Simple Beginners TU

continued from page 7

six inches or so. The wire coming from the variable ceramic capacitor, CT-1, should be very small, as it is to be inserted down in the cathode terminal of the VFO tube socket, after removing the tube, and the tube is carefully reinserted in it's socket, being careful that the wire does not slip out, or short circuit to ground or another pin. This wire should not be pushed down close to the chassis, in order to minimize capacitance effects.

Note that this circuit shown as Figure 4 is actually a part of the Mainline Keyer shown earlier as Figure 2. The left side of the RF choke marked X goes to X on figure 3, and can be any length, a shielded wire will be best.

Now that we're ready to transmit, the job of setting the shift to 850 cycles is before us. It is a bit difficult for most beginners to set shift accurately, inasmuch as proper equipment for the job is seldom available.

How to do this accurately is a bit too hairy for this article, but briefly. . .while monitoring your own signal, and switching back and forth from mark to space, etc., try to set it so that it fairly accurately matches some of the incoming signals. If you have a musical ear for pitch, this chore is easier. When you think you're close enough, make a call or two on the air; and ask for help when you hook some one. Many of the old timers have th TT/O, or other means of determining shift, and will be happy to assist you. Just be careful that you are not too wide initially; best to err on the narrow side, and then holler help when you hook someone. Most of us can print just about any shift encountered, so don't worry too much about anything except staying under 900 cycles.

Oh, boy! Now we're on the air. Your little one-lunger is not the ultimate but it will please you very much and you have started. You're gonna have a ball. Good luck and happy RTTYING.

•••

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FEBRUARY 1968

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Vol. 16 No. 2 30 Cents

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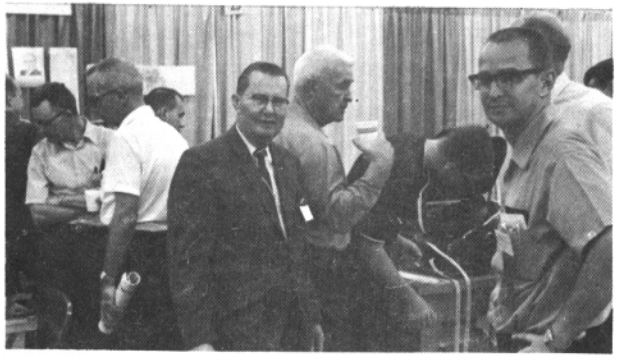


Above- Jay Starks, K5OIM checking copy.
Lower Photo- with Suit Coat-Durward Tucker W5VU
Right With glasses- Prof. Bob Lunday of U. of Texas.

ANNUAL SPRING BARTG DX CONTEST

We have not received any official information from BARTG regarding this contest but have heard that the rules are the same as last year and on the following dates.

1) WHEN

0200 G.M.T. March 2nd to 0200 G.M.T. March 4th, 1968

2) BANDS

3.5; 7.0; 14.0; 21.0 and 28.0 mc/s. Amateur Bands.

3) STATIONS

Stations may not be contacted more than once on any one Band. Additional contacts may be made with the same station if a different Band is used.

4) COUNTRY STATUS

A.R.R.L. Country list - except that KL7, KH6, and VO to be considered as separate Countries.

5) MESSAGES Messages exchanged will consist of: -

a) Message number
b) Report (R.S.T.)
c) Time in G.M.T.
d) Country.

6) POINTS

a) All two-way RTTY contacts with stations in one's own Country, will earn two points.
b) All two-way RTTY contacts with stations outside one's own Country, will earn ten points.
c) All stations will receive a bonus of 200 points per Country, including their own.

7) SCORING

a) Two-way exchange points, times total Countries worked.
b) Total Country points, times number of Continents worked.
c) Add item (a) and (b) together. This is your total test score.

i.e. SAMPLE SCORE

a) Exchange points (302) times Countries (10). 3,020
b) Country points (2,000) times Continents (3). 6,000
c) Add item (a) and (b) above 9,020
(total test score).

