“THE NEW DXER’S HANDBOOK” ©

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Originally this handbook was written for the membership of the Utah DX Association. Some of the details are specific to our Utah location. If you are in another region you will have different, but similar resources for DX clusters, QSL bureau contacts, card checkers, etc. Your specific details can easily be found on the web.

Some of our members asked for an azimuth chart to be included in the handbook. The one on page 30 is again specific for Utah. You can easily generate one for your exact location by using one of the resources listed in the propagation chapter.

Good luck with your DXing!

Forward: **Every accomplished DXer was a beginner at one time. This booklet contains many of the basics of successful DXing. DXing can become a lifelong passion. It is also a lot of fun! DXing offers opportunities of personal growth in a wide variety of areas from geography, to science, to language skills. It also offers a competitive outlet for those who are so inclined.**

I hope that this short handbook will give a running start to those new to our ranks.

Best regards,
Bryce Anderson, K7UA

CHAPTER - 1

Listening – The key to successful DXing:

The humble student approached the Zen Master, bowing and slowly gaining the courage to ask: "Master….. What is the secret of working DX?" The Master smiled and simply replied: "**Listen. Always listen**, Grasshopper."

Listen? Why? Listen for what?

In the most literal sense an accomplished DXer is truly a hunter. Great hunters know what they are hunting, what it looks like, what it sounds like, and where it is likely to be found. They don't just tromp through the woods hoping that their prize will just stand in front of them saying "Hey, shoot me!" They know when and where to look to improve their odds and they keep a keen eye open to find the big game before someone else does.

That is why we listen. We are scouting the band for stations that just came on the air. The weak ones from far away that no one else has noticed yet. If you are the first to find a great DX station, you will probably get him. You will have no competition. Also, some openings to the most remote places on Earth are only a few minutes long. You have to be there at just the right time. Sometimes propagation can be very selective in who can contact who. You might just be the only one hearing that rare DX station.

Oh! I don't need to do that! I'll just wait for him to come up on the DX Cluster system.

OK. If you are **"THE T-REX"** of 20M this might work out fine. You have the power to destroy your competition and slam through any pile up. However, for the rest of us, once a rare DX station is spotted the competition skyrockets. And by not listening, you will miss out on those weak ones that no one else ever hears or bothers to spot. Using DX Clusters is a terrific tool, but it isn't the only means to becoming a successful DXer. We will discuss DX Clusters in a later chapter.

Now back to **listening - the key to successful DXing.** The concept of listening is very simple. Start on one end of the band and slowly tune up or down the band looking for DX. You should especially check out the DX portion of that band. The DX portion is usually the lower end of each sub-band (phone & CW). While you are slowly tuning, stop on each station that you hear for a few seconds and figure out if they are DX, working DX, or of no interest to a DXer. Pick out call letters. They are the obvious way to determine if a station is DX or not. The subject that they are discussing can also be a clue. A rag chew discussing something mundane can be skipped over. A station ripping off QSOs as fast as they can go is something to be checked out further. Pay special attention to weak signals, phone operators speaking with accents or in a foreign language, and to signals that just sound "funny." By funny I mean having a "fluttery" sound, an echo, or a poor CW note. Signals that travel over the poles are impacted by the aurora that is always present. It gives both phone and CW signals the fluttery sound. It is called "arctic flutter." Once you have heard it, you will never forget it. Echoes come from signals arriving at your

location from multiple paths. The difference in those path lengths creates the echo. Sometimes US stations sound this way from "backscatter," but some DX stations from very far away may be arriving via multiple paths and also have an echo. Poor CW notes may be caused by echoes or from technical issues at the DX station. A poor power source or equipment that was not constructed to modern standards may tip you off to a DX station. Commercial power is very poor in many parts of the world and good equipment may be very hard to obtain. Of course when you tune upon a huge pileup you know that something of interest is on!

The best way to listen is by wearing headphones. Having a nice speaker to use with rag chews, waiting for your turn on the net roster, or other casual operating is fine. For DXing you need headphones. Headphones allow you to reduce the noise around you and to use the minimum of AF gain (volume). You can concentrate better without distractions. **You will hear a weak signal better with headphones.** Trust me on that.

Not just any headphones will do. First they have to be comfortable so that you can wear them for extended periods. Another factor to consider is the frequency response of the headset. High fidelity headsets designed for music have a very wide frequency response. Typically from 50 to 20,000 hertz. Communications only uses a range from about 300 to 3,000 hertz. You don't want those super highs because in a communications situation they are just noise. The chest thumping bass response is also useless. You are better off with a headset designed for communications. Various manufacturers make them. Most of us use headsets made by Heil Sound http://www.heilsound.com/ . They are the standard for ham radio and difficult to beat. Noise cancelling phones can be useful if you have something like an amplifier blower making a constant sound that can be blocked out. The final choice of a headset is very personal, just like picking out a pair of shoes.

As you gain experience in listening you will get greater and greater rewards. There is no doubt that an experienced DXer will pick out many more DX stations than a less experienced operator. You too can gain that skill through practice. After a while you will be able to "sniff out" DX that many others won't even notice.

CHAPTER - 2

DX Cluster basics

Back in the day there was no Internet or DX clusters. Buddies called each other on the phone or on local 2M frequencies to get the word out to their friends about a good one being on. That is why UDXA still has a 2M frequency of 147.60 coordinated with the VHF Society. It's a relic of an earlier time. Nowadays DX Clusters are an infinitely better solution to that issue. They have become so important that every serious DXer needs to have Internet access and know how to properly use a DX Cluster. A few purists hate the concept, but like it or not the technology is here. Here is a brief summary of how to use a cluster.

How it works: There are many DX clusters throughout the world. They are all connected via the Internet. Consequently data that is submitted to any one of them gets instantly routed to all of them world wide. The data is called a "spot." The spot shows the call of a DX station, the frequency that it is operating on, the time, and identifies who submitted the spot. Various software filters at the cluster or on your own computer can pass through spots that are relevant to you and screen out ones that are not. Our local cluster is NC7J and can be accessed at www.nc7j.com or via telnet or packet connections. There are useful functions at that site to filter spots that you wish to see or do not wish to see. There is also a very valuable function to search for data. If you want to see if ZS8M has been active and at what times and frequencies, you can just search for his call. Obviously that will help you know when and where to look for him.

Great. I now am connected and I see spots for stations that I want to contact. It is working.
Here is a more advanced concept. While all of the clusters get sent pretty much the same data there are reasons to monitor more than one. The mother of all DX clusters is in Finland and operated by Radio Arcala OH8X. It can be accessed at http://www.dxsummit.fi/ . It can be useful to see the stations that are being spotted in other parts of the world to get a feel for propagation conditions or to see if that new DXpedition actually went on the air when they said that they would. You might even see yourself spotted from Europe.

Some cluster manners: It is considered poor form and very much frowned upon to spot yourself. The idea is to spot DX stations. While it is possible to send messages via this system, it is not Instant Messenger and should not be used as such. It isn't Twitter either. No one wants to hear your "tweets." Not every DX station warrants being spotted. Don't clutter up the cluster with spots from really common places. No one cares about them. If you are fortunate enough to be the first to discover a great DX station consider whether to spot him or not. Or to spot him a little later. If you and a couple of other guys found the DX at the same time and you got through first, hold off spotting. Give the other discoverers a chance to work him. They have earned that right by finding the DX on their own too. Once you send that spot an instant dog pile is likely. The height of stupidity is to show the world how clever you are by spotting some really rare DX before you have worked it yourself. It is comical to see a

spot and then hear the guy who sent it trying to make it through the chaos that he just created. Also, don't spot a station that already has drawn a big crowd. He already has all that he can handle. Did you just work a guy calling CQ and now he is CQing again? Give him a boost with a spot. Some DX stations will ask you to spot them. Don't duplicate spots that are already posted. Always be **VERY** careful what you enter. If you meant to enter PZ5XX on 20M CW and you mistype it as P5XX you will tick off the whole world! Tens of thousands of alarms will go off. Everybody needs North Korea on CW and you will instantly become extremely unpopular! If you see a spot for a good one and you can hear him, listen to be sure that the call sign of the spot was posted correctly. Mistakes are made. A call may have actually been HH3AA (Haiti), but some guy can't count dits and posted it as 5H3AA (Tanzania). Then everyone after him assumes that they worked a 5H, when actually they did not. Always double check the facts. One final thought. Just because you see a good spot does not mean that you can hear him. Don't just pile in and start calling him without first listening to see if you can actually hear him well enough for a QSO. If you can't hear him, leave him to the guys who can. That goes double if the DX station is running simplex.

CHAPTER - 3

The Holy Grail of DXing - the ARRL's DX Century Club:

"Real men don't eat quiche and real DXers are always working on DXCC."
Well, maybe that isn't true, but it ought to be!

Back in 1935 the ARRL launched what is the premier award in all of amateur radio. The idea was to work at least 100 "countries" and to obtain written proof of those contacts. The term "country" does not always mean a literal country. Hawaii and Alaska are part of the USA, but because of their distance from the rest of the nation they count as separate countries. The award was reborn after WWII. It was again modernized in 2000. The term "country" has been updated to the more accurate term of "entity." There are some rather complicated rules about what constitutes an entity, but it is no longer something that is open to interpretation as it once was. See http://www.arrl.org/dxcc for information on the award. A current countries/entities list is available at http://www.arrl.org/country-lists-prefixes . I'm going to use country and entity interchangeably in this chapter. I just can't break the habit.

DXCC is a really nice award!

So should you care about this? Maybe you don't, but most DXers are interested in working as many countries as they can and attaining and upgrading their DXCC award. It is a life long competition with other hams, and with yourself. **The DXCC award is a badge of DXing competency that is to be prized!** There are actually a number of different awards in DXCC. There are "mixed" (any mode counts), phone, CW, RTTY, QRP, satellite, single band (160M, 80m, etc.) awards, and the highly prized 5 band DXCC award for confirming 100 countries on each of the traditional bands of 80, 40, 20, 15 & 10M.

The basic DXCC award requires 100 confirmed countries, but that isn't the end. There are endorsement stickers to place on your award certificate for confirming more countries. The stickers are issued at intervals defined in the DXCC rules. See the link above.

There is another award called the "Challenge." The Challenge is an extension of regular DXCC. This one requires 1,000 band-countries for the basic award. A band-country credit is given for a confirmed country on any given band from 160 – 6M. Example: If you work England on 80M, 20M, and 10M you get three band-countries. The DXCC endorsements and "Challenge" can be a life long quest.

There are currently 340 entities on the DXCC list. A DXer within ten entities of that possible number is listed on the "Honor Roll." A DXer who has them all is "#1 Honor Roll." Both are great honors to attain and a select few of our club members hold those high honors.

A bit of advice to new DXers. DXing is addicting. Once you get hooked you will work very hard to get a new country, especially if it is a rare one. Some of the rare entities may not have anyone operate from them for long periods of time… like 20 years! To get on the Honor Roll, you can't afford to miss

expeditions to those places when they happen. At my advanced age I really can't miss any. I'll probably be dead of old age before some of them come on again. ☹ Don't forget to get the confirmations as you go. I didn't do that and when I got interested in the "Challenge" my statistics were dismal. I had worked hundreds of band countries and never bothered getting the confirmations. I'm still playing catch up.

The confirmation process has been modernized. For DXCC purposes the contacts may now be either in written form or confirmed via the ARRL's Logbook of the World (LoTW) system. We are fortunate to have two certified card checkers in our club that can verify your QSLs. Either Don, N5LZ or Darryl, K7UT can check out your cards. Incidentally, CQ Magazine www.cq-amateur-radio.com has a very similar award that can be verified by Curt, K7CU. We will talk about LoTW and general QSLing in a later chapter.

IMHO every DXer should be interested in DXCC. ☺

CHAPTER - 4

The DXer's Tool Kit - This chapter is full of stuff that I have learned first hand as a DXer. I hope that it is useful to you.

