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MODEL 15 PRINTER MINT CONDITION. Includes wired table with monitor speaker, etc. and case of paper. $75. George Guler WØOIR, Route 1, Box 74B, Kasson, Minn. 55944, phone 507-635-2501.

UT-4 COMPONENTS. All items still available - See prior ads. GI-AY-5-1013 UART still $8.00. Fairchild 33512 FIFO $13.00, 2/$25. Note COMPUCODER builders (QST June 1975): MC1408L6 is lower-cost plug-in replacement for the MC1408L-7 specified. Peter Bertelli, W6KS, 5262 Yost Place, San Diego, CA, 92109. 714-274-7060.

FOR SALE: CLEGG 27B with 011 power supply. $250.00 or trade for ST-6 in good working condition. K2GA, 16 Sunset Dr., Voorhees, N.J. 08043.

HAL COMMUNICATIONS CORP. announces the availability of the new improved ST-5 manual. ST-5 customers (give us your invoice number) can obtain one for $1.00 ppd, others $3.00 ppd. HAL COMMUNICATION CORP, Box 365RJ, Urbana, Illinois 61801. Phone 217-367-7373.

FOR SALE: MODELS 19 and 15, runs good. Also ST-5, AK-1 TD, and the 19 is a tape maker. Pick up only. "Bob" phone (609) 877-3420. Willingboro, N.J.

ST-5A IN ATTRACTIVE LETTERED CABINET with tuned filters and all features built in. First $85.00 gets it postpaid. Brian Richardson, WB4QQM. 1217-H Manassas Ct. Raleigh, NC. 27609

RTTY CLOSEOUT - NS-1 boards (Journal Oct. 1975) $2.75 ppd. A few wired/tested units still available, $29.95 ppd. Nat Stinnette Electronics, Box 1043, Tavares, FL 32778

***** ***** *****

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RTTY JOURNAL
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RTTY JOURNAL

November 1975

EXCLUSIVELY AMATEUR RADIOTELETYPE

VOLUME 23 No. 9 35 Cents

CONTENTS ---

"VOLTA" RTTY DX CONTEST - Dec. 6-7.

RULES

1) TEST PERIOD: 12.00 GMT December 6th to 18.00 GMT December 7th, 1975.
2) BANDS: All Amateur Bands 3,5-7-14-21-28 MHz.
3) EXCHANGE POINTS: All two-way RTTY contacts between stations of the same Country are not valid. All two-way RTTY contacts with stations in own Zone will count for two points. All two-way RTTY contacts with stations outside one's own Zone will count for points in accordance with the Exchange Points Table . The two-way RTTY contacts made on 7 MHz are worth the double and on 3,5 or 28 MHz are worth the triple.
4) CONTACTS: Stations may not be worked more than once on any one Band. Additional contacts may be made with the same station if a different Band is used
5) MULTIPLIERS: A multiplier of one is given for each Country contacted . The same Country may be claimed for extra multiplier if a different Band is used
6) SCORING: Total exchange points times the total number of multipliers times the total number of valid QSO's.
7) COUNTRY LIST: DXCC Country List except that the W Call areas from WØ to W9 and the VE Call areas from VO to VE7 will be considered as separate Countries.
8) MESSAGES: Stations will exchange messages consisting of : GMT, Call Sign, a progressive number and Zone number. Example: 1625 - i2AAA - Ø61 - 15 .
9) LOGS AND SCORE SHEETS: Use one log per Band. Log forms, score sheets & Exchange Points Table available for IRC's from SSB & RTTY Club, P.O. Box 144, 22100 Como, Italy. These logs and sheets are not obligatory. Logs should contain (in order) Band, Date, Time GMT, Call Sign of station worked , messages numbers sent and received (progressive number and Zone), Country multiplier and exchange points.
   Entries must be received not later than 20th January 1976 to qualify (it is advisable an air mailing).
   Send Logs and Score Sheets to:
   A.V. RTTY DX CONTEST COMMITTEE
   SSB & RTTY Club
   P.O. Box 144
   22100 Como (Italy).
10) SWL ENTRIES: This Contest is open to SWL RTTYers . The same Rules apply as are used for transmitting stations and a separate results table will be made for these entries. Logs must contain: Band , Date, Time GMT, Call Sign of station heard, numbers sent by that station and the exchange points. The same station is only valid once on each Band.
11) AWARDS: Silver Plaque "SSB & RTTY Club" to the winner. Silver Plaque "Associazione Radiotecnica Italiana" High Score Europe. Plaque "SSB & RTTY Club" SWL High Score. Certificates for top scores in each U.S.A. and Canadian Districts and each Country.
12) WORLD RTTY CHAMPIONSHIP: Points and positions achieved in this Contest will be valid for inclusion in the "World RTTY Championship" for 1975.

*****

Tape Recorder as a TD/Reperf.

If you don't like the old noisy oily thing cluttering up your shack and you want to start going electronic, try using a cassette tape recorder.

Bridge the cassette input to your demodulator input or receiver output. Press record and play buttons and record the signal tones from the receiver. You can then play back by going from the cassette output to the demod. input. (Turn the receiver gain down) The tones recorded on the tape will activate the demod. same as from the receiver.

If you have AFSK you may record the tones from AFSK on the cassette and play them back thru the demod. or directly to the transmitter.

This is a good medium to record pictures on. The cassette tape will record 30/60 minutes on each track and may be turned over to double the recording time. There is a rudimentary length scale on the cassette reel that you can use for start and finish of the picture. They also file much easier than punched paper tape and you have only a small compact cassette rather than a roomful of punched paper tape that must be picked off the floor as in the case of the old TD. Also the tapes can be used over again if you don't want to keep the picture.

W5EOO Vern Dillaplain
124 Indian Trail
Little Rock, Ark.
72207

***

THE ABC-1

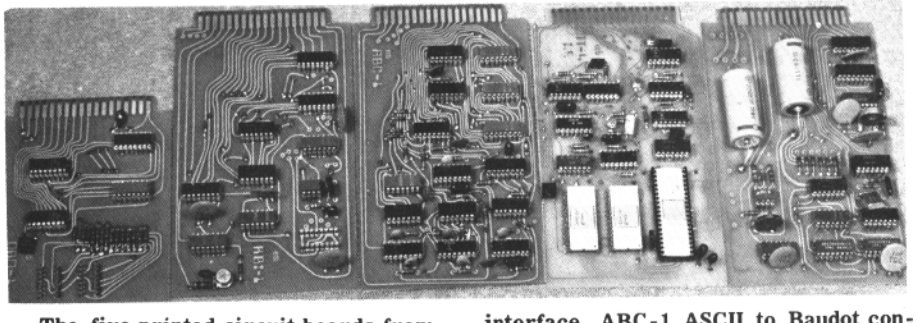
COLE ELLSWORTH, W6OXP
10461 Dewey Drive
GARDEN GROVE, CA. 92640

INTRODUCTION

After acquiring a surplus ASCII encoded keyboard (Reference 1) it was desired to use this keyboard on the amateur RTTY frequencies. Under present FCC regulations, only 5-level code is permitted (commonly called Baudot code but actually a version of the Murray code). Therefore, we needed a conversion device that would change the 8-level ASCII code to a 5-level code. There are several different approaches to this problem presently in commercial use. One of the earlier conversion methods utilized tape reperforators and tape readers to accomplish the conversion. The more modern video display communications terminals in some instances use computer memory and software to make the conversion. Some integrated circuit manufacturers have made available commercial versions of custom programmed ROMs which greatly facilitat a bi-directional conversion but seem to be somewhat different in format from the author's requirements, not to mention the expense involved.

The ASCII code is capable of generating 128 characters of which up to 96 may be printing characters. (The remaining 32 are termed "Control" characters). The Baudot code is capable of generating only 32 characters so a "Case Shift" method is used to provide a second set of 32 characters while maintaining a five-bit code. Thus the need for FIGS shift and LTRS shift on 5-level machines is apparent. It is the requirement for generation of the case shift character that makes the problem of conversion from ASCII to Baudot so interesting. Conversion in the opposite direction, i.e., from Baudot to ASCII, is relatively simple. Witness the recent publication of a circuit (Reference 2) that requires only four ICs to perform the conversion. The author has been mulling around several possible approaches to the conversion problem when two significant situations arose which served to solidify the design approach. The first was during the course of a discussion of the matter with Jerry, WB6WPX when he suggested "jamming" the case shift character into the Baudot output bit stream just ahead of the character requiring the case shift. The second was the development of the UT-4 by Irv, W6FFC (Reference 3). The FIFO in the UT-4 makes the perfect buffer for absorption of the case shift character (which is generated within the period of a few microseconds) without significant delay in conversion of the following AS CII character.

