RTTY Character Counter-

alternative approach, thought to be original with the author, is to put the 47 ohm resistor in series with a ground return resistor which runs between ground and the negative side of the loop supply. All Mainline demodulators have such a resistor which is rated at 20 watts and usually has a value between 1000 and 3000 ohms.

The circuit is illustrated in Figure 7. An additional transistor is required, which serves not only to present the Selcal with voltages of the proper polarity, but as an input isolation stage as well. On the W4VWS, Driver board, there are pads and space available for the additional components.

The potential at the junction labled loop (-) is minus 2.8 volts during mark, and zero during space. The negative voltage will overcome the forward bias at the base

of the MPS3393, cutting it off. In this case, the potential of the collector, labeled IN, will be 3.6 volts, but will drop to appoximately 1.5 volts when connected to the Character Counter. Thus, the input to the Character Counter is high (greater than one volt) during mark.

During space, the transistor is forward biased, saturated, and the collector is at a low potential of about 0.2 volts. Thus, the input to the Character Counter is low (less than 0.3 volts) during space.

One special advantage of this circuit is that it provides some isolation between the logic and the loop, thus serving to protect the logic should one accidentally apply an excessive input voltage to the Character Counter.

Special thanks go to Bert, K4EEU, for building a Character Counter and giving the author an evaluation of the unit prior to publication of this article.

***

First Class Mail
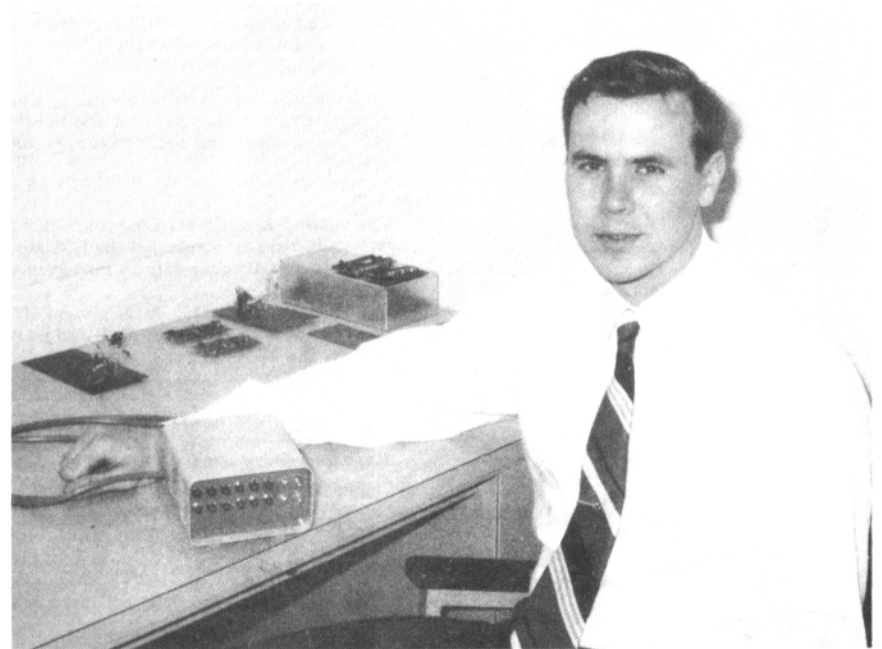
'Frank' K5ANS

CONTENTS

SSB & RTTY Club

BOX 144–COMO (Italy)

Alexander Volta RTTY DX Contest

The SSB & RTTY Club of Como (Italy) claims the sixth edition of the Alexander Volta RTTY DX Contest.

The contest will be entirely devoted to increase the interest of all the radio amateurs in RTTY, and to remember the italian discoverer of electricity Alexander Volta.

RULES

(1) TEST PERIOD
14.00 GMT December. 5 to 20.00 GMT December 6

(2) BANDS
The test will be conducted in the 3,5-7-14-21-28 MHz amateur bands.

(3) EXCHANGE POINTS

(A) All two-way contacts with stations in one's own zone will receive two points.
(B) All two way contacts with stations out side one's own zone will receive the points stated in the Exchange Points Table.

(4) Stations may not be contacted more than once on each 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 as a separate multiplier, if a different band is used.
The one's one country doesn't count as a multiplier.

(6) SCORING
Total exchange points times number of multipliers.

(7) COUNTRY STATUS
A.R.R.L. Country list-except KL7, KH6 and VO, to be considered as separate countries.

(8) MESSAGES
Stations will exchange messages consisting of:
(A) Check (RST)
(B) Zone number

(9) LOGS AND SCORE SHEETS
Use one log for each band.
Free log forms and score sheets are available on request from SSB & RTTY Club, Box 144, Como.

These forms are not obligatory. Log should contain: band; times ; NR sent and received; call signs; countries multipliers; exchange points.

(10) SWL
The contest is valid also for SWL RTTYers Are valid the same rules of the OM and a separate result table will be made for these entries.
The logs must contain; date, time(GMT), call sign of station heard, RST and number sent by the station heard , exchange point. The same station is only valid once on each band.

(11) DEADLINE
Logs and score sheets go to

A.V. RTTY CONTEST MANAGER

FANTI Dott. FRANCO
Via A. Dallolio n. 19
40139   Bologna   ITALY

They must be postmarked not later January 10th 1971 to qualify.

(12) CERTIFICATES

Certificates will be awarded:
-to the two top scorers in each country;
-to the two top scorers in each U.S. call district;
-to the three top scorers with power input under 100 W.
-to the three top scorers SWL.

(13) WORLD RTTY CHAMPIONSHIP
Points and positions achieved will be valid for inclusion in World RTTY Championship 1970.

Digital Auto start for RTTY

Dr. FRANK STEWART, K5ANS
Physics Dept. N L U
MONROE. LA. 71201

Introduction

The Character Counter is a digital electronic device which distinguishes between hits (non-RTTY signals) and signals that one may reasonably expect to be valid RTTY characters. It was designed as an antigarble accessory for the Selcal. It does not recognize individual RTTY characters (the Selcal does that) but provides a form of autostart for quality RTTY transmissions and discriminates against those which would print only as garble.

Basically, autostart operation with the Character Counter is as follows: After a suitable number of consecutive valid RTTY characters have been received, the Character Counter turns on the printer motor and allows normal printing. Should the print begin to develope an excessive number of hits, the printer selector magnets are automatically switched from the usual demodulator keying loop to an auxiliary 60-ma. power supply, thus placing the printer in a forced mark-hold, or non-print condition. The printer motor remains on, but turns off approximately a minute later if the quality of the received signal does not improve. If it does improve, the selector magnets revert back to the keying loop and normal printing recurs. The usual demodulator autostart circuits need not be used at all.

Autostart Methods

During the last decade, autostart on the high frequency bands has gained widespread popularity. Four practical methods are in use to achieve it. They are the (a) demodulator squelch circuits (b) Selcal (c) Automatic Printer Control, and now the (d) Character Counter. Prior to a description of the Character Counter, a brief description of the other three methods will be given for comparison purposes, along with the major disadvantages of each.

(a) Demodulator squelch circuits. This is the most common method used. Either the mark, or both the mark and space detector outputs are sampled and printing is allowed only if the "effective key down ratio" (1,2) is sufficiently high, for example
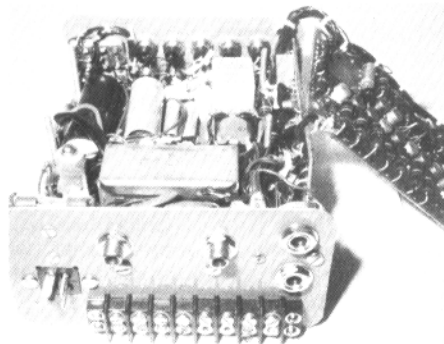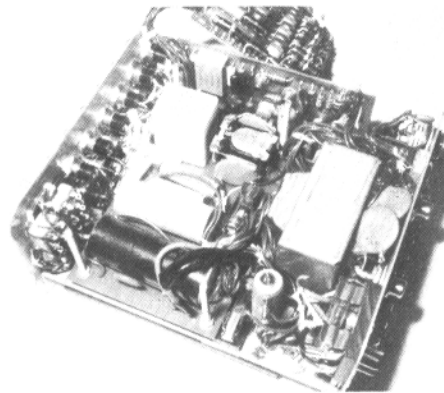
"Interior view of the Character Counter with optional lamp driver board removed. The 4PDT relay with the white plastic cover serves as both the print relay and printer control relay. Along the left edge is an optional, unpublished, five-transistor input isolation circuit which provides transformer coupling between the loop and the logic. Standard phone jacks are mounted at the rear; one is in series with the loop while the printer magnets plug into the other. The two W4VWS boards are mounted below the chassis."

