TAB 1259

$7.95

Secrets of Ham Radio DXing

DXing

DXing

DXing

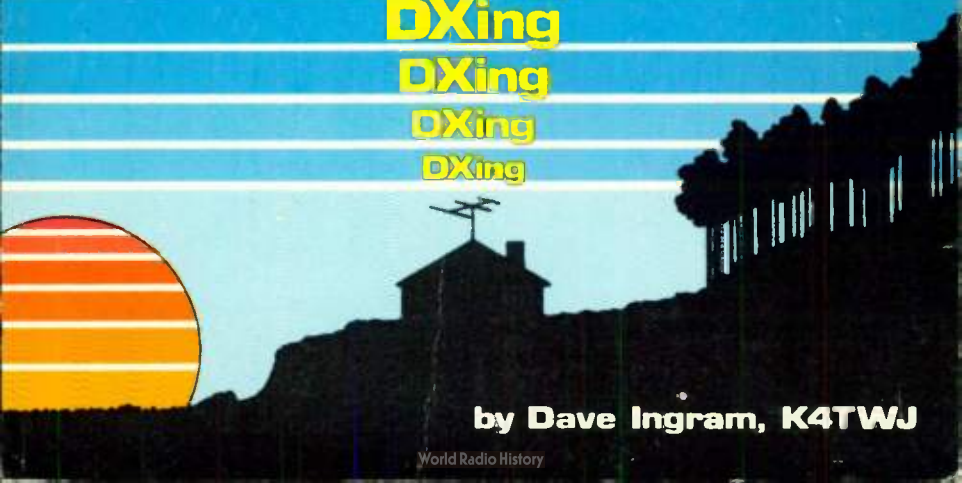
DXing

DXing

DXing

DXing

DXing



by Dave Ingram, K4TWJ

Secrets of Ham Radio DXing

by Dave Ingram, K4TWJ

An exceptional sourcebook for every amateur radio operator who wants to effectively and *consistently* communicate with other hams throughout the world. Here are the how-to's of getting the most DX with even limited operating time and a minimum budget for equipment and antennas, upgrading a station without wasting money, and understanding the secrets of "Big Gun" operators who always seem able to work each new and exotic location as soon as it comes on the air. It's for the beginning DXer *and* the experienced operator who wants to review the philosophy, principles, and practices behind this fascinating facet of amateur radio!

Every phase of the art and science of DXing is explored . . . its history, its current practices and status, even future trends. Find out about the special techniques for operating every amateur band for long-distance communication from 160 meters through VHF, and every mode from CW to television. Has all the info needed to design and set up the "ultimate" DX station, plus how to make the most of a less-than-ideal location or equipment and antenna set-up.

Beginning and experienced DXers will learn how to use simple psychology to obtain QSL cards from important distant stations, find inexpensive operating ideas—both hardware and informational—to improve operating results, and learn how to plan a "serious" DXpedition with hard data on what works, and what *doesn't*! PLUS, there's a DXers "notebook" and five appendices with a wealth of reference data for both serious and casual DXers . . . details of the most highly-sought operating awards (DXCC, WAZ, WPX, and Honor Roll), DXCC country list, beam headings, international amateur radio prefixes, worldwide QSL bureaus, *and* a list of international "Q" signals for the CW operator!

ISBN 0-8306-1259-9

Secrets of Ham Radio DXing

by Dave Ingram, K4TWJ

TAB BOOKS Inc.
BLUE RIDGE SUMMIT, PA. 17214

FIRST EDITION

FIRST PRINTING

FEBRUARY 1981

Printed in the United states of America

Library of Congress Cataloging in Publication Data

Ingram, Dave.
Secrets of ham radio DXing.

Includes index.
1. Radio—Amateurs' manuals. I. Title.
TK9956.1515 621.3841'66 80-28157
ISBN 0-8306-9618-0
ISBN 0-8306-1259-9 (pbk.)

Secrets of Ham Radio DXing

Other TAB Books by the Author

No. 859 *The Complete Handbook of Slow-Scan TV*
No. 1120 *OSCAR: The Ham Radio Satellites*
No. 1189 *10 Meter FM for the Radio Amateur*
No. 1258 *44 Electronics Projects for Hams, SWLs, CBers & Radio Experimenters*

Contents

Preface

DX! The very sound of those two simple letters creates a stir of excitement in the hearts of radio amateurs around the world. This situation has existed since the first days of radio communication, and it will surely continue to exist for all the years to come. Whenever and wherever there's another challenge to conquer or another and longer distance to span, there the DXer will be found, striving to prove his ability and make his mark in those annals of time and progress. This ability to communicate with distant lands on a person-to-person basis of international friendship and goodwill is the mainstay of Amateur Radio; it's the true communications ability for which radio amateurs are known and respected. It's the fascinating, exciting, sleep-stealing, nerve wracking, hopelessly addictive (and often competitive!) world of DXing. It's the driving force that keeps communicators of all lands highly inspired for a whole lifetime of activity.

The concepts of DXing are, in many respects, similar to those associated with fishing: one's success is directly related to his skill, equipment and, occasionally, luck. There are serious and casual enthusiasts, and each pursues his own goals and interest as his lifestyle permits. The many avenues of DXing include almost every exotic form of communication such as Slow Scan TV, satellites and moonbounce, plus the most common and popular aspect, low band worldwide communicating. While each of these areas (plus many which you may have overlooked!) are discussed

herein, the bulk of this text relates to low band DXing. I'm quite sure there are enough ideas, concepts and suggestions presented to increase almost anyone's DX ability, yet this book is by no means intended as the last word or lone authority on the subject. Furthermore, concepts and techniques are prone to change over the years, and avid DXers must change their techniques with those times. Since each and every DXer has his own special blend of operating tactics and methods, I'm sure many old-time DXers will visualize text changes or additions to this book. We welcome your inputs, and will make every possible effort to include that information in subsequent volumes or publications.

In addition to proving highly beneficial to the world of DXing, the future years may impose a stringent need for this DX capability. The additional amateur bands acquired during the 1979 *World Radio Conference,* coupled with the expanded worldwide amateur satellite program will afford extensive DX opportunities. The radio amateur should strive to use these means whenever possible to assist with such problems as the world hunger situation and the approaching clouds of world famine. Through this personal communications means, vast amounts of the Earth's area can ultimately be made substantially more productive than presently visualized. Amateur Radio can also be used to assist underdeveloped world areas in a manner similar to that presently used during national emergencies. The responsibilities for such useful applications of DXing rest with each and every amateur.

Creating a book of this nature isn't an easy undertaking, and I would like to thank the following amateurs for their information and assistance. Jimmy Long, W4ZRZ; Glen Tillack, W6KZL; Stew Perry, W1BB; Gus Browning, W4BPD; Mavis Russell, VK3BIR; Hisanobu Mori, JA9BE; George Jacobs, W3ASK; plus a host of other DXers lending their personal opinions and ideas.

Thanks, also, to Autek Research, Skytec Company, MFJ Enterprises, The American Radio Relay League and the editors of *CQ Magazine* for information and assistance included in this book.

Finally, a very special thanks to my XYL, Sandy, WB4OEE; for bearing with me through the tribulations of this fifth publication, for typing this manuscript and for quietly waiting with cooling meals and late dates, as I continued chasing that one additional new country on the 20, 10 or 160 Meter band.

Dave Ingram, K4TWJ

Chapter 1
The Challenge of DXing

The challenge and excitement of communicating over long distances is as old and popular as amateur radio itself. Ever since Guglielmo Marconi succeeded in transmitting an electromagnetic wave across the room of his tiny apartment, generation after generation of communicators have strived to conquer longer and longer distances. The thrill of such communications never wanes. Each new area contacted, every new distance covered represents an esteemed accomplishment which all radio amateurs cherish. The true pleasures of DXing are a mainstay of amateur radio which will never fade. See Figs. 1-1 and 1-2.

DXing embraces many forms and concepts; each unique in its own way, yet all related in their common aspects. Whether a radio amateur contacts a rare foreign country via a long-path propagated signal or communicates across his own country via signals bounced off the moon, the thrill is the same. It's a sense of accomplishment which yields pride and, yes, power—the same power one feels with superbly engineered cars, strong horses or the ability to influence others. Fortunately, however, the power of amateur radio DXing doesn't adversely affect non-involved members of our society.

But DXing is infinitely more! It's also communicating over 100 mile paths via 2 GHz, talking across the country on tropospheric-ducted two-meter signals, receiving signals from the far reaches of our universe via radio astronomy, transmitting thousands of miles

Fig 1-1. One of the most popular and active radio amateurs in the South Pacific is Tom Christian, VR6TC. (Tom's great, great grandfather was the original Tom Christian of "Mutiny on the Bounty" fame. The classic ship, HMS Bounty, was recently raised from its resting place in the waters off Pitcairn and now rests on the side of this tiny tropical island.) In addition to his outstanding amateur activities, Tom provides all communications for the island country of Pitcairn. He is often heard on 21,350 KHz arranging for vitally important items necessary for his area's health, education and welfare. SSTV gear was a recent addition to Tom's station.

using mere milliwatts of power and much, much more. Thus DXing is, like to beauty, in the eyes of the beholder. See Fig. 1-3.

THE EARLY DAYS

The era of 1915 to 1925 was a phenomenal period for amateur radio and the world of DXing. Spark gap transmitters and galena crystal detectors with oatmeal-box coil tuners comprised an amateur's "set-up", and their operation was an experience seldom forgotten. Indeed, many of today's "young DXers" are still amazed at the feats of those wireless pioneers. Frequencies and wavelengths were relatively unknown—the amateur, or "Sparks", as he was known, merely connected his transmitter to the longest and highest wire he could erect-and started hammering CW at a comfortable rate. Transmitters were necessarily home-constructed from such items as small Tesla coils (communication distance was directly related to spark size!), motor driven breaker-gaps (a spark wheel . . . the number of its contacts roughly determining the signal's pitch) and tin-packed fruit jar condensors and rectifiers. Visitors (and often operators!) standing near these "down-to-business" systems were often jolted off their feet as sparks jumped to them from one or two feet away. The hand key, which literally flamed with high voltage arcs, was handled with the respect of a 45-caliber pistol, and power systems in many neighborhoods were often strained to their limit as these colossal energy-grinders swung into action. One interesting account of

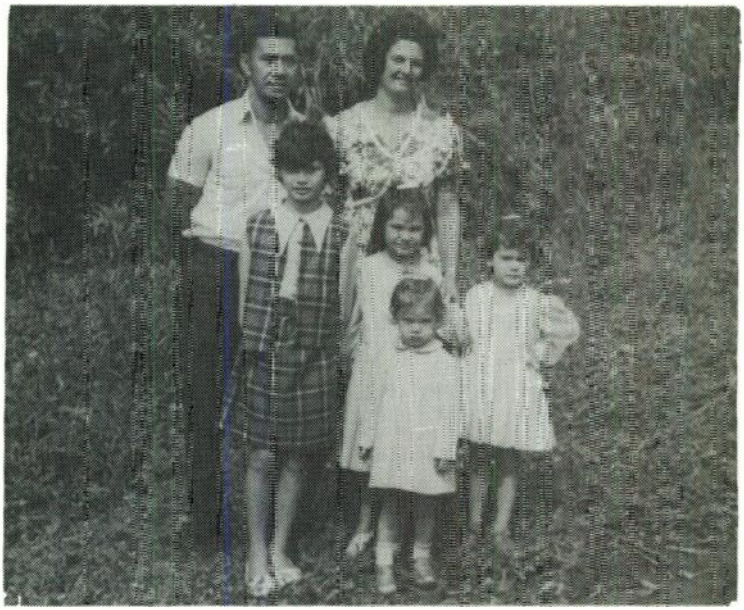


Fig. 1-2. The legendary island family of Tom Christian, VR6TC, during Summer of 1979. Tom and Betty Christian and their four daughters, Jacqueline (9 yrs.), Raelene (6 yrs.), Sherileen (4 yrs.), and Darlene (3 yrs.).

"spark gap DXing" is presented in the following by Wilmar Goodman, a genuine "Sparks" residing in the southern United States during the early 1900's.

Irate neighbors had forced Goodman to move his spark gap setup to a rural location adjacent to his city, since his operation seriously affected street and house lights. His radio location was thus atop a reasonably high hill, and his antenna was strung approximately one-quarter mile to the top of a city water tank. The transmitter, with its many jars and large coil was placed in a large room adjacent to a friend's home—its power came from the city's lines.

Tiring of the usual "DX" contacts (stateside QSO's), Goodman and his rural friend, Bell, began operating during the hours between midnight and dawn. Goodman knew that fewer U.S. stations operated during this time—he didn't realize, however, the fantastic possibilities of worldwide propagation of long wave signals. Goodman recalls the coolness of ozone, his arm-hairs standing on end from the vast amount of stray electricity and the purple-blue glow from the antenna outside as he and Bell called

"CQ DX" late one evening during 1916. That particular call was returned by a wireless operator in South Africa—who was receiving Goodman and Bell on a simple crystal detector!

Goodman was ecstatic over the event, but few people honestly believed history until the QSL card arrived a month later. Needless to say, the local newspaper heralded the event and Goodman and Bell thus acquired their honors as true "Sparky DXers". Soon after that cherished contact, however, the city forced Goodman to remove the large antenna which had proved its DX worth, and Goodman and Bell then began investigating the possibilities of a broadcast station for the area. A couple of years later, World War I closed down individual wireless activities for the education. The era of spark gap was growing to a close.

DXING DURING THE 30'S AND 40'S

During the DX era of the "Golden Thirties", numerous technical advancements had been made and radio amateurs were taking advantage of the various recently-developed vacuum tube circuits. Sunspot activity, like the amateur spirit, was at an all-time high and worldwide communications with the most basic radio apparatus was possible. Regenerative receivers and one or two-tube transmitters running less than 100 watts provided communications with such places as China, Iraq, Tibet and, of course, the ever-popular "down unders" in Australia and New Zealand.

Breadboard-assembled transmitters with soft glowing tube filament added a "warmth" to operations which all pioneering DXers nostalgically recall. Amateur bands were uncrowded, and many stations were as identifiable by their crystal controlled frequency as by their call letters. DX pileups were relatively mild, yet the difficulty of extremely long distance communications was compounded by low RF power levels, ineffective antennas and unstable receivers. See Fig. 1-4.

DX activities during the 1930's embraced some remarkable ideas and concepts. Many operators, with more available time than money, modified their social lifestyle to accommodate on-the-air operating habits—habits which also altered as communications with various areas was achieved. Few amateurs could afford to invest more than $100 in their complete setup, yet their ingenuity produced results which are still noteworthy by modern standards. A true DXer might spend several hours polishing the copper-tubing tank coil and each RF connection in his transmitter, as he strived

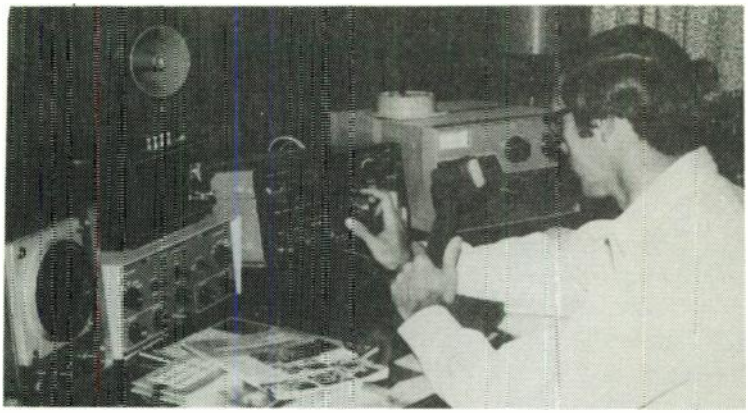


Fig. 1-3. The amateur setup of the author, K4TWJ, blends several aspects of DXing without unnecessary rearrangement. Mode capabilities include SSB, CW, SSTV, OSCAR satellites, 10 meter FM, UHF, RTTY and 160 meters—the equipment is a combination of commercial, modified and home-constructed units. Additional station gear (not visible) is behind the operator's chair and a book-shelf outside the room holds DX magazines, log sheets and operating references.

for the last watt from his prized rig. Blue-envelope receiving tubes (manufactured by a company known as Arcturus) were in high demand among DXers, since they were believed to have higher sensitivity than regular clear-envelope tubes.

Another "DX generation" came to life during the late 1940's and this group also enjoyed some exciting worldwide communications—sunspot activity and signal propagation, however, were never again as great as the 1930's era. Twenty Meters was the prime DX band during this time, but 10 Meters followed closely on its heels. Windom and Zepp antennas were giving way to Rhombics, Vee beams and various forms of collinear arrays. A few DXers began using large, stacked yagi arrays, and the term "California Kilowatt" was introduced into amateur vernacular.

Variable frequency oscillators (VFOs) began replacing quartz crystal-controlled oscillators and shortwave receivers reached a new dimension of sensitivity and selectivity. Breadboard assemblies were becoming extinct, and hand-crafted chassis were proving their superiority for home-brew builders.

A few mobile enthusiasts were having the time of their lives working the world on 10 Meter AM. The usual array of mobile gear consisted of a tube-type broadcast band converter, a five or six-frequency crystal-controlled transmitter in the thirty-watt category, a dynamotor for high voltage and a quarter-wave steel

whip antenna. Gentlemanly procedures were still noticeable in DX pileups, and amateurs took the time to share their personal lives and interests with their distant friends.

SIDEBAND, TRANSCEIVERS AND THE HONOR ROLL

The following decades, the 1950's and 60's, were periods of substantial change in amateur radio and DXing. Single sideband (SSB) revolutionized audio communications, receiver design techniques advanced significantly, and the first amateur SSB transceivers were introduced (remember the Collins KWM-1 and the Sideband Engineers SB33?). DXpeditions became popular among globe-trotting amateurs and compact transceivers began appearing in numerous autos and weekend cottages. The thrill of DXing was making a hard-hitting impact on today's generation of radio amateurs. A number of present *Honor Roll* DXers were racking up contacts with countries which soon thereafter were deleted from DXCC listings. Other budding amateurs began their climb up the DXCC listing while using such basic equipment as National NC-98 receivers and Heath DX-35 transmitters.

The Hammurland HQ160 and the Johnson *Ranger* were popular CW rigs during this time. Several DXers added proximity switches to their Ranger VFO dials which automatically switched on their VFOs for quick frequency zeroing during DX activities. *CQ Magazine* featured an article which allowed a separate transmitter and receiver to operate "transceive fashion" for higher DX contest scores. DX bulletins and networks gained widespread popularity, and each DXer had his own "secret weapons", and "gimmicks". The complexity and effectiveness of these items ranged from simple to sophisticated. One item was a patterned metal strip along the edge of the station desk. The strip was cut in various spaces so as to automatically produce the station ID when its associated metal pen was whisked across the strip. Elsewhere in the U.S., a DXer was rumored to own a rhombic antenna mounted on poles affixed to his own railroad cars. The train engine could be moved and the complete rhombic rotated as desired. Technical operations were only one side of the "DX coin", however. Serious DXers were also planning their moves and spending equal time either arranging on-the-air meetings with desired contacts or studying world propagation on various bands.

Three large scale DXpeditions took place during the 1960's: The *Lloyd and Iris Colvin*, W6KG, expedition sponsored by the *YASME Foundation*; the *Don Miller*, W9WNV, expedition, spon-

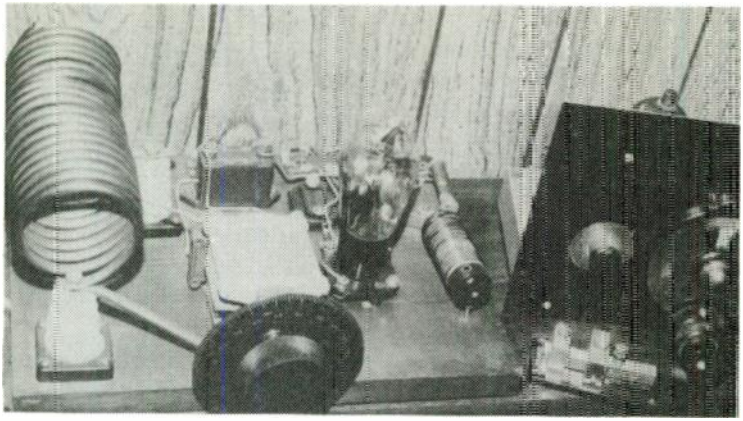


Fig. 1-4. A typical DX setup of the 1930's included a breadboard "TNT" transmitter and two-tube regenerative receiver. These simple but effective setups worked the world while their "open air" style provided heart-warming memories. "DX Qualified" blue envelope tubes are used in the receiver.

sored by the *World Radio Propagation Study Association*; and the *Gus Browning*, W4BPD, expedition, sponsored by the same association. This association's trustee was the late E. C. Atkerson, W4ECI; a name and call known around the world for his outstanding support and contributions to amateur radio DXing. See Fig. 1-5.

DXING DURING THE 70'S

DXing during the early 1970's was a different situation for many amateurs. Sunspot activity was minimal, and 20 Meters was usually the highest-frequency amateur band capable of supporting DX communications. The 40 meter and 80 meter bands were wide open, though, particularly during the hours around dawn in the U.S.—Japan, Singapore and Hong Kong could be worked with 200 or 300 watts of power and an efficient inverted vee antenna. Most DXer's, however, ran the legal power limit, and this author has often heard the signals from U.S. DXers change from strong to barely readable as they turned their 80 meter beams(!) toward areas in the Northern Hemisphere. Similar situations were also noticed on the "hot" 40-meter DX band. The keynotes to successful DX operations amidst this competition were, and still are, a matter of common *DX sense* (slyness).

The avid DXer takes advantage of off-hours and unusual operating times when the "wolf pack" is minimal. He studies the band and keeps track of all signals, realizing that pileups can decoy the herd and leave other DX stations open for quick contacts before

the multitude also "moves in." Finding a special DX station, the DXer is careful not to reveal his catch by tuning up on that frequency. Likewise, the DXer continues searching for other stations while waiting to contact his rare (and hopefully unnoticed) catch. The procedure becomes a natural movement—tuning with one hand while writing calls and frequencies with the other hand. The routine is occasionally broken as a DX station is contacted and removed from the "operating list". The true DXer is far more than a mere knob twister; he's a hunter in the strictest sense of the word. He learns the lifestyle and operating habits of each station he desires to contact, then alters his own habits to conform.

Sunspot activity began to change during the latter 1970's, and the Maximum Usable Frequencies began to climb. All amateur bands between 80 meters and 10 meters came alive with worldwide propagation. This diversified DX activity and lessened the pressures on many pileups. Several new transceivers particularly suited for DXing were introduced, and a dazzling array of beam antennas became available for amateurs able to overcome the rising problem of zoning restrictions. A massive DXpedition to the highly sought area of Clipperton Island was the final event which rekindled practically every DXers dormant enthusiasm and reactivated amateur radio's greatest international sport—DXing.

THE SERIOUS VERSUS CASUAL DXER

DXing is different things to different people. While one amateur might relish a DX alert telephone call at 3:00 A.M., enthusiastically activating his rig and operating solidly until he makes his prized QSO (heaven forbid that his daily work schedule should interfere with DXing); another amateur might cringe at the work of processing QSL's for the DX contacts which he makes during week-end efforts and evening pileups. Although both of these amatuers are true DXers, their different lifestyles produce different patterns of activity. Such is the situation of life. Possibly this explains why the majority of *Honor Roll* DXers are either retired or self-employed with flexible business hours.

Practically every amateur is, to some degree, a casual DXer—whether trying a new rig to prove how far he can communicate or occasionally flexing his electronic muscles to work some exotic DX location. The inner pride of long distance communication is a personal accomplishment all amateurs relish.

Since the casual DXer doesn't feel any pressure to maintain a high country score and doesn't necessarily worry about keeping

Fig. 1-5. Two of the most well known and respected DXpeditioners in the world: Lloyd Colvin, W6KG; and Iris Colvin, W6QL. Lloyd and Iris have travelled to over 135 countries, held 104 different calls, made over 550,000 QSO's and have a 275,000-count QSL collection weighing over 2000 pounds. Lloyd and Iris have worked DXCC using approximately 79 different calls, and they presently hold the largest number of DXCC certificates of any couple in the world. They both hold 5 Band DXCC awards, both have been on the DX Honor Roll for the last decade and both hold Extra Class Licenses.

pace with the activities of local "DX kings," he can thoroughly enjoy his DX operations. If the casual DXer can't rock a pileup and contact a rare station, he isn't heartbroken, he is usually equally pleased to contact a more common DX station which is approximately the same distance from his location. Likewise, the casual DXer doesn't worry about sneaking home from work or getting up during the night to contact a new country. He's quite content to wait for a more convenient opportunity. The casual DXer can also afford to miss a few hours of a prime evening's operating to attend a concert or dine out with his friends or family. In other words, the casual DXer operates whenever he can—but he doesn't get upset when he can't operate. Make no mistake about his actual operating tactics and skills, however; many casual DXers are very sharp operators with the equipment to support their actions! See Fig. 1-6.

The serious DXer is a different breed. He's an amateur fully devoted to the cause of contacting every conceivable area of the world. He knows this effort requires flexibility in his operating hours and habits, that some opportunities seldom knock twice, and that "all out efforts" require the use of every available asset. This amateur can't afford the guesswork of using low power or reduced size antennas. In addition to maximum transmitter power capabilities and at least four-element yagi arrays on their prime

activity bands, the majority of serious DXers also have an extra rig ready for use during unforeseen circumstances.

The "Big Gun" DXer has been in the DX game for several years and he knows the secrets of successful DXing. His job is usually flexible enough to allow time off when a new country or DXpedition is activated. His family and friends are understanding, and they don't object to occasionally changing their plans to accommodate his "mild" request of: "Dear, would you mind taking the kids and mother-in-law to the lake for a week while I work the Clipperton DXpedition . . . Thanks". A serious DXer may, when necessary, carry a couple of sandwiches or bowl of soup into his room and dine alone while chasing DX on 20 meters. Other times he may be found asleep over his rig at 4:00 A.M. This same DXer has learned to split-sleep so he can get on the air at dawn, dusk and near midnight. Propagation forecasts and DX bulletins guide his general activity schedule, and he's fully aware of that lone amateur station in an area which others consider impossible to contact. It takes a lot of time to contact 300 countries, and the serious DXer is willing to put forth the effort. He is, in essence, obsessed with working DX. He's a very special breed of amateur; possibly the last of a dying group of seriously devoted communicators. The Big Gun DXer is extremely stiff competition during any pileup he might enter—actually he often starts pileups rather than joining them. He knows the habits of the station he wishes to contact and he has the necessary hardware to accomplish his goal. See Fig. 1-7.

Both the casual and the serious DXer should realize that pileups create interest and attract others, but that they can benefit by temporarily bypassing such pileups and searching for other equally rare contacts during that time. There's nothing wrong, for example, with passing up a contact with Lord Howe Island for a contact with New Zealand when both countries are needed for DX credit. In fact, the DXer may later be pleasantly surprised to find the DX station that caused the pileup operating via call district procedures or calling CQ on another frequency after an operating disturbance.

Many times pileups are self-escalating. A relatively common DX station begins operating, and the "wolfpack" appears. Others, hearing the action, join the clamor for a contact and the mob increases. The situation mushrooms and still more amateurs begin calling; many never even hear the DX station's call (example: "Thanks for the QSO old man, you're 5 by 9 . . . please repeat your call.") Big Gun DXers seldom become involved in these pileups,

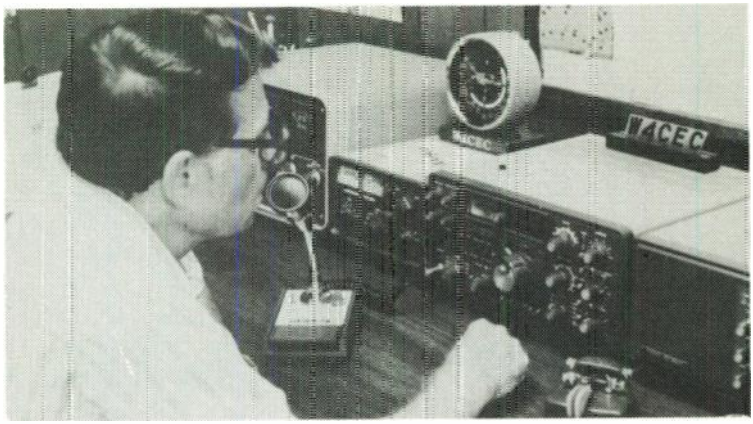


Fig. 1-6. Erskine (Jack) Jackson, W4CEC has been an outstanding casual DXer for many years. Jacks spends a large portion of his amateur radio time constructing or modifying gear and antennas. DX contacts allow him to evaluate each advancement while providing an inner pride of true accomplishment. Every station Jack constructs is an amateur's dream to view and operate with homebrew microphones and fully matching equipment (regardless of manufacturer).

because they probably have that country confirmed *and* because the DX operator often creates bedlam trying to maintain discipline during such ridiculous periods. Both casual and serious DXers should realize that other DX stations will also be active during that time—and contacts with those stations will not suffer unnecessary confusion.

UHF DXING

The high frequency operator should be aware that *his* interest is not the only aspect of DXing. UHF DXing has been popular for many years, however it has only recently reached a new pinnacle of activity. Modes such as *tropospheric ducting, transequatorial propagation,* and *EME* (Moonbounce) are being enjoyed by both old-time DXers and new comers to amateur radio. The challenge is supreme and new techniques are being pioneered practically every day. Tremendous advancements will be made in this area during the forthcoming decade.

UHF DXing embraces some concepts far different from those of band DXing. Signal ducting, for example, is becoming increasingly used for long distance UHF operations. These tropospheric ducts are usually orientated on a north-south axis in the eastern U.S. and either east-west or north-south in the western U.S. While signal ducting appears to follow a somewhat predictable pattern of

occurence and location, the unsuspecting UHF operator may experience difficulty locating and getting a signal into the duct. Old time UHF operators in each area can usually provide information in this respect. Lacking such help, the UHF operator can operate mobile and/or portable throughout the unknown area while continuously monitoring such widely-accepted frequencies as 144.200 mHz for unusual activities. As of this writing, the appearance of tropospheric ducting and its use for communications is a little known technique—it's a game of chance which the UHF operator learns to play and uses as he can.

One example of signal ducting was related by Bill Kitchens, WA4EWA. Bill has a highly efficient setup at his home (See Fig. 1-8), and he has contacted many states on both 2 Meters and 70 Centimeters. However, Bill's most outstanding DX is usually worked from his auxiliary location atop a mountain near his home. Other mountain tops are accessible to Bill, but they do not allow his signals to enter the tropospheric duct. Recently, Bill contacted the

Fig. 1-7. A serious DXer, Glen Tillack, W6KZL; has been at the top of the DXCC Honor Roll for several years. Glen uses two transceivers: one continuously tuned to 20 meters and one for use on the other bands. His amplifier is homebrew—4-1000 final with remote power supply. Homebrew SSTV gear sits on the left of station console. Glen has always been handicapped by an antenna zoning restriction, so antenna is a three-element beam (26 foot boom) atop a mere 45 foot tower. Obviously DXing isn't what you have, but how you use it.

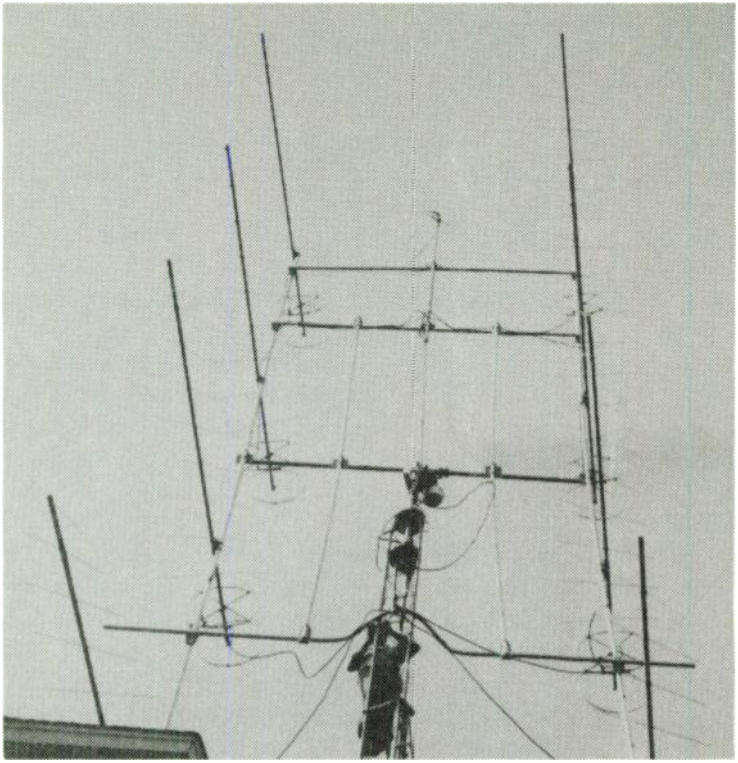


Fig. 1-8. Two-meter DX array of Bill Kitchens, WA4EWA; consists of eight 11-element circularly polarized yagis rotatable in both azmuth and elevation. The array is 60 feet tall and mounted on top of 65 foot tower and is quite efficient for Tropo, EME and OSCAR DX work. That's Bill working on a phasing section.

far side of Arkansas from his mid-Alabama mountain-top site via tropospheric ducting. He is now making plans to move to his mountain top-duct site and build a home there.

A consideration affecting UHF performance (and often HF as well) is the water table level of a specific location. If a high-elevation site is "infested" with iron ore and has very dry soil, the results will not compare to a lower-elevation site with a higher water table and better soil conductivity. That's worth considering the next time you're house hunting.

Transequatorial propagation is becoming better known today—although extensive research is still needed in this area. Basically, transequatorial propagation is long distance communications on 2 meters when the equator is situated between the associated stations. Stations in the southern United States have

contacted South American amateurs and European amateurs have contacted African amateurs via TEP.

Earth-Moon-Earth (EME), or moonbounce, is another DXchallenging aspect of UHF communications being pioneered by many amateurs. It is one of amateur radio's most esteemed areas, requiring a combination of the highest amateur radio skills for successful operation. The moonbounce enthusiast must be able to construct and maintain a highly efficient UHF system, be familiar with basic astronomy techniques, have the persistence of an avid DXer and be willing to work with some rather unusual parameters.

In the same way that a kilowatt setup and multielement beam on 20 meters doesn't assure specific DX contacts, an elaborate EME setup is useless without the human (or computer) element of overall propagation analysis. Seeing the moon and bouncing a signal off it are two different things. The Earth-Moon-Earth distance, for example, varies between 225,000 miles (perigee) and 250,000 miles (apogee) daily, producing flunctuations of up to 2 dB on reflected signals. The EME signal may also be masked by moon reflection losses and periodic Milky Way or Galactic noise. Another propagation variable is Faraday rotation of EME signals. This effect is caused by the Earth's Ionosphere "twisting" the polarization of radio waves leaving or returning to Earth. Since Faraday rotation is less pronounced during evenings when the moon is at high elevation angles, the moon-bouncer should watch for such times. Nautical almanacs provide this information.

The actual EME path attenuates a 144-MHz signal approximately 260 dB. Overcoming this loss requires a high power transmitter, a sensitive receiver and a high gain antenna. The antenna must also have a narrow beamwidth and "gunsight" aiming accuracy to assure success in hitting the moon while rejecting extraneous galactic noise. The *minimal* acceptable antenna gain figure of 20 dB doesn't allow *any* margin for signal variations. An overview of EME parameters is shown in Fig. 1-9.

The beginning moonbouncer should schedule activities during the three or four days of the month when the moon is at maximum distance from the Milky Way. He should operate when the moon is above 40 degrees elevation, and he should use a fixed pattern of transmitting/receiving times which can be interpreted by others attempting to contact him.

SSTV DXING

Slow Scan Television (SSTV) is a unique form of long distance visual communication which has recently gained widespread

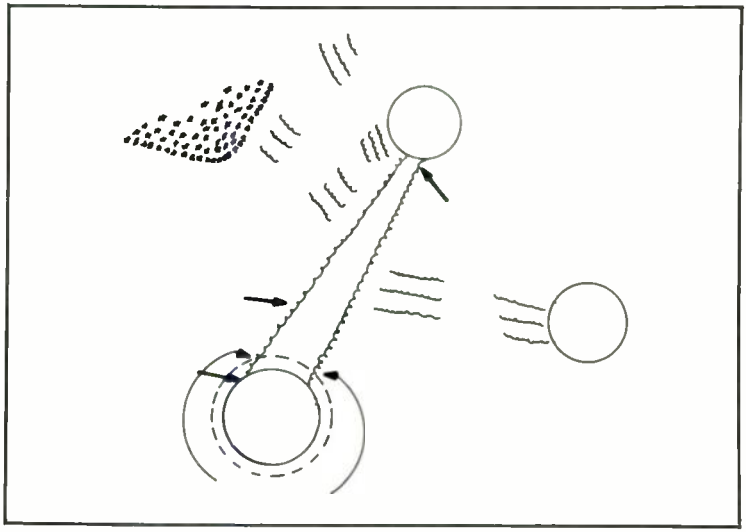


Fig. 1-9. A basic outline of the parameters affecting EME operations. The indicated signal levels will result in moon-returned echos barely perceptible above the noise floor and variations of 2 dB can destroy one's signals. In this example the frequency is in the 144 MHz range.

popularity. Essentially, SSTV transmissions consist of conventional television pictures slowed down approximately 1,000 times. This reduction in scanning rate results in a corresponding bandwidth reduction which allows a series of still pictures to be transmitted over voice-grade channels. These voice-bandwidth signals can be transmitted around the world via the high frequency amateur bands such as 20, 15 and 10 meters. By comparison since conventional (Fast Scan) TV signals occupy a wide (at least 3.5 MHz) bandwidth, they must be transmitted on frequencies above 100 MHz, or via wideband communications satellites—necessarily restricting their transmission range.

As this book is being written, amateurs in over 130 countries are active on SSTV. The awe and excitement of exchanging pictures with DX contacts is an unsurpassed experience. During one evening's activities, the SSTV views might include scenes of Israel or transmissions from King Hussein, JY1; in Jordan. Another time, one may view scenes of Pitcairn Island transmitted by Tom Christian, VR6TC; or views of an Alaskan sunset. The possibilities are, indeed, unlimited. See Figs. 1-10 and 1-11.

A high frequency DX setup can be equipped for Slow Scan TV in a few minutes. The SSTV monitor's input parallels the station

speaker leads to view incoming pictures, and the SSTV camera's output is connected to the transmitter's audio input. A conventional audio tape recorder may be used for recording incoming or outgoing pictures.

The SSTV newcomer should experience few problems receiving video transmissions from distant amateurs. Basically, he keeps an ear (and eye!) on the widely-used SSTV frequencies (within 10 kHz of 14,230 kHz, 21,340 kHz and 28,680 kHz) during the times each band is open for DX. Soon, the sound of SSTV is heard and pictures begin wiping down the monitor screen.

Adjacent channel interference (QRM) can play havoc with SSTV pictures—fortunately there are ways around this problem. Most SSTV DXers transmit several eight-second frames of each picture. Since interference seldom lasts the length of a full SSTV transmission amateurs attempting to receive these pictures can fabricate a continuous loop of recording tape approximately 8 seconds in length, thread the loop into their tape recorder and allow it to record the incoming pictures. As each picture is being viewed, its interference level is also inspected. When a "clean" picture is seen, the tape recorder is stopped and switched to play back the view. At other times, both the transmitting and receiving Slow Scanners monitor their frequency until interference is minimal. Then at a cue word, they jump at the silent period and transmit a single SSTV picture using the highest power level they can muster (legally!).

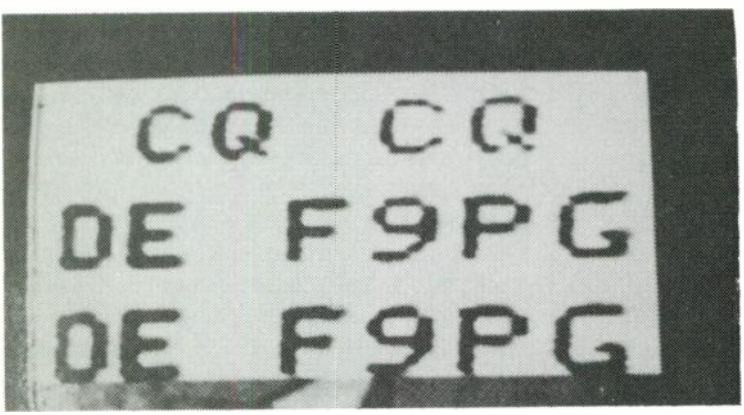


Fig. 1-10. Slow Scan TV picture received from F9PG in France during a video "CQ" transmission. The call sign was superimposed over a view of a large antenna system to stir interest. Dual ID's are beneficial when trying to get through adjacent channel interference.

Fig. 1-11. This Slow Scan TV view shows HB9ADD in Switzerland posing behind his camera while trying to watch his on-the-air transmission on an adjacent monitor. There's plenty of DX amateurs operating SSTV in over 120 countries.

Many foreign countries employ 50 Hz power systems, which produces a very slight change in the transmitted SSTV horizontal and vertical scan rates. These signals seem to run slower than 60 Hz-synchronized (United States) signals. In fact, 50 Hz SSTV signals are often sound-compared to old fashioned film projectors merrily clunking along their way. 50 Hz synchronized signals also produce a slightly narrower raster than 60 Hz signals, thus alerting the Slow Scanner to their DX origin. Some SSTV DXers have been known to mark their monitor screens for quick recognition of 50 Hz pictures; others have designed circuits which activate an alarm when 50 Hz-generated sync pulses are received.

Another general aspect of DX operation which is equally applicable to Slow Scan TV involves knowing all one can about the DX station one seeks to contact. An alert SSTVer, for example, would recognize ZK1AA as a SSTVer and during a pileup lull, might exchange pictures with him. Ethics play an important role in this—the Slow Scanner should never call a DX station via SSTV without warning him. SSB should be used to initiate these contacts, and to ascertain that the other station has his video gear operational.

Slow Scan Television is one of amateur radio's most fascinating communication frontiers, and its popularity is increasing rapidly. Many DXers with high country scores are beginning to

operate and enjoy SSTV. The challenge of long distance visual communications, coupled with SSTV's adaptivity to other amateur activities such as OSCAR satellites or low band DXing, has given new life to operating for many old time amateurs.

FM DXING

The majority of radio amateurs relate FM activities to the restricted range-Very High Frequencies above 100 MHz. A substantial amount of long distance FM communication is taking place, however, in the 29,500 kHz to 29,700 kHz region of 10 meters. Practically every weekend, this RF spectrum comes alive with worldwide FM activity and the operations resemble 2 meters during a fantastic band opening.

One's squelched 10-meter FM rig might sit quietly for an hour and then come forth with signals from South America or Europe. DX can then be worked in the same casual and enjoyable manner on 2 meters. Repeaters and remote base setups are also quite popular on 10 meter FM, and their DX capabilities are tremendous. In the early part of 1979, this author often heard amateurs in various parts of Europe contacting other DX stations through United States-based repeaters. At that same time, amateurs were contacted in all areas of the world on 10-meter FM while using 20 watts of power! Sunspot cycle 21 (the present cycle) should continue producing outstanding radio propagation until the late 1980s. During this time, the 10 FMer should realize some phenomenal results using this unique mode.

An outline of the present 10 Meter FM bandplan is shown in Table 1-1. Most of this mode's activity centers around the *International Direct* frequency of 29,600 kHz, with activity spreading up the band (in 20 kHz increments) as necessary. Operating "simplex" on the output frequencies of 10 FM repeaters has proven quite acceptable provided it doesn't create unnecessary interference.

OSCAR SATELLITE DXING

Until the 1980's, communications via amateur satellite were necessarily restricted to less than 2000-mile distances by the low orbit of these tiny spacecrafts. Yet, many amateurs were able to contact a number of nearby countries during the relatively brief time of a satellite pass. One amateur actually achieved DXCC during that "second phase" of the OSCAR (Orbital Satellite Carrying Amateur Radio) satellite program. That nostalgic era is

now drawing to a close, and the "third phase" of the OSCAR program is getting underway. The results promise a fascinating new world of unique DXing capabilities for all amateurs.

Phase 111 OSCAR satellites will be high altitude—eliptical orbit craft capable of providing reliable and dependable intercontinental communications for a large number of hours each day. The UHF frequencies utilized by these Phase III satellites and their users allow relatively small antennas and low RF levels to be employed. There is little guess-work concerning communication abilities, since signals reaching the satellite are retransmitted to the distant amateur station which is being relayed by the "bird". Each amateur can hear his own satellite-returned signals exactly as others hear them, and can operate in "full duplex" mode.

The possibilities of this satellite arrangement are endless: Amateurs in California, Nevada, Japan and England can conduct mutual "roundtables" with all signals being solid copy. DX and emergency bulletins can be simultaneously broadcast to amateurs around the world, and the DXer can precisely predict when he will contact a specific area. Truly, the Phase III era of OSCAR satellite activities will open new doors of international friendship and goodwill.

The first Phase III satellite was destroyed during launch on May 23, 1980, its replacement is now due to be launched into orbit sometime during 1982, and a number of additional Phase III craft

Table 1-1. 10 Meter FM Bandplan used by amateurs around the world. Note that "direct" communication on a repeater output frequency is acceptable. The world of 10 FM opens many possibilities for amateurs prefering channelized operations. Two meter-to-10 meter repeaters are also presently allowing handie talkie-equipped amateurs to communicate intercontinentally.

Repeater Inputs	International Direct Frequency	Repeater Outputs
29,520 kHz	29,600 kHz	29,620 kHz
29,540 kHz		29,640 kHz
29,560 kHz		29,660 kHz
29,580 kHz		29,680 kHz

NOTE: "Direct", or "Simplex" operation on repeater output frequencies is permissible and popular, provided direct interference isn't created.

