in pressure-sensitive mats, photoelectric cells, and even pass the wire through your prized pieces of electronics to insure that they won't go anywhere without your permission.

The height of any alarm system is the

main control unit. It must be kept hidden from intruders. It must also be self-powered in case they should get to your fuse box and shut down your electricity. The more elaborate control boxes are equipped with remote keyboard on-and-off systems that let you tap in a secret code to turn the alarm on or off. Although these are certainly more expensive, it's a more professional way to go if you have the bucks to support this type of system.

Any one of these systems is better than no protection at all. Since you're into the hobby of electronics, you have qualified yourself and your equipment as a prime target for

thieves who need to turn a quick buck. Your antennas on the roof of your home or car will certainly signal anyone that there are goodies inside.

Most insurance companies will balk at paying for extra electrical stuff unless they have been specifically insured before the break-in. Do yourself and your insurance company a favor and protect this gear with some sort of an audible and visual alarm system. For less than \$100, you can scare the daylights out of anyone entering your radio room, and chances are they won't even look back when the alarm goes off—regardless of how inexpensive it may be. **PC**

It's Back!

THE AMATEUR RADIO VERTICAL ANTENNA HANDBOOK

CAPT. PAUL H. LEE, USN(RET), N6PL



Capt. Paul H. Lee's *Vertical Antenna Handbook* became a classic in its first printing. Out of print for several years, this **Second Edition** has been brought out in response to your demand and the needs of the service. Among the topics covered are vertical antenna theory, design, installation, and construction. Specific information is given on vertical arrays, feeding and matching, short verticals, ground effects, and multiband and single-band verticals, plus there is a section that answers many of the most commonly asked questions about vertical antennas for the amateur. The **Second Edition** features an addendum on antenna design for 160 meters, the band that finally is coming into its own.

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PIRATES DEN

BY DARREN LENO, WD0EWJ

FOCUS ON FREE RADIO BROADCASTING

Many excited POP'COMM readers who scan for pirates in the frequencies just above the AM broadcast band have been sending in reception reports of KPF-941. Although this Yonkers, New York, area station says it is not a pirate and indeed is in possession of an FCC issued "secondary remote" broadcasting license, whether or not that license was ever intended to provide this type of community oriented programming directly to the public is being put to the test.

Dave Beauvais, KB1F, a researcher for Magic Media in Amherst, Massachusetts, commented that KPF-941's callsign, frequency, and power output are all consistent with the "remote broadcast secondary service" initiated by the FCC in 1983.

"The service became notorious in 1983 when a cable news service . . . was heard up and down the east coast, doing a grand imitation of a pirate running test programming," said Beauvais.

"The station was, in fact, perfectly legal and the 'test program' was simply off-air network news feeds being relayed to the network's news vans in the field," he stated.

"KPF-941 appears to have gone every-body 'one better' by undertaking to broadcast directly to the public," Beauvais further suggested.

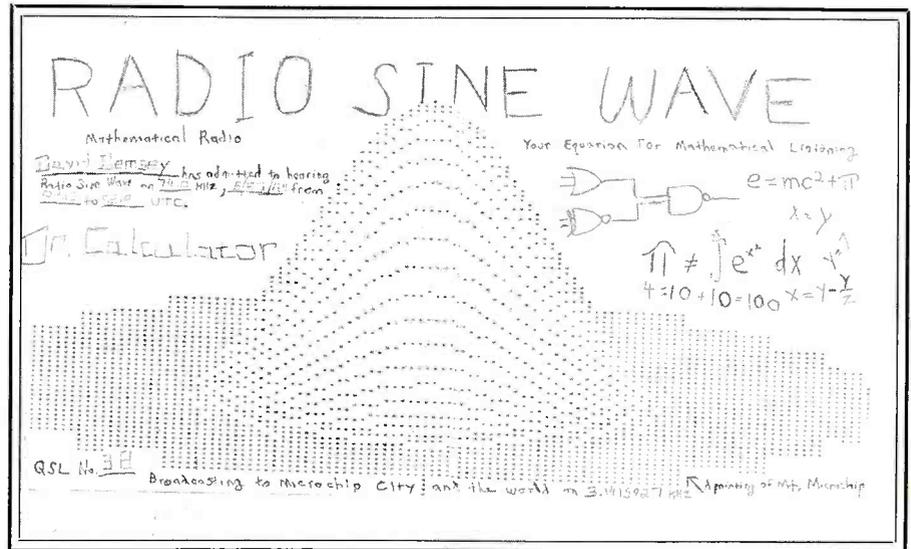
KPF-941 has announced a broadcasting schedule from 2100 to 0700 GMT (4:00 p.m. - 2:00 a.m. EST) on 1622 kHz nightly. Whether the station is still conforming to this schedule or still on the air at all today is up to you to find out. As of the day this column was submitted for publication, KPF-941 was still providing its brand of refreshing community programming to its listeners.

Apparently, KPF-941 is issuing QSL cards for correct reception reports sent to PO Box 327, Hastings on Hudson, NY 10706.

I have this odd feeling that this interpretation of the Secondary Remote Broadcasting Service, although very popular with thousands of listeners, might not be very popular with the FCC. If KPF-941 remains active, you can surely expect to see similar stations springing up in every metropolis and small town in the country.

Why Not?

I think it is unfortunate the FCC continues to ignore petitions to create a minimally restricted hobby or community broadcasting service. Such a service would benefit everyone in the long run, guaranteeing freedom of speech on the airwaves to ethnic and political minorities, and encouraging creativity in programming. Small communities would be able to set up and operate a tiny (but effective) volunteer radio station at a fraction of the cost and red tape that would other-



Radio Sine Wave QSL cards feature a painting of mythical Mount Microchip. This one was received by David Dempsey.

wise be required. "Studio-artists" would have a new creative outlet.

In the January, 1983, issue of *Popular Communications*, Editor Tom Kneitel presented an outline for a non-commercial, community oriented, minimally restricted radio service. Tom's suggested service would be established between 1610 and 1620 kHz with power limited from 2 to 5 watts—just enough to cover your neighborhood, or Tuttle, North Dakota.

In the December, 1984, issue of *The ACE*, John T. Arthur presented an outline for a "Free Radio Broadcast Service." It would have been established between 1605 kHz and 1710 kHz, with restricted power to 25 watts.

Fred Huntley of Nevada City, California presented a proposal before the FCC on May 14, 1984, that would have established a "Private Individual Amplitude Modulation Broadcast Service" between 1625 to 1775 kHz with powers between 100 and 1000

watts. Mr. Huntley justified his proposal by claiming "the people of America are entitled to have their voices heard without the restrictions and obstacles as currently exist on the commercial AM broadcast band due to business considerations."

These are but a few of the proposals I've seen, and a fraction of the number of proposals the FCC has quickly tossed out. Undoubtedly, more petitions will follow as there seems to be a growing movement in this country of people fed up with the monotony of commercial broadcasting that caters to the musical and moral tastes of the age group that has the buying power.

This is not bad in and of itself. Commercial radio definitely has its place in our society, and I would by no means "do away with it." But why shouldn't a minority interest (including small groups and individuals) have the right to broadcast non-commercial programming to its members and others willing to listen.

When listeners send a "SIKPO" signal rating to Radio Sine Wave, the station returns the favor by rating the quality of their reports with the "SIKPO" scale.

Instant SIKPO rating of your reception report

	Bad	1	2	3	4	Good
Style					X	
Intelligence				X (questionable)		
Knowledge						X
Plausibility	X					
Overall					X	

Does reader of report require aspirin after reading the report?
 Can this guy operate the *Passaic RF-4000*?
 he says he's got?
 Are details accurate? (see next question)

Did reporter copy details from *FREND X?* (probably)

Less than 3 means no QSL (really slipped by on that one)

My purpose in this editorial was not to put forward my own proposal for a community oriented broadcasting service, but to encourage you to support ideas that will bring about a more interesting variety of music, entertainment, ideas, and community service on American radio than we are currently enjoying. Some pirates serve in this unique capacity. In the current spirit of deregulation, why not the airwaves?

Many pirate broadcasters would be quite happy to legally do what they are doing now. Several broadcast for distinct reasons—to inform, persuade, and indeed entertain listeners in some capacity. And what about those pirates that refused to become licensed? What excuse could they possibly have now for operating illegally. Sympathy would be hard to come by.

The number of people lending moral support to license-free broadcasters in the form of reception reports, telephone calls to loop-lines, and even monetary donations is at an all-time high. The current proliferation of unlicensed stations on the airwaves today is saying to the FCC that America is ready for low regulation community broadcasting. Why aren't they listening?

Pirate Band Scan

KOLD: Doug Rink of Florida says this station was playing "lots of 50's rock and roll" on their new transmitter at 2306 on 7389 kHz. KOLD's closing words were "Time is nature's way of keeping everything from happening at once." How profound.

KPF-941: "The All New 1622." Nolan Stephany of New York, and Wayne Blair were two of the many POP'COMM readers to report this occupant of 1622 kHz. DJ Bob Randall played a variety of music from classical to country to rock. Phone calls and requests were solicited from the audience.

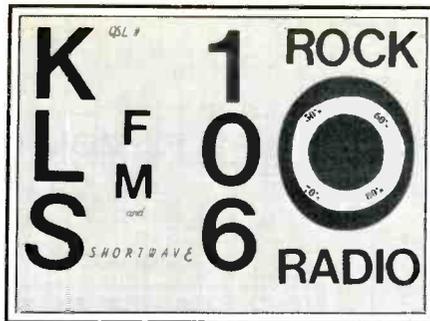
KRZY: Here's a pirate that has a musical variety. Michelle Shute heard KRZY on 7435 kHz at 0024 GMT playing the Rocky theme song, music by the Kingston Trio, and bagpipe music. She adds that the announcer sounds like a popular KQRP DJ.

J. M. Epperson of Illinois and Greg Geiger of Wisconsin also heard this transmission. They mentioned that KRZY was taking phone calls and poking fun at the FCC. PO Box 982, Battle Creek, MI 49016 for reception reports.

Radio Clandestine: This veteran pirate was heard on 7391 at 0613 GMT and playing country music when Michelle Shute tuned them in. Doug Rink of Florida also heard this broadcast, as did John Norfolk of Oklahoma. John was rather disappointed at some of the "stupid, smutty songs" he heard them play.

Radio Free Piracy: In Georgia, David Molinelli snagged his first pirate station on 0449 GMT on 7300 kHz. Music was played by Queen. This station claims to be broadcasting from Savannah, Georgia.

Radio North Coast Int'l: C. K. Redding in Rhode Island heard his pirate on 7390 kHz. No time was mentioned in his report, but this pirate seems to have a habit of



KLS began its pirating career on the FM band, later moving to shortwave.

broadcasting in the early evening hours. Reception reports go to PO Box 245, Moorhead, MN 56560.