***

75 percent or more. This method is employed in the Mainline TTL (3) and ST series (4,5) of demodulators, as well as in other units (6).

Such demodulators do a good job of ignoring voice and A-1 (keyed CW) signals but do turn on the printer motor for a steady carrier on the mark frequency, even if no RTTY is transmitted. These units will

also turn on the printer motor for extremely weak RTTY signals, or even for strong ones suffering from heavy interference, although the print may be so garbled that is is unreadable. While one may not regard this as an operational defeat of the demodulator, it is an annoyance in that there is no really satisfactory way of electronically discriminating, at one's option, against unreadable signals. Simply decreasing the receiver-demodulator sensitivity does limit system response to only strong signals, but has the disadvantage of discriminating against weak, yet perfectly readable signals, and, of course, does nothing to eliminate garble printed from strong signals with which there is heavy interference.

An additional annoyance is that in all but the TTL/2 and ST-6, a steady carrier on the space frequency will cause the printer to run open.

(b) The Selcal (7,8,9) represents a distinctive autostart refinement; the printer will respond only to a preprogrammed sequence of valid RTTY characters. Reception of the sequence "NNNN" either turns off the printer motor, or reverts the printer to a non-print condition by other methods (two of which are shown in Figs. 1 and 2). The basic Selcal should be used only in conjunction with the demodulator autostart circuitry; otherwise, if the 4N turn-off were missed at the end of a message, the printer would print garble indefinitely, responding to random noise.

A popular objection to the use of the Selcal by those who wish to print messages addressed to several different stations is based upon the premise that the Selcal may turn on for only one particular set of three or four RTTY characters; however, this is not true. Selectively grounding the inputs to the various character gates allows the Selcal to respond to several different codes simultaneously. Indeed, if all twenty inputs were grounded rather than connected to the buffered shift register outputs, the Selcal would respond to any set of four RTTY characters. Even such a trivial application of the Selcal would result in an improvement in autostart operation over that realized with the use of only the demodulator in that virtually all CW will be ignored as well as steady carriers on the mark frequency (the author prefers that his machine not turn on if someone is simply "tuning up".). With these two exceptions, however, such operation still suffers from the same annoyances discussed earlier; once the Selcal has been turned on there is no garble or steady-space protection other than 'hat offered by the demodulator alone. In addition, the use of a demodulator-Selcal combination has one disadvantage of its own. The demodulator must receive signals for three or four seconds (or longer) before it will allow the Selcal to operate. All too often the Selcal misses its turn-on code and an entire message is lost.

(c) A novel form of autostart was achieved by K3NIO (10) with his Automatic Printer Control (APC). It was actually developed prior to the Selcal and the Mainline TTL, but not many amateurs used it, probably because of its complexity; its circuit includes almost three dozen transistors, as many diodes, and over one hundred resistors.

The APC counts RTTY characters by simply counting start pulses. It assumes the first spacing condition immediately following a prolonged period of marking is the beginning of a start pulse. Hits are recognized only by a spacing condition existing at what should be the middle of a stop pulse, i.e., 145 ms after the beginning of a start pulse. A reversable binary counter counts up one step for each valid character and down five steps for each hit. Only after 32 upcounts does one's printer turn on. Once on, the printer turns off if an excessive number of hits are received, i.e., seven hits prior to the reception of 32 valid characters.

One user of this system on autostart nets, W6FFC, feels that a 32 character turn-on requirement is excessive; too much readable print is lost due to APC turn-offs following only momentary periods of garble. Lowering the turn-off requirement, decreasing the number of down-counts per hit, or both, would further enable the printer to "hang on" to a noisy signal but would seriously degrade the protection the system offers against noise and CW.

(d) The APC article was used as a starting point in the development of the Character Counter. The author felt that a turn-on requirement of a small, but <u>consecutive</u> number of valid RTTY characters would solve the operational problems of the APC. In addition, it was desirous to have a motor delay circuit independent of the print control circuit. Finally it was felt that the problem of complexity and laborious construction time could be minimized by the use of integrated circuits. Inexpensive

Motorola Resistor - Transistor - Logic (RTL) was chosen so that the Character Counter could be driven from the author's Selcal. For those not having the Selcal, a suitable Driver independent of the Selcal was designed.

Printer Control Circuit

Essential to the proper operation of the Character Counter is a circuit which will revert the printer to a forced mark-hold condition in absence of RTTY signals. Such a circuit the author built to control his Model 19 printer is shown as Fig. 1. The print relay, a part of the Character Counter, may be the same as that supplied with the Selcal, a Sigma 65F1A-12DC. An equivalent, but somewhat better quality relay is the P & B Type RS, 12VDC, 1350 ohms. The print relay serves to actuate the 3PDT printer control relay which switches the printer selector magnets from an auxiliary power supply to the keyed loop for normal printing. Virtually any power supply - control relay combination may be used as long as at least 40 ma can be drawn by the printer while it is in non-print. During that time, a resistor should be switched into the loop to substitute for the DC resistance of the printer. Its value, shown as 270 ohms in Fig. 1, should be chosen accordingly.

In lieu of constructing an auxiliary power supply, the loop power supply itself may be used. Fig. 2 shows such a circuit designed for the Mainline TTL "floating loop". In this, or in a similar system, one must be careful in mounting the print relay so as not to ground any of its contacts, and to insure that the Selcal and the demodulator keying circuit still operate normally, even when the printer is in a forced mark-hold condition. In other words, the demodulator must not be reverted to standby at any time or the Selcal/Character Counter could not recognize and count RTTY characters.

Schematic Diagram

The schematic/logic diagram is shown in two parts, the print-nonprint circuit, (Fig. 3a) and the motor control circuit, (Fig. 3b).

The print-nonprint circuit requires five gate outputs from the Selcal (or a suitable Driver): Inverse Decode, Clock-ϕ, In, Hit, and 4N. These outputs are well-labeled on the Selcal schematic. The appropriate I.C. pin numbers and gate identifications are as follows:

1. Inverse Decode: Pin 3 of the inverse decode "B" inverter.
2. Clock-ϕ: Pin 6 of the Clock-ϕ inverter, pin 3 of the Set gate, or pin 5 of the Shift gate.
3. In: Input to the Selcal, pin 8 of the SR5 inverter, or pin one (clear input) of the SR5 flip flop.
4. Hit: Pin three of the Hit A gate, pin ten of the Hit B gate, or pin six of theStart FF.
5. 4N: Pin 12 of the 4N gate, or pin 10 (preclear, or direct clear) of the print flip flop.

The first three inputs are identified by pads on the Selcal boards supplied by K4OAH and K0OJV.

In making the above connections from the Selcal to the Character Counter one will not overload the Selcal in any way. Indeed, every effort was made to minimize Selcal loading.

In addition to the above five connections, the Character Counter must be provided with ground and plus 3.6 VDC lines. The Selcal power supply easily handles both the Selcal (600 ma) and the entire Character Counter (350 ma.). The author recommends putting in a 1.5 amp fuse immediately after the emitter of the RCA 40310 power transistor.

The print-nonprint circuit drives the motor control circuit with six outputs:

1. Print - Q
2. Print - Not Q
3. 4N - Q
4. DC2 - Not Q
5. DC4 - Not Q
6. DC8 - Not Q

In each case, "Not Q" is identified by a bar drawn over the Q. All six outputs are readily identified in both parts of Fig. 3.

Boards (undrilled) are available for the Character Counter ($4.00) and Driver ($3.50) from W4VWS (11). Fig. 4 shows the logic package layout of his boards. Using these boards plus a Selcal power supply board of his own design, the author constructed a Character Counter housed in an LMB CO-3 cabinet and chassis. This unit may be plugged in to virtually any loop somewhat like a reperforator. The printer plugs into the LMB cabinet. The Character Counter board supplied by W4VWS is somewhat too long to fit in to the CO-3; therefore, it was necessary to cut off approximately 3/8 inch near the end which holds the transistors and the 100 mfd capacitor. The print transistor (MPS-3393)

and the sigma relay were replaced by a single MPS-6515 transistor; a 12 volt power supply and a 12 VDC relay were used for printer control. For best regulation, the 12 volt output of the Selcal power supply was not used, but rather a separate bridge rectifier was constructed, driven from the same transformer.
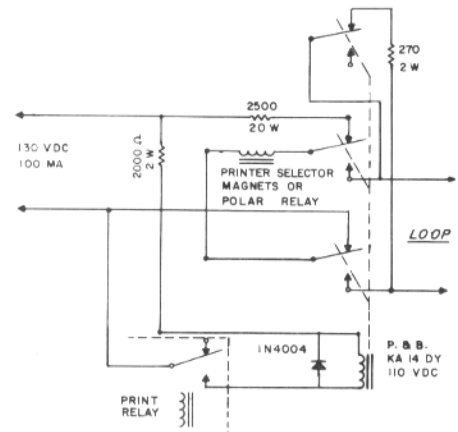

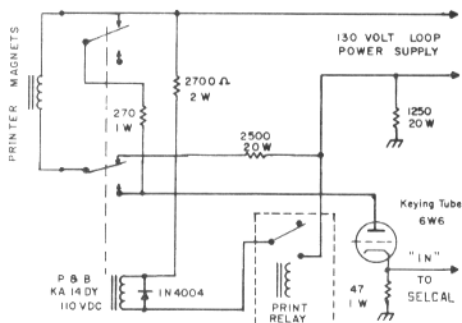FIGURE 1. Printer Control Circuit
(Shown in non-print condition)

FIGURE 2. Printer Control Circuit with TTL Floating Loop Power Supply.

