for anyone interested in home computing. It's published by Anchor Press/Doubleday (Garden City, New York, USA) in hardback for $17.95.

"The Hacker's Handbook", by an author who calls himself Hugo Cornwall, is intended to be a guide for enthusiasts who want to use their computers to break into various protected databases. Now in its third edition, the book actually gives a good overview of how computers are used for communications. One of the most interesting chapters is about "Shortwave Radio Hacking", which is actually an introduction to the completely legal (in most countries) activity of monitoring RTTY signals on shortwave. This section is one of those expanded in the new edition, which has a short summary of satellite transmissions. Available for GBP 6.95 from Century Communications (Portland House, 12-13 Greek Street, London W1V 5LE, England).

"Out of the Inner Circle", by Bill Landreth, is a young hacker's story of his exploits and techniques, intended to teach system operators how to protect their systems from unwanted interference.

"Dvorak's Guide to PC Telecommunications" is a wonderfully comprehensive 1000 page plus book about every aspect of hooking computers up to modems. It discusses all the various online services in details. There's even a section on packet radio! It comes with two disks filled with programs (including a very nice telecommunications program called Telix SE) and many discount coupons that alone are worth the price of the book. (A hefty, but well worth it USD 50). The author, John Dvorak, is a well-known computer journalist, with a weekly column in the "San Francisco Examiner" and a monthly column in "PC Magazine".

8.7 CONTACTS

Clubs are common among both radio hobbyists and computer hobbyists. There are a few both enthusiasts who combine both hobbies.

ASTUR is a group of radio amateurs using the Atari ST computers. For more information send 2 IRCs to:

```
ASTUR
W. Elsschotlaan 21
B-8460 Koksijde
Belgium
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The Commodore Radio Users Group (CRUG) is now producing a magazine called "Connections", which is to come out four times a year. Subscriptions (in the UK) cost GBP 8 a year. For more information contact:

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Commodore Radio Users Group
Simon Lewis
69 Irvine Drive
North Clippens, Linwood
Paisley, Renfrewshire
PA3 3TB Scotland
```

We'd like to remind you that Radio Sweden and Sweden Calling DXers can be contacted through the international information utility CompuServe (Easyplex 70247,3516), through the FidoNet system (to George Wood at 2:501/297) and by packet radio to SM0IIN on the packet radio BBS SM0ETV.

The Electronic Edition of the Sweden Calling DXers bulletins can be found on the CompuServe HamNet Forum, the Pinelands BBS, and many other telephone-based and packet radio computer bulletin boards.

Future updates to this guide can be expected. For more information, listen to Sweden Calling DXers, or follow the Electronic Edition of the bulletin.

- The Tucson Amateur Packet Radio group (Box 22888, Tucson, AZ 85734, USA) offers a quarterly called "The Packet Status Register Quarterly". It's available to members for USD 12 (in the US) a year.

8.4 MAGAZINES–COMPUTERS IN GENERAL

Ordinary computer hobbyist magazines sometimes carry articles about computers and radio. They also have the latest on computer developments, of course.

The best British PC magazine we've seen is "Personal Computer World" (53 Frith Street, London W1A 2HG, England). It covers all micro- computers, not just IBM compatibles. The ads alone are worth the purchase price.

There are many American PC magazines. Some, like "BYTE", "PC- World", and "PC Magazine" seem to concentrate on the most expensive new systems, and carry less of interest to the ordinary user.

There are many more magazines aimed at Mac, Amiga, Atari, and other users.

"The Whole Earth Review" (Box 38, Sausalito, CA 94966-9932, USA) is an interesting American quarterly which devotes some space to computers. It also updates the excellent and now sadly out-of-print "Whole Earth Software Catalog" from the same people, as well as the original counter-culture Bible, "The Whole Earth Catalog". The latter is now available on CD-ROM (for USD 153). Also available is the excellent "Signal" catalog of communications tools and information frontiers (USD 18). The Whole Earth people are also behind the WELL (see chapter six) and the Well Newsletter is sometimes found reprinted in "Whole Earth Review."

8.5 PUBLICATIONS–COMPUTERS AND RADIO

Radio Netherlands, in cooperation with the European DX Council, has published "INFODUTCH", which reviews computer programs for radio hobbyists for a variety of popular computers. There is also a list of computer bulletin boards of interest to radio listeners and a long address list of radio-related software suppliers. Radio Netherlands has also published a leaflet on receiving weather satellites called "Weather Satellite Fact Sheet". From: Radio Netherlands, Box 222, NL-1200 JG Hilversum, the Netherlands.

Our regular contributor Jim Grubbs has published many interesting books about computers and radio. "The Commodore Ham's Companion" is a 160 page guide to using Commodore computers with amateur radio. In 14 chapters, the book takes a close look at selecting a Commodore computer for the ham shack, the basics behind programming a computer for RTTY, Morse, AMTOR and Packet Radio; the ins and outs of information management; message storage systems and radio bulletin boards, and more. "The Commodore Ham's Companion" is available for USD 15.95 plus shipping.

"Get ***Connected to Packet Radio" is Jim Grubbs' 200 page guide to this new mode and its possiblities. The book includes everything a beginner needs to get started, and concludes with a detailed bibliography of articles about packet and a list of sources of equipment. An excellent guide to radio's newest frontier. USD 12.95 plus shipping.

Jim Grubbs has also published a reprint of his popular "Command Post" column from "Commander" magazine. Aimed at using Commodore computers for amateur radio applications, the 32 page booklet includes program listings for morse code send and receive, radioteletype send and receive, duplicate checking, and program exchange over the air. Some of the most popular hardware and software for the amateur radio station are reviewed as well. "Command Post" is available for USD 9.95, plus shipping. Shipping for the above publications is USD 2.50 in North America, USD 6.00 overseas airmail for up to three books. From: QSKY Publishing, Box 3042, Springfield, IL 62708, USA

"The Radio Hacker's Code Book" by George Sasson, is 239 page guide to RTTY and TOR transmissions, and includes computer programs for deciphering coded signals such as from the German wartime machine Enigma. GBP 6.95 from Duckworth.

8.6 PUBLICATIONS–HACKING

A number of books have been published recently about "Hacking"–a word that covers many aspects of the hobby of spending hours playing with computer terminals. "Hackers" by Steven Levy, is subtitled "Heroes of the Computer Revolution". It's about three generations of computer enthusiasts–the university students of the 1950's and 60's who first discovered the joys of online computer terminals, the enthusiasts of the early 70's who developed the first micro-computers, and the teen-aged games programmers of the 80's. Recommended reading

8 FOR MORE INFORMATION

The computer scene changes rapidly. This guide was out-of-date before it was written, and the previous edition was updated six times before this edition was published. There are a number of ways to keep up with the latest news.

8.1 ONLINE NEWS

Viewdata systems, networks and bulletin boards are probably the fastest way. For example, there is the "Online Today" section on CompuServe, as well as extensive forums devoted to different computers. Micronet 800 has broken many stories about developments in the British micro scene.

The HamNet Forum on CompuServe is an ongoing meeting about the radio listening hobby, and the CompuServe HamNet Data Library is the quickest way to access the Electronic Edition of the Sweden Calling DXers bulletins. The HamNet Data Library also includes the biweekly "ARRL Newsletter" and the "W5YI Report". BBS systems like the Pinelands BBS and the ANARC BBS, and the Shortwave Echo are fast ways to share tips.

8.2 RADIO

Radio programs are another quick source of news. Both "Sweden Calling DXers" (Tuesdays/Wednesdays on Radio Sweden) and "Media Network" (Thursdays on Radio Netherlands) carry regular reports about computers and their use in the radio hobby. There may be a local radio program about computers, such as the BBC's "Chip Shop", the Dutch NOS "Hobbyscoop", Sweden's "Datorernas Vrld" and Denmark's "DataVoice" on The Voice.

There are also a number of amateur radio nets devoted to computers. Here are some:

North America:

```
Apple--Sundays at 17:00 on 14329 kHz
Atari--Sundays at 16:00 on 14320 or 14325 kHz
Commodore--Mondays at 17:30 on 14240 kHz
Commodore (West Coast)--Sundays 09:00 Pacific time on 7162.5/3830
Commodore (East Coast)--Saturdays 15:00 Eastern time on 7228 kHz
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UK:

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RAMTOP Net--Saturdays at 11:00 AM British local time on 3630 kHz.
BARTG Datanet--Sundays at 10:00 hrs GMT on 3660 kHz
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8.3 MAGAZINES–COMPUTERS AND RADIO

Magazines are a good source of news, although as one psychologist has pointed out, a fanatical urge to buy every computer magazine in sight is often the first symptom of a computer addiction.

- The major American amateur radio magazines, "CQ", "73", "Worldradio", and "QST", regularly carry information about using computers with radio. Don't ignore the advertisements, which often present new computer products. "CQ"'s "Antennas & Accessories" column by Karl Thurber often focuses on new amateur radio software. "73" has many interesting articles, including the monthly packet radio column. The British "Practical Wireless" has a regular "Computing in Radio" column.

- The people behind "Los Numeros Online" have begun publishing a quarterly magazine about computers and radio called "Bits, Bytes & BBSs". Compiled and edited by KristinKaye, the first issue came out in June, 1990. While a number of pages were devoted to computers (and not radio), there is some interesting information, including a lengthy list of radio-oriented BBS's. The magazine costs USD 16 in North America, USD 25 for foreign airmail, from Moonbeam Press, Box 149, Briarcliff Manor, New York 10510, USA.

- FRENDX (published by NASWA, 45 Wildflower Road, Levittown, PA 19057, USA) has a monthly "Computer Corner" written by Bill Cole.

- "QZX" (2025 O Donnell Drive, Las Cruces, New Mexico 88001, USA) is "The Journal Covering Amateur Radio & Sinclair Computers." The only issue we've seen is number 12, dated Dec., 1984.

7.2 OSCILLOSCOPES

Multibotics (2561 South 1560 West, Woods Cross, Utah 84087, USA) has been selling an interface called the MB230 Workshop, which promises to turn a computer into a digital storage oscilloscope. It also is a digital voltmeter and can be used to control motors, lights, and relays. Available for Commodore 64 (USD 130), Apple 2+ and 2E (USD 160), and Atari 800 (USD 140). New versions have been promised for the IBM PC, Amiga, and Atari 520ST.

The October, 1986 issue of "Ahoy" magazine (back issues for $4.00 from Ion International Inc., 45 West 34th Street, Suite 407, New York, NY 10001, USA) contains an article and short Basic program called Digital Scope for using a Commodore 128 as a digital oscilloscope. The article gives details of the analog to digital interface necessary, which is attached to a joystick port.

7.3 CHU and WWV Computer Time

Copyright 1985 and 1986 by Jim Grubbs

Do you know what time it is? I mean, do you REALLY know what time is it? My computers do, thanks to a special signal transmitted every minute by the Canadian time standard stations, CHU.

During the 31st to 40th second on each minute, you'll hear some strange tones. By itself it doesn't tell you much, but with a little programming your computer can turn it in to a very accurate time signal. The code is actually are good friend ASCII. Standard Bell 212 tones are used for mark and space–that is 2225 kHz for mark and 2025 kHz for space. The characters are eight bits long with one start bit and two stop bits.

On the surface it would appear that all you need to do is feed the audio signal from your receiver to your regular telephone modem and use a standard telecommunications program to receive the transmissions. It's not quite that simple. In order to make effective use of the time available, the transmissions are sent at 300 baud, but the encoding within the eight bits of data is non-standard. The time code consists of a ten digit number repeated twice during the one second interval. The first character is always a 6 followed by three digits for the day of the year. Finally 6 digits indicate the UTC time in the form HHMMSS. The digits themselves are sent in binary coded decimal and do not follow the standard least significant bit protocol.

There are similar transmissions from the American standard time and frequency station WWV. The National Bureau of Standards Time and Frequency Users' Manual details the form of these transmissions. In the case of the WWV transmissions, a series of pulses represent each digit. The particular form used by WWV is a modification of the Inter- Range Instrumentation Group or IRIG time code format.

Each digit in the current time is sent in binary coded decimal. That's the same basic concept used on the CHU signal. Rather than using standard modem tones however, WWV uses a special low frequency sub-carrier at 100 Hertz.

Each frame of time code begins with a unique spacing of pulses to mark the beginning of a new minute. To help keep things in synchronization, a position identifier is transmitted every ten seconds.

While the theory behind the transmissions is similar to that used by CHU, in practice a bit more hardware and software are required for correctly decoding the signal. Also the sequence of information is different. CHU begins with an identifier, a 6, followed by the day of the year and the time in the form hours, minutes and seconds. On the WWV signal, a synchronization signal starts the sequence, the minutes come next, then the hours and finally the day of the year.

To successfully decode the signal using a home computer will require the construction of a simple tone decoder or demodulator for the 100 Hertz signal as well as the tone used to mark the beginning of each minute. Machine language software to read the output of the decoder is needed to insure that the computer stays in step with the signal.

If you are interested in learning more about the WWV signals, you may wish to write to the US Department of Commerce, National Bureau of Standards, Washington, DC and tell them you are interested in purchasing NBS special publication 559. It details all of the WWV services and is a handy booklet to have even if you aren't interested in the computer time signals.

For more information about the CHU transmissions drop a note to The National Research Council, Ottawa, Ontario Canada K1A 0R6 and ask for the publication "Canada's Time Service" by A.G. Mungall. The booklet should allow any adept programmer to write the code necessary for any computer.

7 EXPANDING HORIZONS

The PC world changes so quickly it is almost impossible to keep up. In the next section we'll list some of the ways to try to follow developments. In this chapter we include some of the more unusual aspects that so far don't fit into any other category.

7.1 TELETEXT

Teletext is a system for transmitting "pages" of text using the "unused" lines in a TV picture. The system is widely used in Europe: Britain has Ceefax and Oracle, Swedish Television carries Text-TV, and similar systems can be found in Germany, and other countries. Teletext can also be found on European satellite-TV. Super Channel has a modest Teletext service and the various Sky Television channels on the Astra satellite also carry Teletext to households across Europe.

Teletext is also available in other parts of the world, for example New Zealand. News, sports, weather, and similar information is usually offered.

Sometimes the information can be of special interest to radio hobbyists. Eurosport in fact carries the Radio Sweden schedule to Europe on Teletext page 496. Among the hundreds of pages of information offered by Television New Zealand's Teletext service, is a page called "DX Listening, Radio Amateur, and CB Information". It's updated every Monday by Bryan Clark.

Generally, special television receivers are needed to access Teletext. Manufacturers could make modules to provide this service on older sets, but they have chosen the more profitable route of restricting access to more modern sets with Teletext built in. But Teletext is also as close as your PC.

Microtext (7 Birdlip Place, Horndean, Hants. PO8 9PW England) is selling a Teletext adaptor for the Commodore 64. This is used together with the signal from a video cassette recorder (VCR) to provide the Teletext pages on the computer screen. We've tested the unit, and found it works well, and is inexpensive, GBP 70, plus postage.

Another British company has developed a Teletext adaptor for the IBM PC and compatibles, the PC Text Teletext Adaptor. This comes on a full-size PC expansion card, which plugs into an empty slot inside the PC. The card includes a receiver (no VCR required) and is provided with a standard European antenna jack. The program that accompanies the card includes a scan to find channels carrying Teletext signals.

We've tested the PC Text Teletext Adaptor and it does work. There were a few drawbacks. The biggest problem is that the card requires a strong input, more than could be provided by setting up a simple antenna in the middle of downtown Stockholm or even the building central antenna or the Swedish Radio cable system. We finally had to hook the thing up to the RF output of a VCR (connected to the central antenna) to get a strong enough signal. Even that failed after a few weeks.

The adaptor receiver covers only channels 21 to 68. Swedish Television's Channel 1 is on VHF, so we were unable to read Text-TV on that channel.

The Microtext Commodore 64 adaptor came with a special program that included Swedish letters. The PC Text adaptor does not, so that any letters outside of the standard English 26 letter alphabet appear as grey blocks on the screen. However, when text was printed the Swedish letters were displayed correctly.

The adaptor includes provision for downloading computer software from Teletext. Since Swedish Television's Text-TV does not include telesoftware, we were unable to test this.

The PC Text Teletext Adaptor costs GBP 169.95, more than twice the cost of the Commodore unit. Unfortunately the company selling the adaptor does not provide a British VAT refund, and European buyers must pay an extra GBP 4, overseas buyers an extra GBP 7. The card and software are produced by Micro Projects Ltd. in Stoke-on-Trent, England. The PC Text Teletext Adaptor can be ordered from:

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Database Publications
Macclesfield
Cheshire
SK10 4YB England
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Orders can also be made to +44-625-87 99 40, by Fax to +44-625-87 99 66, or to PRESTEL *89, then 614568383.

The system contains more than 90 conferences, from AIDS, Poetry, Peace, and Writers to CD's, Science Fiction, and 6 different Grateful Dead conferences. (The system has a strong San Francisco Bay Area flavor.) There are also conferences on Radio, Television, Media, Telecommunications, Video, and Packet Radio. Among the Whole Earth people who are active users is former ANARC Executive Secretary Robert Horvitz.

The Well carries a basic monthly charge of USD 8, plus an online charge of USD 3 per hour. Access through the CompuServe Packet Network (CPN) costs an additional USD 5 an hour. The Well is accessible via a number of local telephone numbers in the San Francisco area, as well as via the CPN. To reach the Well via the CPN, American users can call 1- 800-848-8990 and ask for the local number. When logging in to a CompuServe node, type "WELL" at the "Host Name:" prompt. International users can call one of the Computer Sciences Corporation numbers mentioned under CompuServe above, and after typing "cps" type "well" for the host.

New American users should call +1-415-332-6106 and type "NEWUSER" at the log-in prompt to register.

6.10 STARTEXT

This is a local online computer service operated by the Fort Worth (Texas) "Star-Telegram". It has around 4000 subscribers and serves the Dallas/Fort Worth metropolitan area. Originally at 300 and 1200 baud, 2400 baud is scheduled to be introduced in late 1990. Jim Frimmel (developer of the Shortwave Navigator for the Macintosh) has a regular column called "Guide to International Broadcasting". StarText also carries a number of regular columns on ham radio and other radio- related themes.

6.11 HAMCALL

Buckmaster Publishing (Whitehall, RT3, Box 56, Mineral, VA 23117, USA, tel. 1-703-894-5777) provides an on-line system solely to list amateur radio callsigns. So far the system only includes American callsigns, but Buckmaster plans to add international calls. The system is updated monthly (compared to the printed annual "Callbook", which has quarterly updates). This is the same company listed in Chapter II for their callbook on CD-ROM.

uunet is reachable through the Compuserve Packet Network or via Tymnet, and they can open accounts for you at either. To take a news-feed from uunet, your computer must have the suite of UNIX programs called "uucp," or one of the substitutes designed for non-UNIX machines. uunet can direct you to sources, and they aren't expensive. For a free information kit, contact uunet at 3110 Fairview Park Drive, Suite 570, Falls Church, VA 22042-4239 (voice phone 703-876-5050).

6.7 REC.RADIO.SHORTWAVE

Ralph Brandi has sent the following contribution about the newsgroup rec.radio.shortwave on USENET:

The network contains many newsgroups, one of which, rec.radio.shortwave, is devoted to the radio monitoring hobby. This group was created late in 1989 after a suggestion by Richard Shapiro, in order for those of us who are interested in the hobby of monitoring radio communications to have a place to exchange messages, tips, and opinions. Contributors discuss topics of almost any kind, including (but not limited to) shortwave broadcasting, scanning of all kinds, clandestine and pirate broadcasts, DXing small or distant shortwave stations, utility and teletype monitoring, military eavesdropping, the ECPA, station schedules, QSLing SW broadcasters, spectrum usage, equipment design and modifications, antennas, receiver reviews and recommendations, and many more.

There is a wide range of contributors, from DXers with years of experience, to expatriate graduate students wondering how they can hear their home country's domestic services. A few shortwave stations are also represented on rec.radio.shortwave, including the Voice of America and the Christian Science Monitor stations. People with access to USENET can access rec.radio.shortwave with a variety of programs, including readnews, vnews, and rn (if available).

Those who have access to BITNET can also get access to rec.radio.shortwave (plus some additional material not available to subscribers to the newsgroup) through the SWL-L mailing list, available through the LISTSERV service of the machine CUVMB.CC.COLUMBIA.EDU. To subscribe to the mailing list, send a message containing the text SUBSCRIBE SWL-L MY-BITNET-ADDRESS to LISTSERV@CUVMB.CC.COLUMBIA.EDU.

Messages from UUCP/Usenet (and Internet) can be sent to Fidonet (see the last chapter). For example, you can send messages to Sweden Calling DXers using the following address:

