The New
RTTY *Journal* ©

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Happy 90th Uncle Ray!

Ray Hunter, VE3UR, celebrated his 90th Birthday this year.

RTTY CONTEST SCHEDULE - SUMMER 1999

Date & Time	Name & Sponsors	Date & Time	Name & Sponsors
06/12 0000 to 06/13 2400	ANARTS WW RTTY Contest	08/21 1200 to 08/21 0800	SARTG WW RTTY Contest
06/26 1800 to 06/27 2100	ARRL Field Day Contest	08/21 1600 to 08/21 2400	
07/17 1800 to 07/18 0600	North American QSO Party	08/22 0800 to 08/22 1600	
07/24 0000 to 07/25 2400	Russian WW RTTY Contest	08/28 1200 to 08/29 1200	SCC RTTY Championship

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

It's late May and another Dayton Hamvention has come and gone. It's No. 34 in a row for me and would be pretty old hat by now except for all of the friends I see each year. Dayton has always been *The Gathering Place* for us digital fanatics. Each year, we see old friends, make new friends, and put a face on that call sign we've seen on our screen. This year, we changed hotels and much to the better in my opinion. We must thank Dale Sinner, W6IWO, in particular for spearheading and organizing this move. I think we must all agree that The Holiday Inn at Dayton Mall did a super job - clean rooms with air-conditioners that worked, a good restaurant, and a clean and full service hotel. The food at both the Friday and Saturday night banquets was great. I can't think of one thing that we needed that the hotel didn't have. We owe big thanks to Dale and to Mr. Tom Studebaker of the Holiday Inn. Dale and Tom and I are already laying plans for next year. Big thanks are also due to Ron Stailey, K5DJ, for organizing the Friday night RTTY DXers Banquet and to Joe Wittmer, KB9SIZ, for organizing the Saturday night RTTY Journal banquet. These fellows really "did us proud"! This issue includes several pages of photos Joe took at one time or another during the weekend. I hope you find your face in one or more of these shots. Space here is limited but check out our web page to see all of the Dayton photos from this year at our web site *www.rttyjournal.com*

We have a lot of interesting articles this issue. I'd like to welcome Alan Hobbs, G8GOJ, to The New RTTY Journal. Alan writes about "5 Unit Codes" and discusses the Baudot vs. Murray vs. ITA1 code controversy. This article first appeared in the Winter, 1998 issue of DATACOM, published by the British Amateur Teledata Group (BARTG). Ron Stailey, K5DJ, has a trip report - "My weekend in Dayton" which I am sure you will enjoy. Bruce Lifter, WT4I, discusses his most recent DX contest at *The Ranch*. Tom Kleinschmidt returns with another article in his history series and some photos. Eddie Schneider , W6/G0AZT, provides the results of our last January's CQ/RTTY Journal RTTY WPX Contest. And - of course - I have a few words to say about the "care and feeding" of DSP modems - almost the same as an ST-6, but not quite.

It's summer and time for fishing and vacation. Don't forget your RTTY stuff. Dale and Faye and Linda and I will be at the ARRL SW Division Convention on The Queen Mary next fall - October 1-2-3. We're planning on some sort of RTTY gathering at that time. See the August edition for more details, but mark those dates on your calendar now!
73 de Bill K9GWT

Field Day 1999
Don't forget your cameras - Pictures needed for August issue

Bill Henry, K9GWT Ron Stailey, K5DJ Ray Ortgiesen, WF1B
Bill was presented with the Technical Achievement / Development Award

WPX Multi-Two Operating from the W5KFT Ranch

Bruce Lifter, WT4I
wt4i@palmnet.net

When Ron, K5DJ, and Jay, WS7I, invited me to contest at The Ranch during the WPX RTTY contest, I jumped at the opportunity. If the fact that Ron has been winning just about every contest he enters from *The Ranch* wasn't enough, Wayne's (K7WM) tale about Leonard the Bull in last November's issue of The New RTTY Journal was more than enough added incentive to go.

It was after dark when we arrived at The Ranch the evening before the start of the contest. Jay and Ron were sure to warn me to take it slow on the 2-mile driveway to The Ranch. Leonard the Bull has the habit of lying in the middle of the dirt driveway. All the cattle and native wildlife are free to roam the 2600 acre Ranch. But, no Leonard this time.

After unloading all the equipment, we spent all night swapping stories about *The Ranch*, previous contests, and ham radio in general. I've found part of the excitement of multiple operator contesting is the social time you have with the other operators. We were having so much fun none of us knew what time we called it a night.

The next morning we were dragging, but we managed to get the station ready for the contest with a few hours to spare. So, we headed to the two-horse town of Llano, Texas for lunch and food supplies. If you are ever passing through the area, I highly suggest stopping by Cooper's Old Time Pit Bar-B-Que, "Home of the Big Chop." Outside, in an open-air setting, they have several large cast iron barbecue pits. Before you go in, you point at the piece of meat you want and they throw it on a cafeteria style tray. Then you take it inside where you pay by the pound. That was simply the best barbecue I have ever tasted.

After we got back to *The Ranch*, we made our final preparations and decided on our category. I told the guys back home in Florida that the only reason I was going to Texas was to help the "Florida Boys" win a plaque. So, my mission was to make sure that *The Ranch* did not enter the multi-single operator category. After discussion on the merits of multi-multi versus multi-two we finally decided on the multi-two category, figuring we could switch to the multi-multi category during the contest if we changed our minds. I guess I was successful, because the "Florida Boys" won the North America plaque for the multi-single operator category.

This was the first contest I have operated in the multi-two category. I found the multi-two category is a nice bridge between the multi-single and multi-multi categories. You can be pretty competitive with a single tower and a few operators in the multi-single category. But, to be competitive in the multi-multi category, you need several towers and room for several stations and many operators. Multi-two seems to be a perfect fit for *The Ranch.*

While I have operated many contests in the multi-single category with the "Florida Boys", we typically had 6 to 15 operators. For this contest we would only have 3 operators, operating 48 hours with 2 stations. Jay was gracious enough to volunteer for the late night shift for the first night. Rates were very slow the first night, we decided not to operate the second late night shift. This was probably due to the many operators in the single operator category who are not allowed to operate the entire contest. Maybe all categories should be limited to 30 hours? Other than the first late night shift, we had no real set operating times. We just sort of relieved each other every few hours. As it turns out, without the second late night shift, 3 operators was the perfect mix for the contest.

One of the advantages of running in the "Multi-Two" category over the "Multi-Single" category is that you have two eyes watching the log. We used WriteLog as our logging program, allowing us to network two computers together so that both operators could see the entire log. Many times during the contest, one of us would notice a broken call or badly entered serial number in the other's log. Identifying it early allowed us to correct the log while the information was still on the screen. As a result, our log was one of the cleanest I have ever seen for a team effort. Contesting with Ron and Jay is loads of fun. These guys have been operating together for years. The friendly banter between them is non-stop. They were both winning RTTY contests before I joined the hobby. Jay was kind enough to point out some single radio techniques for catching additional multipliers that I had not considered. Ron demonstrated his effective use of two monitors running under Windows 98. I've found this is a must for single operator, multi-radio contesting.

Ron Stailey, K5DJ **Bruce Lifter, WT4I**

Jay Townsend, WS7I

Contesting from *The Ranch* can get you spoiled. George, K5TR, the station manager, has done a marvelous job building the station. For much of the contest I relied on Jay and Ron to manage the antennas. With a combination of stacked Yagis and tri-band beams, mixed with antenna switches and stack match devices, there were times that I thought we had 9 antennas on a single band. Although Ron and Jay might disagree, I think most of the time we just made sure we had an antenna pointed in every direction. There is definately no shortage of aluminum at *The Ranch*. This along with the fact that there is no man-made noise at the site provides for excellent signal reception.

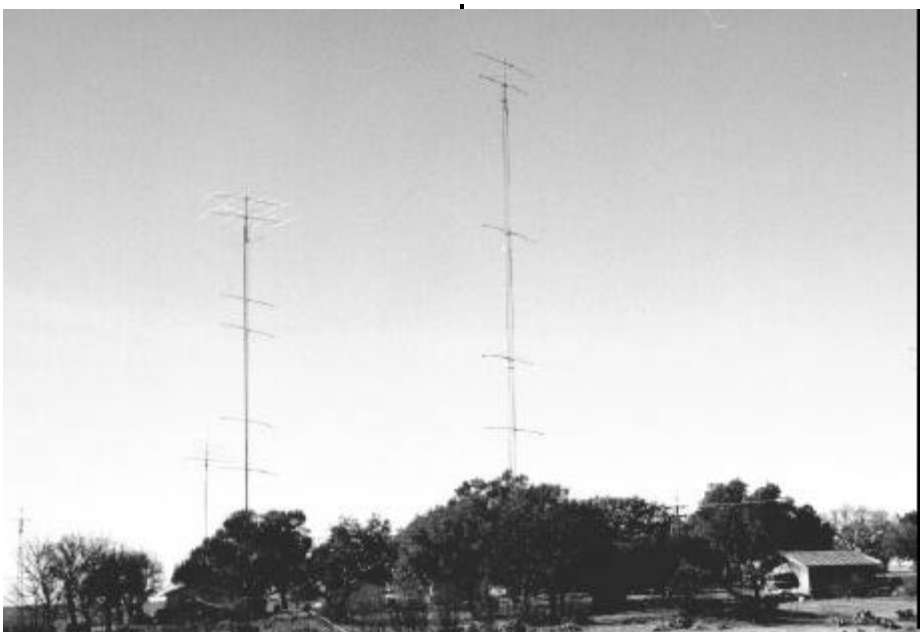
Our hourly rate was not that impressive to me. Single operator contesting is much more intense, especially running multiple radios. The thing that amazed me most about contesting from *The Ranch* was consistency of the rate. On Sunday afternoon when I expected things to severely slow down, the stations just kept coming. It was not just the stations but also the multipliers. When Ron posted his score last year, I thought it almost unbelievabe. He had posted almost double the prefixes we had in Florida during our multi-single effort. There was no mistake. Once again, this year we logged close to twice as many prefixes as most of the single operator and multi-single stations.

At the Dayton Hamvention we were presented the first place world plaque, donated by the Amateur Radio Trader magazine. We made almost 2400 QSOs with nearly 600 unique prefixes. Our 3,105,340 points set a new world record for the Multi-Two category. Also after examining the scores, we found we could have won the world plaque for the multi-multi category if we had chose to enter that category.

My only regret while in Texas was that I did not get a chance to meet Leonard the Bull. Maybe I will get a chance to return to *The Ranch* for another contest. Thanks to Ron, K5DJ, and Jay, WS7I for the opportunity to work a contest with a couple of the RTTY grandmasters. Specials thanks to Bryan, W5KFT, for letting others enjoy his tremendous contest station.

See you on the bands, Bruce WT4I

Leonard the Bull says "Come on back Florida Boy"



Bryan Edwards W5KFT's Contest Station "The Ranch"

5 Unit Codes

By Alan G. Hobbs, G8GOJ

In articles that mention RTTY codes there is usually reference to Baudot, Murray and ITA2 codes. These codes are often taken to be identical and interchangeable. Even "respectable" engineering journals do not seem to understand the fundamental differences between the different codes. For any two equipments to satisfactorily inter-operate, it is essential that the code in use is thoroughly specified and understood, and the same at each end. The purpose of this article is to explain the similarities, and the differences, between the codes, and to indicate their relationship to the Radio Amateur.

All codes have their strengths and their weaknesses. For instance, one of the strengths of the Morse code is that commonly used letters have short codes, making them easier to send. Whereas one of its weaknesses is the difference in length between the code for the shortest character 'E', and the code for the longest character '0', which takes 19 times as long to transmit. This vast difference in length made the Morse code difficult, but certainly not impossible, to mechanise. For example, the Creed Morse printer, developed in the early 1900's, read and printed in plain language, a perforated Morse tape at speeds of up to 100 words per minute.

It had long been realised by many telegraphic engineers, that the real answer to the mechanisation of telegraphy was to use a code in which every character took the same time to transmit. A so-called "constant length" code. With 26 letters in the alphabet, it was only natural that the most popular codes would all consist of 5 signalling elements, with each element taking one of two states, e.g. +v/-v, off/on, etc. Therefore the number of available combinations is two raised to the power five: i.e. 2 x 2 x 2 x 2 x 2 = 32

By reserving two of the combinations for use as non printing "shift control" characters, it is possible to associate a numeral or punctuation mark with every letter of the alphabet, effectively doubling the capacity of the code. Naturally, this will slightly reduce the rate at which the message is transmitted, but the machinery could be designed to insert these shift characters automatically, thereby reducing the effort on the part of the operator.

BAUDOT MULTIPLEX SYSTEM

The earliest successful printing telegraph system that used a 5 unit code, was the Baudot Multiplex System, which was devised by Emile Baudot, of the French Telegraphic Service, in 1874. This is a time division multiplex system, and utilises (1) certain printing details of the Hughes printing telegraph instrument, (2) the distributor arrangements invented by Bernard Meyer in 1871 which were employed in a Morse multiplex system, and (3) a 5 unit code devised by Johann Gauss and Wilhelm Weber. The system was adopted in France in 1877, and thereafter its use in France was extensive, and it was to some extent adopted in other countries. The British Post Office adopted the Baudot system for use on a simplex circuit between London and Paris in 1897, and subsequently made considerable use of duplex Baudot systems on their Inland Telegraph Services.

The Baudot distributor could be designed so that it could be used by from two to six operators. The quadruple Baudot system, using four operators, was adopted as the standard installation for use in the British Post Office. The distributor, consisting of copper segments and rotating brushes, successively connected each operator to the line, for a time long enough to transmit the 5 units corresponding to one character. Additional segments transmitted correcting currents, from one end to the other, to maintain synchronism between the sending and receiving stations. Hence the Baudot system was one of the earliest 5 unit synchronous systems.

The standard speed of transmission, by each operator, was 180 characters per minute, each character being set-up manually on a small piano like keyboard, which only had five keys. The keys were so arranged that once pressed down, they latched down, and were only released by the distributor when all the 5 elements of the character had been transmitted. The operator was given an audible indication of the keyboard unlocking by means of what is known as the "cadence signal". This signal came from the operation of the electromagnet which released the keys. The manipulation of the Baudot keyboard called for a high degree of operating skill, since a definite, unvarying, rhythmic speed of signalling was necessary.