Theory of Operation.

In this section, the author assumes the reader is familiar with RTL operation as described in either the Selcal articles, or in Chapters, 1, 2, 3 and 5 of the "RTL Cookbook" (12). In addition, the reader should have available the Selcal timing chart.

The heart of the Character Counter is the five stage decode counter, DC1 – DC5. After 16 RTTY characters, the print flip flop, (FF), P_3 and P_4, is set, and a Hi appears at Print Q, turning on the print transistor and relay. In addition, the 4N

FF is reset (low appears at 4N-Q), so that only eight RTTY characters will be required to again set, the Print FF should it be reset for any reason. The inverters P5 and P6 increase both the noise immunity and the fan-out of the print FF. Switch S1 corresponds to a "Fast-Slow Autostart" switch in that when closed, only eight characters are ever required for printing.

The decode counter is precleared by a 3-input "OR" gate formed by the decode preclear gate (DPG) and the decode preclear buffer (DPB). The 3 inputs come from the following outputs.

1. Selcal Hit Gate
2. Third 4N Inverter (4NI-3)
3. Antispace Gate (ASG)

The Selcal Hit gate provides a positive pulse whenever marking is detected anytime during the central 11 ms of the 22 ms start pulse. The 4NI-3 provides a positive pulse upon Selcal recognition of the sequence "NNNN". Two other circuits effectively locally generate 4N pulses and they will be described later. The output of 4NI-3 serves as a master turn-off for the entire Character Counter in that when its output is high, both the decode and hit counters are precleared, and the Print FF is reset. The ASG output is high if a spacing condition exists during a certain interval during the stop pulse. The entire decode interval could be used since this interval should lie wholly within the stop pulse interval; however, the decode gate (DG) and the decode inverter (DI) select this interval to be only the second half of the 5.5 ms inverse decode pulse. With the stop pulse well underway (about 4 ms) before the ASG searches for a spacing condition, slight bias distortion (or a slightly inaccurate Selcal clock!) will not contribute to hits being registered unnecessarily while the printer is producing a readable copy.

In addition to preclearing the decode counter, the DPB drives a four stage Hit counter, HC1 – HC4. In this context, each output pulse of the DPB is considered a hit. The output of the HC is a positive pulse generated by a half-monostable HM after the sixteenth Hit. This output pulse is routed to one input of a three-input "OR" gate formed by the 4N gate (4NG) and 4NI-3. Thus, should the HC ever accumulate 16 hits before it is precleared, the Character Counter will turn off just as it would, should it receive a 4N pulse from the Selcal.
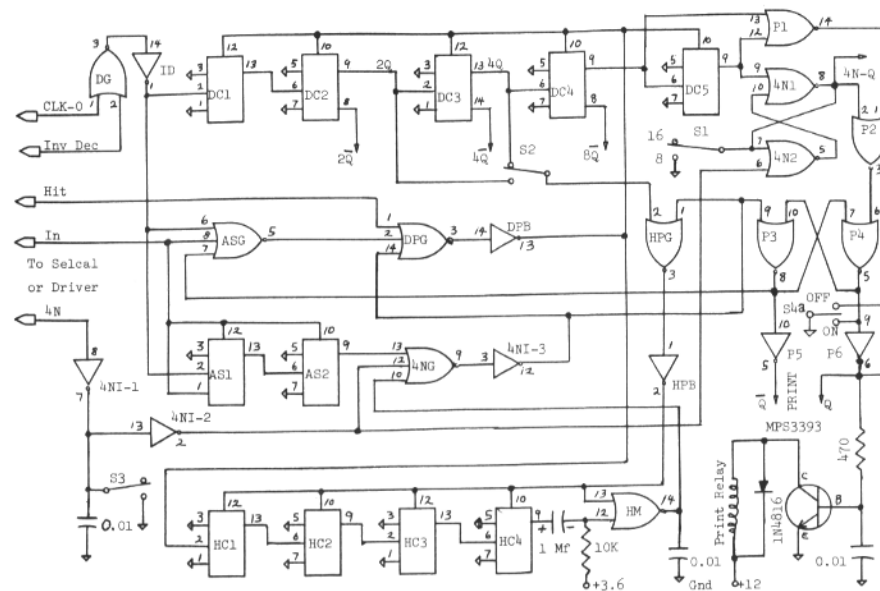
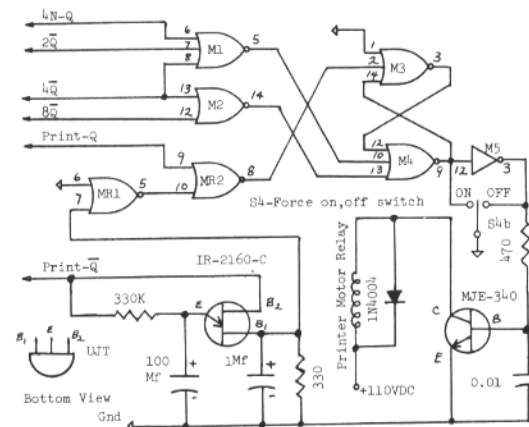Figure 3a. Print-nonprint circuit for the Character Counter.

Figure 3b. Printer motor control circuit for the Character Counter.

The HC is precleared by the two-input "OR" gate formed by the hit preclear gate HPG and the hit preclear buffer HPB, One of these inputs goes to the master turnoff, the output of 4NI-3. The other input is high after either two or four consecutive inverse decode pulses, selectable by the operator by switch S2. In normal operation, the HC is precleared by DC4-Q, that is, every four consecutive valid RTTY characters. If one wants to hang on to an especially weak or noisy signal, he should allow the HC to be precleared by DC2-Q (two characters). The HM is disabled whenever the HC is precleared so that pulses from the DC will not reset the print FF by firing HM. HC

remains self-preclearing, however, because of the propagation delay time associated with 4NG, 4NI-3, HPG and HPB.

A high at any of the three inputs of the 4NG, 4NI-3 "OR" gate will immediately turn off the Character Counter, and open the print relay. One of these inputs is momentarily high for each Selcal 4N pulse; another is momentarily high should the hit counter fill up; the third may be driven high by the two-stage antispace counter AS1 and AS2. Under a condition of steady spacing the Selcal continuously generates 5.5 ms decode pulses spaced 163 ms apart. After three of these (about one-half second) the output of AS2 flips
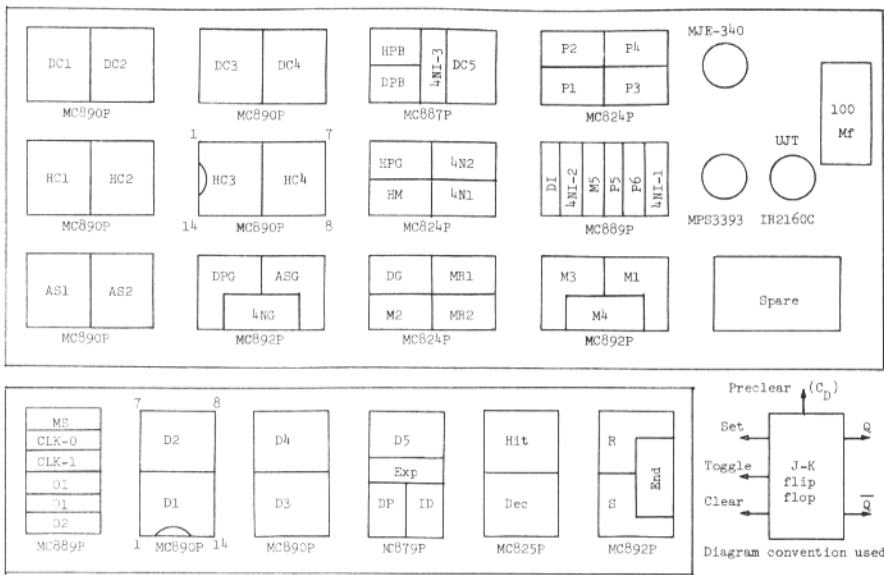
Figure 4. Logic layout used by W4VWS (bottom, or copper foil view) for the Character Counter board (3" X 6") and the Driver board (1.75" X 4.5"). All packages are orientated identically (see the HC3 - HC4 package).
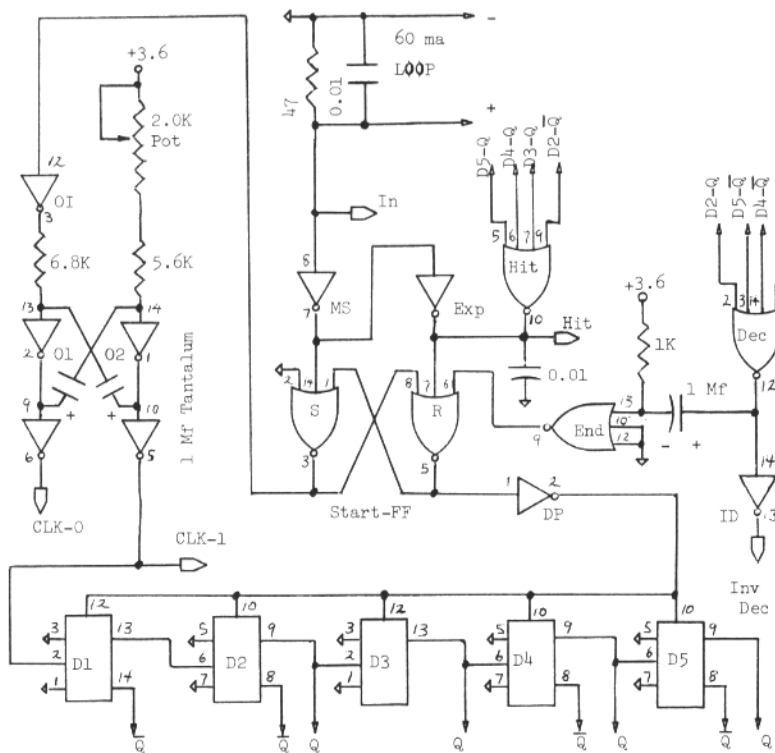