An initial cut at the design resulted in a 12-chip circuit with a timing budget that appeared feasible. A second cut at the design resulted in an operational prototype requiring ten chips including the three conversion PROMS. At the suggestion of W6FFC, a circuit was developed to provide automatic generation of a Baudot LETTERS shift character following a LINE FEED. This feature eases generation of proper end-of-line routine when using an ASCII keyboard and is well worth the three additional chips required. The



The five printed circuit boards from left to right: DRO-1 character counter and display driver (short board), KBI-1 interface, ABC-1 ASCII to Baudot converter, UT-4 IF main board, UT-4 IF auxiliary board.

final design uses 15 chips and was dubbed the ASCII to Baudot Converter - version 1 (ABC-1).

The logic diagram of the ABC-1 is illustrated in Figure 1. Figure 2 is the converter timing diagram. Interface with the UT-4 is shown in Figure 3. Note that one additional 7400 chip (IC 13) and one switch (S9) must be added to the UT-4 circuitry to provide ABC-1 interface while maintaining full capability of the UT-4 in the originally intended application.

FEATURES

1. Converts all ASCII characters that have Baudot equivalents to the proper Baudot character.
2. Converts all non-equivalent characters to a Baudot BLANK unless otherwise programmed in the appropriate PROM.
3. Converts both upper and lower case ASCII alphabet characters to the equivalent Baudot character.
4. Provides automatic Unshift-on-Space for Baudot machines.
5. Provides Automatic Letters Shift after LINE FEED.
6. Provides a Baudot Letters Shift on receipt of ASCII "RUBOUT" or "UNDERSCORE".
7. Provides a Baudot Figures shift on receipt of ASCII "UP ARROW" or " ".
8. Provides for direct throughput of ASCII code.
9. Provides 3-state buffered data outputs for data bus applications.
10. Easy interface to the UT-4.

FUNCTIONAL DESCRIPTION

Parallel format ASCII data is applied to inputs (address lines) of 8223/74188 PROMs U4, U5, and U6. Note that only bits 1 through 5 are used for addressing the PROMs. Bits 6 and 7 are applied to 2-line to 4-line decoder U7. The binary state of bits 6 and 7 are decoded by U7 to provide an enable signal to pin 15 of the appropriate PROM. Decoding of ASCII bits 6 and 7 is arranged by means of U2B so that both upper and lower case ASCII alphabet will be converted to the equivalent Baudot character.

PROM output data (in Baudot code) bits 1 through 5 from all three chips are "wire-or'd" and applied to a 3-state buffer U8. If U8 pins 1 and 15 are both low, data from the selected PROM passes through U8 and appears at the output of the converter.

Simultaneously with the appearance of ASCII data at the inputs of the PROMs, the keyboard strobe signal is applied to U1A. U1A and B provide a total strobe delay of approximately 7 microseconds. At the end of this delay period, the strobe signal appears at the output of U2A. When the ABC-1 is connected to a FIFO such as in the UT-4, the delayed keyboard strobe signal causes a "shift-in" signal to be applied to FIFO pin 17. Because the data at the output of ABC-1 chip U8 is already present at the FIFO data inputs, this data is entered into the FIFO as a parallel format Baudot character.

The preceding paragraphs describe what happens in the converter when no case shift is required. Let us say that the character converted in the previous example was the character "R". Let us now assume that the next ASCII character from the keyboard is a period. Conversion of this character to Baudot code requires that it be preceded by a FIGS shift character. The state of bits 6 and 7 in the ASCII period character cause PROM U6 to be selected for punctuation characters (numeral conversion also takes place in this PROM). PROM U6 output bits 6 and 7 are Low and High respectively for a period character and are applied to the case shift detector latch U9A, B where pin 12 of U9A was Low for the previous character R. Bit 7 is High and so has no effect on the latch. Bit 6 is Low, causing U9A, B to change state and pin 12 goes High. This low to high transition is applied to input B1 of 1-shot U10A, generating a 6-microsecond wide FIGS shift gate at U10A pin 4. This gate performs three functions. It inhibits U8 causing U8 outputs to revert to the 3rd (high impedance) state, and because of the current sources through R21-R25, U8 output bits B1, 2, 4, 5 go High. Bit 3 goes low because of the inverted (Low) output of U2C which is the second function of the FIGS shift gate. The 3rd function of this gate is to generate a "Case Shift Strobe" pulse by means of U3A, B and U2A. This strobe is delayed 2 micro-seconds by U3A, permitting the parallel data at U8 output (bits 1, 2, 4, 5 High and bit 3 Low - Baudot FIGS shift) to settle to a static condition before being entered into the FIFO by the strobe signal.

So far, approximately six microseconds have elapsed since the ASCII data and strobe for the ASCII character "period" appeared at the input to the converter. At the end of the 6 microseconds, U8 is enabled, and U2C output returns to a high level. At this time the Baudot character for a period (B1, 2 equals Low, B3, 4, 5 equals High) is present at the output of U8. One microsecond later the delayed (7 microsecond) keyboard strobe

from U1B appears at U2A pin 11 and now the Baudot period character is entered into the FIFO. Generation of a LETTERS shift character in U10B is similar to the foregoing except that U2C output remains high (U8 outputs B1 through B5 are all High).

Thus it is apparent that all normally converted characters are delayed by seven microseconds within the converter before being strobed into the FIFO. If a case shift character is required, it is generated and strobed into the FIFO during the seven-microsecond delay interval.

U11, 12, 13, and U2D form the "Letters shift after Line Feed" circuit. U11, 12 detect the presence of a Baudot Line Feed character at the output of U8. The output of U12 goes low when the normal delayed strobe pulse from U1B appears at U11A. After a one microsecond delay

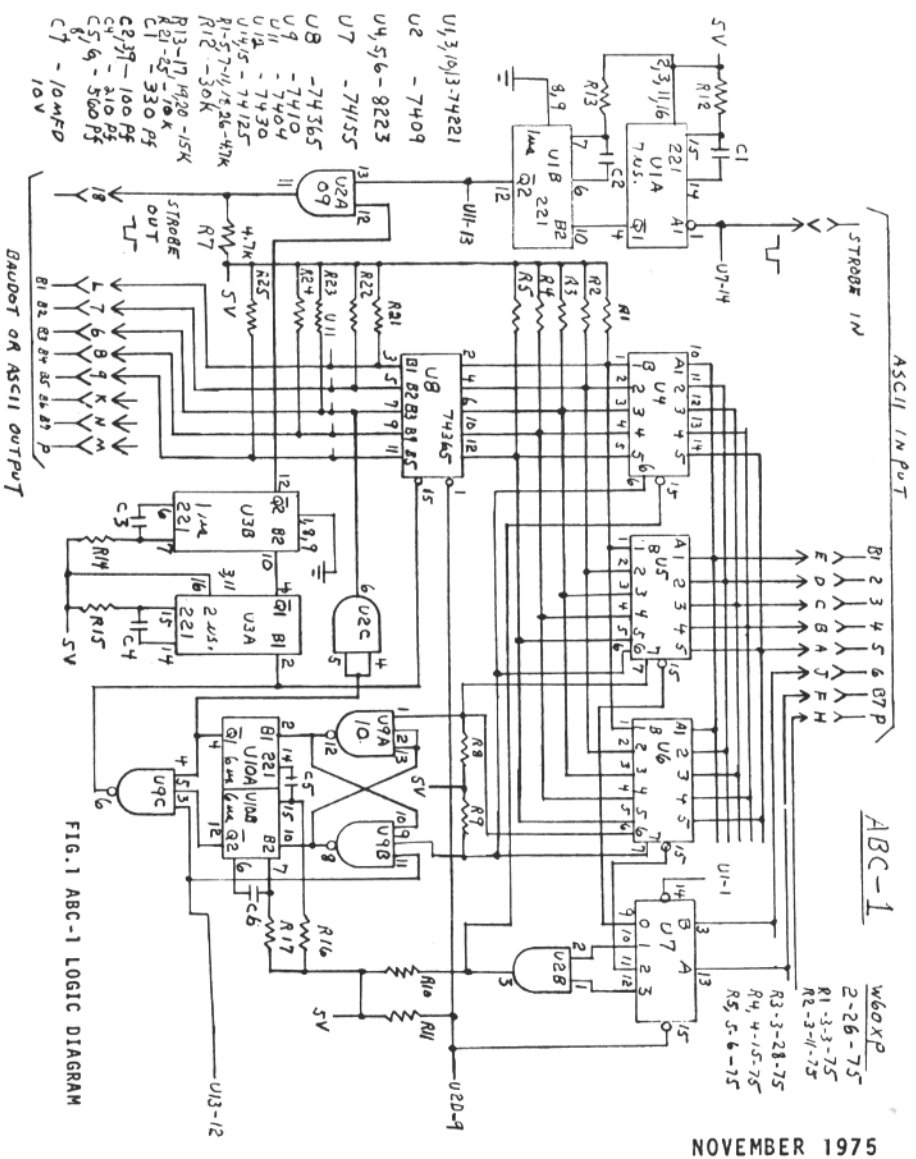


FIG. 1 ABC-1 LOGIC DIAGRAM

through U13A, U13B generates a six microsecond pulse that is applied through U2D and U9C to start the generation of a Letters shift character as previously described. A non-printing character such as Letters shift, following a line feed, gives the machine time to return to the left margin before printing the next character.

