Fifty Years of RTTY

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The New
RTTY *Journal*©

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From the Editor

As of this issue, this RTTY magazine has been published continuously for 50 years. Our name has evolved over the years from RTTY , to RTTY Journal , The RTTY Digital Journal , The Digital RTTY Journal , The Digital Journal , and finally to The New RTTY Journal . Whatever the name, we re still the same bunch of radio teletype nuts. The original RTTY magazine started out as a newsletter and monthly report to the members of the Southern California Radio Teletype Society (SCRTS). Meetings were held once each month at the home of a member. The club predated the RTTY magazine by five to ten years. The first issue of RTTY magazine celebrates the fact that the FCC finally approved use of radio teletype over HF radio as of December 23, 1952, a fine Christmas gift to amateur radio . At this time, Leo Shepard, W6LS, was the president, and Merrill Swan, W6AEE, was editor of RTTY. Page 3 listed a total of 73 members of SCRTS. While RTTY started as club newsletter, many of us in the vast hinterlands heard of the newsletter and soon Merrill had his hands full mailing copies of RTTY all over the world.

This issue of The New RTTY Journal is devoted to a celebration of our 50 years in print. I have tried to recognize and reproduce as many of what I feel were landmark articles as possible. I would like to have had 10 times this number of pages to reproduce even more of the great stuff I have rediscovered while thumbing through back issues. In the end, we had to condense what we printed and then refer you to the CD Volume in which you will find the complete article. (Yes, that is a sneaky way to sell our CD-ROMs!) I hope that I haven t skipped over mention of you or your articles or your favorite authors or articles. Please accept my apology if we have missed any of your favorites.

Throughout the issue, you will find the following icon:

CD 3

It indicates which RTTY Journal Archive Disc an article is on. For example, the icon above would indicate the article is on disc three.

Your

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Amateur Radio Teletype Christmas Gift

CD 1 January, 1953

Here is the FCC action that started it all . Since the end of World War II in 1945, a growing number of hams on both coasts had been using RTTY on the VHF bands. Just about all of this operation used AM AFSK modulation with 2125 and 2975 Hz tones. A few hams had even tried RTTY on the HF bands using CW-style on/off keying. That didn t work very well and use of any non-Morse code on HF was at the minimum a grey area of the FCC rules.This 1953 ruling by the FCC clearly permitted use of the Baudot RTTY code and FSK modulation on HF. Note that only ITA 2 Code (Baudot), 850 shift, 60 wpm, and operation on 80, 40, and 20 meters was allowed. Use of RTTY at other speeds, other codes, with narrow shift, and on other HF bands came later.

On December 23, 1952, FCC announced its action on Dockets 10073 and 10173. This action covers other items besides radio-teletype. ARRL Official Bulletin 378 gives the details. NARC (National Amateur Radio Council) thru its official broadcasting network released this news on the evening of 23 December. It is of passing interest to note that throughout the actions relative to Docket 10073 and 10173 NARC has extended its assistance in behalf of the teletype proposals. On the other hand ARRL has not been favorable. Time will prove the wisdom of these two group s policies. Following is given portions of the proposed rule making as issued by the FCC.

12.107 Special provisions regrading radio teleprinter transmissions. The following special conditions shall be observed during the transmission of radio teleprinter signals on authorized frequencies by amateur stations:

(a) A single channel five unit (start-stop) teleprinter code shall be used which shall correspond to the international Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar) but special signals may be employed for the remote control of receiving printers, or for other purposes, in figures positions not utilized for numerals. In general, this code shall conform as nearly as possible to the teleprinter code or codes in common commercial usage in the United States.
(b) The nominal transmitting speed of the radio teleprinter signal keying equipment shall be adjusted as nearly as possible to the standard speed of 60 words per minute and, in any event, within the range 55 to 65 words per minute.

c) When frequency-shift keying (type F-1 emission) is utilized, the deviation in frequency from the mark signal to the space signal, or from the space signal to the mark signal, shall be adjusted as nearly as possible to 850 cycles and, in any event within the range 800 to 900 cycles per second.

d) When audio-frequency-shift keying (type A-2 or type F-2 emission) is utilized, the highest fundamental modulating frequency shall not exceed 3000 cycles per second, and the difference between the modulating audio frequency for the mark signal and that for the space signal shall be adjusted as nearly as possible to 850 cycles and, in any event, within the range 800 to 900 cycles per second.

12.111 (a) (2) (i) Amendment:

(i) 3500 to 4000 kc, using type A-1 emission and, on frequencies 3500 to 3800 kc, using type F-1 emission, to those stations located within the continental limits of the United States, the Territories of Alaska and Hawaii, Puerto Rico, the Virgin Islands, and all the United States possessions lying west of the Territory of Hawaii to 170 west longitude.

12.111 (a) (3) Amendment:

(3) 7000 to 7300 kc, using A-1 emission on frequencies 7000 to 7200 kc, using type F-1 emission and, on frequencies 7200 to 7300 kc, using type A-3 emission or narrow band frequency or phase modulation for radio telephony.

12.111 (a) (4) Amendment:

(4) Amend by addition of the authorization for the use of type F-1 emission on frequencies 14000 to 14200 and 14300 to 14350 kc.

Official Bulletin Nr. 378
from ARRL Headquarters, West Hartford, Conn.
December 23, 1952
To All Radio Amateurs

Bt: FCC today finalized proposals on docket 10073 and 10173 with the following results. Effective February 18, 1953 General and Conditional Classes Licenses are permitted 75 and 20 meter voice operations. Effective February 20, 1953 voice is authorized in 7200 to 7300 kc by all amateurs except Novice and Technician. Novices are permitted CW operation 7175 to 7200 kc. Frequency shift keying, including Radio Teletype is permitted in non voice portions of 80, 40 and 20 meters. New standards are adopted for teletype operation and procedures for signing off amateur calls is made more strict. Note again these changes are not effective until February 18, and 20 respectively. Details February QST, or refer June QST 1952 issue for essential details.
AR.

First HF RTTY Contest

CD 1 September, 1953

HF RTTY contesting started within nine months after HF RTTY was authorized. Here are the rules and a list of ALL the scores submitted!

In order to stimulate RTTY activity, the first Annual Amateur Radio Teletype Sweepstakes Contest will be held October 31 and November 1, 1953.

All Amateur Radio Teletype Stations may participate, the only requirements being the compliance with the FCC rules governing Amateur Radio Teletype operation. Scores will not be credited to those stations who s emissions do not meet the above requirements.

All frequencies may be used, which are authorized by the FCC. This will enable all stations to compete on a more equal basis, at this time. At some later date, this rule may have to be modified, to count only one contact with each station.

Scores will be on the basis of one point for each message transmitted and receipt acknowledged, and one point for each message received. Points scored as above multiplied by the number of States, Provinces, Countries, (ie: Japan, Hawaii, Cuba, etc) will give your total score.

Highest score in each of the above areas will be awarded a Certificate by RTTY. A complete listing of all stations competing will appear with results. Entries should be in the following form: message number, your call, his report, his message number, call time, State, frequency, and the number of points claimed. All entries should be mailed not later than November 7th, 1953. Get your equipment in order and join in on the fun.

Contest Results

			States	Prov.	Pts.		
W3PYW	Frank White	Silver Spring, Md.	11		40	440	A-B-C
W9TCJ	Bob Weitbrecht	Williams Bay, Wisc.	7		27	189	A-B
W1BGW	Jack Berman	Dorchester, Mass.	7	1	22	176	A-B
W6AEE	Merrill Swan	Pasadena, Calif.	7		25	175	-B-C
W6IZJ	Ed Phillips	Sierra Madre, Calif.	4		27	108	-B-C
W9GRW	Ray Morrison	Skokie, Ill.	5		11	77	A
W3LMC	Howard Snyder	Baltimore, Md.	3		7	21	A C
W1AW	Murray Powell	Newington, Conn.	3		6	18	A
W1TWP	T.M. Dale (Bim)	Portsmouth, N.H.	2		4	8	B
W4FJ	T.P. Mathewson	Richmond, Va.	1		2	2	A

Twenty-nine stations reported or were worked during the twenty-four hour period from Four P.M. E.S.T., October 31, to the same time November 1, 1953, for the first attempt at a contest using FSK RATT.

Top honors go to Frank White W3PYW with a total score of 440 points. Next came Bob Weitbrecht W9TCJ with 189 points, followed by Jack Berman W1BGW with 176 and Merrill Swan W6AEE with 175 points. Other scores are listed together with the above.