8) OPERATION

The Contest will be divided into two parts, single and multiple operating Stations. The transmission of RTTY on more than one frequency at one time will be disallowed.

9) LOGS AND SCORE SHEETS

Logs and Score Sheets should be received by: - Hon. Secretary, B.A.R.T.G., Alan Walmsley, G2HIO, The Firs, 3 Trinity Close, Ashby-de-la-Zouch, Leicestershire, ENGLAND.

Not later than 1st May, 1968 to qualify.

(Note) Any country will count as a multipier for each band it is worked on. e.i. you work England or three different bands it will count as three countries. This should help multi-band operation and don't forget ten meters.

Let us use ALL Bands

A Better FSK for the 100 & 200V Exciters

IRVIN HOFF, W6FFC
12130 Foothill Lane
LOS ALTOS, Cal. 94022

The RTTY portion of the 200-V is the same as that for the 100-V, so all remarks apply to either unit equally. They both have two jacks on the rear, one marked "FSK-1" (direct) and the other is "FSK-2" (polar relay). Figure 1 is a simplified schematic showing what both these jacks are connected to.

Although not immediately apparent, "MARK frequency" will be obtained when the diode gets enough positive voltage to conduct, and "SPACE frequency" occurs when the diode is biased off with negative voltage. The amount of shift is controlled by a pot in the cathode of the reactance tube (which shifts the 8 meg. oscillator somewhat, causing a frequency change.)

If no plugs are inserted into either jack, then the diode is biased off (as shown) with roughly -50 volts, since jack "FSK-2" is then grounded (normally closed jack), and the two 100K resistors form a voltage-dividing network. This -50 VDC will not hurt the diode but negative voltages over perhaps -80 volts or more could destroy the diode.

Now let's take the case where we plug the keyboard directly into "FSK-2". You will remember the keyboard is shorted for "MARK" and an open circuit for "SPACE", since the keyboard is nothing more than some on-off switches operated in sequences by a cam wheel.

During keyboard "MARK", then, we have the same situation as shown in Figure 1, that is, "FSK-2" is grounded, and there is about -50 volts on the diode, holding it in "SPACE frequency". Now when the keyboard goes to "SPACE" (open circuit), +340 volts is introduced into the resistor network, and this voltage over-rides the -100 volts, causing the diode to now conduct with about one milliampere of current. Thus the reactance tube conducts, causing the frequency to switch to "MARK frequency" on the transmitter. This is NOT WHAT WE WANT, AS IT COMES OUT UPSIDE DOWN!

Now if a polar relay is used in the keyboard circuit, (polar relays have double-throw contacts), then you can use the "other" contacts and invert this operation. The same goes for mercury-wetted relays. However, such relays have years ago gone out of popular use, and there are many other and better ways to accomplish the same purpose with better results and greater reliability.

Before going further, let's see what would happen if the keyboard was plugged directly into "FSK-1" jack. Now during keyboard "MARK", the diode will be grounded through the keyboard, and thus the circuit can partially conduct. When the keyboard is opened for "SPACE", the normal -50 volts bias again appears to drive the diode to "SPACE frequency". This system "works" fairly well, other than you usually get inconsistent results, due to varying ground resistances back through the keyboard contacts. This method has two additional disadvantages:

(1) You often find it difficult to get the shift you want with this arrangement, since there is no positive voltage to cause the diode to conduct normally, and
(2) The keyboard must be separated from the printer, causing the operator to obtain "local copy" from the receiver. This is rather a nuisance, particularly if the other station is not on your same frequency.

Now why did Central Electronics set the transmitters up this way? Well, I can only guess, but don't forget the 100-V (and even the 200-V) are not really "new" designs at all. When they were first conceived, polar relays were rather popular with most RTTY converters then in use, such as the W2JAV, Twin Cities, etc. Not knowing what kind of converter the prospective owner was likely to use, this was a "safe way" to develop the RTTY system. After all, most other manufacturer's transmitters had NO PROVISION FOR RTTY AT ALL!