Figure 5. Driver circuit for the Character Counter.

high and the Character Counter promptly turns off.

The first two 4N inverters 4NI-1 and 4NI-2 reduce the 4N fan-in of the Character Counter from two gates to one. By momentarily grounding the output of 4NI-1 by either a push button (S3) or a set of Stunt Box contacts, one may turn off the Character Counter independently of the Selcal.

The printer motor flip flop M3 and M4 is set by gate M2 following the 12th decode pulse. Thus, the printer motor has a chance to achieve proper speed prior to printing following the sixteenth decode pulse. Inverter M5 provides increased noise immunity. Gate M1 will set the motor FF following only the sixth decode pulse if the 4N-FF is not set. In this case, printing will commence following the eighth decode pulse.

Anytime the Character Counter turns off, a Hi on Print-Not Q is applied to a unijunction transistor (UJT) serving as a relaxation oscillator. Approximately a minute later the (UJT) fires, resetting the motor FF through the motor reset gates MR1 and MR2. Gate MR2 insures that M3-M4 cannot be reset should Point-Q be high, that is, should the Character Counter turn back on again after a momentary off period.

The Driver and Power Supply

The circuit in Fig. 5 may be used in lieu of the Selcal for driving the Character Counter. It is identical in many respects to those parts of the Selcal circuit which generate the pulses needed for the Character Counter. The clock frequency should be adjusted to 181Hz as in the Selcal, with the 2.0K pot. There have been minor wiring and layout changes in order to minimize the number of individual IC packages required. There are only two significant changes. The End pulse is generated by a half-monostable following the Decode pulse. A half monostable fires only on negative going input transitions; therefore, the End pulse is not begun until the conclusion of the Decode pulse. A new IC package, the MC879P has been used, which consists of a JK-FF (the fifth Divider D5) two Buffers, (the divider preclear DP and the inverse decode ID) and an expander Exp which expands the hit gate to the needed five inputs.

There is no provision in the Driver for supplying 4N pulses. Such would require a character recognition and counting circuit, along with a shift register and its toggling set and shift gates -- in other words, well over half of a Selcal. One may as well build a Selcal if he wishes to recognize "NNNN" electronically. In lieu of 4N pulses, the Character Counter may be turned off by momentarily mechanically closing switch S3 as has been discussed previously and the input of 4N1 should be grounded.

The power supply is practically identical to that used in the Selcal. It is shown in Fig. 6 for the benefit of those not having access to the Selcal articles.

The author prefers a liberal use of bypass and filtering capacitors. Disc ceramics (0.01 Mfd, 100 V) have been placed between the plus 3.6VDC and ground foil strips every two inches on both circuit boards. Every line entering the metal enclosed cabinet and chassis, has been bypassed with 0.01 Mfd, 1 KV disc ceramics. If the reader builds the Character Counter and connects it to his Selcal, the seven lines from the Selcal (3.6VDC, ground, and five gate outputs) should be kept short, shielded and bypassed with
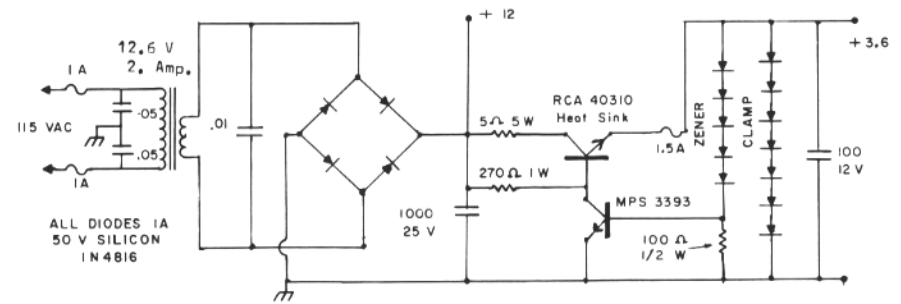

FIGURE 6   POWER SUPPLY

0.01 Mfd, 100 V disc ceramics. Although not indicated in the schematics, the outputs of DG, 4NI-1 ASG, 4NG, HM, Hit, Decode, and the transistor bases (15) were also bypassed. RTL is inexpensive, but has poor noise immunity and is quite susceptible to rf-pickup. The relatively small effort required to eliminate glitch (12), transient and rf-pickup problems is richly regarded by carefree, reliable logic operation.

Summary

The Character Counter will provide foolproof autostart operation for virtually any printer/demodulator combination. All demodulator autostart circuitry should be turned off so that the loop is continuously being keyed by random noise. One may either use a limiter or operate limiterless. Indeed, in the better quality demodulators, some advantage is realized with limiterless/DTC operation (13,14).

The Character Counter is immune to steady carriers, voice and code; there must be valid RTTY typing present. The author hastens to point out, however, that a long string of Morse dashes will give a turn-on as this transmission is equivalent to that of a steady succession of "LTRS" characters, and the printer will respond accordingly. The Character Counter promptly shuts off when the transmission, regardless of its nature, ceases.

In normal operation, the printer motor turns on after 12 consecutive RTTY characters without a hit, and normal printing commences after 16 (or after six and eight characters, respectively, should S1 be closed). This represents a relatively quick response, especially since non-print RTTY characters such as LTRS, Carret, and LF are also counted. On autostart nets in which the author prints everything readable, hardly any printing is missed at all at the beginning of any transmission and no special call up or turn-on codes are necessary from the transmitting station. At the end of a message it is customary to send a string of eight to ten N's. The printer locks up into mark-hold immediately following the fourth N, so there is no chance of its printing garble during the Morse identification.

Tests made with W6FFC with 170 H_z shift show that the Character Counter will respond to RTTY signals within 50 to 60 H_z of the autostart net frequency.

The hit counter operates continuously, but is forced to start over every four consecutive (or only two, depending on the position of S2) valid RTTY characters. If, prior to the reception of the 4N turnoff, print becomes so garbled that the hit counter fills up (16 counts) the printer reverts to nonprint. This could happen due to fading or heavy interference (or even if the RTTY signal leaves the air!). Since a 4N pulse was not received, the printer will resume printing almost immediately (after only eight characters rather than 16) should the print improve.

In view of the above, one readily understands and appreciates the difference between the eight and 16 character turn-on requirement. The end of a message is usually concluded with a string of N's. After the fourth N, 16 rather than only 8 characters are required for a turn on: therefore, there is little chance of one getting a undesirable turn on should additional N's, spaces, carrets, LF's, and LTRS be received before the transmitting station finally leaves the air.

The Character Counter is somewhat slow to turn on for weak or noisy signals, and indeed may not turn on at all if there is heavy interference. This is intentional. Central to the design philosophy was the desire to have a turn-on for readable print, but not otherwise. Once turned on, the Character Counter will tolerate a greater-or-lesser amount of garble depending on the position of S2. With the garble switch S2 in the "four" position, only three or four random characters are printed following complete loss of signal; only random noise being present in the receiver. On the other hand the character counter will follow a completely garbled, unreadable signal through perhaps 1/4 to 1/3 of a line of copy.

