RESULTS 1976 SARTG CONTEST

	Call	Points
1	I8AA	309720
2	IAPYS	303850
3	CT1EQ	292340
4	K4GMH	215760
5	4X4MR	165075
6	F9XY	156800
7	KH6AG	150960
8	I1COB	135200
9	WB4VUP/8	126795
10	K7BV	119160
11	HBØAVK	114665
12	W3JSX	114120
13	ON5WG	113560
14	F6ALL	108000
15	DJ8BT	96915
16	W9OEQ	94720
17	I5HZZ	91590
18	XE1AFU	90720
19	VE5BX	87580
20	SL5AR	86010
21	WA3JTC/ZP5	85550
22	I3FUE	80190
23	DJ6JC	78750
24	UA9PP	75240
25	I2OLW	74115
26	LZ1KAB	71205
27	HB9HK	68320
28	WAØTAS	68115
29	K6WZ	68100
30	OE3PHA	62750
31	DJ2YE	61880
32	K8JUG	55680
33	IC8EGJ	55000
34	KØJWX/6	50400
35	KJ6DL	45150
36	W3KV	44580
37	SM6AEN	43855
38	OZ4DZ	43475
39	G3ZWW	40280
40	IT9VBJ	36630
41	JA1DI	32760
42	VE2QO	32220
43	DK6DC	31740
44	K3RVC	27105
45	OK2BJT	23865
46	DJ9IR	22825
47	K4GJW	21504
48	OK1MB	20300
49	SM7BGE	19890
50	LA7AJ	19720
51	JA7ML	18765
52	G3RDG	17250
53	DL6WZ	14550
54	VK5RY	14450
53	SM6EBM	12150
54	LA2IJ	11625
55	GW3IGG	10560
56	CE3MA	9430
57	WA2OQO	8050
58	DL8MY	8030
59	IØZSG	7140
60	K4JAF	6175
61	K5OYZ	6095
62	DL9QP	5310
63	PAØWDW	5225
64	DJ3OE	3450
65	VK2SG	3300
66	OK2BMC	2990
67	PY2CBS	2925
68	EA3AHM	2600
69	VK5IF	2475
70	CE3EX	2400
71	9M2MW	1900
72	JA1EUL	1815
73	VE2DKK	1800
74	SM6FYV	1740
75	G3HJF	1700
76	F6BIQ	1575
77	VE7BDQ	1440
78	OY1A	1080
79	JR3PJK	1080
80	OZ8GA	945
81	DK4IS	680
82	SM3CKP	330
83	JX2FL	275
84	OZ1VZ	250
85	OH3IH	40

MULTIOPERATOR

1	W1MX	156040
2	SM5EOS	151060
3	SK7BY	115050
4	W9HHX	91080
5	HA5KBM	79800
6	OK1OFF	64695
7	HAØKDA	62400
8	OK1KSL	40480
9	OZ4EDR	29440
10	TF3IRA	27000
11	SM7ACN	18910
12	LA7V - ALFA	4160

SWL's

1	OK2-5350	151500
2	I4-14707	123820
3	Poul T. Menadier	118215
4	I3-13018	88830
5	I3-14258	67650
6	NL-4783	47040
7	NL-4577/ PA-3475	13225

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RTTY JOURNAL
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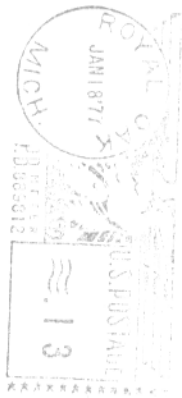
FIRST CLASS MAIL



RTTY JOURNAL

February 1977

EXCLUSIVELY AMATEUR RADIO TELETYPE

Volume 25, No. 2 — 35 Cents

CONTENTS

BARTG RTTY CONTEST

WHEN.
0200 GMT Saturday March 26th until 0200 GMT Monday March 28th, 1977.

The total Contest period is 48 hours but not more than 30 hours of operation is permitted. Times spent in listening count as operating time. The 18 hour non operating period can be taken at any time during the Contest, but off periods may not be less than 3 hours at a time. Times on and off the air must be summarised on the Log and Score Sheets.

WHO. There will be separate categories for Multi Operator Stations and SWL'S.

BANDS.
3.5, 7.0, 14.0, 21.0 and 28.0 Mhz. Amateur Bands.

STATIONS.
Stations may not be contacted more than once on any one Band, but additional contacts may be made with the same Station if a different Band is used.

COUNTRY STATUS.
ARRL COUNTRIES LIST and in addition each W/K and VE/VO Call area will be counted as a separate Country. (But W/K & VE/VO counted once only for QCA).

MESSAGES. Messages exchanged will consist of:

a. Time GMT. This must consist of a full 4 figure group. The use of the expression "Same" or "Same as yours" will not be permitted.

b. RST and Message Number. The message number must consist of a 3 figure group starting with 001 for the first contact made.

POINTS.
a. All two-way RTTY contacts with Stations within one's own Country will earn TWO points.
b. All two-way RTTY contacts with Stations outside one's own Country will earn TEN points.
c. All Stations will receive a BONUS of 200 Points per Country worked including their own. NOTE Any one Country may be counted again if worked on another Band but Continents are counted once only.
d. NOTE. The Proof of contact may be required in cases where the station worked does not appear on any other Contest Logs received.

SCORING.
a. Two way exchange points times total Countries worked.
b. Total Country points times Bonus points times number of Continents worked.
c. Add (a) and (b) together to obtain your final score.

Sample Score.

Exchange Points (302) X Countries (10)	= 3020
Country Points (10) X Bonus Points (200) X Continents (3)	= 6000
(a) and (b) added together to give a score of	9020

LOGS AND SCORE SHEETS
Use one Log for each Band and indicate any rest periods. Logs to contain:
Date, Time GMT, Call sign of Station worked, RST report and message number as sent, RST report and message number as received and exchange points claimed. All logs must be received by May 31st 1977 to qualify.

Certificates will be awarded to: The leading Stations in each class and to the top Stations in each Continent and each W/K VE/VO Call area. The final positions in the Results Table will be valid for entry in the "World Champion of RTTY" Championship.

The Judges decision will be final and no correspondence can be entered into in respect of incorrect or late entries.

Send your Contest Logs to: Ted Double, G8CDW) 89 Linden Gardens Enfield, Middlesex, ENGLAND EN1 4DX

CONTINUED ON PAGE 15

MACHINE LANGUAGE IS EASY

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INTRODUCTION

Many amateurs are hesitant to use microprocessors in place of hard wired logic to perform operations around the ham shack because they are unfamiliar with machine language. Well, machine language is both easy and fun to learn. Certainly, it's no harder than learning a foreign language in high school.

Once you learn machine language, you'll be able to program microprocessors to act as timers, pulse generators, calculators, comparators, etc. This fact is what makes microprocessors so powerful. When you build a system using integrated circuits, the circuit can only perform its intended function, but a microprocessor can be taught to perform many tasks, just by entering a new program.

When you learn a foreign language, you not only learn what the words stand for, but how they fit together. That's true for machine language too. The actual machine instructions work together with the data words and addresses to form a program. This article is too brief to provide an in depth analysis of machine language, but it will present the basics for a good beginning in learning machine language. While the specific examples in this article use the instruction set of the MCS6502 microprocessor, you'll find that the same principles apply to the 8080, Z80, 6800 or F8.