Second Annual RTTY Sweepstakes Results

CD 1 December, 1954

W3PYW	2262	W6LDF	966	W1AW	320	W3LMC	60
W2JAV	1680	W6MTJ	768	W8IJV	270	W9ZBK	40
W2BDI	1640	W6OWP	500	W5HZF	252	W7HRC	18
W6CG	1616	W1BDI	456	W3CRO	224	VE3GL	4
W9TCJ	1241	W8HP	450	W3UWM	126	W7PQJ	2
W8ZM	1092	W1BGW	440	W5VJP	108	W3EBZ	2
W6AEE	1079	W2TKO	419	W4VP	98	W6ZNU	2
W8BL	1022	W8GRL	324	W6OGG	80		

Other participants who did not submit scores: W1FGL, W2AKE-2, W2PBG, K2USA, W4MOP, W4VP, W5RJG, W6BGE, W6BNB, W6DOU, K6EJM, W6EV, W6EGZ, W6LGO, W6MZO, W6OLC, W6SCQ, W6TRX, W6WYH, W6PNW, W6PZV, W6RL, W7AXJ, W7CO, W7LU, W8BYB, W8GLS, W8GRR, W8UKK, W9GRW, W9SPT, W9UAU, VE2ATC.

RTTY Pioneers

There have been many pioneering articles printed in the RTTY Journal over the years. In addition to the other articles and personnel mentioned in this issue, I believe that we must include the following authors and articles as landmark contributions to the state-of-the-art of amateur radioteletype.

Mark III TU

Bob Weitbrecht
W6NRM

CD 1 January, 1961

Bob Weitbrecht, W6NRM/W9TCJ, was a very active designer and user of RTTY equipment in the 1950's and 1960's. Bob's Mark III TU was very popular, duplicated by many RTTY Op s, and later followed by Mark IV and Mark V versions. Deaf himself, Bob was one of the early advocates and pioneers in the use of teleprinters for communications over the telephone system by the hearing impaired.

This is a new Terminal Unit for use in radioteletypewriter communication work. It is a compact self-contained unit that accepts audio tones from a communication receiver tuned to a RTTY signal and translates them into the needed DC pulses for keying a teletypewriter machine. This is the receiving mode. For transmission, a unique system built into this TU permits the same machine to be used for transmitting using its self-contained keyboard. No special modifications to the machine need be done in fact, any teleprinter with its selector magnet and keyboard in series as for landline connection can be plugged directly into this TU and then it is ready for teleprinter work. A simple diode shifter circuit is included in the TU design to permit generation of frequency-shift keyed (FSK) signal when it is hooked up to any of the usual VFO circuits as found in amateur transmitters. Furthermore provision is made for precise shift adjustment, relying on the responses of the calibrated mark and space filters contained in this TU. All in all, the result is an optimal terminal unit design that should be of much value to the RTTYer, whether old-timer or just starting the game. And there are a number of significant related features as will be disclosed as they turn up in this paper. The main features of this TU are as follows:

1. Standard bandpass filter-limiter-discriminator system, having bandpass of 1700-3400 cps at its input, and discriminator tuned for 850 cps shift at 2125/2975 cps peaks.

2. Input impedance 5000 ohms and 4 ohms. The latter value matches the loudspeaker connection on any communications receiver. (600 ohms impedance possible, with the proper transformer)

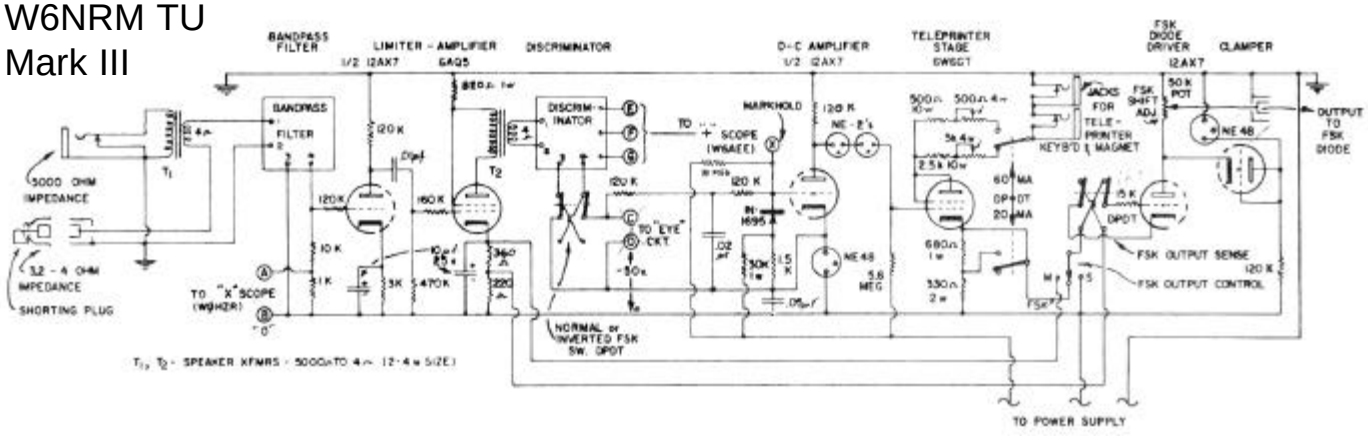
3. Full limiting on audio inputs down to 2 microwatts. Normal operating level 10 milliwatts, so over 37 decibels of dynamic limiting is available.

4. Novel teleprinter loop circuit permits use of any standard keyboard-teleprinter without any particular modifications. Machine receives from and sends through this same loop circuit, and the TU takes care of all reception and transmission as controlled by the station. 20 or 60 milliampere loop current available. One side of teleprinter loop is grounded.

5. Simplified circuit for operating transmitter frequency shift diode, together with provision for self-calibration on shift, relying on indications from the calibrated discriminator.

Frank Gaude, K6IBE, and Vic Poor, K3NIO (later W5SMM), wrote the two following articles in 1963 and 1964, pretty much turning upside down a few sacred cow ideas about RTTY reception. The comments and the circuits described influenced the design of virtually all FSK demodulators from this time on.

W6NRM TU Mark III



A New Approach to TU Design Using a Limiterless Two-Tone Method

Frank Gaude, K6IBE

CD 2 June, 1963

Progress in radio teletype terminal unit design has been slow. This progress has probably been frustrated by ideas and equipments being essentially a carry-over from the wire services. Radio uses a medium which has properties different from a wireline and this single fact has not always been kept in mind in HF radio TU design. It is believed that this mental block is about to be broken and real improvements in radio TU performance can be expected presently. The design presented in this article will indicate a path which can be followed to realize a reduction in error rates that are experienced on typical HF radio circuits. A brief history of the design approach will be given so the flow of conceptual thinking can be appreciated.

A Second Look At Limiterless FSK Detection

Victor D. Poor
K3NI0

CD 2 January, 1964

Frank Gaude, K6IBE, has done a great service to amateur RTTY with his exploratory work using variable threshold (slideback) detectors in place of the usual limiter-discriminator type circuit. Under many A-B tests the K6IBE (TU-D) converter has outperformed limiter-type counterparts, however, some amateurs have observed, that under certain conditions the TU-D converter has a higher error rate than a limiter type. This is particularly true under conditions of high impulse noise (such as is characteristic of summer conditions on 80 meters), of fast-fade backscatter type signals, and (this is the most serious for the amateur) under normal conditions when the sending operator is a slow typist.

The fact that the error rate goes up rapidly when the signal is not tape sent is a clue to an important improvement that can be made in the detector. First of all, I think it can be safely asserted that the detector which produces the lowest error rate is the one in which the decision level (the voltage level where the slicer or Schmitt Trigger changes from MARK to SPACE or SPACE to MARK) is always at the most probable value for the halfway point between MARK and SPACE. Now most probable is a statistical thing and varies widely under certain conditions, but not all conditions. When a signal is tape-sent and there is not a great deal of impulse noise, then the dual slideback detector produces nearly optimum detection. The reason for this is that there is always a valid sample of the MARK and SPACE levels stored up in the detector signal level capacitors. In the event of impulse noise, the voltage stored in these capacitors is more or less randomly arrived at and does not represent a true value for MARK or SPACE. In the case of slow keyboard sending a SPACE signal does not come along often enough to maintain a valid sample of the space level in the capacitor storage. As a result, the detector thinks that the SPACE signal has faded out during the period between keying. In other words, the detector decision level rests halfway between MARK and zero, rather than halfway between MARK and the most probable value for SPACE. since, in the absence of keying, we don t know what the actual signal level for SPACE is, we must assume some value and the most probable level is the same as the MARK channel. This means that as time passes from the last instant of keying, the decision level should return to zero and not halfway between zero and the MARK detector output. Figure one illustrates this idea.

