Loop-Snoop- cont.

Continued from Page 12

output voltages of approximately 0.2 to 4 volts. The A.C. output voltage varies directly with the loop current.

Plug the LOOP-SNOOP into your loop and connect the tone output to the vertical amplifier of your scope. Set the horizontal sweep to the low range. On steady mark you will see the band of audio horizontally across the face of the scope. On steady space you will see only the horizontal sweep trace. Now then, send LTRS at machine speed and adjust the horizontal sweep for proper sync. You should see: (1) an unbroken audio band consisting of the five marks and the stop pulse; (2) a short horizontal trace with no vertical displacement, which is the stop pulse; and (3) probably a tall spike or two.

Now try some other letters and observe the pattern. Be sure to check the TD pattern and compare it with the keyboard pattern. Contact adjustment can readily be checked (or even adjusted) by pattern observation. The LOOP-SNOOP will not pin point the exact location of the "spike generators" but by process of elimination they can be found.

None of the components are the least bit critical. Most of them should be "standard stock items" in your junk box. The DPDT loop reversing switch, the 2K resistor and the diode could be eliminated if correct polarity is observed at all times. All components can be mounted on a small bit of vector board or tie points and placed inside a mini-box.

Address Correction Requested
RTTY JOURNAL
P O Box 837
Royal Oak, Mich. 48068

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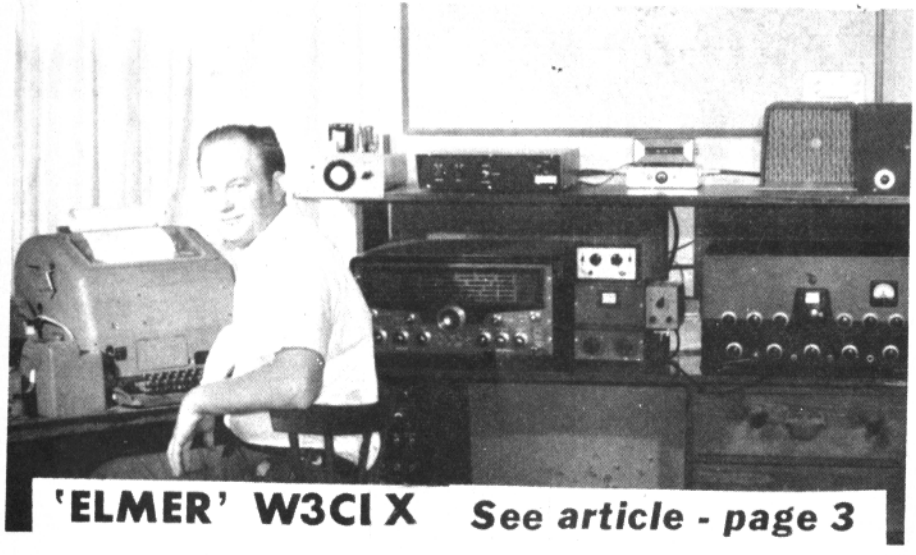
RTTY JOURNAL

January 1972

EXCLUSIVELY AMATEUR RADIO TELETYPE

VOLUME 20 No. 1 30 Cents

Faster RTTY Speeds- See Page 2



'ELMER' W3CI X See article - page 3

CONTENTS

Faster RTTY Speeds Authorized by FCC.

The petition by Keith Petersen and Bruce Peters, submitted about a year ago, to allow fast printer speeds on amateur RTTY has been favorably acted on by the FCC.

We can imagine some unfavorable comments from many, feeling that it will lead to confusion. We doubt it very much, the great majority of hams will stick to 60 wpm and the few that have facilities and the desire to experiment can now pioneer in case of future general use.

For 100 wpm reception many of the TUs in use will require some small changes. We hope that an article can be published explaining these changes. Although our printer is capable of three speeds we will see you at 60 wpm for some time to come. Let's not have another SSB-AM hassle all over again.

The pertinent paragraphs of the decision are printed here. January 7th is the effective date.

5. The Commission is not of the opinion that increased speeds will result in the disruption of existing amateur teleprinter operations. Commission experience indicates that amateur operators have consistently demonstrated their versatility in adapting to new operating situations and conditions. As higher speed operation becomes more widespread, it is believed, that operators preferring each speed will either pre-arrange their time schedules and parameters of operation or will localize their operations to certain band segments and, thus, minimize the effects on present amateur teletype operation. Regarding the availability of higher speed teletype equipment versus cost, reply comments filed in the proceeding allege that used equipment can be obtained at reasonable costs within the budget of amateur operators. Other comments claim that provision for higher speed operation will encourage amateurs to utilize their technical abilities to design and develop the necessary speed conversion techniques. Many teleprinter machines are, in fact, convertible to other speeds of operation by substitution of the appropriate gears.

9. In consideration of the foregoing, the Commission concludes that adoption of its proposal to amend Section 97.69(b) of the Rules to permit higher speed amateur teleprinter operation is in the public interest, convenience, and necessity. Authority for this rule change is contained in Sections 4(i) and 303(r) of the Communications Act of 1934, as amended. IT IS ORDERED that, effective January 7, 1972, Part 97 of the Commission's Rules is amended as set forth in the Appendix attached hereto.

10. IT IS FURTHER ORDERED, that this proceeding IS TERMINATED.

FEDERAL COMMUNICATIONS COMMISSION
Ben F. Waple
Secretary

APPENDIX

Part 97 of the Commission's Rules is amended as follows:

1. In Section 97.69, paragraph (b) is amended to read:

97.69 Radio teleprinter transmissions.

* * * * * *

(b) The normal transmitting speed of the radio teleprinter signal keying equipment shall be adjusted as closely as possible to one of the standard teleprinter speeds, namely, 60 (45 bauds), 67 (50 bauds), 75 (56.25 bauds) or 100 (75 bauds) words per minute, and in any event, within the range of plus or minus five words per minute of the selected standard speed.

*****

4th Giant RTTY 'FLASH Contest

Prof. Franco Fanti
via A. Dallolio 19
40139 Bologna, ITALY

1. CONTEST DATES

1st 0700-1500 GMT, February 20th, 1972.
2nd 1500-2300 GMT, February 26th, 1972 giving a total contest time of 16 hours.

2. BANDS

3, 5, 7, 14, 21 and 28 MHz, Amateurs bands.

3. COUNTRY STATUS

The ARRL Countries list will be used.

4. MESSAGES

Messages will consist of:
a) RST check number
b) zone number.

5. EXCHANGE POINTS

a) Each two-way RTTY contact with a station in one's own zone will receive 2 exchange points.
b) Each two-way RTTY contact with a station outside one's own zone will receive exchange points in accordance with the 'exchange points table'.
Note: stations may not be contacted more than once on any one band but additional contacts may be made with the same station if a different band is used.

6. LOGS AND SCORE SHEETS

Use one log for each band.
Logs to contain: date, time (GMT), call signs, Countries, RST and zone numbers sent and received and exchange points.
All logs must be received by March 20th, 1972, send them to:

7. MULTIPLIERS

A multiplier is given for each Country worked. A separate multiplier may be claimed for the same Country if a different band is used.
The operators own Country does not qualify for a multiplier.

8. SCORING

Total exchange points times the total number of multipliers.

10. AWARDS, MEDALS & FREE SUBSCRIPTIONS

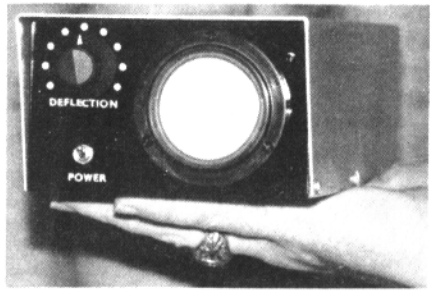
The contest Committee will compile three separate lists.
a) general classification;
b) classification of stations using a power of 100 W or less;
c) Short Wave Listeners.
In each of these three classes the following awards will be made:
1st: gold medal.
2nd: silver medal.
3rd: bronze medal.
4th to 7th: will receive a 12 month's subscription to the CQ elettronica magazine.
8th to 10th: will receive a 6 month's subscription to the CQ elettronica magazine.
There will also be awards for all of the operators and SWLs that send logs.

