The New
RTTY *Journal* ©

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Jay Dyer (W8JAY) JT1FCP presenting HAL P38 to
N. Khosbagan, JT1CD, Secretary of the Mongolia Radio Sport Federation

RTTY CONTEST SCHEDULE - SPRING 1999

Date & Time	Name & Sponsors	Date & Time	Name & Sponsors
03/14 1800 to 2200	High Speed Sprint RTTY Contest	05/01 2000 to 05/02 2000	ARI International DX Contest
03/20 0200 to 03/22 0200	BARTG WW RTTY Contest	05/08 1200 to 05/09 1200	VOLTA WW RTTY Contest
04/03 1600 to 04/04 1600	EA WW RTTY Contest	06/12 0000 to 06/13 2400	ANARTS WW RTTY Contest
04/24 1200 to 04/25 1200	SP DX RTTY Contest	06/26 1800 to 06/27 2100	ARRL Field Day Contest

Dates and Times subject to change

Updated information available at:

LA9HW RTTY Page: http://home.sn.no/~janalme/RTTY.html

Jim's Gazette: http://www,n2hos.com/digital

N1RCT Web Site: http:// www.megalink.net/~n1rct

SM3CER Contest Service: http://www.sk3bg.se/contest

ARRL: http://www.arrl.org

BARTG: http://www.bartg.demon.co.uk

OR - The New RTTY Journal will airmail a printed copy to you. *For each contest,* send $3.00 for U.S., Canada, or Mexico destinations or $4.00 to other countries. Please allow 3 weeks for processing and delivery.

The New
RTTY *Journal*©

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Hits & Misses

Bill Henry, K9GWT
ghenry@advancenet.net

Well, here it is February again – and 1999, the last year of this *century*. The ionosphere "boom" we highlighted on November's cover continues. Every month brings more DX and longer band openings. Openings on 15 and 10 are no longer unusual but are now expected. This year's WPX goes on as I write and it is bigger and better than ever. If you have plans – or even inkling – to upgrade your station, don't wait. This *is* the time. Miss it and you'll have to wait another 11 years or more. So, you'd better start drawing plans about where the new tower and Yagi stack will go this spring. It's also time to lay-in some spare tubes for the linear and replace some of that old RG8 cable. Of course, you might also want to have a look at modern modems (hint, hint). This is just the beginning of the best propagation we'll have for some time to come. The peak isn't here yet, but "it's coming". **It's time to get on the train or watch it go by!**

Speaking of the WPX contest, we have Great News! The RTTY WPX contest now has two sponsors, The New RTTY Journal and **CQ Magazine**. We owe a large thank you to Dick Ross K2MGA, Al Dorhoffer K2EEK, and the entire staff at CQ Publishing. Long the leader in Contesting on SSB and CW, CQ now co-sponsers two RTTY contests, The CQ/RJ WW DX RTTY Contest in September, and the CQ/RJ WPX RTTY Contest in February. The WPX contest will continue with the same people as before - Eddie (W6/G0AZT) as manager and doing the logs and Ron (K5DJ) as the director and making the plaques. The New RTTY Journal will do the certificates – but on time! The 1998 WPX Certificates are still "in process". I know you've heard this before and it's my fault. I apologize and promise that all will soon have their 1998 WPX Certificates. Further, it is our intention to have plaques and certificates for the 1999 WPX at the Dayton Hamvention this year. Thanks for your patience about the delays and "welcome aboard" CQ!

Hallelujah!We have finally figured out how to make the long-promised CD-ROM archives of The RTTY Journal. Joe has now computer-scanned every issue of the first 25 years twice. A big thank you to all who donated or loaned us original copies of the RTTY Journal. While our photocopies looked pretty good to the "naked eye", they didn't scan at all well. Scanning good-condition original magazines made a big improvement – worth the extra work and delay! The three CD-ROMs we offer at this time are for the issues that were ½-page size – 1953 through 1977. We've also added a couple of vintage RTTY Call books and some other "interesting stuff" to Archive Disk 3. The first 3 CD-ROMs will be available by late April and we will have a limited number in the booth for sale at Dayton. However, we make each disk ourselves and will not have time to "burn" new disks while at Dayton. If you want to take some home with you, better call Joe and place your order. See page 13 for more details. Note that all subscribers get a 25% discount.

About the mail – and maybe not getting your magazine. We cannot figure out why, but some of you are not getting delivery. Every issue mailed is sent via air mail postage and our post office assures us that we are using the correct postage and that the envelope, label, and everything else "is correct". If that's so, what's happening? We wish we knew. If you don't get an issue, call or email us. We'll get another copy to you somehow as soon as possible. Thank you for your patience. If your post office, state, or country has unusual rules, please let us know. We'll be glad to add extra labels or instructions if that is what is needed!

This issue has quite a variety of articles, from DXing to rig modifications to graphs to plans for the Dayton gathering. I think it's a good collection – let me know what you think. Missing this month is Tom Kleinschmidt's history series – he had to go to England (lucky fellow) and we ran out of space. I promise that Tom's series will resume next issue. Also missing is "Tape Off The Floor". I thought it was a great idea but I sure haven't had much feedback pro or con. Let me know if you want more of this – and maybe one of you would like to edit this feature?
73 de K9GWT

Dayton 1999

Plan ahead, make your room and dinner reservations early.
(see page 7)

Filters & Occupied Bandwidth

Bill Henry, K9GWT
ghenry@advancenet.net

Since we hams first started using HF FSK RTTY in 1953, the topic of "which filter is best?" has been cussed, discussed, and debated. Some like narrow filters, others say that makes tuning difficult; some want filters with steep skirts, others say that only adds distortion. Most say "filters cost too much" but the guys designing and selling filters say "you gets what you pays for". It turns out that we're all correct at one time or another. The "Filters and RTTY" debate turned up again on the WF1B reflector again last December. I know this is "preaching to the choir" but here's a little more on the subject.

By the way, I assume that the transmitted spectra is the same whether we use the "FSK" mode of the transceiver or run audio tones in LSB mode (not "AFSK" but also not really "FSK"). I'll tackle this one later. For now, assume that the RTTY signal comes from a "perfect" transmitter.

Bandwidth – Occupied and Otherwise:
You can probably find as many different definitions of RTTY signal bandwidth as you can find engineering textbooks. We have "occupied bandwidth", "necessary bandwidth", and "half-power bandwidth" and so on. A couple of definitions: (1) "Occupied bandwidth" is the bandwidth that contains all transmitted power down to 0.5% or greater of the maximum level (-23 dB). (2) "Necessary bandwidth" is the part of the occupied bandwidth that is sufficient to insure transmission of the information. The CCIR and FCC have a formula for this (Bn=B+2DK). The half-power bandwidth is of course the –3 dB bandwidth or Fo/Q for a tuned circuit. Receiver designers use the ½ voltage (-6 dB) bandwidth because it is very easy to measure. Finally, as a modem designer, my "rule of thumb" for input filters is BW=Shift+3Baud. So, what are the bandwidths of a RTTY signal? The top portion of Figure 1 shows the actual measured spectra of a 45.45 baud, 170 Hz shift RTTY signal. The various "bandwidths" of this RTTY signal are:

½ Power BW (-3dB)	=	192 Hz
½ Voltage BW (-6dB)	=	200 Hz
Necessary BW (B+2DK)	=	249 Hz
Occupied BW (-23 dB)	=	268 Hz
"Henry's Rule"	=	306 Hz
-30 dB BW	=	355 Hz
-40 dB BW	=	650 Hz
-50 dB BW	=	990 Hz

Ok, so which numbers do we believe and use to choose a filter? Ideally, the receiver filter should be exactly wide enough to pass the RTTY signal without distortion – and narrow enough to completely eliminate all interference that is "close" in frequency. Well, it just isn't an ideal world. There are many conflicts and compromises we must make – and the "best" choice varies with the situation.