THE LANGUAGE

A simple definition of machine language is a group of unique words made up of ones and zeros. For example, a simple language of two bit words might look like this:

word	meaning
00	add
01	subtract
10	multiply
11	divide

Obviously, a language using two bits is pretty limited. The popular eight bit microprocessors of today use 8 bit instructions giving 256 possible instructions. A typical word in this language might be

01101001

This particular word could be an instruction, a piece of data or an address in memory.

MACHINE INSTRUCTIONS

Machine instructions for the 6502 or 8080 are eight bit words that cause the accumulators, registers, arithmetic logic unit and flags of the microprocessor to perform specific functions. If you examine the list of MCS6502 instructions in table 1, you will observe that there are fifty-five different operations that can be performed.

Consider the instruction at the top of the list with the mnemonic (nickname) ADC. This instruction adds the value of a memory location and a carry to the value of the accumulator and stores the resultant value in the accumulator.

Since 8 bit microprocessors can address 65,000 memory locations, it's a fair question to ask which memory location's value should be added to the accumulator? The answer can be found by a discussion of the addressing modes used in the 6502. Many of the 6502's instructions, such as the ADC instruction, have up to eight addressing modes. It is this feature that makes the 6502 such a powerful microprocessor. The eight addressing modes add both flexibility and power to the programming capability of the 6502.

An explanation of three of the addressing modes for the ADC instruction should be sufficient to illustrate the flexibility of these modes. A summary of all of the addressing modes for the MCS6502 is provided at appendix 1. The first mode to be covered is the immediate mode. When you use an instruction in the immediate mode, you simply place the value itself in the next memory location in the program listing. For example, if you wanted to add the value five to the accumulator, it would look like this using hexadecimal notation:

69	ADC
05	value

The 69 is the OP CODE for adding memory to accumulator in the immediate mode. Of course, in the immediate mode the actual value is used in place of a memory location.

The microprocessor would see this portion of the program in binary as shown below.

01101001	69
00000101	05

If you are not familiar with hexadecimal numbers, a conversion to binary and decimal is provided by figure 1. Hexadecimal makes for simple notation as the 8 bit word is divided into two four bit words so only two digits are needed to specify any number up to 256 base 10.

The next addressing mode is called the absolute addressing mode. For this mode

you simply list the exact memory location, where the value is, that you want to add to the accumulator. For example, let memory location 1701 hold a value that you wish to add to the accumulator. The OP CODE for adding memory to the accumulator in the absolute mode is 6D. So the program would look like this:

```
6D
01
17
```

table 1

ADC	Add Memory to Accumulator with Carry
AND	"AND" Memory with Accumulator
ASL	Shift Left One Bit (Memory or Accumulator)
BCC	Branch on Carry Clear
BCS	Branch on Carry Set
BEQ	Branch on Result Zero
BIT	Test Bits in Memory with Accumulator
BMI	Branch on Result Minus
BNE	Branch on Result not Zero
BPL	Branch on Result Plus
BRK	Force Break
BVC	Branch on Overflow Clear
BVS	Branch on Overflow Set
CLC	Clear Carry Flag
CLD	Clear Decimal Mode
CLI	Clear Interrupt Disable Bit
CLV	Clear Overflow Flag
CMP	Compare Memory and Accumulator
CPX	Compare Memory and Index X
CPY	Compare Memory and Index Y
DEC	Decrement Memory by One
DEX	Decrement Index X by One
DEY	Decrement Index Y by One
EØR	"Exclusive-or" Memory with Accumulator
INC	Increment Memory by One
INX	Increment X by One
INY	Increment Y by One
JMP	Jump to New Location
JSR	Jump to New Location Saving Return Address
LDA	Load Accumulator with Memory
LDX	Load Index X with Memory
LDY	Load Index Y with Memory
LSR	Shift One Bit Right (Memory or Accumulator)
NØP	No Operation
ØRA	"OR" Memory with Accumulator
PHA	Push Accumulator on Stack
PHP	Push Processor Status on Stack
PLA	Pull Accumulator from Stack
PLP	Pull Processor Status from Stack
RØL	Rotate One Bit Left (Memory or Accumulator)
RTI	Return From Interrupt
RTS	Return From Subroutine
SBC	Subtract Memory from Accumulator with Borrow
SEC	Set Carry Flag
SED	Set Decimal Mode
SEI	Set Interrupt Disable Status
STA	Store Accumulator in Memory
STX	Store Index X in Memory
STY	Store Index Y in Memory
TAX	Transfer Accumulator to Index X
TAY	Transfer Accumulator to Index Y
TSX	Transfer Stack Pointer to Index X
TXA	Transfer Index X to Accumulator
TXS	Transfer Index X to Stack Pointer
TYA	Transfer Index Y to Accumulator

Notice that the low order address 01 is looked at first by the microprocessor before it looks at the high order address 17. The processor stores the low order address in an internal register so that the entire address is available when the microprocessor fetches the value from memory.

A handy addressing mode that you can use when you are in memory locations 0000 to 00FF, (the first 256 memory locations) is called zero page addressing. Since the high order address for all locations below 00FF is zero, the zero page mode allows you to delete the high order address from the program. For instance, if you want to add the value in memory location fifteen (000F) to the accumulator, the program would look like this:

```
65   ADC (zero page)
OF   memory location 15
```

BINARY TO HEXIDECIMAL CONVERSION

Decimal	Binary	Hex
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

figure 1

ADDRESSES-DATA

You've probably noticed by now that in the first example a piece of data followed the instruction and in the last two examples addresses of 16 bits and 8 bits respectively followed the instruction. Since data and memory addresses are 8 bit words, it's fair to ask how does the microprocessor differentiate instructions from data and addresses? Basically, this function is accomplished in the instruction decoder which recognizes each instruction. When the instruction decoder decodes an instruction, it increments another register in the microprocessor, called the program counter, the correct number of bytes so that the instruction decoder only looks at instructions. For an immediate instruction one byte is skipped. Thus, you can see that position is all important. If, for example, an error in your program causes the instruction decoder to look at a piece of data, the processor will eventually become lost in memory space.

A SIMPLE PROGRAM

Let's look at a short example that uses some of the facts we've learned. This miniprogram uses the one instruction we've learned and starts at memory location 0007. For this example we'll assume that as the processor looks at memory location 0007, the accumulator has the value zero in it. As you examine the program that follows, the three arrows indicate the three memory locations with instructions.

	MEMORY LOCATION	PROGRAM
→	0007	69
	0008	03
→	0009	6D
	000A	01
	000B	17
→	000C	65
	000D	1F
	000E	
	....	..
	....	..
	....	..
	001F	0A
	....	..
	....	..
	1701	02

Can you determine the value in the accumulator as the microprocessor reaches location 000E? The answer is OF in hex or 15 decimal.

The answer 15 resulted from the following operations. The immediate instruction at location 0007 added the value three to the accumulator for a sum of three. The next instruction at location 0009 adds the value at memory location 1701 to the accumulator. Since the value 02 is in location 1701, the accumulator takes the value five. The final zero page instruction adds the value at 001F, which is decimal 10, to the accumulator. Thus, the final value in the accumulator is fifteen.

CONCLUSION

To actually begin writing machine language programs, you'll need to learn the remaining instructions of table 1, but they are no harder than the ADC instruction covered in this article. An excellent textbook to learn about these instructions is the **Programming Manual** from MOS Technology, Norristown, Pa. As an alternative for those who want to study the instruction set of the 8080, I recommend **Bugbook III** or **Bugbook V.** With these books, I'm sure you'll find learning machine language is both fun and easy.

***

APPENDIX 1
Summary of MCS6502 Addressing Modes

ACCUMULATOR ADDRESSING
This form of addressing is represented with a one byte instruction, implying an operation on the accumulator.