In Figure 2, waveform 11 of the timing diagram is a composite of the various conditions at the converter output strobe line. The "Typed character strobe" (center pulse in the pulse train) will appear on the strobe line everytime a character key is pressed on the keyboard. The case shift strobe and LSAL strobe are shown as dotted lines indicating they will appear only under certain conditions. Depending on previous conditions, all three strobe pulses can appear in the sequence illustrated when the converter receives an ASCII LINE FEED character.

CONSTRUCTION

The timing components should be kept clear of the trigger inputs on the one-shot multivibrators. Five percent tolerance dipped mica capacitors and five percent quarter-watt resistors should be used in the one-shot timing circuits. Three ABC-1 converters have been constructed and the timing was well within tolerance using off-the-shelf five percent components.

Use of a printed circuit board makes construction much easier and decreases chances of wiring errors. Even so, the P.C. board has a high component density and traces are very close together. Great care should be exercised during assembly and soldering to prevent errors in component location, IC orientation, and solder bridges. Sockets or Molex pins are recommended for the ICs.

P.C. BOARDS AND PROMS

EDI (Reference 4) has been authorized to make a P.C. board available for the ABC-1. This is a glass epoxy, double-sided, plated-through hole circuit board. It will fit a standard .156 inch spring 18-position double-readout edge connector. Boards only, or complete parts kits including the three pre-programmed PROMS are available.

If you already have a UT-4, Figure 3 shows the changes required to interface with the ABC-1. If desired, EDI has a modified UT-4 PC board with these changes incorporated. Order "UT-4 IF" PCB/kit. This PCB fits the same type edge connector socket as the ABC-1.

TROUBLESHOOTING

Most comments on troubleshooting in the KBI-1 article apply to the ABC-1. The converter is a fairly complex circuit with critical timing parameters. If a scope is not available, it is mandatory that the associated UT-4 be operational in order to check converter operation.

Strobe and data lines from the KBI-1 outputs to the ABC-1 inputs and from the ABC-1 outputs to the UT-4 should be less than 20 inches in length. Transmission line techniques must be used for longer lines as described in the KBI-1 article.

Logic levels at the seven data inputs to the ABC-1 must be stable at the time the keyboard strobe goes low at U1A-1 and U7-14. As indicated in the timing diagram, the minimum width of the strobe pulse is 15 microseconds. If your keyboard strobe is pulsed with a pulse width, for example, of five microseconds; then U14 of the KBI-1 must be used to stretch this five microsecond pulse to at least 15 microseconds. Another possible source of improper operation is errors or omissions in the switching and control circuitry (S1, S9) in Figure 3. To use the Repeat message function in the UT-4 during operation with the KBI-1/ABC-1, PRELOAD switch S5 is set to PRELOAD. KYBD switch S9 to IN and the message is typed into the UT-4 memory from the keyboard. KYBD switch S9 is then set to OUT and REPEAT switch S8 is set to REPEAT. Then PRELOAD switch S5 is set to NORMAL and the message is continuously recirculated through the UT-4. REPEAT switch S8 also permits local copy on your printer during the repeat sequence when using the UT-4 IF circuit board. KYBD switch S9 must be returned to IN if you wish to continue using the keyboard after completing the repeated sequence.

ACKNOWLEDGEMENTS

In addition to the valuable suggestions contributed by W6FFC and WB6WPX, thanks is due Peter, K6SRG for his many helpful comments and for wringing out the first prototype PCB. The author is indebted to Steve, WA6TVA for pointing out the need to force the case shift latch to the letters state when auto letters after line feed is generated. Appreciation is also extended to many others who offered suggestions and encouragement including K2SMN, K3TML, WA5NYY, W6GQC, and WA7ARI.

COMING UP

The next article in this series will describe a serial in - serial/parallel out Baudot to ASCII converter.

REFERENCES

1. Ellsworth, C.A., "The KBI-1", RTTY JOURNAL, September 1975.
2. Lancaster, Donald M., THE TTL COOKBOOK, 1974 p. 153.
3. Hoff, Irvin M., "The Mainline UT-4" RTTY JOURNAL, March 1975, p. 4.
4. Electronic Development, Inc., P.O. BOX 951, Salem, Oregon 97308.

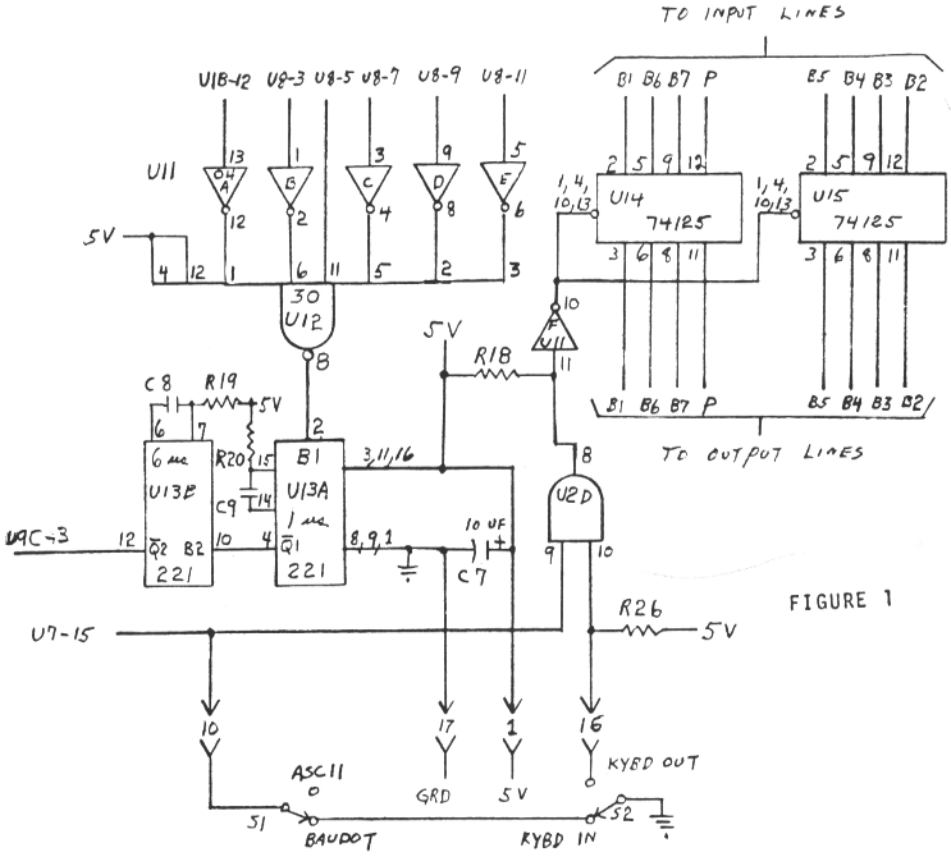


FIGURE 1

ABC-1 NOTES - 1. ASCII inputs B1 thru B7 are positive logic (Mark equal High level). 2. U4 is alphabet prom that converts both UC and LC ASCII to Baudot. U5 is control function prom for Carriage Return, Line Feed, and Bell. U6 prom converts numerals, punctuation, and space bar. 3. Most ASCII characters with no Baudot equivalent convert to a Baudot BLANK character. 4. U11, 12, 13 generate a Baudot LTRS shift function immediately following a Baudot LF, thus providing a standard end-of-line routine capability of CR, LF, LTRS. 5. Baudot outputs B1 thru B5 are positive logic (Mark equals High level). 6. U14, 15 provide direct ASCII throughout when S1 is in ASCII position. 7. For U1, 3-8, 10, 13 Vcc is on pin 16 and Grd is on pin 8. For U2, 9, 12 14, 15 Vcc is on pin 14 and Grd on pin 7.