```
George.Wood.@f297.n202.z2.fidonet.org
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6.8 LOS NUMEROS ONLINE

Havana Moon is the pseudonym of a well-known writer about clandestine transmissions, especially the numbers signals often used to communicate with spies. Now he or she has developed a computer service called Los Numeros On-Line. It's like a computer bulletin board, but it's included as a conference within a system called Portal, headquartered in Cupertino, California.

Users have access to a number of international computer networks, such as Arpa, Bitnet, Fidonet, MCI Mail, Internet and Usenet. The system includes columns by some well-known clandestine broadcast experts, newsletters such as Sweden Calling DXers, program schedules from major international broadcasters, forums for special interest groups, and a database of downloadable software for Commodore, IBM, and Macintosh users.

The forums cover such topics as covert communications, the golden age of radiio, radio law, military radio, alternative broadcast radio, and pirate radio. One interesting section is "The Radio Room", Saturday Night Live teleconferences, that provide an opportunity for live interaction with the experts in the field. These have included representatives of The Voice of June Fourth - a Chinese Political Clandestine Broadcaster, and the author of the best-selling "The Cuckoo's Egg" - an account of how a KGB espionage ring was caught snooping in American Defense Department computer systems.

It's hard to say if this system is an improvement over some that already exist, such as CompuServe, the ANARC BBS, and the SWL Echo on the Fidonet system. But it certainly seeks to be comprehensive, and might be worth a try. For more information, call Portal at +1-408-973- 9111. Or write to MoonBeam Press, Box 149, Briarcliff Manor, NY 10510, USA.

6.9 THE WELL

The Well (Whole Earth 'Lectronic Link) is an online system started by the "Whole Earth Review" (the people behind the famous "Whole Earth Catalog"). It opened in April, 1985 and is centered in Sausalito, California.

(c) Copyright 1989, Whole Earth Review

Those who know Usenet generally describe it with enthusiasm or exasperation–often both. It is the motherlode of noncommercial electronic information, a service spawned by hackers that grew to Amazonian dimensions in a decade. Still growing rapidly, Usenet is already indispensible for academics, researchers and people in technical professions, and it's gradually becoming accessible to the general public.

Brief glimpses of its burgeoning role have already appeared in the mass media. Chinese students in North America used it to organize support for the pro-democracy movement back home. Scientists turned to it for hot news about "cold fusion" and new superconductive materials.

The virulent software infection unleashed by Robert Morris, Jr., made headlines in 1988 by clogging it up for a few days. (The untold story there is that the antedote was also distributed through Usenet. Systems that went offline to "protect" themselves had a harder time recovering.)

Usenet is an information cooperative. There is no owner, no control center, no membership fees. It's not even an organization, really. Each Usenet site has someone designated as the administrator, and there is a "backbone cabal" of senior administrators who act as Usenet's custodians. But that's about it, in terms of human bureaucracy.

Within that minimal framework, some 16,000 sites are now linked by phonelines and data circuits to distribute about 3,000 articles, announcements, queries, polemics, reports and comments each day on every conceivable subject. An estimated 580,000 people have regular access to Usenet through local site computers–twice as many as did two years ago, ten times as many as six years ago.

The vast majority of Usenet sites are in North America, with beachheads in Europe, Asia and Australia. Begun in 1979-80 as a user-run service for student programmers working with UNIX (an operating system for computers), most of the early sites were on college campuses, and most of the messages concerned computing. The volume was small enough that the communication costs went unnoticed in departmental phonebills.

Today, the message traffic is so large that communications costs and staff time are big budget items, particularly at "backbone" sites, where articles and electronic mail converge for forwarding. No one really knows what the total cost of Usenet service is. Each site handles its own financing, and arrangements between sites are negotiated privately. Individual users at most institutionally- sponsored sites pay nothing for access. However, the real total cost must run into millions of dollars per year.

Usenet sites today are typically colleges, research centers, high-tech corporations and public agencies. A growing number of non-institutional dial-in points give or sell public access (see list below). Computer topics and programming still account for about 40the postings. But other interests have rapidly expanding support–especially social and political discussions, science, and recreations.

How do Usenetters slog through 3000 articles a day? They don't. Articles are posted to "newsgroups," which are like continually-updated topical magazines that any site can arrange to get. Some newsgroups have "moderators" (editors) who do all the posting. Most do not. Anyone on Usenet can post an article to a unmoderated newsgroup, and within a few days it will propagate to every subscribing site. Or, the poster can put geographic limits on distribution (only the Bay area, just Canada, etc.).

There are currently about 600 newsgroups, covering everything from backpacking to microbiology, feminism to Fortran. The newsgroup for shortwave listeners is called "rec.radio.shortwave".

To use Usenet you have to find a convenient, affordable point of access. Even if you aren't working or studying at a site-sponsoring institution, you may be able to convince a friend who is to capture articles or newsgroups for you on floppy disk. They might even let you dial in to their computer directly to download material, or to visit in person to browse once in a while.

Then there are public access sites. The WELL is a Usenet site, and has at least three features which recommend it as a good choice for access. First, there is an online conference devoted to using Usenet effectively. When you enter the WELL, type "g usenet" to get there. It has a library of basic references, you can ask questions without feeling stupid, get answers from the staff gurus, and read the answers to others who are elsewhere on the learning curve. The second attraction is that the WELL gets nearly all of the active newsgroups, mainstream and otherwise. The third is that the cost is low (USD 8/month and USD 3/hour, plus communications link charges). [The WELL, 27 Gate Five Rd., Sausalito, CA 94965; voice phone 415-332-4335.]

Another site to consider is "uunet" in Falls Church, Virginia. This major gateway gets all the newsgroups. It is a nonprofit corporation founded by USENIX, the UNIX users association, to improve access and provide news-feeds to other sites on contract. Prices depend on all sorts of variables (how many news-feeds you want, how you connect to uunet, etc.), but the base-rate is $35/month, plus communications charges.

6.4 PRESTEL

PRESTEL is a British viewdata system, which has spread to a number of other countries. It uses a rather cumbersome graphics system, and was originally intended to be used with home TV sets and very simple television remote control units. Because of this early plan, while PRESTEL transmits to its users at a rate of 1200 baud, it receives at only 75 baud. It can be very slow, and user input is very limited, compared with the North American systems.

PRESTEL itself has more than 45,000 subscribers in Britain. It provides information on a wide range of subjects from "Coach Hire" to "Computers". One of the most interesting sections of PRESTEL is Micronet 800, which carries the latest news on the micro-computer scene.

PRESTEL does include some pages of interest to radio amateurs within the "Gallery" section of "Micronet 800". G4AVV has a "magazine" beginning on page 323000421. Other pages of interest are 323000223, 323000382, and 323000405.

Here are some PRESTEL mailboxes of interest:

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"Practical  Wireless"  magazine  202671191
Radio Netherlands                019996700
AMSAT-UK                         019896741
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Originally PRESTEL was free outside of office hours, which attracted many home users, especially to the Micronet section. During 1989 PRESTEL began charging for all usage, and many home users have switched to the rival Microlink system.

Besides it's message system, MicroLink has added a service called WeatherLink. Using a monitoring station in Kent, WeatherLink intercepts signals from the NOAA 9 weather satellite four times a day. Live pictures from the satellite are recorded and stored on MicroLink. Subscribers can download the weather satellite maps, if they have special software.

The Radio Society of Great Britain has a PRESTEL standard (1200/75 baud) bulletin board evenings only. It can be reached at +44-0707-57 477.

6.5 MINITEL

France's Minitel is probably the most impressive, certainly the most widespread, viewdata system in the world. Minitel was created when the French PTT sought to do away with the tremendous cost of printing annual telephone catalogs by putting the directories online and giving telephone users FREE terminals. The system soon expanded to include far more than the Yellow Pages.

For example, amateur radio operators can obtain information on ionospheric propagation conditions over Europe through their Minitel terminals. The service is being sponsored by the Centre National d'Etudes des Telecommunications for a trial period.

Teletext is very similar to PRESTEL-style viewdata systems, allowing access to many screen pages of information and news. Viewdata or videotext is available over the telephone, while Teletext is transmitted using the unseen lines in TV signals. But now the two systems have been combined on Minitel.

Ceefax, the BBC's Teletext service, is available in France, over the Teletel viewdata system. With two million subscribers, the telephone-based Teletel is the world's largest videotext network. The service, called BBC Telecordiale, provides British and world news, as well as financial, sports, weather, and travel information, all in that most unFrench language, English.

Germany's counterpart to PRESTEL is called Bildschirmtext. The shortwave listeners club Kurzwellenclub-Schwalmtal e.V. has its own section. See information on pages *9201630#, *920163014#, and *920163014110a#.

6.6 USENET

Another way radio news is spread around the world is through Usenet. The following is edited from an article in from the Winter 1989-90 issue of the "Whole Earth Review" (27 Gate Five Rd., Sausalito, CA 94965 USA), and is reprinted with the kind permission of the author. If you're interested in accessing Usenet, we strongly recommend sending for a back copy. They cost USD 6 each, postpaid.

The Usenet Underground, by Robert Horvitz

5. After pressing [ENTER] you'll see:

```
If additional lines are not needed press RETURN.

MBX:
```

   Some electronic mailbox systems need a second line for addressing, but CompuServe does not. Press [ENTER].

6. MCI will display the address one last time. If the displayed information is incorrect, at the prompt

```
Is this address correct (Yes or No)?

Pressing Y and [ENTER] continues.  Pressing N and [ENTER]
deletes the entry.
```

The same message may be sent to multiple recipients by entering the next address at a CC prompt. If a RECEIPT is requested, the MCI user will receive two receipts. The first will be a verification of delivery to the CIS system, and the second will be a receipt upon delivery to the CIS subscriber.

If an MCI subscriber receives mail from a CIS subscriber and types ANSWER immediately after reading the mail, the MCI Mail system automatically addresses the reply.

Messages can also be sent to CompuServe users from Internet. For example, if you are on Internet and want to send a message to Radio Sweden's CompuServe mailbox from a machine that understands domain- style addressing, here's the address to use:

```
70247.3516@compuserve.com
```

Access to networks such as IPPS or Datapak mean users can contact many systems around the world, as long as they know the proper address number. Japan's Space Board provides information for professional and amateur astronomers, including satellite orbital elements. It can be accessed via packet-switched networks to node number 440881406100.

6.3 DELPHI AND GEnie

Both Delphi and GEnie advertise their low cost, compared to other services. Delphi costs from USD 4.80 an hour, and offers a library of programs to download, multi-player games, shopping, news services, and plane reservations.

Sign-up costs USD 10, with the first hour online free. Users in North America can sign-up by calling 1-800-365-4636 with their computers and modems. At "Username:" type "joindelphi", and at "Password:" type "pcresource". The address for Delphi is: 3 Blackstone St., Cambridge, MA 02139, USA.

GEnie, operated by General Electric, is very similar to CompuServe, and has more than 190,000 subscribers. GEnie offers news, shopping, an airlines guide, an encyclopedia, and online games. There are more than 60 "RoundTables", the equivalent of the Forums on CompuServe.

One of these is the Radio and Electronics RoundTable, run by Larry Ledlow. This includes separate sections for Shortwave Listening, Scanning, Electronics Service and Repair, Amateur Radio, Radio and TV Reception and Interference Problems, Professional Broadcasting, Engineering, Satellites and Space Topics, Consumer Electronics, a Trading Post for buying and selling gear, and more.

GEnie has a one-time sign-up fee of USD 30, which includes two hours of free time. Connection charges between 6 PM and 8 AM weekdays and all day weekends run USD 6 an hour for 1200 baud and USD 10 an hour for 2400 baud. Prime-time use costs USD 18 an hour, which makes it more expensive than CompuServe.

Free online sign-up is available in North America by dialing 1- 800-638-8369 (with communications program set for half duplex, 300 or 1200 baud). When connected enter "HHH". At the "U#=" prompt enter "XTX99591, GEnie". Have a credit card ready. For information you can call 1-800-638-9636, or write: GE Information Services, 401 N. Washington, Rockville, MD 20850, USA.

GEnie is expanding into Europe, and can now be accessed in three countries: Germany, Switzerland, and Austria, via GEIS network services distributors. For more information about European access, call +49- 2233-6091 (in Germany 02233-6091).

and data phone rates. However, European users can now access the system for USD 20.50 an hour by typing "CSF" at the Center prompt instead of "CPS".

Here are some local CSC access telephone numbers:

```
London          071-437-4393
Paris           1-433-50101 (1200 baud)
Bern            031-260-787
Stockholm       08-764-6595
Tokyo           3-234-9251
```

CompuServe users can send messages via telex and fax, and can send and receive messages to a number of other systems, such as MCI Mail and Internet. Here are a number of CompuServe mail addresses of interest to radio monitors:

```
Radio Sweden (George Wood)    70247,3516
ANARC (Robert Horvitz)        76210,517
"73" Magazine                 70310,775
Ontario DX Association:
     Harold Sellers           73737,3453
     David Clark              71311,2677
     Allen Gastle             73757,1037
AF Systems                    71310,3712
National Radio Club           72457,2345
```

6.2 MCI Mail

MCI Mail users can send a message to a CompuServe mailbox by following this guide, provided by Tom Sundstrom. The procedure is a variation on creating messages for MCI Mail subscribers:

1. At any TO or CC prompt type in the CIS recipient's name (not numbers) and the letters EMS in parentheses:

   ```
   George Wood (EMS)
   ```

   or to get a receipt:

   ```
   George Wood (EMS, RECEIPT)
   ```

2. Press [ENTER] and you'll see the following prompt:

   ```
   EMS:
   ```

3. Type

   ```
   CompuServe
   ```

   and press [ENTER]. You will see the prompt:

   ```
   EMS    281-6320  COMPUSERVE
   Enter recipient's mailbox information.
   MBX:
   ```

4. Enter the EasyPlex mailbox number:

   ```
   70247,3516
   ```

   and press [ENTER]. Make sure the EasyPlex mailbox number is correct before you press [ENTER]. There is no way to validate the mailbox number on a different mail service.

6 VIEWDATA AND INFORMATION UTILITIES

Viewdata or videotex systems are large commercial database services, offering information to thousands or hundreds of thousands of subscribers. Often these are accessible over special data networks (Packet Switched Systems) which make use much less expensive than if ordinary long distance calls were placed.

In the United States a number of online databases, sometimes called Information Utilities", offer their services to home computer owners. Subscribers to such systems can usually access up-to-the-minute news, sports, and weather information; can send messages to each other; and even play games. Among these services are GEnie, Delphi, Prodigy, and CompuServe.

6.1 COMPUSERVE

CompuServe is the largest of the online services, with more than 500,000 users. In 1989 CompuServe bought its closest competitor, the Source, putting it far ahead of the other systems. It is also the most comprehensive system. Besides up-to-the-minute news from AP and UPI, there's access to a variety of informational databases and an online encyclopedia.