Figure 1 shows the allocation of the Baudot code which was employed in the British Post Office for continental and inland services. It will be observed that a number of characters in the continental code are replaced by fractionals in the inland code. Code elements 1, 2 and 3 are transmitted by keys 1, 2 and 3, and these are operated by the first three fingers of the right hand. Code elements 4 and 5 are transmitted by keys 4 and 5, and these are operated by the first two fingers of the left hand.

Because the combinations were set-up manually, the code was so arranged that the finger movements to be performed by the operator were as evenly divided as possible between the right and left hands, and also as few as possible for those characters having the greatest frequency of occurrence. This ensured the minimum fatigue of the operator. A fine example of Baudot equipment may be seen in the Science Museum in London. Until the autumn of 1997, another fine example was to be seen in the BT Museum in London. Unfortunately, this museum is now closed to the public.

The Baudot code was eventually standardised for multiplex systems as the International Telegraph Alphabet number 1 (ITA1), and is shown in figure 2.

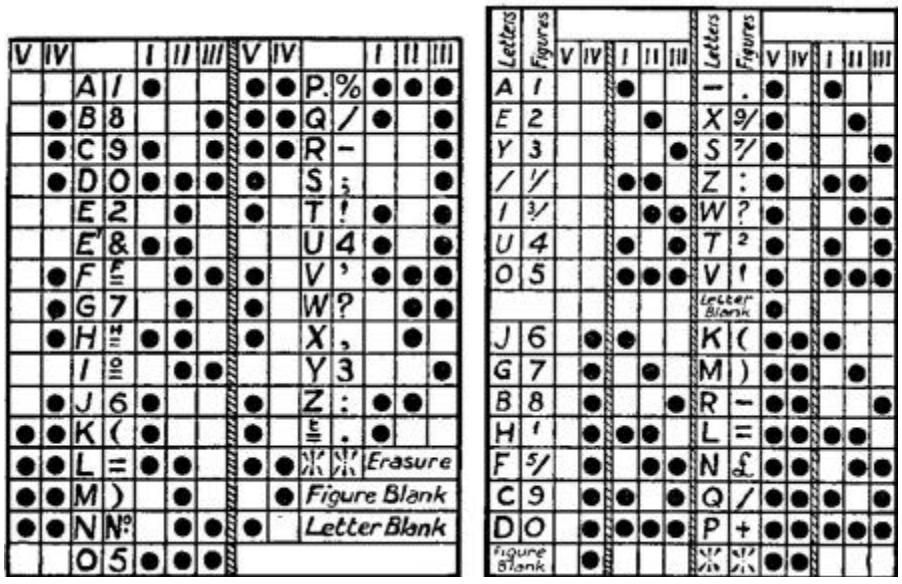


Fig. 1: The Baudot Code

MURRAY TYPE-PRINTING MULTIPLEX SYSTEM

This system was designed in 1901 by Donald Murray, a New Zealand sheep farmer, as a combination of the best features of the Baudot multiplex system and the Murray automatic system. Murray also employed a 5 unit code, but the allocations of the of the signal combinations differed very considerably from that used in the Baudot code, as is shown in figure 3. The main reason for this was that he chose to use a keyboard layout similar to that of a typewriter, which relieved the operator of the burden of setting up the individual code elements. This allowed Murray to allocate the codes so that those characters having the greatest frequency of occurrence were given a combination which involved the least number of mechanical operations, thereby reducing the wear in the equipment.

International Telegraph Alphabet No. 1

NUMBER OF SIGNAL	LETTER CASE	FIGURE CASE	No. OF IMPULSES 1 ST.	2 ND.	3 RD.	4 TH.	5 TH.	REMARKS
1	A	1		■	■	■	■	■ INDICATES POSITIVE CURRENT
2	B	8	■	■			■	□ INDICATES NEGATIVE CURRENT
3	C	9		■			■	
4	D	0					■	
5	E	2	■		■	■	■	
6	F	SEE NOTE 1.	■				■	
7	G	7	■		■		■	
8	H	+			■		■	
9	I	SEE NOTE 1.	■			■	■	
10	J	6		■	■		■	
11	K	(		■	■			
12	L	=			■			
13	M	)	■		■			NOTE 1. AT THE DISPOSAL OF EACH ADMINISTRATION FOR ITS INTERNAL SERVICE.
14	N	SEE NOTE 1.	■					
15	O	5				■	■	
16	P	%						
17	Q	/		■				
18	R	—	■	■				
19	S	.	■	■		■		
20	T	SEE NOTE 1.		■		■		NOTE 2. FOR PAGE PRINTING INSTRUMENTS
21	U	4		■		■	■	
22	V	' (APOSTROPHE)				■		
23	W	?	■			■		
24	X	, (COMMA)	■		■	■		
25	Y	3	■	■		■	■	
26	Z	: (COLON)			■	■		
27	CARRIAGE RETURN	CARRIAGE RETURN			■	■	■	
28	FRESH LINE SEE NOTE 2	FRESH LINE (SEE NOTE 2)		■	■	■		
29	LETTER BLANK (SPACE)	LETTER BLANK (SPACE)	■	■	■	■		
30	FIGURE BLANK (SPACE)	FIGURE BLANK (SPACE)	■	■	■		■	
31	* (ERROR)	* (ERROR)	■	■	■			
32	INSTRUMENT AT REST	INSTRUMENT AT REST	■	■	■	■	■	

Fig. 2: International Telegraph Alphabet Number One

At the transmitting end, the Murray system comprised: (1) A keyboard perforator, which produced a tape in which the code was perforated transversely. The feed holes being in line with the front edges of the perforations, so that the direction in which the tape should be read was at once apparent, and; (2) A transmitter which could be mounted adjacent to the perforator in order to give the minimum possible distance between the perforating and transmitting mechanisms. With this arrangement the distance was reduced to only 16 character spaces.

In the transmitter, the five contact levers which sensed the perforations in the tape were connected to individual segments on a distributor, very similar in principle to the Baudot transmitter distributor. Additional segments on the distributor operated an electromagnet which stepped the tape forward after the line brush had passed the segments connected to the five contact levers. A novel feature on the transmitter was a start-stop device which sensed the size of the tape loop between the perforator and the transmitter, and held the five sensing levers in the space position, thereby sending spacing currents to line until the tape became slack. Mutilation of the tape, or disconnection of the transmitter, was thus avoided.

At the receiving end, the Murray system comprised: (1) A reperforator which produced perforated tape corresponding to the original sending tape, and which could then be used for onward transmission to further stations, and; (2) A printing receiver which interpreted the incoming line signals, and printed the characters on a paper tape. The Creed multiplex printer was commonly used for this purpose, which employed a series of bell-cranks and a rotating typehead, as used on the later models 3 and 7 series of teleprinters. Either the reperforator, the printing receiver, or both, could be connected to the receiving distributor as required by the local circumstances.

START-STOP SYSTEMS

Synchronous printing telegraph systems employing constant length codes, such as the Baudot and Murray, were a great advance over the previous telegraph systems. However, they suffered from a lack of flexibility, and required very accurate means for maintaining accurate synchronism between the transmitting and receiving instruments. To overcome these disadvantages, a number of inventors experimented with the ingenious idea of starting and stopping the receiving mechanism for each character. For this purpose, a "start" signal was transmitted immediately preceding the code elements, and a "stop" signal was transmitted immediately after the code elements had been transmitted. The code employed was still a 5 unit code, with the start signal equal in duration to one code element, and the stop signal being in some cases equal in duration to one code element, and in other case more than one element - often 1.5 elements. For this reason the code is sometimes referred to as a 7 ½ unit code. The transmitting and receiving instruments were now arranged to have a definite rest position, at which point they were precisely in phase with each other in readiness for their respective timing cycles when released.

Because the transmitter and receiver effectively re-synchronised at the start of each character, it was no longer necessary for the speed of the instruments to be very accurately controlled, and simpler centrifugal governors which maintained the speed to within +/- 0.5% were now adequate. This implies the possibility of a noticeable speed difference between the two ends of a system, so the receiving mechanism is arranged to rotate for a shorter time period than the transmitter

	1	2	3	4	5		1	2	3	4	5
A		●	●			Q	1	●	●	●		●
B	?	●			●	●	R	4		●		●	
C	(		●	●	●		S	'	●		●		
D	ª	●			●		T	5					●
E	3	●					U	7	●	●	●		
F	⅓	●		●	●		V	)		●	●	●	●
G	⅔		●		●	●	W	2	●	●			●
H	⅕			●		●	X	£	●		●	●	●
I	8		●	●			Y	6	●		●		●
J	⅞	●	●		●		Z	.	●				●
K	⅝	●	●	●	●		FIG SPACE	FIG SPACE	●	●		●	●
L	/		●			●	LTR SPACE	LTR SPACE			●		
M	⁹			●	●	●	LINE PAGE	LINE PAGE				●	
N	–			●	●		*	*	●	●	●	●	●
O	9				●	●	COL	COL		●			
P	0		●	●		●							

*12345 gives invisible correction on page printers & * on slip printers.

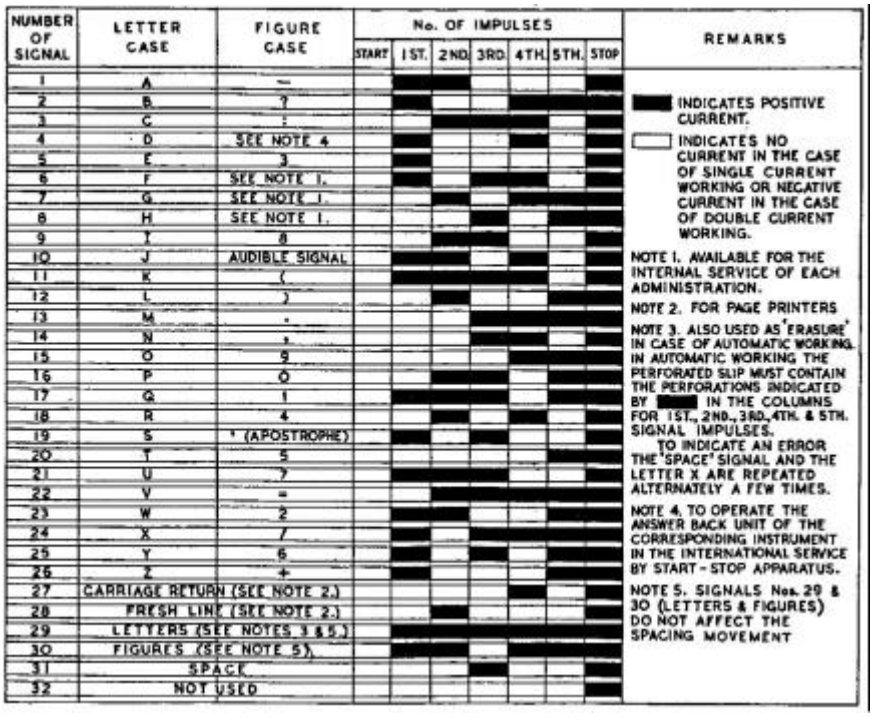
Fig. 3: The Murray Code

mechanism. The time difference usually being equal to one element period, but sometimes only equal to half of one element period. By this means the receiver was always at rest before the start of the next character, even with speed errors greater than 0.5%.

The earliest type of start-stop instrument was introduced in America in 1907 by Charles L Krumm and his son H Krumm. It was manufactured by the Morkrum company, which would later become the Teletype corporation, and began to find practical application about 1920. The instrument employed a typewriter style keyboard, and printed the received signals direct onto paper tape, without requiring the intermediate use of perforated tape at either end of the system. It was capable of working at a speed of 40 words per minute, in either simplex or duplex.

SUMMARY

Virtually all mechanical teleprinter equipment which remains in Amateur hands dates from after the early 1930's and was, therefore, designed in accordance with CCITT standards, and uses either ITA2 or its American equivalent. The only teleprinters which used the Murray code, and may still exist in ever deceasing numbers, are the very early Creed models 3A, 3W, 3X, 3Y and 3Z tape printing machines. The later Creed models 3B, 3C, 3D and 3E used the standard ITA2 code. No teleprinters were ever produced which used the Baudot code, but that is hardly surprising when one considers that the Baudot code was used in a very early synchronous system, and all teleprinters, as we now know them, operate on the start-stop (asynchronous) principle. Also, as far as this writer is aware no computer programmer has yet implemented the Baudot code or the Murray code for the Amateur home computer market, no matter what may be found in advertisements in the Amateur press.



NUMBER OF SIGNAL	LETTER CASE	FIGURE CASE	No. OF IMPULSES START	1ST.	2ND.	3RD.	4TH.	5TH.	STOP
1	A	—		■	■				■
2	B	?		■			■	■	■
3	C	:			■	■	■		■
4	D	SEE NOTE 4		■			■		■
5	E	3		■					■
6	F	SEE NOTE 1.		■		■	■		■
7	G	SEE NOTE 1.			■		■		■
8	H	SEE NOTE 1.				■		■	■
9	I	8			■	■			■
10	J	AUDIBLE SIGNAL		■	■		■		■
11	K	(		■	■	■	■		■
12	L	)			■			■	■
13	M	.				■	■	■	■
14	N	,				■	■		■
15	O	9					■	■	■
16	P	0			■	■		■	■
17	Q	1		■	■	■		■	■
18	R	4			■		■		■
19	S	' (APOSTROPHE)		■		■			■
20	T	5						■	■
21	U	7		■	■	■			■
22	V	=			■	■	■	■	■
23	W	2		■	■			■	■
24	X	/		■		■	■	■	■
25	Y	6		■		■		■	■
26	Z	+		■				■	■
27	CARRIAGE RETURN (SEE NOTE 2.)						■		■
28	FRESH LINE (SEE NOTE 2.)				■				■
29	LETTERS (SEE NOTES 3 & 5.)			■	■	■	■	■	■
30	FIGURES (SEE NOTE 5).			■	■		■	■	■
31	SPACE					■			■
32	NOT USED								■

REMARKS

■ INDICATES POSITIVE CURRENT.

□ INDICATES NO CURRENT IN THE CASE OF SINGLE CURRENT WORKING OR NEGATIVE CURRENT IN THE CASE OF DOUBLE CURRENT WORKING.

NOTE 1. AVAILABLE FOR THE INTERNAL SERVICE OF EACH ADMINISTRATION.

NOTE 2. FOR PAGE PRINTERS

NOTE 3. ALSO USED AS 'ERASURE' IN CASE OF AUTOMATIC WORKING. IN AUTOMATIC WORKING THE PERFORATED SLIP MUST CONTAIN THE PERFORATIONS INDICATED BY ■ IN THE COLUMNS FOR 1ST., 2ND., 3RD., 4TH. & 5TH. SIGNAL IMPULSES. TO INDICATE AN ERROR THE 'SPACE' SIGNAL AND THE LETTER X ARE REPEATED ALTERNATELY A FEW TIMES.

