DX - Cont.

CONTINUED FROM PAGE 15

RTTY from ZD9GC on Gough Island became a solid fact on the week end of February 17-18. In spite of fierce CW QRM from the contest in progress at the time he was real solid copy on the East Coast of the U.S.A. The speed was 50 baud and the shift at 425 hz. Gerhard, ZS3B did a fb job of getting things to go in an orderly manner and as a result several of the boys on frequency were able to put this rare prefix in their logs. Tune your receivers around 14085 at about 2000z on week ends and you may be in for a bit of a surprise.

By the time you receive this there may still be a few days to go before the BARTG Contest starts. At this time we can only advise you not to miss it, especially you DXers that are close to 100 countries worked. I am sure that you will find at least one new one in the pile-ups.

Wolf, DL8VS, and DX Manager for the GARTG writes to say that Carl, HB9P, and his group will again be active from Liechtenstein during the WAE Contest April 28/29. The call sign will again be HBØD and this time Wolf hopes to be one of the operators. This will be a good opportunity to contact this rare prefix if you missed the previous DXpedition.

The 7th U.S. call area seems to be in control of the WAC Award so far this year. With our congratulations, the second to be issued in 1973 goes to---

Nr. 207 James H. Barrows W7BCT

From time to time and as space permits we would like to dig into some of the back issues and extract a few choice items from the DX column written at that time. It will let the newcomers in on what went on at that time and let the oldtimers say to themselves, "I wonder what ever happened to that fellow".

WVØWT, John, quite active from Crete. D14IA reports that CN8HP will put Morocco on the air momentarily. Cas, HL9KK received permission for RTTY operation look for him on 14090 and 7040 kc. YV 1EM coming thru on 21 mc. with fine signals. TA2TC will soon be QRV.

73 de John

*****

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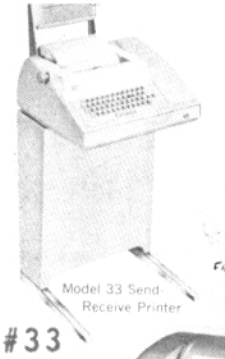

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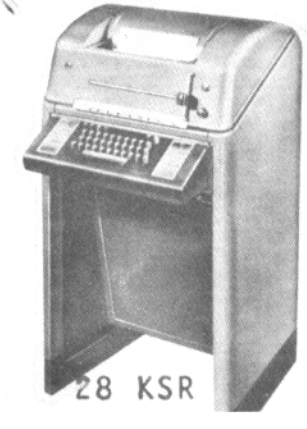

CONTENTS

5th WAEDC DX RTTY Contest - April 28-29

The Deutscher Amateur Radio Club (DARC), the sponsor of the RTTY WAEDC, and the Deutsche Amateur Fernschreib Gruppe (DAFG), the manager of the RTTY WAEDC, have the honour to invite RTTY amateurs all over the world to participate in the 5th RTTY WAE DX Contest 1973. - This contest is always held on the last weekend of April.

1. CONTEST PERIOD:
   Apr.28,0000 GMT - Apr.29,2400 GMT
   (cf. also 5.: rest period)
2. CONTEST CALL: CQ WAE de ...
3. BANDS: All bands 3.5 thru 28 MHz
4. CLASSIFICATIONS:
   Single operator, single tx
   Multi operator, single tx
5. REST PERIOD: Only 36 hours of operation of the 48 hours are permitted for single operator stations. The 12 hours of non operation may be taken in one, but not more than 3 periods anytime during the contest. The periods need not be equal but must total a minimum of 12 hours and must be clearly indicated in the log.
6. EXCHANGE: a)QSO-Nr. b) RST.
7. POINTS: Each 2xRTTY contact with stations within one's own continent will count 1 point, with stations outside one's own continent 3points. Contacts of non-Europeans with Europeans will count 5 points for non-Europeans but 3 points for Europeans.
   Each station may be worked once per band.
   Each QTC - given or received - will count 1 point.
8. MULTIPLIER: The multiplier is determined by the number of countries worked on each band.
   The European Country List and the latest ARRL country list will be used. In addition each call ares in the following countries will be considered a multiplier: JA, PY, VO,VE VK, W/K, ZL, ZS, UA9, UAØ.
9. SCORING: The final score is the total QSO points plus QTC points multiplied by the sum total countries from all bands.
10. QTC-TRAFFIC: Additional point credit can be realized by making use of the QTC traffic feature.
    A QTC is a report of a QSO that has been taken place earlier in the contest and later send back to another station. The general idea being that after a number of stations has been worked, a list of these stations can be reported back during a QSO with another station. An additional 1 point credit can be claimed for each station reported.
    a)A QTC contains time, call and QSO number of the station being reported. i.e. 1300-DJ3KR-50. This means that at 1300 GMT you worked DJ3KR and received number 50.
    b) A QSO can be reported only once and not back to the originating station.
    c) Only a maximum of 5 QTCs to a station is permitted per band. You may work the same station several times to complete this quota. Only the original contact, however, has QSO point value.
    d) Keep a uniform list of QTCs sent. QTC 3/5 indicates that this is the 3 rd series of QTCs and that 5 QTCs are reported.
11. CONTEST AWARDS AND CLASSIFICATION OF WINNERS:
    There are 3 classifications:
    a) up to 200 watts D.C. input
    b) more than 200 watts DC input
    c) S W L 's
    Certificates to the highest scorer in each classification in each country and call area mentioned above. Continental leaders will be honoured and 2nd and 3rd place certificates will be given in areas of sufficient participation.
    There is no minimum of operation time, but a reasonable score is required for an award.
12. SWL - SCORING:
    For points, multiplier and scoring confirm 7., 8., and 9.
    Each station may be reproted once per band and 5 QTCs per station per band may be reported.
13. DISQUALIFICATION: Violation of the rules of the contest, or unsportsmanlike condukt, or taking credit for excessive duplicate contacts will be deemed sufficient cause for disqualification.
14. LOGs: Logs must contain: bands, exchanges send and received, call signs, QTCs sent and received, points, multiplier.
    Use a separate log for each band. Enclose a summary sheet showing the scoring, rest period, classification, your name and adress in BLOCK LETTERS !!
15. DEADLINE: June 10th, 1973
16. The decisions of the Contest-Committee are final.

Mailing adress: WAEDC-Committee
D-8950 Kaufbeuren
Postbox 262
West Germany

*****

Teletype Message Generator

COLE ELLSWORTH,W6OXP
10461 Dewey Drive
GARDEN GROVE, CA. 92640
and
W.G. MALLOCH- W8KCQ

INTRODUCTION

For a number of years, the users of teletypewriter services have relied on an automatic response from an interrogated teletypewriter terminal to confirm completion of a desired traffic circuit. The interrogated terminal, upon command, generates a station identification code or message, for instance, "DE KX6IT". This message is usually generated by an electro-mechanical device consisting of a number of coded bars on a rotating drum momentarily closing electrical contacts. With the advent of low-cost, multifunction integrated circuits, it becomes feasible to generate the message using digital logic with a resulting increase in reliability and ease of maintenance coupled with a much lower cost of acquisition and installation. Moreover, some electro-mechanical message generators are mechanically peculiar to a specific type or family of teletypewriter machines whereas this method is directly applicable to any machine or circuit of any family of teletypewriter machines using compatible signaling codes.

TELETYPEWRITER SIGNALING CODE

The presently employed Baudot (Murray) teletypewriter code is a binary code, that is to say, a two-state condition such as the presence or absence of current. As applied to most teletypewriter circuits, it is a condition of current flowing in a loop (referred to as a "marking condition" or Mark) or no current flowing in the loop ("spacing condition" or Space). Each character printed or machine function generated on a teletypewriter is determined by the sequence of mark and space pulses received by the machine. The format of the signaling code depends on the maximum required number of different characters to be printed or functions to be performed by the machine. The two most common formats in use are the 5-level and 8-level formats. The term "level" refers to the number of unit intervals or pulses in the intelligence determining portion of the code. Each unit interval is either a Mark or Space as determined by the code for the desired character. The 5-level code has 25 or 32 character permutations available and the 8-level has 28 or 256 permutations available.

In order to keep a transmitting machine and a receiving machine in synchronization a start pulse is placed in front of the group of intelligence pulses. A stop pulse is placed at the end of the group of intelligence pulses to complete the synchronization function. The start pulse is always a space condition and is the same pulse width or unit interval as an intelligence pulse. The stop pulse is always a mark condition and its minimum duration may be up to 2 unit intervals.

The 5-level code may be divided into three subcode types depending on the width of the stop pulse. For example, a 60 word-per-minute (wpm) 5-level code character includes the start pulse and five intelligence pulses each of which has a pulse width of 22 milliseconds. Each 22-ms pulse or bit may be referred to as a "unit". If the stop pulse in this group is also 22 ms wide then we call the group a 7-unit code. If the stop pulse is 31 ms wide then we call it a 7.42-unit code. The 7.42-unit code is the most common 5-level code. Another code in use is the 7.5-unit code in which the stop pulse is 33 ms wide. The intended effect of the longer stop pulse is to decrease the amount of message garble under marginal operating conditions. However, the longer stop pulse has the undesirable effect of slightly decreasing the circuit speed capability.