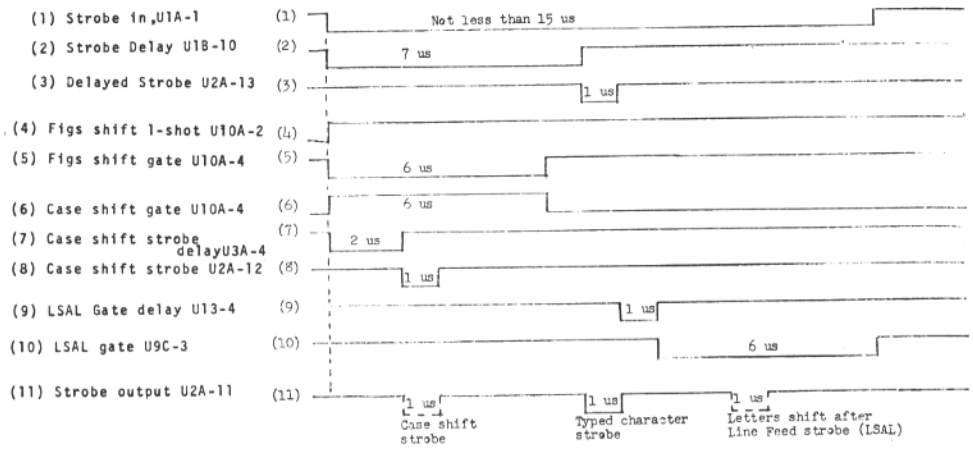


FIG. 2 ABC-1 TIMING DIAGRAM

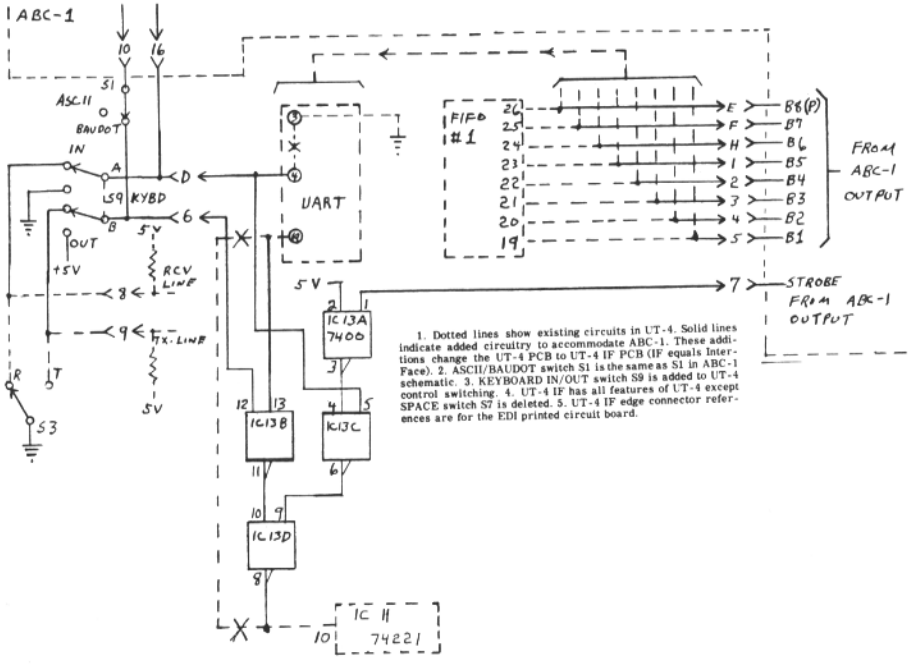


FIGURE 3-Changes required to interface UT-4 to ABC-1

*****

DIGITAL -- DATE, TIME, MESSAGE GENERATOR

Part 2

B.D. LICHTENWALNER
29 Michael Rd.
STAMFORD, CN. 06903

POWER SUPPLY

The DDT MG requires a power supply that can deliver 5 volts at 1 amp and 200 Ma at 12 to 18 volts. The 5 volts requirement is best met by using the very conveniently packaged LM 309K. Be sure to attach the LM309K firmly to the cabinet to aid in dissipating the heat from the circuit. A small U-shaped fin would also help to keep the unit cool. Diodes DX, battery BT, and resistor RL in the power supply can be eliminated. These components allow the clock chip to continue operating should AC power fail. The battery will be charged whenever the AC power supply is operating. It is advisable to check the current flow into the battery when fully charged to assure yourself that it is not exceeding 1 or 2 Ma when the Nicad batteries have reached full charge. Adjust R1 to set this current level.

Programming the 8223 Memories.

When unprogrammed 8223 ROM's are purchased all of the outputs will be at a "O" level. A small programming fixture as shown in figure 2 is all that is required to program these units. To program the ROMS I use the following procedure as outlined in Signetics Data Handbook.

1. Ground Pin 8, and remove VCC from Pin 16,
2. Remove all output loads.
3. Ground the Chip Enable Line, Pin 15.
4. Address the location to be programmed by selecting the address using the five SPDT switches. For address 00000 all switches will be at ground level. Address 00010 would be selected by placing switches 1, 3, 4, 5, at the ground level and Switch 2 at the plus 5 volt level. In the addressing scheme, bits are addressed from right to left. The right most bit represents the least significant bit in the address and the left most bit represents the most significant digit. The table in Fig. 4 shows the sequence of addresses and their equivalent decimal value. Remember when programming a sequence of characters, the order of message must start in the least significant position of the memory and be located in increasing addresses.
5. Apply plus 12 volts to the Pin to be programmed through a 390 OHM resistor. One Bit is programmed at a time. The Bit to be programmed is selected by Switch 6. This technique will be applied only to those pins that must be at a "1" level at the end of the programming process.
6. Apply plus 12 volts to Pin 16 for as short a period of time as possible.
7. Verify that the Bit has been programmed by checking the output voltage across the 1K resistor with switch 7 in the verify position.
8. Continue to the next bit to be programmed at this address. When all bits at an address have been programmed and verified, advance the address and program the bit pattern for that address.
9. If during the verification process, a bit has been found to not be programmed, repeat steps above.

This process is quite simple, but requires a great degree of attention. One bit in the wrong position or address and the chip is useless. There is no way of returning a bit to the "O" level once it has been programmed.

If you prefer to not program your own chips, Electronic Development offers the service of programming tc your specifi-

--NOTE- CORRECTIONS TO PART 1-- OCTOBER RTTY JOURNAL

First, on page 6 in the lower schematic there is a logic block marked U16B. This block should be marked U16D.

Second, at the top sentence of the second column on page 7 the sentence should read, "a diode as shown between the U16D output".

Third, the picture at the bottom right of page 7 shows the large circuit board that is the main circuit board of the DDTMG. The clock board is mounted vertically in the chassis and appears toward the top of the inside of the chassis.

Fourth and finally, Jim Page at EDI has run into some difficulties in getting things underway in kitting the DDTMG. However, kits and parts and perhaps completed units will be available thru:

Kelly Associates
P.O. Box 2100
Glenbrook, Conn. 06906

cations at a very nominal fee. A self-addressed note to them will bring convenient forms to help you lay out your message.

To prepare the data to be programmed into the Memories, we will look at the RTTY message differently from the C.W. message. All RTTY information will be contained in Bit positions 1 through 5. Bits 0, 6 and 7 are used as control functions. As a result, it is important to keep these Bits 0, 6, and 7 as zeroes during the programming operations. The Bits will be set at the one level for each space and at the zero level for each mark. The start and stop pulses will not be programmed. They are inserted automatically by U9. Any handbook, such as "Ham RTTY" will show the code required.

Let's look at an example. To code the letter "A" into the first address of a Memory, we progress as follows. Select the first "address" in the Memory. This is represented by address 00000. The Baudot representation of the letter "A" is MARK MARK SPACE SPACE SPACE. This means that in the Memory we want Bits 1 through 5 to be set as follows: Bit 1 - 0; Bit 2 - 0; Bit 3 - 1; Bit 4 - 1; Bit 5 - 1; Again, remember Bit 0, 6, and 7 will remain at 0 level. After completing the "writing" of the first character, advance the address to 00001 and program that character. Continue advancing the address switches to complete the message.