The Electronic Mall offers online shopping catalogs for almost any kinds of goods, which can be ordered. There's an extensive travel section, with listings of all the world's passenger air flights, fare information, and bookings. There's even a service for obtaining visas.

A Citizen's Band Simulator mimics citizens band conversations, with direct communication with other users on more than 40 "channels". (Although it is in fact more like packet radio than real CB.)

The most exciting part of CompuServe is the system of special interest groups. There are dozens of these, for various professions, and for interests from ecology and health to different kinds of computers and space exploration. Among the first forums started was the HamNet Forum, for amateur radio operators, which includes sections for shortwave listeners, scanner enthusiasts, and satellite DXers.

Both Radio Sweden's DX Editor George Wood and former Association of North American Radio Clubs Executive Secretary Robert Horvitz are assistant system operators on the HamNet Forum. The Electronic Edition of the Sweden Calling DXers bulletins are available every week in the HamNet Forum Data Library, along with extracts from other DX programs and a variety of other files of interest to radio monitors. The HamNet Forum SWL meeting, which is becoming a major gathering place for radio hobbyists. Tips about new stations and modes are being exchanged and beginners are getting advice about antennas and new receivers.

Many computer software and hardware companies can be found on CompuServe. MFJ, AEA and Icom have sections in the HamNet Forum. There's also a Comsumer Electronics Forum, with a section on satellite television, TVRO. Several astronomy and space forums offer information that should be interest to satellite and space DXers. There's also a forum for Broadcast Professionals.

CompuServe starter kits are available from computer stores (including Radio Shack and Walden Books). Kits sometimes come with other products, such as communications software or modems. Information can also be ordered from 1-800-848-8199, or by writing to 5000 Arlington Centre Boulevard, Box 20212, Columbus, Ohio 43220, USA.

CompuServe costs USD 12.50 an hour for both 1200 and 2400 baud, around the clock, plus communications fees. CompuServe has a nationwide network of telephone numbers, which cost a extra USD 0.30 an hour to use. To find the telephone number of the closest CompuServe node, American users can call 1-800-848-8990.The system can also be accessed via networks such as Telenet and Tymnet, although these cost more than using CompuServe's own network.

The system can also be accessed internationally via packet switching networks. Many countries offer special data networks, which cost less than international telephone calls. In Britain there's IPSS, in Canada and Sweden Datapak. European packet switching users can access CompuServe less expensively by using the Network User Address (NUA) 228464510003, which is routed to a main mode in Berne, Switzerland.

CompuServe can also be reached through Computer Sciences Corporation, which offers uplink telephone numbers in many major cities in Western Europe and the Far East. Originally CSC cost USD 20 an hour, which made it about the same as national data networks, but much easier to use.

In 1989 CSC increased its rates (without notifying users) to USD 50 an hour, only slightly less in many cases than a normal long distance call to the United States, and contrary to the trend towards cheaper international

- COMSTOR–tel. +1-713-483-5817–press information from NASA.
- Starship Enterprise BBS–tel. +1-904-786-8142–Larry Van Horn, author of the "Signals From Space" column in "Monitoring Times", is the sysop for two subboards: Subboard 8 is devoted to scanner/SWL/utility frequencies and news, while subboard 9 is for space and satellite news.
- ???? BBS–tel. +1-215-698-1905–this Philadelphia-based BBS has a Satellite TVRO section.
- C-SPAN BBS–tel. +1-202-628-0158–operated by the satellite-TV network which monitors the American government. C-SPAN uses its satellite transponder to relay the BBC World Service and a variety of other international broadcasters.
- KALW is a public radio station in San Francisco, California (91.7 MHz). A member of American Public Radio, it relays many BBC World Service newscasts and programs. It what other radio stations may follow, KALW has opened its own BBS at +1-415-641-4373. It offers program updates, listener feedback, and ongoing forums on language/ideas, PC talk, audio and video, media and the arts.

5.7 NETWORKS

There are thousands of computer bulletin boards (BBS) across North America, some even for shortwave listeners, such as UBIX and the ANARC BBS. But a big problem has been the cost of long distance phone calls. Now the American telephone company Sprint is trying to alleviate that problem with a system called "PC Pursuit". This allows home computer enthusiasts to use special low-cost lines at night to access distant BBS systems.

The basic PC Pursuit membership costs USD 30 a month, which entitles the user to up to 30 hours of non-prime connect time (6:00 PM to 7:00 AM weekdays, all day weekends, and some holidays). The Family membership provides up to 60 non-prime hours for USD 50 a month. There are also discounts for the disabled. For more information, in North America call SprintNet at 1-800-835-3638.

There is an international BBS network called PC Board International. It is similar to the FIDO system. The network links some 120 boards in the US, Norway, Denmark, and Saudi Arabia. There are hopes the system can be extended to Japan and Singapore. Among the 90-odd conferences is one for radio amateurs and another called "Global Chat". Comments written in each conference at one bulletin board are relayed to the others, permitting worldwide communication.

Here are two numbers for connection to the system. In the United States there's the Tidewater Aamateur Radio and Computer BBS at 1-804-471-3360. In Norway, try the Thunderball Cave at +47-2-32 52 18.

```
218-525-1788  ?/Duluth, MN
301-350-1299  UNIV. Marlboro BBS/Upper Marlboro, MD
301-670-9621  W3INK BBS/Gaithersburg, MD
303-273-4136  ?/Ravenswood, WV
305-842-1861  Mensa BBS
305-859-9443  Orlando Communicator/Orlando, FL
313-629-2854  Flint Area BBS/Flint, MI
318-688-7078  NoChange #2/Shreveport, LA
404-289-2050  No Frills BBS/Decatur, GA
404-363-1640  Hams Bulletin Board/Forest Park, GA
408-984-7937  Rainbow Connection/CA
504-834-2544  The Connection/New Orleans, LA
509-697-7298  Central Washington RBBS/Selah, WA
512-734-3521  The Radio Flyer/San Antonio, TX
516-736-2208  Bald Hill Tech Control/Farmingdale, NY
602-954-0413  Phoenix BBS/Phoenix, AZ
603-424-5497  Stateline BBS/Merrimack NH
603-525-4438  73 Magazine/Peterborough NH (major ham radio magazine)
612-291-0567  Digital Newsletter BBS/St. Paul, MN
612-431-1149  ARCC BBS/Apple Valley, MN
614-457-4227  HBBS/Columbus, OH
703-435-0836  Sterling Information Exchange/VA
703-734-1387  AMRAD BBS/Fairfax, VA
805-251-5558  Westlink BBS/CA (Westlink Amateur Radio News Service)
816-241-1012  Commodore Hams BBS/St. Louis, MO
904-733-4515  JACE BBS/Jacksonville, FL (Atari Users Group)
907-243-0324  ?/Anchorage, AK
914-485-3394  Hamnet-80/Poughkeepsie, NY
```

5.5 HAM RADIO–EUROPE

- Ham-Net Hull–tel. +44-482-49 71 50–is a British BBS for amateur radio operators. It carries bulletins from the Radio Society of Great Britain and can be reached 17:45-08:45 hrs during the week and from 17:00 hrs Fridays until 08:45 hrs Mondays (local time).
- Skytel–tel. +44-202-30 48 51–is run by Skywave Software.
- Maptel–tel. +44-702-55 29 41–is run by Maplin Electronics.
- React BBS–tel. +44-376-51 88 18–run by the British amateur radio emergency organization.
- SM0HVL BBS–tel. +46-8-29 63 20.
- SM0SUV Ham System–tel. +46-760-92 759.

5.6 SPACE/SATELLITE-TV/OTHER–NORTH AMERICA

- AMSAT Software Exchange–tel. +1-512-852-8194–is a Texas-based BBS with up-to-date information about amateur radio satellites.
- AMSAT-North America has a series of BBS's. The AMSAT-NA BBS, the Datalink Radio BBS, is at +1-214-394-7438 and is located in Texas. Others are:

  619-279-3921 WB6BDY in California 714-738-4331 N6DBF in California 404-393-3083 Atlanta Radio Club in Georgia 513-427-0674 Celestial BBS in Ohio 713-480-1840 WD5EFC in Texas
- NASA BBS–tel. +1-205-895-0028.

- Kenwood BBS–tel. 1-213-761-8284–is operated by Kenwood Communications. The system is operating on a trial basis outside office hours in the Pacific time zone.
- SMA Industries BBS–tel. 1-703-250-1837–in the Washington, DC area has a section for scanner and shortwave hobbyists. Those people who have radio news, items for sale, or hobby hints are invited to use the board. It's open daily 06:00-24:00 hrs (local time).
- Datanet/3000–tel. 1-215-563-9211/9213 (300 baud) and 563-9815 /9816 (1200 baud)–is a multi-user BBS with 32 sub-boards including SWL and ham boards. At the ":" prompt, type "Hello Guest,BBS.Datanet" and ¡return¿. 6:00 PM-7:00 AM weekdays, 24 hours weekends (local time).
- The Rebel Rouser–tel. 1-301-982-2327–is for both amateur radio operators and shortwave listeners, located in Maryland.
- The Associated Public Safety Communications Officers BBS–tel. 1- 904-423-1312–offers late-breaking FCC news affecting radio users, plus other news of interest.

5.3 SWL AND SIMILAR INTERESTS–EUROPE AND AUSTRALIA

- Radio Netherlands/NOS–tel. +31-35-45395–provides Radio Netherlands data sheets, frequency schedules, and program news. FIDO 2:500/202.
- Rundfunk Datenbank–tel. +41-1-56 52 70–is a Swiss BBS for radio enthusiasts. It covers all German language broadcasts–long wave, medium wave, and short wave, with frequency tables, station addresses, and DX, tropical band, contest and club news. Sweden Calling DXers bulletins are included as well.
- KWCS-BDVI Mailbox–tel. +49-2151-47 65 67–Germany's first SWL BBS. Operated by Kurzwellenclub-Schwalmtal e.V.. They also have a section on Bildschirmtext (see below).
- Dublin Users Bulletin Board System–tel. +353-1-88 56 34–(also known as the Irish Information Exchange or IRIX) contains a Radio Database section, maintained by Edward Dunne. The board uses the European CCITT tones Monday to Friday 20:00-08:00 hrs and all day weekends. But as a favor to Americans lacking the CCITT tones, and in keeping with Ireland's position between the rest of Europe and the Americas, on Wednesdays 13:00-16:30 hrs the North American Bell 102 tones are used. This is another European BBS with the Sweden Calling DXers bulletins.
- The Irish Amateur Computer Club BBS includes a section for Ham Radio and Satellites at 353-1-903341, and the radio section is sig 7. The system operates 24 hours a day with both 300 and 1200/75 baud.
- Timestep Electronics BBS–tel. +44-440-82 00 02–this is a PRESTEL compatible (1200/75 baud) BBS from a company which sells weather facsimile interfaces for the BBC Micro.
- The Italian Radiolisteners Association BBS–tel. +39-59-39 67 38.
- Matilda–tel. +61-3-894-1517–is operated by Radio Australia.

5.4 HAM RADIO–NORTH AMERICA

The following list is of some telephone BBS's in the United States that support Amateur Radio. Some of these are strictly for hams, while others support "SIG's" (special interest groups) for hams. Note that BBS's change so often that some of these numbers may no longer be active:

```
Phone-Number (all +1)  Name/Location
================================================================
201-271-4517  WB2TIX Radio BBS/Bound Brook, NJ
201-494-3649  Micro-Fone TBBS/Metuchen, NJ
203-665-1114  Ham Radio Net/Newington, CT (FIDO)
206-285-3040  Ham-Net and Electronics BBS/Seattle, WA
214-223-0983  ?/Dallas, TX
```

UUCP/Usenet, you can send messages to Sweden Calling DXers using the following address:

George.Wood.@f297.n202.z2.fidonet.org

PunterNet is a similar network to Fido, which has a ham/SWL/scanner conference (number 15). This is frequented by many members of the Ontario DX Association. Here is a list of PunterNet systems supporting this conference (as of February 9, 1990):

NAME	TELEPHONE	NODE	LOCATION	BAUD
PSI-WordPro	416-896-1446	1	Mississauga, ON	9600
TPUG	416-273-6300	2	Mississauga, ON	2400
House of Comments	416-831-6102	84	Pickering, ON	2400
K.E.B. System IV	416-266-4444	111	Toronto, ON	2400
Artificial Horizon	416-873-6422	115	Georgetown, ON	2400
Info/PDX BBS	503-620-6642	25	Portland, OR	9600
Foggy Town BBS	506-847-9765	95	Saint John, NB	9600
Tri-City BBS	519-658-0446	118	Cambridge, ON	9600
Abacus Conf. Net	604-272-4311	45	Richmond, BC	2400
[A-B-C] Connection	604-272-4644	107	Richmond, BC	9600
Rainbow BBS	604-792-4256	122	Chilliwack, BC	2400
DataCom	613-938-5000	16	Cornwall, ON	9600
K.E.B. System III	705-549-7397	109	Penetang, ON	2400
Diamond Bar BBS	714-923-1031	18	Ontario, CA	9600
Teleterm Amiga West	714-984-9580	117	Ontario, CA	9600
Programmer's Den	714-623-6704	122	Pomona, CA	2400
WCI Network Gateway	(Gateway Only)	50	Toronto, ON	9600

Here are some North American BBS's for shortwave listeners that are not members of the SWL Echo or PunterNet:

- UBIX–tel. 1-614-866-4392–was probably the first BBS for SWLs. It was created by Universal Amateur Radio for both SWLs and radio amateurs, although the system is now solely aimed at SWLs. The system is run on the computer used by Universal for business, and is open only after office hours (Monday to Saturday 8:30 PM to 9:00 AM Eastern Time, all day Sunday). The system now requires a password to access. Write to Universal (1280 Aida Drive, Reynoldsburg, OH 43068, USA) for a manual and password (don't forget return postage). UBIX offers news bulletins, shortwave DX tips, electronic mail to other users, and sales information from Universal.

- ODDX BBS–tel. 1-804-596-2710–is operated by the Old Dominion DXers in the state of Virginia.

- Lakes Region BBS–tel. 1-312-289-0014–is operated by John Hodal, editor of the "Digital Communications and Computer Corner"column in the "RCMA Newsletter" in the United States, which is mainly intended for VHF and UHF monitors. There is a special section for RCMA members, and other scanner hobbyists. (John can also be contacted via CompuServe, to ID 71530,51.)

- The Monitoring Post–tel. 1-312-289-0014–for scanner enthusiasts.

- Scan Atlanta BBS–tel. 1-404-763-4369–is also for scanner fans.

- The American Federal Communications Commission has a bulletin board system called Public Access Link at 1-301-725-1072. Ther are announcements and public notices, but no messaging or file downloads. There is also no log-in procedure, other than pressing "Enter" on the computer to start. 1200 baud.

- NOAA Space Environment Laboratory's Forecast and Advisory BBS–is an experimental service operated by the U.S. Department of Commerce. It provides forecasts, warnings, real time data and summary information designed to serve a broad cross section of users concerned with propagation and solar activity. There are two telephone numbers: 1- 303-497-5000 and 1-303-497-5042.

NY Transfer	718-448-2358	1:107/105	Staten Is., NY
The Event Horizon	718-494-9273	1:107/608	Staten Is., NY
Black Box BBS	718-667-4470	1:107/115	Staten Is., NY
Dits & Bits	719-637-1525	1:128/35	Colo. Springs, CO
Catamount BBS	802-864-7116	1:325/104	S. Burlington, VT
Augusta_Forum	803-279-4124	1:360/1	N Augusta, SC
The Flamethrower	804-730-1291	1:264/50	Mechanicsville,VA
The Domain	804-739-0321	1:264/164	Midlothian, VA
HAWG-HOUND II BBS	804-539-8296	1:271/146	Suffolk, VA
Diplomat BBS	804-872-7859	1:264/48	Newport News, VA
CITINET	807-345-3991	1:148/124	Thunder Bay, ON
Mercury Opus	813-321-0734	1:3603/20	St. Petersburg,FL
Cat House II BBS	813-441-4770	1:3603/120	Clearwater, FL
Pegasus BBS	816-454-5042	Opus 1:280/8	Kansas City, MO
Tower of Babble	817-281-0612	Opus 1:130/48	Ft. Worth, TX
BJ's RBBS	818-248-1087	8:912/1.0	La Crescenta, CA
Third World	818-700-9591	1:102/803	Chatsworth, CA
Star's Realm	906-346-9835	8:969/1	Gwinn, MI
ANARC BBS	913-345-1978	1:280/3	Shawnee Miss., KS
Joe Brown's BBS	914-667-9385	1:107/139	Mt. Vernon, NY
Light Speed BBS	914-695-1443	1:272/2	Middletown, NY
M&M's Pelham Public BBS	914-738-6857	1:107/116	Pelham, NY
CrossRoads	915-755-3053	1:381/36	El Paso, TX
NightLine HST	916-362-0715	Opus 1:203/39	Mather AFB, CA
Amateur Radio QuickBBS	916-366-5531	1:203/111	Rancho Cordova,CA
ENC BBS	919-353-6538	1:151/505	Jacksonville, NC
ALS BBS	919-460-0586	Opus 1:364/706	Cary, NC
Capitol OPUS	919-781-4203	1:151/121	Raleigh, NC
Shortwave Possums	61-2-651-3055	Opus 3:713/605	NSW, Australia
Amiga Point, IBM World	?	1:154/8.2	S. St. Marie, MI
BECS Tandy OPUS	?	Opus 1:343/1	WA
BriDon BBS	?	Opus 25:2604/107	Abbotsford, BC
Computers for Christ #17	?	1:7501/0	Mission, BC
CONCH--Fossilized Shell	?	1:106/357	
The CrossPoint	?	1:124/4115.222	Garland, TX
Down In The Valley	?	Quick 1:360/1.23	
Far Point	[unlisted]	1:106/357.1	Houston, TX
K5CNF Corpus Christi	?	1:160/50.9	Corpus Christi,TX
The Lion's Den	?	1:360/5	Augusta, GA
Machine Midwives	?	Quick 1:309/2.2	AZ
The Mdtn_BBS Point #17	?	1:150/511.17	
Merritt's EZPoint	?	1:124/1113.2004	Dallas, TX
MetroMedia-CT	?	Opus 1:142/555	CT
Mission Control	?	1:161/148.301	Concord,CA
PCBox	?	1:203/888	CA
Pennington Computer Inc.	?	1:360/5.2	Martinez, GA
There's No Point	?	1:104/904.6	
Uhura	[unlisted]	Opus 1:125/98	San Francisco, CA

A number of FIDO BBS's in Sweden participated in the SWL Echo during 1989. However, the system operators of the boards involved discontinued, since it was felt not enough Swedes were using the Echo. That meant that Echo users could no longer contact Radio Sweden directly. However, such messages can still be sent, using the regular FIDO mail system.