MacGyver can fix anything with a tooth pick and a roll of duct tape. Most of us need something more than that. In this chapter we will discuss some of the basic tools that should be in a DXer's tool kit.

What do you need? A DXer's greatest assets are **operator skill and persistence**. Skill comes with experience. There is no away around it. An experienced DXer will work more DX with a modest station than an inexperienced op will be able to do with a top notch setup. Always learn as you go. You will get there with time. On the other hand, persistence can start right now. I have had several times when the pileups for rare expeditions were so large and I was at such a geographical disadvantage that I became discouraged. The same has happened when I have spent day after day listening for that new one without ever being able to hear them well enough for a QSO. If you don't try your chances of success are **zero**. Even a low probability is better than that. If you keep trying you might just make it! If you don't you automatically fail. Dogged persistence has paid off for me. **You can't work them if you are not there!**

A station: Obviously to make any contacts you need a station. Your **antenna system** is the most effective place to invest your time and money because it impacts both your receiving and transmitting capability. Having large beams on high towers is the way to go, but many of us can't do that for financial or logistical reasons. Do not be discouraged if you are only able to put up a simple antenna. No, you won't smash every pileup that you are in, but you can still work a lot of DX. Low angle radiation is the key to working great distances. A 100 ft tower will give you that for your big beam, but a much lower height can also be effective. To start getting significant low angle radiation a horizontal antenna needs to be at least one-half wavelength high. That is only 10 meters high on the 20M band or about 33 ft. No it isn't as good as the taller tower, but it isn't terrible either. I have worked all of my 328 countries with a tower never over 42 ft. Some of our "#1 Honor Roll" club members have done it without huge towers. You can be very successful with a small tower or wire antennas, but it does take more work.

The receiver: Second only to the antenna system is the receiver. All modern rigs are transceivers containing both a transmitter and a receiver. Any of them can be used for DXing. The transmitter section doesn't vary much in quality between units. A 100 watt output power is standard. Some are a little more powerful than that, but not by enough to make much difference. The receiver sections in the various transceivers, however, are **not** all equal. After your antenna system, invest in the transceiver with the best receiver that you can afford. "You can't work them if you can't hear them!" Sensitivity is important. Some radios will pick up weaker signals on the higher bands like 15M better than others. On the low bands like 80M the band noise makes that issue largely moot. A more

important factor is the degree of selectivity that is determined by the rig's filters. These filters allow you to block QRN and QRM from other stations. In general, crystal filters are better than DSP (digital signal processing) filters. Many DSP filters leak some undesired signals through them. The older technology crystal/mechanical filters actually are a lot less prone to this. However, a combination of both crystal filters and DSP is a great way to go. Another very important factor in a receiver is dynamic range (DR) . DR is a technical quality that defines how well a receiver can reject strong adjacent signals without distorting the one that you are trying to listen to. These problems are most apparent on a crowded band like during a contest. In a contest, a rig with poor DR will sound like a mish mash of signals that can become indistinguishable. A discussion of these technical qualities is beyond the scope of this chapter, but it is a matter to be seriously evaluated.

See this link for more information about dynamic range:
http://www.radio-electronics.com/info/receivers/dynamic_range/dynamic_range.php
Some of the latest transceivers have been designed to excel at DR while maintaining high sensitivity. See the Sherwood Engineering site for lots of good information on specific receiver evaluations here: http://www.sherweng.com/table.html . Some radios get a lot worse with this problem when the noise blanker (NB) is turned on. My old Kenwood TS940SAT is so bad in this regard that one time the NB got accidentally turned on and I thought the rig had crapped out. The band was crowded and every signal became so distorted that I couldn't copy any of them.

Here is a little trick that I use to improve my receiver's sensitivity:
Sometimes less is more. When listening for a very weak signal turn your RF gain DOWN. Sometimes this improves sensitivity by suppressing the AGC (automatic gain control) in your receiver. AGC is designed to reduce the receiver's gain to keep strong signals from blasting your ears out. It still reduces the receiver's gain with moderate strength signals. Turning down the RF gain is counterintuitive, but it works! Let the rig run at its maximum sensitivity by disabling the AGC. Always learn as you go.

And finally **The Transmitter**: Many new operators make the mistake of getting an amplifier instead of getting a good antenna. A better antenna helps your transmitter AND your receiver. High power certainly helps one punch through QRM, but it is of no help for your receiving capability. Being an "alligator" (big mouth, little ears) isn't desirable. High power is great if you can afford an amplifier. If you have done your best with your antenna and receiver it is the next logic step. However, like having a modest antenna, a 100 watt rig will let you work a lot of DX. In fact, having a 100 watt rig **AND** a modest antenna will still allow you to work a lot of DX! You can improve your chances of getting through a pile up on phone by tailoring you audio's "presence." Having high quality audio with the correct amount of compression will add to your success. The human voice is not equal in its level over all frequencies in the voice's range. Compression will increase its average peak power. Your microphone's frequency response should be tailored for communication. See the chapter on "listening." That which is good in a

headset's frequency response is also good in a microphone's frequency response. Here is a good article on the theory of compression. It isn't written about amateur radio, but the idea is still the same: http://www.barryrudolph.com/mix/comp.html

Backup One more thing before we leave the equipment section. Keep in mind the fact that your rig or antenna might fail at a particularly bad time. A while ago I was anxiously awaiting a DXpedition that I needed for an all time new one. My rig died at the worst possible time. ☹ Within a couple of days I was able to scramble and come up with a substitute. Everything worked out, but I relearned the need for back up to any critical system. OK, maybe you don't think that not being able to use your radio is critical. Remember that DX addiction thing? If an all time new one is about to come on then I DO feel it is critical! I used to compete in combat shooting matches. At one time I attended a great shooting school called "Thunder Ranch." The owner/instructor is Clint Smith, a real character. According to Clint: "Two is one and one is none." What he means by that is that everything made by man can and will fail. If you have two guns one might fail, but you will still have one. If you only have one and it fails you are up the creek, and in the context of the school, probably dead. ☹ Same thing with radios! Think twice before giving away or trading in for near nothing your old rig when you upgrade. After you get your new tower, keep that old G5RV strung up in the tree. Backup is a good thing.

Be Flexible: Make your station as flexible as possible. Be able to operate on as many frequencies and modes as you can.

Flexible modes: SSB might well now be the DXer's primary mode. It wasn't always so, but today there is as much or more DX activity on phone as any other mode. Everybody has phone capability. Happy hunting on phone!

Some old timers claimed that it would be the end of the world when morse code was dropped as a licensing requirement. The world changed and somehow survived. With that concession, CW is still the most effective form of communications. While some futuristic digital modes like those used for moon bounce can actually copy signals below the noise level, CW beats anything else. Why? Simple. It is of a narrower bandwidth than any other mode. Without getting theoretical on you, just accept the fact that CW has about a 10 db effectiveness advantage over phone. 10 db is the equivalent of increasing your power ten times. 100 watts of CW is as effective as 1,000 watts of SSB. This really helps if you have a low powered station. At this time many hams do not know the code. That is ok, but they are missing out on a valuable resource. If you are one of them, consider learning CW (at least well enough to do basic exchanges) , or (speaking blasphemy) use your computer for CW. After all, it is just another digital mode. (Incidentally, for decades some of the world's top CW operators have used keyboards instead of keys.) While it is great to be able to run CW fast, sometimes running slow is the

way to go. A couple of years ago a guy in TT- Chad (an all time new one for me) was working CW on 20M at about 6 words per minute. Apparently he was building a new skill. The pileup was calling him at high speeds. That was just plain dumb. You should always send at the same speed as the station that you are calling! He couldn't possibly copy those speed demons. I tried to slow down my keyer. It wouldn't go anywhere near that slow. I got up and dug through my closet and found a hand key. I plugged it into the rig in place of my keyer and called him at 6 wpm. I got him! My competitors didn't learn and kept calling him at 35 wpm without success. I wonder why? After that I keep a straight key hooked up to my rig in parallel to my keyer and just tucked out of the way. Like I said earlier, learn as you go.

I spent lots of time in the military running RTTY. I got sick of it and to this day I really don't like the mode. It is, however, a resource to pick up DX stations. By obtaining that capability I have worked some all time new ones that I would have missed otherwise. Digital modes other than RTTY have really caught on. Some of them like PSK and Olivia are very effective, even with very low power. These modes should not be overlooked.

Flexible frequencies: All of the HF bands are good for DXing. I have picked up all time new ones on 75/80M and all of the higher bands. Having the capability to take advantage of propagation on every band is a big advantage. When 10M is really open, the world is at your feet. Even with a very small station. Try to have antennas that will function on all of the HF bands. Most DX operation occurs in the bottom end of the bands. If you have a license less than an Extra Class you are at a definite disadvantage. The remaining Advanced Class operators are in pretty good shape, especially on phone. Generals, however, have an uphill fight. Lots of DX stations operate higher in the bands, but many do not. Let's face it. Most DX stations really don't care about working as many W's as they can. They have already worked thousands of them. Some DXpeditions are nice guys and try to work everybody, giving special attention to American General Class operators. This is especially true if there are American operators on the expedition team. Many others just don't care about the quirks of the American licensing system. It is really worth the effort to upgrade if you are serious about DXing.

CHAPTER - 5

Split Operation & How to Be Heard in a Pileup.

What is working split and why would I want to do it?

Working split is simply transmitting and receiving on two different frequencies. Many DX contacts are made by calling the DX station on his own frequency and listening for his reply. Transmitting and receiving on the same frequency is called working "simplex." That works fine unless a large number of stations start calling the DX station. That will almost certainly happen with a truly rare DX station. Everybody wants to work him. Once a bunch of stations get calling it becomes impossible to hear him respond to anyone because the callers are transmitting on top of him. And they probably are a lot stronger than he is!

What is the solution? When this situation begins, a good DX operator will announce that he is going to "work split" and that he will listen on another frequency and not on his own. That is usually done simply by saying something like "listening up 5" or on CW "up 5" or "U5." That means that you should call him **not** on his own frequency, but 5 khz above him.

Before we go further, here is a very short history lesson. Before the late 1960's, and for a lot longer for many hams, a station consisted of a separate transmitter and receiver. The HF transceiver didn't exist until then. With separate units it was very easy to transmit and receive on two different frequencies. In fact the issue was to get your transmitter set to the same frequency that you were receiving on! Working split, especially on phone was common. At first when the transceiver came into existence the split capability was lost. The transmitter and receiver tracked each other. Very convenient for normal work, but a real step backwards for some DXing. To regain the loss, it was necessary to purchase an outboard VFO that would give the rig two VFOs that would operate independently and once again allow split capability. Some transceivers simply couldn't do it. Luckily for us all modern transceivers have the capability to work split within a band. Most rigs use two digital VFOs called "A" and "B." One VFO is set to the DX station's frequency and the other one to your desired transmit frequency. Simple. See your radio's instruction manual for how to do it. The most desirable set up, however is to have what is called a "sub-receiver." That gives you the capability to transmit on one frequency, to receive on that same frequency, and at the same time to receive on another frequency. We will talk about how to use this in a minute. One more important point before we go on. Having the DX station listening on one frequency and transmitting on another allows you to hear him answer calls without interference from the callers. The same is not necessarily true at the DX end. Again, many stations may be calling on the same frequency clobbering each other. In that case the DX station should spread them out frequency wise by now saying "listening up 5 to 10." You pick a spot in that range to call and hopefully the DX station can now separate out the callers. Elementary so far. Now this is where skill gets involved.

How do I make myself heard in a pileup?