Even today, most manufacturers merely recommend some circuit for their equipment that has previously appeared in this very magazine. This is one case where

the amateur engineer has shown industry the "way to go".

Now what to do about it? The TT/L and TT/L-2 are quite popular RTTY demodulator units. (Demodulator in this case is the same as "TU" or "Converter"). The Electrocom FSC-250 is identical in the output loop as the TT/L and TT/L-2, so all comments apply to that unit as well, with a bit of understanding by the reader that minor differences might exist, such as perhaps a different size of filter capacitor, or a slightly different brand of transformer, or a bridge rectifier for full-wave instead of half-wave, etc. These differences are immaterial to the outcome.

Figure 2 shows one system that may be used. An empty plug must be inserted into "FSK-2" jack to make this system work. However, if you desire narrow-shift c.w. identification, put a 150K pot from this plug to a c.w. key which is then connected to ground. If the c.w. key has a "side-arm" remove it, as it will never be used.

In Figure 2, during keyboard "MARK", the 150K resistor connected to point "A" will be grounded, and the diode will conduct from the positive voltage now passed by the open "FSK-2" jack (courtesy of the plug placed in "FSK-2" jack). Thus "MARK frequency" on the transmitter. When the keyboard goes to "SPACE", there will be about -150 to -170 volts at point "A", and this will overcome the positive voltage on the diode, again placing negative bias on the diode. This system works very nicely, and allows the keyboard and printer magnets to be placed in series to get local copy directly off the printer. It has 3 minor disadvantages:

(1) You need an additional wire between the keyboard and the printer magnets, a minor thing indeed, and
(2) You cannot "retransmit" from an incoming signal. This is also a minor inconvenience.
(3) It would be difficult to add a second transmitter to this system, such as a crystal-controlled "autostart transmitter".

There is yet another system that one can use with good results. It was published in the September 1967 "RTTY JOUNRAL" opposite page 13. That system has some minor disadvantages as well. Mostly that it would be difficult to add a second transmitter; "retransmit" is not feasible, and narrow-shift c.w. identification was not offered.

The circuit in Figure 2 and also the circuit in the September RTTY JOURNAL were devised by Keith Petersen W8SDZ. Both circuits are good circuits and either may be used.

An excellent circuit with none of the disadvantages of the others is shown in Figure 3. This circuit can be used with a variety of demodulators, including the TT/L, the TT/L-2, the Electrocom, most of the W6NRM units, literally any unit whose FSK system puts out positive voltage for keyboard "SPACE" configuration. It is merely an "inversion" stage using the high voltage of the 100-V or 200-V from jack "FSK-2" on the collector of an inexpensive 300-volt transistor. This transistor is biased by its emitter diode so that if there is zero or negative voltage during keyboard "MARK" the transistor will not conduct, and hence the voltage on the collector remains whatever it normally would be at "FSK-2" jack. (Around +150 volts or so). This keeps the 100-V or 200-V in "MARK frequency" as the diode conducts.

