

Additions Classified

DOVETRON MPC-1000R REGENERATIVE RTTY TERMINAL UNIT is the logical combination of the MPC-1000C and the new TSR-500 Speed Converter-Regenerator. The Memory Section may be loaded with up to 5 FIFOs for a total of 200 characters of storage. A second UART provides local teleprinter copy during Receive-PRELOAD and Send-RECIRCULATE. ERROR CORRECTION has been provided and incorrect and mis-spelled words may be erased from the Memory Section by pressing the local keyboard's BLANK key. Front panel controls permit Signal and Loop speed selections of 60, 67, 75, 100 WPM Baudot and 110 Baud ASCII. BLANK DIDDLE, Tee Dee INHIBIT and VARIABLE CHARACTER RATE are standard features. The optional CW IDer (TID-100) displays its coded output on a front panel LED. Both UARTS are the new Intersil CMOS IM6402 and permit a 1.5 CU Stop Pulse. Amateur List: \$745.00 with 80 character Memory. \$820.00 with 200 characters. Delivery: 30 days ARO. DOVETRON, 627 Fremont Avenue, South Pasadena, California, 91030. 213-682-3705.

SELL: HAL FACTORY WIRED ST-6 with AK-1 and 425 Hz discriminator \$290; HAL 128 EMO, 128 character buffer memory for DKB-2010 keyboard \$55. W3JW, 1098 Mountain Rd., Pasadena, Maryland 21122 (301-437-0171).

COUNTER HEATH IB-1100, \$100.00; Dual Chan Scope Heath IO-105 factory aligned \$250.00; ST-5A with Cap decade box to copy any shift, \$75.00; PLL-1 TU built by NuData Elect. beautiful, \$55.00; XTAL controlled AFSK std. (K4EEU) phase coherent \$40.00, Model 15 KSR on stand with spare for parts perfect for beginning RTTYer, \$80.00. Pickup preferred. Ken Hopper K-9 DNY (317)-787-8661.

SELL HEATH SB-301, SB-401, SB-620, SB-650, with all manuals, cables, now in service, excellent working condition. RTTY transceiver. \$600 + shipping or trade for Model 28ASR. WA6CPP, #10, Wallace, Calif. 95254.

FOR SALE: Model 33 KSR's, some with modem. Model 28 Delta ASR. Fredrick Ghofulpo, 15865 Flanagan, Roseville, MI 48066. 313-771-1487. Call before 9:00 P.M. EST.

NEED A SCHEMATIC OR MANUAL for a Northern Radio FS Converter? Type 107, Model 2. W5FIL, 726 Teal Drive, Grand Prairie, TX 75051.

FIRST CLASS MAIL

RTTY JOURNAL
P.O. Box 837
Royal Oak, MI. 48068

RTTY

MARCH 1977

JOURNAL

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Volume 25, No. 3

35 Cents

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RESULTS - 1976 CARTG CONTEST.

* 1. I1PYS 1,955,244	36. VE2QO 206,960	63. W1ZXA 19,304
* 2. W3EKT 1,584,380	37. SM6ASD 172,550	64. F6BIQ 18,760
* 3. CT1EQ 1,562,660	38. VE2ARA 143,620	65. VE6ALR 18,500
* 4. W4CQI 988,612	39. JA7ML 141,250	66. VE4FG 17,267
* 5. CE3M 928,988	40. KJ6DL 135,450	67. G3ZKE 15,996
* 6. K8JUG 794,928	41. EA3AHM 104,220	68. K8UFW 13,815
7. KH6AG 794,015	42. WØMT 102,290	69. WD4SCP 11,820
8. WD8CPU 787,695	43. OZ4DZ 97,495	70. G3RDG 11,568
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10. KØJUX/6 669,900	45. W7UX 89,016	72. VE3BPM 10,668
11. K7BV 623,120	46. K8JIM 74,740	73. VE7DTA 10,300
* 12. 9H1EL 585,600	47. IT9BVJ 74,592	74. K8KAG 9,944
13. K6VZ 546,625	48. VK3KF 63,680	75. JG1KPR 9,108
* 14. HB9AVK 526,876	49. KZ5OD 57,500	76. JR6AG 9,000
* 15. VA6JGL 526,828	50. PAØCWI 48,350	77. SM6EDH 8,600
* 16. I5HZZ 507,688	51. HAØKDA 44,716	78. W8TCO 7,280
* 17. OH4DX 493,468	52. K4JAF 44,113	79. 9M2MW 6,864
* 18. VE2JR 463,672	53. W7C8Y 43,940	80. SM6CAL 5,904
19. K4AGC 456,990	54. VE2AXO 41,068	81. JA1FFX 5,271
20. VE5DX 446,505	55. WA6DEI 36,885	82. WØØEM 5,040
21. VK2SG 442,070	56. ØK1MP 36,010	83. LA2IJ 4,896
* 22. DJ6JC 426,500	57. VE7BDQ 32,100	84. ØK2BJT 4,494
* 23. SM6VVA 421,924	58. LA7AJ 30,030	85. VE1AHG 1,864
24. W4YZ 347,760	59. JX6XF 29,544	86. W6AEE 1,428
25. K7BVT 345,180	60. ØK1KSL 23,000	87. DAØWDW 360
* 26. W6JOX 343,240	61. VE7CM 19,837	88. WAØEMX 240
* 27. W7RLL 342,234	62. VE6AYM 19,652	
* 28. W3KV 332,032		
29. PY6HL 329,325		
* 30. JH1ISF 296,488		
31. VAØYDJ/4 275,160		
* 32. VE1XP 272,920		
* 33. VK6CT 270,640		
34. VE7YB 250,600		
35. WØTAS 242,060		

	<u>Multi-Operated</u>	
	* 1. W1MX 1,104,592	
	* 2. ØK1ØFF 172,830	
		31,828
	3. TF3IRA	

	<u>SUL Printer</u>	
1. Paul Menadier		445,028
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3. Alberto Marchesini		296,320
* 4. Jurg Hodler		246,352
* 5. Jerry Heien		189,216
6. Hajime Suzuki		81,040
7. Ted Double DRS 184S6		61,740

A Simple Selcal for use with the UT-4

Hal Beebe W9RY/W9OEQ
20035 Burr Oak Lane
Mokena, Illinois 60448

wouldn't have to worry about clocks, dividers, and glitches.

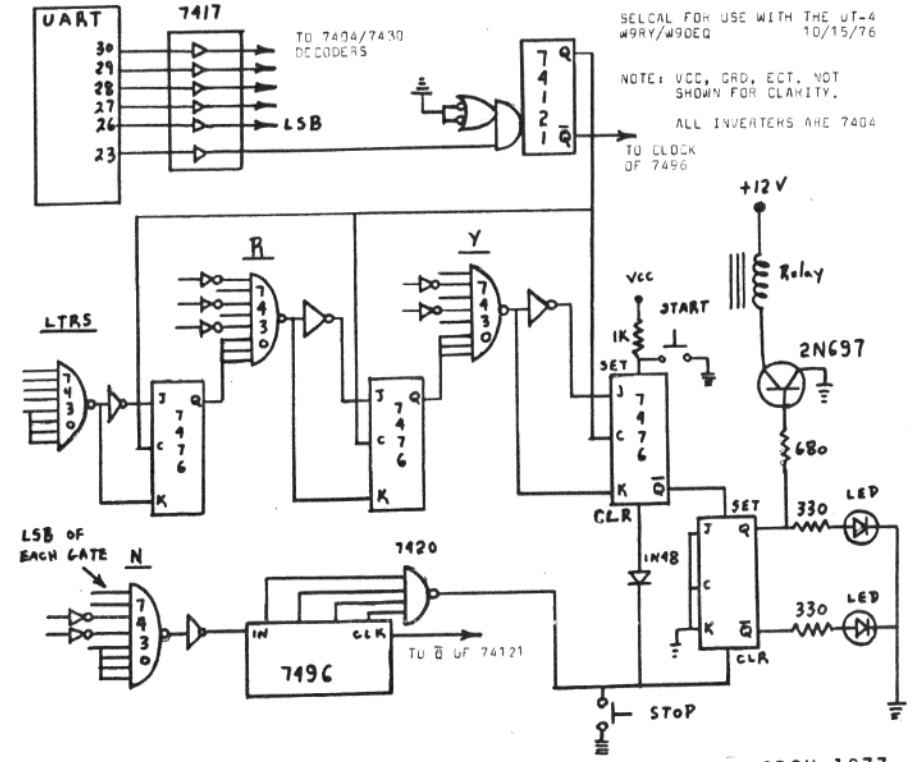
There are two possible places of picking up the parallel data from the UART. One on the receive side and the other on the transmit side. The fanout capability of the UART is about one chip, so that dictated, the transmit side between the last FIFO and the UART be the point of attachment of the SELCAL. Some sort of buffering was required so I used a 7417 non-inverting hex driver between the UART and the SELCAL. I suppose that the same thing could have been tried on the receive side but I chose the transmit side. For my strobe I used pin 23 of the UART. This pin is called the Data Strobe. Pin 24, the EDC (end of character) would also work.