The simple answer is to transmit in the clear from your competitors! Detecting patterns in how the DX operator responds to callers is invaluable. More on that later. Of course you have to make your call sign understandable to the DX station. On simplex it is difficult to ever be in the clear once multiple stations start calling. If you listen carefully, however, you may be able to time your calls between the other callers. That may let you through. Use clear phonetics on phone and a clear "fist" on CW. Be brief. Give your call once and then listen. If the DX station does not answer anyone try again. The loudest station may well win out on simplex, but not always. The guy in the clear when he sends his call will be heard best. Unless the pileup grows, you will get your turn as the competition thins out. On simplex, gentlemen may give each other a momentary clear shot and then send their call expecting the same in return. That's nice, but it usually doesn't happen. ☹ Some inexperienced DX operators answer the last person who called. That station was probably in the clear, but this sets a bad precedent. Once a DX station starts doing this the callers go longer and longer trying to be the last one to transmit. The result is usually someone transmitting over the DX station. Sometimes they don't listen for two or three quick QSOs that go on underneath them. ☹ After listening for a while, and detecting a pattern with the DX operators behavior, you may have no choice except to try and be the last one calling. This really is poor procedure, but it might work. Don't be ridiculous about it. Give the poor guy a chance to answer. A competent DX operator won't let this happen and will go split. One more thing. If the DX station comes back with a partial call, like "The Whiskey 7, go ahead" or on CW "W7?" Don't call again if you are not a W7!

Now it is time to talk about more advanced skills. Like I said above - **listening to the DX station and detecting patterns is invaluable.** Once a pileup goes into split mode skill becomes more important than shere signal strength. Again, you goal is to transmit in the clear. If the split has gone beyond a single frequency, like the "5 to 10 up" scenario, transmitting where the DX is actually listening becomes key. Just blaring away on a set spot might work, but it might not. The idea is to find where the DX is listening or to anticipate where he will listen next. With most transceivers, to do this you must switch your radio's VFOs to use the receiver to try and find the station that just connected with the DX. With a normal rig this requires jumping back and forth between receiving on VFO A and VFO B to hear the DX station and also search for the guy he is in contact with. This can be tricky and if you are not careful you may end up transmitting on the DX station's transmit frequency by mistake. We have all done it, but you look like a real lid. In many cases the DX will hear you call on the same frequency that the last successful station used. Give it a try. You won't be the only one who figures this out. Other experienced operators will be doing the same thing. Others will be trying to find the station in contact with the DX and then calling on the same frequency as the successful one too. If a pileup gets very large the spread may go much wider, especially on phone. In that case figuring out where to transmit becomes paramount. Calling on the last station's frequency may not work. Keep listening. See if another station on that frequency was successful or if the DX gave his VFO a spin to again spread things out. If you hear another success story on the same frequency, try again. If you don't, search again for

the station that made it through. Try to detect a pattern. You may well see that each successive contact goes up a little in the band. In that case set yourself up a little above the last guy that was successful and try there. Keep working on finding a pattern. Some guys will list the frequency that worked for them on the DX cluster. That can be useful, but everyone in the world sees it and tries that frequency. If you cannot determine a pattern or hear the other stations that are calling (which sometimes happens on the higher bands) then pick a freq and call. If no luck you can either move a little and try again or just keep on with your original freq. In this situation getting through becomes partly blind luck.

As I mentioned earlier, some transceivers have a built in advantage in working split. They have a sub receiver that allows you to listen to the DX station on his frequency and search for the callers at the same time on another frequency. This can be very valuable, but it is not absolutely necessary. Radios like the Yaesu FT1000/FT2000 series have true sub receivers. The Elecraft K3 has an option to add a sub receiver. The top of the line Icoms like the IC7800 also have a sub. Many other Icom radios have what Icom calls "dual watch." It isn't exactly a sub receiver, but it does allow you to listen to two frequencies at once. A transceiver with a true sub receiver normally sends the audio from each of its receivers to your headphones separately in "stereo." Dual watch puts the two signals together into both ears. Not quite as good, but still useful. You are using headphones by now aren't you?

The key to pileup busting is more than shere power. Many times it requires skill. Try out the ideas that I gave you here. Your success rate will improve.

CHAPTER – 6

DX Propagation Basics: Propagation is a real science and cannot possibly be covered completely in a short chapter. I do hope, however, to give the new DXer some basics in understanding how it all works and that understanding will improve your odds of making great DX contacts.

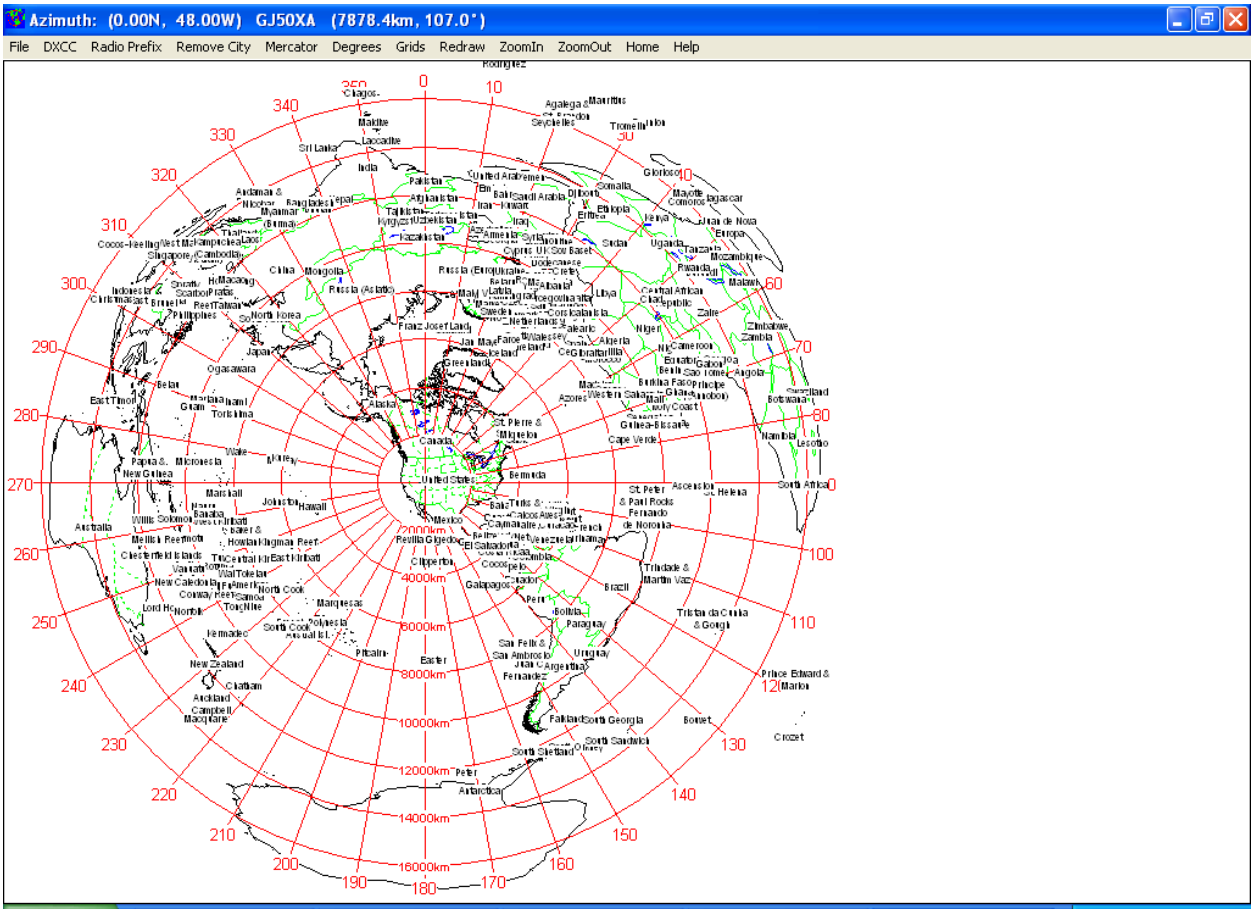
First a little very basic theory: Above what we normally think of as the Earth's atmosphere are four layers of ionosphere. If you will think back to your high school chemistry an ion is an atom that is missing an electron or the free electron itself. This occurs in the ionosphere by the Sun's radiation beating down on those upper layers and jolting individual atoms to give up a free electron. These ions make a very conductive layer wherever this occurs.

The ionosphere has three basic layers designated by the letters "D", "E" and "F". The "F" layer is broken down into two sub layers called the "F1" and "F2" layers. The D layer is closest to the Earth at a lower altitude than the E layer which is lower than the F1 and finally the F2 layer. Radio signals may be either reflected or absorbed in the ionosphere. The level of ionization is determined by many factors all related to the Sun. Radio waves of different wavelengths are impacted differently by the ionosphere. Shorter wavelengths (higher frequencies) penetrate deeper into the ionosphere than longer wavelengths (lower frequencies.) This makes for radically different propagation depending on a radio wave's frequency. During the daylight hours the D layer forms at a relatively low altitude. It mostly acts as an RF sponge. The longer wavelengths are soaked up by it during the day. The D layer disappears at night. That is why standard AM radio has very limited range during the day, but may go great distances at night by reflecting off of one of the higher layers. Conversely, UHF and VHF frequencies normally penetrate all of the layers and shoot out into space, never to return to Earth. During daylight the higher HF ham bands can penetrate the D layer and then are reflected by the F layer. At night the lower bands are reflected by the F layer, but the F layer may not be ionized densely enough to reflect the higher bands. Once again those signals blast out into space. When the Sun is directly overhead (local noon) sometimes there is enough energy to ionize the "E" layer. This is especially true at the summer solstice when the Sun's rays are coming in at a higher angle than in the winter months. At that time, the E layer can be very densely ionized. Sometimes this ionization can be so dense that it will reflect VHF signals like 6 M.

The bottom line of all this is that the lower bands are open at night and the higher bands during daylight. The 20 M band is in the middle and can be open anytime. Actually, all of the higher bands can be open at night depending on the level of the Sun's activity. Radio waves propagate around the world by bouncing between the ionosphere and the Earth. Multiple hops occur in long distance communications. Sea water is much more reflective than dirt. Therefore paths that transverse the oceans are more favorable than land paths. Each hop causes signals to decrease.

Enough of the theory. Now the practical stuff! Everyone knows that the shortest distance between two points is a straight line. That is the path that radio signals normally follow. That route is called the "short path." If you grew up looking at the maps in school you probably learned a very distorted view of the world. Those maps are usually a Mercator Projection which distorts the extreme north and south polar regions. It is also misleading that those maps give you the picture that Europe is almost due east of the USA, that India is just further east and that South Africa is south east. That just isn't true. No flat map can represent the round Earth accurately in all respects. That can only be done with a round globe. If you put a string between those distant points on a globe and the USA you get a true bearing that is called a "great circle" route. The great circle is the real direction to distant points. **Your beam antenna won't work well unless it is pointed in the right direction!** Here is a free source to compute the actual beam headings for your individual QTH. http://www.njdxa.org/dx-tools/beam-headings.php . I have put a chart at the end of this handbook for my location as a sample. If you live within a few hundred miles of my QTH it should be accurate enough. If you don't, then just use the link above to generate one for you exact location. Also, see below an azimuth map centered on Utah. The program to create this map is available as freeware at http://www.qsl.net/ve6yp/ . Download Azimuth3.zip from this site and install it. It is a very nice free program. There are many other programs available on the web to compute azimuth maps. The ARRL sells a very nice azimuth wall map that I own. See www.arrl.org .

From the map below you can see that Europe is north-north-east from us, and not due east. England is at 38 degrees, over the north polar region. India is actually nearly due north at 348 degrees, directly over the North Pole. South Africa is almost due east at 97 degrees, far from the south east bearing that the Mercator map suggests.



As I mentioned earlier this is the “short path” to distant locations and usually radio waves follow that most direct path. Note that I said usually. It is very common for signals from the most distant locations to go the other way around the Earth. This happens on different bands because of daylight or night paths. In our early morning the Earth is dark to our west. The 40 M band works best at night. Therefore by sending your signal into the darkness it just might propagate around the entire dark half of the Earth and come out at the sunset end of the dark path – on the other side of the world! During the winter it is common to work Europe via this “long path” on 40 M. The “long path” is exactly 180 degrees from the azimuth shown on our map. Don’t count yourself out just because you don’t have a beam antenna. I only have vertical on 40 M, but knowing that something good might come in via the long path is still useful. In the mornings look for propagation over the dark side of the Earth to our west.

