POPULAR ELECTRONICS

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COMMUNICATIONS 1967 HANDBOOK

CITIZENS RADIO (CB)

Getting a License—Using the 10-Code
Installing Equipment—Joining a Club
About the Canadian General Radio Service
Details on REACT, HELP, DAIR, HART, etc.

PLUS: CB 5-WATT TRANSCEIVER CATALOG

BUSINESS RADIO SERVICE

Who Gets a License—Private Channels
Comparison With CB—Choice of Bands
Remote Control—The Specialty Services

SHORT-WAVE LISTENING

Tuning All the Bands—How To Report
Pirate Broadcasters—Look for TV DX
SWL Antennas—Clubs—Call Listings

AMATEUR (Ham) RADIO

The Code is Easy—How To Be a DX Man
All About SSB—Make Your Own QSL's
Operating Hints—Inside Station W1AW

PLUS: HAM GEAR MODEL/PRICE CATALOG

Antenna Specialists smashes the "sound barrier" with these spectacular new "MACH III" spiral-circuit mobile CB antennas (ten models)

Functional Flight-Stream design!
Totally new, sleek, clean base design. Looks great, and serves a purpose—completely houses and protects radical new printed coil! High-impact cyco-lac plastic is beautiful, impervious to weather. New short (32") whip.

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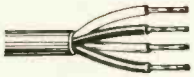

Antenna Rotor Cables
Sturdy, flexible, plastic insulated cable for rotor applications. Color coded. Chrome, vinyl plastic jacket resists sun and aging.

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Excellent mechanical and electrical characteristics for long service life. Special jacket offers maximum resistance to abrasion and ozone. Use as power supply cords and interconnecting cables. Ideal for remote control circuits, special press-to-talk microphone circuits, and other applications.

Shielded Hook-Up and Grid Wire
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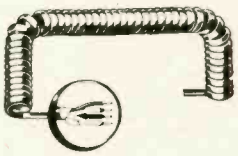

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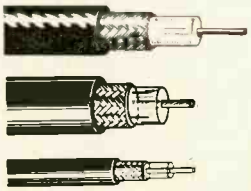
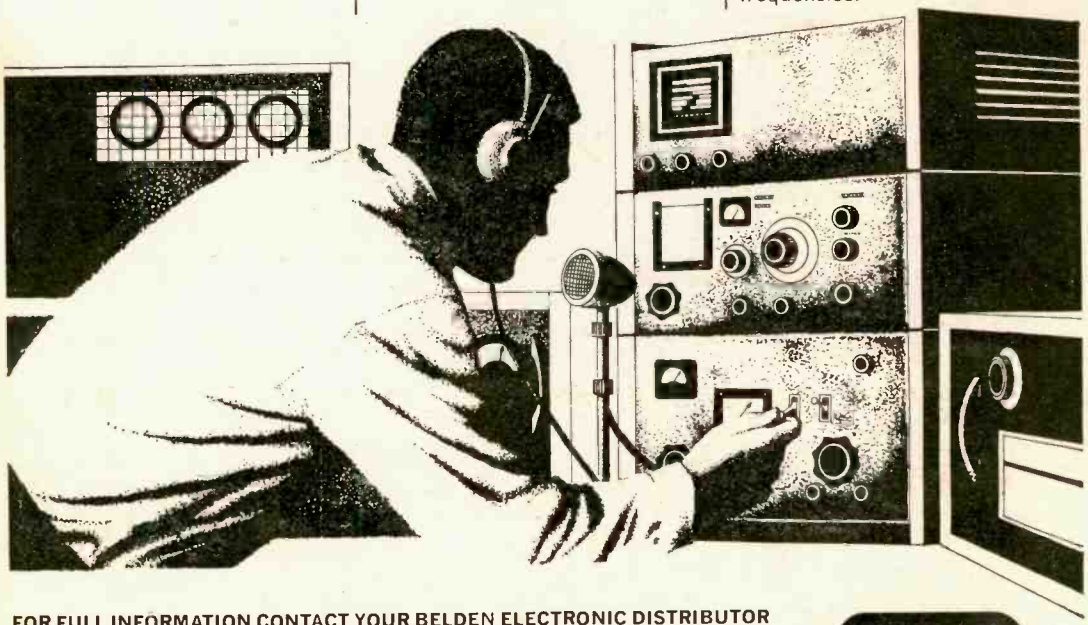
Ham Transmission Lines—Parallel Type
Uniform quality control provides uniform impedance. Brown polyethylene for best weather resistance and lowest losses.



Ham Transmission Lines—RG/U Type
Designed for lowest losses, longer service life, and maximum dependability. Cables are essentially flat with no peaks in attenuation to reduce signal on either high or low frequencies.



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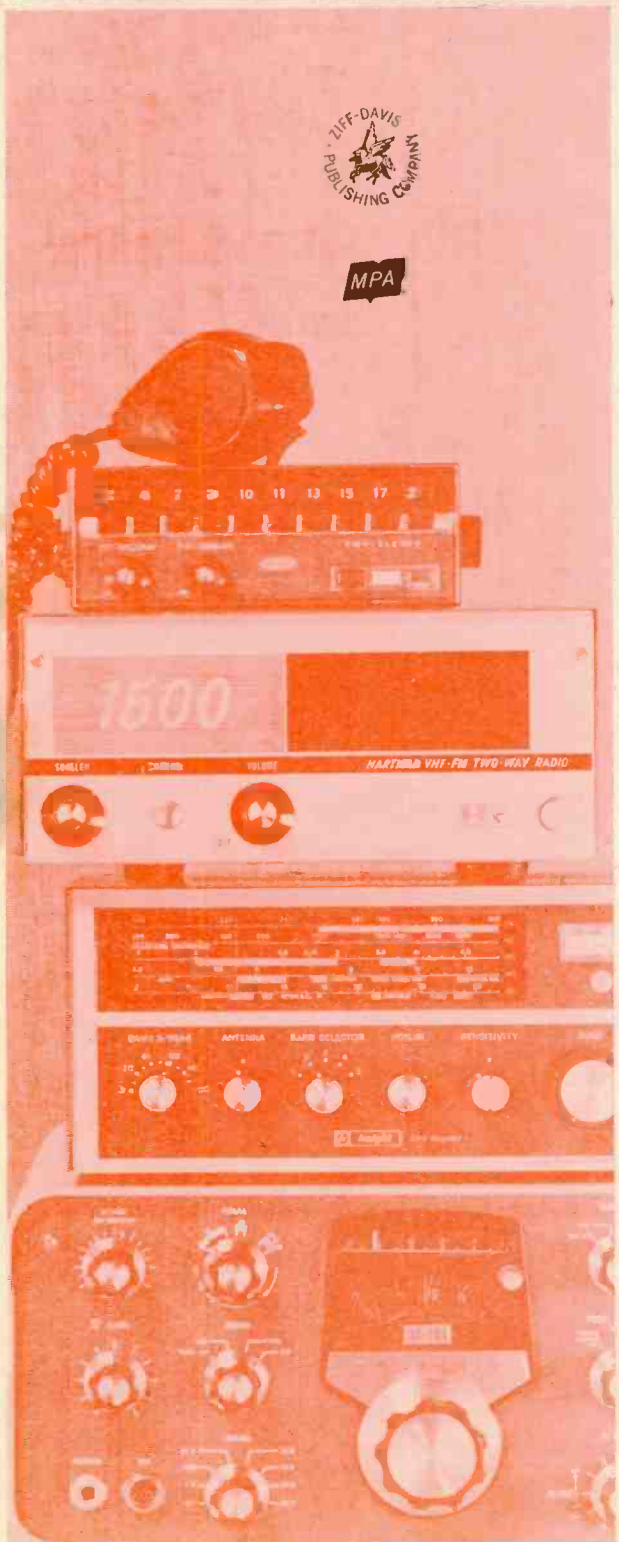
CIRCLE NO. 5 ON READER SERVICE CARD

1967 Edition

1967 COMMUNICATIONS HANDBOOK



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CONTENTS

punchy galore

Was it possible to put *extra* punch, *extra* power and *extra* performance into a 5 watt CB mobile radio . . . and sell it for only $99.95? B&K, creators of the famous Cobra CAM 88, thought so—and built the new Cobra V. The 5 channel Cobra V is solid state, all-the-way. Those who have heard it and tested it say it is a most remarkable achievement in miniaturization—in CB technology—in selectivity, sensitivity and 100% modulation. It's true; this one's got punch galore. We've proven it . . . now you can. At B&K Distributors.

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WHERE ELECTRONIC INNOVATION IS A WAY OF LIFE

CIRCLE NO. 4 ON READER SERVICE CARD

Becoming a Short-Wave Listener

SWL

The Why And How Of Starting a New Hobby

By Hank Bennett, W2PNA/WPE2FT

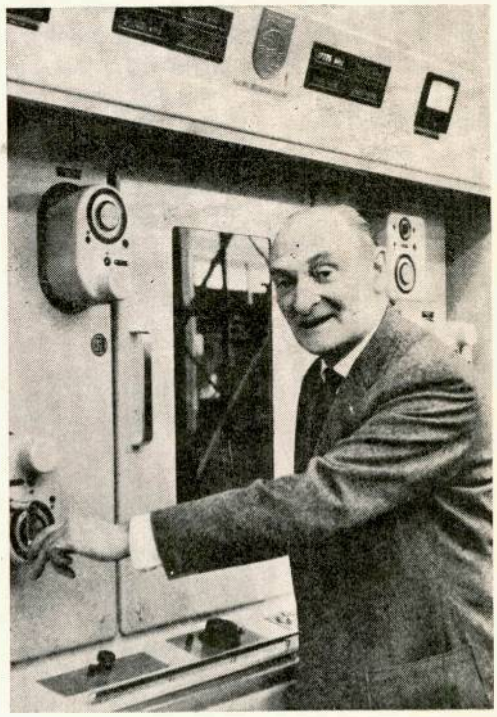
IT'S SAFE TO SAY that most people in North America are aware that there is such a thing as short-wave radio. To some people, "short wave" is synonymous to propaganda broacasting. To other people, "short wave" is something used by the American astronauts for communication between their orbiting capsule and ground stations. Few are aware that there are short-wave stations continuously broadcasting programs for North American audiences and that practically all of these stations transmit programs completely free of commercial advertising.

In Europe, Asia, and Africa, there is far more interest in listening to short-wave broadcasting stations than there is in North America. This is especially true behind the Iron and Bamboo Curtains. Many people in countries behind those Curtains suspect that their own governments withhold and/or suppress news which they do not wish their people to hear, and that they present their own program of world news, often distorted, exaggerated, or slanted to suit their needs.

Unfortunately for dictorial governments, the people behind the Curtains often cannot tune in local radio stations because the signals will not reach them. Hence, they tune to the short-wave bands where radio signals can be heard halfway around the world.

Also, people living on small islands around the world, too far from large land areas to hear AM broadcast-band signals, turn to the short waves for their news, music, or sports programs. And ships cruising the seven seas are kept abreast of the latest happenings around the world through the medium of short-wave broadcasts.

Over a number of years the author has had the opportunity to discuss short-wave broadcasting with people from all walks of life and at all age levels. It would appear that the average person believes it takes a



One of the most widely known short-wave radio personalities is Edward Startz of Radio Nederland, Hilversum, Holland. Producer and announcer of his own "Happy Station Program," Startz has been broadcasting to his English-speaking friends for decades. Listen for him any Sunday afternoon around 2 p.m. Eastern Standard Time in the 25-meter band.

Most serious SWL's sooner or later join a club to avail themselves of the opportunity to get hot tips on new stations, changes in frequency, etc. The Newark News Radio Club, oldest SWL club, had this distinguished group of officers in late 1966: (top row) Richard Labate, executive secretary; Albert Sauerbier, treasurer; Harold Williams, corresponding secretary; (bottom) Emil Vandevelde, membership secretary; Bill Schultz, president.

lot of know-how and expensive equipment to tune in short-wave broadcasts. True, you do require training in electronics if you want to obtain an amateur radio transmitting license—or any of the various commercial licenses. But for the purpose of short-wave listening, no license is required, there are no fees attached, no experience is necessary, and you do not have to lay out a lot of your hard-earned money for a receiver capable of pulling in broadcasts from London, Cairo, Melbourne, or Mexico City.

Your First Receiver. Thirty years ago practically every console radio designed for use in the living room was capable of tuning in two or three of the major short-wave broadcasting bands. The 1966-67 radios capable of tuning the short waves are few and far between. Most of the receivers that you will see in the average department store are for AM or FM broadcasts only. Only one manufacturer of high-fidelity equipment sells a receiver capable of tuning in the major short-wave broadcasting bands.

This happy chap is Paul Johnson, Monmouth, Ill. A short time before this picture was taken, Paul had logged short-wave stations in 45 countries and had received 37 verifications. The two receivers are a Heathkit GR-54 and a Hallicrafters S-120.

Over three-quarters of the receivers—also in the department stores—that tune the short waves are transistorized and were made in either Japan or West Germany. A transistor portable with provisions to tune short-wave bands makes a wonderful Christmas or birthday present. It also represents a good "jumping-off point" for your first adventures in DX'ing (tuning in the distant stations) on either the AM broadcast or the short-wave bands.

For about the same amount of money that you would pay for a fine-looking transistor portable, you can buy an American- or Japanese-made "communications-style" receiver. These receivers have the advantage of being designed for short-wave listening and, even at the lower price levels, very frequently include various features that SWL's find desirable. In price, the "communications-style" receivers range from about $59 to $120.

The budding SWL should also consider the possibility of buying a "second-hand" communications receiver. Most second-hand receivers are in perfect operating condition and have only been discarded because the previous owner was moving up to a top quality and more expensive product (or moving to the VHF region, or going 100% single-sideband).

How To Tune. In tuning your AM broadcast-band radio, you've become accustomed to rapidly turning that main dial —you know exactly where your favorite stations are on the dial and it's a cinch to tune in the station that you want. But this method of tuning doesn't work too well on the short-wave bands.

Look at the dial on your AM broadcast receiver—the main dial may be four inches

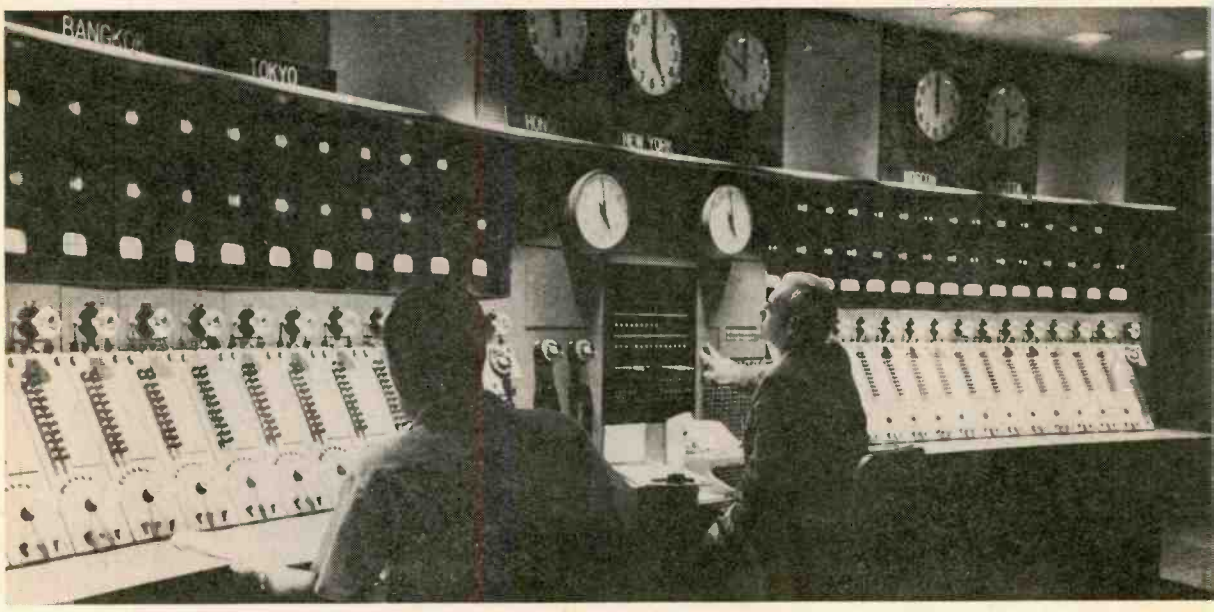
in length and cover a tuning range of 540 to 1600 kHz or about 110 channels. Now look at the tuning dial on a short-wave receiver. A comparable four-inch segment might cover from 13,000 to 21,000 kHz, or about 8000 channels! You can readily see what this means: there are far more frequencies covered and, therefore, many more stations. If you turned your short-wave dial at the same speed as you do your AM broadcast receiver, you would pass right over anything that there is to be heard.

In tuning the short waves, you must tune very slowly and very carefully. You will find, in many cases, that there are a dozen stations broadcasting in a half dozen languages and all within a barely perceptible movement of your main tuning dial knob. With care you will be able to separate these stations into their own respective channels.

What You Can Hear. Before you know it, you'll be listening to a program of light music from Buenos Aires, a newscast from Oslo, or, perhaps, a sporting event from the West Indies. The average person, when first tuning the short-wave bands, may find that all the spoken languages are foreign. You'll hear an assortment of Dutch, French, Russian, and other languages.

But don't become discouraged if you fail to hear a program in your native English. Just try again. Short-wave stations generally broadcast program after program, hour after hour, in a multitude of languages, and English is likely to be one of them. Most short-wave station programs are of short duration, and if you tune in a quarter hour or half hour later, you may hear an English newscast.

What else can you hear on the short waves? You can hear discussion programs in English transmitted by "Radio Budapest," the "Voice of America," "Radio Canada," "Radio Moscow," and many other stations. You'll be able to pick up broadcasts of current events aired by stations where the news is originating rather than having to wait for it to clear the news services to your AM home-town station. In recent years the author has heard news programs coming from a foreign city in which the sound effects included rifle fire from a local uprising tak-



No one questions that short-wave broadcasting is used to disseminate truth and propaganda throughout the world. It is principally a contest between Radio Moscow and the Voice of America, and the latter now seems to have the upper hand. This is the master control of the VOA in its Washington, D.C., studios. Twenty-six programs can be fed simultaneously through this board to VOA transmitters here and overseas.

ing place outside of the studio. We've also picked up transmissions from weather planes as they were flying in the eye of large hurricanes.

In other portions of the short-wave spectrum, you'll be able to hear ships talking with other ships or with coastal stations. You can hear planes on trans-oceanic flights from many parts of the world. You can tune in on the "hams," the amateur radio operators, as they discuss new additions to their equipment, route messages, or converse with fellow hams overseas. With a VHF receiver, you can hear buses on the highway, trains running between terminal points, truck and taxi companies, fire and police services, forest fire stations, satellites, and nearly anything else that is on the air.

But perhaps above all you will find your greatest enjoyment in tuning in the foreign broadcasting stations—learning the culture and customs of people in foreign lands—and the policies of their government—and listening to music from the northern and southern hemispheres, from the Old World and the New.

For those readers who prefer religious programs, the short-wave channels offer many of them. One of the most widely

Various international short-wave broadcasting stations mail advance program guides to American audiences. Pictured above are a few of the attractive pamphlets presently being distributed. Listeners can usually be put on a program mailing list by sending in a detailed reception report to the broadcasting station.

ENGLISH-LANGUAGE BROADCASTS TO NORTH AMERICA

FOR THE MONTH OF JANUARY

Prepared by ROBERT LEGGE

TO EASTERN AND CENTRAL NORTH AMERICA

TIME—EST	TIME—GMT	STATION AND LOCATION	FREQUENCIES (MHz)
7 a.m.	1200	Copenhagen, Denmark	15.165
7:15 a.m.	1215	Helsinki, Finland	15.185 (Tues., Sat.)
		Melbourne, Australia	9.58 or 11.71
6 p.m.	2300	London, England	6.195, 7.13, 9.51
		Moscow, U.S.S.R.	7.15, 7.205, 9.665, 9.685
6:45 p.m.	2345	Tokyo, Japan	11.78, 15.135
7 p.m.	0000	London, England	6.195, 7.13, 9.51
		Moscow, U.S.S.R.	7.15, 7.205, 9.665, 9.685
		Peking, China	15.06, 17.68
		Sofia, Bulgaria	6.07
		Tirana, Albania	7.265
7:30 p.m.	0030	Budapest, Hungary	6.235, 9.833
		Johannesburg, So. Africa	9.675, 11.90
		Kiev, U.S.S.R.	7.11, 7.31, 9.645 (Mon./Thurs./Fri.)
7:50 p.m.	0050	Vatican	5.985, 7.25, 9.645
8 p.m.	0100	Berlin, Germany	5.96, 6.16
		Havana, Cuba	6.17, 11.76
		London, England	6.195, 7.13, 9.51
		Madrid, Spain	6.13, 9.76
		Moscow, U.S.S.R.	7.15, 7.205, 7.31, 9.665
		Prague, Czechoslovakia	5.93, 7.115, 7.345, 9.72
		Rome, Italy	6.01, 9.63
8:15 p.m.	0115	Berne, Switzerland	6.12, 9.535, 11.715
8:30 p.m.	0130	Bucharest, Rumania	5.99, 9.57
		Cairo, U.A.R.	9.475
		Cologne, Germany	6.075, 9.64
		Hilversum, Holland	9.59
8:45 p.m.	0145	Stockholm, Sweden	5.99
9 p.m.	0200	Lisbon, Portugal	6.025, 6.185
		London, England	6.195, 7.13, 9.51
		Moscow, U.S.S.R.	7.15, 7.205, 9.665
10 p.m.	0300	Bucharest, Rumania	5.99, 9.57
		Budapest, Hungary	6.235, 9.833
		Buenos Aires, Argentina	9.69 (Mon.-Fri.)
		Havana, Cuba	6.135, 6.17
10:30 p.m.	0330	Accra, Ghana	6.11
		Prague, Czechoslovakia	6.095, 7.115, 7.345, 9.72

TO WESTERN NORTH AMERICA

TIME—PST	TIME—GMT	STATION AND LOCATION	FREQUENCIES (MHz)
6 p.m.	0200	Melbourne, Australia	15.22, 17.84
		Tokyo, Japan	15.135, 15.235, 17.825
6:50 p.m.	0250	Taipei, China	11.825, 11.86, 15.345
7 p.m.	0300	Moscow, U.S.S.R. (via Khabarovsk)	9.54, 11.755, 15.14
		Peking, China	9.457, 11.82, 15.095
8 p.m.	0400	Sofia, Bulgaria	6.07
8:30 p.m.	0430	Budapest, Hungary	6.235, 9.833
9 p.m.	0500	Berne, Switzerland	5.965
		Cologne, Germany	6.145, 9.735
		Moscow, U.S.S.R. (via Khabarovsk)	9.54, 9.64, 11.755

known stations, and the pioneer in religious broadcasting, is HCJB, Quito, Ecuador. Located atop the Andes Mountains, this station has a tremendous signal that can be heard in nearly every corner of the globe. First Blessings, as given by newly ordained priests of the Roman Catholic Church, may be heard from time to time from the English-speaking "Vatican Radio."

Would you like a broadcaster to play your request recording? Well, one of the finest musical programs on the air today—for smooth and easy ballroom dance music—is "Victor Sylvester and His Orchestra." This program is broadcast several times weekly and beamed to countries all over the world from the British Broadcasting Corporation studios in London. Sylvester devotes his entire 45-minute program of instrumental music to requests from people in India, the South Seas, United States, and from every country where there is a radio set capable of tuning the short-wave bands.

Or you might try the "Happy Station Program" which is broadcast to listeners in North America from Hilversum, Holland, on Sundays at 2 p.m. Eastern Standard Time (1400 by the 24-hour clock; 1900 Greenwich Mean Time). Eddie Startz, the congenial host of this 80-minute program, may read your letter on the air and perhaps play a tune that you have requested. Numerous other short-wave stations also have record request shows, nearly all of them in English.

Ruby Jean Beatson, left, a student trainee in the Burmese Service of the VOA, broadcasts with Miss Myint Myint Zaw, a translator-announcer from the Washington, D.C., studios of the Voice of America.

Would you believe that there are SWL's (Short-Wave Listeners) who have actually learned to master a foreign language, thanks to the short-wave stations that conduct language lessons? "Radio Nederland" in Holland, with Dutch lessons, and "Radio Japan," in Tokyo, with Japanese lessons, are two of the stations that have regularly scheduled language lessons.

Your Antenna. If you use an older table model or console receiver, an antenna is a must. It can be simply a length of antenna wire strung up between two trees, or house and garage, or any place where you can anchor both ends. To this you attach another piece of wire, preferably with an insulated covering (as opposed to the bare wire that you've used for the antenna itself) and this wire is fed into the house and attached to the antenna terminal of your receiver. For safety's sake, you should purchase a lightning arrestor and install it following the directions given.

An outdoor antenna is preferable for a communications receiver, but because of the added sensitivity of communication receivers, somewhat shorter antennas will suffice.

At least two manufacturers of electronic equipment specialize in selling antennas for use by hams or SWL's. One of these manufacturers, Mosley Electronics, sells an SWL antenna that can be erected in about two hours for about $15. This antenna uses a system of "wave traps" to tune its own electrical length to the seven principal short-wave broadcast bands. The second manufacturer, Hy-Gain Electronics, sells a kit of parts for erecting an antenna out of an apartment window.

The Short-Wave Bands. Because it was done that way many, many years ago, SWL's continue to refer to the short-wave

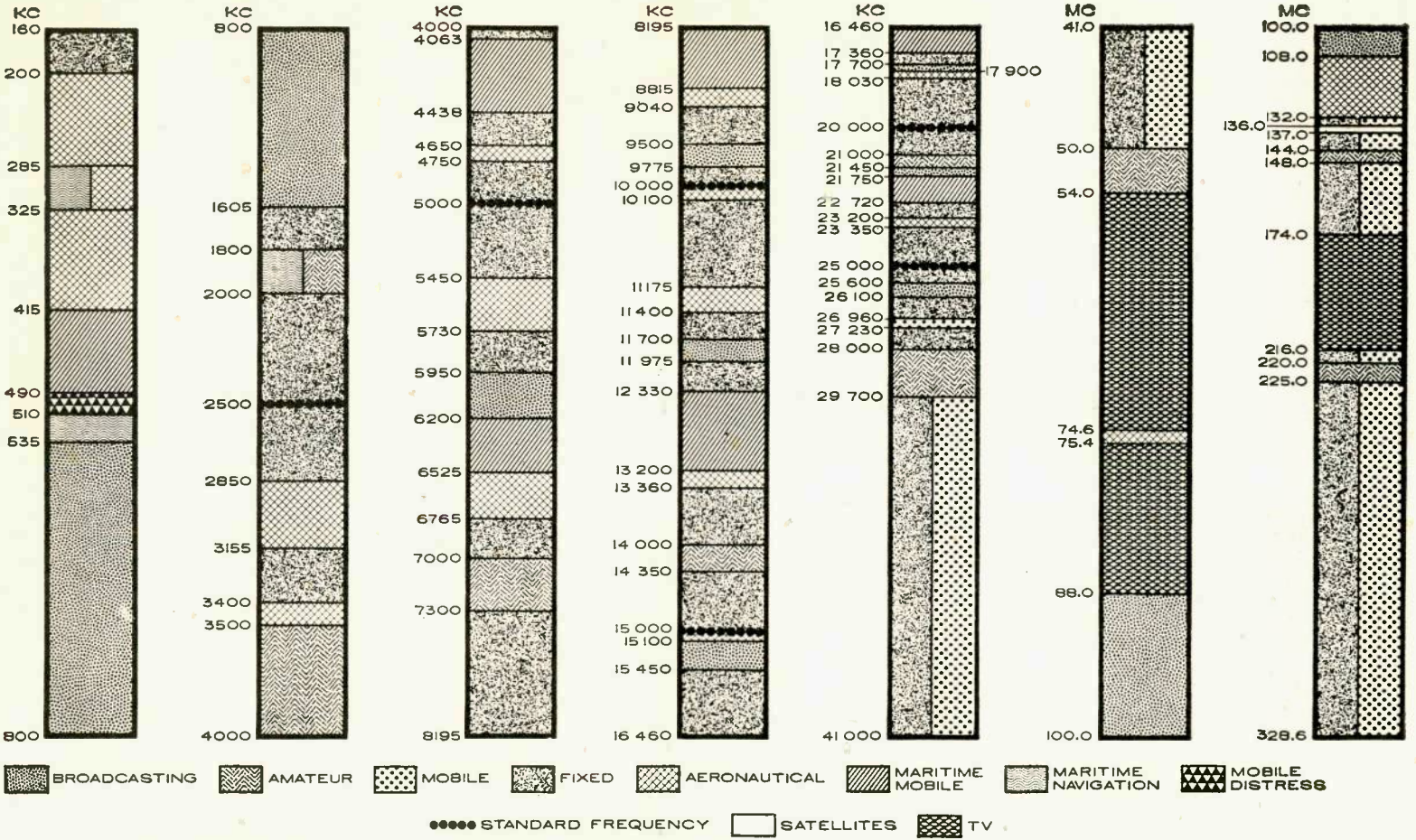
International Call-Sign Prefixes

The call-signs of radio stations throughout the world have been established by international agreement. The first two letters, or numeral and letter, are the key to identification. Using the list below, the SWL can tell at a glance what country he is monitoring.

AAA-ALZ	United States
AMA-AOZ	Spain
APA-ASZ	Pakistan
ATA-AWZ	India
AXA-AXZ	Australia
AYA-AZZ	Argentina
BAA-BZZ	China
CAA-CEZ	Chile
CFA-CKZ	Canada
CLA-CMZ	Cuba
CNA-CNZ	Morocco
COA-COZ	Cuba
CPA-CPZ	Bolivia
CQA-CRZ	Portuguese Colonies
CSA-CUZ	Portugal
CVA-CXZ	Uruguay
CYA-CZZ	Canada
DAA-DTZ	Germany
DUA-DZZ	Philippines
EAA-EHZ	Spain
EIA-EJZ	Ireland
EKA-EKZ	U.S.S.R.
ELA-ELZ	Liberia
EMA-EOZ	U.S.S.R.
EPA-EQZ	Iran
ERA-ERZ	U.S.S.R.
ESA-ESZ	Estonia
ETA-ETZ	Ethiopia
EUA-EWZ	Bielorussia
EXA-EZZ	U.S.S.R.
FAA-FZZ	France & Territories
GAA-GZZ	United Kingdom
HAA-HAZ	Hungary
HBA-HBZ	Switzerland
HCA-HDZ	Ecuador
HEA-HEZ	Switzerland
HFA-HFZ	Poland
HGA-HGZ	Hungary
HHA-HHZ	Haiti
HIA-HIZ	Dominican Republic
HJA-HKZ	Colombia
HLA-HMZ	Korea
HNA-HNZ	Iraq
HOA-HPZ	Panama
HQA-HRZ	Honduras
HSA-HSZ	Thailand
HTA-HTZ	Nicaragua
HUA-HUZ	El Salvador
HVA-HVZ	Vatican City
HWA-HYZ	France & Territories
HZA-HZZ	Saudi Arabia
IAA-IZZ	Italy & Areas Under Mandate
JAA-JSZ	Japan
JTA-JVZ	Mongolian Republic
JWA-JXZ	Norway
JYA-JYZ	Jordan
JZA-JZZ	West New Guinea
KAA-KZZ	United States
LAA-LNZ	Norway
LOA-LWZ	Argentina
LXA-LXZ	Luxembourg
LYA-LYZ	Lithuania
LZA-LZZ	Bulgaria
MAA-MZZ	United Kingdom
NAA-NZZ	United States
OAA-OCZ	Peru
ODA-ODZ	Lebanon
OEA-OEZ	Austria
OFA-OJZ	Finland
OKA-OMZ	Czechoslovakia
ONA-OTZ	Belgium
OUA-OZZ	Denmark
PAA-PIZ	Netherlands
PJA-PJZ	Netherlands Antilles
PKA-POZ	Indonesia
PPA-PYZ	Brazil
PZA-PZZ	Surinam
QAA-QZZ	International Abbreviations
RAA-RZZ	U.S.S.R.
SAA-SMZ	Sweden
SNA-SRZ	Poland
SSA-SSM	Egypt
SSN-STZ	Sudan
SUA-SUZ	Egypt
SVA-SZZ	Greece
TAA-TCZ	Turkey
TDA-TDZ	Guatemala
TEA-TEZ	Costa Rica
TFA-TFZ	Iceland
TGA-TGZ	Guatemala
THA-THZ	France & Territories
TIA-TIZ	Costa Rica
TJA-TJZ	Cameroon
TKA-TKZ	France & Territories
TLA-TLZ	Central Africa
TMA-TMZ	France & Territories
TNA-TNZ	Brazzaville
TOA-TQZ	France & Territories
TRA-TRZ	Gabon
TSA-TSZ	Tunisia
TTA-TTZ	Chad
TUA-TUZ	Ivory Coast
TVA-TXZ	France & Territories
TYA-TYZ	Dahomey
TZA-TZZ	Mali
UAA-UQZ	U.S.S.R.
URA-UTZ	Ukrainian U.S.S.R.
UUA-UZZ	U.S.S.R.
VAA-VGZ	Canada
VHA-VNZ	Australia
VOA-VOZ	Canada
VPA-VSZ	British Colonies
VTA-VWZ	India
VXA-VYZ	Canada
VZA-VZZ	Australia
WAA-WZZ	United States
XAA-XIZ	Mexico
XJA-XOZ	Canada
XPA-XPZ	Denmark
XQA-XRZ	Chile
XSA-XSZ	China
XTA-XTZ	Upper Volta
XUA-XUZ	Cambodia
XVA-XVZ	Vietnam
XWA-XWZ	Laos
XXA-XXZ	Portuguese Colonies
XYA-XZZ	Burma
YAA-YAZ	Afghanistan
YBA-YHZ	Indonesia
YIA-YIZ	Iraq
YJA-YJZ	New Hebrides
YKA-YKZ	Syrian Arab Republic
YLA-YLZ	Latvia
YMA-YMZ	Turkey
YNA-YNZ	Nicaragua
YOA-YRZ	Rumania
YSA-YSZ	El Salvador
YTA-YUZ	Yugoslavia
YVA-YYZ	Venezuela
YZA-YZZ	Yugoslavia
ZAA-ZAZ	Albania
ZBA-ZJZ	British Colonies
ZKA-ZMZ	New Zealand
ZNA-ZOZ	British Colonies
ZPA-ZPZ	Paraguay
ZQA-ZQZ	British Colonies
ZRA-ZUZ	Union of South Africa
ZVA-ZZZ	Brazil
2AA-2ZZ	United Kingdom
3AA-3AZ	Monaco
3BA-3FZ	Canada
3GA-3GZ	Chile
3HA-3UZ	China
3VA-3VZ	Tunisia
3WA-3WZ	Vietnam
3XA-3XZ	Guinea
3YA-3YZ	Norway
3ZA-3ZZ	Poland
4AA-4CZ	Mexico
4DA-4IZ	Philippines
4JA-4LZ	U.S.S.R.
4MA-4MZ	Venezuela
4NA-4OZ	Yugoslavia
4PA-4SZ	Ceylon
4TA-4TZ	Peru
4UA-4UZ	United Nations
4VA-4VZ	Haiti
4WA-4WZ	Yemen
4XA-4XZ	Israel
4YA-4YZ	International Civil Aviation
4ZA-4ZZ	Israel
5AA-5AZ	Libya
5BA-5BZ	Cyprus
5CA-5GZ	Morocco
5HA-5IZ	Tanganyika
5JA-5KZ	Colombia
5LA-5MZ	Liberia
5NA-5OZ	Nigeria
5PA-5QZ	Denmark
5RA-5SZ	Malagasy Republic
5TA-5TZ	Mauritania
5UA-5UZ	Niger
5VA-5VZ	Togolese Republic
5WA-5WZ	Western Samoa
5XA-5XZ	Uganda
5YA-5ZZ	Kenya
6AA-6BZ	United Arab Republic
6CA-6CZ	Syria
6DA-6JZ	Mexico
6KA-6NZ	Korea
6OA-6OZ	Somali Republic
6PA-6SZ	Pakistan
6TA-6UZ	Sudan
6VA-6WZ	Senegal
6XA-6XZ	Malagasy Republic
6YA-6YZ	Jamaica
7AA-7IZ	Indonesia
7JA-7NZ	Japan
7RA-7RZ	Algeria
7SA-7SZ	Sweden
7TA-7YZ	Algeria
7ZA-7ZZ	Saudi Arabia
8AA-8IZ	Indonesia
8JA-8NZ	Japan
8SA-8SZ	Sweden
8TA-8YZ	India
8ZA-8ZZ	Saudi Arabia
9AA-9AZ	San Marino
9BA-9DZ	Iran
9EA-9FZ	Ethiopia
9GA-9GZ	Ghana
9KA-9KZ	Kuwait
9LA-9LZ	Sierra Leone
9MA-9MZ	Malaya Federation
9NA-9NZ	Nepal
9OA-9TZ	Leopoldville
9UA-9UZ	Burundi
9XA-9XZ	Rwanda Republic

Unassigned

6ZA-6ZZ	9HA-9JZ
7OA-7QZ	9VA-9WZ
8OA-8RZ	9YA-9ZZ



This is how the radio frequency spectrum is divided in North and South America from 160 kilocycles to 328.6 megacycles. Slightly different frequency allocations exist in Europe and Asia, although these differences are mostly confined to the higher frequencies (above 30 mc.)

broadcasting bands in two different frames of reference—frequency and wavelength.

The international short-wave broadcasting bands are known as the 49-meter, 41-meter, 31-meter, 25-meter, 19-meter, 16-meter, and 13-meter bands. According to international treaty (not strictly adhered to), the above bands are comparable to the following frequencies: 5950-6200 kHz, 7100-7300 kHz, 9500-9775 kHz, 11,770-11,975 kHz, 15,100-15,450 kHz, 17,700-17,900 kHz, and 21,450-21,750 kHz.

There are a few specialized short-wave broadcasting bands for listeners in the tropics (see page 37). The most important of these minor bands is the one around 60 meters (4700-5100 kHz).

Your best chances for picking up English transmissions will be during the early to late evenings (your local time) from stations in Africa, Europe, and Western Asia, and during the hours around sunrise from stations in the Far East and Pacific areas. Always tune the 19-, 25-, and 31-meter bands first and then the 41- and 49-meter bands. The 13- and 16-meter bands are usually only active during daylight hours. However, you might as well forget the tropical bands during daylight hours; it takes darkness for signals on

Producers Nancy Grosshans and Maggie McNamara discuss a Radio New York Worldwide program. Miss Grosshans was formerly with the Voice of Kenya in Nairobi; Miss McNamara is the well-known stage, TV, and film star. WNYW is the only commercial U.S. station on the international broadcasting bands.

FCC Frequency Assignment Lists

Special lists of call-sign and frequency assignments by the FCC are available from Cooper-Trent, Inc., 1130 19th Street N.W., Washington, D.C. 20036. These lists are reproductions from the FCC files and are sold on a unit basis, or on subscription. They include stations in the aviation, industrial, marine, public safety, experimental, land transportation, and broadcast services. For details on prices, write to Cooper-Trent; however, note that a complete listing of all broadcast stations (AM, FM and TV) would cost about $12.00.

North American Shortwave Association

The NASA is the only "all-shortwave broadcast" club in North America. Membership is $4 per year, which includes 12 issues of the club's "NASA-Frendx" bulletin. Members may pay $6 to receive the bulletin via first-class mail. A typical bulletin contains information on new members, "Around the Clubs" commentary, station information, awards given, and a special last-minute "Flash Sheet." Write to NASA Headquarters, 1503 Fifth Ave., Altoona, Pa. 16602, for membership blanks.

American SWL Club

This club specializes in thorough coverage of happenings on the international broadcast bands, sends its monthly publication "SWL" first class mail to members. Dues, $4.00. Details from 16182 Ballad Lane, Huntington Beach, Calif. 92647.

Radio New York Worldwide Listeners Club

With over 3000 members in 76 countries, this club is sponsored by WNYW (formerly WRUL), "Radio New York Worldwide." Membership is open to anyone for $1.00. A monthly publication containing DX tips, technical information, and feature articles is distributed to the membership. Club members also receive a certificate for wall mounting and a wallet-size numbered membership card. Members are invited to listen to their program over WNYW on Saturdays at 2307 GMT and Sundays at 1307 GMT. For details, write to: RNYW Listeners Club, Attention Mr. Irwin Belofsky, Radio New York, 485 Madison Ave., New York, N.Y. 10022, USA.

Learning Dutch By Radio

From the months of March through August 1967, "Radio Nederland" will broadcast its third "Dutch By Radio" language course. Readers interested in learning how to speak and read Dutch should write to "Radio Nederland," P.O. Box 222, Hilversum, Holland, for details. This course is not a basic one, but is intended for advanced students. The broadcasts are 15 minutes long and 26 are given during each "semester." Although the schedule has not been completed at this writing, it will be supplied to all interested parties.

these frequencies to travel any great distance. A few notable exceptions are stations operating in the tropical bands in Australia, Indonesia and other Southwest Pacific areas. If you tune carefully, you may be able to log some of them within an hour or two after your local sunrise.

There are a number of other channels that are used for short-wave broadcasting. These are to be found in between the bands listed above. Many stations operate between 5700 and 5950 kHz. And there are a few broadcasters between 11,975 and 12,100 kHz. One of Israel's short-wave outlets operates on 9008 kHz, and stations from several other countries can be heard between 9350 and 9490 kHz, especially from Spain, Pakistan, the Soviet Union, and Egypt.

Several clandestine broadcasting stations operate outside of the usual short-

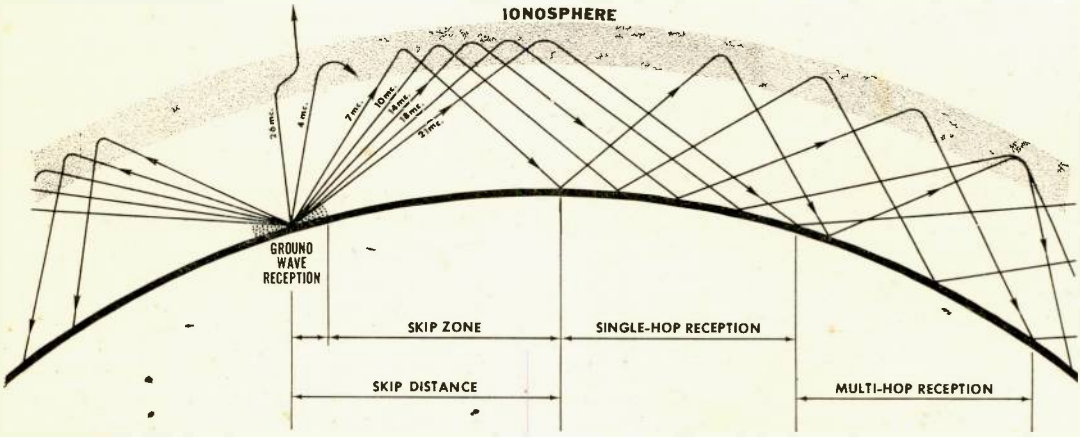
(Continued on page 42)

International Ice Patrol

Ice broadcasts (in CW) are made twice daily, at 0048 and 1248 GMT, by the U.S. Coast Guard. Transmissions are made on 155, 5320, 8502 and 12880.5 kHz from station NIK, Argentia, Newfoundland. Each broadcast is preceded by the general call "CQ" on 500 kHz with instructions for all interested parties to shift to one of the other clear channel frequencies. Station NIK opens up with a 2-minute test signal using the International Ice Patrol call-sign (NIK) and then broadcasts at 15 words per minute (repeated at 25 words per minute). Transmissions of ice maps using 60-rpm drum speed facsimile are made from time to time on 5320, 8502 and 12880.5 kHz.

How To Listen To The World

This famous book on the art of short-wave listening is now available in North America in a brand-new edition. Prepared by O. Lund Johansen, HTL is a primer on how to DX, what to listen for, how to report, etc. Packed with interesting articles prepared by experts, this 176-page book has a place in most SWL shacks. Price, $3.50. Available in stores, or from Gilfer Associates, P.O. Box 239J, Park Ridge, N.J. 07656.



This simplified drawing shows how radio signals are propagated around the curvature of the earth. At heights between 60 and 350 miles above the surface is a region called the ionosphere. The free electrons in this rarefied region distort the path of a radio beam. When the distortion is sufficiently great, the radio beam is said to be reflected back to earth. The ability of the ionosphere to reflect radio waves varies from hour to hour, day to day, month to month, and year to year. Generally speaking, the higher frequencies are more usable in the daytime than at night, in local winters vs. local summers, and when the sunspot number is high.

In the above drawing, a high-frequency radio wave (26 MHz) is distorted by the ionosphere, but because the free electron density is too low, the wave passes on out into space. A much lower frequency radio wave (4 MHz) is nearly reflected, but the ionosphere absorbs most of the signal before it can be returned to earth. Frequencies between 7 MHz and 21 MHz are reflected at different angles to the ionosphere and returned to earth. The differing angles result from the fact that for a particular electron density the higher radio frequencies must travel further into the ionosphere before being reflected. Thus, the highest frequency that can be propagated around the earth depends not only on the density, but also upon the angle at which the radio beam strikes the ionosphere.

Note how the skip zone is created between the fading out of the ground-wave signal and the first returning signal from the ionosphere. Reception of DX signals further away than the "single-hop reflection" is made possible by "multi-hop" reflections (double, triple, or greater) depending upon the frequency of the radio wave.

Tuning the AM Broadcast Band

SWL

There Is More To AM Radio Than Rock-and-Roll

By Stewart Drake

ALMOST EVERYONE in the United States listens to AM radio at some time each day. The reasons why are obvious—there are more programs, more stations to listen to, and more radio receivers that tune the AM band (540-1600 kHz) than any other frequency range.

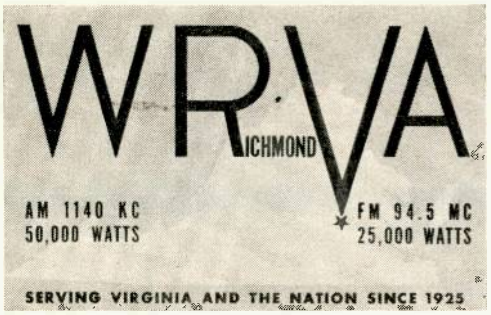
It was inevitable that the broadcast band would spawn the majority of the DX'ers—whether or not they eventually gravitate to the short waves or to the ham bands. Since equipment to start DX'ing on your own is right at hand, why don't you try listening to something other than rock-and-roll on the AM broadcast band? The techniques of BCB DX'ing are simple, and because of the vast number of stations on the air, the results are immediately rewarding.

Allocation of Frequencies. The listener should understand the basic scheme of frequency allocation of AM broadcasting stations in the United States. The FCC has established three classes of stations: clear channel, regional channel, and local channel. These titles are misnomers, for although a clear-channel station is permitted to operate with a full-time power output of 50,000 watts—the maximum power permitted in the United States—it does not mean that this broadcasting station has sole use of that frequency. In actual fact, several stations strategically located throughout the country will all be assigned to this "cleared channel."

As an example, look at the stations that operate on 1530 kHz. In the East you will find WCKY, Cincinnati, Ohio. In the midwest is KGBT, Harlingen, Texas, and in the far west KFBK, Sacramento, California. All three of these stations may presumably be on the air at the same time to serve their primary listening area without fear of mutual interference. Also on this same frequency you may find a number of daytime-only stations (WQVA, WMBT, KMAM, WCTR, etc.). These stations are local or regional broadcasters that are permitted to operate only during the hours of daylight and must sign off near local sunset.

The stations assigned to the regional-channel frequencies are permitted a daytime maximum power output of 5000 watts. After local sunset, many of the regional stations must reduce their power to 1000 watts. This lower power is sufficient during nighttime to serve their primary listening areas, and it simultaneously reduces the chance of interference with other regional broadcasters assigned to the same channel. The regional-channel frequencies are also used by the daytime-only broadcasters and, as in the case of the daytimers that operate on the clear channels, they must sign off at local sunset.

Broadcast-band DX'ers call the six frequencies assigned by the FCC as the local channels the "graveyard." The six frequencies used by the locals-only are 1230, 1240, 1340, 1400, 1450, and 1490 kHz. Each of these channels has more than 150 station assignments, covering all 50 states, all the Canadian provinces, and such out-



This typical QSL card is used to verify reception of WRVA, Richmond, Va. Hundreds of AM broadcasters send out QSL cards acknowledging correct reports. You can hear WRVA on 1140 kHz any evening.

lying points as the Virgin Islands and Puerto Rico. Local-channel stations may operate 24 hours a day with a daytime maximum power of 1000 watts and 250 watts for nighttime operation.

In the AM broadcasting band, the listener will find several frequencies that are seemingly exclusively used by the major broadcasters in Canada, Mexico and Cuba. With the exception of the Cubans, the various governing bodies concerned have worked out these frequencies to prevent unnecessary interference.

Frequency Separation. By international agreement, AM broadcasting stations in North America may operate on one of 107 frequencies in the band between 540 and 1600 kHz. This is equivalent to spotting broadcasting stations every 10 kHz. In Europe and most African countries, the separation between adjacent channels varies between 8 and 9 kHz. In South and Central America, and portions of the West Indies, you will observe some separations on the order of 15-25 kHz. For lack of a better title, North American DX'ers refer to all stations not operating on the 10-kHz separation principle as being "split-channel" stations.

On the East Coast, one of the most commonly heard split-channel stations is ZBM, Hamilton, Bermuda, on 1235 kHz. Listeners east of the Mississippi may also intercept the propaganda broadcasting station (Spanish-language) called "Radio Americas," which is located on Swan Island in the Caribbean. This station is generally found on 1165 kHz, but varies its frequency ± 10 kHz from time to time. Another easy DX station to catch at night is 4VEF, Cap Haitien, Haiti, on 1035 kHz. The languages broadcast by this station include French, Creole, and English.