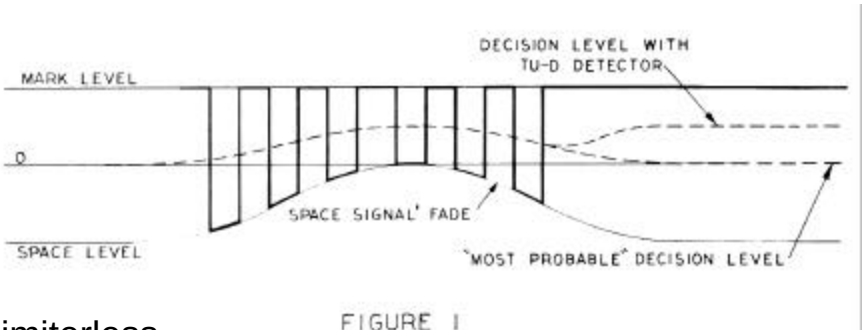


FIGURE 1

Limiterless FSK Detection

A Microprocessor Controled WHO ARE YOU

Andrew White
K9CW

CD 4 January, 1979

In 1977 and 1978, Drew White, K9CW, developed a special computer system that he used on 2 Meter RTTY in Central Illinois. He called this system a WRU , the teleprinter abbreviation for the Who aRe yoU automatic answer-back feature. But Drew's software went far beyond just responding to a WRU call. It was in fact one of the first radio mail storage and retrieval systems, preceding the soon to be very popular packet radio mailboxes. Drew's software ideas and this article led to a whole generation of radio mail devices, including the HAL MSO system.

Everywhere we look these days we find manufacturers advertising new products controlled by one of the many inexpensive microprocessor chips available today. Even in amateur radio, applications exist for these versatile new devices. They are employed in RTTY/morse code keyboards repeaters, and contest duplicate QSO checkers just to list a few areas. Recently I became interested in the use of a micro-

processor as an advanced VHF RTTY repeater controller. While the microprocessor can simply replace the discrete logic elements necessary for repeater operation, the local intelligence provided by the microcomputer permits several complex functions not before possible. This article presents as novel interactive RTTY message handling system currently in operation at the author s QTH. Instead of listing microprocessor programs in detail, I shall describe the operation of the system for others to use as background in their own program development. In conclusion, I shall review some of the characteristics of a successful message handling system.

WHO ARE YOU?

You may be curious why I have called the system a Who Are You or, simply, WRU. The term originated long ago in connection with an automatic answerback sequence called the Who Are You or WRU key. It is actually a combination of two Baudot characters sent sequentially; FIGS then D. (1) When a user wished to send a teleprinter message to another location over a switched wire communications network, the user would first establish a connection with the remote site and then transmit the WRU code. Upon receipt of the FIGS-D combination, the called teleprinter would respond with a preprogrammed message or identification number. The person who initiated the contact then knew that the remote machine was energized, that the correct destination was connected, and that the communication line was satisfactory. The caller could proceed with the message and have some assurance it would be received without requiring the presence of an operator at the remote teletypewriter. From this point forward, I shall use the term WRU to mean an entire answer-back system, not just the specific Baudot code I have mentioned.

For amateur RTTY communications, a modified WRU type of operation has been used for many years. Special decoding devices continuously monitor the RTTY demodulator output searching for selected sequences of characters. For example, a ham might arrange for a bell to sound whenever his call is received to signal him to come look at the printer. Even today the decoding function is performed by a set of coded bars or levers in the teleprinter machine stunt box (1, 2, 3). A particular sequence of characters causes a switch to close which will ring a bell or turn on the printer or begin some other local function. Modern decoders or selcal units (4, 5) use TTL logic devices and memories to replace the coded levers in the mechanical machine. Now, we can use the microprocessor to perform this task.

Connections

Cole Ellsworth
W6OXP

CD 5 January, 1987

In 1987, we were all getting our feet wet with computers and trying to make sense of the sometimes very confusing business of connecting them to the outside world. Cole Ellsworth, W6OXP, authored a series of articles about Connections . For the first time, and in one place (The RTTY Journal), we could find the pin-outs for those data connectors, what handshaking meant, and which PC interrupt did what. Dale Sinner later reprinted this complete series in the popular Connections special RTTY Journal publication.

This is the first of a series of articles on connecting various items of radio equipment together to form a working system. I will start with generalities such as serial and parallel connections or interfaces. The Dictionary of Electronics defines interface as: (1) A point or device at which a transition between media, power levels, modes of operation, etc., is made or (2) The two surfaces on the contact sides of mating connectors that face each other when mated . If readers are interested, we can go on to specific types of equipment connections in the following months.

Serial Interfaces: There are many types of serial interfaces. For example, the teleprinter current loop is a serial interface where each current or no-current (mark or space) period in time is one bit of information, one after the other in time. Instead of current driven circuits, one can use a voltage controlled circuit where the intelligence is conveyed by the presence or absence of a voltage, say 5 volts and zero volts. These two levels of voltage can still represent marks and spaces over a period of time. In either the current loop or voltage level case, the advantage of a serial interface over a parallel interface is that only one pair of wires is required for the transmission of data between two separate items of equipment. Parallel interfaces commonly require nine or more signal lines plus a common line to transfer data.

Data Compression

Peter Schulze
TY1PS

CD 7 February, 1994

In 1994, Peter Schulze, TY1PS, authored the first of a two-part article about data compression, the first to be printed in the amateur radio press. Peter used the new CLOVER emission to send compressed files of digital images and digitized voice via HF radio. Peter later included these ideas in his EXPRESS system software. This software has since grown into the very popular commercial DTS software system sold by Peter's EURAF firm in Benin.

New technologies swept through the HF digital bands in the past few years and our modes will never be the same again. The availability of sophisticated hardware opened up the way to faster throughput. Clover and Pactor, combined with inventive software products gave us features not even dreamed about a few years ago. Who could imagine, even as late as 1990, routine transmissions of digitized pictures in full color, the exchange of huge binary files and, yes, play with digital voice transmissions on HF that takes place now? These advances came about because of new technology but also because of advances made in two key areas data compression and error correction.

Data Compressions Part I: Most of you have heard of data compression and I

am sure many of you use it every day. Even so, applications that apply compression mystify us and seem to employ witchcraft to accomplish an impossible task. The following is an overview of the different methods used and how they are applied in amateur radio.
Let s start with a discussion of the advantages that data compression gives us, then look at the commonly used technologies and examples of their performance. Error correction will be discussed in a later article as a separate subject.

So what is data compression? In short it is a way to reduce the size or amount of data contained in a file without losing the information contained in it. Interestingly this is nothing new to amateur radio. Compression has been used since the very beginning of wireless communication. All of our Q codes are nothing less than an elegant way to reduce the amount of data to be transmitted!

DSP Modem

Johan Forrer
KC7WW

CD 7 September, 1994

Also in 1994, Johan Forrer, KC7WW, presented a two-part article about use of Digital Signal Processing to build a RTTY modem. His ideas have since been used by himself and a number of other authors to develop RTTY modems that exist only in software that runs on the PC.

This article describes an HF modulator-demodulator (modem) that is based on Digital Signal Processing (DSP) principles. A practical approach is shown, rather than the usual terse mathematics that usually accompanies this kind of discussion. This article is intended for those interested in experimenting with HF digital communications using DSP software. A low cost DSP platform is also described for implementing some of the ideas presented in this article including complete source code for a high performance HF digital modem.

What is DSP? To some, this means the manipulation of digital data to extract something meaningful. To the communications engineer, it actually means quite a bit more. Consider the following analogy: As experimenters, many are familiar with analog circuits that use various interconnected components, such as resistors, capacitors, and operational amplifiers. The constructor uses some schematic or rather, an electrical behavioral model as a reference. Similarly, DSP in the most general sense is the modeling of such systems in an all-digital domain. This involves sampling of real time signals where its accuracy, resolution, sample rate, as well as a multitude of algorithms plays an important role.

RITTY

Glenn Vinson
W6OTC

CD 8 February, 1996

As our PCs grew in speed and memory, it became possible to do many things in the PC that had previously required separate dedicated hardware. In 1995, Brian Beezley, K6STI, offered his RITTY software modem. This was the first use of the PC itself to do the software tasks that were normally assigned to a stand-alone DSP modem. Glenn Vinson, W6OTC, reviewed the RITTY program in the February, 1996 issue.