After the completion of my UT-4 I began exploring the possibility of using a SELCAL circuit I had on hand in conjunction with the UT-4.

The SELCAL circuit is one that was developed by W9ZTK and had appeared in 73 Magazine. It was straightforward TTL logic, didn't require memories, and had had fairly widespread use. It did have a clock and dividers that had given me fits for a time in the form of glitches in an earlier constructed version.

Looking at the UART chip, you will see that there is a serial to parallel conversion that takes place in the chip and a flag that comes up high when a complete character has been entered. Here, then, was the basis for my conversion. I would have a SELCAL that would operate at whatever baud speed I was receiving and work along with any speed that I might have my machine operating and

The parallel data from the UART passes through the 7417 buffers and then over to the 7404/7430 decoders. Data coming from the UART has pin 26 as the LSB (least significant bit). When a character is decoded by 7404/7430 combination, it causes a 7476 flip flop to operate. From there on, it operates in typical domino fashion as each correct



character is received in sequence. Any incorrect character, or out of sequence character, and the 7476 flip flops will not operate in the correct manner and the SELCAL will not turn on. 2.2K resistors should be added to the 7417 outputs and connected to plus five volts. These are open collector types and you would not be able to get a logic high at this point without them. The resistors are not shown on the drawing.

A four N turn off is provided by the 7496 shift register and the character decoding 7404 inverters and 7420 gate. Manual turn on and off is provided for as well as status indicating LED's. I have the relay in my SELCAL controlling the 12 volt line to the autostart relay in my ST-6. Inspection will disclose many combinations of autostart with this arrangement.

One word of caution. As with any TTL project, use plenty of by-pass capacitors, not only where the five and twelve volts come into the board, but right at the chips themselves. Those little glitches will drive you right up the wall without adequate by-passing.

Since I have a two letter call only two

Mechanical C.W. ID'er.

JIM WORREST, KØHNO
5144 Holdrege St.
LINCOLN, NB. 68504

The automatic mechanical keyer (KY-65/ARA-26) is a small, lightweight keyer that was designed to be used in Air Force planes, has come on the surplus market. This little machine takes very little work to make it an ideal c.w. ID'er for RTTY.

The first thing you have to do after you get a keyer is to remove its top. Lift the top straight up to avoid breaking any of the teeth of the plastic gears that are mounted under the cover. You will see three wheels, two metal ones and one plastic, the respective contacts that the wheels actuate, and the levers that release the contacts in sequence so only one wheel is keying the circuit at a time.

There are two methods for modifying the keyer for ham use. The first is the simplest and which almost all Rtty'ers can use. The second will take a bit more work, but may be necessary to use by those few who have lengthy call signs or those hams that want to use the keyer as an automatic c.w. CQ'er. Be certain that you don't want any of the benefits of the second method before going on with the first; because there is no turning back after using the first method.

The first method requires that you lift up or cut off the contacts that are actuated by the metal wheels and remove the lever that pulls the contact away from the plastic

characters are shown in the drawings after the LTRS. This section could be expanded to any number of characters that you might choose. Further expansion could include such things as turning the reper on and off, WRU, etc.

I make no claims for anything original in this project. For those who might ask why I didn't do this or that, I can only say that I was trying to work with what I had at the time. I probably didn't have the parts required, or I didn't think of it, or all of the above.

Cost: I used prepunched perfboard from Radio Shack and hand wired and the IC's, and the like, came from firms like Poly Paks, the whole project came to less than ten dollars.

A review of W9ZTK's article in 73 Magazine might be in order for those who want a more complete picture of the operation of the SELCAL. The original article was entitled: "A RTTY SELCAL with TTL LOGIC" and was in the November 1972 issue. Irv Hoff's UT-4 article appeared in RTTY JOURNAL in March 1975.

wheel.

There are 93 teeth on a plastic wheel. With three teeth or the equivalent space that they would take equaling a dash or a space between words, two teeth equaling a space between characters, and one tooth equaling a dot; there should be more than enough room for "de" and 95% of the calls issued in the U.S. to fit on one wheel. If you make a mistake as you are programming a wheel, it is very easy to correct. Just use some of that super stick liquid that sets in ten seconds to glue back a tooth.

With the aid of a variable power supply, I can set the speed of the ID'er so my machine will print nothing but "V"s and blanks. The motor speed is very easy to set. It will run on anything from 10 to 30 volts d.c. You should put a capacitor across the motor to protect your power supply against voltage spikes.

The second method doesn't require the destruction of any of the mechanism. You will have to remove the two metal wheels and replace them with the plastic ones that has the message that you want to send on them. You may also wish to mount a spoke on the innermost wheel to take advantage of the automatic stop feature that these machines have.

Unused keyers with information sheets can be obtained from Surplus Center, P.O. Box 82209, Lincoln, Nebraska 68501. Just order the Automatic Code Keying Device (item #2248) and include enough postage to ship a five pound box to your QTH

One Chip Crystal Controlled UART Clock.

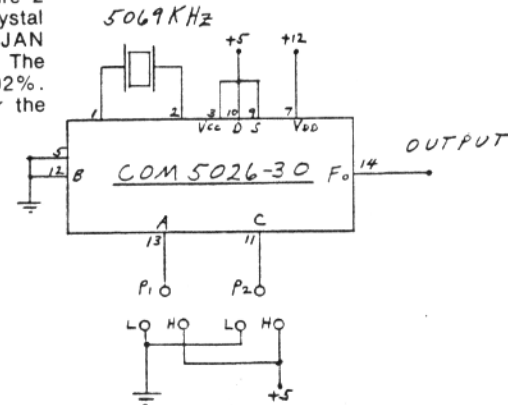
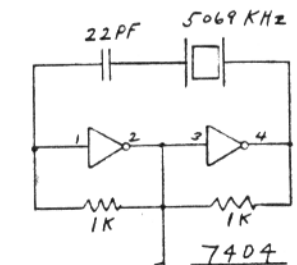
RON FINGER, KL7HOH
3417 E. 65th Ave.
ANCHORAGE, AK. 99502

SMC Microsystems Corporation makes a series of programmable baud rate generator IC's for operation with a UART. The COM5026-30 chip is suitable for Baudot operation. The circuit shown in figure 1 applies. The package is a standard 14 pin DIP. The P1 and P2 program lines can be selected with jumpers, a switch, or be driven with external TTL logic. The output will drive 2 standard TTL loads. Power requirements are +5 volts at 50 ma. and +12 volts at 25 ma. If more than one frequency is needed (as with the UT-4 on 60/100 WPM) a single crystal oscillator can be used to drive 2 or more 5026-30 or 5026T-30 chips. Figure 2 shows the circuit. A surplus 5070 kHz crystal (CR7/U holder) is available from JAN Crystals for \$1.00 including postage. The error with this frequency is only .02%. NASCO is suggested as a source for the 5026-30 at \$11.00 each.