Acknowledgements

Appendix - Parts and Prices

The total parts' cost may vary from $35 or less to perhaps $80, depending on the cabinet and quality of parts selected, what parts one already has available, whether or not he already has a Selcal and whether or not he uses the W4VWS boards.

Depending on options, the Driver will cost from $12 to $18. The 800 series logic for the Driver costs $9.25. The 700 series logic cost $8.07. The author used the 800 series; it is rated for a wider temperature range and less attention need be paid to cooling and air circulation. The W4VWS Driver board costs $3.50. The 39 cent Mallory MTC pot (vertical mount) used by many Selcal builders does not have the stability or resolution necessary to accurately set the clock frequency. The author uses an Amphenol 3800P wirewound trimmer at $1.75. For one who insists on the Mallory, an MTC-4 horizontal mount rather than a vertical mount will fit nicely on the Driver board. For the tantalum capacitors, one should use the sprague 150D, 1 Mfd, 35WVDC at $1.34 each.

The power supply will cost about $15. The transformer should be a 12.6 VAC, 2 amp filament type such as the Stancor p-8130 or the Merit p-2959.

Exclusive of all relays, the print-non-print section will cost from $28 to $35. The 800 series logic cost $21.15; the 700 series, $18.32. The W4VWS board is $4.00. The discrete parts including resistors, capacitors (including 10 bypass capacitors), transistors, diodes and switches will cost about $7.00. The IR2160C seemed to be the only UJT available to the author locally. The Motorola 2N4871 (at 75¢) may be substituted.

It is assumed the reader already uses a 110VDC printer motor relay. If it is an AC-type, it must be replaced or else the MJE-340 transistor must drive a DC "slave" relay which in turn operates the printer motor relay. If the Sigma 65F1A-12DC ($1.50) or the P & B Type RS, 12VDC $3.05) is used as a slave, then the MJE-340 ($1.06) may be replaced with an MPS3393 (32¢). Less sensitive 12VDC relays should be driven with the higher-gain MPS6515 (64¢) In a unit built by the author, a MJE340-110VDC relay combination was used, but a 12VDC relay was used in the printer control circuit (See Fig. 1). The P & B KHP17D11, 4PDT, 3A, 12VDC at $5.05 proved an excellent choice. Thus, the cost of a suitable printer control circuit including this relay shunted by a 1N4816 and driven by a MPS6515 is about $6.00.

Finally as far as a cabinet is concerned, the grey LMB CO-3 ($5.40) makes for an attractive unit, especially if one needs to build driver and power supply. For just the Character Counter board, either the grey 6" x 5" x 4" LMB "Tite-Fit" ($1.83) or the equivalent Bud Minibox ($1.90) is ideal. In any case, however, virtually any all-metal enclosure is quite suitable.

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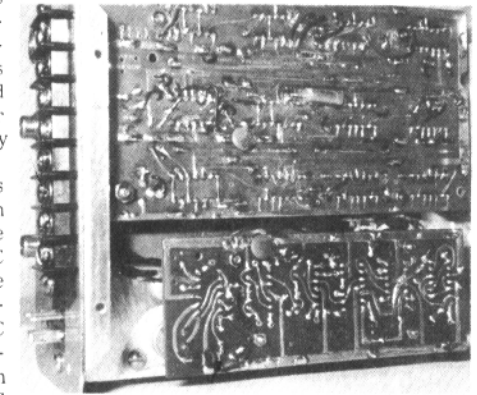
"Bottom view of Character Counter showing the W4VWS Driver (smaller of the two) and Character Counter boards."

APPENDIX B
Optional Input Circuit

The usual method of driving a Selcal is to sample the 60 ma. loop current with a 47 ohm resistor as shown in Figure 2. With the use of some demodulators, however, it is either undesirable or impossible to add such a resistor between ground and either the cathode of the keying tube, or the emitter of the keying transistor. An

VHF RTTY NEWS

RON GUENTZLER, W8BBB Editor
Route 1, Box 30
Ada,   Ohio 45810

VHF "STANDARDS"

Because there are frequent new-comers to RTTY, it is worthwhile to periodically review the modes of operation on the VHF bands.

Normally on both 2 and 6 meters, AFSK (Audio Frequency Shift Keying) is employed. This is not meant to be construed that FSK (Frequency Shift Keying) is never used, just that AFSK is the more common mode of operation on VHF.

AFSK is used by applying the output of an AFSK keyer to the microphone input of an AM or FM transmitter.

The most commonly used tones for AFSK are 2125 Hz for Mark and 2975 Hz for Space.

When AFSK is applied to an AM double sideband transmitter it is known as 6A2 modulation. When AFSK is applied to an FM transmitter and the deviation is 12 kHz, the modulation is called 30F2. (Usually, the deviations are held below 12 kHz.)

With 6A2 modulation, the antennas are usually horizontally polarized. On VHF, cross-polarization (one antenna horizontal and the other vertical) usually results in large signal losses. In general 6A2 operation is not "channelized"; i.e., no specific frequency is used. This is similar to voice AM (DSB & SSB) operation where operation is on any legal frequency and QSO's are on a catch-as-catch-can basis. Usually, 6A2 operation is in the 145 to 145.5 MHz range. There are some areas in which operation is at specific frequencies. Some information is available here as to what frequencies are used in those areas. Please ask.

30F2 operation is usually by means of crystal-controlled transmitters and receivers. Therefore it is desirable to use a specific frequency for operation. The "national" FM frequencies are 52.600 MHz and 146.700 MHz. As I understand it, in this area, there is no activity on 52.600 MHz. However, in the Twin Cities area 52.600 MHz is widely used. Otherwise, practically all VHF FM RTTY seems to be on 146.700 MHz with the exception of Detroit where it is also on 146.820 MHz and Milwaukee where it is on 146.880 MHz. With FM, vertical polarization is used.

If I have missed any specific operating frequencies, please write and I will be happy to publish the information.

A NEW VHF DX RECORD?

"Cappy" Ricks, W8DXW, in Chardon, OH writes: "Don't know if I have a DX record for six. I worked W4VME - Jim - Clearwater, FL on Dec. 22, 1969, 1950 to 2015 EST. Freq. 50.7 - AM-AFSK - with a Utica 650 - 20 Watts - 5 element Telrex Beam. So maybe that tops W1ORI and K9CGD." Any more comers?

ACTIVITY HERE

For a long time, as some readers will verify, I have been trying to get information on VHF RTTY activity, but information has been slow in coming. Therefore, the following is a list of stations heard or worked from here in the last few months. No brag - just trying to generate copy. I run autostart 24 hours per day, so if any station comes on, it is printed. All stations 30F2 on 146.700 MHz:

K8OEF heard talking with K8YTE es W8GYV

W8PYM heard talking with WB8AAK

W8DYV heard talking with K8ZOA es WB8AAK.

A four-way QSO with K8LMN, WA8MJL, es WB8FNB

Talked with W9LVX (ex W8HLJ).

K8ZOA heard talking with WA8ABT.

Talked with K8ZOA

K9AHX heard calling K9KRE.

Talked with WA9OLQ es W9INF. Heard WA9EXS es W9ZGC.

Heard WA9OKC. WB9ESE, es W9HTH, but could not break.

Talked with K8OEF, W8BX, K2RAM/8, es WA8SEL.

The stations listed above are in (general areas of) Detroit, South Bend, Chicago, Lafayette, Indianapolis, and St. Marys, Oh.

Again, let's have some information about VHF RTTY operation.

73 ES CUL, RG.

RTTY-DX

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

Hello there ....

Although this is the November issue, the complexities of publication are such that at the moment of writing this it is still two weeks before the Contest but by the time you read it the Contest will have been long over. So, there is not much we can say about the Contest except to voice some speculation as to what might take place based upon what is going on at the moment. Voicing opinions of this sort is a dangerous game as they usually turn out to be wrong in the final analysis; but we will give it a go anyway.

Band conditions have been excellent. Even Ten Meters, which had been extremely poor during the past several months has been open to all parts of the world during daylight hours. It has also been indicated by the "Propagation" column in CQ Magazine that good conditions would continue through October. It is also anticipated that RTTY activity on 40 and 80 Meters will hit an all time high this year during the Contest. WAC on 40 Meters at least is a distinct possibility.