If you tune well after sunset or towards the morning hours, look on 1466 kHz for 3AM2, Monte Carlo, Monaco. This AM broadcasting station is rated at a power output of about 400,000 watts! The author believes that the best time to try for this easily heard European DX catch is early Monday morning (around 0100 EST) when many of the North American stations are silent. At the same time, try tuning for Dakar, Senegal, on 746 kHz, or "Radio Nacional Espana," San Sebastian, Spain, on 773 kHz.

The crowded conditions in the AM broadcasting band are a real challenge to the DX'er. With a reasonably good receiver, a long-wire antenna and a good ground system, you should never fail to be amazed at just how many distant stations you can really hear in the AM broadcasting band. During the winter season (1965-1966), the author heard broadcasting stations on 171 frequencies in the small band that extends from only 540 to 1600 kHz.

Call-Letter Assignments. In most cases, AM broadcasting stations in your area will have call-signs that begin with either the letter "W" or "K," depending upon your location in the United States. Canadian stations have call-signs starting with the letter "C," and Mexican stations with the letters "XE." Practically all AM broadcasting stations east of the Mississippi River have call-signs beginning with the letter "W." West of the Mississippi, most of the AM stations have call-signs beginning with the letter "K."

There are a few exceptions and these result from a mix-up in call-letter assignments made many years before the above general rule was put into practice. Hence, we have KYW, Philadelphia; KDKA and KQV, Pittsburgh, Pennsylvania. Conversely, WDAY is in Fargo, North Dakota, and two stations in Texas—WFAA, Dallas, and

WBAT, Fort Worth, Texas—have the wrong prefixes. There are several others.

In assigning new call letters for AM broadcasting stations, the choice is frequently left up to the broadcaster. If a particular call-sign has not been previously allocated, and a new AM broadcasting station would like to use it, the broadcaster may request use of this call-letter group from the FCC. Many seemingly meaningless call-signs are really part, or all, of the initials of the station owner.

Some call-signs refer to the name of the city in which the station is located. One of those errant call-signs, WACO, is appropriately enough located in Waco, Texas. From a Chamber of Commerce point of view, WPG was once assigned to Atlantic City, New Jersey, standing for the WORLD'S PLAY GROUND. Other examples include WNEW, New York City; KARK, Little Rock, Arkansas; and WCAM, Camden, N. J.

Broadcasting Time Limitations. A broadcast-band DX'er who wants to round out his total of stations heard and verified is faced with the awesome problem of broadcasting time limitations. The daytime-only stations may operate from approximately local sunrise to local sunset. In practice, this means that the station may sign on the air, or sign off the air, within a range of 15-20 minutes of sunrise or sunset in that community. There are a few instances where a broadcaster in this category is permitted on the air prior to sunrise, but this only occurs when there is no interfering station on the same frequency to the east of the "eager" broadcaster. At the same time, this broadcaster must consider the possibility of an all-night station operating on the same frequency that might object to a 4 a.m. return of the daytime station.

Some AM broadcasters are permitted "limited-time" operation and may thus be on the air past their local sunset hour. Provision must be made for the broadcaster not to interfere with stations to either the east or west, or to any clear-channel station. The operating hours of the limited-time broadcasters are very erratic and vary to a great extent according to the frequency and geographical position of the broadcasters on that channel.

The unlimited-time stations, as the name implies, may operate 24 hours a day, seven days a week. Some of these broadcasters will have a silent period (generally one night a week) that is reserved for maintenance of the transmitting equipment. After you have been DX'ing the broadcast band for some time, you will begin to know which stations can be counted on to be silent at regular intervals and which stations just never go off the air. The advantage of listening in during a silent period is quite obvious, since the potentially interfering stations are often hundreds or even thousands of miles away. With nearly 5000 broadcast-band stations on the air in North America, you will always have an opportunity to hear a new station.

Reception Conditions. One of the major problems concerning DX on the broadcast

One of the best of the AM broadcasters is WJR, "The Goodwill Station," Detroit, Mich. A 50,000-watt transmitter is located in nearby Riverview.

band involves day-to-day weather. The ideal time to tune for DX is on a winter evening when the temperature dips below the freezing point. During the summer months, the lightning static level caused by near or distant thunderstorms can obliterate even reasonably strong signals from transmitters only 75-100 miles away.

The aurora borealis will also ruin otherwise good AM broadcast reception. During severe—so-called ionospheric—storms, practically all of the sky wave signal from AM broadcasting stations will be absorbed. Such disturbances generally last for 24-30 hours and then reception conditions gradually return to normal. Fortunately, these storms are a rare occurrence.

The broadcast band is also susceptible to many other forms of electrical interference. A faulty thermostat on a tropical fish tank, a bad thermostat on an oil burner, old fluorescent lamps, most neon signs, most pieces of medical equipment, and even sewing machine motors will ruin reception. The only solution to the problem presented by this excessive interference is to do your tuning at night, when most of the electrical equipment has been turned off.

Tuning the AM Tests. A good time to log many AM stations that you would not normally hear is when a broadcaster checks out his station equipment in the wee small hours of the morning. Such tests are run according to FCC regulations and may occur weekly, biweekly, or even monthly. During some test periods, the announcer may play request recordings or even accept telephone calls from DX listeners who want to chat for a few moments. But, as a general rule, the station transmits a test tone (usually a steady 1000 cycles) which is used by an independent monitoring company to measure the transmitting frequency.

Only one station identification is required during each test period and whether you hear it or not is just a matter of chance. The author listened to 41 test programs on one weekend and came out of it with only two positive DX identifications. On the other hand, some AM broadcasting stations will give their call-signs as often as every two or three minutes.

In Conclusion. If you are going to do any serious AM broadcast listening, you should equip yourself with a pair of headphones. With headphones you can often distinguish a signal far better and with considerably more ease than when it is heard through a loudspeaker mixed in with external noises. Obviously, headphones will also be appreciated by other members of your household.

Another point worth mentioning is that there are many stations on one frequency that have similar sounding call-signs. On 1490 kHz, for example, there is WTXL, West Springfield, Mass.; WDXL, Lexington, Tenn.; and WDXB, Chattanooga, Tenn. On the same frequency, watch out for WRNB, New Bern, N. C., and WRMT, Rocky Mountain, N. C. Or, if you miss the last letter of the call-sign, you may have trouble distinguishing between such stations as WMRF, Lewistown, Pa., and WRMB, Greenville, S. C.

Just because DX'ing on the AM band is the oldest part of the fascinating hobby of short-wave listening, don't neglect it—you'll be both amazed and amused at some of the things you can hear.

Jamming On the Broadcast Band

DX'ers tuning for European BCB stations should be aware that certain frequencies are unlistenable because of Iron Curtain jamming. At the latest report, jamming was interfering with 683 kHz (Berlin RIAS), 719 kHz, 737 kHz (Hof RIAS), 791 kHz (VOA), 854 kHz (Berlin RIAS), 989 kHz (Berlin RIAS) and 1088 kHz.

North American Radio-TV Station Guide

A 128-page book listing over 5000 AM radio stations, 1500 FM stations and 1000 TV stations (North American ONLY), this Station Guide is cross-referenced according to frequency and geographic location, with separate listings by call-signs. Published by Howard W. Sams, & Co., Inc., 4300 West 62 St., Indianapolis, Ind. Price, $1.95.

World Medium Wave Guide

This is the only frequency list of AM broadcasting stations (520-1602 kHz) outside of North America. Guide also contains a listing of AM broadcast-band stations within North America, plus a listing of long-wave (151-433 kHz) broadcasters. Available from Gilfer Associates, P.O. Box 239E, Park Ridge, N.J. 07656. Price, $2.25.

SWL DX'ing On The Ham Bands

There Are Many Reasons To Tune The Radio Amateurs

By William Schultz

TRY LISTENING IN on the ham bands and you may never go back to the international broadcasting bands! There are about 400,000 radio amateurs scattered throughout the world. They comprise a pretty good cross-section of the population and the things which interest them are quite varied. But politics, race or national origin rarely enter into a ham conversation, and ham radio is a hobby where last names are never used.

If you don't care to hear about the deal one ham is making with another for a new car, turn your dial just a few kilohertz. There you may hear a couple of engineers discussing electronics theory, or two doctors setting up a transfer from one eye bank to another. You may pick up an African ham explaining that zebra and antelope meat are common commodities in the butcher shops of his area, or enthusing over the sailboat racing on Lake Victoria. You may learn about the excellent reef fishing off the coast of British Honduras, or about the unusual quality of some of the cabinet woods carved from trees grown there.

Or you may hear our military servicemen in Libya, Saipan, Alaska, or Antarctica talking to their loved ones at home, courtesy of ham radio. During hurricanes and earthquakes, when all regular lines of communication are broken down, you'll hear the amateur "emergency nets" take over to keep the disaster area in touch with the outside world. You may even someday listen to the voice of Tom Christian, direct descendent of Fletcher Christian of "HMS Bounty" fame, from his amateur radio station (VR6TC) on still-lonely Pitcairn Island.

"DXomania." There is a occupational hazard connected with the hobby of ham-band listening One day, you will suddenly realize that you have heard hams in about 25 countries scattered around the world. You'll wonder why you have heard Bolivia but not Paraguay, New Zealand but not Tahiti, the Philippine Islands but not Singapore, Rhodesia but not Tanzania—and you'll consciously start trying to fill the gaps in your logbook. You will have been bitten by the mythical DX bug: you'll have "DXomania."

Symptoms of DXomania are the inability to eat regular meals ("not NOW, for Heaven's sake, I think this weak station is in Nepal!"), the inability to sleep ("conditions were good this evening; maybe Fiji will be coming through around 3 a.m."), and astigmatism from constant staring at the dials. It is said that cauliflower ears can develop from wearing headphones for hours on end. Others may tell you that, within 24 hours of infection, the DXomania disease can transform a good-natured, smiling Ham-Band Listener into a nasty, snarling Ham-Band DX Hound.

Once bitten by the DX bug, all you can do is be thankful that you picked the ham bands for your listening pleasure. More than 300 separate land areas, including islands and island groups, are recognized as separate countries by radio amateurs. Ham activity from all of them will keep

you hopping. And since there are more countries, it follows that the ham-band DX'er has the best chance of any to rack up a really high score in his logbook.

Don't let the language problem bother you; you don't have to be a linguist to DX on the ham bands. While you will hear foreign languages (mostly Spanish) used when they are native to both the parties in contact, English is the universal tongue of ham radio. Three-fifths of the amateurs in the world live in the United States and at least another fifth are English or of English extraction. So most of the others learn to speak English as a second language. You'll find that a Russian ham in contact with a Cuban or a Peruvian in contact with a Finn will almost certainly be using it.

The Ham Bands. In order to reduce interference between different types of stations, the radio spectrum is, by international agreement, sliced up like a big bologna and divided between the various radio communications services. Several slices are allocated to the Armed Forces. Others are reserved for broadcasting, police, overseas and ship-to-shore telephony, aircraft, CB, LORAN and other navigational aids, and the radio amateurs. The amateur slices are then cut up again by the the Federal Communications Commission (FCC).

Frequency Allocations for Amateur Radio

BAND (meters)	REGION 1* (kHz)	REGION 2** (kHz)	REGION 3*** (kHz)
10	28,000-29,700	28,000-29,700	28,000-29,700
15	21,000-21,450	21,000-21,450	21,000-21,450
20	14,000-14,350	14,000-14,350	14,000-14,350
40	7000-7100	7000-7300	7000-7100
80	3500-3800	3500-4000	3500-3800

*Europe, Africa, U.S.S.R.
**North & South America, Northeast Pacific
***Asia (except U.S.S.R.), Australia, New Zealand, and portions of the Pacific

Those hams using Morse code (CW) are permitted to operate anywhere in any of the ham bands, but most do not stay in that portion of the ham bands that is reserved for radiotelephony. If you don't "copy" CW, you will be primarily interested in the radiotelephony or voice portion. You will find that this portion of most bands is cut into two segments, one for U.S. operation, and the other for foreign operation. To avoid swamping foreign hams by the sheer weight of U.S.A. numbers, American hams are not permitted to operate in the foreign portion though you will often find foreign stations in the U.S. segment of the bands.

In addition to the amateur bands listed in the accompanying tables, there are a number of others of lesser importance. For example, the 160-meter band covers the frequencies of 1800 to 2000 kHz in Regions 2 and 3, and from 1715 to 2000 kHz in Region 1; however, in the latter region, operation is only permitted in certain countries with a maximum power of 10 watts. The 6- and 2-meter bands, covering the frequencies of 50,000 to 54,000 and 144,000 to 148,000 kHz are tunable by the SWL through the use of specialized equipment; these ham bands are too high in frequency to be covered by normal radio receivers. In addition, there are no less than eight more amateur bands that are still higher in frequency!

Because most other countries also have regulatory radio commissions which formulate the rules for their own citizens, some foreign amateurs are permitted to use only a portion of the ham bands listed in the tables. A few countries may permit operation outside of the frequencies shown. And, because international commissions could not compromise some divergent points of view, the ham-band DX'er has to pick his way between the short-wave broadcasting stations in the 40-meter band. You'll find that a half dozen of these stations, or more, also cause interference on the upper portion of the 80-meter band, particularly in the 3925 to 3975 kHz portion. One of the stations that you may hear frequently is the BBC, London, operating on either of two frequencies, 3952.5 and 3975 kHz, during mid-evenings.

Along about here, if you're new to the hobby, you will undoubtedly wonder why each radio service wasn't given one big chunk of the bologna instead of several

little slices. The answer lies in propagation conditions, which change from hour to hour, day to day, month to month, and year to year. The variation between daytime and nighttime reception on the standard AM broadcast band is a familiar example, although different bands react differently to the same changes in conditions. The aim of the slicing process is to insure that each service will always have a usable band available for communication.

Propagation on the higher frequencies is best during the day, in the summer, and at or near the peak of the 11-year sunspot cycle (next peak due in 1969). Conditions on the lower frequencies are best at night, in the winter, and at or near the low point in the sunspot cycle. At the top of the cycle, the 10- and 15-meter ham bands are the best daytime bands, usually open to those parts of the world where the signal path is entirely in daylight. At night, the best bands will be 20 and 40 meters; optimum conditions will prevail when the path is wholly in darkness. At the bottom of the cycle, 10 and 15 meters are useless for DX purposes. The useful DX bands then become the 20-meter band, with the path in daylight, and 40 and 80 meters if the signal paths are in darkness. In all cases, daylight bands will show some improvement during the summer months and nighttime bands peak up when the sun goes south for the winter.

Voice Portions of the Amateur Radio Bands

BAND (meters)	FOREIGN OPERATION (kHz)	AMERICAN OPERATION (kHz)
10	28,000-28,500	28,500-29,700
15	21,100-21,250 (high end used most)	21,250-21,450
20	14,100-14,200	14,200-14,350
40	7050-7150 (7050-7100 used most)	7200-7300
80	3700-3800 (3750-3800 used most)	3800-4000

Your Receiver. If you have an ordinary AM radio receiver with one or two short-wave bands built in, you may as well forget trying to tune in the hams. You originally purchased the radio because it had good tone quality. Technically, this means that the circuits had to pass a band of signals at least 10 kHz wide.

On the very crowded ham bands, you need a receiver with a bandpass capability of only 2 to 5 kHz in order to cut out adjacent channel interference. Only a communications-type radio receiver, built for minimum bandpass with maximum intelligibility, will accomplish this feat. Cost of a new receiver will run from less than one hundred dollars to well over one thousand dollars for the finest set. But most radio supply houses also have, at suitably reduced prices, reconditioned receivers that have been traded in by hams or SWL's who were looking for better or later-model receivers.

If you're a beginner, you won't know how much or what type of gadgetry you want in your receiver. The best bet is to buy something on the inexpensive side. In six months or a year, as your ideas on receivers will have jelled, you should trade the low-cost receiver for exactly what you want at the least economic loss.

The receiver must have a bandspread dial for the amateur bands (this is a secondary dial for fine tuning, calibrated to the amateur bands) and a BFO (beat frequency oscillator; you'll need it if you decide to study code and to listen to the single-sideband—SSB—transmissions). Hams are gradually scrapping their straight

Edward Zebrowski divides his DX'ing time between the ham bands and the international short-wave broadcasting bands. He was issued the POPULAR ELECTRONICS identifier WPE1FTG. Ed uses 3 receivers, including a Hallicrafters Model S-120.

AM transmitters and switching to SSB. Tuning in on SSB requires a certain knack of fine tuning and good receiving equipment. Look for a receiver with a product detector which will greatly facilitate SSB reception.

Your Antenna. You'll hear ham signals if you connect your antenna lead-in to a bedspring, but you'll hear more if it's hooked to a good out-of-doors antenna. Generally speaking, the higher you can get your antenna in the air, the better will be the reception. Or, if you don't have that much space available, you can get a good "trap vertical" antenna from the dealer who sold you the receiver. This antenna is attached to a single post driven into the ground and needs only clear space straight above it to work efficiently. It will automatically tune to 10, 15 and 20, or 10, 15, 20 and 40 meters, and cost about $20.

One word of advice: vertical antennas pick up more man-made noise (auto ignition, electrical, etc.) than their horizontal counterparts. If you live near a traffic artery, the horizontal wire may be best for you. A horizontal "trap" antenna for ham-band reception is made by Mosley Electronics. Called the RD-5, this antenna resonates in the 10-, 15-, 20- and 75-meter bands. The RD-5 is similar to the SWL-7 made by the same manufacturer for international broadcast reception.

Last, but not least, join a good club that specializes in ham-band listening or includes the ham bands in its coverage. Each organization publishes a club paper, consisting largely of reports by its members of their experiences. The reports it contains, specifying what stations and countries are currently being heard, along with frequencies and times, are invaluable to the expert and the neophyte alike.

United World DX'ers Club

A non-dues-paying club, the UWDXC has only one cardinal rule: each member must try to listen in on at least two DX stations a day. At the end of the month, each member submits a detailed reception report of what he has heard. This club is just getting organized; details are available from Robert Hejl, 17 Alexander Ave., Farmingdale, N.Y. 11735.

Reporting, Veries, and QSL's

SWL

How to Report What You Have Heard

By John Beaver, Jr.

THE short-wave listener is the unsung hero of international broadcasting. From SWL reports, a broadcaster can determine just how well signals are being received and whether or not the programming is more or less what the listener expected. So important are these reports that some international broadcasting stations actually have paid monitors in various countries throughout the world. These stations are in the minority, however. Some 98% of the international broadcasters depend on listeners' reports to verify the quality of overall reception.

The SWL's who send reports of reception to international broadcasting stations can be classified into four categories: (1) those who listen for pleasure and entertainment; (2) those who listen to gain a better understanding of international affairs, or to learn a foreign language; (3) those who listen for the purpose of collecting QSL cards and verifications; and (4) those who listen and monitor broadcast transmissions for the sole purpose of reporting technical information back to the broadcaster.

Verifications (veries), or QSL's as they are commonly called, are acknowledging letters or cards sent to the listener by the station after the listener has submitted satisfactory proof of reception. Many QSL cards are colorful and some are very plain, but they all serve their intended purpose—proof that a DX station has been received.

The QSL may be no more than a few words on a card. Some QSL's are accompanied by station schedules, and, in a few cases, by souvenirs from the country of the verifying stations. One Latin American station has been known to send a listener a small native doll in return for an exceptionally good reception report—good in that it was thorough and of use to the station's technical staff.

If a short-wave listener qualifies under categories 1 and 2, his reception report will rarely contain technical information. He will probably be commenting on the programming, or asking for information about the country, or inquiring about language courses.

Several international short-wave broadcasting stations have sponsored their own SWL clubs. The officers of the Radio Canada Short Wave Club are (left to right): S.B. (Pip) Duke, President and Supervisor of Engineering Services for the CBC; Simone Rubal, Club Secretary; and Duncan Nicholson, Vice President and Assistant Supervisor.

In reporting for a QSL (category 3), it is particularly important to remember that stations prefer a reception report of transmission over an extended period of time—a minimum of one half hour and, if at all possible, one or two hours in length. Such reports are of much more use to the station. It is not unusual for a SWL to report on reception over a period of several hours on several different days. Since station schedules are so varied, the listener must judge for himself just how long he can monitor a particular station's transmissions and when conditions will warrant a longer or shorter reporting period.

What To Include. Once you have identified the country and call-sign (or slogan) of a short-wave broadcaster, try to determine the frequency of the transmitting station as accurately as possible. Station announcements are a valuable aid. However, when no frequency announcements are made and the language is unfamiliar, other methods of determining the frequency are required. A listing of stations by frequency (as in the "World Radio TV Handbook") is very helpful. The SWL must include the frequency in his report in order to assist the station in determining which of several parallel frequencies has been heard. When a station has several transmitters, or parallel frequencies in operation, the listener should always indicate which transmitter is being tuned. Broadcasters also like to see a comparative signal strength report, and the SWL will find this is relatively easy to provide—especially when the station is transmitting the same program on two or more frequencies.

All reports must include the date and time of the broadcast, and the time zone. Simply stating, for example, 0600 hours, is not sufficient. If local time (at the SWL monitoring post) or another time zone is being reported, be sure to specify which one. The listener should also try to obtain a clock with a sweep second hand and should verify its accuracy periodically by checking with the transmissions of WWV or CHU.

A good report should itemize selections of music heard (the title or a brief description); provide a short resume of broadcast news items, feature talk or other programming; and mention any other peculiarity that will assist the station in verifying the tuning of its frequency. If the transmissions are in a language other than English, the SWL should listen carefully for anything that will assist him in reporting the nature of the programs (music, talks, etc.), and in these cases a clock with a sweep second hand is of particular value.

Program details in the report should be concise and to the point. Practically every international broadcasting station will check the report against the master station log for the time period indicated. Irregularities or insufficient information will always rule out the chance of a verification or QSL card coming through.

Reporting Codes. The listener should include a report on signal strength and readability of the particular transmission being reported. Bear in mind that stations are very much interested in knowing exactly how they are being received in a particular locality. Various reporting codes have been developed to simplify and standardize methods of conveying this information. The SINPO and 555 Code are the most popular and the most often used.

Regular monitors and listeners to the British Broadcasting Corporation are asked to use the 555 code. This code is simple and comprehensive and the novice listener may find it useful as a guide when tuning and monitoring stations other than those of the BBC. The newest code is the SINPO code, which is rapidly gaining popularity among SWL's—although it remains relatively unknown among amateur radio oper-

The 555 Code

Signal Strength	Interference	Overall Merit
0 Inaudible	0 Total	0 Unusable
1 Poor	1 Very severe	1 Poor
2 Fair	2 Severe	2 Fair
3 Good	3 Moderate	3 Good
4 Very good	4 Slight	4 Very good
5 Excellent	5 None	5 Excellent

(Continued on page 30)

Times Around The World

Listed below are the differences between local Standard Time and Universal Time (UT) in a great many countries. A plus sign indicates the number of hours that local Standard Time is "ahead" of Universal Time; a minus sign indicates the number of hours that local time is "behind" UT. Differences between local Daylight Saving Time and UT are also shown. Greenwich Mean Time (GMT) and UT are interchangeable for the purposes of this list.

COUNTRY	Standard Time	Daylight Saving
Aden	+ 3	
Afghanistan	+ 4½	
Alaska	— 8	
Albania	+ 1	
Algeria	+ 1	
Argentina	— 3	
Australia		
Victoria		
New South Wales,		
Queensland,		
Tasmania	+10	
N. Territory		
S. Australia	+ 9½	
W. Australia	+ 8	
Austria	+ 1	
Bahamas	— 5	
Barbados	— 4	
Belgium	+ 1	
Bermuda	— 4	
Bolivia	— 4	
Brazil		
Eastern	— 3	
Manaos	— 4	
Acre	— 5	
Brunei (N. Borneo)	+ 8	
Bulgaria	+ 2	
Burma	+ 6½	
Cambodia	+ 7	
Canada		
Newfoundland	— 3½	— 2½
Atlantic (Labrador, Nova Scotia, Quebec)	— 4	— 3
Eastern (Ontario)	— 5	— 4
Central (Manitoba)	— 6	— 5
Mountain (Alberta)	— 7	— 6
Pacific (Br. Columbia)	— 8	— 7
Yukon	— 9	— 8
Ceylon	+ 5½	
China		
People's Rep.	+ 8	
Taiwan	+ 8	+ 9
Colombia	— 5	
Congo, Rep. of		
Leopoldville	+ 1	
Elisabethville	+ 2	
Congo Rep.	+ 1	
Cook I.	—10½	
Costa Rica	— 6	
Cuba	— 5	
Curaçao	— 4½	
Cyprus	+ 2	
Czechoslovakia	+ 1	
Dahomey	+ 1	
Denmark	+ 1	
Dominican Rep.	— 5	
Ecuador	— 5	
Egypt	+ 2	+ 3
El Salvador	— 6	
Ethiopia	+ 3	
Falkland I.	— 4	
Faeroes I.	UT	
Fiji I.	+12	
Finland	+ 2	
France	+ 1	
Germany	+ 1	
Gibraltar	+ 1	
Gilbert I.	+12	
Ghana	UT	
Great Britain	UT	+ 1
Greece	+ 2	
Greenland		
Thule area	— 4	
Angmagssalik	— 2	
Guadeloupe	— 4	
Guam	+10	
Guatemala	— 6	
Guiana (Br.)	— 3¾	
Guiana (Dutch)	— 3½	
Guiana (French)	— 4	
Guinea	UT	
Haiti	— 5	
Hawaii	—10	
Honduras	— 6	
Honduras (Br.)	— 6	
Hong Kong	+ 8	+ 9
Hungary	+ 1	+ 1
Iceland	— 1	UT
India	+ 5½	
Indonesia		
N. Sumatra	+ 6½	
Java, Borneo, Bali	+ 7½	
Celebes	+ 8	
Iran	+ 3½	
Iraq	+ 3	
Ireland (Eire)	UT	+ 1
Israel	+ 2	
Italy	+ 1	
Ivory Coast	UT	
Jamaica	— 5	
Japan	+ 9	
Jordan	+ 2	
Kenya	+ 3	
Korea	+ 9	
Kuwait	+ 3	
Laos	+ 7	
Lebanon	+ 2	
Liberia	— ¾	
Libya	+ 2	
Luxembourg	+ 1	
Madagascar	+ 3	
Malaya	+ 7½	
Mali	UT	
Malta	+ 1	
Marshall I.	+12	
Martinique	— 4	
Mexico	— 6	
Monaco	+ 1	
Mongolia (Outer)	+ 8	
Morocco	UT	
Mozambique	+ 2	
Nepal	+ 5.40	
Netherlands	+ 1	
Neth. Antilles	— 4½	
New Caledonia	+11	
New Guinea (Australian)	+10	
New Hebrides	+11	
New Zealand	+12	
Nicaragua	— 6	
Nigeria	+ 1	
Norfolk I.	+11½	
Norway	+ 1	+ 2
Pakistan		
West	+ 5	
East	+ 6	
Panama	— 5	
Papua	+10	
Paraguay	— 4	
Peru	— 5	
Philippines	+ 8	
Poland	+ 1	+ 2
Portugal	UT	+ 1
Puerto Rico	— 4	
Rhodesia	+ 2	
Ruanda-Urundi	+ 2	
Rumania	+ 2	
Samoa I.	—11	
Sarawak	+ 8	
Saudi Arabia	+ 3	
Senegal	UT	
Seychelles	+ 4	
Sierra Leone	UT	
Singapore	+ 7½	
Solomon I.	+11	
Somalia	+ 3	
S. Africa (Union of)	+ 2	
Spain	+ 1	
Sudan	+ 2	
Surinam	— 3½	
Sweden	+ 1	
Switzerland	+ 1	
Syria	+ 2	
Tanganyika	+ 3	
Tahiti	—10	
Tasmania	+10	
Thailand	+ 7	
Trinidad	— 4	
Tunesia	+ 1	
Turkey	+ 2	
Uganda	+ 3	
Uruguay	— 3	
U.S.S.R.		
Moscow, Leningrad	+ 3	
Sverdlovsk	+ 5	
Tashkent	+ 6	
Vatican	+ 1	
Venezuela	— 4½	
Vietnam (Rep.)	+ 8	
Virgin I.	— 4	
Windward I.	— 4	
Yemen	+ 3	
Yugoslavia	+ 1	
Zanzibar	+ 3	

All-Time Countries List

The following is a complete listing of countries that you may claim to help you qualify for one of the POPULAR ELECTRONICS DX Country Awards.

1 Afghanistan
2 Agalega, St. Brandon Islands
3 Aland Island
4 Alaska
5 Albania
6 Adabra, Cosmoledos Islands
7 Algeria
8 American Samoa
9 Amsterdam, St. Paul Islands
10 Adaman, Nicobar Islands
11 Andorra
12 Angola
13 Anguilla Island
14 Antarctica
15 Antigua, Barbuda Islands
16 Argentina
17 Armenia
18 Aruba, Bonaire, Curacao Islands (Netherland Antilles)
19 Ascension Island
20 Asiatic Russia
21 Auckland, Campbell Islands
22 Australia (including Tasmania)
23 Austria
24 Aves Island
25 Azerbaijan
26 Azores Islands
27 Bahama Islands
28 Bahrein Island
29 Bajo Nuevo Island
30 Baker, Canton, Enderbury, Howland Islands
31 Balearic Islands
32 Barbadoes
33 Belgium
34 Bermuda
35 Bhutan
36 Bolivia
37 Bonin, Volcano Islands (Iwo Jima)
38 Botswana (Bechuanaland)
39 Bouvet Island
40 Brazil
41 British Guiana (Guyana)
42 British Honduras
43 British Phoenix Island
44 British Virgin Is.
45 Brunei
46 Bulgaria
47 Burma
48 Burundi*
49 Cambodia*
50 Cameroun
51 Canada
52 Canal Zone
53 Canary Islands
54 Cape Verde Islands
55 Cargados Carajos Island
56 Caroline Islands (Eastern)
57 Caroline Islands (Western)
58 Cayman Islands
59 Central African Republic*
60 Ceuta, Melilla (Spanish Morocco)
61 Ceylon
62 Chad*
63 Chagos Island
64 Chatham Island
65 Chile
66 China (including Manchuria)
67 Christmas Island (Indian Ocean)
68 Christmas, Fanning, Washington Islands (Line Islands)
69 Clipperton Island
70 Cocos-Keeling Islands (Indian Ocean)
71 Cocos Island (Pacific Ocean)
72 Colombia
73 Comoro Island
74 Congo Republic (Brazzaville)*
75 Congo, Republic of (Leopoldville)
76 Cook Islands, Northern (Manihiki Is.)
77 Cook Islands, Southern
78 Cormoran Reef
79 Corsica
80 Costa Rica
81 Crete
82 Crozet Island
83 Cuba
84 Cyprus
85 Czechoslovakia
86 Dahomey*
87 Denmark
88 Desroches Island
89 Dodecanese Islands (Rhodes)
90 Dominica Island
91 Dominican Republic
92 East Germany (including East Berlin)*
93 East Pakistan
94 Easter Island
95 Ebon Atoll
96 Ecuador
97 El Salvador
98 England
99 Estonia
100 Ethiopia
101 Faroe Islands
102 Falkland Islands
103 Fernando de Noronha Island
104 Fiji Islands
105 Finland
106 Formosa (Taiwan)
107 France
108 Franz Josef Land
109 French Guiana
110 French Polynesia (except Marquesas Island)
111 French Somaliland
112 French Saint Martin
113 Gabon*
114 Galapagos Island
115 Gambia
116 Georgia
117 Ghana*
118 Gibraltar
119 Gilbert, Ellice, Ocean Islands
120 Glorieuse Island
121 Greece
122 Greenland
123 Grenada & Dependencies
124 Guadeloupe
125 Guam & Cocos Islands
126 Guantanamo Bay
127 Guatemala
128 Guernsey & Dependencies (Channel Islands)
129 Guinea*
130 Haiti
131 Hawaii (including Tern Island)
132 Heard Island
133 Honduras
134 Hong Kong
135 Hungary
136 Iceland
137 Ifni
138 India
139 Indonesia*
140 Iran
141 Iraq
142 Ireland
143 Isle of Man
144 Israel*
145 Israel-Jordan Demilitarized Zone*
146 Italy
147 Ivory Coast*
148 Jamaica
149 Jan Mayen Island
150 Japan
151 Jersey Island (Channel Islands)
152 Johnston Island
153 Jordan
154 Juan de Nova, Europa Islands
155 Juan Fernandez Island
156 Kaliningradsk
157 Kamaran Island
158 Kazakh
159 Kenya
160 Kerguelen Island
161 Kermadec Island
162 Kirghiz
163 Kure Island
164 Kuria Maria Island
165 Kuwait
166 Kuwait-Saudi Arabia Neutral Zone
167 Laccadive Island

Countries marked with an asterisk in the listing above are valid for credit only if heard on or after the dates indicated below.

48	Burundi	July 1, 1962
49	Cambodia	July 21, 1954
59	Central African Republic	August 13,1960
62	Chad	August 11, 1960
74	Congo Republic (Brazzaville)	August 15, 1960
86	Dahomey	August 1, 1960
92	East Germany & East Berlin	October 7, 1949
113	Gabon	August 17, 1960
117	Ghana	March 6,1957
129	Guinea	October 2, 1958
139	Indonesia	May 1, 1963
144	Israel	May 15, 1948
145	Israel-Jordan Demilitarized Zone	May 15, 1948
147	Ivory Coast	August 7, 1960
168	Laos	July 21, 1954
183	Malaysia, Eastern	September 16, 1963
186	Mali	June 20, 1960
196	Mauritania	June 20, 1960
216	Niger	August 3, 1960
220	North Korea	June 25, 1950
221	North Vietnam	September 1, 1954
247	Rwanda	July 1, 1962
262	Senegal	June 20, 1960
271	Somali Republic	July 1, 1960
275	South Korea	June 25, 1960
279	South Vietnam	September 1, 1954
293	Tanzania	July 1, 1964
311	Upper Volta	August 5, 1960
320	West Germany & West Berlin	October 7, 1949

for SWL DX Awards

Applicants are urged to be careful in listing countries, particularly those which have changed names in recent years. Changes will be published in POPULAR ELECTRONICS.

168 Laos*
169 Latvia
170 Lebanon
171 Lesotho (Basutoland)
172 Liberia
173 Libya
174 Liechtenstein
175 Lithuania
176 Lord Howe Island
177 Luxembourg
178 Macao
179 Macquarie Island
180 Madeira Island
181 Malagasy (Madagascar)
182 Malawi
183 Malaysia, Eastern*
184 Malaysia, Western
185 Maldive Island
186 Mali*
187 Malpelo Island
188 Malta
189 Marcus Island
190 Mariana Islands (Rota, Saipan, Tinian, etc.)
191 Maria Theresa Reef
192 Marion, Prince Edward Islands
193 Marquesas Island
194 Marshall Islands
195 Martinique
196 Mauritania*
197 Mauritius
198 Mexico
199 Midway Island
200 Minerva Reef
201 Moldavia
202 Monaco
203 Mongolia
204 Montserrat Island
205 Morocco
206 Mozambique
207 Nauru Island
208 Navassa Island
209 Nepal
210 Netherlands
211 New Caledonia
212 New Guinea, Territory of
213 New Hebrides
214 New Zealand
215 Nicaragua
216 Niger*
217 Nigeria
218 Niue Island
219 Norfolk Island
220 North Korea*
221 North Vietnam*
222 Northern Ireland
223 Norway
224 Oman Sultanate (Muscat)
225 Oman, Trucial, Das Islands
226 Palmyra, Jarvis Islands
227 Panama
228 Pantelleria, Pelagian Islands
229 Papua Territory
230 Paraguay
231 Peru
232 Philippine Islands
233 Pitcairn Island
234 Poland
235 Portugal
236 Portuguese Guinea
237 Portuguese Timor
238 Puerto Rico
239 Qatar
240 Reunion Island
241 Revilla Gigedo Island
242 Rhodesia
243 Rio de Oro (Spanish Sahara)
244 Rodriguez Island
245 Romania
246 Roncador Cay, Serrana Bank
247 Rwanda*
248 Ryukyu Islands (Okinawa)
249 Saint Helena Island
250 Saint Kitts, Nevis Islands
251 Saint Lucia Island
252 Saint Pierre Islands
253 Saint Vincent Island
254 San Andres, Providencia Islands
255 San Felix, San Ambrosia Islands
256 San Marino
257 Sao Tome, Principe Islands
258 Sardinia
259 Saudi Arabia
260 Saudi Arabia-Iraq Neutral Zone
261 Scotland
262 Senegal*
263 Seychelles Islands
264 Sicily, Eolian, Ustica Islands
265 Sierra Leone
266 Sikkim
267 Singapore
268 Sint Maarten, St. Eustatius, Saba Islands
269 Socotra Island
270 Solomon Islands
271 Somali Republic*
272 South Africa
273 South Arabia Protectorate (including Aden)
274 South Georgia Island
275 South Korea*
276 South Orkney Island
277 South Sandwich Island
278 South Shetland Island
279 South Vietnam*
280 South-West Africa
281 Spain
282 Spanish Guinea
283 Spitzbergen (Svalbard)
284 Spratly Island
285 Sudan
286 Surinam
287 Swan Island
288 Swaziland
289 Sweden
290 Switzerland (including I.T.U., Geneva)
291 Syria
292 Tadzhik
293 Tanzania*
294 Thailand
295 Tibet
296 Togo
297 Tokelau (Union) Islands
298 Tonga (Friendly) Islands
299 Trinidade, Vaz Islands
300 Trinidad, Tobago Islands
301 Tristan da Cunha, Gough Islands
302 Tromelin Island
303 Tunisia
304 Turkey
305 Turkmen
306 Turks, Caicos Islands
307 Uganda
308 Ukraine
309 United Arab Republic
310 United States of America
311 Upper Volta*
312 Uruguay
313 Uzbek
314 Vatican City
315 Venezuela
316 Virgin Islands
317 Wake Island
318 Wales
319 Wallis, Futura Islands
320 West Germany (including West Berlin)*
321 West Pakistan
322 Western Samoa
323 White Russia
324 Willis Islands
325 Yemen
326 Yugoslavia
327 Zambia

The countries listed below have been deleted from this all-time countries list, but credit may be taken for reception (and verification) on or before the dates given.

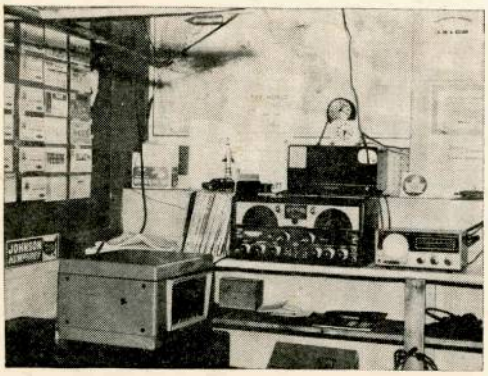
D1	Borneo (Indonesian Kalimantan)	April 30, 1963
D2	British Somaliland	June 30, 1960
D3	British Togoland	March 5, 1957
D4	Celebes, Molucca Islands	April 30, 1963
D5	Damau and Diu	December 19, 1961
D6	Danzig	September 1, 1939
D7	Eritrea	November 30, 1962
D8	French Equatorial Africa	August 16, 1960
D9	French India	October 31, 1954
D10	French Indo-China	July 20, 1954
D11	French West Africa	August 6, 1960
D12	Germany	October 6, 1949
D13	Goa	December 19, 1961
D14	Gold Coast	March 5, 1957
D15	Italian Somaliland	June 30, 1960
D16	Java	April 30, 1963
D17	Karelo-Finnish Republic	July 15, 1956
D18	Korea	June 24, 1950
D19	Kwantung Peninsula	September 2, 1945
D20	Manchukuo	September 2, 1945
D21	Newfoundland & Labrador	March 31, 1949
D22	Palestine	May 14, 1948
D23	Ruanda-Urundi	June 30, 1962
D24	Saarland	December 31, 1956
D25	Sabah	September 15, 1963
D26	Sarawak	September 15, 1963
D27	Spanish Morocco (except Ceuta & Melilla)	April 6, 1956
D28	Sumatra	April 30, 1963
D29	Tanganyika	June 30, 1964
D30	Tangier	October 28, 1956
D31	Tannu Tuva	November 15, 1945
D32	Timor (Indonesian)	April 30, 1963
D33	Trieste	October 25, 1954
D34	West Irian (formerly Dutch New Guinea)	April 30, 1963
D35	Zanzibar	June 30, 1964

ators. Many short-wave stations, notably "Radio Japan" and "Radio Nederland," prefer the SINPO code and ask their listeners to report reception using this system.

The SINPO code chart, with Q-code equivalents and ratings, appears on page 31. Use of the SINPO code is simplicity itself. When reporting to a station whose signals are loud and clear and completely free of any interference, the report should state: SINPO 55555 (not S5 I5 N5 P5 O5).

Other Details. A report might also include comments on the program the listener heard and what he liked or did not like. However, the SWL should remember to be constructive and not unjustly criticize program content without offering some suggestions as to how it could be improved. Each international broadcasting service is going to thousands of listeners, and it is quite impossible to suit the ear of everyone. If a report is complete and accurate, it will be noted by the station's personnel handling SWL reports. It will enable the broadcaster to plan future programming and to adjust schedules and frequencies if reception was not satisfactory over the period of time that the SWL monitored.

The SWL should also remember to be courteous in requesting a QSL (verification). The following example can be used as a guide: "If this report of reception on the dates, times, and frequencies checks accurately with your station log and is found to be of value to your engineering staff, verification would be sincerely appreciated."



In this SWL shack, note convenient layout of receivers (Hallicrafters SX-100 and Lafayette HA-52A), work space, world map, and tape recorder. Drew Kalman, Dearborn, Mich., used this equipment to log 102 countries, with 50% verified.

It is always proper to include return postage when sending station reports. The listener should remember that to some extent the station is doing him a favor by verifying his reception report. Many broadcasters will indicate that return postage is not required, and those short-wave broadcasters which are government-owned obviously do not need to be sent return postage.

Return postage for foreign countries can be sent in the form of an International Reply Coupon (IRC) which is available from local post offices. However, listeners should be aware that IRC's are NOT valid in Bulgaria, Congo, Peru, Pitcairn Island, Saudi Arabia, Somali, Sweden, the Soviet Union, Yemen, and Yugoslavia.

In some unusual cases, the SWL may find it necessary to obtain mint (unused) postage stamps from the country involved. Mint stamps can be purchased from stamp dealers who specialize in this service. Also, many Sunday newspapers that regularly publish a stamp collecting column will list stamp dealers who specialize in selling mint foreign stamps.

Tape-Recorded Reports. In recent years, tape recordings in place of written reports have become a very effective means of obtaining QSL's. Obviously, a short-wave station that receives a report on tape is able to judge far more accurately just how its signals are being received.

Before starting to record on tape, the listener should tune in the broadcaster as well as possible. From this point on, the listener should not change any of the receiver settings regardless of how the signal fluctuates or interference increases or decreases. The broadcaster is interested in knowing exactly how the signal strength and readability varies over a period of time and how the signals are being affected by other stations or electrical disturbances. Tape reports must be long enough to be of value to the station; a 30-minute report is about the minimum necessary to

Time Conversion Within U.S.A.

Universal Time (Greenwich Mean Time) (*hours*)	Eastern Daylight Time	Eastern Standard or Central Daylight	Central Standard or Mountain Daylight	Mountain Standard or Pacific Daylight	Pacific Standard Time
0000	8:00 p.m.	7:00 p.m.	6:00 p.m.	5:00 p.m.	4:00 p.m.
0100	9:00 p.m.	8:00 p.m.	7:00 p.m.	6:00 p.m.	5:00 p.m.
0200	10:00 p.m.	9:00 p.m.	8:00 p.m.	7:00 p.m.	6:00 p.m.
0300	11:00 p.m.	10:00 p.m.	9:00 p.m.	8:00 p.m.	7:00 p.m.
0400	Midnight	11:00 p.m.	10:00 p.m.	9:00 p.m.	8:00 p.m.
0500	1:00 a.m.	Midnight	11:00 p.m.	10:00 p.m.	9:00 p.m.
0600	2:00 a.m.	1:00 a.m.	Midnight	11:00 p.m.	10:00 p.m.
0700	3:00 a.m.	2:00 a.m.	1:00 a.m.	Midnight	11:00 p.m.
0800	4:00 a.m.	3:00 a.m.	2:00 a.m.	1:00 a.m.	Midnight
0900	5:00 a.m.	4:00 a.m.	3:00 a.m.	2:00 a.m.	1:00 a.m.
1000	6:00 a.m.	5:00 a.m.	4:00 a.m.	3:00 a.m.	2:00 a.m.
1100	7:00 a.m.	6:00 a.m.	5:00 a.m.	4:00 a.m.	3:00 a.m.
1200	8:00 a.m.	7:00 a.m.	6:00 a.m.	5:00 a.m.	4:00 a.m.
1300	9:00 a.m.	8:00 a.m.	7:00 a.m.	6:00 a.m.	5:00 a.m.
1400	10:00 a.m.	9:00 a.m.	8:00 a.m.	7:00 a.m.	6:00 a.m.
1500	11:00 a.m.	10:00 a.m.	9:00 a.m.	8:00 a.m.	7:00 a.m.
1600	Noon	11:00 a.m.	10:00 a.m.	9:00 a.m.	8:00 a.m.
1700	1:00 p.m.	Noon	11:00 a.m.	10:00 a.m.	9:00 a.m.
1800	2:00 p.m.	1:00 p.m.	Noon	11:00 a.m.	10:00 a.m.
1900	3:00 p.m.	2:00 p.m.	1:00 p.m.	Noon	11:00 a.m.
2000	4:00 p.m.	3:00 pm.	2:00 p.m.	1:00 p.m.	Noon
2100	5:00 p.m.	4:00 p.m.	3:00 p.m.	2:00 p.m.	1:00 p.m.
2200	6:00 p.m.	5:00 p.m.	4:00 p.m.	3:00 p.m.	2:00 p.m.
2300	7:00 p.m.	6:00 p.m.	5:00 p.m.	4:00 p.m.	3:00 p.m.

provide a broadcaster with the information he desires.

And outside noises should not be permitted to appear on the tape. The listener must record directly from the speaker terminals or headphone jack and should never try to record the sound from the loudspeaker through the recorder's microphone. Sufficient leader tape on each end of the recording tape should be provided. If the listener decides to record transmissions over several different days, it is important to remember to use one track of the tape for the first day, and the second track for the next day, or to interrupt the tape with voice announcements establishing exactly when and how the transmissions are being recorded. Be sure to plainly mark on the tape which of the two standard speeds (3¾ or 7½ ips) was used in making the recording.

A written note should be sent with the tape, containing the listener's name and address, the date and time of the record-

DX Awards Program

Holders of WPE Monitoring Certificates are eligible to apply for awards that may be affixed to the certificate itself. Three awards are now open—one for 25-150 verified countries, one for 20-50 verified states, and one for 6-12 verified provinces/territories. Details on joining the WPE Monitor Program will be found in the March, May, July, September, November (1966) and January (1967) issues of POPULAR ELECTRONICS. Award application forms appear in the February, April and November 1965 issues of POPULAR ELECTRONICS. To qualify for an award, the steps listed below must be followed.

1 Each applicant must be a registered WPE Short-Wave Monitor and must enter his call letters on the application form (or facsimile).

2 Each applicant must submit a list of stations (any frequency or service) for which he has received verifications, one for each state, country or province heard. The list should contain 25, 50, 75, 100, or 150 countries if applying for a country award, or 20, 30, 40, or 50 states if applying for a state award, or 6, 8, 10 or 12 provinces/territories if applying for a province award. The following information must be furnished in tabular form and in alphabetical order by country, state, or province for each verification.
   (a) Country, state, or provinces/territories heard
   (b) Call-sign or name of station heard and verified
   (c) Frequency
   (d) Date the station was heard
   (e) Date of verification (postmark dates are acceptable)
   (f) For the states award only, indicate whether the broadcast was a normal transmission for the class of station received, or a test.

   All of the above information should be copied from the station's verification. Don't list any verification you can't supply for authentication on demand.

3 All pertinent verifications, whether QSL cards or letters, should be carefully packaged and stored by the applicant until such time as instructions are received to send in some or all of them for checking purposes. Instructions on how and to whom to send the verifications will be given at that time. Failure to comply with these instructions will disqualify the applicant.

4 A fee of 50 cents (in U. S. coin) must accompany the applicant's list of verifications to cover the costs of printing, handling, and mailing. This fee will be returned in the event an applicant is found to be ineligible for any of the awards. Applicants outside of the United States may send 60 cents (U. S.) in coins of their own country if they so desire. However, please do NOT send any International Reply Coupons (IRC's) or personal checks

ing, the frequency monitored, the antenna used, make and model of receiver, and a courteous request that the station consider the recording for QSL purposes.

Time Conversion. While the SWL might prefer to use his own time zone in making his report, he will find that most broadcasters appreciate the thoughtfulness of converting from local time to that of the broadcaster. Since short-wave stations are scattered throughout the world, it has become a common practice to report reception in terms of Greenwich Mean Time (GMT), or as it is more commonly referred to in this space age, Universal Time (UT).

The 24-hour clock system is now generally understood and accepted throughout the world. In this system, the hours from 1:00 a.m. to 11:00 a.m. are expressed as 0100 to 1100. Noon, or midday, is referred to as 1200. From 1:00 p.m. to 11:00 p.m. ,the times are expressed as 1300 to 2300. Midnight is 0000.

Some reporters prefer to use 2400 for midnight; although both are technically correct, 0000 is more commonly used.