SMC Microsystems Corp.
35 Marcus Blvd.
Hauppauge, NY 11787

JAN Crystals
2400 Crystal Dr.
Ft. Meyers, FL 33901

NASCO
235 Robbins Lane
Syosset, NY 11791



WPM	BAUD	KHz	OUT	P1	P2
60	45.45	727.23	L	L	
75	56.88	910.18	H	L	
100	74.20	1187.35	L	H	

FIG. 1 - BASIC UART CLOCK

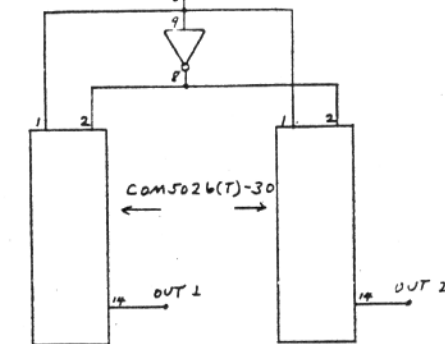


FIG 2 - FOR ADDITIONAL CLOCK OUTPUTS

INTRODUCING the DTU-1.

No. 1 of 2 Parts

RICKY JOHNSON, WA0CKY
1860 Pawnee
LINCOLN, NB. 68502

INTRODUCING THE DTU-1 (Digital Tape Unit-First Attempt)

The UT-4: "... brings the computer age to the typical teletype enthusiast," to quote Irv Hoff. Most computers use magnetic tape rather than punch tape for the long term storage of information. Therefore, to complete the transition to the computer age, I designed the DTU-1. The DTU-1 is a control and buffer system that converts any standard cassette recorder (not deck) into a digital system that will:

- 1) Store large quantities of 5 or 8 level information; 6 hours of 45.45 baud (60 wpm) baudot per C-60 cassette. The circuit as drawn is for 5 level but by re-wiring a couple of pins on the uart it will handle 6, 7, or 8 level information.
- 2) Record and play back at totally independent baud and O.P.M. rates. For instance information recorded at 60 wpm can be played back at 100 wpm and full machine speed. A hand-typed message will play back at full machine speed and any baud rate.
- 3) Allow limited editing of information previously recorded. The limitation is that characters may be deleted or changed but not added.
- 4) If the tape is advanced somewhere before the start of the selection wanted, the unit will hunt up the beginning of the selection then stop and wait for a command to begin playback.
- 5) Allow those with video units to feed their screens at up to 440 baud and thus scan in a few minutes large quantities of information such as auto start activity for the day. (To do this requires a slight change in the clocks of the video unit.)

Theory of Operation:

The DTU-1 records the information in blocks of 70 characters which take up about 2 inches of tape. There is about one inch of blank tape between each block of characters. This means that most of the time the recorder is sitting idle with its tape drive motionless. The circuit is made up of several sections. A buffer unit holds the characters before they are recorded and after they have been read from the tape. Two clocks are used to establish the baud rates involved. A master control circuit is used to control the tape drive and buffer unit. A pulse circuit

encodes information for recording on the tape. A simple reading circuit reliably recovers the information. Interface to the loup is provided for by the buffer circuit.

Buffer:

If the buffer circuitry looks familiar, it is because it was appropriated for this circuit from the UT-4. Why design a new one when Irv did the work for me? For this specialized application a few subtle changes have been made. For instance, pin 10 on IC 1D connects to the other side of S-3 than it does on the UT-4. The time constants on IC 6 have been changed to fixed values to approximate the 1.42 unit stop pulse. (2 unit in the case of 110 baud).

To read the loup an opto isolator is used. Most any one will probably work. I used the Fairchild FTK0050 which costs \$1.00 for three of them from James Electronics. With a 60 ma loup, 100 ohm resistor (1/2 watt) is paralleled with the the LED side of the isolator to insure the current through the LED is below the 60 ma. maximum for the FTK0050.

For playback, some method of keying the loup is necessary. The method used in the UT-4 works fine and is used here. For the Mainliner TTL-2 a modification is necessary to convert the TU over to transistorized keying. The necessary circuit can be mounted in a minibox and plugged into the octal socket the keyer tube is now using. The circuit draws its power from the socket. Be sure to add the connection to pin 6 to bring the high voltage needed to that pin and also to remove the diode connected between the grid and cathode of the keyer tube. The DTU-1 now connects directly to the base of the keying transistor. No switch is necessary if the 680 ohm resistor shown on pin 10 of IC 1D is removed. If you should happen to want to go back to the keyer tube, just plug it back into the socket. For long term use, the diode should be replaced as it will prolong tube life.

The Clocks:

Two clocks are required. One variable and one fixed. The variable clock again is lifted from the UT-4. The fixed clock derives its input from the 7490 in the variable clock. The 450909 Hz present on the 7490 is divided by 64 to obtain the 7045 Hz fixed clock. This frequency is arbitrarily chosen and any frequency will work if the time constants on IC 24 are changed accordingly. In fact, the unit has been tested at 1760 baud and works fine. But the locating of information is much more difficult and the volume of data that can be stored is not increased nearly as

much as the baud rate. This is due to the blank areas needed between the characters. These areas are not (can not) be reduced in size. The builder may experiment with high rates but it is recommended to start out as designed.

The fixed clock also provides the basic frequency for the pulse circuit used to record the information. If the baud rate is increased the 7045 Hz output should be retained to feed the pulse circuit.

Control Unit:

The idea of the DTU-1 is to record the information in data blocks of a fixed size. A control unit is necessary to handle this operation. On record the control unit: Waits until 70 characters have been read into the buffer from the loup; Starts the tape drive; waits 1/2 second, then records these 70 characters and shuts down the tape drive. The process repeats until all information has been recorded. There will be a short group of characters (1-69) left in the buffer. To record these simply press the "run out" switch, S-7, and the characters will be recorded in the same manner as the full sized blocks. On playback the process is reversed with the tape drive starting when there are nine, or no, characters left in the buffer. These nine characters insure constant output while the next block is being located and read into the buffer. Output on playback may be interrupted at any time with the "load" switch. In fact, characters may be read out one at a time with this switch.

The playback may be started anywhere desired, even in the middle of a block of characters. IC 24 will automatically set the counters to zero when required to maintain sync. A short hesitation will occur as sync is restored. This hesitation will not cause any errors and only occurs when starting to read from the middle of a block of characters.

Playback/Record Circuits:-

So far no mention has been made as to the method of encoding the information on the tape. After many trials the pulse system used here was found to be the most satisfactory. It was far more reliable than AFSK tones. Each mark bit consists of **blank tape**. A handy feature that assures mark hold even when the tape is not moving. Each space bit consists of 8 pulses at 3522.5 Hz. The pulses are buffered and fed directly to the high level input on the cassette recorder. If only a microphone level input is available on your recorder try putting a 150K resistor in series with this output.

On playback these space pulses are fed through an impedance matching transformer and a simple baud pass filter which has some intentional ring. The sine wave output of the filter is converted to ttl compatible

square waves by the transistor. The retriggerable multivibrator smooths the pulses into a high level output. The output will be low when no pulses are received, thus the original wave form is reproduced but is upside down and has heavy spacing bias. IC 1A inverts the signal and feeds the now right side up signal to the Uart which removes the heavy spacing bias and stores the characters in the buffer. The ring and time constants on IC 24 cause the heavy bias. The ring and time constants are chosen to cover up for momentary tape drop outs. With the values chosen only 3 of the 8 pulses are necessary to recover the space pulse in good form. The system also tolerates large speed errors, wow and flutter. Information recorded on one recorder that runs 7% fast plays back perfectly on another recorder that runs at the correct speed. Doing the same thing using standard 170 Hz shift AFSK tones resulted in complete garble at a recording speed of 45.45 baud (60 wpm).

Cassette Recorder and Tape:

Any cassette recorder with an index counter will work just fine with this system. A deck does not have sufficient output power to drive the input circuit but could be used if amplification is provided before the input to the playback circuit. The DTU-1 will record so many "tapes" on one cassette that an index counter is needed to locate the approximate starting point of the selection to be sent. The tape recorder I am currently using is the Radio Shack CTR-30 which lists for \$80 but is often on sale for \$60.

One modification is necessary. Provision must be made to connect the relay to switch on and off only the motor in the recorder. The "remote control" jack found on most cassette recorders controls the current to the electronics as well as the motor. Many "remote control" jacks can be easily modified to control only the motor and this is what I did on the CTR-30. On some recorders the jack is soldered directly to the P.C. board and in such cases, it is easier to add another jack for this purpose.