The Indian Ocean is located at the most distant point on the planet from us (antipode). The outermost circle on an azimuth map is actually a single point in the Indian Ocean. Notice that this point is the same distance no matter what heading we use. <u>What I’m getting at is that signals from the Indian Ocean may arrive from any direction!</u> Most of the time a signal will come either via the short path or the 180

degree opposite long path. Once in a while this isn't true. Odd propagation via a "crooked path" sometimes occurs. By this I mean that you find that your beam peaks in a direction that is neither the short or long path. It does happen. Sometimes signals get bent around the aurora zone at the poles. Other times a highly ionized spot occurs directly under the Sun that has nothing to do with either regular path. In these cases it may be possible to do a "bank shot" (just like in pool) to get to a remote location when no direct propagation is possible. An excellent example of this sometimes happens over the Atlantic Ocean. You can't hear Europe at north-north-east, but you can at south east! This usually happens on the higher bands like 15M.

It has been said that "there is no such thing as a free lunch." One special case in HF propagation comes close. There is a big enhancement in propagation particularly at sunrise, but also at sunset. During that time of twilight something wonderful happens and it has nothing to do with werewolves. Along that line between daylight and darkness enhanced propagation often occurs. Watch out for this. As the so called "grey line" passes over us good things happen. This can be very useful in working other locations along that boundary, but only for a short time. I have made some of my very best contacts along that line into the Indian Ocean using this mode. By plotting where the grey line occurs at other places on the Earth, you can also frequently predict signal peaks from DX stations. This peak may still occur when their grey line does not run over our location. Always keep an eye open for good things to happen over the grey line.

My point to all of this is to make you aware that signal propagation is kind of fickle. Weird things also happen through "ducting" and other odd phenomena that are too complicated for this short chapter. Just remember to use your azimuth map to aim your beam and don't forget the long path and the grey line. The Indian Ocean is a wild card and so is crooked path propagation!

Propagation prediction is very difficult to do. There are, however, some basic indicators that help. Scientists are always tracking what is happening with the Sun. Without getting complex there are three very useful parameters to use to predict band conditions. They are solar flux and the "A" and "K" indexes. The higher the solar flux the better. It has been very low for years! The lower the A and K indexes the better. They indicate activity in the Earth's geomagnetic field. When the geomagnetic field gets agitated by the Sun, propagation degrades. See this site for lots of information on this science:

http://dx.qsl.net/propagation/ and if you want even more information check out http://www.swpc.noaa.gov/forecast.html

Beacons:

The International Amateur Radio Union represents amateur radio's interests world wide. Each member country has a representative organization within the IARU. Ours is the ARRL. The IARU has established a "beacon network" to research HF propagation. The network consists of automated stations in several locations around the world that transmit on a closely synchronized schedule. The beacons operate on frequencies of: 14.100, 18.110, 21.150 and 24.930 Mhz. By monitoring these frequencies it is easy

to detect band openings to the various beacon locations.
See: http://www.ncdxf.org/beacon/intro.html for general information on the beacon project.
See: http://www.iaru.org/articles for articles on the beacon system. Check this out!

Propagation prediction programs:

The U. S. government has spent enormous amounts of time and money in creating a very accurate modeling program for predicting HF propagation. This software (VOACAP) is **freeware** from the U. S. government, but it is cumbersome to use without some sort of an interface program. In the past I have used VOAProp. See: http://www.g4ilo.com/voaprop.html . This program is very useful and also **free!** The VOAProp web site has a link to obtain your free copy of the VOACAP calculation engine that is required to drive VOAProp. As an added useful feature, VOAProp will also show you which IARU beacon is transmitting at that instant! It is well worth the effort to install this software.

After using VOAProp for several years, I recently upgraded to a more advanced suite of programs written by VE3NEA - (the same guy who provides CW Skimmer) . See: http://www.dxatlas.com/ . This suite consists of four separate programs that work together. The combined cost is about $75.00, but the capabilities surpass VOAProp in how well the data is presented and they also have additional useful features. However, both VOAProp and DX Atlas use exactly the same underlying U. S. government software calculation engine. Therefore, the free one is just as accurate as the expensive one. DX Atlas just presents the data in a fancier format.

Some of our club members like another free propagation prediction program, W6EL Prop. See: http://www.qsl.net/w6elprop/ . This program has a wealth of options to present the prediction data in the form of maps or in numeric/tabular form. Since it is also **free**, why not get a copy and try it out?

There is also a brand new **free** online propagation prediction service that uses Google Maps to specify the **exact** locations for the transmitter and receiver sites. It is called **VOACap Online.** See: http://www.voacap.com/prediction.html . Once the path end points are specified, the online display then shows a color graph of times and frequencies with probabilities of success for communications between the two locations. Very nice.

Any of these propagation prediction programs will give you **very** useful data. **I highly recommend that every DXer obtain access to some form of accurate propagation prediction data.** With multiple free sources, why not get copies of all of them and see what works best for you?

Once you have a good understanding of propagation it will certainly improve your odds of working more DX!

CHAPTER - 7

Phonetics: Using phonetics is the best way to make your call sign understood on phone. Everybody knows that. The aviation world and the US military use the same standardized set of words: Alpha, Bravo, Charlie, Delta,…. etc. It is not, however, the only phonetic alphabet that was ever created. The US military used to use a different one: Able, Baker, Charlie, Dog…etc. Some police forces use: Adam, Boy, Charlie, David…, etc. There are also ones using geographic names: Amsterdam, Boston, Casablanca, Denmark,…etc. Good grief. So what should you use? In general the US military-NATO-aviation- ICAO phonetic alphabet is the best. See http://en.wikipedia.org/wiki/NATO_phonetic_alphabet . From personal experience I don't like to use "Sierra." My old call was K7SAI. The English language skills of DX operators are now very good. Back when I held that call it wasn't necessarily so. Americans and Spanish language speakers understood Sierra. Asian operators in particular took it like it sounds…. as the letter "C". What to do? I tried several options and finally settled on "sugar." Commonly used, but not standard anywhere. Later as K7UA I used Kilowatt Seven Uniform Alpha. Back when there were no calls starting with KW (like KW7A) it was fine. Now sometimes it gets mistaken for KW and not K. I have had contest log exception items sent to me showing a mismatch of QSO data because I was logged as KW7UA. ☹ I quit using it. Some words just work better for international hams than the standard phonetic alphabet. When the USSR (**Union** of Soviet Socialist Republics) existed the Russians used "Union" for U. That faded away. Everybody knows the USA is the United States of America. United is now a very common phonetic for U. The same with America for A. Even the Russians that have UA calls frequently use United America. Boy, they wouldn't have said that during the Cold War! "Radio" is more common for R than Romeo. It is a great one for radio amateurs.

So, what's my point. Use phonetics that work. If the DX station is struggling with your call don't keep beating them with the same phonetics. Shift to something else. Shift from Kilo Seven Uniform Alpha, to Kentucky Seven United America. You get the point. Some cities and other geographical locations work well. Yokohama, Honolulu, London and Norway come to mind. Stay flexible.

There isn't anything like phonetics for numbers. In general there isn't as much confusion with them. A wise DXer still has a couple of tricks in his arsenal. If the DX station is struggling with the number in your call, count up to it. This is: Kilo Seven, -----one, two, three, four, five, six, seven ---- Uniform Alpha.

Knowing how to pronounce your number in the DX station's native language can also be useful. For most of us who are located here in US call zone 7, that is "Siete" in Spanish, "Sette" in Italian, "Sieben" in German, etc. For that matter, if you have the skill just speaking to a DX station in their native language is always welcomed.

CHAPTER - 8

The Art of QSLing: QSL cards have been a part of ham radio from the very beginning. It has been a tradition to post them above your station to catch the eye of visitors and to remind the operator of his accomplishments. If you are interested in DXCC or many other awards you are required to have proof that the contacts necessary for the award took place. In this chapter we are going to talk about the old school ways to get those cards and bring the subject into the 21st century with electronic QSLing. The ARRL has always had very stringent rules on the validation of QSLs for the DXCC award. These high standards have preserved the integrity of the award.

Old school: Paper QSL cards

Almost all stations, DX and otherwise, will issue paper QSL cards. The trick is to get the DX station to answer your card. There are a variety of ways to increase your odds of getting a paper QSL card.

The surest route is to send your card directly to the DX station. The cost of foreign postage is high. The current price (2011) to send a one ounce letter to foreign destinations is 98 cents. The return price from those countries is often higher. Most DX stations will reply to you if you supply a self addressed envelope and pay for the return postage. In theory all nations who receive mail are members of the Universal Postal Union (UPU). There is a document called an international reply coupon (IRC) that can be purchased at the local post office and sent to the DX station as payment for the return postage. The current US price for an IRC is $2.10. In theory this will pay for a return airmail letter from any country in the UPU. Despite the supposed rules, some countries do not honor IRCs and others insist on two or more IRCs to pay return postage. Also, some countries have silly rules that the IRC must be from the country that the letter is being returned to or they won't cash them in. The whole IRC thing is a hassle so many DX stations ask for one or two "green stamps." A green stamp is a US dollar. Most DX stations direct addresses are available at www.qrz.com . Also, frequently the DX station tells you how they want to receive QSLs at that site. It is incredibly useful**.** Another valuable resource for QSL information world wide can be found at http://hamcall.net/call .

See IRC sample below:

Now for a few things that I have learned about sending letters to foreign countries and getting a return back. First, mail theft is rampant in many third world countries. The chance of having your letter looted is a certainty in some of them. To reduce the chance of that happening do not do anything that gives the mail thieves a clue that your letter has anything valuable in it. Start by NEVER using station call letters in the addresses. Don't do anything else to the envelope that makes it stand out. Mail thieves may well handle the letter and see if they can feel anything inside other than the usual papers. Something thick inside or being able to see through the envelope and detect your IRC or dollar bill is a dead give away. Always use so called "safety" envelopes that do not let a person see through the paper. Be sure that the envelope is well sealed. Use tape if you have to for a good seal. When sending letters to South America it is a good idea to always tape the flap shut. It might help a little in keeping the crooks out. Sometimes the station will explain exactly how to improve the odds of non-pilfered delivery on their QRZ page. For a guarantee of delivery to real trouble spots you may have to resort to "registered mail." This process requires a written audit trail of every stop that the mail makes. It is expensive, but crooks probably don't want to be caught by disclosing who lost or tampered with the letter.

I have started using foreign airmail envelopes from Bill Plum DX Supplies (plumdx@msn.com). Bill sells sets of envelopes for outgoing and returning airmail that nest neatly inside of each other. The current price is $35.00 for 200 sets. By using those I don't give a clue to mail thieves that there is anything special inside. The inner envelope is not noticeable and it is also light in weight. Some annoying countries charge much more for a little extra weight. Also, some of them charge more for larger envelopes than their normal airmail standard. I used to use standard #10 US business envelopes for the returns. I kept getting them back cut down in size and taped together or folded over to decrease their dimensions. I wised up and quit using them. Bill also sells foreign postage stamps that may make the

return process easier for the DX station. So far I have not used that service, but I really do like Bill's nested airmail envelopes.

Some DX stations use a QSL manager. This is simply another ham who has volunteered to take over the DX stations QSLing chores. QSL managers are very reliable and you will almost certainly get an answer from them if you are in the DX station's log. The best thing that can happen to you is that the DX station has a QSL manager in the USA. That way your postage each way is just a standard 44 cent stamp and delivery is certain.

The Daily DX offers a link to finding various QSL routes at: http://www.dailydx.com/routes.html . There are lots of good resource links on this site. The various DX bulletins also frequently list QSL routes in their publications. We will be talking about DX bulletins in a later chapter.

All of this is kind of discouraging because of the expense involved. Luckily there are some alternatives that are a lot less expensive.