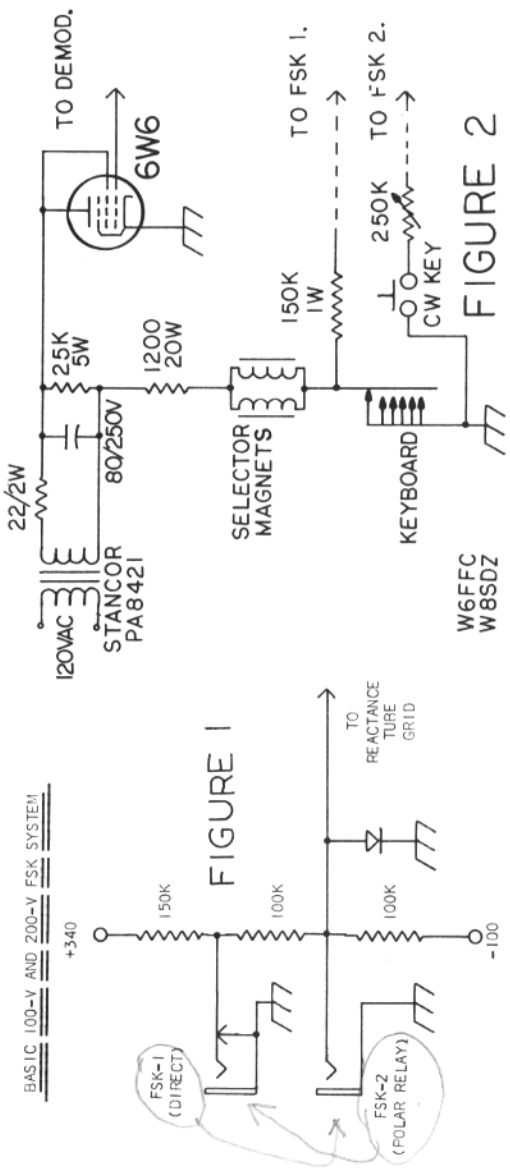
When the voltage from the FSK system on the demodulator goes positive, as is the case with keyboard "SPACE" with most demodulators, the transistor conducts, the voltage at the collector then drops to a fraction of one volt, and thus the voltage at "FSK-2" drops to almost zero. Thus the diode in the transmitter is again biased off with about -50 volts. This system offers, in effect, a solid-state fast-switching relay. It not only isolates the transmitter FSK system from the local loop of the demodulator, it puts you "right side up". Unlike the other two systems, this does not in any way change the original voltages in the transmitter at all.

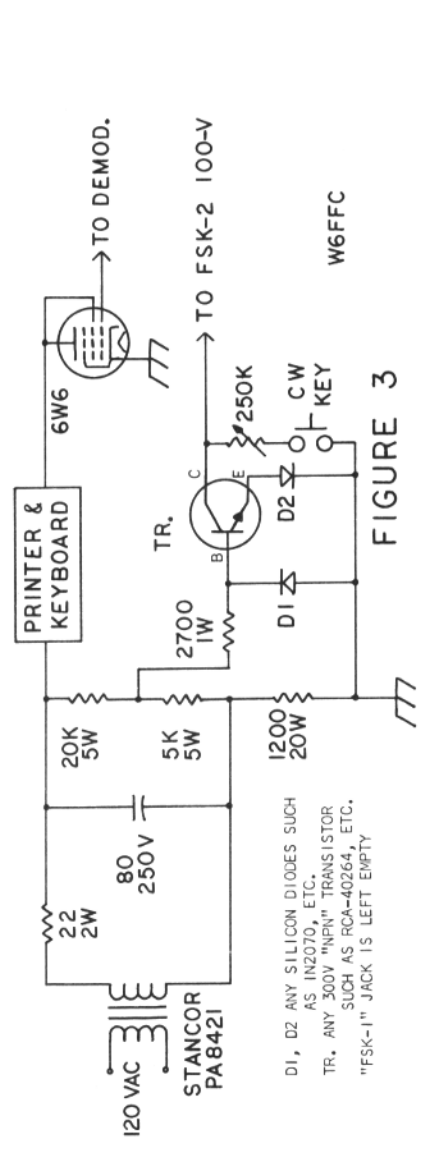
This system offers:

(1) No modifications to the basic demodulator FSK system or loop supply,
(2) keeps the keyboard and printer magnets in series for local copy without tuning the receiver to the frequency,
(3) keeps the printer keyboard and magnets in the demodulator's keyer tube plate circuit where "retransmit" then becomes possible if desired and
(4) makes it easily possible to switch the demodulator's FSK system to another transmitter if desired for VHF operation or for a second transmitter, such as many people use for "autostart" frequencies.

The transistor has a protective diode at the base, which should pass negative voltage to ground. This keeps whatever negative voltage there may be from the demodulator's FSK system during keyboard "MARK" from damaging the transistor, as this negative voltage will be held to a maximum of about 0.6 volts by the diode. The positive voltage during keyboard "SPACE" is safely handled by the transistor itself.