DX Awards. There are numerous awards available to the SWL for QSL'ing or verifying a certain number of countries, states, or Canadian provinces. Many SWL's collect these certificates, which are usually very attractive and colorful. Details on POPULAR ELECTRONICS' award program appear at left.

Reporting Forms & Log Sheets

Special station logging sheets (punched for a 3-ring binder) and pads of 50 reporting forms designed according to recommendations of international

Riding the TV DX Trail

SWL

Looking For Freak Conditions Results In DX

By Gary Olson

THOSE rolling black bars that have pestered your Channel 2 TV reception are a sign of "sporadic-E". At least a dozen times each year freak radio wave propagation conditions permit the transmission of TV signals out to distances of 1300-1500 miles or more. Since TV signals are supposed to die out rapidly at distances of 80-100 miles, the sudden appearance of a TV program transmitted a thousand miles away is real DX.

From mid-May through to the first week of August—is the time when a budding clan of TV DX'ers keeps scanning those vacant (no locals) TV channels. Sporadic-E, or "E-skip" as it is sometimes called, usually is first noticed on Channel 2. If conditions are right and the channels are occupied at the right distances, DX can sometimes be seen on Channels 2, 3, and 4. The chance of E-skip on Channels 5 and 6 is less than on the lower three channels, but many TV DX'ers have picked off choice stations by "viewing-in" at the proper moment.

Television DX is not limited to just the stations in the United States; transmissions from Canada, Mexico, Cuba, etc., are reported during the month of June.

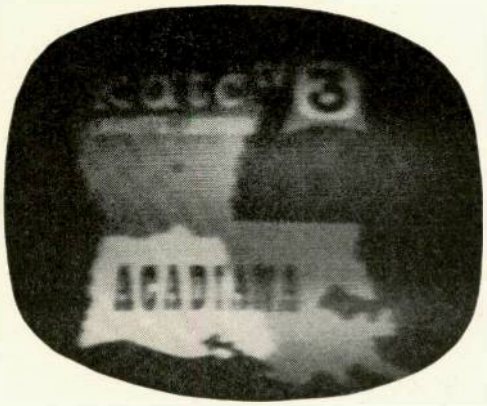
Sporadic-E: What Is It? The transmission of most radio signals well beyond the curvature of the earth is due to the bending or reflecting of the signals by the "ionosphere," now a popular term because of space satellite activities. The ionosphere is plagued by freak conditions that scientists neither understand nor are able to predict the occurrence of. Sporadic-E is the most notorious—it affects all radio wave transmissions from 4 to 100 MHz.

While most ionospheric effects take place slowly, sporadic-E comes on in a sudden onslaught. Freak conditions may last a few minutes, or an hour or so, or even a whole day, but no one can say why. When sporadic-E is "in," radio signals are reflected at a height of only 65-70 miles above ground level. Normally, most radio signals below 8 MHz would simply pass through this region.

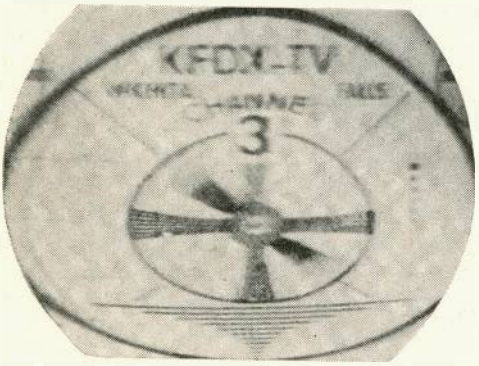
Television channels were originally assigned by the FCC on the premise that nothing in the ionosphere would affect frequencies above 54 MHz. Sporadic-E, though comparatively rare, does affect low-band reception (channels 2 through 6), and on occasion even the FM broadcasting band above 88 MHz.

TV DX: When and Where

TYPE	CHANNELS	TIME OF YEAR	TIME OF DAY	DISTANCE
E-Skip	2- 6	Late May to Early August	0800-1100 1700-2100	500-1500 miles
E-Skip	2- 4	Mid-November to January	1700-2100	600-1500 miles
Tropo	2-13	Mid-June to Mid-September	1900-0200 0500-0900	200- 800 miles
Tropo	14-83	May to Mid-September	2000-0100 0500-0800	200- 450 miles



This photograph was taken at a station break (as were all the others in this article) and serves as a "verie," or proof of reception. From Harrington, Ill., to Lafayette, La., is a distance of about 925 miles—a sizable hop for Channel 3 E-skip.



Wichita Falls, Texas, is just under 950 miles from the author—another example of E-skip. Note how the picture is tearing and that there is a strong ghost. This type of TV picture is typical of E-skip when the signal is undergoing heavy fading.

Scientists have confirmed that sporadic-E ionization is cloudlike and that these clouds move along above the earth as if being pushed by a strong wind. Coupled with the phenomenon of suddenly appearing and disappearing sporadic-E are the erratic DX conditions which can change in a few minutes.

Television DX via sporadic-E is characterized by signals that fade in and out—somewhat akin to the fading due to airplane reflections, though at a somewhat slower rate. The distance covered by sporadic-E is rarely less than 500 miles, most common between 800 and 1100 miles, and rarely beyond 1500 miles. Sometimes TV DX can be seen in excess of 1500 miles, but this is due to so-called "double-hop" conditions where the signal is reflected by two separate sporadic-E clouds.

Tropo DX'ing. Summer is also the time of the year when TV DX signals can be seen at double or even triple the usual ground wave range via "tropospheric bending." This type of DX propagation is not affected by the ionosphere, but by weather and atmospheric conditions less than 5-6 miles above the earth's surface.

On some occasions (far more frequent than for sporadic-E), an "inversion" of the temperature humidity rate takes place in the low atmosphere. Television signals are then trapped between the ground and the inversion, guiding the wave over distances of 300-500 miles.

Tropo DX signals are sometimes stronger than sporadic-E signals and the fading is slower and deeper. Most DX'ers report that tropo signals stay in view much longer than the mysterious short-lived sporadic-E TV DX signals.

Equipment. The impression that TV DX'ing necessitates an extra investment in equipment is false. Unless you live in the metropolitan New York, Los Angeles, or Chicago areas, your chances of seeing some TV DX are quite good. They are better if you have an outdoor antenna, and still better if that antenna is on a rotator.

A TV DX'er located about 15-20 miles from the nearest transmitting station can usually catch some DX with a 2-, 3-, or 5-element antenna. But the bigger your antenna, the better your DX. And, photograph the TV screen—that's your verie.

Photographing TV Screen

There is a precise technique for photographing pictures on a TV screen. The TV picture is being produced at a rate of 60 fields and 525 lines per second. The fields are interlaced to 30 frames. The number of lines determines the picture definition. To take usable photos, the camera must be slowed down to either $\frac{1}{25}$ or $\frac{1}{30}$ second. Use film with an exposure index of 100, or slightly higher. With normal TV picture tube brightness, a typical exposure would be at f stop openings of either 2.8 or 4.0. If you have a choice, try not to use a camera with a focal plane-type shutter.

60 Meters—DX the Tropicals

SWL

Marconi Was Tuned Up Near This Band and His Equipment Wasn't As Good As Yours—So Why Not?

By Bob Hill, W1ARR/3

IF YOU NEED fast, fast, FAST relief from the rigors of everyday DX'ing—now that you've logged 100-plus countries—why not treat yourself to the tropical band between 4700 and 5100 kHz? This is the 60-meter band that was allocated many years ago for domestic broadcasting by countries in or near the equatorial regions. For the listeners down south, the lightning static below 3 MHz is so intense that normal AM reception is practically impossible during the evening hours. Many would-be listeners are also 50 to 250 miles from the nearest broadcaster and the 60-meter band has solved the problem of coverage at a lower atmospheric noise level.

Since most of the 60-meter stations are programmed for local listeners, the power output is only 5 to 10 kilowatts. The languages used are generally Spanish and Portuguese in South America and local dialects in Africa and Asia. A good long-wire antenna is a blessing for catching those weaker ones, but a short indoor antenna can snare the strongest stations.

What You Can Hear. In general, no matter where you live in North America, you'll hear many stations from Latin America (particularly Venezuela, Colombia, and Brazil) during early- and mid-evening hours. Eastern and Midwest North American DX'ers can pull in Africa during the late afternoon and again around 11 p.m. to 2 a.m. EST (0400-0700 GMT), while Rocky Mountain and Far West listeners will find their best bets for Africa to be around 8-11 p.m. PST (0400-0700 GMT) and occasionally around 6-8 a.m. (1400-1600 GMT). Asia is a breeze for Western

Listening On 60 Meters

This table will help you to determine when to search for a particular area of the world. Times are GMT and are valid from about October to April; if you are hardy enough to brave summer static, you'll find that DX signals fade in about an hour later and fade out about an hour earlier. Subtract 5 hours for EST, 6 for CST, 7 for MST, and 8 for PST.

AREA OF WORLD	EAST	MIDWEST	ROCKIES	PACIFIC
Central America	1100-1230 2300-0300	0000-0300 1100-1300	0100-0300 1100-1330	0130-0300 1100-1400
South America	0900-1200 2230-0600	0900-1230 2330-0600	0030-0600 0900-1300	0130-0600 0900-1330
West Africa	0400-0730 2100-2400	0400-0730 2200-2400	0400-0730 2300-2400	0400-0730
Central/South Africa	0400-0600 2100-2230	0400-0600 2200-2230	0400-0600	0400-0600
East Africa	0300-0430	0300-0430	0300-0430 1400-1430	0300-0430 1400-1530
Europe (U.S.S.R.)	0130-0530	0130-0530	0200-0530	0300-0530
South Asia	0130-0230 1100-1230	0130-0230 1100-1330	0100-0230 1100-1500	0100-0300 1100-1600
Far East	1000-1230	1000-1330	0830-1430	0600-1600
Oceania	0700-1300	0630-1400	0600-1500	0430-1630

SWL's between 11 p.m. and 8 a.m. (0700-1600 GMT), but it's a stiff wind for their Eastern brethren around 4-7:30 a.m. (0900-1230 GMT). Everybody can tune for Oceania around 0600-1300 GMT, and all areas have a shot at hard-to-log European U.S.S.R. regional outlets around 0200-0500 GMT.

You might start things off by looking for the powerful Colombian station HJAE, "Radio Sante Fe," Bogota, which transmits in Spanish 24 hours a day—HJAE has a good signal on 4965 kHz, and can be tuned in any time during the evening. Some Latin stations such as HRVC, "Radio Evangelica," Tegucigalpa, Honduras, 4820 kHz, and ZYY9, "Radio Timbira," Sao Luiz, Brazil, 4975 kHz, will carry English programs or announcements at times; but the only broadcaster south of the border that uses English full time is the Windward Islands Broadcasting Service, transmitting from St. Georges, Grenada, on 5015 kHz. If it's rare birds you're after, cast your nets for such elusive Spanish-speaking specimens as CP75, "La Cruz del Sur," La Paz, Bolivia, 4985 kHz (severely chopped up by CW marker station WKA24); OAX9E "Radio Tropical," Tarapoto, Peru, 4937 kHz; and HCVS6, "La Voz de Saquisili," Ecuador, 4903 kHz.

Except for Europe, where only a handful of Soviets broadcast on 60 meters, the other continents are well represented. With a little luck and a lot of determination, you can bag all six continents. In fact, you can knock off all but Europe (the Russians) in English.

The Six Continents. Listeners in the East and Midwest should try for: Windward Islands Broadcasting, Grenada, 5015 kHz, 2245 GMT s/off (North America); ZYY9, Brazil, 4975 kHz, 0100 on Mondays (South America); Moscow, U.S.S.R., 4860 kHz, around 0400 and later in Russian (Europe); Eastern Nigeria Broadcasting, Enugu, Nigeria, 4855 kHz, 2300 s/off and 0500 s/on (Africa); AIR, Delhi, India, 4960 kHz, with news at 1230—a tough one! (Asia); and VLT4, Port Moresby, Papua Territory, 0730-1300 or so (Oceania).

The DX'ers in the Mountain and Pacific areas should try for: HRVC, Honduras, 4820 kHz, 0300-0330 on Mondays (North America); HJGF, Bucaramanga, Colombia, 4845 kHz, 0400 s/off (South America); Kiev, Ukraine, 4940 kHz, around 0500 in Ukrainian (Europe); ELWA, Monrovia, Liberia, 4770 kHz, 0615 s/on (Africa); Kabul, Afghanistan, 4775 kHz, news at 1400 (Asia); and VTW2, Tarawa, 4912 kHz, 0730-1030 on Thursdays (Oceania).

Another incentive for tuning 60 meters is that many countries are either very difficult or downright impossible to hear on the international broadcasting bands. Would you believe that you could pick up Afghanistan, Azores, Brunei, Burma, Cameroon, Central African Republic, Cook Islands, French Somaliland, Gabon, Georgian SSR, Portuguese Guinea, Sao Tome, Spanish Guinea, Turkmen SSR, and Togo? And there are others.

It should be mentioned that there are two more tropical bands (3200-3400 and 2300-2500 kHz) where good DX is hiding out, but the QRM and QRN difficulties are enough to defeat all but the most stubborn and experienced listeners.

So crank that "RF Gain" control up full, set the selectivity to "Sharp," and forget the "high" bands for a while. Come on "up" to 60 meters where the DX is great.

Broadcasting Stations of the World

The U.S. Government Printing Office has for sale four volumes that list all non-U.S.A. radio broadcasting stations—AM, FM, and TV. The first volume (called Part I) is an alphabetical list of AM stations by country and city. Part II is the same list rearranged according to frequency. Part III does the same thing for all FM stations (country/city and by frequency), while Part IV (the fourth volume) covers TV broadcasters. Parts I, II, and IV are $2.25 each, and Part III is only $1.50. Available from the Superintendent of Documents, G.P.O., Washington, D.C. 20401.

SWL Program Guide

This is a listing of the English-language broadcasts of 40 international broadcasters arranged by the hour. Each listing shows duration of broadcast, area to which transmission is beamed, etc. Guide is printed on Bristol stock and bound in plastic. Prepared by SWL Program Guide, 218 Gifford St., Syracuse, N.Y. 13202. Price, $2.00.

Join The SWL Card Swap

SWL

Add to your collection and double your fun

By Walter R. Levins

THE CARDS you see on this page were all received from fellow short-wave listeners. Like the author, these SWL's have increased their hobby enjoyment by swapping SWL/QSL reporting cards. Such an exchange makes new friends and serves as a handy means of gathering information about the other fellow's equipment, DX'ing techniques, country totals, etc. After you have your own SWL cards, you will probably want to start your own collection.

There are scores of SWL/QSL card printers who advertise their wares in the classified ad columns of the various electronics magazines. Cards are not expensive, but it is our recommendation that you select something which is colorful and—if possible—novel. Oddly enough, few experienced SWL's use their cards for reporting the reception of stations they've intercepted—they use reporting forms printed for that purpose—although they may send a card along as a "gesture."

Names and addresses of SWL/QSL card swappers can be found in many SWL club bulletins. The Canadian DX Club, for example, has a Swapper's Column; as does the Newark News Radio Club, International Short Wave League, etc. A new club called the International League of Signal Chasers is devoted completely to card swapping.

How To Get Started. When you've received your supply of cards and chosen a few names and addresses, send your card along to each of them in an envelope (so that your card can be put up on the other swapper's wall) and include a few polite words of greeting. If your card is going overseas, a few words in the native language of the recipient is always appreciated and guarantees a card in return. And, don't forget that many card swappers are also stamp collectors!

You might also add a picture of yourself or your SWL setup—if it is not on your SWL/QSL card already—and occasionally a picture postcard of your locale. You'll be surprised at the response these little thoughtful actions bring forth. Soon, with just a minimum investment in money and time, you'll have brand-new friends from around the world—that'll surprise your mailman!

In the sample SWL cards below, note the use of various "identifiers" or call-signs. Although no official agency issues such "identifiers," they can be obtained from The International Short Wave League, POPULAR ELECTRONICS' Short-Wave Monitoring Club, etc. Many SWL's use these "identifiers" to call attention to their listening posts.

SWL

SWL Antennas

To Improve Your DX, Use a Good Antenna

By J. C. Gillespie

THERE IS no record of the number of disenchanted SWL's who bought good receivers only to attach them to poor antennas. Some years ago it was the custom of many SWL receiver manufacturers to enclose a hunk of wire in the receiver shipping carton. When this wire was coupled to the receiver, some signals could be heard on most of the International Broadcasting Bands; but so could a lot of unnecessary noise and interfering signals.

The needs of the SWL have not really been forgotten, though, and the following paragraphs will serve as a reminder that at least three manufacturers sell antennas ideally suited for SWL DX'ing.

Peak Efficiency. Every communications engineer will agree that there is nothing equal to the signal-grabbing ability of a resonant antenna. Mosley Electronics Inc. (4610 N. Lindbergh Blvd., Bridgeton, Mo. 63042) solved the dilemma of how to make a single antenna resonate on 6 different short-wave broadcast bands by inserting traps to electronically alter the length of the flat-top section. When the SWL tunes within the resonant band, the traps act as insulators. As soon as the SWL tunes outside the resonant band, the traps simply act like so much more wire and shorten the overall length of the flat-top. Thus, the SWL-7 works at peak efficiency in the 11-, 13-, 19-, 25-, 31-, and 49-meter bands.

For the SWL who wants to concentrate on DX'ing in the ham bands, a similar Mosley antenna—called the RD-5—is available. This trapped antenna will resonate in the 10-, 15-, 20- and 80-meter bands.

All-Band DX'ing. For the average SWL likely to tune *any* frequency between 550 kHz and 30 MHz there is nothing equal to the flat-top (called the "Inverted L").

While by no means as responsive in the short-wave broadcast bands as the trapped antenna*, the Inverted L is simple to erect and is non-critical in operation. For that budget installation, Hy-Gain Electronics Corp. (Highway 6 at Stevens Creek, Lincoln, Nebr. 68501) offers its SW-6. The flat-top section is 50′ long, and the antenna is sold with 50 feet of insulated lead-in, molded plastic end insulators, and 18 feet of nylon rope attached to each end.

Single-Band DX'ing. The SWL specializing in DXing only one band—say 19 or 31 meters—can make good use of a vertical antenna. World Radio Laboratories (3415 W. Broadway, Council Bluffs, Iowa 51501) has an 18′ vertical which is base-loaded and needs only to be attached to a pipe sunk in the back yard. Changing clips on the loading coil resonates this "WVG-mkII" vertical to any frequency or narrow band of frequencies from 10 to 80 meters.

Taking a different approach to all-band listening, but still a vertical antenna, is the Hy-Gain SW-9. This antenna consists simply of a 9′ telescoping element attached to a heavy-duty bracket which is bolted to a window frame or side of a house or apartment. For SWL's with space restrictions, the SW-9 is worth serious investigation.

*The Mosley SWL-7 has a figure 8 receiving pattern with the lobes of maximum signal pickup broadside, or at right angles to the wire. Thus, if strung north-south, the SWL-7 picks up best from east and west. On the other hand, the "Inverted L" picks up better off the ends of the flat-top.

SWL

Radio Caroline

Broadcasters Become "Pirates" On The High Seas

By Edward Griffin, Jr.

MOST CITIZENS of the United States are unaware that in many foreign countries there is no commercial broadcasting. And, to add insult to injury, those people with radio or TV receivers pay a license fee just to listen or look. One such country is staid old England, where the British Broadcasting Company has eminent domain over all AM and FM radio and most of television. At least, the BBC did until a "pirate" broadcaster called "Radio Caroline" started to operate.

Now about four years old, "Radio Caroline" and her sister ships* probably have a greater audience than the BBC and are making money hand over fist. Commercials, pop music, and rock-and-roll blare forth from a ship anchored five miles at sea—and presumably not in the territorial waters of England.

Actually, "Radio Caroline" is a general name given to two ships, one off the coast of Ramsey, Isle of Man, and a second off Harwich, Essex. The first, "Radio Caroline North," is operating on 1520 kHz with a power of 10,000 watts. The second, "Radio Caroline South," is on 1187 kHz with 60,000 watts. Both transmitters, by the way, were made by Continental Electronics, Dallas, Texas.

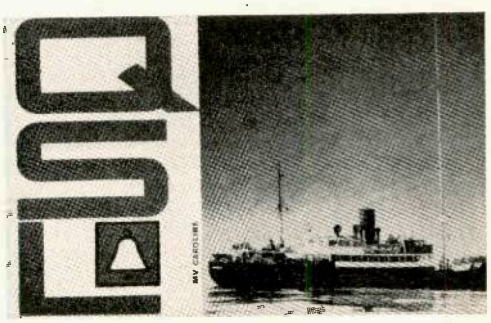
Schedules and QSL's. The popularity of the pirates has resulted in a 20-hour broadcasting day—0600 to 0200 GMT. And, as though it were not enough to twist the British tail with illegal broadcasting, the "Radio Caroline" stations are actively seeking reception reports and are sending out mail bags filled with QSL cards. The two ships have also sponsored a "Radio Caroline Club" in Liverpool, where for a small fee (about $1.50) a member receives an identification card, car bumper stickers, and posters, and has first-say in requests to be played on the air.

During the winter months, "Radio Caroline South" is a good DX catch for any American SWL. The best time to listen is in the brief period before shutdown (2000-2100 EST) or when they come on the air (0100-0200 EST). In reception reports, DX'ers are urged to include the frequency, time in GMT, date, and any suggestions for programs.

Radio Caroline North, P.O. Box 3, Ramsey, Isle of Man, England

Radio Caroline South, c/o Roman O'Rahilly, 54-62 Regent St., London, W.1, England

Radio Caroline Club, 61 Lord St., Liverpool 2, England.



This verification was received from "Radio Caroline" for a broadcast that was logged by the author on 1520 kHz at about 0220 EST in mid-October.

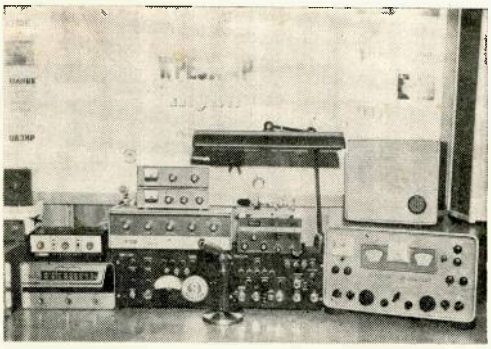
*In addition to "Radio Caroline," operating at this writing are: "Radio City" on 1034 kHz; "Radio London" on 1133 kHz; "Radio Essex" on 1349 kHz; "Radio Scotland" on 1259 kHz; and "Radio 390" on 773 kHz. All stations verify reception reports; see 1967 Edition of "World Radio TV Handbook" for addresses.

(Continued from page 16)

wave bands. Two of these are "Radio Euzkadi, The Voice of the Basque Underground" (probably in Spain) on 13,214 kHz, and what was formerly known as "The Kiss Me Honey Station," so named because they played a recording of "Kiss Me Honey" continuously while on the air. During the past year they changed to a recording by "The Beatles." The most recent logging of this station has been on 11,695 kHz, varying slightly at times, jamming the transmissions of quasi-clandestine "Radio Peyk-e Iran" on the same frequency.

The Clubs. As you find yourself becoming more and more interested in the hobby of short-wave listening, you may want to get more detailed DX'ing information and take part in an organized radio club. In addition to many neighborhood clubs which specialize in membership over a very limited area, there are a number of topnotch nation-wide or world-wide clubs to which you may apply for membership. These clubs all issue periodic bulletins to their members.

Some clubs devote their bulletins strictly to coverage of activities on the standard broadcast band. Others also cover the short-wave bands, the amateur bands, the utility channels; and have a host of additional features, such as listings of SWL card swappers, items on tapesponding (corresponding by the tape recording method), and technical tips.



With equipment capable of tuning almost any frequency, it is little wonder that Jack Forbing, Fort Wayne, Ind., has amassed DX verifications from 168 countries (3500 stations). Jack is also a CB'er.

Newark News Radio Club

Organized in 1927, the NNRC is probably the oldest SWL'ing club in existence. Membership is $5 per year and all members receive monthly copies of the NNRC "Bulletin" which averages 55 pages per issue. The "Bulletin" contains detailed information on all phases of SWL'ing (International Broadcasting, FM & TV, medium-wave, utilities, etc.) with special sections on Card Swapping, Competitions, etc. Detailed information and a sample "Bulletin" are available for 25 cents from Corresponding Secretary Harold S. Williams, 50 Third Ave., Seymour, Conn. 06483.

International Short Wave Club

The oldest short-wave club in Europe, the ISWC was founded in 1929 and has been operating ever since. This club prides itself on the fast dissemination of news concerning schedules, frequencies, etc., of the short-wave broadcasters. A monthly bulletin is published called "International Short Wave Radio." Details on membership can be obtained from the ISWC, 100 Adams Gardens Estate, London, S.E. 16, England.

How They Sound

If you're not sure just what international short-wave broadcasting stations should sound like, try playing the 12" LP "Shortwave Listeners' Record." This record has 18 segments of typical broadcasts from such stations as Solomon Islands, "Radio Finland," "Kol Zion," "Radio Baghdad," etc. The Volume I record is available for $3.95 from SWL Records, 4017 Jackson Ave., Culver City, Calif. 90231. A Volume II recording featuring 16 other short-wave broadcasters is to be released this winter.

International Short Wave League

Noted for its intense interest in DX'ing the ham bands, this British short-wave club issues a monthly bulletin called the "Monitor" which contains columns for the newcomer, ham-band DX'er, short-wave DX'er, contest listener, etc. Details on membership can be obtained from the ISWL Headquarters, c/o Bernard Brown, G1889, 60 White St., Derby, England.

World Radio TV Handbook

This internationally recognized guide to short-wave listening is now in its 21st edition. Published in Denmark, but printed in English, the WRTH is a 300-page-plus book itemizing all of the short-wave broadcasting stations throughout the world, and including programs, frequencies, call-signs or slogans, power, antennas, etc. Any SWL who has ever used the WRTH would never be without the latest edition. It is published annually; a special Summer Supplement is also available. Sold in the U.S. and Canada through Gilfer Associates, P. O. Box 239J, Park Ridge, N.J. 07656. Price, $4.95.

What Is Amateur Radio?

AMATEUR RADIO

Removing The Cloud Of Mystery Surrounding a Great Hobby

By Herb S. Brier, W9EGQ

TO RADIO AMATEURS, amateur radio is the electronic magic carpet which expands their horizons to include the entire world—a world in which they have a million friends. When radio amateurs (commonly known as "hams") are on the air, their daily cares drop away. Hams share common interests with the King of Bhutan, a U.S. presidential candidate, a missionary in a remote African jungle, and with many others like themselves located anywhere on this globe.

To the Federal Communications Commission, on the other hand, amateur radio is officially a "service" with the fundamental aims of improving the communications art, promoting world peace and understanding, providing emergency communications, and offering the United States a reservoir of self-trained electronic technicians.

Every radio amateur takes it as a matter of personal pride that he has earned the right to be on the air by passing an official national government examination. This is the only path to becoming an amateur; there are no shortcuts. But it is not difficult to earn a ham radio license. We make this statement to counteract the stories you may have heard about how hard it is to pass the amateur exams. Some people exaggerate the difficulties to camouflage the reasons why they are not amateurs and some hams are not above exaggerating them to increase their own sense of accomplishment.

From Country to Country. Among the 400,000-plus licensed radio amateurs throughout the world, there are some that earn their living in electronics. In addition, there are "doctors, lawyers, and Indian chiefs," not to mention schoolchildren, housewives, beauty contest winners, butchers, prizefighters, stockbrokers, nuns, ministers, generals, princes, and factory presidents, blind individuals, and invalids. All of them have one thing in common: they have taught themselves the why's and wherefore's of radio communications and have become radio amateurs through love of the game.

That fellow on the left is one of the many "famous names" who hold radio amateur licenses: Barry Goldwater, W7UGA. He is shaking hands with an old friend, Alberto H. Calleja, XE1NE, of Mexico City. XE1NE is Mexico's most active DX'er; a photo of his antenna appears later on in this chapter.

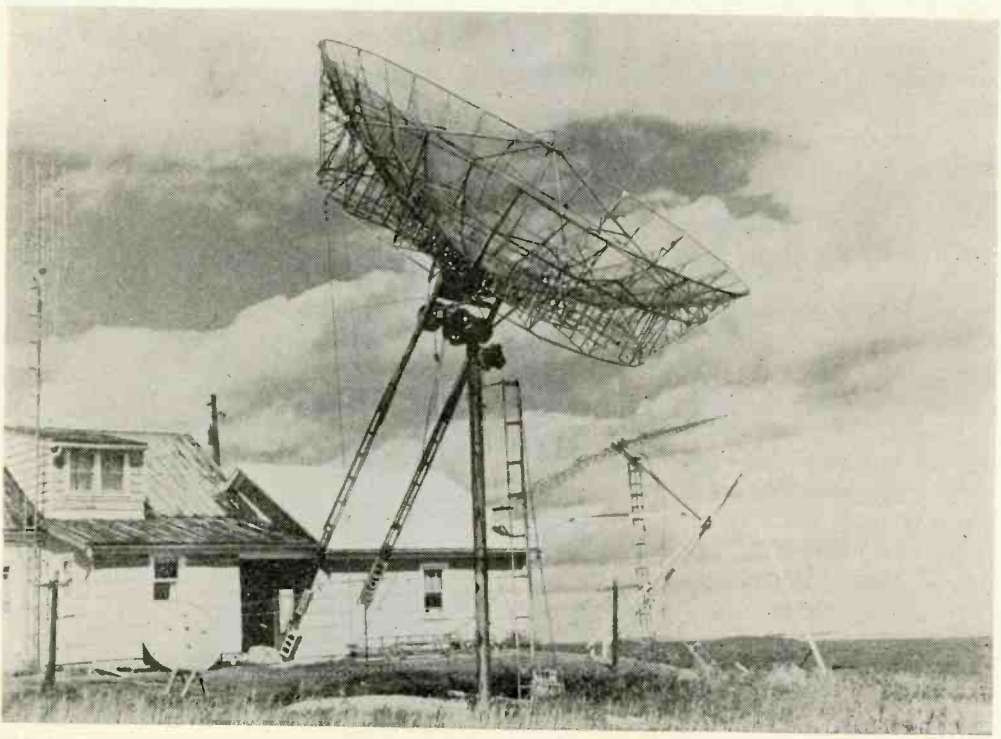
Amateur radio stations are to be found in homes, automobiles, boats, airplanes, in submarines (through the courtesy of the United States Navy), lighthouses, and in a building under the snow at the South Pole. For many years, amateurs and their equipment have been part of virtually every scientific expedition to unexplored parts of Africa, Asia, South America, and the frozen Arctic and Antarctic regions.

As described by George Lesnick, W9EBQ, beginning on page 87, chasing DX is the major interest of many amateurs. Other hams are builders and experimenters; they experiment with radioteletype, TV, and have built several OSCAR's (Orbiting Satellites Carrying Amateur Radio) which were launched in cooperation with the United States Air Force to relay UHF and VHF signals. Some hams bounce their signals off the moon.

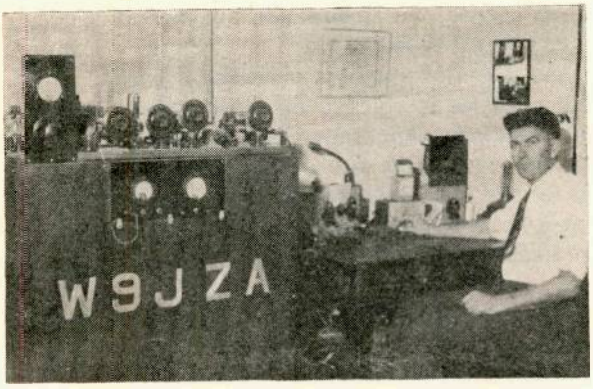
Many amateurs concentrate on public service. They relay messages—often between military personnel and their families. They enroll in the Amateur Radio Public Service Corps, Radio Amateur Civil Emergency Corps, or the Military Affiliate Radio Service (MARS)—sponsored by the Army, Navy, and Air Force—all of which give valuable training for use in communications emergencies. Each year these groups are called into service in the wake of tornadoes, hurricanes, etc. The first news of the 1964 Alaskan earthquakes was relayed via amateur radio.

Obviously, there is more to amateur radio than just talking to other amateurs. Nevertheless, "rag-chewing"—idle chit-chat between amateurs—does serve a useful purpose. It is one of the most direct and personal means of communications between citizens of different countries. Amateur radio represents one of the few contacts people in the Soviet Union have with countries beyond the Iron Curtain.

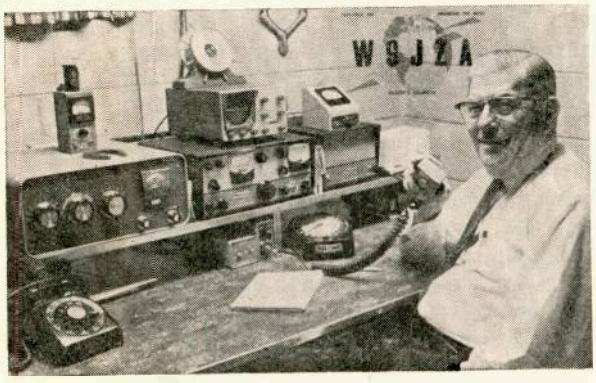
And when we speak of the romance of



This imposing antenna installation was used by Vic Michael, W3SDZ, Williamsport, Pa., to contact Arecibo, Puerto Rico. The signals were reflected off the lunar surface on a frequency close to TV channel 14! Huge antennas indicate that their owners are serious experimenters. Through the assistance of the U.S. Air Force, hams have placed several satellites in orbit and used them for long-distance communications.



These "before and after" photos are spaced 35 years apart. Note the changes in the ham equipment and the operator. About the only thing that has remained the same has been the enthusiasm of Gilbert "Gil" Galambus, W9JZA, of Hammond, Indiana.



amateur radio, we sometimes mean that literally. A growing proportion of radio amateurs are women, and it is fairly common for unattached OM's (male amateurs) and YL's (young lady operators) to meet first over the air, then in person, get married, and start raising their own future radio amateurs.

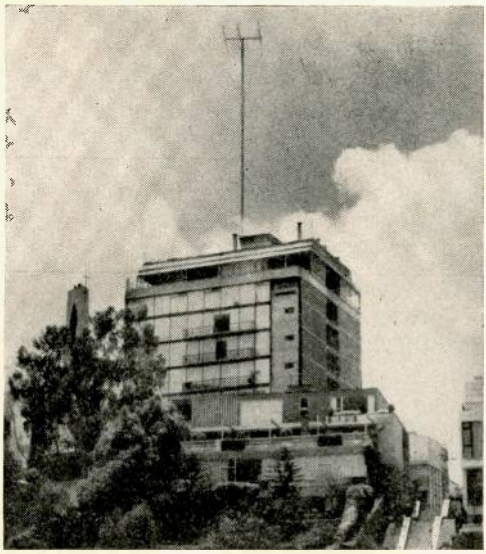
Obtaining an Amateur License. All radio amateurs must pass a federal examination before receiving a license to operate an amateur station. This requirement is specified in several international treaties because amateur radio transmitters are powerful enough to cause worldwide interference to other services. Also, amateurs are permitted to build and adjust their own equipment; therefore, each government must be certain that its amateurs have the necessary knowledge to operate their equipment properly.

In the United States, the Federal Communications Commission will issue an amateur license to any citizen (born or naturalized) who passes the appropriate examination. Currently, there are five classes of licenses available—Novice, Technician, Conditional, General, and Extra Class.

Corresponding to a learner's permit, the NOVICE license authorizes applicants who have never held a valid United States amateur license and who pass a simple test to get on the air and "learn by doing" what is necessary to qualify for a permanent license. The examination consists of a simple written test on elementary electronics theory and a five word-per-minute code test. The license is good for one year and is not renewable; it permits code operation in small segments of the 80-, 40-, and 15-meter amateur bands and phone or code operation in the 2-meter band using a crystal-controlled transmitter with a power up to 75 watts—sufficient power to work all over the United States and most of the world under favorable conditions.

The Novice, Technician, and Conditional class license examinations are given by mail under the supervision of a volunteer examiner. The volunteer must be an adult holding an amateur license of the General class or higher, or a commercial radiotelegraph license, or be in the service of the United States as the operator of a manually operated code station.

The TECHNICIAN license is issued for five years and is renewable. It grants all amateur operating privileges on the frequencies above 50 MHz. The examination consists of a 5-wpm code test and the same written examination as given for the General and Conditional licenses. This written test is considerably more comprehensive than the Novice test, but the average applicant passes it easily after a few months of spare-time study. Incidentally, you can obtain a Novice license and then a Technician license, or you can apply for them simultaneously, but you cannot obtain a Novice license after you have sat-



The tower atop this 10-story office building on the outskirts of Mexico City supports the beam antenna of XE1NE. It's no wonder that XE1NE can say that he has one of the highest ham radio antennas in all of the world—especially since Mexico City is about 7500 feet above sea level to start with.

isfactorily passed the Technician exam.

The GENERAL class license grants all amateur privileges. Obtaining it requires passing a 13-wpm code test and the standard amateur written test under the supervision of a Federal Communications Commission engineer at one of the examination points listed on page 53.

If you are physically handicapped and cannot travel, live more than 175 miles from the nearest point where the FCC gives amateur examinations at least twice a year, or are living overseas, you may apply for a CONDITIONAL license by mail. It grants the same privileges as the General license, except that you may not act as a volunteer examiner for Novice, Technician, or Conditional examinations.

After you have held an amateur license of any class except Novice or Technician for two years, you are eligible to take the EXTRA CLASS examination. It consists of a 20-wpm code test and a comprehensive written examination on advanced electronics theory. At present, except for the prestige involved, there are no operating privileges attached to owning an Extra Class license, but anyone who qualifies for it has a right to feel proud.

No fee is charged for a Novice license, but a $4 fee is charged for other licenses and renewals. Application fees are not refunded, even if the applicant fails to qualify for the license he applies for. Upgrading a license takes the $4 fee. A change of address takes a $2 fee.

Eventual License Changes. For some time, the Federal Communications Commission has been studying methods of upgrading the amateur license structure. Subject to possible revisions, the new rules envision granting all amateur privileges to Extra Class licensees. A new First Class license, with a 16-wpm code test and a written test on a level between the General and Extra Class written exams, will grant all privileges, except the right to operate code in the lower 50 kHz of the 80-, 40-, 20-, and 15-meter amateur bands. General and Conditional licensees will not be able to operate code in the lower 50 kHz, or phone in half of the phone assignments in the 80-, 40-, 20-, and 15-meter amateur bands, but they will have all other amateur privileges. Technician licensees will retain all present privileges, except the right to operate in the lower 250 kHz of the 50-MHz amateur band. Novice licenses will be good for two years but without 2-meter phone privileges. In addition, the class of license held will be apparent from the amateur's call letters.

Do not be overly concerned about these proposed license changes. They will not force any presently licensed amateur to take another examination in order to stay on the air (except a Novice at the end of his license term, of course). They are designed, instead, to give amateurs an incentive to improve their technical skills. Furthermore, it will be one year after the changes are officially announced before they start to go into effect and two years before they are fully implemented.

The Amateur Bands. Overly simplified, radio signals travel in straight lines and would quickly disappear in the endless space above us unless they were bent or

This semi-humorous certificate was issued to hams who supplied communications during the 1957 "Hurricane Audrey" disaster in Louisiana.

reflected in some manner and returned to earth. The "ionosphere"—an electrified region 50 to 250 miles above the earth created by the sun's ultraviolet radiations—does most of the reflecting by acting like a giant radio mirror. Conditions in the "troposphere" (lower atmosphere) also affect radio signals, and both the "ionosphere" and the "troposphere" are changed by every change in the sun. In addition, a change in propagation conditions never affects two different amateur bands in the same way.

Predicting radio wave propagation conditions is not the most accurate science in the world. But the very uncertainty as to whether your next contact will be with an old friend on the other side of the world or with a new friend a hundred miles away is one of the great fascinations of amateur radio. In general terms, however, the characteristics of the different amateur bands look like the following:

160 METERS (1.8-2 MHz): The reliable range on the 1.8-MHz band varies from up to 25 miles or so during the day to a few hundred miles at night. Occasional contacts out to a few thousand miles are possible on winter nights when static is low.

80-75 METERS (3.5-4 MHz): On the 3.5-MHz band, you can expect to work out to 100 miles or so regularly during day-

This certificate is undoubtedly the radio amateur's most-sought-after DX award. The certificate (and endorsements) issued by the ARRL would occupy an honored spot on the shack wall of any ham.

Steve Solo, W8IEC, Detroit, Mich., combines two hobbies: ham radio and SWL'ing. His shack walls are plastered with certificates including many from countries overseas. As an SWL, Steve has earned a POPULAR ELECTRONICS 50-State Monitor Award.

light hours and out to several thousand miles at night when conditions are good. This is probably the best band for the beginning Novice or General amateur with simple equipment.

40 METERS (7-7.3 MHz): Very good for daytime work over distances between 250 and 600 miles and a night range of 900 miles and up describes normal 7-MHz conditions. But "skip" may prevent you from hearing signals from stations closer than 1000 miles away (except those within a few miles of your station) on some winter nights. Also, at night the band is filled with International broadcasting stations.

20 METERS (14-14.35 MHz): Year in and year out, the 14-MHz band is probably the best amateur DX band. Depending upon propagation conditions, its range varies from 600 to 12,000 miles. The band is often filled with high-power stations using high-gain beam antennas, making competition for DX very difficult for low-power stations.

15 METERS (21-21.45 MHz): During favorable portions of the recurring sunspot cycle (such as now), daytime and early evening DX conditions are frequently even better here than on the 14-MHz band. This is the band where Novices work most of their DX.

10 METERS (28-29.7 MHz): Very much controlled by sunspot conditions, DX signals from all over the world roll in on 28 MHz all day from early fall until late spring during certain years. Fortunately, DX conditions should be favorable on this band for the next several years.

6 METERS (50-54 MHz): Fifty MHz is the lowest frequency amateur band open to Technician licensees. Under extremely favorable conditions, worldwide DX can be worked on it; but its normal range is around 100 miles, interspersed with numerous "short-skip" openings between 600 and 2000 miles in the spring, summer, and occasionally in midwinter.

2 METERS (144-148 MHz): The "normal" range on 144 MHz is 50 to 60 miles, with extended ground-wave openings out to a few hundred miles being quite frequent in the spring and fall months. Several well-equipped ham stations have worked over 40 states on this band.

1¼ METERS (220 MHz and above): Conditions on 220 MHz are quite similar to those on 144 MHz, except that shorter antennas are used. The lowest frequency on which amateur TV is permitted is 420 MHz. Considerable experimenting with bouncing signals off the moon for long-distance, over-the-earth communications has been done on 1296 MHz (as well as on the 144-, 220- and 420-MHz bands). So far, most of the work on still higher amateur frequencies has been conducted by serious experimenters.

The following pages will tell you more about hams, and how you can put your own station on the air.

Eye Bank Network

Over 150 radio amateurs devote time and effort to the daily "Eye Bank Network" which covers 55 cities in the United States and Canada. The net meets each morning on 3970 kHz and in the evening on 3963 kHz. All transmissions are SSB. Roll call is generally handled by Chubby Walter, W9DOG, Plainfield, Ind. The "Eye Bank Network" reports on the availability and requirements for eye tissue, the need for fresh eye tissue always being urgent. The network is involved in about one eye transplant or emergency per day.

National Calling and Emergency Frequencies

The voluntary program of the Amateur Radio Public Service Corps (ARRL) has proposed the use of the following full-time frequencies for emergency calling: 3550, 3875, 7100, 29640, 50550 and 145350 kHz. Part-time frequencies are 7250, 14050, 14225, 21050, 21400 and 28100 kHz. The emergency call on CW is "QRRR" and on radiotelephone it is "CQ Emergency."

Mechanics of Getting A License

AMATEUR RADIO

Obtaining your first license is simpler than you think

By Herb Brier, W9EGQ

BECAUSE radio waves can travel around the world, national governments must exercise some control over who operates the radio stations. If everyone chose his own frequency and appointed himself an operator, the fellow in Australia would find it just as difficult to get through as the communications system in the next city. The technique of granting operator licenses was established by international treaty. The amateur radio operator must know Morse code and must have some knowledge of his equipment and operating techniques.

Unlike many other professions (and hobbies) that require state or federal licenses, the licensing of amateur radio operators has been reduced to the simplest terms. Once you have mastered sending and receiving code and know your theory, you'll find that getting your first license is amazingly easy.

Applying for Your License. When you are ready to apply for a by-mail license, carefully follow these procedures: Write to the Federal Communications Commission office nearest you (you'll find the address on page 53) and request Amateur License Application Form 610.

Carefully choose a person to act as your volunteer examiner (see suggestions below). When your Form 610 arrives, the volunteer examiner will give you your code test. It consists of two parts—a 5-minute code transmission at the specified speed (5 wpm for the Novice and Technician licenses; 13 wpm for the Conditional license) which you must copy for at least one minute (60 consecutive seconds) without error or

Just before this photograph was taken, Jerry Wayne Caudill, WN4CQD, Morehead, Ky., worked his 33rd state and had QSL's verifying contacts with Canada, Puerto Rico, Virgin Islands, and Guadeloupe. Jerry is on all three Novice bands, running 75 watts on the lower frequencies and using a Heathkit low power rig on 2 meters.

FCC FORM 610
JANUARY 1964

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

FORM APPROVED
BUDGET BUREAU NO. 52-R069.16

APPLICATION FOR AMATEUR RADIO STATION AND/OR OPERATOR LICENSE

DO NOT WRITE IN THIS BLOCK

GENERAL INSTRUCTIONS

1. THIS APPLICATION IS DIVIDED IN TWO PARTS. PART I IS BELOW AND PART II ON THE REVERSE. COMPLETE THE PART THAT DESCRIBES YOUR REQUEST.
2. USE TYPEWRITER OR PRINT CLEARLY IN INK.
3. APPLICATION MUST BE SIGNED AND DATED.
4. SEND ONE COPY OF APPLICATION AND REQUIRED EXAMINATION PAPERS TO FEDERAL COMMUNICATIONS COMMISSION, GETTYSBURG, PENNSYLVANIA, 17325.
5. ENCLOSE APPROPRIATE FEE WITH APPLICATION, IF REQUIRED. SEE SPECIAL INSTRUCTION A.

SPECIAL INSTRUCTIONS

A. FEES—Enclose appropriate fee with application, if required. DO NOT SEND CASH. Make check or money order payable to Federal Communications Commission. (See Part 97, Volume VI of FCC Rules to determine whether a fee is required with this application.)

B. CRIMINAL CONVICTION INFORMATION—If you have answered "Yes" regarding criminal convictions, furnish the following:
(1) For each such conviction, give these details—
(a) The nature of the offense, the date of the conviction, and the name and address of the court;
(b) The sentence imposed, including the fine and imprisonment; if execution of the sentence was suspended in whole or in part, state to what extent it was suspended;
(c) The dates of commencement and termination of actual imprisonment, if any;
(d) If released on parole, give the dates of commencement and termination of parole, and state whether or not parole was successfully completed without incident; if presently on parole, give name and address of parole officer;
(e) State whether or not radio facilities were used in committing the offense; if such facilities were so used, describe how they were used.
(2) A statement as to the nature and duration of your present employment or business activity, and the name and address of your employer.
(3) A description of the proposed use of Amateur Radio if the requested license were to be issued.

PART I—FOR NEW AMATEUR RADIO STATION AND/OR NEW OPERATOR LICENSE. DO NOT use this part to modify or renew an existing license or to change operator privileges. (See Part II)

1 NAME OF APPLICANT
LAST NAME | FIRST NAME | MIDDLE INITIAL

2 MAILING ADDRESS
NUMBER AND STREET
CITY | STATE
ZIP CODE | COUNTY

3 BIRTHPLACE AND DATE
CITY AND STATE | MONTH, DAY, YEAR

4 WITHIN TEN YEARS PREVIOUS TO THE DATE OF THIS APPLICATION, HAS THE APPLICANT BEEN CONVICTED IN A FEDERAL, STATE, OR LOCAL COURT OF ANY CRIME FOR WHICH THE PENALTY IMPOSED WAS A FINE OF $500 OR MORE OR AN IMPRISONMENT OF SIX MONTHS OR MORE? (See SPECIAL INSTRUCTION B above) — YES / NO

5 A. IS APPLICANT APPLYING FOR AN OPERATOR LICENSE?
B. If yes, give class (Novice, Technician, Conditional, General, or Extra)
C. Give Current Call Sign or Control No. (If any)

6 A. DOES APPLICANT HAVE ANY OTHER AMATEUR RADIO APPLICATION ON FILE WITH THE COMMISSION THAT HAS NOT BEEN ACTED UPON?
B. If yes, state its purpose and date submitted

7 A. IS APPLICANT APPLYING FOR A STATION LICENSE? (If yes, complete this form, if no, proceed to certification)
B. CHECK ONE
☐ INDIVIDUAL STATION *(Available only if applicant is applying for or has an operator's license)*
☐ CLUB STATION *(Applicant must be a duly appointed trustee for a bona fide amateur radio organization and must have an operator's license of other than novice class)*
☐ STATION FOR RECREATION UNDER MILITARY AUSPICES
☐ ADDITIONAL STATION _____ (Individual, Club)

8 A. IS APPLICANT REQUESTING A CALL SIGN PREVIOUSLY HELD IN THIS CALL SIGN AREA? (See SPECIAL INSTRUCTION A above)
B. Give Call Sign

9 STATION LOCATION *(If the same as the mailing address write "SEE ITEM 2")*
NUMBER AND STREET
CITY | STATE | COUNTY

10 REMOTE CONTROL POINT
A. NUMBER AND STREET
CITY | STATE
B. REMOTE CONTROL WILL BE BY:
☐ WIRE ☐ RADIO *(Submit information required by Section 97.43(b)(6) of the Commission's Rules)*

11 ANTENNA — YES / NO
WILL THE ANTENNA STRUCTURE EXCEED AN OVERALL HEIGHT OF 170 FEET ABOVE GROUND LEVEL OR ONE FOOT ABOVE THE ESTABLISHED AIRPORT (LANDING AREA) ELEVATION FOR EACH 200 FEET OF DISTANCE, OR FRACTION THEREOF, FROM THE NEAREST BOUNDARY OF SUCH LANDING AREA? *(If yes, you must complete and file herewith FCC FORM 401—A, except as may be otherwise provided in Section 97.45(a) of the Commission's Rules)*

12 STATION CONTROL
WILL THE PREMISES OF STATION LOCATION AND OF REMOTE CONTROL POINT, IF ANY, BE UNDER YOUR CONTROL AT ALL TIMES DURING LICENSE TERM? *(If no, submit explanatory statement unless Item 14C is applicable)*

13 FOR CLUB STATION APPLICANTS
A. OFFICIAL NAME OF CLUB
B. CLUB STATUS *(Attach a certified copy of the constitution or the organization papers and bylaws)*
☐ CORPORATION ☐ UNINCORPORATED ASSOCIATION
C. IS ANY OFFICER OR DIRECTOR OF YOUR CLUB AN ALIEN, OR ARE MORE THAN ONE-FIFTH OF THE MEMBERS OF YOUR CLUB ALIENS? — YES / NO
D. SIGNATURE AND TITLE OF CLUB OFFICER CERTIFYING APPLICANT AS TRUSTEE TO APPLY FOR AND HOLD STATION LICENSE IN BEHALF OF CLUB.