Programming of the time and date feature requires using the Control Bits 0, 6, and 7. Let's review what each of these bits control.

Bit 0 in RTTY mode indicates that the data to be "printed" should come from the clock generator circuit rather than the Memory Bank. This is accomplished with the Switch U10 and U11 A and B. When Bit 0 is programmed to the 1 level, Bits 1, 2, 3 and 4 select which of the clock characters are to be printed. Bit 1 selects the tens position of the month or hour, Bit 2 at the 1 level selects the units position of the month or hour. Bit 3 selects the tens position of the day or minute, and the Bit 4 selects the units position of the day or minute. Bit 6 programmed at the 1 level will force the clock into the Clock mode and Bit 7 programmed to the 1 level will force the clock to display the Date mode. To "print" the first digit (tens position of the hour) the following character would be in the selected address.

Bit 0 - 1; Bit 1 - 1; Bit 2 - 0; Bit 3 - 0; Bit 4 - 0; Bit 5 - 0; Bit 6 - 1; Bit 7 - 0; To select the digits of the time output, successive addresses in the Memory would be identical to the above line except the 1 in Bit position 1 would be replaced by A 0, and the 1 would be placed successively in Positions 2, 3, and 4. To indicate that a TTY message is ended, Bits 6 and 7 are both set to the 1 output.

Programming the Memories for C.W.

In the C.W. mode, all 8 bits of the Memory are used in coding the message. The message is layed out as shown in Diagram 1. Each Morse element is coded as a "1". A dot consists of one Morse element, a dash consists of three Morse elements. Inter-element spaces require one Morse element while intercharacter elements require three Morse elements. The spacing between words is equal to seven elements. All spaces are programmed as "0" level in the Memory.

The message is started at the address chosen for C.W. message. Bit 0 represents the first Morse element. I recommend at least one address (8 Bits) be left at the zero level to set off the C.W. message at the beginning and end of message. The first Bit of the Message is placed in the Bit 0 position. The next element is placed in Bit 1 position and so on through the Memory. When the Bit 7 is programmed, advance the address one count and continue the message starting at Bit 0 for that address. Progress through the entire message until the complete C.W. message is programmed. Then allow at least one full address as blanks (0) level, then code the end of message character. This character consists of the 3, 4, 5, and 6 Bits being coded as "1"s.

Construction

The easiest method of construction uses the circuit boards available from Electronic Development Inc. The plug-in clock and message generator board allow easy building and a great deal of flexibility in housing the circuitry. The photographs show one packaging possibility used by K1ZPX in a complete control console for his RTTY station. The original circuit was developed with hand-wired boards and performed very well. Adequate bypassing from Vcc to Ground 1 is one of the secrets in getting TTL logic to work. A .01 uf Disk Ceramic for each 4 TTL circuits is adequate.

Included in the control box is a Hoff-designed UT-4, power supplies for both units, and switching circuits to select up to 3 transmitters and receivers. There is one interconnecting cable to the ST-6 that contains all the control signals required for both circuits.

Testing

First, get the digital clock working. This is easy since there is very little circuitry for this unit. The message generator board is not required for this step. Be sure the voltages are proper to the clock. Check out each switch setting to be able to set the time and date, and watch it operate. The seconds should reset to "00" when the time is selected for setting. When the setting switch is placed in the run position, this counter should begin counting. When the count reaches 8, the Chip should switch to date mode. After two seconds in this mode, back comes the time and the second counter should now begin counting at 10. Just one word of caution. The Clock Chip is very sensitive to static discharges. As a result, don't solder on the circuit board or its interconnections with the Chip in the circuit. Take it out and place it in its shipping pad to act as a discharge preventor. Also use a socket for the Chip.

After the clock is working, remove it from its socket and insert the message generator into its socket. With power applied, check the output of the NE555 clock and set its frequency at 91 HZ. A counter is best for this, but a scope will do using 60 HZ as a reference signal. Place the C.W. Memory in its assigned location. This location will be consistent with the address "wired" into the address counter preload. The RTTY Memory must be plugged into the First Position on the Memory Bank. Pressing the C.W. start switch should force the address wired into the preload into the address counters U6 and U7. The counter should advance and the C.W. message should appear at the output pin. When the message is complete the reset character, Bits 3, 4, 5, and 6 at the "1" level, will reset the C.W. Latch (U17 A and B) off.

When this circuit is working, it is time to try the RTTY message. With the Digital Clock removed, the RTTY message should print with blanks in the place of the time and date digits. When the end of the TTY message is reached, the TTY reset character will force the C.W. Latch on and the C.W. message will be sent.

When the above circuits are checked, out it is time to check out the Time/Date De-multiplexer. First, using jumper wires, tie the clock digit lines to plus 12 volts. Then select the following clock segment lines and tie them to plus 12 volts. The digit shown should appear:

Set A	Seg B	Seg E	Seg F	Seg G	No.
1	1	1	1	0	0
0	1	0	0	0	1
1	1	1	0	1	2
1	1	0	0	1	3
0	1	0	1	1	4
1	0	0	1	1	5
1	0	1	1	1	6
1	1	0	0	0	7
1	1	1	1	1	8
1	1	0	1	1	9

When all of these tests are completed, shut down power and plug in the clock. When power is first applied, the clock will indicate all 8's. Try the message generator in RTTY mode and see that the 8's print properly. When they do, go ahead and set the correct time and date in the clock. Pressing the RTTY start switch should give you that desired message we all wanted when we started the project. Out will come the time and date, providing the programming of the Chip was correct.

This circuit has been operating for about 8 months now without a circuit failure. It has really been handy to use with the relay and WRU system at W1HAB. With an external programmer, the unit becomes a very versatile unit to send up to 8 different messages at the touch of a button. More on that in a later article.

Special thanks are due to WA1DQL who provided the motivation to do the design and to K1ZPX who was the guy to check out the prototype. Also to KZUSG for the photographic work. WA1RUA converted the early design sketches to the attached schematics.

Bibliography
Bell and Schmidt
QST November 1973

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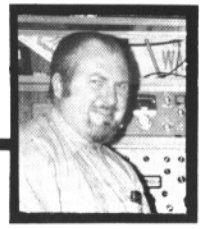
1975 RTTY ART CONTEST
Oct. 1 thru November 30, 1975

See last month for details.

RTTY-DX



JOHN POSSEHL - W3KV
Box 73 Blue Bell, Pa., 19422

Hello there . . .

With the lazy days of Summer behind us the cool Autumn weather seems to bring on a new vigor for activity, RTTY-DX not excepted. The last week end of September was the start of what will hopefully be a great season for the DXer. You may recall a few issues back we indicated the possibility of activity from Malty by Jeff, G3YDR. Unfortunately, due to problems beyond his control, Jeff was not able to get on and in August was back in the UK for a short holiday. At that time he indicated to us that most of the problems had been resolved and that he would be QRV soon after returning to the island. On 26 September the world was greeted with the first RTTY activity from Malta with good signals from 9H1ER. This call is issued to Jeff's friend and co-worker, Alex, G3YDQ, who had all the equipment available and between them got the station on the air. Both boys took turns operating with the calls 9H1ER and 9H1EL/A. Early keyboard garble was eventually cleared up and all areas of the world were contacted in the first few days of operation. The boys handled the tremendous pile-ups like real contest pro's and had stations stacked up in a holding pattern waiting to get a QSO. This prevented, in most cases, the usual bedlam of everyone calling at the same time as a station was being worked. QSL cards are not yet printed and the boys ask your patience. They recommend sending your cards to 9H1ER or 9H1EL/A c/o Malta Amateur Radio League -

P.O. Box 575
Valletta, Malta

In the midst of all this frantic activity another block buster appeared from across the seas in the West Indies. Sunday, September 28, 1730z commenced the very first RTTY operation from the Island of Antigua. Mickey Campbell, VP2AR, got his Creed 7B clacking and several QSO's were made in the USA and Europe. Not too much more information at this time as this column was about to go to press but surely by this time many more contacts have been made. Cards go to . . .

P.O. Box 550
St. John's, Antigua West Indies

With the seasonal change in propagation occurring as the cooler weather approaches the Far East and South Africa have been coming into this area again in the morning hours, the former short path and the latter long path, at about 1200z. Jan, ZS6BBK, tells us that there may soon be renewed RTTY activity from Gough Island (ZD9), and from Marion Island, ZS2MI. There has not been any activity from either of these areas on the ham bands for almost two years so those of you that missed them last time will have another opportunity. In the past these stations have used 50 baud speed and the standard commercial shift of 425 hz inverted.