FUNCTIONAL DESCRIPTION

The design objective was a simple, semi-programmable, all-electronic message generator using low-cost TTL IC logic packages and meeting the following requirements:

1. The required serial message format is: LTRS, Space, De, Space, K, X, FIGS, 6, LTRS, I, T, Space, CR, LF.
2. The message generation cycle is to be initiated by an external momentary contact closure and/or a TTL compatible negative-going pulse.
3. The device is required to be self-stopping at the end of the message generation cycle.

4. The device keyer output is to be compatible with any normal TTY loop without regard to loop polarity or voltage level.
5. The device's message is to be field programmable; either by means of plug-inboards or minor hardwire changes, or both.

Figure 1 illustrates the operation of the device at a basic functional block diagram level. Figure 2 is the detailed logic diagram schematic.

Block 1. SYSTEM CONTROL, IC-6. When the circuit is in a idle state, IC-6 generates a signal that inhibits Block 2 clock pulse generation and sets the 8-unity Bit generator and Function Gate generators in Block 3 and 4 to a "cleared" condition. On receipt of an external start signal, System Control removes the clock Inhibit and System Clear signal. The device now begins the message generation cycle. At the end of the message, Block 4 generates an end-of-cycle signal which returns Block 1 to idle status, thereby terminating the message cycle.

Block 2. CLOCK, IC-1. This IC is connected as a gate-controlled pulse generator. The time between the negative-going edges of two adjacent pulses is set to equal the desired unit or bit width, i.e., 22 ms for a 5-level 60 wpm machine.

Block 3. TTY 8-UNIT BIT GENERATOR, IC-2, 3, 12. The clock pulse from IC-1 is fed to 4-bit binary counter IC-2. The output of the binary counter is decoded by 1 of 10 decoder IC-3. This decoder

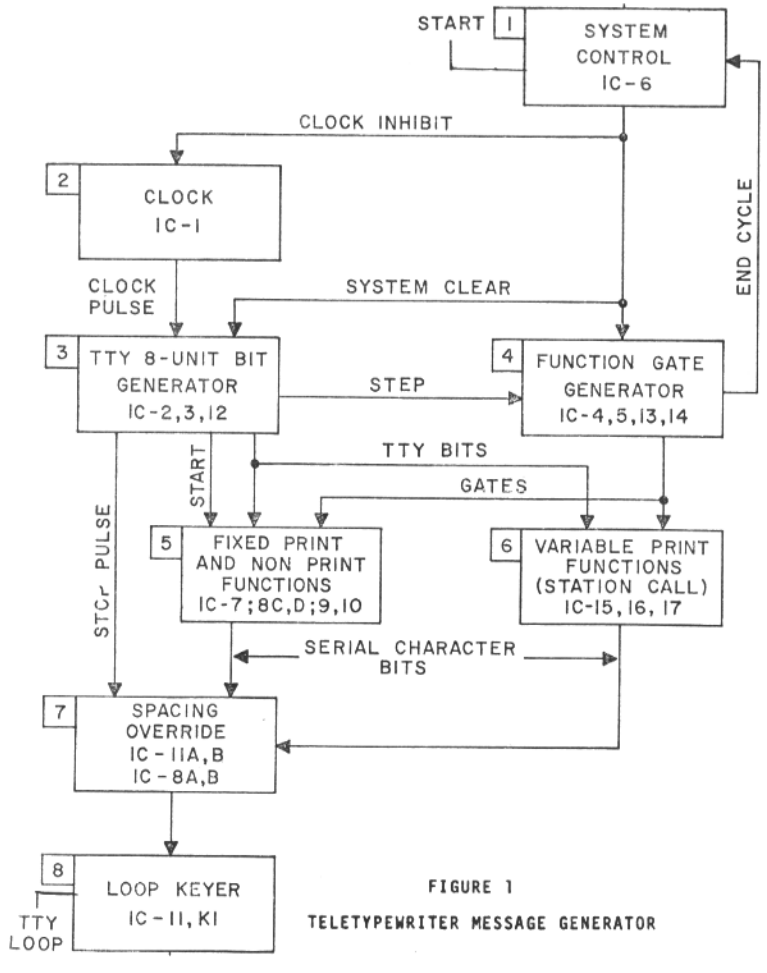

FIGURE 1

TELETYPEWRITER MESSAGE GENERATOR

sequentially produces 8 unit bits each character generation cycle. In order of generation they are Start, 5 intelligence bits, and Stop which is 2 units in length. At the end of the 7th unit bit (half way through the Stop pulse) a step pulse is applied to Function Gate generator Block 4. Complements of the bits are available through Hex inverter IC-12. An 8-unit code is used instead of the standard 7 or 7.42-unit codes in the interests of circuit simplicity and minimum package count.

Block 4. FUNCTION GATE GENERATOR, IC 4, 5, 13, 14. This block is functionally similar to Block 3. The decoder section is a 1-of-16 decoder. The active function gate is advanced to the next decoded line each character generation cycle of Block 3. The last (16th) function gate pulse is inverted and applied to System Control Block 1 to terminate the message generation cycle. IC 13 and 14 invert all function gates to match character coding logic.

Block 5. FIXED CHARACTER IC-7, 8C, D, 9, 10. These 2-input and 3-input gate ICs combine the active function gate from Block 4 and selected intelligence bits from Block 3 to form the desired fixed print and non-print TTY functions.

Block 6. VARIABLE CHARACTER, IC 15, 16, 17. This block is functionally similar to Block 5; combining function gates and selected bits to form the desired printing functions. It is labeled variable as this is the area of the circuit that can be programmed for different station call signs by use of plug-in PC boards.

Block 7. SPACING OVERRIDE, IC 11A, B, IC 8 A, B. In order to realize gate and interconnection economy in Blocks 5 and 6 during the generation of certain characters, it was convenient to allow a spacing condition to exist at the outputs of these blocks during the stop pulse generation period. The logic gates in Block 7 ensure that the stop pulse is always fed to loop keyer Block 8, even if a spacing condition from Block 5 or 6 happens to be present simultaneously with the stop pulse.

Block 8. LOOP KEYER, IC 11C, D, K1. Ic-11C, D drives loop keying relay K1. Only one gate is used when driving a normally-open contact relay. The second gate is used as an inverter if a normally-closed contact relay is used. A high-voltage transistor could replace the relay if loop polarity is observed.

PHILOSOPHY OF CHARACTER CODING LOGIC

The idle condition of a teletypewriter is the marking (loop current flowing) state. Moreover, examination of a coding chart reveals a slight preponderance of mark over space in the code as a whole, if we disregard the seldom used Blank character. Thus, it is logical to set up a condition at the loop keyer where it is only necessary to create a spacing condition at the proper intervals to generate the desired message.

The first space pulse in any character or machine function is the start pulse. In the letters (LTRS) function, where all five information pulses are marking, the start pulse is the only spacing pulse in the entire code group. So, to generate a LTRS function, it is only necessary to apply the start pulse to the loop keyer and the machine performs the LTRS function.

GENERATION OF LTRS FUNCTION

Refer to the logic diagram in Figure 2 to follow the formation of the LTRS function. Initially the circuit is in the standby state. Clock IC-1 is inhibited. Binary counters IC-2 and IC-4 are set to zero count. One-of-Ten Decoder IC-3 is low on output 0 and is high on the remaining 7 outputs (Outputs 8 and 9 are not used for 5-level codes). Output 0 of IC-3 (pin 1) is labeled Stop 2 which is the last half of the 2-unit stop pulse and is applied to IC-8A as a low level. The remaining input to IC-8A is a high level from output 7 (Stop 1). The output of IC-8A is a high, inverted by IC-8B, and applied to both IC-11A and IC-11B as a low. Therefore, with one input of both IC-11A and IC-11B at a low level, the output of these nand gates will always be high, regardless of whether highs or lows appear at the remaining inputs of IC-11A or IC-11B. For instance, in the case of generating characters with only one or two information bits marking, it is convenient to set up the character coding logic so that a spacing condition (a high level at the output of IC-17) is applied to the remaining input of IC-11B during the last half of the stop pulse. Thus a low on one input of IC-11B "overrides" the spacing condition, keeps the output of IC-11B high, and in turn keeps the loop in the marking state during the entire stop-pulse period.

To initiate generation of the message and the first character (LTRS), momentarily depress START switch S4. This sets the Q output of flip-flop IC-6 to low, removing the inhibit from Clock IC-1 and reset from IC-2 and IC-4. The first negative-going edge of the clock pulse toggles binary counter IC-2 causing output O (Stop 2) of IC-3 to go high and

output 1 (Start) of IC-3 to go low. At this time both inputs of IC-8A are high, its output is low, and the output of IC-8B is now high and applied to one input of both IC-11A and IC-11B. Simultaneously, output 1 (Start) of IC-3 is low and is applied to one input of IC-10 causing the output of IC-10 to go high. This high is applied to the remaining input of IC-11A. Both inputs of IC-11A are now high, causing the output to go low, creating a spacing condition at the Loop Keyer. Thus it may be seen that the loop is in a spacing condition immediately following arrival of the first negative-going edge of the clock waveform and remains in this condition until the next negative-going edge of the clock again toggles binary counter IC-2 at which time output 1 (Start) of IC-3 goes high and output 2 (intelligence bit 1) goes low. As soon as output 1 goes high, the output of IC-10 goes low, and the resulting high output of IC-11A causes the loop keyer to return to the marking condition. This sequence completes generation of the start pulse, which is always a spacing condition. Successive clock pulses applied to binary counter IC-2 move the low output of IC-3 in turn through outputs 2 through 6 (intelligence bits 1 through 5). Because Function Gate generator IC-4 and IC-5 is still set to O and because output O of IC-5 (labeled LTRS) is not connected, no space pulses are generated during the periods of the 5 intelligence bits and the loop keyer remains in the marking state. Clock pulses continue to move the counter and decoder through 7 (Stop 1) and returns to output O (Stop 2). These two units of stop pulse complete the formation of the LTRS function.