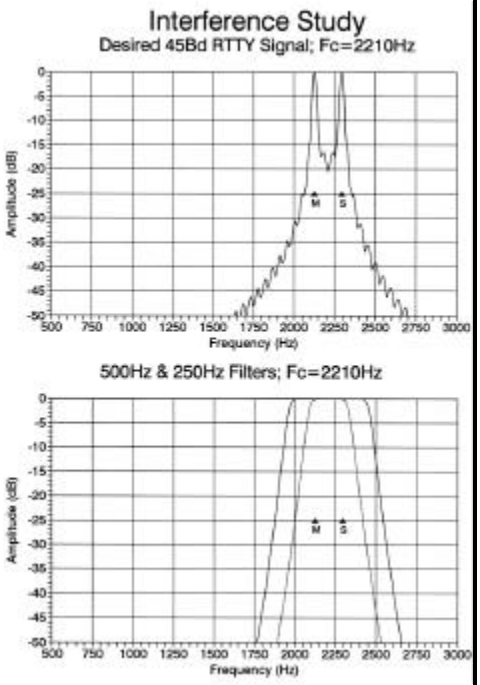

Figure 1. 45 Bd RTTY Spectra
and Typical Receiver Filters

Options and Trade-Offs:
According to engineering theory, we should choose a receiver filter that exactly matches the desired signal's spectra. This gives maximum signal-to-noise when receiving weak signals as well as good rejection of most adjacent channel interference. But, we also have to choose a filter that is available, generally a 500 Hz bandwidth filter or 250 Hz for some rigs. I personally prefer to use a wide filter most of the time because it is easier to tune-around and find signals – I "hear them coming" as I tune across the band. This is a good idea if you are chasing DX and the band is not very crowded (S&P mode). But, if you're in a contest and particularly if you're calling CQ and not tuning a wide range, a very narrow 250 Hz filter may be just the ticket".

Another factor to consider is "ringing". Quite often, a 250 Hz filter or even some 500 Hz jobs "ring". It's uncomfortable when copying CW and an unqualified disaster for RTTY. Each "ring" looks like an interfering RTTY signal to the demodulator, creating distortion and adding "hits". I recall trying a certain 500 Hz receiver filter on AMTOR. I started the link using the SSB filter and then switched to 500 Hz. Immediately upon choosing the 500 Hz filter, the ARQ ERROR light started flickering. The filter actually added distortion. Conversely, the Ten-Tec Paragon has a "sweet" little 250 Hz filter that doesn't ring and works great on RTTY. Recent generation receiver filters are better and I have to believe that data modes have finally "caught on"!

The frequency response curve of my "ideal RTTY filter" has nice rounded top and gently sloping side skirts – like the ones shown in the lower graph of Figure 1. Unless it's a DSP implementation, you do NOT want to use a filter with flat or ripply top and near-vertical skirts. These guys ring – and ring – and ring. Engineers like to talk about "ideal "brick wall filters" with a flattop and square side-skirts. Crystal and mechanical filters have been built that come very close, but these things are NOT friendly to data modes. With the advent of DSP, I have to hedge since in the digital

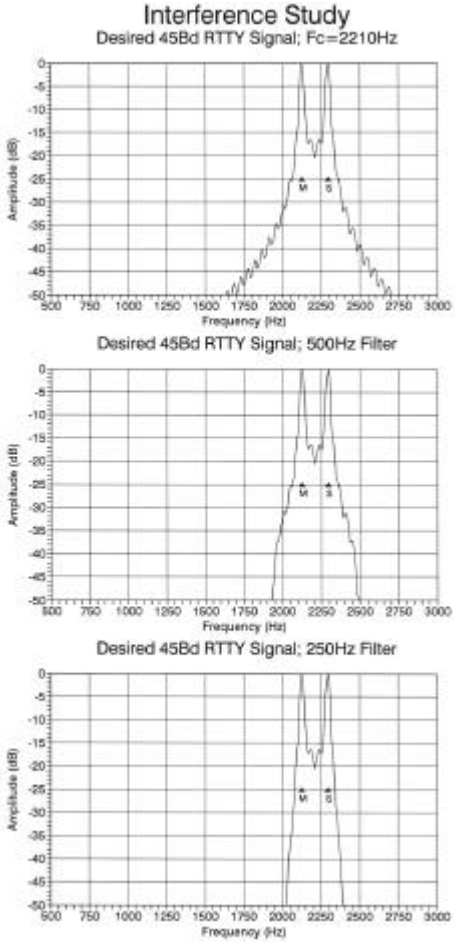

Figure 2. RTTY Signal
through 500 Hz and 250 Hz filters

filter domain, you can make virtually any filter shape and set the phase and amplitude response as well - "have your cake and eat it too". As they say "it's only software" – but that's another story.

Figure 2 shows that we can definitely get the 45-Baud RTTY signal through either of Bill Henry's "ideal" filters. Note what happens to the low-level skirts of the RTTY signal. While the –40 dB width of the original signal is 650 Hz wide, it's only 500 Hz after going through the 500 Hz filter and 330 Hz after the 250 Hz filter. Now think about this – what if we used LSB and 2125/2295 tones when transmitting AND used a 250 Hz filter in the transmitter signal chain? Wow! This would sure knock-down those spurious signals, wouldn't it? Also, think about the extra carrier and unwanted sideband rejection we'd get. Put this idea in the "why don't they make them this way?" category. Reason: there's still more of them (voice operators) than us (data operators). Unfortunately, HF radios are still made for talkers, but the keyboard crowd is growing!

Interference and Choice of Filter:
I am an engineer and I love numerical analysis, spreadsheets, and graphs. I'll spare you the numbers and spread sheets, but boy do I have great graphs to share! The simulation is based on the measured RTTY signal spectra and the "ideal" filter curves shown in Figure 1. I simulate interference from another RTTY signal by creating another column in the spread sheet and then translating the original RTTY spectra data to the new column with a frequency offset of 1000 Hz, 500 Hz, and 250 Hz. I then use formulas within the spreadsheet to compute a composite signal, the RMS sum of the original and interfering signal at each 5Hz increment (300 to 3000 Hz). This composite signal is what you get if you just use the SSB filter, ignoring minor variations of actual SSB filters. The spreadsheet also allows me to pass the composite signal + interference through the 500 Hz filter or a 250 Hz filter. Finally, I add an "AGC amplitude correction" that normalizes each filter output to a max. level of "0 dB".

RTTY Interference Spaced 1kHz:
The upper graph in Figure 3 shows the SSB filter output when another RTTY signal (interference) is 1kHz below our desired signal and both signals have the same amplitude. The interference is obviously a long way "away" from our desired signal and the filters in even the lowest cost TNC gadgets will probably sort one from the other. But, if you have a 500 Hz filter the lower graph shows that you can completely wipe out the interference. The situation changes a little in Figure 4. Here the interference is 40 dB stronger than the guy you want to print, almost 7 S-units stronger (6dB / S-Unit). Top-level RTTY demodulators like the ST-6, ST-6000, and ST-8000 will pull this out with ease, but "sorry Charlie" if you have a modem without input filters. Again, selecting the 500 Hz filter (lower graph) cleans it all up, even for the simplest modem.