Gin, JA1ACB, passes the good word that a printer will be on its way to Lord Howe Island during the first week of October. The next order of business is to somehow obtain a TU and AFSK so it may be a little while yet before the action starts from there. If anyone can help in this matter get in contact with Gin Cecil, VS6CL, is reported to be very active but is running low power. However his location is favorable to North America, so don't pass up the weak ones. Kei, JD1ABH, is active now from Marcus but using only a whip antenna. A beam will soon be installed but probably not in time for the CARTG Contest.

DU1POL and DU1PT provide regular activity from the Philippines and Paul, KA2PJ, is a new station from Japan and is located at Sagami Bay, south of Tokyo.

Mac, ex-VK9MC/P29MC, is now VK3CCC so that ends activity from Papua Territory for the time being. Nothing heard from George P29GG on New Guinea lately either.

We have received word that Pete, WA60IR, and formerly K25PW, is now located at Dhahran, Saudi Arabia working for ARAMCO waiting for licensing problems to be resolved before putting RTTY on all bands from this rare spot. Collins gear, printer, and TU are already there. When activity starts the QSL manager will be WA6AHF.

We congratulate the following stations who recently received the RTTY Merit Award as indicated.

Worked All States Nr. 3 Art Bradley - K4YZV
W.A.C. Nr. 1 on 7 MHZ Tech. Univ. of Darmstadt - DLØTD
W.A.C. Nr. 15 on 14MHZ Len Bjureblad SM6AEN
W.A.C. Nr. 3 on 21 MHZ Len Bjureblad SM6AEN
Endorsement Plate for DXCC - RTTY Plaque
130 Countries Confirmed - Charlie Latham - W5QCH
140 Countries Confirmed - Bob Deseck - ON4CK

It took Art from 1968 to 1975 to collect all the cards for WAS, a feat every bit as difficult as DXCC. The boys at DLØTD did a great job in getting the very first all Forty Meter WAC. Now who will make it on 80? This coming Winter along with the several DX Contests occurring should be a good time to try.

The Associazione Radiotecnica Italiana (ARI) and member of the I.A.R.U. announces the constitution of the ---

Italian Amateur Radio Teleprinter Group -

- to represent the Italian Radio Teleprinter Amateurs at the International level.
- to strengthen the bond of International friendship and cooperation.
- to further the interest of amateur teleprinter operation in the world.
- to assist its members with technical advice and information.
- to publish RTTY articles and news in official magazine "Radio Rivista"
- to increase contest and DX activity
- to promote annual meetings and conventions between amateurs in Italy and the world.
- to contribute to the benefit of novices and amateurs having practical or technical problems.

For further information contact Lamberto Rossi, I5RDL, RTTY Manager of ARI, P.O. Box 50, 56021 Cascina, Italy.

We have been advised that South African RTTY Amateurs are also in the process of forming a Group. More details as they become available.

Dave G3YYD, is an 80 Meter RTTY DX'er and is available for skeds on that band. Dave points out that the 3610 - 3630 khz segment used mainly in North America is in the midst of SSB activity in Europe and other parts of the world. Most all activity on 80 is centered around 3590 plus minus QRM. So Statesiders would be wise to tune that area particularly in contests.

Carl, OE5CA/YK, is now back in Austria. Another amateur is in his place, OE6DK/YK, but we are not yet certain if he gets on RTTY in the ham bands.

Larry Filby, K1LPS, has retired from the U.S. Navy and after his last tour of duty in Italy is now back in Vermont and in process of getting a station going again. As his QTH is not in the call book we give it to you as . . . RFD #3, Barre, Vermont 05641.

K6WZ reports that Gil, CP5EE, active and located at . . . P.O. Box 904 Santa Cruz, Bolivia. A rare country on RTTY.

North Ireland is quite active these days and one day we printed GI3TZF, GI4AIO, and GI4AHP, engaged in a three way QSO. Some other stations printed in random tuning have been WB4MIZ/HK3, HK3PB, LU1CAB, LU7DDG, OE9AHI, OE6RI, OH6JG, UK3DAA, UW3HQ, KL7HFV, KP4JM, LX2FD, EA3AHM, LA5KB, LA6XO, HA5KFU, HA5KKP, HAØKDA, GM3WGM, ZE1CE, TU2GA, 4X4MR, 5U7BA.

Next month we will publish the RTTY-DX Honor Roll so please get your totals of Worked/Confirmed to me as soon as possible and thanks to those that have already done so.

*** 73 de John

VHF COLUMN ???

Unfortunately, Ron received only one short news item about VHF activities the past month. With increasing activity around the country, especially on FM, it seems to us that communication between different areas is more essential than ever. Ron and the JOURNAL are more willing to spread any news received. But first we have to have the news. Send information direct to Ron and let's have a full column next issue.

Write to ---

Ron Guentzler, W8BBB
212 Grandview Blvd.
Ada, Ohio 45810

*****

Different Type of Brag Tape

MELVIN LEIBOWITZ,W3EKT
25 Holley Hill Rd.
WILMINGTON,DE. 19809

Brag Tapes are fun for the newcomer to RTTY but can be tiresome to older hams with the time they consume.

I realized that although I consistently work certain stations, I have only a vague idea of the equipment they use. Many of us keep a 3x5 index card file of the stations we work but few of us take the time or trouble to transpose an entire brag tape to the index card. I usually enter the name, call, date and QTH along with any unusual items.

I have accordingly revised my "brag tape" to a format that will fit on a file card as per the enclosed sample. It is surprising how much information that can be given in a minimum of time and space.

Many other stations have adopted this idea and the information presented often provokes a topic for discussion. I hope that others will see fit to adopt this format. It certainly has its good points without many of the objections to the conventional brag tape.

W3KET-MELVIN LEIBOWITZ,25 HOLLY HILL ROAD,WILMINGTON,DELAWARE 19809.BASIC STATION 28KSR-28RT TYPING REPERF AND TD COMBINATION. 15KSR-14TD DRAKE R4C RECEIVER,ST6 TU. TRANSMITTER HOME BREW SOLID STATE HETERODYNE EXCITER, HEATH HW16 DRIVER FOR PAIR OF 814'S IN GROUNDED GRID 250WATTS OUTPUT. 130' END FED ANTENNA FOR 80 & 40 METERS.GROUND PLANE VERTICAL FOR 20 METERS ACCESSORIES: HEATH HO10 SCOPE AND IB1100 COUNTER. DRAKE W4 WATTMETER. OTHER GEAR: COLLINS 51J, R390 & 392 RECEIVERS. KENWOOD TS511 SSB TRANSCEIVER. MOTOROLA R43GGB AND DRAKE TR22 FOR 2METER FM.RACAL RA17C RCVR. AGE IS 52 AND AM SINGLE. AM SEMI-RETIRED AND WORK AS ELECTRONIC TECH PART TIME. ADVANCED CLASS LICENSEE SINCE 1944. MEMBER ARRL, QCWA, NAVY MARS CALL IS NØEYF. TNX QSO ES HOPE CU AGN SOON 73, MEL

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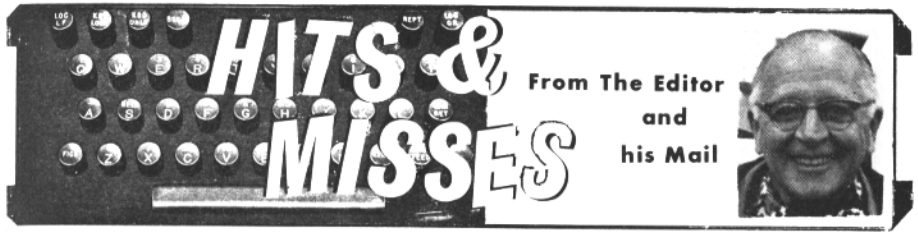

Last month we attended the ARRL convention held in the Sheraton Conference Center near Washington. We were lucky, arrived a day early and got a room, unfortunately 60% of the others with confirmed reservations in their hands were turned down. To make things worse, the location is way out in the boondocks and other accommodations were difficult to find and very confusing to reach. The food situation was terrible, you ate when the one restaurant was open or you didn't eat. $3.75 for breakfast, $3.50 for lunch and $7.50 for dinner - no a la carte, just a buffet. On Saturday you did have a choice of a cup of coffee in a paper cup for 35¢ and stand up and drink it. Why this Sheraton Hotel was ever picked I will never know and from the angry people I would guess they are still hearing from irate customers.