GENERATION OF SPACE FUNCTION

The Space machine function character code has only bit 3 of the five intelligence bits in the mark state. Examination of 1-of-16 decoder IC-5 in Figure 2 shows that output O (pin 1, labeled LTRS) is low during the idle condition and during the first character generation cycle of IC-3. At the time output 7 (Stop 1) referred to in the preceding paragraph, goes high, a pulse is applied to the CLK input of IC-4. This changes the count from 0 to 1 and moves the active low from output 0 to output 1 in IC-5. Output 1 is labeled Space 1 and is connected to one input of IC-7A through switch S1. This input goes low, (all three inputs were high) the output goes high and is applied to IC-9B. At this time the B3' input to IC-9B is still high so the output goes low, causing IC-10 output applied to IC-11A to go high. However, as the Stop 2 bit applied to IC-8A is now low, the remaining input to IC-11A is also low and loop keyer IC-11C continues to hold K1 in the marking state. The next clock pulse applied to IC-2 moves the active low output of IC-3 to Start. This low is applied to pin 12 of IC-10 but, because of the low already from IC-9B to pin 3 of IC-10, the output of IC-10 and input pin 9 of IC-11A remain high. At the same moment the active low in IC-3 moves from Stop 2 to Start, the output of IC-8B goes high and IC-11A output goes low, creating a spacing condition of K1 for the duration of the Start pulse. Successive clock pulses continue to move the active low through the outputs of IC-3. Because input to pin 3 of IC-10 remains in the high state, the loop keyer remains spacing throughout the periods of information bits 1 and 2. At the instant bit 3 goes low, the signal at pin 4 of IC-9B goes from high to low and IC-10 now has all inputs high. This causes loop keyer relay to go to the marking condition for the duration of intelligence bit 3. K1 returns to spacing condition during the periods of bits 4 and 5 and then goes to marking during Stop 1 and Stop 2 periods. The Space machine function character is now complete.

GENERATION OF MESSAGE CHARACTERS

Completion of the Space machine function character described above has advanced the count in IC-4 to three. Decoder IC-5 is now low on pin 3, labeled "D". This low is inverted by one section of IC-13 and applied as a high level to pin 9 of IC-9D. The character "D" has intelligence bits 1 and 4 marking. These two bits are applied to the inputs of IC-7B. Both inputs are high at all times except during the periods of bits 1 and 4. Thus, a spacing condition exists at the output of IC-9D during the formation of the letter D except during the periods of bits 1 and 4, which are marking.

It is now apparent that as each character is completed, Gate Function generator IC-4 and IC-5 is advanced one count, and the associated active output is applied to a logic gate or group of logic gates, enabling the appropriate selection of marking or spacing intelligence bits from Bit Generator IC-2 and IC-3 to form the desired characters. Character generation continues until the beginning of the 17th pulse input to IC-4 which sets output 15 (pin 17) of IC-5 from low to high, and applies a negative going level to CLK input (pin 1) of flip-flop

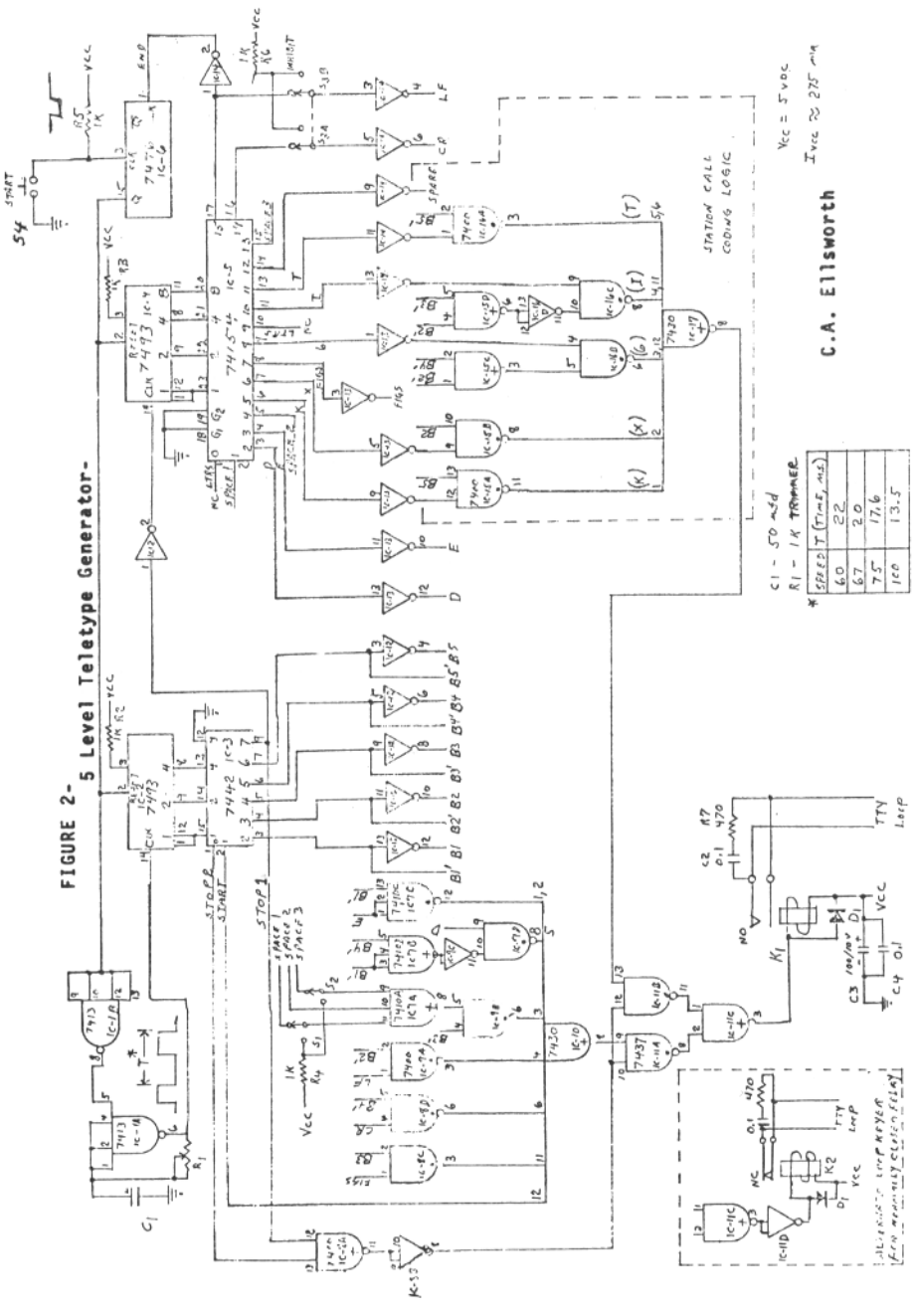

FIGURE 2-

IC-6. This causes IC-6 output Q to go low which resets both binary counters to zero and inhibits Clock IC-1, returning the message generator to idle. Should CLR input (pin 3) of IC-6 be held low continuously, it will override the end-of-cycle signal on pin 1 and the message generator will repeat itself until the low on pin 3 is removed.

MACHINE FUNCTION PROGRAMMING

Switch S1 is provided to inhibit the Space 1 machine function if a space is not desired before the first printed character in the message. When Space 1 is inhibited, the message generator forms the non-printing machine function LTRS. Switch S2 inhibits a space after the last printed character in the message. Switch S3 inhibits the Carriage Return (CR) and Line Feed (LF) machine functions when Line Feed (LF) machine functions when a continuous line of print across the page is desired.

PROGRAMMING THE CALL SIGN

As many as four different character gating configurations are required for programming the generator. The gating configuration selected for a specific character is dependent upon the number of marking pulses in the character. Figure 3 tabulates characters according to their marking pulse content and illustrates the appropriate gating configuration. The notation FG at a gate input in the figure indicates connection to the inverted Function Gate originating at IC-5. The notation M' indicates connection to the appropriate Marking bit from Bit Generator IC-3. Note that marking bits are selected only when the character contains one or two marking pulses. The notation S' indicates connection to the appropriate Spacing bit from IC-3. Spacing bits are selected when the desired character contains three or four marking pulses. The numerals to the right of each character in columns one and two refer to the location of marking pulses in the 5-bit pattern. The numerals in columns three and four refer to the location of spacing pulses in the bit pattern. In Figure 3D note the absence of a prime mark after the S input reference. This means that the spacing bit for characters in column four must be inverted instead of coming directly from the outputs of IC-3. Refer to connections in IC-8C and IC-12, pin 8 in Figure 2 for an example.

As previously covered in the text, no gating or connections are required for the LTRS function.