IMMEDIATE ADDRESSING
In immediate addressing, the operand is contained in the second byte of the instruction, with no further memory addressing required.

ABSOLUTE ADDRESSING
In absolute addressing, the second byte of the instruction specifies the eight low order bits of the effective address while the third byte specifies the eight high order bits. Thus, the absolute addressing mode allows access to the entire 65K bytes of addressable memory.

ZERO PAGE ADDRESSING
The zero page instructions allow for shorter code and execution times by only fetching the second byte of the instruction and assuming a zero high address byte. Careful use of the zero page can result in significant increase in code efficiency.

INDEXED ZERO PAGE ADDRESSING – (X, Y indexing)
This form of addressing is used in conjunction with the index register and is referred to as "Zero Page, X" or "Zero Page, Y". The effective address is calculated by adding the second byte to the contents of the index register. Since this is a form of "Zero Page" addressing, the content of the second byte references a location in page zero. Additionally due to the "Zero Page" addressing nature of this mode, no carry is added to the high order 8 bits of memory and crossing of page boundaries does not occur.

INDEXED ABSOLUTE ADDRESSING – (X, Y, indexing)
This form of addressing is used in conjunction with X and Y index register and is referred to as "Absolute, X", and "Absolute, Y". The effective address is formed by adding the contents of X or Y to the address contained in the second and third bytes of the instruction. This mode allows the index register to contain the index or count value and the instruction to contain the base address. This type of indexing allows any location referencing and the index to modify multiple fields resulting in reduced coding and execution time.

IMPLIED ADDRESSING
In the implied addressing mode the address containing the operand is implicitly stated in the operation code of the instruction.

RELATIVE ADDRESSING
Relative addressing is used only with branch instructions and establishes a destination for the conditional branch.

The second byte of the instruction becomes the operand which is an "Offset" added to the contents of the lower eight bits of the program counter when the counter is set at the next instruction. The range of the offset is -128 to +127 bytes from the next instruction.

INDEXED INDIRECT ADDRESSING
In indexed indirect addressing (referred to as (Indirect, X)), the second byte of the instruction is added to the contents of the X index register, discarding the carry. The result of this addition points to a memory location on page zero whose contents is the low order eight bits of the effective address. The next memory location in page zero contains the high order eight bits of the effective address. Both memory locations specifying the high and low order bytes of the effective address must be in page zero.

INDIRECT INDEXED ADDRESSING
In indirect indexed addressing (referred to as (Indirect), Y), the second byte of the instruction points to a memory location in page zero. The contents of this memory location is added to the contents of the Y index register, the result being the low order eight bits of the effective address. The carry from this addition is added to the contents of the next page zero memory location, the result being the high order eight bits of the effective address.

ABSOLUTE INDIRECT
The second byte of the instruction contains the low order eight bits of a memory location. The high order eight bits of that memory location is contained in the third byte of the instruction. The contents of the fully specified memory location is the low order byte of the effective address. The next memory location contains the high order byte of the effective address which is loaded into the sixteen bits of the program counter.

***

Interface for UT-4 to Kenwood 820 for FSK

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If you are one of the many new owners of a Kenwood TS-820, and would like to give it a trial on FSK, this interface is for you. It is really very simple and uses only two transistors and two resistors.

Kenwood tells you in their manual to "insert a relay coil into the closed loop circuit and the relay contacts into the RTTY jack." This is not a good idea for many reasons, and especially if you are using a UT-4. You would be losing all the benefits such as speed conversion and distortionless keying.

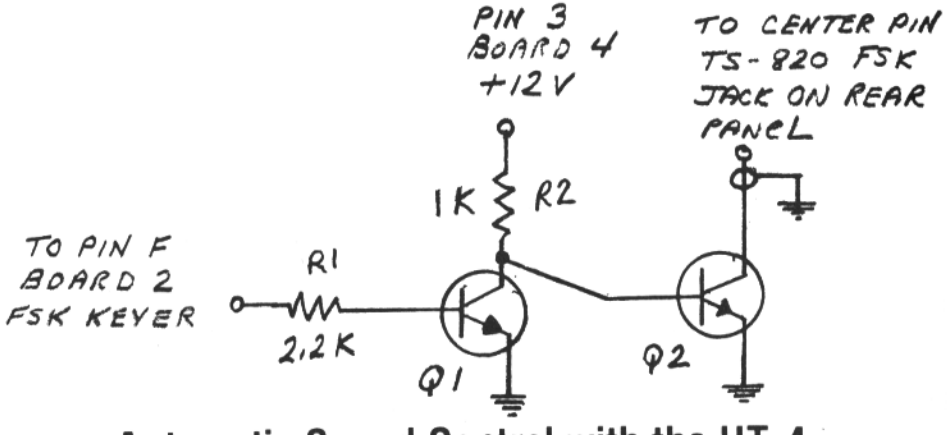
You can use the output of the 741 OP AMP to key the transmitter. Since the OP AMP is - 12 on mark and + 12 on space, you will need an inverter and a transistor to act as a switch. The TS-820 requires a closed circuit for mark and an open circuit for space into the RTTY jack on the rear panel. This is actually shorting the center terminal of the jack to ground for mark. The plug required is a standard ¼ inch phone jack and I do recommend using shielded wire for this connection. In the diagram all numbers refer to Clyde Keenans boards (K7WTQ).

Q1 and Q2 - 2N2222 or equiv.

R 1 2.2K

R 2 1K

I built mine on a terminal strip and mounted it inside the UT-4 cabinet on the screws that hold the edge connectors. I have been using it successfully now for about three months.



Automatic Speed Control with the UT-4

F. HURTAUD, F8XT
Chillac
16480 Brossac, FRANCE.

For those that, like myself, are not such good typers, they have well enough to do looking at their fingers and time to time at the paper without additionally giving a glance to the memory state indicator meter!

A system according the output speed to the state of the memory at any time is quite useful. Necessity makes hams ingenious and the system described here answer the question.

T1 acts as a DC amplifier and T2 as a variable resistor across the output speed potentiometer.

As soon as a voltage is appearing on the 47 ohms, through the amplification of T1, the resistance of T2 decreases just as if you were lowering the resistance of the pot. So the output speed is increasing. When the voltage across that 47 ohms is at the maximum (memories full), the pot is practically shorted and speed is at a max depending on the value of the series resistor. So you can't overload the memories. **Fig. 1.**

Consequently, there is no more use for the meter and you can suppress it. You just need one thing. That is to know when the memories are empty - to know when you can pass from transmit to receive. An additional gadget will fulfill that.

On fig. 2 T3 is a NPN silicium and has its base at a height when there is nothing in the memories so the LED lights, but as soon as the first character is stored, the base voltage following those of pins 14 of IC9 and IC10 goes down and the LED blows out. So when at the end of the transmission it lights again, you know that the memory is clear and you can flip flop the transmit receive switch.

With that system no care about transmitting tapes or printing at the keyboard, the automatic speed control does the job and changes of speed is very soft.

I suggest you suppress the output speed pot and have a fixed resistor of the same value and into the hole on the panel put a switch with an in steady position so that you can press at the end of your hand typing to use momentarily a maximum output speed. The purpose of the variable resistor on the emitter of the NPN is a compensation of the small amount of positive current remaining across the 47 ohms by a negative voltage brought from the 12 volts. For adjustment, put a voltmeter across the 47k and memory being clear (LED lighting) turn the adjustable 470 ohms from maximum until the voltage changes and go back slightly. That's all.

