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MONITORING TIMES

***** "RAWHIDE" TO "FADEAWAY" *****

by Robert Leary

A cowboy talking to a basketball player about his jump shot? No, not on your life! This was the most influential person in the United States talking to a trusted advisor.

I had been waiting and searching on that day -- April the 9th --, my Yaesu FRG-7700 receiver pouring its heart out, through the bands, just as I had done so many times before. But they could not hide forever.

I first checked all the usual "hot spots": 23.265, 18.027, 13.247 -- nothing. I went to 13.215, 11.176. Again I drew a blank. 10.881, 10.530, 9.018, 8.967. My S-meter stood lifeless.

I rallied forward, 6.756, 5.710: again, nothing to hear except myself grumbling unprintables! They say, "When the going gets tough - the tough get going". I had

checked all the most likely frequencies, now it was time for a run through the unlikely.

I moved on to 29.899 where -- behold -- I caught the tail end of a message from "SAM-86972" (Special Air Mission) to "Candlestick"!

I sat glued to my chair, playing the waiting game. Mention was made of "FOX-215" which I knew from experience was a code name for the frequency 17.990 MHz.

Although I can't reveal the contents of the message between "Rawhide" and "Fadeaway" (last section 605 cut my coax), I can tell you that the conversation I heard would never make it to the newspapers. It is safe to assume that I wasn't the only "outside ears" to have listened in on this conversation, either!

For those of you who don't

know who "Rawhide" and "Fadeaway" are, check the listing below. If you are a newcomer to shortwave listening, the accompanying table can be of great help to you in identifying code names and frequencies.

Secret Service call signs and their probably identifications

Acrobat..... Andrews Air Force Base
 Angel..... Air Force One
 Cactus..... Camp David
 Cement Mixer..... White House Situation Room
 Coach House..... Dulles Airport
 Crown..... White House Communications Agency
 Curbside... Washington National Airport
 Fadeaway.... Secretary of State, Alexander Haig
 Finley..... Secretary of Defense,

Casper Weinberger
 Flag Day... Speaker of the House
 Nighthawk... President's Helicopter when president not on board
 Punch Bowl... US Capital Building
 Radiant..... Doria P. Reagan
 Rainbow..... Nancy Reagan
 Rawhide..... Ronald Reagan
 Reliant..... Ronald P. Reagan
 Ridgeline.... Reagan Residence, (California)
 Roadrunner... WHCA Mobile Van
 Skymaster..... Andrews AFB Command Post (Secret Service)
 Timberwolf..... George Bush
 Treasure Ship... Vice-President's Plane

A List of "FOX" Frequencies Heard On Shortwave

Freq. kHz		
5700	6683	6715
10583	11182	11249
12317	13212	18027
29899		

Profiles: Robert Leary Of Akron, Ohio: A Serious Listener

This month we are privileged to show you the listening post of a longtime listener from Akron, Ohio. Robert enjoys all aspects of the hobby from the lowest frequencies clear through UHF. Military communications are his forte.

A brief glance at Robert's listening log over the last few

months reveals some good catches (all frequencies kHz):

13201 USB Military Air Command returning from Cairo, Egypt
 4746 USB NOAA weather reconnaissance aircraft WP-3 Orion
 9018 USB Special Air Mission (SAM 12493) working

Mac Dill AFB (FL.)
 11177 LSB Air Force 2 (Vice Presidential flight) to Andrews AFB
 8922 USB "Windsong" tactical aircraft; mission unknown
 12343 USB Coast Guard cutter Hamilton working Portsmouth NAS
 6769 USB Ohio Army Reserves, Columbus to Canton, OH
 8967 USB SAM-27000 (Air Force One) taking ex-presidents to Sadat's funeral
 8239 USB FCC on air tests
 11246 USB US Navy weather reconnaissance aircraft
 6712 LSB Air Force One (Reagan on board) to "Crown" (White House)
 6693 USB Halifax Military (Canadian military aircraft)
 5696 USB US Coast Guard primary channel
 8984 USB US Coast Guard tracking manned balloon "Double Eagle 5"
 8568 USB "Speedbird"; Australian military
 18027 USB Air Force One (SAM-27000) working Crown
 6723 USB US Navy to aircraft
 6715 USB Air Force Two

(SAM-26000) Vice Presidential flight

Robert also has some advice for listeners puzzled by jamming signals:

RADIO JAMMING

The Russians call it their "Over The Horizon Radar" most short wave listeners refer to it as the "Wood Chopper" or "Wood Pecker", but what really is jamming?

The military's definitions should help you to recognize jamming more easily.

RADIO JAMMING: JAMMING is the enemy's intentional intrusion of unwanted electronic signals in our communications networks. The enemy's purpose in jamming may be to annoy or confuse us, or he may attempt to completely deny us the use of our radio capability by broadcasting a jamming signal too strong for us to override.

TYPES OF JAMMING: Two types of jamming are widely used. (A) BARRAGE: Barrage jamming is similar to an artillery barrage. It covers a broad bank of frequencies. (B) SPOT: Spot jamming is similar to rifle

(Continued on page 3)



Robert's busy listening post features surplus military and commercial radio equipment, as well as one or two modern receivers. QSL cards (as well as Star Trek posters!) adorn the walls of his shack.

FROM THE EDITOR

BOB GROVE

With this third issue of MONITORING TIMES, we enjoy a continued expansion of informational content -- 16 pages worth! With the larger publication, coupled with a substantial increase in printing costs, our subscription rates have increased slightly: \$9.50 for one year, \$18 for two years and \$25 for three years.

As with our introductory rates last month, our readers may subscribe at these rates with the guarantee to hold up to three years at no increase. We strongly urge our readers to subscribe early, avoiding another increase in rates. As MONITORING TIMES grows, so does its printing costs!

SEVEN DOLLARS FOR HOW MANY ISSUES?

Apparently some confusion arose among our readers as to the special introductory subscription rate (now expired).

Although the subscription form clearly showed the rate -- 6 issues for \$7, 12 issues for \$14 and 18 issues for \$21 -- the confusion apparently came from the editorial invitation.

The editorial read, "...you may receive up to 18 issues...for the low early-subscribers rate of only \$7.00 per year". Some of our readers mistook that to mean 18 issues for \$7, overlooking the "per

THEIR RIGHT TO LISTEN

Few areas of communications stir up such a hornet's nest of controversy as the privacy provision of the 1934 Communications Act.

A bill has been introduced into the Florida House of Representatives (House Bill 129, authored by Rep. Mary Ellen Hawkings of Naples, FL) prohibiting licensed amateur radio operators from possessing any receiver capable of tuning in law enforcement agencies!

The intended bill does not refer merely to mobile police receivers, but to any receiver...even in the private home of the user! If passed, House Bill 129 would outlaw scanners in the state of Florida.

According to Billy Williams, N5UF, Section Communications Manager for North Florida (American Radio Relay League) one ham has already been jailed because a policeman witnessed his use of a 2-meter ham rig and thought he was using a police radio.

It's only two more years till 1984. Was George Orwell right?

Another bitter area of controversy is the "theft of services" contention by the pay TV industry concerning direct reception ("piracy") of satellite signals.

By law, any transmissions of a broadcast nature are excluded from the privacy regulations of section 605. Is there a difference

year".

... AND GROWTH CONTINUES

We apologize for the unintentional confusion. In any case, quite a few of our readers took advantage of the early-bird special. Our mailing list now swells at approximately 20,000 and there seems to be no end in sight.

We warmly appreciate the trust and support our readers have shown. We hope we continue to deserve that trust, responding to the needs of our readers.

We are privileged to inaugurate a number of guest columnists this month. Our "call for authors" resulted in a number of excellent articles by qualified writers. We know that you will enjoy reading them and will benefit by their insights.

AN S.A.S.E. MIGHT GET A REPLY With hundreds of letters crossing my desk each week, the cost of postage is horrendous. A typical request may begin, "Please send me everything you have on....". Obviously, such a request is unreasonable. Even more unreasonable is the fact that such extravagant requests rarely are accompanied by a self-addressed stamped envelope!

If I can be of help, I will. But please try to meet me halfway.

between watching the Monday night movie direct from the satellite instead of via your local TV station? Is it the material or the transmission that is considered private? Why?

It might be pointed out that these signals propagate through your own private property, through your body, without permission by the TV industry. Does this constitute trespassing?

For years, TV poll-takers have monitored your listening habits by tuning in the oscillator leakage from your TV antenna, thus accumulating a file on your personal entertainment habits without your permission. Is this not invasion of privacy?

When was the last time you drove past the screen of an outdoor movie, catching a glimpse of the action over your shoulder? By analogy, even though the screen is illuminated for all to see, you are disallowed from viewing it because you haven't paid the gate admission! After all, the light spectrum is simply a higher-frequency extension of the radio spectrum and your eyes become the antennas and receivers.

Clearly, only the groundwork has been set and court battle scenes loom on the horizon. No one is predicting the winner, but high stakes are involved both by the TV broadcasting industry and the home TV market as well.

I thought you would like to know that you can copy RTTY from a scanner. I use a Kantronics Signal Enforcer. I use the demodulated signal jack output to a Kantronics Field Day 2 key input jack. (William Forbey, Flint, MI). (Very interesting!...ed.)

Just wanted to tell you how much I enjoyed my new Scanverter. I received it in time to use it during the launch of STS-3 and heard some interesting talk.

On 294.6 I monitored "Variety 1" who directed the Coast Guard cutters.... I did hear some chatter on 393.0 MHz between some (aircraft) and NASA.

Bob Ednunds,
Merritt Island, FL

It was with much amusement that I read your reply to EM, Hillsboro, Oh, request for information on the poor performing Bearcat 300 (March/April 1982 Technical Topics). I think you have done a disservice to EB, by not telling him, "like it is".

We have tried since the Bearcat 300 has been released to the market to make this unit perform to very minimal standards. We were not able to accomplish this until we completed some modifications in our shop. In case you might think that this is just one isolated case, this just "ain't so". We have eleven of these units at the present time, and all have been modified.

Of course the Electra Company has been invited to re-evaluate our complaints which have been documented by police departments, fire departments, ambulance services, as well as other users.

It is our opinion that the Bearcat 300 is a very poor investment, and certainly not up to the standards of other Bearcat equipment that we are familiar with.

Now, could it be that you have not done your home-work, or could your reply to EB be biased by the full page advertisement on page 5 of your March issue?

Robert T. Schmidt

(Electra has a competent and responsive service department. Why are you modifying 11 BC-300 scanners? What are the modifications? EB complained of low signal strengths; our BC-300 has sensitivity better than that stated by the manufacturer, exceeding scanners to which it has been compared.

So far as protecting our advertisers, we do not accept advertising from manufacturers who do not deliver quality merchandise. The BC-300 remains, in our estimation, a good investment.

The BC-100 hand-held programmable has had a rough introduction. Engineers at Electra have been making significant improvements in the performance of the little unit. A complete product review is scheduled to appear in July Monitoring Times, ed.)

I have heard that you may offer some shortwave program schedule listings. How may I obtain these? (Bryan Geyer, Manhattan Beach, CA)

(Several timely publications from clubs and other newsletters specialize in international broadcasting program schedules. Check Books and Publications.

I would encourage you to develop a column in your publication dealing with spy stations, decryption of coded messages and contributions from readers who are or may have been professionals in the area of codes and cyphers.

I am a member of the American Cryptogram Association and have been an interested student of items of history related to intelligence, codes, coded communications, etc. I believe items of interest could be explained and discussed in such a column without breaking any laws and without being unpatriotic.

(Zel Eaton, Kirksville, MO)

You would be surprised (at) the vast amount of hobbyists who are interested in (spy) transmissions but never got together just because they had no idea of the amount of people who were interested. Yes, please go ahead and start a column by all means!!!

(Ken Bryant, Hialeah, FL)

(We are pleased to announce the appearance of several new writers in MT. One of whom, John Santosuosso, is well known for his expertise in pirate, clandestine and "spy" numbers stations. John is tentatively scheduled to appear in the July issue.

In the mean time, does ANYONE out there KNOW FOR SURE the identity of these tantalizing numbers stations?...ed.)

SEVERE WEATHER COMMUNICATIONS

With spring evolving rapidly into summer, turbulent weather has become commonplace. In an effort to collect data regarding storm systems, the National Weather Service sustains an HF network to coordinate weather offices.

Frequencies (kHz) commonly used by the NWS include:

2776 AM/SSB training
5923 SSB/FAX regional fire network
5937 SSB/FAX regional fire network
6976 SSB/FAX regional fire network
6979 SSB/FAX regional fire network
6977 AM/SSB training
9947 AM/SSB training

Morning check-ins are reported by listeners, especially on the 6977 kHz frequency. During storm season, these could be real hot spots on your shortwave dial!

Listen In On The World's News-- As It Happens!

By Ralf F. Munster

"Argentina Invades Falklands", "UN demands Argentina Withdraw", "Lord Carrington Resigns", "British Fleet Sails" - so the headlines shout and the 7 p.m. TV news elaborates.

But suppose you want to hear what the BBC has to say about these developments; which are the best frequencies, and at what times? Maybe you want to go one step further and try to hear Argentina's side of the story directly. Do they broadcast in English and can they be received in North America? If you twirl the dials on a shortwave receiver fairly assiduously, you are almost bound to run into the BBC; but R.ARG is a horse of a rather different color altogether. They broadcast with only a fraction of the power (50 kW) of the BBC and only at certain hours on weekdays. Try 2200-2230 (beamed to Europe and Africa) and 0100-0130 (beamed to So. Ce. and No. America) all on 11710 kHz. With SW broadcasters changing frequencies and times at least four times a year, how does a listener keep up with them? One answer is found in an unpretentious, forty page, offset printed monthly: the Review of International Broadcasting (RIB), published and edited by Glenn Hauser (P.O. Box 6287, Knoxville, TN 37914). A sample issue is available for \$1.25 (twelve issues by 1st class mail in No. Am. \$15).