CONSTRUCTION OF PROTOTYPE DEVICE

The physical configuration of the prototype message generator consists of two printed circuit boards (main and station call) with edge connectors, a regulated power supply, and a fully enclosed aluminum cabinet to provide Radio Frequency Interference (RFI) shielding as well as control mounting facilities. The main printed circuit board is a universal Dual In-line Package (DIP) type breadboard with 15 sets of DIP IC pads for the 14 ICs and one DIP reed relay. Each IC pin pad has up to three solder pads for inter-connection. The station call board is about half the size of the main board and mounts the three ICs indicated within the Station Call Coding Logic box in Figure 2.

Table 1 is the prototype parts list. Total cost of the IC packages was less than ten dollars. The cost of all components including ICs, power supply, and transformer but not including printed circuit boards, connectors, and cabinet, amounted to less than thirty-five dollars. These costs are quoted at single unit prices.

Although not indicated in the logic diagram or in the parts list, the prototype device utilizes a 4-position single-pole rotary switch to select one of four 1000 ohm trimpots for R1 in the clock circuit. Each trimpot is adjusted for one of the four operating speeds listed in the Speed - Time in Milliseconds table in Figure 2. Also not shown on the logic diagram are Vcc to ground bypass capacitors for ICs 1 through 6. These are 0.1 mfd disc ceramic capacitors mounted as close as possible to Vcc and ground pins of each of the indicated ICs. These capacitors are required for suppressing noise generated by IC internal switching transients.

The spark suppression network (C2, R7) across the contacts of the keying relay is mandatory. Operation of the device without this network will result in premature failure of relay contacts, and in erratic operation of the circuit due to noise. Diode D1 suppresses the voltage transient caused by back-EMF generated in the coil of the relay at deenergization.

Normally-open contact reed relay K1 (SPST) is the type actually used in the prototype device. It is less costly and easier to obtain from supply sources than normally closed contact reed relay K2 (SPDT) shown in the Alternate Loop Keyer configuration in Figure 2. Actually, the alternate configuration (K2) is preferred for most applications because loop

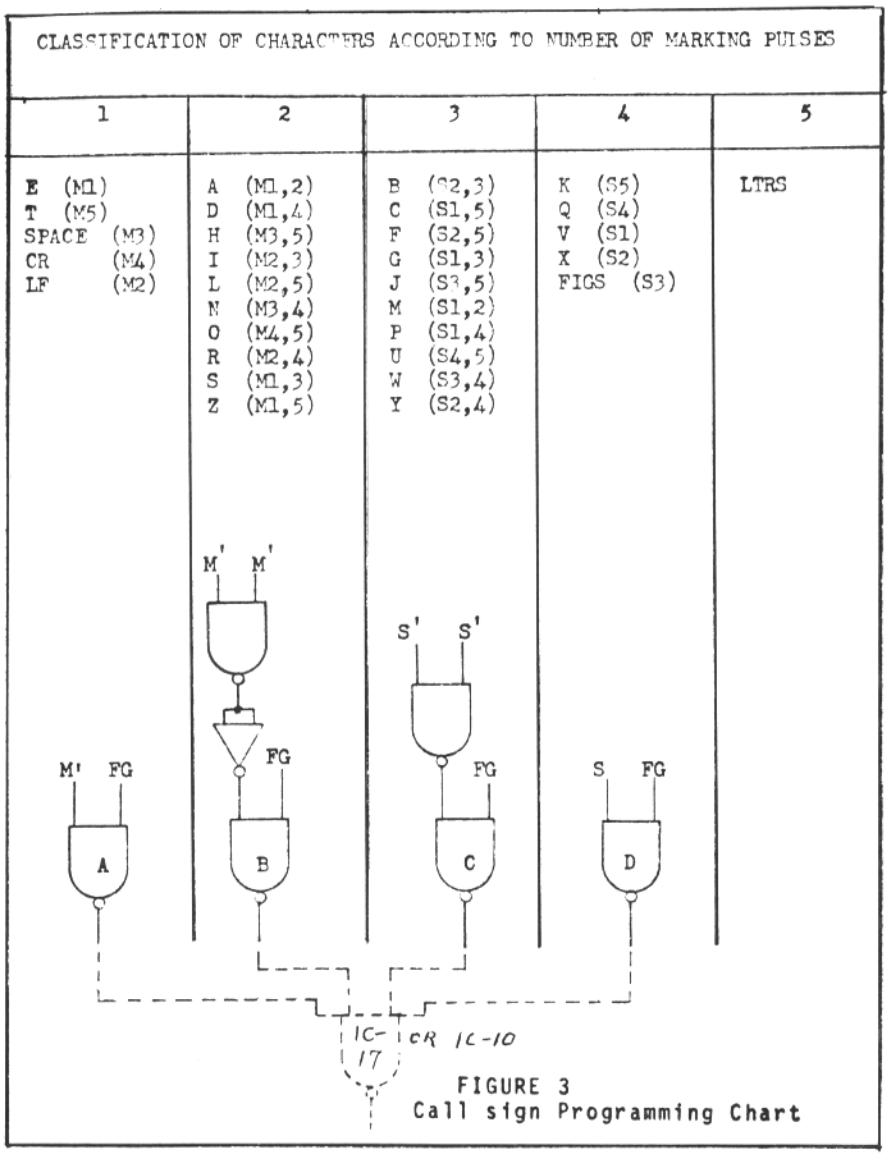

FIGURE 3
Call sign Programming Chart

continuity is maintained when device power is removed.

The power supply consists of a line-to-6.3 volt, one ampere power transformer and a rectifier-regulator circuit with one percent line-load regulation of the 5 volt dc Vcc output. Vcc should be maintained within the limits of 5 volts + 5 percent.

Troubleshooting improper operation is simplified if a typing reperforator teletypewriter is available as this permits recording of all normally non-printing machine functions on paper tape. Should a character not be the same as programmed, correlation of the tape readout with the appropriate area of the logic diagram should assist in isolating the problem. Experience has shown that almost all initial checkout problems in a handwired prototype device result from improper or missing connections. RFI can cause problems although the prototype has functioned without error in the

immediate vicinity of gain radiators with power inputs of 100 watts rms at 14 mHz. Most RFI problems can be cured with proper application of shielding and installation of bypass capacitors on all input/output lines.

SUMMARY

A simple, reliable, low-cost method of generating short teletypewriter messages has been described. An operational prototype message generator utilizing state-of-the-art integrated circuits has been constructed and tested under field operating conditions. This prototype unit was built with components costing less than thirty-five dollars at unit quantity prices.

G. A. Ellsworth
W. G. Malloch

All inquiries should be addressed to C.A. Ellsworth W60XP, 10461 Dewey Dr., Garden Grove, CA. 92640 An SASE would be appreciated.

TABLE 1
PROTOTYPE MESSAGE GENERATOR PARTS LIST

K1	C.P. Clare LA005, 5V, 380 ohms, SPST no, DIP package.
K2	Grigsby-Barton 5V, 80 ohms, SPDT with
IC-1	SN7413
IC-2,4	SN7493
IC-3	SN7442
IC-5	SN74154
IC-6	SN7476
IC-7	SN7410
IC-8,9,15,16	SN7400
IC-10,17	SN7430
IC-11	SN7437
IC-12,13,14	SN7404
	diode, DIP package.
D1	Silicon diode.
C1	50 mfd, 10V tantalum.
C2	0.1 mfd, 400V paper.
C3	100 mfd, 10V electrolytic or tantalum.
C4	0.1 mfd disc ceramic.
R1	1000 ohm trimpot
R2-6	1000 ohm, 1/4 watt.
R7	470 ohm 1/4 watt.
S1,S2	SPDT toggle switch.
S3	DPDT toggle switch.

Power supply, regulated 5Vdc at 300 ma.

APPENDIX
BIBLIOGRAPHY

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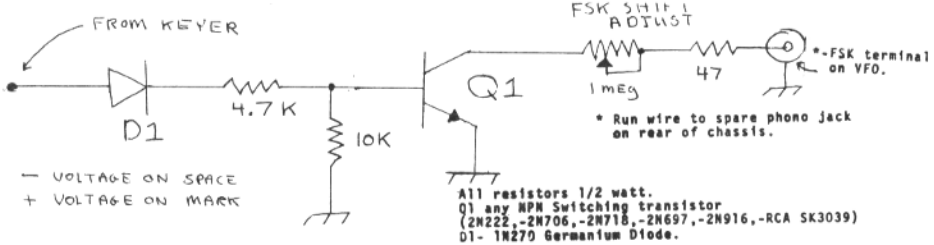
2. **Designing with TTL Integrated Circuits.** Texas Instruments Electronics Series, McGraw Hill Book Co. 1971.
3. **The Integrated Circuits Catalog for Design Engineers.** Texas Instruments Incorporated. 1972.

*****

SB-102 DRAWING

We were overdue and had been expecting it -- we omitted the drawing for the article - March issue page 12 - FSK for the SB102. The drawing is printed here and we are apologetic again



PROTECTION - MOC1000

A question on the possible rupture of the MOC 1000 used in the article on "An interface between loops" in the March issue, page 3, brings the following comments from the author Dave Chapman W9DPY.

There is no doubt that the MOC-1000 as with all other similar devices will rupture if a reverse voltage (including spikes) is applied.

It is very unusual to develop a "reverse spike" in TTY loop circuits with the built in rectification of the keyer tubes and keyer transistors. In fact the reverse voltage is so unusual that it did not appear worth mentioning.

Further, in the event that anyone would be interested, the MOC-1000 can be protected by either shunt or series diodes. The series diode being less desirable as leakage in the external diode will not fully protect the LED.