The tape used is not critical. C-60 cassettes are recommended because the quantity of information storable on a C-90 or C-120 cassette is so great as to be unmanageable. The longer cassettes may be useful to those few who will be storing the 6-10 hour long RTTY pix. Since most operators will be able to store their entire tape library on one or two cassettes, cost is no object. But I have found the "three packs" sold by K-Mart to work perfectly and they only cost \$1.00 on sale.

Construction:

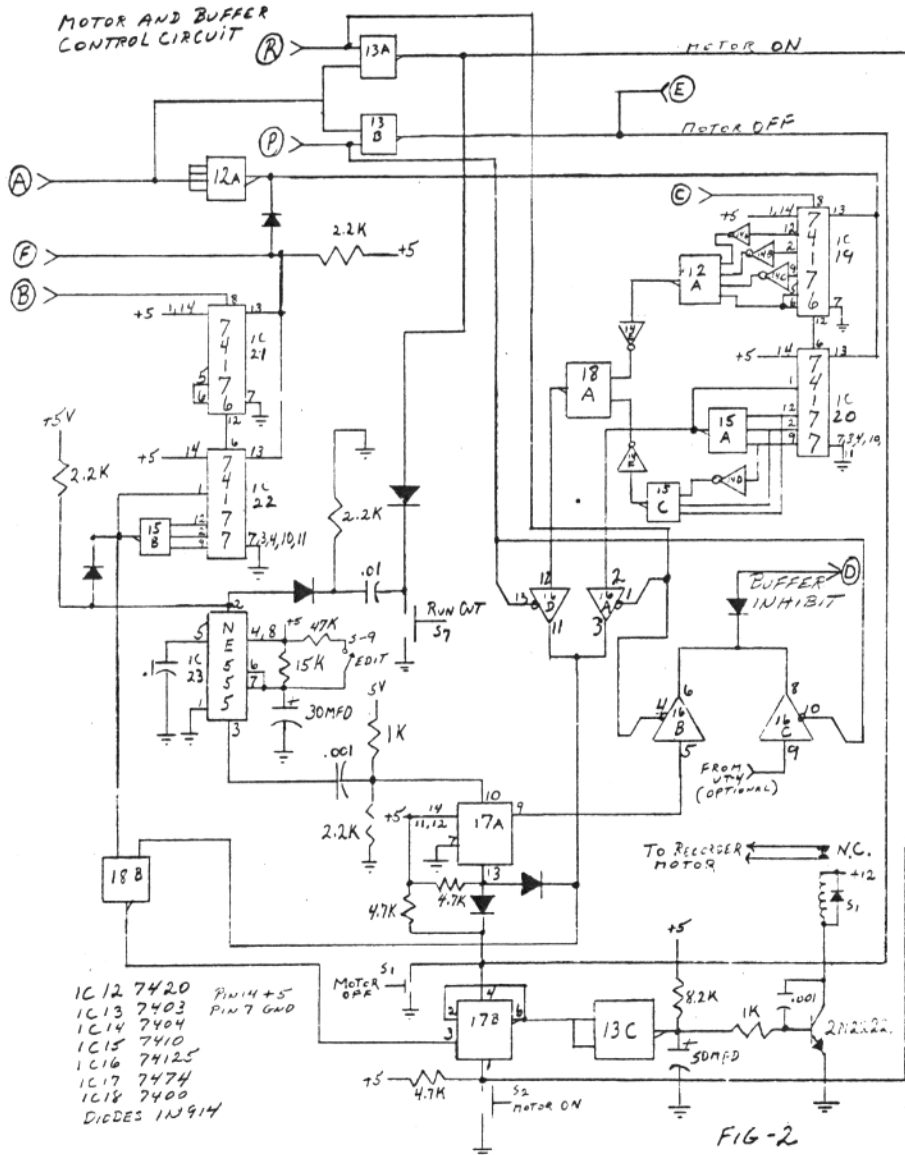
As of this time no pc boards are available. The buffer unit can be built on one of the boards designed for the UT-4 without many trace cuttings or jumper wires. Not shown on

the diagram are the numerous by-pass capacitors that should be put on the 5 volt line throughout the circuit. Warning — do not substitute other types of divide by 10 and divide by 16 ics for the 74176 and 74177. These are the only ones that will work in the circuit as it is designed. Pin 9 of IC 16C must be connected to +5 volts if it is not connected to the UT-4. The connection to the UT-4 will be covered next month.

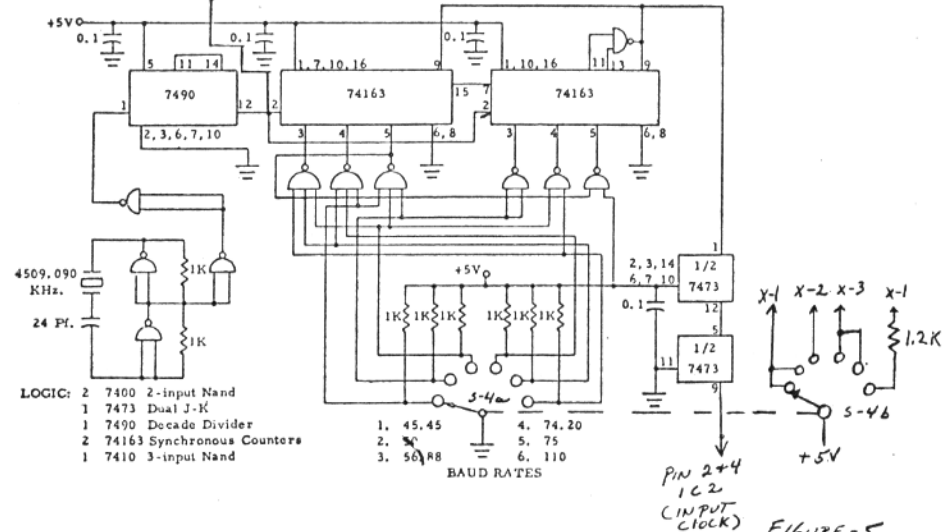
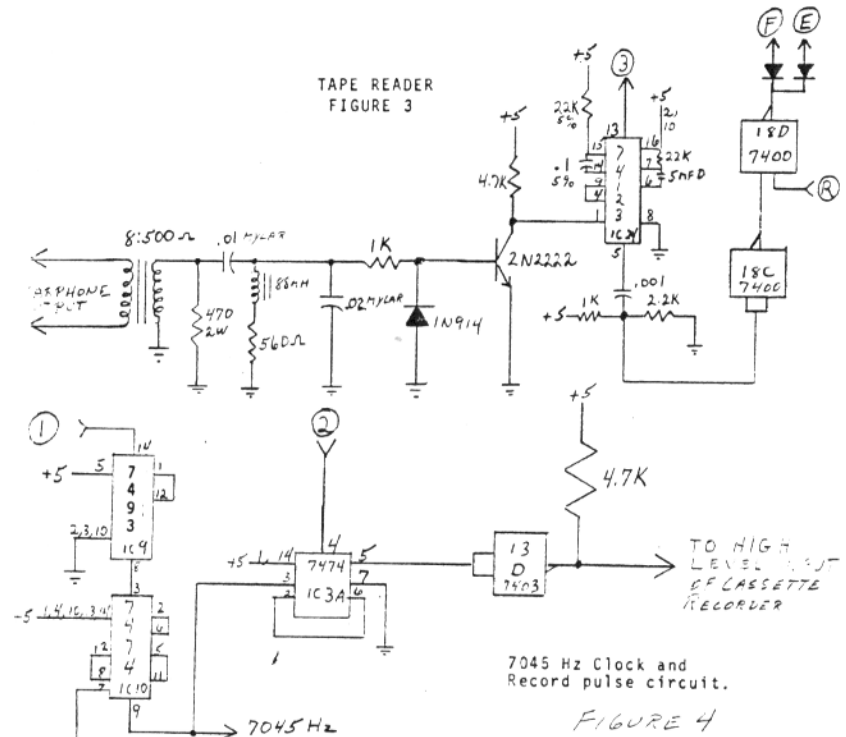
Next month we will cover power supplies

for the DTU-1 and the use of the DTU-1 with a UT-4. (In case you are wondering, you do not need a UT-4 to use the DTU-1.) Also to be discussed are the operating procedures used and special operations such as splice free editing. In coming months, I hope also to present a system of automatic cw id for the system which allows the transmission of long tapes without the need to worry about the time.