RIB's cycle of center features, lists up to eight pages of "Broadcasts in English", times and frequencies by country; "Shows We Like", recommended programs by time; "News in English" and "DX Programs in English".

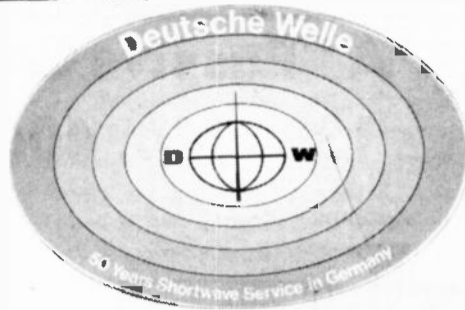
RIB regularly reproduces several pages from the BBC's "London Calling", including reading comments on programs, it has a variety of other features, too numerous to mention. There are any number of DX pxs (distant programs) on the air. One is Radio Canada International's (RCI's) "SWL Digest," produced by Ian McFarland, an essential part of which is Glenn Hauser's own "DX nx" (news), the complete text of which is regularly reproduced in RIB. It is beamed to Africa Saturday, approx. 2130-2157.

For an overall view of what is to be found on the airwaves, you will sooner rather than later want to acquire a copy of the current edition of the World Radio TV Handbook (WRTVH) in effect, "bible" of the SWL and MWL (medium wave listeners), the 1982 edition is available from Grove Enterprises for \$16.50.

A bonus of the annual volumes is the "Special Feature Section", most important of which is the receive survey by Larry Magne. The publication is, however, not without its limita-



HAUT LEVE
L'ESPRIT
REVOLUTIONNAIRE:



tions. With few exceptions the schedules it contains are those of the D-season which extends from Nov. 1 through March 6 whereas the J-season (May 3 - Sept. 5) is almost upon us. Though my copy was ordered well in advance of publication, it did not arrive until Feb. 9. This sort of thing is unfortunately apt to continue until its editor, F.M. Frost, takes some concerted steps to have it computerized and insists on an absolute deadline with the publisher, Billboard Ltd.

Another reference work is

New Tuner For Shortwave Listeners

A new low-cost tuner for shortwave and longwave listeners has been announced by Grove Enterprises.

The TUN-3 MINITUNER is a helpful accessory for modern consumer communications receivers such as those from Kenwood, Yaesu, Sony, Panasonic, Radio Shack and other popular manufacturers.

Providing both frequency preselection and antenna matching from 100 kHz through 30 MHz, characteristics are said to be as good as its more expensive predecessor, the Signa Match.

The all-new Minituner is housed in a compact 4"W x 2"H x 3"D aluminum cabinet. It is connected between the antenna (standard coaxial connector provided) and the receiver via a coaxial cable (also provided).

The listener merely selects the frequency range of interest on a bandswitch knob, then adjusts the tuning control for maximum signal.

The circuit is passive; no power is needed. Designed to suppress out-of-band images, intermod and dynamic distortion from strong signal overload, the handy Minituner carries an attractive price: only \$54.95 plus \$2 UPS shipping or \$5 via U.S. Postal Service.

Delivery is expected on or before June 1st, 1982. To order your new Minituner, call Grove Enterprises toll-free at 1-800-438-8155.

The Complete Shortwave Listener's Handbook (2nd edit., 1980) by Hank Bennett and Harry L. Helms (\$8.95), also obtainable from Grove Enterprises, Inc. Though not as up to date by now as one might wish, this 306-page book includes eighteen chapters plus an appendix, dealing with terminology, receivers, antennas, frequencies, propagation, reception by areas and frequency, amateur radio, monitoring, FM/TV ding, utility stations, logbooks, and much more.

Frequencies for RCI's Saturday SWL Digest: 17875, 17820, 15150, 11945. Having trouble finding the BBC? Try 21710 (2000-2245 and sun-up to 1830), 15260 (2000-0230), 15070 (0300-0230), 9510 (to 0430; 2200-0915), 6175 (2000-0730); 5975 (2245-0630).

Listeners may wish to tune in Radio Norway; try their English broadcasts—Sundays and Mondays. Underscored freqs use 250 kW transmitters, others 100 kW: 15125 (at 1400), 15125/15195 (1600), 15175 (2000), 17840 and 15175 (2200), 15205 and 11870 (0000 GMT Mons), 11740 and 11840 (0200), 11895 and 11870 (0400), 11895 (0600).

Just a sampling of the international flavor of broadcast reception. Give them a try—you'll probably get hooked!

RBI
QSL



Feel Like Writing ?

MONITORING TIMES would like to encourage our talented readers who feel they would like to write an authoritative article. Any budding authors (or publishing giants) out there?

We are willing to pay \$25 and throw in a free subscription for any article accepted, 500-1000 words. Reproducible artwork or photos (black and white) are welcome.

Simply send a brief resume of your qualifications along with an outline of your subject.

Need some suggestions for topics? How about these:

Frequency allocations, assignments, locations and call signs

Computers and listening
Antennas and feedlines
International Broadcasting
Spy numbers stations
Utilities monitoring
VLF... who's out there?

Pirates and clandestine broadcasters

Radio propagation
Radio systems
Scrambling techniques
Simple do-it-yourself projects
Hints for better listening
Radio astronomy
Controversial subjects
FCC rules and regulations
Satellite TV
Communications satellites
Videotext/Information exploration

This is just a smattering of subjects being requested by our readers. Now, let's hear it from our writers!

Profiles: ROBERT LEARY

(Continued from page 1)

fire. It covers a single frequency or a narrow band of frequencies. More powerful and sophisticated equipment is required to accomplish barrage jamming effectively. If the same amount of power is used in spot jamming, the jamming signal becomes virtually impossible to override.

TYPES OF JAMMING SIGNALS: There are five types of jamming signals. A jamming signal is the actual sound you would hear on your radio receiver if you were being jammed by the enemy.

THE FIVE TYPES OF JAMMING SIGNALS: (1) Sparr (2) Sweepthrough (3) Random Keying (4) Stepped Tones (5) Random Noise

Of the five types of jamming signals, RANDOM NOISE is the most dangerous because it is the most difficult to detect. It sounds like the normal rushing noise you would hear when your radio receiver is turned on. Regardless of the type of jamming signals used, if the enemy is successful in jamming you, he can effectively deny you the use of your radio communications.

Product Review

By Bob Grove
AEA MBA-RO MORSE/RITTY
READER

For those of use addicted to monitoring the shortwave spectrum, the accessories can provide the endless, hours of fascination as a Morse/RTTY reader.

Plugged into the external speaker or headphone jack, the present genre of readers may provide dependable copy, faithfully spelling out messages from Morse code or radioteletype messages, newscasts and weather reports worldwide.

One of the most recent entries is the MBA-RO from Advanced Electronic Applications (PO box 2160, Lynnwood, WA 98036). Since I was already familiar with competitive instruments, I was eager to get my hands on the newcomer.

The MBA is housed in a durable aluminum cabinet, measuring 8³/₄" W x 5-7/8" H x 2" D. Weight is approximately 2 pounds. A DC power supply (model AC-1, 13 volts @ 500 ma.; available at extra cost) is required.

Input impedance is universal, matching virtually any audio impedance normally encountered on receiving equipment.

All controls are panel-mounted, clearly-marked rotary switches. Morse speeds of 3-99 wpm track automatically. RTTY speeds of 60, 67, 75 and 100 wpm are accommodated by the MBA. Even ASCII 110/300 baud/sec. sampling is possible.

Audio passband filters are factory adjusted for 170 or 425 Hz shift (narrow and wide shift RTTY). Other shifts are internally adjustable.

Best of all, the MBA sports 32 bright fluorescent characters, the longest segmented display presently available. The circuit houses 17 integrated circuits plus one microprocessor chip.

But how does the unit perform in actual field use? I decided to find out. Acquiring the optional AC adaptor and plugging the unit into a Kenwood R-1000 general coverage receiver. I began to explore the RTTY/CW domain.

It seemed that the ham bands would be a good place to start; after all, I could expect 60 wpm speed and practice the proper tuning procedures of the MBA. Carefully tuning the dial through the 20 meter band I came across the familiar "diddle-diddle" sound of radioteletype. Adjusting the dial slowly to illuminate the LED indicators on the MBA audio filters, I was immediately rewarded by perfect RTTY copy rolling across the display window.

Feeling reassured that I must be doing something right, I dialed up a few more 20 meter RTTY signals; all were copies with no effort. Clearly, it was time to move on to bigger quarry!

Tuning up considerably higher in the spectrum (it was late afternoon), I encountered a faster RTTY signal (100 wpm) at about 25517 kHz. Sure enough, with a little propitious tuning, A Spanish language test tape revealed itself.

Next I decided to try the MBA on CW. Switching to Morse, I moved through the spectrum. On 12546 kHz I found CLA, a Cuban coastal station endlessly repeating its callsign to hold the frequency. Sure enough, the MBA endlessly showed "CLA" on its display. Curious as to the speed of the CW signal, I switched the MBA to "speed": after a brief sampling time, "30" came up on the display. Thirty words per minute. I wish I could copy cw as fast as that!

Although my initial experience with the MBA was successful, it must be remembered that any RTTY/Morse reader will take some getting used to. Other attempts to copy radioteletype were often futile, sometimes because of weak signals,

sometimes because of non-standard baud rate or bit inversion.

I found that the actual tuning procedure was a little cumbersome; my success came from a slightly different method than that indicated in the instructions sheets which accompanied the unit.

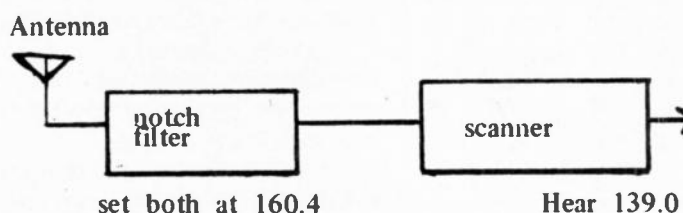
And, as with any Morse reader, CW signals will be copied

faultlessly only if the keying is perfect, without fading.

With these limitations in mind, the new owner will enjoy hours of intrigue on the airwaves, but only after a thorough familiarization period.

(MBA Morse/RTTY reader, \$299.95; AC-1, \$14.95. From dealerships or contact AEA, PO box 2160, Lynnwood, WA 98036)

A "Passive Converter" For 135 - 144, 406 - 420 MHz



Although most of us are plagued by images of unwanted out-of-band signals on our scanners, especially in busy metropolitan areas, few listeners are aware of a golden opportunity to turn this shortcoming into an advantage!

Images are produced in all scanners in the mixer stage of the superheterodyne circuitry. Two frequencies are produced for each single frequency we want to hear. These two signals will be separated by either 21.4 MHz (Radio Shack, Regency, and Fox) or 21.6 MHz (Bearcats).

For example, when you are listening to your favorite highway patrol channel on 154.695 MHz and suddenly an aircraft comes blaring in, you are actually hearing an image from 133.295 (133.3) MHz on your Radio Shack, Regency or Fox scanner. Similarly, it could be from 133.095 (133.1) on your Bearcat.

Let's put this dilemma to work for us. Suppose you would like to hear a local US Army base on 139.000 MHz. Adding 21.4 MHz,

you would punch up 160.4 MHz (add 21.6--160.6--on your Bearcat) on your programmable scanner (see diagram).

Since both of these frequencies belong to the railroads, they are not likely to be busy all of the time. And if the image signal is strong enough (generally a few dB lower in intensity than the actual programmed frequency due to the scanners selective tracking circuitry) you will hear the military base.

But suppose you want to hear an image which plops down right in the middle of a busy high band channel? What then? Easy. You use a simple external notch filter to remove the busy channel.

True, there will be some loss of signal strength. If the loss is too great, an external preamplifier may be used to beef up the desired signal.

This method of "image enhancement" has been used quite satisfactorily at Grove Enterprises using the Scanner Filter and Power Ant combination. Similar filter/preamp combinations should work satisfactorily.

MBA READER,TM A NAME YOU SHOULD KNOW



What does MBA mean? It stands for Morse-Baudot and ASCII. **What does the MBA Reader do?** The RO model (reader only) uses a 32 character alphanumeric vacuum fluorescent display and takes cw or tty audio from a receiver or tape recorder and visually presents it on the display.

The copy moves from right to left across the screen, much like the Times Square reader board. **Is the AEA model MBA Reader different from other readers?** It certainly is! It is the first to give the user 32 characters of copy (without a CRT), up to five words at one time. It can copy cw up to 99 wpm and Baudot at 60-67-75 and 100 wpm. Speeds in the ASCII mode are 110 and hand typed 300

baud. The expanded display allows easy copy even during high speed reception.

The AEA model MBA has an exclusive automatic speed tracking feature. If you are copying a signal at 3-5 wpm and tune to a new signal at 90 wpm, the MBA catches the increased speed without loss of copy.

The MBA Reader allows a visual display of your fist and improves your code proficiency. It is compact in size, and has an easily read vacuum fluorescent display.

The Reader operates from an external 12 VDC source. This allows for portable/mobile or fixed operation.

Check the AEA model MBA Reader at your favorite dealer and see all the features in this new equipment. If your dealer cannot supply you, contact **Advanced Electronic Applications, Inc.**

P.O. Box 2160, Lynnwood, WA 98036 Call 206/775-7373

Prices and specifications subject to change without notice or obligation

AEA Brings you the
Breakthrough!

Anti-Submarine Warfare Practice Thrills Listeners

A US Navy anti-submarine warfare (ASW) network during mid April resulted in a barrage of phone calls here at the Monitoring Times/Grove Enterprises monitoring station.

Frequencies of 11212 and 11214 kHz (USB) were busy, with encoded references common. The "playground" (operations area) was in the Atlantic Ocean off the southeast coast of the United States. Magnetic anomaly detectors (MAD) were carried by P-3 aircraft to detect "alligators" (submerged subs).