Just as digital signal processing has begun replacing whole sections of receivers, especially in commercial gear, we are now seeing DSP beginning to make a significant impact on amateur radio digital communications technology. While HAL has placed DSP technology on its PCI-4000 and P38 HF modem plug-in boards, Brian Beezley, K6STI, has written a program that, for $100, eliminates the need for a dedicated HF modem altogether, in favor of using the processing power of a 386 or faster PC with a math coprocessor, VGA, a Creative Labs Sound Blaster 16 (or Vibra 16) card and his proprietary software filtering and signal processing algorithms. Only 2 wires run between a transceiver and the Sound Blaster card: audio out, preferably from some fixed level source such as a recorder output, from the receiver to the Sound Blaster s line input jack, and audio in from the card s output jack to the radio s mike or phone patch input. Place the rig in LSB mode, adjust the VOX to respond properly to the AFSK input level and RITTY is ready for action.

www.rttyjournal.com/contests — up-to-date contest information

The “Irv Hoff Legacy”

One author stands out in the 50 years of the RTTY Journal. Irv Hoff, K8DKC/W6FFC has to be our father of modern radioteletype . Irv s first article was Getting Started on Radioteletype (August, 1962). At that time, Irv (K8DKC) lived in the Detroit area and had three interests flying commercial airplanes (United Airlines), driving little cars very fast, and RTTY. I don t know if he wrote many articles about airplanes and sports cars but his by-line appeared 80 times in the RTTY Journal between 1962 and 1979. Irv and Keith Peterson (W8SDZ) introduced the Mainline RTTY systems that included the TT/L and TT/L-II Demodulators. Irv then moved to California, changed his call to W6FFC, and wrote articles on the ST-3, ST-5, and ST-6 Mainline Demodulators, AK-1, AK-2, and XK-2 AFSK Oscillators, as well as the UT-1, UT-2, UT-3, and UT-4 UART Data Buffer Devices. In 1970, Irv also wrote a wonderful series about how to get your Model 28 Teletype machine up and running the famous Mouse articles. Most of us with Model 28s would never have been able to get on the air without his guidance. Irv was an airplane pilot, a sports car driver, and a ham radio enthusiast, but not an engineer. Irv had a persistent and inquiring curiosity, gleaning ideas here, there, and everywhere, asking many questions. He kept trying ideas and asking more questions until he was sure he had the ultimate gadget. There are many Irv stories, but the one I recall best occurred at Dayton in 1969 or 1970. Irv was hot on the ST-6 project and holding court at the RJ hospitality suite. Ask him any question, and he was off sometimes for hours! Years later, Ed Trego, W9WKC, still recalled a 15 minute dissertation on why the value of resistors RDC-1 and RDC-2 in the ST-6 was 47 ohms and not 56 or 39 ohms. Irv liked to save paper and he drew his schematics on the back of teletype paper the roll type. By midnight, Irv s ST-6 schematic stretched all the way across the King s Room, out the door, and down the hall about half way back to the office. For those of you who recall where the King s Room was at the Imperial House Hotel, that was at least 200 feet of paper. These were exciting times for radioteletype and we are all fortunate that we had Irv there to lead such a project. We ve reproduced portions of Irv s most famous articles below.

The Mainline TT/L FSK Demodulator

Irv Hoff, W8DKC
Keith B. Peterson, W8SDZ

CD 2 November, 1964

The word demodulator is becoming standard practice with commercial and military organizations. Converters are now often thought of with respect to units automatically changing Morse code to RTTY; changing 8-level to 5-level; changing 50 baud to 45 baud, etc.

This project grew out of dissatisfaction with conventional limiterless methods (even the TU-E which K8DKC called the TU-H after minor modifications) and the desire to incorporate the concepts outlined by Beard and Wheeldon; Thomas; the DTC circuit; Poor; and others.

It was soon discovered that the demodulator would need provisions for both FM and AM detection.

As a result, the TT/L FSK Demodulator is perhaps the ultimate in versatility since it has a basic unit to which any type of input (FM, two-tone, narrow shift, etc.) may easily and inexpensively be added. This offers, at the same time, an excellent test bed for further development work if comparative tests are to be made, they can then be made with the same unit, and a definite trend established.

If the basic FM with limiter section is added, the total unit is then called the TT/L version. If a limiterless input section is further added, it becomes the TT/LF. If, as a few might do, a heterodyne unit is added allowing variable shift with narrow filters, this is called the TT/LH.

At K8DKC, all three sections have been added (TT/LFH). The limiter section can be operated limiterless; giving three two-tone input configurations possible from broadband to 70-cps Collins filters.

At W8SDZ, the basic TT/L is in use, and has been giving such excellent results (both on FM and with the limiter switched out for broadband limiterless operation) that no plans at present call for additional input sections to be added.

Mainline Solid State ST-6 Demodulator

Irv Hoff, W6FFC

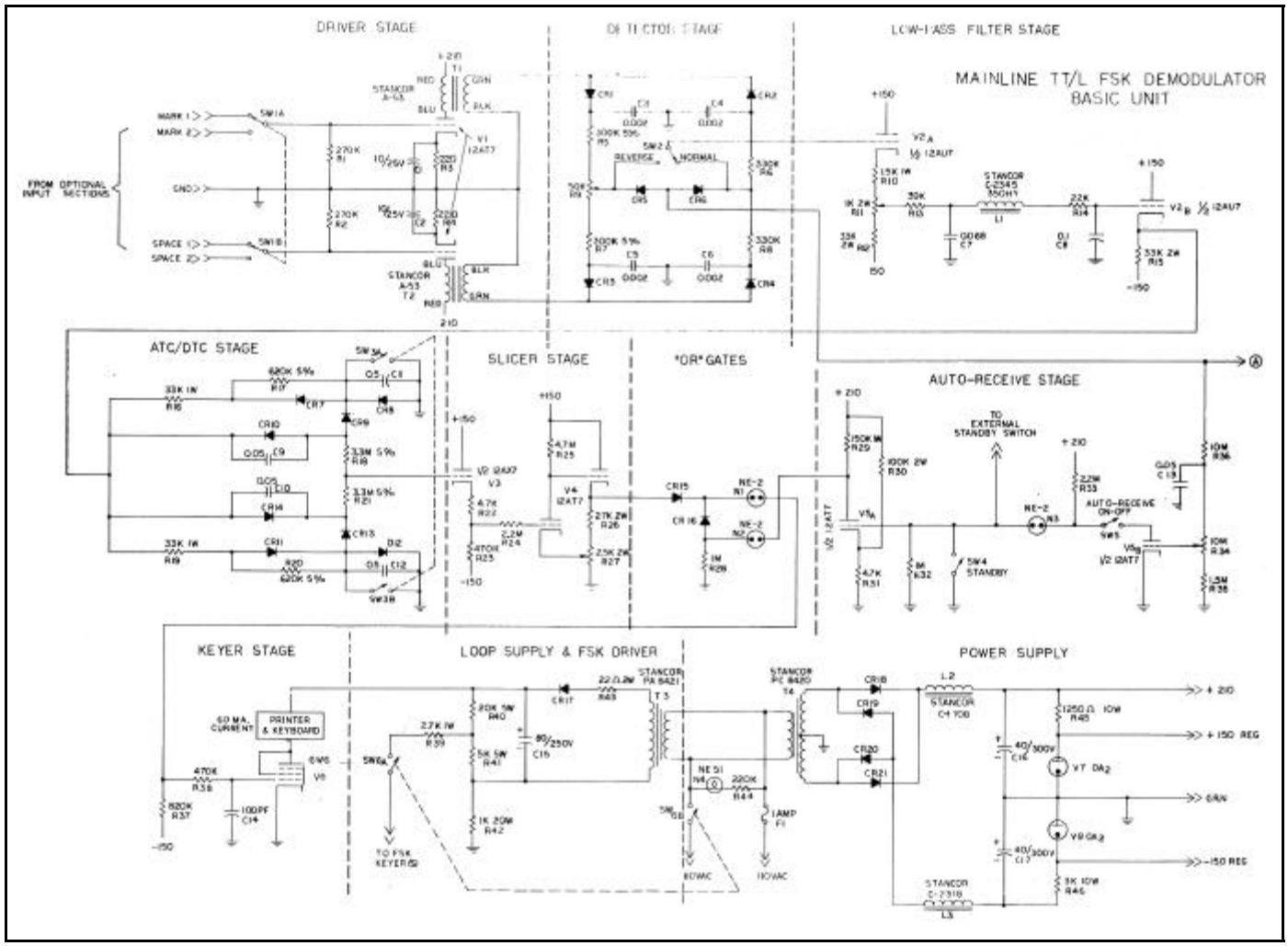
CD 2 September, 1970

The Mainline ST-6 RTTY Demodulator is similar in design and layout to the Mainline TT/L-2 (Sept. 1967 RTTY JOURNAL; May 1968 QST). It is all solid state, using a number of 709C operational amplifiers in addition to other transistor devices. The Mainline TT/L-2 was an upgraded Mainline TT/L (Nov. 1964 RTTY; Aug. 1965 QST). These tube-type RTTY demodulators have been extremely popular with serious RTTY enthusiasts. The ST-6 follows in this great tradition.