Another trick I found useful is what I call an automatic memory clearance:

When you first put the supply on the UT-4, memories are full of wild characters that your machine is printing and that can occur as well everytime you are readjusting the supply voltage. On fig. 3, transistor T4 is shorting the switch memory clear a very short time when you first put the supply on (in fact just the time the capacitor between the +5 and the base load) after that you can forget the transistor and use of the switch as it was nothing across.

And last, an ultimate trick that may be of some use for the home brewers:

For transmit/receive I am using a DPDT switch which is on my home brew ST-6. On the transmit position, it is grounding the "stand by", allowing the motor to run and grounding the "on" connection of the transmitter. On the receive position, I have another grounding possibility that I am using to pass the UT-4 from transmit to receive with the aid of another transistor as the last diagram shows clearly and don't need any further explanation. I hope that will be of some use to someone and my best 73s to all of you from F8XT.

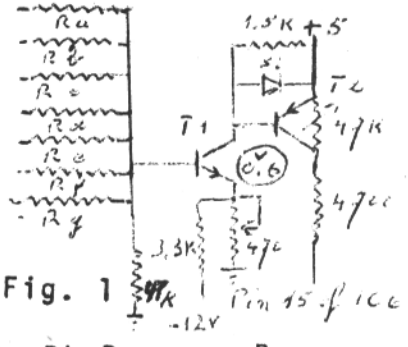


Fig. 1

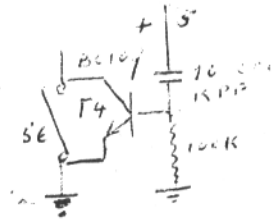


FIG. 3

Ra-Rb-Rc------Rg.
See optional D1A Converter.
T1 NPN BC109- T2 PNP BC350

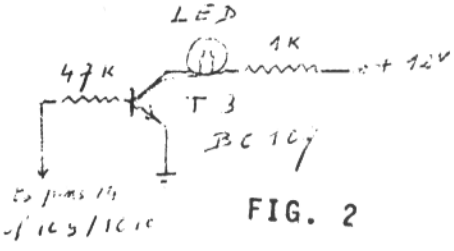


FIG. 2

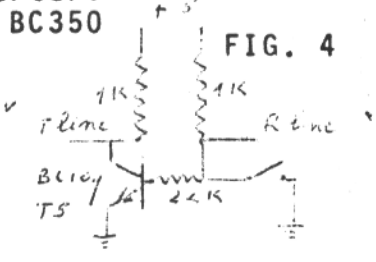


FIG. 4

***

RTTY theory & applications-

Ron Guentzler, W8BBB, Editor
212 Grandview Blvd.
Ada, OH.45810

RTTY SIGNAL BANDWIDTH
Part 4 - FOURIER SERIES AND CIRCUITS

For the last three months we have been discussing calculations in AC circuits and how to obtain the Fourier Series from a given waveform. This month we will continue the discussion by indicating how a circuit can be solved when a steady-state non-sinusoidal waveform is applied to a linear circuit.

In order to conserve space we are not going to repeat the figures appearing in this "column" last month. We hope the reader will bear with us on this point and will refer to last month's issue at the appropriate points.

Suppose that a RTTY signal is applied to a linear circuit containing just enough energy-storage elements (inductors and/or capacitors) that a transient analysis technique seems to be overpowering. How is the circuit to be solved? Because we used a square wave for our example last month and because we showed (the month before) that a square wave is quite similar to a repeated RTTY character such as the letter "R", we will use a square wave for our discussion.

We have to make several assumptions: 1) The signal (square wave or repeated RTTY character) has been present for a while so that initial turn-on transients have died out. 2) The circuit is linear; i.e., does not contain diodes, and 3) The signal being applied is continuously repeated. Again, although these assumptions seem to be restrictive, many situations and circuits will meet these criteria.

Last month we showed that a square wave can be "decomposed" into a DC voltage and a series of sinusoidal voltages which are harmonically related. The example we used was a square wave having a 130-volt magnitude and a Baud rate of 45.45. This was shown in Figure 1. We found the Fourier series for this wave and said that it could be thought of as a group of generators and a DC source connected in series. The voltages and frequencies of the various sources were shown in Figure 2.

Now, if that square wave were to be applied to a rather complex, but linear, circuit, the circuit could be solved in the following manner: The circuit of Figure 2 is connected to the circuit to be solved. All sources except the DC supply are reduced to zero voltage; this does not mean that anything is disconnected, just that only the DC source will have effect upon the circuit. Find the current flowing by means of ordinary DC circuit techniques; store the answer (write it down). Now, turn off the DC source and turn on one of the AC sources. Any one will do, but in order to keep track of what is going on, turn on the fundamental-frequency source (58.5 V at 22.7 Hz). Find the current flowing due to that source using ordinary AC circuit calculation techniques. Store that answer. Turn off the 22.7 Hz source and turn on the 19.5 V, 68.2 Hz source; solve the circuit for the 68.2 Hz source. Store the answer. Repeat the process for every other source, again one at a time, storing each answer as it is obtained.

Once all the answers have been obtained, simply add them! Probably the best way to add them is to graphically plot each answer (as we did in Figure 3) and then graphically add (again, as we did in Figure 3). The resulting current will have the waveform and magnitude that you plotted.

The procedure just described is lengthy but it gives the answer. Also, even though it might even seem overpowering, it is actually a series (no pun) of simple steps. (This is the point where a digital computer comes in handy; they can't really do much, but they are superlative when it comes to doing a series of simple steps over and over.)

Next month we will look at the Fourier Series resulting from several typical RTTY characters and see what bandwidth is required at baseband (before modulating the carrier), and we will compare the RTTY bandwidth and compare it with that of a square wave.

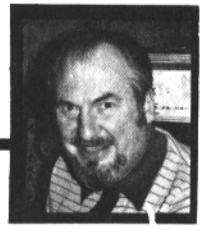
VHF RTTY NEWS

Ted Double, G8CDW, B.A.R.T.G. Contests and Awards Manager, supplied the results of the 8th (1976) B.A.R.T.G. VHF RTTY Contest. First place was won by DK1AQ with 228 points on 144 MHz and 10 points on 432 MHz with a total of 34 contacts and the best DX of 498 km. A total of 33 logs were submitted. Six countries were repre-

CONTINUED ON PAGE 10

RTTY-DX

John Possehl, W3KV, Editor
P.O. Box 73, Blue Bell, PA.19422



Hello there . . .

In a recent letter from Fred, CX7BZ, a partial quote, "the most hearty thanks from all of us down here who in one way or another benefitted from the valuable and unconditional help of Dick, WA3JTC/ZP5. Without any doubt it was only through his personal effort of time and assistance that it was possible for many of us to put RTTY signals on the air to give DX friends the opportunity to contact new countries in this mode," unquote.

Yes, Dick is not QRT from Paraguay after a two year tour of duty from which all of us interested in RTTY-DX benefitted, as Fred points out. Through his efforts the following stations will keep Paraguay active in the RTTY mode, Peter, ZP5WO; Jorge, ZP5LR; John, ZP5XT; and Fernando, ZP5TE. If you wish, cards can go via Peter, U.S. Embassy, FBIS, APO New York, 09881.

Dick also has logs and cards for the CP1BE operation and will QSL upon receipt of your QSL along with a SASE or IRC's to his new QTH noted below. For at least the next two years he has been assigned to the Memphis District, Corps of Engineers and his home QTH there is . . .

Lt. Col. R.R. Manahan
4499 Kerwin Drive
Memphis, Tenn. 38127

The new call sign has not been determined at this writing but he expects to be QRV again in either February or March.