14 FOR STATION APPLICANTS UNDER MILITARY AUSPICES
A. EXACT IDENTIFICATION OF MILITARY UNIT OR GROUP TO OPERATE AMATEUR STATION
B. DOES THE APPLICANT ACCEPT RESPONSIBILITY FOR INSURING THAT THE STATION WILL BE OPERATED ONLY BY A LICENSED AMATEUR OPERATOR? — YES / NO
C. THE STATION WILL NOT BE USED BY THE U.S. GOVERNMENT. APPROVAL TO ESTABLISH AN AMATEUR STATION ON U.S. GOVERNMENT PREMISES IS HEREBY GRANTED
_____ (Signature of official in charge)
_____ (Title or authority to approve)

CERTIFICATION

I CERTIFY that all statements and attachments herewith are true, complete and correct to the best of my knowledge and belief and are made in good faith; that I am a citizen of the United States; that I am not the representative of any alien or foreign government; that I waive any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same whether by license or otherwise; that the station to be licensed, if any, will be inaccessible to unauthorized persons; that if trustee of a club station, I will immediately submit the license for cancellation upon termination of my trusteeship.

_____ (Applicant's Signature) _____ (Date)

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND IMPRISONMENT. U.S. CODE, TITLE 18, SECTION 1001.

THIS BLOCK FOR FCC USE ONLY

	CODE	EXAM	SCREEN	SIGH	BB	
Y						
N						

Amateur License Application Form 610, which must be used in applying for a station and/or operator's license, looks like this. The reverse side of the form is used to change the address of a licensed station.

omission, and a sending test. The Novice/Technician code test contains no punctuation marks or numerals; the Conditional/General test contains both, with each one being counted as two letters.

If you fail the code test, the examination stops immediately without further ado. But if you pass, you fill out your Form 610 and give it to the volunteer examiner. Also, if you are applying for a Technician or Conditional Class license, you hand the examiner your $4 license fee in the form of a check or money order payable to the Federal Communications Commission. (No fee is required of Novice license applicants.)

The volunteer examiner will then write a letter to the Federal Communications Commission, stating that you passed the code test under his supervision and requesting the necessary material for giving you the written examination. In addition, his letter will state his qualifications to act as a volunteer examiner and will include both his and your names and mailing addresses. After signing the letter, the examiner will mail it, your application Form 610, and your license fee (if any) to the Federal Communications Commission, Gettysburg, Pa. 17325 within 10 days of the time when you passed the code test. A suggested form for the examiner's letter is at right.

Upon receipt of the letter, the FCC will mail the necessary examination papers directly to the volunteer examiner, who will be responsible for conducting the examination and returning the papers to the FCC. If for any reason you fail to take the examination within the specified time (normally within 20 days of the time it was mailed by the FCC), he will return the unopened examination envelope to the FCC. Your application fee will not be returned, however.

In conducting the written examination, the examiner will hand you the sealed envelope containing the examination (20 multiple-choice questions for the Novice test or 50 multiple-choice questions for the Technician/Conditional Class test) and the answer sheet.

Read the instructions and after signing each examination sheet and answer sheet, select an answer to each question from the five possible answers listed and black in the corresponding square on the answer sheet.

When you have finished the examination, the examiner will certify on the back of the answer sheet that you completed the code test and written examination in his presence without help. He will then place the material in a large stamped envelope (furnished by you) which he will mail to the Federal Communications Commission, Gettysburg, Pa. 17325.

If you pass the examination, your license and assigned call-letters will arrive in a few weeks. If you should fail the exam, don't feel too bad; you can study a little more and try again 30 days later.

Examiner's name
Examiner's street address
City, State, and Zip Code
Date

Federal Communications Commission
Gettysburg, Pa, 17325

Gentlemen:

I, ..., have been asked by ....., ..., ... (insert applicant's name and mailing address) to act as his volunteer examiner for his ..... (insert Novice, Technician, or Conditional) Class amateur operator license examination. His completed #610 application form and license fee (if required) are enclosed. Mr. ..... demonstrated to me his ability to send and receive the radiotelegraph code at a speed of ..... words per minute on ..... (insert date).

Please send me the necessary material to administer the ..... Class examination to Mr. .....

I am over 21 years of age and (add one of the following) I hold an amateur operator license of the ..... (insert General, Advanced, or Extra) Class, dated ....., and my amateur call-sign is ..... (or) I hold commercial radiotelegraph license number ..... dated ..... (or) I am employed at ..... in the service of the United States as the operator of a manually operated radiotelegraph station.

To the best of my belief and knowledge all the above information is correct.

Examiner's signature .....
Examiner's name and permanent address (print clearly) .....
.....
.....
.....

Although the examiner's letter need not be precisely in this form, the above sample contains all of the material required by the Federal Communications Commission from a volunteer examiner requesting the written examination material for the Novice, Technician, or Conditional Class license exam.

General Class Examination. Exactly the same procedure is followed when you take the General Class examination as for the by-mail exams, except that an official FCC representative conducts it in his office and a written examination follows the code test.

If you take the examination at a regular FCC office, it is not necessary to make a prior appointment; nevertheless, it is a good idea to write ahead of time for your Form 610 application blank and the suggested date on which you should appear, because published dates are subject to change.

Should you plan to take the examination at any of the other points where the FCC conducts amateur exams quarterly, semi-annually, or annually, it is necessary to write in advance to the Engineer-in-Charge of the FCC District in which the examination is to be held for your Form 610 and exact information as to where and when the exam will be held. You mail the filled-in 610 application form and your application fee back to the Engineer-in-Charge at least a week ahead of the scheduled examination date. You will then be told where and when to appear to take the examination.

Hardship Conditions. If you are applying for a Conditional Class license because a permanent physical handicap makes it extremely difficult or impossible for you to travel (and are located 175 miles from a point where the FCC conducts General Class examinations twice a year, or oftener), obtain a doctor's certification of your physical condition and give it to your volunteer examiner so that he can include it with his letter to the FCC.

Call Letters. Unless you have previously held an amateur call-sign, you have no choice as to the call-sign that you will receive. And even if you were previously licensed, there are only a couple of very special circumstances under which you might get a special call-sign. These circumstances are: if you once held a 2-letter call, you can apply for it or the nearest available 2-letter call; if you previously held a call-sign which has not been assigned for the past five years, you can apply for it; and a radio club can obtain the call letters of a deceased club member for its club station. The "rub" is that there is a $20 fee required; and even if the request for special call letters is denied—as most requests are—the fee is not returned. However, a BONA FIDE club or other group requesting an unassigned special call-sign, such as WA9USA, for short time use at a fair or a convention will be issued the call-sign without paying the $20 fee.

When an amateur license is renewed on time (up to one year past its expiration date), the same call letters are retained. If a Novice qualifies for a higher class license before his Novice license expires, he will receive a "counterpart" call-sign. For example, the current WN9EGQ (if there is one) would be issued a call like WB9EGQ. Once a Novice license expires, however, its call-sign is immediately subject to reassignment.

Finding a Volunteer Examiner. Almost any qualified amateur in your area will be willing to act as your volunteer examiner. If you do not know any amateurs, ask the countermen at radio shops or supply houses (or call the local TV or radio station) either for the name of a local amateur or the address of the amateur radio club in your area. Failing these sources, drop a note to the American Radio Relay League, Inc., 225 Main Street, Newington, Conn. 06111, and ask for the address of the nearest amateur radio club.

Not only will the club be a source of volunteer examiners, but it may offer code and theory classes for prospective amateurs. Over 400 clubs offer formal courses of this type one or more times a year; and members of other clubs offer help on an individual basis.

Canadian Radio Amateur Licensing Handbook

Would-be hams north of the border should purchase this informative book which contains vital licensing details. The chapters cover example licensing questions and answers, operating procedures, clubs and associations—and there is a complete listing of all Canadian ham licensees, including addresses. Prepared by Jim Kitchin, VE7KN, the book is sold by R. Mack & Co., Ltd., 1485 S.W. Marine Drive, Vancouver 14, B.C. Price, $2.50.

Where Amateur Radio Examinations Are Held

General and Extra Class amateur examinations are offered at the Federal Communications Commission's district offices listed below at the times shown. The number in parentheses following the city is the district number. Listed at the bottom of the page are other cities where General and Extra Class examinations are offered quarterly (Q), semiannually (S), and annually (A). The number of the FCC district in which the city is located follows in parentheses. Write to the Engineer in Charge, Federal Communications Commission, of the appropriate district for precise information on the time, date, and exact location of the next scheduled examination. You may take the examination at any of the listed locations, but you must make prior arrangements with the district office. No prior arrangements are necessary for examinations at the district offices themselves unless otherwise stated. No examinations are given on legal holidays, and when a legal holiday falls on a Saturday, all Federal offices are closed the day before.

Alabama, Mobile (8M) 439 U.S. Court & Custom House, Wednesdays, by appointment.

Alaska, Anchorage (23) 54 U.S. Post Office Bldg. and Court House. By appointment.

California, Los Angeles (11) Mezzanine 50, 849 S. Broadway. Wednesdays at 9 a.m. and 1 p.m.

California, San Diego (11SD) Fox Theater Bldg. 1245 7th Ave. Wednesdays, by appointment.

California, San Francisco (12) 323-A Custom House, 555 Battery St. Fridays at 8:30 a.m.

Colorado, Denver (15) 5024 New Custom House, 19th between California & Stout Sts. First and second Thursday of month at 8 a.m.

District of Columbia, Washington (24) Room 204, 521 12th St., N.W. Fridays. Code test at 9:30 a.m. and 1 p.m.

Florida, Miami (7) 51 S.W. First Ave. Thursdays. 9 a.m.

Florida, Tampa (7T) 738 Federal Office Bldg., 500 Zack St. By appointment.

Georgia, Atlanta (6) 2010 Atlanta Merchandise Mart, 240 Peachtree St., N.E. Tuesdays and Fridays at 8:30 a.m.

Georgia, Savannah (6S) 238 Post Office Bldg. By appointment. (2nd and 4th Tuesday of each month)

Hawaii, Honolulu (21) 502 Federal Building. Tuesdays, Wednesdays at 8 a.m. and by appointment.

Illinois, Chicago (18) 1872 New U.S. Court House & Federal Office Bldg., 219 S. Dearborn St. Fridays at 9 a.m.

Louisiana, New Orleans (8) 829 Federal Office Bldg., 600 South St. Mondays at 8:30 a.m.

Maryland, Baltimore (4) 415 U.S. Custom House, Gay & Water Sts. Mondays and Fridays, 9 a.m.

Massachusetts, Boston (1) 1600 Custom House. Wednesdays, Thursdays, and Fridays, 8 to 10 a.m.

Michigan, Detroit (19) 1029 New Federal Building. Wednesdays and Fridays at 9 a.m.

Minnesota, St. Paul (16) 208 Federal Courts Bldg., 6th and Market Sts. Fridays at 8:45 a.m.

Missouri, Kansas City (17) 1703 Federal Bldg., 601 East 12th St. Fridays at 8:30 a.m. to 11 a.m.

New York, Buffalo (20) 328 Federal Bldg., Ellicott & Swan Sts. First and third Friday of month at 9 a.m.

New York, New York (2) 748 Federal Bldg., 641 Washington St. Tuesday through Friday, 9 a.m. to noon.

Oregon, Portland (13) 441 U.S. Court House, 620 S.W. Main St. Fridays at 8:45 a.m.

Pennsylvania, Gettysburg 334 York St. 1st and 3rd Tuesday. By appointment.

Pennsylvania, Philadelphia (3) 1005 New U.S. Custom House. Mondays thru Wednesdays, 9 to 10 a.m.

Puerto Rico, San Juan (22) 322-323 Federal Bldg. Fridays at 9 a.m.

Texas, Beaumont (9B) 301 Post Office Bldg., 300 Willow St. Tuesdays by appointment.

Texas, Dallas (10) 1314 Wood St. Tuesdays, 8 a.m. to 1 p.m.

Texas, Houston (9) New Federal Office Bldg., Room 5636, 515 Rusk Ave. Tuesdays, 9 a.m.

Virginia, Norfolk (5) 405 Federal Bldg. Fridays, 9 a.m. to 10 a.m.

Washington, Seattle (14) 806 Federal Office Bldg., First Ave. & Marion St. Fridays at 8:30 a.m.

OTHER EXAMINATION POINTS

Albuquerque, N. M. (S) (15)
Bakersfield, Calif. (A) (11)
Bangor, Maine (A) (1)
Billings, Mont. (A) (14)
Birmingham, Ala. (Q) (6)
Boise, Idaho (S) (13)
Charleston, W. Va. (Q) (19)
Cincinnati, Ohio (Q) (19)
Cleveland, Ohio (Q) (19)
Columbus, Ohio (Q) (19)
Corpus Christi, Texas (Q) (9)
Davenport, Iowa (Q) (18)
Des Moines, Iowa (Q) (17)
El Paso, Texas (S) (10)
Fairbanks, Alaska (S) (23)
Fort Wayne, Ind (Q) (18)
Fresno, Calif. (Q) (12)
Grand Rapids, Mich. (Q) (19)
Great Falls, Mont. (A) (14)
Hartford, Conn. (S) (1)
Hilo, Hawaii (A) (21)
Indianapolis, Ind. (Q) (18)
Jackson, Miss. (S) (8)
Jacksonville, Fla. (S) (7)
Jamestown, N. D. (A) (16)
Klamath Falls, Oreg. (A) (13)
Knoxville, Tenn. (Q) (6)
Las Vegas, Nev. (S) (11)
Lihue, Kuai, Hawaii (A) (21)
Little Rock, Ark. (Q) (8)
Louisville, Ky. (Q) (18)
Lubbock, Tex. (S) (10)
Marquette, Mich. (A) (16)
Memphis, Tenn. (Q) (6)
Milwaukee, Wis. (Q) (18)
Nashville, Tenn. (Q) (6)
Oklahoma City, Okla. (Q) (10)
Omaha, Neb. (Q) (17)
Phoenix, Arizona (Q) (11)
Pittsburgh, Pa. (Q) (20)
Portland, Maine (S) (1)
Rapid City, S. D. (A) (1)
Roanoke, Va. (S) (5)
St. Louis, Mo. (Q) (17)
Salem, Va. (S) (5)
Salt Lake City, Utah (Q) (15)
San Antonio, Texas (Q) (9)
Schenectady, N. Y. (Q) (2)
Sioux Falls, S. D. (Q) (16)
Spokane, Wash. (S) (14)
Syracuse, N. Y. (Q) (20)
Tucson, Ariz. (S) (11)
Tulsa, Okla. (Q) (10)
Wailuki, Maui, Hawaii (A) (21)
Wichita, Kan. (S) (17)
Williamsport, Pa. (Q) (20)
Wilmington, N. C. (S) (5)
Winston-Salem, N. C. (Q) (5)

Learning The Code

AMATEUR RADIO

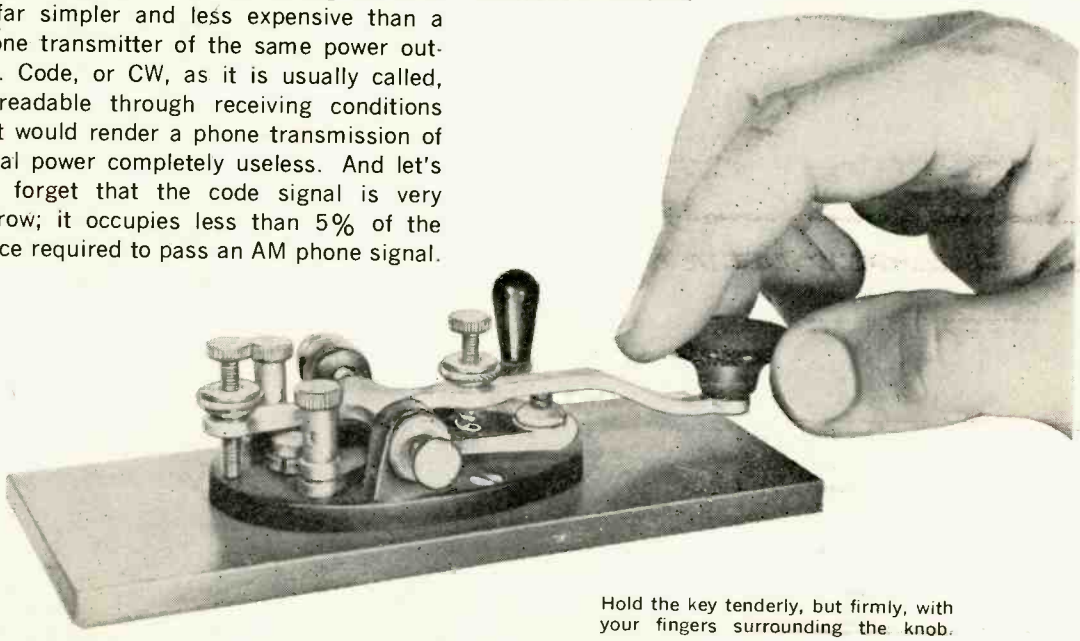
It's Not As Difficult As Some People Imagine

By Herb S. Brier, W9EGQ, and Nicholas Rosa, WB6JTJ

ALL APPLICANTS for an amateur radio license must pass both a code and theory examination. Many prospective amateurs consider learning the international Morse code a waste of time, because it is easier to talk over the air and this is all that they plan to do. Nevertheless, the code requirement is part of an international treaty agreement, and although the Federal Communications Commission has simplified the exam, you still must have the ability to send and receive at least five words per minute.

Learning to send and receive the code is not nearly so difficult as some people prefer to imagine. And radio amateurs agree that code has advantages in its own right. A transmitter for sending nothing but code is far simpler and less expensive than a phone transmitter of the same power output. Code, or CW, as it is usually called, is readable through receiving conditions that would render a phone transmission of equal power completely useless. And let's not forget that the code signal is very narrow; it occupies less than 5% of the space required to pass an AM phone signal. Finally, CW has a fascination of its own, as is attested to by many amateurs.

Personal Code Instruction. For most people, the easiest way to learn the code is with the aid of a good teacher, either individually or in a code class. In any case, don't make the mistake of attempting to memorize the code as a system of dots and dashes. You should think in terms of every alphabetical letter or numeral transmitted by code having its own distinctive rhythm. Don't be scared off by tangents; just pay attention to the sound of the "dit." And, the "dah." When these two are run together, they will sound like "didah," not "dit-dah." Draw out that "dah"; make it sound like "da-ahh."



Hold the key tenderly, but firmly, with your fingers surrounding the knob.

READ WHAT THE EXPERTS SAY ABOUT knight-kit® VHF-FM MONITOR KITS

From December 1965 POPULAR ELECTRONICS:

"Well, at long last! A major kit manufacturer has produced a police/fire receiver . . . Allied Radio's KG-221 can be wired from scratch in less than 8 hours . . . It's a real bargain."

From May-June 1966 ELEMENTARY ELECTRONICS:

"Perhaps the best buy we've seen yet in a VHF FM receiver . . . covering the 152 to 174 megacycle band. A companion receiver, the KG-220 covers 30 to 50 megacycles. Building the kit is about a one evening project—even for beginners . . . You'd have to spend a lot more before you'd get a significant improvement in performance."

From July 1966 CB MAGAZINE:

"After two evenings of fun, the receiver was completed . . . Sensitivity was excellent . . . Frequency readout was good . . . Bandwidth checked out right on specs . . . an excellent buy for the money."

KG-221A. 152 to 174 Mc FM Monitor Kit is an easy-to-assemble receiver that lets you monitor police, fire, civil defense, U.S. weather bureau, forestry, conservation, and many other broadcasts. Two IF amplification stages and RF stage give top-notch sensitivity. Complete with all parts, wire, and easy-to-follow instructions..... $44.95

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CIRCLE NO. 14 ON READER SERVICE CARD

When you see the printed letter H, you don't sit down and analyze it; you don't take it apart; you don't say, "Let's see, this is a letter with two vertical posts—side by side—with a short horizontal bar connecting them about halfway up—something that looks like goalposts." Rather, your eye takes in the whole pattern of the letter at once. You see "H" and your mind automatically registers "aitch"—and there are no steps between the eye recognition and the mental response. Obviously, this goes for any letter in the alphabet.

Thus, when you hear "didah," your mind registers "A" immediately—the same way as your eye sees the letter H. Only this time it is your ear that is taking in the whole pattern. You delete the steps between the pattern and the letter that you want to recognize by not counting and translating into dots and dashes and then groping for whatever letter those dots and dashes are supposed to represent.

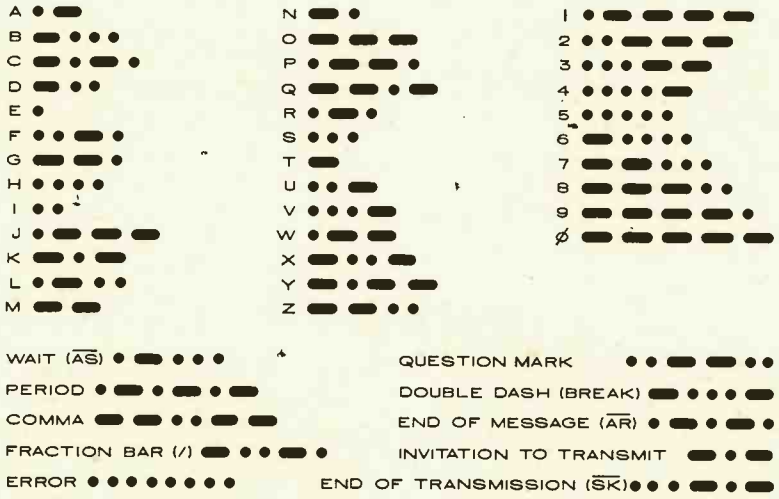
The CW operator learns very quickly that his whole technique depends on rhythm. Act as though you're in a dance class and, even though you may feel a little silly, start with the simplest sounds: "dit," E; "dah," T; "didah," A. Whistle them—the shortest, easiest whistle for "dit" and a distinctly longer whistle for "dah." Now start putting these three sounds together; try whistling TEA or EAT. Now try AT, and then TEE, or TAT.

Seven Most Commonly Used Letters. Any crossword book can confirm the fact that the seven most commonly used letters are E, T, A, O, I, N, and S. In code, they would sound like this: "dit," E; "dah," T; "didah," A; "dahdahdah," O; "didit," I; "dahdit," N; "dididit," S.

Whistle these sounds, or, if you come to a code class prepared, key them on your oscillator or buzzer. Now look at what you've got—a whole bucketful of words! To get yourself right off the ground, try these: IT, ON, NO, TAN, TEN, NET, SET, SENT, TO, TON, TOTE, TONE, NOTE, NOT, SEAT, SOT, TIN, SIN, SIGN, TEST, NEST, EAST, NOSE, NOISE, TASTE, and SEASON.

Learning the sound of these seven letters constitutes "Lesson I" in your code instruction. You can spend 15 minutes or a half hour practicing with the E T A O I N S sounds. On the next day, or whenever you are ready for your next lesson, start on "Lesson II," then "Lesson III," and so on, until you have completed "Lesson VIII."

What To Do With Lesson II. In "Lesson II" you will be picking up the sounds from



International Morse code is not as fearsome as it looks. Transmission and reception of punctuation is not required to pass a Novice ham examination. Special letter groups such as AS and SK are transmitted without spacing between letters; when written or printed, these groupings are identified by a bar drawn over the two letters.

Eight Easy Code Lessons (Learn by the Sound)

LESSON ONE		LESSON TWO		LESSON THREE		LESSON FOUR		LESSON FIVE	
dit	E	didididit	H	dahdah	M	didididah	V	dahdahdidah	Q
dah	T	didahdit	R	dididahdit	F	dahdididit	B	didahdahdah	J
didah	A	dahdidit	D	didahdah	W	dahdahdit	G	dahdididah	X
dahdahdah	O	didahdidit	L	dahdidahdah	Y	dahdidah	K	dahdahdidit	Z
dididit	I	dididah	U	didahdahdit	P				
dahdit	N	dahdidahdit	C						
dididit	S								

LESSON SIX		LESSON SEVEN		LESSON EIGHT	
didahdahdahdah	1	dahdidididit	6	dahdahdididahdah	comma
dididahdahdah	2	dahdahdididit	7	didahdidahdidah	period
didididahdah	3	dahdahdahdidit	8	dahdidididah	break (BT)
dididididah	4	dahdahdahdahdit	9	dahdididididah	hyphen (THT)
dididididit	5	dahdahdahdahdah	Ø	dididahdahdidit	question
				dididididididit	error (8 dits)
				dahdididahdit	virgule (/)

the letters H R D L U C. In "Lesson III" you will only have to contend with five new letters, M F W Y P. Obviously, you should repeat any lesson as often as you think necessary. Also, notice that you are getting the alphabet in groups of diminishing size and in order of frequency-of-use in the spelling of English words.

Of course, you are getting these letters in the increasing order of difficulty, and you should learn the most common and the easiest letters first. When you have any of these lessons down cold—by sound—by rhythm—you should go on to the next group. That group will be a little tougher, but will also consist of fewer letters. By the time you get to Q J X Z, and the punctuation, you will have mastered so many "easy" letters that these seemingly "hard" letters will cause no sweat.

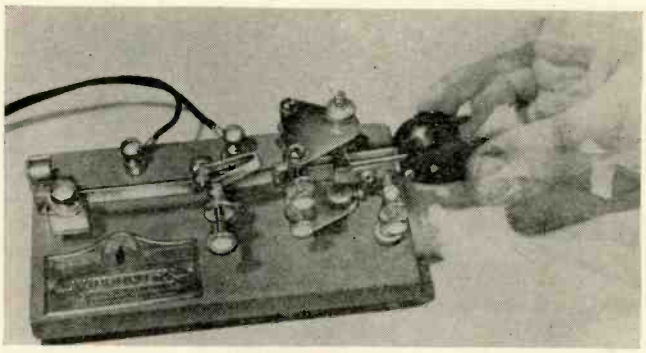
Once you feel you have mastered the sound of the additional six letters in "Lesson II," you add them to the seven letters you absorbed in "Lesson I." This creates a whole new vocabulary, including: TOOTH, TEETH, DENTIST, DOCTOR, NURSE, RUSTLE, CATTLE, DOLL, DELICIOUS, ENSUE, HUSTLE, SEAL, LEASE, RENT, HOUSE, and so on and so on.

You should always review the lessons that you have already given yourself before tackling a new one. If there is an interval between lessons, always run over the letters from the previous lessons just as if you were practicing scales on a piano. Mix the letters up; don't stick to the frequency-of-use sequence. Use ALL the letters that you have learned in making up words and sentences for each lesson. At a rate of one lesson a day—averaging 20-25 minutes, you will learn the entire alphabet in from 5 to 10 days—strictly by sound. (Doing it any other way might involve you in anything from two to five weeks of hard work.) Also, you will be receiving code well from the start—which is exactly what the amateur radio test requires.

Spacing. Ideally, there is a space of one "dit" between parts of a single letter. This will eventually prove to be the time it takes you to release the pressure on your telegraph key and push it down again. Furthermore, you will ideally allow the space of one "dah" between the letters in one word—and three "dah's" between words.

When the "sound" of code is put on the printed page, the letter H is made to look like "dididit." This may appear to refute the above statement concerning spacing, but if the letter H were printed as "dit dit dit dit," you could never figure out whether it was an H or E E E E. You will eventually key the letter H as "dididit"—it has its own distinctive rhythm.

You will soon find that certain WORDS—the common ones—have their own unmistakable rhythm, too. The word sounds of IN, THE, AND (and its substitute ES), BE (the substitute for the word FROM),



The "bug" is semi-automatic and, through the mechanics of a vibrating spring, makes its own equally spaced dots. This is the key for speed demons with the ability to send up to 35-40 words per minute. A few would-be hams have learned to send using the bug—only. The FCC will permit exams to be taken with the bug—but you must bring your own with you.

ABT (ABOUT), TNX (THANKS) will simply leap from your earphones or speaker as "one letter." So will the universal laughter signal, HI, and of course, CQ.

About Sending. You must learn to send code with a rhythm—hopefully a smooth rhythm. Send only when you are comfortable and have allowed plenty of room for your arm on the operating table. Don't lean on your elbow, but do have the elbow on the table. Lift your wrist off of the table and learn to swing your hand up and down from the wrist. Don't get the idea that you tap the key with your index finger, although it may appear to be done that way. You must learn to send with your wrist and not your fingers.

Adjust your key so that the contacts meet squarely and are spaced approximately 3/64" apart with a moderately heavy spring tension. Place the key on the table in line with your shoulders and let your thumb, first finger, and middle finger surround the knob. Relax. Don't attempt to send faster than you can receive. Concentrate on all of these fundamentals and you're sure to develop a good "fist."

Code Practice Tapes Available

Lafayette Radio Electronics, 111 Jericho Tpke., Syossett, N.Y. 11791, has a 7" reel with basic code to 8 wpm ($6.35), or advanced lessons to 18 wpm ($5.39).

Pickering Radio Co., Box 29, Portsmouth, R.I. 02871, sells a 7" reel (3.75 ips) that progresses from 1 to 15 wpm in 8 lessons; also available in 3" reel for 1.875 ips speed. Both tapes are $5.95, postpaid. They can be played at double speed to provide practice up to 30 wpm.

Code Practice Records Available

Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680, has one LP recorded on both sides that progresses from 1 to 15 wpm in 10 lessons ($4.49). Instruction booklet included.

Ameco Publishing Corp., 178 Herricks Rd., Mineola, N.Y., puts out one LP recorded on both sides that progresses from 1 to 8 wpm, and one LP that progresses to 18 wpm ($3.95, single, or $7.50 for both LP's). FCC-type exam questions and instruction booklets included with both.

Burstein-Applebee Co., 1012 McGee St., Kansas City, Mo. 64106, sells one LP recorded on both sides that progresses from 1 to 15 wpm in 10 lessons ($4.80), and one LP recorded on both sides progressing from 16 to 25 wpm in 12 lessons ($4.80). Detailed instruction booklets furnished with both.

Elektra Corp., 51 West 51 St., New York, N.Y. 10019, can supply one LP with all-encompassing code lessons for Novice to General class (5 to 13 wpm). Cataloged as CC-1 ($3.50).

Epsilon Records, 206 E. Front St., Florence, Colo., has three LP's that progress to 13 wpm using "word method." Cataloged as ER-1001 ($9.95).

Folkways, 165 West 46 St., New York, N.Y. 10036, puts out one LP recorded on both sides, acclaimed as method used by U.S. Signal Corps and Vocational High School, New York. Cataloged as FX-6141 ($5.95).

Lafayette Radio Electronics, 111 Jericho Tpke., Syosset, N.Y. 11791, sells one LP recorded on both sides that progresses from 1 to 17 wpm in 12 lessons ($3.50).

John F. Rider, Publisher, Inc., 850 Third Ave., New York, N.Y. 10022, can furnish three 10" LP's progressing from 1 to 8 wpm in 28 lessons ($9.50); also, three 10" LP's progressing from 9 to 20 wpm in 18 lessons ($8.95). Both sets sold with detailed instructions.

Howard W. Sams & Co., 4300 West 62 St., Indianapolis, Ind. 46206, has three LP's with instruction booklet—programmed-learning type of lessons progressing from 2 to 22 wpm ($6.95).

Correct Key and Bug Operation

AMATEUR RADIO

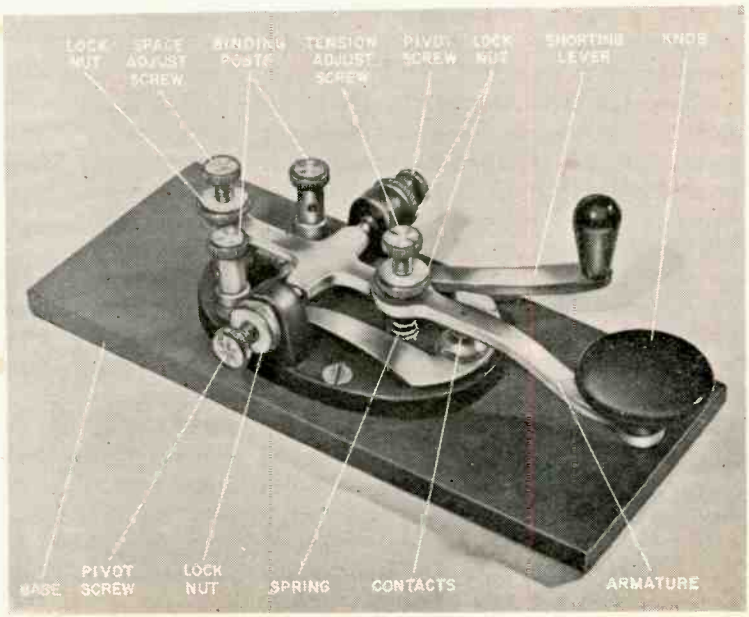
As They All Say—Practice Makes Perfect

By Marshall Lincoln, K9KTL

When you start operating in the amateur CW bands, you will find that the sounds of Morse code sent by many hams bear only a slight resemblance to the precise signals sent during the W1AW code-practice transmissions and those on your code records or tapes. Many operators fail to observe proper spacing between letters in a word and spacing between words. IFYOUARELUCKY THEIRSENDINGISASEASYTOREADASTHIS LINEOFTYPE. Other hams are apparently "rock and roll" fans. Some dashes are long; others are short. One word is sent fast, the next word is sent slow; or their dashes are sent at a sedate 10 words per minute, but their dots rattle through your headphones at 30 words per minute.

You have undoubtedly complained about these and other sending faults, but are you sure that other hams aren't just as unhappy with your sending as you are with theirs? Before denying such a possibility, you should tape a sample of your transmission and then about a day or two later, listen to a replay of the tape. If you can copy your own fist, chances are you are in good shape. But if it sounds like a lot of garbage, or you swear that it isn't you, or that you think your tape recorder distorts your signal, then you are eligible for membership in the fraternal order of Unfriendly Fists Anonymous.

Possibly, if all of us took a more critical



The more you know about the key, the more you will get to like it. Adjust it properly, and treat it firmly, squarely and with authority. How you adjust the key is largely a matter of preference, but there are some basic guide lines to help you.

look at our own sending, there would be fewer unanswered calls. Let's briefly review the rules for good sending and take off from there. Like a spoken language, the Morse code is a coherent combination or grouping of sounds that make up a letter, word, or phrase. The letter "V" is not just three dots and a dash—it's more like the opening bars of Beethoven's Fifth Symphony.

Learn To Receive First. The experts generally agree that you should FIRST learn to receive BEFORE you begin to send. If you start using a key before you know what good code sounds like, you're likely to form some bad habits.

In the preceding article (on page 54), WB6JTJ has suggested a novel method of learning the code through assimilation of the sounds of the individual letters—as opposed to the rote method of dot and dash. While some experts might not approve of this scheme, it has worked in actual practice and is particularly suitable for people with a sense of rhythm.

Where's a good place to find good code sounds? Probably the best is off the air —from a station sending CW from punched tape. This "machine code" is usually perfect, since it is untouched by human hands. Even if it's too fast for you to read most of it, you should be able to catch enough characters to sense the rhythm, and proper combination of sounds.

Once you have learned to receive at least 5 wpm, you are ready to learn how to send. The trick is to imitate as closely as possible the perfect code you've been listening to. No one expects you to measure off each "dit" and "dah" you send to be sure they fit a master plan, or timing sequence of dots, dashes and pace.

The length of the "dit" is the basic unit or time element. A "dah" is equal in length to three "dit's." Spaces between "dit's" and "dah's" equal one "dit." Spaces between letters in a word equal three "dit's," and spaces between words equal seven "dit's."

Key Adjustment. Your task will be easier if your key is properly adjusted. A good rule of thumb recommended for beginners is to set the gap adjustment screw on the key to obtain about 3/64" space between contacts. More experienced operators prefer less spacing. The smaller the space, the less distance your fist has to travel. But trouble begins and erratic and garbled sounds become the keynote when the gap is made too small.

Spring tension should be adjusted to obtain comfortable but positive action. If the tension is set too stiff, you will tend to clip your "dit's" and "dah's"; they will sound staccato—like a machine gun, instead of like a rhythmic language. Also, too much spring tension is likely to give you a quick dose of hand fatigue. If the spring tension is too light, your characters will have a tendency to run together.

Your Operating Position. There's an old axiom that says something to the effect that if you slouch down in your chair, your code will automatically become as sloppy as your posture. Sit up straight; not stiff as a ramrod, but comfortably erect. Put both feet flat on the floor.

Rest your forearm, right up to your elbow, on the table, straight back from the key. Not enough room on the table for that much arm? Then move things around so that there is room. Your arm acts as a support for your wrist.

Your wrist is used as a lever, and it should not rest on the table. When in action, it bobs up and down slightly. Most of the action takes place in the wrist itself, causing your fist to move the most. Your fingers, once they grip the key, do not move around as if you were playing the piano or a violin.

The right way to grip the key knob, like the right way to adjust the key, is whatever way helps you to send good code comfortably. The way generally recommended is to have your thumb, first finger, and middle finger surround the knob as shown in the photo on page 54. Your third and fourth fingers are allowed to rest in a relaxed position curled partly into your palm. Your fingers grip the key gently, and at all times.

Keep your wrist flexible. Don't let it

tense up. When you press down to close the key, your wrist should spring UP slightly. When your fingers come up with the key, your wrist should move DOWN. Sounds backwards at first, but with a little practice you'll get the swing of it and find that it's quite comfortable.

Tips on Sending. Here are a few words of wisdom from the experts.

Don't rush your "dit's". Keep the spaces between them the same length as the spaces between the "dah's."

Don't send choppy code, with the "dit's" and "dah's" clipped. Just let 'em roll out at a smooth, even pace.

Don't force yourself to send fast. Your speed will build up gradually as you get more practice.

Don't try to send faster than you can receive.

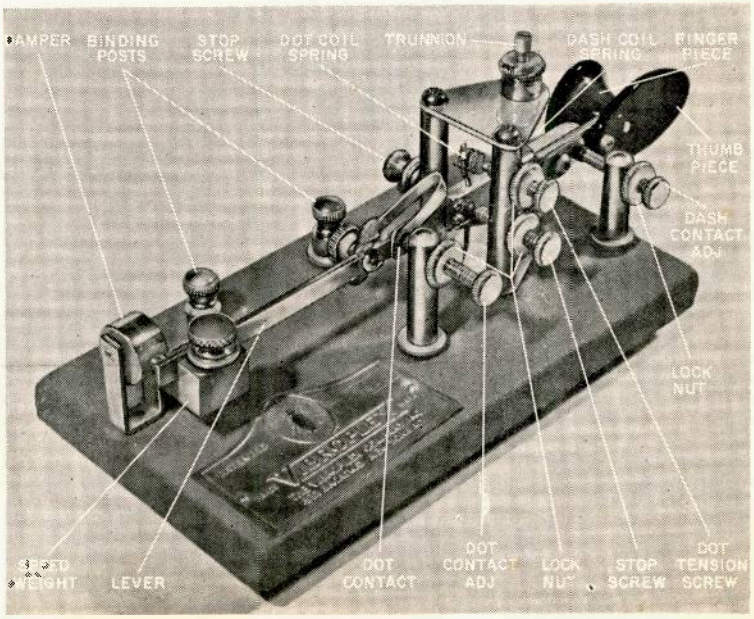
Do take pride in your sending. Your reputation will be no better than the quality of your fist.

So You Want To Man a Bug. Well, there's certainly no harm in it. A lot of very capable operators do just that. But, don't rush this step like too many fellows do. Don't believe that all hot-shot operators use a bug and you'll never amount to anything if you don't use one too. It's awfully easy to make a pest of yourself on the air with a bug if you don't know how to use one properly. As a general rule, you shouldn't use a bug on the air until you are able to send and receive at least 13 wpm.

Here's what the Air Force, in its tech manual on Morse code, says about sending with a bug; "The bug is designed to make sending easy rather than fast, and perfect control of the bug is far more important than speed."

A bug relieves you of the work necessary to form more than one "dit" in a sequence of "dit's." All you do is move the bug paddle to the right and hold it there. The reed vibrates and whips out "dit's" like there's no tomorrow. When you get all you need (and no more), you relay your touch on the paddle and the reed stops vibrating. "Dah's" are formed individually by moving the paddle to the left, and then releasing it.

Posture and arm position are essentially the same as for a straight key. To move the paddle left and right, ROLL your arm from side to side. This helps produce proper rhythm and is less tiring than flexing the wrist or doing a jig with your fingers. Working the bug is like playing



Is the bug a monster or your best friend? It depends upon how well you are able to receive code. As with some musical instruments, you must listen to the sound as you strum away—you may think otherwise, but you can't send faster than you receive. The main purpose of the bug is to make sending easier, not faster.

certain musical instruments: you have to listen to what you are doing.

Bug Adjustment. Like a fine watch, the bug must be properly adjusted to work right. While the adjustment screws that bristle from all sides of a bug can be set to please your own sense of touch and balance, there are some general rules to follow. The Bell System, for instance, offers this advice:

(1) Adjust the BACK TOP SCREW until the reed **lightly** touches the DEADENER, and tighten the lock nut.

(2) Adjust the FRONT STOP SCREW until the separation between the end of this screw and the lever is approximately 0.015 inch, and tighten the lock nut. A greater separation is permissible if you prefer more lever movement.

(3) Move the lever to the right, hold it in this position, stop the vibration of the reed, and adjust the "dit" contacts until they just meet without flexing the contact spring, then tighten the lock nut. This is a very important adjustment; it should be checked after tightening the lock nut, to see that it has not changed.

Changing the position of the weight (which controls the speed of the reed), or changing the tension of the retraction and "dah" springs, should not throw the bug out of proper adjustment.

May your fist be as popular as a friendly handshake.

Radio Amateur Callbooks

The world-renowned "callbook" is the only publication listing licensed radio amateurs. It is issued in two separate sections—each complete within itself. The Radio Amateur Callbook lists only those hams (all K and W calls) licensed in the United States; published quarterly, it costs $5.95. The second section is the Foreign Radio Amateur Callbook and lists all known licensed hams outside of the U.S.A. (including Canadians). This volume is also published quarterly and is $3.95. Callbooks are available at most radio stores.

Suggested Operating Frequencies

Hams initiating calls using wide-band FM are urged to do so on either 52.525 or 146.94 MHz. On RTTY, the initial calls should be on 3620, 7040, 14090 or 21090 kHz.

World's Greatest Code Teacher

AMATEUR RADIO

Off-The-Air Code Lessons Inspire Many Would-Be Hams

Marshall Lincoln, K9KTL

A KNOWLEDGE of Morse code is essential to obtaining an amateur radio license. Thousands of hams have found that the easiest way to get the feel of how code sounds over the air is to tune in the headquarters' station of the American Radio Relay League, W1AW. This amateur radio station can easily qualify as the world's biggest, loudest, oldest, and most reliable code practice station.

Code Practice Sessions. That "QST" call preceding each CW transmission means "calling all amateurs," and W1AW is equipped to make the same transmission simultaneously on all the amateur bands from 160 through 2 meters. And, operation on each of the bands is at full legal power input of 1000 watts—simultaneously!

W1AW has a reputation for being on the air every evening of the year (except Christmas) come rain, hail, snow, or ionispheric disturbance. Even during the big power blackout in the northeast section of the United States in 1965, W1AW was on the air as usual—but with a softer voice. The station attendants had fired up emergency generators and put two 150-watt transmitters on the air for the regular code practice sessions.

Another reason that W1AW is such a good teacher for those practicing code reception is that its "fist" is perfect. All of those smooth dit's and dah's from W1AW are machine-made and all the operator has to do is set the speed knob, push the "go" button, and stand back. Transmissions are made at speeds ranging from 5 to 35 words a minute. The broadcasting schedule calls for the slower and faster speeds to be sent on alternate nights, so beginners, as well as old-timers, can get the kind of practice they want. Practice material is taken from publications issued by the ARRL, thus enabling anyone copying the transmissions to look up the text and check his accuracy.

Other Services. A popular service of W1AW is transmitting "bulletins" issued by the ARRL headquarters staff. These bulletins cover diversified subjects and during any week may refer to space communications, contests, changes in radio regulations, predictions of radio conditions to come, etc. All the bulletin transmissions are in CW, SSB, and radioteletype. The CW bulletins—sent at 18 wpm—make good code practice material.

Some of the other services provided by W1AW for the serious amateur are code proficiency transmissions and frequency measuring tests. The code proficiency runs are kind of like "mid-term exams" for code students. These runs are special CW transmissions scheduled approximately once each month to test the CW copying ability of anyone who cares to tune in. Transmissions are made at speeds of 10, 15, 20, 25, 30, and 35 wpm. Listeners who copy these transmissions may send them back to the ARRL headquarters for grading. Certificates and endorsement stickers for the highest speed copied correctly are issued by the ARRL.

Frequency measuring tests are made four times a year. These tests are primar-

ily for the benefit of ARRL Official Observers, but they may also be used by anyone who wants to check the accuracy of his frequency measuring equipment and his ability to use it. During these tests, the crystal-controlled transmitters at W1AW transmit a series of long dashes (interspersed with station identification) on the 80-, 40-, and 20-meter CW bands. While amateurs throughout the country are measuring these frequencies (which are different during every test), a commercial frequency measuring laboratory is doing likewise. The laboratory acts as the umpire and the results are compared with the reports submitted by W1AW listeners.

How W1AW Started. In the very early days of the ARRL, a very modest ham station was operated by the League employees during their lunch hour. In 1928 the League set up operation of station 1MK as its first full-time headquarters station in office space shared with the Connecticut Air Guard. Twice-per-evening broadcasts of special bulletins on amateur radio subjects began as early as 1930.

The call "1AW" (later W1AW) was then held by Hiram Percy Maxim, the League's chief founder and long-term guiding light. When Maxim died in 1936, the ARRL obtained Maxim's call letters for its own station. The brick building that houses W1AW was built in 1938 and has been recently remodeled to provide space for more equipment and expanded operations.

At this writing, the W1AW attendants are Murray Powell, W1QIS, and Chuck Bender, W1WPR. One or the other is on duty each afternoon and evening to maintain the station, show visiting hams around the facilities, and to put the rigs on the air.

W1AW Master Schedule (effective October 30, 1966)

The ARRL Maxim Memorial Station welcomes visitors. Operating-visiting hours are Monday to Friday from 3 p.m. to 3 a.m. EST, Saturdays from 7 p.m. to 2:30 a.m. EST, and Sundays from 3 p.m. to 10:30 p.m. EST. The station address is 225 Main St., Newington, Conn., about 7 miles south of Hartford. A map showing street detail will be sent on request. The station will be closed November 24, December 25-26, 1966; January 1-2, February 22, and March 24, 1967.

GMT*	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
0000	.....	.....	.....	.....	RTTY OBS[3,7]	.....	.....
0030			**Code Practice Daily[1] 10-13 and 15 wpm**				
0100	.....	CW OBS[1]	CW OBS[1]	CW OBS[1]	CW OBS[1]	CW OBS[1]	CW OBS[1]
0120-0200[4]	.....	.....	7.080	3.555	7.080[6]	3.555[6]	7.080
0200	.....	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]
0205-0230[4]	.....	.....	3.945	50.7	145.6	1.82	3.945
0230	**Code Practice Daily[1] 15-35 wpm Tues., Thurs., Sat., 5-25 wpm, Mon., Wed., Fri., Sun.**						
0330-0400[4]	.....	.....	3.555	7.080	1.805	7.080	3.555
0400	RTTY OBS[3]	.....	RTTY OBS[3]	RTTY OBS[3]	RTTY OBS[3]	RTTY OBS[3]	RTTY OBS[3]
0410-0430[4]	.....	.....	3.625	14.095	7.045	14.095	3.625
0430	Phone OBS[2]	.....	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]
0435-0500[4]	.....	.....	7.255	3.945	7.255	3.945	7.255
0500	CW OBS[1]	.....	CW OBS[1]	CW OBS[1]	CW OBS[1]	CW OBS[1]	CW OBS[1]
0530-0600[4]	.....	.....	3.555[6]	7.080[6]	3.555	7.255	3.555
0600-0700	.....	.....	7.080	3.945	3.555	7.255	7.080
0700-0800	.....	.....	3.945	7.255	3.945	3.555	3.945
2000-2100	.....	14.280	21/28[5]	14.095	21/28[5]	14.280	.....
2100-2200	.....	14.100	14.280	14.100	14.280	14.100	.....
2300-2345	.....	7.255	21/28[5]	21.1[6]	21/28[5]	7.255	.....