Literally "any" 300-volt "NPN" transistor will work adequately in this circuit, as it only pulls about 2 mills during conduction, and none during non-conduction. (This is less than 0.01 watts during conduction.)





GET GOING! on RTTY + A SIMPLE TU for the BEGINNER

TERRY BEELER, W4FUI
Rt. Box 260
Oak Hill Rd.
CANDLER, N. C. 28715

(In response to our request for a simple TU to start beginners with a minimum of equipment and expense we received several suggestions all of them using the simple one tube job shown by QST, in March 1965, by W1KLK. Terry, W4FUI, suggested several changes however that combine several other features in one unit. His article follows.)

The following TU (or demodulator) is simple, inexpensive and works. No credit is assumed for any of these circuits. Where known, due credit is given to the originator. Considerable reference is made to circuits and articles previously published in QST; it is suggested that some effort be made to have access to these issues. If they are not available, do not despair; the shematics are presented here.

First, let us latch onto the QST's listed: March, May, and August, of 1965; also, August and September of 1966. If you're ready, let's go!

Take the QST of March, 1965, and turn to page 28 for the W1KLK article "RTTY RECEPTION FOR BEGINNERS". It's just that. If you're a beginner, this is the place to get started.

Note the simplicity of the diagram on page 29, Figure 1. Or, look at the schematic Figure 1 below. But. . .whoa, don't build it yet, more to follow. . . .

Now leave the book open to page 29 where you can see it, and open the May, 1965 issue, to Irv's "Mainline Keyer", shown as Figure 2, for those that don't have the magazine:

What we're gonna do now is marry these two together. This will give you a constant local loop, so you can type locally anytime you want. Also, when properly used, will provide excellent reception on moderately good signals. And, as used here with Irv's keyer, will provide the keying pulse necessary for the transmission of RTTY.

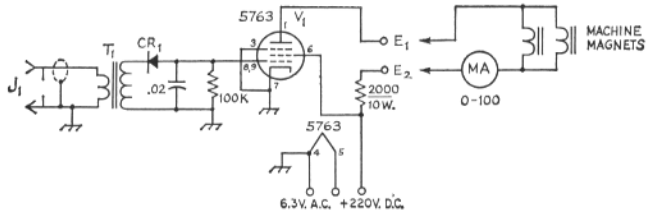


Fig. 1 — Circuit diagram of the simple converter. The 100,000 ohm resistor is ½-watt composition, and the 0.02-μf. capacitor may be ceramic or Mylar type.

CR_1—Silicon diode, 400 volts p.i.v., 750 ma. (GE504, 1N540, etc.).
E_1, E_2—Binding posts.
J_1—Phono jack.
T_1—Audio output transformer, 5000-ohm primary, 3-ohm secondary (Knight 62 G 064 or an equivalent output transformer salvaged from a b.c. receiver may be used).

Figure 1

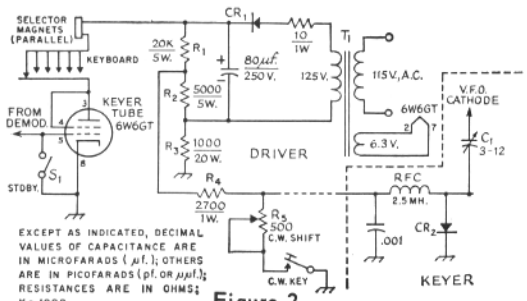


Fig.2.—The "Mainline" f.s.k. driver and keyer circuits. The keyer, shown boxed at the right by dashed lines, should be as close as possible to the v.f.o. tube. The driver section can be installed anywhere; dotted connection between the driver and keyer can be any desired length, preferably of shielded wire (a common ground connection between the two units is assumed).