There are also a number of academic data networks, such as ArpaNet, InterNet, and UseNet. (See the next chapter.) These can be used to send messages to FIDO users. For example, if you are on Internet or

Auto-BBS	503-255-1432	1:105/50	OR
The No. Portland Harbor	503-283-2940	1:105/21	Portland, OR
The Freq Show	503-286-3941	1:105/51	Portland, OR
The Family BBs	503-655-6198	1:105/202	West Linn, OR
TECHbooks_One	503-760-1473	1:105/4	Portland, OR
Minas Tirith	504-455-8665	Opus 1:396/10	New Orleans, LA
The ComPort/KE5WJ PBBS	504-643-6380	1:390/1	Slidell, LA
The Communicade	508-758-9703	1:101/840	Mattapoisett, MA
Hardware Hangover BBS	508-921-4864	Opus 1:324/1	Beverly, MA
Dave's Opus/Lowell Hub	509-454-3864	Opus 1:324/200	Lowell, MA
Boardwalk	512-258-5528	1:382/5000	Austin, TX
Father Guido's Junction	512-295-4710	1:382/49	Buda, TX
Soft World	512-383-9898	1:397/2	Edinburg, TX
The Antenna Farm	512-444-1052	Opus 1:382/40	Austin, TX
Health-Link	512-444-9908	1:382/5	Austin, TX
Tranquility Bay	512-836-8275	1:382/36	Austin, TX
KIC-BBS	513-762-1115	1:108/89.0	Cincinnati, OH
Digidial	514-654-1518	1:167/131	Lachenaie, PQ
Arcane_BBS	514-687-9586	1:167/116	Laval, PQ Canada
SWL / Montreal	514-933-8490	1:167/99	Montreal, PQ
PComm #D5	514-989-9450	1:167/1.0	Montreal, PQ
Jenny's Dog House	517-374-1088	Opus 1:159/650	Lansing, MI
St. Joseph Med. Center	602-235-9653	1:114/15	Phoenix, AZ
UA Today (U of Arizona)	602-621-5669	1:300/3	Tucson, AZ
VAXCat	603-424-0923	Opus ?	Merrimack, NH
InterVisioN	603-547-6485	1:132/123	Francestown, NH
Legal_Beagle	603-883-4466	1:132/115	Nashua, NH
The Pinelands RBBS	609-859-1910	1:266/32	Vincentown, NJ
Jersey Devil Citadel	609-893-2152	8:950/11	NJ
Nick's Nest	612-490-0341	Opus 1:282/4	Vadnais Hgts, MN
Nick's Nest	612-490-1187	Opus 1:282/3	Vadnais Hgts, MN
Think-Tank BBS	612-725-8091	Opus 1:282/18	Minneapolis, MN
Carleton U OPUS	613-564-5672	Opus 1:163/214	Ottawa, ONT KEBBS
Opus MNP	613-836-7835	1:163/107.0	Kanata, ONT
Ham BBS	614-457-4227	1:226/110.8	Columbus, OH
The CCS Multi-Board	614-875-2286	1:226/70	Columbus, OH
The Alternative BBS	614-927-3644	1:226/190	Columbus, OH
No Carrier	615-360-8419	Opus 1:116/27	Nashville, TN
SkyLink BBS	615-391-3186	1:116/500	Hermitage, TN
The Unknown Opus	615-443-4306	1:116/4	Lebanon, TN
Trillion BBSystem	616-530-0821	1:228/17	Grand Rapids, MI
M.U.O.N. BBS	616-534-7149	1:228/23	Wyoming, MI
Metropolis	617-721-7360	1:101/149	Boston, MA
RBBS-PC of Fargo	701-293-5973	8:960/1	Fargo, ND
WesternType BBS	702-366-9107	1:10/720	Las Vegas, NV
Sara's Outpost	703-358-9112	1:109/306	Arlington, VA
Lucky's Loony Bin	703-938-9738	1:109/10	Vienna, VA
Sonoma Online!	707-545-0746	1:125/7	Santa Rosa, CA
The Breakfast Club	713-579-8979	1:106/992.0	
Uplink Rochester	716-442-8144	1:260/228	Rochester, NY
LOGIC Systems	716-482-5073	1:260/202	Rochester, NY
Middletown_BBS	717-944-0655	Opus 1:270/211	Middletown, PA
Al's Cabin	717-686-3037	1:107/860	Milford, PA
Dino][	717-944-6877	1:270/213.0	Middletown, PA

Appleholic's BBS	216-273-1340	1:157/511	Hinckley, OH
The BUSY SIGNAL	301-358-5754	Opus 1:261/1031	Baltimore, MD
The 3 WINKs RBBS	301-590-9629	1:109/126	Gaithersburg, MD
The Transponder	301-655-3996	1:261/1027	Randallstown, MD
The 3 WINKS RBBS	301-670-9621	1:109/126	Gaithersburg, MD
Thunder Bay BBS	301-831-9012	Opus 1:109/202	Mt Airy, MD
The Twilight Clone	301-946-5035	1:109/205	Rockville, MD
The 8th Sea	303-252-9235	1:104/610	Northglenn, CO
The Comm-Post	303-534-4646	1:104/6	Denver, CO
The Dinosaur Board	303-652-3595	1:104/114	Niwot, CO
King's Market BBS	303-665-6091	1:104/115	Louisville, CO
The Dinosaur Board	303-652-3595	1:104/114	Niwot, CO
King's Market BBS	303-665-6091	1:104/115	Louisville, CO
Microlink B	303-972-9600	1:104/108	Denver, CO
MACropoedia BBS	312-295-6926	1:115/295	Lake Forest, IL
Prometheus Multi-Line	312-386-4290	1:115/386	Oak Park, IL
Samson	312-394-0071	1:115/108	Arlington Hts, IL
Elk Grove Repeater	312-529-1586	1:115/529	Elk Grove, IL
Cope BBS	312-790-0187	Opus 1:115/777	Glen Ellyn, IL
Shangri-La! BBS	312-798-2092	1:115/798	Glenwood, IL
The House QuickBBS	313-352-1210	1:120/56	Southfield, MI
Blue Water TBBS	313-649-6213	1:120/24	Birmingham, MI
Tony's Corner QuickBBS	313-754-1131	1:120/13	Warren, MI
High Flight	317-497-4718	1:201/90	West Lafayette,IN
Indy's SouthSide BBS	317-882-9330	1:231/30	Indianapolis, IN
Night Flight	316-721-0581	1:14/609	Wichita, KS
Home of Collins Radio	319-377-0004	1:14/635	Cedar Rapids, IA
PCalgary	403-271-5563	1:134/11	Calgary, AB
Athens FORUM	404-546-7857	1:370/5	Athens, GA
Atlanta Connection	404-929-0800	1:133/205	Atlanta, GA
The Continuum...	405-681-6323	1:147/3	Oklahoma City, OK
CyberNation	405-789-9108	1:147/54	Oklahoma City, OK
TechTalk BBS	407-269-5188	1:374/1	Titusville, FL
Allied-Flight BBS	407-642-7426	1:3609/2	Palm Beach, FL
Tranquility Base	408-251-4926	1:143/31	San Jose, CA
MacDaze BBS RRH-Tabby	408-253-3926	1:204/	Cupertino, CA
House of Ill Compute	408-733-3734	1:143/21	Sunnyvale, CA
MacScience!	408-866-4933	1:143/36	Sunnyvale, CA
Sir Dep's Dungeon	408-992-0846	Opus 1:204/40	Sunnyvale, CA
The Eyrie BBS	409-846-0664	1:117/304	College Stat., TX
Bridger	412-266-5947	Opus 1:129/55	Ambridge, PA
Maltese Alien	412-279-7011	1:129/58	Carnegie, PA
Harvester Music Support	412-344-8226	8:7001/1	Pittsburgh, PA
Zone 8 Echogate	412-344-8504	1:129/34	Pittsburgh, PA
BlinkLink	412-766-0732	Opus 1:129/89	Pittsburgh, PA
Pioneer Valley PCUG #1	413-256-1037	Opus 1:321/109	Amherst, MA
Quaboag Valley Transfer	413-967-9541	1:321/131	Ware, MA
ET - SCRIBE<M>	415-621-8425	1:161/256	San Francisco, CA
Diablo Valley PCUG-BBS	415-943-6238	1:161/55	Walnut Creek, CA
The Aviation BBS	416-444-2028	1:250/601	Toronto, ON Black
Hole BBS	419-228-7236	1:234/16	Lima, OH
NorthWest Ohio Rbbs	419-448-1421	8:965/1	OH
Opus' General Store	419-885-7043	1:234/1	Sylvania, OH
The Gaslight BBS	501-444-8420	1:391/4	Fayetteville, AR

professional ARPANET and USENET, but it's been set up non-profit by enthusiasts. In fact, FIDO's developer Tom Jennings compares its support by hobbyists with amateur radio.

Both Radio Sweden and Radio Netherlands can be reached over the FIDO system. Messages to Radio Sweden should be sent to George Wood at 2:501/297. Messages to Radio Netherlands can be sent to Jonathan Marks at 2:500/202.

In April 1986, Larry Digioia, sysop of the "Neverboard" in Pittsburgh, Pennsylvania, organized a small group of FIDO BBSs to exchange messages related to shortwave listening. The Neverboard has since shut down, but the SWL Echo lives on. Not only are there many more BBSs involved now (the best guesstimate as of November, 1989 was 250+), but growth continues at a steady 5-10 new BBSs per month, and discussion has broadened to include the recreational monitoring /scanning of all forms of radio communication.

The Echo bulletin-boards exchange messages nightly about shortwave equipment, antennas, scanners, info sources, tuning tips, questions and answers, making for a much bigger and livelier array of messages on each system, and saving callers money, since they can access the pool through their nearest node.

The following list from the ANARC BBS is based on the origin-tags of messages received during a 9 month period. There are many more BBSs carrying the SWL Echo than are listed here, since the Echo also feeds into other nets with their own distribution hierarchies. There may also be some BBSs listed which have recently died or dropped out.

NAME	TELEPHONE	NODE	LOCATION
The Mercury Connection	201-249-0172	1:107/372	New Brunswick, NJ
The Parthenon	201-463-0315	1:107/337	Piscataway, NJ
Passing Thru	201-721-3087	1:107/3	Old Bridge, NJ
Free NCC 1701-A Network	201-906-0159	Opus 1:107/342	Edison, NJ
Crystal Mountain BBS	203-228-1708	1:320/777	CT
Bruce's Bar and Grill	203-236-3761	1:142/208	West Hartford, CT
Trumbull Mini-BBS	203-261-6434	Opus 1:141/370	Trumbull, CT
The Overlords Domain	203-344-0495	1:320/89	Middletown, CT
The Bit Bucket	203-349-1173	Opus 1:320/550	Middlefield, CT
Source of Magic	203-431-4687	Opus 1:141/725	Ridgefield, CT
Orions Nebula	203-438-9908	Opus 1:141/705	CT
Hart-Metro Opus	203-563-6455	1:142/911	Wethersfield, CT
The Farm	203-628-4644	1:141/880	Milldale, CT
SpaceStation Regula Two	203-657-8238	1:320/835	Glastonbury, CT
TeleTalk	203-674-1802	Opus 1:142/328	Farmington, CT
Logical Data BBS	203-667-1484	1:142/667	Newington, CT
Ye Olde Libraerie	203-933-2690	1:141/390	New Haven, CT
Dozy's Den HST	204-233-6406	Opus 1:348/1	Winnipeg, MB
Tech-Talk-Toll	204-269-7373	Opus 1:348/40	Winnipeg, MB LSO
II	206-334-7039	1:344/1170	Everett, WA
The Brier Patch	206-774-9566	Opus 1:343/5	Brier, WA
Awakening BBS	206-582-5579	Opus 1:138/102	Tacoma, WA
Burrell's BallPark NEC	206-752-4672	1:138/52	WA
The Boardwalk	206-941-3124	1:343/47	King County, WA
Bangor ROS ROSnet#07	207-942-7803	1:132/301	Bangor, ME
NYC Fire Dept BBS	212-964-8090	1:107/700	New York, NY
On The Waterfront	213-306-2581	Opus 1:102/521	Marina Del Rey,CA
Long_Island RB	213-370-4113	1:102/138.0	Los Angeles, CA
Micro Source BBS	213-391-1351	1:102/5	Los Angeles, CA
Hatzlacha	213-466-3861	1:102/743	Los Angeles, CA
Sun BBS	213-769-5732	1:102/220	Gardena, CA
DataLink BBS	214-394-7438	1:137/61	Dallas, TX
Southern Crossroads	214-418-9679	1:124/4115	Carrollton, TX
System-2 RBBS-PC	215-631-0685	1:150/623	Norristown, PA
TurboXT RYBBS	215-745-9774	1:150/614.0	Philadelphia, PA

of thousands BBS's around the world now, both open and closed, hobbyist and professional. It's impossible to keep up. The lists that follow are as accurate as we can acertain, but changes happen constantly. We'll try to keep you advised to changes in updates and on the air on "Sweden Calling DXers."

5.1 BULLETIN BOARDS–SWL NORTH AMERICA

ANARC BBS–1-913-345-1978–this is the pre-eminent SWL BBS in North America, and probably the world. Reorganized and moved many times, the ANARC BBS was started for the Association of North American Radio Clubs by Bill Krause on a Commodore 64. Later the A*C*E BBS, operated by Kirk Baxter for the Association of Clandestine Enthusiasts, was converted to become the ANARC board. The system came back online in February, 1990 after high winds caused a power outage, which led to the failure of the hard disk.

Among other features, the ANARC BBS carries the following message boards for the various ANARC Clubs and organizations, and other categories:

- Association of North American Radio Clubs (ANARC)
- NASWA message center
- SPEEDX message center
- Minnesota DX Club messages (MDXC)
- Michigan Area Radio Enthusiasts (MARE)
- Miami Valley DX Club section
- Jobs in Radio
- Canadian International DX Club
- Radio Netherland's "Media Network" message center
- National Radio Club (NRC) section
- All Ohio Scanner Club (AOSC) messages
- Radio Communication Monitoring Association (RCMA)
- General Shortwave section
- VHF/UHF Radio Section
- World Radio TV Handbook Headquarters messages

The ANARC BBS also carries message boards for three "Echos" (see below under FIDO): the Shortwave Echo, the Ham Radio Echo, and the TVRO Echo. The system also carries the weekly Sweden Calling DXers Electronic Edition.

The Pinelands RBBS–1-609-859-1910–is operated by Tom Sundstrom, who was honored by the World Radio TV Handbook in 1989 for his radio computer achievements. It is also on the Fido SWL Echo (number 1:266/32) and is one of the first places the Sweden Calling DXers Electronic Edition can be found every week.

5.2 FIDO AND THE SWL ECHO

FIDO is an international network of BBS systems all running the same public domain software for the IBM PC. There are thousands of FIDO boards, most in North America, but some as far away as Indonesia and Sweden. Each FIDO BBS is independent, but the most interesting feature is that for one hour every night all the FIDO systems close down and forward messages to each other over telephone lines.

Users who send messages to people in other cities have to maintain accounts to pay for the telephone charges, but these charges are much cheaper than ordinary telephone calls. FIDO is in fact a network very much like the

5 TELECOMMUNICATIONS–COMPUTER BULLETIN BOARDS

As we wrote in Chapter I, one of the best uses for computers in the radio listening hobbies is for communication. Computers can communicate with each other over telephone lines. Larger systems will be discussed in the next chapter, but most of this communication is via computer bulletin board systems (BBS), which vary widely. Most are more advanced than the previously discussed amateur radio bulletin boards (although recent amateur radio satellites carry advanced message forwarding systems and packet radio is making sophisticated mailboxes possible).

Generally BBS systems allow callers to leave messages, either for all other callers or one or more individuals. Most contain conference systems, either general or focusing on specific topics. There are also libraries of files, texts or computer programs of interest. A growing number of BBS's are devoted to the radio listening hobbies or have dedicated sections for monitors.

Computer Bulletin Boards are a decentralizing form of communications, sometimes regarded as subversive or illegal by the Establishment. On February 14, 1990, US federal agents and local police officers in Cincinnati, Ohio, raided the home of the Cathouse BBS (tel. +1-513-528-0707), which had been used as a forum for messages, opinion, and news for satellite television enthusiasts. The authorities apparently objected to the board's spreading of information about modifications to satellite receivers to circumvent scrambling protection.

In addition to the computer and a telephone, telecommunications requires a modem (modulator–demodulator) which goes in between. The modem turns the 0's and 1's of the computer into tones that can be carried over a telephone line, and appropriate software. Data communications can vary according to speed (baud rate) and the tone frequencies used. The most common speeds are 300, 1200, and 2400 baud. North America and Europe use different tone systems at 300 and 1200 baud. The North American system is known as Bell, the European CCITT (1200 baud in North America is Bell 212A, while the European version is CCITT V.22, while 2400 baud internationally is V.22bis). Nowadays most modems are dual standard, but if you want to access a bulletin board using a different system, make sure your modem can handle it.