*****

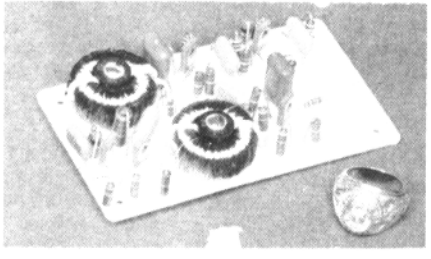
Transistorized Phase-Shift RTTY Scope- -

ELMER MOORING, W3CIX
9318 Milbrook Rd.
ELLICOTT CITY, Md. 21043

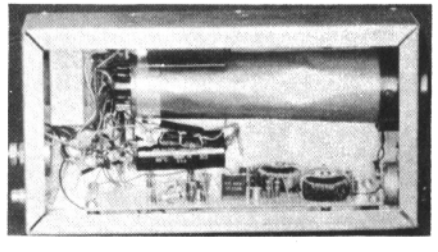
A cross-pattern scope or the ST-5 and ST-6 type tuning meter [1, 2] is fine for tuning normal RTTY signals; however, during QRM conditions a phase shift type scope [3] is preferable to help sort out the proper mark-space frequencies. This phase shift monitor scope uses signals directly from the receiver output (or TU input) and displays a rotating line on the face of the CRT. The angle of rotation is a measure of frequency, while the length of trace indicates amplitude; thus, most of the CRT face area contains useful spectrum information. At a glance one can determine approximate frequency shift of either the received or transmitted frequency, can tune the signal rapidly to correspond to the TU filters, and can determine frequency separation of interfering signals.



Exterior view of Phase Shift Scope.



Complete circuit board using the Circuit Stik Construction technique.



Interior view of early prototype. Power supply included. Note the power transformer crammed against the CRT base. This unit required shielding to eliminate slight trace hum. (Heathkit neck shield 206-180).

Theory of Operation

The heart of the phase shift indicator is the simple RLC network shown in Figure 1. The series LC circuit is resonant near the mid frequency of interest. Near resonance, the impedance of the LC circuit is minimum; thus, E_T approaches zero while E_L is large and exhibits rapidly changing phase about the resonant frequency. Two sine waves applied to the deflection plates of a CRT produce a pattern dependent upon the phase and amplitude relationship between these sine waves. With the two sine waves either in phase or 180° out of phase, a straight line appears whose angle on the CRT face depends upon the relative amplitudes of the two signals. With 90° phase shift between the two deflection plates, an ellipse appears with an eccentricity dependent upon the relative amplitudes between the two signals.

Referring to Figure 1, the LC circuit is resonant near the center of the frequency range of interest (2550 Hz.). For a high Q circuit, the phase angle varies from near 180° to 0° over a narrow range of frequency, which yields straight lines on the oscilloscope tube. Around resonance, an ellipse appears since the signals are around 90° out of phase; however, the width of the ellipse is collapsed to zero since the amplitude of the series voltage (E_T) decreases to zero

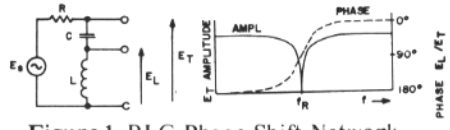


Figure 1 RLC Phase Shift Network

as the phase approaches 90°. Thus a straight line will appear on the CRT for all frequencies of interest and will rotate about the center of the tube face as the frequency varies. Typical patterns for a complete phase shift monitor scope receiving RTTY signals appears in Figure 2.

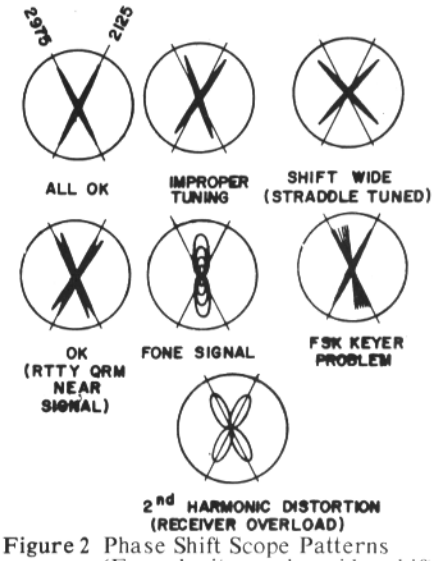


Figure 2 Phase Shift Scope Patterns (For clarity, only wide shift illustrated.)

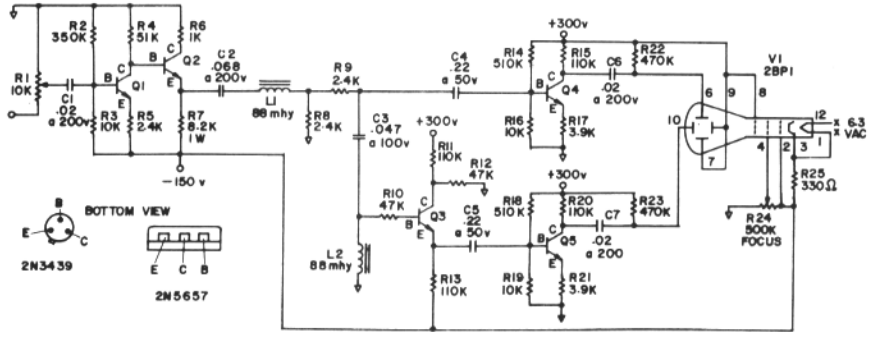
Circuit Description

The complete schematic appears in Figure 3. The input stage (Q1) yields a gain of about 20 (approximately the ratio R4/R5). R2 and R3 are bias resistors. Q2 is an isolation emitter follower which reduces Q1 collector loading and offers the current drive necessary for the LC phase shift network. The series compensating network (C2, L1, R8) could be eliminated; however, it offers two advantages. C2-L1 resonate at approximately 2K Hz to yield an increasing impedance over the 2-3K Hz indication range which compensates for the increasing voltage across the phase shift inductor (L2) with increasing frequency. This maintains the same scope trace length at 2125 Hz and 2975 Hz. Another advantage of C2-L1 is that signals far above and below the 2-3K Hz range do not produce a trace on the CRT, thus limiting the pattern to the desired range of frequencies. R9, C3, L2 comprise the phase shift network described in Figure 1. C3-L2 resonate at 2550 Hz. Q3 serves as an isolating emitter follower to offer a high impedance across L2 and maintain high Q for the network. Q4 and Q5 are identical amplifier stages with a gain of approximately 20 (ratio of collector load to emitter resistor). Resistors R14-R16 and R18-R19 furnish bias for the transistors.

Construction

Parts layout is not critical. In the several prototype units built during design, various construction techniques were tried with equal success (point-to-point wiring, Vector board with flea-clips, and Vector board with Circuit-

Continued on Page 16



C1, C4, C5 - Paper or Mylar
C2, C3 - Sprague Orange Drop
C6, C7 - Paper or Mylar (low D.C. leakage)
R1, R24 - Linear Taper 1/2 Watt or Greater
Q1-Q2 - 250 Volt Breakdown or Greater 2N5655 or equivalent (can be same as Q3-Q5)
Q3-Q5 - 400 Volt Breakdown or Greater 2N3439 (to-5 case) 2N5657 (77 "Postage Stamp" case) 2N4240 (to-66 case)
V1 - Almost any 1" to 3" CRT (P1 Prosphor Preferred)
All Resistors 1/2 Watt Except R7

Figure 3 Complete Schematic of the Phase Shift Monitor Scope

THE TTL SELCAL---

KENNETH BRANSCOME, K5OJM
5935 Vanderbilt
DALLAS, TX 75206

Part 2

3. The Input Circuit

The input circuit is used as an interface between the logic in the TTL Selcal and the outside world. This not only translates the incoming signals to TTL logic levels of the right polarity, but also protects the logic circuitry from large transients or signals which other wise might damage the logic circuitry.

The basic difference in the two input networks shown is that one is inverting and the other non-inverting. The one used will depend on the incoming signal. The DATA line should be high, or 1 for mark and low, or 0 for space.

4. Character Decoding Register and Selector Magnet Driver

The character decoding register is a 5-bit register consisting of five D-type flip-flops. As each bit of the TTY character is entered on the data line, the shift pulse (which occurs at the center of each bit of the character) shifts the bit into the register. SR5 will follow the character bits delayed by exactly one-half a bit time. Since the shift pulses are accurately timed, SR5 then regenerates each bit of the character and removes all incoming distortion. This then is used to drive the selector magnet driver transistor through Nand gate X-21A. Gate X-21A is used to hold the Teletype loop in a mark-hold condition until the auto start sequence has been received. Once the proper sequence has been received, gate X-21A is opened and the selector magnet driver will follow SR5. When the alternate function control is used, an additional OR gate must be installed in the CR-4 control line to allow the alternate functions to also uninhibit the selector magnet driver.

The start line is used to preset SR5 to 1 when the start FF goes off. This is to insure that the output is in mark at the end of a character and to prevent noise from accidentally leaving SR1-1 at 0 at the end of a character, causing the teleprinter to run open.