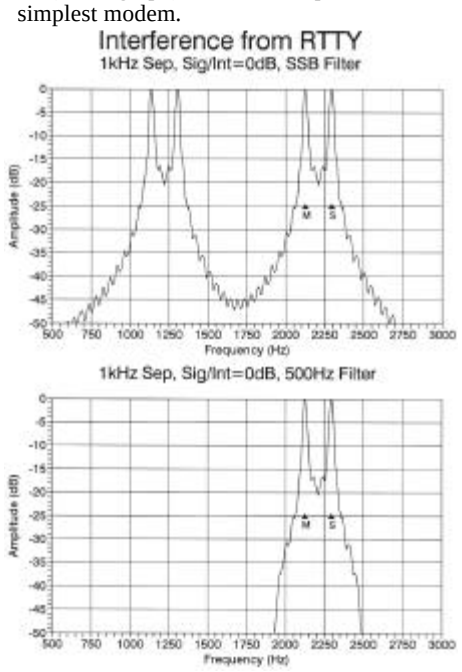

Figure 3. Interference, 1kHz spacing, Equal Amplitude

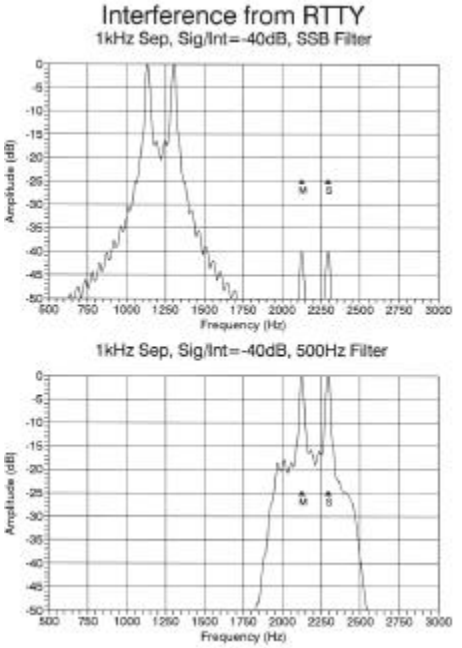

Figure 4. Interference, 1 kHz Spacing, Signal/Int. = -40dB

RTTY Interference Spaced 500 Hz:
Things get a little more interesting if the interference is only 500 Hz away. The equal strength situation is shown in Figure 5. Again, a top-notch demodulator will pull out your signal when using the SSB filter and turning on the 500 Hz filter makes all modems look good. But, checkout Figure 6! Now the interference is 40 dB stronger and even the 500 Hz filter doesn't do much good. This is a good place for those who have a 250 Hz filter to show-up the rest of us. There is admittedly some "fur" (distortion) on the Mark frequency peak, but you will get some copy. By the way, note that the Space signal output is "clean" from all three filters – SSB, 500 Hz, or 250Hz. If you have a demodulator that will do Space-Only copy, you may not need either the 500 or 250 Hz filter.

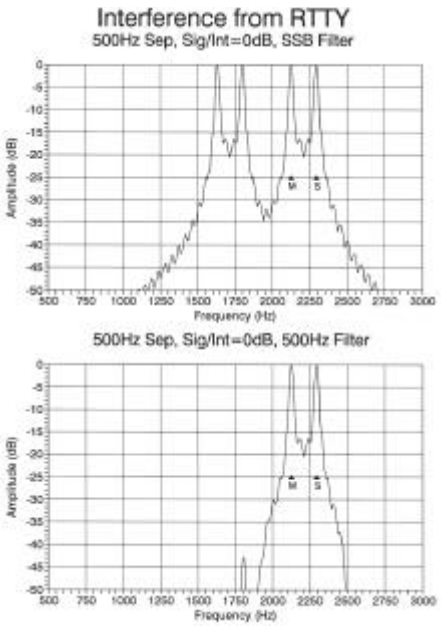

Figure 5. Interference, 500 Hz Spacing, Equal Amplitude

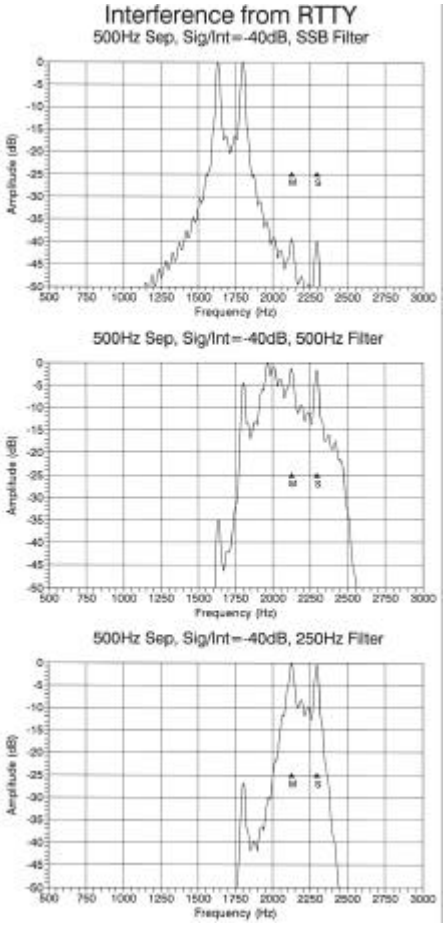

Figure 6. Interference, 500 Hz Spacing, Signal/Int. = -40 dB

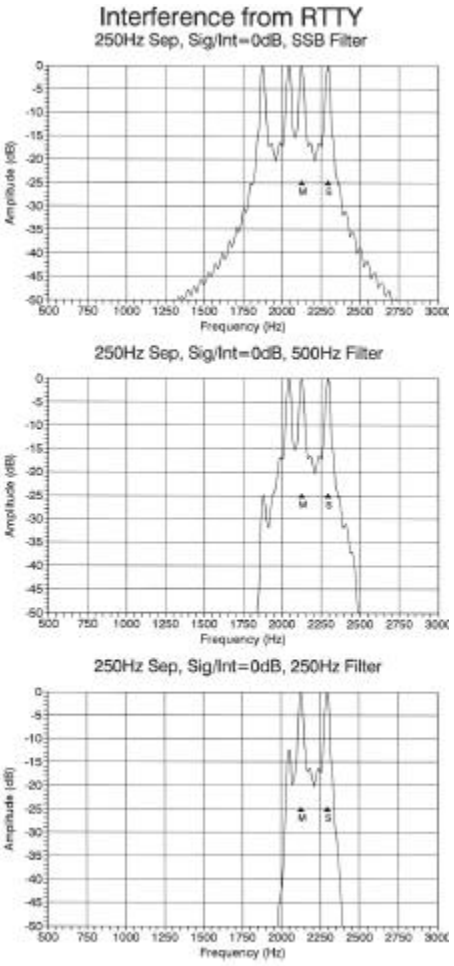

Figure 7. Interference, 250 Hz Spacing, Equal Amplitude

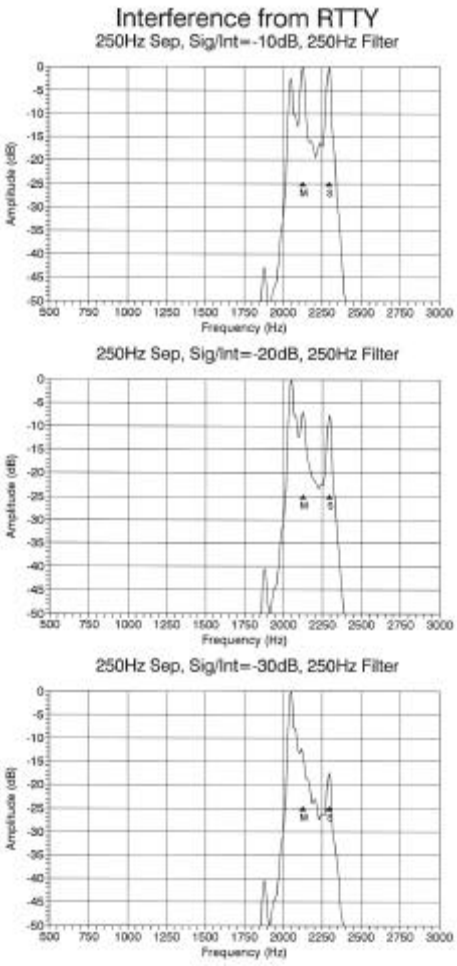

Figure 8. Interference, 250 Hz Spacing, Signal/Int. = -10 dB

RTTY Interference Spaced 250 Hz:
Here's where we separate the "men from the boys"! The equal amplitude case (Figure 7) sure looks messy – and the 500 Hz filter doesn't help a bit. The 250 Hz filter does work and you can copy this condition with a modest modem if you have a 250 Hz filter. The situation really goes to "you know where" when the desired signal starts fading. Figure 8 shows only a 10 dB difference in amplitude (about 2 S-units). Find the Mark signal! It really isn't there. But, look at that Space signal. Here's a case where none of your receiver filters will help a bit. I hate to keep harping on this – BUT – those of us with a demodulator that will copy Mark-Only or Space-Only are gonna work this guy. Everybody else gets to watch.