A modem command standard has emerged among modem manufacturers, developed by the Hayes company. Hayes compatible modems share common commands, usually beginning with the letters "AT". It's useful to have such a modem, since modern communications software often takes the Hayes commands for granted.

Telephone lines can sometimes introduce interference or "noise" in a computer contact. It's important that files transmitted over telephone lines be perfect, since a single mistake in a computer program can mean the program will not work. Protocols have been developed to check for errors in file transfers. Typically a communications program will contain XMODEM or KERMIT or a similar protocol. As modems reading 9600 baud and faster have been developed, manufacturers have reached agreement on an error-checking protocol built right into the modem. This is called MNP (Microcom Network Protocol), and provides hardware error detection, error correction, and data compression. MNP works on several levels, and when two MNP modems make contact with each other, they carry out their communication at the highest level available to both, automatically.

Most modems are stand along external units that are attached through a cable to the computers serial (RS-232) port. There are also internal modems on cards that plug into IBM compatibles. These are usually somewhat less expensive than the external units, and leave the serial port free.

The British PRESTEL system (see the next chapter) uses a split speed system, where the remote computer transmits at 1200 baud, but the home unit uses only 75 baud. A number of European modems carry this split speed (known as V.21). Fortunately systems such as PRESTEL now offer 1200/1200 baud service as well, so V.21 may soon be a thing of the past.

There are many communications programs available. One of the most popular for IBM PCs and compatibles is ProComm. This was developed as Shareware, and version 2.4.2 can often be found on BBS's or via computer hobbyist clubs or magazine advertisements. A newer version, called ProComm Plus, is being distributed through the ordinary commercial outlets.

Communications software has parameters that have to be set. The number of data bits used can be either 7 or 8. The parity can be even or odd, or no parity. And there can be 1 or 2 stop bits. The typical BBS uses 8 bytes, no parity, 1 stop bit, usually written 8-N-1. Larger systems, such as CompuServe (next chapter) usually use 7 bytes, even parity, 1 stop bit (7-E-1). If you have your program set for 8-N-1 and get garbage on the screen, change to 7-E-1.

Most BBS's are free to use, operated by hobbyists. Some ask for donations by regular users. The user does have to pay for the telephone call, which in some cases can lead to very high long distance bills. There are tens

On the other hand, several CompuServe HamNet users have strongly criticised this program.

The system requires 512 k RAM minimum, 1 serial port, and 1 floppy drive, and costs USD 100. The program works better with a color EGA or VGA monitor and a hard disk. The program will run on portables, such as from Toshiba, Tandy, and Zenith. An RS-232 to TTL interface, needed if the user doesn't have the manufacturer's interface, costs an additional USD 100 for a 4 radio external interface, USD 130 for an internal PC interface with 1 serial port and 1 radio port. A spectrum analyzer module is also available, for USD 230. For an additional USD 275 an option is available to digitally record up to 170 minutes of receiver output on hard disk or a tape back-up system.

Simon Collings

Simon Collings, G4SGI, (Southwold, Harnham Lane, Withington, Cheltenham GL54 4DD, England) has developed a software control package for the IBM PC and the Yaesu FRG-8800 receiver. PC-Monitor offers the user 1000 dual frequency VFOs, each with a 50 character comment. The receiver frequency can also be stepped by using the computer's cursor keys or mouse. An integrated SWL logbook is also included.

A version capable of controlling the Yaesu FRG-9600 scanner, in addition to the FRG-8800, is under development.

The full version of PC-Monitor costs GBP 25. An earlier version with fewer facilities is available in the public domain, and can be ordered from Public Domain Software Library, Winscombe House, Beacon Road, Crowborough TN6 1UL, England.

Systems and Software International, Ltd.

Systems and Software International, Ltd. (4639 Timber Ridge Drive, Dumfries, VA 22026, USA) offers an unusual interface for the Macintosh and R-7000 scanner called the Remote Computer Scanning System (RCSS). This allows the scanner to automatically and unattended scan unlimited banks of VHF and UHF frequencies and log all signal activity. This should help find new frequencies to monitor.

Another RCSS model works with the R-71. It also scans unlimited banks of frequencies, and can store 99 memories per bank. The R-7000 interface is advertised at USD 190, the R-71 at USD 200.

Radio Runner

Radio Runner is a Macintosh control program that won a 1989 "World Radio TV Handbook" Industry Award for Most Innovative Software. Available from San Lorenzo Software (100 Hare Way, Boulder Creek, CA 95006, USA), this program (in the word's of the WRTH) "combines clever use of maps and database material with direct control of a wide range of receivers in the Icom and Kenwood family. The program is extremely user friendly and has obviously taken time and trouble to compile."

for USD 10 plus shipping. (See Chapter II for more details.)

Electronic Equipment Bank

Electronic Equipment Bank (516 Mill Street, N.E., Vienna, VA 22180, USA) several years ago developed an interface between the Icom R71 and the Commodore 64 computer, called the MEC 71 alpha. This has been followed with a newer MS-DOS system called the CRIS 6000 Computer Radio Interface System. CRIS is designed to work with Icom, Kenwood, and Yaesu receivers and transceivers, as well as AOR scanners. It requires a PC or AT with at least 256 k of available memory. The basic CRIS software includes the following functions:

Read up to 800 memory channels from a disk file into RAM. Set radio frequency and mode to current RAM memory channel. Scan selected RAM channels. Log date/time, frequency/mode, and signal strength to disk.

There is also a spectral display option.

CRIS costs USD 749 plus USD 8 shipping. The spectral-display option costs USD 300. There are many other options as well.

AF Systems

AF Systems (P.O. Box 9145, Waukegan, IL 60079, USA) has developed a Commodore 64/R-71 interface called ADVANCED SEEKER, which consists of a hardware interface as well as disk-based software. The software in the earlier version, which we tested, included files on up to 26 International Broadcasters, with starting and ending times, and up to four frequencies. If you want to listen to an international broadcaster, Seeker scans the schedule data and offers a menu of those broadcasters on the air. You then select a broadcaster and Seeker scans the available frequencies, choosing the strongest signal (which may or not be from the broadcaster in question).

If the broadcaster you are listening to has a scheduled frequency change, Seeker will make the change automatically. The software is disk-based, to make updates easier to introduce. To monitor signal strength, it is necessary to solder an additional wire from the receiver's EX-309 connector to an easily accessible point in the Icom (which may nullify the warranty).

AF Systems has developed a new IBM version of Seeker called SEKKER-PC which will work with the Kenwood R-5000 and Icom R-71 receivers. The system is impressive–with a database to manage receiver memory channels, direct keyboard entry of frequencies, mouse support, and automated unattended control. Seeker-PC requires a PC with 512 k RAM, a serial port, game port, and either two floopy disk drives or a hard disk. It will support a Microsoft or compatible mouse and HP LaserJet or dot matrix printers.

The R-5000 version requires the Kenwood IC-10 kit, but the IF-232 interface is not required. The software is available on both 3.5 and 5.25 inch disks, and the package includes the Seeker-PC hardware interface. The entire package costs USD 479 plus USD 13.50 for shipping and handling.

Datametrics

Datametrics (2575 S. Bayshore Drive, No. 8A, Coconut Grove, FL 33133, USA) has developed a hardware/software interface called the DATAMETRICS COMMUNICATIONS MANAGER, for the IBM PC and Icom R-7000 scanner. According to the advertisements, it offers 1000 channels per file, with improved scanning. Users can make a scan list for any number of frequencies. The computer will then log the activity (with time and date) on each of the frequencies. Communications Manager costs USD 299.

DataCom, Int.

DataCom, Int. (Box 5205, Hollywood, FL 33083, USA) offers the DATACOM 4 package that will allow an MS-DOS computer to control up to 8 digital radios simultaneously, including no less than 35 receivers, transceivers, and scanners from Icom, Yaesu, Kenwood, JRC, Collins, and other companies. Advertised features include scan functions added to radios that lack them, frequency and information memory limited only by disk storage, screen display of all channels in memory, with a full description of each, and a logging utility. The program allows you to set up 26 menus, each with 200 frequencies. Logging of date, time, and duration of a transmission is automatic.

There are additional hardware and software options that the WRTH 90 says "perform some of the most sophisticated scanning we've seen." There is also data terminal support for the AEA PK-232, Kantronics KAM, and Universal M-7000 units.

4 RECEIVER INTERFACES

Apparently the first computer-controlled receiver was a Bearcat scanner. Unlike modern units, which are self-contained receivers whose operation can be expanded by computer interface, that early Bearcat needed the computer to work. Unfortunately sales were light and the product disappeared from the market.

Despite that set-back, many of the latest receivers and transceivers are computer interfaceable. This has several advantages, for example adding many new memory channels. One can also access databases, such as all English language shortwave broadcasts worldwide or all local scanner channels, with notes and remarks.

One might have an interface access the computer's own time clock so that the screen display is a menu of all available broadcasts to your part of the world in the language of your choice. You choose the station, and the computer samples all of the available frequencies, choosing the strongest. Radio amateurs can have programs for packet radio that automatically log contacts, include satellite tracking, and automatically rotate antennas.

This sounds very useful. The problem is that computers are often sources of RF noise, which means that as long as the computer is on, it's impossible to hear anything on the radio. Such problems can be solved by installing RF chokes in all cables, and grounding and shielding all equipment. Sometimes it works.

As computer chips grow more power and continue to drop in price, future receivers may have so much computer power packed into them that a computer interface would be pointless. But for the time being, a computer interface can add a lot to a receiver.

The main companies manufacturing computer-compatible equipment are Yaesu (who's system is called CAT, for "Computer-Aided Tuning), Icom, Kenwood, and JRC. The more recent AOR scanners can also be computer controlled.

Yaesu's Kjell Stroem has written a number of articles on interfacing various Yaesu models (such as the FRG-8800 receiver, FRG-9600 scanner and FT-9800 transceiver) to various computers. Externally controllable functions include mode selection, IF passband control, frequency selection, and channel storage. A program for using the FT-757GX transceiver with was published in the March, 1985 issue of the Swedish amateur radio magazine "QTC" and reprinted in the September, 1985 issue of the American magazine "QST". (There was an error in the program listing, which was corrected in the December, 1985 issue.)

In November, 1986 Kjell Stroem wrote in "FRENDX" (sample copies USD 1.00 in North America, USD 2.00 overseas, from NASWA, 45 Wildflower Rd., Levittown, PA 19057, USA) about interfacing a Yaesu FRG-8800 receiver with a Commodore 64. It includes both a BASIC program and construction details for an easy-to-build interface.

Kjell Stroem has also written a program called "Watson" (short for "What's On?) to control the Yaesu FRG-8800 with the TRS-80 Model 100 computer. The program is a database that lets the user see the stations and frequencies that are current for that time of day. One is selected, and put into the receiver, after which control returns to the front panel controls. A print-out of the program listing is available free of charge from Radio Sweden.

The October, 1985 issue of "Popular Communications" has an article by Russ Kroeker about interfacing the Commodore 64 with ICOM equipment, including the R-71 receiver. The article discusses both software and a hardware interface. Unfortunately the description of the interface is very brief and the author does not even identify the two integrated circuits used. Kjell Strom says these are type 40106 "hex Schmitt- inverter" (gates A,B,D, and F) and a 4081.

In recent years a number of commercial products for computer control of receivers and transceivers have appeared on the market. Here are some of the more interesting:

As mentioned in Chapter II, Tom Sundstrom's ENGLISH LANGUAGE SHORTWAVE BROADCAST SCHEDULES can load frequencies directly into a JRC NRD-525 or a Kenwood R-5000 receiver. Tom has also developed receiver control programs for these two receivers. These require special hardware interfaces from the manufacturers, but allow you to load lists of frequencies (such as are found in SWL magazines and club bulletins) into the receiver memories, along with a number of other features. Both programs allow mode setting per frequency. The JRC version additionally offers filter and AGC and attenuation settings. The Kenwood version additionally allows manual control of the receiver, including VFO and memory selections and settings, program scan, and other control options as prescribed by Kenwood.

The JRC version requires the CHH-532 interface, the Kenwood version requires the IF-232C interface and the IC-10 IC kit. The serial cable preparation is up to the user as per instructions from JRC or Kenwood. The control programs are USD 50 each, plus shipping. A demonstration version of the Kenwood program is available

completed demodulator costs USD 179, while a kit is available for USD 129 and a PC board kit for USD 29. Multifax PC software costs USD 49, and is available for CGA (Version 2.3), EGA (3.4), VGA (4.0), and VGA with RAM drive in expanded memory or hard disk (5.0). Information and a demo disk is available for USD 2.

QST

The "On Line" column in the October, 1985 issue of "QST" describes a packet radio interface for the Macintosh called MacPacket/TAPRterm. For more information contact: Jack Brindle, Brincomm Technology, 19451 Gulf Blvd. No. 503, Indian Rocks Beach, FL 33535, USA.

Mike Stone

Mike Stone, editor of "SPEC-COM", has produced software for the Radio Shack Color Computer which will allow reception of WEFAX signals, such as can be heard on the NOAA satellites on 135.5 MHz. Instead of using a hardware interface, the program allows WEFAX reception "with joystick control" (which we assume means interfacing through the joystick port). WEFAX 1.1 will receive 60, 90, and 120 lines per minute facsimile in full screen format. Hard copy print-out is also possible. For more information, write to: SPEC-COM Membership Services Department, P.O. Box H., Lowden, IA 52255, USA.

Timestep Electronics Ltd.

Timestep Electronics Ltd. (Wickhambrook, Newmarket, CB8 8QA England), sells receivers, interfaces and software for the BBC Micro for monitoring weather satellites. The company has added equipment for the IBM-PC and compatibles as well. Complete Meteosat systems are available from GBP 599.

Technical Software

Technical Software (Fron, Upper Llandwrog, Caernnarfon, LL54 7RF, Wales) sells TX-3, a transceiver program for RTTY, ASCII and CW for the BBC Micro-B and BBC Master, Commodore 64 (tape GBP 20, disk GBP 22), Sinclair Spectrum (tape GBP 35, disk GBP 37) and Vic 20 (RTTY/CW only tape GBP 20). The company says these require only an inexpensive interface, called the TIF-1, available as a kit for GBP 20, readymade for GBP 40.

RX-4 is a receive only program for RTTY, CW, AMTOR, and SSTV (BBC-B and Master and Commodore 64 tape GBP 25, disk GBP 27; Vic-20 tape GBP 25; Spectrum tape GBP 40, disk GBP 42). It also requires the TIF-1 interface. RX-8 for the BBC Micro adds FAX and UoSat decoding. Including hardware interface, the system costs GBP 259, with a discount for RX-4 users.

The APT-1 decoding module enables all weather satellites to be received on any FAX system. Includes full AGC and signal-derived synchronisation for pictures from any source. Plugs into the RX-8 system directly. GBP 59 (39 if ordered with the RX-8).

ICS Electronics Ltd

ICS Electronics Ltd (Unit V, Rudford Industrial Estate, Arundel, West Sussex BN18 0BD, England) sells the MET-2 Meteosat Receive System for the IBM-PC, Amiga 500, and Atari 1040ST computers. The system includes anantenna, preamp, 20 meters of cable, receiver/demodulator, power supply, software, and full documentation. It costs GBP 600 plus VAT and postage (in Britain GBP 9.50).

Garex Electronics

Garex Electronics (Harrow House, Akeman Street, Tring HP23 6AA, England), offers an Atari Animated System for automatic frame capture and animation from Meteosat, as well as still pictures from NOAA and other VHF satellites. The interface unit and software costs GBP 459. Similar systems are available for the Amiga and for PC compatibles for the same price. A complete system with antenna, preamp, receiver/interface, software, and cables is available for all three computers for GBP 689. These prices include VAT and UK postage.

G and G also offers ART-1, a complete sending and receiving terminal for RTTY, AMTOR, and CW for the C-64, for USD 199, as well as a number of other products.

DRSI

DRSI (2065 Range Rd., Clearwater, FL 34625, USA) has developed the PCPA-1 PACKET ADAPTER, an expansion card TNC that plugs into IBM PCs and compatibles. It includes terminal software, which can run in the background, so that the PC can be used for other work. The PC*Packet Adapter is available for USD 140, the accessory HF modem for USD 80.

Heath

The Heath Company (Benton Harbor, MI 49022, USA, tel. 1-800-253- 0570) sells a very small TNC called the HK-21 POCKET PACKET, which includes a built-in 16K bulletin board. It costs USD 220.

Heath also sells Mitsubishi's VisiTel, a black and white SSTV transceiver designed for telephone service. The system allows people to send pictures over the telephone, to other VisiTel users. But, according to a review in the January, 1989 issue of "73" magazine, VisiTel also works to send SSTV over amateur radio transceivers. It costs around USD 400 per unit.

PacComm

PacComm (3652 West Cypress Street, Tampa, FL 33607, USA) offers a very small low current TNC called the MICROPOWER-2. The company also manufactures a PC expansion card TNC called the PC-320 for both HF and VHF operation, for USD 210. The MICROSAT PSK is a special satellite modem that attaches to an ordinary TNC to permit contact with satellite packet radio, which uses the PSK modulating system at 1200 and 400 baud. It's available for USD 220.

HAL Communications Corporation

HAL Communications Corporation (Box 365, Urbana, IL 618801, USA) was first known for its high quality slowscan television equipment. They have entered the multimode market with a PC expansion card called the PCI-3000. Modes include AMTOR, RTTY, ASCII RTTY, and CW. Packet, SSTV, and fax are NOT included. It requires a PC with 512k RAM minimum and one disk drive.