NOTE 4. TO OPERATE THE ANSWER BACK UNIT OF THE CORRESPONDING INSTRUMENT IN THE INTERNATIONAL SERVICE BY START - STOP APPARATUS.

NOTE 5. SIGNALS Nos. 29 & 30 (LETTERS & FIGURES) DO NOT AFFECT THE SPACING MOVEMENT

Fig. 4: International Telegraph Alphabet Number Two

In 1922, Frederick George Creed in Croydon designed a start-stop receiver, and a few years later produced a combined transmitter and receiver having a typewriter style keyboard. This machine, known as the model 3 and operating at 65.3 words per minute, printed the messages directly onto a gummed paper tape and was widely adopted for the British Post Office Public Telegram service. 1931 saw the introduction of the first Creed model 7 page printing teleprinter, operating at the now standard speed of 66.6 words per minute.

Early start-stop machines tended to use versions of the Murray code but, in the 1930's, the CCITT standardised on the International Telegraph Alphabet number 2 (ITA2), shown in figure 4, for start-stop telegraph systems. The Americans chose to use a variation of ITA2 known as the Teletypewriter code, which is shown in figure 5.

For those readers who wish to learn more about the history of telegraphic communications, and the ingenuity of the engineers and inventors involved, this writer would recommend a trip to your local library, where you should ask for: Telegraphy by J W Freebody, published by Sir Isaac Pitman in 1958.

Editor's Note: *This article comes to us from the Winter 1999 issue of DATACOM, the monthly magazine published by the BARTG. Alan brings a lot of very interesting information to the discussion. We must admit to a couple of mysteries regarding the code tables for Baudot and Murray. These tables are reproduced exactly as Alan discovered them but Alan and I are at a loss to explain the meaning of some of the nomenclature. For example, the two Baudot tables (Figure 1) are supposedly two different ways to present the same code - but - look at the differences (for example, FIGS - F, H, I, N, P, S, T, V, X). Also, what does the "F double underline" for FIGS-F mean? Note all the 1/, 3/, 5/, etc. FIGS case notations for the Murray Code (Figure 3). The same notations are used in the second of the two Baudot tables. Any idea what this means?*

Finally, for us "Yankees", I've added tables for the "Baudot" character set we found on our Model 15 teleprinters and the "Baudot" variation used for the US weather service.

Teletypewriter Code

NUMBER OF SIGNAL	START ELEMENT	CODE ELEMENTS 1	2	3	4	5	STOP ELEMENT	AMERICAN TELETYPE COMMERCIAL KEYBOARD	
1		●	●				●	A	—
2		●			●	●	●	B	?
3			●	●	●		●	C	:
4		●			●		●	D	$
5		●					●	E	3
6		●		●	●		●	F	!
7			●		●	●	●	G	&
8				●		●	●	H	£
9			●	●			●	I	8
10		●	●		●		●	J	'
11		●	●	●	●		●	K	(
12			●			●	●	L	)
13				●	●	●	●	M	.
14				●	●		●	N	,
15					●	●	●	O	9
16			●	●		●	●	P	0
17		●	●	●		●	●	Q	1
18			●		●		●	R	4
19		●		●			●	S	BELL
20						●	●	T	5
21		●	●	●			●	U	7
22			●	●	●	●	●	V	;
23		●	●			●	●	W	2
24		●		●	●	●	●	X	/
25		●		●		●	●	Y	6
26		●				●	●	Z	"
27					●		●	CARRIAGE RETURN	
28			●				●	LINE FEED	
29		●	●	●	●	●	●	LETTERS	
30		●	●		●	●	●	FIGURES	
31				●			●	SPACE	
32							●	BLANK	

Fig. 5: Teletypewriter Code

BARTG Subscription Information
(British Amateur Teledata Group)
DATACOM

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South Yorkshire
S66 7PD
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Members@bartg.demon.co.uk
US (Air Mail): $30.00 US (in bills)

Silent Key

Ray Petit, W7GHM

It is with deep regret that we must report the passing of Ray Petit, W7GHM, the inventor of CLOVER. Ray passed away the morning of June 13, 1999 at the age of 55 at his home in Oak Harbor, Washington. Ray suffered a stroke in early March caused by a brain tumor that left him mostly paralyzed. Continuing growth of the tumor resulted in additional strokes that finally took his life. His wife Joyce, twin brother Roy, older brother Todd and sister Polly survive Ray.

Ray was a long-time advocate and experimenter in advanced digital radio techniques. Doing business as Petit Logic Systems, Ray designed and developed equipment for Coherent CW, Frequency Synthesizers, Morse-to-Teletype Converters, and most recently, CLOVER modem technology. Ray has authored many technical articles for the RTTY Journal, CQ, Communications Quarterly, QST, and other amateur and engineering publications. After years of study of the problems of sending digital data via HF radio links, Ray invented a modulation waveform and communications protocol that is now known as "CLOVER". Ray teamed with HAL Communications Corp. in 1990 and his CLOVER technology is now used throughout the world in commercial, government, and amateur communications systems. Ray was a "scientist of the old school" - his modem designs were founded both on theory and proven by use. Ray spent many hours testing and revising his ideas based upon actual on-the-air performance. Prior to his illness this winter, Ray could usually be found on 20 meters trying new CLOVER ideas with his long time friend Ed Bixby, AK0X.

Ed adds the following comments about his good friends Ray and Joyce Petit:

"But Ray wasn't all brain; there was a big heart there too. As a young man, Ray became an Eagle Scout and a vigil member of The Order of the Arrow, a service organization to the Boy Scouts. Ray continued his support to the OA into his adult life.

"Although seemingly complete opposites, technician and artisan, Ray and Joyce were true soul mates. Ray would slave over computer software while Joyce quietly read and wrote poetry, providing Ray with quiet and unquestioning support in the process. And it was Joyce's artistry that named CLOVER when Ray showed her the four-lobed pattern of QPSM modulation on an oscilloscope. Ray and Joyce loved nature and in recent years managed a days-long backpack trip into the Cascade Mountains at the head of Lake Chelan, Ray's hometown. They seldom left their beloved home in Oak Harbor on Whidbey Island in the Olympic Peninsula archipelago. Long walks through the island's streets and along its beaches provided necessary relief. Ray truly did walk to a different drummer."

We will all miss Ray.

U.S. 5-Unit Teleprinter Codes

Bit Number 5 4 3 2 1	Hex	Letters	Figures: ITA#2	MIL Std	Weather	TWX	Telex
0 0 0 0 0	0 0	blank	blank	blank	blank	blank	blank
0 0 0 0 1	0 1	E	3	3	3	3	3
0 0 0 1 0	0 2	LF	LF	LF	LF	LF	LF
0 0 0 1 1	0 3	A	-	-	↑	-	-
0 0 1 0 0	0 4	space	space	space	space	space	space
0 0 1 0 1	0 5	S	'	🔔	🔔	🔔	'
0 0 1 1 0	0 6	I	8	8	8	8	8
0 0 1 1 1	0 7	U	7	7	7	7	7
0 1 0 0 0	0 8	CR	CR	CR	CR	CR	CR
0 1 0 0 1	0 9	D	WRU	$	↗	$	WRU
0 1 0 1 0	0 A	R	4	4	4	4	4
0 1 0 1 1	0 B	J	🔔	`	↙	.	🔔
0 1 1 0 0	0 C	N	,	,	○	(not def)	,
0 1 1 0 1	0 D	F	(not def)	!	→	¼	$
0 1 1 1 0	0 E	C	:	:	◍	WRU	:
0 1 1 1 1	0 F	K	(	(	←	½	(

Bit Number 5 4 3 2 1	Hex	Letters	Figures: ITA#2	MIL Std	Weather	TWX	Telex
1 0 0 0 0	1 0	T	5	5	5	5	5
1 0 0 0 1	1 1	Z	+	"	+	"	"
1 0 0 1 0	1 2	L	)	)	↖	¾	)
1 0 0 1 1	1 3	W	2	2	2	2	2
1 0 1 0 0	1 4	H	(not def)	Stop Mtr	↓	(not def)	#
1 0 1 0 1	1 5	Y	6	6	6	6	6
1 0 1 1 0	1 6	P	0	0	0	0	0
1 0 1 1 1	1 7	Q	1	1	1	1	1
1 1 0 0 0	1 8	O	9	9	9	9	9
1 1 0 0 1	1 9	B	?	?	⊕	⅝	?
1 1 0 1 0	1 A	G	(not def)	&	↘	&	&
1 1 0 1 1	1 B	Figures	Figures	Figures	Figures	Figures	Figures
1 1 1 0 0	1 C	M	.	.	.	.	.
1 1 1 0 1	1 D	X	/	/	/	/	/
1 1 1 1 0	1 E	V	=	;	⊕	⅜	;
1 1 1 1 1	1 F	Letters	Letters	Letters	Letters	Letters	Letters

LF: Line Feed CR: Carriage Return

Ref: Reference Data for Radio Engineers, Fifth Edition, Howard W. Sams, Inc., 1968

DSP and Soundcard Modem Considerations

By Bill Henry, K9GWT
ghenry@advancenet.net

Many modern RTTY modems use DSP (Digital Signal Processor) devices. When used correctly, a DSP modem will be as good as - or even better than - our familiar analog RTTY modem (ST6, etc.). But, RTTY performance can be pretty disappointing unless the proper care is taken when installing and adjusting a DSP-based RTTY system. Here are some suggestions.

Transmit problems: Beware of software-set AFSK output levels! This feature works by using software to scale the output of the D/A converter in the DSP modem or digital sound card. Although this makes it very simple to adjust the output level, it can also cause you to radiate a whole bunch of spurious signals. Reducing the digital "amplitude" scale is the same thing as reducing the number of bits of resolution in the D/A converter. HAL uses a 14 bit D/A in its DSP modems. This device produces a very clean transmit waveform when run at full output, utilizing all 14 bits. But, if software scaling had been used to reduce the output by 12 or 18 dB, it would be the same as throwing away 2 or 3 bits of precision. Reducing the precision of the digital-to-analog conversion process adds distortion - more and stronger spurious signals in the output! Using software to reduce a nominal 0 dBm full scale output down to microphone levels (-30 dBm) is the same as reducing the D/A resolution by 5 bits. That's why HAL modems include a rear panel potentiometer to set the AFSK output level. The software is set to always use the maximum range of the D/A. PC "sound cards" may not have an analog volume control. But, I recommend adding one rather than adjusting the output by scaling the digital output. Otherwise, a greatly scaled-down sound card output can result in a "very nasty" transmitter output.

Set the transmit level out of the modem as high as possible and then attenuate the audio signal at the transmitter if necessary. This minimizes hum and RF interference, producing a good signal-to-noise at the transmitter rear panel. Several of us have also discovered that shielded twisted-pair cable and balanced audio connections are good ideas for both transmit and receive audio if cables are longer than 10 or 15 feet. Experiment with which end of the shield you ground. The "best ground" point varies with the shack and rarely is it good practice to ground the shield at both ends. 600:600 ohm audio transformers can be found at most hamfests and may produce surprising improvements.

Having a direct "FSK Input" on the newer transceivers is definitely a "plus" for amateur RTTY. This feature also allows us to use narrow receiver filters. In comparison, if you use tones into the audio stage of an SSB transmitter, you may be forced to use the voice bandwidth SSB filter when receiving (usual for older rigs, less common for new equipment). *However, there is nothing inherently wrong with using audio tones to send RTTY via an SSB transmitter*. For 30 years, I have transmitted RTTY and other data signals via audio tones. This is the ONLY method used by commercial HF data users. The technique works very well if done properly. BUT, there are many ways to "go wrong". A bad RTTY signal can easily be generated by "over-enthusiastic adjustment" of the microphone gain control. I call this *new country mode* - you hear a new country and crank-up the TX gain control to be sure he hears you. Chances are, the portion of your signal he's listening to may actually get weaker. But, there will be a LOT of other RTTY operators up and down the band who can suddenly hear you - "real well"!

Some folks argue that if you generate a RTTY signal using tones into an SSB transmitter, you have to worry about spurious signals from less than perfect suppression of the carrier and unwanted sideband. The argument further goes that "pure FSK has only one signal on the air at a time - Mark or Space". Well, that's true if your radio really does generate a frequency-shifted RF carrier when in "FSK mode". These days, FSK circuitry is usually buried in an IC deep in the radio. But, if you dig deep enough, you find that, in spite of the "FSK" front panel label, what actually happens inside the radio is that your digital RTTY signal really changes the audio frequency of an oscillator buried in the frequency synthesizer module of the transceiver. Further, this audio oscillator output then drives the balanced modulator stage. Hmmm - sounds a whole lot like SSB with tones to me! In fact, it's exactly the same, but the tone generator is hidden away inside the radio cabinet. This arrangement is every bit as susceptible to unwanted sideband and carrier suppression problems as generating the tones in the modem, outside of the radio cabinet.

My suggestion: generate your RTTY signal using either "AFSK" or "FSK", but be careful! Have someone listen to your signal and look for "birdies".

Receive Problems: DSP RTTY modems (including sound cards used as modems) also require special care when receiving. Most of the “analog” modems we've used for RTTY included some form of automatic compensation for amplitude variation in the receiver audio output. The ST6, ST6000, and ST8000 style modems all include an amplitude limiter stage. The ST-8000 also has a linear AGC system. These modems are very tolerant of different receiver output levels. The claim has often been made that an ST-6 (or ST-8000) would print "stuff I can't even hear". AND - it's true! The ST-8000 copies RTTY down to -65 dBm (440 microvolts)!

In contrast, a DSP modem includes no limiter or AGC and receive audio is fed directly into the A/D converter. The dynamic range of DSP modem (minimum to maximum signal level) is determined by the resolution of the A/D conversion. If you want to get the full dynamic range and full capability from a DSP modem, you need to set the audio level carefully so that maximum output of your receiver is very close to the maximum input of the A/D converter. While a DSP modem will work if your receiver only puts out 1/4 or 1/10 of the A/D maximum, it will work much better if you feed it a little more audio.

With this in mind, the tuning indicators on HAL DSP modems (DXP38, P38, PCI-4000, DSP-4100) are set up so that they show full scale when the receiver output is set to the optimum level for the A/D. If your tuning indicator shows low deflection, then you are not feeding enough audio into the modem! It may help your reception considerably to just turn up the volume a little (but not too far!).