Other Modes and Waveforms:
This article is a lot shorter than the topic became for me. Of course I got carried away and have a lot more graphs to show! I can hear some of you snoring after only 8 figures and I don't want to kill the RTTY Journal. So, I've limited this article to only three cases where the interference comes from another RTTY signal. This is the typical HF contest or DX situation and the dominant interest for most of our readers. However, if you are interested in similar interference simulations for 200 Bd FSK (P-Mode), 300 Bd FSK (HF Packet &G-TOR), and CLOVER-II, call up the RTTY Journal web site and click on "Bill's Graphs". I should offer a prize to anyone who manages to look at all of them – and stay awake!

Conclusion:
This short study indicates that there are a lot of different numbers people use to describe signal bandwidth. I contend that interference is really the worst problem we have and that therefore we should always be talking about the "occupied bandwidth" – or "interference bandwidth". Because signals fade up and down – and – our desired signal is always much weaker than the interference, I prefer to think about the 40 dB or even 50 dB bandwidth of an interfering signal. 50 dB is really only a little over 8 S-Units. That's a pretty common situation, particularly when signals are fading. There is nothing stable about HF signals. The amplitude, phase, and frequency change constantly due to changes in propagation. The changes can be over a wide range and rapid. The simulations that show a marginal reception capability for simple demodulators quickly fall-apart when the signal fades – and it is always the wanted signal that fades, not the interference! I'm a modem designer and seller. Yes, I am biased. But, if you really want to work ALL the RTTY signals – and not just the strong ones – you need a good demodulator. It's part of the receiver and "you can't work 'em if you can't hear 'em."

Next issue (June), I want to tackle the "FSK" Vs "AFSK" thing – "one more time". EVERYBODY on RTTY has an opinion on this topic. Drop me a letter or e-mail and I'll try to be sure to cover your points.

Dayton Hamvention

Dale Sinner, W6IWO
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There is lots of exciting news to tell you about this year's Dayton Hamvention. We have changed hotels and have chosen the Holiday Inn Dayton Mall this year. The hotel is located a block from the Dayton Mall at I-75 and Rte 275 in Miamisburg. If you have not yet made any Dayton preparations, now is the time. This is a major change for us but we now believe your stay will be more enjoyable. Let me start by asking you to make your plans today. Don't hesitate a minute more or you might miss out on the best year yet at Dayton. We only have a block of 75 rooms reserved and they are sold on a first-come first-served basis.

The Holiday Inn has very nice accommodations, and we are pleased to have them host our group. The rooms are a little bit more expensive than we paid in the past but the Quality Inn was also going to charge us the same amount last year if they had been able to get the hotel upgraded. You will find that this hotel has been recenty remodeled and has all the arrangements we need. Here are some of the conveniences you can expect. All rooms include a work desk, computer/fax hookup, complimentary newspaper, remote control cable TV, in-room movies, coffee maker, and in-room voice mail. In addition, the hotel has an inside heated pool, sauna, whirlpool, putting green, ping pong, pool table, video games, and fitness room.

Delphine's Restaurant is located within the hotel and features a daily breakfast buffet. A beautiful lounge is at your disposal. There is even a Sports Bar. AVIS rent-a-car has an office on the premises for those wishing to rent a vehicle. However, if you are planning on renting a car, it should be done as soon as possible. Availability at convention time may be a problem. The AVIS number is (937) 435-4404 or (800) 331-1600.

You may be wondering about transportation to and from the arena. Not to worry! The Dayton Convention Bureau has busses scheduled for the Dayton Mall. The mall is within walking distance (about a block). Our hotel also has two shuttle buses available but these will be on a first come, first served basis. A short walk to the Hamvention buses at the Dayton Mall sounds like the best way to go.

For those of you who will be flying in, airline discount information is available by browsing www.hamvention.org/tickets.html or by phoning (937) 276-6930. Don't wait to make your reservations, seating may be limited.

As mentioned above, the hotel is across the street from the Dayton Mall. This is a major mall and has some 130 stores and specialty shops. Major stores include Sears, Penny's and Lazarus. Naturally, the mall has a number of restaurants and a food court. However, I am told there are many other food service outlets within a mile of the hotel. Not that you will need them but some of us just have to have our junk food. HI!

That pretty much sums up the hotel details and I'm impressed. However to make sure the hotel was up to our standards, Bill Henry and his wife, Linda, spent a night there recently. They were impressed by the accomodations and services the hotel has to offer. If you are now excitied about staying there, it's time to make your move. Make your reservations by filling out the enclosed form or browsing the rttyjournal.com web page. Mail your deposit and the form to me and I'll handle everything from then on until you arrive. Confirmation will be sent to you within the last couple of weeks either via e-mail or by snail mail.

Now let's get on with some of the particulars we have planned for you. Again this year there will be two dinners, one Friday night and one Saturday night. The Friday night dinner will be hosted by Ron Stailey, K5DJ. Ron will also be giving out awards at this dinner. He has also planned for us a presentation of the DXpedition to Galapagos, HC8N. Either Trey Garlough, N5KO, or Glen Vinson, W6OYC, will give a talk and slide show. At press time we were not sure which of these fine gentlemen was going to be available. As always, there will be a no-host bar before dinner and after dinner the New RTTY Journal will be hosting a hospitality suite. Look for other surprises such as door prizes. You will no doubt, see Eddie Schneider, W6/G0AZT, at this dinner where he will probably be roasted for some of his recent projections on the internet. He owes a lot of people free drinks at the NRJ hospitality suite. Ron has done a fine job on this Friday dinner in past years and I know you can expect the best from him again. Dont miss this one!

On Saturday night the annual RTTY Journal dinner will be held. Joe Wittmer, KB9SIZ, will be our host. This will be Joe's first year at hosting this dinner but has it all lined up for us. You may remember Joe from last year, he was the person taking all of the pictures with the digital camera. Ray Ortgiesen, WF1B, will be this night's speaker. His presentation will cover his and Eddie Schneider's, W6/G0AZT, trip to Aruba where a new contest record was set for low power in the CQ/RJ WW. No doubt this will be a very entertaining talk and slide show. After dinner you are all invited to the NRJ hospitality suite for a libation and conversation. Again, you won't want to miss this hospitality suite because Eddie Schneider will be presenting his free drinks program. I assume he will be serving drinks to all who ask. Eddie's wild and crazy projection which he recently lost will now be paid in full. There has been much to do about this on the internet but this night we will not forget. We'll see you all there. So sign up now for this dinner.

At press time we did not have a forum slot assigined to us but we will hear from DARC soon. Our topic has not been decided yet either but there are serveral we can choose from. Our forum has been a highlight of the RTTY group for over 20 years and we hope you will all attend this year to keep our tradition going.