A very low cost silicon diode such as the 1N4001 silicon, or the 1N3194 connected as shown on the inclosed sketch will do the job.

These are not cureall for careless handling. If you short the power supply directly thru the LED even with the diode protection, it will still blow the LED.

If the voltage is reversed on a short and the surge is heavy, the 1N4001 will blow allowing the LED to blow.

***

Defeating Non-overline function on model 28 printer.

"DICK" MALANOWICZ, W2CY
48 South Lake St.
HAMBURG, N.Y. 14075

Almost all the model 28 Teletype printers in use are now modified with the automatic carriage return and non-overline functions as described in Irv Hoff's excellent series of articles on the "Mouse" machine in the RTTY JOURNAL a few years ago. However, intentional overlining would be a benefit, especially to those of us that like to print RTTY art. The January 1973 issue of the RTTY JOURNAL shows a typical example of what happens when the printer has the non-overline function. You "didn't see" too much!

There is an easy way to have your choice of overlining or non-overlining, each function can be placed into operation in a matter of a few seconds.

Examination shows that the carriage return function bail in the printer is operated by an arm that extends towards slots 4 and 5 of the stunt box. There also is an extension on the carriage return function bail that extends towards slot 9 of the stunt box, this is normally used with a modification kit to provide local back space in the printer. Adding a few parts to operate slot 9 in the stunt box is all that is required to have a normal carriage return without a line feed.

The following parts should be ordered from Teletype Corp., allowing one month for delivery. They will ship C.O.D.

1 - 153262 Arm
1 - 153254 Bracket
2 - 151657 Screw
2 - 2191 Washer
1 - 153916 Mod Kit
1 - 152667 Function Bar

If the top of the stunt box is not already equipped with clips to cut out a function, also order:

1 - 152127 Clip
1 - 150543 Screw

While waiting for the parts, it is best to review Irv Hoff's articles in the May and June 1970 issues of the RTTY JOURNAL concerning the removal, loading, and replacement of the stunt box in the printer.

Remove the stunt box from the printer and insert all the parts from the 153916 Mod Kit and the 152667 carriage return function bar into slot 9 of the stunt box. There should be a clip on top of the stunt box between slots 8 and 9, and if not, add the 152127 clip and the 150543 screw in the hole between slots 8 and 9.

Now, looking at the bottom of the printer, note how the carriage return arm is hooked to the carriage return function bail, and is located in between the guide bar and the bracket. Hook the 153262 arm to the extension of the carriage return function bail, making sure that it is lined up in the same position as the other arm, and place the arm in the slot underneath the guide bar. Place the 153254 bracket underneath the guide bar, securing the 153262 arm. The bracket can only be placed one way. Secure the bracket with the two screws and lockwashers through the two holes from the top of the guide bar. Operate the arm with your finger, making sure that nothing binds.

Now is a good time to lube the printer, as all parts are now exposed with the stunt box removed. Lube the stunt box too!

Replace the stunt box into the printer.

To operate the printer with normal non-overlining, swing the 152127 clip into slot 9 so that the function pawl does not operate. Slot 9 is now inoperative.

To defeat the non-overlining, swing the clip out so that the function pawl operates in slot 9. When a carriage return signal is received by the printer, slot 9 operates, allowing a carriage return function without a line feed.

If there is not a complete carriage return with slot 9 operating, the clamp screw on the carriage return lever and the carriage return bail at the bottom of the printer should be loosened and adjust the two slightly. Tighten the screw.

Happy overlining!

***

ST-5A and TU73.

NEXT MONTH - TU Issue - The famous ST-5 TU originally run in the Journal in May 1970 will celebrate its third birthday with a re-run including a few modifications and a brand new Auto Start feature by the author Irwin Hoff, W6FFC. This TU along with the ST-6 are probably the most popular solid state TUs now in use.

For those that want to try something new we have an interesting and rather simple solid state TU submitted by A.D. Helfrick, K2BLA. If we can find enough room we hope to publish both in the May issue.

***

Crystal Controlled AFSK Discussed

BERT KELLEY, K4EEU
2307 South Clark St.
TAMPA, FL. 33609

On September 1972 two very similar AFSK generators were described that were modernized versions of a WB8AAK design. Since the K4EEU AFSK generator worked well and had low distortion output, the author was puzzled by the statement in the WB4FPK article on pg. 11, that, since the "generator was not phase synchronous, it could not be used with a SSB generator . . . as it would generate transients far from the operating frequency".

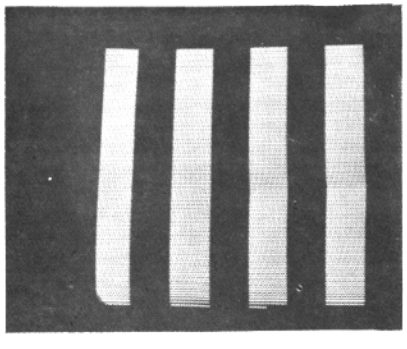
Later, in developing a slow scan TV test generator, I had the opportunity to examine the keying characteristics of the AFSK generator circuit more critically. Briefly, the slow scan generator used three crystal oscillators at 1.2 mHz, 1.5 mHz, and 2.3 mHz. Digital logic was used to switch between these oscillators to generate the slow scan signals for sync picture black, and picture white so that a pattern was generated for monitor adjustment. The generator used the same oscillator, switching, digital dividers, and low pass filter circuits as the AFSK generator. The audio output frequencys of 1200, 1500, and 2300 cycles, were comparable to these used in RTTY. A linear discriminator in the monitor would respond to any audio frequency in this band, so, if any other frequencies were generated it would show up in the monitor picture. But the monitor's picture was clean and showed only the signals for picture black and white, as shown in the photo. This was a convincing demonstration that the switching method was free from any transients or unwanted audio frequencies.

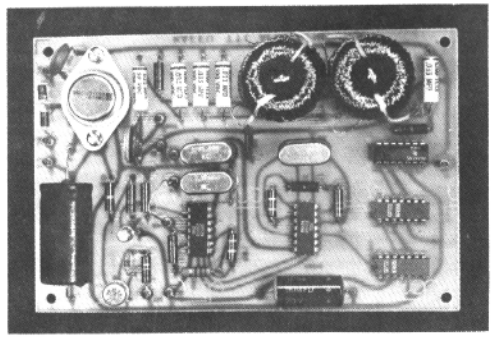
An oscilloscope examination shows what is actually happening when the two crystal oscillator outputs are switched to the logic dividers by the TTL NAND gates. The switching transition, the boundry between mark and space, is very short. The point of switch shows at only one point, and this discontinuity, or "transient" is divided by the factor of 1,000, the same as the RF output of the oscillators. It would take many successive non-standard transitions to vary the output a fraction of a cycle at the output, and of course, this is a condition that can not occur. Switching by digital devices at the RF frequency is as fast and clean as any, and superior to AFSK generators that switch audio directly.

The further action of the low pass filter removes any audio components above about 3 khz and converts the output to a pure sine wave as confirmed by distortion measurements.

Any problems in the use of an AFSK generator such as this in the HF bands is due to shortcomings in the SSB equipment rather than the generator. The SSB generator should have excellent unwanted sideband suppression, carrier suppression, and a well shaped filter passband. If the transmitter is a top-notch filter design, the most probable cause of spurious radiation is excessive audio level, or overload --- the same condition that causes splatter in the phone segments of the bands. Keep the transmitter and linear adjusted properly.

RTTY operators needing an AFSK generator for the station would do well to look into this keying design that offers low cost construction, stable - no adjustment operation, and accurate shifts without use of a frequency standard or counter. To aid in construction, the author has a G-10 epoxy plated, 4 x 6" circuit board for $8pp. This board is complete with built in power supply and is designed for minibox mounting. See photo.





RTTY theory & applications.

RON 'RG' GUENTZLER, W8BBB
Route 1 Box 30
ADA OHIO, 45810

This is a rerun of a series of elementary RTTY Theory and operation articles that we published several years ago. With a continual influx of new RTTY fans, and no back issues of the old magazines available, we have received a number of requests for this type of information. Ron Guentzler, the author will continue his VHF column and this series will be run as space permits.

PART 2- BAUDOT CODE

Before commencing with the Baudot code, let's review what was discussed last month. In the case of manual telegraphy, the person who is sending translates the letters to be sent into a code which he sends by opening and closing a circuit with a telegraph key. The person receiving receives the message by listening to the sounder which makes a click every time the circuit is opened and closed by the telegraph key at the sending end. The "receiver" (the person receiving) translates the series of clicks into letters and writes them down. The basic objections to this system are the slow speed and the requirement for a skilled operator to be present at each end of the circuit.

In the case of printing telegraphy (Teletype), the person sending depresses a key on the keyboard corresponding to the letter to be sent; this letter is mechanically translated into the opening and closing of contacts. These contacts replace the telegraph key. At the receiving end, a magnet operates and releases an armature in response to the contacts at the sending

In the case of printing telegraphy (Teletype), the person sending depresses a key on the keyboard corresponding to the letter to be sent; this letter is mechanically translated into the opening and closing of contacts. These contacts replace the telegraph key. At the receiving end, a magnet operates and releases an armature in response to the contacts at the sending end, and the armature, in turn, operates a selector which translates the opens and closures into the letter that was being sent.