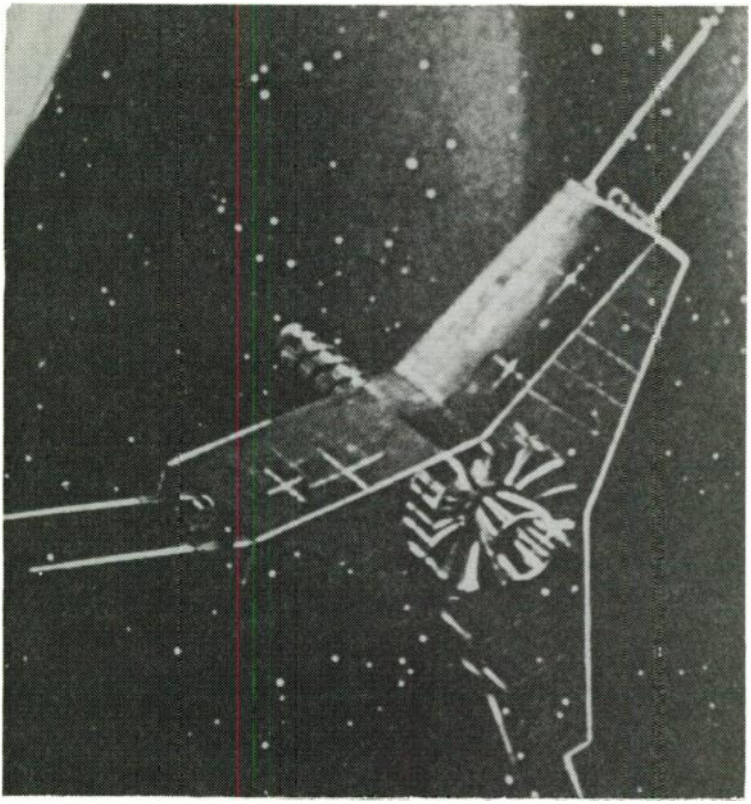


Fig. 1-12. The OSCAR Phase III satellites will open new communication frontiers for all DXers. These elliptical-orbit, high-altitude spacecraft relay UHF signals between countries throughout the world.

are being planned. If you want to enjoy one of the hottest new eras of DXing, you'll surely investigate the OSCAR satellite program. Additional information on OSCAR is available from the *American Radio Relay League*, 225 Main Street, Newington, Connecticut 27, Washington, DC 20044. See Fig. 1-12. Also see TAB book No. 1120 *OSCAR: The Ham Radio Satellites.*

Chapter 2
The Fine Art of DXing

I once knew a businessman that took his weekend fishing quite seriously. His colleagues dubbed him a true sportsman, and his array of fishing trophies proved this true. The man was well-equipped both physically and mentally, and to him fishing was an *art*. His array of fishing equipment was phenomenal: special magnesium-filled rods with torque-sensitive handles, exotic lures and a wide variety of sinkers which controlled the lures' underwater sink rate. The fisherman's boat featured a massive motor which allowed him to reach selected locations in minimal time. This enthusiastic man would study his lakes as accurately as a DXer studies a particular amateur band. Topographical mpas indicating water depths alerted him to locations frequented by the particular kind fish he sought. Fishing magazines and conversations with old timers at each lake gave him insight into each fish's habits. Almanacs and weather forecasts influenced his decisions on exact fishing times and locations. "No use looking for large Bass in this area," he would say after checking the water temperature, "it's too cool and too deep—better look for a more shallow and shaded area and maybe one with some tree branches in the water." This weekend fisherman would start out before dawn, quickly launch his boat and employ all his techniques at the precise time the fish he sought were in their most vulnerable state. This man obviously had his "act together" and enjoyed much better results than the less-prepared casual fisherman.

In the same way that successful fishing involves more than merely throwing a line in a stream or lake, the *true art* of DXing is substantially more involved than merely tuning an amateur band in search of that elusive country or contact. DX bulletins and on-the-air conversations alert the DXer to many DX opportunities. Propagation forecasts and daily sunspot reports also assist in determining the quality of various signal paths. Low power short wave stations operating near the amateur radio bands are located and situated throughout the world and may be used as beacons to determine band openings (Up-to-date lists of these stations may be found in the many weekly SWL bulletins and other publications). Knowing these things is why *true* DXers are sometimes found calling directional *CQs* on what initially appears to be a dead band.

The high-scoring DXer has been known to stalk his needed contacts with the same cunning and skill exhibited by big game hunters on safari. For example, let's assume a DXer spots VKØPK on Maquarie Island working Japanese amateurs on the 20 Meter band. If the expert DXer is unable to contact VKØPK through the pileup of foreign stations, he will probably return to approximately that same frequency an hour earlier the next day seeking the contact. This time, he diligently tunes for the VKØ, knowing that once another pileup gets underway he may again miss his chance for a contact. He's hoping to hear the VKØ initially calling *CQ* or checking a frequency for activity. If VKØPK doesn't appear on the air, the DXer considers whether workday on Maquarie and, depending on circumstances, either returns to the search the next day or exactly *seven days later.* He may also give a "blind call" to the VK0 in hopes of stirring his activity, or he may contact an Australian amateur and ask his assistance in also calling the VKØ. If nothing works, the DXer continues his efforts: DX newsheets and on-the-air conversations eventually inform him of the VKØ's operating style—of his occupation and his interest in other amateur bands or activities. Eventually the desired contact *will* be made.

Another example of DX stalking is the following account of how Honor Roll DXer Jimmy Long, W4ZRZ; managed to contact the elusive country of Cocos Keeling (VK9LA) during his efforts to communicate with every country in the world.

There was only one radio amateur on Cocos Keeling, and he was on the air; Jim could be waiting for years to contact this rare country. Through investigation, Jim learned that his quarry worked as a telegrapher for the Australia Post and Telegraph Company, and finally sent him a telegram asking for a scheduled contact. The

time Jim picked for this schedule was an evening hour on Cocos Keeling, and a time when that particular amateur band was open to the United States. When the precise time for the schedule arrived, Jim began calling the VK9. Lo and behold, there he was returning Jim's call! Following the contact, VK9LA signed off the air, leaving the pileup wondering what was happening. Obviously, planning and plotting have their rewards. See Figs. 2-1 and 2-2.

The true DXer spends considerably more time hunting for rare stations than actually operating on the air. Time that isn't used for reading DX sheets or propagation guides is spent tuning the bands. The search is endless—station equipment is seldom switched off. An ample supply of cooling fans, coupled with periodic maintenance assures the gear is in top shape and ready to use whenever the occasion arises.

There are three basic and interrelated requirements for effective DXing: a top-notch and dependable station and antenna system, a substantial amount of DXing knowledge and enough free time to pursue one's goal. An amateur possessing a state-of-the-art rig, complete with 2 KW PEP amplifier and four-element monoband beams has one-third of the battle won. The DXing knowledge is acquired through *experience,* extended conversations with DXers and through reading all available sources of DX information; including monthly publications and various weekly/biweekly DX newsletters. Finally, the amount of available time plays a *major* role in an amateur's DX scoring. As previously mentioned, the majority of Big Gun DXers are either retired or enjoy flexible work hours. Hence their high DX count.

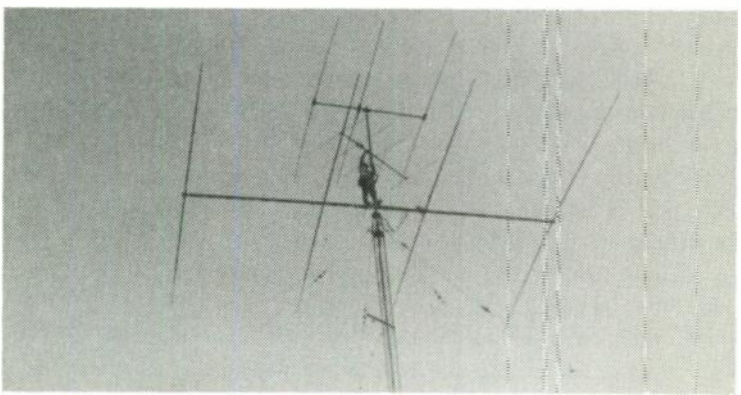


Fig. 2-1. World-renowned DXer, Jimmy Long, W4ZRZ; is adjusting a matching section on his 10 Meter yagi atop a 120-foot tower. Jimmy is standing on the boom of his wide-spaced 20 Meter yagi—but where's his safety belt?

The casual DXer must fit his amateur activities into a life schedule which prevents his continual on-the-air operations. Obviously, he will realize maximum benefits from his precious operating time by using the legal limit of RF power. If, for example, an Indonesian station appears on 20 Meters SSB, he *will* cause a pileup. The first amateurs contacting him will be those running the legal limit of power; amateurs running medium power will spend substantially more time in the pileup before making a contact. Meanwhile, the Indonesian amateur may sign off the air and go to bed, leaving the remaining amateurs waiting until "next time" and the opportunity to contact Indonesia may not reappear for several months. Thus one may consider how *long* he cares to wait before contacting a specific DX area given his available operating time and then decide how much power he should run.

The three parameters: equipment, DXing knowledge and time might also be considered from the following viewpoint on DX scoring. Let's assume that an amateur uses one of the presently-popular high frequency transceivers, a 2 kw PEP linear amplifier of *creditable* design and four element beam antennas for 20 and 15 Meters. Let's further assume this amateur has a high "DX IQ", subscribes to at least one DX bulletin service and one propagation forecast service. If he *practically lives* by his rig (save occasional disruptions for work times and unavoidable social chores), he should be able to contact *300 countries* in three to 3½ years. If the same DXer uses that same setup but only one kilowatt PEP (or 500 watts input when operating CW), the same score will take approximately *14 to 18 months longer.* If he can only spend weekends and one or two brief evenings a week at his rig, he will probably require *seven to eight years* before reaching the 300 country mark.

An amateur using only a high frequency transceiver and triband beam can also reach the 300-country mark, however the time element will be directly proportional to his on the air activity. If he is *truly devoted* to the cause and a *top notch DXer, eight to ten years* is an accurate estimation. If this same amateur must diversify his time, *one or two lifetimes* would be a logical estimation.

There are no easy solutions! DXing is an art and a time-consuming process. This time element can only be reduced with knowledge and *high power*, thus serious DXers usually run the full legal limit for their particular area. See Fig. 2-3.

But, don't despair—there is an "easier" side of DXing. There are over 125 "common" countries in the world which support a relatively large amateur population. Pileups over countries such as

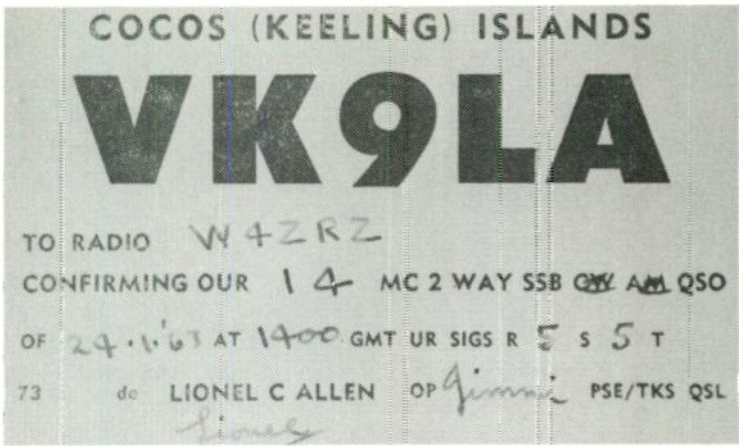


Fig. 2-2. A prized QSL resulting from the DX stalking techniques described in this chapter. This card is presently displayed on the wall at Long's Amateur Electronics, Birmingham, Alabama.

England, Russia, Australia, New Zealand, Japan and Spain are minimal. An amateur running any good quality transceiver, a kilowatt amplifier and triband beam should experience few problems contacting 100 of these countries within four weekends of on-the-air activity—in half that time if a DX contest occurs during one of those weekends. An amateur operating a high frequency transceiver without a kilowatt amplifier can expect to spend 16 to 20 weekends contacting his first 100 countries—a figure which can be substantially reduced if the amateur subscribes to DX bulletins and squeezes in an hour of operating before going to work each morning. The next 100 countries are more difficult to contact (you've worked the easy ones!), so the DXer must change his operating times, and begin using all his DX knowledge. See Table 2-1.

Before delving into specific DX operating tactics, it should be reemphasized that off-the-air planning and plotting produces the greatest returns for an investment in time. Band tuning, regardless of its method, is taking *pot luck* on whatever DX is available. A DXer cannot spend too much time *listening*—but even if he listens 18 hours a day he can still miss vitally-needed contacts by simply being on the *wrong frequency* at the *wrong time*. Two hints: If you are running less than the legal power limit and/or are new to the DXing game, steer clear of band edges, and search for stations approximately 30 to 50 kHz higher—for example 14.230 to 14.250

kHz. Reorientate your beam and recalibrate your rotor to stop at south rather than north. This will allow quick changes from European, Japanese and Australian area contacts. Remember: *time is of the essence.* You want to contact DX stations *before* a pileup builds to an uncontrollable level.

OPERATING EFFECTIVELY

No matter if a DXer has an hour, a half day or a full day to spend at his rig—he wants the maximum return for his time. A systematic approach to DXing is necessary to produce these results.

Whenever possible, try to be waiting on a band *slightly before* it opens for DX. Search the band diligently, paying strict attention to weak signals (less informed amateurs will soon be piling up over the stronger DX signals, regardless of their location). Sketch a running log of each DX station, and his exact frequency (digital dials are helpful here). Within a few minutes, you should be sufficiently familiar with band activity to spot each new DX station as it comes on the air. Stop band tuning only to contact stations which will add to your DX standing. After a few days practice, you should be contacting DX stations as soon as they hit the air; *creating* the pileups which others generate *after* your QSO's. Don't slacken your pace at this point—increase it! If you've been taking advantage of band openings and marginal signals on 20 Meters, you've reaped its best times during the first two hours you've operated. Switch to 15 Meters and being using similar procedures. Approximately an hour later time, you can begin keeping an ear on 10 Meters.

As the evening hours approach, follow the band operating procedure in reverse while again watching for weak DX signals which briefly appear before propagation dies. Finally, check the daily propagation forecast from WWV before retiring for the day. These forecasts, coupled with DX bulletins and other propagation announcements from monthly magazines, etc., can guide your choice for the next period of amateur activity. During slack periods, compare notes with other DXers around the world. You can *both* benefit, and *your* DX score can be boosted by learning of DX activity as it is happening rather than after it has happened.

Operating effectively also involves techniques obtainable *only* through listening and studying on-the-air habits of *true DXers,* plus flexibility in changing with the *times* and *trends*. Avoiding self-centered, braggart and "knob twisting" operating reflects your professional and intelligent attitudes. Be *efficient, concise* and

Fig. 2-3. Among the few amateurs enjoying DX activities on 20 Meters without the aid of high power linear amplifiers are "new country" stations, such as T2AAA, Bob Taylor—The country is Tuvalu; a weather station in the South Pacific.

accurate particularly in pileups, and you'll soon acquire an honorable title among DXers. Watch how rapidly true DXers get through pileups, exchange information quickly and then get out of others' way, and you'll recognize this professional technique in action.

For good practice sessions, try turning-off your linear and operating at the exciter level only. You'll quickly learn to listen carefully and evaluate the other station's ability and situation before blatantly calling him. You'll learn precisely how to take advantage of opportunities and marginal conditions and the capabilities of keen operating. You'll learn the difference between *useful* and *pointless* large pileups, and much, much more. Later, when you switch back to high power, you'll realize a substantially higher success ratio.

WORKING YOUR OWN PILEUPS

During the few days of maximum sunspot activity each month, it's quite possible for U.S. DXers to create and work their *own* pileups on the H.F. bands. This is accomplished by monitoring propagation forecasts and on-the-air activity, then placing an accurately planned *CQ DX* call during that period of peak conditions. Since radio propagation will be optimum during that time, low power DX signals can be received with surprising clarity and the DXer's full-kilowatt signal will be one of the strongest signals received by distant amateurs. If the U.S. amateur is located in a sparsely-populated area, he can also add his *state* and/or *county* to the CQ call as extra "bait" for return calls—amateurs in such states as Delaware and Wyoming are thus situated to create

Table 2-1. 100 "meat and potatoes" countries and their prefixes which the new DXer can contact with minimal effort and few problems. Slightly more than 100 countries are listed here to compensate for missed contacts, lost QSL cards, etc. These 100-plus countries are usually quite active during weekend worldwide DX contests.

AP	PAKISTAN	HA	HUNGARY
CE	CHILE	HB	SWITZERLAND
CO	CUBA	HBO	LIECHTENSTEIN
CP	BOLIVIA	HC	ECUADOR
CT1	PORTUGAL	HH	HAITI
CT2	AZORES	HK	COLUMBIA
CX	URUGUAY	HKO	SAN ANDRES
C6A (ex VP7)	BAHAMAS	HKO	SERRANA BANK
C31	ANDORRA	HL	KOREA
DL	GERMANY	HP	PANAMA
DU	PHILIPPINES	HR	HONDURAS
EA	SPAIN	IS	SARDINIA
EA8	CANARY ISLAND	JA	JAPAN
EI	IRELAND	JD	OKINOTORI-SHIMA
EL	LIBERIA	J3A	GRENADA
EP	IRAN	W,K	U.S.A.
F	FRANCE	KG4	GUANTANAMO BAY
FG7	GUADELUPE	KG6, KH2	GUAM
FM7	MARTINIQUE	KG6S, R, T	MARIANA ISLANDS
F08	TAHITI	KM6	MIDWAY ISLANDS
FP8	ST. PIERRE	KP4	PUERTO RICO
FY7	FRENCH GUIANA	KV4	VIRGIN ISLANDS
G	ENGLAND	KX6	MARSHALL ISLANDS
G1	NORTH IRELAND	KZ5	CANAL ZONE
GM	SCOTLAND	LA	NORWAY
GJ	JERSEY	LU	ARGENTINA
GW	WALES	VP1	BELIZE

LX	BULGARIA	VP2D	DOMINICA
OA	PERU	VP2K	ST. KITTS
OD5	LEBANON	VP2L	ST. LUCIA
OE	AUSTRIA	VP2S	ST. VINCENT
OH	FINLAND	VP5	TURKS AND CAICOS
OK	CZECHOSLOVAKIA	VP9	BERMUDA
ON	BELGIUM	VU	INDIA
OX	GREENLAND	XE	MEXICO
OZ	DENMARK	YB	INDONESIA
PA	NETHERLANDS	YN	NICARAGUA
PJ	N. ANTILLES	YO	ROMANIA
PY	BRAZIL	YS	EL SALVADOR
PZ	SURINAM	YU	YUGOSLAVIA
P29	NEW GUINEA	YV	VENEZUELA
SM	SWEDAN	ZE	RHODESIA
SP	POLAND	ZL	NEW ZEALAND
SV	GREECE	ZP	PARAGUAY
TF	ICELAND	ZS	SOUTH AFRICA
TG	GUATEMALA	3B8	MAURITIUS
TI	COSTA RICA	3D2	FIJI ISLAND
UA	ASIATIC U.S.S.R.	3D6	SWAZILAND
UF6	GEORGIA U.S.S.R.	4U	UNITED NATIONS
UL7	KAZAKH U.S.S.R.	4X4	ISRAEL
UR2	ESTONIA	5Z4	KENYA
VE	CANADA	6Y5	JAMICA
VE1	SABEL ISLAND	8P6	BARBADOS
VK	AUSTRALIA	8R	GUYANA
9V1	SINGAPORE	9Y4	TRINIDAD

substantial pileups. The resulting group of callers will be anxious to make a contact and exchange QSL cards, even though they habitually expect the U.S. amateur to conduct only one long-winded QSO.

If you want to keep the pileup rolling, you'll need to rapidly pass along the vital information and move to the next caller without letting the pileup build to exorbitant levels *or* letting the on-frequency activity wane. Practice this technique by noting operating procedures of DX stations. Finally, remember to send each DX station a QSL to prove your sincerity and DX credibility.

Besides operating at the kilowatt level during the monthly peak condition, a most successful way to create a pileup is to be on the right band *precisely* when the signal from your area is the only one received by the distant amateur; thus making yourself a "sitting duck" for DX calls. This author, for example, has created many pileups on 10 Meters by beaming toward Europe at around 6:30 A.M. local time and pouring a strong signal into that area until 30 minutes later when other U.S. stations began appearing on the band.

The ethics of using high power for communications during prime band openings (when low power transmissions usually suffice) can be *touchy*, so the DXer should restrict his "pileup" activities to those *few minutes* of peak conditions, and occasionally check band activity to ensure that he isn't becoming a sheer (and highly unpopular) "muscle flexer". Remember, no one likes a showoff.

There are also some undesirable consequences in this form of reverse-pileup operations: The U.S. station will work a number of "common" DX stations and quite possibly miss that rare, low power DX station briefly appearing during this prime time. One should consider whether he desires to contact a large number of Japanese amateurs or one or two Indonesian or Fiji stations. And again, the reader is urged to use the "reverse-pileup" technique in a *considerate* and *discreet* manner. Calling *CQ DX* on 14,205 kHz during the middle of prime DX openings is *inconsiderate, arrogant, fooolish*—and *liddish*. The best DX is still contacted through extended periods of listening, listening, listening....and occasionally calling once or twice.

DXING THE 10 METER BAND

Situated midway between high frequency and ultra high frequency allocations, 10 Meters is one of amateur radio's most

unique communications bands. The propagation characteristics of 10 Meters is directly related to sunspot activity: during low sunspot periods, the band is closed for DX; during high sunspot periods it's wide open for worldwide communication using very low power levels.

Ten Meters is basically a daytime band, opening approximately three to four hours after sunrise and closing approximately one to two hours after dusk. The best times to enjoy 10 Meter DXing are during the spring and fall, since summer and winter slumps on this band often result in north-south propagation only. The best times for 10 Meter DX operations are when sunspot counts rise above 170. During these times, U.S. amateurs can fill three or four logsheets with solid DX contacts from a mere two hours of operation. These times are also extremely enjoyable for operating with RF power levels below 100 watts. During the 1979 DX contest, for example, this author contacted numerous Japanese amateurs whose licenses restricted them to ten watts. Their 10 Meter signal consistently produced S8 to S9 levels in Alabama.

A relaxed DX atmosphere, coupled with a relatively wide and uncrowded frequency spectrum are the mainstay of 10 Meter enjoyment. Many amateurs are thus able to enjoy extended and truly meaningful DX conversations on this pleasurable band.

Ten Meters may be considered a "sleeper" since it is often open for DX (as evidenced by the many beacon signals heard operating in or near the 28 mHz region) but with low amateur activity. These are the ideal times for U.S. amateurs to call *CQ DX* on or near the popular frequency of 28,600 kHz. Since low power levels (exciters or transceivers operating "barefoot") are commonplace on 10 Meters, a high-power U.S. station calling *CQ* on an open but unoccupied portion of this band can expect exceptional results. The DX station, casually checking 10 Meters for a possible opening during this time will literally be blown out of his chair by the strong U.S. signal! Naturally, the high power level should *not* be maintained after the band has been "opened".

Another aspect of 10 Meter operation which has recently gained widespread acceptance is the use of Narrow Band FM (NBFM) in the 29,500 to 29,700 kHz frequency range. 10 Meter FM is similar in concept to 2 Meter FM (small, squelched equipment continually monitoring established FM channels) except 10 Meters offers worldwide communications capabilities. As this book is being written, amateurs in over 75 countries are operational on 10 FM. The majority of this FM activity occurs

during weekends, and the 10 FM bandplan shown in Table 1-1 is usually employed. A U. S. Amateur can contact at least a dozen countries on 10 FM during a leisure and part-time Saturday's activity on this band/mode.

The usual power levels on 10 FM range upward from 5 watts (Yaesu FT901DM). Mobile, portable and fixed station activities are blended on 10 FM; the International Direct and Calling Frequency is 29,600 kHz, with activity spreading up the band as necessary. Numerous repeaters and remote base setups on 10 FM make it an FM DXers "haven of delight."

DXING THE 15 METER BAND

The 21 mHz amateur band exhibits properties similar to both the 20 and 10 Meter bands: it has outstanding DX capabilities, it usually "opens" before and "closes" after 10 Meters, and it is substantially affected by sunspot activity. Fifteen meters usually offers a wider array of DX activities than available on 10 Meters, however it doesn't hold the DX capabilities of 20 Meters. This "second choice" band, 15 Meters, is "open" almost year 'round, with signals peaking during early evening hours. Many times during periods of high sunspot activity, 15 Meters continues to be alive with DX until a couple of hours before midnight, one's local time.

The communications atmosphere on 15 Meters is also a "split" between 10 and 20 Meters: There is an air of competitiveness, numerous Big Gun DXers, and an occasional long DX conversation when activities are slack. The sharpness of DX paths on 15 Meters helps to reduce interference levels, yet means that a DXer trying to contact a station can spend several hours without success. One of the secrets of 15 Meter operations is knowing when to begin...and when to stop. It's difficult to beat mother nature (propagation)!

There are two portions of the 15 Meter band which are particularly beneficial to the DXer: 21,000 to 21,075 kHz *CW* and the 21,250 to 21,300 kHz Extra Class-only SSB. The Extra Class section is particularly worthwhile for DXing since interference levels are minimal, and since this is the only fully restricted amateur spectrum *specifically dedicated* to long range communications. The effect is similar to adding an additional linear amplifier to one's setup. If you don't possess an Extra Class License, this frequency range alone should be, in itself, enough reason to get cracking at this goal. The first 25 kHz of both 15 and 20 Meters CW are other very important and restricted DX ranges which require

an Extra Class License to operate—needless to say, 15 and 20 Meter CW are the epitome of true DX activities.

There are a number of SWL guides presently available which list low power broadcast stations operating near 21 mHz. These stations can provide beacon-type references to determine the direction and quality of 15 Meter openings.

DXING THE 20 METER BAND

20 Meters is the prime focal point of amateur DXing activities; it is "open" to more areas of the world for longer periods each day than any other amateur band. If an amateur is confined to single band of operation due to economic or interference problems, his overwhelming choice should be 20 Meters. And, this "first choice" amateur band is "home" for the largest number of DXers and for the highest power signals. Operating this band with a marginal setup is like driving the *Indianapolis 500* in a compact car—it's safe only when the "big boys" aren't around.

There are two separate DX portions to the 20 Meter band: the CW portion (prime DX in the 14,000 to 14,050 kHz range) and the SSB portion (prime DX in the 14,200 to 14,265 kHz range with foreign amateurs also working split frequency in the 14,170 to 14,200 kHz range). Since the majority of amateurs prefer voice communications, the DXer with limited time, experience, antennas or transmitter power will reap maximum benefit when operating 20 Meters CW. An Extra Class license is vitally important to the 20 Meter CW operator, since it allows him to operate the relatively interference-free range of 14,000 to 14,025 kHz.

The 14,200 to 14,265 kHz SSB portion of 20 Meters is a DXers delight. A vast number of foreign amateurs can be found in this area during almost every hour of the day or night. Top-notch operating tactics and high power levels are necessary to complete in pileups with this range—but one can usually enjoy good results by tuning this range for weak and DX stations which are either just beginning their daily activity or are being overlooked by other DXers. Try to avoid getting sidetracked into massive and time consuming pileups unnecessarily, as you can miss other equally important DX contacts. Alternatively, you might continue tuning the band while occasionally rechecking a pileup for periods of slack activity—transceivers with frequency-programmable memories are advantageous for this operation.

The most opportune times to operate 20 Meters are during local dawn, dusk and during the late evenings when propagation

begins to shift (the time varies with local seasons, but is approximately 9:00 p.m. during winter and 11:00 p.m. during summer—your local time). These times will give you an "edge" on others, since skip conditions will favor you.

Unlike other high frequency amateur bands, 20 Meters doesn't suffer excessive seasonal slumps. It is open to one geographic area or another most of the year. Noise levels are relatively constant year round, with Spring and Fall months producing exceptional band openings.

Many DXers employ two antennas for 20 Meters: omni-directional antennas for *spotting* DX before the mob also hears it and uni-directional high gain antennas for *working* that DX. See Fig. 2-4.

DXING THE 40 AND 80 METER BANDS

These bands support a creditable amount of DX activity during the times of darkness at both ends of a communications path. DX signal levels are lower than those on 20 Meters, and several broadcast services create problems for both American and DX SSB operators. CW keying is generally slower and SSB calls are longer on these bands as DXers strive to push their signals over medium-attenuation paths.

Forty and 80 Meters are almost inverse copies of the 15 and 10 Meter bands. Ten Meters is a daytime band and 80 Meters is a nighttime band. Fifteen Meters closes during early evening and 40 Meters closes soon after sunrise. Ten and 15 Meters are best when sunspot activity is high while 80 and 40 Meters are best during low sunspot activity.

Antennas are prime considerations for 40 and 80 Meter DX operators, since wavelengths at these frequencies are quite long. Dipoles, with their unity gain and high radiation angles, are relatively poor DX antennas. You'll have a difficult time working DX with a dipole or inverted vee on 40 or 80 Meters. Ground planes or full sized verticals produce low radiation angles and thus perform reasonably well on these bands, provided they are at least one-quarter wavelength away from obstructions and have an unobstructed view of the horizon in the directions of desired communications. Until recent years, massive beam antennas were considered impractical for 40 and 80 Meters—today, DXers erect fixed-direction-wire Yagis, selectable Rhombics or Vee beams for these bands.

The bulk of CW DX on 40 and 80 Meters operates within the first 35 kHz of these bands (7,000 to 7,035 kHz and 3,500 to 3,535

kHz). Foreign SSB stations on 40 Meters transmit between 7,050 to 7,100 kHz, while listening for U.S. stations on 7,150 to 7,160 kHz. Foreign SSB stations on 80 Meters transmit between 3,765 to 3,810 kHz while listening for U.S. stations on 3,800 to 3,825 kHz. Operate these bands near dawn and midnight for best DX results.

DXING THE 160 METER BAND

The proverbial "Top Band" of amateur activity, 160 Meters offers a unique challenge for stout-hearted DXers or amateurs appreciating glints of nostalgia along with their operation. Situated only slightly above the AM broadcast band (1800 to 2000 kHz), the static crackles and an air of gentlemanly agreement concerning spectrum use on 160 Meters truly brings the golden age of radio back to life.

One-sixty suffered a minor reduction of popularity during the 1960's, when many commercial manufacturers stopped production of units capable of operating 160 Meters. That situation was rectified during the 1970's however and 160 Meters is presently regaining its popularity ten-fold. See Fig. 2-5.

DXing techniques on 160 Meters are somewhat different from those used on other amateur bands. Amateurs in each state and foreign country are restricted by frequency and power allocations. See Table 2-2. CW and SSB activities are conducted according to "gentlemen's agreements", which also define a region of the band known as the *DX window*.

Fig. 2-4. Dave, C5AAM, enjoys relatively good results DXing on 20 Meters while using only an Atlas 210 Transceiver. Of course, that Gambian call adds some "physiological dB's!"

160 Meters is a night-time band, with signals peaking at the sunrise and/or sunset ends of a path. European signals would thus peak into the central U.S. around midnight U.S. time, while South Pacific and western DX signals would peak around sunrise U.S. time. The typical length of such optimum 160 Meter DX openings (peak conditions) are from five to ten minutes (occasionally up to an hour) which means that one must be ready and waiting for DX signals to rise above the noise level for brief communications.

Noise is the greatest limiting factor on 160 Meters, for one must be able to hear DX in order to work it. The majority of successful 160 Meter DX setups are situated in very low noise locations and employ two or three separate noise-dodging receiving antennas with large, vertically polarized transmitting antennas. This does not mean, however, that one must have an elaborate antenna system in order to work DX on "Top Band"; it merely means that those amateurs restricted to smaller antennas must watch for optimum propagations and use whatever assets they have available.

Several amateurs have achieved outstanding DX results on 160 Meters while using a vertical antenna worked against an elaborate ground system for transmitting and a 250 to 500-foot long wire five to ten feet above the ground for receiving. Since the vertical transmitting antenna can re-radiate noise to the receiving antenna, a 160 Meter dipole was also used when necessary—located 200 to 400 feet away from the vertical to ensure a high signal-to-noise ratio. Various forms of Beverage or mini-beverage and loop antennas also perform quite well for receiving DX signals on 160 Meters.

Besides obtaining low noise reception on 160 Meters, the "Top Band" DXer should strive for the best ground system possible. This ground could consist of ground rods, buried radials, buried metal objects and anything else capable of providing an effective ground screen. Obviously, 160 Meter verticals placed over saltwater or marsh afford excellent transmitting capabilities.

The majority of 160 Meter DX activity is conducted as shown in Fig. 2-6—amateurs in the U.S. and Canada transmit between 1800 and 1807 kHz while working DX stations that are transmitting in the *DX Window* range of 1825 to 1830 kHz.

Not all DX stations operate in the DX Window, however, so sharp 160 Meter operators know to tune the *full* 160 Meter band when signals from specific areas may propagate into their location. Russian Amateurs, for example, frequent 1950 to 1954 kHz while

listening for U.S. replies on either 1800 to 1803 kHz or 1845 to 1850 kHz. While some Hawaiian Amateurs operate 1800 to 1805 kHz, others move to 1995 to 2000 kHz to avoid "stateside" QRM. Japanese amateurs must operate between 1901 and 1907 kHz.

Obviously, one must spend a reasonable amount of time operating 160 Meters and comparing notes with other "Top Banders" to become fully familiar with this part of the spectrum. One of the best ways of learning and keeping informed about 160 Meter operations is Stew Perry's (W1BB) *160 Meter Bulletin*. The ideas and DX news items presented in these sheets are superb, and W1BB's personal thoughts add a special note to each bulletin.

An effective "beginners" antenna for 160 Meters is shown in Fig. 2-7. Although this skywire isn't a true DXers "dream antenna," it will perform quite efficiently and permit newcomers to try "Top Band" with minimum effort.

OVER-THE-HORIZON RADAR AND THE DXER

During the early 1970's, an unusual type of interference became occasionally noticeable on 20, 15 and 10 Meters. This interference, which resembled the sound of a woodpecker tapping on a tree, encompassed an approximate 50 kHz bandwidth; its center frequency being discernible only by a peak in signal strength—which often attained S-9 levels. Stateside triangulations

Fig. 2-5. *Mister 160 Himself*—Stew Perry, W1BB. An outstanding DXer since the 1930's, Stew has worked and confirmed over *148 countries* on the "Top Band". One of the keys to W1Bb's success is a remote "shack" overlooking the Atlantic Ocean with a number of 160 Meter antennas for both transmitting and receiving erected at that low-noise location. Stew has published a 160 Meter newsletter for many years, and he assisted with the 160 Meter information presented in this chapter.

indicated the source direction as due north. Extensive search and intruder watch efforts later uncovered the "woodpecker's" source: A long distance radar installation in Estonia.

Following a period of governmental and political pressure, the U.S.S.R. curtailed or restricted its use of this over-the-horizon radar and the high frequency bands once again quieted for a time. But during mid-1979, the Estonian over-the-horizon radar once again appeared on the high frequency bands. This time, the "woodpecker's" signal strength was S-9 to 20dB over 9, and the center frequency often fell around 14,200 kHz. As this book is being written, numerous groups are again pressuring the U.S.S.R. to curtail or restrict these transmissions. The Federal Communications Commission and the American Radio Relay League have asked that amateurs copying this interference notify their offices. F.C.C. Field Engineering Offices are interested in date, time, signal strength of and beam headings to the interference.

There are a number of reasons why each and every amateur should take time to report his observations concerning the Estonian radar, but the primary one is that 10,000 reports provide more concrete and factual evidence than a mere handful. During future years, there's little doubt that unanimous complaints from all shortwave users will permanently shut down the Estonian radar.

There is only a limited amount of information concerning over-the-horizon radar available to the general public, consequently numerous rumors and accusations result from the use of such long-range systems. The United States is reportedly also developing a long range HF radar, and the system may be installed near the Florida beach area. During a recent hurricane in that area, protective radomes were blown from their mounts and experimental antennas which could be used for such purposes were uncovered. Almost immediately, two alien submarines surfaced and began photographing the arrays. Obviously, over-the-horizon radar is of prime interest among many world powers.

The biological and environmental effects produced by colossal power-long range radar is another controversial issue being raised by several private and governmental organizations. Concerns range from electronic invasion of privacy to accusations of health hazards created by excessive exposure to RF energy. Readers interested in further discussion on this issue should read "The Zapping of America".

MEANINGFUL DX COMMUNICATIONS

Both serious and casual DXers have developed a greater interest in *meaningful* radio communications. This situation may be partially due to the unpopular concepts of "DX nets" and "list" operations, or it may be a natural outgrowth of the desire to truly communicate with distant lands rather than merely logging countries and exchanging QSL cards. Whatever the reason, these meaningful communications are definitely opening new horizons for many amateurs. What is there, for example, driving "Big Gun" DXers to enjoying hour long QSO's with amateurs in places such as France, England or Japan, if not to share lifestyles and ideas? This mainstay of long distance communications promises to surpass amateurs' interest in country scoring and DXCC standings; particularly as "new generation" DXers arise and if today's DXing concepts do not change during the coming years. Many DXers seriously feel there's no challenge, or true prestige, in working DX today as there was a few years ago.

DXers electing to confine the bulk of their activities to personalized and expanded communications rather than "list" and "net" activities are having the time of their lives. They exchange magazines and gifts between their lands; they supplement on-the-air QSO's with cassette letters and they build international friendships which extend far beyond continental boundaries. Frequently seldom-heard (and often rare) DX amateurs hear of these activities and join the gatherings. Everyone wins, and the

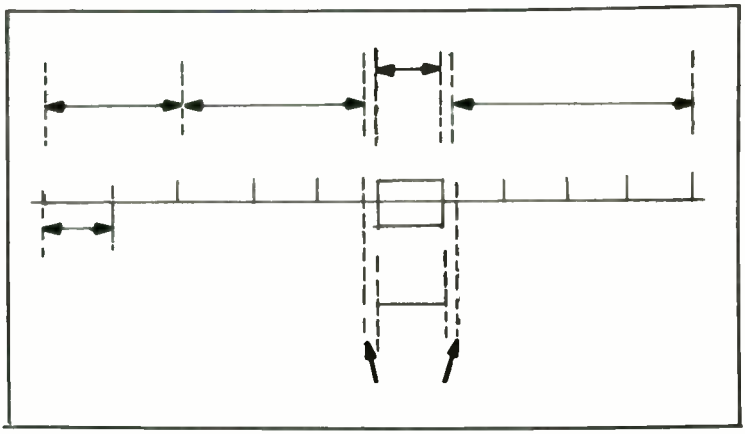


Fig. 2-6. Outline of amateur activites conducted on the lower half of 160 Meters, with a description of the "DX Window" described in text.

Table 2-2. Frequency and power allocations for the amateur 160 Meter band. CW and SSB sub-bands and the "DX Window" are handled by "gentlemen's agreement" rather than via FCC regulations.

Area	Maximum DC plate input power in watts							
	1800-1825 kHz	1825-1850 kHz	1850-1875 kHz	1875-1900 kHz	1900-1925 kHz	1925-1950 kHz	1950-1975 kHz	1975-2000 kHz
	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night
Alabama	500/100	100/25	0	0	0	0	100/25	500/100
Alaska	1000/200	500/100	500/100	100/25	0	0	0	0
Arizona	1000/200	500/100	500/100	0	0	0	0	0
Arkansas	1000/200	500/100	100/25	0	0	100/25	100/25	500/100
California	1000/200	500/100	500/100	100/25	0	0	0	0
Colorado	1000/200	500/100	200/50	0	0	0	0	200/50
Connecticut	500/100	100/25	0	0	0	0	0	0
Delaware	500/100	100/25	0	0	0	0	0	100/25
District of Columbia	500/100	100/25	0	0	0	0	0	100/25
Florida	500/100	100/25	0	0	0	0	100/25	500/100
Georgia	500/100	100/25	0	0	0	0	0	200/50
Hawaii	0	0	0	0	200/50	100/25	100/25	500/100
Idaho	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Illinois	1000/200	500/100	100/25	0	0	0	0	200/50
Indiana	1000/200	500/100	100/25	0	0	0	0	200/50
Iowa	1000/200	500/100	200/50	0	0	100/25	100/25	500/100
Kansas	1000/200	500/100	100/25	0	0	100/25	100/25	500/100
Kentucky	1000/200	500/100	100/25	0	0	0	0	200/50
Louisiana	500/100	100/25	0	0	0	0	100/25	500/100
Maine	500/100	100/25	0	0	0	0	0	0
Maryland	500/100	100/25	0	0	0	0	0	100/25
Massachusetts	500/100	100/25	0	0	0	0	0	0
Michigan	1000/200	500/100	100/25	0	0	0	0	100/25
Minnesota	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Mississippi	500/100	100/25	0	0	0	0	100/25	500/100
Missouri	1000/200	500/100	100/25	0	0	100/25	100/25	500/100
Montana	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100

Nebraska	1000/200	500/100	200/50	0	0	100/25	100/25	500/100
Nevada	1000/200	500/100	500/100	100/25	0	0	0	0
New Hampshire	500/100	100/25	0	0	0	0	0	0
New Jersey	500/100	100/25	0	0	0	0	0	0
New Mexico	1000/200	500/100	100/25	0	0	100/25	500/100	1000/2000
New York	500/100	100/25	0	0	0	0	0	0
North Carolina	500/100	100/25	0	0	0	0	0	100/25
North Dakota	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Ohio	1000/200	500/100	100/25	0	0	0	0	100/25
Oklahoma	1000/200	500/100	100/25	0	0	100/25	100/25	500/100
Oregon	1000/200	500/100	500/100	100/25	0	0	0	0
Pennsylvania	500/100	100/25	0	0	0	0	0	0
Rhode Island	500/100	100/25	0	0	0	0	0	0
South Carolina	500/100	100/25	0	0	0	0	0	200/50
South Dakota	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Tennessee	1000/200	500/100	100/25	0	0	0	0	200/50
Texas	500/100	100/25	0	0	0	0	0	200/50
Utah	1000/200	500/100	500/100	100/25	100/25	0	0	100/25
Vermont	500/100	100/25	0	0	0	0	0	0
Virginia	500/100	100/25	0	0	0	0	0	100/25
Washington	1000/200	500/100	500/100	100/25	0	0	0	0
West Virginia	1000/200	500/100	100/25	0	0	0	0	100/25
Wisconsin	1000/200	500/100	200/50	0	0	0	0	200/50
Wyoming	1000/200	500/100	500/100	100/25	100/25	0	0	200/50
Puerto Rico	500/100	100/25	0	0	0	0	0	200/50
Virgin Islands	500/100	100/25	0	0	0	0	0	200/50
Swan Islands	500/100	100/25	0	0	0	0	100/25	500/100
Serrana Bank	500/100	100/25	0	0	0	0	100/25	500/100
Roncador Key	500/100	100/25	0	0	0	0	100/25	500/100
Navassa Island	500/100	100/25	0	0	0	0	0	200/50
Baker, Canton, Enderbury, Howland	100/25	0	0	100/25	100/25	0	0	100/25
Guam, Johnston, Midway	0	0	0	0	100/25	0	0	100/25
American Samoa	200/50	0	0	200/50	200/50	0	0	200/50
Wake	100/25	0	0	100/25	0	0	0	0
Palmyra, Jarvis	0	0	0	0	200/50	0	0	200/50

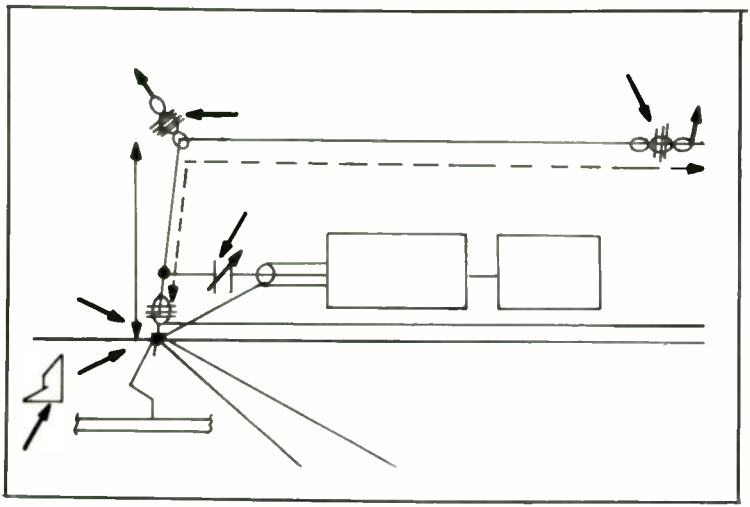


Fig. 2-7. A "beginners" 160 Meter DX antenna which performs relatively well. A good ground system is the key to its performance.

ensuing QSO's become virtual "vacations" to places around the world.

If you are seeking additional pleasures in your amateur operations—investigate the possibilities of *meaningful* DX communications. You'll find a world of truly exciting people waiting behind each and every CQ call, and the resulting QSLs can be supplemented with postcards and photos.

The art of DXing is many things to many people. It can mean that one restricts one's communications to only rare and exotic DX stations, it may involve UHF communications with nearby states, it may encompass satellite operations or visual communication via slow, medium or fast-scan television or it may involve personally-gratifying and dynamic communications with popular foreign areas. Whatever the situation, DXing is one of amateur radio's greatest assets. This has been the case ever since the very first years of radio communication, and it's quite obvious that amateurs will always strive to communicate over longer and longer distances, proving again and again the superb challenge of DXing.

Chapter 3
Setting Up the DX Station

Successful DX operations do not happen by mere chance; they are planned from the ground up. Naturally, such planning begins with the location and layout of the radio amateur's station. This chapter will discuss these considerations and provide the prospective DXer with an overview of DX station design. See Figs. 3-1 and 3-2.