The first to consider is the **QSL bureau system**. Many countries offer a slow speed, but cheap QSL delivery system called the QSL Bureau. It is usually referred to as the "buro." In the USA the ARRL is the sponsor of this system. In our area the ARRL affiliated club "The Willamette Valley DX Club" http://www.wvdxc.org/dotnetnuke/ handles incoming QSL chores. They handle all of the cards for the US seventh call area. If you have a "7" in your call they are your contact. Other areas have other sponsoring clubs. These guys are practically saints providing this valuable service free of charge. If you go to their web site and click on the "QSL bureau" tab they tell you everything that you need to know to sign up.

In a nutshell, this is how the QSL bureau system works. The national organizations exchange QSL cards in bulk shipments that cuts way down on postage. It is slow, but cheap. In the W7 call area, you open an account at WVDXC and buy postage credits and envelopes to ship your cards in. Free of charge they receive, sort, and then forward the cards directly to you. If you are active you will get lots of cards from all over the world. Since Utah is one of the rarer states, many foreign hams want your card for their Worked All States (WAS) award. ARRL membership is not required for this incoming service and the WVDXC has done the labor since the 1960s. This service of WVDXC is only for INCOMING cards. To send your replies via the bureau the ARRL offers an OUTGOING QSL service. See http://www.arrl.org/outgoing-qsl-service . The ARRL accepts your cards in bulk and forwards them on to all of the other countries' QSL bureaus. Some countries do not have a QSL bureau so this service won't work for those cards. ARRL membership **is required** for this service, but the rates are cheap compared to mailing the cards yourself. IMHO this service alone is worth the price of ARRL membership for a DXer.

I have frequently used another option to send my outgoing QSLs for contacts that I want answered quicker than via the bureau, but that I don't want badly enough to pay the expense of going the direct route. Les, WF5E http://www.qsl.net/wf5e/ offers a unique outgoing QSL service. Les receives your outgoing cards in bulk from you and then determines the best way to get you an answer. He charges $1 for two cards. He takes advantage of postage savings by sending multiple cards at the same time directly to the DX station or to their QSL manager. Les sends the DX station whatever they require to

get your QSL. This can be either a postage prepaid international business reply envelope or a return envelope and IRCs. The DX station simply returns a batch of cards in the preaddressed envelope with the postage paid by Les. This only works with stations that will answer the cards in a batch. Some hard cases will not do it. When the cards come back to Les he forwards them to your incoming bureau and you receive them with your other normal bureau cards. He puts a small rubber stamp imprint on them so that you know the card came via his service. Some club members have had return rates as high as 85% using Les' service. This process is slow, but not as slow as using the normal outgoing bureau process. Cards sent via the regular QSL bureau can take one or more years to arrive. You have to be patient.

New School: Electronic QSLs

Two modern computerized systems have come into existence to cut out all of the expense and delays of sending paper QSLs. The ARRL invested a lot of time and money to develop their Logbook of the World (LoTW) electronic QSL system. See http://www.arrl.org/logbook-of-the-world . This system maintains the ARRL's high integrity for DXCC verifications. It may also be used for other ARRL awards like WAS and the Triple Play award. The League's site tells you all about this service, but here is the basic idea. A ham must register with them through a rigorous process to prove that they are the real holder of the call sign. Once you have proven who you are, an electronic digital certificate is issued to you. You can then use that certificate to securely sign and upload your log data to the LoTW system. This can be done with manual entries, but it is much more convenient to use a computer logging program. I use Logic 8. Once the certificate was installed on my computer it only takes a couple of mouse clicks in Logic to upload the file. The LoTW system then matches your log entries against the uploaded data from other stations and if it finds a reasonable match (band, mode, and time within one-half hour) you get credit for a confirmed QSL. This is all shown in your LoTW records. I also use Logic to download those new confirmations into my logging program, but that isn't necessary to use the system. The real records are maintained on the LoTW system. When you get around to claiming credit for an award you pay a fee for each credit. It is very reasonable compared to the expense of postage for paper QSLs.

There is another electronic QSL system called eQSL. See www.eqsl.cc . This system works differently than the LoTW system. A user registers with eQSL and then you are allowed to send electronic QSLs that look like an actual paper QSL to the stations that you work. (Again I use my logging program to very easily upload and download the eQSL data.) Call signs can be registered without any proof of who actually holds the license, but these are not taken very seriously. One can obtain "authenticity guaranteed" (AG) status by submitting a copy of your license to eQSL for verification. eQSL claims that AG confirmations are more safe than paper QSLs because there is so little chance of forgery. They are probably right. The eQSL system differs from LoTW in that it does not make any attempt to match QSO data with the other station. A deal was in the works with ARRL to accept eQSLs for DXCC credit, but the negotiations broke down. The League wanted security used that was unreasonable to the people who run eQSL. It is now very unlikely that the ARRL will ever accept eQSLs. CQ Magazine, however, DOES accept eQSLs for their awards. The eQSL service is free, but they accept donations and will upgrade your status for a very minimal charge. To utilize CQ's award system one must be a "bronze" member. That only costs $15 per year. Besides CQ other groups including eQSL itself offer awards qualified by eQSL confirmations. Only AG user's confirmations count for the awards. "Silver" membership costs another

$15 per year and allows fancier QSL designs. IMHO everyone that uses eQSL should help them out by becoming at least a bronze member.

CHAPTER - 9

DX Intelligence: I'm not talking about your IQ, but in the context of gathering information. The more that you know about what is going on in the DX world, the more successful you will be.

Back in the 1970's I ran to the mail box every week to get my few badly copied pages of "The West Coast DX Bulletin." The art has advanced since then. Now there are a number of DX bulletins and services that you can subscribe to. For knowing what is going on in the DX world every day subscribe to "The Daily DX", an Internet publication by Bernie McClenny W3UR see: http://www.dailydx.com/ . Bernie also publishes another similar publication "The Weekly DX." For a fee The Daily DX subscription comes every day via email. Another paid subscription bulletin is by Carl Smith N4AA called "QRZ DX." It is sent weekly either via email or postal mail. See: http://www.dxpub.com/ N4AA also publishes a bimonthly DX Magazine that is very nice. It arrives via postal mail. There are also two really good weekly DX bulletins and they are free of charge! See "The 425 DX Bulletin" at http://www.425dxn.org/ . The Italian 425 group also puts out a monthly magazine accessible at http://www.425dxn.org/monthly/index.html that shows what happened the past month. It has lots of interesting pictures, QSL cards, etc. It is really fun to look over. The second **free** bulletin is the OPDX Bulletin (Ohio & Pennsylvania) http://www.papays.com/opdx.html . Also, the Daily DX has a calendar of expeditions that is available to anyone for free at: http://www.dailydx.com/Calendar.htm Being a glutton for any shred of DX news I subscribe to all of them. There is a lot of duplication, but each has its own sources and unique style.

And if that was not enough: If you want to learn a whole lot about DXing, no matter how experienced you are, get a copy of "The Complete DXer" written by Bob Locher, W9KNI. It is available from Idiom Press at http://www.idiompress.com/books-complete-dxer.html . I highly recommend this book! It was out of print for a time, but is now again available in the 3rd Edition. It is simply awesome.

Author's Comments

I served as President of the Utah DX Association in 2008 and then continued on as a member of the club's board of directors for the next two years. During that time I saw a real need to coach our new members on how to become successful DXers. I wrote this booklet to give them something that is easy to understand yet will quickly teach them the skills that took me years to discover on my own. Now in hindsight it all seems so simple.

To my surprise this primer has gained a much wider Internet readership than just our local club. That is great. Wherever you are, I really hope that you have enjoyed it and that it has helped you gain some new skills. Nothing would please me more than to learn that I have helped a new generation of young DXers get started.

73,

Bryce Anderson, K7UA
k7ua@comcast.net

AZIMUTH CHART

The North Jersey DX Association Presents
Your Personalized DXCC Countries List & Beam Headings

Beam headings prepared for, K7UA ,
Headings centered on American Fork, UT - Your Latitude 40.41 Your Longitude 111.81

Prefix	Country	Short Path	Long Path	Miles	Lati-tude	Longi-tude	Cont-inent	CQ Zone
1A	SMOM	38	218	5,761	41.9	-12.4	EU	15
1S	Spratly Is.	310	130	8,037	8.8	-111.9	AS	26
3A	Monaco	40	220	5,489	44.0	-7.5	EU	14
3B7	Agalega/St. Brandon	23	203	10,199	-10.0	-56.0	AF	39
3B8	Mauritius	28	208	10,903	-20.3	-57.5	AF	39
3B9	Rodriguez Is.	13	193	10,970	-19.7	-63.4	AF	39
3C	Equatorial Guinea	67	247	7,759	1.8	-10.0	AF	36
3C0	Annobon	71	251	7,558	1.3	-5.4	AF	36
3D2	Fiji	244	64	5,987	-17.0	-178.0	OC	32
3D2/C	Conway Reef	243	63	6,367	-22.0	-175.0	OC	32
3D2/R	Rotuma Island	249	69	5,796	-12.0	-177.0	OC	32
3DA	Swaziland	78	258	10,147	-27.0	-31.5	AF	38
3V	Tunisia	43	223	5,956	36.8	-10.2	AF	33
3W/XV	Vietnam	316	136	8,121	10.8	-106.7	AS	26
3X	Guinea	77	257	6,223	10.0	13.0	AF	35
3Y	Bouvet Island	130	310	9,366	-54.0	-3.4	AF	38
3Y/P	Peter 1st Island	172	352	7,566	-68.0	90.5	AN	12

4J	**Azerbaijan**	**14**	**194**	**6,726**	**40.5**	**-50.0**	**AS**	**21**
4L	**Georgia**	**17**	**197**	**6,589**	**41.5**	**-45.0**	**AS**	**21**
4O	**Montenegro**	**34**	**214**	**5,950**	**42.3**	**-19.2**	**EU**	**15**
4S	**Sri Lanka**	**344**	**164**	**9,070**	**7.0**	**-79.9**	**AS**	**22**
4U/I	**ITU Geneva**	**39**	**219**	**5,335**	**46.2**	**-6.2**	**EU**	**14**
4U/U	**U.N. Headquarters**	**77**	**257**	**1,967**	**40.8**	**74.0**	**NA**	**5**
4W	**Timor Leste**	**286**	**106**	**8,296**	**-8.6**	**-125.6**	**AS**	**28**
4X	**Israel**	**28**	**208**	**6,998**	**32.0**	**-35.0**	**AS**	**20**
5A	**Libya**	**44**	**224**	**6,268**	**32.5**	**-12.5**	**AF**	**34**
5B	**Cyprus**	**28**	**208**	**6,761**	**35.0**	**-33.0**	**AS**	**20**
5H	**Tanzania**	**45**	**225**	**9,521**	**-7.0**	**-39.5**	**AF**	**37**
5N	**Nigeria**	**68**	**248**	**7,189**	**6.5**	**-3.0**	**AF**	**35**
5R	**Madagascar**	**46**	**226**	**10,461**	**-18.5**	**-47.0**	**AF**	**39**
5T	**Mauritania**	**73**	**253**	**5,710**	**18.0**	**16.0**	**AF**	**35**
5U	**Niger**	**64**	**244**	**6,800**	**13.5**	**-2.0**	**AF**	**35**
5V	**Togo**	**70**	**250**	**7,140**	**6.0**	**-1.5**	**AF**	**35**
5W	**Western Samoa**	**240**	**60**	**5,324**	**-13.0**	**172.0**	**OC**	**32**
5X	**Uganda**	**47**	**227**	**8,794**	**1.0**	**-32.5**	**AF**	**37**
5Z	**Kenya**	**44**	**224**	**9,126**	**-1.5**	**-37.5**	**AF**	**37**
6W	**Senegal**	**76**	**256**	**5,742**	**15.0**	**18.0**	**AF**	**35**
6Y	**Jamaica**	**115**	**295**	**2,626**	**18.0**	**76.0**	**NA**	**8**
7O	**Yemen**	**27**	**207**	**8,452**	**13.0**	**-45.0**	**AS**	**21**
7P	**Lesotho**	**84**	**264**	**10,055**	**-29.5**	**-28.0**	**AF**	**38**