The selector magnet driver transistor is selected according to the type of Teletype machine to be used. For the Model 32, a high voltage loop supply is not necessary since only about one volt at 20 ma is required. Therefore, almost any NPN transistor can be used. The loop supply can be the 5-volt logic supply and a 180-ohm 1-watt resistor for the current limiting resistor. In this case the three NE-2 spike suppressors are not required.

For Models 15, 19, 28, and other machines requiring 120 volts DC at 20 or 60 ma high voltage loop supply, the Motorola MJE 340, the TI A5T5058 or A5T5059, or any other NPN transistor with a VCEO of 250 volts or more can be used. The NE-2's are used to limit the inductive spike when the circuit is opened, to prevent damage to the driver transistor. An external current-limiting resistor must be used.

Models 15, 19 and 28 teleprinter selector magnets can be operated with loop supply voltages as low as 12 volts. However, the range selector on the teleprinter will be severely limited and operation of the teleprinter may be erratic.

NOTE: In an application note from the Teletype Corporation, they do not recommend the use of less than 40 volts at 20 ma through the TD and keyboard contacts of their equipment. A film will build up on the contacts which the lower voltages and currents cannot readily break down, and will result in erratic printout after prolonged operation.

The outputs of the shift registers SR1 through SR5 represent the information bits of the Teletype character at the time the decode pulse is present. Note that typing in a character will not leave bits 1 through 5 in the register but rather, bit 5 will be in SR4 and the stop pulse will be in SR5. In other words, it will be shifted one step further.

The outputs SR1 through SR5 are used to drive the five decoding gates X-10, X-13, X-16, X-19 and X-20.

5. The Character Sequence Tree

Decoding gates X-10, X-13, X-16 and X-19 are the four character recognition gates. The characters are recognized in that order and are programmable at the operator's discretion. Associated with each gate is a D-type flip-flop which remembers when its character recognition gate has recognized a character and enables the next gate up the tree. Regardless of their previous state, should the flip-flop gate fail to recognize a character in the proper sequence at decode pulse time, it will be left in the off

state when it is clocked by the decode pulse.

The first three stages of the sequence tree, X-12A, X-12B and X-15A in one sense are used in reverse in that when the flip-flop is in the on state, it is considered to be off as far as the tree states are concerned. This was done to minimize the number of gates required. In the same manner, the off state of the flip-flop is considered on, as far as the sequence tree is concerned. The last stage, X-15B, is used in the normal sense and when it is clocked on it latches on and cannot be turned off except by the signal TER going to 0.

Gate X-10 is always enabled. When the first character is recognized, the decode pulse clocks FF X-12A off, since the output of gate X-13 is a 0 when a character is recognized and a 1 when it has not recognized a character at decode pulse time.

The Q side of X-12A enables gate X-13 and allows it to recognize the next character. Should the correct character be recognized at decode time (providing the first two characters are different), X-12A is turned on and X-12B is turned off. This continues until gate X-19 recognizes its character and turns on X-15B which turns on the autostart relay. When X-15B turns on, the Q side of X-15B feeds back to gate X-18B, forcing gate X-18B to have 1 on its output at all times, and the decode pulse will not turn FF X-15B off.

The Alternate Function Control, when incorporated, acts in the same manner as X-19, X-15B and X-18B, allowing the control of another function by changing the last character in the control sequence. The alternate function board has positions for two additional controls, giving a total of three functions which can be remotely controlled by the TTL Selcal.

The relay control flip-flop can be forced on by the force-on pushbutton, grounding the set input to the flip-flop.

6. The Auto Stop Control

The auto stop control can turn off the relay control flip-flop in three different ways.

a. By receiving four N's in succession
b. Letting the data line remain quiet; that is, no space to mark transitions, for more than 20 to 30 seconds
c. By the force-off pushbutton

The 4-N sequence controller monitors the shift register continuously for N's. Each time an N is recognized, a count is placed in the divide-by-4 ripple counters X-14B and X-17A. Each time an N is not recognized, the counter is reset to zero. When the fourth N is recognized, the carry plus turns on X-17B which resets the auto start flip-flops.

Note that when 4 N's are recognized, if no other characters are sent you will not be able to force the relay back on with the force-on button until at least one non-N character is received.

The "Quietline Turnoff" will turn the printer off when there has been no mark to space transitions for about 20 seconds.

A transition from 1 to 0 on the data line causes the output of inverter X-21B to go from 0 to 1. This places a strong positive spike on the base of transistor Q7, which will partially discharge the 50-uf capacitor in the emitter lead of UJT Q4 and restart the 20-second timing cycle. A complete reset will require several such transitions. The capacitive coupling to the base of Q7 allows it to turn off even though the output of X-21B is high.

When the 20-second RC network is allowed to time out, UJT Q4 is momentarily turned on. This turns on transistor Q5 and causes an output signal TER.

The second input to gate X-21C is used as the force-off input. When the force-off pushbutton grounds its input to X-21C, an output pulse is placed on the TER line to shut off the motor.

7. The Regulated Power Supply

The regulated power supply consists of a transformer, a bridge rectifier, filter capacitor and LM309K integrated circuit voltage regulator. This regulator is short-circuit protected and almost indestructible. It requires no external adjustments and only two small external capacitors for operation. It is rated for about 1-Amp output current. It is important that the LM309K have a 0.05-uf RF bypass capacitor placed directly from the IN and OUT pins to ground (the case). Use the Centralab UK20-502 disk ceramic capacitor. Other types have insufficient Q.

PROGRAMMING THE TTL SELCAL

Select the calling sequence desired and enter the characters in the appropriate box in the Programming Chart, Figure 9, Ch1, Ch2, Ch3, and Ch4. Referring to a Teletype code chart, determine the bit patterns for each character. Use the standard that space is a 0 and mark is a 1. SR1 is analogous to bit 1 in the character, SR2 is anlogous to bit 2, etc. Fill in the chart with the appropriate 1's and 0's. Note that the code for N is SSMMS (bit 1 on the left and bit 5 on the right). The correct entries are made in the programming chart for the character N. A 0 in a bit position means that the 0 side of that particular shift register stage is connected to the input of the character recognition gate.

The connections between the shift register and the character recognition gates may be hard-wired or connected by a set of 20 SPDT switches, or a programming plug.