The Volta Contest did take place after all although the information arrived much too late for publication. Word got around very quickly however and the weekend of 18th December had the familiar "CQ Contest" tapes going on all bands. No reports of any unusual activity are available at this time.

You have had due notice of the "Giant Flash" Contest for the two eight hour sessions in January so this event should be well attended.

The results of the 1976 SARTG Contest are out and the I8AA was top man of 85 entries, W1MX first in the multi-op division, F6ALL takes the QRP honors, and in the SWL division OK2 - 5350 came in first. A standing ovation to all of the above.

W A C All 14 MHZ.

Nr. 34	Raymond E. Owen	W8JMG
Nr. 35	Larry L. Filby	K1LPS

For Larry it took six years to make it from the Vermont QTH due to his duty tours in Guam and Italy for Uncle Sam. He is now hot after WAS from the Green Mountain State. Ray just returned to RTTY after a 13 year vacation from ham radio and is now hoping to eventually close in on the DXCC Award.

Who's Who . . . Paul KØJWX/6 now signs KOPJ/6 and Peter ex-K8YEK is now W8US.

Some new activity from South Africa comes from ZS6AAM, Chas. Stevens, P.O. Box 738, Sandton TVL 2146, R.S.A.

ZS3HF is a new station QRV from South-West Africa. H.H. Fischer, P.O. Box 6009, Windhoek.

Qsl's for Riki, 4X4NJ can go via WA4WTQ, D.E. Kohler, Midland, Va. 22728.

DM3BBM/4X is again active and QSL to the DM bureau.

GM3DJT and GM3COC are active from Scotland. GI3GXP and GI4AMP from North Ireland. EI5C occasionally comes booming in from Dublin with his 50 baud and 850 shift.

RTTY is becoming very popular in Spain with EA3SB, EA3YX, EA3ANW, EA3NU, EA7UU, EA3WO, EA1LQ and also EA8HT, EA8IT from Canary Islands all reported in recent weeks.

Those still looking for confirmations from OY1A might try his QSL manager,

Bob Huntington, W6TCQ
5014 Mindura Drive
Torrance, Ca. 90505

In a recent contact with Syd, VK2SG, Carl K6WZ comes up with the following regarding Lord Howe over which there has been much speculation lately. Ken, VK2BKE/LH does have the gear on the island but he has not been active in the mode himself. Other VK hams frequently visit the island and one of them may have been briefly playing around with the gear which may account for earlier reports of activity from there. Ken, being the only medical doctor there is kept quite busy in that endeavor and has had little time to get things set up himself. He may, repeat, may, get things in shape by February but this depends entirely upon his work schedules. So the best we can say at this time is to keep

your ear tuned to that area and you may be rewarded with a new country in the near future.

Here are a couple of more rare ones to keep the receiver dials in motion. Glenn, K3SWZ had a QSO with TN8CC, Brazzaville, Congo Republic on 24 December. Mike was using 170 shift but inverted and he says to QSL via REF, the French Bureau. Unfortunately he only gets on the air one or two days a month so it will require a great deal of patience to find him not to mention the tremendous pile-ups when you do.

Uli, DK3CU, reports that VR4BT on Guadalcanal (ah yes, we remember it well) will be ready to go QRV RTTY very soon. Hop, W3DJZ says that Alex, 9H1ER may soon be working in Haiti and hopes to get a HH9 call while there. So it looks like the year 1977 will start out as a good one for RTTY-DX.

The RTTY Journal offers the RTTY Merit Award for single band W A C. The Award is in the form of a certificate and is issued free upon presenting proof of contact to the QTH at the head of this column. As of the end of 1976 the Award has been issued to the following amateurs.

W.A.C. - 3.5 Mhz.

Nr. 1 W1MX

W.A.C. - 7 Mhz.

Nr. 1 DLØTD

W.A.C. - 14 Mhz.

Nr. 1	K3SWZ	Nr. 18	K6WZ
Nr. 2	WØMT	Nr. 19	G3ZWW
Nr. 3	W5RYA	Nr. 20	DL8VX
Nr. 4	DJ8BT	Nr. 21	W3EKT
Nr. 5	SL5AR	Nr. 22	WØJCO
Nr. 6	DK4ZF	Nr. 23	PY2CYK
Nr. 7	JH1TFF	Nr. 24	WB9LUK
Nr. 8	I3-13.018 (swl)	Nr. 25	WA6WGL
Nr. 9	DJ1QT	Nr. 26	WB4TPU
Nr. 10	W4ZLH	Nr. 27	K4GJW
Nr. 11	VP2MRW (W2PLQ)	Nr. 28	DL8QP
Nr. 12	F6ALL	Nr. 29	I8YRK
Nr. 13	K4YZV	Nr. 30	G3YDR
Nr. 14	W7JWI	Nr. 31	I1PYS
Nr. 15	SM6AEN	Nr. 32	JA7ML
Nr. 16	W1MX	Nr. 33	G3HJC
Nr. 17	W9OEQ (W9RY)	Nr. 34	W8JMG
		Nr. 35	K1LPS

W.A.C. 21 Mhz.

Nr. 1	WØMT
Nr. 2	DJ8BT
Nr. 3	SM6AEN
Nr. 4	K6WZ
Nr. 5	DL8VX
Nr. 6	W3EKT
Nr. 7	WA6WGL

W.A.C. 28 Mhz.

Nr. 1	FG7XT
Nr. 2	WA6WGL
Nr. 3	DJ8BT

73 de John

Theory - Applic. Cont.

CONTINUED FROM PAGE 8

sented, with the majority of the operators from England, but Sweden had its share of activity. Thanks, Ted, for the information.

From Tom Bosscher, WA8URE, Trustee for WR8ACN, Kent County Repeater Assoc., 2608 Blaine, Grand Rapids, MI 49507, we have some RTTY Repeater news: WR8ACN RTTY repeater, 146.100 MHz In - 146.700 MHz Out, 20 watts ERP at 350 feet HAAT, receiving at 600 feet, narrow shift, audio repeat (but will be regenerated soon). Everyone welcome to use it and members are willing to help beginners. There are about 20 users to date. Thanks, Tom.

Speaking about repeaters, we have a hot issue going on in this part of the country. Two meter voice repeaters are now so common that there are no frequencies left for them. Although 146.700 MHz was very widely used for simplex RTTY operation since the early 1950's, it is slowly being displaced by voice frequency repeater transmitters. This station was effectively silenced several years ago by a voice repeater located 100 miles away. There is now a voice repeater located a few miles away with its output on 146.700 MHz. Because repeaters are essentially "alligators", the simplex operator is simply wiped out without warning. We would appreciate receiving comments about placing voice repeater outputs on 146.700 MHz. Either send the information here or to Robert L. Scott, W8SFK, 3955 Garling Road, Luckey, OH 43443.

73, ES CUL, RG

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Beginners Handbook --

This is not a talk show to sell our book but from the questions we are asked over the air and in letters, we feel it can answer most of the problems of getting on RTTY. It was these questions and our own problems that led to the publishing of the book.

Ron's article explaining RTTY and how it works is written for the beginner and the best we have ever seen. The rest of the book has wiring diagrams, TUs, picture art, operating procedure, etc. Unlike most of the other handbooks on RTTY, is is up-to-date and factual in a simple manner. We are well into our 2nd thousand and have shipped it to many foreign countries with many repeat orders. Our only mistake was pricing it so reasonable. $2.50 from the RTTY JOURNAL or from HAM RADIO books. The Beginners RTTY Handbook.