Many thanks to an anonymous contributor for this information.

SPECIAL SCANVERTER SECTION

USING SCANVERTER WITH A SHORTWAVE RECEIVER. Yes, it can be done. Cover the entire 225-400 MHz range when tuning 10-27 MHz on a general-coverage receiver!

The same bandstacking technique is used with this procedure. The table below shows the whole-MHz frequency points. Add decimals as needed between whole MHz intervals.

Table 1

SW	UHF										
10	225	244	262	280	298	316	334	352	370	388	
11	227	245	263	281	299	317	335	353	371	389	
12	228	246	264	282	300	318	336	354	372	390	
13	229	247	265	283	301	319	337	355	373	391	
14	230	248	266	284	302	320	338	356	374	392	
15	231	249	267	285	303	321	339	357	375	393	
16	232	250	268	286	304	322	340	358	376	394	
17	233	251	269	287	305	323	341	359	377	395	
18	234	252	270	288	306	324	342	360	378	396	
19	235	253	271	289	307	325	343	361	379	397	
20	236	254	272	290	308	326	344	362	380	398	
21	237	255	273	291	309	327	345	363	381	399	
22	238	256	274	292	310	328	346	364	382	400	
23	239	257	275	293	311	329	347	365	383		
24	240	258	276	294	312	330	348	366	384		
25	241	259	277	295	313	331	349	367	385		
26	242	260	278	296	314	332	350	368	386		
27	243	261	279	297	315	333	351	369	387	225	

ALL FREQUENCIES MHz.

Shortwave bandstacking conversion scheme. Receiver dial frequency on left will receive any frequency in row to right.

SIMULTANEOUS VHF/UHF AIRCRAFT RECEPTION

It is possible for your scanner to receive normal 118-136 MHz signals at the same time you are using the 225-400 MHz Scanverter. Simply utilize the scanner's attachable whip. This way, local aircraft signals will bypass the Scanverter which has been connected to an outside antenna.

The Scanverter will continue to work normally, converting UHF signals to VHF as described in the instructions.

SCANVERTER: HINTS FOR BETTER RECEPTION

ANTENNAS: An antenna designed for 225-400 MHz operation must be used. Common single-band or multiband scanner antennas are inadequate as they are designed for low, high and UHF scanner frequencies, not the 225-400 MHz band.

Examples of usable antennas include: discons like the Hustler DCX, log-periodic beams like the Scanner Beam, and home-brew ground planes with elements approximately 9-10 inches long. A Radio Shack 20-176 with elements cut is an example of the latter antenna.

COAXIAL CABLE: The selection of appropriate coax is as important as the antenna. Best choice is RG-8/U low-loss foam-dielectric. Next, RG-59/U or RG-6/U low-loss foam dielectric. Do not use RG-58/U or any cable that is not low-loss.

PREAMPLIFIERS: Since military aircraft fly very high and use low power UHF transmitters, the use of an external preamplifier is recommended. Although this might encourage out-of-band interference in some cases, a filter would probably solve that problem.

TIGHT CONNECTORS: A common cause of poor sensitivity and interference is loose Motorola plugs. Be sure that the expanded shells of both plugs rub snugly against the jacks when they are inserted.

IMAGE INTERFERENCE: The presence of FM and TV broadcasters, FM land mobile signals or commercial VHF aircraft communications on the CVR-1 is a sign of image interference. This is generally due to the close proximity of these users in a metropolitan area.

Such signals may be drastically reduced...or even removed...by a good tunable filter like the Scanner Filter.

USE WITH PORTABLE RADIOS: While it is possible to use Scanverter with plastic-cabinet tunable aircraft radios, these receivers tend to be vulnerable to out-of-band interference. Aircraft band scanners are recommended for Scanverter use.

FCC AUTHORIZES NEW VHF MODE

With FM dominating the VHF/UHF land mobile spectrum, it will be interesting to see what results from a series of experiments to take place in the 151.635-152.000 MHz band.

The new mode is called amplitude-compandered single sideband, and is ostensibly capable of compressing the speech spectrum into a much narrower swath than now used by FM transmitters. It is incompatible with present-day scanners.

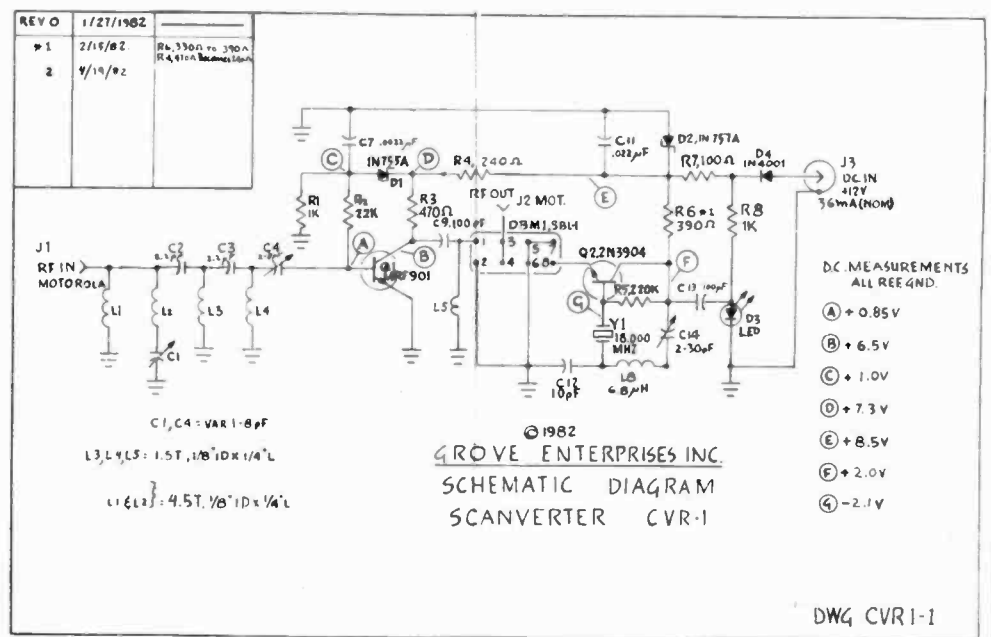
Applicants who desire to test the new technique may choose among eleven channels with ten kilohertz bandwidth and no geographical restrictions. These channels are: 151.640, 151.670, 151.700, 151.730, 171.760, 151.790, 151.820, 151.850, 151.880, 151.940 MHz. Two additional channels are available: 151.970 MHz (telephone maintenance) and 152.000 (Special Emergency Radio Service).

Other discrete frequencies throughout the high band are expected to become available under special authorization.

Glenn Hauser Heard On Shortwave

Noted international broadcasting authority Glenn Hauser may now be heard on shortwave station WRNO. His popular program, "World of Radio" presents station profiles, listener comments, developments in communications and other topics of timely interest.

At this writing, Glenn's program is slated to be heard Sundays at 2330 UTC on 11955 kHz, and Tuesdays at 1900 UTC on 15420 kHz.



SCANVERTER:

Making A Good Converter Even Better

Our competitors said it couldn't be done; no one could design a frequency converter 175 MHz wide and expect decent rejection of out-of-band interference. Surely not for under \$100!

Obviously, a challenge like that couldn't be ignored. We examined every conceivable approach, building mock-ups in the lab. Most didn't work; one did!

Scanverter is the world's first broadband frequency converter featuring "bandstacking", a proprietary Grove Enterprises concept which allows a wide frequency range to be overlapped within the smaller range of the mating receiver.

But as with any radical new product, improvements are made along the way. We would like to take this opportunity to present these improvements for those of our readers who are technically-inclined. These modifications should not be attempted by anyone not familiar with electronic circuitry.

The accompanying schematic diagram is a recent representation, differing in several respects from that which came with your unit. The modification list to

follow refers to the original diagram in the CVR-1 instruction manual. Starred items improve sensitivity.

(1) C2 and C3 (trimmers) have been replaced by 2.2 pF disc ceramic capacitors.

* (2) IN754A zener diode has been changed to IN755A. Same result (better sensitivity) may be observed by inserting a IN914 signal diode in series with the original IN754A, but must be connected with reversed polarity (cathode to cathode).

* (3) C5, L5, C6 and L6 are deleted, C4 connects directly to point "A".

(4) C13 shown incorrectly; actually connected from point "F" to ground.

* (5) 1½ turn coil now added between pin 2 and ground (pin 2) of DBM.

(6) D4 is deleted.

(7) C7 is changed to .0022 uF.

(8) C11 is changed to .022 uF.

(9) C8 and C10 are deleted.

* (10) L1 and L2 (3½ T.) are squeezed together, or replaced by 4½ T. Be sure turns do not touch, and coil does not touch copper foil board.

(11) C4 is peaked near 240 MHz; C1 is peaked near 380 MHz.

FLTSATCOM: UHF Military Communications Satellite

Parked in a geostationary orbit and controlled by the Department of Defense at Sunnyvale, California, five US Navy communications satellites provide worldwide air-to-ground coverage in the UHF aircraft band.

Several previous satellites have utilized UHF communications, including the LES, GPS,

SDS and TacSatCom series.

The present FLTSATCOM satellites are parked in orbit at 100W, 72.5E, 23W, 172E and 93W.

Downlink communications are in the 243-270 MHz band. Twelve solid-state transmitters are capable of 33-46 watts of output power on 23 channels designated as follows:

Quantity	Function	User	Bandwidth kHz	Bits/sec.
1	Fleet broadcast	USN	25	1200
9	Fleet relay	USN	25	1200-32,000
12	AF commun.	USAF	5	75
1	Wideband data	USAF	500	various

Very little clear voice will be heard on any of the FLTSATCOM channels; most is data and much is encrypted.

Spread Spectrum Communications

By Rick Ferranti
WA6NCX/1

Spread Spectrum is one of the most recent developments in modern communications technology. This unusual mode of communication gets its name from its method of smearing voice or data signals over a much broader bandwidth than they would normally occupy with conventional AM, SSB, or RTTY forms of modulation. The result is a signal virtually undetectable by the usual general coverage receiver or scanner -- and which has important advantages over AM or SSB when it comes to interference and noise.

Spread spectrum's two advantages -- immunity from detection and immunity from interference (intentional or not) -- have made it a technology of great interest to the military and to various rf communications users. In fact, much of the military's communication is already carried by spread spectrum modulation via satellite links, with its use slowly infiltrating the hf, vhf, and uhf bands as well. With so much of this technology already in place, and more to come in the future, it would be good for those monitoring the airwaves to understand the basics of spread spectrum (SS) communications.

Normally, your voice has frequency components from about 300-2800 Hz or so, and, if you send your voice over a conventional SSB transmitter, you will occupy

a 2.5 kHz slice of the RF spectrum. This is the same amount of bandwidth your voice originally had. Not so with spread spectrum -- the same 2.5 kHz wide voice signal could cover 2.5 MHz or even 250 MHz in a typical SS transmission!

There are basically two ways to do this. First, you can hook your transmitter to a fast-hopping frequency synthesizer (as in a scanner, but much faster) which pseudo-randomly hops over a very wide band of frequencies, dwelling on only one frequency for a short while (as shown in figure A). The receiver that's supposed to be hearing you also has a fast-switching synthesizer in it that tracks your transmitter's signal in perfect synchronization. This is a pseudo-random hopping pattern -- both you and your intended receiver know where you'll go next, but someone without that knowledge wouldn't hear a thing. To him, the transmitter's output looks like noise -- it appears as noise spikes all up and down the spectrum.

If any interference is present on some channel that you've happened to hop onto, it may destroy your message for that brief instant, but all is well again as soon as you flit off to another frequency. This is the basis of SS's inherent interference rejection -- you may get clobbered on one channel for a moment, but your radio hops to hundreds or even thousands of channels, so the net effect is that the interference

hurts you only one hundredth or one thousandth as much!

The second method of generating SS is to "direct spread" the original modulation with another wideband signal, also pseudo-random (see figure B). Here you could modulate your 2.5 kHz wide voice signal with a 250 kHz wide pseudo-random pulse train, and in turn use that wideband composite signal to modulate a transmitter. Your voice looks like a bunch of noise splattered up and down a wide bandwidth; the energy is spread so thin that a conventional narrowband receiver won't even hear it. But if you have a wideband receiver, and use the same pseudo-random pulse train for demodulation as the transmitter used, you recover the original voice signal -- even though it appeared to be buried in the noise. The trick is, of course, that you know where to look at the right time. This bit of transmitter-receiver correlation is what makes spread spectrum tick.

There are also hybrid systems which combine both frequency hopping and direct spreading, very complicated communications technology.

The obvious question is how you, a communications monitor, can tap into these sophisticated transmissions. Unfortunately, there's not much hope here. If you're very close to the transmitter signal levels may be high enough to raise the noise level of your receiver. You may be able to detect the presence of a direct spread system with a panoramic adaptor or spectrum analyzer. This would look like a noise "hump" -- perhaps a megaHertz wide -- on the display. If you're contending with a frequency hopper, look for occasionally recurrent spikes on the display and try to tune to one of them with the receiver. If it's not a hybrid system you may catch a syllable before it hops away from you.

Remember: these systems are designed to avoid detection and demodulation; unless you already know the long and complicated spreading sequence you won't crack the transmission. A real challenge for amateur crypto-analysts!

Despite difficulties in receiving them, spread spectrum communications are here to stay. Whether frequency-hopping, direct spread, or hybrid system, the noise immunity and low profile of these transmissions continue to attract more users. And we, as monitors, will continue to seek ways to hear what they're up to!

Reference: R.C. Dixon, Spread Spectrum Systems. New York: Wiley, 1976.

(Rick Ferranti is a specialist in VHF/UHF measurement and cryptanalysis. He is presently completing his technical training at M.I.T.).