RTTY GROUP BANQUET DINNERS

Friday Night
(5/14/99)

RTTY Contesters DXers Dinner

Featuring DXpedition to Galapagos, HC8N

Saturday Night
(5/15/99)

RTTY Journal Dinner

Slide Presentation on DXpedition to Aruba, P40RY by Ray Ortgiesen,WF1B

SEE INSIDE FLYER FOR INFORMATION / FORM

Multi-Radio Operation

Bruce Lifter, WT4I
wt4i@palmnet.net

Operating multi-radios is a lot of fun and you can stay BUSY. Many of you may have heard me on the air operating with "The Florida Boys" (see picture). While I do enjoy operating multi-single, quite often you can have too much free time. Operating single-operator multi-radios is quite the opposite. I am going to discuss with you why operating multiple-radios is done and how I set-up for RTTY Round-up.

Multi-Radio History
The RTTY contest community was slower at adopting the use of two radios by operators in the single operator category than were by the CW and SSB contest communities. I imagine that the reason was that until recently, RTTY contesting required use of two computers to decode each radio. Additionally, unless a third logging computer was used, the logs from the two radios had to be manually merged following the contest. As recent as two years ago there were only a few RTTY operators using two radios.

About two years ago the major RTTY contest logging programs introduced innovative features that have revolutionized RTTY contesting. RTTY by WF1B introduced the capability to network multiple computers together, allowing two radios to share one log. Ham System by OH2GI provided the capability to run two HF radios from the same computer. WriteLog by W5XD was introduced at Dayton with the capability to not only network computers but to allow up to four HF radios to share the same computer.

Very quickly, most of the top ten operators in the single operator category switched to running two radios in the major contests. It appears that two radios are not enough. In the 1999 ARRL RTTY Roundup, at least 4 operators, K5DJ, AA5AU, KA4RRU and myself (WT4I), claimed to have run three radios at the same time. What is most interesting is that we all ran WriteLog software with three different computer configurations.

Don, AA5AU ran three computers all networked together. (How he kept all those keyboards and mice straight I will never know.)

Mike, KA4RRU and Ron, K5DJ ran two computers networked together. Two radios were on one computer and the third radio was on another computer.

My configuration was running all three radios from a single computer. While it is certainly debatable, I was told this was the first time this was done in a RTTY contest.

Writelog Software
My strongest reason for running all three radios from a single computer was to eliminate the confusion of multiple keyboards and mice. For the RTTY Roundup, I had three 4"X4" windows lined up across the 17" monitor, each decoding a different radio. The focus to each radio was changed by simply clicking within each decode window. Nothing could be simpler.

The most important feature provided by WriteLog software for single operator multiple radio operations is "RTTY Single Tx Lockout - Last one wins." This feature ensures that only one radio is transmitting at any given time. When the focus is changed to a new radio and a function key is hit, the current transmission is stopped and the new radio then keys the transmitter. Without this feature, it would be easy to make a mistake and transmit with two radios at the same time.

Even with the advanced features of the software, multiple radio contesting is a challenge. There are many ways to take advantage of the additional radios.

1 Run Station, 2 Search and Pounce Stations
At the beginning of a contest, it is usually all I can do to keep a run station going and search and pounce on another band at a casual rate. I guess I am a bit rusty at the start of a contest. It has usually been a while since my previous contest. It doesn't take too long before I have a rhythm and I am searching and pouncing at a pretty good rate.

Next, I begin with the second radio. Many of you probably know some of the older computers have long delays from the time a function key is hit until the radio transmits. This becomes an ideal situation for multi-radio operators to slip in extra time between CQs. Once a pile-up starts on the first radio the second really pays off. While a station is sending their exchange on the first radio, I have free time to work another station on the second radio. There is no impact on the first radio.

The third radio comes in to play when there is trouble busting a pile-up on the second radio. Many times you don't get through on the first call and have to wait until the exchange between two other stations is finished. I use this time to try and work another station on the third radio. I try to always have stations ready to work on the second and third radios.

My goal for the first half of the RTTY Roundup contest was to add a few extra QSOs each hour to my rate using the third radio without affecting my normal two radio activity. Fixing the third radio on 10 meters seemed the most effective. I only used it when I was waiting for a station on the second radio. Using this method, I picked up 29 extra stations on 10 meters in the first 10 hours while concentrating on 15, 20, and 40 meters with the other 2 radios. You might say this is a lot of work for just a few QSOs but 50-100 extra QSOs in a contest can really make a difference in the final standings.

2 Run Stations, 1 Search and Pounce Station
I usually don't run two stations until the second day when the rates have fallen. In order to run two stations, I make my CQ message as short as possible. Otherwise there is less chance to catch someone trolling the band. In addition, my frequency could be mistaken as open. Running two stations simply requires alternately calling CQ on two different bands with two different radios. I usually try and run two relatively uncrowded bands (i.e. 10,15 meters) and search and pounce on a more crowded band (i.e. 20 meters). It is just too hard to keep a frequency at the same time as running two stations.

The big plus of running two stations is that I have a transmitted signal on the air nearly 100% of the time. Even better, if I am lucky enough to get a mini-run on both stations at the same time, both frequencies are maximized. New stations have a greater chance of finding me because either my station or another station's signal is on the air at all times on two bands!

Simultaneously running two frequencies can get tricky if you get a pile up on both frequencies. Things can get a mess in a hurry! The number one thing to keep in mind is don't panic. Different stations have different exchange styles; therefore, different time duration on the air. Since I can not have more than one transmitted signal on the air at a time, I must manage to keep the alternating rhythm in sync or I will lose stations on one radio. This gets tough when working stations with odd exchanges.

When I first tried two radios running at the same time, I could not deal with the amount

of activity. If two mini pileups started, I would lose one of the frequencies. With much practice and adrenaline I have now maintained mini pile-ups on two radios for as long as 10-15 minutes. In the RTTY Roundup I saw the short term rate meter(~10 minutes) get as high as 176/hour.

The third radio comes into play when things get slow on the two run stations. While alternating CQs I have discovered I have time to tune the third radio. If I run across a new station, I sit on the frequency and try to sync my runs stations with the calling station so that I can slip in an extra QSO on the third radio. Later in the contest, I find that I have worked 95% of the calling stations on 20 meters. Two or three extra QSOs each hour using the third radio is all I expect to get. As long as things are busy on the two run stations, the third radio sits idle.

Search and Pounce Tuning Indicators
The key to search and pounce contesting is having a good tuning indicator. I have monitor scopes on 2 stations and use the software tuning indicator built in to the Writelog software for the third TNC (HAL P38). While the software tuning indicator is nice, nothing beats an oscilloscope for a tuning indicator. I can literally tune my FT990 with my peripheral vision while concentrating on the CRT screen at the same time. The software tuning indicator takes my full attention. Obviously the P38 now has its own scope option (RTTY-1). If you are patient and spend a fair amount of time searching hamfests you might find something, but nobody wants the old oscilloscopes that operate in the audio frequency range. I have seen plenty for $10 or less. If you are patient, you can find smaller models for a little bit more.

Antennas for Multi-Radio Contesting
When I first started multi-radio contesting, I used a Butternut vertical as my entry antenna for the second radio. This worked well in combination with my tri-band Yagi antenna. The vertical helps with interference problems between the two radios since one antenna is horizontally polarized and the other is vertically polarized. I was surprised how well the vertical worked on 40 meters. I elevated the vertical about 10 feet and used 3 radials cut for 40 meters. With this combination I could operate on 20 and 40 meters pretty effectively at the same time. Using the vertical on the other bands wasn't nearly as good as the Yagi.

My next antenna improvement involved putting up a second Yagi. I had an A4S not being used so I mounted it up about 45 feet on the same tower as the TH6 at 68 feet. I found that I needed filters so I built some 1/4 wave stubs. I was never satisfied with the stubs so I bought a few of the ICE band pass filters. These helped, but I still had some interaction between 15 and 20 meters. Finally to solve this problem, I put up another tower. The TH6 went up on the top of the new tower and I stacked a 40-2CD ten feet above the A4S on the old tower.