Few amateurs can afford moving into an optimally-located home merely because they've become seriously involved with DXing. There are, however, several alternatives which can be used to one's advantage. First, national surveys and census figures indicate that people move on the average of every six years—recent issues of the *Radio Amateurs Callbook* show that many amateurs move even more often. The next time you're faced with an unavoidable move, you might consider acquiring a quaint home in the highest possible location, well-removed from city noises and electrical interference. Topographical maps can prove helpful if you are unfamiliar with the geographic areas. The ideal location will also have a high water table or soil conductivity, an absolute minimum of man-made radio-frequency noise and a clear view of the horizon in every direction. Once you've found your "dream location" (compromises will be inevitable) you can check out its communication ability with a mobile rig. You'll want to operate from the planned location several times at different hours and note noise levels on various bands. Remexber to check zoning laws and neighborhood antenna restrictions. Any questionable legal areas should be settled *in writing* before a contract or lease is signed.

Since the majority of radio amateurs presently live in less than optimum locations, we must make the best of our situations through whatever means we find available. Amateurs confined to apartments or condominiums might consider auxiliary, portable or mobile setups for their DXing activities. A permanently-installed antenna at an often visited relative in a rural location, for example, can turn one's otherwise slack weekends into DXing delights. The amateur might sell his relatives on the idea of improved TV reception from an antenna mounted near the tower's top. The amateur radio antenna would, naturally, be mounted atop the tower, too. The amateur could, with minimal planning, be on the air from this site within thirty minutes after his arrival. Vans and campers with ready-to-operate setups are also suited for these activities: The amateur can operate at any outlandish hour while also sleeping in the camper. Relatives have been known to appreciate visitors bringing their "own room" during visits.

Some amateurs purchase a small plot of land atop a mountain near their home and use that site for weekend DXing. Again, this concept works very well if the DXer owns a small camper or enclosed truck which can double as a radio room. If you decide to follow this plan, be sure to secure enough land to support a large home. You may later decide to permanently move onto that "proven" DX site!

Mobile setups have also proven their DX ability, particularly when a full kilowatt of power is combined with a prime mountain top location. Several amateurs have equipped recreational vans or campers with dual 12-volt power systems, large AC generators and crank-up towers for DXing pleasures. Knock-down beam or quad antennas can be fitted on these towers and a complete kilowatt station can be fully operational within 15 to 20 minutes after one stops at a desirable location.

TOWERS AND ANTENNAS

The first and foremost consideration in any DX setup is a tower high enough to place the station antenna above surrounding objects. Antenna heights of less than 50 feet will handicap serious DX activities, so don't skimp on the tower. Every additional foot of antenna height is a well-spent investment, and it will concentrate future station expansion or ground-level improvements. Crank-up and/or tilt-over towers are beneficial for earth-bound amateurs or operators faced with squeamish neighbors. During periods of low on-the-air activity, crank-up towers can be lowered to provide a

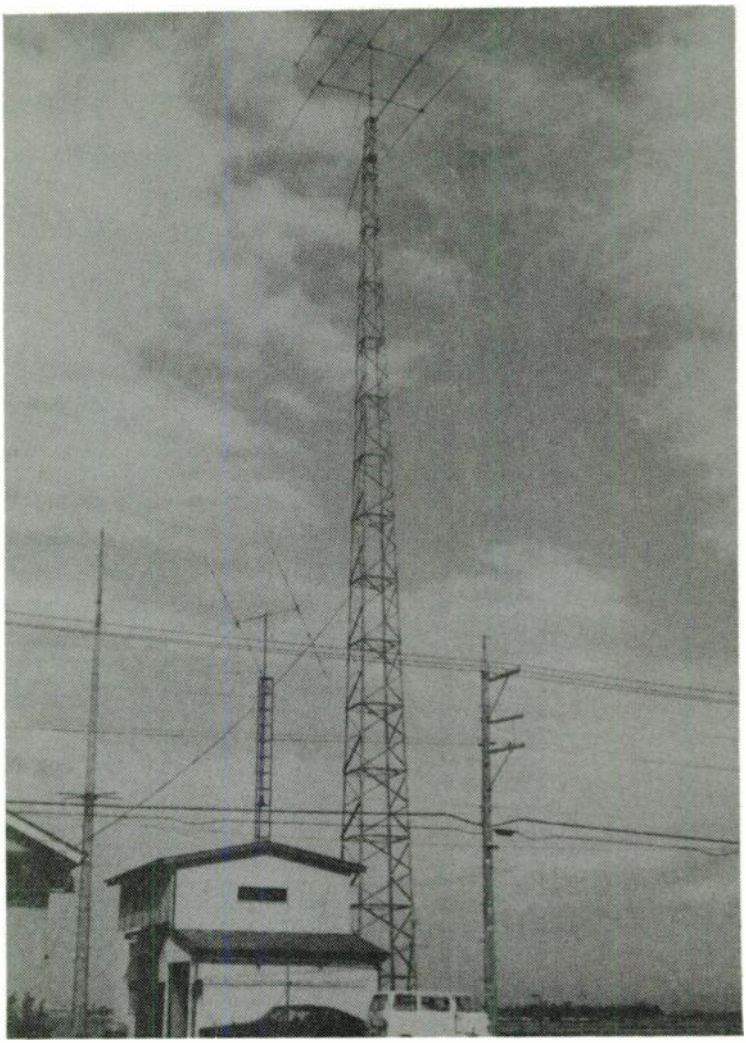


Fig. 3-1. This "no compromise" amateur station of JA9BE bears a striking resemblance to a commercial communications center. The 130-plus foot tower supports monoband beams for 20, 15 and 10 Meters and a horizontal boom from the tower's top supports a vertical 8JK beam for 80 Meters. The tower in the background supports a triband quad. A two-element 40 Meter beam was installed on the sky needle (left tower in picture) after this photo was taken.

measure of "cloaking" for the amateur's beam antenna(s). See Fig. 3-3.

The antenna placed atop a DXers tower should provide all the gain and directivity one can financially afford. Optimum-spaced

monoband beams are usually preferred over triband arrays and, as you've often heard, if the antenna stays up through a full winter's fury, it's probably too small!

Some amateurs will not be able to erect a large tower and beam antenna at their present location. This may impair their DX ability but it doesn't eliminate it, several alternatives are possible. Minibeams or wire arrays (Rhombics, Vee beams, etc.) have been known to work their fair share of DX while ground planes and verticals are also quite worthy of installation. Basically, the antenna equation means getting the most from one's situation—whatever it is and thoroughly enjoying its results. Try to avoid placing the main DX antennas directly over the statin's location. This will reduce the possibility of present and future RF feedback problems, plus it will provide additional conveniences which will be discussed elsewhere in this book.

Next, a large number of half-wavelength radials should be laid from the antenna's ground support and connection. Approximately 120 lengths of grounding cable or inexpensive aluminum fence wire buried six to eight inches below ground level are the ideal choice. Alternately, two or three-dozen shorter radials may be laid and more added as time permits. These radials are attached to the tower or antenna grounding rod, and several radials should also be securely connected to the station's cold water pipe and station ground rod located outside the amateur radio room. The most convenient time to lay radials is after a hard rain when the ground is soft and pliable. Picks or yard tillers make this job easier. Finally, fresh grass may be planted over the radials to prevent erosion from destroying one's efforts. The effectiveness of this low resistance ground system will directly affect the station's DX capabilities.

Grounding efforts should also be continued at the operating desk. A one or three-inch wide copper strap should be screwed to the back of the desk, and connected via the shortest possible route to the outside ground with a heavy strap or braid which is *independent* of all transmission lines. A relatively large diameter, short grounding wire should then be connected from the desk's copper strap to the rear panel of *each* piece of equipment used in the amateur station. If the outside ground connection is temporarily disconnected from the copper strap, it should be possible to measure a resistance of less than *one ohm* from the cabinet of *any* piece of station equipment through connecting cable shields to the antenna, through the tower and through the radials to the outdoor station ground and back to the removed ground connection. If the

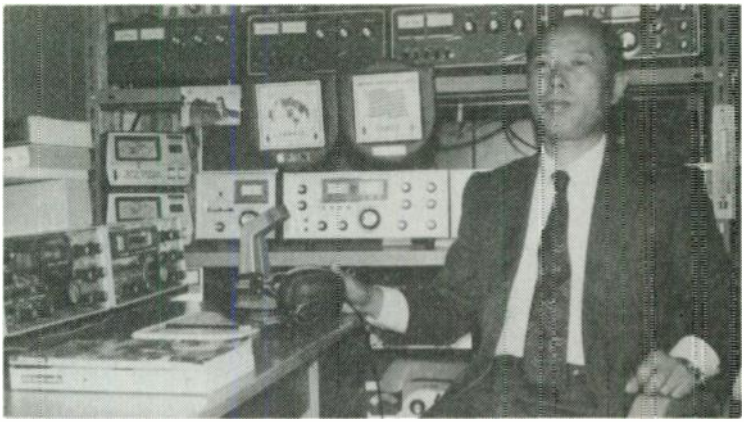


Fig. 3-2. Inside view of the station belonging to Hisanobu Mori, JA9BE. His equipment includes separate FTDX401 transceivers and FL2100B linear amplifiers for 20, 15 and 10 Meters, plus an additional complete station consisting of a FL101 transmitter, FR101 receiver and FT101E transceiver. An all-band receiver is also visible below the tabletop. Note his recently-acquired 5 Band DXCC and 5 Band WAS awards on wall.

reading is higher, each connection should be rechecked and recleaned.

THE RADIO ROOM

Since the radio amateur spends a considerable amount of time in his radio room, or "shack" as it is affectionately called, it should be a place which encourages interest and reflects one's personal preferences and life style.

A casual DXer may overlook a depressing atmosphere in his radio room if he only spends two or three hours at a time. During a long DX contest, however, the DXer may prematurely tire, fall asleep or acquire a "closed-in" feeling and make a mad dive for fresh air precisely when a band becomes "hot". Recently-emphasized theories of positive mental attitude prove that one's environment directly affects one's attitudes and degree of success. *Sure* you can work DX from a closet, bedroom or basement-located kilowatt setup, but a few touches of inspiration can add 3 to 6 dB's to your "DXing confidence". Amateurs questioning this need only compare the views from an unobstructed mountaintop amateur station, complete with massive antennas and peaceful surroundings, with that of a station in a small room which has no windows, bare walls, and nearby screaming children. Few amateurs keep their eyes riveted to their receiver's dials 100 percent of the time.

DX awards, current propagation charts, maps and photos of distant lands one has contacted are far more *DX-inspiring* than family reunion photos and model airplane collections. Window views of the far horizon and/or the station tower and beam are also more inspiring than a yard-full of shrubs or the neighbor's pool (remember, our prime concern is serious DXing). If you've accomplished any goal of which you're proud, place some recognition of it (a certificate or whatever it may be) in a prominent place near the rig. It will inspire you during difficult pileups, and if you truly think you can succeed—you will! Enter each pileup ***knowing*** you'll get your station. "Can-I-do-it?" attitudes are not necessarily successful. Always think positive—and set up your "shack" to reflect that attitude!

The majority of radio amateurs prefer setting-up their rigs in dedicated rooms which can provide isolation from family activities if necessary or desirable. Ideally, this room should permit the DXer to operate during any hour of the day or night without disturbing other family members. Inexpensive wireless intercoms can be used for quick in-house communications. The room should be efficiently laid out and large enough to include two full stations complete with linear amplifiers and SSTV or OSCAR, gear; a work/study desk, shelves for books and magazines, and a bulletin board. There should be room for future expansion (such as removing a closet for setting up an ATV or FM rack). An enclosed area for spare parts and tools is also highly desirable; particularly for those unexpected Saturday-evening problems which happen primarily during DX contests. The lighting arrangement should be capable of providing bright, dim, direct and indirect illumination to suit the DXers varying desires and hours of operation. Inexpensive light dimmers on two or three separate 100-watt lights in the shack usually accomplish this. Cork sheets, available at home improvement centers, can be used to sound-proof radio room walls while providing a professional appearance. Awards or posters can then be affixed to the cork with push pins. See Fig. 3-4.

If the amateur is in the market for a comfortable chair for his radio room, he might consider modifying one of the popular wraparound (barrel) chairs, adding dual speakers in the top section. This section curves around one's body and head, and the speakers then act like custom earphones when one leans back in the chair. A final touch to this custom chair would be to add remote push-button tuning of the station transceiver (the Yaesu FT901DM/FV901DM combination, for example, has provisions

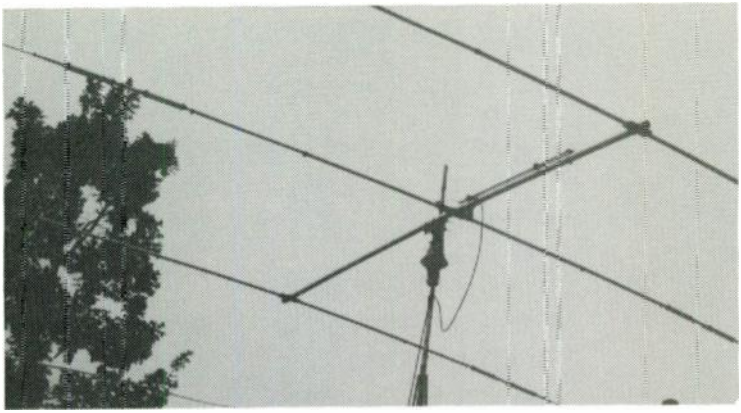


Fig. 3-3. This triband beam mounted on a crank-up tower proves its worth in DX pileups—and may also be lowered to almost roof level to avoid detection by neighbors and adverse weather. With one minute of "cranking", the beam rises above the tree in background.

for this), and a remote "tap to talk" switch on the chair's arm. Shades of *Star Trek!*

Strategically-located weekend cottages or vacation homes with the "great room" or family den-type floor plans are quite useful for single or husband-wife amateurs. This idea centers around establishing a very large "communications room" and including everything from lounge chairs, a fireplace, complete kitchen facilities and an observation deck with the full amateur radio setup. This arrangement must be seen in actual operation to be fully appreciated! There will be a natural tendency to let the rig run continuously, and this blends perfectly with the relaxed vacation home atmosphere. Almost immediately, the amateur begins working DX while enjoying early morning coffee and watching the sunrise across far horizons, or contacts those previously-missed and seldom active areas while grabbing a late night snack from the nearby refrigerator. It's unfortunate more people can't enjoy this style of living. The reduced pressures provide a healthy outlook on life (and it's also great for DXing). See Fig. 3-5.

WIRING CONSIDERATIONS

The casual amateur radio operator using only a 200-watt transceiver should experience few problems connecting antennas and using the 115 volt AC power from home outlets. High power DX setups are substantially more demanding on electrical distribu-

tion systems and an accurately engineered wiring arrangement will provide an appreciated level of reliability, convenience and safety. Unless absolutely necessary, *do not* power a linear amplifier from regular AC outlets in the home. Relying on ordinary house wiring for such heavy current demands results in poor voltage regulation, while excessive I-R drop can create possible fire hazards. Powering linear amplifiers from 115-volt circuits also lowers the obtainable high voltage by 10 to 15 percent—an important consideration when trying to generate every available watt of RF energy.

Regular 110-volt house outlets can be used for powering lights, station accessories and transceivers. If several items require 115-volt power, use two or three outlets which are on separate AC lines and run extension cords as necessary to prevent overloading a single outlet. For example: the station high frequency transceiver, clock and rotor may be plugged into one outlet (intermittent rotor use will not cause long-term wire heating). Another outlet can handle SSTV gear (which uses minimal current), three or four Rotron fans and the 2 Meter FM transceiver used for DX alert information. A third outlet might be used for OSCAR gear, 10 Meter FM gear and a general-coverage receiver (again, it's highly unlikely these three items will all be used at the same time).

Fig. 3-4. This efficient DX setup of Mavis Russell, VK3BIR; exemplifies "inspiration" (QSL's and world map), convenience (three transceivers ready to use according to conditions), and variable lighting (a goose neck light with dimmer). Mavis recently carried one of the rigs on a "vacation/DX operation" to New Hebrides and operated as YJ8IR.

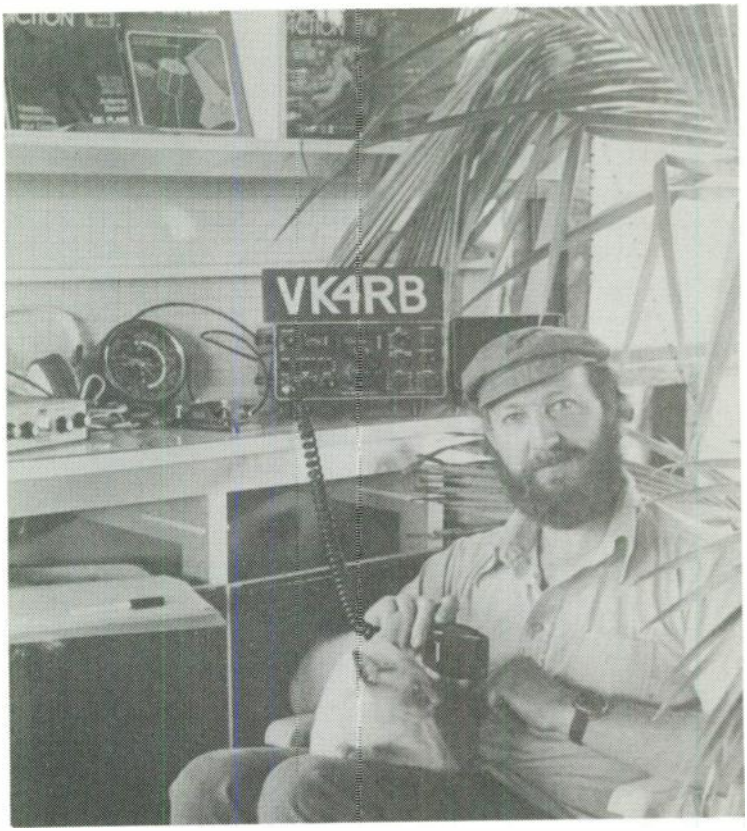


Fig. 3-5. A prime example of relaxed lifestyle DXing is this cottage setup of Reg Brown, VK4RB; on Airlie Beach, Queensland, Australia. Reg uses a Yaesu Transceiver and 800-foot longwire antenna, tuned for all-band operation with an MFJ antenna tuner. Note the direct cooling of shack by the ocean breeze and the palm tree shading the rig. Reg is a professional musician who enjoys evening DXing.

Meanwhile, the station's high-power amplifier is powered from a separate 220-volt line run directly from the home's meter and fuse box. Both sides of the linear amplifier's 220 volt line should be fused at the point where the voltage is secured and the wiring to the radio room should be #6 or #8 size to minimize I-R losses. A large breaker box should be located in the radio room to disconnect *all AC power* to the amplifier when it is not in use.

Many DXers run both dedicated 115 and 230 volt lines from their power box to the radio room, eliminating all dependence on home outlets. This is an advantage since it provides two "main switches" for the station and it helps eliminate stray wires in the

radio room. Breaker boxes also help prevent lightning surges from reaching equipment via AC power lines—an unfortunate circumstance which can happen when the amateur forgets to unplug gear while he's away from home. Professional electricians may shed additional light on this subject should additional questions arise.

Somehow, there seems to be an inverse relationship between effective station wiring and neatness. Wires seem to defy neat routing and AC outlets never seem to be mounted in the right place. One solution to "rat's nest" wiring is the use of "rat runs" between various areas in the radio room. These "runs" are wooden or plastic troughs which can carry and conceal interconnecting cables. The cables are placed inside the troughs, and a protective top cover is then placed over it. Amateurs can acquire additional wiring ideas by visiting their local broadcast stations and noticing how they handle similar problems.

Finally, a *fire extinguisher* and a *flashlight* should be placed in a conspicuous and convenient location in the radio room. Hopefully, they will never be needed, however their accessibility is vitally important and should not be overlooked.

EQUIPMENT CONSIDERATIONS

Ever since high frequency transceivers were introduced to the amateur radio fraternity there has been mild controversy concerning the fate of separate transmitters and receivers versus these "one-package" stations. Until recent years, high frequency transceivers were compromise units. Their selectivity was fixed and they had no speech compressors, notch filters, band-pass or I.F. tuning. Yet amateurs learned to appreciate the transceiver concept and began their own modification crusades. Slowly the situation changed, and today's state-of-the-art high frequency transceivers do, indeed, offer the same conveniences as separate transmitter/receiver setups—often even more.

Highly-desirable transceiver features for DXing include selectable AGC (fast, slow, off), a tunable narrow-band CW filter, and either a remote VFO or digital frequency memory. The transceiver's RF output should be *at least* 100 watts, and its components should be overrated enough to withstand periods of extended use. See Fig. 3-6. An efficient cooling fan and air circulation system are also vitally important. Fully solid-state transceivers, with their inherent "instant-on" operation are also highly beneficial for amateurs with limited operating time. Many

DX contacts can be made using these units during brief periods which would be overlooked by tube-unit owners. See Fig. 3-7.

Amateurs using high frequency transceivers as their main station setup should also consider securing a high-performance general coverage receiver for uses such as monitoring band openings during unusual hours, listening for low power broadcast or beacon stations operating near ham bands or for a clear transmit frequency when operating "split". A general coverage receiver will prove highly beneficial, particularly if it features high sensitivity and selectivity and accurate frequency calibration. See Fig. 3-8.

Several avid DXers have been known to place an additional receiver across town from their location and remotely-control it via telephone lines. This arrangement provides two unique possibilities. First, if a DX station is weak at the DXers location, it may prove to be stronger at the remote receiver site. Such occasions are quite common: compare a DX signal's strength at your location with reception at your local amateur friend's location—you may be surprised! Second, the remotely-located receiver will allow the DXer to monitor *himself* and provide an accurate perspective of his signal strength position during a pileup. In other words, the DXer will be able to hear the pileup and his own transmission much as the DX station hears it. He can then shift his frequency and time his calls to provide a clear and easily-received signal.

Rather than trading or selling an extra high-frequency transceiver one may have available, it can be placed by the bedside or den lounge chair and connected to an auxillary antenna (or the primary station antenna can be switched to an extra coaxial cable routed to the room). This simple idea has been known to produce

Fig. 3-6. The Kenwood TS1805 and YAESU FT901DM are two state-of-the-art transceivers featuring every modern convenience from frequency memory and bandpass tuning to internal speech compressors, variable IF-bandwidth and effective noise blankers. Both rigs also feature effective air circulation and blowers.

exceptional results simply because it allows the amateur to casually operate during times when he otherwise could not. Somehow when even the luckiest of amateurs switches off his rig for a few hours rest—suddenly, a band such as 20 Meters unexpectedly comes alive. DX can easily be worked with low power and a basic antenna—and there are few, if any, amateurs calling. A lounge chair or bedside rig can literally work the world during these times—times which you'll never realize you're missing until that extra rig is put to use.

Performance ratings of amateur equipment have become somewhat precarious since different manufacturers have been known to use different methods of measurement. While the classic measurements of such parameters sensitivity and selectivity provide reasonably good insight into a receiver's performance, they don't describe its weak-signal threshold and noise floor, its ability to combat on-frequency interference, or its dynamic range. Likewise, the true performance of transmitter ALC or speech compressor circuits may not be adequately specified for accurate evaluation.

Most radio amateurs can't personally afford delving into these proof-of-performance type measurements consequently they evaluate different units during on-the-air operation. Initially, this approach seems terribly expensive (who can afford to buy every piece of new gear merely to prove how well it performs?). Such is not the case! An amateur can, through conversations with local amateurs and equipment distributors, usually find someone in the local area who recently purchased a particular unit. A few inquiries to that amateur often results in an invitation to visit and try the new rig on the air. In this way, an amateur can soon evaluate several rigs and determine which characteristics of each are directly applicable to his particular style of DXing—and which characteristics are of minor importance. A receiver's continuously variable IF bandpass, for example, will be much more important to a DXer located in a very noisy location than noise floor and dynamic range.

A relatively large number of DXers build their own linear amplifiers and antenna tuners, and there are several basic reasons why. All amplifiers are expensive and many lack features desired by avid DXers. Furthermore, home-constructed linear amplifiers and antenna tuners add a sense of pride to one's setup.

Parts for both linear amplifiers and antenna tuners are popular flea market items at hamfests throughout the world. Amateurs taking advantage of these opportunities and carefully shopping for

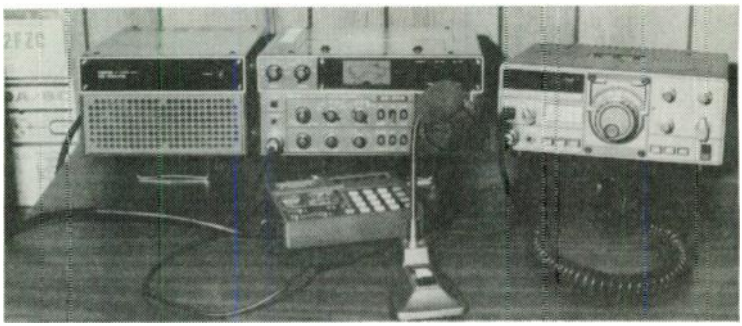


Fig. 3-7. The easily-portable *Icom IC701* and *Kenwood TS120* are two examples of fully solid-state "instant-on" transceivers. These rigs are small enough to be used in a living room, bedroom, camper or anywhere the DXer may elect to set up business.

items of interest can ultimately produce some beautiful equipment for a fraction of the price of equivalent commercial gear. The main items to seek in flea markets are tuning capacitors, plate transformers and filter capacitors. A pocket ohmmeter can be used for briefly checking items before purchasing them. Remember, though—*used* power amplifier tubes are *not bargains*, play it safe and purchase new ones.

The use of antenna tuners is a controversial issue among avid DXers. Essentially a tuner is used when an antenna doesn't perform perfectly. It allows a perfect impedance match to be established between that imperfect antenna and the station's final RF amplifier. If an antenna tuner must be used continually, the antenna proper needs attention. If, however, an amateur has an antenna trimmed for the phone section of a band he may be justified in using a tuner for occasional CW operations.

Two considerations should be kept in mind when using antenna tuners. First, the tuner *does not* improve performance of poor radiators, it merely provides a measure of comfort for the RF stage feeding the radiator. Second, antennas exhibiting an SWR of over 2.5:1 (tuned to exhibit an SWR of 1:1 to the RF stage) cannot withstand high RF power levels. Balun transformers and coaxial cables will arc-over or burn out unless the RF power level is reduced to less than half their usual maximum rating.

The introduction of all-solid-state transceivers has created another worthwhile use for antenna tuners. The tuner is placed between the transceiver and linear amplifier and used to achieve a 1:1 SWR at the transceiver output. The transceiver's final

amplifier protection circuits will then allow full RF output for driving the linear amplifier. Since many popular transceivers produce only 110 watts of RF output and amplifiers employing tubes such as 3-500Z or 3-1000Z require 110 to 140 watts for full output, a good impedance match is vitally important.

RF FEEDBACK

Occasionally, a high power amateur radio setup may experience RF feedback problems that appears as distortion on the transmitted signal, erratic plate current readings on the exciter and/or linear amplifier (usually an up-scale indication without modulation applied) or as a "hot" microphone which gives "lip burns" when touched. Smaller amounts of RF feedback will affect SSTV monitors, monitor scopes or other sensitive units during on-the-air transmissions (but not during receive periods).

RF feedback is caused by small amounts of the transmitted signal "getting into" sensitive input stages of various equipment. Since the amateur setup is usually situated in the signal induction field (within two or three wavelengths of the antenna), RF can re-enter equipment at low-level points (such as microphone inputs) and be reamplified. This results in feedback similar to that exhibited when a microphone is placed near a speaker in a public address system.

Locating RF feedback paths can be a time-consuming process unless an effective pattern of correction is applied. Initially, the amateur should recheck the complete station ground system to assure that all connections are absolutely perfect. A corroded ground connection anywhere in a system can create RF feedback. If the problem still exists, connect AC neutrals directly to the outdoor ground via heavy cable, then bypass both sides of each AC line to ground with . 01μf, 600 volt disc capacitors. If the problem remains, bypass both sides of the AC line entering *each piece of affected equipment* at the point of the AC line's entry. If a small amount of RF feedback still exists, try bypassing the audio frequency input to the transmitter with a 100 to 470 pf capacitor and install a 1 μH RF choke in series with the AF input lead. These two components should be mounted directly at the microphone input jack inside the transmitter. RF problems persisting beyond this point must be found by a lengthy "hunt and try" process consisting of tightening connectors and screws in all equipment and antennas and resoldering low-level input connections. We will assume (and wish for your sake) that the station antenna isn't mounted directly above the equipment room!

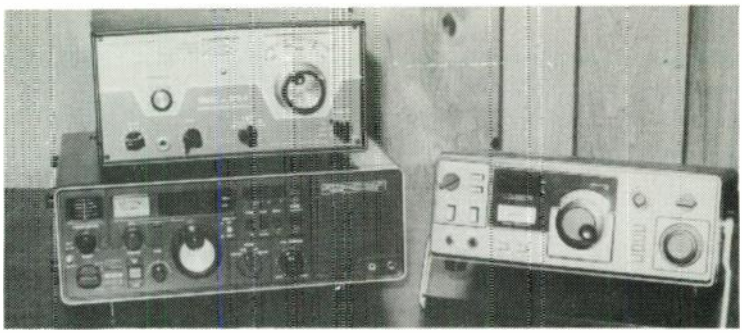


Fig. 3-8. General coverage communications receivers such as the Drake SPR4, Yaesu FRG7000 and the Kenwood R1000 are extremely useful for checking DX paths and band scanning while operating other frequencies. All three units can be used with an amateur transmitter for reliable DX communications.

LINE NOISE

Regardless of how carefully a radio amateur may lay out a station, he will probably be faced with AC line-noise problems at some time in his life. High levels of AC line noise, which literally mask all signals below S5 to S9 level, can drive a DXer mad. He will have to stalk the source of his noise problems rather than chasing DX. A systematic approach is necessary to minimize the time wasted on this diversion. The following guidelines are presented for amateurs faced with AC line noise problems: Follow these suggestions and you'll be back into the DXing game in minimum time.

The first step in tracking line noise problems is checking one's own location for cleanness. Using a battery-powered receiver to monitor line noise on the affected band, carefully disconnect the main AC lines feeding your home. If this involves more than switching a circuit breaker and you're not familiar with AC lines, *Don't take chances on being electrocuted*—call an electrician! If the interference disappears when AC power is interrupted, check for possible causes such as loose connections, bad doorbell transformers and faulty fire sensors by sequentially disconnecting each item from AC power.

If the line noise continues when AC voltage is disconnected, it is being produced by an external source. To locate it, try rotating your beam antenna while searching an affected band for a null in the noise. This will indicate the approximate direction of the source. Next, use a battery-powered receiver tuned to an affected amateur band and walk the indicated area to determine the exact source of the noise. Do not use FM radios for this step; their limiter stages

are designed to reduce or eliminate AM noise pulses. Broadcast band AM radios are also ineffective in locating line noise sources, because they respond to various types of hash and glitches propagated along any and all power lines. If the previous steps are followed, the line noise source should soon be narrowed to within two or three power poles.

Next note how weather conditions affect the line noise. If, for example, the noise begins at dusk and stops around dawn, a street light or its contactor may be at fault. If the line noise stops during rainy weather and increases in strength during hot weather, power line clamps or glass insulators are probably defective. Line noise from the last two sources is unfortunately quite common throughout the United States. Numerous power companies use aluminum-body, crimp-on clamps which corrode easily and also expand and contract with temperature variations. Once these clamps begin corroding, line noise interference begins building and the amateur is forced to take action.

After the radio amateur has generally located the noise-producing area, he should contact his local power company for repairs. His first repair call will probably be routed to an "engineering group" which may or may not prove worthwhile, but the amateur ***should not*** give up. Somewhere in every power company there's a "communications section", which works with two-way radios, microwave links ***and*** line noise problems. Usually, several radio amateurs are employed in this section. The amateur bothered by line noise usually finds these people very understanding and sympathetic with his problem. If the amateur contacts this group and fully describes his research concerning his line noise, he stands a 95% chance of getting the problem cleared very quickly. The amateur can work with this group in solving the line noise problem: It schedules a repair visit and notifies the amateur, so he can monitor an affected band while various pieces of power-distribution equipment are temporarily disconnected. When the faulty equipment is disconnected the noise will stop and the solution will be nearby.

The joint-effort solution to line noise problems has proved fruitful throughout the United States while threats of FCC action on power companies has merely provoked a verbal battle. Yes, power companies are required by law to maintain "clean" lines, but they'll often spend three times the effort arguing that it's not their fault than in fixing problems. Friendly and personalized joint efforts solve problems faster, and that's what we're trying to accomplish.

Chapter 4
Antennas and Propagation

Aside from the obvious prerequisite of high quality communications gear, the single most important consideration in any DX setup is a highly efficient antenna system. The importance of this final link in an amateur station cannot be over-emphasized. Just as restricted antennas deter one's achievable results, elaborate and uncompromising arrays assist in outstanding DX abilities and enjoyment. Truly, the quality of their antenna system is a prime factor which separates casual "DX chasers" from *serious* DX operators.

Communicating reliably through large pileups or under adverse propagation requires *more than* 1,000 watts of *Effective Radiated Power*—and this level is only *legally* obtainable through antenna gain.

The beginning DXer with limited funds desires the greatest returns for his financial investment. Indeed, one of the most frequently asked questions in amateur circles is whether to purchase a kilowatt linear amplifier or a good, high tower and effective beam antenna. Remember, amplifiers won't help you to hear *one bit better,* and "if you can't hear them, you can't work them". Facts are facts—every 3 dB increase in signal strength is equivalent to doubling the previous signal strength. 100 watts of RF energy boosted 3 dB becomes 200 watts. Another 3 dB boosts this to 400 watts. Three more dB boosts the 400 watts to 800 watts, and the *next* 3 db gain boosts 800 watts to 1600 watts!

Assuming that a 1,000-watt linear amplifier operates at 50% efficiency and feeds a unity-gain antenna, the Effective Radiated Power (ERP) will be *500 watts*—of course if the unity gain antenna is a ground plane or vertical, it will produce vitally-important low angle of radiation.

A barefoot high frequency transceiver (200 watts input, 100 watts output assumed) feeding a three-element monoband yagi 65 feet or higher above ground can yield up to *650* to *700* watts ERP, *plus* a similar low angle of radiation *and* up to 7 or 8 dB increase in received signal strengths. Suddenly, you're hearing DX signals you didn't realize you were missing! Beam antennas below 55 feet in height are not as effective because their angle of radiation is higher—knock off 3 or 4 dB in your calculations if your beam will be erected at a low elevation. If trees and/or structures block your antenna (regardless of its type—yagi, quad, vertical or inverted vee) in certain directions, knock 4 to 8 dB's off your radiated signal strength in those directions. If you elect to go the full route (two kilowatt amplifier input and four element beam up 70 feet the clear), your signal will be 100 watts plus 10 dB (1000 watts from the amplifier...PEP only, of course) plus an approximate antenna gain of 9 dB, or approximately *8,000 watts Effective Radiated Power.*

This should not be considered as dictating the necessity of a beam antenna for working DX. Numerous amateurs have recently contacted over 100 countries while using verticals, ground planes or basic wire antennas. Beam antennas merely *make life easier* for the DXer. See Fig. 4-1.

The majority of beginning DXers will probably consider placing a triband beam atop their station tower, since this affords the greatest operating flexibility for a limited financial investment. While a quality tribander will perform substantially better than a ground-mounted vertical or simple dipole antenna, its performance on any *one* high frequency amateur band *will not equal* that of an optimum-spaced single band yagi. The DXer should ponder this point carefully before deciding on a particular antenna. If lifestyle and operating times dictate a 90% confinement to one band, the amateur would profit by utilizing a "no compromise" antenna for that band. Occasional operations on other bands could be handled by verticals or other simple antennas, and they could be replaced by a second tower equipped with stacked monoband beams when the lifestyle changes. If the beginning DXer's situation permits operation on, say, 20, 15 and 10 Meters—and separate monoband

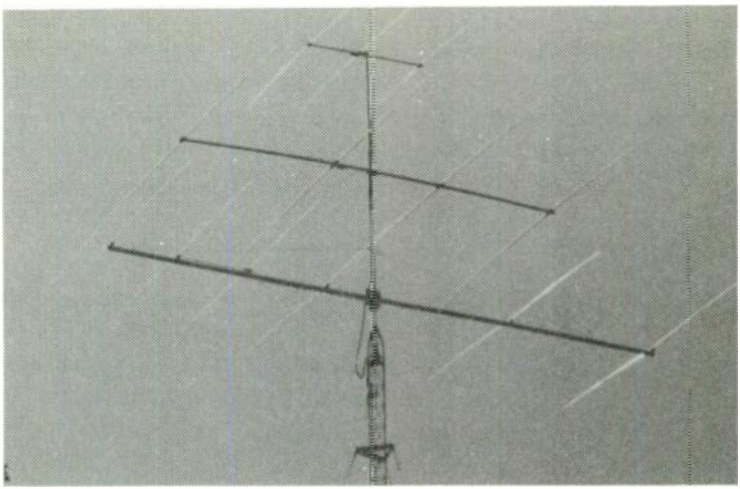


Fig. 4-1. One is great, but three are supreme! This proven-effective DX array belongs to WB4RZN Lynn and WB4IWW, Dennis McCluskie. It includes a KLM six-element monobander for 15 Meters at 70 feet, a Hy Gain four-element monobander for 20 Meters at 80 feet and a Hy Gain three-element monobander for 10 Meters at 90 feet. The system is obviously stiff competition in any pileup.

beams can't conveniently be erected—he may profit by using a high-quality triband beam.

Remember, however, that triband beams are a compromise. Their maximum front-to-back ratio and forward gain (which are usually *lower* than their advertised specifications) are usually produced only on the *highest* operating band (10 meters). The beam's traps, used to reduce element lengths, each absorb small amounts of usable RF energy which slightly lowers the efficiency. Amateurs using triband beams can definitely work their fair share of DX, but their signal will be somewhat weaker than others using similar RF power levels and monoband beams. The station with the weaker signal will, naturally, spend more time in each pileup before contacting the desired station. See Fig. 4-2.

Many manufacturers of triband beams (and monoband beams) reference their antenna's gain against a purely hypothetical radiator known as an *isotropic source,* and the definition of an isotropic radiator varies widely. Some manufacturers explain it as a quarter-wave whip mounted horizontally and worked against three or four vertically-mounted radials. Other describe an isotropic source as a computer calculation of the horizontal intensity from a vertically-polarized dipole, or as several randomly-polarized radiators placed in some location which can't

be referenced against the Earth's body. Obviously, antenna gain figures related to such vague concepts cannot provide accurate indications of performance. This is the reason why several amateur magazines refuse to publish antenna gain figures. Not being able to determine forward gain of various beam antennas, what's a DXer to do?

One solution involves using "rule of thumb" calculations similar to flea market "guesstimates" of transformer current ratings (three fingers of core laminations equals 600 milliamps of current capability). Beam antennas with the *longest* boom and *largest* diameter elements are the *best* performers. A three-element 20 Meter beam with a 24 foot boom, for example, should out-perform a four-element 20 Meter beam with an 18 foot boom. A long-boom, four element beam should out-perform a short boom, 5 element beam. The key beam antenna characteristics are thus the combination of *wide spacing* and *driven element efficiency* (including matching devices and baluns) rather than merely element counts—or manufacturers' published gain figures.

HORIZONTAL VERSUS VERTICAL ANTENNAS

One of the oldest arguments in amateur radio circles relates to the *vertical* versus *horizontal* polarization of communication antennas. Both forms of radiators have their advantages and disadvantages. The DXer must select the type which best fits his needs and physical/financial capabilities.

The basic horizontal and vertical radiators are, respectively, dipoles and quarter-wavelength verticals. Both of these antennas exhibit unit gain, yet both are the basic building blocks of more sophisticated amateur arrays. The dipole's maximum radiation is at right angles to its elements, with minimum radiation from its ends. Its height above ground determines its overall angle of radiation, and thus determines the dipole's DX effectiveness. In order for a dipole (or gain array employing a dipole driven element) to perform at maximum capability, both "sides" should be RF fed (through baluns, for example) and worked against a low resistance ground. Unbalanced dipoles are, effectively, quarter-wave whips mounted horizontally and worked against "ground in the air".

Horizontal arrays such as yagis or log periodics, erected at heights over 50 feet above the ground are exceptionally good DX antennas due to their gain and directivity. Thus their use on the 20, 15 and 10 Meter bands has become the amateur's universal standard during recent years. Horizontal radiators erected at

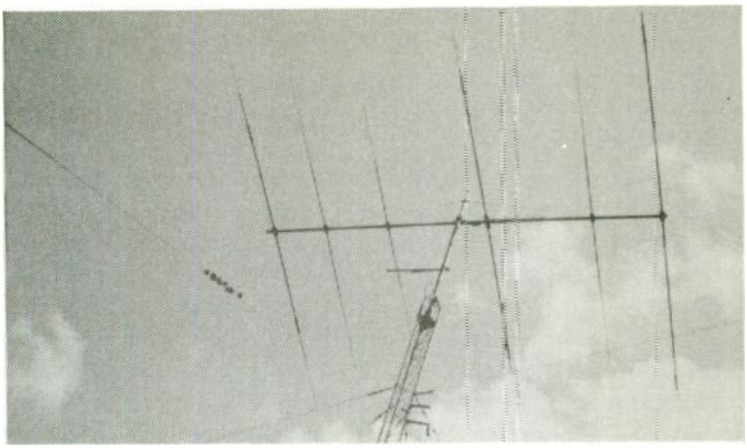


Fig. 4-2. One of the most popular and efficient triband beam antennas, used by DXers around the world, is Hy Gain's TH6DXX. This yagi features a 24-foot boom which allows optimum element spacing for each band. Since only three of the beam's six elements are used on any one band it is a three-element and not a six element beam.

heights below 50 feet reflect a large amount of their RF energy skyward at high angles. This causes the transmitted signal to undergo numerous Ionosphere-to-Earth hops during DX transmissions, thus considerably attenuating the signal and offsetting the benefits of a well-designed array.

The basic vertical radiator is a quarter-wavelength antenna mounted at ground level and electrically operated against the ground. The maximum radiation from the vertical radiator is at right angles to the element, with minimum radiation off its end (straight up). This means that the ground-mounted vertical radiator concentrates its maximum radiation directly at the far horizon—an asset for DX activities. In order for the vertical antenna to produce the best results, the antenna must have an *unobstructed* view of the horizon in the directions of desired communications, it must be *at least* 30 feet from other objects and it must work against an *efficient* ground. The ground acts as an electrical mirror, synthesizing half of the antenna so shortcomings in ground systems destroy the performance of vertical antennas. Verticals mounted above ground should employ at least *four* ground plane radials and non-metallic supports, otherwise these systems will act as off-center fed vertical dipoles. See Fig. 4-3.

Tower-mounted vertical beams, which are usually rotated by element phasing techniques, are good DX antennas, provided they

have good horizontal "viewing room" and efficient ground systems. Their low radiation angle is worth 3 to 4 dB, compared to horizontal arrays erected at ground level.

YAGIS AND QUADS

Two of the most consistently popular antennas in the DX world are monoband yagis and cubical quads. The multi-element yagi presently enjoys a slight edge in popularity among serious DXers, because it combines performance, ease of handling and "conservative" appearance. Monoband yagis are easily home constructed and additional elements can be incorporated as the DXer desires. Tiltable boom-to-mast plates allow yagis to be serviced directly from their supporting towers with a minimum of problems. The optimum performance of yagi antennas is secured only when their elements are wide spaced. Indeed, element spacing is more important than element count in very known test of antenna performance. Almost every triband yagi antenna compromises on element spacing on the lower bands and this decreases the array's effectiveness. Some casual DXers have extended the boom length of their tribanders and picked up 2 or 3 additional dB on 20 Meters—however this usually ruined the yagis 10 meter performance. Today, many casual DXers using tribanders extend their boom and add separate reflectors for each band. The results are relatively good but still not equal to that of full-size monoband yagis.

The cubical quad antenna is a top DX performer in every sense of the word, but its unwieldly appearance and awkward construction layout has restricted its acceptance and use by many radio amateurs. Yet, the following facts concerning cubical quads speak for themselves. The driven element of a cubical quad has *one full wavelength* of signal capture area (wire)—twice that of a yagi. More received signal voltage can be induced in the longer element and when transmitting the full wavelength element can more effectively radiate a signal. This possibly explains the often-noted 2 dB higher gain of quads compared to comparable-sized yagis.

The vast majority of reports indicate quads out-perform yagis when both are mounted at low heights—particularly below 55 feet. This may be due to the yagi's horizontally-polarized driven element, which causes transmitted signals to radiate at high angles, while the quad's driven element radiates from both its horizontal *and* vertical sides thus producing a lower radiation angle. Cubical quads are also reported to produce higher gain than

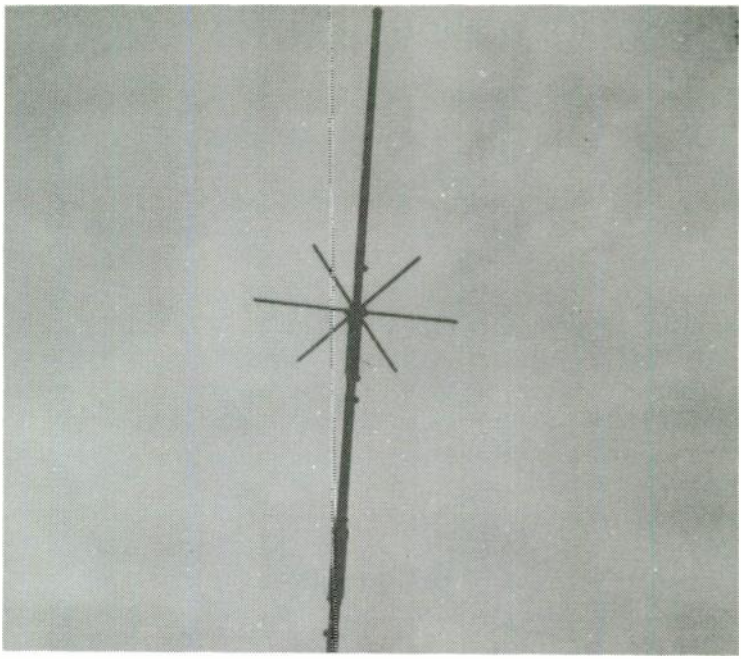


Fig. 4-3. The Newtronics 4BTV is an optimum quarter wavelength vertical radiator for 20, 15, 10 and 40 Meters. In order for this, or any other, vertical antenna to operate efficiently, a multi-conductor ground radial system must be employed and the vertical radiator must have a clear view of the distant horizon.

yagis utilizing equal length booms—possibly due to the full wavelength of wire used for each element of the cubical quad. See Fig. 4-4.