C_1—3-12-pf. ceramic trimmer.
CR_1—Silicon diode, minimum ratings 100 ma., 400 p.i.v.
CR_2, CR_3—Germanium diode, 1N270 or similar.
R_5—500-ohm linear control.
S_1—S.p.s.t. toggle (or integral with transmitter control switch; see text).
T_1—Power; 125 volts, 50 ma.; 6.3 volts, 2 amp.

Figure 2

The combination of these two circuits is shown in figure 3. Note that some of the component numbers have been changed from the other circuits to prevent duplication. Note the FL-8 Range Filter shown in the diagram, it is not necessary and can be left out entirely- but if you have one around or can pick one up at surplus for a couple of bucks it will improve reception considerably.

Since the range filter has an extremely sharp band pass at 1020 cycles, careful tuning of the receiver to put the space signal at this frequency is necessary. Other filters could be substituted but this little job will give excellent results with careful tuning on good signals.

Just tune the receiver to put the space signal at the frequency of the filter. The sharp bandpass of the filter will reject the mark signal. If the filter is not used, it will be necessary to null out the mark with the Q-multiplier, or put it at zero beat.

Now take another look at Figure 3. See the wire coming from between the two resistors, R-1 and R-2, marked X. Keep that and those components in mind; we'll come back to this later.

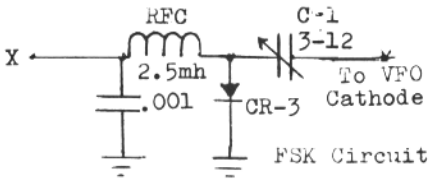
At this point, with or without the filter, we can do a pretty good job of printing. But reading the other fellows is not enough. Let's talk to 'em! Let's get that old Viking II or DX-100 going on RTTY.

It is easy to FSK the VFO. Most VFO's are of the Clapp variety, or a variation of it. It really doesn't matter too much which kind of VFO we use, they'll all shift beautifully. It's just a matter of determining where we're going to put the wire from the keyer.

Merely build the unit shown below as Figure 4 on a long 5 or 6 lug solder-lug strip, and mount it on the tube side of the VFO chassis, as near as possible to the VFO tube, and preferably less than about

Continued on page 20

Figure 4



CR 3 Germanium Diode. 1N270 or similar.
C-1 Ceramic Trimmer- 3-12 pfd.