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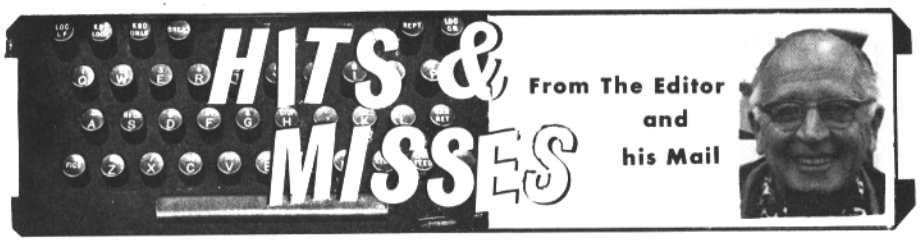

A short letter from Carl Steavenson, K6WZ, notes that on the frequency chart, in the January QST, several sections in the CW bands are banned to RTTY operation.

Except for the 7100-7150 segment this will not affect present RTTY operating portions. Activity on that segment is seldom heard but if it is illegal, should be watched. We do not know if this is an official restriction or just made up by the ARRL to designate the novice sections but will check and get an official ruling.

The restrictions on 10-15-20 and 80 are outside the normal RTTY operating area although during contests are close enough that during contests might be used. We doubt if this is official but in any event, RTTY should stay out of the portions so the novices can have a chance.

***

Nothing to do with RTTY directly, but the more we think of it, the more we are against a codeless amateur license regardless of the privileges.

The only difference between the CB uncontrolled bedlam and the amateur bands is 5 words a minute. Think about it . . .

The theory or at least answers can be learned in a cram course - Probably a million of the present 30 million CB's could and would afford a kilowatt set-up. With only 250,000 licensed amateurs now, think what this would mean to QRM. The interest and desire are there - except when you mention code most of them say - oh, and that is the end. Anyone, and we use this literally, can learn code at 5 words a minute, not in a few nights, but with a little dedication, time and desire, it is really no problem.

We are not knocking the CBers. Amateur radio can use them and at present more than ever are getting licenses.

We don't pretend that the government needs code operators or that the license will ever be used on CW but we do think that the time and dedication in learning it makes at least the basis for a good amateur. Something for nothing does not make good operators.

***

Dayton is getting closer - April 28-29 and May 1st. RTTY forum on the 1st.

***

BACK ISSUES

New subscriptions and classified ads are cash in advance as we have no method for billing. New subscriptions will be started with the current issue and one back issue, if requested. Please do not ask us to start any further back than this. Back issues - if available - may be ordered at 35 cents each at time of subscription. The JOURNAL is mailed about the 20th of the month preceding the dated month. May and June are a combined issue and July-August is a combined issue.

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1977.- Jan.-[1]

A duplicate of any back issue may be obtained from R. Wilson, 411 Clearview Dr., Cedar Falls, IA. 50613. $1.00 pp. Reprints of all UART articles, $2.00 pp.

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Audio Signal Source

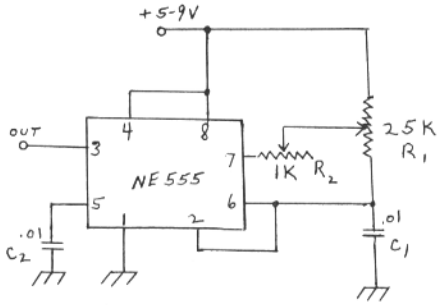
NAT STINNETTE,W4AYV
890 Virginia Ave.
TAVARES, FL. 32778

Have you ever needed a good signal source, one that will stay put? Well, here's a circuit that can be assembled in minutes, gives a square wave, and is ultra-stable, approaching crystal control. The circuit is not original with me but is suggested by Signetics using their NE555 timer. The IC is connected as an astable multivibrator. With the values shown in the diagram the range is approximately 1300 Hz to 4400 Hz.

There is nothing tricky about building the unit. I made up a p.c. board and mounted it in a small mini-box with power supply external. Use only good quality Mylar capacitors for C1 and C2. Fresh clean pots will also contribute to stability. For power I use 5v. as I already had a power supply. I found that the 5v. is quite satisfactory although the output is on the low side. A 9v. transistor battery will work quite well and gives a little more output. It should last for some time as the unit draws only about 8 ma. The lower voltages are preferred as it is more stable than with the higher voltages. The NE555 is rated at 18v. maximum.

In using this unit, set the approximate frequency you want with R1 then tune down to the last Hz with R2. If you want to get some other range, do it by changing capacitor C1. Making it a smaller value will move the range upward. No attempt was made to calibrate the unit as I use it in conjunction with my Heath counter.

Toroids can be tuned quite easily with this signal source. See November 1973 RTTY Journal. William Johnson W5CBC has an excellent description of how to do it. A word of caution, however, when tuning toroids or resonating any circuit. Since a square wave is rich in harmonics you might find two or three peaks on the volt meter. Just pick out the strongest or highest reading. This will be the fundamental.



RENEWING PUNCHES

ANDREW MILLER, WBØOAF
Box W-15
TOGO, MN. 55788

A short time back I acquired an old Model 14 reperf, and I mean old. This particular one was really in "ruff" shape. It looked as if water had dripped on it for several years, creating immense amounts of corroded parts and rust. I was anxious to see if the thing would work so just plugged it in and sure enough "it did".

So I cleaned it up, shined the old thing with drill wire brush and a few drops of oil and put it back in service.

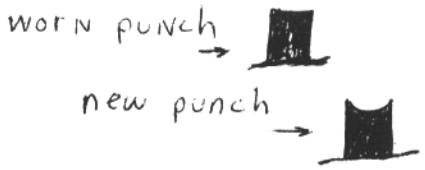
After a period of several weeks, the paper tape was hanging up in the punches, for what reason I didn't know. I fiddled a little with it and that didn't help at all. So I threw the 14 on the bench and started in.

I removed the punch block, (a leading teletype handbook doesn't recommend this) carefully taking all of the punch assembly apart. I examined the punches carefully and sure enough, they were dull. This was causing an incomplete hole and creating a binding problem on the block.

I had found only one sure way to renew these punches to their finest. For anyone that likes fiddling with tedious work (I do) you will get your moneys worth here; actually it's not that bad at all.

I located some regular valve grinding compound and a hard, sharp tool. Any tool will work. I used the pointed end on a file here in the shop and sharpened it a little more but to a blunt end. At this time I would like to mention that the punches on the reperforator are "hollow ground". In other words, the center of the punches should be lower than the sides to punch a clean hole in the paper. Mine were so worn that they were flat.

Begin grinding by applying a small dab of grinding compound and firmly with small circular motions grinding the punches. Each punch if worn badly takes approximately 15 minutes. It is well worth the effort and my machine works like new. I hope this little idea helps some of you do-it-yourself type fellows.



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PRINTED CIRCUIT BOARDS: RTTY SELCAL with TTL logic, (73 Magazine, November 72) $12.00. ST-5A-W/PS (2 boards) $6.25. AK-1, $4.25; CW ID'er (Feb 73, 73 Magazine) $4.75. Logic probe (Dec. 74, 73 Magazine) $1.00. Autostart RTTY encoder and decoder (Jan. 67, 73 Magazine) $11.00. Synthesizer - 75-S Collins Rec. (Dec. 75, Ham Radio) 2 boards $12.50. Instructions and parts list included. S.J. Zalewski, 29307 Red Cedar Drive, Flat Rock, MI 48134. (313) 782-9316.