Drawing #1 on page 10-11.



TAPE READER
FIGURE 3



IC 1,2,4,7-7403
 IC 5-7420
 IC 8-7474
 PIN 14=+5 PIN 7=GND

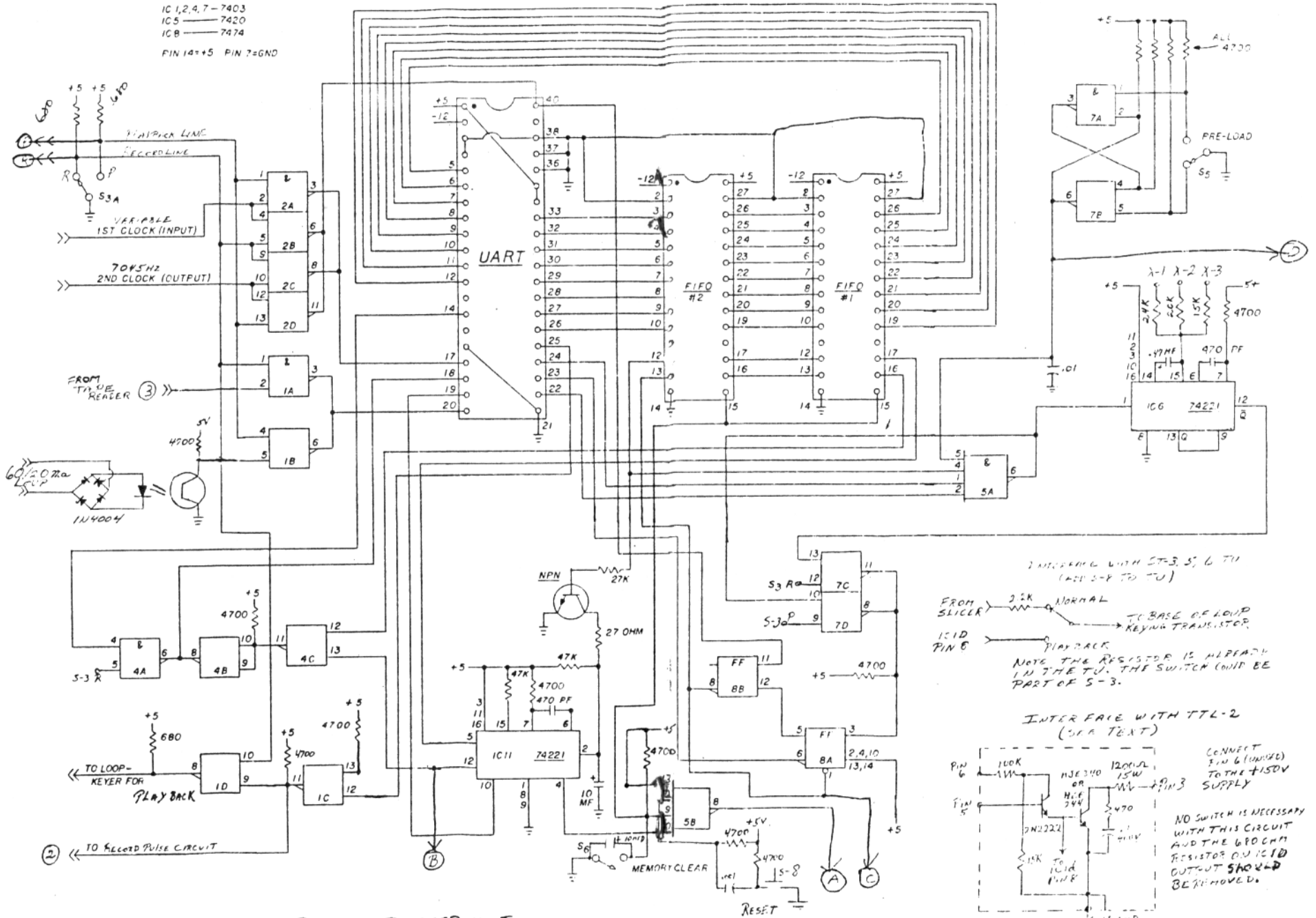


FIG-1

DIGITAL BUFFER UNIT

RTTY theory & applications.

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



RTTY SIGNAL BANDWIDTH Part 5 - TTY CHARACTER FREQUENCY COMPONENTS

In Part 3 of this series we discussed how to find the Fourier Series for a periodic function and proceeded to find the series for a square wave. The results were shown to be the equivalent of a group of oscillators connected in series, the oscillators being set to the frequencies and amplitudes (voltages) given.

This month, we are going to present the results of analysis of several repeated TTY characters. The characters and their Fourier components (both frequency and rms amplitude) are given in the Table. The characters are assumed to be part of a continuous string of the same character being repeated over and over; the rate is 45.45 Baud for a Bell System 7.42-unit code (61.3 wpm).

For reasons of expedition, the "a" components were found; that is, the "zero time" point of the character to be analyzed was shifted so that all the "b" terms would vanish. (See Part 3, 1977 JAN, p. 8-10).

Therefore, the resulting series is a cosine series. (Only those characters which are symmetrical can be expressed as a simple cosine series. By analyzing only symmetrical characters, it was possible to save considerable work.)

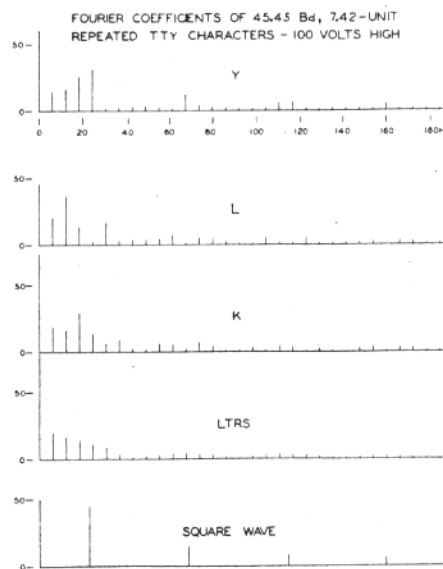
The characters were assumed to be 100 units (volts) high. The reason for choosing a 100-unit amplitude is that the results can be changed easily in magnitude. If, for example, a 260-V wave were desired, the results could be obtained simply by multiplying all magnitudes by 2.6; if a current wave were desired, a multiplication by 0.6 would convert the results to a 60-mA full scale basis. Also, by using a 100-unit amplitude, the components are automatically in terms of percentage of the values of the original wave. (In the multiplication process, only the amplitudes are multiplied in order to account for different magnitudes of the original signal; the frequency components are dependent upon the time intervals within the wave.)

The results given in the Table can be easier to interpret if plotted as was done in the figure. The vertical axis is the relative amplitude, and the horizontal axis is the frequency. The presentation shown here is commonly referred to as a spectrum plot. The height of each vertical line represents the amplitude of a component, and the relative horizontal position indicates the frequency.

Also, the spectrum plot of a 100-unit amplitude 45.45 Bd square wave is given. The values plotted for the square wave were taken from Part 3. However, because the values given for the square wave in Part 3 were for the 130-volt square wave and we want to compare it with 100-volt amplitude TTY characters, the magnitudes given in Part 3 were divided by 1.3. The square wave values were not tabulated here because the frequencies do not correspond with the TTY character frequencies even though both the square wave and the TTY characters have the same Baud rate of 45.45 Bd (a bit width of 22 milliseconds). The basic frequency of the TTY characters is related to the repetition period which is 163 milliseconds and the basic frequency of the square wave is related to its repetition rate which is 44 milliseconds.