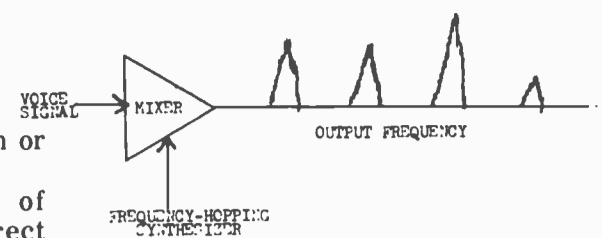


FIGURE A: FREQUENCY HOPPING SPREAD SPECTRUM

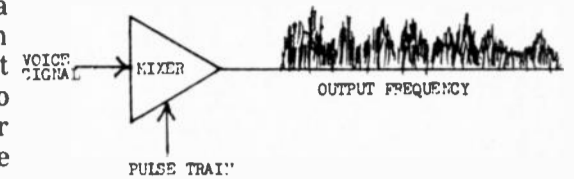


FIGURE B: DIRECT SPREAD TRANSMISSION

NOTE: Authorization has recently been extended to amateurs who wish to experiment using spread spectrum techniques. A special temporary authority (STA) has been granted to AMRAD, a research and development oriented ham club in Washington, D.C.

Four experiments are to be carried out by the group:

(1) Frequency hopping using military radio equipment in a 3-way link

(2) Frequency hopping for voice/data transmission in the 10 meter band

(3) Direct sequence spread spectrum in the 420 MHz band using amateur TV gear

(4) Moonbounce experiments in the 420 MHz band.

The signals may be hidden because authorization to intercept the signals may be made only by a "key", a random-like code or cipher.

The hams will be using frequency spreads of at least 2 MHz, thus spreading the power over a very wide bandwidth. As a result, potential interference on any one frequency is inconsequential.

With frequency hopping, channels may change 20 times a second or more; military hopping may be as often as 100 times a second! A fast binary stream ("gold code") is used to trigger the synthesizer. A receiver needs a copy of this stream to track the transmitter.

We would like to give special thanks to progressive radio amateurs like Hal Feinstein WB3KDU, chairman of the AMRAD group, for his professional dedication to the evolution of modern communications.

Interested readers may wish to contact AMRAD by writing to them at 1310 Courthouse Rd. N., Arlington, VA 22201.

New Computer Book Catalog From Hayden

Hayden Book Company (50 Essex St., Rochelle Park, NJ 07662) has released their 1982 Computer Science Catalog. Interested readers may request a copy by writing direct, or by calling 1-800-631-0856.

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New From The Publishers



While the Grove bookstore does not yet stock the following titles, we thought that our readers would be interested in some recent publications from TAB Books (Blue Ridge Summit, PA 17214), McGraw Hill (1221 Avenue of the Americas, New York, NY 10020) and Radio Shack (available locally).

HOW TO BUY AND CONVERT SURPLUS ELECTRONIC EQUIPMENT by Mark S. Starin (TAB 1388, 480 pp., 5 1/4" x 8 1/4" hardback, \$23.95)

It has been at least 20 years since the editors of CQ Magazine put together their popular surplus conversion handbooks, and no one—until now—has taken on the job.

Starin has chosen for his projects several of the most popular surplus radios currently on the market: AN/TRC-77 receiver-transmitter, AN/GRC-9 receiver, AN/PRC-6 transceiver, AN/FRR-36 receiver, RT-66/67/68/69/70 receiver-transmitters and even the Motorola H-series handie-talkies.

An introductory chapter suggests sources of surplus gear and briefly describes ancillary surplus test equipment available for repair and alignment.

A chapter on antennas provides instructions on building appropriate skywires, dipoles, vertical radiators and dummy loads as well as a transmatch.

All projects are meticulously detailed and lavishly illustrated for the home experimenter who wishes to try his hand at refurbishing for use several fine pieces of surplus gear now being sold at a fraction of their original costs.

AMATEUR RADIO THEORY AND PRACTICE by Robert L. Shrader W6BNB (McGraw Hill, 340 pp., 7 1/4" x 9 1/4")

Intended for the serious hobbyist who wishes to pursue an amateur radio license, Shrader's book progresses from basic introductory theory and practice all the way through more advanced information. At the close of each chapter, a series of questions and answers provide a handy checklist of progress.

Judicious students of this text should glean considerable insight into amateur radio in preparation for Novice, Technician, General, Advanced and even Extra class licenses. Subjects are keyed to reveal which classes of licenses are covered by the material being presented.

The book is not a crash course for immediate licensing; rather, it contains meaty material intended for digestion by the serious

hobbyist who takes pride in learning the basics about radio communications.

Virtually every aspect of amateur communications theory is examined, replete with illustrations. Components, antennas, receivers and transmitters, digital circuitry, advanced systems, interference, learning the code, rules and regulations, even a valuable appendix of data tables and graphs is included.

A compact, yet information-packed, guide.

ELECTRONIC ENGINEERS' HANDBOOK by Donald G. Fink and Donald Christiansen (McGraw Hill, 2253 pp., 6 1/2" x 9 1/2" hardbound, \$75)

Intended for the professional electronics engineer, this new second edition of the handbook is an awesome collection of valuable data, circuit design parameters, component engineering considerations, and systems and applications.

Also covered in comprehensive detail are data processing, telecommunications, sound reproduction and recording, radar and electronic navigation, data processing and computers, even visible and near-visible light sources.

The handbook evolves through four major realms of electronics: Principles Employed in Electronics Engineering (particle theory, steady-state phenomena, human engineering, units, symbols, formulas, principles); **MATERIALS, DEVICES, COMPONENTS AND ASSEMBLIES** (materials and properties, discrete and integrated components, UHF/microwave devices, transducers and sensors); **ELECTRONIC CIRCUITS AND FUNCTIONS** (filters, attenuators, amplifiers, oscillators, modulators, demodulators, converters, waveform generation, measurements and control, antennas and wave propagation); and **ELECTRONICS SYSTEMS AND APPLICATIONS** (broadcasting and recording, fixed/mobile telecommunications, data, radionavigation, bioelectronics, reliability).

This exhaustive compendium is an invaluable asset as a reference tool for any electrical or electronic engineer, and provides deep insight into electronics for the serious hobbyist.

ELECTRONIC COMMUNICATION by Robert L. Shrader (McGraw Hill, 801 pp., 7 1/2" x 9 1/2", hardback)

This fourth edition of a classic textbook covering all phases of electronic communication continues in the tradition of educational excellence from McGraw Hill.

Intended for classroom instruction at the community college or technical school level, the language is within the grasp of high school students as well.

Shrader's work is divided into 35 chapters, conveniently grouped by topic: DC and AC theory, inductance and capacitance, vacuum tube and semiconductor

theory, measurement, oscillators and amplifiers, receivers and transmitters, modulation, antennas, power generation, broadcasting, radionavigation, digital circuitry, licenses and laws, even amateur radio -- all are treated in meticulous detail.

Because it is a textbook, Electronic Communication is copiously illustrated; each section closes with a list of questions to test the understanding of the student for the material previously covered. Major chapters conclude with a list of typical questions encountered on an FCC commercial radiotelephone examination related to the topics in that chapter. Typical amateur radio exam questions are included in an addendum at the end of the book.

Appendices include standard component values, trig tables, log tables, emission designators and a list of Q signals commonly used for CW communications.

A special addendum clusters amateur radio examination questions, indicating page numbers on which the answers may be found. An extensive alphabetized index is included.

For formal instruction, Electronic Communication is a textbook well worth serious consideration.

MODERN DICTIONARY OF ELECTRONICS by Rudolf F. Graf (Radio Shack 62-2310, 832 pp., 5 1/2" x 8 1/2", \$8.95.)

It has been ten years since the immensely popular fourth edition of Radio Shack's dictionary was published. Now, the enlarged fifth edition has been released.

Containing nearly 20,000 entries, the new edition is a fountain of concise information. From abampere to zoom lens, absolute

digital position transducer to zero transmission-level reference point, the dictionary is a handy, quick reference for definitions.

The final pages of the compendium include tables of units and equivalents, schematic symbols and even the Greek alphabet with its symbolic applications.

MICROCOMPUTER DICTIONARY by Charles J. Sippi (Radio Shack 62-2311, 606 pp., 5 1/2" x 8 1/2" \$7.95)

Timed for release along with the Modern Dictionary of Electronics (described above), the new Microcomputer Dictionary couldn't have come at a better time.

With computer language spewing out of digital factories with the speed of light, most of sentient civilization is staggering under the burden of unfamiliar vocabulary.

More than 5000 terms and definitions are included in this new release from Radio Shack. Language of definitions is written in easy-to-understand vocabulary; the Microcomputer Dictionary would make an excellent addition to a high school library shelf.

Unlike the companion electronics dictionary, the Microcomputer Dictionary contains an extensive appendix -- a minicourse -- on microprocessors and microcomputers. Surprisingly, only one of the illustrations is of Radio Shack merchandise, a fact which lends a great deal to the credibility of the publication.

Far from a commercial ploy, the new Microcomputer Dictionary is a serious entry into the world of technical literature for the layman.

WAYNE GREEN BOOKS

Novice License Study Guide
by Timothy M. Dantel N8RK
This book emphasizes the practical side of getting a license and putting a station on the air. Complete with information about learning Morse code, the latest FCC amateur regulations and application forms, this guide is easily the best path into the exciting world of ham radio.
SG7357 \$4.95

General License Study Guide
by Timothy M. Dantel N8RK
Learning rather than memorizing is the secret. This is not a question and answer guide that will gather dust when the FCC issues a new test. Instead, this book will be a helpful reference, useful long after a ham upgrades to General. Includes up-to-date FCC rules and an application form.
SG7358 \$6.95

The Magic of Ham Radio
by Jerry Swank WBHXR
Under various call signs, WBHXR has been heard on the ham bands since 1919. He has watched amateur radio grow from the days of Model A spark coils to an era of microprocessors and satellite communications. Drawing on his own colorful experiences and those of many other hams, Jerry has compiled this word picture of ham radio during the past six decades.
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World Repeater Atlas
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Behind the Dial
by Bob Grove
This book explains, in detail, what's going on on all the frequencies, from shortwave up to microwave, including some of the secret stations of the CIA and FBI Surveillance, station layout considerations, antenna systems, interface, and the electromagnetic spectrum are included.
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by Dr. Ralph E. Taggart WB8DQT
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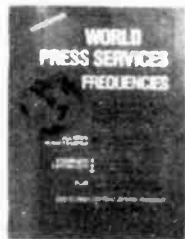
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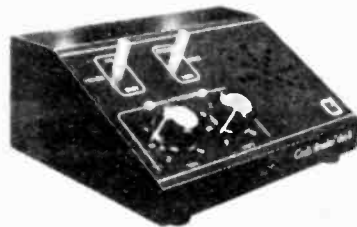
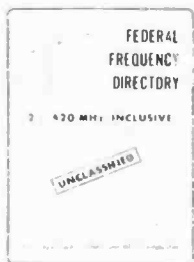
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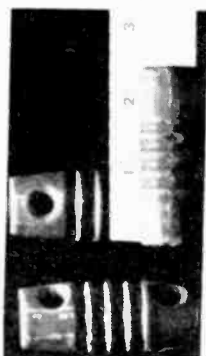
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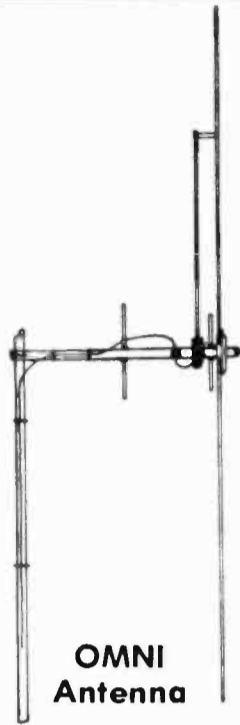
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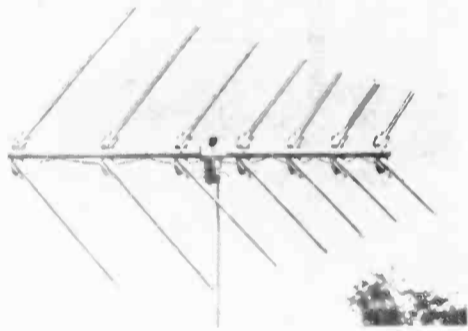
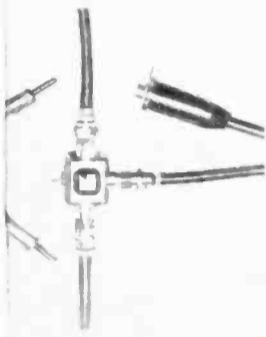
ANT-4 '69⁹⁵ With AC '77⁹⁵ plus '2⁰⁰ UPS or '5⁰⁰ USPS. The Power-Ant allows the user to "control" the level of incoming signals. Use as active antenna or antenna pre-amplifier. (Not recommended in metro area when used with external antenna). The Power-Ant gain: 25 dB on low and high band, 15 dB at UHF, 8 dB at 900 MHz! Low noise (1.8 dB nominal). Operates from 12 VDC. 2 3/4" H x 3 1/2" W x 5" D.



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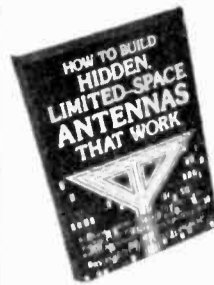
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HOW TO BUILD HIDDEN, LIMITED SPACE ANTENNAS THAT WORK, by Robert J. Traister. 308 pages, 6x9. Here's help for hams, SWLs or anyone with a receiver or transmitter, but no place for conventional antennas. Special projects for apartment and high-rise dwellers. Projects include a suspended multi-band vertical, window antenna, attic dipole; devise antennas from existing downspouts, fences, TV antennas or window screens. BOK-8 '91.



WORLD RADIO TV HANDBOOK (1982 Edition), 595 pages, 6x9. An international reputation as the standard reference for broadcast listeners. Shortwave, longwave, FM and TV stations worldwide are all listed. Schedules, frequencies, programs, languages and even musical scores of interval signals are presented. Additionally, the WRTVH provides beam headings, addresses of broadcasters, band plans, frequency allocations and articles of interest written by world-renowned authorities. BOK-3 '16⁹⁵.