The discussion ended with the concept that a different code than the one used with manual telegraphy was needed for use with teleprinters because a teleprinter, being a mechanical device, requires a code of uniform length regardless of the character being sent.

THE BAUDOT CODE

All printing telegraphy, until recently, used the five-element Baudot code. (Amateurs are still required to use it by law, but commercially it is rapidly becoming extinct.) The code is given in Table 1. Each row lists a separate character (or pair of characters) and each column corresponds to a "time-slot" or a "bit." The M in a particular location indicates that a mark is sent at that time and an S indicates a space.

In most cases, there are two characters corresponding to each row. This is necessayr because there are only 32 code combinations available in a five-element code. However, there are more than 32 characters that one would like to send. Therefore, most of the code combinations have to be used for two things. (What the two characters are may vary greatly from machine to machine. This will be discussed later.) As an example, the first row lists "A" and "-". Which is meant when the combination MMSSS is sent?

The answer is relatively simple. Why on a typewriter do some of the keys have just one character and some have more than one? For example, the "7" key also has "&". The answer, when considering a typewriter, is to keep the number of keys to a minimum. The answer, when considering a teleprinter, is that only 32 keys are permitted. The next question is: How do you tell a typewriter whether it is to print a "7" or an "&"? By shifting. There is a subtle point here. On a typewriter there are two kinds of shifts: 1) Locking, and 2)

Non-Locking. On a teleprinter there is only one type: Locking. The shifting is done by hitting the FIGS or LTRS keys. When the LTRS key is depressed, the receiving machine performs a "stunt" rather than typing something; this stunt locks the printer in the necessary position to print the letters and characters appearing on the lower portions of the keys or the letters and characters appearing on the left side of the left column in Table 1.

When the FIGS key is depressed, the code sent from the keyboard is translated by the receiving machine to shift and lock into the position that will type what is on the upper portion of the keytops or what is shown in the right side of the left column in Table 1. Once the receiving printer is in FIGS it will remain there forever or until a LTRS is received. (Some printers are equipped with a "down-shift on space" arrangement whereby they shift to LTRS when LTRS or a character space is received. This is done for certain practical reasons that will be described later.)

THE ALPHABET

The FCC states in paragraph 97.69(a) of the Rules and Regulations: "A signal channel five-unit (start-stop) teleprinter code shall be used which shall correspond to the International Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar) but special signals may be employed for remote control of receiving printers, or for other purposes, in "figures" positions not utilized for numerals. In general, this code shall conform as nearly as possible to the teleprinter code or codes in common commercial usage in the United States." Table 1 gives the CCIT Alphabet No. 2 referred to above.

The arrangement of most of the characters other than the letters and numerals varies greatly from machine to machine. The reason is that different users have different requirements. Ten of the "standard" codes can be found on p. 845 of REFERENCE DATE FOR RADIO ENGINEERS, 4th Ed., IT&T. 1956.

THE CODE ELEMENTS

Let's examine the meaning of the M's and S's in Table 1. Take, for example, the row in Table 1 corresponding to the letter "Y". Going across the row from left to right, the letters MSMSM appear. This means that when the "Y" key on a keyboard is depressed, the keyboard sends a mark, a space, a mark, a space, and a mark in that order. It sends them by closing, opening, closing, opening, and closing the keyboard contacts. If an oscilloscope were placed in series with the contacts, a pattern as shown in Figure 1 would appear.

Now look at the "A" row. The letters MMSSS appear. This means that the letter "A" is sent by sending a mark, a mark, a space, a space, and a space. The pattern appearing on an oscilloscope would be as shown in Figure 2. This may appear simple enough, but a little reflection may reveal two problems: 1) How does the receiving machine know when the first mark ends and the second begins. and 2) When does the first mark begin? The answers to both these questions have some subtle implications...

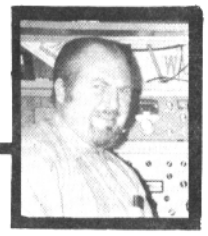
TABLE 1
INTERNATIONAL TELEGRAPHIC ALPHABET NO. 2

CHARACTER		TIME SLOTS				
		1	2	3	4	5
A	-	M	M	S	S	S
B	?	M	S	S	M	M
C	:	S	M	M	M	S
D	Who R U	M	S	S	M	S
E	3	M	S	S	S	S
F		M	S	M	M	S
G		S	M	S	M	M
H		S	S	M	S	M
I	8	S	M	M	S	S
J	Bell	M	M	S	M	S
K	(	M	M	M	M	S
L	)	S	M	S	S	M
M	.	S	S	M	M	M
N	,	S	S	M	M	S
O	9	S	S	S	M	M
P	0	S	M	M	S	M
Q	1	M	M	M	S	M
R	4	S	M	S	M	S
S	'	M	S	M	S	S
T	5	S	S	S	S	M
U	7	M	M	M	S	S
V		S	M	M	M	M
W	2	M	M	S	S	M
X	/	M	S	M	M	M
Y	6	M	S	M	S	M
Z		M	S	S	S	M
Line feed		S	M	S	S	S
Carriage Ret.		S	S	S	M	S
LTRS		M	M	M	M	M
FIGS		M	M	S	M	M
Space		S	S	M	S	S
Blank		S	S	S	S	S

* *

CONTINUED ON PAGE 17

RTTY-DX



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

Hello there...

I imagine our honorable editor has some anxious moments as press time draws near because it is a rare thing when this copy gets to him right on time. We usually hold it open to the last possible moment hoping to have some last minute news of tremendous importance for the RTTY-DXer. However, such things rarely if ever happen and the copy usually gets to Dusty a day or so later than intended. Imagine his surprise this month when he gets the copy about two weeks ahead of time. Reason is that we are sailing off for a couple of weeks of R & R down on the Spanish Main. So far we have said nothing of interest to the RTTY-DXer so we had better see what we can come up with.

RTTY activity has been on a steady increase from the countries in Eastern Europe during the past year and we imagine that the trend will continue as machines become more available. Some of the active stations are -- OK1MP, OS2PBM, OK2OP, HA5FA, HA5FE, HA5KBF, HA5KFB, HA5KDQ, HA5KKC, YO2AFB, UK1AAA, UK3XAB, UW3NA, UW3HQ, UK4FAD, UK2GAX, UP2CG, UB5SR, and a bit further East you can sometimes find, UA9PP, UA9YB, and UA9OS. I wonder if anyone can enlighten us all as to why there has been no RTTY activity to date from SP and LZ land? There was a flurry of activity from YU a few years ago but nothing since.

That big signal coming from EA8URE in mid February was with Manual, EA8CI at the keyboard. We understand that the contact counts toward some sort of diploma issues by the Apanish Amateur Society, URE, but details are lacking at the moment. From Spain proper EA7NJ and EA7KF have been very active in recent weeks.

With his tour of duty completed, Les, GI3VYZ, is now back in England and presently operating from the Royal Signals station, G4RS. Perhaps those that have not received a WSL for the GI contact could contact Les at

Royal Signals ARS, G4RS
c/o Les Thompson
Blandford Camp
Blanford, Dorset

Stateside hams can get a fast response on HV3SJ QSL's by sending a SASE to W6KNH at --

C.J. Schoenfeld Jr.
42 Donald Drive
Orinda, Ca. 94563

We are very pleased to report that YJ8JS is back in business and has been active on week ends at between about 0600 and 0900 GMT on the 20 meter band.

VS6GA has also been coming thru to Europe during the local morning hours.

It has been reported that EI5BH has had a QSO with MP4BBW on 40 Meters. This band has been showing quite a bit of activity in this part of the world particularly since the higher frequencies have been closing down in this part of the world from about 0000z. It pays to scan both 7090 and 7040 khz as you are apt to find activity on either frequency.

On 80 meters most of the DX stations seem to work around 3590 khz. and most stateside activity is from about 3615 to 3630 khz. So you see it pays to look around a bit on the lower frequencies.

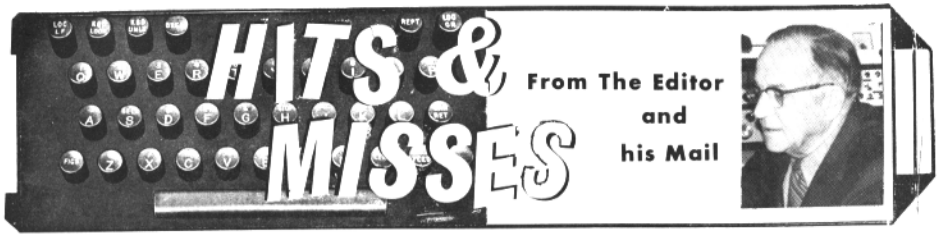
To continue with DX reports. OD5ES has been contacted by ON4BX. Arthur reports this station as having 50 baud speed and 850 hz shift in reverse.

Zoli, HA5FE has been heard calling HM1BB so there appears to be some continued activity from Korea. American Samoa has been reported back on the active list with activity by KS6DH. If you should happen to run into VP8JV on CW or SSB ask him to go to RTTY and he will be happy to oblige. Brian usually does not work RTTY on the ham bands but does have the gear and he counts for Antarctica. His QSL manager is as follows--

A.B. Hopple, W3DJZ
122 Sunset View Dr.
Newcumberland, Pa. 17070

We are very pleased to report that

CONTINUED ON PAGE 20



In last months' issue we mentioned the confusion on which segment of the 40 meter band should be used for RTTY. Based on a few comments we had received we suggested 7090. With the idea of checking this band a few days later we tuned up on 40 and found a group at 7040. In the QSO following the stations suggested 7040 as being better than 7090. As it made no difference to us in any way the following night we checked 7040, found nobody, but there was a qso going on at 7090. At least 7140 seems to have lost it's promoters but confusion still exists on the other two segments. Guess the only answer is to check each one, hopefully find some action and join in.