Software Systems Consulting

Software Systems Consulting (1303 S. Ola Vista, San Clemente, CAS 92572, USA) sells PC HF FACSIMILE 4.1 which includes a demodulator, software, and frequency list for HF fax broadcasts, for USD 99. The demodulator plugs into the serial port (COM 1, 2, 3, or 4) and into the receiver's audio output. The package also comes with a cassette tape with examples of fax signals. The software includes a tuning feature to help tune in fax signals correctly. The system works with CGA, EGA, and VGA graphics. PC GOES/WEFAX includes all of the above, but also receives images directly from U.S. and Soviet weather satellites, and includes what is called "a complete orbital tracking system" (presumeably a satellite tracking program), and resolution of up to 256 gray scales, for USD 250.

PC SLOW SCAN is a transmitting and receiving program for slowscan television for IBM PCs, including the hardware modulator-demodulator. It requires a PC with 640 K memory, parallel port, serial port, graphics card, transceiver, and tape recorder, and costs USD 150.

PC SWL is a receive-only program.

PC HF FACSIMILE is available in Britain from Comar Electronics (1A Birmingham Road, Cowes, Isle of Wight, PO31 7BH) for GBP 99 with VAT plus GBP 2.75 for postage to Britain. PC GOES for GBP 199, plus postage.

David E. Schwittek

David E. Schwittek (1659 Waterford Road, Walworth, NY 14568, USA) offers the Precision AM/FM WEFAX Demodulator for use with NOAA and Meteor and GOES satellite fax, as well as HF weather and news fax. The

Newer products include the Data Engine (with two ports and potential speeds as high as 56,000 baud) for USD 369. The Telemetry Unit with Weathernode EPROM combines weatherwatching with packet radio. It interconnects weather sensors to any brand TNC, and comes with a temperature sensor. There is also an optional anemometer to measure the wind. Users can connect and obtain temperature and wind information. The KTU is available for USD 299, while the anemometer is USD 110.

Software from Kantronics includes: the PC Starter Pac with the Pacterm terminal program for packet radio, a cable to connect a TNC to aa PC serial port, and two books on packet radio and MS-DOS. The package costs USD 25. For twice that amount, Kantronics offers the PC- Combo package, with two terminal programs, Kanterm-PC and Pacterm, as well a fax program called Superfax. Available separately is SuperFax II, a more advanced program which permits unattended operation. This requires a Kantronics TNC using version 2.8 or later firmware, and supports CGA, EGA, VGA/MCGA, and Hercules graphics. It lists at USD 40.

For the Macintosh user there is WeFaxWorks, which also works with any Kantronics TNC version 2.8 or later, and which also costs USD 40. There is also a 64/128-Combo package on disk for the Commodore 64 and 128, with two terminal programs and a WEFAX program.

AEA

AEA (Box C-2160, Lynnwood, WA 98036, USA) offers a similar variety of interfaces for digital modes. The PK-232 MBX is a multi-mode controller offering Packet (both VHF and HF), RTTY, CW, ASCII, FAX, and Navtex. It uses ordinary communications programs, although AEA also sells PC Pakratt with Fax for MS-DOS, MacRATT with Fax for the Macintosh, and Com Pakratt with Fax for the Commodore 64. We've tested the PK-232 and it works very well. It lists at USD 416, but can be found for USD 310.

MFJ

MFJ (P.O. Box 494, Mississippi State, MS 39762, USA) also sells interfaces and software, starting with the MFJ-1224 standard interface (USD 100) and the MFJ-1229 Deluxe model (USD 180) (which includes a tuning indicator). These interfaces include CW, RTTY, ASCII and AMTOR and will work with any computer with an RS-232 or TTL port, such as IBM, Apple, Commodore, TRS-80, Atari, and TI-99. They will run software from AEA and Kantronics as well as MFJ's own. Vic-20 and C-64 software is included.

There is also a receive-only interface (MFJ-1225) compatible with the computers above for USD 70.

For packet radio, MFJ offers the VHF MFJ-1270 B for USD 140 and the the HF/VHF MFJ-1274 for USD 160, which includes a tuning indicator. Both include a WeFAX mode and connect to either RS-232 or TTL ports and can be used with ordinary communications programs. MFJ sells its own Starter Packs with cables and programs for the Vic-20, Commodore 64, IBM, and Macintosh.

The MFJ-1278 multi-mode data controller includes packet, AMTOR, RTTY, ASCII, CW, FAX, Navtex, and SSTV, all for USD 280. The top-of- the-line is the MFJ-1278-Turbo, which includes a 2400 baud packet modem for USD 360. The 2400 baud modem can be purchased separately (MFJ-2400) for USD 80. MFJ-1289 Multicom is an IBM compatible program for use with the 1278. It allows the user to transmit and receive multi-gray Weaterh fax maps, SSTV, and AP news photos. IT costs USD 60.

The MFJ-1292 Video Digitizer connects between a video camera and an IBM compatible to capture digitized video snapshots on disk, which can then be transmitted. It includes a plug-in PC expansion card and software, including software to convert the digitalized snapshots to packet, SSTV, or fax. The complete package lists at USD 200. The software for transmitting and receiving digital pictures is called the MFJ-1288 and will work with most packet controllers and IBM compatibles. It's sold separately for USD 10.

G and G Electronics

G and G Electronics of Maryland (8524 Dakota Drive, Gaithersburg, MD 20877, USA) now offers the communications/interface programs and Morse code tutors formerly manufacturered by Microlog. These include SWL, a receive-only cartridge for RTTY, AMTOR, and CW for the Commodore 64. The single unit plugs into the cartridge port and cables run from the unit to the receiver. The interface is an ordinary-sized software cartridge, and at USD 64, is very inexpensive. However, the unit has only simple filters which make it less sensitive than more sophisticated units from other companies.

MHz. In Israel, 145.300 MHz seems to be a popular frequency. In North America, packet can be found on 145.03, 145.05, 145.07, and 145.09 MHz, with 145.01 MHz used for communications between local area networks.

A number of amateur radio satellites, such as (the now defunct) Fuji-Oscar 12 and its successor Fuji-Oscar 20, Amsat-Oscar 13, and several of the recent "microsats", carry packet radio bulletin boards.

Look for packet from UoSat-Oscar 14 on 435.070 MHz; from UoSat- Oscar 15 on 435.120 MHz; from Pacsat-Oscar 16 on 437.025, 437.050 and 2401.100 MHz; from Dove-Oscar 17 on 145.825 MHz: from Webersat-Oscar 18 on 437.075 and 437.100 MHz; and from Lusat-Oscar 19 on 437.125 and 437.150 MHz. All downlinks require and SSB receiver, except DO-17, which is FM. UoSats are 9600 baud, all others are 1200.

Oscar 13, the most powerful amateur radio satellite yet built, orbits the Earth in an elliptical orbit that makes it available in the Northern Hemisphere for up to 8 hours at a time. The RUDAK packet channel had, as of April 1990, not gone into operation. It's downlink is on 435.677 MHz.

FO-20 carries a packet radio bulletin board. The downlink is on 435.910 MHz, as is a digital beacon.

Stations transmitting to packet satellites use a modulation system called PSK. The satellites downlink at 1200 baud using "Binary Phase Shift Keying" modulation in SSB. Special modems are required for this mode. AMSAT-UK sells a printed circuit board and description for a PSK modem. (See below under "PacComm" for a commercial PSK modem.) The one exception is Dove, the Brazilian youth and peace satellite, which uses ordinary packet (as well as a digital voice synthesizer).

3.5 INTERFACES FOR DIGITAL MODES

A number of articles for building RTTY interfaces have appeared in amateur radio magazines. Jim Grubbs published a schematic for a simple interface in the April, 1985 issue of "Commodore User" magazine, as well as a short program for using the interface to monitor morse code. The following month's issue contained a follow-up article with an RTTY program.

The November, 1985 issue of "Antic" magazine carried an article on using an Atari computer for RTTY and AMTOR. Another article included a BASIC program for receiving morse code as well as a diagram for an interface.

A description of an interface for monitoring WEFAX using a Commodore 64 computer can be found in the January, 1985 issue of the "FAX Journal". For more information write to: R.J. Alvarez, 2512 Arch Street, Tampa, FL 33607, USA.

Digicom is an inexpensive Commodore 64 program for packet radio that requires only a simple packet modem rather than a TNC. The program and instructions for building the modem can be obtained from a number of sources. One is: Devcom, 336 Joya Loop, Los Alamos, MN 87544, USA.

3.6 COMMERCIAL INTERFACES

There are a great many digital interfaces and software packages on the market, for a variety of computers. Many work with the Commodore 64, which before the popularity of IBM "clones" was easily the most common computer among radio enthusiasts, as well as probably the most popular home computer in the world. Most packages are for both sending and receiving and are thus more expensive than simple receive-only units. Many of these units also include other modes besides RTTY, such as morse code (CW), packet radio, AMTOR, FAX, or slowscan television (SSTV). Perhaps the three best-known interface manufacturers are Kantronics, AEA and MFJ.

Kantronics

Kantronics (1202 E. 23rd Street, Lawrence, Kansas 66044, USA) offers a number of interfaces for digital modes. The All mode KAM is a dual port unit capable of operating packet, RTTY, ASCII, AMTOR, CW, and WEFAX. It can also be used as a packet bulletin board, and can be linked to two radios to provide a gateway between two bands. It's available for USD 320.

Kantronics also offers the KPC-2 PACKET COMMUNICATOR II, which features a direct TTL connection for easy hook-up to the Commodore 64 as well as the usual RS-232 port (for IBM and Macintosh). It includes both Bell 202 and 103 tones for both VHF/UHF and HF packet radio, and can operate WEFAX. This lists at USD 169. The KPC-4 is similar, but offers dual ports, while the KPC-2400 provides 2400 baud (or more technically, 2400 bits per second).

Just what is it we need to teach the computer to do? A WEFAX picture consists of 800 lines, with each line taking EXACTLY one-half second for transmission. The signal is a musical note which varies smoothly from about 1500 Hz to about 2300 Hz, where 1500 Hz will produce black, 2300 Hz will produce white and different tones in between produce grays proporational to the signal note itself. We may consider two different ways to display pictures. One way is a gray scale proportional to the WEFAX tone transmitted. TV weathermen capture their weather satellite pictures this way. While the results are very impressive, the hardware interface between the radio receiver and the computer is complicated and expensive.

A second way is to produce a picture using only black and white. The resulting pictures aren't as sharp as the gray scale pictures, but the interface to the radio is simpler and cheaper. We used this approach in developing our WEFAX system.

The interface between the radio and the computer consists of an integrated circuit which "listens" to the incoming musical chirps. Our WEFAX system breaks each half-second chirp into nearly 500 individual tones. One at a time, the inerface examines each tone and determines if it is above or below about 1900 Hz. If the incoming tone is below 1900 Hz, a single output line is pulled LOw. If the incoming tone is above 1900 Hz the output is driven HIgh. The hardware operates fast enough to follow the incoming signal EXACTLY.

Now, we need to teach the computer to receive, decode, and display each line of incoming picture information. Before we can do this, we must teach the computer to determine EXACTLY when a half second has elapsed. (Patrick Bass, "Antic" ST Program Editor)

3.3 PACKET RADIO

Copyright 1985 by Jim Grubbs

What's like radio teletype but won't print on a teletype machine? What's based on telephone computer communication techniques but doesn't connect to a telephone? The answer is packet radio.

World wide communications links for computers often use a technique called packet transmission. The information to be sent is divided into many small groups of characters. Each packet as these groups are called contains addressing information and error correction information. The result is that packets from many different locations can share the same communications channel and all arrive at the proper destination error free.

Amateur radio operators throughout the world have adapted this system to radio transmission. Rather than using telephone links transmission techniques like those used for radio teletype are employed. Most of the activity occurs in the VHF spectrum with much of it done in the 144 MHz band. On VHF 1200 baud channels are the norm, while on shortwave frequencies slower rates must be used in order to obey bandwidth limitations. Experimentation is being done in the UHF range that allows channels to exchange data at rates of 19,200 baud.

One of the most unique aspects of packet transmission involves the addressing that is available. For example, by using packet radio on the 2 meter ham band I can use my ten watt FM transceiver to repeat to a special digital repeater located several miles from me. With the proper addressing my signal is sent on to another repeating station about 50 miles to the northeast. There the signal is picked up by a wide area repeater (a super repeater if you will). The signal is relayed into a station just a few miles from my dad's house. With a station similar to mine, he will receive my messages approximately 30 seconds to one minute after I send them.

3.4 THE SPREAD OF PACKET RADIO

Packet has become the fastest growing mode in amateur radio. While digital repeating from one station to another (digipeating) is part of the system, hops involving more than 2 or 3 stations have turned out to be impractical, due to the number of stations on packet channels. Networks are being developed to link packet bulletin boards. More and more stations are upgrading to 2400 baud operation.

The protocol standard used for Packet Radio is called AX.25, and is a development of the X.25 standard used for ordinary digital communications. The hardware interface for AX.25, called a Terminal Node Controller, or TNC, was developed by amateur radio operators in Tucson, Arizona, and is called TAPR (Tucson Amateur Packet Radio). The TAPR 2 standard is that which is used today, and TAPR-2 TNCs are available from a number of companies.

Most packet radio operations can be found in the 2 meter amateur radio band between 144 and 148 MHz, although there is packet activity on HF and on UHF bands. In Europe much activity centers around 144.675

3 DIGITAL RADIO MODES

Cop Macdonald writes in "Mother Earth News" no. 81:

"Radio amateurs, like many other people these days, are buying home computers. And regardless of how many additional uses he or she might plan for the machine, a ham purchaser almost always wants it to be part of a system of communication.

"In theory at least, personal computers and ham rigs can be interconnected, and the combination can then be used to transmit and receive text by radio. Three types of codes are commonly employed for these transmissions: ASCII (standard computer code), Baudot (normal teleprinter code), and Morse (dots and dashes).

"However, in this case what seems to be simpler in principle turns out to be not so easy in practice. For one thing, obtaining all the necessary bits and pieces of equipment–and integrating them into a smoothly functioning system–requires knowledge and patience.

"If you already have a ham radio transceiver (or a shortwave receiver) and a home computer, you have two of the four elements needed to create a working system. The third component is a piece of interface hardware. This unit functions as a kind of translator, converting the 1's and 0's of computer language into the changing audio tones of radio language, and visa versa. Finally, you'll require the appropriate software. Just as a home computer needs game software to play games and accounting software to do bookkeeping, it will also need communications software in order to communicate. The overall problem is further complicated by the fact that there are many different makes of home computers...each with its own peculiarities."

3.1 RTTY AND AMTOR

RTTY (or radioteletype) is used for a great many purposes. Military communications, embassies, and other government agencies rely on it–although such transmissions are usually coded. Easier to monitor are international meteorlogical transmissions, ships at sea, and aeronautical communications. RTTY is an especially fast growing mode on amateur radio. Transmissions can be heard, for example, in the 80 meter band between 3580 and 3600 kHz and in the 20 meter band between 14080 and 14100 kHz.

Possibly the most exciting RTTY transmissions are from international news agencies. Though much of their networking is today carried out over cable and satellite links, most agencies still rely on shortwave to reach some subscribers, or as a back-up. It can be very exciting to see news copy on your screen, or coming off your printer, knowing that the same news is being printed at the same second at newspaper offices and radio and television stations around the world.

While the Associated Press has ended shortwave RTTY transmissions in favor of satellite relays, the other "Big Four" agencies–UPI, Reuters, and AFP–are well represented on shortwave. Howwever, it's often more exciting to monitor news reports from smaller agencies, such as Cairo's Middle East News Agency and Cuba's Prensa Latina. The Yugoslavian news agency Tanjug relays the Non-aligned News Pool.

The latest amateur radio use for RTTY is the mailbox. This is similar to the computer bulletin board (see Chapter VI). Radio amateurs with RTTY capability can transmit a signal to turn on the mailbox, leave messages for other amateurs, and read messages to themselves. There are a number of inexpensive mailbox software packages on the market. RTTY mailboxes are popular, although in many cases they have been superceded by packet radio or AMTOR.

AMTOR is an improved RTTY that uses simple error correction to improve readability. It sounds like crickets chirping. Packet Radio is the latest digital mode. Packet mailboxes and bulletin boards are flourishing, especially in North America, offering virtually all the features of over-the-telephone systems.

3.2 FAX

Another digital mode that lends itself to monitoring with the help of a micro-computer is facsimile, or FAX. This is used for transmitting both photos and weather maps on shortwave, and for satellite weather photos (WEFAX) on VHF and UHF. There are even plans for high speed (9600 baud) FAX shortwave broadcasts from Japan in the early 1990's.

The September, 1986 issue of "Antic" magzine takes up reception of WEFAX. The following is reprinted with their kind permission:

and station profiles. The latest features are grids to plot station schedules, and a Memory Manager to list all of the memory sets in a receiver. These listings show up in the "favorite frequency" fields of station schedule cards.

All parts of Shortwave Navigator can be updated and edited. The only possible drawback to the program is that it can't be used (yet) to directly interface with the receiver. The Memory Manager comes close, but a human is still required to punch up the memory button manually. On the other hand, that may reduce some computer radio interference.

Shortwave Navigator Version 2.0 costs USD 50 (outside North America USD 55) and includes one free upgrade. Available from DX Computing, 232 Squaw Creek Road, Willow Park, TX 76787, USA. Tel. 1- 817-441-9188. DX Computing's Jim Frimmel can also be contacted on GEnie (Jim.Frimmel), American Online, and Prodigy (TKVW75A).