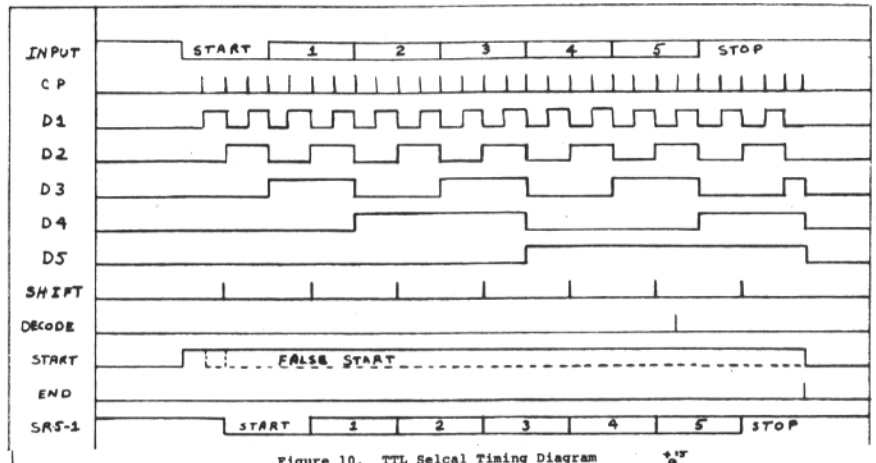


Figure 10. TTL Selcal Timing Diagram

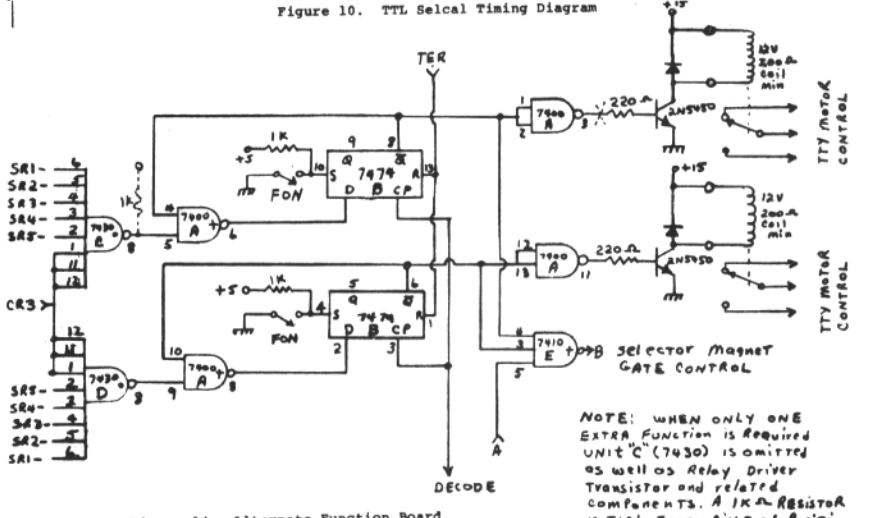


Figure 14. Alternate Function Board

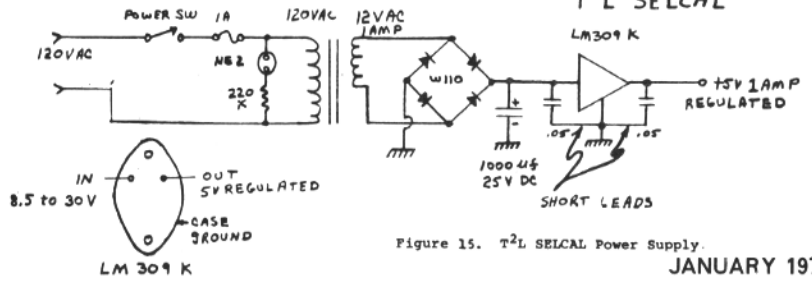


Figure 15. T²L SELCAL Power Supply

CHECKOUT SEQUENCE

1. Equipment Required
   a. Oscilloscope, preferably a DC type
   b. Teletype keyboard or other type of TTY signal generator
   c. VOM
   d. Electronic counter desirable but not required.

2. Check that the power supply voltage is 4.7 to 5.3 volts with no visible ripple on the oscilloscope. Verify that the clock is operating and the countdown string is operating as previously described. Set the frequency with a counter or lissajous patterns compared to the 60-cps line frequency (for 60 wpm).

3. Attach keyboard or other signal source to the input of the TTL Selcal.

4. With the clock in the test mode of operation, verify the CP frequency. (Each mode has a different calibration.)

NOTE: In the normal operating mode the OSMV charging circuit requires a resistor of approximately 35K (for 60 wpm); whereas, in the test mode of operation a resistor of approximately 18K is required (for 60 wpm).

   a. Verify that there are seven shift pulses present each time a keyboard character is depressed.
   b. Verify that there is only one decode pulse.
   c. Verify that there is only one end pulse. This pulse will be very narrow and difficult to see.
   d. The false start pulse, FS, cannot readily be checked except under normal operation no pulse should be observed.
   e. Verify that each time a keyboard character is depressed, the start FF turns on (start line high) and then turns off at the end of the character.

5. Operation of the Shift Register.
   a. Depressing the letters character repeatedly, verify with an oscilloscope that each 1 output of the shift register goes low for one bit period and remains high the rest of the time. Conversely, verify that each 0 output of the shift register goes high for one bit period and remains low the rest of the time.
   b. The selector magnet gate will be checked later.

6. The Auto Stop Circuit

With the input set at steady mark or steady space, the TER line normally should set high and have a negative pulse about every 20 seconds. If the TER line is a 1 with no negative pulse, check the UJT timer.

With a scope on the Q output of X-14B, press an N on the keyboard; it should alternately go high and low with each N pressed. The fourth N pressed should make X-17B go high and the TER line go low. Continue pressing N's and X-17B should remain high. Pressing any other character should make the Q outputs of X-14B, X-17A and X-17B all go low regardless of their previous state.

Place a temporary jumper across the 50-uf capacitor in the emitter lead of the UJT Q-4 to disable the 20-second timer for the next check.

7. Verify Programming of the Four Control Characters
   a. Depress the letters character.
   b. With VOM, check the inputs to the character recognition gates and record each input. Compare this pattern to the desired character pattern; the patterns should compare exactly. A 1 or high input is analogous to a mark (or hole in the tape). A 0 or low input is analogous to a space (or no hole in the tape).
   c. Press the first character in the control sequence. The Q output of flip-flop X-12A should go to 1.
   d. Press the second character. The Q output of X-12A should go to 0 and the Q output of X-12B should go to 1. When the third character is pressed, the Q output of X-12B should go to 0 and the Q output of X-15A should go to 1. When the fourth character is pressed, the Q output of X-15B should go to 1 and the Q output of X-15A should go to 0.

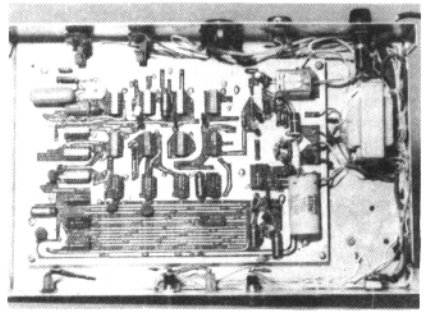
The Q output of X-15B should now remain at 1 unless the time out turns it off or the NNNN sequence is sent. Once the printer motor is turned on, the gate driving the selector magnet output should follow the incoming signal delayed by exactly one-half a bit period.

8. When the above checks are completed, remove the jumper installed in Step 6 and return J1 and J2 to their normal operating positions. Re-adjust the clock frequency for the desired teleprinter operating speed.

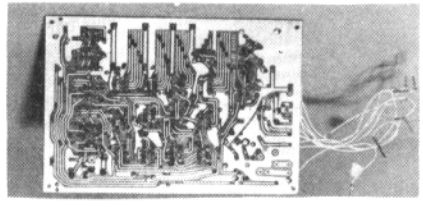
CONSTRUCTION

Several units have been constructed

by the author. The first unit was made by using sockets and wire wrap. A second unit was started using breadboard cards available from BF Enterprises of Hawthorne, Massachusetts. However, this was put aside in favor of a double-sided printed circuit board. There have been about five different versions of the original board, each with its own improvement.



TTL SELCAL Printed Circuit Version, Top View



TTL SELCAL Circuit Side, Printed Circuit Board

The unit should be constructed in a metal box with all lines in and out of the box bypassed for RF. Stray RF and switching transients from motors, fluorescent lamps, and the like play havoc with digital switching circuits and can result in very erratic operation. Wiring inside the chassis between integrated circuits is not critical; one look at the wire side of the wire-wrapped version would convince even the most skeptical builder of this. Keep 110v AC power line and selector magnet driver lines well separated from the logic circuitry.

If a printed circuit board is used, keep in mind that special PCB drills are necessary when using G-10 epoxy glass board material. Standard high speed drills generally are good for about 25 to 30 holes before the cutting end begins to melt. These PCB drills are made of carbide and are priced from $2.00 to $4.00 each, depending on the supplier. These bits are very fragile; dropping one on the floor can shatter it into many pieces. If one should break in use, don't discard it since the broken stub seems to cut almost as well as a new bit. You should not attempt to use these bits in a one-fourth-inch drill motor. I use a Dremel Mototool, which seems to work quite well. Make sure you grip the drill on its shank, and not down on its flutes.

The only indicators used were neon bulbs across the 120-volt line between the switch and the transformer and across the output plug to the teleprinter motor. The relay can be any unit which will pull in on the power supply voltages available and not draw more than 50 to 100 ma. This means a minimum of about 100-ohms coil resistance for a 6-volt relay to operate off the 5-volt logic supply.

The contact rating of the relay used to control the teleprinter motor is important and should be capable of about 6 amps at 120 volts AC. This may seem high, but it is necessary to take care of the inductive load of the teleprinter motor.

The FON and FOF switches should be located inside the cabinet of the TTL Selcal. If remote operation is desired, a small relay can be placed inside the cabinet and the relay control wires run to the remote location.

The integrated circuit voltage regulator can have from 7 to 30 volts DC input. Experience has shown that because of the ripple on the raw DC, anything below about 8.5v input is marginal. The most satisfactory and inexpensive power transformer found is a 12-volt 1-Amp filament transformer connected across the full wave bridge. These are available for about $2 from Allied Radio Shack. For those who wish to construct their own PC boards, blueline copies of the negatives used by the author are available for $3.50 a set.

INSTALLATION OF THE TTL SELCAL

The input of the TTL Selcal must be a positive signal with respect to ground. It is necessary to have a good ground between the TU and the TTL Selcal. Those who have a tube-type TU may place a 220-ohm, 2-watt resistor in the cathode of the keyer tube, place a short across the selector magnet output of the TU, and set the TU loop current to 20 ma.