Pre-Contest activity has been very encouraging and if a high percentage of the activity continues through the Contest period scores will be higher than ever this year. Here are some of the prefixes noted in the few weeks preceding the Contest. CR6 - CT2 - DL - EA - EI - ET - F - FG7 - FO8 - FY7 - G - GM - HA - HB - HI8 - HK - HP - I - IS - JA - KG6 - KH6 - KL7 - KP4 - KR6 - KZ5 - LA - LU - LX - OA - OE - OK - ON - OZ - PA - PY - SM - SV - UA - UP - UQ - UR - VE - VO - VP9 - VU - W - XE - YV - ZD9 - ZL - ZS -. Of course all of the above will not show up, but with two, three, or more bands used by even half of them the multiplier possibilities will be really fantastic. Next month we hope to give a review of what really happened!!

In late September we almost fell off the chair when we heard Giovanni, I1KG, in QSO with ET3USA on Twenty Meters. A short time later we were happy to make contact with Bart in Asmera, Ethiopia. Those fb signals emanate from an Apache feeding of Quad antenna. The RTTY gear is a Model 15 with Model 14 for tape. Bart's home call is K8IRC, Iron Mountain, Michigan and his present QSL address is --

    Post Office Box 123
    Headquarters Company
    APO New York, N.Y. 09843

He was really getting ready to enter his first Contest on RTTY, and look for him on 15 Meters also.

Jan and Joey, ZS6BBK and ZS6BBL, the OM-XYL team down in Johannesburg are doing a great job in bringing renewed activity from South Africa. They also pass along the great news of the recent activity of Sandy, ZD9BO, on Gough Island in the South Atlantic. You will have to do a bit of "range finding" and filter switching for Sandy as he uses 50 Baud and the European standard shift, about 425 Hz. Joey tells of hearing him in QSO with Gin, JA1ACB, which, no matter how you measure it, is real long haul DX. Sandy's usual operating times are around 0730-0900Z especially on weekends. Jan says that the following stations are active down there in South Africa, ZS6AJS, ZS6ARL, ZA1ANT, and of course ZS6BCT.

Leo, formerly EL2BD, (now K4AGC) tells us that he left his Model 19 in Monrovia when he left in August and that Lee, EL2CB may pick up where he left off. Let us hope that Lee gets the station going on RTTY real soon.

This month we are pleased to announce the addition of the following two stations to the ever growing list of WAC certificate holders.

    Nr. 132 Marcel R. Mongrain
        VE2LO/W6
    Nr. 133 Gin S. Naniwada
        JA1ACB

Marcel got them all in the last WAE RTTY Contest, and his station also won in the multi-operator category. Marcel is growing some huge antennas at his Huntingdon Beach location and will be the station to watch in the coming Contest season. Gin of course has been giving that Asian contact to many of those working toward WAC and the hardest one for him to get was South America. This is another "first" for Gin, as he be-

comes the first JA station to make WAC - RTTY. Gin would also like to tell you that on 40 Meters he is usually between 7020 and 7030 Khz. Due to the severe QRM from International broadcast stations and SSB activity both the usual 7040 and 7090 frequencies are impossible on RTTY.

If you really want to give the new beam you just put up a test give K2GQJ/mm a call next time you hear him. He is on the hospital ship Repose in the area of the South China Sea and really puts out a potent signal. Really a shame that these /mm calls can't count as something

Pierre, FY7YQ has really put French Guiana on the RTTY map with his excellent signal the past few months. We are happy to report that Pierre also makes trips to Surinam on an average of about once a month and informs us that he may get on RTTY from Paramaribo in October or November so keep your ear tuned for a PZ1 signal. NOTE-between the hand written draft of this article and the typed copy we had a QSO with Pierre and he says that he will do his best to set up a station at about the 29 October for that weekend.- The last known activity from there on RTTY was in 1965 by PZ1AX and by this time there is a whole new generation of RTTY'ers that need this country.

Larry, formally KG6NAA, (now K1 LPS) is back on the bands again after his move to Vermont. He reports that the DX really pounds in. No doubt Larry will be pretty busy again as I imagine that probably more fellows need Vermont for WAS than needed Guam for DXCC.

Carl, WB6RXM; Joe, W9AE; and Adrain, VK2FZ, have been doing some real serious work toward a five band WAC and in fact have had five band contacts among themselves recently. Their original efforts on 80 and 40 were at around 0500-0800z with signals pretty much down in the noise. On Adrain's suggestions they went to the 1100-1400z time period and it made a considerable difference, with good copy all around. You Contest operators might keep this in mind. Carl also had a contact with Duncan, ZM2 AFE/3 on 40 Meters.

At the ARRL Convention in Boston it was great to say hello to several of New England RTTY boys and I guess a great time was had by all. We were also happy to meet Jim, VP9BY and Sandy, ex-KP4AXM, both active some years back and anxious to get back into it again soon. Charlie, W1KJL, brought his new ST-6 along and I brought a Mite machine both of which were on display

at the Suite Dusty had at the Convention. With those two little gems and a small tranceiver you have instant DXpedition possibilities. By the way, last month I said I thought I heard Charlie operating from KP4. Well, it seems that indeed he did and his experiences during that short stay were quite amusing. He promises to tell us all about it one of these days.

Those of you that entered in previous Contests already know about the VOLTA Contest coming up on December 6-7th. Log sheets and rules were sent out to all former contestants. Those of you that want log sheets can direct your request to   SSB and RTTY Club
            Box 144, Como, Italy
Full rules appear elsewhere in this issue.

Fifty years is a long time, and for one to maintain an active interest in any one thing that long is amazing. We were indeed happy to learn that your Editor, Dusty, received the "50 Year Award" at a special breakfast meeting of the QCWA at the ARRL National Convention. CONGRATULATIONS from the RTTY gang. May the years keep piling up.
73 de John

BARTG to handle World DX Contest-

The British Amateur Radio Teleprinter Group-BARTG-will assume the responsibility for nominating the winners of the 1970 World RTTY Championship. Winners are determined by comparative scores in the 5 RTTY contests during the year. Complete rules were published in January 1970 RTTY JOURNAL.

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K2RSR/VP9

HITS & MISSES

From The Editor and his Mail

Back home from the north east and the ARRL National Convention at Boston. John, W3KV, our dx editor and his lovely XYL Marie were also in attendance and it helped make this one of the most enjoyable hamfests we have attended.

Although there was no notice of any RTTY meetings in the advance brochure of the convention there were two on the program. Walter Miller, Jr. talked at one on solid state concepts for RTTY. As the meeting was at noon, a previous engagement kept us from attending but we understand it was well attended and enlightening. The second meeting was on getting started in RTTY, conducted by Jerry Jodice, W1ZQM and had about 75 in attendance. It was at this meeting we learned how few hams ever heard of our RTTY JOURNAL. After a large number of questions as - where can I get a machine, - how do I wire up a TU to my receiver - where can I find this or that-Jerry introduced us and mentioned the Journal. Our first question was "How many of those present ever heard of the RTTY JOURNAL? Out of the 75 present 5 put up their hands. One thing this proves to us is there are a great many fellows interested in RTTY that never make it because they don't know how to get started. The same question at Dayton usually has the opposite results with almost 100% at least knowing about the Journal and over 50% subscribers. What this proves I don't know, maybe some of the more active RTTY hams in the North East should push the subject at local meetings. The interest seemed to be there but knowledge on getting started is scarce. This is not a plea for subscribers but we do know from many letters that the Journal has been of great help to many just getting started.

***

Very seldom have we strayed away from RTTY or related subjects. RTTY however is part of Ham Radio and as every editor of a Ham Radio magazine seems to comment on the ARRL we are going to have our small say also.

This was the first National ARRL convention we have attended. We also visited the headquarters at Newington on our way home. We talked to directors,

headquarters personnel, committee members and others interested and active in league affairs, and in every case we were impressed by the dedication of everyone towards making the ARRL a guide and guardian for all of ham radio.

Not that we say the ARRL is perfect, no organization is, criticism is good for any group and from our experience any of the directors are very happy to discuss problems with any member, possibly one weakness is the lack of communication between members and their director, bet that 75% of you readers don't even know the name of your director, but we did come away convinced that the entire league is doing its best to further ham radio. It is very difficult to be "all things to all people", only a politician tries to do this. Next time we have a gripe, instead of getting all worked up over it on the air, let's put our gripes in writing or talk it over with a director and get his ideas and maybe the other side of the question that we know nothing about. Personally we are convinced that without the league there would be no ham radio -- it's that simple. Lets support it.

***

ST-6 Follow Up---

The ST-6 demodulator promises to be one of the most popular articles we have published. In view of this the author, Irvin Hoff, W6FFC has written a rather complete follow up article on trouble shooting - voltage measurments and other hints and kinks on building and operation of this demodulator. We have the article now and will publish it in the next issue.

***

WHAT WE NEED
    ARE LITTLE HINTS
        OR ARTICLES
            TO FILL UP
                THESE LITTLE
                    SPACES.

***

RTTY ART Made EASY

DON ROYER, WA6PIR
16387 Mandalay Ave.
ENCINO, CAL. 91316

Have you ever wished that you could make some of that RTTY art that you may have printed? Well, so did I at one time -- it being a great deal easier than you might think.