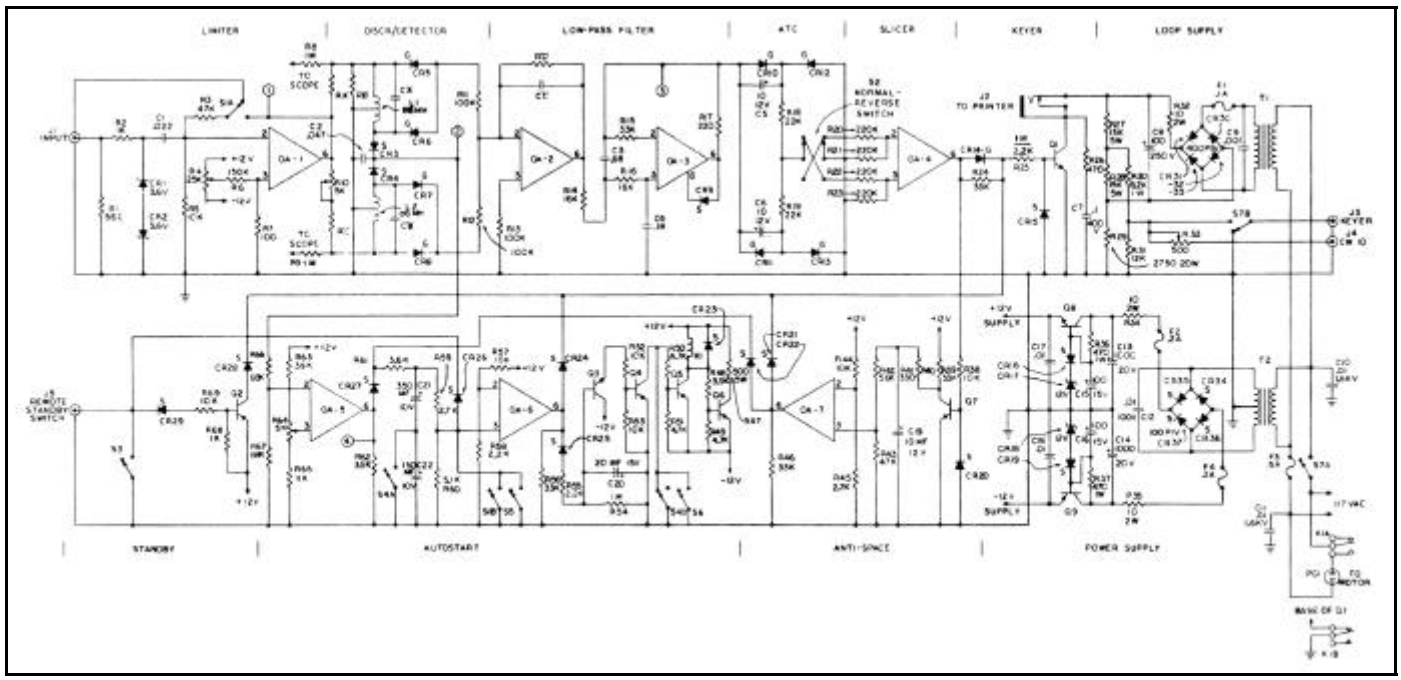
Features

The ST-6 has an outstanding limiter, a well-designed linear discriminator, full wave detection, a 3-pole active low-pass Butterworth filter, a threshold corrector allowing limiterless (AM) copy, a high-gain slicer permitting extremely narrow shift signals to be copied normally, a 300 volt loop keyer transistor, the well-known Mainline floating loop offering optimum FSK keying of the transmitter, and a 180 volt loop supply.

The Mainline TTL



The Mainline ST-6



In addition, optional bandpass input filters for 850 and 170 shift are provided, automatic printer control with motor delay (autostart) that ignores voice or c.w., and anti-space system that immediately locks up the printer if the signal goes to space longer than a normal RTTY character, simplified switching that provides good flexibility, and a symmetrical plus-minus 12 volt power supply that is adequately regulated. The unit has a limiter on-off switch, a fast-slow autostart switch for rapid break-in, a manual motor on switch, a meter for tuning signals, remote standby provisions, etc.

The Mainline UT-4

Irv Hoff, W6FFC

CD 3 March, 1975

The Mainline UT-2 was described in last month s issue. It is essentially a regenerative repeater utilizing the UART chip. With a second clock it can be used as an up (or down) converter both for transmit and for receive. If used as a down converter, the input speed cannot exceed the maximum character rate of the output speed otherwise it would over-run with loss of characters.

The Mainline UT-4 adds buffer storage, virtually eliminating over-run possibilities with hand typing. It also offers visual display of buffer quantity. An integral delay system offers the operator the ability to select an output rate that gives a steady, uniform transmission speed. The system effectively brings the computer age to the typical RTTY enthusiast.

Basic Design Philosophy: Most RTTY operators hand type approximately 40-45 WPM. Even so, the mechanical limitations on the keyboard of the machine sometimes prevent the operator from typing as well as he otherwise might. The idea behind the Mainline UT-4 was to allow the operator to type as fast as he cares to, in as jerky a manner as he likes, while selecting an output rate that keeps characters backed into the buffer memory enabling a continuous and steady output speed. This makes it possible for the operator to type easy words rapidly and yet slow down on those that are more difficult without affecting the output speed at all. Those who have heard such a system being used are instantly aware that something is different . The effect is similar to that of a slow-running tape distributor, yet no tape is being used.

Advantages: When the operator can select his own output speed, it usually allows him to make fewer errors than when he is trying to approach machine speed. The system allows him to use 100 WPM gears if he is really a fast typist or otherwise has found the mechanical limitations of the 60 speed gears detrimental to his typing style. Even with 60 speeds gears, the machine can receive 100 WPM hand typing with no loss of characters if the person typing is not averaging over approximately 64 WPM. The operator can also transmit at 100 WPM with his machine geared for 60 WPM, although his maximum actual output speed would be that of the printer itself, or about 60 WPM, due to keyboard limitations. This would allow for the first time a reasonable intermix of various speeds with printers geared for one specific speed. A number of other interesting possibilities come to mind with the optional T.D. control system, a person can send a CQ tape at the same speed he plans to hand-type during the QSO this in itself offers a most interesting phenomena of advertising in advance what the other person could expect from your typing. Of course the output speed could be run quite slowly to conserve paper if a lengthy CQ were needed. These are some of the more obvious possibilities available.

The “Mouse” Machines

Irv Hoff, W6FFC

CD 2 February, 1970

The October 1969 RTTY Journal carried the announcement of a large number of 28KSR machines which the Northern California Amateur Radioteletypewriter Society, Inc. was making available. Within a matter of only a few days, the entire group of machines was spoken for and within 10 days, some $40,000 had been sent to NCARTS. Original negotiations had indicated there might be as many as 200 machines, but the final figure was 160. Of these, 120 were overhauled by Western Electric, and 40 were designated as non-repaired . George Hutchison and myself visited Western Electric offices and personally inspected several of the machines. We could find no discernable differences between the two categories, as they all looked like never have been used condition.

On Friday 17, October, a check for the entire 160 machines was presented to Western Electric officials, and on the following Tuesday, the machines were picked up by National Van Lines representatives. Within the next several weeks, they had been delivered to various parts of the country, and at a total cost of no more than $150 to anybody. The overhauled machines cost the buyer $115 less shipping costs, and the non-repaired were $26 cheaper.

This was the first time that any model 28 equipment was officially made available to amateurs, and it was also the largest (by some margin) group of machines ever made available as well as the largest amount of money transacted in such an undertaking.

The timing on the project seems to have been flawless and indeed everything worked out about as ideally as it could have. A large number of people cooperated to make this possible including Pacific Telephone officials, Western Electric people, NCARTS board members and moving company representatives.

There were over 350 requests for the 160 machines many of which had to be returned with an apology that the demand had far exceeded the supply. An effort was made to distribute the machines in an equitable manner, following first choice by California enthusiasts. Machines went to: California, Oregon, Washington, Utah, Nevada, Colorado, South Dakota, Minnesota, Iowa, Illinois, Wisconsin, Michigan, Ohio, New York, New Hampshire, Maine, Massachusetts, Maryland, Virginia, Florida, Tennessee, Alabama, and Louisiana. Letters were received from every state in the USA except Rhode Island, and several letters arrived from Canada.

The TOR Mode Revolution

Starting with an article by G3PLX in the December, 1980 issue, amateur radioteletype experienced an explosion in new modes and ways to send data over HF radio. In 1980, Peter Martinez, G3PLX, introduced his AMTOR mode, a modified version of the commercial ship-to-shore teleprinter mode. AMTOR was the first radio amateur HF data mode that provided workable error detection and correction. Each letter was coded so that the receiving station could automatically detect errors and request repeat of flawed characters. AMTOR also introduced the concept of pulsed ARQ transmissions between two linked stations.

AX-25 Packet Radio was started in the early 1980 s for VHF and UHF communications. 300 bd FSK packet radio was attempted on HF but with major problems due to the modulation format as well as the AX-25 protocol. A number of experimenters worked on ways to fix HF packet radio. While a true fix was never found, the effort spawned a number of new modes that continue to this day.

In 1991, Dr. Thomas Rink, DL2FAK, introduced a new mode called Pactor . Pactor combined the best parts of AMTOR and VHF Packet Radio. Pactor allows sending and receiving upper and lower case characters and is about 2 times the speed of AMTOR. CLOVER-II was also introduced in 1991 by Ray Petit, W7GHM. CLOVER-II uses four rather than two tones, is faster than Pactor, uses phase modulation, and was the first HF data mode to use adaptive control of the modulation format to match propagation conditions. In 1994, Dr. Phil Anderson, W0XI, introduced G-TOR, also an ARQ mode that will send data faster and with error correction. Unlike Pactor or CLOVER, G-TOR required only a ROM change in a KAM demodulator. It did not require new modem hardware. In 1995, Dr. Rink introduced Pactor-II, a PSK version of Pactor that is faster and adaptive to changing conditions. Also in 1995, Ray Petit introduced CLOVER-2000, a 2 kHz wide modem waveform for commercial applications. CLOVER-2000 is approximately 4 times faster than Pactor-II or CLOVER-II. Most recently, a slower, non-ARQ mode has gained popularity for amateur use PSK-31. PSK-31 was also developed by Peter Martinez, G3PLX. PSK-31 has a very narrow bandwidth and uses a software modem that uses a PC sound card and runs in the host PC. Portions of the introductory articles about these modes follow.