However, the convention was good otherwise. We moderated the RTTY session and were again reminded of the lack of communication among RTTY fans, especially on VHF. Ron is more than happy to print information on frequencies, shifts, speeds etc. in his VHF column. Drop him a line now on aby activity in your area. It is not likely that national standards can be settled but it would help to know what the others are doing.

***

Mini-Computers are definitely popular. We can tell from our letters and talking to fellows at the ARRL convention. ASCHII code is now allowed for stations working Oscar 6 and 7, get permission first, but there are problems with this code on RTTY with present equipment, so don't look for a sudden change even if it is allowed. We can't help but comment however, that RTTY is probably ahead of all other modes as far as experiments and new innovations are concerned, and the innovators haven't had to upgrade their license either. ***

Dear Dusty:

I am saddened to report that Carl Thrasher W2SAS became a silent keyboard on September 9th, 1975.

Carl has been very active on RTTY for a number of years, especially on MARS. Besides his RTTY activity, Carl was known as the fellow that always had time to help the other fellow get started, many times supplying needed parts as well as know-how. I am sure everyone that had any contact with Carl will join me in saying RTTY lost a wonderful person.

de Mack, W2ZPW

BACK ISSUES -

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Mini-Computer Control of RTTY Station

Part 1.

TOM ASCHENBRENER, WA9EXS/5
6165 VERDE VALLEY
DALLAS, TX. 75242

The following words are a brief description of the configuration and control logic of WA9EXS/5. This station is completely controlled and monitored by a T.I. 980A mini-computer (CPU) and was assembled over a 1.5 year span from commercial surplus equipment. The software controls the whole RTTY station. Essentially all logic that determines the operating modes of the station is done by the CPU. The hardware block diagram is shown in Fig. 1 to give you an idea of the set up. The majority of the work went into the software area and hence this area consumed most of the time. I'll start this discussion with a brief description of the methods used to enable the CPU to control and sense its external devices such as the control console (a model 35KSR), etc. and then describe the finished RTTY stations operational characteristics.

There are two major methods that are used to get information in and out of the CPU; interrupt and scanning. Interrupt is the mechanism used in most large CPU's and is the second best method of communication with the outside world (the first being Direct Memory Access channels). Interrupt is the process by which an external device forces a specific set of instructions to be executed and the normal set is temporarily suspended. Scanning is just as its name implies. Periodically the CPU checks each of its devices looking for input or output from the device. There are two devices that use the interrupt mechanism of the CPU; these are the M35KSR control TTY and the "Real Time Clock (RTC)". Hardware takes care of the serial/parallel (and vice versa) conversations needed to interface the M35 with the CPU. This hardware interrupts only when a full character has been processed and another character is needed from the CPU. (This is the function a U-ART was originally designed for.) Hardware was used for this because the code (ASCII) and speed (100 WPM) never change, thus a reduction in program logic was realized. The second interrupt device, the RTC, utilizes a 10 KHz Xtal osc that is divided down to 1 KHz (1MS). This 1 MS signal then interrupts the CPU 1000 times a second allowing the CPU to count seconds, minutes, hours, and days.

The second I/O method, scanning, takes care of the transceiver and T.U. The transceiver is checked each 1.0 MS for the busy/idle status of the currently selected radio channel. This information is needed so the CPU will not turn the transmitter on while there is another user on the channel. The transmitter is also checked each 1.0 MS for possible T/R frequency updates as input from the M35 keyboard.

The T.U. is controlled entirely by the CPU scanning. The CPU does the serial/parallel (and vice versa) conversations of the incoming and outgoing text to the T.U. This is done for a number of reasons, the most obvious is that this allows the speed

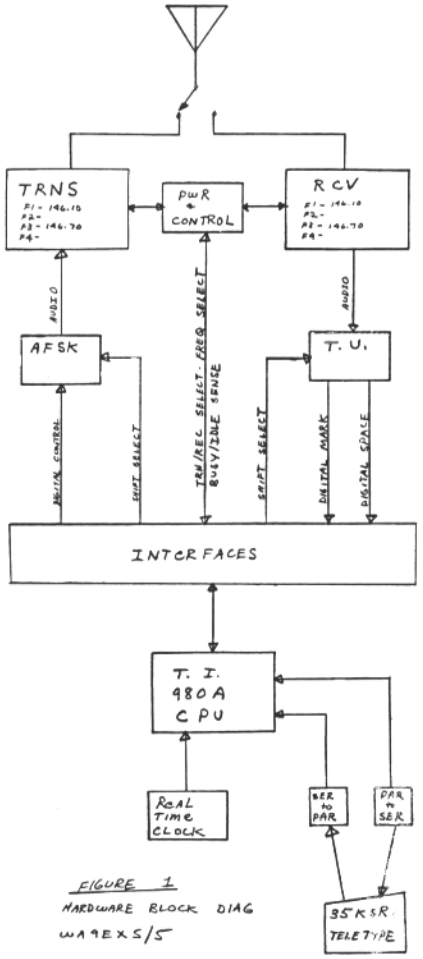

FIGURE 1
HARDWARE BLOCK DIAG
WA9EXS/5

of incoming and outgoing text to be changed at will. 100 WPM and 60 WPM is easily accommodated by typing one command on the M35 keyboard. The largest use for the software doing serial/parallel conversation is that it allows me to do experimentation on digital filtering of the incoming signal to increase the noise immunity of the system. For instance at 60 WPM the bit time is 22 MS. The TTY machine mechanically samples the pulse only once such that a noise hit at the sample time results in a wrong bit being assembled. I am currently experimenting with sampling multiple times and then averaging the results (digital filtering) to form each bit. This has been tested on noisy signals with good results and more work will be done on this when the 20 meter equipment is back on the air in 2-4 months. For sending TTY signals, the CPU merely commands the AFSK oscillator to send a space (or mark) tone for the appropriate number of milliseconds to make up each transmitted character.

The following is a description of the two major areas of software logic. The first is the logic needed for local printing and station control. This section of logic performs all code conversations from ASCII to Baudot and vice versa. Also handled is the required speed conversion and associated character buffering for the "UP" and "DOWN" conversion cases. The buffers are currently set at 400 characters each and are changeable by program re-assembly. The majority of this section of logic is for the "local command decoder". Commands to control the station status and configuration can be typed on the M35 keyboard as follows:

(A) /TRN-**X** Where X can be 1, 2, 3, 4 depending on which transmitting frequency is desired in the transmit mode.

(B) /RCV-**X** Same as TRN except for receive mode.

(C) /SFT-**X** Where X can be the character "N" for 170 Hz or "W" for 850 Hz shift.

(D) /SPD-**X** Where X can range from 2 WPM approximately 700 WPM.

(E) /AUTO-**X** This puts the local printer in SEL-CALL to respond only to "WA9EXS DE".

(F) /OPEN Allows the local printer to copy all incoming test from the radio channel.

(G) /TIME Allows the current time to be input to the CPU.

The following are single character commands for convenience in use.

(H) "X-ON" Turn transmitter on and go to transmit mode.

(I) "X-OFF" Turn transmitter off and go to receive mode.

(J) "SOH" Send the station ID and time to the radio channel.

For example, the following commands are typed to use the station with the local repeater here in Dallas.

/TRN-1 Set transmit frequency to 1 (crystalled for 146.10)
/RCV-3 Set receive frequency to 3 (crystalled for 146.70)
/SHF-N Set shift to 170 Hz
/SPD-22 Set to 60 WPM
/OPEN Set printer to non-sel-call

Now each time the X-ON character is typed, the transmitter comes on and automatically switches to 146.10. When the X-OFF key is depressed the receiver is enabled on 146.70.

To transmit and receive direct on 146.70 all that is needed is to type:

/TRN-3

This sets it so the transmitter uses 146.70 (the third freq.) as its output.

The second major area of software is one that I call "remote services". These consist of such things as any station of the circuit being able to get the time, leave messages for another station or query for messages for himself.

For example, if any station types "WA9EXS?" My station will wait for the channel to go idle and then respond with the current time and date. This is used to check if I am on the air or to put time into a QSO between two other stations. For example if WB5LID and WB5LHL are in a QSO, WB5LHL may have time sent after one of the transmissions by typing:

WB5LID ES WA9EXS? DE WB5LHL

This will cause my station to respond with:

10:30:47 07/07/75

as soon as the channel goes idle (WB5LHL dropping his carrier in this case). This feature is useful for a message left via auto start when the sending station doesn't have RTTY TIME facilities of his own.