The author has used both quads and yagis, and the quad *always* out-performed the yagi "thumbs down". The quad could practically create its own band openings, and also exhibited 5 to 8 dB more front to side ratio than the yagi. The quad, however, fell victim to two major storms, and lost a parasitic element each time. Thus in a year's time, it became a rotary loop (quads are not mechanically rugged arrays). The yagi, however, continued to perform reliably and still sits atop its aluminum perch, working plenty of DX and "riding out" numerous tropical storms and edge "blowoffs" from tornadoes.

Whether the amateur is willing to spend the necessary time and effort to erect, tune and maintain a cubical quad is strictly personal taste. If a yagi is used, he can rest easier during storms and neighborhood scrutiny. Either antenna is an outstanding

performer—the serious DXer shouldn't draw any conclusions on which array is "best" until he has *personally* tried them both.

DELTA LOOPS AND QUAGIS

Two parasitic arrays which have recently evolved from yagi and the quad are the *delta loop* and the *quagi* antennas. While additional research on these antennas is still needed, both antennas have established themselves as relatively good DX performers.

The delta loop, at first glance, resembles the upper part of a cubical quad (Fig. 4-5). Electrically, however, the two antennas are quite different. All upright sections of the delta loop are driven with RF, thus using the support structure to maximum benefit. Plumber's delight construction, coupled with the use of conventional angle brackets and U-bolts make this an inexpensive and easily home-constructed gain antenna for the experimental-minded DXer.

The delta loop may employ *two, three* or more elements, depending on available "skyroom" and the availability of aluminum tubing. Gain of the delta loop is approximately the same as a yagi of comparable boom length. If the amateur elects to build a two-element delta loop, the best performance will be realized by using a driven element and *reflector* rather than a driven element and *director*—which, incidentally, holds true for *all* parasitic arrays. Additional information and construction details on the delta loop may be found in the *Antenna Handbook* and the *Radio Amateur's Handbook,* both published by the *American Radio Relay League.*

The *quagi* was introduced to the amateur fraternity during mid-1978. Essentially, this antenna design replaces a yagi's driven element with that of a cubical quad and changes the array's boom to a non-conductor such as wood or PVC pipe. Several amateurs report that the overall performance of these arrays is slightly superior to either the yagi or quad, however additional investigations of quagi performance are still needed. As of late 1979, the majority of quagi arrays have been used on amateur bands above 50 MHz—few DXers have employed quagis for 20, 15 or 10 meters. This seems unfortunate since the large capture area of the quagi should prove beneficial for long distance communications. Additional information on the quagi may also be found in the previously mentioned handbooks.

VERTICALS AND GROUND PLANES

Vertical radiators are probably the least understood and appreciated antennas used by today's radio amateurs. The effec-

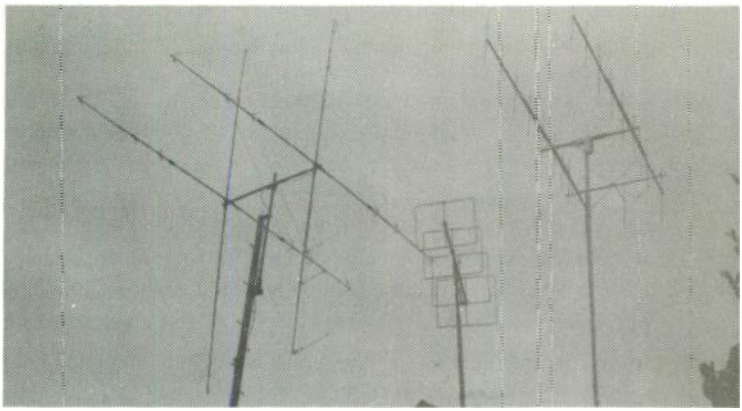


Fig. 4-4. The triband cubical quad, 2 Meter quad and 21-element quad-yagi (Quagi) at OE8MOK in Haimburg, Austria. The full wave-length of wire in each element of the cubical quad affords maximum signal capture and radiating area.

tiveness of these low-angle RF radiators is constantly overshadowed by higher gain arrays which allow the DXer to concentrate his RF energy into specific directions as desired. Vertical antennas, however, allow the amateur with limited funds and restricted area to enjoy the thrill of DXing on a scale only slightly lower than that of DXers using large arrays. Numerous surveys over the years have shown that amateurs using vertical antennas realize best results when operating *CW*—probably because the vast majority of DXers prefer operating single sideband. Vertical antennas are particularly worthwhile for 160, 80 and 40 Meter operations, since few massive gain antennas are used on these bands.

In order for a vertical antenna to operate properly, it *must* employ an efficient ground system and its radiation pattern must not be obstructed by building or foliage. If the vertical can't see the horizon from its point of ground installation, it *must* be raised to roof-top level and operated against a ground plane radial system. Ground planes mounted above ground should use non-metallic supports, since a vertical antenna mounted on a metal mast or tower will load the metallic mast and produce a distorted radiation pattern. Remember these guidelines while visualizing the vertical antenna from its electrical design standpoint and you'll reap maximum efficiency from your vertical antenna—something few amateurs have experienced.

The basic vertical antenna is a quarter-wavelength radiator worked against a low resistance ground. This ground is produced

by using between *36* and *120* radials, each a half wave long and buried six to eight inches below the ground. This results in the low angle of RF radiation which concentrates the transmitted energy directly at the horizon and reduces the number of signal "hops" to the distant contact. Additional parasitic elements can be added to a vertical antenna system to create beam-type arrays. If a parasitic element is used, the greatest advantages will be realized when using a *reflector* rather than a *director*. Likewise, three or four-element vertical beams perform substantially better than two-element setups.

The ground plane antenna has been known to produce good DX results when mounted *high enough* to clear local obstructions. Its radials should be cut approximately 5% longer than the vertical element and drooped at an approximately 45° angle. The ground plane should be mounted on a wooden support or PVC pipe to prevent decoupling by the "stub" of a metallic mast. This author has used both ground planes and three-element yagis on 20 Meters during the last two decades, and some interesting results have been noted. When both antennas were erected at the same height and this height was *below 35 feet,* the ground plane worked *nearly* as well as the yagi—provided large pileups were avoided and CW was operated most of the time. A large number of DX contacts using the ground plane were made by calling stations in a direction which operators with directional antennas were overlooking at that particular time. When the author's ground plane and yagi were both raised above 50 feet, the yagi became a *superb* antenna while no improvement was noted with the ground plane. This confirms the fact that height is *irrelevant* to the performance of any vertical radiator—provided it sees the far horizon from *wherever* it is mounted.

SIGNAL PROPAGATION OVERVIEW

The avid DXer is acutely aware of the vital role which the earth's ionosphere plays in long distance communications. This understanding of signal propagation allows him to use his equipment to its maximum efficiency and work the greatest amount of prime DX. Results achieved through the intelligent use of favorable signal propagation often overshadow that achieved by other amateurs using more elaborate station setups. Thus, all serious DXers should continuously strive to learn more about the parameters affecting long distance signal propagation. While several books have been published on this subject, a brief overview will be presented here.

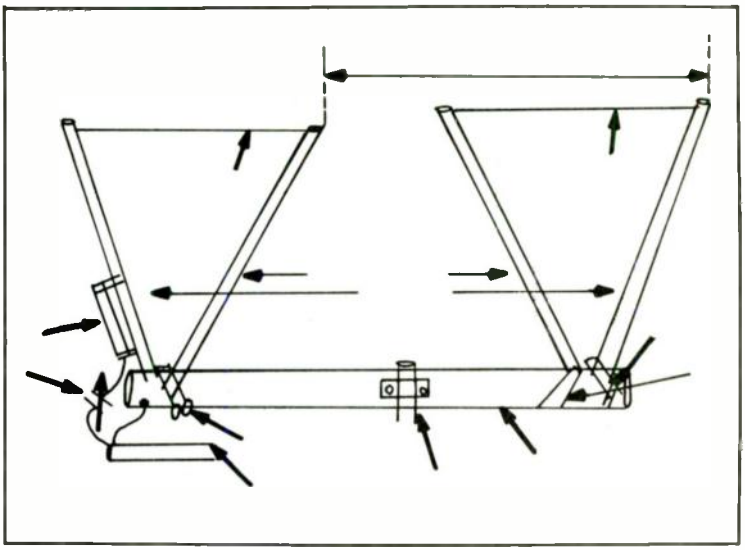


Fig. 4-5. The DELTA LOOP antenna features "plumber's delight" construction and minimal horizonal "wingspread" while performing very well. The vertical uprights can be bolted to the boom in any convenient manner and the gamma-matching rod can be salvaged from old CB beam parts—tune the rod and capacitor for minimum SWR. This complete antenna can be turned with a small TV rotor.

Two basic waves eminate from a transmitting antenna: a *ground wave* and a *skywave.* The ground wave may be used for predictable and reliable line-of-sight communications, while the skywave's fate is determined by the earth's ionosphere.

The ionosphere extends from approximately 50 to 250 miles above the earth. It is composed of rarified air and gases which become ionized by photon and ultraviolet energy emitted by the sun. This energy varies in quantity and form, thus ionizing various levels of the ionosphere. As transmitted sky wave signals hit the ionosphere, they are reflected toward distant points on the earth. The ionosphere may thus be visualized as a variable-density electrical mirror for electromagnetic waves (radio signals)—the primary layers affecting long distance communications are shown in Fig. 4-6.

The lowest area of the ionosphere is the *D* layer, which is located in a region approximately 40 to 60 miles above the Earth. This layer adversely affects DX communications on the high frequency bands by absorbing or attenuating signals rather than reflecting them—and any signals which *may* be reflected back to

earth from the low-altitude *D* layer are restricted to short or medium distances or multihop propagation.

The *E* layer is situated approximately 60 to 100 miles above the earth, and it also affects long distance communications on the high frequency amateur bands. If the *E* layer is not ionized, it creates a varying amount of attenuation on signals passing through it—this effect is most pronounced during hours of darkness. If the *E* layer is ionized (which stands the greatest possibility of happening around the local noon hour), it becomes a reflector for radio signals. Signals reflected by the medium-height *E* layer, however, cannot attain the long distances produced by reflections from higher layers. The concept here is quite simple: the *higher* the reflector, the *greater* the *first hop* distance, and it is this first hop which directly affects DX results. Sunspot counts *over 150* directly affect the E layer, and usually produce skip conditions on amateur bands above 28 MHz. A condition which occurs primarily during spring and early summer months is sporadic "E" openings. Caused by variations in the normal amount of ultraviolet energy hitting the ionosphere's *E* layer, this effect sporadically ionizes patches which reflect signals at 28 MHz and higher frequencies.

The *F* layer is responsible for the *majority* of low frequency, long distance communications. Since this layer is the one nearest to the sun, it receives the maximum amount of photon and ultraviolet energy. During daytime hours, the *F* layer splits into *F1* and *F2* layers, during evening hours, these layers combine into a *single* (and slightly lower) *F1* layer. The *F* layer is usually located at 250 miles maximum height during summer and 175 miles during the winter. The 11 year sunspot cycle, however, influences these figures.

Sunspots are explosions of tremendous magnitude on the sun's surface. During these explosions, large amounts of photon and ultraviolet energy is emitted. This energy has a direct relation on the earth's tides, general weather conditions *and* the ionosphere. As far as the ionosphere is concerned, the larger the sunspot count—the greater the energy from the sun—the greater its signal reflectivity becomes. Obviously, the higher-altitude *F1* and *F2* layers will be *most* affected by high sunspot activity, but all layers of the ionosphere will be affected activity since the *F* layers do not stop or totally absorb this energy.

Since sunspot activity "peaks" and "nulls" in approximately 11 year cycles, radio communications also follow 11 year cycles of "great" and "poor" DX conditions. Occasionally during years of

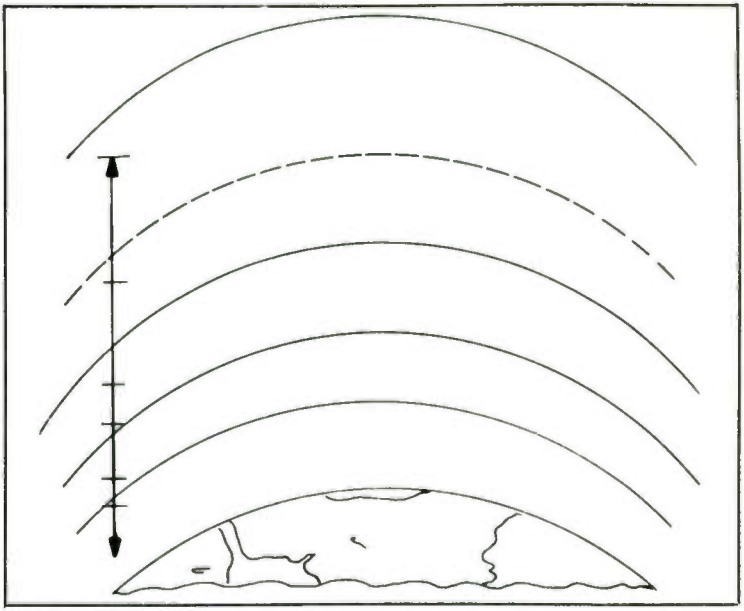


Fig. 4-6. The layers of the Ionosphere and their relative position above the earth. Altitudes indicated are approximate, as seasonal changes and sunspot cycles determine ionization levels. Radio signals reflected by the *F2* layer may be propagated over substantially greater distances than signals reflected by the *D* layer.

rising sunspot activity, solar flares (massive explosions on the sun's surface, producing vast amount of ultraviolet energy) cause *extreme* ionozation of the ionosphere's *D* layer. This results in a mass absorption of radio signals called an *ionospheric storm*. Ionospheric storms are usually accompanied by magnetic storms and poor high frequency conditions. Recently, however, amateurs have found that UHF and 160-Meter propagation and UHF tropospheric ducting can be *extremely good* during magnetic storms and that following a magnetic storm, sunspot counts and high frequency band DX conditions usually boom. Ionospheric and magnetic storms usually last from 24 to 36 hours.

The previously-mentioned phenomena of tropospheric ducting may also be produced by rapid cooling of the earth's surface after an extremely hot period. Summer thunderstorms or the leading edges of weather fronts, for example, can cause UHF signals to be ducted through the region between the ionosphere and the stratosphere. As this book is being written, information is also beginning to appear concerning signal ducting on the 80 Meter

through 10 Meter amateur bands. Although only limited studies have been conducted at this time, it does appear that high frequency signals may experience ducting above certain geographic fault lines occuring near the Earth's tectonic plates. Possible future research concerning this phenomenon could lead to the discovery of true "DX locations" which would allow the radio amateur to literally "pipe" a signal into the area of his choice.

SUNSPOTS, PROPAGATION, AND EFFECTS

Until recent years, few amateurs were familiar with the sophisticated techniques of propagation forecasting and ionospheric evaluation. Most knowledge centered around the benefits of cool, clear evenings for good DX or general word-of-mouth information on band openings. While various amateur magazines carried monthly information on band conditions, this information proved too old to be reliable by the time of its publication. Then, the situation began to change. A number of amateurs began setting up telescope arrangements which allowed them to directly observe sunspot activity. Almost any telescope can be used for this purpose: it's aimed at the sun, and its image is focused onto a small sheet of paper placed six to ten inches behind the telescope (*Note: Never* view the sun directly *regardless* of the filter used). The observer is thus afforded a view of the sun, and can directly observe solar flares or unusual spots. Assuming an accurate notebook comparing solar and band activity file is maintained over a long period the amateur will come to recognize those solar events which directly affect radio communications. Then, it becomes a relatively easy matter to predict good DX conditions. Additional information on sunspot observation techniques may be found in the A.R.R.L. *Radio Amateur's Handbook*. It is doubtful, however, that even the avid DXer will take the necessary time to begin home sunspot observations, thus a more straightforward way to obtain information may be in order.

The *National Bureau of Standards* radio station WWV, in Fort Collins, Colorado presently broadcasts up-to-date propagation condition data and forecasts for the following 24-hour period at 18 minutes after each hour. These broadcasts are transmitted simultaneously on 2.5, 10 and 15 MHz, and last for approximately 20 seconds. Since a number of the popular amateur transceivers include a 15 MHz time/frequency position on their bandswitch, the DXer need only flip this switch to acquire right-to-the-minute propagation information—which includes present sunspot count,

solar index, solar flux, previous 24 hour radio conditions and forcoming conditions plus the condition of the Earth's geomagnetic field.

W1AW, the *American Radio Relay League's* station, transmits bulletins concerning a variety of amateur radio activities, *including* propagation data. The schedule for these bulletin transmissions and their frequencies appears each month in *QST Magazine.*

George Jacobs, W3ASK; and Ted Cohen, N4XX; presently support two propagation services for radio amateurs: *Dial-A-Prop* and *Mail-A-Prop*. Dial-A-Prop is accessed by telephoning a New England-area telephone number whenever late-breaking information is desired. (Naturally, the amateur pays the cost of this long distance call). Mail-A-Prop is a by-subscription bi-weekly bulletin service. The reader can contact N4XX or W3ASK for additional details and rates of these services.

Chapter 5
Contesting and QSLing

If there is any event that opens doors of opportunity and provides DXers with challenges to their endurance and ability, it's a worldwide DX contest. The relatively large number of these contests conducted during weekends throughout the year allow many beginning DXers to attain creditable country tallies in a minimum amount of time.

Besides the large number of "common" foreign countries which may be contacted with relative ease during a contest, many DXpeditions are also planned around these events to realize maximum contact counts from their operations. Almost any amateur with a decent rig and antenna should be able to contact *at least* 100 countries during a DX contest, and by the law of averages, at least a *dozen* of these contest contacts should be "rare" rather than "common" DX. What better way to "kick-off" one's initial DXing activities?

DX contests are also highly useful as proving grounds for both the radio amateur and his station. Inefficient operating tactics will become acutely apparent after a few hours of contest operating—afterward the amateur can analyze his technique and evaluate new ideas. Equipment deficiencies and layout problems are also brought into perspective during DX contests, and they are also extremely useful for trying out new rigs and antennas. Indeed, there is no more *rigorous* and *complete* test of the amateur's total setup. While many avid DXers enter contests for the sole purpose

of scouting out those few desperately-needed new countries, other DXers enter contests strictly on a competitive basis—to prove their communications abilities on the basis of high contact counts. Thus contests have something for everyone—and everyone is, in one sense or another, a winner.

PREPARATION

The amount of painstaking effort and pure hard work many amateurs have willingly invested in preparing for a specific DX contest is often phenomenal. How many amateurs, for example, would be willing to carry all their equipment 50 to 100 miles and erect a massive antenna on a 100-foot-plus tower for a mere 48 hours of *straight* operating activity? Stout-hearted, indeed, are such dyed-in-the-wool contesters!

On the other hand, we find the vast majority of amateurs merely preparing their home stations for the onslaughts of a coming contest in a more natural manner. All equipment should be checked well in advance of the contest time to assure its reliable operation. If a rig's oscillator acts sluggish and requires two or three snaps of the bandswitch to "kick" it into action, or a linear amplifier's cabinet develops an irritating vibration after three or four hours of "heated" use, these problems will surely be escalated during a contest. Antenna idiosyncrasies somehow always turn into major problems during DX contests—particularly during cold, stormy weather. While it's virtually impossible for the amateur to completely outwit Murphy's Law, he stands a fairly good chance of sidestepping problems by taking a "critical view" of his setup *before* a contest. An ample supply of spare parts, basic test equipment and a few clip-lead jumper wires should also be kept nearby during contest time to make it easier to change final amplifier tubes or swap key paddles, should such necessities arise.

The DXer will be well advised to inform family members of upcoming contest activities, since they can divert telephone calls and prevent other interruptions during times of prime band openings. Alternatively, many contesters find contests ideal times to plan out-of-town family visits which leave him home *alone* to devote full time to contest operating. Of course, the amateur's particular methods of preparation for contests and for checking antenna or equipment performance during actual use will vary but such plans *should be formulated.* See Fig. 5-1.

During the weeks and days before a specific DX contest the amateur has ample time to contact the sponsor for or to make his

own log and "dupe" sheets for the event. There's also sufficient time to scrutinize contest rules and regulations, the results of that same contest in previous years, and to study propagation predictions for the contest period. These maneuvers will practically "lay out the course" for the contester, telling him what DX he can expect on which band and the approximate level of competition he can expect. The contester can also "guesstimate" the score he must achieve in a given amount of time to remain competitive. This figure somehow seems slightly more difficult to attain each year—either operating tactics are on a ever-increasing scale of professionalism or score-gouging has become a highly perfected art.

But, there is no reason to score-gouge any contest: it's being untruthful to oneself—and if discovered, it permanently discredits practically everything for which that amateur originally stood. The usual certificates issued to contest winners are *minor* recognitions: the *major* benefit of a contest is that *personal pride* and *satisfaction* the DXer feels. Play it straight and you, too, will agree there are really *no losers* in DX contests—working new countries and making a higher score is always worth the effort.

OPERATING TACTICS

Few subjects in amateur radio are more controversial than operating techniques for use during DX contests. Truly, one can expect to receive fifty different opinions from fifty different DXers asked about contesting. The information in this section isn't intended as mere fuel for that fire; it is presented as an overview of accepted techniques endorsed by the *general DX population* (except for one or two personal opinions that may have crept in out of pure enthusiasm!). Beyond that point, the reader can add his own thoughts as he sees fit!

If you're entering a contest to achieve a top score, you'll want to be there ready to go at the opening minute. You'll aim for both contacts and multipliers during the first few hours, while attempting to bypass all pileups over "common" DX whenever possible. This doesn't mean you should shy away from pileups which seem like "duck soup", however, since your operating skills and/or current propagation conditions may be favoring you during this high-scoring period.

If you can crunch through a pileup within three or four accurately placed calls, fine! Then try your luck with another DX station in a similar area, and if you rock that pileup, "lay-in with the

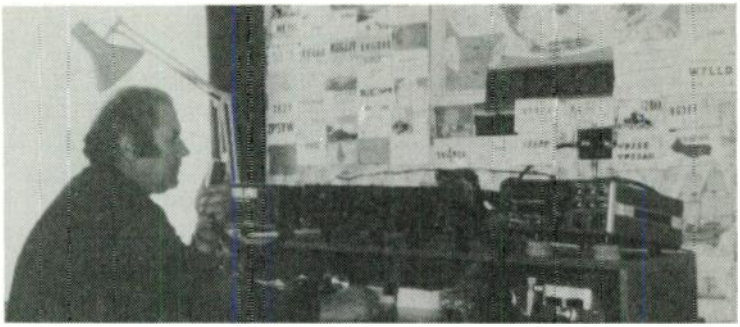


Fig. 5-1. DX contester Max Orasch, OE8MOK; knows that turning a high score means efficient operations right from the starting minutes. Max also uses DX contests to seek new countries and check the performance of newly-installed equipment and antennas. Note his boom lamp for late-evening DXing and the quickly-reached shelf of reference materials below his desk.

punches" while propagation is in your favor. Conditions will change soon enough (usually within an hour), and you'll need to either change bands and start this technique anew, or begin "digging in" on the band you're using. Remember, however, not to become "rutted down" to the point of staying in pileups for extended periods. You can work the same station more easily later—and you may miss *more exotic* DX when you're buried among callers in a lengthy pileup.

Study your prey: try to assess his skills and analyze his tactics. If he's efficient and clever, he may instinctively react to well-planned calls. If he's sending CW at a pretty fast rate, call him at a faster rate—and do it *efficiently* (*once*, without "frills, or his call). If the DX station indicates he's listening "up 10" but is picking off QSO's *up 5* kHz from his frequency, call him *up 4*. If the DX station says he's *QSY*ing to 14,243 kHz, don't waste time trying to be the last contact before the change—move to 14,243 kHz and briefly call him, indicating you're then listening. If the DX station signs off the air for 15 minutes, don't waste contest time trying to change his mind. Set your timer and start chasing other QSO's for 14 minutes—then return to the specified frequency and initiate the first call.

Again, I must emphasize the importance of *studying your prey*. Some top-notch DXers can follow two or three minutes behind QSO operations in their head, exchanging reports with stations after previously recording their calls. If it seems the DX station is returning to a different group than those you hear calling him, start noting those call letters to determine if this "follow-up" procedure

being used *before* you tune off frequency and miss your already-established contact.

If the station you're trying to contact *isn't* proficient in DX operating tactics, you can expect to spend a considerably longer period pursuing a contact. You should carefully consider how important the QSO actually is to your score *before* settling down and trying to devise some method (short of RFing the guy's receiver with some colossal amount of brute power!) of getting your call in the poor chap's log. Pay close attention to DXers making contact with the inexperienced station and try to determine how they managed a QSO. Was the DX station tuning up-frequency through the pileup? If so, move to the pileup's edge and call him. Were there lulls, or "holes" in the pileup in which any station "filling in the blank" snagged a QSO? If so, carefully monitor the pileup for the appearance of such a "hole" and then stick your *perfectly timed, exactly presented* call in there *one time at your maximum power level.* There are two additional special considerations which should be kept in mind this technique (which, incidentally, have proven extremely useful in a wide variety of DX pileups). 1) Although it probably will not result in a contact, you can initially call the DX station two or three times along with others in the pileup while using *less than half* of your available power (the DX station will probably become aware of you in there with the others, but he won't quite be able to make out your call). 2) You'll probably get *only one shot* at the DX station before others close the "hole". Check your plan thoroughly before blowing your chance. If necessary, practice the insertion of your call off the air to determine how it would fit.

Finally, the bedraggled DX contester may find sanity in the knowledge that sticking with it and demonstrating the patience of Job will ultimately produce winning results. Never give up! If you decide to move away from the rig for a while, don't switch it off and turn on a television; let the rig "play" at low volume. You may be pleasantly surprised to later hear the prime opportunity for which you've been waiting.

PLAYING PROPAGATION EFFECTS

Few high-scoring DX contesters achieve their outstanding results by "game of chance" operating and sheer luck; they plan their activities and band-to-band strategy prior to actual contest time. While such pre-scheduled game plans can, naturally, be modified during a contest, they do provide a guideline and help

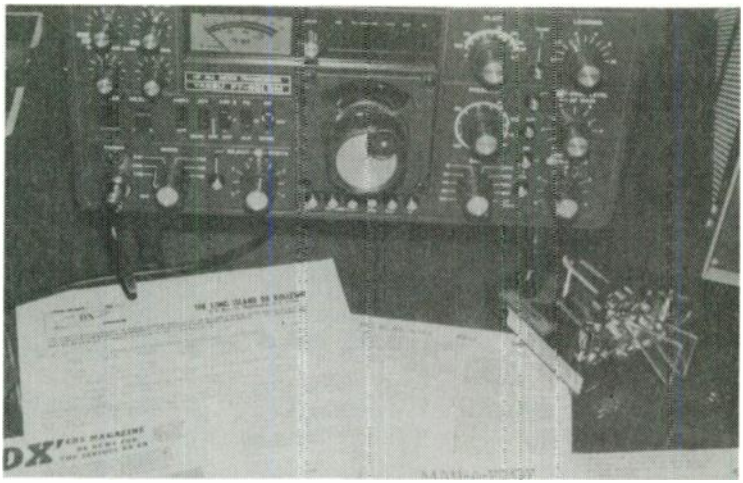


Fig. 5-2. The high-scoring DXer can't afford to depend on sheer luck and brute force power for success. DX bulletins, propagation forecasts and up-to-the-minute propagation reports are but three aids in reducing guesswork.

direct the action during periods of intensive activities—as well as those periods of semi-consciousness when you're half asleep during wee hours!

Prominently-placed propagation/bandplan charts remove one of the many concerns from the DXers mind and allow him to fully concentrate on the business at hand. The prime operating consideration in any DX contest will center around which band to operate during the peak DX hours of dawn and dusk. Don't wait until contest time to decide—use propagation charts to pre-select the best band for your personal use.

As a beginning measure, the DXer can consult propagation forecast listed in monthly amateur publications such as *73*, *QST*, *CQ* and *Ham Radio Horizons*. Then, too, up-to-date bi-weekly propagation bulletins such as *Mail-a-Prop* can be used to determine the validity of one's action plan and to "final tweak" the resulting operating schedule. During the last few minutes before contest time, the DXer should recheck the latest propagation news from a source such as WWV. See Fig. 5-2.

Another worthwhile operating aid which should be placed near the station desk, is an accurate list of relatively low power shortwave broadcast stations which are active near each amateur band. Lists of these stations can be found in up-to-date SWL guides and bulletins. Thus, if a band is predicted to be "open" into a specific area at a certain time, the operator can quickly check that

situation. If the "beacon" (low power broadcast station) is heard at its *usual* signal strength (which was established during previous weeks), the DXer can rest assured his signal will soon reap a number of DX calls.

After a DXer has operated a specific band for a few months, he'll acquire a "feel" for the band and he'll be able to *unconsciously sense* a good opening into a specific area. As an example, the operator may begin noticing the times when DX signals on 20 Meters pour abundantly into his area at 20 dB over S9 levels. Then, during a DX contest, he can tune that same band and quickly assess its condition by the pileups, their success ratio and the signal strengths of the DX stations.

The experienced DXer and/or contester knows how to use propagation effects to his distinct advantage, whereas "newcomers" may not be aware of these effects. DX openings on 40 Meters usually affect a wide geographic area, thus DXers compete with many amateurs also trying to make a successful contact. The only *physical* advantage one can have in this situation is to be physically *closer* to the DX area. For example, amateurs striving to contact Europe on 40 Meters usually compete with all U. S. districts, yet New England amateurs have a distinct geographical advantage in this situation. Southern U. S. amateurs would, likewise, find South American QSO's on 40 Meters "duck soup". Twenty-Meters produces more geographically confined and distinct DX openings than 40 Meters, and signal strengths are higher during these times. The usual DX openings on 20 Meters sweep across the U.S. like a soft "blanket"—best conditions are exhibited at the *leading edge* of this hypothetical "blanket". European openings, for example, sweep from east to west across the U.S., allowing Eastern U.S. amateurs to punch through pileups of Western and Northern amateurs quite easily. As propagation shifts, Mid-west amateurs can "roll through" 20 Meter pileups consisting of Eastern, Northern and Southern U.S. stations. Then as the propagation "blanket's" leading edge moves to the west coast, W6 and W7's can roll through pileups of other U.S. stations. Eastern amateurs will notice this because European signals will drop from 20 dB over S9 to slightly below S9 levels.

Fifteen-Meter DX openings are slightly more confined and pronounced than those on 20 meters, and the "blanket effect's" leading edge is also slightly shorter-lasting. Ten Meters exhibits an expanded version of the effects on 15 Meters. This means the "blanket's edge" on 10 Meters produces extremely good signal

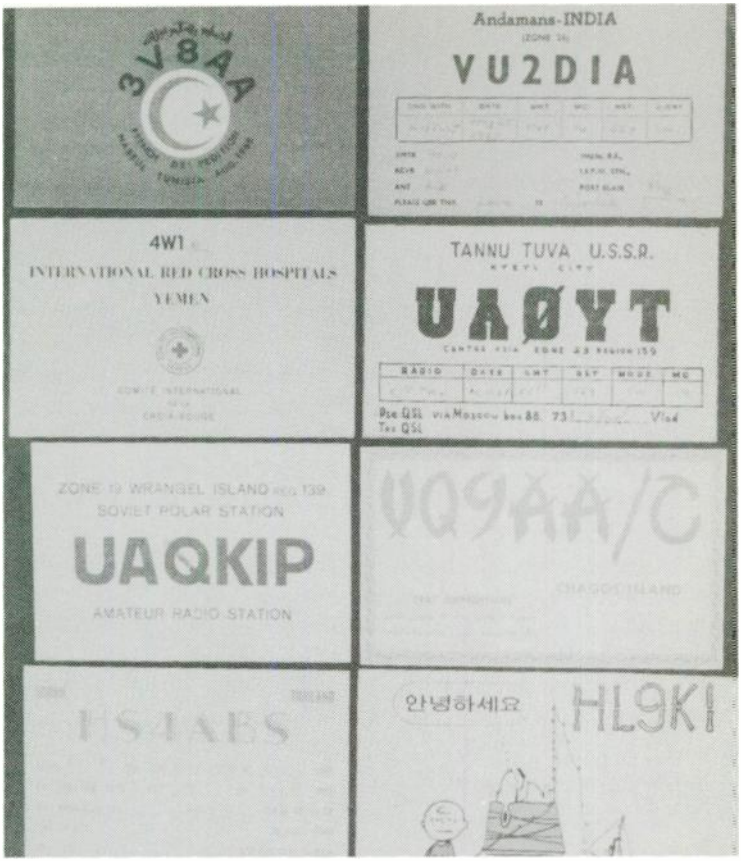


Fig. 5-3. QSL cards from remote and isolated areas of the world have, and will always be, a highly cherished possession among DXers. These cards serve as tangible proof of one's communication abilities. These cards were among the DXers "most wanted" list when contacted by author, K4TWJ.

propagation, and permits successful low power operations during peak sunspot cycle years.

SCORING

Acquiring a top position in any DX contest can only be done by attaining a maximum number of *multipliers*—as long as you're "moving" with multiplier contacts, you're on the winning track. Unfortunately, such periods are confined to relatively brief "runs" *on each band.* Although specific rules differ between DX contests, each multiplier contact is usually worth about four contacts without new multipliers. The question is thus whether to contact 40

stations in a single multiplier or 10 multiplier stations during a given period. Extremes in either direction seldom win contests (actually a lavish number of contacts *and* multipliers are the best!). Keep this in mind during a contest, but don't allow it to become an obsession. Don't waste time in massive pileups over apparently exotic DX when you've already made contacts in the same multiplier area. Likewise, don't allow yourself to become discouraged or "bluffed" into giving up prematurely. Other high-scoring stations can develop rig troubles or be called away later during the contest, their entry may be disqualified, or they may simply be falsely stating their score.

When you tally your final score, do it right. Carefully recheck the contest rules and regulations, using published examples and/or guidelines to ensure your methods of calculation are correct. While some small contest committees re-tally all entries to assure fairness, others merely reject improperly scored logs—and with just cause! Accuracy pays!

As a final "wrap-up" to a contest the operator should review all log sheets and categorized score to evaluate overall results. This evaluation will indicate areas of weakness and aspects of contest operations which may otherwise be overlooked. By learning from this evaluation, the operator will be more prepared for the next contest. Possibly that next time will produce the winning results—maybe even first place!

SENDING AND RECEIVING QSLs

The final courtesy of an amateur radio contact is the confirming *QSL card.* Not all amateurs fully endorse this philosophy, however, which means the DXer often puts as much (or more!) effort into sending and receiving QSLs than he puts into the original contacts. This problem has been further compounded during recent years by rising world-wide inflation and postal costs. Many amateurs, and particularly rare DX stations, simply can't afford to set up and maintain a station *and* mail QSL cards for every contact—particularly for the mass contacts produced during DX contests. If everything is put into perspective, it's also apparent that few foreign amateurs suffer from a lack of QSL's from U.S. amateurs! Then too, DX stations can't all be classified as devoted QSL collectors merely because they *are DX*. The DXer will thus experience approximately a 50% return on his QSL cards unless special measures are taken. There are two assets supporting QSL exchanging; the DX QSL manager system and the large number of world QSL bureaus. See Figs. 5-3, 5-4 and 5-5.

Fig. 5-4. Every DXer has a "special group" of QSL cards with special stories behind how they were acquired or about that particular contact. The stories range from conversations with Kings and Maharajas (JY1 and AC3PT) to battling gigantic pileups for several hours merely to exchange reports with the "rare DX" (VQ9CD and 6ØBW).

The QSL manager system allows the DX station to operate as much as he desires without worrying over mailing QSL cards, since this function is handled by another amateur. Properly submitting a QSL via a manager invariably results in receiving one in return. It should go without saying that any QSL sent to a manager should be accompanied by a self-addressed *stamped* envelope. If the manager is located outside of one's country, the accompanying *self-addressed* reply envelope should bear stamps

used in that country (several DX stamp services are presently active throughout the world) or, as a last resort, *International Reply Coupons* which may be redeemed for stamps can be enclosed. Occasionally, U.S. amateurs enclose U.S. stamps with self-addressed envelopes when mailing QSLs to foreign managers, however this supposes that the foreigner can use our stamps—usually he can't!

Carefully check all information on your QSL before mailing it to a manager. Remember that a manager receives hundreds of cards for each on-the-air operation, and a time difference of *five minutes* can place your call *several pages later* in a log. It's also worthwhile to include a note listing the calls heard *before* and *after* the QSO, since this speeds the locating of your contact in the DX log.

Due to continuously rising postage rates, QSL bureaus have acquired a highly esteemed and appreciated position during recent years. Amateurs can exchange a large number of cards through these bureaus at very low cost, provided the time delay of "third person handling" is acceptable. DXers exchanging QSL's via bureaus should remember this "bulk handling" technique doesn't give the best assurance of a returned card. A *very personalized* and *eye catching* QSL card often increases one's bureau-returned QSL average. Taping return-postage stamps *usable in the particular DX location* to one's bureau-processed card can also improve returns.

There are two special considerations worth remembering when exchanging QSL's via bureaus. 1) Popular DX stations receive hundreds of QSL's for "regular QSOs" on 20 and 15 Meters, thus your card confirming similar QSO has little "unique appeal" to them. 2) DX contacts on 160, 80 or 40 Meters or via unusual modes such as Slow Scan TV or 10 Meter FM are particularly outstanding to both of the involved amateurs, and QSL cards in recognition are commonplace. If you use QSL bureaus when your QSL's are *mutually important*, you'll reap maximum returns.

Throughout the years, *direct* QSLing has proven to produce the *highest returns* on DX QSL's. Unfortunately, this method is also the most expensive means of exchanging cards. If, however, an amateur contacts 115 countries during a DX contest and is willing to spend from $0.75 to $1.50 (two-way postal rates) *per QSL*, he will probably receive approximately 100 DX QSLs within a month. Usually, however, "direct QSL" techniques will be used less than 25% of the time. The following suggestions relate to those times

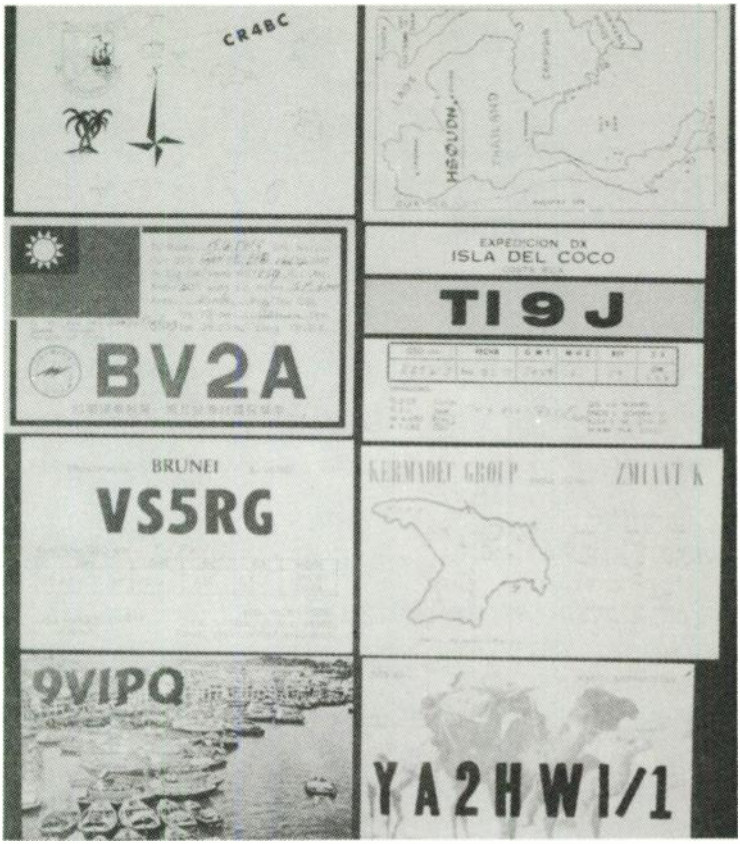


Fig. 5-5. Many times, the anxious DXer bypasses QSL bureaus and sends QSL's directly to the distant station. The results can be a group of intriguing cards bearing such prefixes as CR4, BV2 or VS5.

and, more particularly, to those times when acquiring a particular DX QSL is a very difficult matter.

Since the direct QSL will represent a significant investment, carefully recheck *all information* on the QSL for accuracy. If the contact was made during a contest, include the QSO number (both yours and his) and a brief list of stations which should appear in his log *before* and *after* your QSO. A hand-written personal note discussing your amateur radio activities helps create a feeling of friendship—and a desire for reciprocal QSLing. Finally, include a self-addressed, *stamped* envelope with postage used *in the DX area* to help pay the cost of the returned card. If the DX QSL isn't received within five to six weeks, a follow-up letter may bring

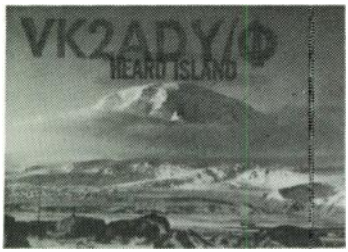


Fig. 5-6. Although the information on reverse of this photograph confirms W4ZRZ's contact with Heard Island, the photo itself has more appeal than a commercially-produced QSL card. Obviously VK2ADY/Ø couldn't afford to turn out two or three gross of such cards, hence their outstanding desirability.

Fig. 5-7. DXing activities are a stamp collector's haven. Amateurs can mount the cards, with or without accompanying envelopes on boards, decoupage them, or preserve them by lamination. Their fascination for later generations is unlimited. Note the prized Pitcairn Island stamps in middle of picture.

results. This time, enclose a second QSL card and self-addressed, stamped envelope in this "package", plus a photo of yourself, a letter of explanation about the contact and why the QSL is so important. The matter of also enclosing paper U.S. currency (such as a dollar bill) is left to the reader's discretion. Finally, the use of utmost amateur ingenuity often results in confirmations when all other methods fail. One example is W6KG's classic cablegram to the rare DX station confirming a contact and asking for a *collect*

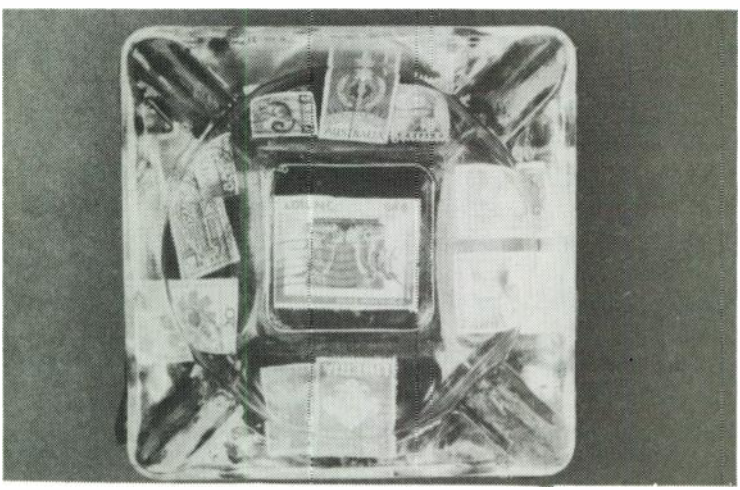


Fig. 5-8. A clear ashtray can be lined with stamps and adhesive felt holds the display intact. Since the stamps are sandwiched between the ashtray and felt, the item is 100 percent useful on the station operating desk.

Fig. 5-9. Exchanging amateur radio magazines with foreign hams is an exciting and mutually beneficial means of expanding horizons. Surface postage is suggested so the cost will be held to little more than that of the purchased magazine. Sharing magazines with (DX) friends produces some very informative results.

cablegram confirmation in return. The absolute novelty and uniqueness of this procedure practically guaranteed results! A novel "direct" QSL is shown in Fig. 5-6.

Stamp collecting is a fascinating "sideline" to direct QSLing which many amateurs find extremely enjoyable. Few amateurs discard envelopes and stamps from distant lands. Amateurs faced with the disposition of excess DX stamps might consider constructing a wall decoupage of these stamps (mounted on a felt background) or lining a clear glass ashtray with the more colorful stamps. Thus the overall results of one's involvement in a single DX contest can provide memories *and* tangible items which can last a lifetime. See Figs. 5-7 and 5-8.

Another interesting "sideline" of DXing involves exchanging amateur radio magazines with distant hams. To hold down costs, this is best accomplished on a one-to-one basis, using surface postal rates on both ends. It's truly fascinating reading how other countries are "coming along" in amateur radio and to see who the "big guns" in those countries have contacted "stateside" (see Fig. 5-9).

Chapter 6
DX Aids

It is fascinating to examine the vast array of station accessories and operational aids available to today's DXers. New accessory-type items introduced via the pages of monthly amateur radio publications lend a "James Bond" or "Matt Helm" touch to one's station—fortunately most of these "DX items" fulfill a necessary purpose and ultimately make life a little easier for both the casual and serious DXer. This chapter will consider some of the presently-popular accessories and provide an overview of their use and capabilities.