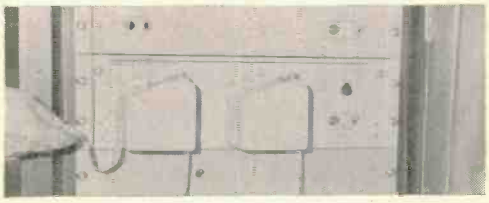
[1] CW OBS (bulletins, 18 wpm) and code practice on 1.805, 3.555, 7.08, 14.1, 21.075, 50.7, and 145.6 MHz.
[2] Phone OBS (bulletins) on 1.82, 3.945, 7.255, 14.28, 21.41, 50.7, and 145.6 MHz.
[3] RTTY OBS (bulletins) on 3.625, 7.045, and 14.095 MHz. 170/850-cycle shift optional in RTTY general operation.
[4] Starting time approximate. Operating period follows conclusion of bulletin or code practice.
[5] Operation will be on one of the following frequencies: 21.075, 21.1, 21.41, 28.08, 28.7 MHz.
[6] W1AW will listen in the novice segments for Novices on band indicated before looking for other contacts.
[7] Bulletin sent with 170-cycle shift, repeated with 850-cycle shift.
Maintenance Staff: W1s QIS WPR NPG. *Times/days in GMT. General operating frequencies approximate.

GMT conversion charts are available without charge from ARRL Headquarters. In lieu of regular code practice, Frequency Measuring Tests will be sent on Nov. 9 and Feb. 10 and W1AW Qualifying Runs on Nov. 15, Dec. 14, Jan. 17, Feb. 15, March 16, and April 14. Operating News in QST outlines selected code practice material each month.

W1AW—Headquarters Station of the ARRL

Here is the operating console of W1AW, Newington, Conn. Code practice lessons emanate from W1AW plus general information for all radio amateurs. Seven 1-kw. transmitters can be operated simultaneously. If you are a ham, you may operate W1AW if you visit this station—but be sure to bring your license.

This tape-punching machine can be used for keying a radioteletype transmitter, but in the photo Murray Powell, W1QIS, is punching the tape for a code (CW) lesson. Text for lessons is taken from various portions of the ARRL magazine, QST.



Tape punched for the code lessons is fed through this "reader," which actually keys the transmitter. Use of punched tape means letter-perfect code.

The ARRL obtained this unusual transmitter from the estate of K7LJA. Built by TMC, it is capable of operation on any band between 2 and 30 MHz.

Ham Radio Equipment Sampler

AMATEUR RADIO

A Condensed Look at Models and Prices

By Herb S. Brier, W9EGQ, and Robert Cornell, WA2HDQ

IF YOU CONSIDER the wide range of frequencies encompassed by amateur radio—from 1.8 MHz up into the GHz region—and the three levels of operating privileges granted by the various amateur licenses, it is easy to see why there is a demand for so many different pieces of amateur equipment.

Whether you are a Novice limited to low-power CW operation in the 80-, 40-, and 15-meter bands or phone and CW on 2 meters, or a Technician limited to the frequencies above 50 MHz, or a General with a multiband sidewinder, you can have professional-looking and professional-operating equipment if you go in for either kit or store-bought gear. Even the homebrew artist will recognize the excellent quality and features found in the current profusion of kits.

Receivers. Historically, the advent of SSB signals, which must be tuned to within 100 Hz (0.0025% at 4 MHz) to be intelligible, revealed how unstable pre-1955 receivers were by today's standards. It took a master's touch to tune in the signals and to keep them tuned in, as the receiver drifted with heat and line voltage changes, or "jumped" frequency if it was jarred. Today, tuning in SSB signals on a modern amateur receiver is easier than tuning in AM signals on an older receiver, especially when interference is bad.

This improvement was accomplished in steps. First, the receiver tuning range per band was reduced from many MHz to a few hundred kHz. Second, great pains were taken to design a drift-free variable high-frequency local oscillator—upon which the ultimate stability of the receiver depends.

To further improve efficiency and stability, some sets run the oscillator over only one band of frequencies (usually in the 5-MHz region), and heterodyne it against a crystal to obtain the desired i.f. frequency. Strictly amateur receivers, such as the Heathkit SB-300, contain crystals only for the amateur bands. But other receivers, such as the Drake R-4A or Collins 75S-3B, accommodate additional crystals to obtain coverage of other frequencies of interest. Of course, these improved oscillator techniques are also used in amateur transmitters and transceivers.

Another trend in modern receiver design is the swing to electromechanical and quartz-cyrstal lattice filters in place of conventional tuned circuits, phase-shift networks, and other complicated expedients to sharpen the response and to improve selectivity. The filters do a good job, simplify associated circuits, and don't need readjustment.

Also featured in some of the newer receivers and transceivers are i.f. noise blankers. In contrast to simple audio noise clippers, a noise blanker is effective against impulse-type noise on SSB and CW signals, as well as on AM signals. The blankers are standard equipment on the Drake R-4A receiver and the Hallicrafters SR-2000 transceiver; they are optional accessories for the Squires-Sanders SS-IR receiver and Collins KWM-2 transceiver.

Receivers intended for amateur use start at approximately $75 for the basic Heathkit HR-10 and go up to about $1000

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CB

Kit GW-14 **$89.95**

Assembled GWW-14 **$124.95**

23-Channel 5-Watt Transistor CB Transceiver

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Assembled GRS-65A **$99.95**

Kit GW-52A **$69.95** (pair $129.95)

New! 2-Watt Walkie-Talkie ... Completely Assembled

Features 2 watts of power for up to 6 mile inter-unit range ... up to 10 miles with 5-watt CB base station; $20 rechargeable battery; 9 silicon transistor, 2 diode circuit for cool instant operation between —30° F and +150° F; superhet receiver with RF stage; adjustable squelch and automatic noise limiter; aluminum case. 3 lbs. Optional 117 v. AC battery charger plus cigarette lighter charging cord $9.95. Crystals extra @ $1.99 each with order.

Deluxe 1-Watt Walkie-Talkie ... Operates Up to 3 Miles

Operates up to 10 miles with a 5-watt CB rig; 10 transistor, 2 diode circuitry; crystal-controlled transmit & receive; adjustable squelch and automatic noise limiter; crystals; aluminum case; earphone; power cords. Includes $20 rechargeable battery for recharging from 117 v. AC or car's cigarette lighter. 4 lbs.

Marine

Assembled MWW-14A **$279.95**

75-Watt Marine Radiophone For Your Boat

Operates up to 75 miles. 6 crystal-controlled transmit & receive channels. Receives 2-5 MHz marine band and AM broadcast. All-transistor receiver with R.F. stage for extra sensitivity and ceramic Transfilters® for extra selectivity. PTT mike. 15-watt amplifier for deck hailing. FCC type accepted for "party-boat" use. Completely assembled and tested. 30 lbs. Assembled MWA-15-1, radiophone remote control unit, 10 lbs.....$99.00

Amateur Radio

Kit SB-100 **$360.00**

Deluxe SSB Amateur Transmitter

Full SSB-CW transceive operation on 80-10 meters, 180 watts PEP SSB — 170 watts CW. Switch select for USB/LSB/CW operation. Operates PTT and VOX; VOX operated CW with built-in sidetone. TALC Heath SB series Linear Master Oscillator for true linear tuning. Mobile or fixed operation with appropriate power supply. Less speaker. 23 lbs. Mobile mount, SBA-100-1 $14.95

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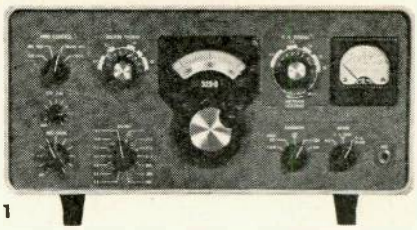
CIRCLE NO. 10 ON READER SERVICE CARD

for the super-deluxe models. Most popular price range is between $250 and $400.

This does not mean that general-coverage communications-type receivers have nothing to offer the amateur. They have been improved, too; and many amateurs prefer the wide range of frequencies covered (550 kHz to over 30 MHz). Prices for usable general-coverage receivers start at about $59.95 for a R-55A Knight-Kit and keep right on climbing to beyond $1500 for units like the National HRO-500, RACAL RA-217, and the Technical Materiel GPR-90RXD, which do everything a specialized limited range receiver will do but over a very wide range of frequencies.

Transmitters. Practically speaking, there are two types of amateur transmitters for use on the frequencies below 30 MHz—low-power CW transmitters, and medium-power CW/SSB transmitters. The former are designed for Novices and Generals who prefer CW and do not need a more elaborate transmitter.

These transmitters are all crystal-controlled and have power ratings ranging from 15 to 90 watts input; they are usu-



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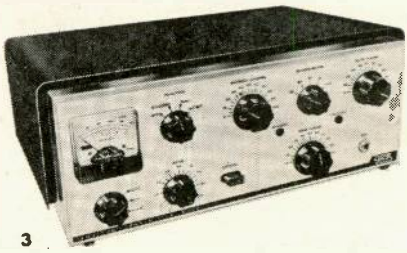
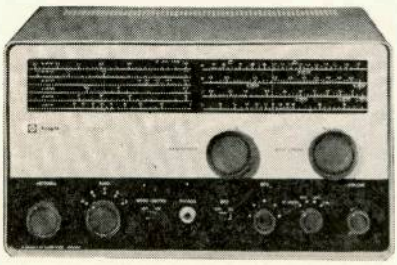


3

RECEIVERS



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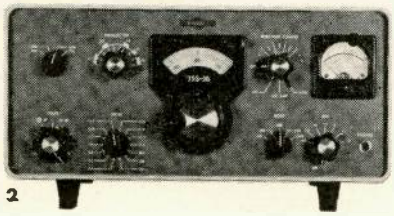

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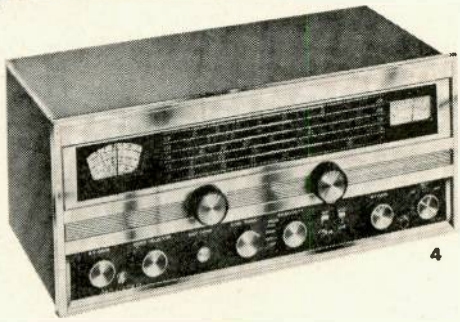

4

TRANSMITTERS

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Transmitters have been dressed up and have come down in size. Many of them match their receiver counterpart in appearance and price. Kits and wired units are plentiful, and SSB is no longer a novelty. When transmitter and receiver are properly matched, transceiver-type operation is easy to accomplish.

1 Collins 32S-3
2 Drake T-4X
3 EICO 720
4 Hallicrafters HT-46
5 Heathkit SB-400
6 Squires-Sanders "Clegg Zeus"

Rich or poor, Novice or old-timer, there's a receiver for you. Prices range from less than $75 to more than $1000. Features range from simple but substantial bandspreads to digital readout devices for "split-hairline" tuning accuracy. Filters, Q-multipliers, and other accessories are built into some receivers, and are available as add-on devices in others. Many of the receivers can be purchased ready-made or in easy-to-assemble kits.

1 Allied's Knight-Kit R-55A
2 Collins 75S-3B
3 Drake 2-C
4 Hallicrafters SX-130
5 Heathkit SB-301
6 Squires-Sanders SS-1R

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ally sold in kit form in the $20 to $90 price range. Wired models (when available) sell for 50% to 60% more.

The simplest of these units cover the 80- and 40-meter CW bands, probably the best place for the average newcomer to begin his amateur career. More elaborate units cover the 20-, 15-, and 10-meter bands; some of them also cover the 6-meter band.

As a bonus feature, some transmitters (Hallicrafters HT-40, Heathkit DX-60A, Knight-Kit T-60, etc.) contain built-in screen modulators to obtain low-power AM phone facilities, at little or no additional cost. In addition, EICO's 730 plate modulator will convert almost any low-power CW transmitter into a plate-modulated AM phone transmitter. The resulting phone signal is usually about 6 dB stronger than that obtained from screen modulation of the same transmitter.

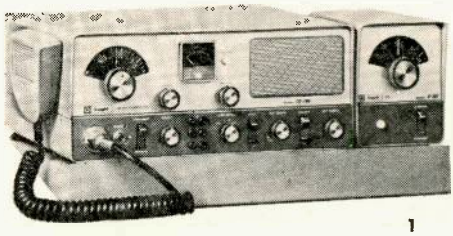
Accessory VFO's add to the versatility of these simple transmitters. Also, the transmitters may be used to drive a linear amplifier to obtain up to maximum authorized power. Watch out for the power rating of the linears; when they are used to amplify AM signals, it is usually necessary to run them at 30% to 40% of the CW/SSB ratings, because of the different efficiencies and duty cycles of the different modes of operation.

Virtually all experienced amateurs now concede that SSB phone signals are superior to AM phone signals on the amateur frequencies below 30 MHz. The signals get out better and occupy less than half as much channel space. In addition, at reasonable power levels, SSB transmitters are less expensive than AM transmitters. These reasons help to explain why there is not a single, high-power AM transmitter for the lower frequencies on the market today.

Transceivers. When you get above the simple low-power CW transmitter, a decision must be made as to whether to go for a transceiver or a separate receiver and transmitter.

A transceiver uses many of its components in both the receive and transmit modes. This reduces size, particularly im-

TRANSCEIVERS



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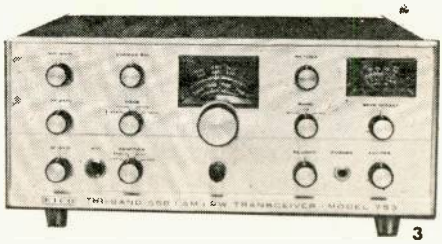

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Transceivers were originally designed for mobile operation, but the economy of having a transmitter and receiver in one package and the deluxe multiband features incorporated in many of these units make them a welcome member in any respectable shack. SSB operation is a snap with these units. Both kits and wired units are available.

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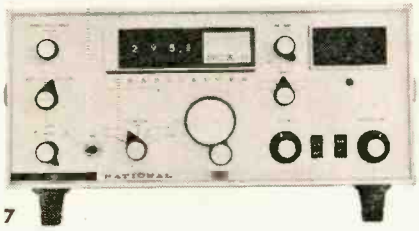

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1 Allied's Knight-Kit TR 106 and its companion VFO V-107
2 Drake TR-4
3 EICO 753
4 Hallicrafters SR-500
5 Heathkit SB-100
6 Lafayette HA-410
7 National NCX-5
8 Squires-Sanders "Clegg Venus"

portant in mobile operation (for which the transceiver was originally designed) and decreases overall cost. Single-sideband transceivers are available from simple 1-band units up to deluxe 5-banders; power ratings range from 135 to 2000 watts PEP.

The fact that a transceiver normally receives on the same frequency on which it transmits creates a minor problem when you're working several stations on slightly different frequencies. To combat the problem, several models, including the EICO 753, Raytheon SBE 34, and the Hallicrafters transceivers, have been designed to be tuned up to 10 kHz on either side of their transmitted frequencies while receiving.

A more serious reception problem than signals a few cycles off frequency is the DX station that operates outside the U.S. phone band and listens for replies inside the band. Accessory VFO's are available for use with some transceivers to permit split-frequency operation.

Prices range from approximately $160 for a basic, single-bander with power supply in kit form up to $1500 for a deluxe, high-power 5-band job. The exact cost depends, of course, upon power and features of the individual transceiver.

Not all SSB transceivers work on CW, but those that do, perform quite well. Of special interest to Novices, some transceivers offer optional crystal control of the transmitted signal either as a built-in feature (as in the Heathkit SB-100) or as an optional accessory (Collins, Galaxy, and National units, for example). The power input of a 200-300 watt transceiver can easily be cranked down to the Novice 75-watt limit.

Advantages of Separate Units. Obviously, when a good receiver is already at hand, purchasing a separate transmitter is more economical than purchasing a multiband transceiver. Furthermore, when matching transmitters and receivers are

(Continued on page 78)

See Equipment Sampler on pages 74-77

Radio Amateur Equipment Sampler

MANUFACTURER	MODEL	KIT OR WIRED	FUNCTION	TRANSMITTER CONTROL	BANDS	MODE	POWER, ETC.	PRICE
ALLIED RADIO	R-55A	Kit	Receiver		BCB/6 m.	AM/CW	6 tubes	$ 59.95
100 N. Western Ave.	R-100A	Kit	Receiver		BCB/10 m.	AM/CW/SSB	9 tubes	99.95
Chicago, Ill. 60680	T-60	Kit	Transmitter	Xtal	80/6 m.	AM/CW	60 watts	54.95
("Knight-Kit")	TR-106	Kit	Transceiver	Xtal	6 m.	AM	12 V/117 V	139.95
	TR-108	Kit	Transceiver	Xtal	2 m.	AM	12 V/117 V	144.95
	V-107	Kit	VFO for TR-106/108		6/2 m.			19.95
AMECO EQUIPMENT CORP.	AC-1T	Kit	Transmitter	Xtal	80/40 m.	CW	15 watts	21.95
178 Herricks Rd.	TX-62	Wired	Transmitter	Xtal	2/6 m.	AM/CW	75 watts	149.95
Mineola, L.I., N.Y. 11501	VFO-621	Wired	VFO for TX-62		1¼/2/6 m.		117 volts	59.95
	CB/CN	Kits	Converters		1¼/2/6 m.			19.95[1] (up)
	PS-1W	Kit	Power Supply for CB/CN				117 volts	12.50[1]
COLLINS RADIO CO.	KWM-2	Wired	Transceiver	VFO	80/10 m.	SSB/CW	180 watts	1150.00
Cedar Rapids, Iowa	32S-3	Wired	Transmitter	VFO	80/10 m.	SSB/CW	180 watts	750.00
	MP-1	Wired	Power Supply for KWM-2				12 V d.c.	198.00
	516F-2	Wired	Power Supply for KWM-2/32S-3				117 V a.c.	115.00
	75S-3B	Wired	Receiver		80/10 m.	SSB/CW/AM	117 volts	620.00
	62S-1	Wired	VHF Converter		2/6 m.	SSB/CW	150 watts	895.00
CONAR DIVISION OF NATIONAL RADIO INSTITUTE	400	Kit	Transmitter	Xtal	80/40/15 m.	CW	25 watts	32.50[1]
	500	Kit	Receiver		80/40/15 m.	AM/CW/SSB	a.c.	37.50[1]
3939 Wisconsin Ave.								
Washington, D.C. 20016								
DAVCO ELECTRONICS INC.	DR-30	Wired	Receiver		80/10 m. + part of 6 m.	AM/CW/SSB	Solid-State	389.50
P.O. Box 2677								
2034 S. Monroe St.								
Tallahassee, Fla. 32304								
DELTA ELECTRONICS LTD.	KW-2000A	Wired	Transceiver	VFO	160/10 m.	SSB/CW	180 watts	595.00
70 Ronson Dr.		Wired	Power Supply				117 volts	99.50
Rexdale, Ont., Canada		Wired	Power Supply				12 volts	120.00
R. L. DRAKE CO.	2-C	Wired	Receiver		80/10 m.	AM/CW/SSB	Solid-State	229.00
540 Richard St.	R-4A	Wired	Receiver		160/10 m.	AM/CW/SSB	117 volts	399.95
Miamisburg, Ohio 45342	2-NT	Wired	Transmitter	Xtal	80/10 m.	CW	100 watts	129.00
	TR-4	Wired	Transceiver	VFO	80/10 m.	AM/CW/SSB	300 W PEP	599.95
	T-4X	Wired	Transmitter	VFO	80/10 m.	AM/CW/SSB	200 W PEP	399.95
	AC-4	Wired	Power Supply for TR-4/T-4X				117 volts	99.95
	DC-3	Wired	Power Supply for TR-4				12 volts	149.95

EICO ELECTRONIC INSTRUMENT CO., INC. 131-01 39th Ave. Flushing, N.Y. 11352	720	Kit	Transmitter	Xtal	80/10 m.	CW	90 watts	89.95[1]
	723	Kit	Transmitter	Xtal	80/10 m.	CW	50 watts	59.95[1]
	753	Kit	Transceiver	VFO	80/40/20 m.	AM/CW/SSB	200 watts	189.95[1]
	751	Kit	Power Supply for 753				117 volts	79.95[1]
	752	Kit	Power Supply for 753				12 volts	79.95[1]
	722	Kit	VFO for 720 and 723		80/10 m.		117 volts	44.95[1]
	730	Kit	Modulator for 720 and 723				50 watts	59.95[1]
GALAXY ELECTRONICS 10 S. 34th St. Council Bluffs, Iowa 51501	"V"	Wired	Transceiver	VFO	80/10 m.	AM/CW/SSB	300 watts	399.95
	AC-35	Wired	Power Supply for "V"				117 volts	79.95
	G-35DC	Wired	Power Supply for "V"				12 volts	89.95
	RX-1	Wired	Remote VFO for "V"					69.95
	NOX-1	Wired	Novice Crystal Adapter					24.95
GONSET, INC. Altec Lansing Corp. 1515 S. Manchester Ave. Anaheim, Calif.	G-50	Wired	Transceiver	Xtal/VFO	6 m.	AM	48 watts	367.30
HALLICRAFTERS 5th & Kostner Chicago, Ill. 60624	HT-40	Wired	Transmitter	Xtal	80/10 m.	AM/CW	75 watts	129.95[2]
	HT-46	Wired	Transmitter	VFO	80/10 m.	SSB/CW	180 W PEP	349.95
	HA-5	Wired	VFO		80/2 m.			79.95
	SR-42A	Wired	Transceiver	Xtal	2 m.	AM	12 watts	199.95
	SR-46A	Wired	Transceiver	Xtal	6 m.	AM	12 watts	199.95
	HA-26	Wired	VFO for SR-42A/SR-46A					49.95
	SR-540	Wired	Transceiver	VFO	80/10 m.	SSB/CW	400 W PEP	[3]
	SR-500	Wired	Transceiver	VFO	80/40/20 m.	SSB/CW	500 W PEP	395.00
	P-500-AC	Wired	Power Supply for SR-540/500				117 volts	119.95
	SR-2000	Wired	Transceiver	VFO	80/10 m.	SSB/CW	2000 W PEP	995.00
	P-2000-AC	Wired	Power Supply					395.00
	SX-146	Wired	Receiver		80/10 m.	AM/CW/SSB		269.95
	SX-122	Wired	Receiver		BCB/10 m.	AM/CW/SSB		289.95
	SX-130	Wired	Receiver		BCB/10 m.	AM/CW/SSB		169.95
HAMMARLUND MFG. CO. 73-88 Hammarlund Dr. Mars Hill, N.C. 28754	HQ-110	Wired	Receiver		160/6 m.	AM/CW/SSB		259.00
	HQ-145AX	Wired	Receiver		BCB/10 m.	AM/CW/SSB	11 Xtal Rx channels	299.00
	HQ-170A-VHF	Wired	Receiver		160/2 m.	AM/CW/SSB	Built-in 6/2 m. converters	439.00
	HQ-180A	Wired	Receiver		BCB/10 m.	AM/CW/SSB	Triple conversion	469.00
	HX-50A	Wired	Transmitter		80/10 m.	CW/SSB	200 W PEP	495.00
HEATH COMPANY Benton Harbor, Mich. 49022	HW-12/HW-22/ HW-32	Kits	1-band Transceivers	VFO	80/40/20	SSB	200 W PEP	119.95

(Continued on next page)

Radio Amateur Equipment Sampler

MANUFACTURER	MODEL	KIT OR WIRED	FUNCTION	TRANSMITTER CONTROL	BANDS	MODE	POWER, ETC.	PRICE
HEATH COMPANY (continued)	HW-29A/HW-30	Kits	1-band Transceivers	Xtal	6 or 2 m.	AM	5 watts	$ 44.95
	SB-100	Kit	Transceiver	VFO/Xtal	80/10 m.	CW/SSB	180 W PEP	360.00
	SB-110	Kit	Transceiver	VFO/Xtal	6 m.	CW/SSB	180 W PEP	320.00
	HP-23	Kit	Power Supply for HW-12/SB-100/SB-110				117 volts	39.95
	HR-10	Kit	Receiver		80/10 m.	AM/CW/SSB		75.00
	SB-301	Kit	Receiver		80/10 m.	AM/CW/SSB	10 tubes	250.00
	SB-400	Kit	Transmitter	VFO	80/10 m.	CW/SSB	180 W PEP	325.00
	DX-60A	Kit	Transmitter	Xtal	80/10 m.	CW/AM	90 watts	79.95
INDUSTRON INC. Whippany Labs. Inc. 77 Jefferson Ave. Westwood, N.J.	Li'l Lulu	Wired	Transmitter	VFO	6 m.	AM/CW	12 V d.c./ 117 V a.c.	225.00
	Li'l Lulu	Wired	Receiver		6 m.	AM/CW/SSB		250.00
INTERNATIONAL CRYSTAL MFG. CO., INC. 18 N. Lee St. Oklahoma City, Okla. 73102	AOD-57	Wired	Transmitter	Xtal	6 m.	CW	5 watts	69.50
	SBA-50	Wired	Mixer/Amplifier	9 MHz SSB	6 m.	SSB	10 W PEP	145.00
	SBX-9	Wired	Exciter	Xtal		SSB		125.00
E. F. JOHNSON COMPANY Waseca, Minn.	Viking "6N2"	Wired	Transmitter	Xtal	6/2 m.	AM/CW	150 CW 100 AM	194.50
		Wired	VFO for 6N2		6/2 m.			54.95[2]
		Wired	Receiver Converter for 6N2		6/2 m.	AM/CW		89.95[2]
LAFAYETTE RADIO ELECTRONICS 111 Jericho Turnpike Syosset, L.I., N.Y. 11791	HA-63A	Wired	Receiver		BCB/10 m.	AM/CW/SSB	7 tubes	59.95
	HA-144	Wired	Transceiver	Xtal	2 m.	AM	Solid-State	189.95
	HA-350	Wired	Receiver		80/40/20/ 15/10 m.	AM/SSB/CW	10 tubes	129.95
	HA-500	Wired	Receiver		80/40/20/ 15/10 m.			149.95 approx.
	HA-410/HA-460	Wired	Transceivers	Xtal/VFO	10 or 6 m.	AM	20 W 12/117 V	149.95 each
	HA-650	Wired	Transceiver	Xtal	6 m.	AM	2.5 W, Solid-State	119.95
	HA-700	Wired	Receiver		BCB/10 m.	AM/CW/SSB	6 tubes	89.95
	HA-1200	Wired	Transceiver	Xtal/VFO	2 m.	AM	25W 12/117 V	189.95
NATIONAL RADIO CO. 37 Washington St. Melrose, Mass. 02176	NCX-5 Mark II	Wired	Transceiver	VFO	80/10 m.	AM/SSB/CW	200 watts	685.00
	NCX-A	Wired	Power Supply for NCX-5				117 volts	110.00
	VX-501	Wired	VFO for NCX-5					249.95
	NC-77X	Wired	Receiver		BCB/10 m.	AM/CW	117 volts	69.95
	NC-200	Wired	Transceiver	VFO	80/10 m.	AM/CW/SSB	200 W PEP	359.00
	HRO-500	Wired	Receiver		5 kHz/30 MHz	AM/CW/SSB/ MCW/FSK	Solid-State	1560.00

PARKS ELECTRONICS LAB.	50-1	Wired	Converter		6 m.		Nuvistor, 117 V	38.00
419 S.W. First Ave.	144-1	Wired	Converter		2 m.		Nuvistor, 117 V	54.95
Beaverton, Ore.	220-1	Wired	Converter		1¼ m.		Nuvistor, 117 V	65.00
	432-3	Wired	Converter		¾ m.		Solid-State	49.95
	144-1P	Wired	Preamp		2 m.		Nuvistor, 117 V	25.00
POLYTRONICS LABS, INC.	PC-6/PC-6CD	Wired	Transceiver	VFO/Xtal	6 m.	AM	18 W 12/117 V	199.95
900 Burlington Ave.								
Silver Spring, Md.								
RAYTHEON CO.	SB-34	Wired	Transceiver	VFO	80/15 m.	SSB	Hybrid, 12/117 V	395.00
213 E. Grand Ave.								
So. San Francisco, Calif.								
SQUIRES-SANDERS INC.	SS-1R	Wired	Receiver		80/10 m.	AM/CW/SSB		995.00
Martinsville Rd. &	Interceptor B	Wired	Receiver		6/2 m.	AM/CW/SSB	117 volts	495.00
Liberty Corners	Venus	Wired	Transceiver	VFO	6 m.	AM/CW/SSB	85 watts	495.00
Millington, N.J.	416	Wired	Power Supply for Venus				117 volts	110.00
(Clegg Labs.)	22'er	Wired	Transceiver	Xtal	2 m.	AM	20 watts	249.95
	Zeus	Wired	Transmitter	Xtal & VFO	6/2 m.	AM/CW	185 watts	745.00
SWAN ELECTRONICS CORP.	350	Wired	Transceiver	VFO	80/10 m.	CW/SSB	400 W PEP	420.00
417 Via Del Monte	400	Wired	Transceiver		80/10 m.	CW/SSB	400 W PEP	420.00
Oceanside, Calif.	250	Wired	Transceiver	VFO	6 m.	CW/SSB	240 W SSB PEP	325.00
	410	Wired	VFO for 350/400		80/10 m.		Solid-State	95.00
	117-XC	Wired	Power Supply for 350/400/250				117 volts	95.00
	14-117	Wired	Power Supply for 350/400/250				12 volts	130.00
TECHNICAL MATERIEL CORP.	GPR-90RXD	Wired	Receiver		BCB/10 m.	AM/CW/SSB/ ISB/FAX/FSK	117/230 V	1552.00
700 Fenimore Rd.								
Mamaroneck, N.Y.								
TRANSCOM ELECTRONICS, INC.	SBT-3	Wired	Transceiver	VFO	80/40/20 m.	SSB	165 W Hybrid	299.50
375 Hale Ave.	SBA-3	Wired	Power Supply for SBT-3				120 volts	99.50
Escondido, Calif.	SBD-3A	Wired	Power Supply for SBT-3				12 volts	99.50
VANGUARD ELECTRONICS LABS.	301 Series	Wired	Converters		40/20/6/2 m. & other		Solid-State	16.95
190-48 99th Ave.								
Hollis, N.Y.		Wired	Power Supply for 301				117 V in, 9 V out	2.95
WORLD RADIO LABS., INC.	84	Wired	Transceiver	VFO	80/40 m.	SSB	300 W PEP	159.95
3415 W. Broadway	AC-384	Wired	Power Supply for 84				300 W, 117 V	79.95
Council Bluffs, Iowa	AC-48	Wired	Power Supply for 84				250 W, 117 V	49.95
	DC-384	Wired	Power Supply for 84				300 W, 12 V	89.95
	TC-6A	Kit	Transceiver	Xtal	6 m.	AM	5 watts	39.95
	TCA	Kit	Power Supply for TC-6A				115 volts	15.95

1. Also available in wired form *2. Also available in kit form* *3. Information not available at press time*

used, the combination offers great versatility. With a snap of a switch, the combination can be operated transceiver-fashion or independently.

Compared to a transceiver, an independent receiver usually offers several degrees of selectivity vs one for the transceiver; this is particularly helpful on CW in the presence of QRM. The separate receiver may be a trifle more sensitive, but this depends upon the relative quality of the receiver and transceiver being compared.

Compared to the transceiver, the independent transmitter may have greater carrier and sideband suppression on SSB, and it may key a trifle better on CW.

UHF/VHF Amateur Equipment. Traditionally, much UHF/VHF amateur operation has been on low-power AM phone. Today, SSB is beginning to gain some acceptance on 50 MHz, at least partially because of the availability of excellent 6-meter SSB equipment such as the Clegg "Venus" and the Heathkit SB-110.

Nevertheless, the low-power AM transceiver is still king of the VHF hill, as evidenced by the just-announced Knight-Kit TR-106 15-watt, 6-meter transceiver, and Lafayette's brand-new HA-460 20-watt, 6-meter transceiver with a built-in VFO; plus other 6- and 2-meter AM transceivers.

Separate transmitters are less plentiful —there are only two: the "Lil Lulu" 12-watt VFO-controlled, 6-meter AM/CW transmitter; and the AMECO TX-62 75-watter for 6- and 2-meter AM and CW.

Kits. Virtually every type of amateur equipment available in ready-to-operate form is available in kit form. There's an interesting thing about kits: as they become more sophisticated, they seem to become easier to assemble.

The use of husky, well-designed printed circuit boards, pre-cut wiring harnesses, easy-to-follow instruction books, and pre-assembled critical, hard-to-adjust circuits all combine to make the kits easy to build. When properly put together, kit equipment performs as well as factory-assembled equipment, looks just as good, and costs from 30% to 60% less.

Operating Your First Ham Station

AMATEUR RADIO

You'll Do Fine, If You Study This Article

By Herb Brier, W9EGQ

GETTING ON THE AIR with your brand-new ham station is somewhat similar to ballroom dancing; you may know all the fundamentals, but you can expect to make a few goofs. The number of contacts you make will depend on how skillfully you can operate your equipment. You will pick up most of your operating habits through trial and error, or by imitating what you hear on the air. But, there's no reason why you can't sound something like a pro from the start.

Your First Contact. Presuming that you have your new license posted in a prominent place on the shack wall (or at least safely in your possession) and that your transmitter is ready to go, let's try out 80-meter CW.

Turn on both the transmitter and receiver and allow them to warm up while you prepare your logbook. Sign the logbook, enter your call letters, transmitter power, frequency (band), mode (CW), and the date. With these preliminaries out of the way, double-check your transmitter frequency—the FCC takes a dim view of out-of-band operation!

Now tune around the band for a few minutes to get an idea of what's coming through. Maybe you'll hear a call something like this: CQ CQ CQ DE WN1ABC WN1ABC WN1ABC CQ CQ CQ DE WN1ABC WN1ABC WN1ABC CQ CQ CQ DE WN1ABC WN1ABC WN1ABC K." This means, of course, that WN1ABC wishes to work (contact) anyone hearing his "CQ" (general call).

You decide to answer the call; so you quickly enter the time and WN1ABC in your logbook. When WN1ABC concludes with "K," you flip your send/receive switch to the "Send" position and transmit: "WN1ABC WN1ABC WN1ABC DE WN9EGQ WN9EGQ WN9EGQ AR," and flip the send/

Selected Abbreviations

THE FOLLOWING LIST OF ABBREVIATIONS USED BY CW (CODE) OPERATORS IS NOT COMPLETE, BUT IT DOES INCLUDE THE MOST COMMON.

AA—all after
AB—all before
ABT—about
AGN—again
AM—amplitude modulation
ANT—antenna
BK—back, break
BN—between
BUG—semi-automatic key
C—yes
CHOP—chief operator
CQ—general call
CUD—could
CUL—see you later
CW—radio code
DX—distance
ES—and (&)
FB—fine business
GA—go ahead, good afternoon
HI—laughter
KC—kilocycle
LID—poor (inconsiderate) operator
MNI—many
N—no
NIL—nothing
NR—number
OM—old man
OP—operator
PWR—power
R—received, are
RCVR—receiver
RIG—transmitter
RPT—repeat, report
SRI—sorry
SSB—single sideband
TKS, TNX—thanks
TU—thank you
U—you
UR—your
VY—very
WUD—would
WX—weather
XMTR—transmitter
XYL—married woman
YF—wife
YL—young lady
73—best regards
88—love and kisses

receive switch back to "Receive." But there is WN1ABC answering another station. You sigh almost in relief. What if he'd answered you?

Chances are you'll react just like all other hams do when you experience that indescribable thrill of making "your" first contact. Your heart will pound, and chills of excitement will run up and down your back; your hands will be shaking so much that you'll hardly be able to press the key. But you'll have a smile of mingled joy and disbelief on your face. ("Listen, Ma! He's answering me!")

Establishing Contact. No matter what type of operating procedure you employ, you'll make an occasional contact—probably more or less by accident. But standard procedures will do the job with less effort.

To call "CQ," meaning "I will answer calls from any station hearing me," send EITHER of the following at the speed at which you want to be answered: "CQ CQ CQ DE WN9EGQ WN9EGQ WN9EGQ CQ CQ CQ DE WN9EGQ WN9EGQ WN9EGQ CQ CQ CQ DE WN9EGQ WN9EGQ WN9EGQ K," or "CQ CQ CQ CQ CQ DE WN9EGQ WN9EGQ CQ CQ CQ CQ CQ DE WN9EGQ WN9EGQ CQ CQ CQ CQ CQ DE WN9EGQ WN9EGQ K."

The "DE" between the CQ's and the call-signs is Latin for "from." And the "K" is the CW procedure signal for "Go ahead; I will now listen."

The first call example given above is a standard "3 x 3 x 3" CQ; however, some experienced op's (operators) prefer the "5 x 2 x 3" CQ, because it increases the percentage of the time that the letters "CQ" are being sent. Futhermore, if conditions won't permit copying a call-sign sent twice, the chances of a successful contact are not very good anyway.

If one CQ isn't successful, try again. But don't increase their length on the theory that more operators will hear you. The trouble is that the average ham will wait no more than a minute for you to stand by. After that, he'll tune away looking for someone else, or call CQ himself.

Phone Operation. On phone, you can say "Calling CQ, CQ, CQ. This is (or from) W9EGQ, W9EGQ, W9EGQ . . . Over." You can also say, "Calling any 2-meter, 75-meter, etc., phone station." Most operators mention their locations when calling CQ.

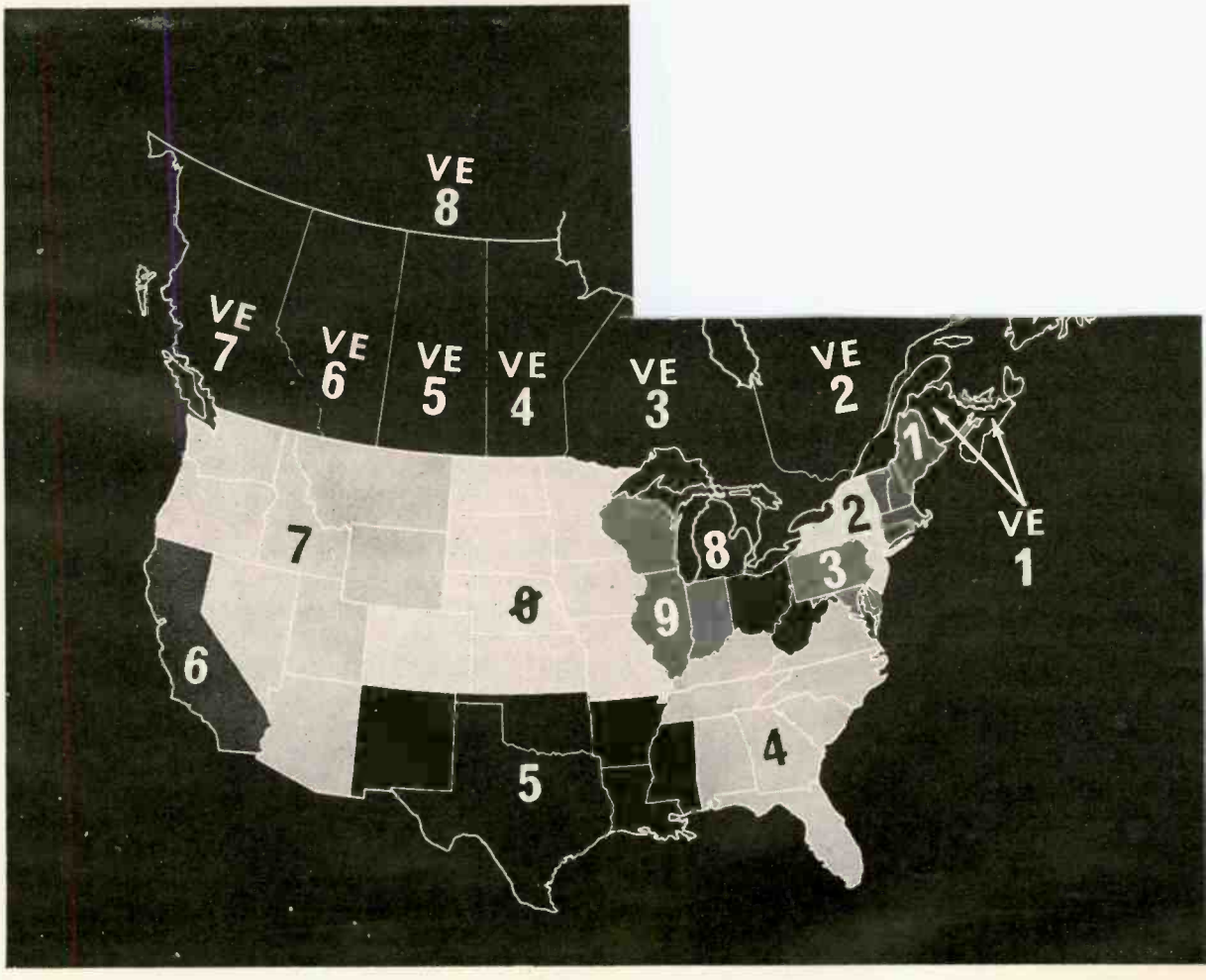
You can use words from a phonetic alphabet to identify the individual letters of your call-sign. There are a number of phonetic alphabets in existence; but we recommend the International Phonetic Alphabet. It is used like this: "W1ABC W1ABC W1ABC This is W9EGQ—Whiskey Nin-er Echo Golf Quebec . . . Over." Of course, you would repeat the call as often as necessary to establish contact.

Note that it isn't necessary to give the

called station's call letters phonetically (the operator already knows them—it's yours that he's interested in). Also, once your call letters are acknowledged, it's a waste of time to keep repeating them phonetically.

Signing Your Call Letters. On both phone and CW, FCC regulations require that you give the reason for putting your transmitter on the air (test, CQ, etc.) and sign your call letters at the beginning and end of every transmission, and every ten minutes in between. However, in a series of alternate transmissions between two or more stations in communication with each other, in which no single transmission exceeds two minutes in length, call-signs

Shown on this map are the various amateur radio



conversation. On phone, say "Break from W9EGQ."

Just shouting "Break break" without signing your call letters is technically illegal (making an unidentified transmission) and most amateurs will ignore such a call. Also, DX stations in particular have discovered that saying "Go ahead breaking station" is an invitation to confusion, because every operator who was patiently waiting his turn begins to call.

Answering CQ's. In answering a CQ, a short call such as "W1DEF W1DEF W1DEF DE W2GHI W2GHI AR" is normally sufficient. If the CQ'er doesn't respond to it, one of three things is probably happening: he isn't listening on your frequency; he's listening to another station; or you're just not getting through at the moment. At any rate, if you don't get an answer to one short call, you can always listen a moment to make sure that the called station hasn't answered someone else, and then call again. When you stand by after making a call and discover the called station already talking to someone else, you can be pretty sure that your call was too long.

Most hams listen first on their own frequencies for answers to a CQ. When there are lots of stations on the band, calling more than 10 kHz from their frequencies is normally not productive, unless the caller specifies where he is listening for replies. When activity on a band is light, however, most hams scan more of the band listening for replies.

If you read carefully the example of how to answer a CQ, you probably noticed that the answer ended with "AR," but after contact was established, each "over" ended with "K." The "AR" means that a call has been made but a contact has not yet been established; a "K" at the end of a call indicates that a two-way contact has been established. "K" at the end of a "CQ" simply means "Go ahead."

The proper use of these procedure signals, as well "SK" (discussed below) is one of the things that distinguishes a crack operator from a mediocre one. (The line over "AR" and "SK" indicates that they are sent as a single character with no space between letters.) Sometimes you'll hear a call ended with "KN"; this means that the calling operator wants an answer from the called station and from no one else.

Interpreting What You Hear. The first transmission after contact is established will probably go something like this: WN1ABC DE WN9EGQ R TNX FER CL UR SIGS RST579 RST579 HR IN GARY IND. NAME HERB. WAT SA AR WN1ABC DE WN9EGQ K," and WN1ABC will reply more or less along these lines: "WN9EGQ DE WN1ABC R FB HERB UR SIGS RST589 IN LITTLE RHODE ISLAND. MI NAME CHUCK. XMTR PWR 40 WATTS. ANT LONG WIRE. WX CLR. AR WN9EGQ DE WN1ABC K."

At first glance, much of the above looks completely unintelligible. But to any experienced ham, it is crystal clear. In using

code, every letter of every word would ordinarily have to be pounded out; to save time, therefore, CW operators lean heavily on abbreviations. These abbreviations are a mixture of phonetically spelled words, words with all the vowels omitted, words with the letter "X" replacing part of them, first letters of commonly associated words, and combinations of the above.

Another group of time-savers are Q-signals, in which, by international agreement, a single three-letter Q-signal expresses an entire thought. For example, "QRM?" means "Are you troubled by interference?" or, without the question mark, "I am troubled by interference." On phone, however, most good operators avoid the excessive use of CW abbreviations, because "saying it with words" is more accurate.

Getting back to our sample contact, after signal reports, locations, and names are exchanged, the contact may last as long or as short a time as the operators involved wish. To terminate a contact, one operator sends ". . . AR WN1ABC DE WN9EGQ $\overline{SK}$," and the other op responds with "$\overline{SK}$ DE WN1ABC."

When you send "SK," it means that the contact is finished; you have made your last transmission, and you do NOT expect the other station to transmit to you again, either.

Giving Signal Reports. The first thing you'll want to know when you contact another station is how well you're being received. Many hams have a tendency to give exaggerated reports; so take extremely good reports with a pinch of salt. There is a standard manner of giving reports—the "RST" system.

From a legal point of view, the "T" (tone) part of a report is most important. The FCC amateur regulations specify that all ham signals on frequencies below 144 MHz must be as stable and pure as the state of the art warrants. With your BFO on, such a signal produces a clear, unvarying tone from the receiver's speaker. In other words, it is "T9". As signal quality decreases from this perfect level, the tone report goes down; a "T1" signal is rough and raucous.

Giving a ham a "T9" report when his signal is rough or unsteady certainly is not doing him or anyone else a favor. Sooner

Selected Q Signals

THE FOLLOWING INTERNATIONALLY RECOGNIZED Q SIGNALS ARE COMMONLY USED IN AMATEUR RADIO. TO ASK THE INDICATED QUESTION, FOLLOW THE Q SIGNAL WITH A QUESTION MARK.

QRG	What is my exact frequency in kilohertz? Your exact frequency is_____ kHz.
QRK	What is the readability of my signals? The readability of your signals is_____ (1 to 5).
QRL	Are you busy? I am busy (with_____).
QRM	Are you troubled with interference? I am troubled by interference.
QRN	Are you troubled by static? I am troubled by static.
QRQ	Shall I send faster? Send faster (_____ wpm).
QRS	Shall I send more slowly? Send more slowly (_____wpm).
QRT	Shall I stop transmission? Stop transmission.
QRU	Have you anything for me? I have nothing for you.
QRV	Are you ready? I am ready.
QRX	When will you call again? I will call again at_____on_____kHz.
QRZ	Who is calling me? You are being called by_____.
QSA	What is the strength of my signals? The strength of your signal is_____ (1 to 5).
QSB	Does the strength of my signals vary? The strength of your signals varies.
QSD	Is my keying correct? Are my signals distinct? Your keying is incorrect; your signals are indistinct.
QSL	Can you acknowledge receipt? I am acknowledging receipt.
QSO	Can you communicate with_____ direct (or through_____)? I can communicate with_____ direct (or through_____).
QSP	Will you relay to_____? I will relay to_____.
QSV	Shall I send a series of VVV? Send a series of VVV.
QSY	Shall I change to_____ kilohertz without changing the type of wave? Change to_____ kilohertz without changing the type of wave.
QTC	How many messages do you have to send? I have_____ messages to send.
QTH	What is your location (position)? My location (position) is_____.
QTR	What is the exact time? The exact time is_____.

UNOFFICAL Q SIGNALS ADOPTED BY ARRL

QRRR	Official ARRL "land SOS." A distress call for emergency use only.
QST	General call addressed to all radio amateurs.

Third-Party Messages

International regulations forbid international radio communications in behalf of "third parties" via amateur radio unless special arrangements have been made by the individual governments to authorize such communications. The United States has negotiated agreements with the countries listed below to permit "unimportant" third-party messages to be exchanged between them. Most of the agreements also permit "emergency" messages to be exchanged—if the emergency messages are transferred from amateur to commercial channels as soon as possible.

BOLIVIA	DOMINICAN REPUBLIC	LIBERIA
BRAZIL	ECUADOR	MEXICO
CANADA	EL SALVADOR	NICARAGUA
CHILE	GREENLAND (XP)	PANAMA
COLOMBIA	HAITI	PARAGUAY
COSTA RICA	HONDURAS	PERU
CUBA	ISRAEL	VENEZUELA

or later, hams with such signals get citations from the FCC monitors calling attention to their poor signals. (Or if they are lucky, they will receive a friendly warning from one of the ARRL's volunteer "Official Observers" suggesting that they check out their rigs BEFORE they get an official FCC citation.) The first reaction of the average ham on getting a citation for having a poor-quality signal is sheer disbelief; he really accepted all those "T9" reports other hams gave him.

Working New States and DX. When you first get on the air, every contact you make will be a new experience. Later, you'll undoubtedly want to work new states and foreign countries for the thrill of it, as well as to qualify for one or more of the various certificates and awards offered in recognition of certain operating achievements. Best known of these awards are "Worked All States" (WAS) and "Worked All Continents" (WAC) offered by the ARRL, but there are literally hundreds of others available.