We (the XYL Maxine and I) have found that there is much basic art work, available from which RTTY pictures may be made. Cartoons, the comic strips, post cards, magazines, newspapers, centerfolds and photographs may all serve as bases for pictures. While these may not be the right size, an inexpensive childs pantagraph may be used to enlarge or reduce them. A portrait of Washington was made from the etching on the dollar bill. While it is not that important, if you have a little sketching talent, that will also help (or enlist your wife and friends as I did).

Having decided on the subject and having the basic art work the right size, run about four feet of paper out of your printer. Use the center portion of the paper for your sketch or carefully tape or glue (white glue works well) the drawing or photo to the paper. Trim the edges so that all is still the same width as originally. Now take out the paper from your printer and insert the four-foot sheet with the sketch on it so that it will be presented to you as it rolls through the machine. Carefully align the edges of the paper on the platen. Use your line feed to bring the top of the sketch into view. With a little practice, you will be able to tell just where any character will strike the paper. You are now ready to overtype the sketch , punching a tape as you go.

We have found that a small selection of characters is all that is really needed to produce either outlined or shaded pictures. While you may not agree with our selection, study the letters and other characters to learn their individual densities. For example, the M and W are the darkest, followed by the H or Z and then by the I. Thereafter, you can use the upshifted characters such as the : or ; followed by the " or - or . and the like, depending upon where you want the print to fall. In this way, you may add the shading that you desire or leave certain areas blank like this:
going from dark to light and back to dark again. Keep this process up over the entire sketch. Remove the four-foot

paper with the sketch from your printer and reinsert your paper stock. Now play out the tape that you have made and see what you have. You will probably be pleasantly surprised. From this point on, we generally take a red pen and indicate on the print where additions, corrections and any changes are to be made and rerun the tape to make the corrections, making a new tape at the same time. In most instances, we can now come up with a pretty good picture with a series of five or six corrected tapes.

Now a few other suggestions on techniques for the tapes and pictures. Many of the machines in use today have non-overline features so we have quit using overlining. Stay with in a 72 character line. Start and end the tape with a series of letters, a couple of carriage returns and about ten line feeds, as this will help the other guy if he is making a reperf tape at his end. Also, keep in mind those who have machines that downshift on space as well as those that do not do so. If you are upshifted and then space and wish another upshifted character, put in another FIGURES character. Of course, the same applied when you want a letter following a space after an upshifted character. At the start of each line, we generally use two carriage returns, the line feed and two LETTERS or FIGURES depending upon how the line starts, to help ensure that the old and tired machines have time to get to the start of a new line. Try to make your tapes as short as possible by taking out any unneeded characters, extra LETTERS, upshifts followed by downshifts and things like extra spaces or downshifts at the end of a line. Above all, be sure to put your credit line at the end, with the hope that others will follow your lead and keep it there.

So if the RTTY pictures are your bag, get with it and make a few. We will surely be pleased to receive them.

***

COMMERCIAL RTTY

Dear Dusty.

In a recent issue you asked for commercial press frequencies. After some correspondence with the "Chicago Tribune" they sent the following list of frequencies:

3235, 3355, 4160, 4242, 4440, 4778, 5040, 5060, 5123, 5314, 5372, 5434, 5460, 5883, 6350, 6425.
**6783, 6875, 6894.5, 6937, 7693.4, 7709,

RICHARD M. NIXON

ORIGINATED BY DON, WA6PIR, ENCINO, CALIFORNIA - TIME MAGAZINE SKETCH..

The basic art for this portrait was found on the cover of a recent issue of TIME magazine....................

H I P A R
A BASSETT HOUND DAWG
ORIGINATED BY DON, WA6PIR - ART BY XYL MAXINE, ENCINO, CALIFORNIA

RTTY Art made from enlarged sketch by Maxine, XYL of W6PIR, from drawing on her printed stationary.....

***   ***

7720.2, 7742 (ssb) 7760 and 7900.
8130, 8142, 9057, 9178, 9201, 10187.5, 10745.5, 10890, 10950, 10965, 10972, 11142. 11630. 11639, 11643, 13470, 13480, 13607.5. 14443.1, 14443.6, 14660, 14698. 14700, 14710, 14714, 14730, 14770 and 18560.5.

The Tribune advises that the greatest amount of activity on a 24-hour basis will be found on the ** frequencies. I have not confirmed any of these and they are world wide in nature. Thus broadcasts may not be in English.

I have found a good press broadcast in English on Saturdays on 16.4 MHz. This station is not too strong here and uses less than normal shift. It must be 425 Hz. but my ST3 demodulator will print it fine.

In addition the Tribune tells me that Associated Press and Reuters no longer use RTTY at all in their operations. Only United Press International has RTTY and they (the Tribune) gave me this address:

Jimmy Darr, Superintendent of Comm. United Press International—
220 E. 42nd Street
New York, New York 10016

Cal Sondgeroth, W9ZTK
800 Fifth Avenue
Mendota, Illinois 61342

***

BACK ISSUES---

The ONLY back issues available are as follows-----
1966- Aug,-Sept,-Oct,-Nov.-Dec,----
1967- No issues-
1968- Jan
1968- Feb,-March,-April,-May,- June,-
      July-August,-Sept,- Oct,-Dec.--
1969- Jan,-Feb,-April,-May,-June,----
      July-August,-Sept, Oct,- Nov,--
      Dec,-.
1970 Jan,- Feb,-March,-April,-May,--
      June,-Sept,-Oct,-
All back issues are 30¢ each.
RTTY JOURNAL Binders are $2.50 each.
      Canada and Mexico $3.00

CLASSIFIED ADS   Rates- $1. - 30 words - Additional words 2¢ea.   Closing date 1st of month.

PARTS KITS FOR ST-6: Build this sophisticated terminal unit, all solid state using P.C. boards. I.C. OP AMPS, with auto start and many other features. Send SASE for information on parts kits now available. Write W1KJL, PO box 689, Portsmouth, N.H. 03801

FM SCHEMATIC DIGEST: Extensive collection of Motorola FM Schematics, Crystal Alignment, and servicing information, 136 pages 11 1/2 x 17. $6.50 postpaid. S. Wolf, 1100 Tremont St., Boston, Mass. 02120.

REFERENCE BOOKS: Tactical Wire Communications Equipment - $2.20; Fixed Plant Wire Systems and Equipment - $2.25; Electromagnetic Wave Theory - $2.95; Fixed Station Communications Equipment - $1.95. (Lesson book FREE with each reference book). All postpaid. FREE LIST. Cooper, POB73, Paramus, NJ 07652.

TI SN72709L (round TU-5), SN72709 (DIP) OP AMP, $1.50, 7/$10.00. Molex DIP IC terminals, 25¢ each. Cinch 14 DIP, 8ICS DIP and round TO-5IC sockets, 60¢ each. Cinch 50-12A-20 12 pin edge connector, $1.70 each. Motorola MC89OP/MC790P $2.00. MC724P, MC789P $1.05. Other MRTL including decade counters and decoder/driver in stock. HP-2800 Hot Carrier diodes 90¢ each, 12/$10.00, matched 4/$4.25. Fairchild 900, 914, 60¢, 923 90¢. All items new and fully guaranteed. Get our catalog. HAL Devices, Box 365RJ, Urbana, Ill. 61801.

SELL- Mainline ST-3 RTTY Demodulator Excellent condition. 170, 400, 500 and 850 shifts frequency counter tuned. Local sale preferred. $85.00 Jim Gibbs, WA8GKU, 14503 Appletree, Featon, Mich. 48430.

SAROC, JANUARY 7-10, 1971, Flamingo Hotel Convention Center, Las Vegas, Nevada. Sponsored by Southern Nevada ARC, Inc., Box 73, Boulder City, Nevada. Advance registration $14.50 per person accepted until January 4, regular registration at door, includes Flamingto Hotel Late Show and drinks, Sunday Breakfast, Cocktail Parties, technical seminars and meetings, ARRL, DX, FM, MARS, QCWA, WCARS - 7255, WPSS-3952 and WSSBA Ladies Program. Flamingo Hotel SAROC room rate $12.00 plus room tax,, per night, single or double occupancy January 3 thru 12, 1971. Mail accomodations request to Flamingo Hotel Mail advance registration to SAROC. W7PRM Club President, W7PBV, SAROC Convention Chairman.

J & J ELECTRONICS solid state RTTY demodulators, integrated circuitry, meter tuning, proven heavy duty loop supply, electronically regulated power supply, 850 & 170 shifts switchable. Electronic keyer stage supplying plus and minus voltages with provisions for adjusting to 1 MA when driving diodes. Write for brochure. J & J Electronics, Canterbury, Ct. 06331.