***

The confusion expected with the permission to use multiple speeds on RTTY has not been a problem so far. A few stations are using 100 wpm but usually going to that speed after making a contact on 60 wpm. If a station has tape equipment and uses it the fast speed can cover more ground in a short time. Frankly in the QSOs we have had at the fast speed, and those we have listened to the typing is the same hunt and peck system that can be easily taken at 60 wpm. To us it seems like putting a car in low gear then reving the motor up to attain the same speed we could get with the motor idling in hi gear.

***

Dayton Hamfest promises to be better than ever. So far we know of someone from every call area except the 7th that will be in attendance. As mentioned before the RTTY JOURNAL will have a hospitality suite at the Imperial North Motel -- The South Room -If you arrive Friday drop around and let us know if you wish to eat with the group, usually about 7:30. If we have an idea of the number eating we can reserve space.

A top grade panel of experts has been lined up for the RTTY Forum. "Irv" Hoff, W6FFC, "George Perrine, W9KOI, of HAL Communications and "Ron Guentzler, W8BBB, should make the meeting not only interesting but very informative.

***

BACK ISSUES-

New subscriptions and classified ads are cash in advance as we have no method for billing. New subscriptions will be started with the current issue and one back issue, if requested. Please do not ask us to start any further back than this. Back issues - if available - may be ordered at 30¢ each at time of subscription. The JOURNAL is mailed about the 20th of the month preceding the dated month. May and June are a combined issue and July-August is a combined issue.

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1969-Oct.-Nov.-Dec.- [3]
1970- None.
1971-Jan.-May.-June- July-
Sept.-Oct.-Nov.-Dec.[8]
1972-Jan.-Feb.-Apr.-May.-July.
Sep.-Oct.-Nov.-Dec.- [9]
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THEORY - Cont.

CONTINUED FROM PAGE 14

In order to answer the first question, let's ask another question: When you copy a CW signal how do you know the difference between a dot and a dash? A dash is three times as long as a dot. You use a "mental clock" when receiving CW; you can tell whether they are dots or dashes by how long they last.

The receiving mechanism in a teleprinter also employs a "clock" or timing mechanism. The machine "knows" how long a mark is supposed to be. If a mark lasts "too long" it must be another mark!

The timing situation with printing telegraphy is more severe than it is with CW. When receiving CW you only have to be able to tell the difference between marks that differ in length by a ratio of 3 to 1. By looking at Table 1 it can be seen that the characters E, A, U, K, and LTRS contain 1, 2, 3, 4, and 5 successive marks, respectively; the receiving teleprinter must be able to "time" with enough precision to distinguish between these five characters. The receiving machine can perform this feat only by running at exactly the same speed as the keyboard on the sending machine.

The same discussion regarding successive marks can be applied to successive spaces. Again, the answer is that the receiving machine must run at the same speed as the transmitting machine in order to accurately time the signal and thus correctly decode it.

In amateur telegraphy, the length of a "time-slot" (a single mark or a single space) is 22 ms (0.022 seconds). For example, in the oscilloscope pattern in Figure 1 each mark and each space is exactly 22 ms long. In the pattern shown in Figure 2, the mark is 44 ms (2 X 22) long and the space is 66 ms (3 X 22) long.

Now to question 2. On a letter that starts with a mark, such as "A", what comes before the mark? An obvious answer, if we consider CW, is: A space. Therefore, we could say: If a space exists before a character, the beginning of any character is indicated by the transition from a space to a mark. Right? Well, try this: What does Table 1 give as the code for "C"? SMMMS. Now, if the beginning of a character is indicated by the start of a mark, when does the letter "C" begin? The answer to this paradox is that something must be sent before every character in order to tell the receiving machine that a character is coming. Before describing how this is done, a "peculiarity" of printing telegraphy must be described. Therefore, we will wait until next month for the description. We will say, however, that both a mark and a space must proceed a character.

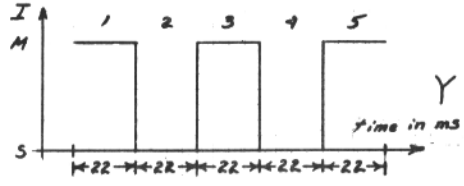

FIGURE 1

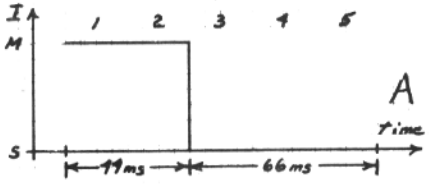

FIGURE 2

SUMMARY

The five-element Baudot code was described. In order to obtain more than 32 characters it is necessary to use some code combinations for more than one character. This is done in a manner analogous to that employed on a typewriter. By shifting the machine, most of the keys are used for two separate characters. The shifting is done by means of the LTRS and FIGS keys.

Because the receiving machine must "time" the incoming signal in order to decode it, the two machines must run at exactly the same speed. Because half the characters in the Baudot code start with a mark and the other half with a space, the receiving machine must be told when a character starts. Next month, the method for telling the receiving machine when a character starts will be described.

73, ES CUL, RG.

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

HAL COMMUNICATIONS CORP: HEADQUARTERS for MAINLINE Solid State RTTY equipment. You can do no better than the ST-6 demodulator at any price. Screened, punched cabinets for the ST-6 now available. For budget TTY, it's the ST-5 for HF or VHF. And the best in AFSK is provided by the AK-1. Our new model 1550 electronic keyer, or the MKB-1 Morse Keyboard, will automatically identify your RTTY station at the push of a button. The extra values are available from HAL Communications Corp., Box 365RJ, Urbana, IL 61801. Phone 217-359-7373

SALE; MODEL 28 TYPING REPERS, type TT 315/UG code LPR-35, or TT317/UG code type LPR-37, tape data 11/16 wide, chadless or fully perforated, excellent, $20.00 each. Model 28 transmitter-distributor type TT334/UG code LXB-9 Excellent, $20.00. Tuning forks 96.19 VPS or 120 V.P.S. unused $2.00 each. Model 28 synchronous motor LMU-12, 3600 RPM. 1/12 HP. 115 VAC, 60 Hz. excellent, $9.50 each. Model 28 synchronous motor 1725/1425 RPM P/N 173937 cont. 115 V - 50-60 Hz. excellent $8.00 each. P.D. 82 synchronous motor for Mite teletypewriter, 115 VAC 60 Hz, unused $15.00 each. Kleinschmidt reperforator type TT107FG, R/O 60-75-100 wpm for automatic typing and reperforating of TTY messages. 7/8 chad tape, synchronous motor, excellent $28.00 each. Reader, high speed. Ferranti model II or III, excellent $15.00 each. Control from panel; for model 32KSR or ASR complete with push button switch, relays, resistors, Jones plugs etc. Excellent $2.50 each. Gears for all types teletype machines. Send us your requirements. Atlantic Surplus Sales, 580 3rd Ave., Brooklyn, N.Y. 11215.

WANT MODEL 28ASR; Have for trade GE Master professional mobile, 80 watts. 2 meter or commercial frequencies, Motorola 100 watt late model Motrac mobile on 2 meter commercial frequencies or other GE 2 meter gear. Joe Moomaw, W4FZG, 304 Valley View, Staunton, VA. 24401. Phones - day - (703) 886-1618, night - (703) 886-1428.

R-390A MFGD. BY COLLINS RADIO - $525.00. #28 Receive - only typing reperforator single base, without cover, ready to operate, 100 WPM, $49.00. 60 WPM gears $10.00. LRX Reperforator transmitter, two 3 speed gear shifts, ready to operate $145. Alltronics-Howard Co., Box 19, Boston, Mass. 02101. (617-742-0048).

FOR SALE - LAST CALL* Deskfax facsimile machines $2, paper for same $5 per roll. Model 14 strip printers $10, T'D's $15, model 14 reperf's $25, model 26's $50, model 19's $65, model 15's $50. Loads of miscellaneous electronics, parts etc. Some 28 parts, TD's etc. Cash and carry. Goodman (312-476-8200), 5826 S. Western, Chicago, Illinois 60636.

KLEINSCHMIDT MANUALS - for TT-4, TT-100, TT-76, TT-107, etc. Mite KSR teletypewriter supplies, gears, parts, covers. Wanted Teletype manuals. Send SASE for list. Typetronics, Box 8873, Ft. Lauderdale, FL. 33310. W4NYF.

HAL COMMUNICATIONS CORP: Announced the revolutionary new RVD-1002 and RKB-1 solid state RTTY system. Provides the ultimate in noiseless, reliable reception and transmission of Baudot coded TTY. The RVD-1002 visual display system receives demodulated TTY pulses from the ST-6 and provides video output to a video monitor, or modified TV set. One thousand (1000) characters are displayed in a 20 line, 50 character per line format, at 60, 66, 75, and 100 WPM if your TU will copy it. The RKB-1 combines reliable TTL circuitry, a high quality commercial keyboard, and a rugged case to provide the best Baudot TTY keyboard available. The electronics is arranged so that you type as if you were using a typewriter.. See them on display at Muskegon and Dayton. Get the details from HAL Communications Corp., Box 365RJ, Urbana, Il 61801. Phone 217-359-7373.