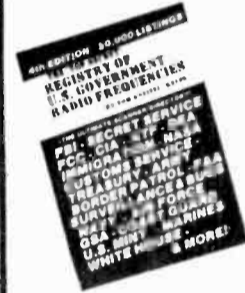
HOME-BREW HF/VHF ANTENNA HANDBOOK, by William Hood. 210 pages, 6x9. Down-to-earth talk includes everything you wanted to know about antennas: full-wave, half-wave and quarter-wave long wires, half-wave dipoles, phased and directional antennas. Dummy antennas, SWR meters, dip wave meters, impedance bridges and more! BOK-10 '63.



THE COMPLETE ACTION GUIDE TO SCANNERS & MONITORS, by Louis A. Smith II. 256 pages, 6x9. A thorough down-to-earth handbook on public service band monitoring practices and accessories. Explains frequency allocations, scramblers, speakers, antennas and more. Rules and regulations are stressed to help you understand the law. All the answers on scanners and monitors. BOK-9 '91.



HOW TO TUNE THE SECRET SHORTWAVE SPECTRUM, by Harry L. Helms. 182 pages, 6x9. If your curiosity is peaked by the subject of unusual signals, this is the book for you. Take a tour through the world's secret broadcast spectrum: pirate broadcasting, espionage, mystery beacons, long-delayed echoes, diplomatic and military channels, space communications. BOK-6 '79.



THE SECRET REGISTRY

120 Pages, 25-600 MHz. Station locations, call signs, code names, info on surveillance and "bugs", scramblers monitoring in the 1930s, pictures of federal QSL cards. Frequencies used by government contractors in aerospace, missiles, ship building, etc. BOK-11 '91.



COMMUNICATIONS MONITORING, by Robert Grove. 117 pages, 5 1/2 x 8 1/2. Written for the shortwave and scanner monitor, this best-selling book describes all facets of radio listening from VLF through UHF. Well-illustrated. Paging, telemetry, voice scrambling, bugging devices, antennas and feedline, choosing receivers and accessories, listening tips, clubs and publications, frequency allocations and more! And a special home projects section! Build your own antennas, amplifier, power supplies, receivers and converters, interference filters and more. BOK-2 '65.



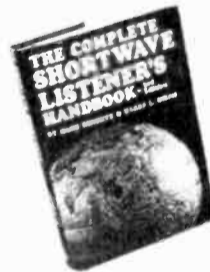
SOUNDS OF SHORTWAVE, by Robert Grove. One of our fastest-selling catalog items. This lively 60-minute cassette features dozens of off-the-air recordings of those strange sounds, finally identified for you! Recognize facsimile, teletype, multiplex, jamming, 'spy' numbers transmissions, slow-scan television, telemetry and more. BONUS! Side two features helpful advice in selecting the best receiver...suggests tests you can quickly perform to determine the quality of a receiver before you buy! Design your own antenna. TAP-1 '53.



World Wide Radioteletype Stations In Frequency Order

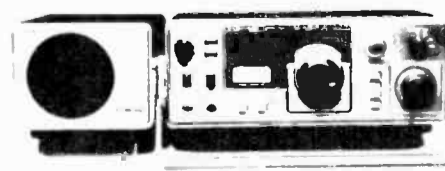
CONTAINS OVER 2000 RTTY STATIONS WITH FREQUENCIES • COUNTRY CALL SIGNS • NAME OF STATION TIMES OF RECEPTION ALL SERVICES AIR • WEATHER • GOVERNMENT PRESS SERVICES • MILITARY DIPLOMATIC

RTTY FREQUENCY GUIDE. The 7th edition of the famous LIST OF RADIO-TELETYPE STATIONS IN FREQUENCY ORDER by Joerg Kligenfuss. News agencies, weather broadcasts, military communications, embassies and telegrams. Abbreviations explained. Over 2000 frequencies, 3-30 MHz, identified by location, agency, call sign and schedule. 50 pages, 8 1/2" x 11. BOK-11 '11⁹⁵.



THE COMPLETE SHORTWAVE LISTENER'S HANDBOOK, by Bennett and Helms (2nd edition). 306 pages, 6x9. The basics of shortwave listening: receivers, antennas, frequencies, radio wave propagation, harmonics, how to keep a log book and how to prepare and send reception reports. Fascinating and rewarding reading. BOK-7 '10⁹⁵.

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Product Review...

The Fox BMP 10/60 Programmable Scanner

Low profile, the Fox scanner is a natural for mobile applications as well as inobtrusive desktop installations. A battery pack (\$39.95) is also available for portable use.

60 pre-programmed police, fire, marine and mobile telephone frequencies are factory-selected for metropolitan action. Manually-programmable and searchable ranges include 32-50, 144-174 and 420-512 MHz. Ten memory channels may be entered from these ranges.

The keyboard is of the touch-sensitivity kind; an audible "beep" verifies the receipt of a keyboard command. Frequency readout is provided by an LED display.

Audio output is two watts, giving it a slight edge over some competitive models when used in a noisy environment. A mobile mounting bracket is available for \$9.95.

Weighing in at a slight 1-1/2 pounds, the compact Fox measures 6 1/2"W x 1-5/8"Hx9"D.

Other functions include "skip" (lockout), "pause" (delay) and "action" (priority).

Sensitivity of the Fox is certainly as good as competitive units: 0.5 microvolts on low and high bands, 1.0 microvolts on UHF.

A swivel whip permits the user to customize the configuration of the built-on antenna for maximum signal interception.

Since the BMP 10/60 is Fox's first entry into the synthesized scanner market there is bound to be room for some improvements.



Our observations which we forwarded back to Fox include:

-Prominent synthesizer or multiplexer whine on many frequencies

-Erratic squelch near tight threshold

-Marine pre-programmed bank unusable due to prominent 156.800 MHz birdie and ever-present weather service broadcasts

-Can't program frequency on channel stopped during "auto" scan; must manually step through all ten channels to get back to that channel

-Squelch adjustment too slow; rotated rapidly while monitoring signal, audio will drop out, then reappear

-"Auto" (scan) always starts on channel 1; resuming scan from another channel being received not possible. Therefore if a signal is being received on channel 1, auto scan cannot be resumed

-"Step" function skips the next higher channel when pressed

-"Seek" (search) function extremely slow, approximately 1 in-

crement per second. Function requires holding key depressed, not automatic

-Large number of birdies (spurious signals) on low band

-Keyboard vocabulary non-standard: "skip"-lockout; "action"-priority; "control"-manual; "pause"-delay; "auto"-scan; "seek"-search.

In spite of the shortcomings indicated, the BMP 10/60 performed well under normal casual listening assignments. Considering the initial entries into the programmable scanners market by its competitors, The Fox is a worthy contender.

The critique offered in this review has been forwarded to Fox engineers. It will be interesting to see how seriously they are taken in the next generation of Fox products.

(Fox BMP 10/60 programmable scanner, \$349.95 from dealers or write direct: Fox Marketing, Inc., 4518 Taylorsville Rd, Dayton, OH 45424. Call toll-free (1-800-543-7892).



Fox BMP 10/60 Scanner and mini-speaker accessory

Publications Of Interest....

COMPUTERS AND AMATEUR RADIO A bimonthly tabloid, Computers and Amateur Radio is produced by Kantronics, well-known innovator of amateur and listening accessories. The inaugural issue contained an informative interview with Phil Anderson WØXI, president of Kantronics. A product display was also included.

For your sample copy, send \$.75 to Computers and Amateur Radio, 1202-E. 23rd St., Lawrence, KS 66044.

INTERNATIONAL LISTENING GUIDE The name Rob Harrington is well known among broadcast DX'ers. He is the North American representative of the informative International Listening Guide.

For a sample copy (if not sold out) of this quarterly publication, send \$1.50 to Rob Harrington, PO box 3434, Littleton, CO 80161.

REVIEW OF INTERNATIONAL BROADCASTING Glenn Hauser's expertly-written journal is one of the foremost international broadcasting publications. His program highlights provide an informative insight into short-wave listening fare.

For your sample copy, send \$5 to RIB, Box 6287, Knoxville,

TN 37914-0287.

SCHREIN'S SCANNER RADIO LISTINGS--COLUMBUS, OHIO Centered on the Columbus (and southern Ohio) area, Schrein's list comprises thousands of discrete listings for the public safety and business band users of the VHF/UHF spectrum. Also included are aircraft and federal government listings. Several ten-codes are assembled for handy reference.

A convenient alphabetical cross reference is included. Unfortunately, no address is given to order the book, published by Norman H. Schrein, Chillicothe Communications.

NEW YORK CITY METRO FREQUENCY PROFILE This second edition by Michael Esposito, of Firecom Communications is an in-depth look at VHF/UHF New York City metro users. Listings include public safety, transportation, press, aircraft, security services, marine, mobile telephone and many federal law enforcement agencies as well.

Over 600 listings on 19 8 1/2" x 11" pages. \$9 plus \$1 postage from Michael Esposito, Firecom Communications, Dept. R, PO box 61 New York, NY 10011.

LIST OF PUBLICATIONS: INTERNATIONAL TELECOMMUNICATIONS UNION (ITU) The ITU serves as an international registry of frequency allocations for broadcast and utilities stations. Copious quantities of information unavailable through normal channels are published by the ITU including master frequency lists of many agencies.

For your free catalog, write ITU General Secretariat, Sales Service, Place des Nations, CH-1211 Geneva 20, Switzerland.

MEDIA NETWORK BOOKLIST Published by Radio Netherlands, this comprehensive list of publications and tapes available to listeners is just one of the free services of the progressive Medianetwork service. For your information-packed packet, write: Jonathan Marks, Producer Medianetwork, English Section, Radio Netherland Wereldomroep, PO box 222, 1200 JG Hilversum, Holland.

SACRAMENTO COUNTY FREQUENCY OUTLINE--1982 EDITION The Sacramento, California area verily burgeons with radio activity. For scanner buffs, this spiral-bound collection of data will be a fountain of useful

information.

Public safety, news media, forestry, utilities, marine and aeronautical, even federal law enforcement frequencies are included. \$6.95 from Frequency Outline, PO box 567, Roseville, CA 95661.

**"Dits And Bits"
The W5YI Report**

While predominantly ham oriented, a semi-monthly publication by Fred Maia W5YI is worth mentioning to our readers.

Dits and Bits is a snappy, ten-page newsletter which includes all manner of fascinating tidbits from the world of radio communications. A recent issue contained articles on the drug-smuggling networks, changes in FCC license tests, the New Jersey scanner bill, pirate TV controversy, new radio control frequencies, cable TV interference restrictions and more.

For a sample copy, send \$1 to Fred Maia W5YI, PO Box 10101, Dallas, TX. 75207.

The Anti-Castro Clandestines After Alpha 66

By John Santosuosso

On Thursday evening March 25 (EST) agents of the FCC raided three homes in the Miami area which were used by the Cuban exile group Alpha 66 for clandestine broadcasts to Cuba. After discovering a transmitter in one house and a shortwave antenna in another, the FCC said each of the homeowners would be issued a notice of liability and fined \$750.00. La Voz de Alpha 66, which had been broadcasting almost nightly in the vicinity of 7040 at 9 p.m. Eastern Time, has been silent ever since.

In addition to Alpha 66, other groups in the Miami Cuban exile community made vehement protests. Among these were Brigade 2506 Bay of Pigs Veterans Association and the old established and widely respected organization, Abdala. Neither group is currently broadcasting on a regular basis, but in the past Abdala has been one of the most active in conducting a radio war against Castro, and there have been rumors that it was getting ready to do it again from a new transmitter site. Brigade 2506 has been suspected of being a sponsor of the now defunct Radio Trinchera (Radio Foxhole). Interestingly enough, although Brigade 2506 would not admit to having transmitted from American soil, the spokesman for Abdala openly declared that, like Alpha 66, his group had indeed made clandestine broadcasts from the USA.

What makes this raid of particular interest is that it appears to indicate a major change in attitude on the part of the Reagan administration toward the exile groups. When Ronald Reagan was campaigning for the Republican Presidential primary election in Florida during March of 1980, he strongly criticized the Carter administration for permitting an FCC bust of an anti-Castro station.

In reality that administration intervened to prevent the FCC from permanently closing down the operation, and it actually returned to the air the next evening. However, there was little chance that Mr. Reagan could have known that at the time. The exiles considered him a close friend, and after his inauguration they frequently made comments about having received 'the green light' from Washington. There was even talk about some of the groups possibly being involved in a Washington-sponsored plot to overthrow the Castro regime.

So why the apparent change? There is no way to know for certain. However, there are several possibilities. It is no secret that Alpha 66 was considered "uncooperative" by some of the other exile groups. They also complained about some of the information it released to the press.

While protesting the closing of La Voz de Alpha 66, some rival groups may have actually welcomed it as a move which would foster cooperation and security in the future. This does not mean that they encouraged or participated in the bust but only that they did nothing to discourage or prevent it.

Another possibility is that the Reagan forces may have seen this as a way to avoid a serious conflict with Castro. The Cuban government has threatened to put a number of high-powered transmitters on the medium wave band, including two 500 kilowatt. Rumor has it that those two may have been designed in a manner to deliberately cause interference over a number of frequencies. Castro has long protested the presence of the clandestines on American soil and has even taken his case to the United Nations. He may have been on the verge of retaliation. The result would have been havoc for a number of medium wave broadcasters in Florida and the Southeast.