Radio Sound Wave: This SSB pirate was heard on 7425 kHz after 0340 GMT by Jeff Zell in Ohio. Music was played by Howard Jones and Night Ranger. The same station was back the next night on the same frequency at roughly the same time. Wayne Blair in Pennsylvania noted Radio Soundwave on 7425 kHz USB at 0446 GMT. Reports go to Radio Sound Wave, PO Box 393, E. Moline, IL 61244.

Secret Mountain Laboratory: Was heard on 7432 kHz from 0530 until 0700 GMT by Walt Sepaniac in Texas. This station plays country & western, jazz, folk, and soul music.

John Block, Jr. caught SML on 7432 kHz after 0000 GMT.

Tangerine Radio: "The Voice of Revolutionary anarchism in North America" with DJ Raunchy Rick was heard by John Paul Braud of Massachusetts on 7430 kHz USB after 0310 GMT. Reports are accepted at PO Box 5074, Hilo, HI 94720.

WKUE: "Playing the greatest hits of all time" claimed the DJ as he put on another "oldie" for his listeners. Doug Rink of Florida was one of them that evening on 7405 kHz after 0323 GMT, and again not much later on 7430 kHz.

Over in Connecticut, Dennis Richards heard WKUE with DJ Mr. Coffee on 7425 kHz after 2000 GMT. Reports go to PO Box 5074, Hilo, HI 96720.

WLXX: This station admitted they were new to the pirate scene when Doug Rink heard them on 7390 kHz after 0500 GMT. An address of Box 76, Delroy, OH 44620 was mentioned. Doug says the station also ID'ed as WLLX.

WMTV: "South Florida's Best Rock" station was noted on 7416 kHz from 0450 until 0537 GMT by Wayne Blair of Pennsylvania.

Over in Wisconsin, John Block, Jr., heard WMTV, your "no frills" pirate station, on 7425 kHz after 0230 GMT. Dave Molinelli also tuned in this broadcast.

Voice of Laryngitis: John Norfolk of Oklahoma and I both heard this hilarious station on 7435 kHz from 0255 until 0325 GMT. Some well-produced skits portraying the life and times of the Huxley clan are well above the ranks of the average pirate. If

someone would issue an award for most original pirate, they'd be my pick.

Voice of To-morrow: Michelle Shute of Florida reports the VOT on 7410 kHz at 0525 GMT signing on with a howling wolf interim signal.

Voice of Venus: This old pirate has been threatening to return to the air for quite some time. Michelle Shute says they were on 7434 kHz at 0112 GMT with comedy skits and playing non-contemporary rock music. One of those comedy skits, according to Greg Geiger, was "The Son of the Paranoid Pirahna," a sequel to their past show about this fish's father. John Block Jr. also heard this show and says the station claims to be transmitting from Minneapolis.

Zeppelin Radio Worldwide: Michelle Shute just caught the end of a ZRW transmission on 7426 kHz at 0053 GMT. The station signed off with a Led Zeppelin song and a recording of crashing and squealing cars.

Radio Woodland Int'l Offers Different QSLs

Some readers may have already heard Radio Woodland, the Voice of Nature. This station offers different QSL cards for each show to those SWLs and DXers ambitious enough to keep sending reports to Box 5074, Hilo, HI 96720. They hope it will serve as an incentive for people to continue sending detailed listening reports, even after they've added a couple RWI QSLs to their collection.

In Conclusion . . .

Monitor is a well done publication devoted exclusively to the European Free Radio scene. It is published irregularly at 31, Avondale Road, Benfleet, Essex, SS7 1EH, England. If you would like to receive the next issue, send \$1.00 (U.S. funds) or 3 IRCs to the address mentioned above.

Media Monitor is a new weekly newsletter concentrating mainly on shortwave radio. Attention is paid to programming schedules and frequency news. For more information, send 2 IRCs to Roger Tidy, 3, Klingsdown Road, London, N.19, England.

The A*C*E RBBS is on line to serve DXers with computers with the latest pirate and clandestine radio news. Call 913-677-1288, 24 hours. Remember, this number is only good if you have your computer hooked to the phone lines with a modem.

I'd like to applaud the wonderful participation by POP'COMM readers this month. I enjoy the feedback I've been receiving from you, and hope you'll contribute your loggings, copies of your QSL cards, pennants—everything to do with pirate radio—to this column. My address is The Pirates Den, c/o Popular Communications, 76 N. Broadway, Hicksville, NY 11801.

Remember, most pirates operate on week-end evenings. Pay particular attention to the frequencies and times mentioned in this column and report back to me what you've been hearing. With a little patience and persistence, you will indeed log these broadcasters. Good luck!

PC

While listening to 8107.0 kHz or 8556.0 kHz, a chirping RTTY sound can be heard indicating SITOR coding. If you use a basic RTTY demodulator with a computer, simply buying suitable SITOR or FEC software will allow plaintext copy. The other option is to purchase a complete terminal unit such as the M600A with built-in SITOR and FEC display capability. The 600A demodulator offers this coding scheme built into read only memory (ROM) providing a quick selection of code option without loading a program from a disk drive.

Try listening to 8327.5 kHz through 8357.5 kHz for 27 channels of ship RTTY traffic. Use 75 baud to read ship traffic.

Other various coastal maritime RTTY frequencies include:

8707.0 kHz at 0700-0715 GMT (FEC)
 8707.5 kHz at 0100 GMT (SITOR)
 8708.0 kHz at 1200 GMT (SITOR)
 8709.5 kHz at 0250 GMT (SITOR)
 8715.0 kHz at 2050 GMT (FEC)
 8717.0 kHz at 2000 GMT (75 baud-reverse)

Also, 12491.5 kHz through 12563.0 kHz are general worldwide ship frequencies. Distress and safety RTTY frequencies are 12562.0 kHz, 12562.5 kHz, 8375.0 kHz, and 8375.5 kHz.

Several coast stations can be found on 4353.0 kHz through 4357.0 kHz using 75 baud Baudot.

The RTTY printout shown in Figure 1 is a U.S. naval station NAU located in San

Juan, P.R. Logged at 1550 GMT, NAU uses 850 Hz shift, 50 baud reverse phase Baudot format. The RY test message must be quite worn due to the repeatable errors found in the word "over" and "lazy."

Ever wonder what Arabic looks like on a standard 5 level Baudot display? Look at Figure 2 and notice the short "words" and

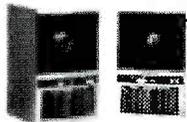
exclamation points—an Arabic text clue. Figure 2 is none other than JANA out of Tripoli, Libya at 14573.0 kHz, 350 Hz shift, 1625 GMT, 50 baud normal phase.

Also, our earlier logged Cuban/TASS relay (14901.0 kHz) has moved to 14928.0 kHz as noted in Figure 3. Same shift, 425 Hz and baud rate—50 baud. **PC**

May We Recommend . . .

When erecting an antenna, be careful not to locate it near electric lines. Antennas located near electric lines tend to pick up noises from those lines—and they pose a safety hazard should they come in contact with the lines.

Excitron ET-A2 Speakers



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The accidental release of deadly methyl isocyanate gas in Bhopal, India last December hit home on many levels. Not only did it shake us all by the lapels and make us more aware than ever about the production and storage of toxic chemicals around us, it also brought out the fact that our own nation had experienced toxic gas leakages in recent times (although to a far less serious extent than in Bhopal, India, where some 2500 persons perished and thousands more were injured to one extent or another). Nevertheless, as relatively "minor" as have been the leakages in the United States, local residents were required to take action to avoid the toxic fumes and some had to seek medical attention.

These events have not escaped readers of this column. Many persons have asked if we would outline some of the vital frequencies that might come into heavy usage just in case future events bring about a need for the public to face up to toxic pollution of the atmosphere where they live, work, or are visiting. For instance, the same gas that caused the Bhopal disaster, methyl isocyanate (MIC), is made at the huge Union Carbide complex located at Institute, West Virginia. Because there have been 25 MIC leaks in the past 5 years at Institute, it would certainly be of interest to people in that area to know the frequencies used at that complex. Union Carbide at Institute operates on 27.45, 30.74, 43.10, 153.14, 153.395, 461.075, 462.40, and 462.75 MHz. Low power communications may also take place on: 153.20, 154.60, 457.525, 457.5875, 457.725, 460.65, 460.9875, 461.0625, 461.6125, 462.2375, 464.6375, 464.7125, 464.7375, 464.7625, 466.0125, 466.0375, 466.0875, 466.1125, 467.20, 467.225, 467.80, 467.825, 467.8625, 467.90, 467.925, 467.9375, and 468.8125 MHz.

In the area of Institute, West Virginia, the Kanawha County Sheriff is on 39.60, 39.76, 39.98, 155.85, and 159.09 MHz. The county ambulance uses 155.265 MHz. Other county agencies utilize 154.085, 155.145, 155.745, 155.76, 155.82, and 158.805.

One of the sites also mentioned in the national news media as a possible storage area for MIC is the Union Carbide facility at Woodbine, Georgia. This plant operates on 153.14, 153.245, 153.275, 153.305, 153.395, 154.515, and 157.74 MHz. According to the 4th Edition of the *Air-Scan Guide To Aeronautical Communications*, there is an aircraft landing area in Woodbine



The storage depots for chemical weapons.

that operates on 122.8 MHz, although this facility is not shown in FAA publications. This landing area is also operated by Union Carbide. The Camden County Sheriff in the Woodbine area uses 154.845, 154.905, and 155.37 MHz. County emergency services are on 155.16 and 155.34 MHz, with other county government operations on frequencies 153.755, 154.055, 155.115, and 155.88 MHz.

At the FMC Corp. plant in Middleport, New York, there was a release of MIC. It was only a small amount, but certainly caused no small amount of concern to persons in the area. It might have been useful to know that this FMC facility operates on 462.275 MHz, with the local PD on 39.14 and 155.25 MHz. The county FD operates on 46.06 and 46.22 MHz, with the sheriff on 39.18, 39.14, 154.755, and 155.25 MHz. FD mutual aid operations take place on 45.88 MHz with coordination between law enforcement agencies on 155.37 MHz.

Not to be discounted, and the subject of concern by many of those who wrote to us, are a number of military installations where CBW (chemical and biological warfare) weapons are stockpiled. Actually, there are eight U.S. Army facilities that are repositories for an enormous stockpile of essentially obsolete weapons such as artillery and mortar shells, rockets, land mines, bombs and bulk containers filled with mustard gas, nerve gas, and hallucinogenic agents. Al-

though the Army carefully tends this deadly cache, these weapons are on tap for disposal in the immediate future since they are all more than 16 years old and aren't in the best of shape. A few are even beginning to leak. This material is extremely dangerous and could take as long as ten years to dispose of.