Take the input to the TTL Selcal from the junction of the cathode and the 220-ohm, 2-watt resistor. In this configuration, assuming the cathode was at ground potential before modification, a mark will be 4 volts and space will be ground

This will require the use of the two-transistor input stage. If you wish to use the same loop power supply, set the teleprinter for 20-ma, place a separate set of current-limiting resistors on the output of your original loop supply, and use this loop for the selector magnets in conjunction with the TTL Selcal.

For those who have an NPN transistor keyer stage, the installation is much more simple. The one-transistor input stage is used. Place a 470-ohm resistor from 5 volts supply to the input of the TTL Selcal input stage. Connect this junction to the collector of the TU keyer transistor. It is assumed that the emitter of the keyer transistor is grounded. In this case, a mark will be at ground potential and space will be 5 volts. The original loop supply now may be used in conjunction with the keyer transistor of the Selcal.

Connection to the teleprinter has been described in another section of this article. The diode in the collector of the keyer transistor is to protect the transistor should the loop supply be hooked up backward.

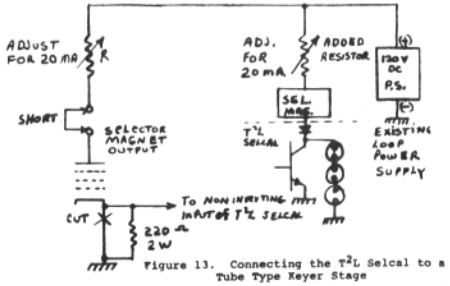


Figure 13. Connecting the T²L Selcal to a Tube Type Keyer Stage

OPERATION

The receiver, TU and TTL Selcal are left on continuously when in use. The calling station should send your call two or three times to ensure that your teleprinter is on. The calling station then should send the traffic he has for you, using your established format. At the end of his transmission, he should send four to eight N's to turn off your printer.

If the sender is using a manual keyboard to transmit his message, it is possible that long pauses of 5 to 10 seconds could cause the Auto Stop circuit to turn off your teleprinter. Should this become a problem, the 0.1-mf capacitor on the output of X-21B can be increased to 0.25 or 0.5 mf, thereby giving a longer discharge pulse to the 50-mf timing capacitor in the UJT emitter.

CONCLUSION

I would like to acknowledge the contribution of Mr. Larry Walrod, VE7BRK, whose assistance in constructing the units made the project possible. Also, I would like to tahnk Mr. Bill Sasnet, W0TEM, for his encouragement and suggestions; and to the Hams on the WBT RTTY network for their patience in waiting for this equipment to be made available.

At the time of writing of this article, one Selcal is in operation in Waxhaw, North Carolina, at WA4ZRS, and two units are in operation in Peru, South America.

The TTL Selcal is the first part of a complete RTTY receiving station which is under development at my home by Larry Walrod and me.

The TU is a slightly modified version of the ST-6 by Irv Hoff. A crystal-controlled single channel receiver designed especially for RTTY reception on a single channel is being developed by Bill Feath, K51WO, for this project and may be the subject of a future article.

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VHF RTTY NEWS

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

This month we have several interesting news items.

"The third B.A.R.T.G. VHF RTTY CONTEST has now been evaluated ... Band conditions seem to have been better for the European Stations during the first leg but the British Stattions were able to enjoy reasonable conditions during the second stage. In general the split operating ideas was very much appreciated as was also the timing in order to minimize the problem of TVI.

"The activity in England was centered around the Home Counties with a considerable rise in activity in the Midlands as well as operation from a number of stations in the West Country. Some contacts of quite good distances were achieved and these results will no doubt encourage operators to use RTTY over longer distances. In this context the use of FSK seems to have a lot to commend it when longer distance contacts are contemplated. Once again the vexed problems of speeds was commented on by several operators as was the matter of the amount of shift being used by some stations.

"The number of logs was slightly down on last year but one very encouraging sign is the appearance of many more G stations now operating with RTTY on the VHF frequencies. A quick look at the results shows that all but two of the logs received came from the UK. Another first was recorded this year with the entry on 70 MHz from Brian, G3YKB, and another first was the 432 MHz log from Ian, G8ATV. Last year no G stations were recorded as using either of these bands.

"Summing up the results have been very encouraging and the event will be held again next year with possibly a change in the scoring system. It is proposed to drop the Country bonus as this tends to favor the Continental stations and consideration will be given to a points per kilometer score system in order to spread the final scores a little and to encourage the making of contacts over longer distances.

"Many thanks to all the stations who supported the event and we look forward to even more support next time round. Ted Double, G8CDW.

Call	Points	Contacts	Countries	Furthest Contact Distance km
70 MHz Band				
G3YKB	202	2	1	45
144 MHz Band				
DJ8BTA	662	10	3	260
G8ATV	263	13	1	238
G3NTT	249	11	1	240
G3XSO	243	10	1	205
G8BNW	241	7	1	240
G8AEL	230	5	1	138
G8DJF	220	9	1	160
G3AJS	216	4	1	187
G3YKB	216	9	1	120
G3TWX/A	209	4	1	175
G8CUO	209	4	1	175
LX1JW	206	1	1	185
G3SBA	205	3	1	80
432 MHz Band				
G8ATV	2010	1	1	23

"The contest manager gratefully acknowledges receipt of an excellent 144 MHz check log from G3FRV.

"The following stations were active during the Contest and gave points to stations who submitted contest logs:

70 MHz Band: G3FRV, G3OLM.

144 MHz Band: G3EFP, G3FIJ, G3FRV, G3LUO, G3NUE, G3OLM, G3WRA, G3XOD, G4ALE/P, G6CW, G8AGT, G8BHD, G8BLG, G8BMR, G8CKF, G8CKT, DC9RY/P, DJ3GK, DJ4KI/P, DJ5BV, DL8CX, DL8PI, DL8UO, DL0OG, PA0OSI.

432 MHz Band: G8BMR."

Thanks again, Ted.

The following information was sent by J.C. Ludwig, Jr., K4DFI, Route 6 - Box 225, Salisbury, NC 28144:

"For some time there has been talk of VHF FM RTTY in Salisbury, and in recent weeks the following stations have become quite active on 146.700 MHz: K4CDZ, Wayne near Winston-Salem, K4DFI, J.C. near Salisbury, W4HWT.

John near Kernersville, W4IRE, John in Winston-Salem, and K4YYJ, Jim in Salisbury.

"Activity usually takes place between 8 PM and Midnight. All stations use 850 Hz shift and AFSK; most are vertically polarized. The majority are using FM transceivers such as Drake, Regency, and Standard. The Standard is particularly convenient since it has test scokets on the back which may be used to feed in and take out audio and perform switching functions while retaining use of the speaker and microphone (voice id is as easy as picking up the mike). Several of the mentioned stations are auto-start on the frequency. Others are working on that goal.

"We have heard rumors of activity on RTTY in nearby areas but so far have been unable to get definite information (We would welcome calls and information from others within this area. Since most use crystal controlled FM receivers it is important that you get on 146.700 to be heard. Care should also be taken to make sure deviation is kept to something like plus and minus 5 kHz." Thank you, J.C.

OK1ALV, Vladimir, in Prague has the following information: "I received a copy of the CQ RTTY Handbook from WOKUI. Because of that valuable literature, we've improved our present TU and made first QSO on 2 meters with DC9RY, Flo in Nuernberg, and last week with DK4LI, near Hanover, during quite normal conditions, with power 70W PEP to 40 El. YAGI array...

"We try to get some hams from Berlin with RTTY rig to be active on VHF bands. In this large town there is RTTY VHF station QRV not yet for the time being, and conditions in this direction are for us quite good almost every evening.

"....I'll try to ask some W/K ham to settle the fee for June and following issues of this year at least, to have this volume complete." (I sent several back issues thru MAY 1971. I will send issues for the remainder of this year. If someone could settle some funds exchange to start with this issue, it would be appreciated -RG) Thank you. Vladimir.

Sandy Jenkins, K8NQW, Cleveland, OH, reports that the AFSK on AM net on 50.700 MHz has been going full tilt including many pictures. They are trying to get an autostart net going on 145.8 MHz, AFSK on AM.

To show how interesting or perhaps frustrating 24 hour autostart can be, we received several perfect CQ's and Brown Fox's from WA5UTF on 146.700 MHz, 40F2 back on 1971 AUG 16. The frustration comes from not being around when they came in. Should have been a solid QSO and a real gem distance wise. At least, we got them!

The constructor (home brewer) might look up the following: IEEE Trans. on Instrumentation and Measurement, Vol. IM-20, No. 3, 1971 AUG, pp. 158-161. Contains information about crystal oscillators. Could provide the basis for a nice FSK of a crystal oscillator.