However, while the above is true, Castro's chief complaint has not been the exile stations. Rather it has been the present administration's plans to put a government-sponsored station, Radio Marti, on 1040 kHz with the sole purpose of broadcasting to Cuba. The administration even announced vague plans for an entire network of stations to broadcast to Central America and the Caribbean. Naturally, the Castro regime would be a frequent target of the network's programming. If Habana planned to retaliate it seems more likely that it would reserve its best punches for Radio Marti. So perhaps Reagan did not care what steps Castro might decide to take. Maybe the closing of La Voz de Alpha 66 was a warning to the exiles that Washington would be taking over the broadcasting activities in the near future and did not want any competition. In any case it seems highly unlikely that after its embarrassment in 1980 the FCC would have acted without administration approval. Perhaps no single reason, but several, are needed to explain why approval was given for the raid, including continued protests by irate South Florida amateurs who frequently complain about interference from the clandestines.

Whatever the reasons for the closing, anti-Castro broadcasts have declined considerably since it took place. In this instance what you do not hear is almost as significant as what you do manage to log. It does appear that some broadcasters at least temporarily have decided it would be best for their health to leave the air. One notable exception is La Voz de Cuba Independiente y Democratica, or La Voz del CID, as it also identifies itself.

Head of Cuba Independiente y Democratica is Comandante Huber Matos. Because of his once-close association with Castro, many of the other exile groups do not trust or like Matos, but it is

said that he has good relations with the CIA, and that may account for his organization's willingness to continue transmitting. Look for La Voz del CID programs on the approximate frequencies of 5105 and 7350 around 9 p.m. Eastern Time (most exile broadcasters observe DST). La Voz del CID's 'Musica Libre' program, which includes some music in English, is carried on 5105 as early as 8 p.m. This organization also buys time on the Dominican Radio Clarin, and you may hear its program on 11700 around 8 or 9 p.m. Eastern time. According to clandestine expert Steve Reinstein, it is also announcing transmissions on Tuesdays and Thursdays on 4980. Steve suggests that the group has purchased time on the Venezuelan Ecos del Torbes. In addition to the above, about the only other anti-Castro clandestine broadcaster which has been heard since the bust is La Juventud Progresista Cubana (The Progressive Cuban Youth), which Steve reports has been transmitting some mornings around 7 a.m. on 7000 kiloHertz. In the past this one has been a frequent evening broadcaster. Sunday afternoons are also a good time to look for it, having been heard April 11 on 6990 kiloHertz.

Despite the decline in recent activity, it may pay you to monitor the frequencies favored by the Cuban clandestines, especially those between 6980 and 7100. In the past such stations have come and gone only to return again. Washington's "light" has often flashed from green to red and then turned green once more. Nor should the exiles be considered puppets of any administration. If they feel it is essential to broadcast they will find a way. It seems most unlikely that we have heard the last from the Cuban clandestines.

CREDITS AND ODDS AND ENDS: My grateful thanks to Steve Reinstein and Havana Moon for some of the information in the above article. The theories, opinions, and errors are strictly my own. The anti-Salvadorean government clandestine Radio Venceremos continues to be active in the general vicinity of 6980 kiloHertz. Morning broadcasts may also be heard, and other frequencies are reportedly in use at times. So it may pay to look around for this one. The anti-Sandinista clandestine Radio Quince de Septiembre has recently been broadcasting evenings on the new frequency of approximately 6897 kiloHertz. An Italian pirate, Radio Pace (Pronounced pache and meaning peace) can be heard evenings after 2200 GMT on 15475 with a repeated, recorded announcement in Italian. It transmits from Verona, reportedly with 3.5 kilowatts.

John Santosuosso served as the editor of the Pirate, Numbers and Clandestines column for the Newark News Radio Club before that club's recent demise)

MT Reader Helps Coast Guard Save Lives

Jim Bazzell of Hawaii deserves congratulations. Recently, two private vessels near the Hawaiian coast lost power and were drifting out of control.

Picking up the distress signals from the vessels, Jim could tell that the Coast Guard had incorrect bearings on the two vessels.

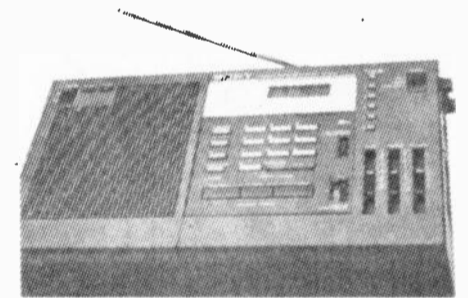
Fortunately, Jim was using a Scanner Beam and was able to take a fix on the two crafts. Notifying the Coast Guard of the proper bearings, all persons on board both vessels were rescued safely.

FCC To Allow Reduced Channel Spacing At UHF

The FCC has decided to allow "off-set" (12.5 kHz) channel spacing in the 450-470 MHz portion of the UHF land mobile band. This contrasts with the previous 25 kHz spacing formerly mandatory in that part of the spectrum.

To avoid possible interference with adjacent-channel users, power will be limited to two watts or less, and the 12.5 kHz users will be awarded secondary status on a non-interference basis.

SIRSA (Special Industrial Radio Service) users will benefit perhaps the most, now able to use the new frequencies in mining and land construction projects formerly limited in channel capacity.



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CH-5 155.670 MHz "Local"

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CH-3 154.190 MHz.
CH-4 154.620 MHz.

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156.800 MHz.

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156.300 MHz.
156.350 MHz.
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CH-2 169.350 MHz
CH-3 169.650 MHz
CH-4 169.110 MHz

NEWS MEDIA

Radio Sta. VOCM
153.990 MHz 153.530 MHz
CBS TV & Radio - 152.870 MHz.
NBC TV & FM Radio
153.290 MHz.

CN RAILROAD

161.415 MHz.

NFLD HYDRO

CH-1 168.840 MHz.
CH-2 167.430 MHz.
CH-3 166.830 MHz.

DEPT. OF FORESTRY

FOREST RANGER STA.)

CH-1 Tx 172.140 Rx 171.210
CH-2 Tx 171.210 Rx 171.210
CH-3 Tx 172.200 Rx 172.390
CH-4 Tx 172.390 Rx 172.390

TERRA NOVA TEL.

173.370 MHz.

HAM - 2M.

146.940 MHz REPTR.
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146.520 MHz DIRECT
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METROBUS)

169.440 MHz

COASTAL STATIONS

By Michael Cournoyer, Sr.
Watervliet, NY

KHz	Location
234.5	USCG Nantucket, Mass.
252	Dept. of Transport, Halifax, Nova Scotia
259	USCG Portsmouth, Va
312	High Seas Oper Miami, Fla
370	WOM Miami Radio Telecom
428	USCG San Francisco, Calif.
472	WLO Marine Radio Alabama
493.6	WOM Miami Radio FLA.
569.8	Cape Town Radio, RSA
572	New York Aeradio, NY

Contributed By
Robert Skwirsk,
Wayne, MI.

Maritime Mobile	Freq. kHz
WJG Memphis, TN	4087.8 USB
Nureonus	4141 USB
WOM Miami Radio, FL	4363.6 USB
WGK St. Louis, MO	4410.7 USB
Tugs & barges	6220 USB, 12432.2
KMB Houston, TX	6522 USB

Time Signals - VNG Lyndhurst, Australia

4500 kHz
Beacon (K) 11.154.5 kHz
Beacon (K) 14.970 KHz
Beacon (W) 15.700 kHz
Gander Aeradio, Newfoundland, Canada
56521 and 13.288

USAF

Shaw AFB, SC - Callsign:
Fireside 3 5703 kHz USB
SAC: 6761, 9027, 8989, 8993,
11226, 13241, 15041

International Broadcasting stations
recently logged by Hank Lucas, Plain-
view, NY.

STATION	FREQ. kHz	TIME E.S.T.
Radio Netherlands	9715	05:30
BBC	11860, 9410	06:30
Kol Israel	9015	01:00
Spain	9630	01:15
Radio Sweden	21615	14:00
Radio Moscow	9685	02:30
Cuba	9525	06:30
Egypt	9475	02:00
West Germany	6085, 9545	
Radio Japan	17825	01:30
Radio Australia	17795	02:30
Vietnam	10040	20:30
Radio Finland	21475	14:30
Portugal	11225	
South Korea	15575	
Nigeria	15120	
North Korea	9977	
Bonaire	9755	
Vatican	6015	
Norway	11850	
Peking (China)	15120	
Turkey	7215	
Brazil	17830	02:00
Radio Ada Dhabi	11755	03:30
Voice of Free China	5985	03:00
Uganda	15325	03:00

PORTLAND, MAINE

Frequencies (MHz)
Contributed by Dave Mellen

PORTLAND P.D.

155.490 Primary
154.695 Statewide (Car to Car)
155.535 County Net (Mutual Aid)

PORTLAND FIRE

154.205 Primary
154.190 County Fire Control
154.310 State Fire (Statewide
Mutual Aid)

MEDCO (RESCUE)

155.175

PORTLAND METRO (BUSES)

453.875

PORTLAND PUBLIC WORKS

159.975

PORTLAND WATER DISTRICT

48.180

PORTLAND JET PORT

119.750 Approach
128.200 Approach/Depart
118.150 Departure
121.900 Ground
120.900 Tower
123.000 Unicom

CUMBERLAND COUNTY SHERIFF

155.625 Primary
154.875 Alternate (Mobile)
154.695 Statewide (Car to car)
155.535 State Net
39.620 Statewide Sheriff Low Band
Detectives Administration Only
39.540 Alternate

LOCAL TAXIS

152.450

LOCAL HOSPITALS

155.325

TRAINS

160.620
161.250
161.205

CIVIL DEFENSE (MAINE)

45.640
45.560

MAINE STATE POLICE

154.695 Statewide
154.665 Zone 1
154.935 Car to Car

GAME WARDENS

155.730

FORESTRY

159.450
159.330

AAA AUTO CLUB

150.935

CIVIL AIR PATROL

148.150
143.750
143.900

AMATEUR RADIO

146.880
147.060
146.700
146.355
146.985
146.880

MOBILE PHONE

152.630
152.750
152.810
152.570
152.600
152.030
152.090
152.060
152.720

RADIO PAGING

152.150
152.240

REPORTERS

173.225
453.000

STATE FIRE MARSHALLS

453.700

BUENOS AIRES, ARGENTINA

Contributed By
Jorge Eduardo Cattaneo

RADIO PAGING**

148.055 148.355 148.475
148.995 149.435 149.555
149.675

CAR EMERGENCY

148.555 Remolques Libertad
149.215, 153.055, 153.395 - Automobile
Club of Argentina

PUBLIC SERVICE

159.785 RPT, 160.085 RPT - CIPEC
(Centro Informacion Permanente
Emergencias y Catastrofes) - Municipali-
ty Ambulances.
160.330 RPT, 161.940 RPT - PAMI
(Proteccion Asistencia Medica Integral) -
Medical Assistance for retired persons.

MAINTENANCE

154.075-154.315 - (Gas escape)
165.095 Electricity
168.055 RPT (162.055 input)
168.955 RPT (162.955 input)
MANLIBA (Mantenga Limpia Buenos
Aires)

RADIO & TV MOBILE UNITS

150.975-LS4 R. Continental
157.795, 162.655 LS5 R. Rivadavia
151.195-TV Ch. 11, LS84
162.210, 162.910 TV Ch. 7, LS82
163.735-TV Ch. 9, LS83

NEWSPAPERS

163.050-163.075
(Editorial-reporters mobiles)

NEWS AGENCY

161.170 (Central and reporters
mobiles)

PREFECTURA NAVAL

154.435 Circulars and Meteorologic.
154.465 Prefectura Buenos Aires.

POLICE

151.675 RPT Seguridad Metropolitana
(RTTY and Phone circulars)
153.535 Policia Federal, Dept. Central
(Transit Control-Motorcycles)

154.675 Policia Federal, Dept. Central
(Patrols)
154.615 Local Frequency between
patrols.
155.575 Policia Federal, Dept. Central
(RTTY and Phone circulars)
158.315 Policia Federal, Dept. Central
(Commissaries)
158.915 RPT Policia Provincia de
Buenos Aires.
164.215 Central Radioelectrica.

444.100(+5MHz) HAM
454.025/454.075/454.100/454.125/454.175-
(all +5MHz) Govt. Mobile Telephone.
457.775/457.875 Prefectura Naval
Mobile Telephone.

AIRCRAFT - Buenos Aires

118.3 Aeroparque Metropolitano
(Tower)
118.5 Aerodromo Moron
118.7 Aerodromo Don Torcuato
118.9 Aerodromo Palomar
119.1 Ezeiza, Aeropuerto Internacional
(Approach)
119.3 La Plata
119.7 Aerodromo Moreno
120.0 Air to Air Comm.
121.7 Ezeiza (Ground Control)
121.9 Aeroparque (Ground Control)
123.9 Ezeiza (Baires Control, radar
South)
125.3 Ezeiza (Baires Control, radar
North)
125.6 Ezeiza (Alternative 8826 kHz)
131.2 Coordination
131.8 Aeroparque, operaciones.

MILITARY AIRCRAFT

SHAW AFB
MYRTLE BEACH AFB, N.C.
Contributed by Rick Tharrington
Wilmington, N.C.

32.450 - Shaw/Myrtle - Air
34.200 - Myrtle - Air
34.600 - Myrtle - Air
36.450 - Myrtle - Air
36.800 - Myrtle - Air
41.90 - Shaw - Ground to Air
38.700 - Myrtle
40.550 - Myrtle - Air
41.700 - Myrtle - Air
46.650 - Myrtle - Air
46.850 - Shaw
46.950 - Myrtle - Air
49.750 - Myrtle - Air
49.850 - Shaw - Air
49.900 - Myrtle - Air
49.950 - Shaw - Air
156.300 - Atlantic - Air
118.850 - Shaw - Air Ground
119.200 - Myrtle - Air Ground
119.350 - Cherry Pt. - Air Ground
119.500 - Bogue - Air Ground
119.700 - Shaw/Symjhnsn - Air Ground
120.000 - N. River - Air Ground
120.050 - Myrtle - Air Ground
120.150 - Cherry Pt.
120.800 - Ft. Brags
121.050 - Shaw
34.150 - McEntire, S.C.