AMTOR, An Improved, Error-Free RTTY System

J.P. Martinez, G3PLX

CD 4 December, 1980

Since getting a microprocessor-based home computer working at G3PLX, some time has been spent using it to perform many of the functions of conventional RTTY equipment. However, the flexibility of the MPU also made it possible to experiment with techniques other than the well known stop-start RTTY code. In the UK we are permitted to carry on experiments of this sort on 2 meters and above, and so no time was lost in trying out synchronous systems, where no start or stop bits are sent, and the clocking of data is done by accurate frequency standards at both ends. Some forward error correction codes were tried, where additional checkbits sent with the data enable the receiver to correctly reconstruct the original data in the event of some erroneous bits. The proved promising, being about the 6 dB better than conventional RTTY. Another area explored was the ARQ technique where errors at the receiving end are detected by the use of extra parity bits, and an Automatic Request for the repeat of the bad character is made by the receiving station. One such system, which needed both stations to operate in duplex mode, gave spectacular results via OSCAR satellites, being completely immune to fading, interference, and errors associated with keeping the receiver on tune. Loss of signal merely caused temporary pauses in the traffic. Adapting this system to everyday Amateur operating practice proved difficult, until the discovery of an ARQ system already in use in the maritime service for telex traffic. This system can be used by two stations in simplex communications on the same frequency, by working in a synchronized quick-break fashion.

PACTOR

Dr. Thomas Rink, DL2FAK

CD 6 July/August, 1991

AMTOR and Packet Radio (PR) have become rather popular ARQ techniques in Amateur Radio. Nevertheless, concerning poor-quality channels, their performance is far from optimum. AMTOR, matched to old mechanical teletype technology, represents the state-of-the-art some 20 years ago; PR was adopted from the X.25 protocol for data exchange on high-quality telegraph lines.

PACTOR (PT), specially designed for operation in noisy and fluctuating channels, is an improved half-duplex synchronous ARQ system combining the reliability of PR with the fixed AMTOR time frame.

Principal Design Considerations: PACTOR comprises all important AMTOR or PR (2-way) characteristics:

Fixed timing structure and full synchronism to ensure maximum speed.
Fast and reliable changeover/break-in
Required bandwidth less than 600 Hz.
100% ASCII compatible (true binary data transmission).
Extremely low probability of undetected errors (16 bit CRC).
Independent of shift polarities.
No multi-user overhead in a narrow-band channel.

Inexpensive hardware (Z80 single board).
High operational comfort (built-in message storage system, etc.).
Listen mode (monitor).
FEC mode (CQ transmissions, etc.).

As a novelty in Amateur RTTY, some additional powerful features have been realized:

Optional coherent mode, i.e. system clocks locked to frequency standards (e.g. DCF77, TV deflection signals and other high precision broadcasts).
Online data compression (Huffman coding).
Automatic speed change (100/200 baud) without loss of synchronization.
Fully acknowledged link termination (no QRT timeout required).
Memory ARQ (even noisy packets can be restored.

CLOVER Is Here

Ray Petit
W7GHM

CD 6 January, 1991

Dale invited me to start a new column for the Journal, and on one of my favorite subject: High Performance of HF data communication! The name of my game is getting more bits for the bandwidth in the rowdy environment of HF propagation. There is broad agreement: something needs to be done about the dismally poor throughput of HF Packet and the relative inefficiency of AMTOR when conditions are good. All the work, of which I am aware, has been directed at making relatively modest changes to the existing protocols, and we can hope that these efforts bear fruit. While the mythical PACTOR has not yet appeared, a far better alternative is on the horizon.

What is it? It s called Clover. It isn t an improvement on Packet or AMTOR, and it is not an adaptation of technology designed for other media. It is a *new modulation method*, a *new coding strategy*, and a *new link-level protocol* designed specifically for the conditions found on HF: crowded bands, multipath, fading, dispersion, impulse noise. My prime goal for the Clover design has been to deliver the highest possible number of error-free data bits per second through a non-ideal HF path having the narrowest possible bandwidth. More specifically:

Obtain a twenty-fold improvement in spectral compactness over narrowband FSK, with bandwidths measured at the 80 dB points.

Use a set of modulation formats capable of delivering data rates well above those of Packet and AMTOR in the best conditions, and at dramatically higher rates when conditions are poor.

Implement a coding system which corrects errors in transmission instead of merely detecting them, such that retransmission of data is required only infrequently. The system should never require retransmission of data that has already been received successfully.

Make the data path totally flexible, such that it can transfer any alphabet without restrictions and forbidden characters.

Develop a collision-free network protocol.

If possible, without degrading performance, make the Clover modem capable of being used with existing radios of recent design.

G-TOR

Phil Anderson, W0XI; Michael Huslig; Glenn Prescott, WB0SKX; Karl Medcalf, WK5M

CD 7 March, 1994

On New Year s Day, W0XI and WK5M transmitted a 9,718 byte file from Kansas to WA4EGT in California on 20 meters in 5 minutes, 20 seconds. The mode was G-TOR. Immediately thereafter, the file was transmitted again, this time using Pactor. It took 20 minutes, 15 seconds. Throughout the month of January, these tests were repeated with over one-million bytes transferred error-free. The average character/second rate for G-TOR was 23.7 and for Pactor 8.64.

G-TOR, short for Golay-TOR, is an innovation of Kantronics Co., Inc. It s a new HF digital communications mode for the amateur service. The error correction coding outlined in MIL-STD-188-141A forms the basis for G-TOR. In order to keep costs low yet take advantage of concepts prescribed in the standards, G-TOR makes use of existing multi-mode TNC hardware but establishes a completely new hybrid-ARQ system in firmware.

The benefits of these innovations are exceptional:

Dramatically increased throughput
Apparent reduction in the effects of interference and multi-path
Low cost

The key features of G-TOR are atypical:

Extended Golay forward error correction coding
Full-frame data interleaving
On-demand Huffman data compression with run-length encoding
Link-quality based baud rate: 300, 200, or 100
2.4 second hybrid-ARQ cycle
Fuzzy acknowledgements
Reduced overhead within data frames
Standard FSK tone pairs (mark and space)

Pactor II

Dr. Thomas Rink, DL2FAK
Hans-Peter Helfert, DL6MAA

CD 7 March, 1994

PACTOR was designed more than five years ago in Germany, in order to overcome the known disadvantages of AMTOR and Packet Radio. PACTOR is a cheap and reliable means of fast, robust, and error-free data transfer over short wave links, and does not exceed the usual 500 Hz bandwidth limit for digital modes. For the first time, not only the complete ASCII character set, but any given binary information could be transferred over short wave, even in very poor propagation conditions. Another aim of the system development was the utilizing of inexpensive and available hardware. Since 8-bit controllers without Digital Signal Processor chips (DSPs) were state of the art at that time, Frequency Shift Keying (FSK) had to be chosen as a modulation method. Up to now, PACTOR with analog Memory-ARQ is still the most robust digital mode used in Amateur Radio. It is also still the fastest FSK mode that fits into a 500 Hz channel. These may be some of the reasons that have made PACTOR a standard, now included in virtually all short wave modems in the Amateur Radio market, and also widely used in the commercial world.

In the meantime, however, more powerful CPUs and DSPs have been developed. Processing power that greatly exceeded the financial limits of the average Radio Amateur a few years ago has dropped to an acceptable price. Some of the current high-end modems for short wave operation already include a DSP, and in a few years, you can expect all new modems to contain these chips. The throughput within a 500 Hz channel, as well as the robustness of a system can still be dramatically improved, by using modulation methods different to FSK, combined with powerful error control coding algorithms. A new standard that takes advantage of the forthcoming hardware generation is thus required.

PSK31 is Sticky

Jim Mortensen, N2HOS

Spring, 2001

Sticky is an Internet buzzword relating to the ability of a website or page to hold the eyeballs of the Internet traveler for an extended period of time. And, at the same time, offer sufficient attraction to draw the same person back to the site over and over again. The stickier, the better.

By that definition, PSK31 qualifies 100% as a sticky mode. This new idea in narrow bandwidth communication attracted a crowd in the beginning, continues to expand its following every day, is in use around the clock on all bands in an astonishing number of countries, and offers some totally new ideas as to the physical and monetary dimensions of the typical ham radio station. Such claims are easy to prove.