More and more receivers and transceivers now include a constant level audio output. This is a great idea and one we RTTY-types have long wanted. But, the actual implementation needs checking and may be a little disappointing! The only real audio standard dates back to the 1930's - "0 dBm" - the voltage required to produce 1 mW into a 600 ohm load. This is about 770 mV rms., or 2.18 V peak-to-peak. This is easily within the range of op-amp technology used in all solid-state transceivers. BUT, what we sometimes find is a constant output that is set to 200 mV or so (about 12 dB low) and the output impedance may be as high as 10,000 ohms. I can wish editorially that radio designers would "pay attention" - but, I suppose that we RTTY types should be happy that we have the constant level output at all! The cure is obvious, even if it is a little clumsy to do. Add some audio gain! A simple audio amplifier using an op-amp works great - set it for x4 gain.

Some A/D converters include internal amplifiers. Fortunately, the TLC320AC01 used in all HAL DSP modems includes this feature and new software releases this summer will include the ability to set the A/D input gain to "0dB", "+6dB" (x2), or "+12dB" (x4). Bottom line - DSP modems receive best when you give them the right signal amplitude. Crank up the level to get full-scale tuning indications!

A Little TTY History

(Part 3)

Tom Kleinschmidt

tomkleinschmidt@home.com

Upon the sale of the Teletype Corp. to AT&T's Western Electric on September 30, 1930 both technology leaders continued developing new products.

Howard Krum stayed with the company as a Vice President in a product development role. One of his new developments was a system for encoding and decoding scrambled messages, allowing for secure communication. Steady work even today as encryption technology gets ever more sophisticated.

On May 15, 1940 the Franklin Institute awarded both Howard Krum and Edward Kleinschmidt the John Price Wetherill Medal: "For his part in the development of a Successful Electrically Operated Duplicating Typewriting Machine Now Known as the Teletypewriter". Later the National Manufacturers Association recognized Howard Krum with the Modern Pioneer award. The Polytechnic Institute of Brooklyn awarded Edward Kleinschmidt the honorary degree of Doctor of Engineering on April 19,1958, he was then 82 years old. *

Edward E. Kleinschmidt left Teletype upon the sale of the company. He established Kleinschmidt Laboratories as an independent development company, assigning all his inventions to Teletype Corp. Kleinschmidt Laboratories was incorporated March 21, 1931. Up until late 1934, when his contract with Teletype expired, he developed an automatic switching system for routing Teletype messages. It included message storage on perforated tape in central offices and an automatic answerback arrangement to return the addressee's number to the sender.

Although new printer (tape and page) designs were offered to Teletype Corp. no further business would take place. So the models and the patents would lay dormant in the Highland Park, IL Lab with his sons and Kleinschmidt moved to Miami, Florida.

His son, Bernard ran a tool and die shop during World War II. Through his contacts he learned that the Signal Corps was looking for a lightweight tactical teleprinter for field use. A demonstration was performed in the Highland Park Lab. The response was positive. In February 1944 Edward demonstrated the tape printer to the Chief Signal officer in Washington, DC. The salient features were lightweight, small size and a basic design that could be made into a tape or page printer. This was at the time when the Teletype Corp. M15 was the standard, not easily made portable. The end result was a contract in 1949 for the TT-4 (model 100) which went into full production in 1950 with an order for 2000 units. A new factory was built in nearby Dearfield, IL. Kleinschmidt Labs was now a manufacturing company.

Bernard died in 1948, son Edward F. continued in product development, and son-in-law Emerson "Bud' Mead became the company president. Edward E., now in his 70s, continued to be active in product development. The entire family had a financial interest in the company. The military contracts continued to roll in. In 1956 the company was sold To Smith Corona (later know as SCM).

Edward E. remained active designing products for the Kleinschmidt Division of SCM until he was 95. His last patent was awarded in the late 1960s. He received over 117 patents during his lifetime, with his first in 1902 for a macaroni twisting machine. In 1975 the family celebrated his 100th birthday. He received birthday greetings from associates, Teletype Corp and two letters from President Gerald Ford. The first congratulated him on his hundredth birthday milestone and a second in recognition of his contributions to the development of printed communications.

Edward E. Kleinschmidt died on August 9, 1977 at 101, one month short of his 102nd birthday, September 9.

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Chicago Sun Times, "Teletype Inventor Kleinschmidt is Dead" August 10, 1977, pg96

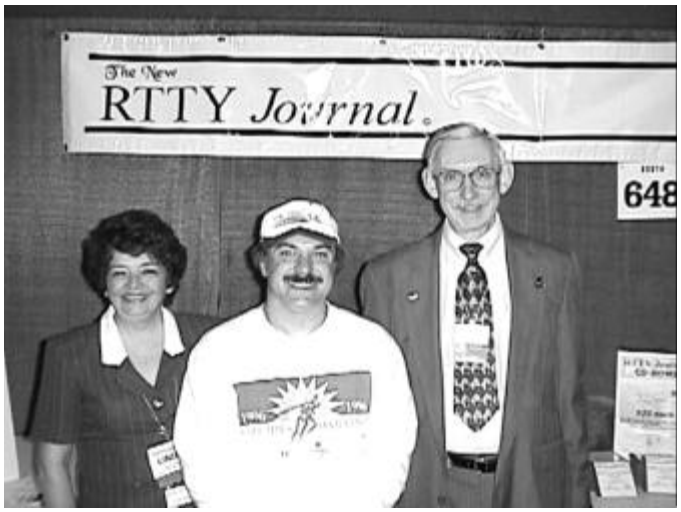
The National Enquirer, "Don't loose your interest in life….", Oct 5, 1976, pg49

The Teletype Story, Teletype Corp, 1958 pg4

*Further details of Mr. Krum's activities are not available to the author as of this writing. Any further information that the reader may have is greatly appreciated and will appear in future articles.

Tom Kleinschmidt is a great grand son of Edward E. Kleinschmidt

1999 Dayton Hamvention

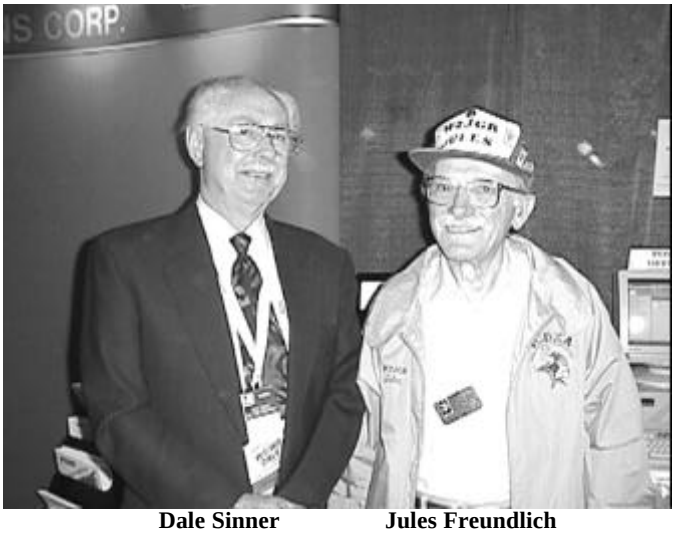


Linda Henry **Joe Coffman WB8YTZ** **Bill Henry K9GWT**

Joe was 2nd time Banquet Winner! 1998 P38 - 1999 DXP38

Paul Van Wie W8OX **Len Morris VE3FJB** **Bill Henry K9GWT**

Bill Henry K9GWT **Linda Henry** **Murvil Lipsey N5ML**



Dale Sinner W6IWO **Jules Freundlich W2JGR**

Dieter Riklin HB9CJD **Stephan Walder HB9DDO** **Rudolf Heuberger HB9PQX**

Peter Casier ON6TT **Bill Henry K9GWT** **Mats Persson SM7PKK**

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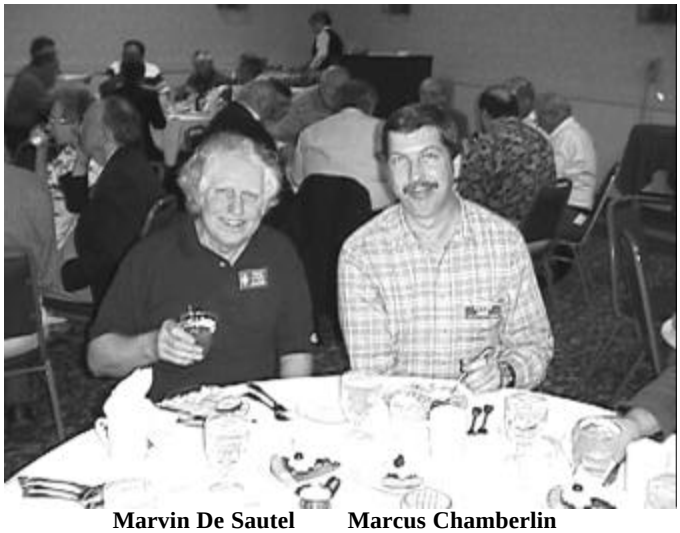
Drew White K9CW | Jim Coleman KA6A | Mark Prather WB9HFK

Bob Boyd W1VXV | Bill Heinzinger W9OL



Marvin De Sautel W7RPT | Marcus Chamberlin WA7PXW

Mike Moore N7RY | Gene Wolford KB7WIP | Donald Simonsen K7AEJ

George Johnson W1ZT | Frank Fallon N2FF | John Hirth W2KI

Lloyd Smith NX4W | Glenn Pladsen AE0Q

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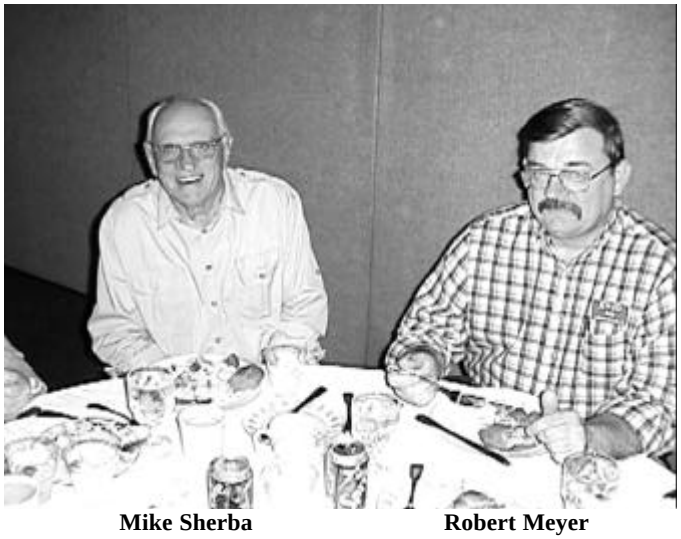
Anna Marie MacKeand and Crawford MacKeand WA3ZKZ — Raj Singh VE6RAJ

Doris Jankowitz NW2B — Jerry Jankowitz NO2T

Suzanne Ortgiesen KA1JGB — Ray Ortgiesen WF1B

Ray presented his DXPedition to Aruba P40RY at the RJ dinner

Jean Paul Tallebois VE3JPT — Ray Hunter VE3UR



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Kenneth Fattman NA0Y | Price Smith W0RI

Jules Freundlich W2JGR | Wayne Matlock K7MM | Ron Stailey K5DJ

Mike Sherba VE3DKW | Ray Hunter VE3UR

"Florida Boys" CQ/RJ World Wide WPX Contest Multi-Single USA Plaque Winners

Jim Johnson KC4HW | Orrin Delaney WA4HDS | Jan Heise W9OL | Bruce Lifter WT4I | Don Winn AF4Z | Steve Iezzi KT4FY

Ron Hall KP2N | Ron Stailey K5DJ

CQ/RJ World Wide WPX Contest - M/2 NA Plaque Winner

1999 Dayton Hamvention

Bruce Lifter **Ray Ortgiesen**
WT4I **WF1B**
CQ/RJ World Wide DX Contest - M/S World Record

Bruce Lifter **Barry Kutner**
WT4I **W2UP**
CQ/RJ World Wide DX Contest - S/O Asst. NA Plaque

Ron Stailey **Wayne Matlock**
K5DJ **K7WM**
CQ/RJ World Wide DX Contest - M/S HP NA Record

Bruce Lifter, WT4I **Tray Garlough, N5KO**
CQ/RJ World Wide WPX Contest - M/S World Record
Tray presented his DX location (HC8N) at the RTTY DXer's dinner

Bruce Lifter WT4I **Raj Singh VE6RAJ**
CQ/RJ World Wide WPX Contest - S/O LP Canadian Record

Jody Millspaugh **Ron Stailey**
VP5JM **K5DJ**
CQ/RJ World Wide DX Contest - NA Plaque Winner

1999 Dayton Hamvention

Tyler Stewart K3MM **Jerry Jankowitz NO2T** **Roy Maull N8YYS**
CQ/RJ World Wide WPX Contest - MM World Record

Bruce Lifter WT4I **Richard Stevens N1RCT**
CQ/RJ World Wide WPX Contest - S/O LP USA Record

Arthur Cohen XE1LL
Winner of the WriteLog Banquet Dinner door prize

John Fleming WA9ALS
Banquet Dinner Winner of The New HAL DXP38 HF Modem

Another "Successful" Year at the Hospitality Suite

Damon Raphael W7MD **Winn Kratz KB0KK** **Dale Sinner W6IWO** **Waldemar Kebsch DK3VN**