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RTTY PICTURE PERF TAPES. Hundreds, including nudes, cartoons, animals, works of art, landscapes, all of the RTTY Art Contests entries. Chad type (fully punched, no lids) 11/16 inch standard Amateur 5-level paper tape. Guaranteed COMPLETELY error-free. Run times from 2 minutes to 10 hours. Listing and info free if request typed on 5-level printer, otherwise send 24 cents in STAMPS. For "Intro Pack" of ten picture tapes of the best, various subjects, various lengths (total run time - 2 hours 12 minutes), send $6.00, immediate delivery, POSTPAID, listing included. Due to popularity of above, "Intro Pack Deluxe" now offered, run time 12 hours 44 minutes, $30.00, shipped PRIORITY mail in USA, surface postpaid overseas. Joe Dickens, WA9UGE, 601 S. Dodson, Urbana, IL 61801.

COMPLETE SET OF COPIES OF THE RTTY JOURNAL. These are all single sheet copies that are not perfect as far as pictures are concerned, but are all readable. My cost was $125.00, will sell for $45.00 and ship. R. H. Wilson, 4011 Clearview Dr., Cedar Falls, IA 50613.

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AUTOMATIC CW ID UNITS. Programs up to 32 dots, dashes, or spaces, easily programmed. All on one board. Less 5V suppiy kit, $13.95, wired and tested $21.95 (your call must be supplied). Interface for above for ST5 or ST6, AFSK or FSK kit $4.50, wired and tested $5.75. Automatic 10 minute resetable timer for ID unit, kit $8.95, wired and tested $13.95. 5V 1A fully regulated short proof TTL supply with transformer and plug in or hard wired board. kit $11.95, wired and tested $18.95. SAVE on all four units, package of above reg. $39.35, kits sale price $35.99. Reg. wired and tested price $60.60, sale price $54.00. Cabinet for above, unpunched (Dozy E box) $7.75 each. Add 75 cents shipping. NuData Electronics, 104 N. Emerson St., Mt. Prospect, IL 60056

DOVETRON TSR-100 TELEPRINTER SPEED CONVERTER-REGENERATOR is a 6" by 7" PC card designed to mount inside of any MPC Series Terminal Unit and is intended to provide signal regeneration and UP-DOWN speed conversion. The 18 socket-mounted CMOS devices include a Uart, two FIFO Ripple Memories (80 characters), a programmable crystal-controlled Dual-Clock, and a bilateral steering section that permits solid-state switching between Transmit and Receive. All Uart functions including Parity are switch-selectable. Both sections of the Dual-Clock are programmable for 60, 67, 75, 100 WPM Baudot and 110 Baud ASCII codes. All 8 parallel data lines are available at the output of the Memory section. The TSR-100 also offers Variable Character Rate, BLANK Diddle and memory functions of Preload, Recirculate and Reset. The BLANK Diddle is Uart-generated (Tri-state mode) and does not contribute time delay or first character errors. A unique Memory Unload circuit prevents character over-runs and provides a TD Inhibit. A pair of LEDs indicate Memory status. All signal input and output ports are fully buffered for easy interface to other terminal units. Power requirements: +5/+15 volts at 85 mils and -12/-15 volts at 10 mils. TSR-100: $195.00. POSTPAID Continental USA. Delivery: 30 days or less. DOVETRON, 627 Fremont Avenue, South Pasadena. California, 91030. 213-682-3705.

MINI-MANUALS, $3.95 each postpaid - M15/19 Wiring Hints, Diagrams and schematics. CV89/URA8 FSK Converter data. TDA2 Stelma Distortion Analyzer, AN/SGC-1 AFSK Converter, conversion details, etc. Teletype Gear Guide. Schematic for CV57 FSK TU - $1.20 postpaid. Technical Manuals, Teletype Equipment and Parts, Surplus Electronics. SASE for lists. Jim Cooper, W2BVE, POB 73, Paramus, NJ 07652.

NEW COMPUTER GRADE CAPACITORS, 71,000 MF at 25V $3.00 ea. Edge connectors 12, 15 & 22 pin gold plated $1.00 ea. Orders include 75 cents for shipping. Stamp brings free catalog. NuData Electronics. 104 N. Emerson St., Mt. Prospect. IL 60056

MODEL 28 ASR - MK III, automatic CR LF, 60 wpm, oiled & adjusted. Excellent condition - mint cabinet. Includes extra paper, winder, loop supply, manuals and schematics. Will deliver within 100 miles. $675 or best offer. M. J. Frue, 34063 Ann Arbor Trail, Livonia, Michigan 48150. 1-313-525-9225.

TECH MANUALS - $6.50 each: TT-63A/FGC, CV-591A/URR, TS-2/TG; following manuals - $8.50 each: R-388/URR, TH-5/TG, USM-50; other manuals - TGC-14/14A, $12.50; TT-298A/B, TT-299A/B, UGC-38, 40, 41 - $15.00. Model 14 TD manuals, $3.00 each. All manuals mostly new, unused. Thousands more in stock. Send 50 cents (coin) for large 22-page listing. W3IHD, 7218 Roanne Drive, Washington, D.C. 20021.

DOVETRON MPC-1000 (E Series) MULTIPATH-DIVERSITY RTTY TERMINAL UNIT. The new E Series represents the sixth generation and adds Automatic CRT Intensity Control, Keyboard Actuated Autostart, Automatic Threshold Control for unattended operation, Fast-Slow Autostart, and Autostart Delayed-Timeout to the MPC's MULTIPATH CORRECTOR, IN-BAND DIVERSITY MODES, and the continuously variable Mark and Space channels. All IC's, transistors and Cmos logic elements are mounted in low-profile sockets for ease of servicing and maintenance. Interfacing to the TSR-100 or UT-4 speed converter/regenerator is accomplished by removing two jumpers at the rear panel. Your QSL brings full specifications. MPC-1000 (Amateur) $495.00. MPC-1000C (Commercial) $795.00. Shipping and Insurance: $7.50 Continental USA. Delivery: 30 days or less. DOVETRON, 627 Fremont Avenue, South Pasadena, California, 91030. 213-682-3705.

PUNCHED AND LETTERED 3½ x 6 x 10" Bud box cabinets for HAL ST-5 kits. All holes punched for ST-5, auto-start and AK-1. $15. Don't sweat over hole alignment and punching. Solder your HAL boards and bolt them into my box..David Tancig, 618 W. White St., Champaign, Ill 61820.

HAL COMMUNICATIONS CORP: Headquarters for electronic RTTY equipment. In demodulators, choose from the incomparable ST-6 or, for a low cost beginning in RTTY, the ST-5. Tailor either to your requirements by selecting the 425 Hz press discriminator, the XTK-100 or AK-1 AFSK oscillators and the ST-5AS autostart for the ST-5. Full details available in our current catalog. Compare before you buy. Bank Americard and Master Charge plans available. HAL COMMUNICATIONS CORP., Box 365RJ, Urbana, Illinois 61801. Phone 217-367-7373.

TELETYPE EQUIPMENT and SUPPLIES. Fresh white roll paper $17.50 per case (4-½ dia.); $21.00 per case (5 dia) plus shipping. Fresh ribbons $1.20 pp. Special for UART and UT users -- forget parallel to serial conversion to punch tape. Parallel data perforator available complete with synchronous motor and tape reel and holder $30.00. Many types of machines available in 28, 14, and 15 series. Assemblies and parts available also. SPECIAL: Need a quiet printer? One Extol RO at 60 and 75 speed is available including floor stand $350.00. SASE for equipment list. P. Andersen, 115 Boyken Rd., Rochester, MI 48063. 313/652-3060.