One of the most popular accessories among both casual and serious DXers is the *Radio Amateur's Callbook*. This listing of all licensed radio amateurs is available in two volumes: *United States* and *Foreign*. A number of often-overlooked aids are included in the *DX* Callbook—including *DX beam headings* for a number of U.S. cities, a *QSL manager directory*, an *international time conversion chart* with "gray zone" indications, an amateur radio *zone/continent/prefix* listing, and a two page *world map* with *amateur prefixes*. The DXer can remove these pages and place them under glass on the operating table, and they will be ready for immediate use as required.

Electrically-rotated card files—such as those used in offices for telephone numbers—can be re-marked with radio prefixes and used as a QSO file and pushbutton-operated beam heading list. A rotary file can also be used to keep track of contact confirmations

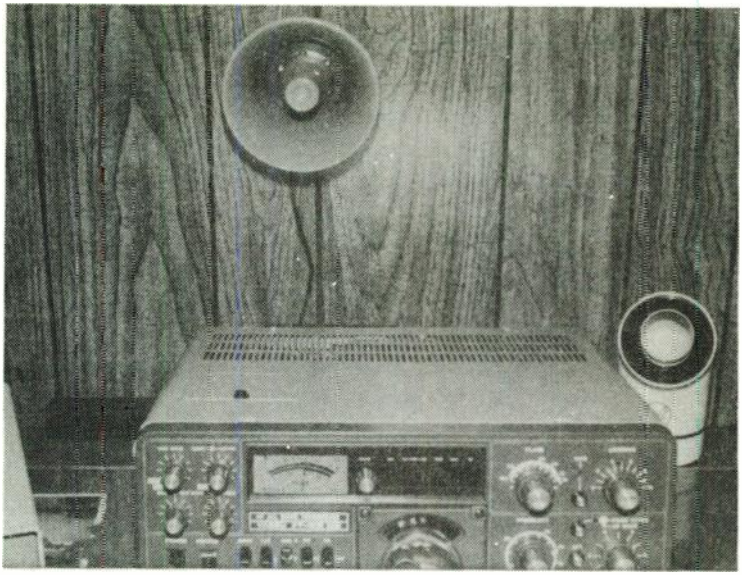


Fig. 6-1. A paging trumpet functioning as a "selectively-tuned" speaker for SSB operations. The frequency response of these units, coupled with their high power handling ability, makes them a staunch performer for many DXers.

for various DX awards, operating trends in certain areas, slow scan operators or anything else the DXers imagination can conjure.

Tape recorders have proven their worth many times over for a number of amateur activities, yet the beginning DXer may overlook their possibilities. Tape recordings of large pileups, which can be reviewed at a later time, offer immense insight into operating tactics—and those tapes can be shared with others and used to evaluate one's own DX techniques. A continuous-loop tape can act as a "backup" during fast contest operating in case vitally-important calls are partially missed. Finally, tape recordings of the calls *before* and *after* a contact can assist in fast logspotting and help assure QSL response. For such use the tape recorder's input can be connected directly to the station speaker through a 1 megohm, 1/2-watt resistor to isolate the recorder's input from the station receiver's audio output stage, and allow the speaker to operate normally.

Earphones with attached boom microphones are enjoyable for DXing. Besides providing extra desk room, voice control (VOX) operation with lightweight earphone-microphone units permits true hands-free operation—a definite asset during DX contests or DXpedition activities. If voice control isn't desirable, a foot-

operated "stomp-to-talk" switch can be placed on the floor near the operating position.

Small paging trumpets, of the type frequently added to mobile CB sets, make very good "selectivity tuned" speakers for SSB transceivers. The natural resonance of these speakers acts like an audio filter to remove adjacent channel interference, while their high power capability is beneficial during the high volume levels in pileups. CW operation with paging trumpets is also pleasurable—the desired signal is reproduced 3 or 4 dB above nearby signals. Many times, the trumpet can be pointed out of the radio room for remote monitoring of DXpeditions or pileups; or for conducting early morning DXing while getting dressed for work (or *trying* to get dressed while working DX!). If you haven't tried one of these inexpensive trumpet speakers, you have a surprise awaiting you. See Fig. 6-1.

Almost every devoted DXer subscribes to at least one DX newsletter or bulletin. These sources of late-breaking news are a most reliable and beneficial means of increasing DX scores—particularly when one's country count exceeds 150 or so. Bulletins published weekly or bi-weekly will naturally supply the most accurate data on "new ones" hitting the air but the monthly bulletins may provide important statistical information related to conditions in various geographic locations in the U.S. DX bulletins include: *The DXers Magazine* (Gus Browning, W4BPD; Editor-in-Chief); *DXers Bulletin* (Vernon, Connecticut-area publications); *Southeastern DX Club Bulletin* (Atlanta, Georgia-area publication); *Long Island DX Club Bulletin* (New York-area publication), *West Coast DX Bulletin* (recently moved and taken-over by K5AAD) and several others. The cost of these publications range from approximately $12 to $22 per year, and they're *worth every penny.* As a compliment to DX bulletins, the DXer should also consider subscribing to a propagation forecast service. See Figs. 6-2, 6-3 and 6-4.

The most outstanding propagation bulletin service currently available is George Jacob's (W3ASK) *Mail-A-Prop*. *Mail-A-Prop* is a bi-weekly two or three-page bulletin describing upcoming conditions on the 160 through 10 meters bands in a "weather forecast" format which is easily read and understood. These forecasts include predictions for each band opening and the approximate quality of the openings, an overview of general conditions during each week of the forecast period, plus a day-by-day analysis and explicitly detailed discussion of upcoming

The DX Bulletin

September 6, 1979
Vol. 1 Issue 4

PROPAGATION FORECAST: Sept 12, 13 High Normal, 14: HN, going to Disturbed, 15 Disturbed Thanks N4XX.

COCOS-KEELING On September 17, 18 and 19, VQ9JJ, VQ9MR and VQ9KK will operate ssb and cw mostly on 20, 15 and 10 Meters. The tentative calls are VK9YJ (VQ9JJ), VK9YR (VQ9MR), and VK9YK (VQ9KK). They will take two TS520s, a Signal-One and spare receivers. Antennas will be verticals and possible a tribander if it arrives on Diego Garcia before they leave. There is already a 20 Meter beam in place on the island but its condition is unknown. They will be there 40 hours, including set-up time and tear-down. QSLs for VK9YJ and YR will go to K9IL, and VK9YK will be handled by WA3HUP. K9IL is R.E. Miles, PO BOX 73R, Romeoville, IL 60441

BOUVET will have to wait for those of us still needing it; the expedition for next winter (if one is made) will not include any licensed amateurs. Cards from the last operation by 3Y1VC have been received by some but many are still waiting. Patience necessary.

ANDAMANS group is not in the offing, getting there presents problems even for Indian amateurs, there is a naval base there and tourists are not welcome. Laccadive Islands (VU4) looks much better, though, with VU2TS and VU2GD nailing things down for a trip in November.

W0SI says he worked ZK1AM for the "last of over 12,000 contacts from semi-rare Manihiki Island" on Aug. 25. Members of the Manihiki group will be speaking at the Midwest Division Convention in Cedar Rapids, Iowa on Oct. 20. Mike (W0SI) also is donating QSL cards for 3B8CD's recent opertion as 3B6CD. Requests go to KC5I, who was known previously as WD5BIF.

A reminder: 6 meter operators meet at 28 885 at 1700 Sundays to discuss propagation and coordinate for openings. They also use that spot to alert others of band openings and to report beacons heard, etc., on 50 MHz.

HP1AC reports working TI5M6CSY/6Y5 and KP4IS on Oscars 7 and 8. Camilo's ready for all callers on both satellites.

If 3B9 Rodriquez is needed per your list. 3B8CF will be there about Sept. 30 for only "a couple days."

CALIFORNIANS and others in the general vicinity should watch for long path openings to Africa about 0400-0700 and 1400-1500 on Fifteen Meters. Also some on Ten Meters around 0530, according to W6NZK. Sounds interesting.

D4CBC, a mainstay on the bands from the Cape Verde Islands, has discouraging problems getting parts for his FT501 and Heath SB200. A benevolent W3 has sent a pair of tubes for the linear but more many be needed. Julio may be the only amateur there soon.

VP8VN listens for Stateside calls on Thursdays and Saturdays at 1000 on the low end of 20ssb, check 14235-240. He is on S. Georgia.

The DX Bulletin is not settled as to exact day (day of week) of compiling information, printing and mailing. For now, try to have reports in the mail to us by mid-week. If it appears Second Class mail will be faster for the majority we will switch to that.

The JORDAN Awards program is now being administered by Terrance Samars, JY9TS. Write to him c/o the Royal Palace, Amman.

The DX Bulletin is a weekly publication devoted to news of interest to DXers worldwide. **The DX Bulletin** is affiliated with no other publication or organization, and is independently published by DXers, for DXers. Commercial advertising is accepted as a service to readers. **The DX Bulletin** actively solicits input and DX reports from all DXers. First Class mailing to US and VE amateurs and Airmail to all others is used. Yearly subscription rates are $22 US and VE, $30 all others. **The DX Bulletin** is printed and mailed from Houston, TX. Address **all** correspondence to **The DX Bulletin**, 306 Vernon Avenue, Vernon, CT 06066 USA.

Fig. 6-2. A sample page from the approximately eight-page DX bulletin which published weekly by The DX Bulletin (306 Vernon Avenue, Vernon, Connecticut). The propagation forecast at the top of this bulletin is especially beneficial, and there's plenty of "juicy DX info" throughout.

conditions. DXers using this propagation service know exactly what to expect from each band during any hour of the day, and may thus plan their activities accordingly. If you're serious about DXing, this service should definitely be considered. Additional information is available from W3ASK or *Mail-A-Prop*, P. O. Box 1714, Silver Springs, Maryland 20902. See Fig. 6-5.

MISC DX TIDBITS & COMMENTS

UN8BL QSL INFO
Don't send them to VE3EUP, he has received no logs and his letters returned as unclaimed.

VK9CGR QSL INFO
Send em via: VK5QX, his name is Paul.

VK9NW QSL INFO
Send em via. Box 214, Norfolk Island 2899 Australia.

VP8SU - S. GEORGIA IS. QSL INFO
(Send to G4CHD)

WANNA WORK BHUTAN (A51) ?
You might try listening between 1200 to 1400Z on and around 14267+ KHz on Tuesdays, Thursdays and Saturdays. At times he checks into the Asian Net (I think it should have been called the SEA (South E. Asian Net.-ed.)

WØQGI NOW STANDS AT 356 CONFIRMED CONGRATS TO YOU LLOYD OM !

ZB2CW GIBRALTER WORKED
(Tnx to Lloyd, WØQGI) Got Mick at 1915Z on 28025 KHz, active on all bands and is also FOC

ZF2BN QSL INFO
(Tnx to Skip, WB8OWM) Send via W4HET

ZK1AM MANIHIKI MADE 15,000 QSO's
(I bet that there would still be a big pile-up if they fired up TOMORROW !) hi

ZL5MC QSL INFO (ROSS IS.)
QSL via: ZL2HE.

ZONE 23 - Remember some UAØ STNS ARE in Zone 23 - Tanna Tuva, of course JT and if China ever opens up they have a number of districts in 23 too.

3C1AA AND 3CØAB DXPEDITION INFO
updated was received too late to do anyone any good ! Sorry about that fellows. Iberia DX Club accepting DONATIONS too.

6Y5 JAMIACA (W8TN/6Y5)
(Tnx to Lloyd, WØQGI) Worked this one at 0036Z on 28565 KHz on October 24.

9H3ZJH WORKED
(Tnx to Lloyd, WØQGI) This one was wkd on 14032 KHz at 0022Z on Oct. 21. He is a good op and name is Peter.

9H4P QSL INFO
(Tnx to Skip WB8OWM) Send em via N2DO.

FROM THE EDITOR TO YOU

TO EVERYONE DOWN IN FT. MYERS, Florida, Peggy and I would like to say hello. If you came by our set-up I hope that we met and had a little "yak" ! If you placed a QSL (or other) printing order I say, thank you very much, if you didn't, well maybe you will send me one when you are in need.

You can be sure that you will get FAST service. I work until 2:30 EVERY NIGHT trying to keep the printing hook clean. I also hope you looked over Peggy's large assortment of her personally made hand-craft items, if you did I hope you either bought something or maybe you placed an order for some special combination of colors, Anything you did to help us we both say, "THANK YOU", (you readers of this magazine may want to order something from Peggy because they surely will make a FB Christmas present for someone. The various things Peggy makes is: Granny Dolls, big ones about 36" tall, small ones about 18 to 20" tall. The big ones sell for $ 10.00 and small ones sell for $ 5.00, then there are those large size dogs and small dogs (same with Cats), they measure about 10" and 6" each, and there is those "neck-tie" snakes. Large dogs are $ 4.50, small ones only $2.50 and those "neck-tie" snakes are only $ 1.00 each (sometimes she uses a neck-tie that sold for up to $ 3.00 each ! I asked her how could you sell something for more than it cost - you guessed it, she said the money was in the "volume" ! These are not faded or worn out neck-ties, but they were purchased by Peggy at a very good price you can be sure ! Hey there OM, maybe YOU have a few neck-ties laying around that are out of style or some color you just don't like. Well Peggy can and will make snakes out of them, so how about sending them down to her and lets see what kind of a looking snake they will make. She does make a small profit out of FREE NECK-TIES ! Those others . . . . well !. . . ! Anyway it keeps her busy these cold (or hot) nights, she sticks with her work till about 1:00 A.M. each night. With maybe a Coffee or hot tea break during the 11:00 P. M. news. Since we both love to keep busy, you can be sure that's how it is around here ALL THE TIME !

Be sure to read Episode 2 of my story, it will be found elsewhere in this issue and in all future issues for the next year or more. Episode 1 was in the issue before this one. I printed up a few hundred extra copies of

Fig. 6-3. Sample page from The DXers Magazine published semi-monthly by Gus Browning, W4BPD (P.O. Drawer "DX", Cordova, South Carolina 29039). This magazine often attains a length of 20 pages, and features full coverage of DX related news. It is considered as the leading publication for late-breaking DX news.

THE LONG ISLAND DX BULLETIN

P.O. Box 173, Huntington, N.Y. 11743

THE LONG ISLAND DX BULLETIN IS PUBLISHED BI-WEEKLY AT 100 WILLOW AVENUE, HUNTINGTON, NEW YORK 11743. SUBSCRIPTION RATES: $10.00 DOMESTIC; OVERSEAS AIR MAIL RATES ON REQUEST. DX INFORMATION MAY BE REPRINTED IF CREDIT IS GIVEN TO THE LI DX BULLETIN

ISSUE 19 - 79 12 SEPT 1979

N4XX PROPAGATION FORECAST - SEPT

SUN	MON	TUES	WED	THURS	FRI	SAT
			12-HN	13-HN	14-HN/DIS	15-DIS
16-BN	17-BN	18-HN/LN	19-HN	20-HN	21-HN/LN	22-HN/LN
23-HN	24-HN	25-HN/LN				

Legend: AN, HN, LN, BN = Above, High, Low, Below Normal. DIS = Disturbed.

***

ALAND ISLANDS - 14 - 18 Sept. by OH2EE/OHØ; ssb: 14,280, 21,380 and 28,580 KHz, cw: up 30 KHz from the low ends of 10, 15 and 20 plus action for Novices on 21,105 and 28,105 KHz. QSL with sae and IRCs to OH2EE.

***

BANABA - VR1AF, who will be on this former Ocean Island for another few weeks, meets with WA6BJS on 14,279 KHz Tuesdays at 0515 UTC. QSL via W7OK. VR1AH also checks-in frequently.

***

CHATHAM ISLAND - ZL2UW/C is regularly around 14,220 or 14,265 KHz from 0600 to 0800 UTC. QSL to the CBA of ZL2UW.

***

COCOS KEELING - 17 - 19 Sept. for 40 continuous hours by VK9YJ (VQ9JJ), VK9YK (VQ9KK) and VK9YR (VQ9MR). Concurrent cw and ssb operations by three stations on 14,275/280, 21,355/360 and 28,595/600 KHz. VKs rescued the lagging license applications by advancing VK-currency for the fees. QSL VK9YK via WA3HUP. QSL VK9YJ and VK9YR via K9IL.

***

FERNANDO DE NORONHA - From 30 Sept. by PY2GWF, PY2P and PY2XB. Power and good antennas on 6 to 160. QSL via PY2GWF.

***

FRANZ JOSEF LAND - UK1PAA, operated by Slava (UA4HGF), is presently equipped for cw only. His favorite daily frequencies are 14,005, 14,015, 14,140 and 14,160 KHz from about 0500 UTC. On Sundays, UB5UAT runs a list for him on 14,140 at 0500 UTC. A ssb rig is enroute to him and should arrive in early October. Slava expects to get a personal callsign, possibly UK1PAL. QSL to Box 88, Moscow c/o UA1OSM.

MORE ON FRANZ JOSEF - UK1PGO is now on Heise Island in the Franz Josef Island group and being heard regularly near 14,030 KHz from 0001 UTC. He is expected to be active on 10, 15 and 20 meters. We also have word that still another group - members of the UK1OAA club station - are well along in plans for a very ambitious near-future FJL DXpedition.

***

MARION ISLAND - As you read this, ZS2MI should have the new rig that was shipped to him from Rhodesia. Johan promises Monday, Wednesday and Friday schedules on 14,240 KHz from 1130 UTC with WA2IZN as MC. He plans to devote the 25th of each month to cw-only for the benefit of the waiting throng. QSL via WA2IZN.

***

MALAGASY - Now through 28 Sept. HB7OP/5R8 plans daily 'split' operations on 14,195 and 28,595 KHz from 2300 to 0100 UTC and at such other times as his work schedule permits. 5R8AL is back from his vacation but gets on the air only occasionally.

***

MACQUARIE ISLAND - VKØPK is often near 14,220 KHz from 0700 UTC but he is always there on Thursdays and Fridays. QSL via VK3OT.

Fig. 6-4. One of the oldest and most widely-distributed DX newsletters is The Long Island DX Bulletin (P. O. Box 173, Huntington, New York 11743). This bi-weekly publication is printed on both sides of a single long sheet and includes a propagation forecast for each forthcoming two-week period.

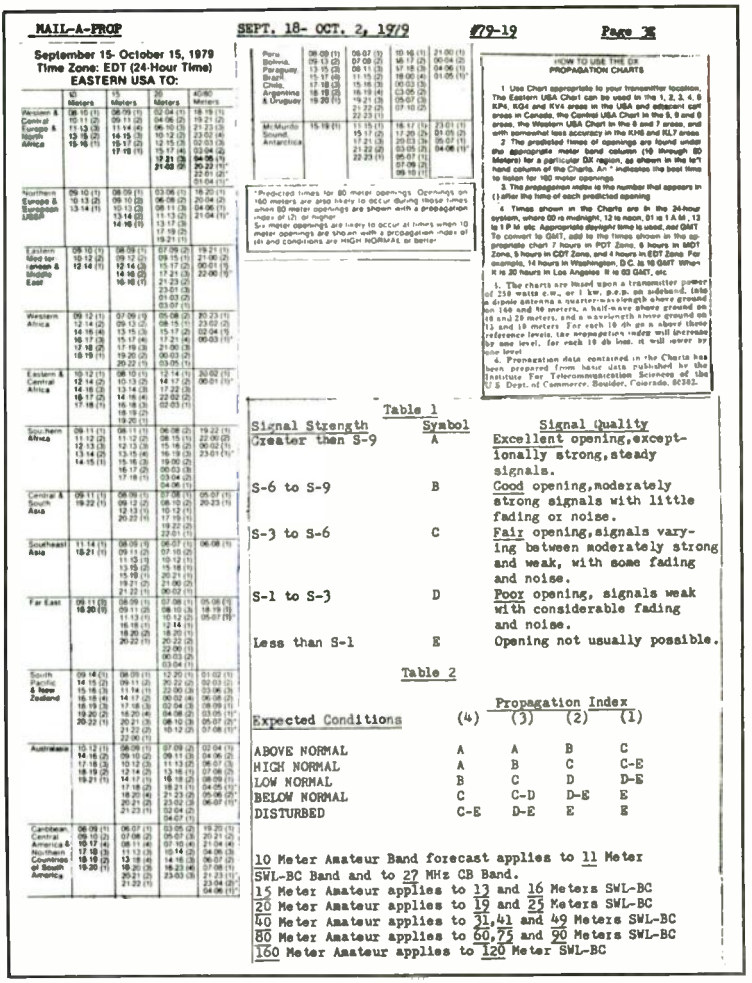
Before discussing the available "hardware" accessories, I should point out that the most important DX aid a radio amateur can possess *can't be purchased*; it must be acquired through extended on-the-air DX operating. I'm speaking of *DXing knowledge* and *operating skill*. This is acquired only through many periods of chasing DX—winning some battles and losing others. It's acquired through extended conversations with old-time DXers, analyzing

their methods, by maintaining a *positive* attitude, and by applying the techniques business managers often call *strategy.* If you seriously want to accomplish a goal—whatever it is—the world's at your disposal. Remember outstanding leaders create and enjoy lasting friendships rather than making enemies. Gentlemanly tactics are the *backbone of amateur radio.* Knob-twiddlers and muscle-flexers are the *QRMers—not* true DXers. *Think* before acting irrationally. Your reputation is at stake *every time* you're on the air. You *can* contact 300 countries while using *basic* amateur equipment—and without *stepping on others' feet.*

THE MFJ-484 GRANDMASTER MEMORY KEYER

A significant creditable amount of choice CW DX slips by many semi-serious DXers during the very early morning hours each day. Since most American amateurs are busy getting ready for their work, it's difficult finding time to sit down at the rig. *MFJ Enterprises, Inc., P. O. Box 494, Mississippi State, Mississippi 39762,* has an ideal solution to that dilemma: a programmable memory keyer (Fig. 6-6) which produces almost "hands free" DXing. With their model 484 *Grandmaster* keyer connected to a rig employing break-in or semi-break-in keying, the DXer need only interrupt his early morning schedule long enough to fill in the other station's call—then *press a button.* When the DX station signs, a quick dive at the keyer's *memory start* button initiates a call and the rig then transmits and returns to receive for the reply. During the "next over", the DXer again need only dive for the unit's *memory 2 start* button (signal report, QTH, and name exchange). Longer QSO's can be accomplished merely by switching the *Grandmaster's* memory select switch to position *K.*

This no-compromise keyer can be reprogrammed in a flash whenever desired by merely pulling the *speed control* out and addressing the desired memory. Pushing in the control then readies the unit—the transmission is initiated by pushing the desired *memory address* button when needed, and the operator can interrupt the memory keyer's transmission and take complete control of any QSO by merely transmitting with the unit's paddle. Using the paddle gives immediate priority over the memory. A delay circuit, complete with front panel control, permits the associated rig to switch back to receive and listen for replies—the listen time is continuously variable up to *two minutes* by another front panel control.



MAIL-A-PROP SEPT. 18- OCT. 2, 1979 #79-19 Page 3E

September 15- October 15, 1979
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	80 Meters	40 Meters	20 Meters	15 Meters	10 Meters
Western & Central Europe & North Africa	08 10 (1) 10 11 (2) 11 13 (3) 13 15 (2) 15 16 (1)	08 09 (1) 09 11 (2) 11 14 (3) 14 15 (3) 15 17 (2) 17 18 (1)	02 04 (1) 04 06 (2) 06 10 (3) 10 12 (2) 12 15 (3) 15 17 (4) 17 21 (3) 21 00 (2)	18 19 (1) 19 21 (2) 21 23 (3) 23 02 (4) 02 04 (3) 04 05 (2) 20 22 (1)* 22 01 (2)* 01 04 (1)*	
Northern Europe & European USSR	09 10 (1) 10 13 (2) 13 14 (1)	08 09 (1) 09 10 (2) 10 13 (3) 13 14 (2) 14 16 (1)	03 06 (1) 06 08 (2) 08 11 (3) 11 13 (2) 13 17 (3) 17 19 (2) 19 21 (1)	16 20 (1) 20 04 (2) 04 06 (1) 21 04 (1)*	
Eastern Mediterranean & Middle East	09 10 (1) 10 12 (2) 12 14 (1)	08 09 (1) 09 12 (2) 12 14 (3) 14 16 (2) 16 18 (1)	07 09 (2) 09 15 (1) 15 17 (2) 17 21 (3) 21 23 (2) 23 01 (3) 01 03 (2) 03 07 (1)	19 21 (1) 21 00 (2) 00 01 (1) 22 00 (1)*	
Western Africa	09 12 (1) 12 14 (2) 14 15 (4) 15 17 (3) 17 18 (2) 18 19 (1)	07 09 (1) 09 13 (2) 13 15 (3) 15 17 (4) 17 19 (3) 19 20 (2) 20 22 (1)	05 08 (2) 08 11 (3) 11 15 (2) 15 17 (4) 21 00 (3) 00 03 (2) 03 05 (1)	20 23 (1) 23 02 (2) 02 04 (1) 00 01 (1)*	
Eastern & Central Africa	10 12 (1) 12 14 (2) 14 16 (3) 16 17 (2) 17 18 (1)	08 10 (1) 10 13 (2) 13 14 (3) 14 16 (4) 16 18 (3) 18 19 (2) 19 20 (1)	12 14 (1) 14 17 (2) 17 22 (3) 22 02 (2) 02 03 (1)	20 02 (1) 00 01 (1)*	
Southern Africa	09 11 (1) 11 12 (2) 12 13 (3) 13 14 (2) 14 15 (1)	08 11 (1) 11 12 (2) 12 13 (3) 13 15 (4) 15 16 (3) 16 17 (2) 17 18 (1)	06 08 (2) 08 15 (1) 15 16 (2) 16 19 (3) 19 00 (2) 00 03 (3) 03 04 (2) 04 06 (1)	19 22 (1) 22 00 (2) 00 02 (1) 23 01 (1)*	
Central & South Asia	09 11 (1) 19 22 (1)	08 09 (1) 09 12 (2) 12 13 (1) 20 22 (1)	07 08 (1) 08 10 (2) 10 12 (1) 17 19 (1) 19 22 (2) 22 01 (1)	05 07 (1) 20 23 (1)	
Southeast Asia	11 14 (1) 18 21 (1)	08 09 (1) 09 11 (2) 11 13 (1) 13 15 (2) 15 19 (1) 19 21 (2) 21 22 (1)	06 07 (1) 07 10 (2) 10 12 (1) 15 18 (1) 18 21 (2) 21 00 (3) 00 02 (1)	06 08 (1)	
Far East	09 11 (1) 18 20 (1)	08 09 (1) 09 11 (2) 11 13 (1) 15 18 (1) 18 20 (2) 20 22 (1)	07 08 (1) 08 10 (3) 10 12 (2) 12 14 (1) 14 20 (1) 20 22 (2) 22 00 (1) 00 03 (2) 03 04 (1)	05 06 (1) 18 19 (1) 05 07 (1)*	
South Pacific & New Zealand	09 14 (1) 14 15 (2) 15 16 (3) 16 18 (4) 18 19 (3) 19 20 (2) 20 22 (1)	08 09 (1) 09 11 (2) 11 14 (1) 14 17 (2) 17 18 (3) 18 20 (2) 20 21 (3) 21 22 (2) 22 00 (1)	02 20 (1) 20 22 (2) 22 00 (3) 00 02 (4) 02 04 (3) 04 06 (2) 06 08 (3) 08 10 (2)	01 02 (1) 02 03 (2) 03 06 (3) 06 08 (2) 08 09 (1) 03 05 (1)* 05 07 (2)* 07 08 (1)*	
Australasia	10 12 (1) 14 16 (2) 17 18 (3) 18 19 (2) 19 21 (1)	08 09 (1) 09 10 (2) 10 12 (3) 12 13 (2) 14 17 (1) 17 18 (2) 18 20 (4) 20 21 (3) 21 23 (2)	07 09 (2) 09 11 (3) 11 13 (2) 13 14 (3) 16 18 (2) 18 21 (3) 21 23 (2) 23 02 (3) 02 04 (2) 04 07 (1)	02 04 (1) 04 06 (2) 06 07 (3) 07 08 (2) 08 09 (1) 06 07 (1)*	
Caribbean, Central America & Northern Countries of South America	08 09 (1) 09 10 (2) 10 13 (4) 17 18 (3) 18 19 (2) 19 20 (1)	06 07 (1) 07 08 (2) 08 11 (4) 11 13 (3) 13 16 (4) 18 20 (3) 20 21 (2) 21 22 (1)	03 05 (2) 05 07 (3) 07 10 (4) 10 14 (3) 14 15 (2) 18 23 (4) 23 03 (3)	15 20 (1) 20 21 (2) 21 04 (4) 04 06 (3) 06 07 (2) 07 08 (1) 21 23 (1) 23 04 (2) 04 06 (1)*	

*Predicted times for 80 meter openings. Openings on 160 meters are also likely to occur during these times when 80 meter openings are shown with a propagation index of (2) or higher.
5-v meter openings are likely to occur at times when 10 meter openings are shown with a propagation index of (3) and conditions are HIGH NORMAL or better

	80 Meters	40 Meters	20 Meters	15 Meters	10 Meters
Peru Bolivia Paraguay Brazil Chile Argentina & Uruguay	08 09 (1) 09 13 (2) 13 15 (2) 15 17 (3) 17 18 (2) 18 19 (2) 19 20 (1)	06 07 (1) 07 08 (2) 08 11 (3) 11 15 (2) 15 16 (3) 16 19 (4) 19 21 (3) 21 22 (2) 22 23 (1)	10 16 (1) 16 17 (2) 17 18 (3) 18 00 (4) 00 03 (3) 03 05 (2) 05 07 (3) 07 10 (2)	21 00 (1) 00 04 (2) 04 06 (1) 01 05 (1)*	
Mid-Pacific Islands, Antarctica	15 19 (1)	11 15 (1) 15 17 (2) 17 21 (3) 21 22 (2) 22 23 (1)	16 17 (1) 17 20 (2) 20 03 (3) 03 05 (2) 05 07 (1) 07 09 (2) 09 10 (1)	23 01 (1) 01 05 (2) 05 07 (1) 04 06 (1)*	

HOW TO USE THIS DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada, the Central USA Chart in the 5, 9 and 0 areas, the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in (1) after the time of each predicted opening.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight, 12 is noon, 01 is 1 A.M., 13 is 1 P.M. etc. Appropriate daylight time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles it is 03 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts e.w., or 1 kw. p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the propagation index will increase by one level, for each 10 db loss, it will lower by one level.

6. Propagation data contained in the Charts has been prepared from base data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

Table 1

Signal Strength	Symbol	Signal Quality
Greater than S-9	A	Excellent opening, exceptionally strong, steady signals.
S-6 to S-9	B	Good opening, moderately strong signals with little fading or noise.
S-3 to S-6	C	Fair opening, signals varying between moderately strong and weak, with some fading and noise.
S-1 to S-3	D	Poor opening, signals weak with considerable fading and noise.
Less than S-1	E	Opening not usually possible.

Table 2

Expected Conditions	Propagation Index (4)	(3)	(2)	(1)
ABOVE NORMAL	A	A	B	C
HIGH NORMAL	A	B	C	C-E
LOW NORMAL	B	C	D	D-E
BELOW NORMAL	C	C-D	D-E	E
DISTURBED	C-E	D-E	E	E

10 Meter Amateur Band forecast applies to 11 Meter SWL-BC Band and to 27 MHz CB Band.
15 Meter Amateur applies to 13 and 16 Meters SWL-BC
20 Meter Amateur applies to 19 and 25 Meters SWL-BC
40 Meter Amateur applies to 31, 41 and 49 Meters SWL-BC
80 Meter Amateur applies to 60, 75 and 90 Meters SWL-BC
160 Meter Amateur applies to 120 Meter SWL-BC

Fig. 6-5. Sample sheet of Mail-A-Prop service from noted forecaster George Jacobs, W3ASK (P. O. Box 1714, Silver Springs, Maryland 20902). This bi-weekly bulletin gives explicit details on the conditions on each amateur band for each day of the forecast period.

Finally, the CW enthusiast can use the *Grandmaster* as a straight electronic keyer whenever desired. The keyer itself features self-completing dot and dash generation and iambic operation. (Iambic operation means that when using a squeeze key (two paddles), and both paddles are squeezed together a transmission of alternate dots and dashes is produced. The first paddle activated determines whether dots or dashes occur first). All

aspects considered, the MFJ *Grandmaster* definitely proves its worth as a station accessory for many amateurs.

THE MFJ-202 RF NOISE BRIDGE

Almost all DXers strive to get every milliwatt of power out of their rig and into the antenna by tuning antennas, pruning feedlines rigging matching devices and checking plate coil taps—the list is endless. One of the most helpful and inexpensive items to assist in these efforts is an *RF noise bridge.* The MFJ bridge (Fig. 6-7) can indicate antenna and/or feedline conditions, and reveal the need to shorten or lengthen them (no more guesswork!). Plus it will indicate exact radiation resistance. When used with the station receiver, the noise bridge also indicates the exact resonant frequency and associated bandwidth of the system.

A noise bridge is also very useful for initially tuning a linear amplifier's input and output circuits *without applying any power* to the amplifier. Think about that! The noise bridge and station receiver's "S" meter are used to indicate such variables as amplifier input impedance and bandwidth *without stressing the RF power amplifier stages.* Tank circuits can be tuned for maximum power output and a perfect 50-ohm impedance match without risking tube damage or electrical shocks. Antenna tuners can be tuned to match an exciter without applying RF before the SWR is exactly 1:1. Once you use a noise bridge, you'll probably wonder how you ever managed without one—and the MFJ unit is top quality.

THE VOMAX AND MFJ SPEECH PROCESSORS

High quality speech processors have been popular accessory items among DXers for several years, and the *MFJ Model LSP-520*

Fig. 6-6. The MFJ *Grandmaster Memory Keyer* can retain four discrete messages, which can be recalled as desired, or the memories can be combined for transmitting longer messages. The memories can be instantly reprogrammed and the unit is also a high-quality iambic keyer.

Fig. 6-7. The MF *RF Noise Bridge* can be used for checking numerous antenna parameters, tuning matching networks, setting plate coil taps and much more. DXers interested in getting top performance from their rigs will surely find this item a station necessity rather than an accessory.

(Fig. 6-8A) and the *Vomax* (Fig. 6-8B) have proven to be outstanding processors. The effect created by "switching in" a processor during an SSB transmission is similar to switching on a linear amplifier—it produces a substantial boost in "talk power".

All speech processors operate on the principle of increasing the average-to-peak ratio of voice characteristics. For example, a 1000-watt Peak Envelope Power signal would attain peak power (1000 watts) only occasionally—the *average* power would be closer to *250* to *350 watts*. A speech processor increases this average so it more closely approaches the peak level. High quality speech processors also *shape* or *filter* speech to avoid placing RF energy in power-robbing low frequencies.

The greatest problem with any speech processor is misadjustment by the user. An over-adjusted processor creates excessive distortion, *terrible sounding* audio and an irresponsible amount of splatter. Any amateur adjusting a speech processor should use an oscilloscope for initial adjustments and monitor his signal to assure a high quality transmitted signal. A poor quality signal *isn't* a DX catcher—so *watch that mike gain!*

Amateurs using speech processors should also be certain that their equipment is capable of handling the additional duty cycle demands. Plate current meters will read higher and final amplifier tubes will run hotter. Weak power transformers may also "buckle" under the new load imposed by the processor. Realizing this, the

DXer can logically conclude that speech processors should only be used *as needed* rather than being left active all the time. Think of it as an "afterburner" which may occasionally be "kicked in" for a brief boost of energy, and you'll realize best results both from your equipment and on the air.

THE AUTEK RESEARCH QF1A FILTER

The active DXer will realize many benefits from using a high-quality audio filter between his receiver and headphones or speaker. Interference ranging from low-pitched hums or growls to ear-shattering high frequency hetrodynes can either be substantially attenuated or *totally eliminated*, while the desired signal can be peaked for maximum strength within a second's time. Bandpass audio filters are also quite useful for reducing mild AC power line hum and atmospheric noises. In fact, a good audio filter can narrow received bandwidths to the point that previously-uncopyable signals will be easily copied.

If you think those weak signals are not necessarily worth going after since your signal would likewise be too weak for them to copy you—you're probably wrong! Those weak signals merely indicate low power at the "other end", and there's probably a genuinely-enthused amateur diligently searching for a contact over there. He will probably be delighted to contact you, and you may receive his QSL long before the "higher power boys" get around to mailing a card.

In recent years, there has been a significant increase in the use of audio filters, even with such technological advances as passband tuning and continuously-variable IF bandwidths. The reason is simple: an audio filter provides additional flexibility. When used in conjunction with IF filters, it provides the *ultimate communication ability* that today's operators expect. IF filters cannot efficiently operate at bandwidths of 20 to 80 Hz or employ 70 dB notch filters tunable over the audio range—audio filters perform this function quite easily.

One of the most outstanding audio filters presently available is the model *QF1A*, produced by *Autek Research, Box 5127T, Sherman Oaks, California, 91403* (Fig. 6-9). This filter will do almost anything except "create" DX signals on the band for one to work!

The *QF1A* features four distinct modes of operation: *peak, notch, low pass* and *high pass*. It also has a second *notch* filter, continuously tunable from 80 Hz to 11 kHz *independently* of the

Fig. 6-8. Speech compressors have for several years been considered the DXers special "trump card" for contest and pileup operating. When properly adjusted, a speech compressor can add up to 8 dB of talk-power to SSB transmissions.

other filter functions. The unit's *peak* function varies the received bandwidth from "flat" (response set by the IF of the receiver) to approximately 20 Hz, and a control on its front panel selects the center frequency of this response curve. The notch function width and frequency is also front-panel controlled and the depth of the notch is 70 dB. The low-pass function adjusts audio frequency roll-off anywhere between 250 Hz and 2500 Hz to eliminate interference as band conditions dictate. This function is quite useful for eliminating high-frequency squeals and static from the desired signals. The high-pass function rejects low-frequency tones, beats or hum, while adding a very pleasing "presence" to almost every SSB signal—and is also very effective for suppressing frequencies below 1200 Hz when operating Slow Scan TV.

The *QF1A* is AC powered and produces over 1 watt of audio output. Installing the *QF1A* is as simple as unplugging the station speaker, plugging it into the *QF1A* and then plugging the *QF1A* into the receiver.

THE SKYTEK ACOUSTIC SPEAKER

A recently-introduced item appealing to many CW DXers is the narrow-band resonant speaker system (Fig. 6-10) manufactured by *Skytek Company,* Box 535, Talmage, California 95481. It is a PM speaker mounted in an acoustic chamber resonator to provide "single frequency selectivity" at one point in the audio spectrum, and the chamber's resonant frequency can be varied from approximately *600* to *750* Hz by varying the length of a tuning sleeve. The *Skytek* speaker provides an approximate 20 dB *boost* for the desired signal while signals approximately *150 Hz away* from that frequency are *not* boosted in strength. There is a switch on the unit's front for by-passing it during SSB operation, and the complete unit is small enough to be placed almost anywhere on the operating desk.

The *Skytek* speaker is *extremely* beneficial when used with transceivers not having narrowband CW filters—producing similar results without the accompanying "ringing". Since the *Skytek* speaker filters directly at room level, all delays and "ringing" are eliminated. Transceivers employing CW filters also benefit by using the Skytek speaker, as it provides a very sharply-tuned resonance point within the receiver's narrowed bandpass.

The author's Skytek unit has proven an outstanding performer. It is placed approximately 3 feet from the operating chair in order to take full advantage of its filtering action, and the tuning sleeve is occasionally adjusted for a "change of pace" in received note. When used in conjunction with a Yaesu FT901DM transceiver, the speaker's performance is identical to the 901's audio peak filter without the "ringing". When S-7 line noises are

Fig. 6-9. The *Autek QF1A Audio Filter* is an outstanding DX aid which must be tried to be appreciated. Its ability to extract a desired signal from vast levels of interference is, indeed, superb.

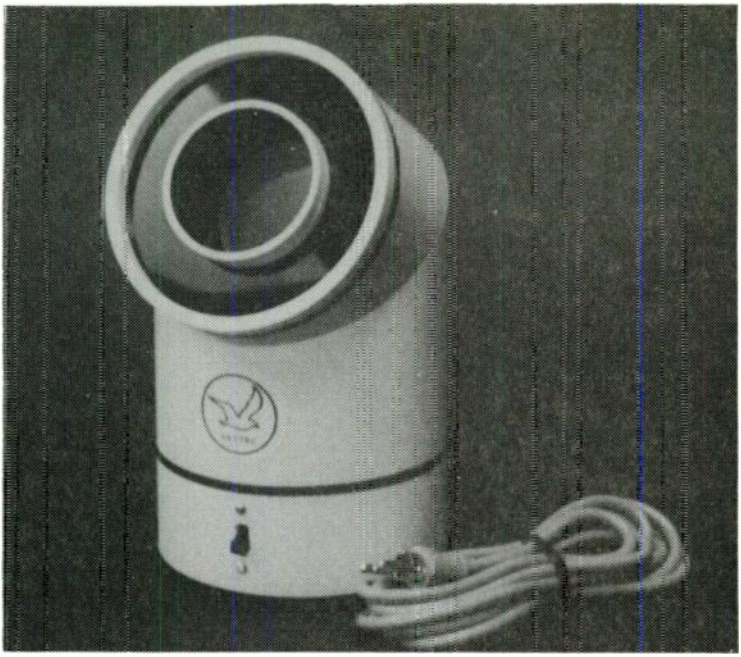


Fig. 6-10. The tunable *Skytek Acoustic Speaker* is an attractive and functional item of benefit to all avid CW DXers. Its compact size, coupled with its angle of sound projection are so "inspiring" they almost send one scurrying for his favorite CW paddle and keyer.

occasionally indicated on the 901's S-meter, the Skytek speaker reduces the "hash" to an unnoticeable level. That function in itself should appeal to many amateurs.

A 100 Hz shift of the transceiver's digital dial is more than enough to remove signals from the speaker's bandpass. When first connecting the Skytek speaker to the FT901DM, the transceiver's CW sidetone (which was usually shack-filling volume) could barely be heard. A quick adjustment of the sidetone level allowed it to "bulldoze" through the Skytek; then when a regular speaker was exchanged, the sidetone was extremely loud! Obviously, the Skytek unit was filtering that slightly off-frequency tone extremely well. If you desire a convenient, small and inexpensive CW aid, the Skytek acoustic speaker should fill your needs very well.

Chapter 7
DXpeditioning

If there's a single word which creates a surge of excitement and interest among practically all amateurs, that word is *DXpedition.* The activity and enthusiasm created on an amateur band by a well-engineered DXpedition is, indeed, a phenomenon to behold. Stations pile up hundreds deep in an attempt to exchange one brief communication with the DXpedition station—usually resulting in a new country contacted.

The DXpeditioning amateurs are usually sharp operators who have their "act together." Consequently, the greater percentage of stations piling-up over a DXpedition usually make a contact and receive a QSL card provided their operating techniques are reasonably efficient. There are two sides to any DXpedition situation: the ***hunter*** and the ***hunted.*** This chapter will be particularly devoted to the latter. See Figs. 7-1 and 7-2.

It seems that at least once in every DXer's life the "call of the wild" has a resounding impact, and the urge to actually *be DX* strikes. The amateur visualizes operating from some exotic island or remote country, passing out contacts to the worlds amateurs waiting at his fingertips, and earning a number of highly-sought DX awards for his endeavors. He studies maps and country lists, reviews contest rules time and time again; and consults other DXers, DX advisory committees, and licensing authorities. Slowly, the DXpedition begins to take shape. Finally, an expedition (which may or may not resemble the original "dream operation") is

undertaken and the amateur actually has that unique experience of being on the "other end" of a pileup. Once usually is not enough! After returning home, the DXer may soon start getting that far-off look in his eye once again and begin planning another *bigger* and *better* expedition.

There are two basic types of DXpeditions: The full-blown, serious, "all-out gusto" expeditions and the casual (yet worthwhile and enjoyable) expedition/vacation. The Colvins' *YASME* expeditions, Gus Browning's world tour operations, the *Clipperton* expedition and the *Spratly Island* expedition are typical examples of *serious* DXpeditions. The *ZF2CN* expedition/vacation of WB4AXN, WA4SBA and N4ZS (plus their XYLs) is typical of the *casual expedition.*

Since the DXer is aware that an expedition is an expensive and difficult endeavor which may never be repeated he will want to insure everything will go smoothly. Obviously, he doesn't want to travel a substantial distance and plan operations during a major DX contest only to find his rig has developed problems which can't be quickly corrected in the field. Nor does he want to let his gear out of his sight for fear it may become lost or entangled in customs. "Fine," you say, "but how can anyone predict *if* and *when* their rig might develop problems, or how can one assure that they will not become separated from their gear?" The odds of such unfortunate circumstances can be reduced to a *minimum* through careful planning, common-sense and the traditional amateur's ability to improvise as necessary. Would you purchase a new car and immediately put it on a long trip before checking it out around

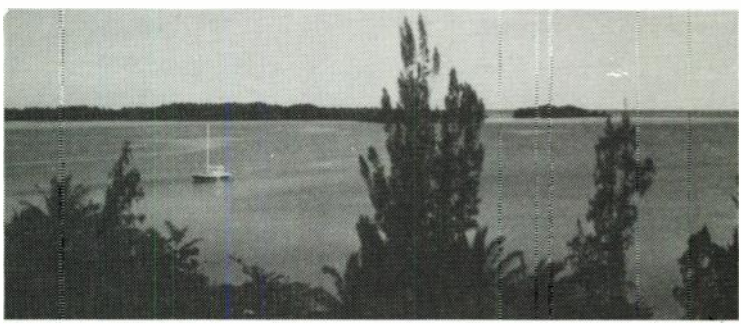


Fig. 7-1. DXpeditions are the once-in-a-lifetime opportunities of which all DXers dream. The chance of traveling to distant lands and operating in an "all out" effort are an unequalled thrill. Shown here is the sailboat "Venture" approaching Palmyra Island in the North Pacific Ocean. This expedition encompassing 2000 miles was conducted by K4SMX, N9MM, K6NA and WB9KTA.