**EDMONTON, ALBERTA
FIRE DEPARTMENT**

Ch	Frequency		Use
	Base	Mobile	
1	413.1125	418.1125	Northern dispatch
2	413.1625	418.1625	Southern dispatch
3	413.7875	418.7875	Tactical
4	413.8375	418.8375	Tactical
5	413.8625	418.8625	Tactical
6	413.9625	418.9625	Tactical

LAS VEGAS CASINOS

Jockey Club	31.040
Mint Hotel	31.240
Riviera Hotel	151.745
Circus-Circus Hotel	151.925
Aladdin Hotel	154.515
Hilton Hotel	154.540
Aladdin Hotel	154.570
Flamingo Hotel	461.325
Landmark Hotel	461.550
Caesar's Palace	461.950
Golden Nugget Hotel	462.000
Sands Hotel	462.050
MGM	462.825
Sands Hotel	462.900
Aladdin Casino	462.925
Hilton Hotel	463.325

LISTENERS LOG

(CONTINUED)

Hilton Hotel	463.375
Silver Slipper	463.775
Sahara Hotel	464.525
Dunes Hotel	464.625
Stardust Hotel	464.725
Maxim Hotel	464.850
Landmark Hotel	465.000

CONNECTICUT STATEWIDE
Contributed by Allan Nesternuk,
Ansonia, CT

CIVIL DEFENSE

33.87
33.78

FORESTRY

44.68
44.72
44.76
44.92

BOARD OF EDUCATION

Greenwich	158.94
Stamford	45.32
Fairfield	155.025
Stratford	155.865

UTILITIES

United Illuminating	48.26, 48.36, 48.46
S. Conn. Gas	153.53
Noroton Water	153.56
Greenwich Gas	37.56
Conn. Light & Power	37.80
Bridgeport Water	48.18

BUS COMPANY

Dunn Bus Co.	155.175
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AMATEUR REPEATERS

2 M out	147.175
Bridgeport	146.895
New Fairfield	147.12
Norwalk	147.39
Stamford	146.655

RAILROAD

Amtrac Frt. Switchers	161.070
Metropolitan	161.28
Penn Central	160.98, 161.07, 13/.16
Providence & Worcester	161.10
Grand Trunk	161.04

TAXI COMPANIES

Bridgeport Yellow Cab	152.270
City Cab Co. Bridgeport	152.33
City Cab of Milford	152.36
Darien Taxi & Trucking	152.27
Davenport Taxi Stamford	152.45
Fred's Taxi Service Milford	152.45
Greenwich Taxi	152.33
Hickey Cab Co. Bridgeport	152.39
New Canaan Taxi	152.42
Royal Cab Co. Ansonia	152.33
Stamford Transit	152.39
Stamford Transit Greenwich	152.39
Star Taxi Co. Bridgeport	152.45
Teddy's Westport Taxi	
Westport	152.27
Wilton Taxi	152.45
Metropolitan	161.28

MISCELLANEOUS

State Correction Dept.	154.86
University of Bridgeport	151.865
United Aircraft Crash Crew	153.38

Radio Shack Gets Bearcat Patent Rights

Electra Company, manufacturer of Bearcat scanning receivers, has granted Tandy Corporation, the giant magnate which owns Radio Shack, the right to use basic Electra patents.

Electra introduced the first scanning receiver to the consumer market in 1968. An advanced microprocessor-controlled scanning circuit invented by Electra's William Baker, coupled with frequency-synthesized scanning, are the main contenders in the patent awards.

It should be interesting to see what new concepts develop now that these two arch-rivals share basic circuitry.

TECHNICAL TOPICS

Q. Where can I get a schematic diagram or instruction manual for an old Hallicrafters SX-99 I picked up at an auction? (F.B., Grafton, OH)

A. Try Don Erickson at the Century Print Shop, 6059 Essex St., Riverside, CA 92504-1599 (see related article elsewhere in this issue).

Q. Every time the CB'er in the adjacent apartment keys her mike, I hear her voice coming through every frequency on my Panasonic RF-2900 receiver. Choice of receiving antenna makes no difference and her rig is properly installed and filtered. What gives? (Peter R., Buffalo, NY)

A. Sounds like a classical case of audio rectification. Your receiver has a plastic cabinet and is vulnerable to saturation from loud signals. Have you tried grounding the receiver? You may wish to try an in-line CB interference trap with your external antenna. If all else fails, try a shunt capacitor from the volume control (clockwise soldering lug) to ground. It may be just as accessible (or more effective) to place the shunt capacitor from base to ground or collector to ground (or both) on the audio preamplifier transistor as shown in figure 1:

Q. Would a Grove Enterprises Power-Ant or an audio filter be the better choice as an accessory for my Panasonic RF-2800 short-wave multiband radio? (Walter W., APO NY)

A. I would definitely opt for the audio filter. It will reduce or eliminate heterodyne interference from adjacent-freq. **A.** Always use a cable with foam dielectric, clearly designated as "low loss" cable. RG-8/U is the best, although the cable vended by a prominent hobby chain is a poor choice. Stick with a well-known brand like Belden (and others). Make sure that it has plenty of copper braid so that it is difficult to see the inner insulation through it. Next to RG-8/U, RG-59/U (home TV coax) low-loss form is a good choice, as is RG-6/U (cable TV coax). Be sure it is easy to affix the appropriate connectors before you buy. Do not be concerned with impedance; either 50 or 72 (75) ohm cable will work just fine. No scanner, and no antenna presents a constant 50 ohm impedance throughout its usable frequency range.

Do not use RG-58/U for any purpose other than short patch cords; it is extremely lossy at VHF and even worse at UHF.

Q. Rather than a question, I have a suggestion for a product: a plug-in adaptor for crystal scanners that would allow the use of additional crystals for more channels. It would plug into an internal crystal socket and have a switch to select external crystals. Possible? (Vernon H., Bronx, NY)

A. An excellent idea, Vernon. What do our readers think? Would you buy it?

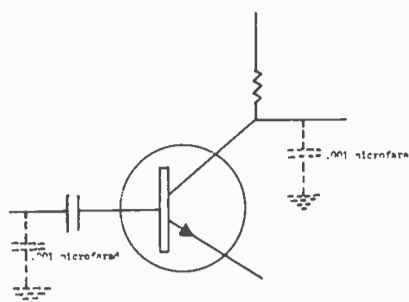


FIGURE 1: SHUNT CAPACITOR ADDED TO AUDIO PREAMPLIFIER TRANSISTOR TO FILTER OUT AUDIO INTERFERENCE FROM NEARBY CB'S

Q. How can I mount two CB or scanner antennas on the same mast without interference to one another? (Calvin C. Davis, CA)

A. Simply mount one above the other. As a rule of thumb, it is best to separate them by at least ¼ wavelength to avoid interaction when operated on the same frequency. From a practical **Q.** Why don't manufacturers install S-meters on their scanners?

A. Good question. Probably because scanners were originally intended for lowcost hobby use, and an S-meter is a sizable cost factor. There is no technical problem with designing one in.

Q. Why are there no scanner receivers which cover the entire 1-1000 MHz range? (Gene B., Chester, VA)

A. Different circuit layouts, choice of component values and design approaches are required for different portions of the radio spectrum. Consequently, scanner manufacturers traditionally chose the three most active (and sought-after) frequency ranges for their research and development efforts. Multi-band scanners automatically switch among completely different front end (RF) stages when they change ranges.

Q. Can I use my CB ground plane antenna for scanner reception?

A. Yes, for low band only. Simply reduce all element lengths 36% (multiply the present lengths by .64). CB beam antennas may be similarly refurbished, but the spacings between the elements will have to be proportionately reduced as well.

Q. I notice that some accessories marked to operate on 12 volts work best when my AC adaptor is set at 9 volts. How come?

A. AC adaptors are not voltage regulated. Typically, under low current drain, a 12 volt adaptor may be putting out 16-18 volts; a 9 volt adaptor, 12 volts. For this reason it is often beneficial to switch to lower ranges when using a selectable-voltage adaptor.

Q. Does anyone have a list of those states which do not permit scanners in automobiles? (Jack Ross, 646 5th St., Wyandotte, MI, 48192).

Jack also pointed out that Michigan is one of those states. Has any of our readers and up-to-date list of states forbidding mobile scanners? Monitoring Times would also appreciate a copy to publish for our readers!

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HF Broadcasting Via Satellite

By Robert Horvitz

The Reagan administration has formed a multi-agency task force to study the possibility of launching a Direct Broadcasting Satellite (DBS) to serve the Voice of America, Radio Free Europe/Radio Liberty, and possibly other nations engaged in international broadcasting. Testimony on this subject was heard last October 23rd by the House Subcommittee on Government Information and Individual Rights. Several experts estimated that a minimum of 6 years would be required to develop an international DBS system, and major political and technical obstacles would have to be overcome in the meantime.

Thomas F. Rogers, who, in his own words, "was responsible for the overall design, development and deployment of the first global satellite communications system" while working for the Defense Department, has spent most of the past year and a half studying and promoting the idea of a high frequency DBS system for international audio broadcasting among increasingly-receptive government agencies. He was apparently inspired by an article published in 1978 by two BBC engineers, which asserted that although the new 26-MHz band for international broadcasting was only marginally useful to terrestrial stations because of poor ionospheric reflection, a transmitter orbiting above the ionosphere could use

this band effectively nearly all of the time.

"If a conventional HF receiver with a 5-kHz bandwidth were used, a 39-dB signal-to-noise ratio could be achieved with a geostationary satellite having a transmitter power of 5 kW. The same result could be achieved with a transmitter power of 1.5 kW. The same result could be achieved with a transmitter power of 1.5 kW if a satellite in an 8-hour orbit were used."

Adding further impetus, the General Accounting Office recommended last March that RFE/RL study the possibility of using satellites to beam their programs into the Soviet Union and Eastern Europe. According to George Jacobs, former Director of Engineering for RFE/RL, this idea was taken to James Buckley, the Under Secretary of State for Security Assistance. Buckley's Senior Science Advisor, William Salmon, testified that "Under Secretary Buckley raised this issue at the July meeting of the Interagency Group on International Communication and Information Policy. The Group agreed to creating an interagency team to make a review of the possible use of DBS by the US for international broadcasting. The International DBS Panel will proceed in three major areas of study. The first concerns the identification of potential US requirements and objectives, to be led by ICA/VOA. NASA will take the lead in the second study area, which deals with

the technical and financial aspects. The third area of study, coordinated by State, will deal with the international policy implications..."

William Conkling, VOA's new Director, added that "we are encouraging also Armed Forces Radio and Television Service (AFRTS) to join with us in these further negotiations."

Most previous discussions of DBS systems had focussed on the use of the super high frequency band, 3-30 GHz. But the 1977 WARC for Broadcasting-Satellites adopted the rules that preclude the use of this band by any nation to broadcast into the territory of any other nation in Europe, Asia or Africa. The HF band, however, has long been used for international broadcasting, without even requiring that the sending nation get permission from the "target" nation. It is possible, then, that less controversy would be aroused by offering an already-existing service, in an already-used band, by means of a satellite, than by attempting to get a new service allocation in a higher band.

HF has other appeals. Perhaps most important, millions of existing shortwave receivers would be capable of tuning an HF/DBS signal, without even a special antenna. Also, the 25.6-26.1 MHz band is currently underutilized, so a satellite would not interfere with many terrestrial stations.

However, George Jacobs presented a list of serious obstacles to the creation of an HF/DBS system: "There appears to be state-of-the-art limitations in space-borne power supplies, radio frequency generation devices, and antenna configurations which could substantially curtail or constrain technological development, unless very substantial funds and resources are made available in an attempt to solve these novel problems. The satellite would likely have to be extremely heavy, heavier than anything we have launched into space for communications up until now. The cost for construction, launch into orbit, and annual operating costs would require an initial congressional appropriation roughly on the order of \$300 to \$500 million, and possibly considerably more. With an expected life of from 3 to 5 years, this amount would have to be appropriated on a periodic basis. The satellite cost would thus be...nearly five times as great as terrestrial transmission costs at the present time."

Thomas Rogers' answer to the problems of high costs and political controversy is ingenious, even revolutionary. He proposes that the satellite be developed as "an international common carrier for international audio broadcasting... I don't want to overstress this—but I do think there are ways by which obtaining this capacity can be approached in which the United States doesn't

just go it alone, but embraces the interests...and desires of a large number of countries as well. My understanding is that there are over 100 countries broadcasting internationally on HF, and if we...encourage the widest participation of international interests in it, this would reduce the likelihood of its disruption at least somewhat, and probably to a great extent. The experience of the Intelsat space communications system/service is instructive and encouraging in this regard... If one imagines, for the moment, using all 50 channels in the 26-MHz region for satellite audio broadcast communications, the cost per channel would come down markedly. I am working on a paper right now that indicates...(that) if we are able to imagine a system that would effectively replace the present country-by-country retail, if I may, transmission plant by an international wholesale transmission plant, I would not be surprised if we could see the basic cost per audio channel, per million square miles of selectable service area, per year being commensurate with the cost of owning and operating the technical plant of a local high-powered AM station, perhaps, roughly, a few hundred thousand dollars a year."

The witnesses who reported to the Subcommittee on October 23rd indicated that preliminary findings of the International DBS Panel might be available by mid-1982.



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RADIO NEDERLAND

Radio Netherlands Inaugurates Computer Experiment

On January 28th, 1982, Radio Netherlands carried the second phase in a series of tests involving home computers. The popular Commodore PET, Sinclair ZX-81 and Atari terminals were chosen for this experiment.

Judging from initial results of the first experiment performed a few months earlier, best results are obtained from receivers within one "hop" of the rebounding shortwave skip wave. Tone frequencies chosen for the interface as well as baud rate also seem to be critical.

Apparently, phase distortion produced by multipath can cause destructive interference to the digital bit rate, resulting in rejection of data by many computers.