PERFORATOR TAPE, 5-LEVEL. Carton of 10 rolls, $7.50 POSTPAID continental U.S.A. (Other locations write for price quote.) Shipped within 10 days ARO. George Engeman 1409 Everett St., El Cerrito CA. 94530.

MODEL 29 KSR MARK III $250, R.O. BASE $15, TYPEBOX $15, motor $10, typing reperf $75, typing unit $75, LXO $50, L.E.S.U. $10, and lots of miscellaneous parts. Ed Wagner, 1018 BirchHaven Cir., Monona, Wis. 53716.

MODEL 28 KSR CONSOLES w/tape unit $325 ea. Loads of 15's, 19's, and 28's -- table models, tables, TD's, motors, keyboards, etc. -- cheap. Goodman, 5454 South Shore Drive, Chicago, IL 60615. (312) 752-1000.

QSL's, CATALOG 30 CENTS. TELETYPE PAPER single sheet rolls 12, 4½ inch rolls per case white, $25.00 per case plus shipping (case wt. 36 lbs.) N & S Print, P.O. Box 11184. Phoenix, Ariz. 85061.

FOR SALE: MINT 28 ASR. Bell Telephone green crackle cabinet, auto linefeed, carriage return, non-overline, auxiliary typing reperf, typing reperf, $500 FOB. Collins 51J4, mint, 3 filters, manual, $325. Ed Bruns, W3EKT, 8308 Longfellow St., New Carrollton, MD 20784. (301) 459-5325.

RTTY CLOSEOUT - NS-1A PLL TU while they last. Wired/tested $24.95. Board $3.00. All postpaid. SASE for info. Nat Stinnette Electronics, Tavares, FL 32778.

FREQUENCY LISTS - We have over 20 lists covering Voice & RTTY frequencies on HF-Shortwave and VHF-UHF. Lists cover Military, U.S. Government, International Police, Aviation, Marine Stations and More. SASE for catalog. Dept Y Handler Enterprises, P.O. Box CC, Northfield, IL 60093.

THE DOVETRON DCM-100 is a poly-phase Direct Conversion Modem employing BASEBAND techniques that completely eliminate the need for input bandpass filtering and channel filters, permitting the error rate to approach the theoretical minimum. A high degree of selectivity is not required in the companion receiver, since this technique also eliminates all the image windows. The Mark and Space channels are both continuously tuneable from 1200 to 3000 Hertz and a dual LED display on each channel permits fast and precise tuning. Full IN-BAND Diversity provides automatic single channel copy during deep selective fades. Auto Markhold, anti-space and anti-CW are standard. FSK and MARK Autostart is offered, and the MARK Autostart is adjustable for Fast or Slow response. The high level loop supply is strappable for either 60 or 20 mil operation. The phase-continuous AFSK tone keyer may be preset with two different Mark-Space-Shift tone combinations, which are operator selectable from the front panel. Rear panel connectors permit plug-in interfacing of the speed-changing regenerators (including the Dovetron Microprocessor and the UT-4). The TSR-200 and TID-100 may be mounted internally. Twenty of the 25 integrated circuits are identical and all are socket mounted. All digital circuits are high noise-immunity CMOS. Availability: January 1977. Amateur list price: $295.00. FOB. DOVETRON, 627 Fremont Ave., South Pasadena, Ca. 91030.

SURPRISE! SURPRISE! 1702A programming at hobbyist prices! 1702A copied - $1, coding form input - $3. Add $9 for prime quality 1702A, or supply your own. Free erasing with order! Fast turnaround! Quantity discounts! SASE for free Hex forms and catalogue of microcomputer kits to: MICROTRONICS: P.O. Box 7454-R; Menlo Park, CA 94025.

WANTED: 100 WPM, ASR MACHINE. Will trade pocket watches, chronometer. What do you have? What do you want? 150 Mile radius. 617-774-3767. Dino Argentini, 12 Rowell Rd., Danvers, MA 01923.

26TH DAYTON HAMVENTION AT HARA ARENA April 29, 30, May 1, 1977. Technical forums, exhibits, and huge flea market. RTTY forum on the 30th. Program brochures mailed March 7th, to those registered within last three years. For accommodations or advance flyer, write Hamvention, P.O. Box 44, Dayton, Ohio 45401.

SELL: TT-179/FG PERFORATOR TAPE READER in excellent working condition with manual, $100. Bob Doersam, W8OEM, 2745 Bristol Road, Columbus, OH 43221 (614) 457-2797.

CENTRAL ELECTRONICS 600L LINEAR amplifier and manual. Needs power supply filter condenser, $100.00. W8UPG. 651 Sanford Ave., Akron, OH 44305.

AUDIO FILTERS - Precisely tuned 88 mh. toroids + - 2 Hz $3.50 each ppd. Specify freq. Nat Stinnette Electronics, Tavares, FL 32778.

UT-4 COMPONENTS. UART's, FIFO's, MC-3408L D/A, most others, prompt first class mail. See July/August 76, other ads for prices. Peter Bertelli, W6KS, 5262 Yost Place, San Diego, CA. 92109. 714-274-7060.

COMPUTER ELECTRONIC KEYBOARD CABINETS. Two sizes. Each has 14 x 6.3 inch keyboard surface with a 15 degree slope. Full sizes are 14W 8.3D 3H and 14W 11.3D 3H. 14x8.3x3 cabinet $14.90. 14x11.3x3 cabinet $16.49. Add $1.00 for shipping. Blue base with choice of white or black top. NuData Electronics, 104 N. Emerson St., Mt. Prospect, IL 60056.

COMPUTER POWER SUPPLY. 5V 25 Amp input voltage 110 or 230V AC. Output regulation + - .1% for 0 to full load. Noise and ripple less than + - .1% peak to peak. Crowbar protected. Type Elpac ELV 125.5. $75.00 each. Shipping included. NuData Electronics, 104 N. Emerson St., Mt. Prospect, IL 60056.

SALE: R-388/URR COLLINS RECEIVER. Midland SWR meter. Best offer, Claude Sweger, Box 1842, Ft. Stockton, TX 79735.

VIDITYPE VIDEO DISPLAY, 60, 67, 75, 100 wpm with RKB-1 Solid State Keyboard, $250.00. Collins R-390, $295.00. NCL 2000 linear, $250.00. Central Electronics 200V, $295.00. WA7JMG Dave Gould, 4230 Jade N.E., Salem, Oregon 97303. Phone (503) 393-7737.

WANTED, DEAD OR ALIVE: Model 35 Typing Unit (only), operable, or at least physically complete. Daryl Duffin, K7ZOF, Iowa Avenue, Ogden, Utah 84404. 801-621-6496 after 5 P.M., M.S.T.

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BARTG RTTY

CONTINUED FROM PAGE 2

a. If a Contestant manages to contact 25 or more different Countries on two way RTTY during this Contest a claim may be made for the QUARTER CENTURY AWARD issued by the British Amateur Radio Teleprinter Group and for which a charge of 2 Dollars U.S. or 8 IRC'S is made.

Make your claim at the same time as you send in a Contest Log.

Holders of existing QCA Awards will automatically have any new additional new Countries added to their records.

b. If any Contestant manages to contact Stations on two way RTTY with all six Continents and the B.A.R.T.G. Contest Manager receives Contest Logs from the operators in those six Continents a claim may be made for the WAC Award issued by the RTTY JOURNAL. The necessary information will be sent on to the RTTY JOURNAL who will issue the WAC Award free of charge.