Current Army thinking looks toward disposing of these weapons "as soon as possible" by incineration; this, in order to get around the problem of moving everything to one central disposal area. Right now, everything is stored and isn't going anywhere. But it's making people who live in the storage areas more than a little nervous. For instance, there are 500,000 M55 rockets, each packed with nerve gas—and having the fuse, explosive charge, and propellant installed. These are already leaking and they have a potential for inflicting harm on the personnel at the storage sites as well as civilian populations near the storage sites. In the past two years, there have been three minor incidents (although no accidents) during the handling of the various agents in storage.

At the Tooele Army Depot in Utah, they have already burned several tons of nerve agents on an experimental basis. Chances are that this will be the way all of the agents will eventually be disposed of at the eight depots. The Army claims that this is a safe method of disposal.



Communications take place during a simulated chemical attack. (U.S. Army photo)



At the U.S. Army Fire Fighter's School (Ft. Rucker, Alabama), trainees perform a fire drill. Note the use of special protective garments required to guard against heat and any possible toxic contaminants. (U.S. Army photo)

For those who have asked for frequency information at and around the storage areas, here is what we came up with:

Tooele Army Depot, Tooele, Utah, operates on 139.035, 141.045, 141.135, 143.055, 163.41, 163.485, 165.035, 165.185, 169.60, and 173.51 MHz. The local PD is on 154.77 while the city government is on 155.04 MHz. The sheriff operates on 155.91 with the county government having facilities on 45.40 and 155.82 MHz.

Umatilla Army Depot, Hermiston, Oregon, is on 165.06, 165.085, 165.185, and 173.51 MHz. The local PD is on 154.875, 155.655, 453.375, and 453.425 MHz, while the FD is on 154.31 and 154.40 MHz (mutual aid on 154.28 MHz). The local government operates on 155.82 MHz. The sheriff is using 154.725, 155.43, 155.595, 155.655, and 156.15. The county government uses frequencies 155.04, 155.76, and 155.805 MHz.

Pueblo Army Depot, North Avondale, Colorado, uses 142.395, 142.455, 142.965, 149.115, 150.555, 409.65, 409.85, 412.925, and 412.975 MHz. Look for county FD operations on 154.07 and 154.43 MHz, while the sheriff operates on 155.475, 158.73, 158.79, 159.03, 159.15, and 460.15 MHz.

Pine Bluff Arsenal, Pine Bluff, Arkansas, uses 38.89, 141.475, 150.705, 150.765, 163.535, 165.06, 165.035, 165.085, 165.16, 165.185, 412.925, 413.235, and 413.525. Check out the local FD on 154.37 and 154.71 MHz, and the PD on 154.43 MHz. The local government frequencies are 153.965, 155.115, 155.775, 155.805, 155.985, and 158.775 MHz. The county fire operations are on 154.16 MHz, with the sheriff using several frequencies, including 37.02, 37.06, 37.10, 37.20, and 37.24

MHz. The county government uses 38.18, 155.955, 158.895, and 158.94 MHz.

Newport Army Ammunition Depot, Newport, Indiana, operates on 139.075, 140.025, 163.535, and 173.46 MHz. County communications services are on 154.89, 155.13, 155.37, and 155.475 MHz.

Blue Grass Depot Activity, Lexington (Richmond), Kentucky, is on 163.635, 165.01, 165.035, 165.185, 173.46, and 173.485 MHz. Local FD operations are on 154.325 MHz while other local government services are on 158.835 MHz. The sheriff is on 155.685 MHz, with the county FD on 153.77 and 154.31 MHz. The area rescue squad uses 154.515 and 155.22 MHz, while REACT utilizes 462.674 MHz.

Anniston Army Depot, Anniston, Alabama is on 41.50 and 126.2 MHz with its aero operations, however other frequencies are not known for certain but may include 36.10, 139.075, 139.32, 140.25, 141.075, 141.125, 141.165, 142.305, 142.905, 143.385, 143.40, 148.70, 165.06, 170.125, 173.46, 412.90, and 413.525 MHz. Local police are on 154.89, 154.845, 155.01, and 156.15 MHz, while the Anniston FD is on 154.34 MHz. Local governmental agencies utilize 155.085 MHz and the local emergency squad is on 155.265, 155.34, and 458.025 MHz. The sheriff operates on 155.01 and 155.67 MHz. County government operates on 153.845 and 155.895 MHz. Civil Defense is on 155.04 MHz.

Aberdeen Proving Ground (Edgewood Arsenal), is operating on 30.51, 32.30, 33.74, 36.10, 36.69, 36.71, 38.45, 40.10, 46.70, 49.90, 139.035, 141.40, 142.90, 143.055, 143.205, 148.025, 148.605, 148.725, 148.755, 148.815, 148.845, 148.875, 150.315, 150.50, 150.695, 150.69, 150.775, 165.035, 165.05,

165.085, 165.185, 170.025, 170.575, 173.41, 173.485, 407.275, 407.325, 407.475, and 413.575 MHz. The local governmental operations take place on 153.86 MHz, while the county government uses 153.995 and 155.085 MHz. The county fire operations are on 33.66, 33.74, 33.76, 460.575, 460.60, and 460.625 MHz (mutual aid on 154.28 MHz). The sheriff uses 37.20, 37.26, 37.30, and 154.785 MHz.

And don't forget, at all of the foregoing army facilities, there is activity on 49.70 and 49.80 MHz. These frequencies are used by EOD (Explosive Ordnance Disposal) teams. A frequency noted in use by the Army during civil emergencies is 34.90 MHz. The American National Red Cross uses 47.42 MHz primarily. The federal EPA uses 41.63, 122.925, 164.45, 165.4125, and 408.00 MHz. At the Tooele facility, the EPA may also use 168.475 and 169.975 MHz.

Of course, should it eventually be decided to transport any of this material to a site other than where it is presently being stored, you may want to listen in on 36.71 and 36.89 MHz. These frequencies have been noted in use by Army convoys on the highways.

During any situation where there has been a leak of toxic material, certainly there will be activity on 155.34 MHz, which is used by many hospitals. There will also be activity on the medical dispatch frequencies of 462.95 and 462.975 MHz, as well as other medical frequencies in the 463.00 to 463.275 MHz band.

Let's all hope that it never becomes necessary for you to have to use any of this information. However, the frequencies may be active during drills and also during disposal operations, so you might wish to check them out at those times.

PC

LISTENING POST

BY GERRY L. DEXTER

WHAT'S HAPPENING: INTERNATIONAL SHORTWAVE BROADCASTING BANDS

By now, Radio Netherlands will have close to fully implemented service from their new 500 kilowatt Flevoland transmitters, on frequencies formerly used by the Lopik site.

The Voice of Germany isn't far behind. Service from Deutsche Welle's new high power Sri Lanka relay was to have begun on a minimal basis in December, 1984. The schedule, effective then, was 0600-0755 in German on 15.105; 1700-1855 in German on 9.685; English from 2100 to 2150 on 6.185; German from 2200-0050 on 6.065, and English again from 0200-0250 on 15.105. Site indentifications are supposedly being made at the beginning of each transmission.

Austria has taken its low power transmitter at Aldrans out of service. It was a top DX catch at one time but has now been moved to the main transmitting site at Moosbrunn, where its 10 kilowatts will continue to operate on its old frequency of 6.000.

Beginning January 1, 1985, Belgian Radio and Television planned to add 10 minutes to its English language broadcasts, making them 55 minutes in length. For North America, the schedule becomes 0800-0855 (except Sundays) on 9.880, 1300-1355 (except Sundays) on 9.880 and 17.610, and 0030-0125 on 5.910.

Radio New Zealand seems on a more solid footing now. The strictly domestic service relays are being supplemented by some programming designed specifically for the shortwave audience and a number of schedule changes have taken place. Broadcasts from New Zealand are now aired at 0345-0630 on 15.485 and 17.705; 0930-1115 on 9.620 and 15.485; 1745-2015 on 15.485 and 17.705; and 2245-0015 on 15.485 and 17.705.

The government of New Zealand apparently intends to do a major rebuilding of the shortwave service, including higher power transmitters some time in the future. One immediate indication of the changes ahead was the adoption of the name Radio New Zealand International. It looks like SWLs can now rest easy as the once shaky shortwave situation there looks a lot more secure.

A new Colombian station came on the air in December, 1984, using 5.936 from variable 0900 sign on. Best identification so far is "Caracol Carreno"—it's a Caracol network affiliate and is located in the town of Puerto Carreno on the Orinoco River bordering Venezuela.

Belated congratulations to the American Shortwave Listener's Club, which celebrated its 25th anniversary at the end of 1984. According to a history of the club in the December bulletin, both of the other major U.S. shortwave clubs—SPEEDX and the North American Shortwave Association—have their roots back in the original



Bob Tarte at his Michigan listening post.

ASWLC. Best wishes to Stewart Mackenzie and the staff for another 25 years. ASWLC is headquartered at 16182 Ballad Lane, Huntington Beach, California 92649. Their monthly bulletin, *SWL*, features shortwave broadcast, medium wave, and utilities. One dollar will get you a sample issue and membership information.

A new book entitled *Shortwave Listening Today*, written by your editor, should be out by the time this reaches you. It's an overview of the entire monitoring and listening hobby with emphasis on shortwave broadcast, filled with operating tips, ideas on expanding your interests and activities, from getting a better response to reception reports to how to promote the hobby and get in touch with other listeners. The book is priced at \$12.95 plus \$1.75 shipping and is available from Universal Electronics, 4555 Groves Road, Suite 3, Columbus, Ohio 43232.

Mailbag

Bob Tarte of Grand Rapids, Michigan says that no matter what he does, he has trouble getting out of bed early in the morning to catch South Pacific DX. We have the same problem with getting up early to chase those nice Latins, Bob, and it has cost a number of loggings over the years!

Sheryl Pasckiewicz of Manitowoc, Wisconsin pulled an all night DX session to take advantage of the good conditions and heard a number of new things as a result. Can't seem to manage that anymore either, Sheryl. Age takes its toll!

D. F. Nutter of Fountain Valley, California taped a lot of his loggings while he was in Saudi Arabia during the late 1970's. In fact,

he has the equivalent of one hundred forty-five 90-minute tapes. His location was some 7,200 feet above sea level and an excellent spot, he reports. He's now using a Kenwood R-1000.

Sergio Hache of Bariloche, Argentina checks in with some loggings of stations from the South American Patagonia, which are included in the log section. Sergio has recordings of stations from this area and invites readers to contact him at CC 1344, 8400 Bariloche, Rio Negro, Argentina.