1998 CQ/RJ World-Wide RTTY DX CONTEST RESULTS

CALL	QSO's	SCORE	POINTS
Multi-Operator Multi-Transmitter			
W3LPL	2,869	4,193,775	6,213
RW2F	2,533	4,102,650	6,078
KH7R	1,870	2,850,391	5,471
HG1W/3	1,874	2,527,096	4,418
RW0A	1,741	2,283,876	4,788
VE7CFD	982	843,024	2,184
SK6TY	611	356,979	1,337
Multi-Operator High Power			
HC8N	2,580	4,384,908	7,382
YL8M	1,751	2,383,107	4,159
I2EOW	1,579	2,288,387	3,859
DL6RAI	1,537	2,251,470	3,765
LT1F	1,689	2,248,092	4,866
TM1C	1,679	2,187,634	4,159
RM6A	1,658	2,137,820	3,845
K5DJ	1,697	2,130,278	3,403
LZ5W	1,572	1,885,926	3,787
K4QD	1,569	1,763,320	3,391
PI4COM	1,290	1,678,512	3,179
IK2HKT	953	1,447,596	2,844
N9NCX	1,022	1,008,432	2,256
K4EA	970	978,132	2,203
PI4CC	1,022	940,032	2,448
EA3BT	886	866,984	2,146
OH0MZA/11	1,009	845,596	2,362
XX9TYD	923	681,392	2,302
VE3FJB	703	629,280	1,840
F8KCF	650	500,472	1,512
VE5TR	700	479,297	1,603
KQ4QM	535	407,875	1,255
N7MB	618	355,020	1,164
VE5RI	444	246,440	1,010
N7GC	346	154,375	625
NG7M	351	124,392	584
Multi-Operator Low Power			
P40RY	2,313	3,741,387	6,693
KE1FO	1,028	1,070,831	2,293
RK3AH	1,044	1,049,016	2,406
OL5Q	1,012	966,896	2,492
LZ9A	805	792,512	1,952
IK1HXN	829	745,324	1,916
HA/W0YR	748	590,292	1,726
K5ED	819	499,772	1,373
DK0IU	513	373,860	1,206
YU7AL	444	311,253	1,077
W3GG	502	307,338	1,086
VE6RAJ	428	236,555	935
F5KDC	353	151,463	793
SN1I	244	101,010	555
PA3AQL	247	86,337	543
N7IZM	184	61,950	350
K9OSH	125	32,604	247
PY3MHZ	57	11,592	161
Single-Operator High Power			
FG5BG	2,000	2,617,904	4,996
XQ8ABF	1,807	2,342,141	5,287
UX0Z	1,471	1,926,768	3,516
(Op:UT0ZZ)			
ER0F	1,696	1,842,515	3,799
(Opr:UX0FF)			
DL5AXX	1,404	1,838,720	3,536
UN5PR	1,114	1,344,966	3,099
YU7AM	1,004	1,232,840	2,380
RX3DCX	1,142	1,099,956	2,564
SP6YAQ	984	1,058,841	2,401
(Opr:SP8NR)			
VA3MM	958	977,262	2,431
S56A	859	945,228	2,082
SM5FQQ	989	940,443	2,357
I1COB	977	932,553	2,349
CX7BF	1,060	922,284	3,014
N2DL	924	891,240	2,122
K2PS	878	874,499	2,029
N2FF	878	810,328	2,036
S58T	836	805,910	1,985
EA1MV	905	778,302	2,059
DL4MCF	869	772,620	1,956
HA3LI	907	740,250	2,115
SK4RY	863	683,436	2,022
(OP:SM4RGD)			
SN7N	732	656,640	1,710
(OP:SP7NMW)			
OK1CM	735	650,430	1,782
W7GG	888	641,752	1,654
JY9QJ	708	623,210	2,030
EA3RH	808	617,118	1,893
K8MM	757	606,760	1,576
K3KO	680	604,844	1,699
GW5KHQ	705	593,928	1,752
W2KI	686	543,444	1,518
UA6AHF	747	524,064	1,648
K4WW	621	466,140	1,371
AH8GL	661	461,244	1,938
VR98BG	724	457,240	1,633
(OP:VR2BG)			
UA6AN	635	455,805	1,447
VE3WQ	570	452,452	1,469
K5YAA	597	412,764	1,298
K5ZD	544	406,722	1,279
ND5S	536	392,689	1,231
SM5FUG	532	382,540	1,234
VE7AGJ	567	376,380	1,394
OK2SG	471	369,600	1,120
EA2ASB	558	357,084	1,308
HA4YF	569	354,450	1,275
W0WH	582	353,296	1,136
N6GG	499	349,798	1,073
SM3AFR	527	310,487	1,237
K0MP	3,270	287,970	993
K8RS	440	269,552	991
WS1F	403	250,900	965
RA3BT	541	249,260	1,133
SM5GVR	454	248,611	1,067
WB0BBY	460	247,748	964
W2JGR/0	341	229,880	821
OK2BXW	353	211,091	841
W6ZL	407	209,484	759
F2AR	400	203,875	875
NN6XX	459	199,329	807
VR2KF	402	188,328	1,064
VE5CPU	358	175,340	797
IK1YLL	319	158,928	616
DJ2YE	315	153,081	699
WA8RPK	334	146,016	624
DL1SWB	336	143,877	723
N6VH	309	139,416	628
S55A	325	135,459	783
DL1JPL	289	135,340	670
ZL2AMI	231	132,581	673
UX1UA	414	130,380	615
JA2AXB	229	120,120	616
NA2M	268	115,227	531
VE7BTO	281	113,344	616
LA7AJ	233	110,390	581
K1SM	308	109,494	711
W6KNB	289	109,052	548
AA9RR	251	108,254	479
CO2KG	435	107,666	1,066
K5CWR	208	101,504	488
W3KV	183	90,000	500
ZP5MAL	229	89,370	662
WB4UBA	200	86,289	587
VE5SF	216	78,456	467
DU1SAN	63	78,318	687
W6JOX	214	77,411	389
KF6BIR	231	76,728	417
KK2M	197	75,046	478
W0ML	168	72,600	440
IK4ZHH	226	71,188	481
N8PR	183	70,784	448
K8VT	195	67,981	433
IT9JOF	181	64,972	439
W9RY	130	61,620	395
WD0BNC	159	57,904	376
KH2D	155	47,736	442
W3MF	158	45,450	303
K0BJ	154	40,176	324
DL1EMH	103	33,108	267
W6CN	108	32,725	275
AJ3M	142	27,522	278
JJ1VEZ	93	24,035	253
DK6CQ	87	22,795	235
AL7L	104	21,762	186
AC0M	93	21,412	212
N7VGO	100	15,554	154
NF6R	86	12,250	175
OA4BR	27	6,804	189
SP1MHV	16	1,271	41
Single-Operator Low Power			
CE8SFG	1,031	1,561,751	4,187
LU3HY	1,256	1,360,836	3,708
VP5JM	1,315	1,298,460	3,230
LU5VV	1,081	1,258,864	3,116
N1RCT	1,150	1,258,254	2,589
F5NBU	1,017	1,085,580	2,445
RZ9WZ	1,102	1,049,510	3,190
NX4W	1,021	889,575	2,175
EA9JZ	837	813,696	2,496
DL2ZAE	728	703,832	1,814
YO3APJ	705	676,498	1,717
HA5BSW	786	656,214	1,833
5B4AGE	958	619,840	2,080
DJ6QT	635	611,420	1,609
LU8FDZ	518	581,436	1,563
EW2CR	725	574,190	1,714
S57U	667	552,036	1,542
HK3YH	609	544,004	1,772
KI6DY/0	722	454,599	1,341
EA4CI	605	451,152	1,446
JE3UFF	530	445,470	1,437
LX1TO	595	433,672	1,436
K2YG	531	420,672	1,252
DK3VN	535	373,451	1,249
9V8ZB	625	363,200	1,600
EA1BAF	523	359,936	1,184
VA3DX	425	347,928	1,064
VP8CEH	548	344,540	1,498
KJ7TH	726	340,561	1,139
SP4TXI	565	331,643	1,261
EA7TV	247	330,225	1,275
EA3TB	507	328,848	1,209
DU3RCM	506	324,339	1,481
SP2EWQ	473	304,876	1,066
9M2TO	547	296,520	1,412
YU7AE	425	284,856	1,144
RA0FF	403	278,760	1,010
RA9MY	459	275,808	1,248
9A7P	460	270,101	1,027
(OP:9A5AEI)			
KJ5SF	450	268,362	877
PI4EUR	469	266,500	1,066
AG4W	451	262,542	893
OK2PCL	400	258,960	1,040
N5XUS	554	247,084	892
5K3W	396	243,810	1,161
SM6BSK	421	236,652	962
KL7Q/4	369	236,130	926
I2HWI	422	232,224	984
EA3DUW	515	231,467	1,097
N7UJJ	488	227,832	863
KC1YF	400	221,400	900
JA1WSK	335	220,033	913
SV1DNW	463	212,443	979
OK2VWB	353	211,002	834
OZ5MJ	347	207,872	812
YO3JF	402	207,760	980
W1VXV	331	200,460	780
W4LC	355	193,018	811
W8EB	319	189,230	745
KC4SAW	340	183,883	763
JA2BY	295	182,336	814
GU0SUP	345	181,888	784
SM7BHM	397	180,061	887
DL7VBJ	350	178,374	822
JH1OAI	260	173,264	728
VE7TLK	272	161,710	785
HP1KZ	399	158,598	891
JH5OXF	301	158,562	766
PA3EMN	318	152,352	736
WA1EHK	308	149,110	806
N6XJ	311	140,732	604
LY2CG	308	140,295	705
N8PS	261	140,220	570
SP9LKS	310	140,097	697
OH3NGB	335	139,293	737
IK1DFH	307	136,077	677
4L8A	404	133,052	1,147
KR4U	300	132,510	631
DJ3NG	268	131,652	636
JH3SIF	244	129,823	659
DL8SDC	263	129,117	669
HK3SGP	288	129,048	849
4X6UO	282	128,495	829
LA5TFA	367	126,063	783
IK6OIN	320	125,716	593
KK5OQ	369	124,384	598
UP6F	278	124,168	748
(OP:UN7FZ)			
K1KU	255	123,578	637
AA7CP	359	119,777	497
W7NN	342	117,688	626
TF3BR	433	116,983	893
MI0BME	293	114,560	640
EA1AHA	249	113,032	568
N5RXF	381	109,630	577
PA3EVY	239	107,322	577
RZ9OU	461	103,968	456
HB9CRV	279	102,935	595
IK4WMH	211	101,612	532
LA7CL	292	101,412	626
EW1EA	247	98,264	568
EI4DW	233	98,088	536
JR1KSK	222	97,650	525
YU1BO	312	97,650	651
DL3GA	223	96,950	554
YO8FR	286	96,854	613
VE2BOB	211	95,914	527
DL6BE	244	95,049	537
S57AW	262	94,380	572
DL1ARJ	215	93,781	491
K9RB	184	92,685	501
T91EZC	228	90,922	538
DL3ARK	230	90,584	536
IK1NEM	231	88,391	563
SM7GXR	225	88,183	541
GW3JBQ	294	87,906	598
KI0OLO	339	87,696	464
K4FPF	197	87,320	472
CO8LY	243	87,265	563
AE5P	272	87,162	438
W1EM	202	86,450	455
DK5MV	200	85,432	472
W1BYH	205	84,611	401
OK1BMW	143	84,249	333
DL4MFP	200	83,237	517
WA6BOB	301	81,812	452
EA7ALO	210	81,280	508
DL6MDT	202	81,015	491
IK2DHU	205	79,826	478
KC8BI	220	79,605	435
SP8FHJ	223	79,599	507
IK3SSJ	251	78,900	526
DL2HX	217	78,403	481
N6OJ	194	74,226	417
YO3FRI	259	73,944	468
S57XX	199	73,920	448
SM7ATL	208	72,600	484
VE3BUC	221	72,420	510
JH3CUL	168	72,210	435
SP2EIW	185	68,586	426
K8CV	171	67,735	437
HB9DOD	201	65,395	451
EA5AFH	184	63,558	321
K6HGF	262	62,834	353
SP3CUG	167	62,730	410
OK2PMS	205	62,592	489
IK2XZB	160	60,214	374
3Z0XR	180	60,060	420
F5OZF	162	60,000	375
K8OSF	191	58,752	459
PA3GKT	181	58,374	423
DL2AL	194	57,816	438
K2QMF	168	57,816	396
KA8YQL	191	57,760	361
DL3AYJ	170	57,183	389
KI0BF	180	56,953	337
JA6CM	145	56,280	402
HB9AWS	200	56,126	422
DJ2OE	162	56,000	400
W9TY	151	54,872	361
KI0IV	169	54,579	339
IT9AJP	135	54,275	325
JH7AJD/1	150	52,920	378
OH3KOK	183	51,520	448
I0KHP	143	50,410	355
W8IDM	159	50,100	334
SM5LNS	190	48,832	436
IK7XCW	160	46,863	369
DL4RU	150	46,284	348
VE2JR	152	45,902	389
JA5FP	156	43,888	422
DL0DX	150	43,754	334
(OP:DK2OY)			
G0PCA/1	196	43,709	401
ZL2JON	116	43,560	330
G0MTN	190	41,124	276
KC6G	150	37,752	264
WT3P	128	36,704	296
VE1AOE	130	35,904	352
NM1W	119	35,432	344
OK1DWC	126	34,983	299
I4HRH	121	34,317	279
IK1GDC	125	33,925	295
OZ2ZB	118	33,390	265
S57NW	134	31,970	278
IK2NCF	125	31,301	277
JA7KM	110	31,270	295
I7ICU	133	31,212	289
HB9HQX	140	30,870	294
OH2OM	123	30,067	281
OK2BMC	139	29,997	297
VE2AXO	114	29,280	305
U1SE	159	29,128	331
JA2KPV	96	29,041	257
W4JLS	123	28,304	244
RK3BY	145	27,132	323
WB9NOV	89	26,010	255
DL2YAK	100	24,174	237
IK4YNR	94	23,647	221
EA5YJ	118	22,500	180
N0QT	95	22,386	182
SL4ZAE	124	22,100	260
OZ6TL	132	21,037	193
I0ZUT	83	20,696	199
ON4KMB	118	20,664	252
W9ISC	103	19,425	175
N2CQ	97	19,224	267
JA2HBK	68	19,089	189
N3UE	98	18,042	194
KR4XM	76	17,766	189
F5DXN	100	17,708	233
OH5HCK	122	17,622	267
K5HDU	90	17,496	162
N0IU	102	17,372	172
OK1DKS	86	17,200	200
SP4BOS	103	17,200	215
EA4BNQ	90	16,632	198
KK5CA	84	16,320	160
IV3KSE	94	15,721	199
JA3BSH	77	15,624	217
AD6EN	95	15,476	146
LX1JH	126	15,433	253
KC6AWX	107	15,379	169
KA5LGP	86	14,469	159
IK8WEI	68	14,268	174
N3RC	73	12,665	149
4X/TF1MM	134	12,596	268
SM6NJK	86	12,342	187
9A6ACY	82	10,266	177
RW9RF	60	10,230	155
YO5AY	67	9,734	157
JR3PZW/1	51	9,316	137
KO0ST	52	9,035	139
PA0EHF	49	8,911	133
KO2FB	63	8,748	108
5R8FU	77	8,536	194
IK2AUK	62	8,514	129
PA0EHF	48	8,512	133
OE1TKW	61	7,980	105
LA1PHA	52	6,156	108
VK4AXM	35	5,300	100
EA2SN	39	4,895	89
SP6NVK	45	4,182	102
GW3YVC	55	4,046	119
SP2GWZ	49	3,616	113
DL7ET	37	3,612	86
DL7MAE	37	3,600	80
AC4HF	34	3,360	70
AA0CY	40	3,300	66
ZS2BWB	33	3,168	99
F6DZD	30	2,368	64
K7ED	22	1,739	47
LZ4BU	19	1,540	55
JN1MSO	15	832	32
W3ZF	10	306	17
SM7BUN	3	63	9
Single-Operator Assisted			
EM0I	2,016	2,544,066	4,634
(OP:UT2IZ)			
OM5M	1,439	2,020,607	3,589
W2UP	1,465	2,014,608	3,572
UA6LO	1,580	1,880,840	3,617
DK3GI	1,205	1,602,325	2,995
DF3CB	1,043	1,316,612	2,602
JS3CTQ	1,082	1,196,800	2,992
9A6D	920	954,930	2,290
DK0EE	919	877,608	2,151
(OP:DL4MDO)			
W9MU	731	641,277	1,701
OH2GI	738	632,880	1,758
UA0FZ	613	534,972	1,636
LA6MP	636	461,235	1,455
EA3BHK	535	430,140	1,340
EY8MM	626	419,250	1,677
OH2LU	571	417,600	1,305
F6IFY	475	335,376	1,096
WF5T	572	304,386	1,046
4U1ITU	463	282,880	1,105
NA4M	565	279,279	1,001
WO9S	367	224,664	814
N3DL	291	157,400	787
WOGJ	238	109,908	516
SP2UUU	234	102,869	533
ON4CAS	218	91,656	536
JA3LDH	200	84,750	565
K0BX	181	75,601	437
W3AG	117	45,080	322
DL5MFF	151	38,988	342
AA2GS/4	157	28,792	244
JA1YNE	70	12,780	180
(OP: JP1OGL)			
K6CT	50	7,519	103
10 Meters			
PW2C	801	323,058	2,341
(OP:PY2KC)			
LU6AM	654	251,520	1,920
LW9EPB	753	205,068	2,229
LU8HWD	539	187,698	1,526
ZS6RVG	467	185,402	1,394
9K2HN	487	161,816	1,432
S51AY	315	105,705	783
PU2LCD	321	100,872	934
LW7EIC	319	100,152	936
S52SK	225	81,732	588
EA7FTR	394	76,788	948
XE1FES	345	72,409	703
CX9BAG	160	38,442	447
OK1MP	120	27,664	304
GW5NF	123	24,016	316
EA8KK	112	22,977	333
W0QDL	119	17,325	231
DJ9XB	72	11,977	203
LZ1CF	73	9,860	170
JA1SJV	41	4,400	110
PA0JED	26	1,863	69
JA2NNF	27	1,809	67
JM1NKT	18	820	41
JA2MOG	13	620	31
JI6JSD	7	160	16
15 Meters			
9A5W	800	371,664	2,088
IY4W	887	367,744	2,176
(OP:IK2NCJ)			
CT1DVV	775	281,634	1,929
UA4LCQ	780	268,647	1,803
Z30M	757	266,832	1,853
VE3X0	703	253,099	1,903
S50U	628	251,379	1,643
9A5Y	546	243,022	1,438
(OP:9A3LG)			
LU8EKC	484	202,917	1,419
DJ5JK	470	199,980	1,212
ZP6CC	489	180,810	1,435
IT9STG	441	136,502	1,042
N4SR	446	128,996	1,084
HJ6VKH	368	110,670	1,085
ON4CBA	305	84,032	808
F5NZO	264	78,648	678
EA2AKP	294	73,656	682
DL9FBS	235	63,210	602
EA2IA	203	60,162	542
JR4GPA	247	56,781	701
PY2MNL	196	50,512	574
JA1BWA	167	49,440	480
EA3QP	230	42,400	530
DL9NDV	172	41,642	443
SP3RBT	151	38,313	387
OK2PDM	143	34,689	373
YU7KMN	144	29,600	370
EA7ESH	212	21,516	326
UP0F	169	21,471	421
UA0FDX	85	16,348	244
OK1CMN	82	11,685	205
YU7YZ	54	7,315	133
KH6GMP	45	5,934	129
JA3MIB	38	5,194	98
IT9ORA	24	609	29
20 Meters			
9A2DQ	912	376,950	2,154
ON4ANT	802	324,162	2,001
IT9GSF	790	307,314	1,897
IT9STX	690	285,950	1,634
HC1JQ	642	281,792	1,904
YU1NR	747	258,750	1,725
G8G (OPR:G0NUP)			659
237,728	1,564		
S53MJ	638	237,440	1,484
PT2BW	495	184,576	1,442
US9Q	559	151,320	1,261
GW4SKA	514	148,336	1,168
AB8K	406	114,532	836
LY4AA	414	102,190	929
XE2DV	409	88,704	896
AA7UN	396	82,560	645
IT9ENB	357	79,891	791
Z31GB	336	73,304	748
RA1AW	339	72,944	752
KE6YTT	370	69,440	560
CT1FRN	293	68,120	655
LU9HS	233	61,304	632
IK2DPP	269	61,152	624
7K4QOK	198	60,384	544
(Opr:JR2BFN)			
I7PXV	258	52,922	563
WA1FCN	185	42,336	441
RA3BB	215	39,176	472
CX3DAT	41	32,400	120
DL9MBZ	172	29,440	368
UA3XBB	133	23,147	293
UT7EF	151	17,862	229
VE6JY	75	14,140	202
IZ3BQT	108	12,485	227
W6IWO	98	10,362	157
SP4OZ	125	8,613	261
YO5TP	100	8,235	135
EA7BDL	81	6,440	161
DH7DJ	60	5,616	156
SP3JHR	70	5,408	169
SP2GNB	68	4,862	143
OH3RM	43	2,632	94
N2ALE	30	1,683	51
LU3XQC	29	1,628	74
JF5FGY	17	1,170	45
40 Meters			
EA8PP	529	212,220	1,572
9A8A	574	164,000	1,312
HA2SX	444	114,777	981
S51DX	413	99,299	911
F/OK1EE	347	60,896	692
KA4RRU	171	28,796	313
YZ7ED	111	17,272	254
K7DSR	105	9,344	146
80 Meters			
9A9A	336	50,850	678
CT1AOZ	217	36,150	482
S57CQ	254	27,030	510
DL4RCK	230	22,207	419
S54A	155	13,728	312
W5AJ	13	380	19