KLEINSCHMIDT TT-4A/TG printer, keyboard, used, good, $48.00 with 60-100 gears. Freight $20. east of Miss. $10. west of Miss. Also have ASR, KSR typing punches. Mark/Space Systems Co., 3562 Conquista, Long Beach, CA. 90808. (213) 429-5821.

FOR SALE: MODEL 32ASR, MINT; with all manuals; spare parts; gears for all speeds; answerback; all options; factory installed: $355, plus shipping by whatever route desired. Model 19, mint; with all components; 75 WPM gears; 60 WPM gears; spare complete typing unit; two spare complete keyboards; less manuals. $135 plus shipping. Alltronics-Howard Model "L" T.U.; mint with manual and cabinet. $110, shipping included. Call or write Chris, WB2CNH, 570 North Street, Harrison, N.Y. 10528. Phone 914-967-2652.

HAL COMMUNICATIONS CORP. can provide you with autostart for the ST-5. Adapated from the proven ST-6 circuity, the ST-5 autostart kit contains drilled, plated PC board, relay and all parts for only $15.00 plus shipping. For the best in UHF RTTY order the ST-5A with auto start and AK-1 only $92.50 plus shipping (no cabinet). Available late April or pick up at Dayton. Hal Communications Corp. Box 365, Urbana, ILL. 61801. Phone (217) 359-7373.

CLASSIFIED ADS-

DOVETRON TELEPRINTER SPEED CONTROLLER - The DOVETRON TSC-1000 Teleprinter Speed Controller is an all electronic, solid-state motor controller that functions as an electronic gear shift for any teleprinter equipped with 100 WPM gears and a 50/60 Hz synchronous motor. Speed control is accomplished by varying both the frequency and amplitude of the power supplied to the motor. A five position front panel switch allows selection of 60-67-75-90-100 WPM operation. The keyboard automatically sends at the same speed as the receiving speed of the typing unit. No buffer storage is required and printer maintenance is reduced to a minimum, because the teleprinter runs only as fast as the received signal. A front panel Range control permits copy of any speed between 50 and 110 WPM with no loss of mechanical range. Copy is greatly improved on weak DX-type signals, and under severe conditions of selective fading, multi-path propagation and keyboard distortion by "synching" to the incoming signal. This Range control also permits answering a station running at a non-standard speed, giving him better copy of your signals. The AUTOSTART circuit provides remote turn-on/turn-off capability and current limiting protection for the terminal unit's autostart components. May be used with any character unit code (7.0, 7.42, 8.0, etc.). Operates directly from 110vac ±10%, 40 to 400 Hz. Since the output of the TSC is not affected by line frequency variations at the input, stable speed control is provided for Field Day and other locations where portable or emergency power supplies exhibit line frequency instability under changing load. Attractively packaged in an 8 x 8 x 11 inch custom enclosure. 15 pounds. (21 pounds shipping). $129.50 FOB. (Calif. residents: $6.50 sales tax). DOVETRON, 1015 Fremont Avenue (PO Box 267), South Pasadena, Calif., 91030. 213-682-3705.

FOR SALE - 28KSR C.R. L.F. non overline $225. Model 15 R.O. $15. Factory wired ST-6 170/850 $195. Houston; Phone 713-288-4947.

(2) MODEL 28 SEND-RECEIVE TYPING REPERFS, complete (TT/253/UG). Synch motors, chadless tape, 7.42 code. One 60WPM, one 100WPM. Very clean; electrically and mechanically perfect. Power driven backspace and metered blank tape feedout. $125 each, firm. FOB San Diego. Pete, W6KS. 714-274-7060.

FOR SALE: COMPACT TABLE-TOP 28KSR with nylon three speed gear shift (60-67-100 WPM) and auto CR/LF and non-overline. Gear shift knob is on front panel and permits speed changing without stopping machine. This is the latest Mark III version and is in excellent condition. $343.00. FOR SALE: SCM-Kleinschmidt M-311 solid state electronic KSR with electronic speed control. Speed of either 60 WPM or 100 WPM is selected by toggle switch inside top cover. Complete with both the service and parts manuals. Excellent condition: $360.00. Both of these machines are about the size of an IBM electric typewriter, and are set up for 110vac, 60 Hz operation. Hank Scharfe, W6SKC, 1015 Fremont Avenue, South Pasadena, California, 91030. 213-799-5886 or 213-682-3705.

FOR SALE: CV89, EXCELLENT. $75.00. Model 28 communications type boxes, $10.00 Postpaid. F.K. McGinnis, 4304 McFarlin Blvd., Dallas, TX. 75205. (214) 528-4499.

CIRCUIT BOARDS. Receiver, December Ham Radio and September Journal, $10. Auto line feed, January '73 Ham Radio $7. TTL AFSK, September '72 Journal, $8 PP. G10 expoxy, plated, with clear photo. Bert Kelley, K4EEU, 2307 S. Clark Ave., Tampa, Florida 33609

FOR SALE: MODEL 28KSR-60-75-100 shift, $95.00. Model 28ASR Auxiliary reperforator with 60-75-100 speed, complete $150.00. F.K. McGinnis, 4304 McFarlin Blvd. Dallas, TX. 75205, (214) 528-4499.

SELL: COMPLETE MODEL 28 RTTY STATION including 28KSR, 28ROTR, 28TD, and professionally built WCI phase locked loop demodulator with plug-in AK-1 AFSK generator. This equipment is in flawless condition and will satisfy the most demanding owner, and includes a complete set of manuals with many spare parts/gears. Price is $925 F.O.B. Oakland, California but will consider all offers. For complete details write Ronald Ott WA6FAD, 3955-107 Vineyard Avenue, Pleasanton, California 94566 (415) 846-1459.

TU FREQUENCY STANDARDS -- Three brand new tuning forks, with better than 0.0005 accuracy, especially designed for tuning TU filters at 2125, 2295 and 2975 -- available separately at $7.40 each or set of three $19.90 post-paid. Hank Frankel, Box 535, Bellmore, NY 11711.

PERFORATOR TAPE 11/16", white, 10 rolls - $1.95 plus shipping. 88mh unpotted TOROIDS, 5 for $2.00 post-paid. WAØTJR, d. r. kelley, 1490 Yaqui Drive, Florissant, Mo. 63031.

FOR SALE: YAESU FR100B RECEIVER, FL200B transmitter, SSB,AM,CW, 240 watts. See page 105, Novembjr, 1972 QST for picture. Mint condition, $325.00. Will swap for model 33 or model 32 and ? K7VQF, 201 - 130th Ave., S.E., Bellevue, WA. 98005.

WANTED; CABINET FOR MODEL 28 KSR or ASR, Clegg Venus 6 meter transceiver, Glegg 416 AC power supply, Clegg SS booster, reasonable. Jerry Buckler, 29 Parkview Dr., Plains, PA. 18705.

SALE; MODEL 28 ASR TELETYPE, in mint condition. Best offer. M. Lindquist, 35 Wayne Dr., Plainville, CT. 06062.

SELL: MODEL 19, GOOD CONDITION $75.00. You pick-up. Richard Vogeley, W2IPT, 554 7th Ave., New Hyde Park, N.Y. 11040.

WANTED: STELMA PC-334, PC-336 or PC-403 PC plug in or any information on these. G. S. Naniwada, JA1ACB,3-4-8, Izumi, Hova, Tokyo 188. Japan.

ST-5A BOARD ONLY $5.25. Parks kit $54.00. Mod. kit for ST-5 $9.00 (Makes ST-5 into ST-5A). ST-5 Board only $5.25, parts kit $47.50. ST-6 boards only $18.00. Parts kit, $128.00. All P.C. boards G10 glass-epoxy 2 oz. Copper drilled and solder plated. All items shipped pre-paid. PEMCO, 422 18th N.E. Salem, Oregon, 97301, (503) 585-1641.

CHICAGO AREA RTTY OPERATORS; Expert repair work performed at reasonable prices. Cleaning (any teletype printer) printer unit alone, $7.50 with keyboard $10.00. Phone 312-631-6889, ask for Neil.

TELETYPE MANUALS $6.50 EACH: TT-107/FG, TT-98, TT-100, TT-76, TT-63A/FGC. Other manuals: TT-117 $10.00, Model 14 TD's $4.50, TS-2/TG $4.50, USM-32 $10.00, R-390/URR $6.50, CV-591A/URR $6.50. Hundreds of Model 28 manuals in stock. Sam Consalvo, W3IHD, 4905 Roanne Drive, Washington, DC 20021.

MITE MANUAL WANTED, TT-297 or 299. Selling Teletype Bulletin 216B (Description, Principles of Operation, 28 KSR, RO). $3.50 pp. Fred Firestone WN9IEE, 806 N. School St., Normal, Illinois 61761.

FOR SALE; BC342N receiver, 1.5 - 18Mhz and original AC supply built in, $40.00. New cabinet for Heath 301 - $11.00. PPD. SFO-2 regenerative repeater $25.00 PPD. CV305 TU $45.00, many other items - drop me a line. Jerry Buckler, 29 Parkview Dr., Plains, PA. 18705