There are several notable features of the results given in the Figure. 1) The dc term dominates (for certain characters, not given, it will not, but it will be a major term). 2) The first few components (lowest frequency) are by far the strongest. This is a natural consequence of the basic structure of the 7.42-unit code; if the code were composed of an even integral number of bits, then the pattern would be markedly different and much simpler. 3) The components generally become smaller as the frequency increases (i.e., as the order of the term increases), but there is no frequency beyond which the components go to zero. This means that the bandwidth required by this signal is, theoretically, at least, infinite. 4) The components of the characters vary in a seemingly erratic manner (other than the

TERM	Frequency (Hz)	Y	L	K	Q	LTRS	M	BLANK
0	dc	59.6	46.1	73.0	73.0	86.5	59.6	19.1
1	6.13	-14.0	-20.0	19.2	4.5	-18.5	-43.0	-25.5
2	12.27	15.9	36.8	15.5	32.7	-16.9	-12.7	21.0
3	18.40	-24.7	13.3	-28.6	-10.3	-14.3	9.3	-14.6
4	24.54	-30.9	2.0	12.9	-19.7	-11.2	10.5	7.6
5	30.67	1.2	15.9	6.1	8.9	-7.7	-0.6	-1.2
6	36.81	2.0	3.2	-8.4	6.3	-4.2	-7.3	-3.4
7	42.94	-2.9	-3.9	1.4	-1.7	-1.1	-3.3	5.6
8	49.08	2.9	3.9	-0.9	1.5	1.4	3.8	-5.6
9	55.21	-2.4	-4.1	6.1	-5.5	3.1	4.5	3.8
10	61.35	1.3	-7.2	-5.4	-2.7	4.0	-0.6	-1.2
11	67.48	12.1	-0.1	-2.2	8.0	4.1	-4.0	-1.3
12	73.62	4.2	-4.5	6.7	0.7	3.5	-1.7	3.0
13	79.75	-2.4	-4.6	-3.5	-4.9	2.4	2.5	-3.5
14	85.89	1.5	2.0	-0.5	0.3	1.1	2.8	2.7
15	92.02	-0.6	-0.8	-0.4	-0.4	-0.2	-0.6	-1.2
16	98.16	-0.3	-0.4	2.1	1.0	-1.3	-2.8	-0.5
17	104.29	1.6	4.7	0.6	3.6	-2.1	-1.0	1.9
18	110.43	-5.3	1.4	-4.5	-2.9	-2.4	1.9	-2.5
19	116.56	-5.7	1.0	3.8	-3.4	-2.5	2.0	2.2
20	122.70	1.0	4.1	0.3	2.8	-1.8	-0.6	-1.2
21	128.83	0.1	0.1	-1.9	1.2	-1.1	-2.1	-0.1
22	134.97	-0.6	-0.8	0.4	-0.4	-0.2	-0.7	1.3
23	141.10	1.0	1.4	0.0	0.4	0.8	1.6	-1.9
24	147.24	-1.2	-2.2	2.2	-2.5	1.0	1.5	1.3
25	153.37	1.4	-2.4	-2.9	-0.2	1.7	-0.5	-1.1
26	159.51	5.2	0.0	0.2	3.5	1.7	-1.7	0.1
27	165.64	1.0	-2.5	2.5	-0.5	1.5	-0.4	0.8
28	171.78	-1.0	-1.7	-1.9	-2.0	1.0	1.4	-1.4
29	177.91	0.8	1.1	0.1	0.4	0.4	1.2	1.5
30	184.05	-0.5	0.7	-0.3	-0.3	-0.2	-0.6	-1.1



general decrease with increasing frequency just noted).

However, if the components for a character are compared with those for the square wave, it can be seen that the amplitudes of the individual components peak in the general vicinity of frequencies present in the square wave. (This can be explained by means of $\sin x/x$ curves.) The "LTRS" character shows this "grouping" or "peaking" nicely.

Although the Fourier Series for a TTY character can be found readily, the number of terms in the series makes analysis by means of Fourier Series very complex. The square wave having the same Baud rate contains only about 1/4 as many terms. Also, there is a close relationship between the square wave and the TTY character Fourier Series at the higher frequencies. Usually, the higher frequency components are the ones that are affected by bandwidth limitations. Therefore, the square wave is a convenient and accurate substitute for a TTY character

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RTTY-DX

John Possehl, W3KV, Editor

P.O. Box 73, Blue Bell, PA.19422



Hello there . . .

An event worthy of a line in the "Guinness Book of Records" took place on 16 January 1977. The first two-way RTTY QSO within the country of Malaysia was accomplished by Mal, 9M2MW, and Colin, 9M2CR. As the boys are located some 200 miles apart the QSO took place on Forty Meters. You are well aware of course of the activity by Mal who has been giving out contacts from this rare country since mid 1976 and fortunate indeed are those that already have the QSL.

Colin fired up on Christmas Eve 1976, his first QSO being with Ron, VK5RY. We are indebted to Colin for passing along some pertinent facts of his past and present activities and we are sure you will be interested in hearing about them. Initial interest in RTTY was triggered by Sid, A4XGB, during long rag chews on SSB, and once the interest was aroused the next logical step was to acquire a machine and TU. The latter was supplied by Ed, W3EKT, whom as you know, has been instrumental in getting many a DX station going on RTTY.

While his first call sign, and one he still holds, is GW3JET, Colin has been roaming around the Far East for the last 30 years for the UN-ITU conducting telecommunications training for many of the emerging new countries in that part of the world. As such he has held such exotic calls as AP2CR, 9V1CR, S2 1CR, 9K2ET, and 5A2CR. He also was a pioneer on SSB along with Gin, JA1ACB, back in the 50's when AM still ruled the roost on fone. Now in retirement he has chosen to stay in that part of the world. It is 3 degrees below the Equator, but with the cooling waters of the Straits of Malacca just 20 yards from the Yagi, who can blame him!

In a recent letter to the Editor of the Journal, Ian, VK5QX, gives us a good picture of RTTY activity going on down in South Australia. The biggest problem is still getting hold of machines and the Creed Model 7B is by far the most common in use and they are acquired as fast as they are released by the Australian P.O. There are some Teletype Model 15's around but they are fairly high in price so the hardest part in getting RTTY down under is to find a printer. There is presently RTTY activity from VK 1, 2,

3, 4, 5, 6 and 7. Barry, VK8DI will soon be QRV from Darwin and he already has the machine. VK9 of course had solo activity in the past from New Guinea and Papua Territory but that area has now been assigned the P2 9 prefix. Activity from rare VK9XK on Christmas Island is rare indeed but he is in a few log books around the world. When conditions are good you might run into some of the boys in South Australia like VK5EM, PI, PB, FY, GV, RY, CCT, BI, IF, WV, HI, and of course 5QX. To overcome the machine shortage many of the boys are turning toward the solid state computer techniques and we certainly agree that that is the way to go. Wonderful things can be accomplished with a few pieces of peg-board and a hand full of those "centipedes."

If the RTTY-DX activity that has occurred so far in January of the New Year continues, we are surely in for a great year of new activity in the Mode. Mid Month saw activity for the first time ever from the Chagos Archipelago, way out there in the Indian Ocean and whose continental status is Africa. Jim, WB6EHV/VQ9, and Tom, WA6EGL/VQ9 have both been active with 850 hz shift and 45 baud speed. They seem to be most active on week ends and Statesiders might try the long path during the early morning hours and short path during the afternoon and evenings. Indications are that the boys will be there at least until May.

Another first is the activity of 9K2EP from Kuwait. Information is limited at this writing but it may be that the operator is SMØDJZ who in any event is the QSL manager. He has been reported as having keyboard problems but can copy okay.

After about a two year QRT, Guy, 9Q5BG is again reported active from the same QTH in Zaire, and with the same big signal too.

There has been activity by John from the St. Vincent Group but at this time nothing from Grenada or any of the other local islands in the Caribbean. John signs VP2SV of course.

CO2FRC very active during the latter part of January to commemorate the 124th anniversary of the birth of Jose Mari. If you have a QSO they will send a special QSL along with a special certificate.

Alex, 5Z4TV, now has a Creed Model 54 which is printing well. He promises to try some finger talk when he returns from a business trip to Paris. Based upon his schedule, that should be about now.

Jean, F6BEX, and formerly FM7AJ, has returned to Paris from a trip to Syria. Unfortunately no opportunity to do any operating. However, he does have an important new assignment with the French National Television.

Who's Who . . . Sam W4EGY is now W4PK.

As noted in HR Report, the first five stations to receive the new ARRL DXCC-RTTY were WA3IKK, W3DJZ, W8CQ, W1GKJ, and W2LFL. We presume that the certificates were numbered in that order. We will report further additions as we become aware of them. Congratulations fellows!