Way back in June, 2000, I wrote of my entry into the world of PSK31 and posted it on the GAZETTE www.n2hos.com/digital/psk31.html. The first two paragraphs of that article are as follows:

If you remember, and the memories give you a warm and fuzzy feeling, then you already know what it s like to get on PSK31. This new mode brings back all the fun and pleasure of RTTY as it used to be the bands filled with stations calling, stations wanting to chat a little or a lot, stations taking the time to type something beside the automated brag sheet, stations that like PSK and want to share the experience. Heck, PSK may even save ham radio from itself and its bad habits!

If you think I am a fan, you are right as rain. If you think I want to get you up and running in PSK, right again. And here s why! It s inexpensive, requires a minimum level of hardware, most of which you already own, and insists on low power. Yet, it is simple to understand, set up and use. No other mode offers so much for so little.

RTTY Controversy

It is an accepted fact that we hams have a studied opinion on most any topic and we re not bashful about informing others. Get three or more hams together, and you have a controversy . RTTY hams are not immune, and we ve had discussions several times over the last 50 years. Often, the debate has been Us vs. Them the RTTY Group (the good guys) vs. the other hams (the uninformed). At first the very use of HF RTTY was not supported by most hams or the ARRL. We also did battle over the issue of more bands, speeds other than 60 WPM, FSK shift less than 850 Hz, codes other than Baudot, eliminating CW ID, and use of special modes such as AMTOR, Pactor, and CLOVER. The RTTY Journal has been the RTTY Champion each time. Most recently, we all went to battle (via pen and keyboard) over the issue of semi-automated stations RM7248 as many of us came to know it. Here s a brief excerpt of the editorial that started it all in the March, 1990 issue and the FCC rules modification in April, 1994 (four YEARS later) where we gained just about everything we d been arguing for.

RM 7248 Petition

Dale Sinner, W6IWO
Buck Rogers, K4ABT

CD 6 March, 1990

In 1987 the ARRL petitioned the FCC for an STA (Special Temporary Authorization), so that a select group of Hams could experiment with HF Packet. These STA s were assigned certain frequencies to operate in and were not expected to deviate but a few KHz at any one time. The program has since been extended a number of times. It s latest expiration date was in January of this year. It now appears the FCC was not looking forward to another extension after such a long time lapse. Something had to be done quickly. The ARRL chose this petition as it s approach to the program but included all the digital modes in the request. Whatever studies that were made by the STA group up to this time had never been published, so no one seems to know if the program was a success or not (i.e. substantiated with facts). Nevertheless, in December of 1989 the ARRL filed their petition for Unattended Automatic Operation with the FCC.

No announcement by the ARRL was made and it was some time before the Digital Community found out about the Petition. Needless to say, many were very upset, putting it mildly. Those of you who watch the BBS s on Packet, are surely aware of all the traffic generated by this petition. The RTTY/AMTOR gang was very upset because they were not even polled. Some in the RTTY/AMTOR group had been operating Automatic but unattended for over ten years with thousands of hours of experience behind them. The real uproar stems from the inability of RTTY/AMTOR and Packet to operate successfully in the same proximity. With only 10 KHz suggested, chaos will definitely result and all parties concerned may very well go back to the old way of attended automatic operation.

Since this all took place, the FCC has now assigned RM 7248 to the Petition and a thirty (30) day response period was put into effect. Unfortunately, the FCC assigned the RM number on February 6, 1990 and again no announcement from the ARRL. So most everyone didn t find out until the end of February about the Petition which left little time to prepare responses. However, there has been much input to the Journal which tells us that many responses were mailed in time to meet the deadline of March 8, 1990. *What happens next?*

The FCC must now decide to either reject or assign an NPRM number to the Petition. If rejected, then square one has been reached and we may still get our chance for input to the League. If it is assigned an NPRM number then we enter another phase of the procedure. A ninety day period now takes effect wherein comments may be filed with the FCC regarding the Petition. This could conceivably be extended further and drawn out for a long time. Whatever the outcome at this point in time, we can only sit back and wait until the FCC takes action or wait for an NPRM number to be assigned. *But should we sit back and do nothing?* We think not. Now is the time to prepare for whatever eventuality takes place. Here is the Committee name list: Dale S. Sinner, W6IWO (Chairperson); Buck Rogers, K4ABT (Co-Chairperson); Bill Henry, K9GWT; Jay Townsend, WS7I; Bob McGwier Jr., N4HY; Tom Clark, W3IWI; Travis Braunn, WA5RGU; Dick Uhrmacher, K0VKH; Mel Whitten, K0PFX; Don Royer, WA6PIR (Attorney at Law); Steve Waterman, K4CJX; Bob Slomka, WD4MNT; Cole Ellsworth, W6OXP.

Report No. DC-2582
Action in Docket Case
April 4, 1994

PR Docket No. 93-850

The FCC has relaxed the amateur service rules to enable contemporary message forwarding systems to operate at hundreds of characters per second while retaining safeguards to prevent misuse.

A message forwarding system is a group of amateur stations participating in a voluntary, cooperative, interactive arrangement where communications from the control operator of an originating station are transmitted to one or more destination stations via forwarding stations, which may or may not be automatically controlled.

The Commission will hold accountable only the licensees of the station originating a message, and the licensee of the first station forwarding a message in a high speed message forwarding system. The licensee of the first forwarding station must either authenticate the identity of the station from which it accepts communications on behalf of the system, or accept accountability for the content of the message.

RTTY Journal Publishers and Editors

RTTY Journal has now survived six different publishers and editors. We ve grown and changed under each leader. Here are a few excerpts of the Hello, I am... and Goodbye, it s been fun... editorials from each of us.

December, 1966

Merrill Swan
W6AEE

It is with mixed feeling that I sit here at my desk, assembling material for the December 1966 RTTY. In one way, it does not seem so long that I tried my hand at the January 1953 copy of our little RTTY magazine, but its some fourteen years ago now. It goes without saying, there would have been no RTTY as its become known, IF there had not been help from so many amateurs who were interested in RTTY in all of its various phases.

January, 1967

Dusty Dunn
W8CQ

In writing any column the hardest part is the first line

The job of publishing the RTTY JOURNAL is a labor of love. Merrill knows this well and we knew it before we started so we have no illusions or regrets. It is fun to do things you love.

As for a few of our immediate plans we have changed the name to RTTY JOURNAL we feel this is specific and descriptive.

The response of friends on the air and by mail has been outstanding in well wishes and offers of help. We have never seen such a loyal group of readers. We only hope to keep and deserve your loyalty.

73, de Dusty Dunn, W8CQ.

May/June, 1977
Dusty Dunn, W8CQ

In writing any column the hardest part is the first line.

We started our first column for the Journal with these words and now after ten and a half years they still seem appropriate as we write the last one.

Publishing the Journal has been fun, thanks to all of the above. Thanks everybody and see you at Dayton... 73, de W8CQ.

July/August, 1977

Don Crumpton
W6KCW

To quote Dusty from the January, 1967 issue The first line is the hardest . We all know that when we transplant anything it has a tendency to slow down. Well the Journal is no exception and we hope that everyone will bear with us until we get our roots set.

I would like to say that I am very proud and happy to serve as your editor and only hope we can continue to bring you the fine publication that Merrill and Dusty have done such a fine job with for these past 25 years. Don Crumpton, W6KCW, Dec. 1977.

From the cover of the December, 1977 RTTY Journal:

DON CRUMPTON, RTTY PUBLISHER, PASSES AWAY MONDAY MORNING. THE JOURNAL WILL CONTINUE.

January 1978

Chuck Edwards
W6MNO

Everyone knows by now that our former publisher and editor Don, W6KCW, became a silent key. This happened in his sleep at 12:30 AM on Monday, November 21st, 1977, just when Don was getting the RTTY Journal on an even keel and making tremendous headway in building it up to be a profitable business. Don s XYL Dee will continue with the publishing and business.

May/June 1986

Dee Crumpton
N6ELP

I just returned from the Dayton Hamvention. In bidding adieu to the assembled RTTY ers, I must admit it was an emotional experience. Most of the audience had been there back in 1978 when I was first introduced as Publisher/Editor of the RTTY JOURNAL. After they got over the shock of my wearing a dress, most welcomed me. Most RTTYers have been very kind and helpful. When I had no Amateur license and didn t know much about publishing and editing there were Elmers around to help.

Don, W6KCW took over the RTTY JOURNAL in May of 1977 and died shortly after that. I took over the chores and now will be handing it on to Dale Sinner, W6IWO of Fountain Valley, California. Dale has been in RTTY for as long as I have known him, which goes back to W6KCW days and the Los Angeles RTTY club.

Stay happy, healthy and on the air. To each of you 73/88 de Dee, N6ELP.

July/August 1986

Dale Sinner
W6IWO

I have been a subscriber of the RTTY Journal for many, many years and still have all my copies on file here. I have enjoyed reading this publication all these years never ever thinking I would some day be the owner and publisher. To me the RTTY Journal is not just a

newsletter or magazine, it is an institution. I shall endeavor to do my very best to continue its traditions, giving our readers the best and latest information I can get my hands on. Please help me by sending in your articles so that I can pass them along through this great publication. The RTTY Journal is now in its 34th year of continued publication and I hope to keep it going for many more years. de Dale, W6IWO

January 1994
Dale Sinner, W6IWO

Since taking over the helm as Publisher, Owner, Editor of the RDJ back in 1986, my life has been significantly changed. My purpose in the beginning was to fill my idle retirement days with something to do. Instead, I fell in love with this new pursuit and it s many challenges.