Jim Johnson KC4HW | Geogre Fundis K4PX | Don Winn AF4Z | Jan Heise K4QD

For the third radio, I designed and built a 3 element mono-band beam for 10 meters (the week prior to the RTTY roundup). I did not want to mess with a matching network so I used a long boom and spaced the elements to make the antenna impedance 50 ohms.

Other than my A4S, which I bought new about 6 years ago, I never spent more than $100 for an antenna. It is amazing what you can find if you keep your eyes open at hamfests. My fellow ham friends will tell you I am addicted to aluminum. I can't walk by a pile of aluminum without stopping to find out what it is. Not counting the miscellaneous pile of aluminum, or the antennas in the sky, I have collected about 5 old antennas, none of which are 100% complete.

Operating Practices
It has been said that you can literally read a book during a single radio RTTY contest. I can vouch for that. Most of my contesting experience has been operating with the Florida Boys at the Platinum Coast Amateur Radio Society (PCARS) club shack during Multi-Single efforts. These are much fun and they usually turn into a social event rather than contests. Usually two or three other hams are in the shack while one takes his turn operating. During the times I have been alone, I think I read every magazine left in the shack. I even went through most of the old handbooks. I guess my point is that while both types of contesting can be a whole lot of fun multi-operator contesting is very different than multi-transmitter operating.

You must always be on your toes with multiple radios. Early in the contest it is easier. Later in the contest, as I get tired, I find I must push myself. It is easy to sit on a frequency and repetitively push the CQ function key. To motivate myself I sometimes try and make it a game to see how fast I can tune in the next search and pounce station. Another thing that works for me is constantly trying to boost the rate meter. If you get lazy, your rate can slide below what you would have obtained with a single radio.

Pushing yourself for those few extra QSOs really makes the difference in the long run. Considering that in most contests the difference between first and second place is less than 4 QSOs per hour average, multiple radio contesting is the easiest way to make up the difference. Who knows, someday we might see single operators running a radio for every band.

See you on the bands, Bruce WT4I

My Configuration

Computer: P200MMX, 64Mb, 17" Monitor, 6 Comports
Software: W95, Writelog 9.21

Radio	TNC	Antenna 1	Antenna 2
Yaesu FT-1000	HAL P38	Hy-Gain TH6 (20m)	Full Wave Loop (80m)
Yaesu FT-990	AF4Z Multi-Modem	Cushcraft A4S (15m)	Cushcraft 40-2CD (40m)
Icom IC-740	HAL CRI-100	Homebrew 3el	YAGI (10m)

RTTY DX-pedition Operator's Guide

By Eddie Schneider, W6/G0AZT
edlyn@califormia.com

Since 1988, I have operated RTTY either in a major contest or in a Dxpedition, with the following callsigns: VP5/G0AZT, VP9/, VP2M/, V2/, C6A/, P4/, ZF1RY, TY1RY, P40RY('92 & '98), 3V8BB and 8R1TT. I have also spent many hours monitoring numerous dxpeditions, some extremely successful, others not so.

So, with a fair amount of pile-up experience, I would like to pass on some operating ideas which I hope, will be helpful to any prospective RTTY DXpedition operator. It is not my intention to insist that you operate in the manner I suggest. After all, it's your money, your station and your time. But I am sure that your RTTY QSO count will increase and you will certainly make many DX chasers very happy, if you at least follow some of my suggested guidelines.

Why take RTTY gear?
More and more DXpeditions now include a RTTY station. The demand for RTTY contacts is ever increasing as hams, who have 'done it all' on CW and SSB, try a different mode in the hope of achieving various goals like DXCC, WAZ and so on. The lucky position operator may be more at home with CW or SSB but RTTY, although not as efficient from the QSO rate point of view, is actually easier. After just a little experience and provided your station is set up properly, you will be amazed at the number of contacts you can make at any given time.

We who go on DXpeditions aim to log the maximum number of contacts possible in our limited time on the air. With that purpose in mind, I suggest the following as to what I think the RTTY DXpedition operator should consider.

What sort of rig is needed?
The ideal transceiver is one which is rated for full duty cycle use on RTTY. It should have selectable 350-500Hz CW filters which will work either in the FSK/RTTY/DATA mode position, or in either sideband mode (AFSK). Trying to print signals with a 2.4Hz wide ssb filter will soon make you change your mind about doing much RTTY! If you elect to use AFSK via the microphone plug, it is very important to ensure that you do not overdrive the rig with too much mic gain. Turn that speech processor off! The rule of thumb, is to key the rig in the sideband mode and turn the mic gain up just enough to move the needle in the ALC position. The rig should produce maximum power without spurious signals.

Which TNC should you use?
The popular AEA PK232, Kantronics KAM, various MFJ versions and Timewave TNCs are considered adequate and rugged enough to survive most airline baggage handler's activities. HAL Communications has recently introduced a compact stand alone DSP unit with a nice tuning indicator, aimed at the RTTY dxpeditioneer and appropriately called DXP38. To prevent strange sounding tones with these stand alone TNC's, always use a seperate power supply and construct the wiring required before you leave home. HAL Communictions also makes full size ISA plug-in DSP boards for PCs, should there be a desktop PC available at the DX site. Hook up is very easy and no Com port is required.

With the modern technology available in fairly high dollar laptops, you may consider using a soundcard as the TNC. WinRTTY by W5XD and RITTY by K6STI use a soundcard, but you should know exactly which soundcard is installed in the computer to ensure compatibility.

Which software?
There are many RTTY contest software vendors. The most widely used are, RTTY by WF1B, Writelog by W5XD and OH2GI Ham System. All these software packages have their own unique features and it is up to you to select the best one for your particular requirements. WinRTTY in conjuction with WriteLog and RITTY with RTTY by WF1B, can both be configured to use a soundcard as the TNC. OH2GI Ham System has the capability of using two TNCs as long as one of them is a KAM.

It is not within the scope of this article to make specific recommendations as to which piece of software is the best. For comprehensive information on software packages go to:

http://www.megalink.net/~n1rct
http://www.wf1b.com/
http://www.halcomm.com
http://www.sci.fi/~ejuhola/oh2gi/
http://www.n2hos.com

Which ever package you choose, ensure that you select 'diddles on' in the setup procedure. Diddles, alternating mark and space tones, are used to keep the TX and RX TNCs in synchronisation when no data is being sent and is much preferred to a single tone carrier.

Avoid RFI problems.
In order to prevent keyboard or computer 'lock-ups' at the most inconvenient times, the use of snap-on or ferrite rod chokes on all cables between the computer, TNC and transceiver is highly recommended.

Split frequency operation.
Running split VFOs is desireable for an efficient RTTY operation outside of a contest! To operate split DURING a contest is very inconsiderate to other contesters and creates total chaos on the somewhat restricted RTTY sub-bands. This is frowned upon by most serious contesters, no matter how rare the DX station may be.

However, runnning split frequency while on a non-contesting DXpedition gives the callers a far better chance of copying your replies. Also, with the co-operation of the callers your contact rate will be maximized. Once you have the station set up, it is adviseable to immediately start running a split operation. If you start off simplex and the pile up gradually becomes larger and larger, you will have great difficulty in maintaining a good QSO rate and then convincing the majority of callers that you have changed your operating procedure midstream. No matter how large the pile up is, it should not be necessary to spread the callers out to the far reaches of the RTTY sub-band. A split of 2 to 5 Kcs is adequate bandwidth and still allows other users, to communicate with each other.