Check Logs

VE4COZ, IZ5BSA, UA0CA, SP3QDU, AA5RF, DL5ZB, DL9GGA, EA8AVR, K2SZ, N5LUQ, OK-2-21478, PI4DTC, DJ5NN, W3JRY, LA5YW, K9EMG, W4NTI, DJ2IA, AE4ZQ, IK0HBN

Happenings at Dayton'99

Ron Stailey, K5DJ

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Hello Everyone! This year's Dayton was a great success, especially for the digital groups. WE HAVE A NEW HOTEL and boy is it great. Sure is nice to have cool air in all rooms all the time for a change. The hotel is a real nice place to stay - everything you can think of is there for the asking.

Many of us arrived early Thursday to get setup at Hara Arena for the weekend. This year everything went so fast and smooth it was down right scary. I arrived at the arena around noon on Thursday and was soon all set-up. Then, I headed back to the Airport to pick up Wayne, K7WM, and on to the Holiday Inn at Dayton Mall.

Thursday is theday for visiting with old friends at the Watering Hole (The Bar), and this year wasn't any different. Many were already there when Wayne and I walked in. The stories were flying around like always. The rules for telling stories at the watering hole are: first, make the story sound good - true or not doesn't matter. Second, the story must be moral building for the new people so they can go WOW! all evening long. You'd be surprised how well the new ones tell stories the very next year.

For most of us, Dayton is about the only place you will see all of your contesting friends. It's really a treat to see everyone each year and hear all that has gone on. This year, we had several new faces at Dayton. We all enjoyed meeting Raj, VE6RAJ. Raj drove down from Alberta, Canada. If you're wondering if Raj is really and truly like he is on the RTTY reflector, the answer is YES! He is a lot of fun. I truly hope Raj makes Dayton 2000 a Canadian "Must Go To". Also, we met Damon W7MD, a first timer to the digital groups hotel. Damon is in the process of strengthening his station in Tucson, AZ to take advantage of better conditions. Sooo, when you hear all that racket coming out of Arizona, one of them is Damon. Welcome to the group.

Friday morning: When the doors open, here come the people. It's a real sight to see - kind of like a young boy walking into a big toy store with a sign saying here are ALL the toys! Most everyone knows what they want to see first since they have had a year to think about it. All the toys were there for us to look at or touch and feel.

While taking a break, I wandered out to the flea market and saw a beautiful tower sticking up. A beautiful tower sticking up will always catch the eye of a contester. So, I just had to go take a peek at it. When I got there, I found aTelex 72' four section tower. As my dear old Pappy would have said "One of the good ones". But, I don't think Delta Airlines would let me take it as carry-on luggage.

The Friday night Contesters/DXers dinner went over very well. We had a great dinner. The after-dinner speaker was Tray Garlough, N5KO. Tray talked about contesting from Galapagos Is. during the CQ/RJWW RTTY DX Contest as HC8N. Tray had slides showing his new station with 130' towers. Everyone said they enjoyed his talk very much. He sure has one heck of a station.

Plaques were distributed to winners of both '98 CQ/RJWW RTTY DX Contest and the '99 WPX Contest. There were some 16 plaques presented at this year's dinner. It's always nice to see new contesters receiving plaques and others reaching higher level of standings. This year Dick, N1RCT, picked up a North American in CQ/RJWW DX and a USA plaque in WPX, nice job Dick. Congratulations to all plaque winners.

Also, a special Technical Achievement Development Award was presented to Bill Henry, K9GWT. In my opinion, no one man is more responsible for the success of digital communications than Bill Henry. My most sincere thanks go to Bill.

"Hostility Room": Many regular people couldn't make it to this year's Dayton Convention, such as Don AA5AU and Eddie G0AZT. The most talk was about "Free Drink Eddie". Where was he?? Well "Free Drink Eddie" was around with his twin brother "Drink'em Fast Freddie!" As you can see, Freddie is somewhat larger than Eddie. (See photos Below)

Saturday evening Banquet was also a big hit. We had another great meal. Ray Ortgiesen, WF1B, was the speaker with a slide show of the World record score in M/S Low Power category from Aruba as P40RY. Eddie G0AZT, and Rays XYL, Susanne (KA1JGB) were part of the team. Two plaques were also presented at the banquet to Jody, VP5JM and Jan, K4QD. Jody won North America in the CQ/RJWW RTTY DX Contest (S/Op L.P.). Jan, K4QD, and crew won the USA plaque in CQ/RJ WW RTTY WPX Contest (M/S H.P. category).

The hospitality room was in full swing again with plenty of spirits for everyone. Special thanks to Bill Henry and HAL Communications for taking care of us again as they have for many years. And, thanks to the door prize donors - HAL Communications, The New RTTY Journal, RTTY by WF1B, OH2GI - Ham System, WF5E QSL service, The Pactor News and WriteLog for Windows.

See ya at Dayton 2000... de Ron K5DJ

F R E E D R I N K E D D I E

Eddie Schneider W6/G0AZT Impersonators

Dale Sinner W6IWO **Bill Henry K 9GWT**

Eddie, RAJ, 'n "Drink'em Fast Freddie"

Joe Wittmer KB9SIZ **Raj Singh VE6RAJ** **Ron Stailey K5DJ**

1999/2000 GUIDE TO WORLDWIDE WEATHER SERVICES

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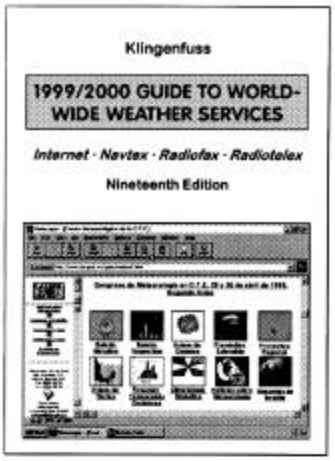

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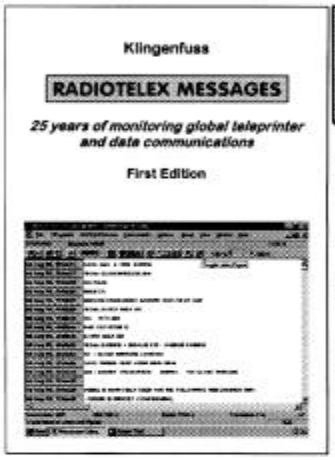

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1999 CQ / RJ Worldwide WPX Contest Results

Multi operators, multi transmitters:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
LY8X	1456	4477	429	1920633		Plq (Wld)
RK3AH	1216	3623	385	1394855		Plq (EU)
SK6NP	913	2845	335	953075		C (SM)
RK6AWJ	900	2353	321	755313		C (UA)
S53MJ	737	1960	332	650720		C (S5)
SV1AFA	597	1744	266	463904		C (SV)
SP5ZCC	516	1551	268	415668		C (SP)
RK1OWZ	465	1353	215	290895		
WB8SKP	337	664	155	102920		C (W8)

Operators:
LY8X: LY1FF, LY1FR, LY2BIL, LY2BKF, LY3NFW
RK3AH: RK3AH, RK3AW, RV3BA, Ross
SK6NP: SM6FUD, SM6WQB, SM6PIS, SM6WWK, SM6BUV, SM6WQA, SM6WET, SM6FKF, Tobias
RK6AWJ: UA6AF, UA6AN, UA6AHF
S53MJ: S53MJ, Maria
SV1AFA: SV1CIB, SV1DPX
SP5ZCC: SP5TAT, SP5UAF, CQ5BPM, SQ5EBJ, 3Z5AAN
RK1OWZ: RA1OJ, UA1OZ, UA1OSS, UA1OMZ
WB8SKP: WB8SKP

Multi operators, two transmitters:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
WS7I	2386	5410	574	3105340	WR+USA	Plq (Wld)
KH7R	1844	6465	441	2851065	OC	Plq (OC)
RK0AXX	1685	6112	418	2554816	AS	Plq (AS)
RW6AWT	1826	5249	449	2356801	EU	Plq (EU)
KP2D	1763	4895	453	2201127	NA	Plq (NA)
OL5Q	1213	3926	402	1578252		C (OM)
K8AA	1334	3285	407	1336995		Plq(USA)
JA6ZPR	512	1450	345	500250	JA	C (JA6)