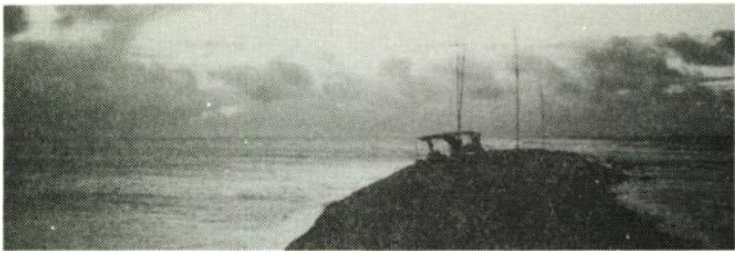


Fig. 7-2. The KP6BD Kingman Reef Expedition in action. Approximately 11,000 QSO's were made in three days from this location in the North Pacific Ocean. Operators included K4SMX, N9MM, K6NA and WB9KTA.

town? Of course not—and by the same token, a "tried and proven" rig is far more desirable than an unfamiliar new rig *unless* a *backup station* is also carried. Few people begin a long car trip without a spare tire or basic items like fan belts and repair tools—likewise spare parts for the rig, extra fuses, a volt-ohm meter and a variable voltage transformer should be a natural part of the DXpeditioner's paraphernalia. The most reliable way to assure that the DXpeditioner doesn't become separated from his rig is quite simply to *hand-carry* compact equipment in flight bags *at all times*.

PLANNING THE DXPEDITION

There are a number of *basic* considerations associated with every DXpedition. Where to go? What is the general situation in that area: its licensing requirements, power availability, travel requirements—and what type of equipment is best suited for the expedition? As these questions are being answered the "first time" DXpeditioner can give himself a *preview* of operating at the receiving end of a pileup by setting up a mobile or portable rig in a rare *county* close to his own city or in his own state. The *International County Hunter's Net* operates on the upper end of 20 Meters; its activities are documented nearly every month in *CQ Magazine*. If a county expeditioner alerts this group, he will find a number of eager and enthusiastic county hunters ready to pounce on his expedition signals. When activity at the first location wanes, the expeditioner can move to another county and start the pileup again—provided his operating ability allowed him to effectively handle the previous pileup and produce a creditable number of QSO's. Within a few days after the county expedition, QSL cards will begin rolling-in and the expeditioner will also get an idea of that end of the operation.

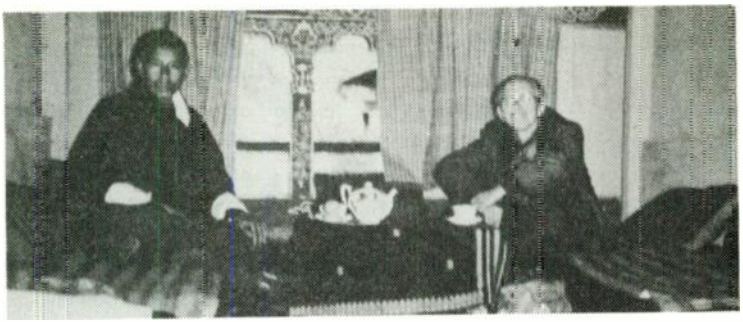


Fig. 7-3. Gus Browning and the High Lama of Bhutan enjoy exchanging ideas in the royal palace during a respite from Gus' amateur operations in that exotic country.

The first consideration of a DXpedition—the area to be visited—depends on a number of variables. If the expedition is to be combined with a vacation trip, the location may already be established. In this case, the casual DXpedition may necessarily be restricted to minimal on-the-air activity. This *should not* preclude laying *foolproof* plans in the same way as does the serious DXpedition. A license for amateur radio operation from the desired area must be obtained (the *American Radio Relay League* has often proved to be quite helpful in supplying information on foreign licensing). The majority of casual DXpeditions usually embark to popular nearby countries such as the Caymens, Jamaica or Bermuda, where there are few problems with licensing, customs or power sources. Knowing a few amateurs in the area to be visited can prove an invaluable asset should unforeseen problems arise as well as simply for getting prepared to operate from that area. There are a number of times when travel bureaus also prove helpful in making expedition plans—particularly when questions of transportation, customs and lodgings are involved. Remember to secure accurate information concerning baggage-weight restrictions and limitations on carry-on baggage (remember, this carry-on baggage will be your *ham equipment*). Think of potential problems from the "Murphy's Law" standpoint, and *be prepared for problems* and ready to pull a solution from your "Pandora's box" of tricks when and if it is needed.

Next, work on the *publicity aspect* of your jaunt. Notify the DX editors of magazines (both domestic and foreign) and DX bulletins of your plans. Be as exact as possible—this will ensure that an awaiting group of contact-hungry DX stations will be listening in the DX portion of a specific band for your activity.

Before embarking on the DXpedition proper, a "mock-up" enactment of the journey can be previewed in the traveler's home. This might involve *carrying* the packed-up equipment several blocks to iron out weight distribution problems, *repairing* similar gear for technical familiarity and trying split-sleeping to evaluate your physical reaction. The knowledge acquired from this mock-up experience, along with an ample amount of careful planning, should help assure the success of the actual DXpedition.

Serious, full-blown DXpeditions require even more effort and planning. Licenses or at least information concerning the procurement of licenses for each stop along the way, must be secured. Immunity shots may be required before crossing continental boundaries and it's highly beneficial to talk with amateurs near the possible ports of call scheduled for the DXpedition. Finally, the magazines can be notified and the expedition is practically underway—provided the financial problems are not overwhelming! There are a vast number of considerations associated with large expeditions consequently, the serious expeditioner is *urged* to contact DX groups and veteran DXpeditioners for additional insights.

The selection of amateur equipment carried on either a casual or a serious DXpedition is vitally important—perhaps more important than the expeditioners' operating ability itself. This is because, quite simply, without *operational* equipment there is no operation! The DXpeditioning amateur should use and study his equipment thoroughly *before* the expedition to assure that he can

Fig. 7-4. The group of Paul McClain, N4ZS (left); Richard Broughton, WA4SBA (beard); Louis Schubert, K4NYK; and Tim Pearson, WB4AXN(right) and XYL's at the beginning of their vacation/DXpedition to the Cayman Islands. A number of contacts were made during this jaunt, but the prime objective was fun and relaxation.

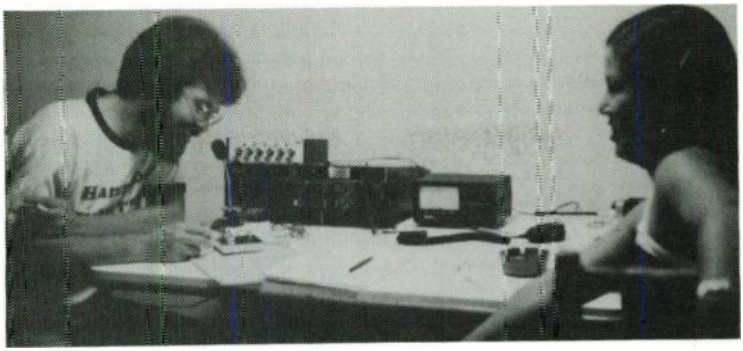


Fig. 7-5. Richard Broughton, WA4SBA, operating 20 Meters from the motel room in the Caymans. Readily available commercial power, coupled with air conditioned rooms and comfortable accommodations made this venture as enjoyable as operating from a home QTH.

make fast, reliable repairs in the field. Newly-introduced equipment, which may still suffer from "bugs" or the unavailability of certain parts, should be avoided whenever possible. Likewise, rigs using a large number of *non-interchangeable* or *unusual* parts in stages critical to all modes of operation should be avoided.

Transceivers, because of their compact size, are the overwhelming choice among today's DXpeditioners. A *tube*-type transceiver with common circuitry can usually be repaired and parts can be located in a minimum amount of time while special semiconductor devices or high frequency RF transistors may *not be available* in remote areas of the world. Also, a transceiver using dual final tubes can *usually* be operated at reduced rating when one tube dies. When a single high-power RF transistor is destroyed and is unavailable, it will render a transceiver useless. Keep your equipment in good operating condition—hams the world over are depending on you!

DXPEDITION OPERATING

The wide variety of opinions concerning DXpedition operating tactics may best be summarized by Abe Lincoln's famed words "You can please *some* of the people *all* the time, but you can't please *all* of the people *all* of the time." If you give DXpedition operations your "best shot", you should have few problems and should emerge successful—consequently acquiring the title of a *true DXer* from both sides of the pileups.

The DXpedition operator should strive to be *fair*, *accurate*, and *polite* in his operations. If you are working stations "up-10", but

occasionally returning to calls *on* or *near* your *own* transmitting frequency, you're asking for problems—and for *deliberate* QRM. If you stand by for a particular station or stations in a *specific* call district but return to that super strong *out-of-sequence* caller, you're practically assuring that the situation will mushroom into an incoherent mass of screaming DXers within two or three minutes. Remember that *you* are in charge of the pileup, and the gang must conform to *your* established procedures. If you snap off contacts, returning to the next caller while the pileup continues, they'll quickly learn to cut short their yelling and listen for your reply. *Stand your ground* and *announce your intentions* in a polite manner (but don't threaten to sign off the air unless the number of callers decreases). Try pulling a number of calls from the pileup and return to them in rapid-fire sequence while also announcing your intentions to reply to *short* calls. Remember that most of the stations can copy you through pileup QRM, and everyone will know who made the last contact if you announce *their call* at the *end* of your transmission. I, personally, would become *infuriated* if a contact asked for *my call* after getting through a pileup. If he didn't know who he was calling, I would conduct a "soapbox serenade" before telling him—then I would shift to a new operating frequency or procedure to help separate the *real DXers* from the "knob twiddlers" and "muscle flexers".

The DXpedition operator should remember to provide *ample time* for *foreign* QSO's. If U.S. callers will not permit this consideration on your part, move into the foreign sub-bands and break often to assure that you're dodging interference. The DX stations will appreciate your consideration and you'll build a creditable country tally. If your DXpedition area is reasonably "rare" and you operate efficiently, you *should* thus have few problems in making a 5-Band DXCC, WAZ, or other award.

Although the techniques are the same for DXpedition operations on all the amateur bands from 160 to 10 Meters, the DXpeditioner is well advised to spend the *majority* of his operating time on the 20 Meter band. Finally, be courteous and QSL all *valid* contacts without showing favoritism or "playing games". DX QSLs are sought after with the same sincerity as DX QSO's—if you can't handle that task yourself, solicit help or make arrangements for a QSL manager.

The DXpeditioner should strive to project an image of international goodwill and friendship in the areas he visits. If this necessitates sacrificing two, three or four hours of operating

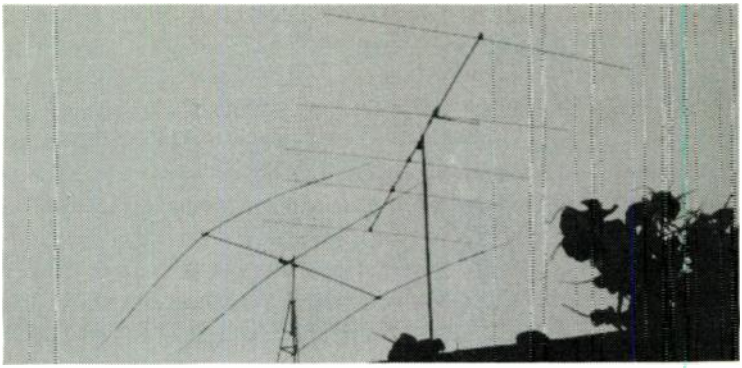


Fig. 7-6. Antennas for the Cayman vacation/DXpedition were held aloft by a small tripod and a borrowed stepladder. Rotation was accomplished manually. Fortunately, the motel landlord was quite receptive to amateur radio operations.

time—so be it! Amateur radio is a door to world friendship and closer understanding between nations. Each of us should strive to keep that door open! DXpeditioning thus becomes far more than merely "tunnel vision" operating from remote areas: it becomes amateur radio *public relations* on an *international* basis.

THE TRAVELS OF GUS BROWNING, W4BPD

During the 1960's Gus Browning, W4BPD conducted an extensive DXpedition to a number of remote and highly sought areas. The expedition's sponsor was the *World Radio Propagation Study Association*—a combination professional and amateur group led by the late E. C. Atkerson, W4ECI. Since "Ack" himself was an old-time DXer and owner of an electronic parts and equipment business, he could keep in touch with Gus during his DXpedition travels and supply equipment and parts as necessary to ensure the continuing success of that approximately nine-year-long jaunt.

Gus himself was a radio-TV shop owner with a good electronics background and an unsurpassed devotion to Amateur Radio (and DXing in particular). Gus and "Ack" made an ideal team—and DXers throughout the world became true "Gus Watchers" for several years. The massive *WRPSA* operation cost over $170 thousand (a similar operation today would cost over *twice* that much), and Gus squeezed each dollar for maximum return. He traveled inexpensively whenever possible, ate lightly and operated almost to the point of exhaustion. The *Collins* equipment received almost as much abuse as Gus. There were times when the

gear was accidentally dropped in the ocean, dried on the hot sands of beaches and continued to operate. The gear was carried atop overland buses and mercilessly vibrated until every tube was shaken from its socket. The tubes were reinserted, broken ones cleaned from the gear, and Gus continued his operations. I recall at one time Gus mentioning huge roaches crawling through his equipment (and on his arms) as he dished out contact after contact from the other side of the world. Those were, indeed, "golden days" of DXing—such devotion is seldom seen today! When I recently queried Gus concerning positive and negative aspects of his many operations he made some truly fascinating comments.

"Although time has faded some memories of the travels, other aspects will always remain vividly intact. I remember sitting at a folding card table on Geyser Reef with my feet in a foot of water and sharks circling the reef, while dishing out thousands of QSO's to hams the world over. As I became cold and wet during the night, many of the fellows asked if I was having fun on the expedition...A live leopard stared in the tent flaps as I handed out contacts from the Himilayan Mountains while traveling to Tibet. That was scary (fun, huh!)....The 132° heat in South Yeman was so intense, my eyes fogged and I couldn't see the rig's dial. Every thirty minutes I would run down and jump in the Red Sea (115°) to cool off, then return to the rig...I'll never forget sitting on freezing cold Bouvet Island in over six feet of snow and ice, wondering if I was having as much fun as the Gus-Watchers back home...Then, too, I remember sitting on Desroches Island with a broken crankshaft in the *only* power plant—and the next boat 20 days away. That was heartbreaking.

"Concerning the more pleasant side, I remember the excitement of the first ever QSO's from spots like Aldabra Island and Bouvet Island...QSO's from Timbucktu, the Palace of the Maharaja in Gangtok, Sikkim and much, much more. I plan to describe the full story in upcoming issues of my *DXers Bulletin*. That may take a couple of years to complete. Considering the many inconveniences I've faced a hundred times—each time saying I wouldn't do it again—I would leave tomorrow for another DXpedition if the funds were on hand. The sooner the better!"

Gus Browning has operated under *170* different call signs; he has visited *168* different countries and has a total of over *600,000 QSO's* from DXpedition spots. He made approximately *30,000 QSO's* from Bhutan; *20,000 QSO's* from Tibet; *25,000 QSO's* from the Seychelles; *23,000 QSO's* from Aldabra and *20,000 QSO's* from

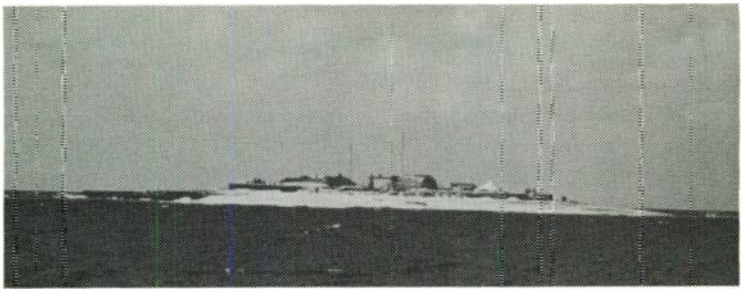


Fig. 7-7. Amboyna Cay, Spratly Island, where IS1DX DXpeditioners aboard the vessel "Banyanda" were warned away by gunfire during their 1979 expedition. Occupants of this particular Cay remain unknown.

Kamaran Island. He is, obviously, a supreme DXer and a DXpeditioner with a hearty soul. See Fig. 7-3.

THE ZF2CN DXPEDITION/VACATION

An increasing number of radio amateurs are including DX operations in their out-of-country vacation.

During the early part of 1979, four amateurs—Tim Pearson, WB4AXN; Paul McClain, N4ZS; Richard Broughton, WA4SBA and Louis Shubert, K4NYK—decided to vacation on one of the island countries near the Florida Peninsula. They considered the Bahamas, the Caymans and the British Virgin Islands, and Tim Pearson's inquiry to the *American Radio Relay League* concerning licensing and operating considerations was answered with the information and necessary paperwork. The Caymans were deemed most feasible from the standpoint of licensing, pleasure and DX appeal.

Within a month, Cayman call signs were received and motel reservations were secured. Since the Caymans are "near home" in the Carribean, innoculations were not required. A quick check with customs and airport officials also confirmed "clear passage" for ham equipment carried on the trip. See Figs. 7-4 and 7-5.

Each member of the group carried his personal rig, or equipment to be shared by the group. Commercial airlines were the group's transportation from the U.S. to Miami, and from Miami to the Caymans. The antennas (and clothes) were handled as baggage on the plane while "carry-on" luggage consisted of the high frequency transceivers. The legalities in Miami went exactly as planned—the equipment was "declared" as Japanese-

manufactured radio equipment, and the group continued on their way. Arrival in the Caymans was straightforward; an auto (and motorcycle, which was used for pleasure riding during tropical downpours!) was rented and the group settled into Spanish Bay Villa on the coast. A Hy Gain THS-Jr. and a 6 meter beam were erected using a borrowed stepladder and a tripod support as shown in Fig. 7-6.

Since this island visit was basically a pleasure jaunt, the gang then set about exploring the area, enjoying the scenery and half-drowning in the ocean while avoiding jelly fish. During slack periods of the days and nights(?), the amateur rigs were activated and a reasonable number of Cayman QSO's were passed out to those who endured the pileup. Finally, the group's time was up and they flew back to the states. Each person had an enjoyable time. The vacation was successful and a creditable number of amateur contacts were achieved. Although the contact count and amateur activity were much lower than that of a "serious DXpedition"....it provided great insight into future DXpeditioning possibilities for those involved.

SPRATLY ISLAND REVIEW

The largest percentage of *serious, limited-time* DXpeditions are planned and accomplished along similar lines: a small group of DXers begins formulating ideas and plans, and slowly a working concept for a DXpedition evolves. One or two veteran DXpeditioners are usually part of this group, and their experience proves valuable. Yet, with apparent odds in their favor, the DXpedition group often experiences some unusual and unplanned problems.

The Spratly Island group consists of small land masses, cays, and reefs located in the South China Sea approximately 250 miles off the coast of Borneo. Until 1979, it had been activated only twice by other brief DXpeditions. The most recent previous DXpedition had been able to work just 48 stations east of the Mississippi due to poor propagation. The group that came together for this 1979 expedition consisted of Stu Woodward, K4SMX (ex-KP6AL and KP6BD); John Ackley, KP2A (ex-DP4AM/Deseschеo); Harry Mead, VK2BJL (ex-VK9ZR); Bill Poellmitiz, K1MM (ex-CEØ ZM); Austin Regal, N4WW (ex-CEØZM) and Bob Schenck, N200. Following a vast amount of coordination and planning, the group met at the Brunei International Airport and began getting activities underway.

Fig. 7-8. The IS1DX group pose for a brief photograph before leaving Barque Canada Reef and heading for home and safety. Operators were (left to right) Stew Woodward, K4SMX, Bill Poelimitz, K1MM; and Harry Mead, VK2BJL. The expedition vessel, "Banyanda" can be seen slightly beyond the Reef's rocky shore.

Their first problem was having their gear impounded by customs until clearance could be obtained, and licenses for amateur gear and operations in Brunei—a British protectorate —were secured. Local amateurs VS5DX, VS5MS and VS5TX were able to offer assistance with many problems. Finding it necessary to spend 72 hours in Brunei waiting for a delayed air shipment of gear the group passed-out many VS5 contacts while informing awaiting amateurs of their progress.

During the three days the previously-chartered vessel "Banyandah"—captained by Jack Binder, TI9JB—was stocked with the amateur gear, generators and antennas, and the journey to Amboyna Cay in the Spratly Islands began to get underway. Very little information concerning Amboyna Cay was available, but the word was that it was vacant. The group also learned from captain Binder that only the previous week a yacht similar in size to the "Banyandah," traveling the waters north of Brunei, had been attacked by *pirates*—the skipper's wife had been shot and the yacht had been stripped clean. Obviously, one couldn't afford to take any chances when traveling these waters.

The DXpedition aboard, "Banyandah" soon approached Amboyna Cay, the largest (supposedly vacant) land mass near Spratly (which was occupied by the Vietnamese). As the ship neared the

Cay, what originally appeared to be rocky formations turned out to be *buildings*. Through binoculars someone *on the cay* could be seen signaling with semaphore flags—which unfortunately no one on board could understand. With a couple of minutes, *cannon shots* were fired and the group dived for cover while throwing the vessel's engines to full throttle and heading back toward Brunei. There were over 100 gallons of generator gasoline on deck, and a cannon hit would surely have proven fatal. See Fig. 7-7.

Once back in Brunei, the group reactivated VS5 using a variety of call signs and began to study alternate islands or cays; each studied for its merit, accessibility and military occupation. A day later, K4SMX, K1MM and VK2BJL decided to go "all out" on a final try and at least activate Spratly for whatever time was possible.

Again, the "Banyandah" left Brunei and moved past such exotic ports of call as Mariaveles Reef, Allison Reef, and on toward Spratly's Pearson Reef, their chosen operating spot. As the group approached the Reef—was only 3 feet high—two objects appearing to be wrecks as well as buildings were spotted. Then, one of the "wrecks" (bearing no flags or marks) began charging at "Banyandah" on an interception course. The group, being in a sailboat, had no choice but to stand their ground, and hope they would not be boarded, while Stew, K4SMX; manned the amateur gear giving a running account of the situation. Tension was extreme as amateurs in Guam, Hong Kong, and Brunei anxiously followed the next few minutes' fate, ready to pass the word around the world. At the last moment, the unidentified vessel abruptly changed course and quickly disappeared around the cay's far side.

The situation was critical: unknown ships and unidentified inhabitants scattered throughout the area could possibly panic whenever amateur signals appeared on the air or even if antennas were spotted. Obviously the DXpedition would be facing unknown circumstances if it was captured by any of these groups.

A final cay of the Spratly group, Barque Canada Reef was then investigated, and found apparently uninhabited. The "Banyandah" dropped anchor off the rocky shore of Barque Canada, and amateur equipment was carried ashore in a dinghy. The enthusiastic DXers anxiously set up a couple of stations and began making contacts as 1S1DX—a call many amateurs proudly entered in their station logs. The stakes of this operation were high for both the DXpeditioners and the "Banyandah"—a continuous "lookout" was necessary and the group realized that at any time they might be

attacked or captured. Approximately six hours later, 1S1DX had passed out over *1200 contacts* on the 20 and 15-Meter bands. A 10-Meter beam was then erected and used for several hours while two of the operators caught a couple of hours sleep.

For the next three days the three remaining from the original group of six DXers battled the massive pileups. Approximately three days later gasoline supplies were almost depleted (as were the pileups!) and the 1S1DX logs boasted over *13,000 contacts.*

The law of averages was pressing the group's security (over 70 hours without a visit from neighbors of unknown intentions) and it was agreed to get out of the area while the "natives were quiet." One station was kept operational on 15 meters until everything else was moved back aboard the "Banyandah", then the final contact was made and that gear scrambled out to the ship. The group beat a hasty trek back to Brunei, then booked return flights before enjoying a brief farewell party in a nearby restaurant. A few days later all of the DXpeditioners were safely back home telling stories of their fantastic voyage. See Fig. 7-8.

Equipment used on the Spratly expedition included *FT-901DM transceivers* loaned by *Yaesu Electronics, Clipperton L* linear amplifiers loaned by *Dentron Corporation,* monoband beam antennas loaned by *Hy-Gain*, plus substantial financial assistance from the *Northern California DX Foundation.* The expedition was, generally speaking, quite successful—in addition to the 13,000 Spratly contacts, there were 15,000 Brunei contacts and 5,000 made from Hong Kong.

It is not known how much time will elapse before another group with enough "gusto" again gears up and faces the perils of reactivating the Spratly Islands. We can be assured, however, that whenever the supreme challenge of some exotic DXpedition lurks on the horizon, there's a group of amateurs somewhere in the world plotting and planning to meet the challenge.

Chapter 8
DXer's Notebook

This chapter presents a gallery of the most-often needed information in a convenient and easy to use form. Keep this book within arm's reach of the station's operating position and these references will be instantly available.

DX AWARDS

Since practically every DXer eventually acquires a lavish variety of exotic QSL cards, it's quite natural to employ these cards as credit toward the many available DX awards. The DX awards program is a logical "sideline" to this challenging and competitive aspect of amateur radio. One should remember, however, to maintain an open mind to avoid placing more emphasis on acquiring awards than actually operating for pleasure or for extending international goodwill. While there are presently over 150 DX awards available from amateur radio groups throughout the world, the most popularly sought and respected United States awards are the 5-Band *DX Century Club* plaque, the *DX Century Club* certificate (along with endorsements for over 100 countries), the *Worked All Zones* certificate, the *Worked Prefixes* award and the *CQ DX* award. Complete details on each of these awards follows. Our special thanks to the *American Radio Relay League* and the DX Editors of *CQ Magazine* for providing information included in this chapter.

ARRL DXCC LIST AND RULES

These rules are effective for different types of *DXCC* as outlined in Rule 1 below. Changes are announced under *DXCC Notes* in QST. See Appendix A for the DXCC country list current as of publication date.

1) The *DX Century Club Award,* with certificate and *DXCC* lapel pin, is available to *ARRL Members* in Canada, the U.S. and possessions and Puerto Rico—and *all amateurs* in the rest of the world. U.S. Novices are *exempt* from the ARRL membership requirement. There are five separate DXCC awards available:

(a) Mixed (general-type); contacts may be made using any mode since November 15, 1945. This DXCC is endorsable; see Rule 5.

(b) Phone; contacts must be made using radiotelephone since November 15, 1945. This DXCC is endorsable; see Rule 5.

(c) CW; contacts must be made using CW since January 1, 1975. This DXCC is endorsable; see Rule 5.

(d) RTTY; contacts must be made using radioteletype since November 15, 1945. This DXCC is *not* endorsable.

2) Confirmations must be submitted direct to ARRL Headquarters for all countries claimed. Claims for a total of *100 or more* countries must be included with first application.

3) The ARRL Countries List criteria (October 1972 *QST*, p. 131) will be used in determining what constitutes a "country."

4) Confirmations must be accompanied by a list of claimed countries and stations to aid in checking and for future reference.

5) With the exception of the 160-Meter and RTTY DXCCs, confirmations from additional countries may be submitted for further credits. For accredited totals between *100 and 220*, in groups that will, at least, bring the new total to a number divisible by *20*; for total accredited totals between *240 and 290*, in groups that will, at least, bring the new total to a number divisible by *10*; for total accredited countries *over 300*, in groups that will, at least, bring the new total to a number divisible by *5*. Endorsement stickers for affixing to certificates will be awarded as additional credits are granted. These stickers will be in exact multiples of 10, i.e. 110, 120, 130 between the 110 and 300 levels and in multiples of 5 above the 300 level.

Exception. Once per year, any DXCC participant having an accredited DXCC total of 250, or more, may make a submission without regard to the number of cards submitted.

6) All contacts must be made with amateur stations working in the

authorized amateur bands or with other stations licensed to work amateurs.

7) In cases of countries where amateurs are licensed in the normal manner, credit may be claimed only for stations using regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edict where amateur licenses were formerly issued in the normal manner.

8) All stations contacted must be "land stations". Contacts with ships, anchored or otherwise, and aircraft, cannot be counted.

9) All stations must be contacted from the same DXCC "country".

10) Contacts may be made over any period of years since *November 15, 1945*, for the *Mixed, Phone, 160-Meter* and *RTTY* DXCCs, and from *January 1, 1975*, for the *CW* DXCC, provided only that all contacts be made under the provisions of *Rule 9*, and by the same station licensee; contacts may have been under different call letters in the same area (or country), if the licensee for all *was the same.*

(You *may not* credit contacts toward one DXCC from several calls held *simultaneously*, however.)

11) Any altered or forged confirmation submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the *Awards Committee.* Any holder of the Century Club Award submitting forged or altered confirmations *must* forfeit his right to continued DXCC participation.

12) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics, an individual *may* be disqualified from the DXCC by action of the *ARRL Awards Committee.*

13) ARRL MEMBERSHIP IS REQUIRED of all DXCC applicants in Canada, the U.S. and possessions, and Puerto Rico. *Novices are exempt* from this requirement. All new DXCC applications *must* contain sufficient funds for safe return postage in the form of U.S. currency, check or money order. For DXCC endorsements and completions of new applications, sufficient funds for safe return postage are also required. A chart showing suggested sums for return postage is available on request from *ARRL Headquarters.*

14) ARRL MEMBERSHIP IS NOT REQUIRED of foreign applicants. Each new DXCC application *must* contain sufficient funds for

safe return postage. For DXCC endorsements and completions of new applications, sufficient funds for safe return postage are also required. A chart showing suggested sums for return postage is available on request from *ARRL Headquarters.*

15) Decisions of the *ARRL Awards Committee* regarding interpretation of the rules here printed or later amended shall be final.

16) Address all applications to ARRL, 225 Main Street, Newington, CT, U.S.A. 06111.

Countries List Critera. as shown in October 1972, QST:

Countries List Criteria. The ARRL Countries List is the result of some 34 years of progressive changes in DXing. The full list will *not necessarily* conform *completely* with these criteria since some of listings were set up and recognized from pre-World War II. While the general policy has remained the same, specific mileages and additional points have, over the past 13 years, been added to the criteria. The specific mileages in *Point 2 (a)* and *Point 3,* mentioned in the following, have been used in considerations made in *April, 1960,* and after. The specific mileage in *Point 2(b)* has been used in considerations made in *April, 1963,* and after. *Point 4* is an additional point *now being added* on recommendation of the DX Advisory Committee.

Any land area in the world, with the exception of such land that would come under *Point 4,* can be placed in one or more of the following categories. Where the area in question meets at least one of the points in the criteria it may be considered eligible as a separate entity, *i.e. a country,* for our Countries list.

1. Government/Administration: An area by reason of Government or a *distinctively separate* administration constitutes a separate entity.

2. Separation by water: An island, or a group of islands, *not having its own government* or *distinctively separate administration,* is considered as a separate entity under the following conditions:

(a) Islands situated off shore from their governing or administrative area must be geographically separated by a minimum of *225 miles* of *open water.* This point is concerned with islands off shore from the mainland *only.* This point *is not* concerned with islands which are part of an island group or are geographically located adjacent to an island group.

(b) Islands forming part of an island group or which are geographically located adjacent to an island, or island group, which

have a common government or administration, *will be* considered as separate entities provided there is *at least* 500 miles of open water separation between the two areas in question.

3. Separation by foreign land: In the case of a country, such as that covered by *Point 1,* which has a *common* government or administration but which is geographically separated by land which is foreign to that country, if there is a complete separation of the country in question by a *minimum* of *75 miles* of foreign land, the country is considered as two separate entities. This 75 miles of land is a requirement which is applicable to land areas *only*. In cases of areas made up of a chain of islands, there is no minimum requirement concerned with the separation by foreign lands.

4. Unadministered area: Any area which is *unadministered will not be eligible* for consideration as a separate entity.

5BXDCC (FIVE-BAND DXCC) RULES

The purpose of the *5BDXCC Award* is to encourage more uniform DX activity througout the amateur bands, encourage the development of more versatile antenna systems and equipment, and provide a challenge for old timers as well as newcomers to DXing. This award *does not* supersede the basic DXCC Award, but is in addition to it.

1. The 5BDXCC Award is available to all licensed amateurs, *except that in* Canada, the United States and possessions, and Puerto Rico, the Applicant must be a *full member* of ARRL.

2. DXCC *Rules 6,7,8,9,11,12,15 and 16,* shall apply to *5BDXCC;* DXCC *Rule 10,* with substitution of a date of *January 1, 1969,* shall also apply. Anyone disqualified from 5BDXCC under DXCC *Rule 11* shall automatically be disqualified from DXCC. Anyone disqualified from DXCC *is not eligible* for 5BDXCC.

3. The 5BDXCC Award will be issued after checking submission of a minimum of *500 different* confirmations representing two-way communications with *100 different "countries"* (per the ARRL Countries List in effect at the time of application—this means that deleted countries are not creditable) on each of *five* amateur radio bands. Phone and CW segments of the band *do not count* as separate bands for this award.

4. Confirmations showing contacts by any legal mode will be accepted. However, *no cross-band contacts* are acceptable, nor will endorsement for mode be given or indicated. Contacts using *repeaters* or *repeater satellites* are *not* acceptable.

5. Application for 5BDXCC will be accepted *only* if submitted completely on a standard form supplied by ARRL Headquarters. (A chart showing suggested return postages is available on request from ARRL Headquarters.) Each applicant achieving 5BDXCC will receive a personalized plaque commensurate with the difficulty and effort required to achieve this award.
6. *Only QSL card confirmations* will be accepted. No credits will be given for confirmations via DX contest or other logs.
7. Only confirmations showing a contact date of *January 1, 1969, or later* will be accepted for credit for this award.

Pictures of the 5BDXCC and 5BWAS Plaques are shown in Fig. 8-1.

THE CQ DX AWARD PROGRAM-RULES

Applications:

■ The *CQ CW DX Award* and *CQ SSB DX Award* are issued to any amateur station submitting proof of contact with 100 or more countries (See Rule 3) on c.w. or ssb. Applications should be submitted on the official CQ DX Award Application *CQ Form 1067B*.
■ All QSOs must be 2 Way SSB or 2 Way CW—cross mode or one way QSOs are *not* valid for the CQ DX Awards. QSLs must be listed in alphabetical order by prefix and all QSOs must be dated after *November 15, 1956*. Except for the mobile endorsement, all QSOs *must be made* from the *same* call area.
■ QSL cards must be verified by one of the authorized checkpoints for *CQ DX Awards*, or must be included with the application. *If cards are sent directly to the Award Manager, postage for their return by first class mail must be included.* If Certified or Registered mail return is desired, sufficient postage should be attached with the application.
■ Country endorsements for 150, 200, 250, 275, 300, 310, and 320 countries will be issued.
■ To promote multi-band usage and special operating skills, special endorsements are available as shown:

A. A *28 MHz. Band endorsement* for 100 or more countries confirmed on the 28 MHz. band.

B. A *3.5/7 MHz. band endorsement* for 100 or more countries confirmed using any combination of the 3.5 and 7 MHz. bands.

C. A *1.8 MHz. Band endorsement* for 50 or more countries confirmed on the 1.8 MHz. band.

D. A *QRPP Endorsement* for 50 or more countries confirmed using five watts input or less.

E. A *Mobile Endorsement* for 50 or more countries confirmed while operating mobile. There is no call area restriction.

F. A *SSTV Endorsement* (CQ SSB DX Award only) for 50 or more countries confirmed using 2 Way Slow Scan TV.

G. An *OSCAR Endorsement* for 50 countries confirmed via Amateur Satellite.

■ Any forged or altered confirmations will result in *permanent disqualification* of the applicant.

■ Fair play and good sportsmanship in operating are required for all amateurs working toward CQ DX Awards. Continued use of *poor ethics* will result in *disqualification* of the applicant.

■ A fee of $5.00 or the equivalent to defray the cost of the certificate and handling is required for each award. Please make checks payable to Billy Williams, N4UF-*CQ Awards Manager.* A $1.00 fee & SASE is required for each endorsement.

Country Status

■ The *ARRL DXCC Country list* constitutes the basis for *CQ DX* Award country status. Deleted countries WILL NOT be valid for the CQ DX Award. Once a country has lost its status as a current country, it will automatically be deleted from our records.

■ All contacts must be with licensed *land-based* amateur stations working in authorized amateur bands. Contacts with *ships* and *aircraft cannot* be counted.

■ Decisions of the *CQ DX Advisory Committee* on any matter pertaining to the administration of these awards shall be final.

CQDX Honor Roll

■ The *Honor Rolls* will list each station with a total of 275 countries or more. To remain on the *Honor Roll,* a stations country total must be updated annually.

■ Separate *Honor Rolls* shall be maintained for SSB and CW.

AS OF *JUNE 1, 1979* ALL APPLICATIONS MUST BE ACCOMPANIED BY A CERTIFICATE PROCESSING FEE OF $5.00.

THE ZONE AWARD PROGRAMS: REGULAR WAZ

The *WAZ* Award will be issued to any licensed amateur station presenting proof of contact with the forty zones of the

Fig. 8-1. The A.R.R.L. 5 Band DXCC plaque and its equivalent for overseas stations, the 5 Band WAS plaque. Full details on the 5 Band DXCC are included in text, and are available from the A.R.R.L.

world. This proof shall consist of proper QSL cards to be checked by the DX Editor or vertified at one of the authorized checkpoints for CQ DX Awards. Most of the major DX clubs of the USA and national amateur radio societies abroad can be authorized checkpoints if they clear in advance with K4IIF. If in doubt consult the *DX Editor.* Any legal type of emission may be used providing communication was established after *November 15, 1945.*

1. The official *CQ WAZ Zone Map* will be used in determining zone boundaries.

2. Confirmations *must* be accompanied by a list of claimed zones showing the call letters of the station QSOed and the mode. The list should also show the applicant's name, call letters, and complete mailing address clearly.

3. All contacts must be made with licensed land-based, amateur stations working in authorized amateur bands.

4. Any altered or forged confirmations will result in *permanent disqualification* of the applicant.

5. Continued use of poor operating ethics will result in *disqualification* of the applicant.

6. In addition to the conventional certificate for which any and all bands and modes may be used, specially endorsed and numbered certificates are available for phone and single sideband operation. The phone certificate requires that *all* contacts be *two-way phone* and the SSB certificate requires that *all* contacts be *two-way SSB.*

7. If, at the time of the original application, a note is made pertaining to the possibility of a subsequent application for an endorsement or special certificate, *only* the missing confirmations

required for that endorsement need be submitted with the later application.

8. Decisions of the *CQ DX Awards Advisory Committee* on any matter pertaining to the administration of this award shall be final.

9. All applications should be sent to: Leo Haijsman (W4KA), 1044 Southeast 43 Street, Cape Coral, Florida 33904.

10. Zone Maps and/or WAZ applications are available from the *DX Editor* or from *CQ* for a self-addressed stamped envelope or self-addressed envelope and one IRC.

The following list of zones is presented as a guide. Any questions will be decided by the zone map.

ZONE 1 *Northwestern Zone* of North America: KL7; VE8-*Yukon*; the VE8-*Northwest Territories, Districts of Makensie and Franklin;* and the islands west of 102° including *Victoria, Banks, Melville,* and *Prince Patrick.*

ZONE 2 *Northeastern Zone* of North America: VO2-*Labrador*; that portion of VE2-*Quebec* north of the 50th parallel, and a portion of the *Northwest Territories*-VE8 east of longitude 102°. The latter includes part of the *District of Franklin* and the islands of *King William, Prince of Wales, Somerset, Gathurst, Devon, Ellesmere, Baffin,* and the *Melville* and *Bootlia Peninsulas.*

ZONE 3 *Western Zone* of North America: VE7; W6 and the W7 states of *Arizona, Idaho, Nevada, Oregon, Utah,* and *Washington.*

ZONE 4 *Central Zone* of North America: VE3, VE4, VE5, VE6, the W7 states of *Montana* and *Wyoming.* WØ, W9, W8 (except W.Va.), W5, and the W4 states of *Alabama, Tennessee,* and *Kentucky.*

ZONE 5 *Eastern Zone* of North America: FP8, VE1, V01, that portion of VE2-*Quebec* south of the 50th parallel, VP9, W1, W2, W3, the W4 states of *Florida, Georgia, South Carolina, North Carolina,* and *Virginia*, and the W8 state of *West Virginia.*

ZONE 6 *Southern* Zone of North America: XE and XF.

ZONE 7 *Central American* Zone: FO8-*Clipperton,* HP, HR, KS4, KZ5, T1, T19, VP1, TG, YN, and YS.

ZONE 8 *West Indies* Zone: CM/CO, FG7, EM7, HH, HI, KG4, ITP4, VP2, VP5, VP7, 6A, KC4-*Navassa,* PJ7/FS7, PJ6, PJ8, and YVO-*Aves.*

ZONE 9 *Northern Zone* of *South America:* FY7, HK, PJ2, PJ3, PJ4, PZ, VP3/8R, VP4/9Y4, and YV.

ZONE 10 *Western Zone* of *South America:* CP, HC, HC8, and OA.

ZONE 11 *Central Zone* of *South America:* PY and ZP.

ZONE 12 *Southwest Zone* of *South America:* CE.

ZONE 13 *Southeast Zone* of *South America:* CW, LU, VP8, and all *Antarctic* prefixes.

ZONE 14 *Western Zone* of *Europe;* CT1, CT2, DJ/DL/DM, EA, EA6, EI, F, G/GB, GD, GI, GM, GW, HB, HL, LA, LX, ON, OY, OZ, PA/PI, PX, 3SM/SL, ZB2, and 3A2.

ZONE 15 *Central European* Zone: FC, HA, HV, I, IT, IS, OE, OH, OK, SP, UA2, UP, UQ, UR, YR, ZA, ZB1/9HI, 9A1.

ZONE 16 *Eastern Zone* of *Europe*: UA1, UA3, UA4, UA6, UA9/*Bashkir* and *Chkalov, UB5, UC2, UN1, and U05.*

ZONE 17 *Western Zone* of *Siberia*: UA9-*Sverdlovsk, Chelyabinski, Komi, Jurgan, Molotav, Omsk, Tyumen,* plus UH8, UI8, UL7, and UM8.

ZONE 18 *Central Siberian* Zone: UA9-*Novosibirsk, Tonsk, Kamerovo,* and *Altai;* UAØ-*Keasnoyarsk,* Irkutsk, Chita, Bruyate Mongolia, and Dickson Island.

ZONE 19 *Eastern Siberian* Zone: UAØ-*Khabarovsk, Amur, Yakutsk, Primorsky, Sakhalin Island, Wrangel Island,* and the *Soviet Kuriles.*

ZONE 20 *Balkan* Zone: JY, LZ, OD5, SV, TA, YK, YO, ZC4/5B4, and 4X4.

ZONE 21 *Southwestern Zone* of *Asia:* EP, HZ, MP4, 9K, VS9 (*except Maldives* and *Socotra),* YA, YI, 4WI, UD6, UF6, UG8, 4S7, VU (except *Andaman* and *Nicobar Islands),* 9N1, and S2 *Bangladesh.*

ZONE 22 *India, Nepal, Bangladesh, Sikkim, Bhutan, Sri Lanka, Maldive Islands, Loccadive Is.* and *South Asia*

ZONE 23 *Central Zone* of *Asia:* AC4, the BY provinces of *Tibet, Sinkiang, Kansu,* and *Hinghai,* JT1, and UAØ-*Tanna Tuva.*

ZONE 24 *Eastern Zone* of *Asia:* BY (*except* the provinces in *Zone 23),* BV, CR9, and VS6.

ZONE 25 *Japanese* Zone: HL/HM, JA/KA, and KR6.

ZONE 26 *Southeastern Zone* of *Asia:* HS, XV, XU, XW, XZ, 3W8, and VU2-*Andaman* and *Nicobar Islands.*

ZONE 27 *Philippine* Zone: DU, KC6, and KG6.

ZONE 28 *Indonesian* Zone: CRØ, VR4, VK9, (except *Nauru, Norfolk* Is, and *Christmas* Is), VS1, VS4, VS5, ZC5, 8F, and 9M.

ZONE 29 *Western Zone* of *Australia*: VK6, VK8, and VK9-*Christmas Is.*

ZONE 30 *Eastern Zone* of *Australia*: VK1, VK2, V3, VK4, VK5, VK7, and VKØ-*Macquarrie* Is.

ZONE 31 *Central Pacific* Zone: KB6, KH6, KJ6, KM6, KP6, KW6, KX6, C2-*Nauru,* VR1, VR3, and ZM7.

ZONE 32 *New Zealand* Zone: FK8, F08, *(except Clipperton)*, FU8/YJ, KS6, VK9-*Norfolk Is,* VR2/3DC, VR5, VR5/A3, VR6, ZK1, ZK2, ZL, and 5W1.
ZONE 33 *Northwestern Zone* of *Africa:* CN2, CN8, CT3, EA8, EA9, 3V8, and 7X.
ZONE 34 *Northeastern Zone* of *Africa:* ST, SU, and 5A.
ZONE 35 *Central Zone* of *Africa*: CR4, CR5-Guinea, EL, TU, TY, TZ, XT, ZD3, 5N2, 5U, 5V, 6W8, 9GM⅛ AND &L1.
ZONE 36 *Equatorial Zone* of *Africa:* CR5-*Sao Thome,* CR, EAØ, TJ, TL, TT, TN, TR, 9Q5, 9U5, 9J, ZD7, and ZD8.
ZONE 37 Eastern Zone of *Africa*: CR7, ET2, ET3, FL8, 6O1, 6O2, 5H3, 5X5, 5Z4, and 7Q7.
ZONE 38 *South African* Zone: ZD9, ZE, and ZS.
ZONE 39 *Madagascar* Zone: FB8, 5R8, FR7, VQ8, VQ9, and VKØ-*Heard Is.*
ZONE 40 *North Atlantic* Zone: LA-*Jan Mayen,* LA-*Svalbard,* OX, TF, and UA1-*Franz Joseph Land.*

The UA9 and UAØ Zones are sometimes rather hard to determine. However, the DX column of *CQ Magazine* August, 1968, issue, pg. 82 has a handy table to use in locating stations in these zones. The WAZ Award is shown in Fig. 8-2.