Duke Alexander, who does a DX report on Radio RSA's "DX Corner" program, has a special DX tape available too, with 31 off-the-air excerpts from stations in Latin America, including Central American political clandestines and lots of tropical band stuff. More info on the 60 minute cassette can be had by writing Duke Alexander, 14113 Stoneshire, Houston, Texas 77060. Include a self addressed, stamped envelope.

Patt Cloonan of Munhall, Pennsylvania probably enjoyed the Happy Anniversary feature on Radio Canada International in the February issue since he's a big RCI fan. He notes one of his favorite programs is "Sunday Morning" at 1400-1700 GMT. He also listens a lot to the CBC Northern Quebec Service on 11.720. The station tells him he's hearing the "exhaust" of the transmitter since it's beamed away from his location. Pat notes this service from 1158 to 2230 on 11.720 and 2230-0608 on 6.195 and says Radio Greenland is or was carried over this service at 1400 to 1430.

Claudio von Fresin of Santa Monica, California serves in the U.S. Air Force and supplies a photo this month. He wonders if anyone listens to shortwave for programs rather than strictly to DX. Deutsche Welle is his favorite, not surprising since he was born in Germany. Claudio says the station sends him a birthday and Christmas gift every year. Shortwave is a lot more popular in Europe and Claudio says he has yet to meet anyone in this country who listens to shortwave. You're right about the popularity aspect Claudio, although shortwave is enjoying a tremendous burst in interest, so you may well meet that fellow listener one day. There's a great amount of program listening going on, in reality more of that than pure DX listening.

Andrew Crowell in Murfreesboro, Tennessee notes that he did get himself moved out to a farm where he now has receivers, scanners, and RTTY equipment all over the place. The antenna is an enviable 1,025 feet, designed as an inverted L. Andrew says he has a special love for the big "boat anchor" receivers and would like to hear from DXers with a similar interest. You can write him at Rt. 10, Box 418-A, Murfreesboro, TN 37130.

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John Palundo of Windber, Pennsylvania uses a portable receiver and complains of problems in hearing stations 5 to 10 kilohertz above and below WYFR on 5.985. The problem is the selectivity of your receiver. John, especially when dealing with WYFR's super strong signal. A receiver with greater selectivity would help, although in this instance it might not entirely cure the trouble.

Bill Kushner of Port Washington, New York started DXing 30 years ago and only recently returned to the fold using a Kenwood R-1000. He wishes POP'COMM had been around when he started!

Let's hear from you next time! Your loggings, questions, comments, news items, clippings, schedules, shack photos, good quality copies of QSLs, and what-have-you are always welcome.

We have a heavy load of loggings this month, so let's get to them. Remember, all times are GMT.

Listening Reports

Albania Radio Tirana. 9.500 2 in French. strong at 2013. (Alpert, NY) 9.375 at 0450 with classical music. (Crowell, TN) 0000-0030 on 7.065. 9.750. 0130-0200 on 7.120 and 9.750. 0230-0300 on 7.120 and 9.750. 0330-0400 on 6.200. 7.300 (Westphal, NY) 0330 on 7.300 in English. (Dementiuk, SC) 11.960 at 1235. (Moran, IL) English 0000-0030. 7.065. 9.760. 0000-0030. (Landkamer, MN)

Algeria Radio Algiers. 9.640 at 2015. Algerian music. English. Into Spanish at 2030. (Dementiuk, SC) 15.215 in Arabic 1330-1430. (Moran, IL) 15.215 8 variable at 2217 in home service in Arabic. (Crowell, TN) 2000 in English. (Ricker, FL) 2022-2027 with Algerian history. (Fravel, WV)

Angola Radio Nacional. 9.535 at 2010 in Spanish with ID by woman. (Pasciewicz, WI)

Argentina Radio Nacional. Mendoza at 1830 on 6.180. (Hache, Argentina)

RAE on 15.345 at 0238 with English. (Dementiuk, SC) 2317 with Spanish guitars during Italian segment. (Tarte, MI) 0000 in Portuguese with multi-lingual ID. (Crowell, TN) 11.710 at 0200. (Landkamer, MN)

Australia Radio Australia. 9.620 at 1958 with interval signal. (Pasciewicz, WI) 9.580 in English at 1435. (Pastrick, PA) 5.995 at 0946 in Neo-Melanesian to mid-Pacific. (Tarte, MI) Papua New Guinea service in English 0754. (Crowell, TN) 15.320 at 0440. news 0500. (Miller, GA)

VLM4 Brisbane. 4.920 at 0922 in English. 30's music time check. pips. news. sports. (Pasciewicz, WI) 0913 financial reports. opera. (Tarte, MI) 0940 in parallel to 6.150. 9.610. 9.660. (Rupp, NM) 1308 swing music. disc jockey. (Gray, MI)

Austria Austrian Radio 5.945 at 0130-0155 in English with news. music. show on wine glasses. (Moran, IL) "Report From Austria" at 0134. (Shute, FL) 6.000. ending English news at 0127. Good signal. (Alpert, NY)

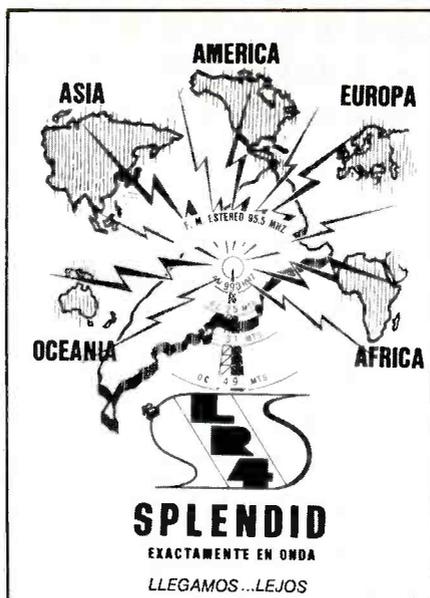
Belgium BRT on 5.910 at 0030 with sports. cooking program. (Miller, GA) 9.900 with DX program at 0037. (Crowell, TN) 5.910. 0050-0111 sign off. Radio World Program. (Fravel, WV) English to North America 0030-0115. (Landkamer, MN)

Belize Radio Belize. 3.285 at 0438 with American pops. (Tarte, MI) 0435 in English with "Sunday Night Serenade." (Crowell, TN)

Benin ORTB Contonou. 4.870 in French at 2245. French pop music. ID 2300 and sign off. (Gray, MI) 2152 in French. ethnic flute music. (Tarte, MI)

Bolivia Radio Illimani. 4.945 at 2253 in Spanish. mentions of La Paz. vocals. jingles. time checks. IDs. tones. news. "Atencion... Sucre..." Parallel to 6.025. (Pasciewicz, WI)

Botswana 7.255 with cow bells and farm animals interval signal from 0345. (Rupp, NM) At 0355 in Setswana and English. 0355 with IS. national anthem. IDs and frequencies. talk by man. (Saunders, NJ) 0357 sign on. (Shute, FL) 0407-0417 music and man announcer. (Fravel, WV) 0406 with western pops. 0348 sign on. ID 0400. commentary. (Gray, MI)



An advertisement for Argentina's Radio Splendid, now off shortwave. Thanks to Sergio Hache, Argentina.

Brazil Radio Brazil Central. 4.985 at 0050 in Portuguese with vocals. frequency announcement. ID. QRM. (Pasciewicz, WI) 0525 with bossa nova. (Tarte, MI)

6.065 Radio Nacional de Amazonia. 0754 sign on with Radiobras IDs. wiping out WYFR and in clear at 0800 when WYFR signed off. (Alpert, NY)

Radio Bandeirantes. Sao Paulo. 9.645 at 0740-0800 in Portuguese. (Moran, IL)

Radio Universo. Curitiba. 9.545 in Portuguese 0843-0910. (Moran, IL)

Radio Rio Mar. Manaus. 9.695 at 1130 with "Happy Birthday" in Portuguese. (Tarte, MI)

Radio Cultura do Para. Belem. 5.045 at 0222 with Latin ballads. bossa nova. off 0300. (Tarte, MI)

Radio Bare. Manaus. 4.895 at 0915. Latin pops. (Tarte, MI)

Radio Maua. Sao Jose do Merti. 5.055 at 0937. tentative. bossa nova. (Tarte, MI)

Radio Globo. Rio de Janeiro. 11.805. all Portuguese at 2259. (Shute, FL)

Radio Guaba. Porto Alegre. 5.965 at 0901. music. Weak but in the clear. (Crowell, TN)

Radio Educadora da Bahia. Salvador. heard on 6.025 at 1025 with QRM from Netherlands/Bonaire 6.020. (Crowell, TN)

Bulgaria Radio Sofia. 11.960 at 1910-1917. music. listener's letters. in English. (Fravel, WV) 9.700 at 2315 with DX program on a Sunday. (Dementiuk, SC) 0000-0030 in English. (Landkamer, MN)

Cameroon Radio Garoua. 5.010 in vernaculars to 0600. then news in English. (Behrendt, NE) 0435 with chants and drums. (Fravel, WV)

Radio National. Yaounde. 4.850 at 0500. headlines in English and French. (Nutter, CA) 2100 news in English. ID "This is the Yaounde station of Radio Cameroon." and into French. (Tarte, MI) 9.745 English news at 2100. full ID 2116. into French. (Alpert, NY) Excellent at 2100 in English. (Miller, IL)

Radio Douala. 4.795 in vernaculars and talks at 0540. (Tarte, MI) 2115 in French with interval signals. news. mentions of Douala. (Pasciewicz, WI)

4.000 Radio Bafoussam. 0503 with drums and vocals. (Tarte, MI) 2050 in French. English at 2100, then back to French. (Pasciewicz, WI)

Canada CFRX. 6.070. weak at 1530 with ID. but great signal at 0640. (Dementiuk, SC)

RCL. 5.960 at 0300 French into English and "SWL Digest." (Gray, MI) 9.755 at 2220 with English to North America. (Pastrick, PA)

Central African Republic Radio Centrafrique. 5.035 at 0504-0521 with music. frequent IDs in French. (Fravel, WV) Regional music. news (from RFI?) 0600-0609. (Tarte, MI)

Chad Radiodiffusion National du Tchadienne. 4.905. in French at 2024. mention of N'djamena. some time of lessons. Also at 0456 sign on with IS. national anthem. ID. (Pasciewicz, WI) 0500 in French. (Nacht, NY) 0506 sign on after wood-xylophone type interval signal. ID "Ici N'djamena." rock and hi-life style pop. (Tarte, MI) 0504 in French. African music. (Gray, MI)