Operators:
WS7I: WS7I, WT4I, K5DJ
KH7R: KH7R, KH7U, KH7L, KH6ND, AH6OZ
RA0AXX: RA0AM, RU0AAN,RU0AB, RU0AM, RU0AT, RV0AR, RV0AR, UA0ANW
RW6AWT: RN6BN, RA6CO, RA6AX, RA6YY, RV6BA, RU6AB
KP2D: KP2N, NP2E, NP2W, NP2DZ, NP2GM, W5TTY
OL5Q: OK1HRA, OK1FLC, OK1INC, OK1FFU
K8AA: K8AA, KG8CO, KI8GM, NU8Z
JA6ZPR: JH6JSR, JH6SQI, JR6CKK

Multi operators, single transmitter:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
HC8N	1837	5466	522	2853252	WR+SA	Plq (Wld)
RY9C	1322	4748	388	1658001	AS	Plq (AS)
DL0GK	894	2800	364	1019200		Plq (EU)
AF4Z	1053	2546	382	972572	USA	Plq (NA)
IK2SGF	891	2815	348	881658		C (I)
VE3FJB	751	2260	307	624438	VE	Plq (VE)
UT7Z	533	1875	259	485625		C (UR)
KJ7TH	787	1406	286	402116		Plq(USA)
K8UC	580	1440	242	348480		C (W8)
9A7P	507	1686	217	329275		C (9A)
RK1OWZ	465	1353	215	290895		C (UA)
K9TSM	344	810	291	235710		C (W9)
VE3UR	228	608	235	142880		C (VE3)
RK9JWZ	240	709	134	95006		C (UA9)
N7IZM	272	491	131	64321		
LA1K	23	90	23	2070		

Operators:
HC8N: N5KO, K6AW
RY9C: UA9CGA, UA9CR, RW9CF
AF4Z: AF4Z, KC4HW, KE4MMI, K4PX, K4QD
IK2SGF: IK2GSF, IK2BUF, IZ2AVK, IK2UCK
VE3FJB: VE3FJB, VE3IJM, VE3DDG, VE3THR, VE3VSM
UT7Z: UR7ZZ, UT4ZO
KJ7TH: KJ7TH, W7II, KW7N, KD7AKN
K8UC: K8UC, K8LEM
9A7P: 9A6NHH, 9A5AEI
RK1OZW: RA1OJ, UA1OZ, UA1OSS, UA1OMZ
K9TSM: WZ9M, N9VUH, KB9RUB, WN9NDU, KA9SYE, KB9BIF, N1LL, WD9AKG, WB9ZEZ, KB9SDU, KE4RIT, N9HZ, KB9MOH, KB9NTY, KB9ATR, N9SPI, W9OKD
VE3UR: VE3UR (Uncle Ray), VE3PKA, VE3JPT, VE3FRD, Nancy
RK9JWZ: RA9JX
N7IZM: N7IZM,N7PWZ
LA1K: LA1K

Single operator, all bands, high power:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
KF3P	1614	4946	423	2092158	WR+USA	Plq (Wld)
Operator: K3MM						
UP5P	1201	4308	399	1718892	AS	Plq (AS)
Operator: UN5PR						
EM0I	1406	4072	426	1534366	EU	Plq (EU)
Operator: UT2IZ						
EA3NY	1086	3588	402	1298138		C (EU)
OH1MM	1105	3043	408	1241544		C (OH)
UX0Z	1049	3343	378	1137288		C (UR)
Operator: UT0ZZ						
W2KI	1006	2880	350	1008000		Plq (NA)
VA3DX	951	3074	358	990442		Plq (VE)
LY6M	953	2943	365	966775		C (LY)
YL8M	947	3060	351	966654		C (YL)
Operator: YL2KL						
HA3LI	840	2564	370	948680		C (HA)
OH1F	1016	2867	366	944389		
Operator: OH1MDR						
NO2T	1077	2681	373	900011		Plq(USA)
K4GMH	970	2331	362	843822		C (W4)
YU7YG	894	2777	337	842264		C (YU)
I1COB	803	2521	339	769157		C (I)
OH2BP	844	2321	329	763609		
VE6AGJ	846	2231	341	760771		C (VE6)
DL4MCF	805	2557	325	747922		C (DL)
RX3DCX	900	2416	339	737121		C (UA)
SN7N	777	2459	325	719257		C (SP)
SM4RGD	712	2155	324	698220		C (SM)
GW4KHQ	800	2331	330	692307		C (GW)
W4GKM	604	2421	265	641565		
OH2GI	680	1979	305	603595		
UA9CLB	698	2236	265	592540		C (UA9)
RX9SR	708	2481	265	591718		
OH6XY	703	200	294	588294		
SP4CHY	665	2014	290	584060		
KG6OK	934	1882	341	577585		C (W6)
OH3FM	702	2008	284	570272		
VE7IN	669	1905	299	569595		C (VE7)
W9OL	719	1769	312	551928		C (W9)
I2UIY	580	1980	277	548460		
IK2HKT	620	1970	266	524020		
UA4HTT	748	1898	272	516256		
K4SB	701	1660	305	506300		
W7WW	872	1613	308	496804		C (W7)
N2WK	644	1673	287	480151		
DJ6QT	596	1784	288	462412		
EA3RH	564	1465	305	446825		
VE3WQ	538	1770	249	440730		C (VE3)
W8KX	562	1419	286	405834		C (W8)
VK6GOM	534	1612	240	386880	OC	Plq (OC)
NE3H	514	1359	248	337032		C (W3)
MI0BME	530	1394	237	330378		C (GI)
RU3AT	492	1341	232	311112		
N0MLJ	559	1252	276	310996		Plq (Rke)
OK2BXW	437	1344	229	307776		C (OK)
KE1AK	542	1279	234	299286		C (W1)
RW6BQ	447	1452	203	294756		
W2JGR	607	1152	253	291456		
ZX2A	400	1179	236	278244		Plq (SA)
OK1CF	353	1256	208	261248		
KC7V	500	988	253	249964		
RK9BZ	431	1317	184	242328		
JA1BWA	364	1163	199	231437		Plq (JA)
WA9ALS	510	1052	219	230388		
JL6HKJ	380	1056	214	225984		C (JA6)
K8VT	487	1068	220	224960		
ZL2AMI	299	1041	205	213405		C (ZL)
W1ZT	394	940	220	206800		
SM5FUG	309	999	192	191808		
NH6XM	347	1028	180	185040		C (KH6)
N4AN	356	800	221	176800		
K5ZD	329	963	182	175266		C (W5)
I2HWI	311	916	191	174956		
DL3GA	308	870	186	161820		
N2ED	325	789	189	149121		
KF6BIR	449	780	187	145860		
K1SM	302	843	172	144996		
W7NN	359	710	197	139870		
W2YE	307	784	174	136416		
K0IR	301	683	176	120208		
AJ3M	311	651	182	118482		
RA3BB	260	694	168	116592		
TY1PS	241	715	156	111540		Plq (AF)
K7ZO	353	644	173	111412		
K6HGF	447	623	168	104664		
ND5S	264	650	157	102050		
NA2M	263	607	168	101976		
W6JOX	311	609	150	91350		
JA3LDH	203	626	132	82632		C (JA3)
ED3TTY	193	600	135	81000		
Operator: EA3GIP						
DJ2YE	183	621	125	77625		
8S4BX	213	533	131	69823		
NA4M	228	502	138	69276		
KC1F	200	488	136	66368		
IK4MTF	196	553	119	65807		
W8PT	186	520	124	64480		
KB5BOB	211	436	113	49268		
LZ1BJ	213	339	133	45087		C (LZ)
DL5YAS	154	442	102	45084		
N1AU	135	401	101	40501		
IK2AUK	145	389	104	40456		
W3DAD	165	375	104	39000		
RA0FU	147	386	99	38214		
SM5EIT	100	367	81	29727		
DM3XRF	124	302	98	29596		
K0BX	125	300	96	28800		
OZ6EI	104	247	85	20995		C (OZ)
AG4W	100	257	79	20303		
JA2AXB	92	274	63	17262		C (JA2)
W9AX	76	202	60	12120		
AA9RR	87	174	67	11658		
DJ2IA	80	160	70	11200		
WO9S	47	99	38	3626		
EA2AVM	43	155	20	3100		
UA9OSV	28	76	24	1824		

Single operator, all bands, low power:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
EU1AZ	1102	3233	416	1210435	WR+EU	Plq (Wld)
N1RCT	1153	2766	373	1031718	USA	Plq (NA)
AA5AU	1215	2725	384	941760		Plq (USA)
WA2ETU	934	2423	361	874703		C (W2)
HA2SX	811	2689	340	822834		Plq (EU)
TM0FSK	824	2589	349	813204		C (F)
Operator: F5CVI						
RZ9WZ/4	953	2525	306	695385		C (UA)
LT0H	770	2269	336	686145		Plq (SA)
Operator: LU3HY						
S57U	697	2104	314	660656		C (S5)
YU7AM	743	2309	312	648367		C (YU)
4Z5CP	710	2360	259	611240	AS	Plq (AS)
NX4W	873	1966	335	592749		C (W4)
RA4HT	771	2003	287	574861		
9A6D	633	1983	286	567138		C 9A
LV5V	647	1918	314	542026		
EA4CI	700	1967	300	531090		C (EA)
G5LP	563	1854	272	504288		C (G)
RZ9OU	581	1785	265	473025		C (UA9)
VP2V/W8JAY	606	1778	263	467614		C (VP2V)
WB8YJF	670	1733	297	463230		C (W8)
KK5OQ	704	1593	282	449226		
RU3QW	660	1680	295	446040		
KI0LO	780	1682	291	440515		C (W0)
W1TY/2	652	1560	275	429000		
TM0P	620	1481	318	423862		
Operator: F6AUS						
VK4UC	498	1474	280	412720	OC	Plq (OC)
IK4WMH	544	1663	245	407435		C (I)
KI6DY/0	833	1604	275	396990		
DK3VN	490	1483	261	387063		C (DL)
H22H	606	1783	232	372290		C (5B4)
Operator: 5B4MF						
RA0FF	517	1525	270	370575		
WB2UEF/4	576	1449	255	369495		
JE2UFF	477	1650	245	363825		C (JA2)
VE6RAJ	644	1597	245	352138	VE	Plq (VE)
AP2TJ	493	1558	250	350550		C (AP)
N6OJ	720	1378	282	349736		C (W6)
EI4DW	518	1514	255	347463		C (EI)
UT7I	558	1729	221	343898		
Operator: UT2IO						
S51F	510	1493	250	335925		
PY2MNL	452	1340	245	328300		C (PY)
DJ3NG	475	1439	227	326653		
VE4COZ	572	1280	253	323840		C (VE4)
EW1EA	499	1511	238	323656		C (EU)
UA0AGI	467	1645	218	322749		
KT1O	579	1364	258	316720		C (W1)
OM3IAG	435	1459	217	316603		C (OM)
N9THC	671	1371	255	314644		C (W9)
UA4CJJ	584	1505	230	311535		
KA2CYN	499	1350	253	307395		
S57IIO	424	1380	222	306360		
DK3WW	429	1274	240	305760		
AH6OM/HI8	498	1282	236	302552		C (HI8)
SP9UNX	462	1308	231	302148		C (SP)
HA4YF	425	1351	223	301273		
SM7BHM	414	1383	216	298728		C (SM)
RA9MY	437	1428	204	291312		
OK2WH	427	1236	229	283044		C (OK)
W0HW	565	1163	231	268653		
OH3NGB	465	1263	207	261441		C (OH)
OH6AAH	429	1162	220	255640		
OZ5MJ	395	1152	221	254592		C (OZ)
UT2UZ	415	998	253	252494		
K3GP	475	1118	225	251550		C (W3)
CO8LY	434	1126	223	251098		C (CO)
KD4RGB	524	1148	218	250264		
IK7YUA	300	1240	200	248000		
JR4GPA	401	1136	218	247648		C (JA4)
N9CK	507	1055	222	234210		
JA2BY	352	1053	216	227448		
PA3EMN	382	1096	202	221392		C (PA)
SM3ETC	400	1117	192	214464		
WA8RPK	448	970	214	207580		
DL3AYJ	331	1022	194	198268		
EU1DX	339	1015	194	196910		
F5PVJ	250	624	159	195750		
KG9X	449	995	190	189050		
OH3KOK	325	966	194	187404		
UA4LU	364	980	188	184240		
OK1HFP	302	984	186	183024		
VE3AIY	337	1079	164	176956		C (VE3)
SV1DNW	372	882	197	173754		C (SV)
AB7LU	503	866	194	168004		C (W7)
SP9LKS	314	921	179	164859		
DM5GI	302	951	173	164523		
SP5ALV	301	893	184	164312		
W3MR	327	851	192	163392		
I2BJS	308	887	184	163208		
W4UK	401	845	193	163085		
SP2EIW	253	781	208	162488		
IK3ASM	313	941	172	161852		
GU0SUP	300	733	218	159794		C (GU)
RA4CTR	371	872	182	158704		
SP4MPH	300	880	180	158400		
SP5ELA	283	903	174	157122		
UX1IL	300	923	168	155064		
IK1NEM	317	822	186	152892		
KB9MCM	399	828	184	152352		
MM0BYC	329	875	171	150500		C (GM)
N1NVX	376	829	181	150049		
RA6AEL	324	926	162	150012		
K5HP	400	811	184	149224		
PB5KT	284	759	196	148764		
OH5TF	338	801	180	144180		
N6GG	327	719	198	142362		
4X/TF1MM	303	902	155	139810		C (4X)
KT1M	335	739	189	139671		
KJ5SF	326	752	185	139120		