Banned Countries

The United States Government has no objection to its radio amateurs talking to any country. A few countries, however, have filed objections to their amateurs engaging in international communications. As a result, international law requires the FCC to forbid U.S. hams to contact these countries. The latest list of such countries includes:

Cambodia (XU)
Indonesia (8F)
Thailand (HS)
Viet Nam (3W8)

By far the most effective way to work new states and countries is by listening, listening, and more listening. But, don't just listen for stations calling CQ; you can often spot some in new states or countries already in contact. By waiting them out, you stand an excellent chance of working them. But don't be surprised to discover that dozens of other hams have the same idea when an exotic DX station is involved.

Operating Habits. Few hams get out as well as they think they should; but if you have unusual difficulties, it's a good idea to look at your operating habits. Check your spacing (if on CW) between letters and words. You may unconsciously speed up your sending and run everything together into an uncopiable mess.

On phone transmissions, you may have a bad microphone, or one ill-suited to your voice. Check your background noise level when on the air and, most important, listen carefully to your diction. Could a stranger catch what you're saying without too much difficulty?

Hams using crystal-controlled rigs should buy a couple of crystals near their principal frequency but separated from it by 2 to 4 kHz; substituting crystals may aid in getting the signal out from under serious QRM. Lastly, try operating at a different time of day—it sometimes pays off.

Exchanging QSL Cards. You will undoubtedly want a confirmation of your first contact. So you send "PSE QSL," which means "Please send me a written confirmation of this contact."

If you are a new ham, you'll have to tell the other operator where to mail his QSL card (it takes at least one issue for a new station to appear in the "Radio Amateur Callbook." Of course, if HIS call is in the "Callbook," you can mail your QSL card first, permitting the other operator to get your address from your card. Actually, sending your card first will net you more cards than if you wait for the other fellow to send his QSL first.

A QSL card needn't be elaborate. But it should be neat and include the following information: date and time of the contact;

call letters of the station worked; signal report; frequency (band); and mode—CW, AM phone, SSB, etc.

Of course, your QSL card should also include your call letters, transmitter location, and your name and complete mailing address. As many hams are trying to work all U.S. counties as possible, you might also include the name of your county on your card.

Operating Someone Else's Station. Your amateur radio license authorizes you to operate (with the owner's permission) the ham station of another licensee. If you are on CW, you use your own call-sign and a "portable designation" (see below). Club stations are exceptions, and each member is assumed to be acting as the agent of the trustee to whom the call letters were assigned; therefore, the club call is always used.

In any event, you must have your original license in your possession when you operate any amateur station (including your own). In addition, the scope of your operating is limited by your license. Thus, if you are a Novice, you can operate an amateur station owned by an Extra Class licensee, but only in the Novice bands with a crystal-controlled transmitter operating at a power of no more than 75 watts.

Mobile and Portable Operation. On CW, you identify mobile or portable operation by following your station call letters by the slant bar symbol (DN) and the number of the call area in which you are operating. On phone, your call letters should be followed by the announcement of the geographical area in which the portable or mobile operation is taking place. For example, ". . . This is W3DEF operating mobile (or portable) three miles east of Bethesda, Maryland"—not ". . . W3DEF slant three."

Special rules govern mobile operation aboard a vessel on the high seas or an aircraft on an international flight. They require sending "/MM" or "/AM" after your call letters on CW and announcing "Maritime Mobile" or "Aeronautical Mobile" at the end of each phone transmission. In addition, on both phone and CW, the name

Just off the main entrance hall of the Franklin Institute, in Philadelphia, Pa., is an amateur radio station manned by members of the Phil-Mont Radio Club. Visitors to the museum section of the Institute can listen in on a ham station in real-life operation through the use of the telephones on the counter.

or the number of the vessel or aircraft and its approximate geographical location must be given at the conclusion of each contact to satisfy the FCC regulations.

These special rules apply only to operations on or over international waters. In the United States, mobile operation on boats and aircraft is treated just like mobile operation on land.

If you plan to operate a mobile or portable station for more than 48 hours without returning to your home address, you must give prior notice in writing to the Engineer-in-Charge of the radio district in which operation is intended.

Operating in Other Countries. Until the middle of 1964, a U.S. law prevented licensed foreign amateurs from operating in the United States (except Canadian amateurs, through a special arrangement). As a result, few foreign governments would allow U.S. amateurs to operate in their countries. But under the U.S. law passed by Congress in 1964, the State Department has concluded bilateral agreements with many foreign governments to allow licensed amateurs to operate in the countries involved.

Their number increases monthly, but at this writing reciprocal operating agreements for ham stations have been established with the following countries:

AUSTRALIA, BELGIUM, BOLIVA, CANADA, COLOMBIA, COSTA RICA, DOMINICAN REPUBLIC, ECUADOR, FRANCE, GERMANY, INDIA, ISRAEL, KUWAIT, LUXEMBOURG, PARAGUAY, PERU, PORTUGAL, SIERRA LEONE, UNITED KINGDOM (ENGLAND)

United States amateurs wishing to operate in one of the above countries (except Canada) should contact that country's Washington, D.C., embassy, or a consulate in one of the larger cities.

A duly licensed amateur from any of the above countries wishing to operate in the United States must apply for authorization from the FCC using Form 610A.

The Making of a DX Man

AMATEUR RADIO

Chasing DX Is Not For Every Ham—But Some Swear By It

By George Lesnick, W9EBQ

W9EBQ, W9EBQ, W9EBQ, South Holland, Illinois, from CR9AH, C-Charlie, R-Romeo, Nine, A-Alpha, H-Hotel, Macao, Asia. How do you copy, Les? Over."

Ever since I got my first amateur license back in 1930, and woke up my family at 1:30 a.m. a few weeks later to tell them I had just worked New Zealand with my 1-tube transmitter, I have been a DX man. There is no greater thrill for me than hearing my call letters come back to me from the other side of the world. Ascension Island, ZD8; Saudi Arabia, HZ; The Vatican, HV; Azerbaijan (Russia), UD6; Pitcairn Island, VR6; and over 300 other countries are out there challenging me to work them.*

Of course, practically all amateurs like to work DX, as is proved by what happens on any ham band when DX breaks through. Everyone on the band loses his "cool," and joins the pack that takes off after the DX like a bevy of screaming teen-agers.

Those hams are not really DX men, however. When conditions return to normal and the DX signals fade out, those hams return to their rag-chewing, message-handling, etc. But not that 10% whose NORMAL activity is DX chasing. This is where I fit in; as DX becomes weaker, scarcer, and more difficult to work, I try that much harder.

Peak Conditions. During the peak of the last sunspot cycle in the late 1950's, the amateur bands were jumping with DX; and even Novices, with their simple 75-watt stations, worked 100 countries to qualify for the DX Century Club (DXCC) award. As the sunspot peak declined, so did DX conditions.

By 1961 and continuing until 1965, 10 meters was virtually extinct as a DX band, and 15 meters was not much better. In addition, 20 meters was open for DX only a few hours a day, instead of around the

No this is not the author; it's Vic Clark, W4KFC, acknowledged by most hams to be one of the world's greatest DX'ers. Vic has a dream QTH in Clifton, Va., with beam antennas about 80 feet off the deck. Besides chasing DX, W4KFC has earned a fantastic reputation as a competitive contest operator.

*Les has already worked well over 300 countries—Ed.

clock as it had been a few years earlier. During this same period, DX conditions on the lower frequency bands were good, but working DX on these bands—even under good conditions—requires a bigger and better antenna system than on the higher frequencies.

As high-frequency DX conditions deteriorated, DX men concentrated on building efficient antennas for 20, 40, and 80 meters. At W9EBQ, for example, I built a big 20-meter rotary beam and put it on a 72-foot, home-built, crank-up tower, and I erected a 400' VEE beam. With the aid of these antennas, and high-power transmitters—and hour after hour of patient listening—I worked almost as much DX under these poor conditions as I did prior to 1960.

Mediocre conditions and the intense competition for the few DX stations made it difficult for the average amateur to work more than an occasional foreign station during the sunspot low. But since the turn-around in the sunspot cycle in the fall of 1965, high-frequency DX conditions have been improving rapidly, and they should remain good well into the 1970's.

This is the ideal time to get into the DX chase. Not only do the 10- and 15-meter bands give the "DX" more room to operate, but signal strength per watt of power goes up with frequency. Thus, low-power signals on both ends of the DX circuits get through more consistently.

Like many high-power ham operators in North America, Olof Fridman, SM5RM, Stockholm, Sweden uses lots of commercially available gear. The exciter is a Collins Radio 32-S3 which drives a home-constructed linear amplifier. The receiver is also a Collins—a Model 75-S3. Olof is very active on 20, 15 and 10 meters from this fine QTH.

Don't get me wrong; even under good conditions, working DX is never as easy as teaching a duck to swim. The great fascination of it is that you can never be certain that your next call—or the next—will be answered, no matter how good an operator you are or what equipment you used. Similarly, no one can predict with any certainty that the first call by a newly licensed Novice will not be answered by a DX station 10,000 miles away .

How to Work DX. Obviously, the name of the game in DX work is competition, both with propagation conditions and with other DX'ers. The easiest way to beat both is by patient listening. If you hear a DX station when it first comes on the air, you will not have too much competition on your first call. But your signal quickly alerts other DX chasers to your find. And a full-fledged DX pile-up immediately develops.

Any DX station can create a pile-up, but the one-in-a-country stations and the DXpeditions often create pile-ups that cover several continents. Once a pile-up has started, you can spend hours calling the same DX station to no avail. You tell yourself repeatedly, "I'll call just one more time," only to find yourself making that "last" call an hour (or more) later. You light cigarettes and forget to smoke them and you shout at the cat for making so much noise. But how fast all the frustration disappears when the DX station answers you.

Unfortunately, there are always some callers who do not hear the "DX" but are calling simply because they hear others doing so. Naturally, these deaf and dumb (but not mute) callers are just as likely to call while the DX operator is transmitting as when he is listening. Their calls trigger off the Nervous Nellies, who are afraid that they have missed something, into a chain reaction of useless calls that soon prevents everyone from hearing the DX station.

This only proves that some of the best and many of the worst radio amateurs chase DX. How smoothly the whole opera-

tion goes depends almost entirely upon the skill and patience of the DX operator. One way that he can keep his frequency from being overwhelmed by calls is to listen and transmit on different frequencies. Also, good foreign DX operators, like "Buggy," 9J2AB, Zambia, Africa, suffer a peculiar kind of "deafness." If "Buggy" acknowledged callers that broke in out of turn, he would be overwhelmed by such calls. But his "malady" prevents him from ever hearing such callers, and even the most obtuse soon gets the "message."

"CQ DX." When conditions to the United States are favorable, a DX operator usually gets so many replies to his own calls that he is not too likely to answer a CQ from a United States station. As a result, calling "CQ DX" is seldom productive, although the number of "CQ" calls heard on the DX bands would certainly lead you to believe differently. And, for obvious reasons, nothing puts a DX man into the "DX Lid" category faster than to be heard calling "CQ DX" on top of a DX station or in the middle of a DX pile-up.

But by choosing spots, "CQ DX" will occasionally pay off even for the low-power operator. For example, if everyone on the band seems to be dueling for the same DX station, moving away from the pile-up and calling "CQ DX" is sometimes productive. Usually, however, you are answered by a loud "W", who covers up any DX station that might call, or someone else starts his own "CQ DX" on the same frequency.

To be honest about it, "CQ DX" works pretty good on run-of-the-mill DX if you have a better-than-average signal, but it is not very effective for digging out the rare ones.

Spreading the News. Of course, not even the most avid DX man can spend all his time combing the bands looking for DX; yet the big DX men always seem to be on the spot when something new shows up. Believe me; this is no accident. Almost as much fun as working DX is talking about it and exchanging tips about where and when to listen for it over the air, at radio club meetings, via DX club bulletins, and through DX columns in "CQ" and "QST."

Not every DX station uses high power, as shown by this photo of Javad Mesbahi, Shiraz, Iran. Javad operated EP2DM until he came to the U. S. for additional training. In Iran, Javad worked over 100 countries using a small Heathkit transmitter.

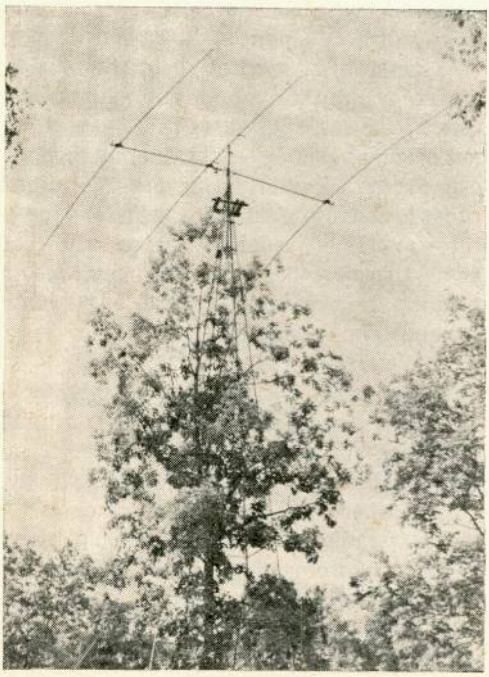
DX men alert each other to the appearance of a rare DX station by various means. One of the methods is via a 20-meter DX net. Another method is the chain-telephone call. Some DX men do not hesitate to call coast to coast to alert a buddy about a really rare one. It is rumored, by the way, that some sharpies on phone have even tried to pick up a rare country or two by long-distance phone patches.

DXpeditions. DX men are forever looking for new countries to work. After a time, however, they work practically all the countries that have regular amateur activity. This is where the DXpedition comes in. A group of radio amateurs pick out an island or country from which there is little (or no) native amateur operation. They next wangle permission from the proper licensing authority to operate from that spot on the map for a limited time. Then, they collect gear, get passports, inoculations, etc., and descend upon the chosen spot for a couple of days of concentrated, contest-type operating.

Some of these DXpeditions operate un-

der difficult conditions and at considerable danger to the operators. Dick, WOMLY, for example, ended his 8-country African DXpedition very hurriedly in July, 1962. He was operating from a second-floor room in Bamako, Mali, when he heard the natives shouting "Fumar!" Seizing his logbooks, Dick scrambled out the window to the roof of a shed and jumped to the ground. A few minutes later, the building and his equipment were completely destroyed by fire. Another example: in January, 1966, Chuck Swain, K7LMU, and Ted Thorpe, ZL2AWJ, on a DXpedition with a crew of three, were lost in a hurricane near Wallis Island in the Pacific Ocean.

On the other hand, during a DXpedition in Bhutan, Gus Browning, W4BPD, operated from the royal palace as the guest of the king. And any licensed amateur who makes prior arrangements can operate in comfort from St. Pierre Island off the east coast of Canada from the same hotel room that DXpeditioners have been using for years. Every year a couple of U.S. amateurs who want to satisfy the urge to be "DX"—to know first-hand how it feels to be the center of a pile-up, and to demonstrate to an admiring world how they would control it—take advantage of this great opportunity.



On occasion, anyone can work DX, regardless of the size of his antenna. However, consistent results require big antennas—sometimes called "antenna farms." Erected by Leonard Chertok, W3GRF, Washington, D.C., the 3-element beam shown here is about 125 feet in the air, and each element averages 70 feet in length. W3GRF chases DX with a vengeance, and has beams on 20, 15 and 10 meters.

With one or two exceptions—notably Communist Albania—practically all the inhabited countries of the world support radio amateur activity. Most recent DXpeditions have been to little islands or rocks protruding from one of the oceans which are recognized as "new countries" for DX purposes. In the United States, the DX Committee of the American Radio Relay League, Inc., determines what constitutes a country for its DX Century Club award. The basis of decision is government, tradition, geographic separation, etc. As countries come and go and governments change, the number of countries on the ARRL list changes, but currently it includes approximately 330 countries. Most other amateur societies around the world use the ARRL country list for their own DX awards.

DX Contacts for Sale? Generally speaking, DXpeditions are underwritten by a number of interested amateurs and "voluntary" contributions from the stations worked. The contributions are usually in the form of a dollar or two included with one's QSL card.

To some of us, this practice smacks of selling DX contacts and QSL cards. About a year ago, for example, one of the top DX men turned down an opportunity to help "sponsor" a world-wide DXpedition by not making the suggested $25 contribution to the cause. When he failed to work the DXpedition at one of its "rare" countries, he got the "message" and sent in his $25 contribution posthaste.

Was it poetic justice when this DX man was still unable to raise the DXpedition at its next stop although several operators heard the DXpedition operator calling him? Actually, there is no reliable evidence that any of the well-known DXpeditions have re-

fused to work anyone or to QSL a contact because that individual refused to make a contribution to the cause; nevertheless, the whole matter makes for hot discussions among DX men.

QSL Cards. To many DX men, working a new country is less than half the battle. The important thing is getting a QSL card to prove it. The QSL cards are needed to qualify for various awards, such as the ARRL's DXCC certificate mentioned earlier and similar awards sponsored by other amateur groups throughout the world.

The main requirement in obtaining a DX confirmation is to send one's own card accurately filled out to show the call letters of the station worked, the date and time (in GMT), band, and signal report, plus your own call letters, name, and address. The card may be sent to the DX station at the address shown in the foreign edition of the "Radio Amateur Call Book," or via the "QSL Manager" (if there is one), or via the station's national QSL Bureau.

The advantage of sending a DX QSL card direct or via a QSL Manager is speed. Including an addressed reply envelope with return postage (in the form of an IRC for foreign addresses) is also most helpful. If you do not provide return postage with your DX cards, the replies will arrive eventually via the U.S. and Canadian QSL Bureau.

What Good Is Chasing DX? Sooner or later, someone is almost sure to say, "I suppose that chasing DX is exciting, but does it really serve any useful purpose?" Without a doubt! DX men have the most efficient antenna systems, transmitters, and receivers—they have to in order to keep up with the competition. And, DX men are also some of the very best operators on CW in the world.

In addition, I think that DX men do more to promote international friendship than many friendship clubs. Speaking for myself, although I have stressed the competitive side of DX chasing, I most treasure the leisurely chats I have had with my friends around the world—Oliver, ZS5JY, in Africa; Uri, UA1KBW, in Leningrad; and Dave, VK2EO, in Australia; to mention a few.

Then there is John Alvarez, CR9AH, Vila Verde, Macao. I have never seen John, and I probably never will, but John is one of my best friends. When my son, George, a combat helicopter pilot in Vietnam, got a rest

You might call Lloyd Wright, VE3CFR, London, Ontario, an all-around radio ham. He goes after DX, but the certificates on his walls attest to public service as well. Visible in the shack is equipment manufactured by Heath, E. F. Johnson, National, and Sonar.

and recreation leave from the war a few months ago, John met George in Hong Kong and returned with him to Macao. There, George was a guest in John's home, where he was treated like a favorite son for the week of his visit.

North American QSL Bureaus

A majority of QSL cards from DX stations are distributed via the ARRL QSL Bureaus. To receive your cards, you must keep a supply of stamped, self-addressed "business-size" envelopes—with your call letters in the upper left-hand corner—on file with your call area QSL Manager.

W1	Providence Radio Association, W1OP, Box 2903, Providence, R.I. 02908
W2	North Jersey DX Assn., P.O. Box 505, Ridgewood, N. J. 07451
W3	Jesse Bieberman, W3KT, RD 1, Valley Hill Rd., Malvern, Pa. 19355
W4	F.A.R.C., W4AM, P.O. Box 13, Chattanooga, Tenn. 37401
W5	Hurley O. Saxon, K5QVH, P.O. Box 9915, El Paso, Texas 79989
W6	San Diego DX Club, P.O. Box 6029, San Diego, Calif. 92106
W7	Willamette Valley DX Club, Inc., P.O. Box 555, Portland, Oregon 97207
W8	Paul R. Hubbard, WA8CXY, 921 Market St., Zanesville, Ohio 43701
W9	Ray P. Birren, W9MSG, Box 519, Elmhurst, Ill. 60128
WØ	Alva A. Smith, WØDMA, 238 E. Main St., Caledonia, Minn. 55921
KP4	Joseph Gonzales, KP4YT, P.O. Box 1061, San Juan, P.R.
KH6	John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, Hawaii 96701
KL7	Alaska QSL Bureau, Star Route C, Wasilla, Alaska 99687
KZ5	Ralph E. Harvey, KZ5RV, Box 407, Balboa, Canal Zone
	CANADIAN
VE1	L. J. Fader, VE1FQ, P.O. Box 663, Halifax, N.S.
VE2	John Ravenscroft, VE2NV, 135 Thorn Crest Ave., Dorval, Quebec
VE3	R. H. Buckley, VE3UW, 20 Almont Rd., Downsview, Ontario
VE4	D. E. McVittie, VE4OX, 647 Academy Rd., Winnipeg 9, Manitoba
VE5	Fred Ward, VE5OP, 899 Connaught Ave., Moose Jaw, Saskatchewan
VE6	Karel Tettelaar, VE6AAV, Sub P.O. 55, N. Edmonton, Alberta
VE7	H. R. Hough, VE7HR, 1291 Simon Rd., Victoria, B.C.
VE8	George T. Kondo, VE8RX, c/o Dept. of Transport, P.O. Box 339, Fort Smith, N.W.T.
VO1	Ernest Ash, VO1AA, P.O. Box 6, St. John's, Newfoundland
VO2	Goose Bay Amateur Radio Club, P.O. Box 232, Goose Bay, Labrador

Making Your Own QSL Cards

Personalize Your Cards As a Spare Time Project

By Marshall Lincoln, K9KTL

IF YOU ARE a ham or SWL, and if lack of time or interest keeps you from building your own gear, you can still "personalize" your hobby with a home-brew QSL card. A personalized QSL card will arouse more than a passing interest and your percentage of QSL returns will climb. And you'll be surprised at how many operators will comment on a personalized QSL—wishing that they had your initiative.

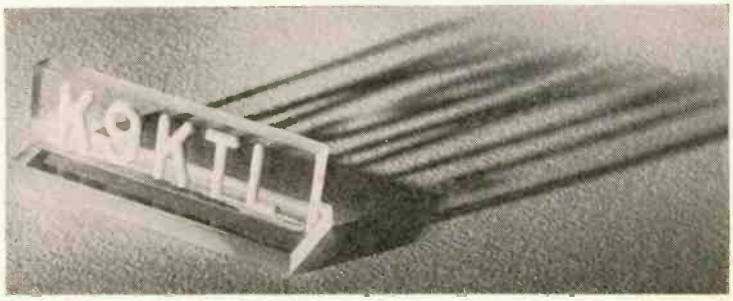
Keep It Simple. The most important thing to remember in designing your own QSL card is to keep the card simple. Avoid the temptation to squeeze in a lot of detail that may seem important to you, but will actually only clutter up the card. Think up a clever, original design, if you can, one that expresses some individuality, and keep the basic essentials in mind.

Your call letters (or SWL identifier) should be part of the basic design. It is not essential to make your name, address, and station data a part of the design. This information can always be placed on the other side of the card. However, put your report on the face of the card.

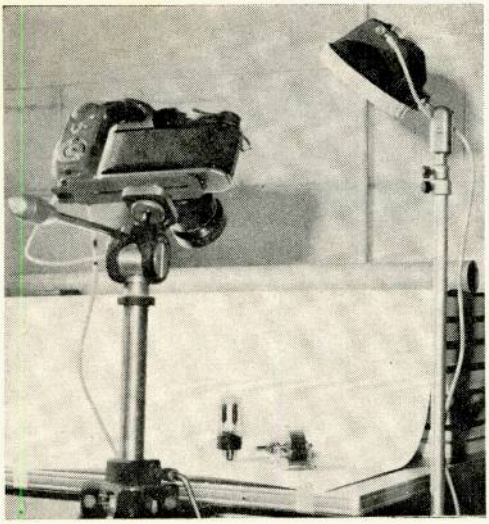
A photo of the operating position is the subject scene on many QSL cards. Such a photo will give the card recipient a clear idea of the equipment you use; but obviously, you must have a neat-looking station layout—which shows some ingenuity—before this can be an effective subject.

A clutter of wires around your operating position will look ten times as bad in a photo as it does in real life. A mass of dark, undistinguished-looking cabinets will become a dull blob in a small photo. Always bear in mind that the finished photo will be the size of a postcard. Details will not be immediately apparent and too many will only clutter up the photo, making it less interesting.

Artistic Designs. Many artistic designs—at least, artistic in the mind of the electronics experimenter—can be worked out around common radio components. A photo of your antenna against a spectacular field of fluffy clouds will make an eye-catching illustration. Your call letters could then be overprinted from a second negative, or maybe added to the original photo by making an overlay.



These plastic letters were spotlighted by a slide projector to take this unusual photograph. The background is pebbled white cardboard and is available from most artist supply stores.



Typical setup for photographing electronic components shows arrangement of camera, background and lights. The BC flash on the camera provides the main light, extension fills in shadows. Use slow film.

A set of plastic letters, such as those in advertising novelties and movie copying stands, could be used to form your call letters, which then could be photographed, or worked into a photo of electronic components. An alternative is to get a set of letters that you can photograph by clipping them from newspaper or magazine headlines. These letters can be glued to small pieces of cardboard and used as props—as shown in the photo on page 93.

Call letters could be formed by the outline of components such as resistors and capacitors and used as an illustration all by themselves. However, this one requires considerable planning since it is very easy to make the photo look cluttered rather than attractive.

Setting Up. Once you have decided on the props, arrange the background so that it will not detract from the finished photograph. If you are using miniature props, you can make a suitable background by unrolling a piece of plain wrapping paper. Then, arrange your props on the paper and study them through the camera viewfinder to find the most pleasant arrangement. Always work slowly and carefully at this stage. A few minutes of extra effort will pay off in the end. Quite often, a tiny detail overlooked in a hasty shooting session will mar the photo and make it necessary to do the whole job over at a later date.

When arranging the props, remember that the proportions you want are those of a standard postcard—3¼" x 5½". You can make your card an odd size or shape to attract attention, but it will probably seldom wind up in the recipient's display or card file, because it simply won't fit in with most of the other cards he receives. This is one time when conformity will pay off.

Camera Tips. The type of lighting used in making your photo will depend on the subject matter and effect desired. If you need a spotlight effect to bring out detail or emphasize shadows, an ordinary flashgun with a deep reflector may give the effect you want, but a regular photographic spotlight will always be best.

An inexpensive compromise is a slide projector. Without a slide in the carrier, a projector will throw a fairly concentrated beam of light at close range. Be careful not to tilt the projector from its normal horizontal position, however, since a projector bulb is very fragile, and the filament will sag and break if a projector is set at an acute angle.

Exposure will be partly a matter of cut-and-try. If floodlights (or any "steady" light sources) are used, an exposure meter can be employed to measure the incident or reflected light. The exposure for flashbulbs and speedlights can be estimated from the published guide numbers. However, when working so close to your subject, you may find the flash guide numbers so high that, even with slow film, you will be unable to stop down the lens. The lighting can be decreased by putting a handkerchief over the flash, or using a filter over the lens.

Once you have a negative that suits your purpose, all that remains is to make a few hundred prints! The number depends on how many QSL cards you expect to send. Whenever you run out, an evening in the "darkroom" will provide you with another big batch of cards.

The data concerning time, frequency,

(Continued on page 97)

Single Sideband Turns Gold

AMATEUR RADIO

SSB Is Nearly As Old As Radio Communications

By Irv Strauber, K2HEA/4

IN THE FIELD of wireless radio, whose time in our society is measured by a brief 65 years, it may come as a rude shock to realize that what most of us think of as a new form of voice communications has already celebrated its Golden Anniversary!

Single sideband—new in application but old in concept—has quietly revolutionized everyday voice communications. Now the dependable mainstay of our global Air Force, proven in point-to-point around-the-world commercial use and rapidly "moving in" on the marine frequencies, single sideband (SSB) is playing an increasing role in shrinking the size of our earth.

What Is Single Sideband? The technique of SSB, or single-sideband suppressed-carrier, as it was called in its earlier days, is not new. It began as an experiment conducted by H. P. Arnold some 50 years ago at the Naval Radio Station in Arlington, Virginia. His experiments showed that when audio modulation was added to a radio frequency carrier, two sidebands were produced—one higher in frequency and one lower in frequency than the carrier wave. It was found that both of the sidebands contained all of the signal elements necessary to reproduce the information being broadcast. In the first practical test outside the laboratory, an antenna at the Naval Station was tuned up and only one sideband was transmitted. The first SSB signal went out over the air back in 1915.

In the years that followed, arguments were presented by many theoreticians who maintained that AM sidebands were imaginary. They were refuted by a dramatic transatlantic SSB radiotelephone demonstration in 1923, which conclusively proved that such a thing as SSB did really exist and did work.

Later, John R. Carson, of the American Telephone and Telegraph Company, reached the important conclusion that is the basis for SSB as we know it today:

> The two sidebands contain identical information and are mirror images of each other. And, of the intelligence radiated by the antenna, the greatest amount of power is contained in the carrier.

It was further proved by Carson that the carrier contained no useful information and simply served as a reference point for the sidebands. Carson developed an electronic circuit called a "balanced modulator" which canceled out the carrier but left the sidebands intact. Patents were secured on this system as early as 1923. Using SSB, AT&T established communications over a transatlantic circuit in 1927.

Amateur radio operators began to take an interest in SSB in 1933 when Bob Moore, W6DEI, built and operated a SSB transmitter. He described his rig in "R-9" magazine and encouraged a few pioneers to emulate his move, leading to a handful of "quacking ducks" on the ham bands in mid-1934. However, there was little further action in ham-band SSB technology until 1947.

War-time electronic research had made vast improvements in the stability of receivers and transmitters and this re-

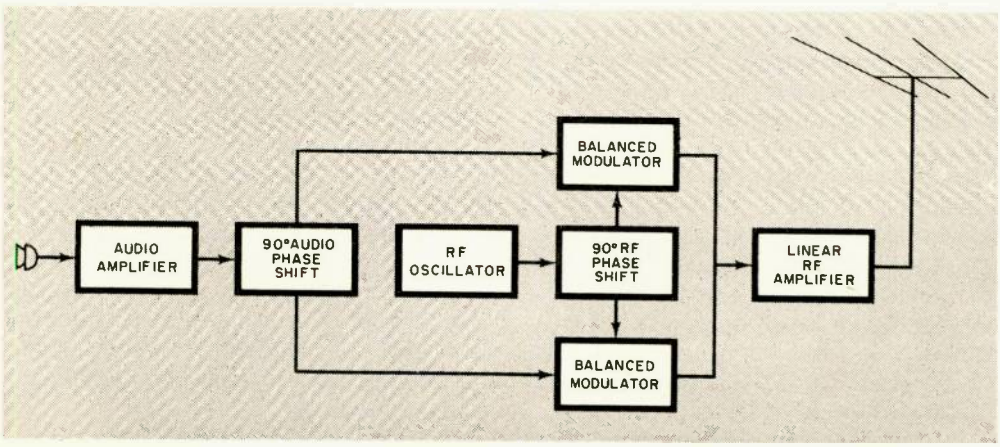
kindled an interest in experimenting with SSB operation. In September, 1947, O. G. Villard, Jr., W6QYT, began operating from W6YX using SSB on the 75-meter phone band. He found W6VQD ready and waiting for him. In October of the same year, a 20-meter SSB QSO was conducted between W6YX and WONWF—much to the amazement of hundreds of listening hams who found that by simply inserting a carrier with the aid of their BFO's, they could actually copy these strange sounds. From this point on, SSB was off and running, and has shown no sign of slackening its pace.

How It's Done. Single sideband for amateurs began with the phasing method of sideband generation developed by Don Norgaard, W2KUJ, for use in his famous "SSB Junior" transmitter. The phasing scheme depends upon two 90° phase shift circuits: one in the r.f. carrier generator and the other in the audio amplifier, as well as two balanced modulators.

Each of the modulators receives one of two audio signals, and one of the two "carriers." In each modulator, the circuits are so arranged as to balance out (cancel) the carrier but not the sidebands (both upper and lower) that are generated in the presence of an audio signal. In other words, there is no output from the modulators when there is no audio signal.

The sum total effect of these 90° phase shifts (one after the oscillator, one the audio) creates a 0° phase difference for one set of sidebands and a 180° phase difference for the other set of sidebands when the signals from both modulators are combined in another stage. The additive effect of all this is to cancel out the uppers, for example, and double the lowers. So all that is left in this instance are the lower sidebands—the carriers never get past the modulators. Should you want to work the upper sideband instead of the lower sideband, simply flip the phase of the audio signal to either one of the demodulators by 180°. This can be as simple as reversing a transformer's leads.

It seems strange that although crystal filters were used for many years to increase the selectivity of communications receivers, their application to SSB generation did not come about until after the phasing method had been developed. In the crystal filter lattice-method circuit, the r.f. signal from the balanced modulator (which is a double-sideband suppressed-carrier signal) is fed into the crystal filter to remove or suppress the unwanted sideband. If the signal is carefully adjusted to the operating characteristics of the filter, only the wanted sideband will pass through the filter. A latter-day improvement is to use a mechanical filter in place of the crystal lattice.



This simplified diagram shows the generation of a single-sideband radio signal. Text above describes the purpose of the phase-shifting networks and balanced modulators.

Talk Power. Limited by FCC Regulations to one kilowatt of input power, radio hams spent years looking for a means of increasing the effectiveness of their signals within the scope of the Regulations. SSB presented this opportunity because, with it, effective output power can be increased while the same legal input power is maintained.

An AM transmitter pours most of its available power output into the carrier. If the unmodulated AM carrier represents 100 watts of power, the instantaneous PEAK output power for a sine-wave signal is approximately 400 watts. It is interesting to note that the AVERAGE power of the modulated signal is only 1½ times the power of the unmodulated signal. This 50% increase in power output is in both sidebands—each sideband actually has only one-quarter of the unmodulated power output.

The receiver must also be taken into consideration when measuring transmitting effectiveness. Each AM sideband is a "mirror image" of the other, containing identical voice information spanning, say, about 3 kHz on either side of the carrier frequency. With a receiver whose bandwidth is 6 kHz, the sidebands are additive and contribute to the total received "talk power." With a more selective receiver, the bandpass can be cut, in this instance, to 3 kHz without affecting the intelligibility. In this receiver, only one sideband would be contributing to the "talk power." Therefore, the conventional 100-watt AM transmitter provides "talk power" equivalent to only 25 watts and the rest of the transmitted power is wasted.

It has been shown that the AM carrier is used only to provide a reference for the receiver's second detector, and the intelligence is carried in the sidebands. If the reference is furnished by the receiver (carrier reinsertion), the receiver functions just as effectively. Thus, the carrier is not needed to transmit a voice signal, and it can be suppressed at the transmitter without losing transmission effectiveness or signal intelligibility. But, while we are getting rid of the carrier, why not also eliminate one of the sidebands? For maximum efficiency and effectiveness, the "mirror sideband" can be readily eliminated and all of the available power can be put into the one intelligence-carrying sideband. The power amplifier that produces 100 watts of carrier would now produce what amounts to one 100-watt sideband.

Theoretically, we should be able to reach 400 watts of peak power, but there are a few differences in the circuitry between the AM transmitter and the SSB transmitter, so that we can actually only get a practical power output of about 250 watts. When you compare this 250 watts of SSB "talk power" with the 25 watts of AM signal power as received on a highly selective receiver, you come up with a power gain ratio of 10 dB.

Summing Up. It should now be apparent that if we use a highly selective receiver with a built-in carrier reinsertion capability, a 25-watt peak output single-sideband transmitter will provide as much talk power as a 100-watt AM transmitter. Although SSB exciters—because of the complexity of the circuitry involved—are more expensive than their AM counterparts, the cost is much less per watt at the higher input power levels than for a comparable AM transmitter.

In today's crowded ham bands, it is easy to see why hams have shifted so rapidly to the use of SSB. Their signals are much more readable than they were 20 years ago and the elimination of bulky, expensive, electronic components has permitted the development of transceivers of small physical size in relation to power output.

(Continued from page 94)

signal report, etc., can be typed on the back of your QSL card when it is addressed for mailing, or blanks for filling in this information can be printed on the back if you take the finished photographic cards to a commercial printer. If you are very careful, you may even get a satisfactory imprint with a rubber stamp.

Shakespeare

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WONDERSHAFT

fiberglass CB antennas offer:

- **protection from weather**
- **ease of installation**
- **low background noise**
- **proven performance**

THE 10-3

WHIP

(MOBILE)

The 10-3's Dilectric loading packs full quarter wave efficiency into just 96". This handsome, efficient antenna stays erect at road speeds, reducing noises.

"I am using a WonderShaft Whip on my car after using steel whips. The WonderShaft out-performs the best of them" . . . Carroll W. Powell, Mexico, Maine (KMA 4533).

. . . owners are up in the clouds . . .

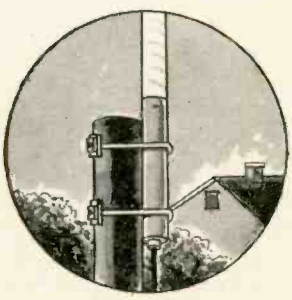
THE 176

"BIG STICK"

(BASE)

The BIG STICK 176 is an excellent CB 18'6" — 27.1 mc fiberglass WONDERSHAFT antenna . . . all directions coverage . . . minimum of dead spots . . . no ground radials . . . independent of mounting location.

Paul Crouch (Crouch TV) Newark, Ohio says . . . "*A Shakespeare 176 BIG STICK, using identical heights, locations and radios outplayed a _____ antenna forty hilly miles away into a tough location. I think Long Rangers are the best antennas.*"



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CIRCLE NO. 7 ON READER SERVICE CARD

Citizens Radio Service Explosion

CB

Getting To Know The In's And Out's Of CB

By Matt P. Spinello, KHC2060

FROM THE HANDFUL of CB licensees spread across the country in 1958 to the 900,000 CB'ers now licensed to operate nearly four million transceivers, Citizens Band radio has become the largest and most populous of the two-way radio communications services. License applications once processed by hand are now fed into a Univac III computer, the only method able to cope with the new license application rate of 15,000 to 20,000 per month. As a communications service offering the general public a short-range (5-20 miles), low-cost ($100-$300) means of two-way radio for business and/or personal communications, CB has surpassed all expectations in growth, technical advancements, and operational applications in just eight years.

As a business tool, CB radio has become a new method of cutting costs, speeding service to customers, and increasing profits. Users have found CB radio a reliable, low-cost method of dispatching service vehicles, giving drivers more territory to cover, and adding greater flexibility. Personal users of the service who originally purchased equipment for radio contacts between their automobiles and homes, were quick to realize a multitude of applications in the areas of public service and emergency assistance.

Hundreds of CB clubs located throughout the country offer assistance to any CB equipped vehicle within calling range. Several National CB associations have begun programs to blanket the country with emergency CB two-way radio networks, and a number of manufacturers, highway safety groups, and industry have begun work on plans to aid the en-route motorist.

It would be next to impossible to sum-

The Citizens Radio Service has enabled willing private citizens to perform services that they could not perform before due to lack of communications facilities. A case in point was this setup during a telethon for a children's rehabilitation program. CB'ers were directed by Wally Rader, KIC5723, and Pete Russell, KIC-1734, to pick up pledges at the donors' homes or offices. Nearly $3000 was collected by the members of the Western New York Pioneer CB Association.

marize the useful applications of CB radio, considering the great number of individual and collective requirements which the service has been fulfilling. One thing is certain: the eight-year growth period of the Citizens Radio Service, from a use and technical development standpoint, has made CB radio one of the most exciting communications developments in this decade. Now we have communications for the average citizen that involves no great outlay of cash and virtually no technical "know-how."

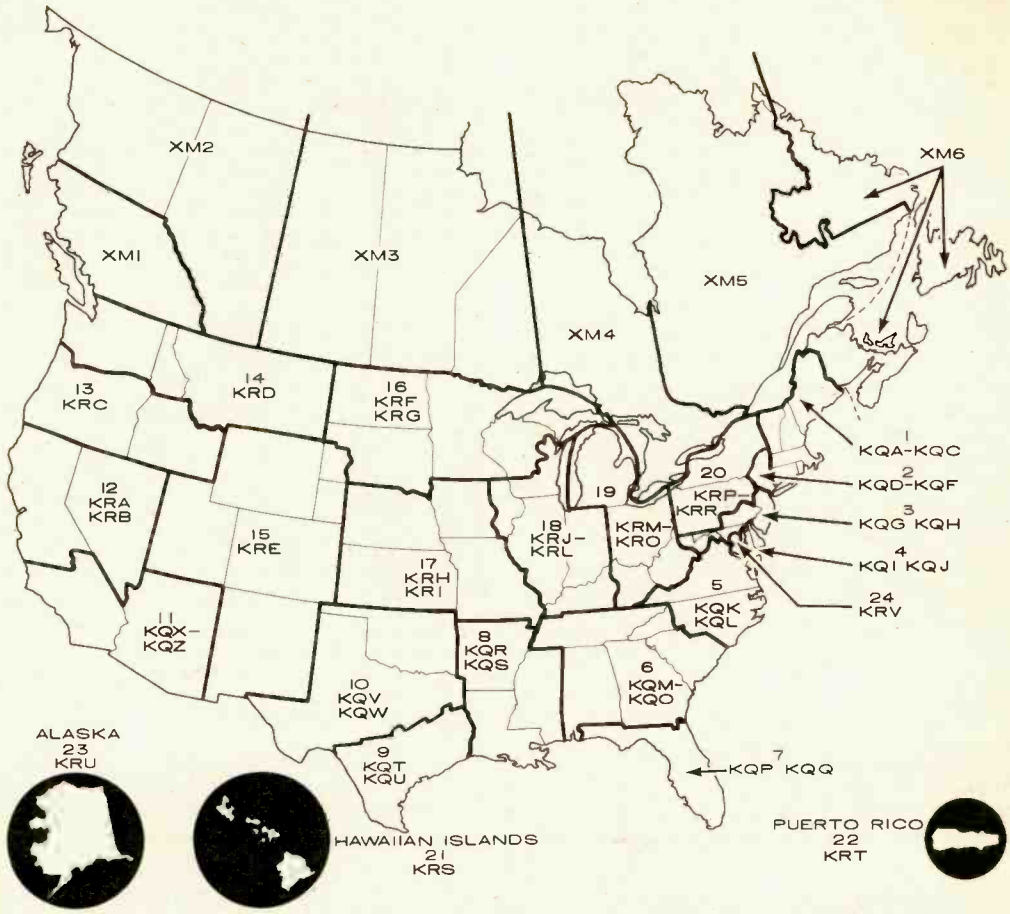
Various Uses of CB Radio. In addition to personal uses, CB is employed by practically every type of business and municipal agency which has a need for two-way radio communications. Farmers, doctors, police and fire departments, taxicab drivers, veterinarians, and marina, service station, and motel operators—all have a particular need for CB radio. Moreover, the same equipment used for business is compatible with equipment used in the home or in private vehicles.

A businessman using CB radio to dispatch a fleet of service trucks will find it useful to have a transceiver in his automobile to keep in touch with the office, or to communicate with any one or all of his service vehicles. And with CB equipment installed in his home, he can be reached by his office, his trucks, or his family.

The same businessman may also find it convenient to take two or more CB units on vacation or on hunting trips. A temporary base station installed in a lake cottage can keep the occupants in touch with Junior out on the lake with the 100-horse cruiser, or with hunters in the woods carrying CB walkie-talkies.

Citizens Band radio permits the family, employees, and other responsible persons the licensee may delegate to communicate within the network of equipment he has installed into his individual system. Uses are limited only to a person's imagination, as long as his brainstorms are within the permissible applications of the Rules and Regulations set forth by the FCC.

CIRCLE NO. 16 ON READER SERVICE CARD →



Call-signs for assignment to CB'ers in 1967 will bear prefixes ranging from KQA through KRV. Different prefixes are issued each year to new CB applicants. Canadian call-signs XM1 to XM6 remain the same.

CB Radio Today. A CB licensee may use as few as two CB transceivers: a base and a mobile unit. On a larger scale, CB licensees may have as many as 200 mobile units in contact with a base station directing a search for a lost child or an escaped convict, or aiding disaster victims following floods, tornadoes, or earthquakes. In addition, CB radio can tie together a network of communications between a mobile unit, base station, and a CB-equipped boat. Water-going vessels can communicate with home, other boats, the yacht club, marina, etc. CB'ers can inquire as to weather conditions, call for help, and even make reservations at CB-equipped hotels, restaurants, and repair stations. And CB radio costs far less than a marine radiotelephone installation and requires a smaller antenna.

A CB transceiver used in aircraft has its own advantages: it can be installed quickly, give a 100- to 150-mile range from altitudes of 5000 to 10,000 feet, and provide the convenience of a direct radio link to home or office. Modern, compact, solid-state equipment makes CB a natural two-way radio addition to aircraft radio, and most units meet FAA requirements.

Rules and Regulations. All Citizens Radio Service applicants are required to read and understand the Federal Communications Commission's Part 95, the Citizens Radio Service Rules and Regulations, BEFORE being licensed. Licensees are also required to maintain a current copy of Part 95 by subscription.

The Rules can be purchased by sending

$1.25 to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Future rule changes and information sheets are forwarded to the subscriber until notice of expiration is received from the FCC, at which time the licensee must renew his subscription.

Eligibility. The FCC states that the Citizens Radio Service is intended for personal or business short-distance radio communications. Any citizen of the United States who is 18 or more years of age can obtain a station license in this service if his application meets the requirements of Part 95.

Partnerships, associations, trusts, or corporations meeting the citizenship requirements of the Communications Act of 1934, such as special police groups and rescue squads, and including any state, territorial, or government entity, can also be licensed in this service, as can any organization or association—including Civil Defense and Civil Air Patrol organizations—operating by the authority of such government entities.

CB has offered the businessman a low-cost method of radio communications. This E. F. Johnson equipment is shown being used at the Charles Machine Works, Perry, Okla. The plant supervisor carries a portable and on the fork lift is a "Messenger I".

CB Channel Assignments

Channel Number	Frequency (MHz)	USE
1	26.965	Voice, same licensee only
2	26.975	" " " "
3	26.985	" " " "
Brown (24)	26.995	R/C & walkie-talkies
4	27.005	Voice, same licensee only
5	27.015	" " " "
6	27.025	" " " "
7	27.035	" " " "
Red (25)	27.045	R/C & walkie-talkies
8	27.055	Voice, same licensee only
9	27.065	Voice, any CB licensee
10	27.075	" " " "
11	27.085	" " " "
Orange (26)	27.095	R/C & walkie-talkies
12	27.105	Voice, any CB licensee
13	27.115	" " " "
14	27.125	" " " "
15	27.135	Voice, same licensee only
Yellow (27)	27.145	R/C & walkie-talkies
16	27.155	Voice, same licensee only
17	27.165	" " " "
18	27.175	" " " "
19	27.185	" " " "
Green (28)	27.195	R/C & walkie-talkies
20	27.205	Voice, same licensee only
21	27.215	" " " "
22	27.225	" " " "
A	27.235	Business Radio only (HELP?)
B	27.245	" " " (HELP?)
23, Blue (C)	27.255	Voice, any CB licensee, also R/C & walkie-talkies, also Business Radio
D	27.265	Business Radio only
E	27.275	" " "

Restrictions. Citizens Radio stations may not be used for any purpose contrary to any law, or for broadcasting to the public in any way, or for unnecessary or frivolous communications. Also, they may not be used as links in the communications circuits of other radio services.

No charge can be made for messages relayed by CB stations, or for the use of licensed equipment by persons other than the licensee. The licensee is responsible for the operation of stations licensed to him. Citizens Band stations may not be used for hobby communications, nor may a licensee of the Citizens Radio Service communicate with "CB" stations beyond a range of 150 miles.

The Class "D" Service. Of the four classes of service available in the Citizens Radio Service, each is intended for a par-

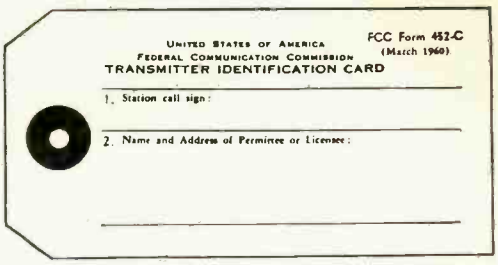
ticular purpose and is assigned a particular frequency band. Equipment for the Class D service is operated on 11 meters with a user's choice of 23 separate channels from 26.965 to 27.255 MHz. Five watts input (four watts output) is the maximum power allowable.

Class D stations may communicate over distances of a few yards to 150 miles. Signal range is dependent upon terrain, type of equipment and location of the antenna. Mobile-to-mobile range may vary from 5 to 40 miles; and fixed-location-to-fixed-location range from 25 to 75 miles.

Specific-Purpose Channels. Thousands of CB'ers across the country, as well as a number of state-wide and national CB associations, have suggested that specific CB channels be used for specific purposes.

Channel 9 is usually accepted as the "National Calling and Emergency Channel." This means that many CB'ers monitor ("listen to") channel 9 when not otherwise occupied. Some licensees contact their mobiles on channel 9, and then both switch to an unused channel to conduct their business. Thus, the only conversation on channel 9 involves a brief calling period, and the channel is clear for others.

There are definite advantages to using a channel in this manner, especially on a national basis. The more users monitoring the channel, the better the chance for an emergency caller to receive help from any one of hundreds of CB'ers within range. Also, using the channel strictly for calling


UNITED STATES OF AMERICA
FEDERAL COMMUNICATION COMMISSION
FCC Form 452-C
(March 1960)
TRANSMITTER IDENTIFICATION CARD
1. Station call sign:
2. Name and Address of Permittee or Licensee:

This identification tag should be attached to each CB transceiver. Patterned after FCC Form 452-C, it is supplied by manufacturers with their equipment.

and emergency transmissions eliminates having to listen to conversations by others that do not involve those monitoring the channel. Channel 9 is one of the few channels where interstation communications is possible.

In many parts of the country channel 13 is used by non-commercial pleasure boats. As an accepted "water-going" channel, it puts boaters in touch with one another and with their individual shore stations and mobile units on the road. Shoreline CB'ers have also taken on the responsibility of monitoring the waterways for distress calls on channel 13.