MacTrak Software

MacTrak Software (Box 1590, Port Orchard, WA 98366, USA) has developed two interesting programs for the Macintosh. DX HELPER provides a Maximum Useable Frequency map, Gray Line, Great Circle, Prefix, Zone, and Soviet Oblast information. There's also a DXCC Country List for radio amateurs. The program also includes a CW drill, and what is called a "WWV Alert". Available for USD 40. Another program called SATELLITE PRO permits automatic tracking of amateur and weather satellites, including control over antenna rotors. Both programs are distributed by Antennas West, Box 50062, Provo, UT 84606, USA. Tel. 1- 801-373-8425. (Please note there is a misprint in the telephone number in the WRTH 90 review of these programs.)

Commodore 64 Software

A few years ago, when the IBM PC was still mainly a business computer, the Commodore 64 was THE home computer. That's no longer the case, but a lot of C-64s remain out there, still capable of doing a lot of work. MoonBeam Press (Box 149, Briarcliff Manor, NY 10510, USA), home of the (in)famous Havana Moon clandestine expert (see "Los Numeros Online" in Chapter 6), has developed a number of C-64 programs for radio monitors.

These include a Morse Tutor, Solar Flux Calculator, QSL Report Writer, and an International Broadcasting Database Manager written for the C-64 "which enables the serious Shortwave Listener to deal efficiently with the complex and ever-changing schedules of International Broadcasters."

This program provides a number of display modes, allowing the user to display a list of all stations, all active stations at a particular time, and time-graphs of broadcast activity by frequency, station or shortwave band. The time-graphs show broadcast activity for a six-hour span of time, one hour in the past and five hours in the future - allowing one to plan listening time. These displays are dynamic, updating every fifteen minutes, so that the current status of shortwave activity is always displayed.

IBM-N Novice Class Licence Software, around USD 35 for DSI-IBM-T Technician Class License Software and DSI-IBM-G General Class License Software. The study materials include theory, code, and regulations and are available from a number of retail outlets, including Amateur Electronic Supply (tel. 1-800-588-0411 or 1-414-358-033 or 5710 W. Good Hope Road, Milwaukee, WI 53223, USA)

QSO TUTOR

Another series of amateur radio license tutorials are called QSO TUTOR, separate programs for Novice, Technician, General, Advanced, and Extra licenses. The programs require an IBM PC or compatible with CGA, EGA, or VGA graphics capability and 256 K memory. They are also usable with monochrome monitors and non-graphics computers. Each program costs USD 30, from QSO Software, 208 Partridge Way, Kennett Square, PA 19348, USA. For an extra USD 2, QSO Software will include a Public Domain disk with a morse code tutor, as well as a contest logger, propagation predicter, and other programs. This disk is also available separately for USD 3. (Add USD 2 for 3.5 inch disks.)

HAM-TIME

HAM-TIME is a large format clock program for MS-DOS computers. Features include: dual UTC/local time display, 12/24 hour mode, US time zones, and time zones around the world. It requires CGA, EGA, or MGA graphics adaptor, 128 K, and DOS 2.1 or above. Available for USD 25 from: ECode Systems, Inc., 335 W. Virginia, Phoeniz, AZ 85003.

BandAid III

BandAid III is a point-to-point propagation program, including a move pointer on a world map for instant bearing and distance, and identification of country. It includes maximum usable frequency forecasts. It requires a PC compatible with at least 320 K RAM and has full mouse support. Available for USD 69 from Base(2) Systems, 2534 Nebraska no. 3, Saginaw, MI, 48601. Tel. 1-517-777-5613. A demonstration program costs USD 10 (credited toward purchase). Also available is the MufMap II worldwide propagation program.

DXLOG

DXLOG is a logging and QSL record program. Country and zone are determined from callsign, a complete DXCC list is included, which can be edited to add new countries. It prints logs, QSL needed lists, QSL labels, and completed DXCC award forms. Available on both 3.5 and 5.25 disks for USD 40 (2.40 sales tax extra in Pennsylvania, USD 5 more for shipping outside North America) from: PAYL Software, Box 926, Levittown, PA 19058, USA. Tel. 1-215-945-4404.

HamCall

HamCall is a CD-ROM catalog of more than 500,000 US callsigns, searchable by callsign, name, address, city, state, zip code, or license class. It requires 640 K RAM, hard disk, and MS-DOS 3.1 or later. The USD 500 package includes the CD-ROM data disk, a Sony CDU- 6100 external CD-ROM drive with interface card for IBM PC/AT type computers and MS-DOS CD-ROM extensions software. Available from: Buckmaster, "Whitehall" Rte 3, Box 56, Mineral, VA 23117, USA. Tel. 1- 800-282-5628 or 1-703-894-5777.

MacIntosh Software: SHORTWAVE NAVIGATOR

SHORTWAVE NAVIGATOR won a 1989 WRTH Industry Award for Most Innovative Software. As Jonathan Marks wrote: "...one of the best graphic connections we have seen so far between the computer and the radio." One of the few programs available for the Macintosh, Shortwave Navigator Version 2.0 requires Hypercard 2.2, a hard disk, and 1 MB RAM minimum.

The program opens with a map of the world. Users can click (with a mouse) on continents, which leads to a listing of countries on shortwave from that continent. Alternatively, you can click on "Programs this hour", for a listing of current broadcasts. Shortwave Navigator is a database of broadcasts and frequencies, with special listings of the day's DX and Media programs, international news, and special programs. There's a log section

The database files are to be updated 4 times a year, and a database file update subscription is available. A demo diskette is available for a postage and handling fee of USD 5.

PC GLOBE 3.0

PC GLOBE 3.0 (PC Globe Inc., 4700 South McClintock, Tempe, AZ 85282, USA) is an "electronic atlas", a database of information that provides instant profiles, detailed maps, and enhanced graphics for 177 coountries, virtually every country in the world. It provides more than 80 categories of information, including economic, political, health and population statistics.

Also included are telephone, telex and what are refered to as "ham radio" codes (probably callsigns). There is also automatic currency conversion, and point-to-point distances, in both kilometers and miles. While not exactly a "radio" program, PC Globe provides much information

The minimum system required is an IBM compatible PC with 512K RAM, twin disk drives (hard disk recommended), DOS 2.0 or later., and an IBM/Compatible color graphics card. After a favorable review in "WRTH Downlink" we bought the original version of the program for use in compiling Sweden Calling DXers. It works very well. Version 3.0 lists at USD 70, although it is advertised as low as USD 39. PC Globe can also be reached by telephone to 1-602-730-9000 or 1-800-255-2789, or by fax to 1-602-730-968-7196.

MFC Technologies

MFC Technologies (3704 1/2 Foothill Blvd., Suite 524, La Cresenta, CA 91214, USA) has developed a number of programs for use during amateur radio contests. SCORE is an MS-DOS program that can be used for the ARRL Sweepstakes, while KOMPLETE is for the ARRL International DX Contest. Both programs allow a contest operator to automatically control a Kenwood TS-940S, TS-440S, or Heath SS-9000 transceiver and a Pro-Search antenna rotor, along with other contesting operations, such as logging and checking for duplicates.

ARIES-1

ARIES-1 by Ashton (Box 1067, Vestal, NY 13851, USA), is an MS-DOS logging program, a terminal program (for use in packet radio), and interfaces with two common packet radio TNCs (see next chapter for information on packet radio) the Kantronics KAM and the AEA PK-232. It also interfaces with Kenwood and Icom transceivers to read frequency and mode and insert this information into the log. The price is USD 65. The ARIES-2 program, which will be mentioned in Chapter 4, controls Kenwood, Icom, Ten-Tec, and Yaessu transceivers.

MICROHAM 1.00

MICROHAM 1.00 is a logging program with pulldown menus and windows, country and county databases with demographics and beam headings, 70 reference screens with informationabout frequency bands, prefixes, etc., an external program selection menu, and a DOS shell. It comes on either 5.25 or 3.5 inch disks, and requires DOS 2.1 or higher, CGA, EGA, or VGA graphics with color monitor, 256k RAM, and a minimum of 1.4 Mbye hard disk storage. Available for USD 25 from Enhanced Systems Corporation, Box 605, Chesterfield, VA 23832, USA.

WB2OPA LOGMASTER

The WB2OPA LOGMASTER is another PC logging program. It automatically indicates if the user is working a new country, state, zone, or prefix. It displays beam heading, CQ and ITU zones, and distance (miles and kilometers) for each contact. The program also detects Kenwood computer ready equipment for frequency and mode insertion, prints logs, QSL cards, and QSL labels. LOGMASTER requires 512k RAM, and a hard drive or two disk drives. It comes on either 5.25 or 3.5 inch disks. The program is available for USD 60, while a demonstration disk costs USD 5. Shipping is USD 2 in North America, USD 5 abroad, from: Sensible Solutions, Box 474, Middletown, NJ 07748, USA.

Diamond Systems

Diamond Systems has developed IBM compatible study materials for the American FCC and Canadian VEC amateur radio licences. Available on both 3.5 and 5.25 inch disks, the courses cost around USD 40 for DSI-

MFJ-1269 is the "SAM" MORSE CODE TUTOR for IBM compatibles. Users can copy select or random letters, or text files. Timing analysis grades progress. In addition, there is a feature for sending practice, using the shift keys as paddles. USD 20.

MFJ also offers a series of amateur radio license upgrade Theory Tutors, for the American licenses. These provide sample tests, as well as explanations on hard questions. Online calculators are included. The Novice tutor is MFJ-1610 for the PC and MFJ-1630 for the Macintosh. The other tutors are: Technician MFJ-1611/1631, General MFJ-1612/1632, Advanced MFJ 1613/1633, and Extra MFJ-1614/1634. All are USD 30 each.

The MFJ-1286 GRAY LINE DX ADVANTAGE displays a detailed world map on an IBM or compatible computer. It shows the moving Gray Line (day/night divider line) and the position of the Sun over the Earth. It can be customized to display any 24 locations and the correct 12 or 24 hour time at each.

Once started it tracks the movement of the Earth. It shows the Gray Line and Sun positions change as time passes. The program works with all graphics adaptors: composite, Hercules, CGA and EGA. It can be run alone or memory resident with other software. The Gray Line DX Advantage is available for USD 30.

MFJ also sells a logging program called the MFJ-1281 Easy-DX. This is primarily aimed at DXers working to log 100 countries for the DX Century Club award. Users can enter any call and the programs tells them whether they need that country on that band or that mode. It also says whether that station has been worked before. The package also comes with a built-in terminal program for packet radio. It will monitor the "PacketCluster" DX spotting network and will send the letters "DX" in Morse code through the computer speaker if a country the user has not yet worked is reported on the network. The program comes on two 5.25 inch disks and requires a PC with 512K RAM. A hard disk is strongly recommended. MFJ-1281 costs USD 40.

Shipping for these products costs USD 4 in the United States, USD 5 to Canada, and USD 30 outside North America.

Technical Software

Technical Software (Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF, Wales) provides a series of amateur radio programs for the BBC micro, Commodore 64, Vic 20, Spectrum, and Acorn Electron computers. These include "MORSE TUTOR", "LOGBOOK", and "R.A.E. MATHS".

SWISSLOG

SWISSLOG prompted Wolf Harranth of Radio Austria International to write: "It does not happen too often that you get a copy of a computer program and decide to buy it on the spot. This is exactly what I did after having tested SWISSLOG, a most useful and highly sophisticated program for amateur radio operators. It is written for IBM PCs, or compatibles using the MS-DOS operative system.

"The first thing you expect from a logbook program is that it helps to keep your log entries up-to-date. This program does much more than that. Let's assume your transceiver is on and you hear OE3WHC calling CQ. As soon as you type in the call, a window opens on the screen and tells you that this is in Austria, Europe, calling from the province of Lower Austria. It gives you the beam direction, the distance in km, DXCC country information, the dates of your first and last contact with that particular station, and more. There is a special input system for contests."

The prefix-country database contains more than 1200 countries and regions. Swisslog can also be made resident, so that it will remain in the background while other programs run. There's also a world map with propagation predictions, and complete editing of logs. There are a number of add-in "extension" programs for real-time support in a number of contests.

SWISSLOG can be obtained from Walter Baur, Kirchweg 68, CH-8102 Oberengstringen, Switzerland, or from Frank Greenhalgh Laboratories, Inc., 151 Broadway, Amityville, NY 11701, USA. Swisslog costs USD 75, a single extension USD 10, and the entire extension package USD 35. Add USD 10 for shipping outside of Europe.

Elektrokonsult AS

Elektrokonsult AS (Box 846, N-3002 Drammen, Norway) has developed a nice international broadcast datebase program for IBM compatibles, called THE RADIO LISTENER'S INTERNATIONAL PC DATABASE. The program runs on PC compatibles running DOS 2.0 or higher, with at least 256 K RAM. It requires one disk drive.

AEA multi-mode interfaces (see the next chapter). Renaissance also sells a morse code trainer called MORSEMAN PLUS, which costs USD 25 plus USD 2 for shipping and handling.

Database

Database (available from Simon Collings, Southwold, Harnham Lane, Withington GL54 4DD, England) is a list of station information, compatible with Jim Button's shareware database PC-File. It includes more than 1500 HF Broadcast entries, standard frequency stations, and an HF WEFAX station list. The system works with the PC-Monitor receiver control program (see next chapter) and requires an IBM PC or compatible running MS-DOS 3.0 or higher, a minimum memory of 512 kB, a harddisk with a minimum of 1 MB of free space, and the Pc-File 5.0 database program. Database is available for GBP 15 and Simon Collings also provides PC-File 5.0 for an additional GBP 5.

2.5 COMMERCIAL PROGRAMS

A glance through any amateur radio magazine reveals dozens of advertisments for computer-related products. Many are programs written by individual amateurs, starting their own "cottage industries". These programs can vary widely in speed, features, and quality. Most involve such uses as antenna design, great circle path calculators, sunrise-sunset calculators, and maximum useable frequency forecasters.

In the beginning, the most common application was logging. Some log programs include extra features, such as QSL card printing, DXCC monitoring, and duplicate searches for contests. Radio Netherlands "Infodutch" booklet (see Chapter VIII) surveys many such programs.

More recently large companies have become involved in developing ham shack software. There are satellite tracking programs that also control antenna rotors, programs to control receivers and transceivers, keep contest logs, etc.

Other companies have concentrated instead on developing hardware and software for digital modes such as fax, RTTY and packet radio (see the next chapter). The market continues to grow, and it would be impossible to review or even mention every offering.

Here are some typical product descriptions, most gleaned from American magazines. Unless otherwise indicated, we haven't had an opportunity to actually test these products, but they seem interesting. More specialized applications, such as digital modes, control of receivers and transceivers and computer communications, are in later chapters.

"Dr. DX" and "Dr. QSO"

Advanced Electronic Application, Inc. (Box C-2160, Lynnwood, WA 98036, USA) has produced two unique programs that can be used for morse code training, "Dr. DX" and "Dr. QSO". Apparently based on a program used by the American military to train radio operators, Dr. DX recreates operating conditions during an amateur radio contest, using morse code. The user can choose and tune across any band, after entering a starting time and location. The stations that appear are from countries that could be expected to appear with regard to propagation conditions for time and frequency. The program even keeps track of contacts and AEA is providing an award to anyone who "contacts" 100 countries.

Dr. DX costs about USD 150. Dr. QSO is less expensive. It duplicates contacts on one band, and permits longer "conversations". Both are contained on plug-in cartridges for the Commodore 64. There is another C-64 program called "MORSE CODE UNIVERSITY". This costs around USD 40.

MFJ Enterprises

MFJ Enterprises (Box 494, Mississippi State, MS 39762, USA) has a number of interesting products. Here are two (more can be found in the next chapter):

MORSE CODE TUTOR is a program for the Commodore 64 computer to teach morse code. Besides sending random letters, the program turns the computer into a morse code keyboard to use with transmitters. We've tested the program and it works very well.

MacSat 3.0

MacSat 3.0 (Geodetic Research Services Ltd., Box 3643, Station B, Fredericton, New Brunswick, E3A 5L7, Canada) is a general purpose satellite tracking program for use with Macintosh computers. MacSat can track up to 21 satellites simultaneously; either in simulation or real time mode. The location of the sun and the day/night line is also displayed. The program has 3 display screens. The text screen displays in tabulated form the satellite ground track coordinates, range, mean anomaly, visibility (elevation and azimuth) and Doppler shift frequency information for all satellites being tracked.

The graphical screen portrays the satellite ground tracks superimposed on a world map. The visibility polar plot displays graphically the precise location of each visible satellite above the observer's horizon.

MacSat continually updates all three screens as the satellites move over the earth regardless of which screen is currently displayed. Screen switching can be done easily at any time. Hard copy prints can also be made. The price is 50.00 Canadian dollars, plus 10 dollars for airmail postage and handling. This includes the program and documentation on 800K diskette. For update from version 2.0, please enquire.

Geodetic's Richard Langley has also developed a Macintosh program for decoding telemetry from the DOVE Microsat. MacDOVE is available free of charge directly from the University of New Brunswick via electronic mail (BITnet: LANG@UNB.CA or SE@UNB.CA) or if someone sends a diskette, Richard will copy the program onto it and mail it back, post free. (Geodetic Research Laboratory, Dept. of Surveying Engineering, University of New Brunswick, Fredericton, N.B., Canada E3B 5A3).

Jim Hale

A program to track satellites for the IBM and Commodore 64 computers is available on disk from Jim Hale and the "Amateur Satellite Observers Data Letter". Cassette-based programs are available for Timex Sinclair, Atari, and Texas Instruments computers. For more information, write to Jim Hale, HCR 65, Box 261 B, Kingston, Arkansas 72742, USA.

KANSAS CITY TRACKER

The KANSAS CITY TRACKER (mentioned above under Amsat) comes with software, an interface connector, and a PC expansion board. The software interfaces tracking programs with the Tracker Board, which provides an interface to antenna rotors. It is compatible with Quiktrak, InstantTrack, Orbits, and Silicon Solution's Graftak programs. The KANSAS CITY TUNER adds hardware to the Tracker board and additional software to provide control of radios to adjust their frequency to correct for doppler effects. The KC Tracker package for the Yaesu/Kenpro 5400A/B or 5600 A/B rotors costs USD 189. The rotor interface option for any rotors costs an additional USD 30. The KC Tuner option costs USD 79. From: L.L. Grace, 41 Acadia Drive, Voorhees, NJ 08043, USA. CompuServe 72677,1107.