EA1BD	275	759	182	138138	
DL7VBO	271	868	159	138012	
K1JE	315	782	170	132940	
KY7M	352	720	182	131040	
HB9AWS	278	867	146	126582	C (H9)
W2GE	319	696	178	123888	
DM3ML	250	813	151	122763	
KC8BI	306	731	167	122077	
WB3D	312	714	163	116382	
KC3LV	311	713	162	115506	
SM4LLN	231	783	146	114318	
DL1ARJ	242	746	152	113392	
SP8AQA	400	1244	90	111960	
WZ1Q	282	699	160	111840	
DL8SDC	270	703	159	111777	
IK1ZFO	260	750	149	111750	
AD1C	256	656	168	110208	
OK2VWB	230	681	160	108960	
EA8/DJ1OJ	226	719	149	107131	Plq (AF)
IK1DFH	228	748	142	106216	
WN6HYX	410	663	160	106080	
F5TEU	238	697	144	100368	
VE7QO	275	663	150	99450	C (VE7)
DL8MFY	217	650	153	99450	
ON4AME	249	553	175	96775	C (ON)
GI4KSH	211	650	141	91650	C (GI)
G0MTN	224	626	137	85762	
IO0KHP	185	630	136	85680	
VE6CKG	227	535	154	83390	
I4HRH	215	576	143	82368	
AE5P	313	583	141	82203	
K2YG	233	550	147	80850	
SP4BOS	191	601	128	76928	
ES4BG	200	560	137	76720	C (ES)
S57KM	200	619	120	74280	
SP6DNZ	210	626	118	73868	
KB7N	250	533	134	71422	
KN3P	204	496	143	70928	
IK7RVY	198	505	140	70700	
PA0RCT	175	524	129	69596	
KF6EDK	314	519	134	69546	
VE6RRD	228	586	115	67390	
AC6JT	298	529	126	66654	
DL3KUD	184	527	124	65348	
K8RS	215	481	135	64935	
IK1GCD	181	538	120	64560	
JR1KSK	202	504	109	63656	C (JA1)
W4JLS	200	496	128	63488	
LZ1JH	226	416	149	61984	
DL9MBZ	197	437	141	61617	
KB4IJ	238	488	124	60512	
OK2BMC	176	480	121	58080	
K8OSF	213	449	128	57472	
DL3YEI	169	519	110	57090	
N6TQS	234	435	129	56115	
A92GD	143	446	119	53074	C (A92)
OK1BMW	161	410	125	51250	
W5KI	180	417	121	50457	
N1AFC	150	444	112	49728	
DH9FAJ	159	439	113	49607	
WA8AA	179	433	114	49362	
N8YYS	168	426	113	48138	
LA7CL	163	428	112	47936	C (LA)
W4AUI	181	379	120	45480	
AD6EN	223	436	104	45344	
ZL2JON	140	415	103	43745	C (ZL)
KO2FB	162	378	115	43470	
DL8ZAJ	147	421	103	43363	
LA5TFA	153	401	108	43308	
IK2NCF	150	420	101	42840	
OK1JN	186	336	125	42000	
W8DN	150	385	105	40425	
W7DPW	199	377	106	39962	
WY7/AL7L	192	365	109	39785	
IK2REA	176	384	103	39552	
JH7AJD/1	138	398	92	36432	
IK2WFN	136	380	93	35340	
YO3APJ	135	319	198	33452	C (YO)
RW4LE	128	352	95	33440	
SM5VZY	126	359	93	33387	
JA1WSK	114	323	100	32300	
WB9BSH	139	321	97	31137	
N0IBT	173	279	111	30969	
KD8FS	143	315	98	30870	
K6ANP	148	287	106	30422	
DJ6WC	106	352	86	30272	
N3UE	134	300	93	27900	
WN1E	130	304	90	27360	
W8IDM	135	295	91	26845	
RA3DRA	107	331	74	24494	
N4DXS	122	278	84	23352	
K9YO	140	270	85	22950	
UA9DD	100	292	78	22776	
IK7WPD	105	277	82	22714	
OZ7XE	120	256	88	22528	
W9ILY	112	267	83	22161	
W6IHG	109	234	92	21528	
WA0SXV	152	235	88	20680	
SK5UM	100	275	75	20625	
AA1SU	137	233	91	20293	
JA0AXA	92	264	73	19008	C (JA0)
PA0EHF	86	261	70	18270	
N3NZ	115	227	74	17798	
AA9UF	118	206	77	15862	
WA6BOB	116	210	74	15540	
DK7FP	69	236	60	14160	
K9EMG	98	182	76	13832	
IK8SCR	72	211	63	13293	
EA4AZJ	120	251	41	12801	
VE3EVV	84	213	60	12780	
UT6I	77	206	61	12566	
RA6AR	83	190	62	11780	
IK4YNR	81	180	65	11700	
VE9WH	75	190	61	11590	C (VE9)
IK7YUC	75	185	60	11100	
IT9STG	72	162	58	9396	
SP9NWB	56	157	56	8792	
JA2BHJ	61	169	50	8450	
IK0QDB	54	185	45	8325	
US2ITU	57	176	46	8096	
IK0MIB	54	170	47	7990	
RX9AM	53	179	43	7697	
M0AEJ	55	139	49	6811	
N5ZM	63	144	47	6768	
OH5VL	54	126	53	6678	
W3AG	53	132	46	6072	
KH0AS	51	150	39	5850	C (KH0)
SP3FAR	45	127	44	5588	
W1EM	53	105	44	4620	
EA4BNQ	43	97	41	3977	
LZ1ZC	61	73	54	3942	
KB9LGJ/QRP	60	72	46	3312	
AD7U	37	83	35	2905	
VE3FU	27	95	27	2565	
DH2RAL	30	88	29	2552	
JA3MIB	28	78	25	1950	C (JA3)
9A6ACY	30	78	24	1872	
VE2FFE	29	71	24	1704	
PS7ZZ	22	77	21	1617	
DL4RU	27	70	23	1610	
W3FQE	29	57	26	1482	
N2ALE/6	30	56	25	1320	
JF2VAX	18	52	18	936	
US4ICJ	18	33	12	396	

Single band, 10 meters:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
XQ8ABF	796	2380	388	831096	WR+SA	Plq (Wld)
HK3TAS	471	1372	274	338335		C (HK)
W2UP	508	1308	264	310780	USA	C (W2)
LW9EPB	430	1233	275	305167		C (LU)
HG1W	468	1252	262	295221	EU	C (HA)
Operator: HA1WD						
ON4AOI	369	1004	214	214856		C (ON)
EA7FTR	393	833	228	170931		C (EA)
LR7H	293	846	205	156087		
Operator: LU7HVH						
S52SK	249	677	179	109064		C (S5)
UX2HO	254	637	165	94594		C (UR)
IK2ZVU	240	613	151	92563		C (I)
WI0WA	220	553	146	80738		C (W0)
N6EE	260	445	164	72980		C (W6)
RW9OX	135	392	91	35672	AS	C (RA9)
JA1SJV	111	301	90	27090	JA	C (JA1)
WA4JQS	103	256	86	22016		C (W4)
DL1SWB	98	270	76	20520		C (DL)
EA1AAA	82	184	72	13248		
DL1LH	78	188	66	12408		
OK2MPS	71	202	59	11918		C (OK)
UA3XBB	77	193	60	11580		C (UA)
LA7AJ	67	182	57	10374		C (LA)
EU1SA	64	175	56	9800		C (EU)
WC4CW	61	146	55	8030		
Operator: KS4DU						
YU7AE	56	160	47	7520		C (YU)
JA7LMZ	49	136	47	6392		C (JA7)
ES4LBO	20	52	18	1040		C (ES)
LZ4BU	17	51	16	867		C (LZ)
DL1FDT/HI8	20	40	15	800	NA	C (HI)

Single band, 15 meters:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
SP5GRM	789	2099	401	766974	EU	Plq (Wld)
EO6F	829	2067	382	710634		C (UR)
CX7BF	656	1924	344	595670	SA	C (CX)
Z30M	700	1741	357	559383		C (Z3)
Operator: Z32PT						
UA4LCQ	698	1225	228	503146		C (UA)
G0LII	597	1564	327	460285		C (G)
ON7UI	423	1087	257	279359		C (ON)
KM6SA/7	521	951	280	266280		C (W7)
Operator: K7WM						
RK6AXS	477	1092	270	265356		
Operator: UA6AJU						
VE6JY	495	1137	259	265034	VE	C (VE6)
9A7R	429	1081	255	248089		C (9A)
UA0CA	372	1020	239	219402	AS	C (UA0)
UP6F	401	1115	209	209731		C (UN)
Operator: UN7FZ						
OH5HCK	386	881	234	206154		C (OH)
EA7DBO	366	872	221	192712		C (EA)
LZ2AU	366	863	222	191585		C (LZ)
FK8VHN	303	898	199	178702	OC	C (FK)
LY2FN	305	768	215	165120		C (LY)
LU8HWD	298	878	186	163308		C (LU)
YO3JF	327	778	202	157156		C (YO)
CM2KC	329	765	192	146880		C (CO)
EA2AKP	287	715	202	144430		
NK4P	284	713	193	137609		C (W4)
Operator: K4WW						
ER5OK	300	686	185	126910		C (ER)
W6/JA3EVZ	308	575	196	112700		C (W6)
SM7GXR	232	590	165	97350		C (SM)
SM6BSK	219	551	175	96425		
HK3WGQ	341	673	133	89505		C (HK)
JA3VXH	203	562	150	84300		C (JA3)
W4LC	214	532	153	81396		
EA7ALO	195	477	159	75843		
VK2KM	176	511	137	70007		C (VK2)
OK2SG	182	450	142	63900		C (OK)
VE6FU	202	427	127	54229		
N7GC	207	367	139	51013		
UA0FDX	161	425	119	50575		
JH7QXJ	151	431	111	47841		C (JA7)
UX1KR	138	399	133	44688		
RA1ACJ	151	357	121	43197		
US5EVD	133	292	99	28900		
K7ON	122	268	103	27604		
OM3PR	56	133	42	5586		C (OM)
LY3IT	38	90	32	2880		
JR3RIY	33	87	32	2784		
SP2UUU	20	58	20	1160		
DL2ZBN/HI8	22	48	20	960		C (HI8)
9M2TO	14	48	16	768		C (9M2)
OK2PMS	10	30	10	300		

Single band, 20 meters:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
I2EOW	767	1866	406	681836	EU	Plq (Wld)
9A8A	730	1813	390	636363		C (9A)
9A5W	704	1697	369	626193		
S58T	636	1573	359	508236		C (S5)
CT4NH	673	1566	337	474967		C (CT)
LR0H	498	1449	270	352107	SA	C (LU)
Operator: LU9HS						
OH2LU	447	1030	276	284280		C (OH)
LY4AA	435	998	259	232633		C (LY)
WQ6/G0AZT	434	674	239	161086		C (W6)
4X6UO	303	892	198	158954		C (4X)
GW4SKA	343	716	211	151076		C (GW)
UT9NA	351	760	210	143640		C (UR)
UA3AFS	321	672	201	133800		C (UA)
DN1JC	297	664	199	128156		C (DL)
IK2DPP	292	666	206	123476		C (I)
RA1AW	317	681	193	118289		
VK6WR	182	538	145	78010	OC	C (VK6)
I7PXV	226	470	161	75670		
Z31GB	208	433	145	62785		C (Z3)
DJ6TK	204	437	142	62054		
UX6F	220	447	132	59004		
YU1NR	180	391	134	52394		C (YU)
UR3IMM	182	385	135	51975		
SM3DXC	164	353	126	44478		C (SM)
W4PA	197	325	136	44200		C (W4)
7K4QOK	122	332	105	34860		C (JA1)
AK0A	200	264	132	34848		C (W0)
UA6LO	132	279	115	32085		
YL3FW	137	287	103	29561		C (YL)
VE7OR	117	264	95	25080		C (VE7)
JM1NKT	73	211	66	13926		
SP8MI	136	279	49	13671		C (SP)
IK1ROV	55	129	51	6579		
SP9GNB	54	114	50	5700		
VK2BQS	15	37	13	481		C (VK2)
AH6YL/HI8	13	27	12	324	NA	C (HI8)

Single band, 40 meters:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
ED8WPX	718	4298	360	1547280	WR+AF	Plq (Wld)
Operator: EA8PP						
S57AW	580	2912	323	950576	EU	C (S5)
YZ7ED	554	2742	350	863730		C (YU)
S51DX	437	2040	274	558960		
F/OK1EE	406	1782	241	429462		C (F)
F5NZO	306	1322	197	234390		
W3SE	229	670	135	90450		C (W3)
SP2HPD	173	694	128	88832		C (SP)
AE5B	212	528	126	66528		C (W5)
VE4AIY	159	604	91	55328		C (VE4)
VE2AXO	32	128	28	3584		
LY2GF	20	82	18	1476		
N6RT	3	12	3	36		

Single band, 80 meters:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
S57CQ	378	1516	207	313812	WR+EU	Plq (Wld)
9A5Y	363	1478	198	263379		C (9A)
OH7WW	303	1204	176	190713		C (OH)
DL4RCK	280	1012	167	152213		C (DL)
LZ/OL5Y	239	964	148	142376		C (LZ)
CT1AOZ	191	798	133	95520		C (CT)
SP9MAX	194	744	123	91512		C (SP)
OK2PHI	160	630	112	70560		C (OK0
IK3SSJ	143	542	99	53658		C (I)
OK2EQ	136	432	102	44064		
KQ4QM	174	396	98	38808		C (W4)
W5WYN	179	386	98	37828		C (W50
UT2II	78	314	63	19782		C (UT)
S59D	77	294	58	17052		
OH5KUY	58	220	49	10780		
LZ/OK1DF	29	168	26	4368		

SWL:

Callsign	Q's	Pts.	WPX	Score	Record	Reward
ONL383	935	2997	360	1078920	EU	C (EU)
F11676	217	667	126	85302		C (F)
UA3-155-776	32	110	32	3520		C (UA)
OH1-688	6	10	10	60		

Check logs were received from the following stations:
DL6UAM, LA1FW, LA5YW, KB7SLJ, EA7ESH, SP3JHR, SP2IU, DL5ZB, EU1SA, IK1ZOE, LZ4BU, OZ1OXB, OZ6TL, RK3BY, RW3XA, SP6AOI, UA0FDX, UT1YV, W4CQE, W7BWI, KE6QR, KO2FB, IL3/IK3PQH, YU7AE, DE1DGD, K3SWZ

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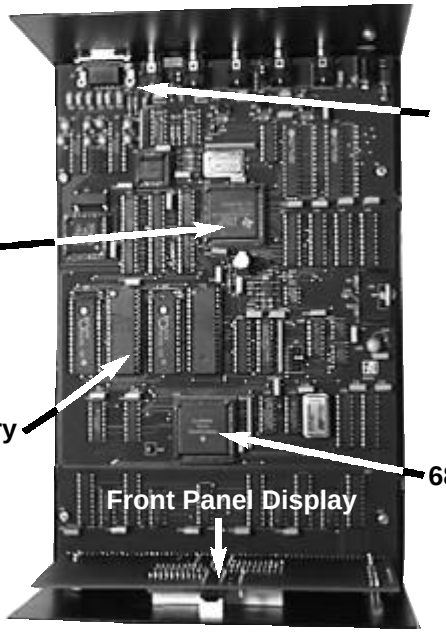

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