W.A.C. 28 Mhz.

Nr. 4 Norman Davis W1GKJ

W.A.C. 14 Mhz.

Nr. 36 John F. Limbach WB4VUP

Norm had the cards on hand since 1971 and last months listing of the single band WAC's reminded him to send them in. John's was made from his Florida location. When he is up North in Ohio he signs WD8CPU so it should not be too long before he gets the parchment from that location also. This would be a first for the "WD" prefix.

The W A S Bicentennial Certificates have arrived and are being issued at this time. Those waiting for the last one or two to complete the set are advised to try to get them in here as soon as possible. All that is required is that you made contact with all 50

states between 1 January 1976 and 31 December 1976. Next month we will run a list of those issued to date.

A reminder of the BARTG Spring RTTY Contest. 0200z 26th March to 0200z 28th March. We guarantee an active week end with lots of good DX.

What follows is QSL information for most of the DX mentioned above.

9M2MW-Malcolm Westwood, 30 Medan Tembaga, Penang, Malaysia.

9M2CR-Colin Richards, 73 Jalan Pantai, Port Dickson, Malaysia.

WB6EHV/VQ9-RM1 Jim Innis, Box 8, Mod 17, FPO San Francisco, Ca. 96685. or via WA4FVT.

9K2EP - via Jan Hallenberg, Sleipnergatan 64-#7, 19500 Mersta Sweden.

5Z4TV - Alex T. Quarmyne, P.O. Box 30592, Nairobi, Kenya.

CO2FRC-Federacion de Radioaficionados de Cuba, P.O. Box 1 Havana, Cuba.

VP2SV-John Caldwell, Palm Island, St. Vincent, West Indies, or via K3GYD.

9Q5BG-Guy Baron, P.O. Box 5202, Kinshasa, Zaire.

VK5QX-Ian Hunt, 8 Dexter Drive, Salisbury East, South Australia 5109.

F6BEX-Jean Pistré, 14 Rue Col. Oudot, 75012 Paris; France.

The writings above are really a team effort and we are indebted to the following for their valued contributions. DK3CU, F6BEX, I8AA, ON4BX, ON4CK, VK5QX, W3DJZ, WA9AKT, and 9M2CR.

73 de John

Theory & Applications.

CONTINUED FROM PAGE 13

when testing for the effects of finite bandwidth; however, it should be remembered that there is a big discrepancy between the square wave and a TTY character at the low frequency end.

Next month we will apply a square wave to a modulator in order to see how the bandwidth at "baseband" compares with the bandwidth of the signal from a modulator.

VHF RTTY NEWS

John, K6YDW, 545 Noyes Road, Visalia, CA 93277, has the following news: "Our 2 meter RTTY repeater is going great guns. The call is WR6AOU, on the 0.100/0.700 pair. Located at Bear Mountain, 3700 feet, east of Fresno. It's been on the air for almost a year now. Running 100 watts ERP, into J pole antennas up at 130 feet on a TV transmitter tower. The machine is running full regenera-

tion. Uses a ST-5A into a UT-2 then into the AK-1AFSK. Right now the group (Central California Amateur Teleprinter Society/CATS) is building up the DT-600 demodulator and a crystal-controlled AFSK for the machine. As of now, we have around 15 stations using the machine - from Bakersfield to Bass Lake. So far we have a good thing going, but we need more fellows to join us."

From Richard Burgett, WB5FHU, and W5ISS and WA5RRT, we have the following: "A RTTY/Voice repeater has been put up in Baker, LA, 15 miles north of Baton Rouge on 147.630 MHz in and 147.030 MHz out. WR5AJO, owned by W5ISS, is running 18 watts output to an antenna up 150 feet on a water tower. This gives us about 20-30 miles, which covers most of Baton Rouge Parish. The repeater is open and we welcome any newcomers."

Thanks John and Rick. That's it for this month. Keep the info coming and we'll keep repeating it!

73 ES CUL, RG

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The post office raised the rates on books and 3rd class mail in July, 1976. We received no notice so innocently sent a lot of mail out at the old rates. Everything was fine until a mailing in January came back with all packages marked "postage due" \$3.25 was the total of fees due. Example: a binder went from 77 cents to 94 cents. Indignant we went to the office and asked how come? THAT was when we found out about the increase on July 1. Fortunately, the mail sorters must have been as ignorant as us of the new rates as we had over 6 months mailing at the old rates. At an average of \$3.00 per week unpaid fees either we made about \$75.00 or the post office lost that much. Proves THAT SOMETIMES IGNORANCE IS BLISS.

The 3 color Bicentennial WAS certificates have been mailed. Some are still available for anyone still waiting for QSL cards for confirmation.

PD Box 514, Mountain View, AR, 72653
Dear Dusty:

May I respectfully suggest that the Journal, or someone else sponsor some kind of a contest on 40 meter RTTY which at present is a vast wasteland. There is less activity on RTTY on that band than there was almost ten years ago when I first started on RTTY.

It is a natural band for closer-in contacts and is not subject to static as 80.

The Dovetron contest sure brought a lot of stations out of the woodwork and perhaps a contest on 40 would do the same thing. I monitor 40 all the time but the only time I hear any activity is on weekends and that is rare.

Herb Draeger WB5HWE

* For over 10 years we have wondered about the lack of RTTY activity on 40 and 80 meters. Except for the DOVETRON WAS contest (with \$1,500 in prizes), activity seems to stay at the same level. DX contests where points may be obtained for stateside contacts finds very little activity. If anyone has some ideas we will be glad to publicize them.

16 MARCH 1977

About once a year we mention that when writing to authors or others, it is common courtesy to enclose a SASE envelope. It is not only the 13 cent postage but the trouble saved in finding an envelope and addressing it.

**BEGINNERS
RTTY HANDBOOK-
\$2.50

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FOR SALE OR TRADE: MODEL 28 ASR's excellent condition with perf or reperf. Will deliver in New England. Trade or \$450.00. George H. Rancourt, K1ANX, White Loaf Rd., Southampton, MA 01073. 413/527-4304.

TELETYPEWRITER PARTS: Gears, manuals, tools, paper, tape, Mod. kits. Gear shifts, ribbons, cranks, keytops, pallets, toroids. SASE for list. Typetronics, Box 8873, Ft. Lauderdale, FL 33310. Buy unused parts, late machines.

DOVETRON MPC-1000R (E Series) REGENERATIVE RTTY TERMINAL UNIT retains all the features of the MPC-1000/MPC-1000C Terminal Units plus the benefits of the TSR-100 Teleprinter Speed Converter-Regenerator. Front panel controls permit signal speed selection (60, 67, 75, 100 WPM Baudot and 110 Baud ASCII), Memory Functions (Unload, Reset, Preload and Recirculate), and Character Rate Over-ride. Two front panel LEDs indicate the status of the Memory Section (Full or Empty) and the state of the TD inhibit line. The latter is controlled by a unique automatic memory unload circuit that prevents character over-runs even when pulling tape. The BLANK diddle character is generated by the tri-state mode of the UART regenerator and prevents a signal time-delay or first character error on the outputted signal. MPC-1000R: Commercial: \$995.00. Amateur: \$745.00. Shipping and Insurance: \$9.50 Continental USA. Delivery: 30 days ARO. DOVETRON, 627 Fremont Avenue, South Pasadena, California, 91030. 213-682-3705.

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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. Zaleski, 29307 Red Cedar Drive, Flat Rock, MI 48134. (313) 782-9316.

MODEL 28 ASR's - KSR's, Repurfs - Keyboards, TD's - Printers, Parts - All priced for Hams. All in excellent condition. A.D.M. Communications, Inc., 1322 Industrial Avenue, Escondido, Ca. 92025. (714) 477-0374

NEWS-NEWS-NEWS-Amateur Radio's News-paper, "Worldradio", Trial subscription - Two issues for one dollar. "Worldradio" 2509-F Donner Way, Sacramento, Calif. 95818

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.