The programs transmitted during the tests included a sunrise/sunset computation and a range/bearing calculation. A free copy of the programs is included in an informative booklet available from Jonathan Marks, Producer of Media Network, *Radio Netherland*, PO Box 222, 1200 JG Hilversum, The Netherlands.

New Air To Ground Telephone System

Western Union is pioneering the amplitude compandered sideband technology (ACSB) with a new microwave air-to-ground radiotelephone system.

Using 899-901 MHz downlink and 944-946 MHz uplink, final testing of the new system is expected to be concluded this summer.

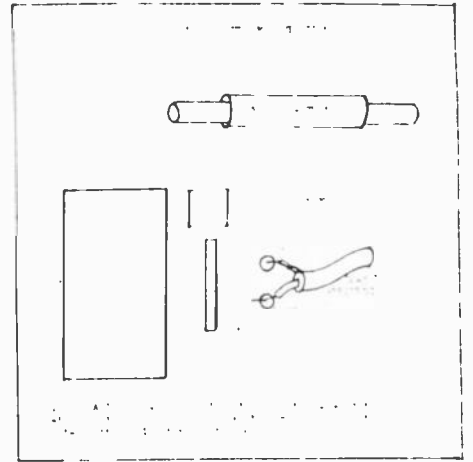
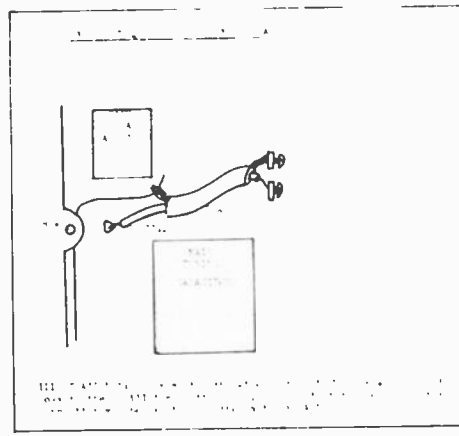
Twenty-four aircraft are equipped at present from American Airlines and Republic Airlines. Pan American, United, TransWorld, Continental, Altair, Northwest Orient, Air One, Delta, Braniff and Eastern have signed to follow.

CABLE TV THREAT TO AERO NAVIGATION

The FCC has recently amended its rules to require cable television companies to obtain formal authorization before using frequencies in the 108-136 and 225-400 MHz bands.

It is common for cable TV systems to use a wide array of VHF bands to distribute programs to home subscribers, converting the incoming frequency bands back to standard TV channels at the user's sets.

The recent ruling came in light of several appeals to the Commission regarding the safety of airborne instrumentation and communications due to leakage of CATV signals from the extensive cable network.



Frequency Readouts For Inexpensive Receivers

Reader David O'Neil (4241 Centurian Circle, Greenacres, FL 33463) has suggested hooking up a frequency counter to an inexpensive receiver for more accurate frequency readout.

John's favorite radios for this project are both from Radio Shack: the perennial CB-60 (now on clearance) and the newer DX-200 other similar radios should work.

As for frequency counters, John recommends an inexpensive kit such as the CT-90 from Ramsey Electronics (2575 Baird Rd, Penfield, NY 14526), selling for \$110-\$130 wired plus shipping at this writing.

Keep in mind that the oscillator of a receiver (to which the counter is connected) is not on the same frequency as the received signal. That frequency will be displaced by the IF (intermediate frequency).

In the case of the DX-200 and similar receivers with an IF of 455 kHz, that frequency must be subtracted from the received frequency. For example, if the

digital display is showing 1655 kHz, you would actually be monitoring a 1200 kHz signal.

A similar process is used in computing VHF or UHF frequencies with a frequency counter. If the IF of the receiver is 10.7 MHz, that amount must be subtracted from the display. Thus, a 42.56 MHz police signal will actually read 53.26 MHz on a frequency counter attached to the receiver's oscillator.

Remember, you must choose a frequency counter capable of responding to a signal at the highest frequency of interest. You could not use a 100 MHz counter with a UHF receiver!

The two illustrations shown here will help you understand better the technique of tapping into the receiver's oscillator.

Notice To International Broadcasting

MONITORING TIMES readers would like to learn more of your services. We would be delighted to publish in-depth, behind-the-scenes looks at your broadcasting stations. Please send glossy photos and copy which you would like to see on the pages of MONITORING TIMES. We are pleased to provide this service to you and to our readers.

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Radio Monitoring Without Going Broke

By Jack McLaughlin
Vernon, N.J.

There are many people that would enjoy monitoring the various radio frequencies were it not for the impression that to be successful your equipment must be expensive. I have been involved in radio monitoring for just over a year and a half and found that this is not necessarily the case. Of course I dream of owning one of the top of the line programmable scanners and a 500 dollar plus general coverage receiver. In these times of inflation, it is difficult for the average family member to spend \$1000 or more on a hobby.

I became interested in hobby radio with a \$39.95 Citizen's Band mobile transceiver. Soon a Multi-band VHF/UHF portable receiver was added for \$50 and a Base C.B. for \$80. Then came a general coverage receiver from Radio Shack. A multi-band trap antenna was constructed from an article in *Popular Electronics* with wire that was given to me. I added a 100' long wire antenna and a matcher that was built from plans found in

Communications Monitoring by Bob Grove. The parts were taken from a discarded TV set. My total expenditure to date is less than that of a medium-priced general coverage receiver!

One might think that with this kind of equipment, my success would be quite limited. On the contrary, I have been very successful. I have identified over 30 shortwave broadcast stations in more than 25 countries, numerous amateur stations and several other utility stations. The 2 meter amateur band is regularly monitored on the multi-band portable as is the VHF aero band. Broadcast band QSL's are displayed from 45 stations in 28 states and 5 countries. Most of all, I have become fascinated with radio of all kinds and find monitoring enjoyable and relaxing.

Someday a Kenwood R-1000 will turn up at my monitoring post as will a Bearcat BC-350. Until then my modest equipment will have to suffice...but I won't be without the excitement, drama and pure joy of radio monitoring.

Operation Tiburon Concluded By DEA

A successful anti-smuggling campaign against South and Central American marijuana traffickers has concluded, according to a report from the Drug Enforcement Administration of the Department of Justice.

**Century Print Shop:
If It Was Ever Printed,
You'll Find It Here!**

For years, Don Erickson has been expanding his unusual service to radio hobbyists. I first learned of Don years ago when he offered to send me copies of some obscure articles which I thought no longer existed.

Since that first encounter, I have discovered that Don offers an extraordinary assortment of reference materials dealing with radio communications, including an extensive collection of Howard W. Sams Photofacts, revered among stalwart hams and radio repair shops. Sams Photofacts contain schematic diagrams, parts layouts and alignment instructions on just about anything ever made for the consumer radio field: Hallicrafters, National, Hammarlund, Gonset...all the oldies but goodies are listed in Sams.

Since I frequently receive correspondence from readers looking for such historical (hysterical?) material, I bring this unusual source of information to our readers.

For a catalog of just what Don does have to offer, write him directly at the Century Print Shop, 6059 Essex Street, Riverside, CA 92504-1599.

"Operation Tiburon", named after the Spanish word for shark, netted over six million pounds of Colombian pot, accompanied by the arrest of some 500 individuals and the confiscation of nearly 100 vessels.

The street value of the contraband was estimated to be some 4 billion dollars.

The net tightened around the illicit smugglers, aided by an extensive communications network involving DEA, Customs and the US Coast Guard. Many local and state law enforcement agencies helped as well.

U.S. Attorney General William French Smith admitted that the US and Colombia are cooperating to strengthen efforts to combat the enormous smuggling network. Nearly 200 more agents from the FBI, Customs and DEA have been added to thwart the illicit traffic in Florida.

BORDER PATROL ASSISTED BY "LEAKY COAX"

A new system of intrusion alarm is being tested in the US southwest borders by the Immigration and Naturalization Service (Border Patrol).

Two ported coaxial cables are buried just beneath the ground, setting up a radio frequency field overhead. If the balanced field is disrupted by someone stepping through it, an alarm alerts the monitoring office.

The system was developed jointly by the US Air Force and the Canadian government.

FOR SALE

SP-600/JX general coverage receiver in good condition. Any reasonable offer. Glen Card, 602 W. Highland Drive, Middlebury, IN 46540.

Realistic 16-channel microprocessor scanner. Range: 30-50, 144-174 and 420-512 MHz. Excellent condition. Cost \$400 in the store; yours for only \$300. Call: Chip Coon (704) 542-9399 or write: 4213 Oldfield Rd., Charlotte, NC 28211.

WANTED

Wide range spectrum analyzer like TS 1011/UPM-84. Must be sensitive and reasonably priced. Call 704-837-2216 between 4 and 5 PM EST or write Bob Grove at Grove Enterprises.

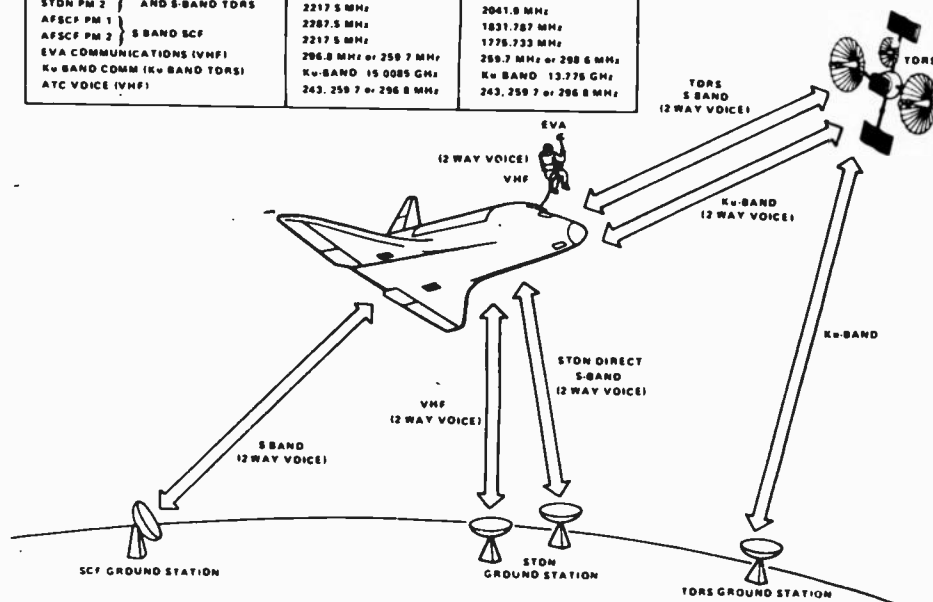
A Message To Advertisers

At the request of our readers, all future advertising will be restricted to merchandise relating specifically to communications. Prospective advertisers are invited to con-

tact our Brasstown, NC offices directly at our corporate address, or by calling 704-837-2216 9-5 EST weekdays to reserve space in the July issue.

SPACE SHUTTLE VOICE FREQUENCIES

FUNCTION/SYSTEM	ORBITER TRANSMIT	ORBITER RECEIVE	
STDN PM 1	S-BAND STON DIRECT	2207.5 MHz	2106.4 MHz
STDN PM 2	AND S-BAND TORS	2217.5 MHz	2041.8 MHz
AFSCF PM 1		2207.5 MHz	1831.787 MHz
AFSCF PM 2	S-BAND SCF	2217.5 MHz	1776.733 MHz
EVA COMMUNICATIONS (VHF)	206.8 MHz or 259.7 MHz	259.7 MHz or 206.8 MHz	
KU-BAND COMM (KU-BAND TORS)	KU-BAND 15.0085 GHz	KU-BAND 13.775 GHz	
ATC VOICE (VHF)	243.259.7 or 206.8 MHz	243.259.7 or 206.8 MHz	



SPACE SHUTTLE RADIO TO BE ENCRYPTED

With the severe budget cuts facing our space program, it is not surprising that the fat has been trimmed from many systems. The enormous HF (high frequency or "shortwave") single side-band radio support so widely heard during Gemini and Apollo flights is virtually extinct. Only a small handful of these frequencies came up during the STS-3 shuttle flight.

Monitoring Times spoke with several communications officials at NASA during that last flight and learned that the worst is yet to come.

An increasing number of mission payloads will be allocated to the Department of Defense. STS-9 will be a DOD practice mission; STS-10 will be the real thing.

To provide security during

these military assignments, primary s-band voice and data channels will be digitally encrypted. UHF backup will not be used during this DOD traffic.

It was estimated by the NASA officials that approximately 1/3 of the Space Shuttle missions will be DOD controlled.

Frequencies reportedly to be used for command voice and ranging are shown below (all frequencies MHz).

SHUTTLE DOWNLINK	GROUND UPLINK
296.8 (Pri. UHF voice)	296.8
259.4 (Backup UHF/RTTY)	259.4
259.7 (Astronaut EVA/shuttle)	
2205.0 (s-band)	1831.0
2217.5 (s-band)	2041.9479
2250.0 (s-band)	2106.4063
2287.5 (s-band)	

Army Exercises Show Frequency Diversity

The recent "Gallant Eagle" exercises by the US Army in the Mojave Desert region of California illustrate the wide frequency distribution used by the military.

With "victor" (VHF) radios operating on low band (34.65 and 41.50 MHz) and aircraft on 134.6 and 263.2 MHz, an unusual frequency--62.4 MHz--was also called up.

Modern scanner radios cover common ranges: 30-50; 118-136, 144-174 and 420-512 MHz. Other ranges are in widespread use for two-way communications, especially by military agencies.

In the European theater, the 50-80 MHz range is frequently used by occupational forces, and even in the United States occasional discrete frequencies in that range are utilized.

Army National Guard units often communicate on "out of band" frequencies during military maneuvers, with the six-meter ham band (50-54 MHz) one of the most popular.

Much wasted spectrum is found between the TV channels, another popular hangout for military radios operating on a non-interference basis.

Thanks to Rick Tharrington for his contribution of "Gallant Eagle" frequencies.