CONCLUDED NEXT MONTH

***

VIRGINIA RTTY NET

The Virginia Radioteletype Net meets on 3625 kHz at 2330Z Daily. This net was reactivated in June. Perhaps you have RTTY capabilities but haven't checked in as yet. Do it now! RTTY can play an important role in emergency situations by providing methods for relaying volume health and welfare traffic. Chris Galfo, WB4JMD, is the net manager.

***

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SALE: FEMALE JACK Panels containing 144 jacks to a 19 inch panel. . .$14.00; Female jack panel containing 24 Jacks, Fahnestock type 218A. . .$5.00; Rack cabinets 24 inches wide 82 inches high 26 inches deep, open front and rear door, Blue with Aluminum trim $50.00; Tuning forks 96.19 vps or 120 vps unused $2.00 each; Mite motor, type PD/82U 115 VAC 60 Cy Unused $28.00; TT socket wrench 7/16 inch on 12 inch handle 1.00; Kleinschmidt allen wrench on 12 inch handle 1.00; Gears for model 14 T.D. with 1800 rpm syn motors 60 wpm unused $8.50 Set; Model 14 Typing Reperf. 60 wpm gears $7.75; Perforator tape 11/16 inch, Box of 10 rolls 4.90 or case of 40 rolls $14.90; Red and Black ribbons nylon, 6 for $6.00 or dozen for $9.00; Roll paper $2.00 per roll; Copyholder for model 28 printer unused $3.95; Distortion test set, type TDA-2 containing scope $39.00; Model 15 platen unused $5.50. Also available model 14, 15, 19, 32, 33 machines. Send us a list of your Teletype requirements. Atlantic Surplus Sales Co. 3730 Nautilus Ave., Brooklyn N.Y. 11224 Tel. (212) 372-0349

EXPERT REPAIR WORK. Any Teletype Corp. model. Repair work $15.00 plus parts no matter how long it takes. Rebuilding by estimate. Write K9WRL or phone (312) 392-2358, ask for Neil. Chicago Area.

HAL COMMUNICATION CORP: Replace those machines with the HAL electronic RTTY RVD-1005 Visual Display Unit and DKB-2010 Dual Mode Keyboard. You'll have a quiet, reliable system allowing you to transmit and display Baudot code at all four standards speeds. Full details available in our data sheets. HAL COMMUNICATIONS CORP., Box 365RJ, Urbana, Illinois 61801. Phone 217-367-7373.

WANTED: 32 ASR's COMPLETE. Must have UCC5, UCC6, or UCC18 all control units. Up to $400.00 depending on condition. Contact DCEB, Inc., 1878 Thunderbird, Troy, Michigan 48084, 313-362-0470.

PC BOARDS FOR THE UT-4 double-sided, thru hole plated, plug-in edge connectors. Write for details. AK2 kit $19.95. XK-2 xtal AFSK kit $34.95. 8 digit 250 MHZ frequency counter completely assembled and ready for use $250.00. Electronic Development, Inc. P.O. Box 951, Salem, OR. 97308. (503) 399-9660.

HAL COMMUNICATIONS CORP. is closing out the RKB-1 RTTY Keyboard. A limited number of unassembled units are available. Write for details of this offer. HAL COMMUNICATIONS CORP., Box 365RJ, Urbana, Illinois 61801. Phone 217-367-7373.

CLASSIFIED ADS-

HAL COMMUNICATIONS CORP. announces the availability of the RVD-1005A ASCII Video Display Unit. Serial or parallel data input, 110 or 300 baud. loop or RS 232 C levels. Request data sheet for full information. HAL COMMUNICATIONS CORP., Box 365RJ, Urbana, Illinois 61801. Phone 217-367-7373.

TELETYPE MODEL 28 KSR's: Good working condition, over 200 available at $350 each. Call: Henry Holder, (817) 420-3021.

WANTED: Model 32 or 33 TTY. Any quantity, any condition for cash or will trade. Call: Ken Payne, (214) 252-7502.

DRILLS - DRILLS - DRILLS Carbide and high speed steel for PC board work. Send SASE for Information. Bob's Electronics Box 393 Bay City, MI 48706.

TECH MANUALS -- $6.50 each: TT63A/FGC, CV-591A/URR following manuals $8.50 each: TT-47/48, R-388/URR, USM-50, 51J4, FR114/U; following manuals $10.00 each: R390A/URR, SRR-11, 12, 13, USM-32, URR-35C. Special manuals (limited quantity): TM-03315-15 TGC-14/14A $10, Navships 95898 TT-298A/B, TT-299A/B $12.50, Navships 0967-170-8010 UGC-38, 40, 41 $12.50. Model 14 TD manuals $2.50 each. Thousands more in stock. Send 50¢ (coin) for large list. W31HD, 7218 Roanne Drive, Washington, DC 20021.

MAGNETIC MEMORY DRUM manufactured by Magne-Head, division of General instruments. Hawthorne, Calif.; Model 8C-161. Size 17 inches x 14 inches x 12 inches, weight about 40 pounds. Drums appear to be in excellent condition complete with connectors. Price $275.00 each. Magnetic memory drum cabinets 24 inches x 82 inches x 26 inches complete with Drum Model 8C-161, 4 power supplies providing plus and minus 12 volts, printed circuit cards, and blower unit. Cabinets appear to be complete and in very good condition. Magnetic Memory Drum with cabinet. . .$390. Photo available for $1.00. Atlantic Surplus Sales Co., 3730 Nautilus Ave., Brooklyn, N.Y. 11224 Tel: (212) 372-0349

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1000V 1 amp diodes 10/$1.00. Many other parts for projects. Write for free list. NuData Electronics, 104 N. Emerson St. Dept. C, Mt. Prospect, IL 60056

UT-4 COMPONENTS. All items still available - See prior Journal ads. GI-AY-5-1013 UART still $8.00. Fairchild 33512 FIFO $13.00. 2/$25. Note COMPUCODER builders (QST June 1975): MC1408L6 is lower-cost plug-in compatible replacement for the MC1408L-7 specified. Peter Bertelli, W6KS, 5262 Yost Place, San Diego, CA. 714-274-7060.

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HAL COMMUNICATIONS CORP. announces the XTK-100 AFSK oscillator for those applications requiring the extra stability of crystal controlled tones. Tone pairs may be anywhere in the range from 1000 Hz to 3300 Hz with high or low tone pairs standard and others optional at extra cost. Constructed on a 3" x 6" PC board with pin-out identical to the AK-1 so that the XTK-100 is a direct plug-in replacement for the AK-1. Request data sheets for full details. HAL COMMUNICATIONS CORP, Box 365RJ, Urbana, Illinois 61801. Phone 217-367-7373.

COMMERCIALLY BUILT ELECTROCOM RTTY CONVERTER. Switchable filters for 170 or 850 shift. Built in scope display, along with Electracom built in AFSK keyer. Excellent condition and all manuals. I have no use for it and it is only sitting in my basement. Somebody make me an offer, you might be surprised. Ed. Trego, W9WKC, 856 E. Market St. Hoopeston, IL. 60942. Phone (217) 283-6914

CIRCUIT BOARDS: Universal Frequency Standard, February 1974 Ham Radio. The best standard you can build. Self contained power, up to eighteen output frequencies for markers, net frequency spotting, counter time bases, etc. Epoxy plated undrilled board with diagram, parts list, picture. Also CW IDer in October 1974 Journal. Includes power, side one, 128 bit reprogrammable memory, same info included as with standard. Either board $8 postpaid First Class. Bert Kelley, 2307 S. Clark Ave., Tampa, Fla. 33609

MODEL 15 KSR's $35.00, 19KSR's with perforators, character counter, TD, Power supply, table with connectors, $75.00. Patch panels with 80 jacks $25.00. Milliampere meter units $10.00. Panel rack cabinets $25.00 and $50.00. Xeroxed copies of 15, 19, and 28 manuals $5.00 Kleinschmidt TPR-311 complete $25.00. NO list so send SASE for reply. Assorted tables and much miscellaneous teletype equipment (cheap). (312) 752-1000 anytime. Goodman, 5454 South-Shore Drive, Chicago, IL. 60615.

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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 20 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, Illinois 61801. Phone 217-367-7373.

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