Well, that's about it for this month. Hope that all got over the Christmas - New Year holiday season successfully and happily. 73 ES CUL, RG.

*****

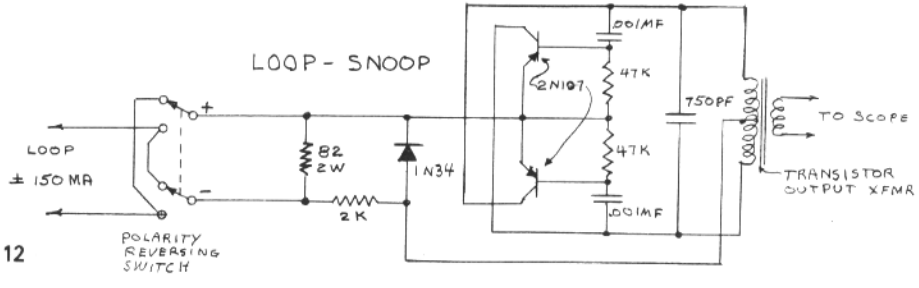
The LOOP SNOOP-

PAUL BLANKMAN, KH6AG
98-823 Iliee St.
AIEA, HAWAII. 91342

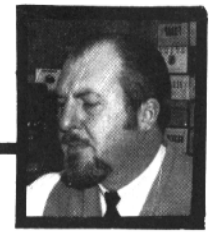
The LOOP-SNOOP is a simple little gadget that will check a D.C. TTY loop with an ordinary audio scope. It will visually show mal-adjustment of TD or keyboard contacts and will deflate your ego when you see the transients and spikes or your loop. The LOOP-SNOOP is small, portable and requires no external power.

The LOOP-SNOOP converts your D.C. TTY pulses into audio pulses (approx. 20 KHz) which are suitable for the average scope found in the RTTY shack. Loop currents from about 5 ma to 150 ma can be observed with resultant A.C.

Continued on Page 20



RTTY-DX



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

Hello there . . .

The Volta Contest took place at the time this column was due to go to press so we do not have too much to report except from our own limited activity. The conditions seemed to be fairly good at this location although many in other areas complained of poor conditions. Ten Meters had fairly good openings to Europe and the mid Pacific and we even managed to copy VK2FZ but with no success on a QSO. Twenty and Fifteen carried most of the activity as usual but I suppose you noticed that those bands close down fairly early anymore leaving only Forty and Eighty for any activity during the hours of darkness. Activity was quite poor on the latter two bands in this Contest. We could print many stations in Europe, some very strong, but could not manage to attract their attention. We cannot imagine there was anyone in the Contest that did not work VP7NH. Bill made an all out effort and had a tremendous signal on all bands, all of the time, or so it seemed from here. The next Contest activity should be the "Giant Flash", which usually takes place in February so details should be available soon, perhaps in this issue.

Applications for the WAC Award continue at a brisk pace and this month we congratulate the following stations who received certificates.

Nr. 174	Guy Baron	9Q5BG
Nr. 175	Wilhelm Meiswinkel	KL8KS
Nr. 176	Les Moskowitz	WA3KEG
Nr. 177	L.S. (Barney) Barnett	ZL2ALW
Nr. 178	Herb Drake	WB6IMP
Nr. 179	Lew Stapp	WØPHY

The past month was marked by the appearance of two new stations to RTTY, both very rare and much in demand. Thanks to Mark, W5EUN, for the information on both as he was the first to contact them. Jean, FM7AJ, started up on November 14 with excellent narrow shift signals coming from a Tempo One Transceiver; a French commercial solid state TU; a Model 28 KSR machine; and a rhombic directed to Europe. Jean is

DX HONOR ROLL

100 DXCC-RTTY
*** NR. 1 ON4BX 106 Confirmed ***

1.	FG7XT	110/102	43.	EA7PZ	55/37
2.	I1KG	107/100	44.	ZL2ALW	48/37
3.	W3KV	105/100	45.	HB9AKA	48/36
4.	ON4CK	100/94	46.	I5CLC	53/35
5.	W8CQ	86/80	47.	PY2CBS	51/35
6.	W5QCH	82/80	48.	W3CIX	43/35
7.	K8YEK	80/78	49.	DL8VX	42/35
8.	DK3CU	75/71	50.	9Q5BG	37/35
9.	F9RC	73/68	51.	ZS3B	53/34
10.	W2LFL	74/67	52.	CE3EX	43/34
11.	W4YG	72/66	53.	I1WT	43/34
12.	WA6WGL	69/64	54.	VE4FG	35/34
13.	K8QLO	68/62	55.	SM5CMG	60/33
14.	G6JF	82/59	56.	VK3NR	51/33
15.	W1GHJ	70/59	57.	HB9ADM	43/33
16.	VE3AYL	63/59	58.	I6CGE	42/33
17.	W3ISE	63/57	59.	VE4BJ	33/33
18.	W5EUN	64/56	60.	WB6QFE	37/31
19.	DJ6ZBA	75/55	61.	W9BT	37/30
20.	WA2YVK	65/55	62.	K9BJM	32/30
21.	SVØWO	61/54	63.	KL7GRF	41/29
22.	I1ROL	60/51	64.	K6YUI	41/27
23.	W4EGY	57/51	65.	WA2EXP	34/27
24.	K8JTT	51/49	66.	WØHAH	51/25
25.	WA3IKK	60/48	67.	G3IYG	33/25
26.	K4VDM	51/48	68.	FY7YQ	29/25
27.	CR6CA	52/46	69.	ON5WG	28/24
28.	EI5BH	52/46	70.	HK3SO	28/22
29.	DJ8BT	51/46	71.	W2IDX	42/21
30.	ZS6BBL	53/45	72.	SMØOY	36/21
31.	WB6RXM	52/45	73.	9J2ED	36/21
32.	OK1MP	49/45	74.	W1KQY	32/21
33.	SM5BO	52/44	75.	4X4MR	34/20
34.	HA5FE	50/44	76.	OZ6OB	33/19
35.	XE1YJ	48/42	77.	ON4CZ	30/18
36.	W9AE	47/42	78.	DL3NO	20/17
37.	W4VJP	42/41	79.	WB6TLA	24/16
38.	I1CAQ	43/40	80.	WAØWST	32/15
39.	W8CAT	41/40	81.	9Y4VU	25/15
40.	LX2BQ	45/39	82.	I1THB	22/15
41.	VE5LG	46/38	83.	WB2NRU	18/13
42.	VK3DM	44/38	84.	K1LPS	25/12

The next listing of the RTTY-DX Honor Roll will appear in the MAY, 1972 issue. Please let me have your Countries Worked/ Countries Confirmed prior to that time.

an engineer at the broadcast station at Fort-de-France and expects to be there about a year or so. His home call is F6BEX and his present QTH is--

Jean - Marie Pistre
O.R.T.F. Box 662
Fort-de-France, Martinique

This was the first attempt by Jean at RTTY and his interest started from the moment he saw the Model 28 and the TU setting there unused at the broadcast station where he works. Jean says that FM7AA may also be QRV very soon.

The second station causing quite a bit of excitement was TI2CAH who started up on November 17th. Jose puts out an extremely strong signal to these parts and is using a FTDX 100 Transceiver into a two element Quad. The TU is homebrew and the machine is a Model 15. Cards can be sent to--

Jose Herrera
P.O. Box 4073
San Jose, Costa Rica

Roland, FR7AB, continues almost daily and weekend activity from Reunion Island. He is mostly on 15 Meters and is now using 45 baud. See last month for his QTH, and Roland does QSL very quickly.

Never quite give up on receiving QSLs. Cards from Hugues, FH8CE, are now coming through for contacts made over a year ago. The explanation for the delay comes via Arthur, ON4BX. Hugues just recently returned to Comorro after a long absence and is just catching upon his mail.

Cards have also been sent out by Paco, XE1WU, for his operation as FPØWU last summer. Paco also sent along a photo copy of his license issued by the office of Postes et Telecommunications of St. Pierre et Miquelon and stamped with the official Seal. If you worked Paco from there and need the card, send yours to--

Francisco Davo
P.O. Box 400
Satelite City, Mexico

We recently had a QSO with a new station in the Canal Zone, KZ5AA. The big surprise was to find Bill, HP1XHG at the keyboard. He had just finished setting up the station there as a MARS facility and told us that he is now KZ5BH, and that HP1XHG is QRT. KZ5AA is an old Army station and we still have QSLs from them for contacts made in the 30's when they were K5AA. You can QSL to--

KZ5AA, Drawer 'L'
Fort Clayton
Panama Canal Zone

From Guy, KZ5LF, we hear that there will be soon additional activity from KZ5PW and KZ5SD.