Chile Radio Nacional. 15.140 in Spanish from 2300 with Latin pops. two minutes of national news on the hour. (Behrendt, NE) 2125 what appeared to be a sportscast. (Crowell, TN) 0000-0250 fade out, uninspired generic Latin pop. frequent IDs. (Tarte, MI) 2350 frequent IDs. several rock numbers. (Dementiuk, SC) 2330 in Spanish. (Moran, IL) Booming in at 2330. (Ricker, FL)

Radio Minería. Santiago. 9.750 at 1015 with Andean flutes. (Tarte, MI) Very good at 1730 with music program. (Hache, Argentina)

Radio Patagonia Chilena. 6.080 at 1700-1900. (Hache, Argentina)

China Radio Beijing. 15.520 at 0030-0100 answering listener's questions. (Moran, IL) 1225 in English to North America. fluttery polar path. (Crowell, TN)

Clandestine Radio Monimbo. anti-Nicaraguan. 6.230 music and political announcements after 0200. (Behrendt, NE)

La Voz del CID (anti-Cuba) on 7.400 in Spanish at 1142. (Moran, IL) CID's "Radio Camilo Cienfuegos" service on 6.299 at 0130. (Westphal, NY) 0630 on 6.300. (Shute, FL)

Radio Venceremos. 6.569 in Spanish at 0318. Thought their transmitter had been blown up. (Shute, FL) They have reserve installations. were off only one day. (Editor)

Voice of the Revolutionary Party for Reunification, anti-South Korea. 4.120 at 1400-1430 in English "Coming to you from Seoul, South Korea" but actually in the North. (Watters, MN)

Voice of the Libyan People. 15.040 strong at 1754

The new Flevoland transmitting site of Radio Netherlands.



with test tones, sign on 1758 with music, fanfare, announcement at 1801, presumed anthem. (Alpert, NY)

Colombia Radio Super, Medellín, 4.875 with Latin music, ID 0500 "Radio Super, la cadena Super." (Dementiuk, SC)

La Voz del Llano, Villavicencio, 6.115, 0730-0750, two male announcers and popular music. (Moran, IL) Usually on 6.117. (Editor)

Radio Sutatenza, Bogota, 5.095 at 0343 with news briefs, Latin music, all Spanish. (Nacht, NY)

La Voz del Cinaruco, Arauca, 4.865 at 0933, music. Weak. (Crowell, TN)

Radio Macarena, Villavicencio, 5.975 at 1035, non-stop Latin music, ID and "Informa en Colombia" at 1100. (Tarte, MI)

Costa Rica TIFC, 5.055 in English at 0328, opera and religious programs, ID in Spanish 0351 with frequencies. (Gray, MI)

Czechoslovakia Radio Prague, 7.345 fighting VOA or WRNO at 0100. Better at 0400 with English. Also better on 5.935, 0100-0200. (Landkammer, MN)

Dominican Republic Radio Clarin, 11.700 in Spanish 0045 with political commentary. (Crowell, TN) 0400-0410 sign off in Spanish—music, anthem, and off. (Fravel, WV)

Radio Earth, via Clarin, at 1700 on a Sunday. (Behrendt, NE) 1800 on a Sunday. (Miller, GA) 0301-0359. (Fravel, WV) 1833 with test, request for calls to (809) 565-7676. Address is P.O. Box 92-2, Santo Domingo. (Pasciewicz, WI) 0300 with Rudy Espinal and "This is the Caribbean." (Gray, MI)

East Germany Radio Berlin International, 15.445 at 1555 in English with Asian service, frequency announcements. (Shute, FL) 21450 at 1135 in English to Southeast Asia. (Crowell, TN) 15.350 at 2020 in English to Africa. (Dementiuk, SC)

Ecuador La Voz del Napo, Tena, in Spanish on 3.280 at 0100, discussion and pop music. (Behrendt, NE) 1049 pop music and male announcer, signal cut in mid-song. (Crowell, TN)

Emisora Gran Colombia, Quito, 4.910 in Spanish from 0200 with news, IDs use theme from "A Man and a Woman" and slogan "Majestacio." (Behrendt, NE)

Radio Quito, La Voz de la Capital, 4.920 at 0400-0500 in Spanish with Latin pops and rock. (Behrendt,

NE) South American disco at 0200. (Tarte, MI)

HCJB, 6.130 at 0830 in English to Australia and Pacific. (Pastrick, PA) 3.220 local service from 0930 sign on. (Crowell, TN) 15.115 English to North America, "Through the Bible" program. (Pastrick, PA) 5.980 English to Europe at 0800. (Alpert, NY)

Radio Zaracay, Santo Domingo de los Colorados, 3.395 at 1046 with anthem or hymn. (Tarte, MI)

CRE, Guayaquil, presumed on 4.656 at 1041 mentioning Esmeraldas and Quito. (Tarte, MI)

Radio Luz y Vida, 4.850 at 0100 with ID, Latin pop. (Tarte, MI)

Radio Nacional Espejo, Quito, 4.680, 0353 with non-stop traditional-based pop. (Tarte, MI)

Radio Jesus del Gran Poder, Quito, 5.050 at 1037 with religious program. (Tarte, MI)

La Voz de la Valle, Portoviejo, tentatively on 4.835 at 0200, marimba and guitar-based rural music. Off 0220. (Tarte, MI) Not active to my knowledge. (Editor)

Egypt Radio Cairo, 9.475 at 2220 with Arabic in home service. Good signal but typically crummy modulation. (Crowell, TN) 0312 with interview in English. (Dementiuk, SC) 0200-0330 in English. New on 15.370 and 9.675 but not very strong. (Westphal, NY)

El Salvador Radio El Salvador, 9.587 in Spanish with music after 0200. Often strong but interference from Netherlands on 9.590. (Behrendt, NE)

Equatorial Guinea Radio Nacional, Bata, 4.926 at 0503 in Spanish. National anthem, vocals, talks, IDs, etc. (Pasciewicz, WI) 2148 with news or commentary in Spanish. (Gray, MI)

Ethiopia Voice of Revolutionary Ethiopia, tentative on 7.110 heard at 0330 in possible Arabic. CW QRM. (Shute, FL)

French Guiana RFO Cayenne, 5.055 with pop music, man announcer in French at 0907. 3.385 with reggae at 0134. (Crowell, TN)

Finland Radio Finland International, 15.400, 1340 in Finnish. ID at 1354 sign off. (Gray, MI)

France Radio France International, 11.670 English news at 0315, 0345, alternating with French 0300, 0330 to Latin America. (Behrendt, NE) Is actually the French Guiana relay. (Editor) 9.790 in English at 0315, 0415. (Westphal, NY) This, too, undoubtedly. (Editor)

Gaben Africa Number One, 4.810 with French,

news, ID, and music from 0500. (Moran, IL) 0510 with numerous musical selections, Marlboro theme, all French. (Dementiuk, SC) 2148, all French. (Tarte, MI) 11.940 at 2240 with transmitter problems. (Tarte, MI)

Ghana GBC on 4.915 at 0559, drum beat opening, ID, home news. (Dementiuk, SC) 0534 Sunday hymns. Also at 2140 with traditional African music. (Tarte, MI)

Great Britain BBC, 9.510 at 0900 in World Service. (Pastrick, PA) 9.590 at 2225 with "Book Choice." (Pastrick, PA)

Greece Voice of Greece, 6.205 at 0344 with Greek music. (Shute, FL) HCJB now here too. (Editor) 9.420, 9.865, and 11.645 at 0130-0145 all news in English. (Westphal, NY) 11.645 with news at 0130. weak. (Behrendt, NE) Caught on 9.420 at 0605-0615 in English. (Moran, IL)

Guatemala TGNC, Radio Cultural, 3.300, 0335 with "Through the Bible," ID 0400. Spanish at 0235. (Gray, MI) 0211 with Beethoven. (Crowell, TN) 0325. (Saunders, NJ) 0300-0430. (Westphal, NY) Spanish 0200, English 0300. (Behrendt, NE)

Radio Chortis, Jocoten, heard on 3.380 at 1050, traditional Latin music and again with MOR music at 2356. (Tarte, MI)

La Voz de Nahuala, 3.360 mariachi-style music and marimba instrumentals. (Tarte, MI)

Radio Tezulutlan, Coban, located on 4.835 in Spanish with local news and marimba ensembles 0200-0230. (Behrendt, NE)

Haiti 4VEH, 4.930 with religious program, ID in French 0030. (Dementiuk, SC) English with occasional French 0013-0029, program on religious freedom in America, ID in French 0029 and program of religious music. Seems like more programs are now locally produced. (Tarte, MI)

Honduras HRVC, 4.820 at 0343 with English religious program. (Tarte, MI) 0300-0500. (Westphal, NY)

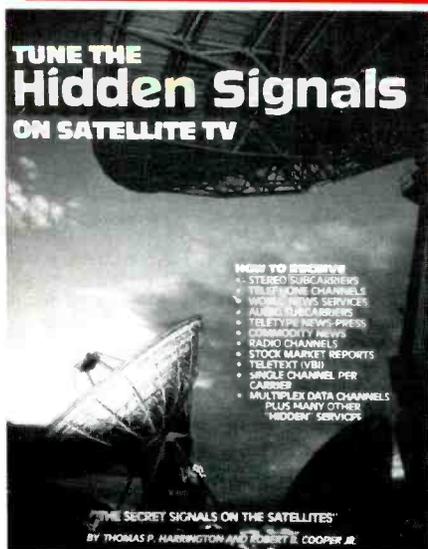
Hungary Radio Budapest, 6.025 at 0200 with interval signal and sign on in English. (Crowell, TN)

India All India Radio, 11.620 at 2100 with music, praise for Indira Gandhi. (Ricker, FL)

Iran VOIRI, 15.084 at 1305 with Bengali service for Southeast Asia. (Crowell, TN)

Iraq Radio Baghdad, 9.610 sign on at 2030 after tones, IS, presumed national anthem and into German.