7Q	**Malawi**	**58**	**238**	**9,774**	**-15.0**	**-35.0**	**AF**	**37**
7X	**Algeria**	**47**	**227**	**5,693**	**36.7**	**-3.0**	**AF**	**33**
8P	**Barbados**	**107**	**287**	**3,740**	**11.5**	**59.5**	**NA**	**8**
8Q	**Maldive Is.**	**353**	**173**	**9,316**	**4.4**	**-73.4**	**AS**	**22**
8R	**Guyana**	**110**	**290**	**4,026**	**6.8**	**58.2**	**SA**	**9**
9A	**Croatia**	**34**	**214**	**5,661**	**45.8**	**-16.0**	**EU**	**15**
9G	**Ghana**	**71**	**251**	**7,079**	**5.5**	**0.2**	**AF**	**35**
9H	**Malta**	**41**	**221**	**6,146**	**36.0**	**-14.4**	**EU**	**15**
9J	**Zambia**	**66**	**246**	**9,449**	**-15.0**	**-28.0**	**AF**	**36**
9K	**Kuwait**	**19**	**199**	**7,464**	**29.0**	**-48.0**	**AS**	**21**
9L	**Sierra Leone**	**78**	**258**	**6,281**	**8.5**	**13.2**	**AF**	**35**
9M2	**West Malaysia**	**316**	**136**	**8,749**	**3.0**	**-102.0**	**AS**	**28**
9M6	**East Malaysia**	**304**	**124**	**8,223**	**3.0**	**-115.0**	**AS**	**28**
9N	**Nepal**	**344**	**164**	**7,616**	**27.5**	**-85.0**	**AS**	**22**
9Q	**Congo, Democratic Republic of the**	**67**	**247**	**8,316**	**-4.3**	**-15.3**	**AF**	**36**
9U	**Burundi**	**54**	**234**	**8,876**	**-3.0**	**-29.0**	**AF**	**36**
9V	**Singapore**	**313**	**133**	**8,780**	**1.3**	**-103.8**	**AS**	**28**
9X	**Rwanda**	**52**	**232**	**8,835**	**-1.5**	**-30.0**	**AF**	**36**
9Y	**Trinidad and Tobago**	**110**	**290**	**3,614**	**11.0**	**62.5**	**SA**	**9**
A2	**Botswana**	**76**	**256**	**9,614**	**-22.0**	**-25.0**	**AF**	**38**
A3	**Tonga**	**237**	**57**	**5,864**	**-21.0**	**175.0**	**OC**	**32**
A4	**Oman**	**9**	**189**	**7,976**	**23.5**	**-59.0**	**AS**	**21**

A5	**Bhutan**	**340**	**160**	**7,502**	**28.0**	**-90.0**	**AS**	**22**
A6	**United Arab Emirates**	**12**	**192**	**7,818**	**25.3**	**-55.5**	**AS**	**21**
A7	**Qatar**	**16**	**196**	**7,766**	**25.3**	**-51.5**	**AS**	**21**
A9	**Bahrain**	**17**	**197**	**7,704**	**26.0**	**-50.5**	**AS**	**21**
AP	**Pakistan**	**1**	**181**	**7,911**	**25.0**	**-67.0**	**AS**	**21**
BS7	**Scarborough Reef**	**310**	**130**	**7,482**	**15.1**	**-117.0**	**AS**	**27**
BV	**Taiwan**	**312**	**132**	**6,743**	**25.0**	**-122.0**	**AS**	**24**
BV9/P	**Pratas Island**	**314**	**134**	**7,212**	**20.4**	**-116.4**	**AS**	**24**
BY	**China**	**322**	**142**	**6,387**	**35.0**	**-116.4**	**AS**	**23**
C2	**Nauru**	**264**	**84**	**5,779**	**-0.5**	**-166.9**	**OC**	**31**
C3	**Andorra**	**44**	**224**	**5,353**	**42.5**	**-1.5**	**EU**	**14**
C5	**Gambia**	**77**	**257**	**5,883**	**13.0**	**17.0**	**AF**	**35**
C6	**Bahamas**	**108**	**288**	**2,240**	**25.0**	**77.5**	**NA**	**8**
C9	**Mozambique**	**63**	**243**	**10,067**	**-20.0**	**-36.0**	**AF**	**37**
CE	**Chile**	**146**	**326**	**5,703**	**-33.0**	**70.8**	**SA**	**12**
CE0/X	**San Felix**	**150**	**330**	**5,019**	**-26.0**	**80.0**	**SA**	**12**
CE0/Y	**Easter Island**	**177**	**357**	**4,727**	**-28.0**	**109.0**	**SA**	**12**
CE0/Z	**Juan Fernandez**	**152**	**332**	**5,488**	**-33.0**	**78.8**	**SA**	**12**
CE9	**Antarctica**	**182**	**2**	**8,319**	**-80.0**	**120.0**	**AN**	**Many**
CN	**Morocco**	**56**	**236**	**5,415**	**33.0**	**8.0**	**AF**	**33**
CO	**Cuba**	**116**	**296**	**2,084**	**23.1**	**82.4**	**NA**	**8**
CP	**Bolivia**	**135**	**315**	**4,787**	**-16.0**	**68.4**	**SA**	**10**
CT	**Portugal**	**52**	**232**	**5,109**	**38.7**	**9.2**	**EU**	**14**

CT3	**Madeira Island**	**61**	**241**	**5,011**	**33.0**	**17.0**	**AF**	**33**
CU	**Azores**	**61**	**241**	**4,445**	**38.0**	**25.0**	**EU**	**14**
CX	**Uruguay**	**137**	**317**	**6,237**	**-34.0**	**56.2**	**SA**	**13**
CY0	**Sable Is.**	**67**	**247**	**2,621**	**43.8**	**60.0**	**NA**	**5**
CY9	**St. Paul Island**	**62**	**242**	**2,571**	**47.2**	**60.1**	**NA**	**5**
D2	**Angola**	**73**	**253**	**8,428**	**-8.8**	**-13.2**	**AF**	**36**
D4	**Cape Verde**	**79**	**259**	**5,391**	**16.0**	**24.0**	**AF**	**35**
D6	**Comoros**	**44**	**224**	**9,954**	**-11.8**	**-43.7**	**AF**	**39**
DL	**Germany**	**35**	**215**	**5,090**	**51.0**	**-6.0**	**EU**	**14**
DU	**Philippines**	**307**	**127**	**7,344**	**14.6**	**-121.0**	**OC**	**27**
E3	**Eritrea**	**32**	**212**	**8,156**	**15.2**	**-39.0**	**AF**	**37**
E4	**Palestine**	**29**	**209**	**7,016**	**31.5**	**-34.5**	**AS**	**20**
E5/North	**North Cook Islands**	**233**	**53**	**4,709**	**-10.5**	**161.0**	**OC**	**32**
E5/South	**South Cook Islands**	**225**	**45**	**5,230**	**-21.0**	**159.5**	**OC**	**32**
E7	**Bosnia and Herzogovenia**	**34**	**214**	**5,836**	**43.9**	**-18.4**	**EU**	**15**
EA	**Spain**	**48**	**228**	**5,256**	**40.4**	**3.7**	**EU**	**14**
EA6	**Balearic Is.**	**45**	**225**	**5,555**	**39.5**	**-3.0**	**EU**	**14**
EA8	**Canary Islands**	**64**	**244**	**5,318**	**28.0**	**15.0**	**AF**	**33**
EA9	**Ceuta & Melilla**	**52**	**232**	**5,357**	**36.7**	**5.4**	**AF**	**33**
EI	**Ireland**	**39**	**219**	**4,594**	**53.3**	**6.3**	**EU**	**14**
EK	**Armenia**	**18**	**198**	**6,647**	**40.5**	**-44.5**	**AS**	**21**
EL	**Liberia**	**78**	**258**	**6,462**	**7.0**	**11.0**	**AF**	**35**

EP	**Iran**	**14**	**194**	**7,064**	**35.8**	**-51.8**	**AS**	**21**
ER	**Moldova**	**26**	**206**	**5,930**	**47.0**	**-29.0**	**EU**	**16**
ES	**Estonia**	**21**	**201**	**5,133**	**59.0**	**-25.0**	**EU**	**15**
ET	**Ethiopia**	**35**	**215**	**8,542**	**9.0**	**-39.0**	**AF**	**37**
EU	**Belarus**	**23**	**203**	**5,477**	**54.0**	**-27.5**	**EU**	**16**
EX	**Kyrgyzstan**	**355**	**175**	**6,722**	**42.0**	**-75.0**	**AS**	**17**
EY	**Tajikistan**	**1**	**181**	**6,910**	**39.5**	**-67.0**	**AS**	**17**
EZ	**Turkmenistan**	**8**	**188**	**6,976**	**38.0**	**-58.0**	**AS**	**17**
F	**France**	**39**	**219**	**5,079**	**48.8**	**-2.3**	**EU**	**14**
FG	**Guadeloupe**	**104**	**284**	**3,366**	**17.0**	**62.0**	**NA**	**8**
FH	**Mayotte**	**43**	**223**	**10,082**	**-13.0**	**-45.3**	**AF**	**39**
FJ	**Saint Barthelemy**	**103**	**283**	**3,271**	**18.0**	**63.0**	**NA**	**8**
FK	**New Caledonia**	**248**	**68**	**6,748**	**-22.0**	**-167.0**	**OC**	**32**
FK8/C	**Chesterfield Is.**	**255**	**75**	**7,088**	**-19.9**	**-158.3**	**OC**	**32**
FM	**Martinique**	**105**	**285**	**3,505**	**15.0**	**61.0**	**NA**	**8**
FO	**French Polynesia**	**219**	**39**	**4,719**	**-18.0**	**150.0**	**OC**	**32**
FO0A	**Austral Islands**	**218**	**38**	**5,027**	**-22.4**	**151.4**	**OC**	**32**
FO0M	**Marquesas Islands**	**214**	**34**	**3,852**	**-8.9**	**140.1**	**OC**	**31**
FO0X	**Clipperton Island**	**176**	**356**	**2,034**	**11.0**	**110.0**	**NA**	**7**
FP	**Saint. Pierre and Miquelon**	**61**	**241**	**2,740**	**47.0**	**56.5**	**NA**	**5**
FR	**Reunion**	**33**	**213**	**10,894**	**-21.0**	**-55.5**	**AF**	**39**
FR/G	**Glorioso**	**38**	**218**	**10,006**	**-10.6**	**-47.3**	**AF**	**39**
FR/J	**Juan de Nova**	**60**	**240**	**10,325**	**-21.5**	**-40.0**	**AF**	**39**