DOVETRON TSR-200 TELEPRINTER SPEED CONVERTER-REGENERATOR is a 5" by 5" PC card designed to mount inside the MPC-1000/MPC-1000C and HAL ST-6 terminal units. It consists of a programmable UART Regenerator, a programmable Dual Xtal-Controlled Clock and a CMOS Bilateral Steering Section, which provides automatic data and clock switching when the TU is switched between REC and XMIT. Power requirements are +5/+20 at 20 mils and -12/+20 at 5 mils. Availability: Stock. Amateur list price: \$99.50 Postpaid USA. DOVETRON, 627 Fremont Ave., South Pasadena. CA. 91030.

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, POST-PAID, 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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**Additional Classified
See Next Page -**

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AUTOMATIC CW ID UNITS. Programs up to 32 dots, dashes, or spaces, easily programmed. All on one board. Less 5V supply 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 resettable 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.

HAL COMMUNICATIONS CORP. announces the DS - 3000 and DS - 4000 series of KSR Video Display Terminals for Baudot and/or ASCII code. Offering error correction capability, multi-speed operation, and 16 lines of 72 characters per line, these terminals employ the 8080 microprocessor in what we believe is the first microprocessor based product offered to the amateur radio communications market. Request data sheet for full information. HAL COMMUNICATIONS CORP., Box 365RJ, Urbana, IL 61801. Phone 217-367-7373.

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.

UT-4 COMPONENTS. All major items available. Uart's \$7.00, Fife's \$14.00 each, MC3408L D/A \$4.50, IC Socket set (29) \$8.00, TTL kits and others. Due to \$1.00 price hike by JAN, no longer stocking those crystals. Have worked out direct replacement "no-change" alternate frequency scheme to retain low-cost features. See April ad. Because of cut-off of K7WTQ PC boards, have discontinued edge connectors and other items peculiar to those boards. Peter Bertelli, W6KS, 5262 Yost Place, San Diego, CA 92109 714-274-7060.

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-SAS 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.

PERFORATOR TAPE, 5-LEVEL. Carton of 10 rolls. \$7.50 POSTPAID continental USA. (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.

HAL COMMUNICATIONS RTTY MICROCOMPUTER MCEM-8080. MCEM-KB/VDU Keyboard/Video Display Unit and MCEM-PS Power supply. Unused and in original packaging. No time to use it. First \$650 or offer takes entire package. Erv. Greene, W7EU, 4326 Hermosa Way, Salt Lake City 84117. 801-277-7309.

TELETYPE MANUALS - Model 28ASR, 3-volume set \$24.50 plus \$7.75 postage. Thousands of other manuals available for military surplus receivers, xmtrs, teletype, radar, test sets. Send \$5.00 (coin) for large 22-page list. S. Consalvo, W3IHD, 7218 Roanne Drive, Washington, DC 20021

QSL's, CATALOG 30 CENTS. TELETYPE PAPER single sheet rolls 12, 4 1/2 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.

WANTED: XK-2 BOARD; information on potted cores used in DT-600; miniature capacitors used in DT-600; any information on future projects by Data Technology Associates. Bill Nelson, WA7SUN, 425 Spencer Creek Road, Kalama, Wash. 98625 (206-673-3825).

HAL COMMUNICATIONS CORP. announces the MCEM-8080 microcomputer. The MCEM-8080 is a complete operating system on a single PC board, including serial I/O at RS-232C levels or 20-60 ma current loop, 3 parallel I/O ports, 1024 bytes of RAM, 1024 bytes of ROM containing the system monitor program, and switches and indicators to manually control all bus and control lines. The powerful 8080A CPU and its family of chips are used. The system monitor allows the use of either Baudot or ASCII terminals, and enables the user to load hex files, dump or display memory, insert data in memory and transfer program control to a specific location. Whether you are a RTTY operator turned computer hobbyist, or a computer hobbyist turning to RTTY for a communications link, the MCEM-8080 should be your choice. Write today for full details. HAL Communications Corp., Box 365RJ, Urbana, IL 61801. Phone 217-367-7373.

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.

28ASR FOR SALE - Absolutely mint Condition. Mark II Typing unit, typing reperf, TD, ESU, cabinet all excellent condition, \$550. Prefer pick up, but will meet you any reasonable distance from Chicago. Joe. 312-690-9571.

CASSETTE INTERFACE - Super simple, super effective. Transfers over 60 bytes per second, loads Tiny Basic (2.25k) in 39 seconds. Board small enough to fit inside most cassette recorders. Complete kit and documented 6502 software only \$24.95 ppd. SASE for more information and list of other 6502 programs available. The Bit Stop, P.O. Box 973, Mobile, AL. 36601.

DOVETRON'S NEWEST PRODUCT is the TSR-500 SPEED CONVERTER-REGENERATOR. In addition to Signal Regeneration, Up-Down Speed Conversion, Buffer Storage, Variable Character Rate, Blank/LTRS Diddle and Tee Dee Inhibit, the TSR-500 is expandable to 200 characters of FIFO memory and features ERROR CORRECTION. Incorrect and mis-spelled words may be dumped from the Input FIFO without disturbing information stored in the rest of the memory section. A SECOND UART provides local teleprinter copy in the Receive-PRELOAD and Send-RECIRCULATE modes of operation. Both UARTs are the new Intersil CMOS IM6402 and may be programmed for 1.5 character unit Stop Bit in the 5 level Baudot code. Designed for installation within the MPC-1000R Regenerative RTTY TU, the TSR-500 also makes an excellent stand-alone peripheral. Best of all, the price (with 2 FIFOs) is the same as the original TSR-100: \$195.00 Postpaid USA. Additional FIFO storage: \$25.00 per 40 characters. DOVETRON, 627 Fremont Avenue, South Pasadena, Calif., 91030. 213-682-3705.

MODEL 35ASR LIKE NEW incl. 101e MODEM, \$1500 - Model 33ASR perfect condition, \$700. Can arrange shipping, Tony, K9HJU (312-349-9002) After 6 P.M.

FOR SALE: TELETYPE MACHINES. Model 28ASR, typing KBD and Aux reperfs, non-interfering tape feed-out. MK III, excellent condition, 60 or 100 WPM, \$450.00. Model 28 KSR, MK III, excellent condition, 60 or 100 WPM \$250.00. Model 28 RO, variable speed motor, new, \$150.00. Model 35 off-line typing KBD tape punch, excellent condition, \$125.00. Kleinschmidt TT-99, working condition, make offer. James E. Nicholson, WA4RWX, 4006 Moss Drive, Annandale, Virginia 22003 (703) 256-9572.

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.

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.

ASR33, EXCELLENT CONDITION, \$900; MITS "Altair" 8800, \$400; Model 15 KSR floor cabinet clean, beautiful shape, \$75. Evenings 707-838-6878. Norm, WB6VSD.

TRADE: DRAKE MN2000 Ant matching network 2000 watts PEP for 28K3R teletype in good condition. Will pay shipping on both. Write or call after 4 P.M. (1-513-866-6813). K8BOX, Donald L. Mack, 125 N. 10th St., Miamisburg, OH 45342.

RTTY-KENWOOD "A" Twins \$700; ST-6 W/AK-2 \$250; ASR 32 mint \$350. All perfect condx. and ready to plug in and go. Also, 19 ASR \$55; 33ASR w/data set \$750. Mike, WB9JAS 312-349-6743.

HAL COMMUNICATIONS CORP. announces the ST-6000 RTTY Demodulator/Keyer. The ST-6000 is 'deally suited for amateur or commercial service offering fixed 850, 425, and 170 Hz shifts for ease of tuning. Standard low and high tone frequency pairs are available, and active filter design allows the use of any set of tone pairs between 1200-3000 Hz. Crystal controlled tone keyer for stability. Self-contained loop supply RS-232C, and MIL-188-C levels for I/O. Scope or meter tuning. Keyboard operated switch. Selectable ATC, and new DTH (decision threshold hysteresis) circuitry allows optimum performance under the most demanding conditions. Complete flexibility in the interconnection of the demodulator and tone keyer allows separate, half duplex, or full duplex operation. Usable at all data rates up to 110 baud ASCII in standard form. The ST-6000 carries the usual HAL one-year warranty, and is an ideal companion to our new DS-3000 KSR microprocessor based communications terminal. Write today for full details. HAL Communications Corp., Box 365RJ, Urbana, Ill. 61801. Phone 217-367-7373.

Additional Classified on following page