It is generally not advisable to use a TX frequency below .082 mark. Certainly not on 20 meters, where there are many Pactor stations. Some seem to think that Baudot below 14.082 is an invasion of "their" frequencies. Although not true, it is pointless trying to run a pile up with a TOR station chirping away for hours on end, on your transmit frequency.

Control of your frequency.
If you do work someone on your frequency, be prepared to spend many minutes restoring some form of sanity back to your operation by having to convince callers that you are not listening on your transmit frequency. There will probably be instant DX cluster spots like "xyz now operating simplex".

Inevitably there will be stations calling you on your TX frequency, despite the fact that your QRZ macro plainly states that you are listening up or down. An occassional check for unnecessary QRM and appropriate but polite comments to the offenders, ought to keep your TX frequency clear.

Programming the macros and Optips.
The following are examples you should consider for your programmable macros. Do not let anyone convince you that the addition of a few 'non essential' characters in these macros will slow down your Qso rate. It is far better to make things as clear as possible right from the start, which avoids unnecessary repeats and save you time in the long run.

a. Always begin each transmission with a carriage return and line feed (cr/lf). If your TNC or software does not automatically insert a cr/lf before any data is sent, add one to the beginning of each macro. The cr/lf sent, will place the first important piece of data, the callsign of the station you are calling, on a new line and to the extreme left of the receiver's screen, which is far easier to detect. It is also recommended that you end each transmission with either a K,KN,BK as appropriate, a cr/lf or a space. This action keeps the important data from being corrupted by noise or QRM at the receiver's end. They will see:
With a trailing character:
QRZ de DX0PED UP 2-5 K$@%c*9
With a space or cr/lf:
QRZ de DX0PED UP 2-5 $@%c*9
Without any trailing characters:
QRZ de DX0PED UP 2-5$@%c*9

b. When replying to a selected station send:
cr/lf XD0DX TU 599 XD0DX KN
Note that the callsign of the station you are trying to work, appears both before and after the signal report. The reason for this is fairly simple. If your selected station happened to be transmitting at the same time as you were giving him a report, when he stops his transmission and just sees "XD0DX KN", he will be pretty sure that you came back to him and he can then respond immediately, which saves you calling him again. The signal report only needs to be sent once. After all, during a DXpedition, EVERYONE is 599 to simplify logging, right?

c. After the completed contact, send:
cr/lf XD0DX QSL 73 DE DX0PED QRZ UP 2-5 K
You have made it clear that you logged XD0DX, identified your station and are now tuning up 2-5 for the next lucky person to get in your log.

d. If you wish to work specific parts of the world, consider:
cr/lf XD0DX QSL 73 DE DX0PED QRZ JA UP 2-5 KN
When you do call for specific areas, do NOT work anyone outside that area. To do so, will open the flood gates for the rest of the world to pounce on you and prevent the specified area callers getting their chance to work you.

e. cr/lf AGN AGN DE DX0PED K is useful if you do not get the full callsign of the station you just tuned in to.

f. Periodically, you should send your name and QSL information to satisfy the inquisitive amongst us, although you will find that most RTTY dxers will, unlike SSB or CW, not persistently keep asking silly questions. They are only too pleased that you are operating their preferred mode and possibly giving them a new country.

g. On many occassions, stations will waste your valuable time giving their name, city, town, state, QTH Locator and even their station details. If this information is not required by you, then politely advise callers that you would much prefer to operate in 'contest style'. Callsign signal report and next please.

Does this all sound too complicated?
Actually, the intent is to make operating much less puzzling. RTTY probably requires more though and advanced preparation than plugging a keyer or microphone into a rig and calling QRZ. However, consider the pleasure you, as the DX, will give to those of us who avidly chase countries on this mode.

May all your RTTY contacts be pleasurable.
73 Eddie W6/G0AZT

Narrow (500Hz) Filter for ICOM 761 in AFSK

By Crawford MacKeand, WA3ZKZ, VP8CMY
jcbmck@udel.edu

The following mod will enable the use of a narrow 455 KHz filter in AFSK operation with the IC-761. It is probably good for the IC-765, although I have not checked this. For other rigs it will be necessary to check out both the selection wiring and the selection logic to ensure that the actual result is what you want!

The ICOM-761, although not having the flexibility of more recent transceivers in software based set-up, is still a good performer in FSK mode. However some new modes, such as PSK31 require AFSK in operation.

To modify the 761, remove first the top cover, remembering to carefully unleash the speaker. Then remove the bottom cover. Relax. The difficult part is done. Well, maybe not quite.

Turn the rig upside down on a clean bench, but avoid getting a hernia. If you don't have the front panel towards you, turn the rig around. Now, peering at the stuff on the MAIN circuit board, you will see two large filters in the left middle near the back. Just on the left of these there are two resistors called R219 and R234, sitting next to each other. [Both are 100 ohms.] From these resistors run two wires, one red and one brown and they head into a cableform running toward you, with final destinations at a row of diodes near an integrated circuit IC-3. That is located to the left of the other bunch of filters located half way between the big ones where we started out and the main tuning knob. Check that you have found the right wires. [If you are lucky enough to have the manual, they are W141, W142 and they actually go to diodes D39 and D40 which are between IC3 and the filter FL2.] Cut both wires somewhere convenient between IC3 and the large filters. Slip some small heat shrink tubing on both sets, and solder brown to red and red to brown. [Shrink the tubing with a heat gun, remember to protect the components in the area with aluminum foil as a heat shield. And it is good to solder the wires with a soldering iron that you have just unplugged. You never know if the heater leaks to the tip.] Then tuck the splices neatly into the cableform :-)

Now find switches S4 and S5. They are between the small filters and the tuning knob. There is a row of 6 of them and probably all are in the NORMAL position, with the "handle" angled to the left. Move S4 and S5 to the REV position, with the "handle" vertical. Put the covers back on. That's it, swap two wires. They are the feeds for the control voltage that selects the 455 KHz filters. Now, whenever the 2.4 KHz SSB filter FL44A was called for you will get the 500 Hz FL52A and vice-versa. Put the covers back on. The speaker connection which you almost forgot goes on the 3 pin plug on the small circuit board at right rear.

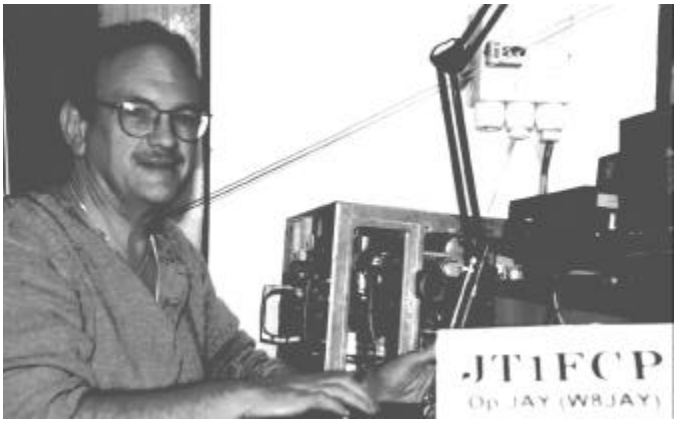
To operate AFSK in PSK31 or RITTY, set the center frequency to 1500 Hz and run in LSB mode. [On the 761 it is most convenient to set up the bands on the rotary MEMORY-CH switch. If you use the UP/DOWN PBs you will have the xcvr select USB on 20 meters and above, and it gets to be tiresome changing back to LSB.] Calibration will be ~1.5 KHz over the nominal freq as is normal with AFSK. [Actually 1500 Hz + half-shift.]

The filter pushbutton IN now selects a "normal" filter width for this arrangement. Wide in AM, narrow in SSB for AFSK and in RTTY for FSK and also in CW. The OUT position reverses these as you would hope.

[There is another problem with AFSK, and that is the audio input to the rear accessory connector ACC1 bypasses the VOX. You have to use the front panel MIC plug, or do another, slightly hairier mod.]