FR/T	**Tromelin Island**	**29**	**209**	**10,521**	**-15.5**	**-54.5**	**AF**	**39**
FS	**Saint Martin**	**103**	**283**	**3,271**	**18.0**	**63.0**	**NA**	**8**
FT5W	**Crozet**	**123**	**303**	**11,516**	**-46.5**	**-52.0**	**AF**	**39**
FT5X	**Kerguelen Islands**	**187**	**7**	**11,760**	**-50.0**	**-70.0**	**AF**	**39**
FT5Z	**Amsterdam**	**292**	**112**	**11,869**	**-37.0**	**-77.6**	**AF**	**39**
FW	**Wallis and Futuna**	**242**	**62**	**5,558**	**-14.0**	**176.0**	**OC**	**32**
FY	**French Guiana**	**107**	**287**	**4,421**	**5.0**	**52.0**	**SA**	**9**
G	**United Kingdom**	**38**	**218**	**4,875**	**51.5**	**0.1**	**EU**	**14**
GD, GT	**Isle of Man**	**38**	**218**	**4,624**	**54.0**	**4.5**	**EU**	**14**
GI, GN	**Northern Ireland**	**38**	**218**	**4,554**	**54.6**	**5.9**	**EU**	**14**
GJ, GH	**Jersey**	**41**	**221**	**4,905**	**49.3**	**2.2**	**EU**	**14**
GM, GS	**Scotland**	**36**	**216**	**4,554**	**55.8**	**4.3**	**EU**	**14**
GU, GP	**Guernsey**	**41**	**221**	**4,879**	**49.5**	**2.7**	**EU**	**14**
GW, GC	**Wales**	**38**	**218**	**4,720**	**52.5**	**3.5**	**EU**	**14**
H4	**Solomon Islands**	**262**	**82**	**6,539**	**-9.4**	**-160.0**	**OC**	**28**
H40	**Temotu Islands**	**255**	**75**	**6,318**	**-12.5**	**-167.0**	**OC**	**28**
HA	**Hungary**	**31**	**211**	**5,654**	**47.5**	**-19.1**	**EU**	**15**
HB	**Switzerland**	**38**	**218**	**5,321**	**47.0**	**-7.0**	**EU**	**14**
HB0	**Liechtenstein**	**37**	**217**	**5,400**	**47.0**	**-9.5**	**EU**	**14**
HC	**Ecuador**	**134**	**314**	**3,516**	**-0.2**	**78.0**	**SA**	**10**
HC8	**Galapagos Islands**	**152**	**332**	**3,183**	**-2.0**	**92.0**	**SA**	**10**

HH	**Haiti**	**110**	**290**	**2,774**	**19.0**	**72.0**	**NA**	**8**
HI	**Dominican Republic**	**109**	**289**	**2,895**	**18.5**	**70.0**	**NA**	**8**
HK	**Colombia**	**126**	**306**	**3,385**	**5.0**	**74.0**	**SA**	**9**
HK0/A	**San Andreas**	**128**	**308**	**2,653**	**12.5**	**81.7**	**NA**	**7**
HK0/M	**Malpelo Is.**	**135**	**315**	**3,156**	**4.0**	**81.1**	**NA**	**10**
HL	**Korea, South**	**317**	**137**	**5,872**	**37.5**	**-127.5**	**AS**	**25**
HO, HP	**Panama**	**129**	**309**	**2,936**	**9.0**	**79.5**	**NA**	**7**
HR	**Honduras**	**134**	**314**	**2,359**	**14.0**	**87.0**	**NA**	**7**
HS, E2	**Thailand**	**324**	**144**	**8,151**	**13.8**	**-100.5**	**AS**	**26**
HV	**Vatican City**	**38**	**218**	**5,764**	**41.9**	**-12.5**	**EU**	**15**
HZ	**Saudi Arabia**	**22**	**202**	**7,607**	**26.0**	**-45.0**	**AS**	**21**
I	**Italy**	**38**	**218**	**5,775**	**42.0**	**-13.0**	**EU**	**15**
IS	**Sardinia**	**41**	**221**	**5,746**	**40.0**	**-9.0**	**EU**	**15**
J2	**Djibouti**	**30**	**210**	**8,466**	**12.0**	**-43.0**	**AF**	**37**
J3	**Grenada**	**108**	**288**	**3,602**	**12.0**	**61.8**	**NA**	**8**
J5	**Guinea Bissau**	**76**	**256**	**6,030**	**12.0**	**15.0**	**AF**	**35**
J6	**Saint Lucia**	**106**	**286**	**3,550**	**14.0**	**61.0**	**NA**	**8**
J7	**Dominica**	**105**	**285**	**3,472**	**15.4**	**61.3**	**NA**	**8**
J8	**Saint. Vincent and the Grenadines**	**107**	**287**	**3,567**	**13.3**	**61.3**	**NA**	**8**
JA	**Japan**	**308**	**128**	**5,485**	**35.7**	**-139.8**	**AS**	**25**
JD1	**Minami Torishima**	**292**	**112**	**5,322**	**25.0**	**-154.0**	**AS**	**27**
JD1/O	**Ogasawara**	**302**	**122**	**5,818**	**27.5**	**-141.0**	**AS**	**27**

JT, JV	**Mongolia**	**335**	**155**	**5,878**	**48.0**	**-107.0**	**AS**	**23**
JW	**Svalbard**	**11**	**191**	**3,971**	**78.0**	**-16.0**	**EU**	**40**
JX	**Jan Mayen**	**22**	**202**	**3,892**	**71.0**	**8.0**	**EU**	**40**
JY	**Jordan**	**27**	**207**	**7,022**	**32.0**	**-36.0**	**AS**	**20**
K,W,A, N	**United States**	**181**	**1**	**477**	**33.5**	**112.0**	**NA**	**3,4,5**
KG4	**Guantanamo Bay**	**112**	**292**	**2,581**	**20.0**	**75.0**	**NA**	**8**
KH0	**Mariana Is.**	**290**	**110**	**6,118**	**16.0**	**-146.0**	**OC**	**27**
KH1	**Baker Island**	**253**	**73**	**4,853**	**0.5**	**176.0**	**OC**	**31**
KH2	**Guam**	**289**	**109**	**6,260**	**14.0**	**-145.0**	**OC**	**27**
KH3	**Johnston Atoll**	**263**	**83**	**3,798**	**17.0**	**170.0**	**OC**	**31**
KH4	**Midway Is.**	**279**	**99**	**3,761**	**28.0**	**177.5**	**OC**	**31**
KH5	**Palmyra Atoll**	**246**	**66**	**3,898**	**6.0**	**162.0**	**OC**	**31**
KH5/K	**Kingman Reef**	**248**	**68**	**3,853**	**7.5**	**162.6**	**OC**	**31**
KH6-7	**Hawaii**	**255**	**75**	**2,949**	**20.0**	**156.0**	**OC**	**31**
KH7K	**Kure Is.**	**280**	**100**	**3,794**	**28.5**	**178.5**	**OC**	**31**
KH8	**American Samoa**	**239**	**59**	**5,330**	**-14.0**	**171.0**	**OC**	**32**
KH8S	**Swains Island**	**241**	**61**	**5,214**	**-11.1**	**171.7**	**OC**	**31**
KH9	**Wake Island**	**279**	**99**	**4,920**	**19.0**	**-167.0**	**OC**	**31**
KL7	**Alaska**	**330**	**150**	**2,232**	**64.0**	**150.0**	**NA**	**1**
KP1	**Navassa**	**114**	**294**	**2,674**	**18.0**	**75.0**	**NA**	**8**
KP2	**Virgin Islands**	**105**	**285**	**3,194**	**18.0**	**64.5**	**NA**	**8**
KP3, KP4	**Puerto Rico**	**106**	**286**	**3,086**	**18.5**	**66.2**	**NA**	**8**

KP5	**Desecheo Is.**	**107**	**287**	**3,029**	**18.3**	**67.5**	**NA**	**8**
LA - LN	**Norway**	**27**	**207**	**4,771**	**60.0**	**-10.7**	**EU**	**14**
LO - LW	**Argentina**	**138**	**318**	**6,159**	**-34.0**	**58.4**	**SA**	**13**
LX	**Luxembourg**	**37**	**217**	**5,205**	**49.0**	**-6.5**	**EU**	**14**
LY	**Lithuania**	**24**	**204**	**5,406**	**54.5**	**-25.5**	**EU**	**15**
LZ	**Bulgaria**	**31**	**211**	**6,043**	**42.7**	**-23.3**	**EU**	**20**
OA - OC	**Peru**	**141**	**321**	**4,248**	**-12.0**	**77.0**	**SA**	**10**
OD	**Lebanon**	**27**	**207**	**6,891**	**33.9**	**-35.5**	**AS**	**20**
OE	**Austria**	**32**	**212**	**5,538**	**48.2**	**-16.3**	**EU**	**15**
OF - OI	**Finland**	**21**	**201**	**5,064**	**60.2**	**-25.0**	**EU**	**15**
OH0	**Aland Is.**	**23**	**203**	**4,966**	**60.2**	**-20.0**	**EU**	**15**
OJ0	**Market Reef**	**23**	**203**	**4,940**	**60.3**	**-19.0**	**EU**	**15**
OK - OL	**Czech Republic**	**32**	**212**	**5,382**	**50.1**	**-14.4**	**EU**	**15**
OM	**Slovakia**	**31**	**211**	**5,426**	**50.1**	**-16.0**	**EU**	**15**
ON - OT	**Belgium**	**36**	**216**	**5,046**	**50.9**	**-4.4**	**EU**	**14**
OX	**Greenland**	**36**	**216**	**2,851**	**63.0**	**52.0**	**NA**	**40**
OY	**Faroe Islands**	**31**	**211**	**4,229**	**62.0**	**7.0**	**EU**	**14**
OZ	**Denmark**	**29**	**209**	**5,037**	**55.7**	**-12.6**	**EU**	**14**
P2	**Papua New Guinea**	**273**	**93**	**7,167**	**-7.0**	**-146.0**	**OC**	**28**
P4	**Aruba**	**115**	**295**	**3,178**	**12.5**	**70.0**	**SA**	**9**

P5	**Korea, North**	**318**	**138**	**5,794**	**39.0**	**-127.5**	**AS**	**25**
PA - PI	**Netherlands**	**35**	**215**	**4,989**	**52.4**	**-4.9**	**EU**	**14**
PJ2, 4, 5	**Bonaire, Curacao**	**115**	**295**	**3,250**	**12.0**	**69.0**	**SA**	**9**
PJ5 - 8	**St. Maarten, St. Eustatius**	**103**	**283**	**3,271**	**18.0**	**63.0**	**NA**	**8**
PP - PY	**Brazil**	**121**	**301**	**6,205**	**-23.0**	**43.2**	**SA**	**11**
PY0/F	**Fern. de Norohna**	**99**	**279**	**5,815**	**-3.0**	**32.0**	**SA**	**11**
PY0/S	**Saint Peter and Paul**	**94**	**274**	**5,717**	**1.5**	**30.0**	**SA**	**11**
PY0/T	**Trindade**	**112**	**292**	**6,636**	**-21.0**	**32.0**	**SA**	**11**
PZ	**Surinam**	**117**	**297**	**4,813**	**-6.0**	**55.0**	**SA**	**9**
R1/FJ	**Franz Josef Land**	**4**	**184**	**4,084**	**80.0**	**-50.0**	**EU**	**40**
R1/MV	**Malyj Vysotskij**	**14**	**194**	**4,613**	**69.0**	**-29.0**	**EU**	**15**
S0	**Western Sahara**	**48**	**228**	**6,729**	**25.0**	**-14.0**	**AF**	**33**
S2	**Bangladesh**	**338**	**158**	**7,755**	**24.0**	**-90.5**	**AS**	**22**
S5	**Slovenia**	**34**	**214**	**5,603**	**46.1**	**-14.6**	**EU**	**15**
S7	**Seychelles**	**20**	**200**	**9,802**	**-4.0**	**-56.0**	**AF**	**39**
S9	**Sao Tome and Principe**	**71**	**251**	**7,636**	**0.3**	**-6.0**	**AF**	**36**
SA - SM	**Sweden**	**24**	**204**	**4,975**	**59.3**	**-18.1**	**EU**	**14**
SN - SR	**Poland**	**29**	**209**	**5,537**	**50.0**	**-20.0**	**EU**	**15**
ST	**Sudan**	**38**	**218**	**7,940**	**15.5**	**-32.5**	**AF**	**34**
SU	**Egypt**	**32**	**212**	**7,026**	**30.0**	**-31.4**	**AF**	**34**
SV - SZ	**Greece**	**34**	**214**	**6,328**	**38.0**	**-23.7**	**EU**	**20**
SV/A	**Mt. Athos**	**32**	**212**	**6,217**	**40.2**	**-24.3**	**EU**	**20**