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CIRCLE 166 ON READER SERVICE CARD

Powerhouse signal. (Alpert, NY) 2100 in English with news and music. (Ricker, FL) 9.745 at 1831 in Arabic with songs, ID. In German on 9.610 at 2029, English at 2100. (Dementiuk, SC) 11.750, 1900 in Arabic, commentary about Iran, ID 1907. (Gray, MI)

Ireland Radio Dublin International, 6.930 at 0333 with 60's pop. (Tarte, MI)

Israel Kol Israel, 15.585 at 1340-1400 in English. (Moran, IL) 9.440 at 2236 in English to Europe and America. (Pastrick, PA) 9.815 at 2245 with Israeli songs. (Dementiuk, SC) 2230 in English, into Hebrew at 2330. (Crowell, TN) 9.815 at 0005 and 0110 in English. (Gray, MI)

Italy RAI, 9.575 in English 0100-0120, parallel 11.800. (Westphal, NY)

Japan Radio Japan, announcing new frequencies at 0000-0100, 9.645, 11.710 but unable to hear them. (Westphal, NY) 11.710 0000-0100. (Landkamer, MN)

Kenya Voice of Kenya, 4.915 at 0330 in Swahili, off suddenly at 0338, back at 0350, suddenly off again 0402. QRM from R. Quito—4.920. (Pasciewicz, WI)

Kuwait Radio Kuwait, 9.840 at 0315-0330 in Arabic. (Moran, IL)

Lebanon Voice of Lebanon, heard on 6.550 at 0310 with theme from *Bridge on the River Kwai*, anthem. (Nacht, NY)

Libya Radio Jamahiriya, 11.815 at 2330 with "Green Book" commentary. (Dementiuk, SC)

Arabic service 15.450 at 2115 to Africa. (Crowell, TN) 15.415 popular Libyan music, Arabic talk. (Moran, IL)

SPLAJBC 7.245 at 0140 in Arabic. (Gray, MI) 3.200, 2352-0001 in Arabic. (Fravel, WV)

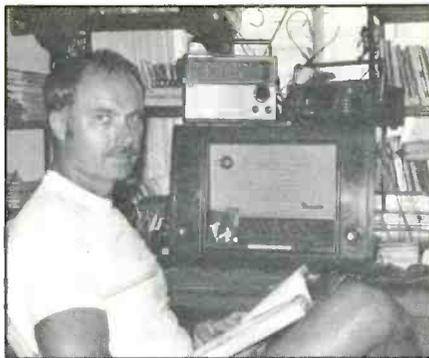
Liberia ELWA 11.835 at 1800 with French and English ID. (Dementiuk, SC) 4.760 at 2150 with English news, religious talk and music. (Nacht, NY) 2148-2000 fade out, religious program from Hollywood, VOA news 2200, Liberian news 2210. (Tarte, MI)

ELBC 3.255 at 2255 in English, contest ads, closing at 2354. (Nacht, NY) 0615 soul music and commercials. (Crowell, TN)

VOA Relay 17.870 at 2255 in English. 15.600 at 1710 in English. (Gray, MI)

Lithuania Radio Vilnius, 17.860, 2300-2330 in English with news and events of Lithuania. (Moran, IL)

Madagascar Radio Madagasikara, 5.010, 0300 sign



Claudio von Fresin listens to shortwave from Santa Monica, California.

on, ID "Radio Television Malagasy" and many mentions of Malagasy. Not heard on this frequency before. (Shute, FL) Reactivated. (Editor)

Mali Radiodiffusion National, Bamako, 7.285 at 0720 with martial music. (Behrendt, NE)

Mauritania Radio Mauritanie, 4.845 at 2141 in unknown language with start Islamic music. (Tarte, MI)

Mexico Radio Mexico International, 15.430 at 0100 with Mexican pops, ID in Spanish. (Tarte, MI) 17.765 Spanish and music to 2300 when buried by VOA. (Behrendt, NE) Located on 9.705 with big band music at 0240. (Crowell, TN)

Radio Huayacocotla, 2.390 at 0053 with commentary in Spanish to 0110 sign off. Transmitter cutting off briefly. (Crowell, TN)

Monaco Trans World Radio, Monte Carlo, 7.160 at 0625 with musical sign on, into English religious program. (Moran, IL)

Mongolia Radio Ulan Bator, English on 9.570 at 1445-1530. (Watters, MN)

Morocco VOA Relay, Tangiers, 6.110 at 1135 with country/western. (Gray, MI)

Namibia Radio South West Africa, 6.185 at 2350-0011, parallel 3.295. Heavy VOA—6.190 QRM at 0000. (Fravel, WV) 3.295 at 0426 with music. commen-

tary in English. (Tarte, MI) 0330 in English—woman in English, man in Afrikaans. (Nacht, NY) 0320 and 0205 in English. 3.270 at 2300 in English with ID, pop music. (Gray, MI)

Netherlands Radio Netherlands, excellent at 0100 during test of new Flevo transmitter on 6.020. IDs in English and eight other languages. (Alpert, NY) 17.605 in Arabic to 1820 sign off. (Dementiuk, SC) 9.590/6.165 with "Media Network" at 0301. (Shute, FL)

New Zealand Radio New Zealand, 11.960 at 0755-0830 classical music, musical ID, time, musical game show. (Moran, IL) 15.485 at 0333 home service relay. (Crowell, TN)

Nicaragua Voice of Nicaragua, 6.017, strong in English at 0400. (Westphal, NY) 6.015 anti-U.S. talks, 0100-0200, 0400-0500. (Westphal, NY) Interference-free at 0400 but heavy QRM at 0100. (Landkamer, MN)

Radio Zinica, Bluefields, 6.120 at 0228 in Spanish with Caribbean music and English announcement 0229. (Tarte, MI)

Radio Sandino, Managua, 6.200 mornings and evenings. QRM from U.S. Coast Guard transmitters in SSB and open carriers noted with increasing frequency. (Crowell, TN)

Nigeria Voice of Nigeria, 15.120 at 1140 in English, political commentary. (Gray, MI) English at 1800. (Ricker, FL) 1806. (Dementiuk, SC) 2149 local news in English. (Tarte, MI) 1800-1830 commentary, "Musical Echos," news. (Miller, GA)

FRCN Kaduna 4.770 at 2152 "You are listening to reggae music on the English service of Nigeria." (Tarte, MI) At 0430, there was a religious program. ID 0442. U.S. pops. (Gray, MI)

Radio Nigeria, Lagos, 4.990 at 0526 with big band jazz, African pops. (Tarte, MI)

North Korea Radio Pyongyang, 9.745 at 1243 in English, commentary on U.S. bases in Okinawa, off 1250. (Gray, MI)

Northern Marianas KYOI, Saipan, 11.900 at 1030, all music with occasional Japanese announcements. (Ricker, FL) 1558 with announcement of frequency change to 9.670 at 1600. (Nacht, NY) 9.665 at 1624. (Gray, MI)

Norway Radio Norway International, 9.530 at 2000 during Sunday English. (Dementiuk, SC)

Papua New Guinea Radio North Solomons, Kieta, 3.322.5 at 0940 with long talk in Pidgin. Barely readable. (Crowell, TN)

Paraguay Radio Nacional, 9.735 at 2314 in Spanish. (Shute, FL) 0905-0930 pop music, Spanish. (Moran, IL)

Peru Radio Tropical, Tarapoto, 4.935 at 0305 in Spanish. Music, IDs, time checks. (Pasciewicz, WI)

Radio Tarma, 4.775 at 0417 in Spanish. IDs, time checks, ballads, ID, and frequency announcement at 0452. (Pasciewicz, WI)

Radio Quillabamba, 5.025 at 2350 with Latin pops, reverb, frequent cries of "Quillabamba!" (Tarte, MI)

Radio Huancavelica, 4.885 at 1025 with Andean music, "El Condor Pasa" with voice over played between selections. (Tarte, MI)

Radio El Sol, Lima, caught on 5.970 at 1025 man and woman announcers, severe QRM, probably from RFE. (Tarte, MI)

Radio Vision, Juanjui, 5.360, 0310 with Latin pops, weak. RTTY QRM. (Crowell, TN)

Radio del Pacifico, Lima, 9.675 at 1215-1300 in Spanish with popular music. (Moran, IL)

Portugal Radio Portugal, 9.560 signing on in French at 0030. (Behrendt, NE)

Saudi Arabia (BSKSA) 7.245 in Arabic at 0055-0105. (Moran, IL) 9.885 at 2253, male singer to sign off at 2359. (Crowell, TN) 5.875 was heard at 0305 in Arabic. (Gray, MI)

Senegal ORTS Dakar, 4.890 at 2145 in vernacular, 0055 with news in French. Abrupt sign off in mid-song. (Tarte, MI) 2250 in French and Arabic. (Gray, MI)

Seychelles FEBA located on 11.895 at 1519 in English to Africa and Asia, religious program, very weak. (Pastrick, PA)

Singapore BBC Kranji relay on 9.740 at 1356-1431, music request show on the World Service. One minute of news at 1400. (Fravel, WV)

Solomon Islands SIBC 5.020 at 1235 in English. Top 40, then "10.00 News Roundup." Off with national anthem at 1300. (Gray, MI)

South Africa Radio RSA, 9.615 at 0220 in English, parallel 5.980. (Gray, MI) 5.980 at 0155 with IS and sign on. Strong QRM from Voice of Free China (WYFR) 5.985. (Crowell, TN) 9.585 at 0404 with news. (Moran, IL) 3.230 and 7.270, 0300-0357 news and commentaries. (Westphal, NY) Various talks at 0318. (Saunders,

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NJ) 4.990 at 0336. Talks in English. (Saunders, NJ) 9.615 at 0150 with DX Report. (Shute, FL) 3.230, 0315 in English pop music, "Good Morning Africa." (Gray, MI) 6.010 heard at 0157 with sign on 0200 "Africa Today." (Gray, MI)

SABC 4.880 at 0400 with external service in Afrikaans. (Behrendt, NE) Afrikaans at 0416. (Tarte, MI) 0423. (Fravel, WV)

Radio Orion, 4.835 at 0400 in English. (Tarte, MI) Capital Radio, Transkei at 0625 on 9.765, pops, commercials, station jingles. (Crowell, TN)

South Korea Radio Korea 9.570 at 1232 with traditional Korean music, extreme flutter. (Crowell, TN) 15.575, 2230-2250 in English, news about Korea. (Moran, IL)

Spain Radio Exterior de Espana, 7.450 at 2340-0000 sign off. "Panorama" program, Spanish by Radio during English to Europe. (Fravel, WV) 7.445 in English at 2300. (Ricker, FL) 11.880 at 0015-0045 in English, parallel to weaker 9.630. (Moran, IL) 9.630 at 0004 in English, talks on Nicaragua and Cuba. (Gray, MI)

Swaziland Trans World Radio, 11.760 at 0620 with religious program in English. (Dementiuk, SC)

Switzerland Swiss Radio International, 11.765, 1330 in English with DX program. (Gray, MI) 3.985 at 0648 in European service, light music. (Crowell, TN) 9.725, 11.715, 6.135, and new 9.885, 0145-0215, 9.540 in English to Indian subcontinent and Australasia at 0708. (Dementiuk, SC) 17.765, 1320-1330 with news in English. (Moran, IL)

Tahiti Radio Tahiti, 15.170 at 0330 with Tahitian

music. (Tarte, MI) Was also caught at 0717 with Tahitian pops. (Crowell, TN)

Taiwan Voice of Free China, 2200 on 6.065 with Chinese popular and country/western music. (Nutter, CA) 0530. (Westphal, NY) 0520 with music. (Crowell, TN) 0524 in vernacular. (Tarte, MI)