TELETYPE PICTURES FOR SALE: Volume 2, 16 pages containing 50 pictures $2.00. Volume 3 coming $1.50. Also audio and perforated tapes. W9DGV-a 2210 30th St. Rock Island, Ill. 61201.

SOLID STATE TU/AFSK generator based on units in July 1969 73 and September 1969 QST. All circuitry including PS on 3x6" G10 glass PC board. 850 and 170 H3 shifts, CW 1D, zener protected transistor loop switch, reversing switch, high and low impedance output FET audio. $40.00 kit form. Cabinet $6.50 extra. Board only $4.50. 3 pole Butterworth filter boards, drilled 3x6" G10 glass, $2.50. Write for details. HAL Devices, Box 365 RJ, Urbana, Ill. 61801.

WANTED: 28KSR teletypewriter, good condition with communication type keyboard. Will trade HT 41 linear amplifier A1 condition. Bart Perrotti, Lakeville, Conn. 06039.

CHARTER JET FLIGHT TO SAROC. Round-trip New York City Las Vegas $229.00, depart JFK 10:00 a.m. January 7th. Roundtrip Chicago Las Vegas $199.00, depart O'Hare 12:00 Noon January 7th. Return January 10th. Includes Meals and Drinks aloft, Flamingo Hotel Room three nights double occupancy, Transportation, and Baggage in and out of Flamingo Hotel, Dinner Show, Midnight Show, Saturday Buffet Luncheon, Sunday Buffet Breakfast, SAROC Tickets, Tax and Gratuity. $60.00 will confirm reservation, includes one dollar service fee. Final payment due before November 25th. Flight cancellation or written request for deposit refund will be accepted until December 1st. SAROC, Box 73, Boulder City, Nevada 89005.

TELETYPEWRITER: TT 100B/FG, Kleinschmidt model 150, send receive, sproket or friction feed, 60 and 100 WPM, keyboard and cover, used, excellent $65.00 ea. Automatic "answer back" unit for the #15-19 teletype machines. This is a device which, when tripped, will send a pre-coded signal of up to 21 characters. It may be operated from the sending keyboard, or as on land line, by remote control. You can code in your call, name or whatever you desire. Complete #15 keyboard with answerback unit $12. ea. Squelch adaptor modification kit; used on radio receiver SP600JX17 Consists of squelch adaptor unit, tubes, knobs, nameplate, cable clamp, terminal strip, w/ LOOK resistor, .01 discap capacitor, skirt assy, and instruction sheet. Unused $6. per set. Free catalog on request. Atlantic Surplus Sales. 580 3rd Ave. Brooklyn N.Y. 11215

WANTED MODEL 28 parts or complete pieces of equipment to build up station. Especially need typing unit (LP) and keyboard base. L. Pfleger, K9WJB, 9627 W. National Ave., Apt. 23, West Allis, Wisconsin 53227.

Additional Classified on Page 19

FILTERS: In plastic modules, fit standard octal sockets; tune for 2125 or 2975 Hz - $2.95 each ($5/set); tuned for other frequencies (specify) - $4.59 each. Dual unit, 2125 & 2975 in one case - $5.50. FAX PAPER wide variety. RELAYS: Mercury-wetted types; time delay types. Send for list, or what do you need? FREE LIST of teletype, fax and electronics parts. Cooper, POb73, Paramus, NJ 07652.

NOTHING EQUALS The Mainline TT/L-2. To date the TT/L-2 is the only unit at a comparative price that is reliable and capable of trouble free operation. A number of publications have recently been edited at a lower cost, but these advocate the use of surplus rejects and are built for a price for people that enjoy puttering, and if the unit is marginal really makes no difference. The solid state TUs that have good quality and comparable to the TT/L-2 range in price $850 to $1200. On the present market. Good quality reliable solid state components are very high. Most of our units are used in Mars, Civil Defense, US Navy, US Air Force, Missionaries, Duke University, Guatemala and the Mainline TT/L-2 is standing by dependable, reliable, a faithful servant. John Roche, W1SOG, J & J Electronics, Canterbury, Ct. 06331.

WANTED: CABINET for 28KSR without ESU. Trade for 19 printer or cash. WU 103 printer, model 14 non typing reperf. L.A. Skeehan, WA5QBS. 1722 S. 125th East. Tulsa, Oak. 74128

FOR SALE - TT 298B/UG Mite teletypewriter with TT-318B/UG keyboard. This set has the 6-contact keyboard connector and internal loop supply. Less cable. Clean inside and out. $225. TT-298B/UG same as above but less keyboard and paper spool. $175. Sell both together for $375. Ray Gilbert, K7VQF, 201-130th Ave. S.E., Bellevue, Wash. 78005. Tel 206-454-0578.

FOR SALE: Heath SB-101 $325, HP-23 with SB-600 spkr $45, SB-200 $179. SB series CW filter $11, SB-301 $239, 6 and 2 meter converters for the SB series $16 each, sixer $25, HR-10 $39, DX-60 $49, HG-10B $27, Comdel CSP-11 speech processor $59, Eico 723 $29, Ten Tec PM-1 $29. Before 3 p.m. call (615)-647-2891. Fred Harris, WA4URA RFD 4, Box 122, Clarksville, Tenn. 37040

RTTY PICTURES FOR SALE. Volume 1, 8 pages $1.00. Volume 2 16 pages $2.00. Over 100 different pictures. Audio and perforated tapes available. W9DGV, 2210-30th. St., Rock Island, Illinois 61201.

FOR SALE MODEL 19, $75, Mdl 15, $50, both with table & power supply. Comm. kbd & type palets. Sync motor, new rubber friction feed platens for 15-19 $5.00 pp. 1.4 kHz filters for 51J4 $25. E.L. Bruns, 8308 Longfellow St. New Carrollton, Md. 20784.

LOADS OF BARGAINS in teletype, telegraph, telephone facsimile and electronic equipment and parts. No list or catalogue. Phone anytime and will be happy to come down on a Saturday or Sunday. Phone (312) GR 6-8200. C.B. Goodman & Co. 5826 South Western Ave. Chicago, Ill. 60636

MODEL 28 COMPLETE set manuals on typing reperforators, postpaid $4.50; M15 paper rewind attachment, new complete $11.50; Paper crank handle for M15 $3.00, M14 TD sync motors $19.00. Free Lists, Jim Cooper, 834 Palmer Ave., Maywood, N.J. 07607

WANTED-TYPE WHEEL or pallets and keytops to convert model 26 from fractional to communications keyboard. Also want source of 3/8 paper tape. C.D. Urquhart, K3AL, RFD #1. Box 354A, Washington, Pa. 15301

FOR SALE: W. U. Model 103 page printer w/manual, Twin City TU and power supply. Must pick up at this QTH. Will sell cheap, might trade. Tel (419) 523-5613 after 9PM Don Heringhaus, WA8ZRZ, Rte 1 box 77, Ottawa, Ohio 45875.

FOR SALE: Teletype Model 32ksr with auto carriage return and auto line feed. 60 and 100 wpm gears. Mint condition. TU available. Hank Scharfe, W6SKC. 1315 Via Del Ray, South Pasadena, Calif. 91030. 213-255-8724.

MODEL 26, $30. Model 100, $20. Will trade my 28KSR for complete professionally built ST-6. Prefer local deal. J.F. Clifton, 1000 W. Carson, Torrence, Cal. 90509

FL-1 FILTER-LIMITER Kit. HAL offers the filter limiter of the Mainline ST-6 for use with any TU. 3 pole Butterworth filter and 709N OP AMP on 3x6 G10 glass PC board. Complete kit including toroids and 12 pin edge connector $11.00. Requires ±6 Or ±12 VDC. Write for more information on HAL RTTY Products. HAL Devices, Box 365RJ, Urbana, Ill. 61801.

REMINDER: If you want your Mainline TT/L-2 FSK demodulator in time for Christmas please place your order now. J & J Electronics, Windham Rd. Canterbury, Conn. 06331

CHANNEL FILTERS for two-tone TU. Brand new Northern Radio 85hz bandwidth. For 170hz shift: 2125/2295 hz, $6.95/per. Single filters: 1955 and 2635 hz (specify 1st and 2nd choice) $1.95 ea. Include postage for 3 lbs per filter. Matching 85 Hz discriminator supplied with each filter. TT-63 Regen Repeater, $25. Collins 18S4, 10 channel xtal control aircraft xmtr (200 watts) & rcvr, 2 to 18.5 mhz., $25. Technical Material Corp. model CFA-1 Dual Diversity (two front ends, one loop keyer) audio TU, built in oscilloscope, 3 1/2" rack mount, excellent condition, $120. Relay panels: over 20 telephone type relays and 2 stepping switches in stylish hinged-door rack mounting, $12.50. Laurence H. Laitinen WA6JYJ, 217 Orchard Rd., Felton, Calif. 95018.