SINGLE BAND WAZ

Effective *January 1, 1973*, special WAZ awards have been issued to licensed amateur stations presenting proof of contact

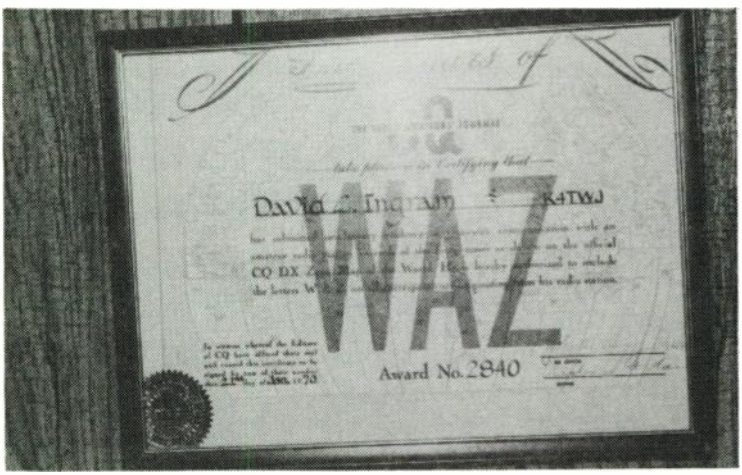


Fig. 8-2. The *CQ magazine WAZ* award which is available for a nominal fee and confirmation of contacts with all radio zones of the world.

with the 40 zones of the world on *one* of the 5 high frequency bands, 80-10 meters. Contacts for a single band WAZ award must be made after 0000 hours GMT, *January 1, 1973.* Proof of contact shall consist of proper QSL cards checked by the *DX Editor* or a member of the *CQ DX Award's Advisory Committee.* Single band certificates will be awarded for both two-way phone, including SSB and AM, and two-way CW.

The first two-way CW winner and first two-way phone winner on *each* of the five bands will receive a handsome plaque showing that he is number one for that band and mode. Subsequent winners will receive numbered certificates.

Amteurs competing for the plaques must have their cards checked by the *DX Editor,* P. O. Box 205, Winter Haven, FL 33880. It is suggested that the cards be sent by registered mail as the winner will be determined by the *earliest* postmark. The Single Band WAZ program is governed by the same rules and uses the same Zone boundaries as the regular WAZ program.

As of *March 1, 1976,* plaques have been awarded for 20 Meter CW, 20 meter phone, 15 meter CW, 15 meter phone and 80 meter phone. Plaques *not yet awarded* include 80 meter CW, 40 meter CW, 40 meter phone, 10 meter CW, and 10 meter phone.

THE PREFIX AWARD PROGRAMS: WPX

The *CQ WPX* Award recognizes the accomplishments of confirmed QSO with the many prefixes used by amateurs throughout the world. Separate distinctively marked certificates are available for 2xSSB, CW and Mixed Modes as well as the *VPX Award* for shortwave listeners and the *WPNX Award* for U.S.A. novice amateurs.

1. Applications:

A. All applications for WPX certificates (and endorsements) must be submitted on the official application form *CQ 1051A.* This form can be obtained by sending a self-addressed stamped envelope to the *Assistant DX Editor.* It is highly desirable to use business size envelopes, 8½ × 11 inches, for this purpose.

B. All QSO's must be made from the *same call area.*

C. All call letters must be in strict alphabetical order and the entire call letters must be shown.

D. All entries must be clearly legible.

E. Certificates are issued for the following modes and numbers of prefixes. Cross mode QSO's are not valid for the CW or 2×SSB certificates.

Mixed (Any Mode) — 400 Prefixes Confirmed
CW — 300 Prefixes Confirmed
2×SSB — 300 Prefixes Confirmed
Separate applications are required for each mode.

F. Cards *need not be sent* but must be in the *possession* of the applicant. Any and all cards may be requested by the *Assistant DX Editor* or the *CQDX Committee.*

G. The application fee for each certificate is $1.00 or eight (8) *International Reply Coupons* (IRC's).

H. All applications and endorsements should be sent to the *Assistant DX Editor.*

■ Endorsements:

A. *Prefix endorsements* are issued for each 50 additional prefixes submitted.

B. *Band endorsements* are available for working the following numbers of prefixes on the various bands: 1.8 MHz-35; 3.5 MHz-150; 7 MHz-250; 14 MHz-300; 21 MHz-300; 28 MHz-250.

C. *Continental endorsements* are given for working the following numbers of prefixes in the respective continents: North America - 126; South America-88; Europe-146; Africa-80; Asia-68; Oceania-51.

D. Endorsement applications must be submitted on *CQ Form 1051A.* Use *separate* applications for *each mode* and be sure to specify the mode of your endorsement application.

E. For Prefix endorsements list only *additional* call letters confirmed since the last endorsement application.

F. A self-addressed stamped envelope or self-addressed envelope with 1 IRC is required for endorsement stickers.

■ Prefixes:

A. The 2 or 3 letter/numeral combinations which forms the first part of any amateur call will be considered the prefix.

B. Any difference in the numbering, lettering or order of the same shall constitute a separate prefix. The following would be considered different: W2, WA2, WB2, WN2, WV2, K2 and KN.

C. *Any prefix* will be considered legitimate if its use was licensed or permitted by the governing authority in that country since *November 15, 1945.*

D. A *suffix* would designate portable operation in another country or call area and would count *only* if it is the *normal* prefix used in that area. For example, K4IIF/KP4 would count as *KP4.*

However, KP4XX/7 would *NOT* count as *KP7* since this is *not* a normal prefix. Suffixes such as /M, /MM, /AM, /A and /P are *not counted* as prefixes. (See also *rule 3E)*. An *exception* to this rule is granted for *portable* operation within the issued call area. Thus contacts with a special prefix such as WS2-JRA/2 counts for *WS2*, however, WS2JRA/3 would count for *W3*.

E. All calls *without numbers* willbe assigned an *arbitrary* Ø plus the first two letters to constitute a prefix. For example, RAEM counts as RAØ, AIR as AIØ, UPOL is UPØ. All portable suffixes that contain no numerals will be assigned an arbitrary Ø. For example, W4BPD/LX counts as LXØ and WA6QGW/PX counts as PXØ.

Verfied Prefixes Award

The *VPX* or *Verified Prefixes Award* can be earned by Short Wave Listeners (SWLs) who possess QSL cards confirming reception of at least 300 *different* amateur prefixes. No mode endorsements are available. Applications are submitted to the *Assistant DX Editor* in accordance with WPX rules.

WPNX

The *WPNX Award* can be earned by U.S.A. Novices who work 100 different prefixes *prior* to receiving a higher class license. The application *may* be submitted *after* receiving the higher license providing the actual contacts were made as a Novice. Prefixes worked for the *WPNX Award may* later be used for credit toward the *WPX Award.*

The rules for the *WPNX Award* are the same as for *WPX* except that only 100 prefixes must be confirmed, and applications are sent to the *Assistant DX Editor.*

WPX Honor Roll

■ WPX Honor Roll

The *WPX HONOR ROLL* recognized those operators and stations that maintain a high standing in confirmed, current prefixes. The rules, therefore, reflect the belief that Honor Roll membership should be accessible to *all active* radio amateurs and not to be unduly advantageous to the "old timers." With the exceptions listed below, all general rules for WPX apply toward *Honor Roll* credit.

A. Only *current* prefixes may be counted toward WPX HR standings; those prefixes to be listed and updated annually in CQ or available from the *Assistant DX Editor.*

B. Special issue prefixes, i.e., 3C, 4A, OF, etc. will be considered current *during their existence* and for *five years* after the date of last issuance after which time they will be *deducted* as credit for *Honor Roll* standings.

C. *Honor Roll* applicants must submit their list of current prefixes (entire call required) separate from their regular *WPX* applications. Forms are available for this purpose and their use is highly recommended. *WPX HR* applications may be obtained by sending a self-addressed stamped envelope (or 1 IRC) to the *Assistant DX Editor.* A *separate* application must be made for *each* mode.

D. A filing charge of $1.00 is required for *each original WPX Honor Roll* application.

E. Endorsements for the *Honor Roll* may be made for 10 prefixes or more. An SASE or IRC should be included.

DX BEAM HEADINGS

A relatively accurate list of countries and their beam headings from one's location is highly beneficial for DXing activities. If these headings are placed under glass on the station desk, the operator can begin swinging his beam the instant a distant prefix is heard. This 3 or 4 second "jump" often permits one (or maybe two) rapid and successful DX contacts before the "wolfpack" descends onto the remote located station.

While several computer-processed beam heading services presently cater to DXers, few amateurs possess such highly directional arrays requiring aiming accuracies better than 5 or 10 degrees. Three or four-element arrays, for example, produce relatively broad cardiod patterns which may be "off target" over *10 degrees* without causing variations in transmitted or received signal strengths. Consequently, "general location" beam heading charts are usually sufficient for aiming all but the most elaborate amateur antennas. A condensed list of approximate beam headings for various cities of the United States is found in Appendix B.

DX QSL BUREAUS

There are a number of "incoming" and "outgoing" QSL bureaus active in various countries around the world, and the DXer should find their services beneficial. Since some bureaus can "change hands" over a period of time, the listing in Appendix C stands a possibility of having a few errors. As a hedge against that possibility, this *QSL bureau* list consists primarily of established

"old standby" bureaus which we feel will continue their services for several years. Remember to add (and delete) bureaus according to the listings in monthly amateur magazines, and your QSL bureau list will be accurate and ready for instant use. You may also find QSL bureaus beneficial when the address of a specific amateur cannot be traced by conventional means.

WORLD TIME CONVERSIONS

Another often used operating reference which many amateurs place on the station desk is a world timetable similar to that shown in Table 8-1. In addition to providing quick correlation of times in various countries, the table can also be used to estimate signal propagation into distant lands or to estimate how long a particular DX station might operate before signing off. If, for example, an amateur in Chicago wants to communicate with Australia via 10 Meters, he should choose a time in which noon is approximately midway between the two locations. This may be found on the timetable of Table 8-1 by looking under Central Standard Time and Australia. The bottom line of this chart reveal that when it's 7:00 AM in Australia, it's 5:00 PM in Chicago – and noon is approximately midway between the locations. The timetable's top line indicates that 8:00 AM in Australia is 6:00 PM in Chicago. Obviously, the only Australia amateurs heard on 10 Meters after 6:00 PM Central Standard Time during weekdays are not working day jobs.

As another example, let's see if we can contact Ethiopia on 15 Meters at 8:00 PM Central Standard Time. Referring to the timetable we find Ethiopia, Central Standard Time, and the noon hour. Counting approximately 7 hours in each direction tells us its 5:00 AM in Ethiopia - 15 Meters hasn't opened, and should there be an Ethiopian amateur with insomnia, he will probably be operating 20 Meters. Continuing that calculation a step further, let's say Ethiopia is heard on 20 meters at 2:00 PM Central Standard Time. The timetable indicates it's 11:00 PM in Ethiopia, thus the foreign amateur may soon go to bed for the evening. When using the timetable of Table 8-1 for calculating band openings on 40, 80 or 160 meters, remember to cross the midnight hour rather than noon. This will thus indicate the vitally important "grey zone" used for low band (40, 80 and 160 meters) DXing.

INTERNATIONAL POSTAL RATES

There are more than a few times when the DXer realizes a need for listings of postal rates to various countries of the world. In addition to the usual reference for mailing letters directly to

Table 8-1. World time conversion table for determining when DX amateurs are prone to operate various amateur bands. The table's use is discussed in text.

Greenwich Mean Time England	Geneva and Central Europe	Greece, Capetown and East Europe	Ethiopia, Arabia	Iran, Reunion Island	India, Central Russia	Tibet	Laos, Thailand	Perth, Australia	Tokyo, Japan	Sydney, Australia	New Caladonia
0000	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM
0100	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon
0200	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM
0300	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM
0400	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM
0500	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM
0600	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM
0700	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM	6PM
0800	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM	6PM	7PM
0900	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM
1000	11AM	Noon	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM
1100	Noon	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM
1200	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM
1300	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night
1400	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM
1500	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM
1600	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM
1700	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM
1800	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM
1900	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM
2000	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM
2100	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM
2200	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM
2300	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM

International Date Line Fiji Islands	Noon	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM
Alaska	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon
Midway, Hawaii	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM
East Alaska	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM
Pacific Standard Time California	4PM	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM
Mountain Standard Time Arizona	5PM	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM
Central Standard Time Illinois	6PM	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM
Eastern Standard Time Washington, DC	7PM	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM	6PM
Atlantic Standard Time, Argentina	8PM	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM	6PM	7PM
Brazil, Greenland	9PM	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM
Azores	10PM	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Noon	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM
Canary Islands	11PM	Mid Night	1AM	2AM	3AM	4AM	5AM	6AM	7AM	8AM	9AM	10AM	11AM	Nocn	1PM	2PM	3PM	4PM	5PM	6PM	7PM	8PM	9PM	10PM

Table 8-2. Postal rates from the United States to various countries of the world.

Air Rates:

Mexico and Canada*	Central America, Colombia, Venezuela, Caribbean Islands, Bahamas, Bermuda, St. Pierre and Miquelon. Also from American Samoa to Western Samoa and from Guam to the Philippines	All Other Countries
$0.17 first ounce	$0.35 per HALF ounce through 2 ounces	$0.40 per HALF ounce through ounces
.15 each additional ounce or HALF or fraction	.30 each additional ounce or fraction	.35 each additional HALF ounce fraction

Aerogrammes, which can be folded into the form of an envelope and sent by air to all countries, are available at post offices for $0.30 each.

Post Cards

a. Limitations: Only single cards are acceptable in international mail. Reply paid cards and folded (double) cards are not accepted in international mail.

Maximum size	6 × 4¼ inches.
Minimum size to all countries	5½ × 3½ inches.

b. Rates:

	Surface	Air
Countries other than Canda and Mexico	19c each	28c each
Canada and Mexico*		10c each

*Letter class mail to Canada and Mexico receives first class service in the United States and airmail service in Canada and Mexico.

Surface rates— Mexico and all other countries

Weight through		Mexico	All Other Countries
lbs	oz.		
0	1	$0.15	$0.30
0	2	.28	.47
0	3	.41	.64
0	4	.54	.81
0	5	.67	.98
0	6	.80	1.15
0	7	.93	1.32
0	8	1.06	1.49
0	9	1.19	
0	10	1.32	
0	11	1.45	2.76
0	12	1.58	
0	13	2.25	
1	0		
1	8	2.50	3.78
2	0	2.83	4.80
2	8	3.16	5.55
3	0	3.50	6.30
3	8	3.83	7.05
4	0	4.16	7.80

MAXIMUM WEIGHT - 4 LBS

foreign amateurs, postal information is also required when mailing large envelopes, heavy items, or when merely exchanging magazines with other amateurs. Obviously, a telephone call to one's local post office for every such occurrence would become a time consuming process. A general outline of United States - originated mail rates (as of early 1980) is shown in Table 8-2. Remember to update this list with a single phone call to your local post office's "customer information" department whenever rates change. Additionally, full size pamphlets concerning all international rates (including special services, customs regulations and international parcel post regulations) are presently available free of charge from the United States Post Office.

Appendix A
A.R.R.L Active DXCC Country List

A2 . . . . . Botswana
A3 . . . . . Rep. of Tonga
A4X . . . . . Oman
A5 . . . . . Bhutan
A6X . . . . . United Arab Emirates
A7X . . . . . Qatar
A9X . . . . . Bahrain
AA (See K)
AP . . . . . Pakistan
BV . . . . . Taiwan
BY . . . . . China
C2 . . . . . Rep. of Nauru
C3 . . . . . Andorra
C5 . . . . . The Gambia
C6 . . . . . Bahamas
C9 . . . . . Mozambique
CE . . . . . Chile
CE9AA-AM,FB8Y,KC4,LA,LU-Z,OR4,
UA1,UK1,VK0,VP8,ZL5,ZS1,3Y,4K,8J
. . . . . Antarctica
CE9AN-AZ (See VP8)
CE0A . . . . . Easter Is.
CE0X . . . . . San Felix
CE0Z . . . . . Juan Fernandez
CM, CO . . . . . Cuba
CN . . . . . Morocco
CP . . . . . Bolivia
CR3 . . . . . Guinea-Bissau
CR9 . . . . . Macao
CT . . . . . Portugal
CT2 . . . . . Azores
CT3 . . . . . Madeira Is.
CX . . . . . Uruguay
D2, 3 . . . . . Angola
D4 . . . . . Rep. of Cape Verde
D6[27] . . . . . Comoros
DA, DF, DJ, DK, DL[2]
. . . . . Fed. Rep. of Germany
DM, DT[3] . . . . . German Democratic Rep.
DU . . . . . Rep. of Philippines
EA . . . . . Spain
EA6 . . . . . Balearic Is.
EA8 . . . . . Canary Is.
EA9 . . . . . Ceuta and Melilla
EI . . . . . Rep. of Ireland
EL . . . . . Liberia
EP . . . . . Iran
ET . . . . . Ethiopia
F . . . . . France
FB8W . . . . . Crozet
FB8X . . . . . Kerguelen Is.
FB8Y (See CE9AA-AM)
FB8Z . . . . . Amsterdam & St. Paul Is.
FC[1] . . . . . Corsica
FG . . . . . Guadeloupe
FG, FS[1] . . . . . Saint Martin
FH[27] . . . . . Mayotte
FK . . . . . New Caledonia
FM . . . . . Martinique
FO . . . . . Clipperton I.
FO . . . . . Fr. Polynesia
FP . . . . . St. Pierre & Miquelon
FR[4] . . . . . Glorioso Is.
FR[4] . . . . . Juan de Nova, Europa
FR . . . . . Reunion
FR . . . . . Tromelin
FW . . . . . Wallis & Futuna Is.
FY . . . . . Fr. Guiana
G . . . . . England
GD . . . . . Isle of Man
GI . . . . . Northern Ireland
GJ,GC . . . . . Jersey
GM . . . . . Scotland
GU,GC . . . . . Guernsey & Dependencies
GW . . . . . Wales
H4, VR4 . . . . . Solomon Is.
HA . . . . . Hungary
HB . . . . . Switzerland
HB0 . . . . . Liechtenstein
HC . . . . . Ecuador
HC8 . . . . . Galapagos Isls.
HH . . . . . Haiti
HI . . . . . Dominican Rep.
HK . . . . . Colombia
HK0 . . . . . Bajo Nuevo
HK0 . . . . . Malpelo I.

HK0 . . . . . San Andres & Providencia
HK0 (See KS4)
HL, HM . . . . . Korea
HP . . . . . Panama
HR . . . . . Honduras
HS . . . . . Thailand
HV . . . . . Vatican
HZ, 7Z . . . . . Saudi Arabia
I, IT . . . . . Italy
IS . . . . . Sardinia
J2, FL8 . . . . . Djibouti
J3, VP2G . . . . . Grenada & Dependencies
J6, VP2L . . . . . St. Lucia
J7, VP2L . . . . . Dominica
JA,JE,JG,JH,JR,KA . . . . . Japan
JD, KA1[6] . . . . . Minami Torishima
JD, KA1[5] . . . . . Ogasawara
JD[26] . . . . . Okino Tori-shima
JT . . . . . Mongolia
JW . . . . . Svalbard
JX . . . . . Jan Mayen
JY . . . . . Jordan
K, W, N, A
. . . . . United States of America
KB, KH1 . . . . . Baker, Howland & American Phoenix Is.
KC4 (See CE9AA-AM)
KC4, KP1 . . . . . Navassa I.
KC6 . . . . . Eastern Caroline Is.
KC6 . . . . . Western Caroline Is.
KG4 . . . . . Guantanamo Bay
KG6, KH2 . . . . . Guam
KG6R,S,T . . . . . Mariana Is.
KH6 . . . . . Hawaiian Is
KH7 . . . . . Kure I.
KJ, KH3 . . . . . Johnston I.
KL7 . . . . . Alaska
KM, KH4 . . . . . Midway Is.
KP4 . . . . . Puerto Rico
KP4[28] . . . . . Desecheo Is.
KP6, KH5K . . . . . Kingman Reef
KP6, KH5 . . . . . Palmyra, Jarvis Is.
KS4, KP3, HK0
. . . . . Serrana Bank & Roncador Cay
KS6, KH8 . . . . . American Samoa
KV,KP2 . . . . . Virgin Is
KW,KH9 . . . . . Wake I.
KX . . . . . Marshall Is.
LA,LB,LF,LG,LJ . . . . . Norway
LA (See CE9AA-AM)
LU . . . . . Argentina
LU-Z (See CE9AA-AM,VP8)
LX . . . . . Luxembourg
LZ . . . . . Bulgaria
M1[3] (See 9A)
N (See K)
OA . . . . . Peru
OD . . . . . Lebanon
OE . . . . . Austria
OH . . . . . Finland
OH0 . . . . . Aland Is.
OJ0 . . . . . Market
OK . . . . . Czechoslovakia
ON . . . . . Belgium
OR4 (See CE9AA-AM)
OX,XP . . . . . Greenland
OY . . . . . Faroe Is.
OZ . . . . . Denmark
P2[7] . . . . . Papua New Guinea
PA,PD,PE,PI . . . . . Netherlands
PJ . . . . . Neth. Antilles
PJ . . . . . St. Maarten, Saba, St. Eustatius
PY . . . . . Brazil
PY0 . . . . . Fernando de Noronha
PY0 . . . . . St. Peter & St. Paul's Rocks
PY0 . . . . . Trindade & Martim Vaz Is.
PZ . . . . . Surinam
S2 . . . . . Bangladesh
S7 . . . . . Seychelles
S9,CR5 . . . . . Sao Tome & Principe
SK,SL,SM . . . . . Sweden
SP . . . . . Poland
ST . . . . . Sudan
ST0 . . . . . Southern Sudan
SU . . . . . Egypt
SV . . . . . Greece
SV . . . . . Crete
SV . . . . . Dodecanese
SV . . . . . Mount Athos
TA . . . . . Turkey
TF . . . . . Iceland
TG . . . . . Guatemala
TI . . . . . Costa Rica
TI9 . . . . . Cocos I.
TJ . . . . . Cameroon
TL[8] . . . . . Central African Empire
TN[9] . . . . . Congo
TR[10] . . . . . Gabon
TT[11] . . . . . Chad
TU[12] . . . . . Ivory Coast
TY[13] . . . . . Benin
TZ[14] . . . . . Mali
UA, UK1,3,4,6, UV, UW1-6, UN1
. . . . . European Russian S.F.S.R.
UA1,UK1 . . . . . Franz Josef Land
UA1,UK1 (See CE9AA-AM)
UA2,UK2F . . . . . Kaliningradsk
UA,UK,UV,UW9-0
. . . . . Asiatic R.S.F.S.R.
UB,UK,UT,UY5 . . . . . Ukraine
UC2,UK2A/C/I/L/O/S/W
. . . . . White R.S.S.R.
UD6,UK6C/D/K . . . . . Azerbaijan
UF6,UK6F/O/Q/V . . . . . Georgia
UG6,UK6G . . . . . Armenia
UH8,UK8H . . . . . Turkoman
UI8,UK8 . . . . . Uzbek
UJ8,UK8J/R . . . . . Tadzhik
UL7,UK7 . . . . . Kazakh
UM8,UK8M,N . . . . . Kirghiz
UO5,UK5O . . . . . Moldavia
UP2,UK2B/P . . . . . Lithuania
UQ2,UK2G/Q . . . . . Latvia
UR2,UK2R/T . . . . . Estonia
VE,VO . . . . . Canada
VE1 . . . . . Sable I.
VE1 . . . . . St. Paul I.
VK . . . . . Australia
VK . . . . . Lord Howe I.
VK9 . . . . . Willis I.
VK9 . . . . . Christmas I.
VK9 . . . . . Cocos I.
VK9 . . . . . Mellish Reef
VK9 . . . . . Norfolk I.
VK0 (See CE9AA-AM)
VK0 . . . . . Heard I.
VK0 . . . . . Macquarie I.
VO (See VE)
VP1 . . . . . Belize

VP2A[15] . . . . . Antigua, Barbuda
VP2E[15] . . . . . Anguilla
VP2K[15] . . . . . St. Kitts, Nevis
VP2M[15] . . . . . Montserrat
VP2S[15] . . . . St. Vincent & Dependencies
VP2V[15] . . . . . Brit. Virgin Is.
VP5 . . . . . Turks & Caicos Is.
VP8 (See CE9AA-AM)
VP8 . . . . . Falkland Is.
VP8,LU-Z . . . . . So. Georgia Is.
VP8,LU-Z . . . . . So. Orkney Is.
VP8,LU-Z . . . . . So. Sandwich Is.
VP8,LU-Z,CE9AN-AZ
. . . . . So. Shetland Is.
VP9 . . . . . Bermuda
VQ9 . . . . . Chagos
VR1 . . . . . Brit. Phoenix Is.
VR1 . . . . . Gilbert & Ocean Is.
VR3,7. . . . . Line Is.
VR6 . . . . . Pitcairn I.
VR7 (See VR3)
VR8, T2[16] . . . . . Tuvalu
VS5 . . . . . Brunei
VS6 . . . . . Hong Kong
VS9 (See 8Q)
VS9K . . . . . Kamaran I.
VU . . . . . India
VU7 . . . . . Andaman & Nicobar Is.
VU7 . . . . . Laccadive Is.
W (See K)
XE . . . . . Mexico
XF4 . . . . . Revilla Gigedo
XP (See OX)
XT[17] . . . . . Upper Volta
XU . . . . . Khmer Rep.
XV . . . . . Vietnam
XW . . . . . Lao People's Dem. Rep.
XZ . . . . . Burma
YA . . . . . Afghanistan
YB,YC[21] . . . . . Indonesia
YI . . . . . Iraq
YJ . . . . . New Hebrides
YK . . . . . Syria
YN . . . . . Nicaragua
YO . . . . . Rumania
YS . . . . . Salvador
YU . . . . . Yugoslavia
YV . . . . . Venezuela
YV0 . . . . . Aves I.
ZA . . . . . Albania
ZB . . . . . Gibraltar
ZC (See 5B)
ZD7 . . . . . St. Helena
ZD8 . . . . . Ascension I.
ZD9 . . . . . Tristan da Cunha & Gough I.
ZE . . . . . Rhodesia
ZF . . . . . Cayman Is.
ZK1 . . . . . So. Cook Is.
ZK1 . . . . . No. Cook Is.
ZK2 . . . . . Niue
ZL . . . . . New Zealand
ZL . . . . . Auckland I. & Campbell I.
ZL . . . . . Chatham Is.
ZL . . . . . Kermadec Is.
ZL5 (See CE9AA-AM)
ZM7 . . . . . Tokelaus
ZP . . . . . Paraguay
ZS1,2,4,5,6 . . . . . South Africa
ZS1 (See CE9AA-AM)
ZS2 . . . . . Prince Edward & Marion Is.
ZS3 . . . . . (Namibia) Southwest Africa
1S[1] . . . . . Spratly Is.
3A . . . . . Monaco
3B6,7 . . . . . Agalega & St. Brandon
3B8 . . . . . Mauritius
3B9 . . . . . Rodriguez I.
3C . . . . . Equatorial Guinea
3C0 . . . . . Annobon
3D2 . . . . . Fiji Is.
3D6 . . . . . Swaziland
3V . . . . . Tunisia
3X . . . . . Rep. of Guinea
3Y . . . . . Bouvet
3Y (See CE9AA-AM)
4K (See CE9AA-AM)
4S . . . . . Sri Lanka
4U . . . . . I.T.U. Geneva
4U . . . . . Hq., United Nations
4W . . . . . Yemen
4X,4Z . . . . . Israel
5A . . . . . Libya
5B,ZC . . . . . Cyprus
5H . . . . . Tanzania
5N . . . . . Nigeria
5R . . . . . Malagasy Rep.
5T[18] . . . . . Mauritania
5U[19] . . . . . Niger
5V . . . . . Togo
5W . . . . . Western Samoa
5X . . . . . Uganda
5Z . . . . . Kenya
6O . . . . . Somali
6W[20] . . . . . Senegal
6Y . . . . . Jamaica
7O . . . . . People's Dem. Rep. of Yemen
7P . . . . . Lesotho
7Q . . . . . Malawi
7X . . . . . Algeria
7Z (See HZ)
8J (See CE9AA-AM)
8P . . . . . Barbados
8Q,VS9 . . . . . Maldive Isls.
8R . . . . . Guyana
8Z4 . . . . . Saudi Arabia/Iraq
Neutral Zone
9A,(M1[1]) . . . . . San Marino
9G[22] . . . . . Ghana
9H . . . . . Malta
9J . . . . . Zambia
9K . . . . . Kuwait
9L . . . . . Sierra Leone
9M2[23] . . . . . West Malaysia
9M6,8[23] . . . . . East Malaysia
9N . . . . . Nepal
9Q . . . . . Rep. of Zaire
9U[24] . . . . . Burundi
9V[25] . . . . . Singapore
9X[24] . . . . . Rwanda
9Y . . . . . Trinidad & Tobago

1. Unofficial prefix.

2. (DA, DJ, DK, DL) Only contacts made Septemer 17, 1973, and after, will count for this country.

3.(DM, DT) Only contacts made September 17, 1973, and after, will count for this country.

4. (FR7) Only contacts made June 25, 1960, and after, will count for this country.

5. (JD, KA1) Formerly Bonin and Volcano Islands.

6. (JD, KA1) Formerly Marcus Island.

7. (P2) Only contacts made September 16, 1975, and after, will count for this country.

8. (TL) Only contacts made August 13, 1960, and after, will count for this country.

9. (TN) Only contacts made August 15, 1960, and after, will count for this country.

10. (TR) Only contacts made August 17, 1960, and after, will count for this country.

11. (TT) Only contacts made August 11, 1960, and after, will count for this country.

12. (TU) Only contacts made August 7, 1960, and after, will count for this country.

13. (TY) Only contacts made August 1, 1960, and after, will count for this country.

14. (TZ) Only contacts made June 20, 1960, and after, will count for this country.

15. (VP2) For credits on QSO's made before June 1, 1958, see page 97, June 1958 QST.

16. (VR8) Only contacts made January 1, 1976, and after, will count for this country.

17. (XT) Only contacts made August 6, 1960, and after, will count for this country.

18. (ST) Only contacts made June 20, 1960, and after, will count for this country.

19. (SU7) Only contacts made August 3, 1960, and after, will count for this country.

20. (6W8) Only contacts made June 20, 1960, and after, will count for this country.

21. (8F, YB) Only contacts made May 1, 1963, and after, will count for this country.

22. (9G1) Only contacts made March 5, 1957, and after, will count for this country.

23. (9M2, 4, 6, 8) Only contacts made September 16, 1963, and after, will count for this country.

24. (9U5, 9XS) Only contacts made July 1, 1962, and after, will count for this country.

25. (9V1) Contacts made between September 15, 1963 and August 9, 1965, will not count for this country.

26. (JD1) Only contacts made May 30, 1976 and after will count for this country.

27. (D6, FH8) Only contacts made after July 15, 1975, count for this country.

28. (KP4) Only contacts made March 1, 1979 and after will count for this country.

A.R.R.L. DXCC Deleted Countries

Credit for any of these countries can be given if the date of contact with the country in question agrees with the date (s) shown in the corresponding footnote.

(AC3[1])[2]	Sikkim
(AC4[1])[3]	Tibet
C9[4]	Manchuria
CN2[5]	Tangier
CR8[6]	Damao, Diu
CR8[6]	Goa
CR8[34]	Port Timor
DA,DJ,DK,DL,DM[7]	Germany
EA9[8]	Ifni
EA9[35]	Rio de Oro
ET2[9]	Eritrea
FF8[10]	Fr West Africa
FH[35]	Comoros
FI8[11]	Fr Indo-China
FN[12]	French India
FQ8[13]	Fr Equatorial Africa
I1[14]	Trieste
I5[15]	Italian Somaliland
J2[16]	Netherlands New Guinea
KR6,8,JR6,KA6[17]	Ryukyu Islands
KS4[18]	Swan Islands
KZ[39]	Canal Zone
P2,VK9[19]	Papua Territory
P2,VK9[19]	Terr New Guinea
PK1,2,3[20]	Java
PK4[20]	Sumatra
PK5[20]	Netherlands Borneo
PK6[21]	Celebe & Molucca Isls
UN1[21]	Karelo-Finnish Rep
VO[22]	Newfoundland, Labrador
VQ1,5H1[23]	Zanzibar
VQ6[24]	british Somaliland
VQ9[36]	Aldabra
VQ9[36]	Desroches
VQ9[36]	Farquhar
VS4[25]	Sarawak
VS9H[26]	Kuria Muria Isls
ZC5[25]	British North Borneo
ZC6[27]	Palestine
ZD4[28]	Gold Coast, Togoland
(1M1)[29]	Minerva Reefs
9K3,8Z5[30]	Kuwait/Saudi Arabia Neutral Zone
9M2[25]	Malaya
9S4[31]	Saar
9U5[32]	Ruanda-Urundi
[33]	Blenheim Reef
[37]	Geyser Reef

1. Unofficial prefix.

2. (AC3) Only contacts made before May 1, 1975, will count for this country. Contacts made May 1, 1975, and after, count as India.

3. (AC4) Only contacts made before June 1, 1974, will count for this country.

4. (C9) Only contacts made before September 16, 1963, will count for this country.

5. (CN2) Only contacts made before July 1, 1960, will count for this country.

6. (CR8) Only contacts made before January 1, 1962, will count for this country.

7. (DA, DJ, DK, DL, DM) Only contacts made before September 17, 1973, will count for this country.

8. (EA9) Only contacts made May 13, 1969, and before, count for this country.

9. (ET2) Only contacts made November 14, 1962, and before, will count for this country.

10. (FF8) Only contacts made August 6, 1960, and before, will count for this country.

11. (F18) Only contacts made before December 21, 1950, will count for this country.

12. (FN) Only contacts made before November 1, 1954, will count for this country.

13. (FQ8) Only contacts made August 16, 1960, and before, will count for this country.

14. (I1) Only contacts made before April 1, 1957, will count for this country. Contacts made April 1, 1957, and after, count as Italy.

15. (15) Only contacts made June 30, 1960, and before, will count for this country.

16. (JZ0) Only contacts made before May 1, 1963, will count for this country.

17. (KR6.8, JR6, KA6) Only contacts made before May 15, 1972, will count for this country. Contacts made May 15, 1972, and, after count as Japan.

18. (KS4) Only contacts made before September 1, 1972, will count for this country. Contacts made Septemer 1, 1972, and after, count as Honduras.

19. (P2, VK9) Only contacts made before September 16, 1975, will count for this country.

20. (PK1, 2, 3, 4, 5, 6) Only contacts made before May 1, 1963, will count for this country.

21. (UN1) Only contacts made June 30, 1960, and before, will count for this country. Contacts made July 1, 1960, and after, count as European Russian S.F.S.R.

22. (VO) Only contacts made before April 1, 1949, will count for this country.

23. (VQ1, 5 H1) Only contacts made June 1, 1974, will count for this country.

24. (VQ6) Only contacts made June 30, 1960, and before, will count for this country.

25. (VS4, ZC5, 9M2) Only contacts made September 15, 1963, and before, will count for this country.

26. (VS9H) Only contacts made before November 30, 1967, will count for this country. Contacts made December 1, 1967, and after, count as Oman.

27. (ZC6) Only contacts made July 1, 1968, and before, will count for this country.

28. (ZD4) Only contacts made March 5, 1957, and before, will count for this country.

29. (1M) Only contacts made July 15, 1972, and before, will count for this country. Contacts made July 16, 1972, and after, count as Tonga.

30. (9 K3, 8 Z5) Only contacts made before December 15, 1969, will count for this country.

31. (9S4) Only contacts made before April 1, 1957, will count for this country. Contacts made April 1, 1957, and aftr, count as Germany.

32. (9 U5) Only contacts made between July 1, 1960 and July 1, 1962, will count for this country.

33. (Blenheim Reef) Only contacts made between May 4, 1967 and July 1, 1975, will count for this country. Contacts made July 1, 1975 and after, count as Chagos.

34. (CR8) Only contacts made before September 15, 1976, will count for this country.

35. (FH) Only contacts made before July 6, 1975, count toward this country.

36. (VQ9) Only contacts made before June 29, 1976, count for this country.

37. (Geyser Reef) Only contacts made between May 4, 1967 and March 1, 1978, will count for this country.

38. (EA9) Only contacts made before January 8, 1976 will count for this country.

39. (KZ5) Only contacts made before October 1, 1979, will count for this country.

Prefix Cross-References

AC[1] (See A5)
AP (See S2-3)
AX (See VK)
CN9 (See CN2, 8)
CR4 (See D4)
CR5 (See S9)
CR5 (See CR3)
CR6 (See D2, 3)
CR7 (See C9)
CR10 (See CR8)
DX (See DU)
EA0 (See 3C)
FA (See 7X)
FB8 (See FH8)
FB8 (See FR7)
FB8 (See 5R8)
FD (See 5V)
FE8 (See TI)
FF4 (See TU)
FF7 (See 5T)
FF8 (See TY)
FF8 (See TZ)
FF8 (See XT)
FF8 (See 5U7)
FF8 (See 6W8)
FL8 (See J2)
FQ8 (See TL)
FQ8 (See TN)
FQ8 (See TR)
FQ8 (See TT)
FU8 (See YJ)
HE (See HB0)
HG (See HA)
HT (See YN)
IM (See IS)
JR6 (See KR6,8)
KA6 (See KR6,8)
KG61 (See JD,KA1)
LA/G (See 3Y, CE9AA-AM)
LA/P (See JX,JW)
MP4B (See A9)
MP4D (See A6)
MP4M (See A4)
MP4Q (See A7)
MP4T (See A6)
OF (See OH)
OQ5,0 (See 9Q5)
PK (See YB)
PX[1] (See C3)
VK9 (See C2)
VK9AA-MZ (See P2
VP2G (See J3)
VP2K (See VP2E)
VP3 (See 8R)
VP4 (See 9Y4)
VP5 (See ZF1)
VP5 (See 6Y5)
VP6 (See 8P)
VP7 (See C6)
VQ1 (See 5H1)
VQ2 (See 9J2)
VQ3 (See 5H3)
VQ4 (See 5Z4)
VQ5 (See 5X5)
VQ8 (See 3B6,7,8,9)
VQ9 (See S7)
VR2 (See 3D2)
VR4 (See H4)
VR5 (See A3)
VS1 (See 9M2)
VS1 (See 9V1)
VS2 (See 9M2;
VS9 (See 7O)
VS9u (See A4)
VX9 (See VE1)
VY0 (See VE1)
XF (See XF)
YN0 (See YN)
YT (See YU)
YZ (See YU)
ZB1 (See 9H1)
ZD1 (See 9L1)
ZD2 (See 5N2)
ZD3 (See C5)
ZD4 (See 9G1)
ZD5 (See 3D6)
ZD6 (See 7Q7)
ZM6 (See 5W1)
ZS7 (See 3D6)
ZS8 (See 7P8)
ZS9 (See A2)
3W8 (See XV5)
3Z (See SP)
4A (See XE)
4M (See YV)
6D (See XE)
6D4 (See XF4)
7G (See 3X)
7J (See JD1)
8F (See YB)
8Z5 (See 9K3)
9E, 9F (See ET3)
9M4 (See 9V1)

Appendix B
Great Circle Bearings
(Beam Headings)

PREFIX	COUNTRY	BEARING, DEGREES ATLANTA, GA	DALLAS, TX	SACRAMENTO, CA
A5	BHUTAN, SIKKIM	6	355	332
AP	E. PAKISTAN	5	352	329
BV	FORMOSA	331	322	307
BY/C	CHINA	344	332	315
C6	BAHAMAS	108	108	96
CE	CHILE	167	156	140
CEØA	EASTER IS.	205	192	167
CEØZ	J. FERNANDEZ	173	163	146
CM, CO	CUBA	163	120	100
CN	MOROCCO	68	62	52
CP	BOLIVIA	160	144	125
CR5	SAO THOME	89	82	65
CR6	ANGOLA	93	86	66
CR7	MOZAMBIQUE	90	82	48
CR8	TIMOR	307	288	277
CR9	MACAO	340	327	306
CT1	PORTUGAL	62	56	43
CT2	AZORES	60	64	58
CT3	MADERIA	70	65	57
CX	URUGUAY	155	146	132
DJ, DL	GER. FED. REP.	40	39	30
DJ, DL	WEST BERLIN	42	36	27
DU	PHILIPPINES	325	314	298
EA	SPAIN	56	52	42
EA6	BALERIC IS.	57	51	42
EA8	CANARY IS.	72	69	49
EA9	CEUTA AND MELILLA	71	65	53
EA9	SP. MORROCO	78	57	52
EAØ	RIO MUNDI	63	77	46
EI	REP. IRELAND	84	42	35
EL	LIBERIA	92	86	72
EP	IRAN	36	25	25

PREFIX	COUNTRY	BEARING, DEGREES ATLANTA, GA	DALLAS, TX	SACRAMENTO, CA
ET	ETHIOPIA	34	53	27
F	FRANCE	49	44	34
FB8Z	AMSTERDAM & ST. PAUL IS.	115	142	264
FB8X	KERGUELEN IS.	140	156	210
FC	CORSICA	52	46	35
FG7	GUADELOUPE	123	108	94
FH	MAYOTTE	79	70	31
FK8	NEW CALEDONIA	260	254	240
FM7	MARTINIQUE	123	110	97
FO8	CLIPPERTON IS.	129	206	154
FO8	TAHITI	241	232	209
FP8	ST. PIERRE & MIQUELON IS.	49	53	58
FR7	REUNION IS.	83	69	20
FS7	SAINT MARTIN IS.	122	107	94
FU8/YJ	NEW HEBRIDES IS.	272	266	352
FW8	WALLIS & FUTUNA	262	252	232
FY7, 8R	FRENCH GUIANA	125	110	100
G, GB	ENGLAND	43	40	32
GC	GUERNSEY & DEPENDENCIES	48 42	44	33
GD	ISLE OF MAN	42	38	34
GI	NO. IRELAND	41	38	33
GM	SCOTLAND	42	39	32
GW	WALES	41	38	31
HA	HUNGARY	43	38	26
HB	SWITZERLAND	46	42	30
HE, HBØ	LIECHTENSTEIN	47	43	31
HC	ECUADOR	170	143	124
HC8	GALAPAGOES IS.	191	167	137
HH	HAITI	137	115	101
HI	DOMINICAN REPUBLIC	132	112	98
HK	COLOMBIA	159	138	115
HKØ	S. ANDRES & PROVIDENCIA IS.	171	135	122
HL, HM	KOREA (SOUTH)	332	325	311
HP	PANAMA	168	141	111
HR	HONDURAS	187	148	119
HS	THAILAND	351	335	312
HV	VATICAN	52	44	32
HZ	SAUDI ARABIA	46	36	10
II	ITALY	51	45	32
ISI	SARDINIA	53	48	35
ITI	SICILY	52	47	34
JA, KA	JAPAN	324	316	303
JT	MONGOLIA	353	343	330
JW	SVALBARD	12	11	7
JX	JAN MAYEN	24	21	18
JY	JORDAN	47	38	16
KB6, KH8	BAKER, HOWLAND, & AM. PHOENIX IS.	270	259	243
KC4	NAVASSA IS.	149	120	102

PREFIX	COUNTRY	BEARING, DEGREES ATLANTA, GA	DALLAS, TX	SACRAMENTO, CA
KC6	CAROLINE IS.	298	290	275
KG4	GUANTANAMO BAY	141	117	99
KG6	GUAM	305	296	280
KG6R,S,T	MARIANAS IS.	312	307	286
KH6	HAWAII	280	273	252
KL7	ALASKA	330	326	340
KM6	MIDWAY IS.	294	290	375
KP4	PUERTO RICO	127	110	96
KS4	SWAN IS.	177	138	110
KS6	AM. SAMOA	258	249	232
KV4	VIRGIN IS.	124	108	97
KW6	WAKE IS.	296	289	276
KX6	MARSHALL IS.	287	280	265
LA	NORWAY	31	28	21
LU	ARGENTINA	162	153	138
LX	LUXEMBOURG	45	42	32
LZ	BULGARIA	44	38	22
OA	PERU	166	150	128
OD5	LEBANON	146	38	20
OE	AUSTRIA	167	41	28
OH	FINLAND	31	37	17
OHØ	ALAND IS.	30	36	16
OK	CZECHOSLOVAKIA	41	36	25
ON	BELGIUM	44	40	31
OX	GREENLAND	7	12	18
OY	FAROES	30	32	26
OZ	DENMARK	37	33	24
P29	NEW GUINEA	252	278	267
PA	NETHERLANDS	43	39	30
PJ	NETH. ANTILLES	144	122	104
PJ-M	SAINT MAARTEN	122	107	92
PX	ANDORRA	53	48	38
PY	BRAZIL	140	131	114
PY-Ø	TRINDADE	127	119	106
PZ	SURINAM	130	116	107
SL, SM	SWEDEN	32	30	21
SP	POLAND	37	34	23
ST	SUDAN	63	55	32
SU	EGYPT	51	43	23
SV	GREECE	50	32	24
SV	DODACANESE IS.	49	35	26
TA	TURKEY	43	35	18
TF	ICELAND	30	30	28
TG	GUATEMALA	199	159	121
TI	COSTA RICA	178	148	119
TJ	CAMERON	83	75	57
TL	CEN. AF. REP.	76	68	46
TN	CONGO REP.	88	80	60
TR	GABON. REP.	87	79	59
TT	CHAD REP.	71	65	43
TU	IVORY COAST	87	79	63