Channel 22 is generally used by Civil Defense groups employing the aid of CB'ers during emergency situations such as floods, searches for missing persons, and traffic control at community events. However, CB'ers working with these agencies in time of emergency may not use their own call-signs, but are given temporary use of Civil Defense call-signs.

The channels listed above are generally accepted by most CB'ers across the country. Channel selection, however, varies in different parts of the country. Many CB clubs have posted signs on main highways leading into the cities in which they operate, to indicate which is monitored in the area as an aid to travelers. If you're in doubt, and in trouble, start with channel 9 and work from there.

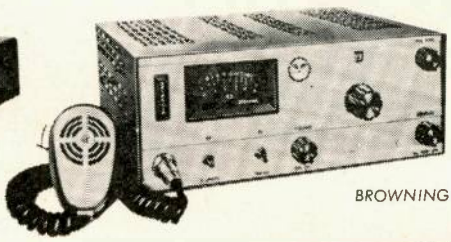
As CB continues to grow, each new station brings the concept of a national CB emergency network closer into view—a network that would be of invaluable assistance during a national crisis. Such a system worked out on a voluntary basis from community to community could serve to aid local, area, or national authorities during times of emergency. But, meanwhile, if you are a small businessman, a fleet truck user, or a farmer, a doctor, lawyer or just plain citizen, with a need for radio communications, either personal or business, you should investigate the possibilities and advantages of Citizens Band Radio, a service that has become—in less than a decade—the largest, most useful two-way radio facility in the history of communications.

CB Equipment Photo Gallery

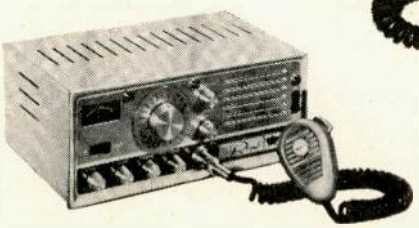
ALLIED RADIO "SAFARI III"

B & K "COBRA V"

AMPHENOL "725"



BROWNING "RAVEN"



e.c.i. "COURIER ROYALE"

EICO "SENTINEL-PRO"

HALLICRAFTERS CB-19

HEATHKIT GW-14

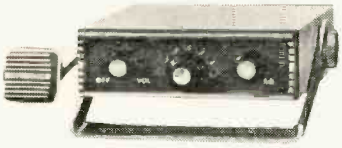
INTERNATIONAL MO-23

E. F. JOHNSON "MESSENGER 350"

LAFAYETTE HB-444/25A

MULTI-ELMAC "CITI-FONE II"

PACE "PLUS 23"

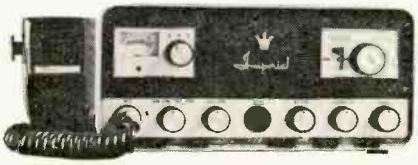


POLYTRONICS "POLY PUP"

PEARCE-SIMPSON "DIRECTOR"

RAYTHEON "TWR-ELEVEN"

SQUIRES-SANDERS "SSS"



REGENCY "IMPERIAL"

TEXAS "RANGER"

TRAM "TITAN"

1967 5-Watt CB Transceiver Sampler

This is a "Quick-Scan" Table itemizing the principal characteristics of those Citizens Radio Service (CB) transceivers which meet the 5-watt input requirements of Part 95 of the FCC Rules and Regulations.

Type of Signal: Although the overwhelming majority of CB transceivers broadcast a straight amplitude-modulated (AM) signal, several models reduce the strength of the carrier and pack slightly more power into the sidebands—which contain the all-important modulation components. The latter signals are referred to in the Table starting on the next page as "DSB" (double-sideband with reduced carrier). Several manufacturers are offering a single-sideband suppressed-carrier transceiver and the emission is referred to as "SSB."

No. of Transmitting Channels: All Class D stations have permission to operate on any one of 23 channels in the CB 11-meter band. Transmission must be crystal-controlled and the tolerances of the crystals must be better than 0.005% in frequency deviation. Although most transceivers are driven directly by crystals that resonate at one-half or one-third the transmitted frequency, a system of frequency synthesis is quite common. This system permits generation of all 23 channels through the use of from 6 to 10 crystals.

No. of Xtal Receive Channels. A majority of CB transceivers incorporate some crystal-control receiving channels—although alternative "spotting" methods are just as satisfactory, if not as convenient. Transceivers with frequency synthesis automatically provide the identical number of transmitting and receiving channels—all crystal-controlled. If the numeral in this column is followed by a "plus" sign and the "Notes" column contains the figure "5," the transceiver has an additional transmitting crystal socket on the front panel.

Tunable Receiver: A means of keeping the cost of a CB transceiver down while adding convenience is to make the receiver tunable (rather than crystal-controlled) with a modest number of crystal-controlled transmitting channels. This arrangement permits cross-channel operation when the base and mobile are transmitting and receiving on different channels. In this column of the Table below, the frequency synthesis transceivers are all considered to have tunable receivers, although strictly speaking the circuitry is crystal-controlled. Bandspread tuning of a receiver with this circuitry is limited and is generally crystal-controlled—meaning that the i.f. channel can be tuned 2.5 kHz above or 2.5 kHz below the nominal channel frequency. In some transceivers such tuning has been given the name "Delta." Unless otherwise indicated, the reader may assume that some sort of "bandspread" tuning has been included in the frequency-synthesis circuit.

Power Supply: In this Table the household a.c. line voltage has been "standardized" at 117 volts. Various manufacturers use 110, 115, or 117 volts in their literature, but we have stuck with the latter since it is closer to the true line voltage throughout most of North America. Many transceivers have circuitry permitting operation from 12-volt automobile batteries, and many can be powered from 6-volt batteries. In the Table, the expression "and" means that the transceiver contains some sort of universal power supply permitting operation from any of the input voltages shown. The expression "or" means that the transceiver contains one power supply and that the supply itself be changed to switch from base station (117 volts) to mobile (12 or 6 volts).

Receiver: There are ony two types of receiver circuits now appearing in CB transceivers. They are related and are either straight superheterodynes, or double (sometimes called "dual") conversion superhets. The latter is generally much more selective and able to cope with interference from adjacent channels or other CB'ers with transceivers operating within one-quarter to one-half mile away. Attention should be paid to the possibility that a simple superhet circuit may include a crystal or mechanical filter to provide selectivity comparable to that of a double superhet.

Circuit: Transceivers can use all "Tubes" or some tubes and some transistors—"Hybrid." A unit with transistors and diodes only is called "Solid-State."

Notes: A detailed breakdown of the coding numerals for this column appears on page 112. These numerals refer to specialized features that are not common to all CB transceivers.

Price: No attempt has been made to differentiate between so-called "list" prices and the usual CB'er "net" prices in the Table. Many manufacturers supplied list prices for inclusion in this Buyer's Guide, leaving the discounting of price to the individual dealer and purchaser. Readers are urged to shop around and compare prices after selecting transceivers that best suit their individual requirements. The letter K identifies the transceiver as being a kit. If the price is immediately followed by a second price, assume that the second price is that of a comparable wired unit.

OLIVER P. FERRELL

Manufacturer	Model	Type of Signal	No. of Transmit Channels	No. of Receive Channels	Tunable Receiver	Power Supply (Volts)	Receiver	Circuit	Notes	Price
Allied Radio Corp. 100 N. Western Ave. Chicago, Ill. 60680	C-540	AM	1	0	yes	117 and 12	superhet	tubes	5	$ 49.95 (K)
	C-560	AM	6	6	yes	117 and 12	superhet	tubes	3,4,7,11	$ 89.95 (K)
	Safari I	AM	23	23	yes	117 and 12	double superhet	tubes	3,7,8,9	$129.95 (K)
	Safari II	AM	5	5	no	12	superhet	solid-state	10,11	$ 59.95 (K)
	Safari III	AM	23	23	yes	12	superhet	solid-state	7,10,11	$ 84.50 (K)
	KN-2520	AM	5	5	no	12	superhet	solid-state	10,11	$ 74.75
	KN-2522	AM	23	23	yes	12	superhet	solid-state	7,10,11	$ 99.95
	KN-2565B	AM	23	23	yes	117 and 12	double superhet	tubes	1,2,3,7,8	$169.95
	KN-2590	AM	8	8	yes	117	superhet	tubes	4,5,7,14	$ 69.95
Amphenol Corporation 2875 S. 25th Ave. Broadview, Ill. 60153	510-B	AM	8	8	yes	117 and 12	superhet	solid-state	10	$199.95
	625	AM	10	10	no	117 and 12	superhet	solid-state	10,11	$189.95
	650	AM	10	10	yes	117 and 12	double superhet	solid-state	3,4,7,8,11	$219.95
B & K Mfg. Co. 1801 W. Belle Plaine Chicago, Ill. 60613	Cobra V	AM	5	5	no	12	superhet	solid-state	11	$ 99.95
	CAM 88	AM	23	23	yes	117 and 12	double superhet	tubes	1,2,3,7,8	$214.95
Browning Labs., Inc. 1269 Union Ave. Laconia, N. H. 03246	Eagle	AM	23	23	yes	117	double superhet	tubes	2,4,7,8,9	$359.00
	Raven	AM	23	23	yes	12	double superhet	tubes	2,3,7,8,9	$269.00
Burstein-Applebee Co. 1012 McGee St. Kansas City, Mo. 64106	BA-8	AM	7	7	yes	117 and 12	superhet	tubes	2,4,5,7,11	$ 79.95
	BA-23	AM	23	23	yes	117 and 12	double superhet	tubes	4,5,7,8,11	$109.95
Demco Electronics Bristol, Ind. 46507	Chalet	AM	6	6	no	12	superhet	solid-state	10,11	$124.50
	Ravelle	AM	6	6	yes	117 and 12	superhet	tubes	3,7,11,12	$124.50
	Satelite	AM	23	23	yes	117 and 12	superhet	tubes	1,2,7,8,9,13	$395.00

Manufacturer	Model	Type of Signal	No. of Transmit Channels	No. of Receive Channels	Tunable Receiver	Power Supply (Volts)	Receiver	Circuit	Notes	Price
e.c.i. Electronics Communications, Inc. 56 Hamilton Ave. White Plains, N.Y. 10601	TR-5	AM	5	5	no	12	superhet	solid-state	n.a.	$ 99.00
	TR-12	AM	12	12	no	12	superhet	solid-state	1,2,7	$139.00
	Courier 23	AM	23	23	yes	117 and 12	double superhet	tubes	1,3,7,8	$169.00
	Courier 23S	AM	23	23	yes	12	superhet	solid-state	1,2,3	$169.00
	Courier Royale	AM	23	23	yes	117 and 12	double superhet	tubes	1,2,3,7,8,9	$249.00
EICO Electronic Instrument Co., Inc. 131-01 39 Ave. Flushing, N.Y. 11352	Sentinel 12	AM	12	12	yes	117 and 12	superhet	tubes	3,4,7,8,11,14	$ 99.95
	Sentinel Pro	AM	23	23	yes	117 and 12	double superhet	tubes	1,2,3,7,8	$169.95
General Radiotelephone Co. 3501 W. Burbank Blvd. Burbank, Calif. 91505	MC-7	AM	23	23	no	117,12 and 6	double superhet	tubes	1,2,3,6,7,8,12,15	$199.50
	SB-72	SSB/AM	23	23	yes	117 and 12	double superhet	tubes	1,2,3,6,7,8,12,16	$399.50
	Super MC-8	AM	23	23	no	117 and 12	double superhet	tubes	1,2,3,6,7,8,12,15	$199.50
	VS-6	AM	5	5	no	117 and 12	superhet	tubes	3,6,11,12,15	$ 99.50
Hallicrafters 5th & Kostner Ave. Chicago, Ill. 60624	CB-12	AM	12	12	no	12	double superhet	solid-state	3,6,10,11,12	$179.95
	CB-14	AM	23	23	yes	12	double superhet	solid-state	1,3,6,7,8,10,12	$259.95
	CB-17	AM	6	6	no	117 and 12	superhet	tubes	10,11	$ 99.95
	CB-19	AM	8	8	yes	117 and 12	double superhet	tubes	4,7,8,11	$149.95
	CB-20	AM	5	5	no	12	superhet	solid-state	10,11	$ 99.95
Heath Company Benton Harbor, Mich. 49023	GW-12A	AM	1	1	no	117	superhet	tubes	10	$ 34.95 (K)
	GW-14	AM	23	23	no	12	superhet	solid-state	7,8,10,11	$ 89.95 (K) $124.95
	GW-22A	AM	5	5	no	117	superhet	tubes	10	$ 47.95 (K)
	MW-34	AM	5	5	yes	117,12 and 6	superhet	tubes	4,5,7,8,11	$ 84.95 (K)

International Crystal Mfg. Co., Inc. **18 N. Lee** **Oklahoma City, Okla. 73102**	MO-23	AM	23	23	no	12	double superhet	hybrid	1,2,17	$245.00
E. F. Johnson Company **Waseca, Minn.**	Messenger	AM	5	5	no	117 and 12	superhet	tubes	6,10,11	$ 99.95
	Messenger II	AM	10	10	yes	117 and 12	superhet	tubes	6,10,11	$149.95
	Messenger III	AM	11	11	no	12	double superhet	solid-state	2,6,10,11	$189.95
	Messenger 100	AM	5	5	no	12	superhet	solid-state	2,6,10,11	$129.95
	Messenger 350	SSB	4	4	yes	12	superhet	solid-state	3,6,10,11,12,16	$299.95
Kaar Electronics Corp. **2250 Charleston Rd.** **Mountain View, Calif. 94041**	D333B	AM	8	8	yes	117 and 12	superhet	tubes	5,6,9,10,11	$229.95
	Mark II	AM	23	23	yes	117 and 12	double superhet	solid-state	1,6,7,8	$219.95
	Skylark 336	AM	11	11	no	n.a.	n.a.	n.a.	n.a.	$179.95
Lafayette Radio Electronics Corp. **111 Jericho Tnpk.** **Syosset L.I., N.Y. 11791**	HB-444/25A	AM	23	23	yes	117 and 6	double superhet	tubes	1,2,3,6,7,8,9,12,14	$179.95
	HB-525	AM	23	23	yes	12	double superhet	solid-state	1,2,3,6,10,12	$149.95
	HB-555	AM	12	12	no	12	double superhet	solid-state	6,10,11,12	$ 99.95
	HB-600	AM	23	23	yes	117 and 12	double superhet	solid-state	1,2,3,6,7,8,12,22	$219.95
	HE-20T	AM	12	12	yes	117 and 12	superhet	solid-state	3,7,8,11,12	$ 89.95
	Comstat 9	AM	9	9	yes	117 and 12	superhet	tubes	5,10,11,14	$ 59.95 (K)
	Comstat 19	AM	9	9	yes	117	superhet	tubes	5,10,11,14	$ 69.95
	Comstat 25	AM	23	23	yes	117 and 12	double superhet	tubes	1,3,6,7,8,12	$139.95
	Dyna-Com 5	AM	3	3	no	Battery	superhet	solid-state	11,18	$ 99.95
Midland International Corp. **1909 Vernon St.** **N. Kansas City, Mo. 64116**	13-150	AM	8	8	no	12	superhet	solid-state	8,11	$124.95
Multi-Elmac Co. **21470 Coolidge** **Oak Park, Mich. 48237**	Citi-Fone II	AM	2	2	yes	12	superhet	solid-state	19	$ 49.95
	Citi-Fone 99	AM	8	8	no	117 and 12	superhet	tubes	7,8,11	$ 99.95
	Citi-Fone SS	AM	23	23	yes	117 and 12	superhet	tubes	1,7,8	$169.50

Manufacturer	Model	Type of Signal	No. of Transmit Channels	No. of Receive Channels	Tunable Receiver	Power Supply (Volts)	Receiver	Circuit	Notes	Price
Olson Electronics, Inc. 260 S. Forge St. Akron, Ohio 44308	CB-8	AM	8	8	no	12	superhet	solid-state	11	$ 70.00
	CB-12	AM	12	12	no	12	superhet	solid-state	3,11	$ 80.00
	Side-Bander II	DSB	23	23	yes	117 and 12	double superhet	tubes	1,7,8,12	$189.98
	Spotter 23	AM	23	23	yes	117 and 12	double superhet	tubes	2,7,8	$109.98
Pace Communications Corp. 24049 S. Frampton Ave. Harbor City, Calif. 90710	Pace I	AM	6	6	no	12	double superhet	solid-state	10,11	$129.00
	Pace II	AM	12	12	no	12	double superhet	solid-state	3,10,11,12	$169.00
	Pace II-S	AM	12	12	no	12	double superhet	solid-state	3,7,8,10,11,12	$179.00
	Plus-23	AM	23	23	no	12	double superhet	solid-state	3,7,8,10,12	$199.00
	5000	AM	6	6	no	12	double superhet	solid-state	10,11	$250.00
Pearce-Simpson, Inc. Box 800 Biscayne Annex Miami, Fla. 33152	Companion III	AM	6	6	no	12	superhet	solid-state	3,11,12	$139.90
	Director	AM	23	23	no	12	double superhet	solid-state	1	$299.90
	Escort II	AM	11	11	no	12	double superhet	solid-state	20	$239.90
	Guardian 23	AM	23	23	no	117 and 12	double superhet	tubes	1,7,8,9	$269.90
	Sentry	AM	6	6	no	12	superhet	hybrid	11	$ 99.90
Polytronics Labs. Inc. 900 Burlington Ave. Silver Spring, Md. 20910	Poly Comm 23	AM	23	23	yes	117 and 12	double superhet	tubes	1,3,6,7,8,9,10,12	$299.50
	Poly Comm 30	AM	23	23	yes	117 and 12	double superhet	tubes	1,3,6,7,8,9,10,12,14	$329.50
	Poly Pup	AM	7	7	no	12	superhet	solid-state	10,11	$149.50

Radio Corporation of America Harrison, N.J. 07029	Mark VIII	AM	9	9	yes	117	superhet	tubes	10,11	$ 99.95
	Mark Nine	AM	9	9	yes	117	superhet	tubes	4,7,8,10,11,12	$114.50
	Mark 10	AM	12	12	no	12	double superhet	solid-state	3,7,8,10,11,12	$189.95
Radio Shack Corp. 730 Commonwealth Ave. Boston, Mass. 02215	Americana-23	AM	23	23	yes	117 and 12	double superhet	tubes	1,2,3,7,8,12	$169.95
	TRC-14	AM	8	8	no	12	superhet	solid-state	11	$ 79.95
	TRC-15	AM	12	12	no	12	superhet	solid-state	3,11	$ 99.95
Raytheon Company 213 E. Grand Ave. S. San Francisco, Calif. 02173	TWR-7	AM	5	5	no	12	superhet	solid-state	3,11	$129.95
	TWR-9	AM	6	6	no	117	superhet	solid-state	11,21	$ 99.95
	TWR-11T	AM	10	10	yes	12	superhet	solid-state	3,6,10,11,12	$169.95
Regency Electronics, Inc. 7900 Pendleton Pike Indianapolis, Ind. 46226	Bronco	AM	8	8	no	12	superhet	solid-state	11	$ 89.95
	Charger	AM	12	12	no	12	superhet	solid-state	11	$110.00
	Imperial	SSB/AM	23	23	yes	117 and 12	double superhet	tubes	1,7,8,16	$299.00
	Mustang II	AM	8	8	yes	117	superhet	tubes	2,5,7,8,11	$ 89.95
	Pacer II	AM	11	11	yes	117 and 12	superhet	tubes	2,4,5,8,9	$110.00
	Range Gain II	DSB	23	23	yes	117 and 12	double superhet	tubes	1,7,8,12	$235.00
	Ranger	AM	11	11	no	12	superhet	solid-state	3,11,12	$175.00
Sonar Radio Corp. 73 Wortman Ave. Brooklyn, N.Y. 11207	Model E	AM	8	8	yes	117 and 12	superhet	tubes	6,10,11,12	$179.50
	Model FS-23	AM	23	23	yes	117 and 12	double superhet	tubes	1,6,7,8,9,10,12	$299.95
	Model G	AM	8	8	yes	117 and 12	double superhet	tubes	4,6,7,8,10,11,12	$229.50
	Model H	AM	8	8	no	117 and 12	superhet	tubes	6,10,11,12	$159.95
Squires-Sanders, Inc. Martinsville Rd. Millington, N.J. 07946	"23'er"	AM	23	23	no	12	superhet	solid-state	1,10,12,22	$235.00
	S5S	AM	5	5	no	12	superhet	solid-state	1,10,12,22	$185.00

Manufacturer	Model	Type of Signal	No. of Transmit Channels	No. of Receive Channels	Tunable Receiver	Power Supply (Volts)	Receiver	Circuit	Notes	Price
Texas Communications Inc. 1601 W. Broad Way Lubbock, Texas 79401	Ranger	AM	4	4	no	117 and 12	double superhet	solid-state	n.a.	$189.95
	Ranger 23	AM	23	23	no	117 and 12	double superhet	solid-state	n.a.	n.a.
	Ranger II	AM	12	12	no	117 and 12	superhet	solid-state	2,3,10,11,12	$159.95
Tram Electronics, Inc. Lower Bay Rd. Box 187 Winnisquam, N. H. 03289	Titan	AM	23	1	yes	117	double superhet	tubes	2,4,7,8,10,12,15	$434.00
	XL-100	AM	23	23	yes	12	double superhet	tubes	1,2,7,8,10,12	$318.00
Utica Corporation 2917 W. Irving Park Rd. Chicago, Ill. 60618	T & C III	AM	23	23	yes SSB	117 and 12	double superhet	tubes	2,3,7,8,12,16	$259.95
World Radio Labs. 3415 W. Broadway Council Bluffs, Iowa 51504	Rustler	AM	8	7	yes	117 and 12	superhet	tubes	2,7,8,11	$ 79.95

NOTES

1—Incorporates frequency synthesis circuitry
2—Transmitter circuitry includes a system of speech clipping or modulation percentage boosting
3—Can be switched to "Public Address" from front panel
4—Unit has a "Spotting" switch on front panel
5—Unit has a transmit crystal socket on front panel
6—Transceiver has socket connections to use manufacturer's selective calling system
7—Meter on front panel reads "S-units"
8—Meter on front panel reads approximate power output
9—Receiver features low-noise Nuvistor front end
10—This description fits basic unit—see manufacturer's catalog for numerous optional accessories
11—Transceiver requires 2 extra crystals per channel
12—Rear skirt provision for remote speaker (paging)
13—Transceiver features dual antenna (switched) connections
14—Transceiver has power switching to reduce transmitter input to 100 milliwatts
15—Receiver features front panel r.f. sensitivity switch or control
16—Transceiver may be tuned to either sideband for SSB mode of operation
17—Main body of transceiver is mounted in trunk and operated from driver's position by remote control
18—Walkie-talkie
19—Transceiver feeds received signal to car radio; no complete receiver in this package
20—Requires only 1 crystal per controlled channel (transmit/receive)
21—Doubles as wired intercom system
22—Receiver features i.f. noise blanking

Getting Your CB License

CB

Save Time and Money By Carefully Filing Your Application

By Peggy Ploger, KLJ8033

APPLYING for a Class D Citizens Band station license is painless and simple as long as you are careful in answering each step of the Application Form 505 correctly and truthfully. The form itself is as official as it appears, but not half as involved as it might seem.

A station license must be obtained from the Federal Communications Commission in order to set up a CB communications system unless you intend to work only with 100-milliwatt walkie-talkies. However, such low power units may not be employed in a licensed CB system unless they have been included in the total number of "transmitters" requested in your application.

Your station license call-sign will appear on your license as issued by the FCC. Your particular call will be good for five years, unless you find a need for more "transmitters" in your CB system than were requested in the original application. This is why it is important to include the total number of transceivers you feel you might be using during the five-year period, including walkie-talkies or portable units.

The maximum number of "transmitters" that a individual CB'er can apply for without "explanation" is six—including his own base station. A business may apply for 12 and be requested to explain the necessity for 13 or more "transmitters." The FCC is not too strict on this point, but does expect reasonableness.

If you should change your address within the five-year period, you are required to notify the FCC of the change. This can be handled by sending a postcard giving your call-sign, name (as it appears on the CB license), and the old and new addresses, including the zip code of the new address. This information should be mailed to: Federal Communications Commission, 334 York St., Gettysburg, Pa. 17325. Your call-sign will remain the same for the rest of the five-year license period.

Filling Out Form 505. The current CB license form accepted for a new, renewed or modified license is FCC Form 505, June 1965.* The form is available from the FCC, Washington, D.C., and it is usually packaged with new CB equipment. Many CB dealers and distributors keep a supply on hand, available for the asking. This same form is used to modify an existing license (increase the number of transmitters, transfer control of licensee corporation, etc.). If a license is lost, a duplicate can be obtained from the FCC by applying for it on Form 505, attaching a statement as to how the original was lost.

All Class D station license applications must be accompanied by a check or money order for $8 made payable to the Federal Communications Commission.

A step-by-step procedure is given below to help the CB applicant complete the necessary paper work. The item numbers match those on a typical Form 505. The top sheet of your Form 505 should be overprinted in large red letters "WORK SHEET." The FCC has included this sheet

*Avoid using any FCC Form 505 other than that dated June 1965. Though forms from 1963 to 1965 are legal, some wording has been changed and the most recent form is your safest bet.

FCC FORM 505
JUNE 1965

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

FORM APPROVED
BUDGET BUREAU NO. 52-R123.12

APPLICATION FOR CLASS B, C, OR D STATION LICENSE IN THE CITIZENS RADIO SERVICE

DO NOT WRITE IN THIS BLOCK

1. Application for Class A station license must be filed on FCC FORM 400.
2. Complete on typewriter or print clearly.
3. Be sure application is signed and dated. *Mail* application to Federal Communications Commission, Gettysburg, Pa., 17325.
4. Enclose $8 fee with application. DO NOT SUBMIT CASH. Make check or money order payable to Federal Communications Commission. The fee will not be refunded even if the application is not granted. Also, fee overpayments of $2 or less will not be refunded. (No fee is required for an application filed by a governmental entity.)

1 NAME OF APPLICANT

BUSINESS NAME (IF ANY) OR, IF APPLYING ONLY AS AN INDIVIDUAL, GIVE LAST NAME

FIRST NAME (IF AN INDIVIDUAL) | MIDDLE INITIAL

2 IF AN INDIVIDUAL OPERATING UNDER A TRADE NAME, GIVE INDIVIDUAL NAME OR IF PARTNERSHIP, LIST NAMES OF PARTNERS (*Do not repeat any name used in item 1*)

LAST NAMES	FIRST NAMES	MIDDLE INITIAL

3 PERMANENT MAILING ADDRESS

NUMBER AND STREET

CITY | STATE

ZIP CODE | COUNTY

4 CLASSIFICATION OF APPLICANT (*See instructions*)

☐ INDIVIDUAL ☐ ASSOCIATION ☐ GOVERNMENTAL ENTITY
☐ INDIVIDUAL/DBA ☐ CORPORATION ☐ OTHER (*Specify*):
☐ BUSINESS PARTNERSHIP

5 CLASS OF STATION (*Check only one*) (*See Instructions*)

☐ CLASS B ☐ CLASS C ☐ CLASS D

6 IS THIS APPLICATION TO MODIFY OR RENEW AN EXISTING STATION LICENSE?

☐ YES (*Give call sign*): ☐ NO

IF YES, EXPLAIN UNDER REMARKS

7 DO YOU NOW HOLD ANY STATION LICENSE, OTHER THAN THAT COVERED BY ITEM 6, OF THE SAME CLASS AS THAT REQUESTED BY THIS APPLICATION? (*See instructions*)

☐ YES ☐ NO

IF YES, FURNISH CALL SIGN(S)

8 TOTAL NUMBER OF TRANSMITTERS TO BE AUTHORIZED UNDER REQUESTED STATION LICENSE

(*Number*)

EXPLANATION MAY BE REQUIRED. SEE INSTRUCTIONS.

		YES	NO
9	DOES EACH TRANSMITTER TO BE OPERATED APPEAR ON THE COMMISSION'S "RADIO EQUIPMENT LIST, PART C," OR, IF FOR CLASS C OR CLASS D STATIONS, IS IT CRYSTAL CONTROLLED? (*If no, attach detailed description; see subpart C of Part 95*)		
10	A. WILL APPLICANT OWN ALL THE RADIO EQUIPMENT? (*If no, answer B and C below*)		
	B. NAME OF OWNER		
	C. IS THE APPLICANT A PARTY TO A WRITTEN LEASE OR OTHER AGREEMENT UNDER WHICH THE OWNERSHIP OR CONTROL WILL BE EXERCISED IN THE SAME MANNER AS IF THE EQUIPMENT WERE OWNED BY THE APPLICANT?		
11	HAS APPLICANT READ AND UNDERSTOOD THE PROVISIONS OF PART 95, SUBPART D, DEALING WITH PERMISSIBLE COMMUNICATIONS FOR WHICH THIS CLASS OF STATION MAY BE USED?		
12	IF THE STATION IS TO BE USED FOR VOICE COMMUNICATION, DOES APPLICANT CERTIFY THAT IT WILL NOT BE USED EITHER FOR COMMUNICATION OVER A DISTANCE EXCEEDING 150 MILES, OR FOR THE EXCHANGE OF CHIT-CHAT, IDLE CONVERSATION, DISCUSSION OF EQUIPMENT, OR HOBBY-TYPE COMMUNICATIONS?		
13	WILL ANY PERSON, OTHER THAN (1) THE APPLICANT, (2) MEMBERS OF HIS IMMEDIATE FAMILY LIVING IN THE SAME HOUSEHOLD, OR (3) HIS EMPLOYEES, OPERATE THE STATION? (*If yes, attach a separate sheet listing the names and relationship of all such persons and give a detailed reason for their operation of your station*)		
14	IF APPLICANT IS AN INDIVIDUAL OR A PARTNERSHIP, ARE YOU OR ANY OF THE PARTNERS AN ALIEN? (*If the answer is yes, do not file this application because you are not eligible for a license*)		
15	IS APPLICANT THE REPRESENTATIVE OF ANY ALIEN OR ANY FOREIGN GOVERNMENT? (*If yes, explain fully*)		
16	WITHIN 10 YEARS PREVIOUS TO THE DATE OF THIS APPLICATION, HAS THE APPLICANT OR ANY PARTY TO THIS APPLICATION BEEN CONVICTED IN A FEDERAL, STATE, OR LOCAL COURT OF ANY CRIME FOR WHICH THE PENALTY IMPOSED WAS A FINE OF $500 OR MORE OR AN IMPRISONMENT OF 6 MONTHS OR MORE? **IF YES, SEE INSTRUCTIONS.**		
17	IF APPLICANT IS AN INDIVIDUAL OR A PARTNERSHIP, ARE YOU OR ANY PARTNER LESS THAN 18 YEARS OF AGE (LESS THAN 12 YEARS OF AGE IF FOR CLASS C STATION LICENSE)? (*If the answer is yes, do not file this application. Persons under 18 are not eligible for a Class B or Class D license and persons under 12 are not eligible for a Class C license*)		

18 **IF ITEM 3 SHOWS A P.O. BOX OR RFD NUMBER, GIVE A DEFINITE LOCATION WHERE THE LICENSEE OR THE STATION MAY BE FOUND.** (*DO NOT GIVE POST OFFICE BOX OR RFD NUMBER.*)

NUMBER AND STREET

CITY | STATE

IF LOCATION CANNOT BE SPECIFIED BY STREET, CITY, AND STATE, GIVE OTHER DESCRIPTION OF LOCATION

DO NOT WRITE IN THIS BOX

SCREENING ☐ Y ☐ N

SIGNATURE ☐ Y ☐ N

SIGN AND DATE THE APPLICATION ON REVERSE SIDE

19. IF APPLICANT IS A NONGOVERNMENTAL CORPORATION, ANSWER THE FOLLOWING ITEMS		YES	NO
A	IS CORPORATION ORGANIZED UNDER LAWS OF ANY FOREIGN GOVERNMENT? (*If yes, do not file the application because you are not eligible for a station license*)		
B	IS ANY OFFICER OR DIRECTOR OF THE CORPORATION AN ALIEN? (*If yes, do not file the application because you are not eligible for a station license*)		
C	IS MORE THAN ONE-FIFTH OF THE CAPITAL STOCK EITHER OWNED OF RECORD OR MAY IT BE VOTED BY ALIENS OR THEIR REPRESENTATIVES, OR BY A FOREIGN GOVERNMENT OR REPRESENTATIVE THEREOF OR BY ANY CORPORATION ORGANIZED UNDER THE LAWS OF A FOREIGN COUNTRY? (*If yes, do not file the application because you are not eligible for a station license*)		

20. IF APPLICANT IS AN UNINCORPORATED ASSOCIATION, ANSWER THE FOLLOWING ITEMS		YES	NO
A	IS ANY OFFICER OR DIRECTOR OF THE ASSOCIATION AN ALIEN? (*If yes, do not file the application because you are not eligible for a station license*)		
B	ARE MORE THAN ONE-FIFTH OF THE VOTING MEMBERS OF THE ASSOCIATION ALIENS OR REPRESENTATIVES OF ALIENS, FOREIGN GOVERNMENTS OR REPRESENTATIVES THEREOF, OR CORPORATIONS ORGANIZED UNDER THE LAWS OF A FOREIGN COUNTRY? (*If yes, do not file the application because you are not eligible for a station license*)		

so that your actual application will be correct and can be processed without difficulty. Fill in the work sheet (in pencil) first, check all the answers, then transfer (in ink) the correct answers to the actual application.

ITEM 1. Insert your business name or legal last name here. (If the license is for business purposes, print in the firm name.) On the second line, enter your first name and middle initial. Married women should use their own names (i.e., Julie Jones, not Mrs. John Jones.)

ITEM 2. If you will be operating under a trade name, you should enter your own name here; or, if in a partnership, you must list the names of your partners in the spaces provided. (Do not repeat any name used in Item 1.)

ITEM 3. Insert your mailing address in this box. If you are doubtful as to the county in which you live, you can phone any local or state government office for the correct information.

ITEM 4. Place an X in the appropriate box.

ITEM 5. Place an X in the box labeled "Class D."

ITEM 6. If you are applying for a CB station license for the first time, put an X in the box labeled "NO." If you are reapplying for a license because you have moved, are adding more units to your system, or if your present license has expired, put an X in the box labeled "YES" and enter your present call-sign on the line below.

ITEM 7. If this is your first request for licensing, place an X in the box labeled "NO."

ITEM 8. Enter the number of "transmitters" you expect to use in your CB system. Two units make a complete two-way radio system; if you plan to add additional equipment to your facilities before your five-year license expires, you should include these in the number to be authorized at this time. Reapplying for the use of more "transmitters" after a license has been issued will require an additional $8 fee. Note the limitation as to number.

ITEM 9. Most CB'ers purchase equipment approved by the FCC for Class D operation, so mark the box labeled "YES" with an X. If you are in doubt, ask your supplier—he should know!

ITEM 10. In almost all cases, you will either own or plan to purchase CB transceivers—mark the box labeled "YES." If you will not own the equipment (it could be leased), you must fill in items "B" and "C" below the question.

ITEM 11. Here the FCC wants to know that you have read and understood the provisions of Part 95 of the Rules concerning the permissible communications for which you will be using your station. You must have a copy of Part 95 in your possession before operating your CB station.

ITEM 12. This question asks you to "certify" that you will be operating your CB system in accordance with the Rules set forth in Part 95.

ITEM 13. If persons other than your immediate family or employees will be operating your equipment, you must list their names and relationships on a separate sheet of paper with a detailed reason for their operation of your station.

ITEM 14. Answer this question with a "NO" unless you are (or, if a partnership, one of your partners is) an alien.

ITEM 15. This question is answered with a "NO" also, or you must give a detailed explanation on another sheet.

ITEM 16. Give an "appropriate" answer here. If your answer is "YES," you must also answer the three lengthy questions asked under this item which are con-

Classes of the Citizens Radio Service

CLASS	FREQUENCY RANGE	POWER INPUT	USE
A	462.55-463.20 MHz 464.75-466.45 MHz (48 channels)	60 watts	voice or control
B	Same as above, but any frequency (no channels)	5 watts	voice or control
C	26.995-27.255 MHz 72.08-75.64 MHz (10 channels)	5 watts (30 watts on 27.255 MHz; 1 watt on 72-75 MHz)	control
D	26.965-27.225 MHz and 27.255 MHz (23 channels)	5 watts	voice

tained in the FCC's "Specific Instructions" sheet attached to Form 505.

ITEM 17. Your answer here must be a truthful "NO" to be eligible for a CB station license.

ITEM 18. If the location from which you will be operating your base station is different from your mailing address, you must enter the station address on these lines.

ITEMS 19 and 20. These need only be answered if applicable. If either of these items pertains to you, take your time in answering them, and if there is any doubt in your mind as to how they should be answered, consult an attorney.

Finally, the FCC asks that you attest to seven statements listed on the bottom of the form by signing on the signature line, dating the form, and checking one last box applicable to your position in applying for a license. Read the statements, understand them, and approve of them before signing.

Now check over all your answers on the work sheet. When you are sure they're correct, transfer this information to the actual application form. Be sure to sign the application when it is completed. No signature, errors, or omissions will necessitate the return of your application by the FCC, without your license! Moreover, you will have to submit an additional $8 fee with your corrected or reapplied application. Mail the form with your check or money order to the Federal Communications Commission, Gettysburg, Pa. 17325.

You will also find an order blank for Volume VI, Part 95 of the Rules & Regulations, attached to your application form. If you do not have a copy, put your name and address on this form and mail it to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 with a check or money order for $1.25. With this subscription, you will receive the current FCC Rules & Regulations for CB and, automatically, all subsequent additions, changes, or corrections.

While You're Waiting. As the waiting time for issuance of a CB license is only three weeks, it is NOT worth taking the chance of jeopardizing the privilege you are requesting by using your transmitter before receiving your call-sign.

When you receive your license, post it near your base station where it can be examined by the proper authorities if the occasion should ever arise. FCC Form 452-C (transmitter identification card) or a photocopy of your license should be attached to each mobile unit you will be using under your call-sign. These baggage tags are included with most units manufactured. Additional tags are available from any FCC field office.

Now you're but half a step from being "on the air." In the brief interim period of waiting for your call-sign to be issued, it's a good idea to review your station setup. Check out your installation from the microphone to the antenna on the roof. Be sure your mobile unit is securely mounted and that all connections from the antenna to the CB unit are solid.

Installing Your CB System

CB

You Can Get a Two-Way System Working In a Few Hours

By John Francis, KHD4785

INSTALLING a Citizens Band two-way radio system is relatively easy, but the installation should be planned in advance to insure the most efficient use of the system. Proper physical location of the transceivers is of prime importance to both base and mobile stations.

A base transceiver is usually installed near the telephone so that messages can be relayed from one facility to the other with no time loss. With the telephone located across the room from the transceiver, a CB call could be interrupted by the telephone, or vice versa, involving jaunts from one communication setup to the other. Also, having to interrupt a CB call to handle a telephone call for any length of time ties up the channel.

Mobile installations should be planned with the safety of the driver in mind. The CB transceiver should be conveniently located in relation to the driver's position, but not obstruct his view of the road or hamper his use of any controls.

Basically, CB systems can be installed in the home or office, in a truck or auto, or even in a cabin cruiser, with little effort, and in about the same amount of time it might take to install a TV receiver. No technical knowledge is necessary since the equipment has been aligned at the factory. It requires only mounting, a proper voltage source, and plugging in the antenna.

Base Station Installation. Since the woman of the house is usually the base station operator at home, it is most convenient to install the base unit in the kitchen. The dwindling size of transistorized gear enables many units to take up just a small corner of the kitchen counter. Where space is at a premium, some CB'ers use

Typical CB mobile installation fulfills all requirements mentioned in the text. This driver found he could conveniently mount his Pearce-Simpson Escort II transceiver under the dash panel of his Chevrolet Impala. The coiled cord mike is a must in all mobile ham/CB installations.

a mobile mounting bracket to suspend the unit under an overhanging cupboard, in much the same way that a mobile unit hangs under the dashboard of a car.

Office or business base stations are more often installed on a secretary's desk, or where someone will be within hearing distance of incoming calls. In factory applications it is appropriate to have the equipment near the switchboard operator, who can handle incoming calls and relay information within the building. A warehouse system involved with dispatching trucks on the road, or in-plant vehicles, would be more efficient on the head foreman's desk, or near the main telephone line in the area.

Before mounting the antenna on the base station roof, it is wise to consider (when there is a choice) where the lead-in wire will enter the building, and then mount the antenna where the shortest length of wire will be needed from the roof to the unit.

Besides grounding the antenna mast, be sure that the transceiver itself is grounded. This will not only contribute to personal safety, but may well save your equipment if lightning should strike your antenna. Also, although it may not add measurably to your signal, it could aid in atmospheric noise reduction.

Mobile Installation. The most practical place for the transceiver in all vehicular installations is under the dash, as close to the driver as possible. But care must be taken to keep both the unit and the mike cable clear of the gas pedal. Mounting the transceiver under the dash puts the controls within reach of both the driver and a passenger.

If the glove compartment is centrally located, there is a chance that the holes (or slots) in the transceiver's mounting bracket will match those used to hold the compartment door-hinge in place. In many cases the same screws will hold the bracket and the compartment door; if they will not, holes can be drilled under the dash to hold the bracket.

Power connections for a mobile unit are usually clearly marked by the manufacturer, or color-coded to coincide with instructions supplied with the equipment. The "hot" lead should be connected to the ignition switch "accessory" terminal so that all power to the equipment will be killed when the vehicle's engine is turned off. However, this type of connection may produce a loss of power (if you use tube-type rigs) due to the increased load through the ignition switch.

For best possible performance, power connections can be run directly to the battery terminals or fuse block. The only obvious precaution with this arrangement is to remember to turn the unit off when leaving the vehicle. A mobile unit powered with an automobile's power supply will be of little value in calling for help with a dead battery.*

Boat Installations. Since there is less equipment and control apparatus aboard most boats than in automobiles, there is normally much more room for mounting two-way radio gear "aboard ship." The decision on where to locate the gear usually hinges on convenience. Generally, the equipment will be bulkhead- or dash-mounted near the wheel, so that it will not be accessible to salt spray or moisture of any kind.

The power source is of prime importance in choosing equipment to be used on a boat. The choice of a power supply for the transceiver will depend on whether the boat is equipped with a 6-, 12-, or 32-volt battery; a 117-volt a.c. generator; or no power source at all. Equipment is manufactured to match any of these power requirements. There are a number of fully transistorized CB units being marketed which operate from 117-volt a.c., 12-volt d.c., or self-contained battery pack sources. For smaller craft without power facilities, lightweight, transistorized equipment can be used on board, carried ashore and used in the field on its own supply, or taken into the home and used on a.c. power.

*More details on installation of CB transceivers can be found in the ELECTRONICS INSTALLATION & SERVICING HANDBOOK, 1967 Edition, now on sale at your favorite newsstand.

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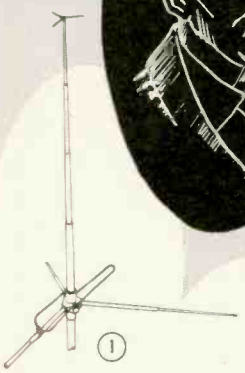
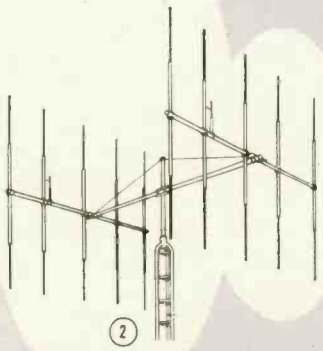


Consider the Devant Special (fig. 1). Features a 10" radial Top Hat for additional goin. This base station antenna is so lightweight you can mount it yourself. Radiates well in all directions. Priced $32.59.



Point your signal where you want it with New Stack'it beams (fig. 2). Stacked beams are available in kit form. Include beams and all parts - - coax yoke, boom and hardware. Purchase for nearly ½ the previous cost of stocking Mosley beams.

STACK'IT 3 (3-el.) KIT: $80.25
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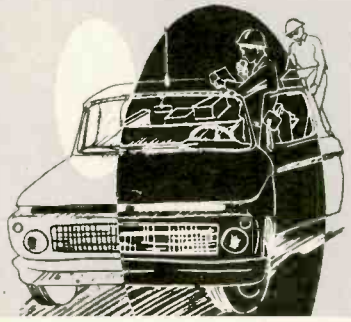
STACK'IT 5 (5-el.) KIT: $109.95

Going mobile? How about a 17" Demon DA-27 (fig. 3)? It's a 'Devil of a Performer'! Only $13.19.

Here's a popular mobile antenna - - - the Deputy DP-27 (fig. 4). Measures 43 ¾". Only $17.59.

Install this one quickly - - the New 3' long Cadet SUC-1 (fig. 5). Incorporates a rubber suction cup for instant installation. Eliminates hole drilling. Operates without a ground on all surfaces, Ideal for REACT and HELP use. Install on cars, boats, campers. Only $22.92. Model PER-1 Cadet (fig. 6) is similar to SUC-1, but is designed for permanent installation. Only $26.66.



Would you believe? Mosley offers you all these CB antennas - - and more! See for yourself! Send for Free 1967 CB catalog (# 113).

Mosley *Electronics, Inc.*
4610 NORTH LINDBERGH BLVD.
BRIDGETON, MISSOURI 63042

CIRCLE NO. 17 ON READER SERVICE CARD

CB Operating Procedures

CB

Improve Your Operating Habits With These Hints

Matt P. Spinello, KHC2060

IT IS not necessary to muster the commanding voice of a network radio announcer to effectively communicate via the Citizens Band. Moreover, no technical knowledge is required to operate the equipment. These two features, in addition to the low cost of establishing and maintaining a CB system, render the service a useful and practical means of two-way radio communications. To effectively operate such a system, however, a few practical operating procedures will pay off immeasurably.

Placing a Call. Speaking distinctly and clearly into the microphone while engaged in two-way conversations over the air has its rewards. When calling a mobile unit, for example, there's a good chance the driver will be more concerned with manning his vehicle than listening to his CB rig. Also, if he is located a great distance from the calling base station, the signal may be weak. It therefore is important to make the call CLEARLY. Clarity also pays off in calling a base station from the mobile since the base station operator may have turned the volume low to keep party-line calls on the same channel from interfering with his other activities.

The following example is representative of the type of calls transmitted by thousands of CB'ers across the nation. The method and procedure is practically standardized.

BASE STATION: "KHA3794, KHA3794 base to mobile. Over."

MOBILE STATION: "This is KHA3794 mobile. Over."

BASE: "What is your present location? Over."

MOBILE: "I'm just passing the 200 block on Fifth Avenue. Over."

BASE: "Did you pick up Johnny at the furniture store? Over."

MOBILE: "Yes, I did. Over."

BASE: "Mike called and is finished with his piano lesson. Can you pick him up on your way home? Over."

MOBILE: "Okay, will do. Over."

BASE: "Also, please call me by telephone before you head in. Over."

MOBILE: "Okay. Over."

BASE: "KHA3794 base, out and clear."

MOBILE: "KHA3494 mobile, out and clear."

In this example, a mother is obviously assigning her husband the task of rounding up their children before he heads home. In addition, she has a message for him that should not be handled over the air and so has asked him to telephone. The housewife has saved time and travel by reaching her mobile unit before it returned to the base station. And since the transmissions were made on a preselected channel monitored by both the base and mobile units in the system, the messages were easily delivered.

The "10-Code." Although the conversation in the example above is short and to the point, it can be trimmed even more by making use of the POPULAR ELECTRONICS

The CB rig you can't kill.

This is Courier's 23-channel TR-23S—the most reliable solid-state CB rig ever built. So reliable, it's GUARANTEED FOR 10 YEARS! With transmitter silicon-transistors manufactured to a higher peak voltage than ever before, plus new zener diode protection. A compact 5¾" W x 6¼" D x 1⅞" H. **Crystals supplied for all 23 channels.** Complete with microphone. Illuminated S meter. Illuminated channel selector. PA system. Auxiliary speaker jack. Single-knob tuning. Modulation indicator. DC cord. Exclusive Courier "Safety Circuit" to protect against mismatched antenna, incorrect polarity and overload. **Just $169, complete!**

See it at your Courier dealer, or mail coupon for full data.

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A Subsidiary of
electronics communications inc.
56 Hamilton Avenue, White Plains, N.Y.

Yes! I'd like to know all about the Courier TR-23S –the CB rig you can't kill.

Name_____

Address_____

City_____ **County**_____ **State**_____ **Zip**_____

CH-67

"10-Code." This method is highly effective when radio traffic is heavy, or when a detailed, lengthy message may tie up the channel for a long period of time. It is even more effective when a mobile unit is near the end of the transmitting/receiving range and where numbers can be more readily understood than individual words or long sentences.

Here is the same message incorporating the POPULAR ELECTRONICS 10-Code:

BASE STATION: "KHA3794, KHA3794 base to mobile. Over."
MOBILE STATION: "This is KHA3794 mobile. Over."
BASE: "What is your 10-20?"
MOBILE: "200 Fifth Avenue."
BASE: "Did you 10-25 Johnny?"
MOBILE: "10-4."
BASE: "Mike is 10-24. Can you 10-22?"
MOBILE: "10-4."
BASE: "10-21 me before 10-19."
MOBILE: "10-4."
BASE: "KHA3794 base, 10-10."
MOBILE: "KHA3794 mobile, 10-10."

Note that use of the 10-Code can cut transmission time nearly in half. When you first use the code it may take just as long to transmit as a fully spoken message. But as you gain familiarity with the basic numbers, the 10-Code will soon become as automatic as the English language. And use of the code will expedite message handling, thus clearing the channel for others.