Today I feel the RDJ has reached a more prominent position in the circle of Ham communications media.

When the ADRS asked me to remain as Editor of the RDJ I did not hesitate to say yes.

My goal was to find a good solid home for the RDJ. The ADRS meets this goal. Not only will they bring new ideas and strength to the RDJ, they will also bring formal representation to the digital community.

January 1997

Jim Mortensen
N2HOS

This is my final act. I informed the IDRA board of directors in October that I would leave this post after the January issue was put to bed.

Others must now write the monthly columns, fill the pages with wit and wisdom, meet the deadlines, answer the phone, write the E-mail, manage the website and constantly strive to keep this magazine alive and well. And I will be there with them, albeit on the sidelines, applauding as each issue comes off the press.

February 1998

Bill Henry
K9GWT

Hello. I m Bill Henry, K9GWT. I m the new owner of the magazine we ve all read and enjoyed for almost 50 years. Many of you know me as the president of HAL Communications Corp. and once-in-a-while RTTY operator. While I have written an article or two and have been associated with RTTY for 35-40 years, publishing is new to me. So, I ask for your patience and especially your comments and ideas. By the way, I m calling the magazine *The New RTTY Journal*.

RTTY Photo Album
1953 - 2002

Ron Geuntzler W8BBB | Dusty Dunn W8CQ | John Possehl W3KV

Sen. Barry Goldwater and Dale Sinner K7UGA W6IWO

RTTY Photo Album

Robin Addie
G8LT

Hiroshi Aihara
JH1BIH

Les Bannon
WF5E

Bart Bartlett
W6OWP

Paul Blankman
KH6AG

Arthur Blave
ON4BX
First RTTY DXCC

Hal Blegen
WA7EGA

Truman Boerkoel
K8JUG

Bob Boyd
NT1V/W1VXV

Ed Bruns
W3EKT

Buck Buchanan
W6VPC

Rod Buszard
W8BYB

Bob Canning
G0ARF

Peter Casier
ON6TT

Phil Catona
W2JAV

John Troost
TG9VT

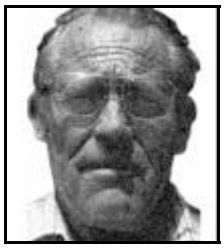
Jody Millspaugh
VP2JM

Peter Schulze
TY1PS

Arthur Cohen
XE1LL

Clark Constant
W9CD

Dee Crumpton
N6ELP



Don Crumpton
W6KCW

RTTY Photo Album

Walter Dallmeier
DL4RCK

Curly Davis
W5HDM

Paco Davo
XE1WU

K6ZBL After The Contest?

Peter Detwiler
WA2MFY

Joe Duerbusch
K0BX

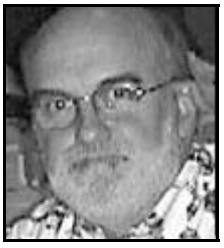
Dusty Dunn
W8CQ

Chuck Edwards
W6MNO

Cole Ellsworth
W6OXP/KR6MF

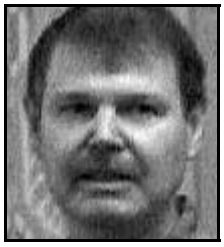
John Fail
KL7GRF

Frank Fallon
N2FF/WA2YVK



John Fleming
WA9ALS

Enrique Fonck
CE3EX



Johan Forrer
KC7WW

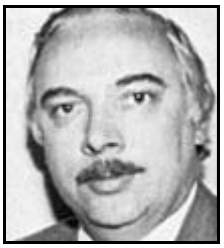
Bob Foster
WA7QWG

Jules Freundlich
W2JGR

Leo Fry
K8PYD

Ron Geuntzler
W8BBB

Barry Goldwater
K7UGA



Roy Gould
KT1N

Ben Grokett
KR6E

Ron Hall
KP2N

RTTY Photo Album

Jerry Jankowitz
NO2T

Doris Jankowitz
NW2B

George Hammon
WA6CQW

Bill Henry
K9GWT

Don Hill
AA5AU

Irv Hoff
W6FFC/K8DKC

Herbert Hoover, Jr.
W6ZH

Ray Hunter
VE3UR

Jean Hurtaud
F8XT

Ralph Irish
WA8GDT

Red Irwin
K9KNW

Jim Jennings
KE5HE

George Johnson
W1ZT

Johnny Johnston
W3BE

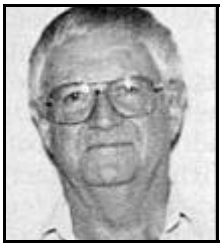
Tapani Juhola
OH2LU

Waldemar Kebsch
DK3VN

Charles Keel
HB9P

Byron Kertzman
W2JTP

Freeman Lang
KH6AX



Rich Lawton
N6GG

Bruce Lifter
WT4I

Samuel Liu
BV4VB

Crawford MacKeand
WA3ZKZ

RTTY Photo Album

Bill Malloch
WA8PCK

Lynn Manalo
DU1AUJ

Abdul-jabbar Ma rafi
9K2DZ

Wayne Matlock
K7WM

Roy Maull
N8YYS

Sid May
G4CTQ/VP2KM/
5N0SISD/EL3SID

Pete McGovern
KE4PPI

Bob Meyer
K9IO/WA9AKT

Jody Millspaugh
VP5JM

Frank Moore
WA1URA

Mike Moore
N7RY

Jim Mortensen
N2HOS

Taka Nagata
JA1JDD

Gin Naniwada
JA1ACB

Ray Ortgiesen
WF1B

Jan Palmquist
SM5FUG

Keith Peterson
W8SDZ

Ray Petit
W7GHM

Beep Philips
W0BP

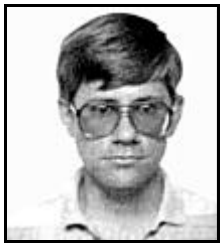
Dale Sinner
W6IWO

Oh Wah Tah!

Jerry Trichter
WA1IUF

RTTY Photo Album

Must be a K9...



Richard Polivka
N6NKO

Vic Poor
W5SMM/K3NIO

John Possehl
W3KV/W3KDF

Skip Prinsen
WB6CYA

Willie Rogg
HB9HK

Don Royer
WA6PIR

Hank Scharffe
W6SKC

Eddie Schneider
W6/G0AZT

Bud Schultz
W6CG

Mary Schultz
K6OWQ

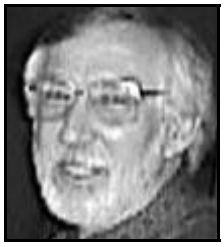
Peter Schulze
TY1PS

Dick Shongut
W2QFR

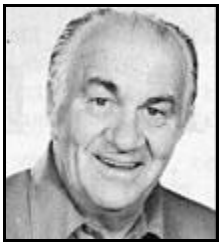
Raj Singh
VE6RAJ

Dale Sinner
W6IWO

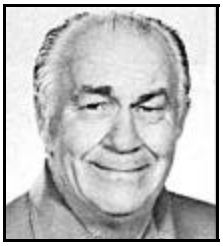
Bud Smith
W2LFL



Nick Smith
W4GKM



Bill Snyder
W0LHS
20 meters is open...



Bill Snyder
W0LHS
The antenna fell down.

Ron Stailey
K5DJ/AB5KD

Bob Stanek
W0HAH

Dick Stevens
N1RCT

RTTY Photo Album

Bob Stewart
ZL2AMI

Frank Stewart
K5ANS

Phil Sussman
N8PS/KB8LUJ

Merrill Swan
W6AEE

Betsy Townsend
WV7Y/KE7PL

Jay Townsend
WS7I/KE7PN

Ed Trego
W9WKC

Jerry Trichter
WA1IUF

John Troost
TG9VT

Dick Uhrmacher
K0VKH

Glenn Vinson
W6OTC

Steve Waterman
K4CJX

First Annual National RTTY Meeting New York City, March, 1955

Jean Weigmont
FG7XT

Bob Weitbrecht
W6NRM/W9TCJ

George Wesley
KB2VO

Drew White
K9CW

Frank White
W3PYW

Joe Wood
AJ0X

Taka Yoshizaki
JA3BN

A TRADITION OF INNOVATION

1970: Mainline ST-6

1972: RVD-1002

1978: DS-3100 ASR

1974: DKB-2010

1975: ST-6000

1981: CT-2100

New Software Features
for PCs with Soundcards!
Waterfall Tuning Display
PSK31 Support

1985: ST-8000

1998: DXP38

From the legendary ST-6 to the DSP-based DXP38, HAL continues to provide the amateur with innovative digital communications products.

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