You RTTY DX'ers are advised to mark your calendars now for the second week in January. This is when Paul, KH6AG, hopes to start his travels through the Micronesia Islands of the Pacific. No fixed schedule is given at this time but Paul will do his best to operate from where and when he can as his work permits. Micronesia includes such island groups as the Caroline Islands and the Gilbert - Ellice Island groups. A look at the map will show that exotic prefixes are numerous. If your beam must get stuck this winter just hope it is pointed toward this area.

We were sure pleased to print Bud, W6CG, in the recent Contest and Bud tells us that he is working hard to get VR1AA in the Gilberts to try a little RTTY. Apparently the equipment is available and if and when any activity occurs it would probably be at 50 baud and 425 hz shift.

Not long ago we had a QSO with Fred, HR2AFK, in another mode. (Yes, very much to my surprise CW and SSB are still being used as a means of communication) You may recall that Fred was quite active about two years ago but he disposed of the antique equipment he was using and went QRT. He does have a new machine now and promises to get it going real soon and put Honduras on RTTY again.

Some of you fellows have had contacts with HC1DL, and we thank Carl, WB6RXM for furnishing his QTH--

Bernardo J. Diaz
P.O. Box 289
Quito, Ecuador

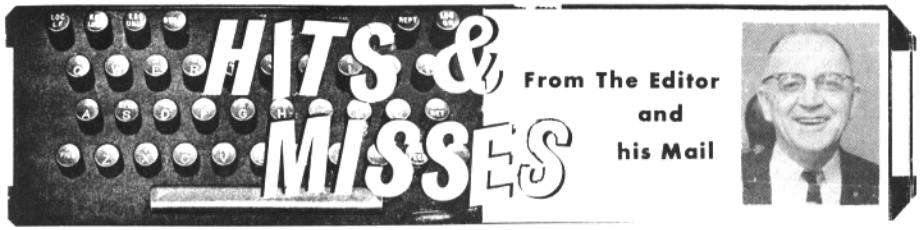
It is a club station and usually only active on weekends, and even then the available power is only on for a limited time. However, it is a good one to watch for as it is the only activity on RTTY from Ecuador at the moment.

Via Dusty we have some recent info from Venkat, VU2KV. He has been very QRL in recent months and has also changed QTH again. His present QTH is--

P.O. Box 467
Calcutta - 1, India

Further good news is that his trip to the States is on again and tentative plans call for him to be in San Francisco around the 21st of January and also attend an International DX meeting in Fresno on the 22/23rd. From there he will travel East via Los Angeles, Las Vegas, Chicago, Detroit, and New York. Venkat will keep Dusty informed as plans materialize so further information will be via these pages but as time is short

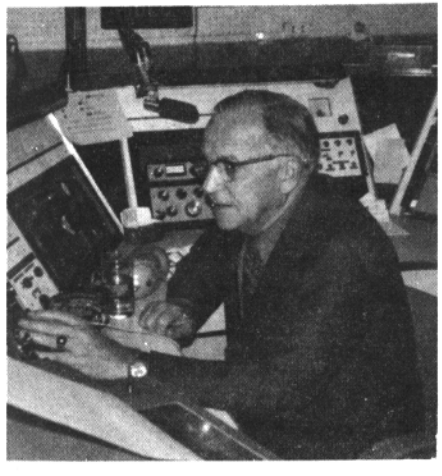
Continued on Page 19



This issue starts the 6th year of our publishing the Journal. Once again we want to thank our authors, our column writers, John, W3KV and Ron, W8BBB for their faithful work for the entire five years and of course the readers who have been so loyal. Very best wishes for the season to all.

***

The picture on the heading of this column is now 5 years old. We feel like the politician that uses his college year book photo for campaign cards many years later. However the biggest change in us is that we are not quite as square as we used to be -- we let our brush cut grow out -- unfortunately we waited too long to ever have it in "mode" style. Carl, HB9P, visited with us several weeks ago and snapped a picture of us, sent us a copy, not being modest we are including it here to prove our point. We are older but not much smarter.



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Dayton Hamfest is April 21-22 this year. Start your plans now to visit us at the RTTY Journal hospitality room.

***

John, W3KV, our DX editor, has received his 100th QSL to confirm RTTY 100 DXCC. Not wanting to check his own cards John is mailing them to us for examination and knowing John we are sure they are all in good order. Our congratulations to John for the first stateside RTTY 100 DXCC.

***

One of the nicest things about ham radio are the friends that are made, not only locally but all over the world. We would be the last to say that a possession of an amateur license makes everyone the type of person we would enjoy an intimate friendship with but it certainly opens a lot of new acquaintances that can and often turn into a very enjoyable association.

In a very small way amateurs have their own United Nations. In the past few years we have greatly enjoyed visits from ham friends from Italy, England, Belgium, New Zealand and Switzerland. Ham radio and RTTY brought us together but the talk has been about everything and in every case a pleasure as well as informative. It would be difficult for me to imagine serious troubles arising between Nations if the friends we have met from other countries were sitting around a table discussing things. (Except possibly during a contest with a rare country on)

***

Another shipment of RTTY Binders, Red with Gold lettering is in stock. The last two shipments of binders have increased in price and with the added postal increase we have been forced to raise our price to $3.00 each in the US and possessions, $3.50 in Canada and Mexico.

***

Be BROAD Minded---
Use NARROW Shift !!

***

RTTY Scope - cont.

Continued from page 4

Stik). Preferably, the power transformer should be mounted to the rear of the CRT, and the input amplifier (Q1) should be towards the front of the unit. The only shielded wire is from the input jack to the gain control (R1).

The compact unit shown is built in a 3 x 5 x 9-1/2 aluminum chassis with the open side up, and an aluminum cover completes the enclosure. Alternately, the unit can be built with the open side down and an aluminum bottom plate used. For the 3API CRT, use a 3 x 5 x 13 chassis. Do not use a steel bottom plate unless a mu-metal tube shield encloses the CRT; otherwise, the centering will shift with magnetization of the cover plate. On the subject of CRT shields, most prototype units showed no hum without mu-metal shields; however, one extremely compact unit had very slight hum on the pattern which was eliminated with a cut down HeathKit CRT neck shield #206-180.

A standard CRT bezel can be used to dress up the front panel and for mounting the CRT. The unit shown uses an old meter case with the movement and glass removed and the opening filed round. A rubber O-ring slipped into the case provides a shock mount for the CRT face. The tube neck is supported with an aluminum clamp and spacers. A special CRT tube socket is omitted by using pins from a standard old tube socket, soldered directly to the leads, with spaghetti over the pins for insulation.

Circuit components are not critical so feel free to use the junk-box; however, C2 and C3 should be high quality (Sprague Orange Drop) to yield high Q and to minimize calibration drift. Of course, it is an unusual junk-box that contains 400 v breakdown transistors. C6 and C7 should have low D.C. leakage so as to not affect CRT centering. Although not necessary, the gain and Q can be optimized by selecting high gain (H_{fe}) transistors for Q2 and Q3. The circuit in Figure 4 can be used to select the two highest gain transistors from a batch for those persons using the same type throughout. Choose for Q2 and Q3 the units with the lowest measured base voltage.

Minimal power is required and voltages are not critical, thus power for the unit can be robbed from other equipment in the shack. The 300 volt load draws 6 ma and the -150 volt load draws 12-14 ma (including CRT). For a built in supply, the author used the smallest transformer on hand, a 250 v ct unit and the circuit shown in Figure 5.

Almost any small CRT can be used, such as the 2BPI, 2API, 3BPI, 3API, and 3RPI. This circuit has adequate output swing to drive any of them with the supply voltages used in this circuit since the CRT deflection factor is greater with reduced accelerating potential (usually 1000-1500 volts). All are sufficiently bright for a well lighted shack. Caution: Check pin connections and heater requirements for your tube (3API requires 2.5 volts). Don't worry about the spot that finally burns on the center of the tube face during undeflected periods; no useful information is contained in the center of the tube anyway. Centering controls are dispensed with for simplicity. Most CRT's are fairly well centered as is; however, a small magnet can be glued to the CRT neck for centering if desired. A small chip from a dime store magnet is adequate, just slide it around the tube neck until the display is centered on the tube face, and a spot of epoxy or Q-dope will hold it.