2.4 PUBLIC DOMAIN AND SHAREWARE

Public domain programs are written by enthusiasts, who give them away for all to use. Shareware programs are also distributed freely, but users who find them useful are encouraged to send a fee directly to the developer. The system works–one of the best communications programs, Procomm 4.2, is shareware (although the developers, Datastorm, have turned to the commercial market for distribution of its successor, Procomm Plus).

Both kinds of programs can be obtained from computer clubs or downloaded from computer bulletin boards. (Note, this is also the main way computer virus programs are spread, so be careful.)

It may be difficult to find radio-related software through these channels. Aero Data Systems (Box 9325, Livonia, MI 48151, USA, tel. 1- 313-471-1787) offers disks of ham software for USD 4.50 a disk (USD 2 shipping on orders under USD 10). Offerings for IBM users include packet radio communications, networking, and bulletin board software (see Chapter 3); an RTTY mailbox, Fax and SSTV reception, a TV satellite locator, and electronics design calculations. There is also C-64 software, including the Digicom packet radio program, and Amiga software.

Another source of radio-related and other public domain software and shareware is Renaissance Software Library (Box 640, Killen, Alabama 35645, USA, tel. 1-800-525-7235). They charge USD 3 a disk (3.50 for 3.5 inch) plus USD 3 shipping and handling per order. Offerings include packet terminal programs, a satellite tracker, propagation program, SSTV decoder, control of Kenwood transceivers, and terminal programs for Kantronic and

against the field of stars. The program also reads the popular NASA and AMSAT format satellite element files and updates its database automatically. It supports realtime antenna rotor control via the Kansas City Tracker interface. There is also a background mode that allows the user to track satellites and point antennas in real-time while running other programs. INSTANTTRACK will work with any PC, AT, PS2, clone, etc., but requires at least 512k memory. Graphics screens require EGA or VGA display.A numeric coprocessor is not required, but is recommended. A mouse is not required, but can be used on the map screens. USD 50/70.

AO-13 PSK TELEMETRY DECODING is a PC program requiring 256k, a serial port, and the G3RUH demodulator. Decoded data from the Oscar 13 satellite is displayed on monitor or printer, and written to file for future reference. USD 35/45.

C-64 SUPERTRAC is a combination of N4HY's Quiktrak program and enhanced graphics. This program can also drive commercially available dual axis antenna rotors, to track satellites as they travel past. USD 30/40.

C-128 is the ORBITS program specifically written to take advantage of the Commodore 128. As many as 20 satellites may be entered into Keplerian files. It requires an 80 column monitor and a Commodore compatible printer. USD 30/40.

COMMODORE AMIGA is designed for the Amiga operating in 80 column mode. Requires a minimum of 256k RAM. The program is translated to AmigaBasic and runs under Workbenk V1.1 or V1.2. Has the same features as C-128 ORBITS but runs considerably faster. It has a provision for mode and phase programming to alert you as to which transponder is active. USD 30/40.

APPLE QUIKTRAK is a menu-driven program that includes a "window track" feature, which identifies mutual "windows" between the user's location and other specified locations around the world. Requires an 80 column card and 64k. USD 25/35.

SATELLITE HELPER for the Macintosh provides tabular data output of tracking and scheduling information for up to 10 satellites. Graphics displays include rectangular, polar, and great circle world maps, and there is a VIEW mode which shows the Earth as seen from the satellite at any time. The program is also compatible with the KLM/Mirage antenna tracking interface. A propagation prediction package is also included. The program requires 1 Mbyte memory and an Imagewriter printer. USD 40/50.

TLMDCMac is a Macintosh application that decodes telemetry (TLM) from any of the four AMSAT MicroSats (AO-16, DO-17, WO-18, LO-19). Telemetry data can be viewed live on the screen by connecting your TNC to one of the Mac serial ports. A Mac 512E, Plus, SE, Mac II, or Mac Portable can be used. USD 25/35.

AMSAT-UK

AMSAT-UK (94 Herongate Road, Wanstead Park, London, E12 5EQ, England) sells a variety of software, hardware, and books for use in tracking satellites and demodulating telemetry. The following prices are for members only. Non-members should add 10UK is GBP 1.50 extra per disk. All IBM software can be supplied in either 5.25 or 3.5 inch format. The following is a selection of the available software:

```
Amstrad PCW (8256) SATPASS (on 3" disk).............GBP 10.00
Amstrad 6128 and CPC Satellite Tracker (on 3") disk..GBP  8.50
Atari Rotator Software (800 XL).....................GBP 12.50
BBC Micro--Real Time Tracking.......................GBP 10.00
     UOSAT Real Time Tracking.......................GBP 10.00
     TLM 13 (To read data from Fuji-Oscar 13).......GBP  9.00
Commodore 64--AZ/EL Rotator Controller Program.....GBP 12.50
     AMS 88 (All satellite tracking)................GBP 12.50
     UOSAT's Telemetry Capture......................GBP 12.50
IBM--DCE Keplerian Element Capture (from UOSAT)....GBP  7.50
     SATSCAN "Par Excellence".......................GBP 15.50
     AZ/EL Rotator Controller Program...............GBP 12.50
     Quiktrak 3.21 (from AMSAT-USA).................GBP 25.00
```

Printed circuit boards and instructions are available for a number of projects, including: UOSAT 1 & 2 Demodulator (GBP 10.00 plus GBP 1.25 for overseas shipping), AZ/EL Rotator for C-64 (GBP 10.00), Atari 800 XL and Sharp PC (GBP 12.50)(plus GBP 2.00 for overseas shipping for both), and the BBC Micro (price not indicated). Orders can be made on Access, Eurocard, and Mastercard. Make checks payable to AMSAT-UK.

2.2 OTHER NON-COMMERCIAL PROGRAMS

The American Radio Relay League magazine "QST" column "On Line" has a Program Library of radio-related programs for many computers, including MS-DOS, Atari, TRS, Sinclair, IBM, Apple, Commodore, and Texas Instruments. A list is available for return postage and a self-addressed envelope from: ARRL, Dept. PX, 225 Main Street, Newington, CT 06111, USA.

Tom Sunstrom

Tom Sundstrom, who won a 1989 "World Radio TV Handbook" Industry Award for his Pinelands Computer Bulletin Board, has written an excellent MS-DOS database program containing information about shortwave broadcasts. The latest edition of the ENGLISH LANGUAGE SHORTWAVE BROADCAST SCHEDULES is a database of more than 550 entries from more than 70 countries. You can search for a particular country or see what is on the air at any time of the day. You can print out information in a variety of formats. With the appropriate interface and correct wiring of the serial cable, you can load the frequencies directly into a JRC NRD-525 or a Kenwood R-5000 receiver. (More about Tom's receiver interface programs in Chapter 4.)

You can edit the database yourself, or subscribe to Tom's update service. Updates are available both from Tom's bulletin board, the Pinelands RBBS or by disk.

Tom Sundstrom also has a UTILITY DXERS LOGBOOK that allows you to collect information on utility stations reported in magazine columns and club bulletins into one file. As you log the stations, you can add your logging information and notes. You can also print out reports in different formats for submission to various magazine columns.

The ENGLISH LANGUAGE SHORTWAVE BROADCAST SCHEDULES program costs USD 20, as does the UTILITY DXERS LOGBOOK, plus shipping. Shipping is USD 2.50 in North America, USD 5 for airmail to the rest of the world.

Tom Sundstrom has a number of other programs available. You can contact him by mail to Box 2275, Vincentown, New Jersey 08088-2275, USA, or via MCI Mail to ID 244-6376. You can also call the Pinelands RBBS at 1-609-859-1910.

2.3 SATELLITE TRACKING

AMSAT

AMSAT (Box 27, Washington, DC 20044, USA) is an international amateur radio satellite organization. A number of AMSAT satellites are in orbit, open to all radio amateurs. To use the satellites, or just to listen to them, it's necessary to be able to track their orbits. A number of mechanical aids have been developed for this, but micro- computers lend themselves perfectly to the task. AMSAT has organized the AMSAT Software Exchange to make this software available, for many popular (and some less common) computers. Here are some of the programs available:

ORBITS provides real-time satellite tracking for the IBM PC and compatibles in either a tabular mode or in a graphics map of the world, upon which up to 8 satellites can be displayed. The map is displayed in a single color in ORBITS II or in multiple colors in ORBITS III. The program also permits automatic control of antenna rotors using the Kansas City Tracker ccomputer interface or equivalent. Keplereian elements can be entered into 8 files with up to 8 satellites in each file. ORBITS II is for PCs with CGA graphics. Available to Amsat members for USD 35, USD 45 to non-members. ORBITS III is for EGA graphics, available for USD 45/55. ORBITS IV is for VGA. USD 55/65.

N4HY QUIKTRAK 4.0 is a tracking program MS-DOS 3.0 or later. It is works with EGA-VGA or CGA graphics, in either single satellite or multiple satellite modes, against a world map. There is also a real- time tabular data screen. The Window Search feature allows you to choose two of 101 cities to find windows of mutual visibility. The program runs faster with a 8087 math coprocessor. It will run on 512k with CGA graphics, but needs 640k for EGA. USD 55/80.

QUIKTRAK FOR IBM is for those IBM owners who do not have graphics capabilities. USD 25/35.

INSTANTTRACK is said to be faster than any other tracking program. It offers a choice of 200 satellites and a menu of 1754 cities, to show which cities are available from the selected satellite. The prograsm displays full color high resolution (EGA/VGA) maps of the Earth, as well as maps of the sky, showing the satellite's position

2 COMPUTER SOFTWARE

A computer by itself does nothing. To get it to work for you, you have to give it a program, written in a programming language. The language closest to the machines digital 0's and 1's is called machine language. It's very fast, but very different from human speech. Other, "higher level", languages have been developed to make programming easier.

Almost all early home computers used a language known as BASIC. This is a very easy language to learn, but can be relatively slow in execution. Here is a very simple BASIC program that can be used on almost all micro-computers running BASIC. It will calculate the length of a halfwave dipole antenna for a given frequency.

```
10 INPUT "FREQUENCY IN MHZ";F
20 M=(300/F)*(.95/2)
30 PRINT "HALF WAVE DIPOLE ",M;" METERS"
40 END
```

If you type in this program on a computer, and then type "run" followed by a carriage return (or "enter") it will ask you for a frequency in MegaHertz. When you type in a frequency and another carriage return, it will give you the proper length. This is a very short and simple program. Most programs are far longer than this, far too long to type in everytime you want to do something. Programs are saved for later use. The most common media today are floppy disks and hard disks.

The most common sizes for floppy disks are 3.5 and 5.25 inches. Typically a 3.5 inch disk will hold 720 kB (kilobytes–each about 1000 characters or symbols). 5.25 inch disks formatted on older disk drives can hold 360 kB, those formatted on newer drives 1.5 MB (Megabytes).

While programs usually come on floppy disks, which can be inserted into and removed from disk drives, hard disks are usually permanently mounted inside computers. Programs and files are transferred to them from disk, and they can hold 20 MB, 30 MB or even 100 MB of information. The biggest problem with hard disks is that if they crash (which does happen) all information is lost. Users should back-up the contents of their hard disks on a regular basis. This is usually done to a series of floppy disks, or to a special back-up tape machine, sometimes called a tape streamer. Of interest to home users who may already own a video cassette recorder are interfaces for back-ups to video cassettes. These have been developed in Britain.

Early home computers used cassettes to store programs. Cassettes are inexpensive, but take much longer to record and playback programs than the hard disks or floppy disk drives. Plug-in cartridges are much faster–since the programs are in place as soon as the computer is turned on. But they are only used with some home computers.

Modern PCs instead use expansion cards with hard disks, which are almost as fast, and far more flexible. These cards serve many different functions. They can hold adaptors for different graphics standards, extra serial or parallel ports, modems for connecting to telephones, terminal node controllers for packet radio, interfaces for controlling receivers or even hard disks.

Useful and easy as it is, BASIC is far too slow for most applications. It can be compiled to run faster, but most computer programs are written in some other language, either another "high level" language such as "C", or in "Assembler", which comes closer to the 0's and 1's of the machine language the computer uses directly.

2.1 PROGRAMS FROM ANARC

Several years ago the Association of North American Radio Clubs set up a Computer Information Committee. First under the leadership of Bill Krause, and later David Snyder (127 Joseph Ave., Staten Island, NY 10314, USA), the committee has been gathering radio-related public domain software, texts and data files.

About 100 files have been catalogued so far, and archived on nine 5.25 inch floppy disks. Included are propagation prediction programs, loggings columns uploaded from club newsletters, equipment reviews, technical tutorials, frequency lists, log organizers, 10 years'-worth of geomagnetic indices, RTTY-reading programs, etc.

Each disk costs USD 3.00 for delivery in North America. For the same price per disk, David will combine files of your choice from different disks onto one or more for shipment. For a current list of what's available, send a self-addressed US-stamped envelope, or a good selection of mint foreign stamps (David's a collector).

Don't forget to indicate what kind of computer you have. And needless to say, the committee's always looking for good new programs and files, if you happen to have any.

1.2 WHAT TO LOOK FOR

In the beginning, micro-computers stored programs on audio cassettes. These were cheap, but far too slow. Most programs are stored today on floppy disks of various sizes. Many computers now come with permanently mounted hard disks, which can hold as much information as dozens of floppy disks.

To avoid a lot of frustration, try to find a computer with either two floppy disk drives or a hard disk and one floppy disk drive.

The newest storage device is the optical disk, or CD-ROM, which is just like the compact disk used to play music. One optical disk can store whole encyclopedias of information. The first disks and drives were playback only, but WORM ("Write-Once, Read Many times") and multiple write systems are becoming available.

CD-ROM systems are relatively expensive.

One further warning–when you add a new piece of equipment to a home computer system, it usually won't work the first time. Sometimes there's something wrong with the unit, or a cable or some other part is wrong or missing. The most common problems can usually be cleared up by reading the product manual carefully. But expect to have to put some time into getting a new peripheral to work properly.

1 INTRODUCTION

The last fifteen years have seen an explosion in the spread of micro-computers. Across North America, Western Europe, and the Far East, more and more businesses are relying on small computers, at prices that would have been unthinkable just a few years ago. Different professions from farmers to lawyers have also discovered the usefulness of the micro or PC ("personal computer").

Radio hobbyists–both shortwave listeners and amateur radio operators–have discovered the usefulness of the micro-computer as well. According to surveys conducted in 1986 by "Practical Wireless" in the UK, "73" magazine in the US, and "CQ Ham Radio" in Japan, 60British radio amateurs owned computers (although only 49connection with their hobby). 55(although 70radio amateurs owned personal computers. Those figures must be considerably higher today.

We've written about many applications of computers in the radio listening hobbies in Sweden Calling DXers, Radio Sweden's weekly electronic media magazine. But the constantly evolving technology and the development of new applications means the amount of material is enormous. That is why we've put together this booklet, as a guide to what can be done with a small computer in the radio shack.

Undoubtedly some of the information will be out-of-date even before this guide is printed. That's why we've added a list of sources to follow developments. And we will continue our policy of publishing regular updates, although the best way to stay in touch with the rapidly changing world of computers is to read magazines, log in to bulletin boards and networks such as CompuServe, and listen to programs like "Sweden Calling DXers".

If you already own a computer, you might want to skip ahead to some of the applications that interest you most. If you're new to the world of computing and you're wondering if the acquisition of a micro-computer might enhance your hobby–read on. But be forewarned–computing can be addictive. You may discover that your radio listening has taken a backseat to a new and equally engrossing hobby!

1.1 THE MICRO AND ITS USES IN THE RADIO SHACK

What we're talking about here is a micro-computer. These come in a number of types, often incompatible. That is, programs for one computer won't work on another.

Several years ago the home computer market was filled with low-priced incompatible machines. Later, the market stabilized around a few computers, such as the Commodore 64, Sinclair Spectrum, and Apple II. The BBC Micro has been very popular in Britain, but nowhere else.

Japan's major electronics manufacturers tried to exploit the market by agreeing on a common operating system called MSX, which however, failed commercially in Western Europe and North America.

The major computer standard today is MS-DOS, the operative system used by the IBM PC. Very few people buy actual IBM machines. Copies, called "clones", from other manuacturers have been cheaper and usually equiped with more features. The PC runs on an Intel 8086 or 8088 integrated chip. The IBM "AT" uses the faster 80286 chip. The latest generation computers of this kind use the 80386 or 80486 chips. The more advanced machines can run software developed for earlier chips, but the reverse is not true. As yet, there is still disagreement over a workable operating system and an expansion card standard for the 80386 machines. The "AT"s should remain the business standard for some years, and home and small business users can continue to use ordinary PCs for some time.

The other main business standard for micro-computers is the Apple Macintosh, which now comes in a variety of models. The Macintosh is very easy for new users to operate. However, it suffers from extreme over-pricing in Europe (the new "Mac Classic" is a welcome step in the right direction) and lacks the range of software available in MS- DOS. There is very little radio-oriented software available for the "Mac".

The most common home computers today are various models of the Commodore Amiga and the Atari ST. Both have excellent graphics and there is a wide variety of games programs for both. However, there is very little specifically radio-oriented software for either machine. There are hardware/software interfaces that allow either machine to run MS-DOS programs, but these are reportedly rather slow.

New interfaces have also been developed which allow other computers to run software intended for different machines. With such interfaces, the Commodore 64 can run programs for the Apple II and Sinclair Spectrum, MS-DOS machines can run BBC Micro software, etc.

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Contents

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