PREFIX	COUNTRY	BEARING, DEGREES ATLANTA, GA	DALLAS, TX	SACRAMENTO, CA
TZ	MALI REP	86	78	63
UA, UV, UW, U UA, UW	EUROPEAN USSR	30	24	16
9, Ø	ASIATIC USSR	3	357	9
UB5, UT5	UKRAIN	27	27	18
UC2	WHITE RUSSIA	35	30	18
UF6	GEORGIA	35	27	10
UG6	ARMENIA	36	26	9
UH8	TURKOMAN	25	16	358
UI8	UZBEK	24	16	356
UJ8	TADZHIK	18	8	345
UL7	KAZAKH	18	10	352
UM8	KIRGHIZ	17	8	347
UNI	KARELO-FINN REPUBLIC	25	21	11
UO5	MOLDAVIA	40	34	18
UP2	LITHUANIA	33	28	19
UQ2	LATVIA	32	27	16
UR2	ESTONIA	31	28	18
VK	AUSTRALIA	255	250	243
VK9	NORFOLK IS.	252	247	235
VKØ	HEARD IS.	176	197	226
VKØ	MACQUARIE IS.	224	223	220
VP5	TURKS & CAICOS IS.	127	108	96
VP8, LU-Z	S. GEORGIA IS.	157	150	141
VP8, LU-Z	S. FALKLANDS	159	151	147
VP8, LU-Z	S. ORKNEYS	157	148	140
VP9	BERMUDA	89	83	79
VQ8	CHAGOES IS.	70	55	356
VQ8	MAURITIUS IS.	74	58	346
VQ8	RODRIGUEZ IS.	72	56	347
VR1	GILBERT & ELLICE AND OCEAN IS.	272	262	249
VR2	FIJI IS.	258	252	237
VR4	SOLOMON IS.	275	269	255
VR6	PITCAIRN IS.	220	212	188
VU2	ANDAMAN & NICOBAR IS.	3	245	320
VU2	INDIA	25	11	343
VU2	LACCADIVE IS.	27	12	340
XE, XF	MEXICO	227	185	126
XE, XF	REVILLA GIGEDO	246	226	154
XW8	LAOS	351	334	310
YA	AFGHANISTAN	23	12	350
Y1	IRAQ	42	34	16
YK	SYRIA	41	36	17
YJ	NEW HEBRIDES	266	259	246
YN	NICARAGUA	180	148	115
YO	RUMANIA	43	36	24
YS	SALVADOR	193	155	120
YU	YUGOSLAVIA	43	38	26
YV, 4M	VENEZUELA	140	122	105

PREFIX	COUNTRY	BEARING, DEGREES ATLANTA, GA	DALLAS, TX	SACRAMENTO, CA
ZA	ALBANIA	48	42	46
ZD7	ST. HELENA IS.	108	101	85
ZD8	ASCENSION IS.	110	103	87
ZD9	TR. D. CUNHA & GOUGH IS.	130	125	113
ZE	RHODESIA	92	86	58
ZK1	COOK IS.	249	242	220
ZK1	MANIHIKI IS.	250	241	223
ZK2, C21	NIUE IS.	251	244	227
ZL	NEW ZEALAND	238	233	223
ZP	PARAGUAY	152	140	125
ZS1,2,4 5 & 6	SOUTH AFRICA	102	97	74
ZS3	S. W. AFRICA	105	98	79
IS	SPRATLY ISLAND	330	322	307
3A	MONACO	50	45	34
3V8	TUNISIA	57	52	38
3W8	VIET NAM	340	312	291
4S7	CEYLON	21	40	331
4U	GENEVA	49	44	33
4W	YEMAN	54	43	17
4X	ISRAEL	47	39	20
4X1	ISRAEL	40	40	??
5A	LIBYA	59	52	38
5B4, ZC4	CYPRUS	45	39	21
5H3	TANZANIA	79	70	39
5N2	NIGERIA	85	78	61
5R8	MALAGASY REP.	84	75	30
5T	MAURITANIA REP.	86	78	63
5U7	NIGER REP.	77	70	54
5V	TOGO REP.	87	80	65
5W1	W. SAMOA	257	250	232
5X5	UGANDA	73	64	38
5Z4	KENYA	73	65	37
60	SOMALI REP.	62	50	20
6W8	SENEGAL REP.	89	82	70
7G1	REP. OF GUINEA	92	86	67
7X	ALGERIA	58	53	41
8Z4, 8Z5	NEUTRAL ZONE	42	32	15
9H1	MALTA	55	49	35
9J2	ZAMBIA	42	83	58
9K2	KUWAIT	348	32	16
9L1	SIERRA LEONE	92	85	71
9M2	WEST MALAYSIA	349	329	306
9M6, 8	EAST MALAYSIA	330	314	296
9V1	SINGAPORE	344	325	300
9N1	NEPAL	10	358	332
9Q5	REP. OF ZAIRE	83	75	51
9U5	BURUNDI	79	71	44
9X5	RWANDA	78	69	42
9Y4(VP4)	TRINIDAD & TOBAGO	129	115	100

Appendix C
QSL Bureaus Around the World

AP	Pakistan Amateur Radio Society, QSL Bureau, Box 65, Lahore, West Pakistan
CE	Radio Club of Chile, Box 13630, Correo 15, Santiago, Chile
CM8-CO8	QSL Bureau, Box 5, Santiago, Cuba
CP	Radio Club Boliviano, Box 2111, La Paz, Bolivia
CT	Rua D Pedro V-7-40, Lisbon 2, Portugal *OR VIA* Associacao De Radioamadores Portugeses, Box 446, Porto Portugal
CT2	Associacao Dos Radioamadores Dos Acores, Box 602, Ponta Delgada, Sao Miguel Island, Azores
CT2	Associacao Dos Radioamadores Da Madeira, Box 358, Funchal, Madeira IS
CX	Radio Club of Uruguay, Box 37, Montevideo, Uruguay
CZ1	Nauru Amateur Radio Club, Box 29, Nauru
C6A	Bahamas Amateur Radio Society, Box 6004, Nassau, Bahama Is.
DA-DL	Lindenllee 6, Box 1155, D-3501, Baunatal 1, Federal Republic of West Germany *OR VIA* QSL Service, Box 400, 6600 Saarbruecken, Fed. Rep. of West Germany
DM	DM QSL Bureau, Box 30, Berlin 55, East German Democratic Republic
DU	Para QSL Bureau, Box 4083, Maila, Philippines
DZA	Lara, Box 484, Luanda, Angola, Africa

D4	LARCV, Box 145, Mindelo, Republic of Cape Verde
EA	URE, Union De Radioaficionados Espandles, Box 220, Madrid 4, Spain
EA4	URE , Estacion Oficial De La Ure, Hortaleza 2, Madrid 4, Spain
EI	Irish Radio Transmitters Society Box 462, Dublin 9, Ireland *OR VIA* Amateur Radio Society of Ireland, Box 938, Dublin 6, Ireland
EL	Liberian Radio Amateur Association, Box 1477, Monrovia, Liberia
FB8,FC, FM7,FP8, FY7	Ref QSL Service, 2 Square Trudaine, 75009 Paris, France *OR VIA* URC, Box 435-01, 75025 Paris Cedex 1, France
FG7	Radio Club Guadeloupe, Box 387, 97110 Pointe -A-Pitre, Guadeloupe, West Indies
FK8	Aranc, Box 3956, Noume A, New Caldonia
FY7	Radio Club De Guyane, Box 508, 97300 Cayenne, French Guiana
G	RSGB, Radio Society of Great Britain, c/o E. G. Allen, G3DRN, 30Bodnant Gdns., London SW20 Dud, Great Britain Cards for Members only may be sent via ISWL QSL Bureau, 1 Grove Rd., Lydney, Gloucestershire GL15, 5JE, Great Britain
GD	W. P. Waid, GD3GOX
GI	R. R. Parsons, GI3HXV
GJ	L. D. Woolf, GJ8AAZ
GM	D. R. Macadie, GM6MD
GU	W.E. Butt, GU2FZC
GW	J. L. Reid, GW3ANU
HA-HG	HSRL, Box 214, 1050 Budapest, Hungary
HB, HBØ	USKA QSL Bureau, Box 9, CH4900 Langenthal, BE, Switzerland
HC	Guayaquil Radio Club - Box 5757, Guayaquil, Ecuador
HH	Radio Club of Haiti, Box 70-B, Port Au Prince, Haiti
HI	Radio Club Dominicano, Box 1157, Santo Domingo, Dominican Republic, West Indies
HK	Liga Colombiana De Radioaficionados - Box 584, Bogota, Colombia

HL9	All HL9 Stations - Address with call letters and name, c/o united States Forces Korea, OAC, OFS, J-6, APO San Francisco 96301
HM	Karl, Central Box 162, Seoul 100 - 00, Korea
HP	Liga Panamena Radioaficionados - Box 175, Panama 9A, Republic Dє Panama
HR	Radio Club Tegucigalpa, Box 149-C, Tegucigalpa, DC, Honduras
HR2	QSL Bureau, Radio Club De Honduras, Box 273, San Pedro Sula, Cortes, Honduras
HS	RASI QSL Bureau, Box 2008, c/o GPO, Bangkok, Thailand
I, IV-IZ	ARI-V Scarlatti 31, 20124 Milan, Italy
JA-JR	J.A.R.L., Sugamo 1-14-2, Toshima-Ku, Tokyo 170, Japan
JW-JX	NRRL, Box 21, Refstad, Oslo 5, Norway
JY	Royal Jordanian A.S., Box 11020, Amman, Jordan
KA	Fearl-M, c/o Sam Fleming, GARH-ID-GS-T, APO San Francisco 96343
KA6-KR6	Radio Society of Okinawa, Box 653, FPO Seattle 98773
KC4US	*VIA* Com Nav Supp for Antarctica, Code S0/ Communications, FPO San Francisco 96601
KG4	GARC, Box 73, FPO New York 09593
KG6	Guam only, *VIA* Box 445, Agana, Guam, Mariana IS
KL7	Alaska QSL Bureau, 4304 Garfield St., Anchorage, Alaska 99503
KM6	KM6BI, Box 43, FPO San Francisco 96614
KP4	Radio Club De Puerto Rico, Box 1061, San Juan, Puerto Rico 00902
KX6	Kwajalein Amateur Radio Club, KX6BU, Box 444, APO San Francisco 96555
LA-LJ	Norwegian Radio Relay Liga, Box 21, Refstad, Oslo 5, Norway
LU	Radio Club Argentino, CC97, Correo Central, 1000 Buenos Aires, CF, Argentina
LZ	Central QSL Bureau, Box 830, Sofia, Bulgaria
OA	Radio Club of Peru, Box 538, Lima, Peru
OD5	RAL QSL Bureau, Box 8888, Beirut, Lebanon
OE	OE, VSV QSL Bureau, Box 999, A-1014 Vienna, Austria

OH	SRAL QSL Bureau, Box 10306, SF-00101 Helsinki 10, Finland
OK-OL	Central Radio Club, Box 69, 11327 Prama 1, Czechoslovakia
ON	UBA, Box 634, 1000 Brussels 1, Belgium
OX4	OX4AA-ZZ *VIA* MARS Director, XP1AB, APO New York 09121
OX5	OX5AA-ZZ *VIA* MARS Director, XP1AA, APO New York 09023
PA-PI	Dutch QSL Bureau, Box 400, Rotterdam 3005, Netherlands
PJ	Verona QSL Bureau, Box 383, Willemstad, Curacao, Netherlands Antilles Cards for Aruba *ONLY* - Aruba Amateur Radio Club, Box 273, San Nicolas, Aruba, Netherlands Antilles
PT-PY	Labre/DF, Box 07-0004, 70000 Brasilia, DF, Brasil
P29	QSL Bureau, Box 204, Port Moresby, Papua New Guinea
SJ-SM	SSA, OSTMARKSG 43, S-12342 Farsta, Sweden
SP	PZK QSL Bureau, SKRYTKA POCZIOWA 320, 00950 Warszawa, Poland
SV	Mediterranean SV QSL Bureau, Box 564, Athens, Greece *OR VIA* SV QSL Bureau, NARU, Box 1442, Athens 20, Greece
S79	Seychelles Amateur Radio Society, Box 191 Victoria, Mahe, Seychelles
TA-TC	Turk Radio Amatorieri Cemiyeti, Box 699, Karakoy, Istanbul, Turkey
TF	IRA, Islenskir Radio Amatorar, Box 1058, Reykjavik, Iceland American Amateurs *only via* Reflavik Amateur Radio Organization, Box 44, FPO New York 09571
TG	CRAG, Box 115, Guatemala City, Guatemala
TI	Radio Club of Costa Rica, Box 2412, San Jose, Costa Rica
U	Central Radio Club, Box 88, Moscow, Russia
VE	CRRL Central QSL Bureau of Canada, Box 663, Halifax, Nova Scotia 83J ZT3, Canada
VE1	L. J. Fader, VE1FQ, P. O. Box 663, Halifax, NS B3J 2T3.
VE2	A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal PQ H3R 2E3

VE3	The Ontario Trilliums, P. O. Box 157, Downsview, ON M3M 3A3
VE4	W. A. Stunden, VE4BJ, 578 Oxford St., Winnipeg, MB R3M 3J9
VE5	A. Lloyd Jones, VE5JI, 2328 Grant Rd., Regina, SK S4S 5E3
VE6	G. D. Holeton, VE6AGV, 4003 1st St., N.W., Calgary, AB T2K OX2
VE7	Howard Martin, VE7AFY, No. 45-9960 Wilson Rd., Ruskin, BC VOM 1R0
VE8	A. Sturko, VE8NS, P. O. 72, Fort Smith, NWT XOE OPO
VP2A	Antigua - Gerald Price, VP2AC
VP2D	Dominica - Austin L. Harris, VP2DAJ
VP2G	Grenada - Fred W. Pressey, VP2GBL
VP2L	St. Lucia - Clement Bobb, VP2LCT
VP2S	St. Vincent - *VIA* QSL Bureau, Box 142, St. Vincent, Windward IS
VP9	Radio Society of Bermuda, Box 275, Hamilton 5, Bermuda
VQ9	VQ9 QSL Bureau, c/o MARS Station, NCS Diego Garcia, FPO San Francisco 96685
VU	Amateur Radio Society of India, Box 534, New Delhi 1, India *OR VIA* Calcutta ARL, 17 Woodlands, 8/7 Alipore Rd., Calcutta 700027, India
A,K,N,W1	Hampden County A. R. Assn., Box 216, Forest Park Stn, Springfield, MA 01108-Foreign Stations only.
A,K,N,W2	North Jersey DX Assn., Box 8160, Haledon, NJ 07508. Foreign Stations Only.
A,K,N,W3	Jesse Bieberman, Leon Lapkiewicz, K3GM, P. O. Box 6238, Philadelphia, PA 19136 Foreign Stations Only.
A,K,N,W4	National Capitol DX Assn., Box DX, Boyce, VA 22620 Foreign Stations Only.
WA-WB4	Sterling Park ARC, Box 599, Sterling Park, VA 22170 Foreign Stations Only.
A,K,N,W5	ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090 Foreign Stations Only.
A,K,N,W6	ARRL Sixth (6th) District DX QSL Bureau, P. O. Box 1460, Sun Valley, CA 91352 Foreign Stations Only.

A,K,N,W7	Willamette Valley DX Club, Box 555, Portland, OR 97207 Foreign Stations Only.
A,K,N,W8	Columbus A. R. Assn., Radio Rm, 280 E. Broad St., Columbus, OH 43215—Foreign Stations Only.
A,K,N,W9	Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126 Foreign Stations Only.
A,K,N,WØ	WØ QSL Bureau Radio Club AK-SAR-BEN, Box 291, Omaha, NE 68101 Foreign Stations Only.
XE	IARU-LMRE, Box 907, Mexico 1, DF, Mexico *OR VIA* QSL Bureau, Box 53, Mexico 1, DF, Mexico
YA	Cards for QSO's before August 19, 1973, may be sent *VIA* DK5AR, Wolfgang Kenner, Johann Uttingerstr 14, 4520 melle 1, German Fed. Republic
YB1	QSL Bureau, Box 314, Bandung, Indonesia
YB2	Central Java Northern Area *VIA* QSL Bureau, Box 88, Semarang, Indonesia Central Java Southern Area *VIA* QSL Bureau, Box 73, Solo, Indonesia
YB3	QSL Bureau, Box 59, Surabaia, Indonesia
YB4	Johanes Titaley, YB4GA
YB6	QSL Bureau, Box 464, Medan, Indonesia
YB7-Ø	ORARI QSL Bureau, Box 2761, Jakarta, Indonesia
YK	QSL Bureau, Box 35, Damascus, Syria
YN	C R E N QSL Bureau, Apto 925, Managua, Nicaragua
YO	The Central Radio Club, Box 1395, Bucuresti 5, Romania
YU	SRJ, Box 48, 11001 Belgrade, Yugoslavia
YV	IARU Bureau, Radio Club Venezolana, Box 2285, Caracas, DF, Venezuela *OR* ARV QSL Bureau, Box 3636, Caracas, DF, Venezuela
ZB2	Gibraltar ARS, Box 292, Gibraltar
ZO4	Joint Signal Board Hdqtrs., British Forces Cyprus, BFPO 53, London GPO, Great Britain
ZD7	W. R. Stevens, ZD7SD
ZD8	Ascension AR Relay League, ZD8ar
ZE	RSR QSL Manager, Box 2377, Salisbury, Rhodesia
ZF1	Cards addressed to Cayman IS *only* may be sent *VIA* ZF1AK
ZL	NZART, Box 40-212, Upper Hutt, New Zealand
ZP	Radio Club Paraguayo, Casilla De Correo 512, Asunction, Paraguay
ZR-ZS	SARL, Box 3037, Capetown 8000, Cape Province, South Africa

3D2	QSL Bureau, Box 184, Suva, Fiji Islands
3D6	Radio Society of Swaziland, Box 21, Ezulwini, Swaziland
4S7	Radio Society of SRI Lanka, Elettra, 7-1/1 47th Lane, Colombo, SRI Lanka, Elettra
4X4-4Z4	Shalom Bacalu, 4Z4BS, IARC QSL Bureau Manager, Box 10191, Tel-Aviv 61290, Israel
5A	QSL Bureau, Box 372, Tripoli, Libya
5B4	Cyprus Amateur Radio Society, Box 1267, Limassoil, Cyprus
5N2	Nigerian Amateur Radio Society, Box 2873, Lagos, Nigeria
5W1	Western Samoa RC, QSL Bureau - Secretary, Box 1069, Apia, Western Samoa
5Z4	RSEA QSL Bureau, Box 45681, Nairobi, Kenya
6Ø	*Via* Box 397, Mogadiscio, Somali Republic
6W8	Via 6W8BF, Box 971, Dakar, Senegal
6Y5	Jamaica Amateur Radio Assn., Jamaica Red Cross, 76 Arnold St., Kingston 5, Jamaica, West Indies
7Q7	H. Y. Bvumbwe, 7Q7AE
8P6	Radio Society of Barbados, Box 814E, Bridgetown, Barbados, Windward IS.
9H1-5	MARL, Box 575, Valetta, Malta
9H4	Eric Rogers, 9H4G
9I-9J	Radio Society of Zambia, Box 332, Kitwe, Zambia
9L1	Sierra Leone ARS, 9L1SL, Box 10, Freetown, Sierra Leone
9H2,6,8	MARTS, Box 777, Kuala Lumpur, Malaysia
9Q5	UZRA, QSL Bureau, Box 1459, Kinshasa, Republic of Zaire
9U5	BARC QSL Bureau, ON5TO, 8 Buterbekeweg, 8-8200 Brugge, WV, Belgium
9V1	SARTS, Box 2728, Republic of Singapore 1
9X5	RAR QSL Bureau, Box 663, Kigali, Republic of Rwanda
9Y4	Trinidad & Tobago Amateur Radio Society, Box 1167 Port-of-Spain, Trinidad

Appendix D
International Prefixes

PREFIX	*COUNTRY*
AP	PAKISTAN
A2C	BOTSWANA
A35	TONGA
A4X	SULTANATE OF OMAN
A51	BHUTAN
A6X	UNITED ARAB EMIRATES
A7X	QATAR
A9X	BAHRAIN
BV	TAIWAN
BY	PEOPLES REPUBLIC OF CHINA
CE	CHILE
CE9AA-AM	CHILEAN ANTARCTICA TIERRA DE O'HIGGINS, PALMER PENINSULA, GRAHAM LAND
CE9AN-AZ	SOUTH SHETLAND IS.
CE0A	EASTER IS.
CE0X	SAN FELIX IS.
CE0Z	JUAN FERNANDEZ IS.
CM	CUBA
CN	MOROCCO
CO	CUBA
CP	BOLIVIA
CR3	GUINEA BISSAU
CR9	MACAO
CT1	PORTUGAL
CT2	AZORES IS.
CT3	MADEIRA IS.
CX	URUGUAY
C21	REPUBLIC OF NAURU
C31	ANDORRA
C5A	GAMBIA
C6A	BAHAMA IS.
C9M	MOZAMBIQUE
DA-DL	FED REP OF WEST GERMANY
DM	EAST GERMAN DEMOCRATIC REP.
DU	PHILIPPINES
D2A	ANGOLA
D4	REP OF CAPE VERDE
D6	STATE OF COMORO

EA ..... SPAIN
EA6 ..... BALEARIC IS.
EA8 ..... CANARY IS.
EA9 ..... SPANISH SAHARA, CEUTA Y MELILLA
EI ..... IRELAND
EL,5L ..... LIBERIA
EP ..... IRAN
ET3 ..... ETHIOPIA

F ..... FRANCE
FB8W ..... CROZET IS.
FB8X ..... KERGUELEN IS.
FB8Y ..... ANTARCTICA
FB8Z ..... AMSTERDAM & ST. PAUL IS.
FC ..... CORSICA
FG7 ..... GUADELOUPE
FH8 ..... MAYOTTE
FK8 ..... NEW CALEDONIA
FM7 ..... MARTINIQUE
FO8 ..... FRENCH POLYNESIA, CLIPPERTON IS.
FP8 ..... ST. PIERRE & MIQUELON IS.
FR7 ..... GLORIOSO, JUAN DE NOVA, REUNION, TROMELIN IS.
FS7 ..... ST. MARTIN IS.
FW8 ..... WALLIS & FUTUNA IS.
FY7 ..... FRENCH GUIANA

G ..... ENGLAND
GD ..... ISLE OF MAN
GI ..... NORTHERN IRELAND
GJ ..... JERSEY
GM ..... SCOTLAND
GU ..... BAILIWICK OF GUERNSEY
GW ..... WALES

HA,HG ..... HUNGARY
HB ..... SWITZERLAND
HB0 ..... LIECHTENSTEIN
HC ..... ECUADOR
HC8 ..... GALAPAGOS IS.
HG ..... HUNGARY
HH ..... HAITI
HI ..... DOMINICAN REPUBLIC
HK ..... COLOMBIA
HK0 ..... BAJO NUEVO,MALPELO,SAN ANDRES & PROVIDENCIA IS.
HK0 ..... SERRANA BANK & RONCADOR CAY
HM,HL9 ..... KOREA
HP ..... PANAMA
HR ..... HONDURAS
HR0 ..... SWAN IS.
HS ..... THAILAND
HV ..... VATICAN CITY
HZ,7Z ..... SAUDI ARABIA
H4 ..... SOLOMON IS.

I, IW ..... ITALY
IA ..... TUSCAN ARCHIPELAGO

IC ..... CAPRI & ISCHIA IS.
IG9 ..... LAMPEDUSA IS.
IH ..... PANTELLERIA IS.
IM ..... MADDALENA IS.
IS ..... SARDINIA
IT ..... SICILY

JA,JE-JJ,JR ..... JAPAN
JD1 ..... OGASAWARA,MINAMI-TORI-SHIMA IS.
JR6 ..... OKINAWA (RYUKYU IS.)
JT1 ..... MONGOLIA
JW ..... SVALBARD IS.
JX ..... JAN MAYEN IS.
JY ..... JORDAN
J2 ..... REP OF DJIBOUTI
J3 ..... GRENADA & DEPENDENCIES

K ..... UNITED STATES OF AMERICA
KA ..... U.S.PERSONNEL IN JAPAN
KB6 ..... BAKER,CANTON,ENDERBURY, HOWLAND & PHOENIX IS.
KC4 ..... NAVASSA IS.
KC4AA,KC4US ..... ANTARCTICA
KC6 ..... CAROLINE IS.
KG4 ..... GUANTANAMO BAY
KG6 ..... MARIANA IS.
KG6 ..... GUAM
KG6R ..... ROTA
KG6S ..... SAIPAN
KH6 ..... HAWAII & KURE IS.
KJ6 ..... JOHNSTON IS.
KL7 ..... ALASKA
KM6 ..... MIDWAY IS.
KP4 ..... PUERTO RICO
KP6 ..... JARVIS & PALMYRA IS.
KS6 ..... AMERICAN SAMOA
KV4 ..... VIRGIN IS.
KW6 ..... WAKE IS.
KX6 ..... MARSHALL IS.
K25 ..... CANAL ZONE
LA-LJ ..... NORWAY
LU ..... ARGENTINA
LU-Z ..... ANTARCTICA
LX ..... LUXEMBOURG
LZ ..... BULGARIA

M1 ..... SAN MARINO

N ..... UNITED STATES OF AMERICA

OA ..... PERU
OD5 ..... LEBANON
OE ..... AUSTRIA
OH ..... FINLAND
OHO ..... ALAND IS.
OJO, OHOM ..... MARKET REEF

OK,OL ..... CZECHOSLOVAKIA
ON ..... BELGIUM
OR ..... ANTARCTICA
OX ..... GREENLAND
OY ..... FAEROES IS.
OZ ..... DENMARK

PA-PI ..... NETHERLANDS
PJ ..... NETHERLANDS ANTILLES
PJ2,9 ..... CURACAO
PJ3,9 ..... ARUBA
PJ4,9 ..... BONAIRE
PJ5,8 ..... ST. EUSTATIUS
PJ6,8 ..... SABA IS.
PJ7,8 ..... SINT MAARTEN
PP-PY ..... BRAZIL
PY0 ..... FERNANDO DE NORONHA IS.
PY0 ..... ST. PETER & ST. PAUL'S ROCKS
PY0 ..... TRINIDADE & MARTIM VAZ IS.
PZ ..... SURINAM
P29 ..... PAPUA NEW GUINEA

SJ-SM ..... SWEDEN
SP ..... POLAND
ST ..... SUDAN
SU ..... EGYPT
SV ..... CRETE,GREECE
SV5 ..... DODECANESE IS.
S2,S3 ..... BANGLADESH
S7 ..... SEYCHELLES IS.
S8 ..... TRANSKEI
S9 ..... SAO TOME & PRINCIPE IS.

TA,TC ..... TURKEY
TF ..... ICELAND
TG ..... GUATEMALA
TI ..... COSTA RICA
TI9 ..... COCOS IS.
TJ ..... CAMEROON
TL8 ..... CENTRAL AFRICAN REPUBLIC
TN8 ..... REPUBLIC OF CONGO
TR8 ..... GABON REPUBLIC
TT8 ..... REPUBLIC OF CHAD
TU2 ..... IVORY COAST
TY ..... PEOPLES REPUBLIC OF BENIN
TZ ..... MALI REPUBLIC

UA1,2,3,4,6 ..... EUROPEAN RUSSIAN SOVIET FEDERATED SOCIALIST REPUBLIC
UA9,0 ..... ASIATIC RUSSIAN S.F.S.R.
UA1 ..... FRANZ JOSEF LAND
UA2 ..... KALININGRADSK
UB5 ..... UKRAINIAN S.S.R.
UC2 ..... WHITE RUSSIAN S.S.R.
UD6 ..... AZERBAIDZHAN S.S.R.
UF6 ..... GEORGIAN S.S.R.
UG6 ..... ARMENIAN S.S.R.

UH8 ..... TURKMEN S.S.R.
UI8 ..... UZBEK S.S.R.
UJ8 ..... TADZHIK S.S.R.
UL7 ..... KAZAKH S.S.R.
UM8 ..... KIRGHIZ S.S.R.
UN1 ..... KARELO-FINNISH S.S.R.
UO5 ..... MOLDAVIAN S.S.R.
UP2 ..... LITHUANIAN S.S.R.
UQ2 ..... LATVIAN S.S.R.
UR2 ..... ESTONIAN S.S.R.

VE ..... CANADA
VK ..... AUSTRALIA
VK2 ..... LORD HOWE IS.
VK9N ..... NORFOLK IS.
VK9X ..... CHRISTMAS IS.
VK9V ..... COCOS IS.
VK9Z ..... WILLIS IS.
VKO ..... ANTARCTICA
VO1 ..... NEWFOUNDLAND
VO2 ..... LABRADOR
VP1 ..... BELIZE
VP2 ..... LEEWARD & WINDWARD IS.
VPZA ..... ANTIGUA,BARBUDA
VP20 ..... DOMINICA
VP2E ..... ANGUILLA
VP2K ..... ST KITTS,NEVIS
VP2L ..... ST LUCIA
VP2M ..... MONSTERRAT
VP25 ..... ST VINCENT & DEPENDENCIES
VP2V ..... BRITISH VIRGIN IS.
VP5 ..... TURKS & CAICOS IS.
VP8 ..... FALKLAND,S.GEORGIA,S.ORKNEY, S.SANDWICH,S.SHETLAND IS.,GRAHAM LAND
VP9 ..... BERMUDA IS.
VQ9 ..... CHAGOS
VR1 ..... BRITISH PHOENIX,GILBERT & OCEAN IS.
VR3 ..... NORTHERN LINE IS.
VR6 ..... PITCAIRN IS.
VR7 ..... CENTRAL & SOUTHERN LINE IS.
VR8 ..... TUVALU IS.
VS5 ..... BRUNEI
VS6 ..... HONG KONG
VU2 ..... INDIA
VU7 ..... ANDAMAN & NICOBAR IS.
VU7 ..... LACCADIVE IS.

W ..... UNITED STATES OF AMERICA

XE,XF ..... MEXICO
XF4 ..... REVILLA GIGEDO IS.
XT2 ..... VOLTAIC REPUBLIC
XU ..... CAMBODIA/KHMER REPUBLIC
XV5 ..... VIETNAM
XW8 ..... LAOS
XZ ..... BURMA

YA.....AFGHANISTAN
YB-YD.....INDONESIA,TIMOR IS.
YI.....IRAQ
JQ.....NEW HEBRIDES
YK.....SYRIA
YN.....NICARAGUA
YO.....ROMANIA
YS.....EL SALVADOR
YU.....YUGOSLAVIA
YV.....VENEZUELA
YV0.....AVES IS.

ZA.....ALBANIA
ZB2.....GIBRALTAR
ZD7.....SAINT HELENA IS.
ZD8.....ASCENSION IS.
ZD9.....TRISTAN DA CUNHA & GOUGH IS.
ZE.....RHODESIA
ZF1.....CAYMAN IS.
ZK1.....COOK & MANIHIKI IS.
ZK2.....NIUE IS.
ZL.....NEW ZEALAND & AUCKLAND,CAMPBELL,CHATHAM,KERMADEC IS.
ZL5.....ANTARCTICA
ZM7.....TOKELAU IS.
ZP.....PARAGUAY
ZR,ZS1,2,4,5,6.....REPUBLIC OF SOUTH AFRICA
ZS1ANT.....ANTARCTICA
ZS2.....PRINCE EDWARD & MARION IS.
ZR,ZS3.....SOUTHWEST AFRICA (NAMIBIA)

3A.....MONACO
3B6.....AGALEGA IS.
3B7.....ST. BRANDON IS.
3B8.....MAURITIUS IS.
3B9.....RODRIGUEZ IS.

3C.....EQUATORIAL GUINEA
3D2.....FIJI IS.
3D6.....SWAZILAND
3V8.....TUNISIA
3X.....REPUBLIC OF GUINEA
3Y.....BOUVET IS.

4K1.....ANTARCTICA
4S7.....SRI LANKA
4U.....UNITED NATIONS,GENEVA
4W.....YEMEN
4X4,4Z4.....ISRAEL

5A.....LIBYAN ARAB REPUBLIC
5B4,ZC4.....CYPRUS
5HI.....ZANZIBAR,TANZANIA
5H3.....TANZANIA
5L.....LIBERIA
5N2.....NIGERIA
5R8.....MALAGASY REPUBLIC
5T5.....MAURITANIA

5U7	NIGER
5V	TOGO
5W1	WESTERN SAMOA
5X5	UGANDA
5Z4	KENYA
6O	SOMALI REPUBLIC
6W8	SENEGAL REPUBLIC
6Y5	JAMAICA
7J	OKINO-TORI-SHIMA
7O	SOUTH YEMEN & KAMARAN IS
7P8	LESOTHO
7Q7	MALAWI
7X	ALGERIA
7Z	SAUDI ARABIA
8J	ANTARCTICA
8P6	BARBADOS IS.
8Q6	MALDIVE IS.
8R	GUYANA
8Z4	SAUDI ARABIA/IRAQ NEUTRAL ZONE
9G1	GHANA
9H1,5	MALTA
9H4	GOZO (MALTA)
9I,9J	ZAMBIA
9K2	KUWAIT
9L1	SIERRA LEONE
9M2	WEST MALAYSIA
9M6	SABAH
9M8	SARAWAK
9N1	NEPAL
9Q5	REPUBLIC OF ZAIRE
9U5	BURUNDI
9V1	REPUBLIC OF SINGAPORE
9X	RWANDA
9Y4	TRINIDAD & TOBAGO IS.

COUNTRY	*PREFIX*
AFGHANISTAN	YA
AGALEGA IS	3B6
ALAND IS	OH0
ALASKA	KL7
ALBANIA	ZA
ALGERIA	7X
AMSTERDAM & ST. PAUL IS	FB8Z
ANDAMAN & NICOBAR IS	VU7
ANDORRA	C31
ANGOLA	D2A
ANTARCTICA	CE9AA-AM,FBBY,KC4,LU-Z, UA1,VK0,VP8,ZL5,ZS1ANT,3Y,4K1,8J
ARGENTINA	LU
ARUBA	PJ3,9
ASCENSION IS	ZD8
AUCKLAND & CAMPBELL IS	ZL
AUSTRALIA	VK
AUSTRIA	OE

AVES IS	YV0
AZDRES IS	CT2
BAHAMA IS	C6A
BAHRAIN IS	A9X
BAJO NUEVO IS	HK0
BAKER IS	KB6
BALEARIC IS	EA6
BANGLADESH	S2,S3
BARBADOS IS	8P6
BELGIUM	ON
BELIZE	VP1
BENIN, PEOPLE'S REP OF	TY
BERMUDA IS	VP9
BHUTAN	A51
BOLIVIA	CP
BONAIRE	PJ4,9
BOTSWANA	A2C
BOUVET IS	3Y
BRAZIL	PP-PY
BRITISH PHOENIX IS	VR1
BRUNEI	VS5
BULGARIA	LZ
BURMA	XZ
BURUNDI	9U5
CAMBODIA/KHMER REP	XU
CAMEROON	TJ
CANADA	VE
CANAL ZONE	KZ5
CANARY IS	EA8
CANTON IS	KB6
CAPE VERDE, REP OF	D4
CAPRI IS	IC
CAROLINE IS	KC6
CAYMAN IS	ZF1
CENTRAL AFRICAN REPUBLIC	TL8
CEUTA Y MELILLA, SPANISH	EA9
CHAD REPUBLIC	TT8
CHAGOS IS	VQ9
CHATHAM IS	ZL
CHILE	CE
CHINA, PEOPLES REP OF	BY
CHRISTMAS IS	VK9X
CLIPPERTON IS	FO8
COCOS IS	TI9
COCOS (KEELING) IS	VK9Y
COLUMBIA	HK
COMORO,STATE OF	D6
CONGO, REPUBLIC OF	TN8
COOK IS	ZK1
CORSICA	FC
COSTA RICA	TI
CRETE, GREECE	SV
CROZET IS	FB8W
CUBA	CM,CO
CURACAO	PJ2,9

CYPRUS	5B4,ZC4
CZECHOSLOVAKIA	OK,OL
DENMARK	OZ
DJIBOUTI,REP OF	J2
DODECANESE IS	SV5
DOMINICAN REPUBLIC	HI
EASTER IS	CEOA
ECUADOR	HC
EGYPT	SU
EL SALVADOR	YS
ENDERBURY IS	KB6
ENGLAND	G
ETHIOPIA	ET3
FAEROES IS	OY
FALKLAND IS	VP8
FERNANDO DE NORONHA	PYO
FIJI IS	3D2
FINLAND	OH
FRANCE	F
FRENCH POLYNESIA	FD8
GABON REPUBLIC	TR8
GALAPAGOS IS	HC8
GAMBIA	C5A
GERMANY, FED. REP. (WEST)	DA-DL
GERMAN DEM. REP. EAST	DM
GHANA	9G1
GIBRALTAR	ZB2
GILBERT & OCEAN IS	VR1
GLORIOSO IS	FR7
GOUGH IS	ZD9
GOZO (MALTA)	9H4
GRAHAM LAND	VP8,LU-Z
GREECE	SV
GREENLAND	OX
GRENADA	J3
GUADELOUPE	FG7
GUAM IS	KG6
GUANTANAMO BAY	KG4
GUATEMALA	TG
GUERNSEY,BAILIWICK OF	GU
GUIANA, FRENCH	FY7
GUINEA BISSAU	CR3
GUINEA, EQUATORIAL	3C
GUINEA, REPUBLIC OF	3X
GUYANA	8R
HAITI	HH
HAWAII	KH6
HEARD IS	VKO
HONDURAS	HR
HONG KONG	VS6
HOWLAND IS	KB6
HUNGARY	HA, HG

ICELAND	TF
INDIA	VU2
INDONESIA	YB-YD
IRAN	EP
IRAQ	Y1
IRELAND	E1
ISCHIA	IC
ISLE OF MAN	GD
ISRAEL	4X4,4Z4
ITALY	I,IW
IVORY COAST	TU2
JAMAICA	6Y5
JAN MAYEN IS	JX
JAPAN	JA-JR
JAPAN, U.S.PERSONNEL IN	KA
JARVIS IS	KP6
JERSEY	GJ
JOHNSTON IS	KJ6
JORDON	JY
JUAN DE NOVA IS	FR7
JUAN FERNANDEZ IS	CE02
KAMARAN IS	7D
KENYA	5Z4
KERGUELEN IS	FB8X
DERMADEC IS	ZL
KOREA	HM,HL9
KURE IS	KH6
KUWAIT	9K2
LABRADOR	VD2
LACCADIVE IS	VU7
LAMPEDUSA IS	IG9
LAOS	XW8
LEBANON	DD5
LEEWARD IS.	
ANGUILLA	VPZE
ANTIGUA, BARBUDA	VP2A
BRITISH VIRGIN IS	VP2V
MONTSERRAT	VP2M
ST. KITTS, NEVIS	VP2K
LESOTHO	7P8
LIBERIA	EL,5L
LIBYAN ARAB REPUBLIC	5A
LIECHTENSTEIN	HB0
LINE IS, NORTHERN	VR3
LINE IS,CENTRAL & SOUTHERN	VR7
LORD HOWE IS	VK2
LUXEMBOURG	LX
MACAO	CR9
MACQUARIE IS	VK0
MADDALENA IS	IM
MADEIRA IS	CT3
MALAGASY REPUBLIC	5R8
MALAWI	7Q7

MALAYSIA, EAST	9M6,8
MALAYSIA, WEST	9M2
MALDIVE IS	8Q6
MALI REPUBLIC	TZ
MALPELO IS	HK0
MALTA	9H1,5
MANIHIKI IS	2K1
MARIANA IS	KG6
MARKET REEF	OJ0,OH0M
MARSHALL IS	KX6
MARTINIQUE	FM7
MAURITANIA	5T5
MAURITIUS IS	36B
MAYOTTE	FH8
MEXICO	XE,AF
MIDWAY IS	KM6
MINAMI-TORI-SHIMA IS	JD1
MONACO	3A
MONGOLIA	JT1
MOROCCO	ON
MOZAMBIQUE	09M
NAURU, REPUBLIC OF	Q21
NAVASSA IS	KC4
NEPAL	9N1
NETHERLANDS	PA-PI
NETHERLANDS ANTILLES	PJ
NEW CALEDONIA	FK8
NEWFOUNDLAND	V01
NEW HEBRIDES	YJ
NEW ZEALAND	ZL
NICARAGUA	YN
NIGER	5U7
NIGERIA	5N2
NIUE IS	ZK2
NORFOLK IS	VK9N
NORTHERN IRELAND	GI
NORWAY	LA-LJ
OGASAWARA IS	JDI
OKINAWA (RYUKYU IS.)	JR6
OKINO-TORI-SHIMA	7J1
OMAN, SULTANATE OF	A4K
PAKISTAN	AP
PALMYRA IS	KP6
PANAMA	HP
PANTELLERIA IS	IH
PAPUA NEW GUINEA	P29
PARAGUAY	ZP
PERU	OA
PHILLIPINES	DU
PHEONIX IS	K36
PITCAIRN IS	VR6
POLAND	SP
PORTUGAL	CT1
PRINCE EDWARD & MARION IS.	Z52
PRINCIPE & SAO TOME IS	S9

PUERTO RICO KP4
QATAR A7K
REUNION IS FR7
REVILLA GIGEDO IS XF4
RHODESIA ..... ZE
RODRIGUEZ IS 3B9
ROMANIA ..... YO
ROTA KG6R
RWANDA 9X
SABAH 9M6
SABA IS PJ6,8
ST. BRANDON IS 3B7
ST. EUSTATIUS PJ5,8
SAINT HELENA IS ZD7
SAINT MARTIN IS FS7
ST. PETER & ST. PAULS ROCKS PY0
ST. PIERRE & MIQUELON IS FP8
SAIPAN KG6S
SAMOA, AMERICAN KS6
SAMOA, WESTERN 5WI
SAN ANDRES & PROVIDENCIA HK0
SAN FELIX IS CE0X
SAN MARINO M1
SARAWAK 9M8
SARDINIA ..... IS
SAUDI ARABIA ..... HZ, 7Z
SAUDI ARABIA/IRAQ
NEUTRAL ZONE BZ4
SCOTLAND ..... GM
SENEGAL REPUBLIC 6W8
SERRANA BK & RONCADOR CAY 8K0
SEYCHELLES IS S79
SICILY ..... IT
SIERRA LEONE 9LI
SINGAPORE, REP OF 9V1
SINT MAARTEN PJ7,8
SOLOMON IS H4
SOMALI REPUBLIC 60
SOUTH AFRICA,REP OF ZR,AZQ,2,4-6
SOUTH GEORGIA IS VP8
SOUTH ORKNEY IS ..... QZ, 2, VP8
SOUTH SANDWICH IS ..... QZ, 2, VP8
S.SHETLAND IS CE9AN-AZ,QZ-Z,VP8
SOUTHWEST AFRICA(NAMIBIA) ZR3,ZS3
SOUTH YEMAN 70
SOVIET UNION:
EUROPEAN RUSSIA SOVIET FEDERATED
SOCIALIST REPUBLIC UA1,2,3,4,6
ASIATIC RUSSIAN SFSR UA9,0
ARMENIAN S.S.R UG6
AZERBAIDZHAN S.S.R UD6
ESTONIAN S.S.R UR2
FRANZ JOSEF LAND UA1
GEORGIAN S.S.R UF6
KALININGRADSK UA2

KARELO-FINNISH S.S.R	UN1
KAZAKH S.S.R	UL7
KIRGHIZ S.S.R	UMB
LATVIAN S.S.R	UQ2
LITHUANIAN S.S.R	UP2
MOLDAVIAN S.S.R	UO5
TADZHIK S.S.R	UJ8
TURKMEN S.S.R	UH8
UKRANIAN S.S.R	UB5
UZBEK S.S.R	UI8
WHITE RUSSIAN S.S.R	UC2
SPAIN	EA
SPANISH SAHARA	EA9
SRI LANKA	4S7
SUDAN	ST
SURINAM	P2
SVALBARD IS	JW
SWAN IS	HRO
SWAZILAND	3D6
SWEDEN	SJ-SM
SWITZERLAND	HB
SYRIA	YK
TAIWAN	BV
TANZANIA	5H3
THAILAND	HS
TIBET	AC4
TIMOR PORTUGUESE	YB-YD
TOGO	5V
TOKELAU IS	2M7
TUNGA	A35
TRANSKEI	S8
TRANDADE & MARTIM VAZ IS	PYO
TRINIDAD & TOBAGO IS	9Y4
TRISTAN DE CUNHA	ZD9
TROMELIN IS	FR7
TUNISIA	3V8
TURKEY	TA,TC
TURKS & CAICOS IS	VP5
TUSCAN ARCHIPELAGO	IA
TUVALU IS	VR8
UGANDA	5X5
UNITED ARAB EMIRATES	A6X
UNITED NATIONS, GENEVA	4U
UNITED STATES OF AMERICA	N,W,K
URUGUAY	CX
VITICAN CITY	HV
VENEZULA	YV
VIETNAM	XV5
VIRGIN IS	KV4
VOLTAIC REPUBLIC	XT2
WAKE IS	KW6
WALES	GW
WALLIS & FUTUNA IS	FW8
WILLIS IS	VK9Z

WINDWARD IS:
- DOMINICA VP2D
- ST. LUCIA VP2L
- ST. VINCIENT & DEPENDENCIES VP2S

YEMEN 4W
YUGOSLAVIA ..... YU

ZAIRE, REPUBLIC OF 9Q5
SAMBIA 9I,9J
ZANZIBAR (TANZANIA) 5H1

Index