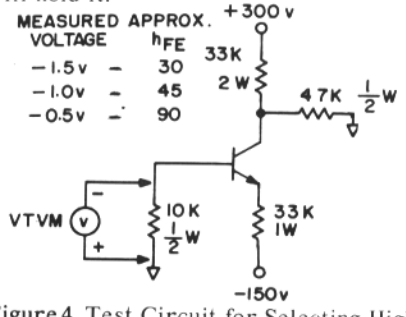

Figure 4 Test Circuit for Selecting High Gain Transistors

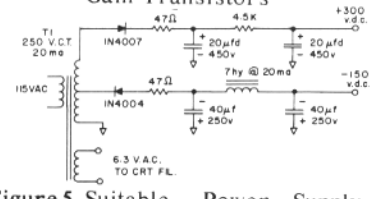

Figure 5 Suitable Power Supply for Monitor Scope

Initial Adjustment

At first turn-on, defocus the spot until after the centering magnet is glued on. With power applied and the input sensitivity control (R1) turned down, the following d.c. voltages should exist:

Q1 collector - approximately 1/2 of the negative supply voltage
Q2 emitter - within 1 volt of Q1 collector
Q3 emitter - -0.5 to -1.0 volts
Q4 & Q5 collector - approximately 1/2 the positive supply voltage.

If the readings are off more than 20%, adjust the operating points by changing the value of R2, R14, R18. Increasing R2 reduces the (negative) voltage at Q1 collector and Q2 emitter. Increasing R14 increases Q4 collector voltage, increasing R18 increases Q5 collector voltage.

Apply a 2-3K Hz sine wave at the input. A straight line should appear on the scope; adjust the amplitude for 3/4 screen deflection. Focus the spot with R24. As the frequency is varied, the line should rotate about the center. If you prefer rotation in the other direction reverse the deflection plate connections (pins 6 and 7) at the CRT (or equivalent pins for your CRT). The line should rotate smoothly from 2 to 3 KHz, with reduced angular rotation and shrinking in size below 1 KHz and above 4 KHz. Calibration marks are placed on the face of the tube by stretching fine black threads across the tube face (behind the bezel) and adjusting these over the trace at desired frequencies (2125, 2295, 2975 Hz). A spot of Q dope out of sight at the tube edge will hold the threads in place. If available, a calibrated oscillator or an oscillator and counter may be used for calibration. However, for those using the ST-5 or ST-6 demodulator, the calibration threads can be easily placed right on the filter frequencies. Just connect the monitor scope to the receiver output, turn on the calibrator and BFO and tune for a tone. Tune the BFO for maximum on the TU tuning meter (or maximum measured discriminator test point voltage), and repeat for mark and space on the narrow and wide shift positions of the TU. Adjust the calibration threads over the scope pattern when the peak discriminator output is obtained.

Obtaining the Parts

The junkbox should supply most resistors and capacitors but few will have CRT's and 400 volt breakdown transistors.

The power transformer can be a STANCOR PA-8416, $4.66 from Lafayette or the Thordarson 22R39, $4.37 from Newark. These transformers have 6.3 volt heater supply which is suitable for the 2BPI and other CRT's. For the 3API, 2.5 volt heater supply is required. Van's (W2DLT) 302 Passaic Ave., Stirling, N.J. 07980 offers unused 3API CRT's in original boxes for $4.50 first class postpaid anywhere in the U.S. Van also has 88 mhy toroids at 5 for $2.00 ppd. 2N3439 transistors are available for $1.19 each from General Radio Supply Co., 600 Penn St., Camden, N.J. 08102. M. Weinschenker, K3DPJ, Box 353 Irwin, Pa. 15642 offers .22 Mfd 100 volt mylar capacitors at 16 for $1, and .02 Mfd 200 volt dipped capacitors at 20 for $1, postpaid.

Acknowledgements

The author wishes to thank Bruce Meyer WOHZR for his original vacuum tube phase shift scope design which served as the foundation for this design. Also I want to thank Don WA6PIR for urging me to write this article to share the design with other RTTY enthusiasts.

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3. Byron H. Kretzman, W2JTP, The New RTTY Handbook, 1962, pp 150-156.
4. Durward J. Tucker, W5VU, RTTY From A to Z, 1970, pp 194-196

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WANTED: UGC-20 and UGC-25 Compact teletypewriters, three speed gear shifts for 28ASR and 28KSR, BRPE-11 high speed tape punches, ST-6 Terminal Unit. Hank Scharfe, W6SKC, 1015 Fremont Avenue, South Pasadena, Calif. 91030 (213-799-5886).

WANTED: TELETYPE BOOKLET, "THE MODEL 28 STUNT BOX" Originally published 1959. Pay any reasonable amount. Larry Kleber, K9LKA/W9CPD, Belvidere, Illinois 61008.

MODEL 28 TYPING REPERF TRANSMITTER, complete with tape handling stand, reperforator distributor unit, Synchronous 1/2HP motor and two tape reels. 115V 60cy AC. .5 amp max signal input/output 130 V max DC .075 amps max.O/A dim. 36 inches high, 20" long, 8-1/2" wide. Trans- dist. is type LAXD4 with 3 speed gear shift. Typing reperf is type LRXB6 also with 3 speed gear shift. Used, excellent $150.00 each while they last. Unused parts for model 14,15,19,28, Mite and Kleinschmidt machines. Send us your requirements. Atlantic Surplus Sales, 580 3rd Ave. Brooklyn, N.Y. 11215.

SELL; MITE TT-"(&/UG PRINTER and keyboard, 3 speed gears, sync. motor, carrying case and manuals $195.00 28 KTR reperf with keyboard, sync motor and remote 3 speed gear shift, $225.00. TDA-2 Distortion analyzer $40.00. OS-8B/U scope $30.00. Glenn Kurzenknabe, K3SWZ, 3600 March Dr. Camp Hill, PA. 17011. Phone 717-737-2341.

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HYCON 616 COLOR GENERATOR - $75.00. BC221E Book and supply -$40.00 Codamite MG-100 CW keyboard keyer - $100.00 Polycom 6 & 2 transceiver - $100.00. Heathkit GC-1A Mohican receiver $60.00 Boehme ink recorder, amplifier, tape puller-$50.00. Heathkit IB-2A LCR bridge-$50.00. Measurements Corp. calibrator 100kc, 1 MC, 10 MC, $15.00. Knight light meter $5.00. W6JX, 14945 Dickens, Sherman Oaks, CA. 91403.

WANTED: BACK ISSUES RTTY JOURNAL, Years 1956 1961 1964 1968 1969 1970 1971 write Murray Fisher W7NSU 1011 Hobson St. Walla Walla, Wa. 99362.

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MODEL 28 TYPING REPERFORATOR transmitter distributor, with tape handling stand, with two tape reels, synchronous motor. Transmitter- distributor type LPR3ARZ with 60-75-100 wpm 3 speed gear shift. Typing reperf type LRXB27 also with three speed gear shift. O/A dimensions 36" high, 20" long, 8-1/2" wide. Used excellent $150. Atlantic Surplus Sales, 580 3rd Ave. Brooklyn, N.Y. 11215.

TELETYPE MACHINES, TABLES, COVERS, power supplies, reperferators, cabinets, tape punches, parts etc. Loads of electronic equipment and parts also. PC boards, Western Union items, clocks etc. Goodman 5826 S. Western Avenue Chicago, Illinois 60636 (312-476-8200).

SWAP: COMMERCIAL TUBE TYPE Electronic Distributor 5-6 code, 60-75-100-200 WPM. Must be externally programmed. Can be used on RTTY or CW. Need test equipment. WOBJ 2801 Wright North Platte, Neb. 69101.

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MODEL 28 TYPING UNITS: Mark II, sprocket feed, $40 each. CV-116 (B)/URR Diversity Frequency Shift Converter, Manual, crystals for 455 kc and 500 kc IF, $125. AFSAV 133C Diversity Frequency Shift Convertor, manual, $95. Radiation Incorporated TDMS Transmitters, Receivers, Power Supplies. Stelma TDA-2 Distortion Analyzer, $35. RD-92 Fax recorder and CV-172 Converter, both $125. Write for details. F.K. McGinnis, 4304 McFarlin Blvd., Dallas, Texas 75205.

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DX News- cont.

Continued from Page 14

interested parties are advised to contact Dusty for the latest information.

A new station is reported active by W5EUN and KZ5LF. The station is VP8ME, and Jay is the operator. His location at Halley Bay would put him in Grahamland, Antarctica and if you happen to QSO you can QSL to --

Gary Pannell, WA5FWC
1301 Gibbons
Arlington, Texas 76010

During the recent Contest Jan, ZS-6BBK, told us to look for VP8JT who was trying to work the Contest. We were not able to print him up here and wonder if anyone did as he would have been an excellent multiplier and a rare country. He is located on South Georgia.

This brings us to the last line for this month.

73 de John

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