For quick reference, it is a good idea to post a copy of the 10-Code near the transceiver at the base station. The overhead visor is a handy location for the code in the mobile unit. Since it is a dangerous practice to transmit while driving, and against the law in many states, a mobile CB vehicle should pull off the road and come to a dead stop before originating or answering a CB call.

"Break-Break." The "break-break" slogan is a nationally accepted means of asking for access to a channel already in use. It is used to "break" into a conversation between two other CB units—when you have a definite reason for doing so. The

"breaker" (the party breaking in) takes advantage of the time between transmissions—after one party has finished a statement with "over," and before the other begins to transmit, by saying "break-break." Once this has been done, the party who was to have begun the next part of the conversation will usually acknowledge the "breaker," at which point he puts in his bid for the channel. This action will usually be followed by a stand-by of the two parties previously engaged in conversation so that the "breaker" may place his call.

As an example, let's consider a conversation by two stations (we'll dub them A and B) who will be joined by Station C, the breaker. Station C has monitored the conversation between A and B, and feels that his message is more important than the verbal exchange in progress.

STATION A: ". . . When you've delivered those last two bundles, come back to the plant, Guy."

STATION B: "10-4, Jim. I'll be heading home in about ten minutes."

STATION C: "Break-break"!

STATION A: "There's a 'breaker' in there. Stand by. Pick it up 'breaker.' "

STATION C: "This is KHD4785 with a call for Dr. Karr."

STATION A: "10-4. Give me a 10-21, Guy. KLJ8486 base, 10-10."

STATION B: "10-4, Jim. KLJ8486 mobile, 10-10."

Unfortunately, the CB channels are a "party line," and not all operators are as courteous as the two above. However, the author has found that if you treat others on your favorite channel as you would like to be treated, it will work like a charm.

Rules To Remember. When operating on the Citizens Band, keep in mind the following ten important rules:

(1) Station identification must be given by both parties at the beginning of and upon completion of each contact, regardless of whether the call lasts 30 seconds or a full 5 minutes.

(2) Use channels 9, 10, 11, 12, 13, 14, and 23 for INTERSTATION communications. All other channels are for use only by stations carrying your own call-sign. Channel 9 should be used for emergency aid.

POPULAR ELECTRONICS Citizens Band "10-Code"

General Station Operation

10-1	Receiving poorly.
10-2	Signals good.
10-3	Stop transmitting.
10-4	Okay—Affirmative—Acknowledged.
10-5	Relay this message.
10-6	Busy, stand by.
10-7	Leaving the air.
10-8	Back on the air and standing by.
10-9	Repeat message.
10-10	Transmission completed, standing by.
10-11	Speak slower.
10-13	Advise weather and road conditions.
10-19	Return to base.
10-20	What is your location? My location is ——.
10-21	Call ——— by telephone.
10-22	Report in person to ———.
10-23	Stand by.
10-24	Have you finished? I have finished?
10-25	Do you have contact with ——— ?

Emergency or Unusual

10-30	Does not conform to Rules & Regulations.
10-33	Emergency traffic this station.
10-35	Confidential information.
10-36	Correct time.

Accident and Vehicle Handling

10-54	Accident.
10-55	Wrecker or tow truck needed.
10-56	Ambulance needed.

Net Message Handling

10-60	What is next message number?
10-64	Net is clear.
10-66	Cancellation.
10-68	Repeat dispatch on message.
10-69	Have you dispatched message ———.

Personal

10-82	Reserve room for ———.
10-88	Advise present phone number of ———.

Technical

10-89	Repairman needed.
10-90	Repairman will arrive at your station ——.
10-92	Poor signal, have transmitter checked.
10-93	Frequency check.
10-94	Give a test without voice for frequency check.
10-95	Test with modulation.
10-99	Unable to receive your signals.

(3) Make your transmissions brief and to the point. Long transmissions tend to confuse, making it hard for the other party to remember all that you may have asked. Since he can't interrupt you on two-way radio as he might on the telephone, it is to your advantage to toss one question at a time.

(4) Stay within the 5-minute limit set forth in Part 95 of the Rules and Regulations. If you have additional information that must be relayed to your station and have used up your time, clear the channel for 5 minutes to allow others to place their calls, then contact your station again once they have cleared and another 5 minutes have passed. This rule does not apply to units of the same station or to emergency communications.

(5) Use YOUR equipment and a DIFFERENT call-sign if you qualify as a member of a duly licensed group activity such as a volunteer fire company, CD service, etc. You are then a mobile unit of the primary licensee.

(6) You may continue to operate and use your present call-sign after moving to a new permanent address. However, you must notify the FCC of the move. Mail a postcard giving your call-sign, your name (as it appears on the CB license), and the old and new addresses, (including the zip code of the new address). Mail the information to the Federal Communications Commission, 334 York Street, Gettysburg, Pa. 17325.

(7) Make use of the 10-Code for speed, intelligibility, and good communications.

(8) Use the "break-break" procedure ONLY when it is absolutely necessary to use the channel. Don't "break" merely to become a third party to a conversation already in progress.

(9) Speak clearly, distinctly, with the microphone approximately two inches from your lips. And speak in a normal tone—shouting only creates distortion.

(10) Be prepared to use any CB channel in case of emergency. Part 95.85 of the Rules permits a waiver of all restrictions where immediate safety of life or immediate protection of property can be demonstrated.

CB Also Means "Public Service"

CB

CB Clubs Promote Safety and Act As Good Samaritans

By Matt P. Spinello, KHC2060

MOST of the Citizens Band clubs in North America have experienced a transition in the past five years. In the early years of CB, licensees gathered for coffee breaks or meetings to discuss CB operations in their areas and the latest CB equipment. From these occasional get-togethers stemmed the first CB clubs, basically organized to help new licensees choose, install, and properly operate their equipment.

As the Citizens Band grew, so did "party-line" problems. The clubs took it upon themselves to monitor and police their membership, and to discuss and work out mutual problems at monthly meetings. CB club officers and members then became aware of the need for emergency communications teams that could be made available on request to individuals, fire and police departments, and Civil Defense agencies.

Clubs Create Rescue Teams. Strictly on their own initiative, hundreds of CB clubs have organized emergency communications and rescue teams and have been given first-aid training by the Red Cross. County and local agencies are gradually working these teams into auxiliary units of their own services with many of the clubs standing by on 24-hour call.

Some clubs are actively engaged in Civil Defense drills, and are equipped to handle disaster situations of almost any category. Other clubs have become unofficial members of sheriff patrols to aid in searches for lost children, downed aircraft, and even criminals.

Several CB clubs have become affiliated with local and county police departments and placed more or less on a stand-by basis. A few police and sheriff departments have installed CB systems and are monitoring them around the clock so that CB'ers can report accidents, fires, burglary attempts, etc., from their mobile units.

Special CD/Police Groups. On a more organized plane, many Civil Defense groups have become affiliated with the police through squads known as Civil Defense Auxiliary Police Corps. These groups are made up of licensed CB'ers who become active members of Civil Defense groups and then join the special squad. Trained in several phases of police work, their CB/CD police duties may include patrolling during Halloween, assistance at fire

This special CB base station is maintained by the ALERT group in Baton Rouge, La. Curtis Lauret, shown logging an assistance request on channel 9, reports that ALERT makes 150 "assists" per month.

or accident scenes, traffic control at parades, or helping in any emergency requiring coordinated efforts of trained personnel.

Wherever such Civil Defense CB groups are organized, a police squad may be set up if requested by the local police chief. Membership is on a voluntary basis, and CB'ers furnish their own two-way radio equipment, automobiles, uniforms, patches, and insurance. Members usually get a training course in first aid.

Regulations require that to remain a member of the police corps squad, members must continue active participation not only in Civil Defense meetings, but in auxiliary police gatherings as well. Radio communication while on "duty" usually consists of passing information on to a control center via their own CB equipment; the messages are then relayed to the proper authorities.

Public Service Work. Among the more than 1000 Citizens Band clubs that have reported to POPULAR ELECTRONICS' monthly column "On the Citizens Band," several hundred clubs have been involved in providing emergency and public service assistance in the past year. The clubs may be large or small, depending on the community and the encouragement given a club by local authorities. Here are two examples:

In October, 1965, a barge loaded with chlorine gas sank in the Mississippi River near Baton Rouge. An ALERT emergency team was soon on duty. Jim Greer is shown operating the base station set up in the West Baton Rouge Sheriff's headquarters.

The Allied Louisiana Emergency Radio Team (ALERT) of Baton Rouge, La., is really two clubs in one: Senior ALERT for CB'ers over the age of 18, and Junior ALERT, an auxiliary group from ages 12 to 18. The youngest group is not permitted to participate in actual emergencies, but they train with senior ALERT members so that they will eventually become proficient senior members. Junior ALERT has its own officers, meetings and projects, but both clubs work in unison for the benefit of the overall ALERT organization.

Founded in May, 1965, ALERT has a membership of 100. ALERT's emergency radio team has assisted in such emergencies as hurricane Betsy and the chlorine barge lift from the Mississippi River, and has answered hundreds of local and area calls for assistance. Members are kept in a state of readiness by practice exercises.

The ALERT Control center is housed in a motor hotel in Baton Rouge with the call-sign KMR5905, and is operated by team members daily from 8 a.m. to 12 midnight. CB channels 9 and 23 are monitored, plus city and state police frequencies. ALERT is currently working with the Louisiana State Police.

The Citizens Radio Emergency Service, Inc., (CRES), in Monroe, Ga., is another active public service organization, representative of the successful smaller teams which prove that size has nothing to do with the effectiveness of an organization's performance. A team consisting of 19 members, CRES is prepared to answer any and all emergency calls.

Every team member is trained in all phases of rescue, police, and communications work by the club's instructors. Using a converted VW bus and a 1964 heavy-duty rescue truck, CRES covers emergency situations from forest fires and lost persons to drowning victims and manhunts for escaped prisoners. CRES also supplies courtesy patrols on principal highways during weekends and holidays to assist motorists.

Active in the Greater Georgia CB Coun-

cil, CRES also participates in district and interstate communications relays. The membership encourages applications from every licensed CB'er residing in the state, and offers assistance to any state, county, or federal agency that may need their help in times of emergency.

These CB'ers Made Headlines. The following may be considered representative of the emergencies handled by CB'ers across the country every year.

DENVER, COLO.—The Metropolitan Denver Citizens Radio Club aided authorities when a 12-foot wall of water headed down the South Platte River, threatening Denver and the metropolitan area. Approximately 200 CB'ers responded immediately to a call for radio communications to help in evacuating persons living along the river. Before the threat was over, more than 500 CB'ers were on hand. Some mobile CB units were placed at roadblocks while others were used for transportation.

NEW ORLEANS, LA.—The Five Watt Wonders CB Radio Club established a 24-hour monitoring station to aid in Mardi Gras festivities. The station handled emergency traffic through contact with CB mobiles stationed at six different Red Cross stations spread along the Mardi Gras parade route. New Orleans Red Cross and police officials were amazed at the swiftness with which the CB'ers handled 113 emergency requests for supplies and ambulance service during the activities.

HALE CENTER, TEX.—It was estimated that at least 100 lives were saved through the efforts of CB radio operators, nicknamed "Minute-Men," during a tornado that ripped through Hale Center. At least two CB'ers drove toward the storm to seek out its intensity and report to the CB Civil Defense Center in Hale Center. When a bolt of lightning revealed the black funnel directly ahead of their automobile, the CB'ers whipped the car in the opposite direction, shouting their findings over the air to warn that the twister was headed for Hale Center. Upon receipt of the news, many other CB'ers drove around the city, honking their horns and spreading the alarm. The tornado warning siren was activated for a solid 30 minutes; it was reported that the CB'er in charge held the button down until the tornado was one block from him, then fled, but not before falling debris from the twister had smashed his car.

TACOMA, WASH.—Two Washington State youths, aged 11 and 12, were reported missing one evening. They had last been seen heading for a densely wooded area on the outskirts of Ashford, near Mount Rainier. At 5:30 a.m. the next morning, teams were made up of sheriff's department deputies, the Tacoma Citizens Band Radio Association Search & Rescue Team, Department of the Interior employees, Webfoot Jeep Club members, and other volunteers. By 10:30 a.m. the boys had been located and returned to the base camp. They had spent the night in an abandoned car in the woods; the only ill effects of their escapade involved a few "hunger pangs."

The Citizens Radio Emergency Service, Monroe, Ga., converted this VW bus into a "Rescue Service" truck. A small organization (seven members are missing from the photo), the CRES group has achieved favorable recognition throughout Georgia.

JULESBURG, COLO.—At 6:45 one morning a pilot put out a "Mayday" plea with his 1-watt walkie-talkie. He was airborne, caught in a ground fog, and unable to determine his location. He had no other radio gear on board. Robert Vincent, a REACT team member, gave the pilot an immediate reply and went to work at getting him back safely on the ground. Following a series of checks and S-meter readings to determine the pilot's direction, Vincent and five other CB stations endeavored to keep the pilot on course. Finally, Vincent spotted an opening in the clouds and asked the pilot if he could see it. After the longest ten seconds in his life, the pilot radioed back, "I see it, I see it!"

FAIRFIELD, CALIF.—Citizens Band Operators around Fairfield, Calif., are still smiling about a medieval robbery attempt that was staged in their area. A CB'er, stopping for gasoline, was asked by the station attendant to notify the police that he was being held up. The CB'er flipped the switch and placed the call while gasoline still poured into his tank (a dangerous practice). In short order, a nearby police squad apprehended three youths with a hunting bow who had been trying to rob the station attendant. Back to Sherwood Forest with 'em!

Willing and Able. Police groups, Civil Defense, and other local agencies, have frequently commended CB clubs and individual CB'ers for their participation in controlling mass audiences as well as for their quick-thinking in emergency situations. But, regardless of whether or not a club is affiliated with a civic or governmental agency, there is not a CB club to be found whose members are not willing to offer communication services in time of need. The FCC recognizes that properly organized and operated CB clubs ". . . may render a service to everyone." The Commission also appreciates the clubs' abilities to police the CB channels.

Personally, the author cannot praise too highly the numerous CB clubs and organizations he is aware of that have done so much in the interests of public service.

National CB Emergency Groups

CB

A Summary of the Plans for Implementing Road Safety

By Matt P. Spinello, KHC2060

CITIZENS BAND radio emergency calls for assistance have numbered in the hundreds of thousands since the first CB license was allocated by the Federal Communications Commission in 1958. Volunteers who have aided emergency victims, whether as a group from a CB club, or as a specially trained team, have earned for CB the distinction of being the largest emergency two-way radio communications system in the world.

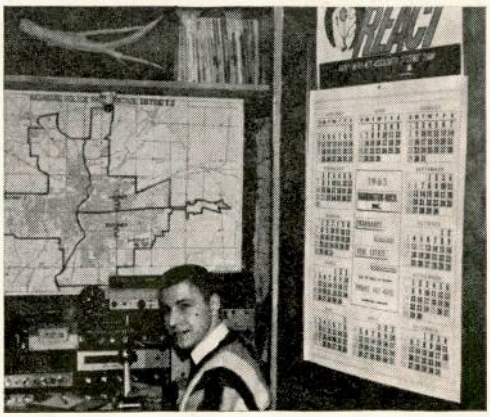
Realizing the potential value and the life-saving aspects of being able to quickly bring help to those in need through mobile CB radio, highway safety authorities, manufacturers, and industrial researchers have initiated a number of plans on behalf of the American motorist. These plans are summarized below.

REACT. Since 1962 the Hallicrafters Company has sponsored an association known as "Radio Emergency Associated Citizens Teams", commonly referred to as REACT. With headquarters in Chicago, Illinois, REACT was established as a nationwide affiliation of citizens "teams" organized to provide communications in local emergencies through CB radio. REACT has now grown to over 1500 active teams with more than 40,000 members throughout the United States, Canada, and South America. And, REACT continues to grow at the rate of about 7 teams per week.

REACT teams promote close cooperation with all other radio communications systems and obligate themselves to monitor a national emergency frequency (CB channel 9) 24 hours a day, 7 days a week. The teams are encouraged to operate and maintain equipment in accordance with FCC regulations, and to locate and report sources of radio interference. Each team is free to organize and operate according to the needs of its own community, and in addition to their own communications equipment, the teams are usually equipped with —or have available on a team basis— emergency equipment.

The REACT organization is handling in excess of 600,000 calls for emergency communications assistance per year, or an average of more than 40 such instances per month, per team. Of these actions, 21% are in connection with automobile accidents; 52%, road assistance; 5.6%, fires; 2.7%, special patrols; and 2.2%, missing persons.

Individuals or clubs interested in taking part in this program can get the full story



Mike Chambers and his REACT team provided emergency communication services when the Richmond, Ind., phone company was disabled by a fire.

by writing to REACT National Headquarters, Dept. HB67, 5th and Kostner Ave., Chicago, Illinois 60624.

National Motorists Safety Plan. The Automobile Manufacturers Association petitioned the FCC in 1965 for the establishment of the Highway Emergency Locating Plan-Radio Service (HELP). The AMA requested that all citizens legally authorized to operate a motor vehicle be eligible for a license to operate in the HELP Radio Service. The AMA asked the FCC to allocate two new frequencies (27.235 MHz and 27.245 MHz) adjacent to present CB channels for exclusive use by HELP. The program is currently using CB channel 9 as the national calling and emergency frequency.

In promoting the HELP program, the AMA's plan is to encourage the development of a nationwide communications network to aid motorists in distress. Motorists requiring aid could call on the HELP channel, where they would be heard by 24-hour monitors within a 5- to 35-mile range of the equipment. The monitoring stations would include volunteer citizens teams, police agencies, road service stations, and hospital emergency rooms.

The AMA believes that the HELP program will afford an opportunity for highway safety engineers to develop specialized radio equipment to solve traffic problems. Furthermore, the AMA feels that even with millions of HELP installations in operation on the requested channels, there would still be unused message capacity because the equipment would only be employed by individual motorists for a short duration during emergencies and because the range of the equipment itself is limited.

A public service program proposed by the Automobile Manufacturers Association would supplement the present CB setup. Called the "Highway Emergency Locating Plan" (HELP), it would provide each motorist with a 2-channel CB transceiver. This CB rig could then be used to call for help should the motorist become stranded or the car disabled. A petition has been placed before the FCC to authorize the Rules and Regulations to put HELP to work.

Highway Emergency Radio. Truckers travel millions of miles per year on American highways. The addition of CB radio equipment could make each vehicle an effective emergency unit to aid motorists in distress. In November, 1963, a large number of members of the trucking industry established an association known as HART —Highway Aid by Radio Truck. The association is a non-profit, self-supporting organization, and is officially recognized by the Michigan State Police and the Michigan Sheriff's Association. The group's services are free to the motoring public, and its main objective is the maintenance of an excellent relationship between the motorist and the trucking industry through the promotion of highway safety.

HART members are instructed in first aid; they carry first aid equipment, and are trained in emergency procedures. The average trucker also has a fair knowledge of mechanics and can usually determine the service needed in breakdown cases.

Among the strict set of rules established for HART members, emphasis is placed on proper CB licensing; promotion of safe driving and exceptional care and maintenance of member vehicles; all possible courtesies and aid to be extended to those in need; detailed handling of major emergencies, including the notification of proper authorities; the protection of exposed personal property of victims at an accident scene; and the extending of HART services without payment.

CB'ers employed by the trucking industry who own—or have access to—at least one mobile unit can obtain more information by writing to HART, Box 141, Dept. CB, Pontiac, Michigan.

Experimental Motoring Safety Plan. Driver Aid, Information, and Routing (DAIR) is an experimental system, and the result of more than nine years of work in the General Motors Research Laboratories.

The DAIR system is designed to help CB-equipped motorists summon assistance in an emergency, to provide automatic routing for extended trips, and to warn of speed and traffic signs. According to GM Research officials, the new system is the most comprehensive yet developed for highway communications.

In operation, motorists would make use of a special console with a related visual sign-minder mounted on the dashboard. The console would be equipped with a microphone for voice communication with an information center; a telephone-type dial for sending out coded messages; and a route-minder punch card reader.

Although this console looks big, it would be mounted on automobiles participating in the newly-formed DAIR project. The CB handset is visible alongside the telephone dial and punched card reader.

This decal is appearing in ever-increasing numbers on motor trucks in the Michigan-Ohio area. It stands for "Highway Aid by Radio Truck." See text on facing page for additional information on HART.

To use the route-minder, the driver would place a specially punched card—coded for his destination—into a slot in the console. The routing equipment would then be activated by signals from magnets buried in the road at each major intersection, and would compare the signals with the punched instructions on the card. Panel lights on the dash would tell the driver whether to turn left, turn right, or go straight through. With all major intersections coded, it would be possible to travel across the U.S. under the system's direction.

A modified CB transceiver would provide communications with a service center under the DAIR plan. The motorist would dial coded requests for road or travel information, police, an ambulance, a fire truck, or a tow truck with gasoline and a mechanic. Small roadside repeaters located every three to five miles would relay the message, and a base station operator would acknowledge it by voice and dispatch the aid requested.

The audio signals would be transmitted on one of two proposed highway safety channels in the Citizens Band. Low-power roadside units would transmit information on the road ahead, upcoming accommodations, and service facilities. The units would contain taped messages and could be activated for transmission of emergency messages from a control center. The car's receiver would be turned on by pulses from buried roadside magnets and would turn off automatically after a message was received.

The visual sign-minder would also be triggered by magnets. Posted speed limits and such traffic signs as "stop," "yield," "railroad crossing," and "curve" would be repeated on a display panel in the car. The driver would be alerted by a "beep." The sign-minder is designed to supplement —not replace—existing traffic signs.

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CB

The General Radio Service

Canada's CB Is Similar, But Better Organized

By Harold Merton, XM-44-042

CANADIANS spent nearly four envious years watching, reading about, and listening to American CB'ers before the Department of Transport (DOT) allocated a similar communications facility to Canadian citizens—the General Radio Service. It has been said that Canadian authorities and GRS users profited by the four-year delay. It enabled them to view the Citizens Band's growing pains, and it gave Canadians the chance to start out on the right foot.

While no statistical proof has appeared in defense of the above statement, the DOT did manage to incorporate in its GRS operating requirements more stringent rules than those of the FCC in the United States. However, operating procedures and basic uses of the General Radio Service are very similar to CB and the DOT is pleased with GRS public service applications.

GRS History. The General Radio Service is one of 20 services licensed under Canada's Radio Act. Within these services there are approximately 140,000 radio stations. This figure includes stations operated by GRS/CB'ers, mobile stations operating in the public and private land mobile services, and stations operated by departments of the federal, provincial and municipal governments. It does not, however, include private, commercial broadcasting stations, military stations, low-powered CB stations (license-exempt under Section 6 of the GRS Regulations, Part II), nor does it include Canada's 565 radio and television stations, or more than 600 stations operated by the Department of Transport.

There are approximately 35,000 licenses issued to GRS users. Unlike FCC regulations that allow all units requested in the original application to be covered under one license, DOT rules require that each piece of equipment in the system be licensed. It is estimated that approximately 10,000 individual GRS operators have signed up for the 35,000 transceivers now in use.

General Radio Service stations are not permitted to communicate with radio stations in any other service. Furthermore, GRS transmissions may not be directed to any person or station located beyond the ground-wave coverage of the station. Operational regulations are much the same as the FCC's as outlined in the Part 95 Rules and Regulations, with the exception of the frequencies allocated to Canadian users. Canadian licensees may only utilize 19 of the 23 channels available to CB'ers in the U.S., ranging from 27.005 to 27.225 MHz. These channels are equivalent to U.S. CB channels 4 through 22.

GRS Licensing. To be eligible for a station license, GRS applicants must be busi-

EDITOR'S NOTE: Harold Merton, the author of this article, is one of Canada's most active CB'ers. He has promoted the use and betterment of the General Radio Service since its inception in April, 1962. His photography and editorial comments regarding the use of GRS have appeared in a number of publications. Harold is the publisher of "SCOPE," a nonprofit GRS publication which he distributes free to more than 5000 GRS/CB users.

Believe it or not, this is the tower used by the author for his CB antenna! Unless a GRS station is close to an airport, Canadians can erect 75′ towers —and higher if they get a DOT building permit.

ness companies incorporated within the Commonwealth, or British subjects or landed immigrants not less than 18 years of age and having a need for direct radio communications with similarly licensed Canadian stations. The licensing of equipment for GRS costs the applicant $3 per unit; the license is valid for three years following the first day of April of the fiscal year in which the license is issued.

There are six districts in Canada (XM1 thru XM6) and license application may be made by mail or in person to the Department of Transport district office nearest the applicant's residence. Each licensing office controls the area in which it is located, and is, moreover, the point from which violation and warning notices are sent. Canadians not familiar with the location of the nearest office in their area may write to the DOT, Air Services Branch, Hunter Building, Ottawa, Ontario.

Tourist Radio Service. There is no provision for CB operators and GRS operators to communicate with one another across the border. But in 1964 the DOT established a new service known as the "Tourist Radio Service," making any licensed U.S. CB'er eligible for a temporary license to use his CB equipment while visiting or traveling in Canada.

Where To Send "TRS" Applications

PORT OF ENTRY	REGIONAL OFFICE
British Columbia	739 West Hastings St. Vancouver 1, B.C.
Alberta	Federal Bldg. 9820 107th St. Edmonton, Alberta
Saskatchewan, Manitoba, Ontario, east including Port Arthur	Winnipeg General P.O. Bldg. 266 Graham Ave. Winnipeg 1, Manitoba
Quebec	Regional Administration Bldg. Dorval, Quebec
Ontario, excluding Port Arthur and west	25 St. Clair Ave. East Toronto, Ontario
New Brunswick, Nova Scotia, Prince Edward & Newfoundland	Federal Bldg. P.O. Box 42 1081 Main St. Moncton, New Brunswick

There is no fee for the service but the license (permit) is not transferable and must be in the operator's possession at all times while he is in Canada. It remains valid for a period of one year, at which time it must be renewed if the operator expects to continue using CB equipment over the border.

Application for "TRS" licensing should be sent to the office nearest the Port of Entry at which the applicant will enter the country. Address all requests to the Re-

Officials from the Department of Transport are anxious to further the GRS. One of the first inspectors to speak at the SWGRA was Mr. J.R.A. Levasseur.

gional Superintendent, Radio Regulations, Department of Transport, c/o the Regional Office.

The DOT requires that a U.S. CB'er state his name and address, CB call-sign, class of service (Class D), and the period of time he intends to be in Canada. The application should be made at least 30 days prior to entry. Under the "TRS," American CB'ers are permitted to use only the Canadian GRS channels 4 through 22, and must adhere to Canadian radio regulations.

A very active GRS/CB club is the "Channel Jammers" in Staffordville. Note jackets and decals.

Rules and Regulations. Although Canadian regulations for GRS/CB users are nearly the same as FCC stateside regulations, there are a few differences worth noting. Within the last year, the DOT has amended portions of the regulations to include low power stations and to spell out rules that may have been misinterpreted by some GRS users.

Walkie-talkies or any CB equipment with a final input of 100 mW or less had previously been banned from the 27-MHz band in Canada. A DOT amendment now permits these units to operate without a license in the 26.97- to 27.27 MHz band, and to communicate with stations in the General Radio Service and Tourist Radio Service. They must, however, conform to the GRS operating requirements.

In another area, the DOT has added two new paragraphs and a new subsection to clearly establish that the GRS is not intended for hobby-type communications or for use merely as a recreational activity. The rule changes provide for the use of emergency communications, and a new subsection now exempts GRS users from keeping a log of calls.

Transceivers used in Canada are basically the same as those in operation in the U.S. except that the DOT requires that all

It was a happy occasion when the South Western General Radio Association received its Provincial Charter in 1964. Gearld Inch, XM-44-969, then president, shows the document to members of the SWGRA.

Many Canadian GRS clubs hold annual competitions to encourage highway courtesy and assistance to the general public. Clair Stockley, left, and Mel Oatridge are shown with awards given them by SWGRA.

equipment meet rigid standards, as specified in DOT Specifications No. 136. In order to receive type-approval from the DOT, transmitters must have an input power reading of 5 watts or less, or a carrier power output of 3 watts or less. Spurious or harmonic output from the transmitter must not exceed 30 microwatts of r.f. power using a standard output termination load. Antenna regulations are similar to those proposed by the FCC (but not exactly, ED.) and are clearly outlined.

These GRS/CB'ers are getting instructions from a coordinator of the Long Range Search Group during an actual search for a missing boy. Although organization has disbanded, the CB services are still used.

GRS Club Activities. Canadian CB clubs began organizing shortly after the GRS was allocated by the DOT in April, 1962. One of the prime activities of Canadian clubs is keeping in a state of preparedness to aid during emergencies and public service requirements whenever called upon.

General Radio Service clubs are located as far west as British Columbia and as far east as Newfoundland. Most clubs have a membership of from 50 to 75, with a few of the larger groups sporting upwards of 200 members. One of the national associations, the South Western General Radio Association, now claims more than 300 active members.

GRS users are very active in club meetings and get-togethers, especially jamborees. Four large events were held in Canada in 1966, the largest being at Tillsonburg, Ontario, and sponsored by the South Western General Radio Association. The event drew upwards of 6000 Canadian and American CB'ers from five Canadian provinces and 25 states.

Canadians are hopeful that the United States will soon find legal clearance to grant GRS licensees permission to use their CB transceivers for necessary communications while visiting or traveling in the U.S. on the same level that the DOT has granted U.S. CB'ers permission to use the Tourist Radio Service in Canada.

In the meantime, the General Radio Service continues to grow in all other areas common to CB activity in the United States. New GRS/CB clubs are being organized throughout the country; rescue teams are being trained to assist in the alleviation of emergency situations; and scores of business and personal users continue to find profitable and necessary applications for CB two-way radio.

Club Callbook

The Northern Citizens Communications Club, Prince Albert, Saskatchewan, Canada, sells a callbook of its membership for 25 cents. Pocket size, the callbook is brought up to date by periodic bulletins.

The Business Radio Service

BRS

If You Need Something Better Than CB, Try The BRS

By Robert M. Brown

BUSINESS RADIO is probably the least publicized and the most misunderstood radio communications service. In a time when Citizens Band radio (CB) has almost blanketed the scene, relatively few electronics enthusiasts are aware of the vast potential for reliable two-way communicating that exists OUTSIDE of the 27-MHz band. That other service, which offers no less than 216 channels, is the subject of this article.

Like CB, the Business Radio Service (BRS) began as the fastest-growing "catch-all" to come along ever (in 1957). It had immense appeal to anyone in business and threatened to become the most populated service under the auspices of the Federal Communications Commission. With the formation of the 11-meter CB band right on the heels of the new BRS (in 1958), this trend leveled off fast. Since 1960, Business Radio Service applications have been increasing, but at a fairly low, consistent, and predictable rate.

The outgrowth of all of this has been a largely underrated radio service that is frequently found to offer substantial technical and operational advantages for serious two-way radio users.

Who Can Get a BRS License? Practically anyone engaged in any kind of commercial enterprise can obtain a BRS license from the FCC. The business bands are also open to educational and philanthropic institutions, hospitals, clinics, medical associations and clergymen, and the total license fee (for ANY applicant) is only $10.00.

In addition to the normal information an applicant files with the Commission, the prospective station owner is asked to select a specific channel (with an alternate) he'd like to use. The selection is usually made by the dealer selling the system who, working with a regional frequency coordination committee chairman, analyzes his buyer's needs and determines what channel he could best occupy without running into interference.

Recognizing that a great deal of deliberation and research have gone into this frequency choice, the FCC generally approves the recommendation and authorizes operation for that channel. Since all applicants are business enterprises, the frequency coordinating chairmen see to it that no competitive firm is put on that channel. This results in a near-perfect "private" or "exclusive" system operation.

Comparison With CB. Many BRS users who have "graduated" from CB feel that the BRS service offers them distinct benefits. The three most obvious advantages seem to be that (1) personal conversations are kept to an absolute minimum, (2) higher power is permitted, and (3) frequencies are assigned individually to help keep down the chances of interference from close-by stations.

Since the FCC requires that all conversation on these frequencies be confined to "essential business traffic," the typical BRS operator spends far less time on the air than does his CB counterpart. Indeed, these transmissions are often so short that channel pile-ups very rarely

reach the intensity found in other services. In addition, an air of importance prevails in the BRS, making the value of this form of communications far more apparent.

Those who qualify for BRS licenses generally have the option of running anywhere from 10 to 600 watts of input power on their assigned frequencies. Normally, the high-powered transmitters serve as base dispatching centers, while the mobiles will average about 15 watts each. This increase in power affects a system's range capability. Where only 10 miles can be relied upon with CB, 30 miles is "the norm" on BRS.

Choice of Bands. With selection dependent on operational requirements and local terrain, you can have your choice of three prime frequency ranges for your BRS equipment. In business radio terminology, they represent (1) low-band, (2) high-band, and (3) UHF-band groupings.

Perhaps best known is the LOW band, a range of frequencies extending from 30 to 50 MHz. This band has propagation characteristics equivalent to a cross between 11-meter CB and 6-meter ham radio. The low band offers the greatest range capability of the three BRS bands, and it is used on a shared basis by county and state law-enforcement authorities, bus lines, pipeline operators and electric utilities. On the low band, it is normal to expect a communications distance factor on the order of 25 to 50 miles from base station to mobile units. Terrain, antenna elevation, and transmitter power, of course, affect this range materially. The prime reason the low band is not employed more in city areas is that, like CB, it is quite susceptible to man-made noise interference. Once you get away from a dense ignition-prone locale, the low band begins to come into its own as a prime BRS medium.

The HIGH band consists of the 152-164 MHz block of frequencies, and communication distance expectations are on the order of 5 to 25 miles. However, with base station antenna size at these ranges physically smaller than for the low band, directional and high-gain antennas frequently permit ranges extending to 40 to 85 miles. In the high band, effective antenna elevation is extremely important in controlling range, and man-made noise and skip are far less bothersome.

The UHF band, from 460 to 470 MHz (just below UHF TV Channel 14), is the least used business radio band. High equipment cost has helped keep the UHF population down, although a recent trend toward increased use is gradually lowering the prices. Also, the equipment is more critical to maintain and requires more frequent check-ups. Operationally, however, the UHF-band should not be overlooked. It is ideal for urban communications and has proven itself over low- and high-band systems, since the wavelength is so short that "dead spots" are almost never encountered.

UHF operation is presently an area of emphasis in the BRS field, with more and more stations and manufacturers exploring its possibilities each day.

Equipment Cost. Contrary to common opinion, CB is not the least expensive communications medium available in the United States. In the last few years, the cost of BRS radios has plummeted, whereas CB prices (because of the frills) have remained pretty much the same. Indeed, the "boom" in BRS sales has forced even the most sophisticated manufacturer to keep prices down for fear of losing out to the new competition. You can spend $10,000 for a 17-station, transistorized, high-power FM system (many local police departments fit into this category), but the typical BRS user is more likely to have paid only about $250 for his mobile set and $300-350 for his base station.

Assuming that you are a newcomer, you can realize appreciable savings by passing up the modern-design sets for quality reconditioned tube radios. Nearly every metropolitan area has a used equipment supplier who can put you on the air with both a 100-watt base and 15-watt mobile for under $300! And more often than not, he'll install the system for you, offer you a good service contract, and throw in a 90-day warranty to boot. It is in the reconditioned equipment area that most alert

Business Radio Service users get started.

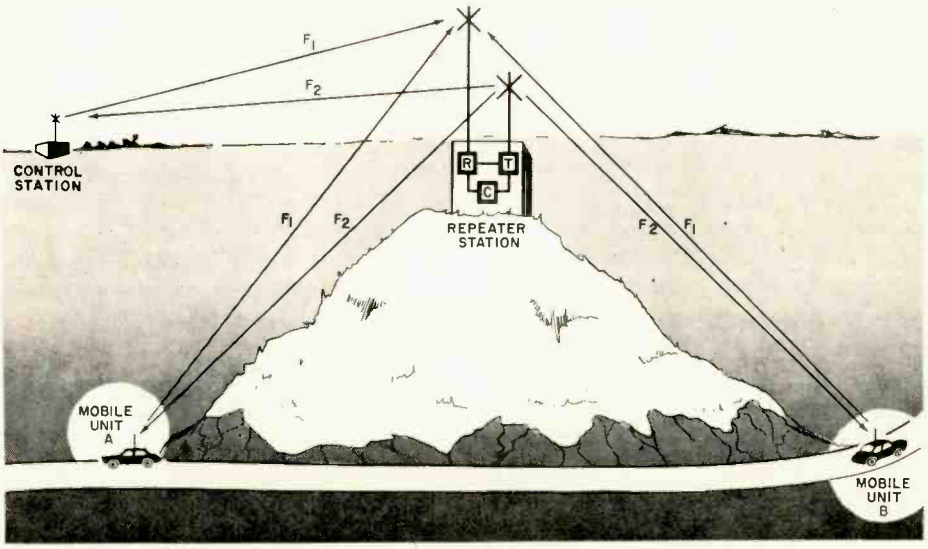
The Business Radio Service permits just about any kind of radiotelephone emission you'd like to employ, provided that the transmitters are FCC "Type Accepted" for correct design and bandwidth considerations. This is hardly a problem, though, since an unwritten industry code of ethics prohibits the sale of any BRS equipment not meeting these standards.

With an eye on CB'ers upgrading to BRS, several companies already well-entrenched in CB manufacture have taken the plunge into AM BRS communications equipment. For the low band (which is close to 27 MHz), AM equipment can be turned out at a fraction of the cost of conventional FM high-band gear. Hence there is a "low-band rebellion" which is now enjoying an unprecedented boom. High on the list of suppliers are Pearce-Simpson, Lafayette Radio, and E.F. Johnson (the latter, incidentally, reports an average unit sales figure of 7.9 radios per customer). And each month still another company announces that it is climbing aboard the bandwagon. The outlook for 1967, then, is that AM BRS equipment will become even more widely used.

Whereas five years ago it took thousands of dollars to enjoy the range and power luxuries of low-band radio, it can now be done with brand-new AM equipment for mere hundreds. True, the noise problem is still there, but no unit is manufactured without effective limiter and squelch circuitry, and the increase in power alone is certainly enough to make it worth a fling. Many AM users buy 10-watt mobile sets and then equip the base station versions with inexpensive linear amplifiers to achieve additional power output. E.F. Johnson even makes an AM power amplifier with its own power supply that can be trunk-mounted for 85 watts in the car!

By late 1967, the low-band/AM rebellion is expected to extend into the high-band area; it is rumored that several manufacturers are already revamping their 144-MHz ham gear for these frequencies. This will open still more doors for the potential BRS user eager to employ less costly AM equipment.

Add to these savings the availability of reasonably priced BRS antennas (Hy-Gain will sell you a complete unidirectional business radio ground plane for $5.40), and you can begin to see the underlying reasons for the popularity of this radio service. (Several land mobile licensing consultants have predicted that by 1972 band occupancy will have DOUBLED on BRS,



A repeater station can greatly increase the range of a BRS system. Operation of the repeater dictates that all mobile units and control stations transmit on one frequency and receive on a second channel. The repeater automatically re-broadcasts (F2) whatever signal it intercepts (F1).

while CB will lag behind due to its limited availability of clear channels).

Private Long-Range Radio. Obtainable for a relatively low monthly fee is a business radio phenomenon called the UHF-band "community repeater." This complex apparatus provides a unique possibility for your enjoyment of the "ultimate" in sophisticated two-way radio. Imagine having your own "private" channel with a GUARANTEE of exclusive non-competitive use plus "blanket" coverage for 50 miles in all directions 24 hours a day. Now imagine that you're accomplishing all this with 15 watts maximum power, and you've just begun to appreciate the beauty of community repeaters.

Often just the rental of low-power BRS transceivers, plus your guarantee that all servicing work will be performed by the same company, will put an automatic radio repeater at your disposal. Furthermore, you'll have the assurance that the owner will not permit any of your competitors to use it at any price.

An example of how this works is illustrated by the operation of Communications Engineering Company (CECO) of Houston, Texas. Two years ago this company installed a high-power community repeater atop KPRC's 1500-foot tower a few miles outside the city. Placing the automatic system on the 460-MHz UHF business band, CECO simply arranged to equip its "subscribers" with compatible UHF band gear. This program has been so successful that CECO now has four separate repeaters atop that tower and anticipates even more expansion in the near future. Customers are pleased with their new coverage ("no dead spots at all existing within city limits") and like the idea of the immediate repair service CECO provides. Coastal Transport Co., one of the company's customers, was so impressed that they upped their initial system from 30 to 47 mobile units and added another base station. "The beauty of a repeater," says a Coastal spokesman, "is that we can talk from control station to control station legally."

Although most repeater companies prefer that their customers lease new equipment, they generally have no objection to your using your own if it is technically operational in conjunction with the repeater. Often the necessary modifications are expensive, but you can frequently buy compatible UHF sets from the repeater company at considerable savings. Houston's CECO, for example, makes use of reconditioned tube sets, passing the reduced equipment costs on to the buyer.

Like CB, portable equipment comes in all sizes and shapes. This "suitcase" transceiver is sold by Aerotron. Battery-operated, it has a 15-watt output.

Another way to save money in repeater use is to "share" your channel with another station subscribing to the system. By equipping your radios with selective calling (tone devices), you'll never hear the other party, and you can realize as much as one-half off the regular monthly fee. Sometimes customers can get together and agree to a party-line arrangement whereby four or five businesses share the use of a single channel in this fashion, cutting costs all the way around.

Hand-Held Transceivers. Particularly in the last few years, walkie-talkies have really come into their own on Business Radio frequencies. While most are a bit larger and heavier to handle than their CB counterparts, BRS battery-powered transceivers offer numerous advantages. On 27 MHz, a quarter-wave telescoping antenna is likely to be monstrous, but the

greatest proportion of BRS portables are designed for operation on 150 MHz. This makes for a substantially smaller antenna—about 17½ inches total.

Whereas high-band walkie-talkies were quite expensive just five years ago, the trend back to AM has sent prices tumbling. Again, ham manufacturers are scrambling for this market, and at least one major U.S. BRS supplier, Aircraft Radio Corp. (N.J.) has announced a complete line of high-band AM equipment. Included in ARC's offering are hand-held units compatible with high-powered base and mobile stations. Within months other companies are expected to follow suit.

To further expand the versatility of walkie-talkies, COMCO of Miami, Fla., (which also has a line of AM 150-MHz gear) is developing an in-car repeater system that should be on the market soon. With this system, a man doing repair work on a telephone pole can talk through his truck radio unit to the company dispatcher miles away simply by speaking into a lightweight hand-carried portable.

Other offerings in this realm are complete BRS stations in the 10- to 20-watt category now available in portable form. Aerotron (N.C.) makes an attaché case set that ranks with the best mobile transceivers, and markets the unit as an industrial service transceiver (for security people). Other companies are rumored to be getting ready to follow suit. The concept of a rather substantially powered portable BRS transceiver has caught on among thoughtful users, and it won't be long before most enterprising businesses have at least one to supplement their existing equipment.

Unlike CB, where the dealer sells you equipment and you find your own service technician, BRS dealers are experts in repairing equipment. Frequently BRS dealers have a stock of equipment to loan out while repair work is undertaken. These men work in the shop of Lakewood Communications, Stoughton, Mass.

Low-Cost Remote Control. Business radio users are fortunate in that the FCC permits the use of remote control station operation without a lot of red tape. When a proposed BRS station location is in a poor area from a radio coverage viewpoint, the sales/service dealer can often arrange for an inexpensive remote control system, based on the automatic repeater concept. There are several ways this can be accomplished, the most feasible dependent upon your distance from a favorable remote control point and the amount of money you're willing to spend.

Many business users prefer to run a cable from the control center to the remote station, paying the telephone company a few dollars each month for the use of their poles. But the most inexpensive method is simply to obtain a leased telephone circuit from your dispatching office to the transmitter. This costs roughly $3.50 per mile per month, and is well worth the expense.

Especially in hilly areas, remote control is both cheap and in vogue. Many alert BRS dealers have remote installations of their own which they lease to potential users in much the same fashion that Texas' CECO does with its automatic repeater. With proper coordination and duplexing equipment, a good number of BRS stations can be coupled to the same remote circuit without creating undue interference with one another.

Private Two-Way Channels. Anyone who tells you that you can have your own "private" BRS communications frequency doesn't know what he's talking about. No one can "own" any radio frequency in the United States. In the case of BRS, however, the FCC is trying hard to coordinate applications BEFORE the license is issued, to prevent undue interference. Business radio bands are busy places, but it's primarily on the lower channels where congestion is critical.

Selective calling is the answer to the need for privacy, and long before anyone had tone-alerting accessories to sell CB'ers, BRS users had them designed into their equipment. Today everyone has a different

CB-Business Radio Comparison

	Class D Citizens Radio	Business Radio
Antenna height limit	20 feet	none
Power limit	5 watts	30-600 watts
Total number of channels	23	173
Relay stations	no	yes
Personal communications	yes	no
Business communications	yes	yes
Communicate with other licensees	yes	no
Remote control of base station	no	yes
Teletype, data transmission	no	on some channels
Mobile unit price range	$60-$350	$200-$1000
Base station price range	$60-$350	$200-$2500
Interconnect with telephone switchboard, etc.	no	yes

name for selective calling (Channel Guard, Tone Alert, Private Line, etc.), and a number of accessory manufacturers—such as Bramco, Secode, and Reach Electronics—sell tone signaling devices that can be installed on older transceivers, making them almost as selective on incoming calls as the latest models off the production lines. In addition, your local sales/service dealer can find out what tone combination is not being used in your area, rendering your new system extremely difficult to inadvertently "trip." Since most stations are still using FM, the heterodyne problem that exists on CB is nearly non-existent on business frequencies. This means that your selective calling device won't trip from channel pile-ups.

Presently quite popular are tone systems which provide an "absentee" service that will either sound the horn or flash the headlights when you are away from the car. It's pretty hard to miss a call. Still other companies make alarm devices which are slightly lower pitched than a telephone ring and considerably louder.

Specialty Services. So far we have concerned ourselves entirely with the Business Radio Service. Although it is the largest of

Although portable BRS equipment is similar to that of CB'ers, it is usually more powerful and rugged. Here, a dock loader is reviewing invoices and shipping instructions with a foreman located in another part of a shipping terminal. A Manufacturers Radio Service license could have been used for this radio circuit instead of a BRS license.

the land mobile group, an interested businessman can often realize certain advantages in passing up the "catch-all" BRS for a radio service band specifically designated for his use. Not every applicant can qualify for a specialty group but, on the other hand, many BRS licensees in metropolitan areas where congestion is a real problem have passed up the opportunity for a special authorization because "it was easier" to get a business license.

For the most part, special service frequencies are like BRS and often follow the same low-band, high-band, UHF-band

sequence. The difference, however, is that frequently more power can be used and there is less station population per channel. Here is a breakdown of the special services available and eligibility requirements.

SPECIAL INDUSTRIAL RADIO SERVICE: Confined to farming, heavy construction, mining, ready-mixed concrete (or hot asphalt) delivery, and slight variations on the above. It should be stressed that your business should fall almost entirely in one of these areas, not just a phase of it.

MANUFACTURERS RADIO SERVICE: Self-explanatory. The FCC restricts a manufacturing company's use of this service to activities not related to retail distribution of products. (In-plant communications, production control, and materials-handling are permitted.)

PETROLEUM RADIO SERVICE: Confined to persons prospecting for, producing, or transporting petroleum products, including such aspects as collecting and refining. Also open to natural gas.

POWER RADIO SERVICE: This includes most local electric and gas companies, and also extends to city water departments.

RELAY PRESS RADIO SERVICE: Confined to newspapers and press associations.

MOTION PICTURE RADIO SERVICE: Open to persons engaged in movie production or filming.

FOREST PRODUCTS RADIO SERVICE: Open to tree farmers and lumber companies engaged in logging, but not to retail or wholesale lumber yards.

TAXICAB RADIO SERVICE: Self-explanatory. Does not include airport limousine services.

RAILROAD RADIO SERVICES: Open to railroad common carriers, including railroad express companies wholly owned by railroads who transport either passengers or property. Does not apply to subways.

MOTOR CARRIER SERVICE: Includes persons engaged in providing motor carrier passenger and/or property service between or within single urban areas, and those companies dealing in local distribution and collection of property. Includes express services and bus lines.

AUTOMOBILE EMERGENCY RADIO SERVICE: Open to auto associations (like AAA) which provide emergency road service, tow trucks, service stations, etc.

Where To Get Assistance. Though Business Radio doesn't attract a great deal of consumer-level publicity, there's a wealth of information you can obtain by mail simply for the asking.

The National Association of Business and Educational Radio, Inc. (NABER), Box 978 Benj. Franklin Sta., Washington, D.C. 20044, is the largest representative of organized BRS users in the country and welcomes letters from interested newcomers. They'll be pleased to send you a wide variety of useful pamphlets and brochures free of charge.

If you contemplate operation in one of the specialty groups listed above, a line to the Chief, Land Mobile Radio Services, FCC, Washington, D.C. 20402, will bring you the name and address of the national association representing that service. Most groups (like SIRSA, which is the official representative of the special industrial licensees) have stacks of material helpful to newcomers, in addition to maintaining active chapters in major metropolitan areas which you can telephone for assistance.

Two monthly magazines are published that carry articles of interest to BRS users: "CEM," 14 Vanderventer Ave., Port Washington, N.Y. 11050; and "Action," put out by the NABER association. And an informative 16-page booklet on two-way radio systems is available free from Pearce-Simpson, Inc., Box 800, Biscayne Annex, Miami, Fla. 33152.

Business radio (and specialty radio services) can, at first encounter, seem vastly complex compared with CB-type communications. The difference, however, is that prospective BRS users do not have to plan their own systems. Manufacturer's sales engineers and skilled independent mobile radio dealers are anxious to provide this service, often without charge. In addition, these dealers also obtain the licenses for their customers, thus leaving an applicant only with responsibility for conducting his dispatching and control in a legal manner.

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