GL and 73 de Crawford WA3ZKZ, VP8CMY.

FIRST CLOVER CONTACT WITH MONGOLIA

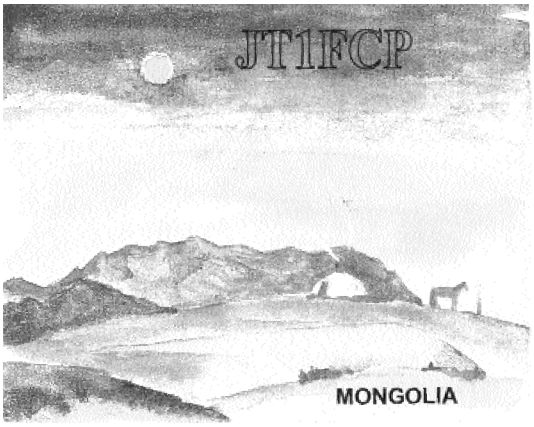


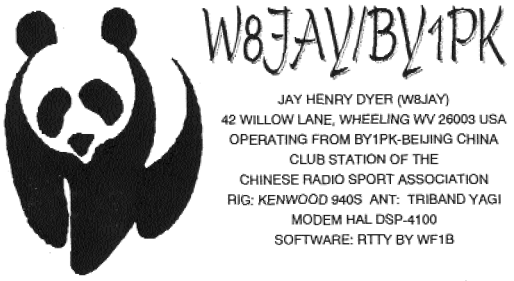
Jay Dyer, W8JAY, makes first CLOVER contact from Mongolia station JT1FCP with Taka JA3KKO (right).

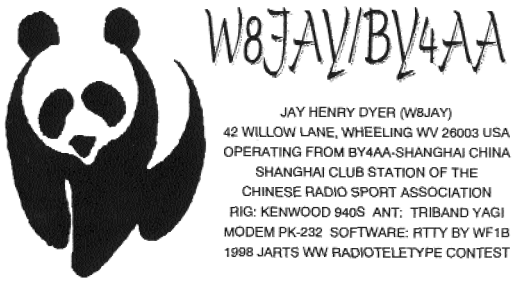
Yutaka (Taka) Tanaka, JA3KKO confirms Jay Dyer's first CLOVER contact from Mongolia station JT1CFP.

N. Khosbagan, JT1CD adjusting monitor while JT1KAA club members prepare for first RTTY contest (JARTS 1998).

Tamir, JT1CF, and Gank, JT1CJ learning to operate RTTY at club station JT1FCP. Tamir is the QSL service manager.







QSO cards from Operating locations JT1FCP (above) as well as China stations BY1PK in Beijing (above right) and station BY4AA, Shangshi.

Humble CLOVER Beginnings

By Ed Bixby, AK0X

I grew up in the small town of Chelan, WA with Ray Petit (W7GHM) and we attended high school together in the late '50s. Although he was known as a dreaded "brain" in those days (Extra Class at age 16 when that meant something) Ray and I became close friends in the Boy Scouts and Order of the Arrow organizations. He helped me obtain my novice license as he did several others. At one point we pledged to go into rocketry together; he providing communications and me propulsion (I knew I wanted to be a physicist being very interested in rockets). Well, I didn't hold up my part of the bargain but Ray did.

We lost contact for many years but, I got his address again and we arranged a SSB schedule on Sept. 4, 1988. We talked of many things then and during the QSOs that followed. I remember him asking me early on if I would be interested in testing a new digital HF communications mode he was developing. I agreed even though I would need to buy a computer.

Fortunately, I became semi-retired in 1991 and had time to support the testing schedule Ray's new technology required. My log book shows a note on 2/9/90 that I would need to buy a home computer to support Ray's efforts. I did so and we conducted a few on-the-air tests on Packet, RTTY, and AMTOR to familiarize ourselves with available technology. We both were left with feelings of inadequacy. I had very little experience with HF digital communications at the time.

Finally, the great day came when Ray could ship me some hardware to test. I anxiously awaited for the package. He sent it via UPS but when I expected it to arrive there was nothing on the door step. Nor the next day or the next. I remember frantically digging through all the snow drifts around my house looking in futility for that package. I went to the UPS office to file a claim and was told in essence: "don't worry, if we can't find it we'll buy you a replacement." I wasn't reassured since there was no such replacement for this one-of-a-kind hardware. Fortunately the driver remembered where he had delivered the package and managed to retrieve it.

Previously Ray had conducted some local tests with Dave Sitner, N0DET, and a few others. But, the first test of CLOVER over long distances occured March 17, 1990. My job was to hit a single key which automatically initiated a transmission from my station via the strange RS-232 box which Ray had sent me. After about 2 minutes, I would Esc from the transmission, switch to a different CW frequency and Ray would tell me to switch back and hit another character so the process could repeat itself. All I got to do was hit one character and the Esc key and I just spent $$ on a new PC! Some communicating!

Later, I found out that we were testing the various modulation techniques that CLOVER now utilizes: BPSM, QPSM, 8PSM, 8P2A, 16P4A etc. The different characters initiated transmission from my station of text from ISAIAH 55 hard wired into the box Ray had sent me. Ray would then look to see what (if any) text he received under the various modes and data rates over this HF path. And, receive he did! That humble beginning was the birth of CLOVER I, a new HF digital communication technology!

Ed Bixby, AK0X
1138 Timber Lane
Boulder, CO 80304

Silent Key

Robert E. Dow, WB2CJL

It is with deep regret we report the passing of one of our RTTY friends. Robert Dow, WB2CJL died at his home
Nov. 28,1999. He was 68.

Bob has been active in amateur radio since 1972 and earned membership in the DX Century Club. For many years, he was a digital traffic handler running a busy BBS. Bob was also a charter member of the Western New York DX Association, past president of the BARRA radio club, and co-editor of the DK2SG RTTY DX notes.

Bob served as an Air Force sergeant in the Korean War with prior service in the New Jersey National Guard.

Bob's motto at the end of each bulletin was "REMEMBER, DX DON'T SLEEP"

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Special Thanks goes out to Don Warburg, WA6HNC; Charles Prindle, W6JOX; Neil Friedman, N3DF; Dale Sinner, W6IWO; and Red Wilson, WB0ESF for loans and donations of RTTY Journals.

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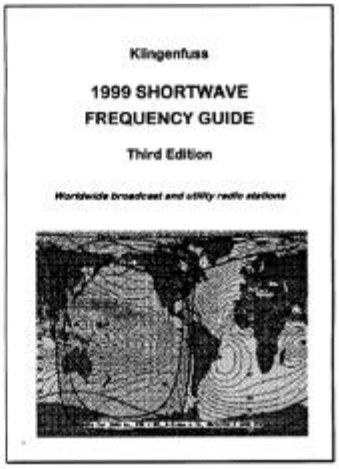

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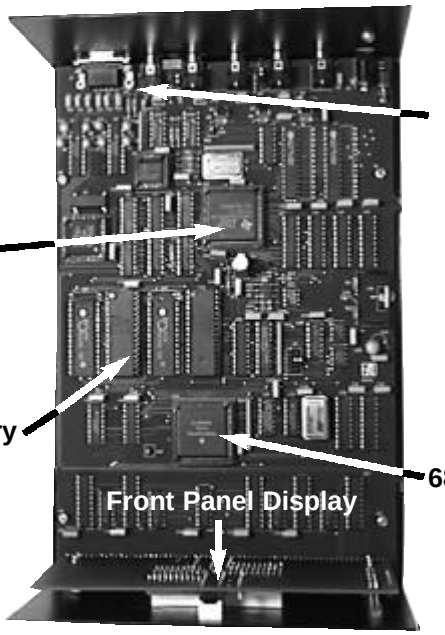

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