SV5	**Dodecanese**	**32**	**212**	**6,525**	**36.5**	**-27.5**	**EU**	**20**
SV9	**Crete**	**34**	**214**	**6,525**	**35.4**	**-25.2**	**EU**	**20**
T2	**Tuvalu**	**250**	**70**	**5,560**	**-8.7**	**-178.6**	**OC**	**31**
T30	**Kiribati**	**256**	**76**	**5,520**	**-4.0**	**-175.0**	**OC**	**31**
T31	**Kiribati**	**245**	**65**	**4,875**	**-5.0**	**171.0**	**OC**	**31**
T32	**East Kiribati**	**224**	**44**	**4,248**	**-10.0**	**150.0**	**OC**	**31**
T33	**Banaba Island**	**248**	**68**	**5,068**	**-5.0**	**175.0**	**OC**	**31**
T5	**Somalia**	**23**	**203**	**8,020**	**20.0**	**-46.0**	**AF**	**37**
T7	**San Marino**	**37**	**217**	**5,668**	**44.0**	**-13.0**	**EU**	**15**
T8	**Palau**	**290**	**110**	**6,808**	**9.5**	**-138.2**	**OC**	**27**
TA - TC	**Turkey**	**26**	**206**	**6,455**	**39.9**	**-32.9**	**EU**	**20**
TF	**Iceland**	**33**	**213**	**3,746**	**64.1**	**22.0**	**EU**	**40**
TG, TD	**Guatemala**	**138**	**318**	**2,196**	**14.6**	**90.5**	**NA**	**7**
TI	**Costa Rica**	**133**	**313**	**2,701**	**10.0**	**84.0**	**NA**	**7**
TI9	**Cocos Island**	**141**	**321**	**2,889**	**5.0**	**87.0**	**NA**	**7**
TJ	**Cameroon**	**64**	**244**	**7,745**	**4.0**	**-12.0**	**AF**	**38**
TK	**Corsica**	**40**	**220**	**5,642**	**42.0**	**-9.0**	**EU**	**15**
TL	**Central Africa Republic**	**58**	**238**	**7,995**	**4.5**	**-18.0**	**AF**	**36**
TN	**Congo, Republic of**	**67**	**247**	**8,287**	**-4.0**	**-15.0**	**AF**	**36**
TR	**Gabon**	**68**	**248**	**7,774**	**0.5**	**-9.0**	**AF**	**36**
TT	**Chad**	**55**	**235**	**7,467**	**12.0**	**-15.0**	**AF**	**36**
TU	**Cote d'Ivoire**	**74**	**254**	**6,888**	**5.5**	**4.0**	**AF**	**35**

TY	**Benin**	**69**	**249**	**7,165**	**6.3**	**-2.3**	**AF**	**35**
TZ	**Mali**	**71**	**251**	**6,338**	**13.0**	**8.0**	**AF**	**35**
UA	**Russia**	**16**	**196**	**5,570**	**56.0**	**-40.0**	**EU**	**16**
UA2	**Kaliningrad**	**26**	**206**	**5,267**	**55.0**	**-20.5**	**EU**	**15**
UA9,UA0	**Asiatic Russia**	**352**	**172**	**5,782**	**55.0**	**-83.0**	**AS**	**17,18,19**
UJ - UM	**Uzbekistan**	**3**	**183**	**6,870**	**40.0**	**-64.0**	**AS**	**17**
UN - UQ	**Kazakhstan**	**355**	**175**	**5,961**	**53.0**	**-76.0**	**AS**	**17**
UR-UR, EM-	**Ukraine**	**23**	**203**	**5,760**	**50.5**	**-31.0**	**EU**	**16**
V2	**Antigua and Barbuda**	**102**	**282**	**3,478**	**17.0**	**59.8**	**NA**	**8**
V3	**Belize**	**132**	**312**	**2,112**	**17.5**	**88.3**	**NA**	**7**
V4	**Saint Kitts and Nevis**	**104**	**284**	**3,322**	**17.3**	**62.6**	**NA**	**8**
V5	**Namibia**	**83**	**263**	**9,230**	**-22.6**	**-17.1**	**AF**	**38**
V6	**Micronesia**	**276**	**96**	**5,866**	**8.0**	**-158.0**	**OC**	**27**
V7	**Marshall Islands**	**271**	**91**	**5,341**	**9.2**	**-167.0**	**OC**	**31**
V8	**Brunei**	**305**	**125**	**8,116**	**5.0**	**-115.0**	**OC**	**28**
VE, VO, VY	**Canada**	**37**	**217**	**875**	**50.0**	**100.0**	**NA**	**2,3,4,5**
VK	**Australia**	**261**	**81**	**8,938**	**-30.0**	**-130.0**	**OC**	**29**
VK0/H	**Heard Island**	**194**	**14**	**11,524**	**-53.0**	**-73.4**	**AF**	**39**
VK0/M	**Macquarie Is.**	**223**	**43**	**8,397**	**-54.7**	**-158.8**	**OC**	**30**

VK9/C	**Cocos Keeling Islands**	**310**	**130**	**9,819**	**-12.2**	**-96.8**	**OC**	**29**
VK9/L	**Lord Howe Is.**	**244**	**64**	**7,541**	**-31.6**	**-159.1**	**OC**	**30**
VK9/M	**Mellish Reef**	**258**	**78**	**7,116**	**-17.6**	**-155.8**	**OC**	**30**
VK9/N	**Norfolk Is.**	**242**	**62**	**7,013**	**-29.0**	**-168.0**	**OC**	**32**
VK9/W	**Willis Is.**	**263**	**83**	**7,374**	**-16.0**	**-149.5**	**OC**	**30**
VK9/X	**Christmas Island**	**301**	**121**	**9,348**	**-10.5**	**-105.7**	**OC**	**30**
VP2/E	**Anguilla**	**103**	**283**	**3,258**	**18.3**	**63.0**	**NA**	**8**
VP2/M	**Montserrat**	**104**	**284**	**3,364**	**16.8**	**62.2**	**NA**	**8**
VP2/V	**Brit. Virgin Islands**	**104**	**284**	**3,172**	**18.4**	**64.6**	**NA**	**8**
VP5	**Turks and Caicos Islands**	**107**	**287**	**2,642**	**22.0**	**72.0**	**NA**	**8**
VP6	**Pitcairn Is.**	**198**	**18**	**4,673**	**-25.1**	**130.1**	**OC**	**32**
VP6/D	**Ducie Island**	**193**	**13**	**4,572**	**-24.7**	**124.8**	**OC**	**32**
VP8/F	**Falkland Islands**	**150**	**330**	**7,095**	**-52.0**	**60.0**	**SA**	**13**
VP8/G	**South Georgia Islands**	**142**	**322**	**7,873**	**-54.0**	**37.0**	**SA**	**13**
VP8/H	**South Shetland Islands**	**156**	**336**	**7,665**	**-62.0**	**58.5**	**SA**	**13**
VP8/O	**South Orkney Islands**	**150**	**330**	**7,865**	**-60.0**	**46.0**	**SA**	**13**
VP8/S	**South Sandwich Islands**	**141**	**321**	**8,280**	**-57.0**	**28.0**	**SA**	**13**
VP9	**Bermuda**	**87**	**267**	**2,647**	**32.3**	**64.7**	**NA**	**5**
VQ9	**Chagos**	**352**	**172**	**10,127**	**-7.3**	**-72.4**	**AF**	**39**
VR2	**Hong Kong**	**317**	**137**	**7,182**	**22.5**	**-114.0**	**AS**	**24**
VU	**India**	**348**	**168**	**7,984**	**23.0**	**-80.0**	**AS**	**22**
VU4	**Andaman Is.**	**329**	**149**	**8,577**	**10.0**	**-94.0**	**AS**	**26**
VU7	**Laccadive Is.**	**358**	**178**	**8,945**	**10.0**	**-70.0**	**AS**	**22**

XA - XI	**Mexico**	**141**	**321**	**1,387**	**24.0**	**98.0**	**NA**	**6**
XA4 - XI4	**Revilla Gigedo**	**180**	**0**	**1,547**	**18.0**	**112.0**	**NA**	**6**
XT	**Burkina Faso**	**68**	**248**	**6,681**	**12.3**	**1.7**	**AF**	**35**
XU	**Cambodia**	**318**	**138**	**8,141**	**11.5**	**-105.0**	**AS**	**26**
XW	**Laos**	**324**	**144**	**7,832**	**18.0**	**-102.5**	**AS**	**26**
XX9	**Macao**	**317**	**137**	**7,210**	**22.0**	**-114.0**	**AS**	**24**
XY - XZ	**Myanmar**	**330**	**150**	**8,093**	**16.8**	**-96.0**	**AS**	**26**
YA	**Afghanistan**	**3**	**183**	**7,424**	**32.0**	**-65.0**	**AS**	**21**
YB - YH	**Indonesia**	**304**	**124**	**9,054**	**-6.0**	**-107.0**	**OC**	**28**
YI	**Iraq**	**20**	**200**	**7,139**	**33.0**	**-44.5**	**AS**	**21**
YJ	**Vanuatu**	**250**	**70**	**6,518**	**-18.0**	**-168.0**	**OC**	**32**
YK	**Syria**	**26**	**206**	**6,908**	**34.0**	**-36.5**	**AS**	**20**
YL	**Latvia**	**23**	**203**	**5,229**	**57.0**	**-24.0**	**EU**	**15**
YN	**Nicaragua**	**134**	**314**	**2,511**	**12.0**	**86.0**	**NA**	**7**
YO - YR	**Romania**	**29**	**209**	**6,017**	**44.4**	**-26.1**	**EU**	**20**
YS	**El Salvador**	**136**	**316**	**2,284**	**14.0**	**89.0**	**NA**	**7**
YT-YU, YZ	**Serbia**	**32**	**212**	**5,839**	**44.9**	**-20.5**	**EU**	**15**
YV	**Venezuela**	**114**	**294**	**3,419**	**10.5**	**67.0**	**SA**	**9**
YV0	**Aves Is.**	**113**	**293**	**3,322**	**12.0**	**67.5**	**NA**	**8**
Z2	**Zimbabwe**	**66**	**246**	**9,735**	**-18.0**	**-31.0**	**AF**	**38**

Z3	**Macedonia**	**32**	**212**	**5,839**	**44.9**	**-20.5**	**EU**	**15**
ZA	**Albania**	**34**	**214**	**6,004**	**41.5**	**-19.5**	**EU**	**15**
ZB2	**Gibraltar**	**53**	**233**	**5,385**	**36.0**	**5.5**	**EU**	**14**
ZC4	**UK Bases/Cyprus**	**28**	**208**	**6,761**	**35.0**	**-33.0**	**AS**	**20**
ZD7	**Saint Helena**	**92**	**272**	**7,748**	**-16.0**	**6.0**	**AF**	**36**
ZD8	**Ascension Is.**	**91**	**271**	**6,981**	**-8.0**	**14.0**	**AF**	**36**
ZD9	**Tristan da Cunha**	**115**	**295**	**8,242**	**-37.0**	**12.3**	**AF**	**38**
ZF	**Cayman Islands**	**120**	**300**	**2,311**	**19.5**	**81.2**	**NA**	**8**
ZK2	**Niue**	**235**	**55**	**5,544**	**-19.0**	**170.0**	**OC**	**32**
ZK3	**Tokelau**	**244**	**64**	**5,125**	**-8.4**	**172.7**	**OC**	**31**
ZL - ZM	**New Zealand**	**229**	**49**	**7,258**	**-41.0**	**-174.8**	**OC**	**32**
ZL7	**Chatham Is.**	**221**	**41**	**7,058**	**-44.0**	**176.0**	**OC**	**32**
ZL8	**Kermadec Island**	**233**	**53**	**6,443**	**-30.0**	**178.0**	**OC**	**32**
ZL9	**Auckland & Campbell Is.**	**212**	**32**	**7,267**	**-52.5**	**169.0**	**OC**	**32**
ZP	**Paraguay**	**132**	**312**	**5,696**	**-25.0**	**57.7**	**SA**	**11**
ZR - ZU	**South Africa**	**97**	**277**	**9,688**	**-33.9**	**-18.4**	**AF**	**38**
ZS8	**Marion Is.**	**116**	**296**	**10,857**	**-46.8**	**-37.8**	**AF**	**38**