Togo RTT, Lome, was heard on 5.047 at 2155 in French, rock orchestral music, announcements, ID and drums. (Tarte, MI)

Tunisia RTT 7.225 at 0520-0600 in Arabic, brief music interludes, popular music program. Also 0705-0720. (Moran, IL)

Turkey Voice of Turkey, 9.660 in English at 2208, QRM from R. Rumbos co-channel. (Shute, FL) 9.560 at 2300, news in English. (Dementiuk, SC)

Uganda Radio Uganda, 5.026 at 0319, no clear ID but mention of Uganda, probably in Swahili. Extended talk at 0340. (Tarte, MI) 0400. (Westphal, NY) Vernaculars at 0330, Afro music, ID, news. (Gray, MI)

Unidentifieds 4.950 at 2200 in French. (Tarte, MI) The new Senegal channel. (Editor)

4.950 in Spanish, 0330-0339 sign off, American rock, badly QRM'd, think ID as "La Voz de Sandinista." (Tarte, MI)

3.200 in Arabic at 0336 with "Mariboro Country" theme (Tarte, MI) Libya (Editor)

7.653 at 0359 in English, news in slow English. VOA feeder? (Saunders, NJ) Yes (Editor)

United States KGEI 7.365 at 0434 religious programming in Russian. (Chinakos, WA)

WYFR 6.175 at 0850 religious program in English, in-

to foreign language at 0900. (Pastrick, PA) 6.160 in English but not parallel 6.065. Off 0745. (Alpert, NY)

AFRTS 9.530 in English to Africa and Europe, at 0911. (Pastrick, PA)

Voice of America, feeder on 7.655 at 0225. (Kendall, IN) 9.575 tentative with special broadcast to Africa in English with news, Letter to Liberia, 0815-0845, tone and off 0901 without formal ID. (Alpert, NY)

WRNO, 7.355, 0245 with commercial. (Shute, FL)

Uruguay Radio El Espectador, 11.835 at 2317 with Latin pops, news 2328. (Tarte, MI)

USSR Radio Moscow, 7.335 in English 1700-0100, 0500-0700, often overriding CHU. (Alpert, NY) 6.175 World Service mixing with BBC World Service at 2000. (Alpert, NY) 11.840 to North America at 1435. (Pastrick, PA) 11.900 at 1220 in English. (Gray, MI)

Petropavlovsk, 2345 in English, talks about communism, music, and news. (Gray, MI)

Arkhangelsk, 5.015 at 0350 with folk music, no talk. (Crowell, TN)

Dzhambul Radio, 0015 on 4.760 ID "Govorit Dzhambul" very good signal. Relay? (Dementiuk, SC)

Vatican Vatican Radio, 11.740 at 0657 in Portuguese (Dementiuk, SC) 7.250 at 0413 with interval signal. (Shute, FL)

Venezuela La Voz de Carabobo, 4.780 at 0320, nice Latin music. (Gray, MI)

4.830 Radio Tachira, 0700 in Spanish, local music. (Punt, PA) 0545 with ID at 0549 and 0600. (Moran, IL) 0215 with frequent IDs (Crowell, TN)

4.840 Radio Valera, Latin and U.S. pops to 0400 sign off with anthem beginning at 0355. (Behrendt, NE)

Radio Juventud, Barquisimeto, 4.900 nearly continuous American and Latin rock. (Behrendt, NE) 0245 with rock. (Crowell, TN)

9.660 Radio Rumbos, at 1200, alternating male announcers. (Moran, IL) 2155 with music and news. (Kendall, IN) 1130 with Latin American news, ID, pop music. (Crowell, TN) 4.970 at 0335 with news, chimes between items. (Crowell, TN)

Radio Capital, Caracas, 4.850 news, ID in Spanish 0109. (Crowell, TN)

Radio Reloj Continente, 5.030 at 1031 with spirited Latin music, ID called out over songs. (Crowell, TN)

Radio Nacional, 9.540 at 0610 in Spanish with pop music. (Moran, IL)

Vietnam Voice of Vietnam, 1330 on 15.010 commentary, ID, and frequencies at 1330. 10.010 at 1115, ID at 1200. (Gray, MI)

West Germany Deutsche Welle on 3.995 at 0405 with news in German. (Tarte, MI) 9.545 in English at 0509 with "Political Review of the Week." (Shute, FL) 6.045 and 6.085 at 0100 in English to North America. (Landkammer, MN)

Sudwestfunk, 7.265 at 0701 with German news, 50's music, current rock, time check, news, soccer scores, weather. (Pasckiewicz, WI)

Yugoslavia Radio Yugoslavia, 9.620 at 2225, ending English at 2230, into French at 2230, Italian 2245, off 2257. (Saunders, NJ)

Zambia Zambia Broadcasting Service/Radio Zambia, 4.910 at 0349 with "fish eagle" interval signal, on with ID at 0400. (Gray, MI) 0350 with interval signal. (Shute, FL)

Our thanks to: Bernard R. Punt, State College, PA; Stephen C. Behrendt, Lincoln, NE; Ted Moran, Chicago, IL; Sheryl Pasckiewicz, Manitowoc, WI; John Miller, Thomasville, GA; Richard Rupp, Albuquerque, NM; Mike Westphal, Alden, NY; Robert Pastrick, Conway, PA; Don Saunders, E. Brunswick, NJ; Michael Landkammer, Faribault, MN; Andrew Crowell, Murfreesboro, TN; David Kendall, Huntington, IN; Sergio Hache, Bariloche, Argentina; Michael Chinakas, Camas, WA; Michelle Shute, Pensacola, FL; Bob Tarte, Grand Rapids, MI; J. Speed Gray III, Grand Rapids, MI; Roman Dementiuk, Charleston, SC; D. F. Nutter, Fountain Valley, CA; Steven H. Waters, Shoreview, MN; Alan J. Nacht, New York, NY; Larry R. Fravel, Clarksburg, WV; David R. Alpert, New York, NY; and Mike Miller, McHenry, IL.

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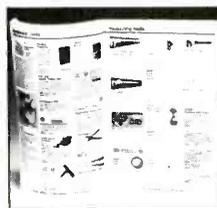
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SCANNER SCENE

BY CHUCK GYSI, N2DUP

MONITORING THE 30 TO 900 MHz "ACTION" BANDS

While the business band radio service serves as a catchall for commercial two-way radio users, the local government radio service serves the same purpose for public safety agencies and governmental units.

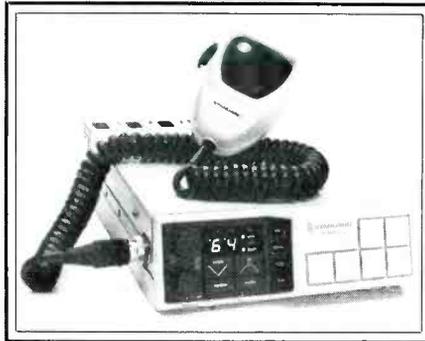
Hundreds of frequencies have been reserved by the Federal Communications Commission for local government radio users in the VHF low, VHF high, UHF, UHF-T, and 800 MHz bands. The only eligibility requirements for licensing in this radio service is that the applicant be a territory, possession, state, or other governmental subdivision, including counties, cities, towns, and governmental agencies such as districts and authorities, except school districts and park authorities (which are eligible in the special emergency or business bands and forestry conservation service respectively).

In most towns and cities across the United States, the local government radio service is used for municipal road and sanitation departments. While most police and fire departments use frequencies in their respective radio services, more often than not you'll hear them using local government channels. An interesting aspect of the local government radio service is that it allows the interface of all agencies under a jurisdiction. For instance, if a town wanted to set up such a system, road crews could communicate with utility workers, police officers could talk with rescue squad members at the scene of an accident, and fire department members could radio water department personnel to increase water pressure at a major fire. Not many jurisdictions realize the full potential of the local government radio service as an interactive resource, but as emergency management and planning becomes instituted in additional areas, its use may expand.

In larger cities, local government radio channels may be implemented in uses such as prison security, airport operations, school security, health operations, street crews, parks and recreation, transit agencies, emergency management, housing authorities, sanitation units, sewer and water utilities, and whatever else you can think of.

While going through frequency listings, you may find your town licensed in the local government radio service, but unless you listen in, you'll never know what the channel is used for. While the frequency may be used by the town's pothole patchers or garbage trucks, don't be surprised to find the police using it for surveillance purposes. The local government channels can be used for any official activities of the licensee.

In smaller towns and jurisdictions, only one frequency is usually used, with all the particular town's agencies and departments all operating on the same channel. In some



The new GX3000 Series land mobile radios from Standard Communications feature 64-channel capacity, and microprocessor-controlled programmable memory with scan, priority channel, programmable timeout timer, and dimmable LED information display. Models are available in UHF (35W), VHF (40W), and 800 MHz (25W), and incorporate wide band channel spread for improved transmission and reception.

instances, when a repeater is used, the different agencies may use their own CTCSS tone so they have to listen to communications from only their own units. Thus, the county road crews don't have to listen to the county prosecutor and vice versa.

Following is a list of available frequencies in the local government radio service:

Low band: 37.10, 37.18, 37.26, 39.06 (2 watts), 39.10, 39.18, 39.50, 39.58, 39.82, 39.90, 39.98, 45.08, 45.12, 45.16, 45.20, 45.24, 45.28, 45.32, 45.36, 45.40, 45.44, 45.48, 45.52, 45.56, 45.60, 45.64, 46.52, 46.54, 46.56, and 46.58.

High band: 153.740 (mobile), 153.755 (mobile), 153.785 (mobile), 153.800 (mobile), 153.815 (mobile), 153.845 (mobile), 153.860 (mobile), 153.875 (mobile), 153.905 (mobile), 153.920 (mobile), 153.935 (mobile), 153.965 (mobile), 153.980 (mobile), 153.995 (mobile), 154.025, 154.040, 154.055, 154.085, 154.100, 154.115, 154.965, 154.980, 154.995, 155.025, 155.040, 155.055, 155.085, 155.100, 155.115, 155.145, 155.715, 155.745, 155.760, 155.775, 155.805, 155.820, 155.835, 155.865, 155.880, 155.895, 155.925, 155.940, 155.955, 155.985 (mobile), 156.000 (mobile), 156.015 (mobile), 158.745, 158.760, 158.775, 158.805, 158.820, 158.835, 158.865 (mobile), 158.880 (mobile), 158.895 (mobile), 158.925 (mobile), 158.940 (mobile), and 158.955 (mobile).

UHF: 453.050, 453.100, 453.150, 453.200, 453.225, 453.250, 453.275, 453.300, 453.325, 453.350, 453.375, 453.400, 453.425, 453.450, 453.475,

453.500, 453.525, 453.550, 453.575, 453.600, 453.625, 453.650, 453.675, 453.700, 453.725, 453.750, 453.775, 453.800, 453.825, 453.850, 453.875, 453.900, 453.925, 453.950, and 453.975.

On UHF, repeaters use an input frequency that is 5 MHz higher than the 453 MHz output channel. For instance, 458.900 would be the input for 453.900. Also, there are frequencies allocated to the local government service in the UHF-T band (470-512 MHz) in major metropolitan areas. Check your local scanner directory for details. On T band frequencies, the input is 3 MHz higher than the output. In addition, some of the 453 MHz channels are shared with users in the police, fire, highway maintenance, and forestry conservation radio services. Some of the 458 MHz channels may be assigned to an agency for simplex car-to-car communications as well. Don't write off listening to the 458 MHz channels because they only seem to be used as repeater inputs.

In the 800-900 MHz band, local government users can apply for their own frequencies, and as we explained last month how one sheriff's department did, can operate on 800 MHz trunked radio systems with business users. Check in the 851-866 MHz range for routine and trunked local government users. The repeater inputs on these frequencies are 45 MHz lower than the output.

New Books

There are a few new scanner directories that have come out over the winter months. *Monitor America* is a national scanner directory. Its editor included detailed information intended for the traveling monitor hobbyist. No longer will one need to buy nine different scanner directories to prepare for that cross-country trip with a scanner. The pocket-size directory, billed as the communications/travel guide, includes interstate road maps, scanner laws, emergency telephone numbers, not to mention detailed coverage of state police and highway patrols, parks, forests and monuments, highway units, the entertainment industry, ski slopes, amateur radio, news media, travelers stations, amusement parks, casinos, and tourist and cultural attractions, etc. Not only are frequencies listed (including major metropolitan areas), but also codes, channel and unit designators, district maps, and other detailed information is included.

In addition, the second edition of the *Greater Philadelphia/South Jersey Guide* is off the press. The coverage area of the more than 160-page directory has been expanded to include all of Southeastern Pennsylvania

Beaming In (from page 4)

So here, at long last, is a modestly priced operational Hieronymous Machine. It operates on a 9-volt battery and it even has a little "bow tie" antenna mounted on its cabinet.

The manufacturer describes his Alpha III Hieronymous Machine as being an "all purpose unit." Sure, it can locate and analyze buried ore, soil, and "other underground specimens." Any self-respecting Hieronymous Machine should be able to do that much in a breeze! But the Alpha III does even more. They say it is "favored by treasure hunters," and you can even "conduct research in insect irradiation, plant growth stimulation, genetic mutations and most other radionic functions." It's a magical communications gizmo—you could tell that from its antenna. The manufacturer assures us that "you can also send telepathic impressions easily." Truly an all purpose unit!

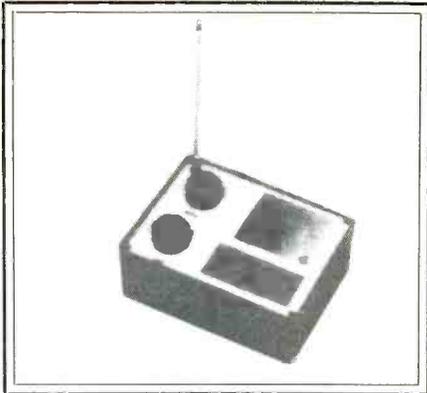
One of the nice features of the Alpha III is that "a mode switch permits the operator to select from three different detection modes." These are the "standard stoker plate mode," a pendulum or the galvanic skin response that features a meter readout. You can also add your own homemade accessories to the Alpha III.

As if this weren't sufficiently versatile, there is an even more sophisticated version. It's called the "Alpha II." It's similar, but permits the user to "duplicate European experiments" because it has 12 tuning dials to "allow utilization, through calibration, of all of the rate charts in existence for the past 30 years."

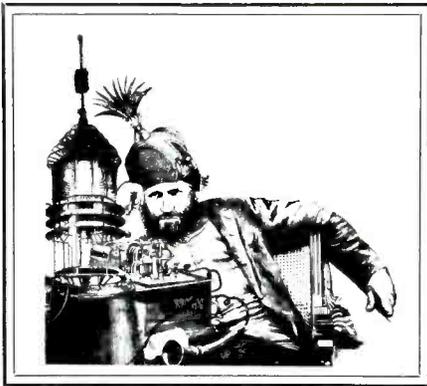
The manufacturer doesn't stop there. For radio fans who don't care to have an all-purpose unit that can do a lot of trivial chores in addition to operating as a spaced-out communications device, there are two other weird radios.

There is, for instance, the ominous "Omega Device," which is described as "an electronic transistorized spirit communicator." Using it, you can presumably hold a "solo seance" and "get answers to vital life questions with just a turn of the dial." Just so you won't take this too lightly, the manufacturer assures us that "it is a type of psionic instrument used in Europe and the Iron Curtain countries." It is described as "a sensitive electronic psychogalvanometer actuated by your sub-conscious mind." All you have to do is concentrate on a question and turn a dial until you "see" the answer. These "startling results" are thanks to basing the design on Quantum Physics which "utilizes empathetic resonance to couple and modulate the wave of frequency of matter with the frequency of thought." Definitely impressive.

The only other communications device that could possibly top this is the "Telecom XII" telepathy machine. This lets the operator "influence others at a distance—send thought messages to friends and loved ones far away—influence your boss to give you a raise—attract a mate—make people like you—even increase your luck." Operated in



The amazing Telecom XII lets you transmit secret messages in order to influence others.



"I wonder what might happen if one were to disconnect the dinky little on-board antennas supplied with any of these units and replace them with a decent rooftop beam..."

a manner similar to the Omega Device, all you have to do is tune the dial and "think." You are assured that your "message and commands will be flashed over vast distances almost immediately." Again, the user is warned that it's another one of those Quantum Physics designs like those used in Europe and the Iron Curtain countries. The specifics of its circuitry do have minor variations from the Omega Device. The Telecom XII uses "empathetic resonance to couple and modulate the frequency of thought waves with the pulsating energy fields surrounding molecular matter" to achieve its "amazing results."

No doubt about it, Spradlin was right on the nose—an empty plastic box does look like piffle when stacked up against these psionic band communications devices. I wonder what might happen if one were to disconnect the dinky little on-board antennas supplied with any of these units and replace them with a decent rooftop beam offering some gain and directivity.

It does worry me that none of the descriptive material I saw makes any mention of how well this equipment sits with the FCC and what kind of station or operator licenses might be required in order to embark on a career in the psionics band.

Imagine yourself sitting at your desk stroking your Hieronymous and turning the dial while, simultaneously, you're thinking as

Scanner Scene...

and South Jersey. The book, edited by your columnist, Chuck Gysi, N2DUP, includes Berks, Bucks, Chester, Delaware, Lehigh, Montgomery, Northampton, and Philadelphia counties in Pennsylvania; Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Hunterdon, Mercer, Ocean, Salem, and Warren counties in New Jersey; and New Castle County in Delaware. All sections of the book have been updated from the first edition, including an expanded detailed listing of Philadelphia police unit numbers. The guide includes all state, county, and municipal radio systems throughout the region, including unit numbering lists and radio codes for every county and most larger towns and cities. There are special sections covering state agencies, mobile telephone, news media, amateur radio, regional agencies, marine, many businesses, etc. A special section details frequencies for Atlantic City casinos.

Either book is available for \$14.95 plus \$2.75 for first-class postage or \$1.25 book-rate postage (New Jersey residents add 6% sales tax) from East Coast News Service, P.O. Box 1119, Flemington, NJ 08822-5019. **PC**

Your Turn

We're always looking for your input to Scanner Scene. We welcome your letters, frequency lists, questions, and photographs. Write to: Chuck Gysi, N2DUP, Scanner Scene, Popular Communications, 76 North Broadway, Hicksville, NY 11801.

hard as you possibly can. The band is in the midst of a great DX opening, and just as you're about to get answers to the mysteries of the cosmos, the FCC comes knocking at your door. What do you say at a time like that? Explaining that you've got Albert Einstein on the line, with Descartes, Nietzsche, and Spinoza standing by on the side is probably not going to do you very much good. You might try telling them "cogito, ergo sum," but if that doesn't work, you could be in big trouble!

Also, they don't mention supplying you with a frequency directory for this new band. You could be twiddling with the tuning dial and thinking hard for years without ever being certain that your messages were being picked up at their intended receiving station. Or, you could be sending out your request for a pay raise via AM and not realizing that your boss only receives SSB.

It would be just my luck to go out and buy one of these things only to find that everybody else had gotten there ahead of me, with every single frequency already occupied by the Voice of America, Radio Moscow, and 20-million truckers all shouting, "Breaker, Breaker, 10-4 Goodbuddy."

Anyway, what with everyone making an effort to come up with strange ideas for April Fools' Day, it is somehow reassuring to know there are always real things that can outstrip fantasy without any difficulty at all!



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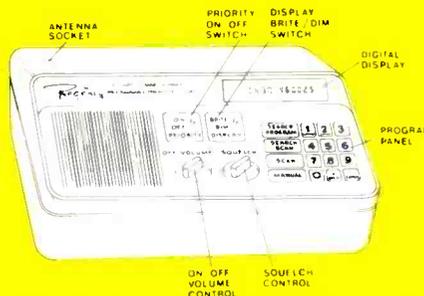
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Sophisticated microprocess-controlled circuitry eliminates the need for crystals. Instead, the frequency for each channel is programmed through the numbered keyboard similar to the one used on a telephone. A "beep" acknowledges contact each time a key is touched. The D310 scans approximately 15 channels per second.

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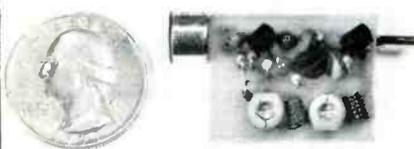


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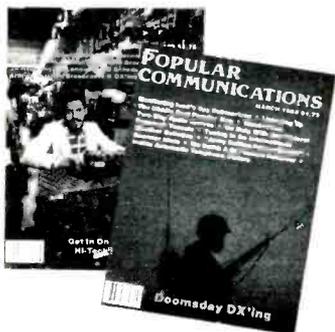
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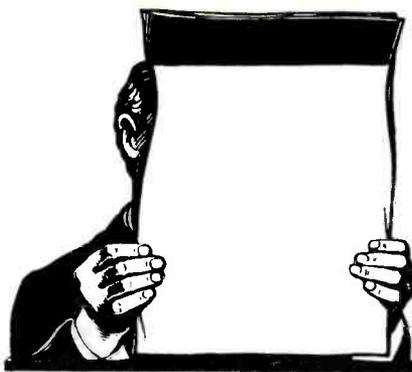
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Speaker: 4-inch dynamic

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