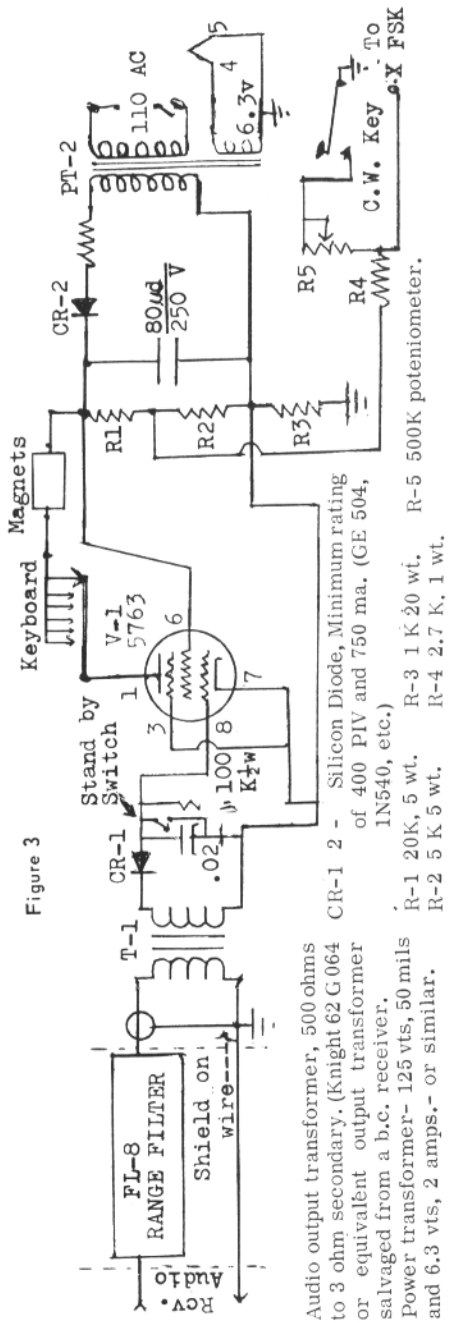


Figure 3

T-1- Audio output transformer, 500 ohms to 3 ohm secondary. (Knight 62 G 064 or equivalent output transformer salvaged from a b.c. receiver.
T-2- Power transformer- 125 vts, 50 mils and 6.3 vts, 2 amps.- or similar.
CR-1 2 - Silicon Diode, Minimum rating of 400 PIV and 750 ma. (GE 504, 1N540, etc.)
R-1 20K, 5 wt. R-3 1 K 20 wt. R-5 500K poteniometer.
R-2 5 K 5 wt. R-4 2.7 K. 1 wt.

kox *Electronic Ultra-Fast Break on RTTY*

JERRY HALL, K1PLP
15 Endleigh Ave.
Pinehurst, Mass. 01866

I think many of us on RTTY have at one time or another had ideas about fast break operation. You know how easy it is to use VOX on SSB transmissions, once you get accustomed to it. Well, ultra-fast break on RTTY can be just as effective - start typing and your carrier comes on - stop typing, and the carrier goes off (everything is electronically controlled). No need to use carriage returns, line feeds, CW ID, and all that between short transmissions, except of course you must identify your station every ten minutes. When you finish your comment or question, even if right in the middle of a line, just say "BK" and stop typing, and let the other fellow continue from there. In amateur RTTY with fast break operation, we can approach the half-duplex operation available to subscribers of the commercial landline services.

GENERAL

The system described here is essentially a VOX type of circuit wired into the local loop - KOX, for Keyboard Operated Transmission. By sampling the loop voltage, the circuit detects the interruption of the local loop current when a tape on the TD is started or when any keyboard key is depressed, and energizes a relay. This relay may be used to key another relay with multiple contacts for turning on the carrier, switching the antenna, etc. An adjustable time constant holds the relay closed for a brief period of time after the TD or typing is stopped.

This circuit is not designed for use in a system where mere keyboard contact closure is used to FSK or AFSK the transmitter (dry keying). Rather, it is intended for use in a system where the keyboard and TD are connected in series with a loop power supply and some form of DC load. Figure 1 shows a typical local loop arrangement where the TD, keyboard, printer selector magnets, and possibly the keyer section of a demodulator are all connected in series. Also shown are points, A, B, and C for connection of the KOX detector circuitry. In most installations, point C will be chassis ground. In the Mainline FSK keying system of the TT/L-1&2 where a polar output keying signal is developed, point A corresponds to the junction of the printer winding and the keyboard contacts, while points B and C correspond respectively to the positive and negative side of the 80 uf filter capacitor. In any system where the demodulator keyer is in the keyboard loop, it is important for proper KOX operation that the printer selector magnets be connected between the keyer stage and the keyboard contacts, as shown in Figure 1.

As long as the TD and keyboard contacts remain closed, the power supply voltage is presented at input A of the KOX detector. When either a tape or typing is started, the contacts open, and the voltage at the KOX circuit input momentarily drops to zero.

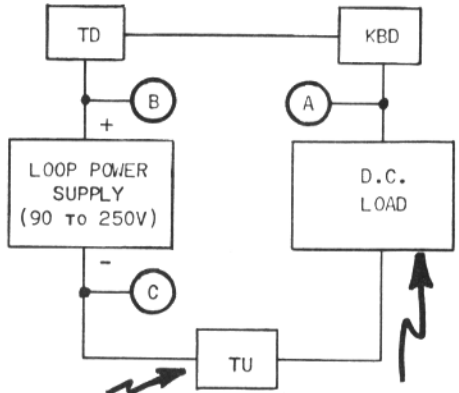


FIGURE 1.

DETECTOR CIRCUITRY

The KOX detector circuitry is shown in Figure 2. A 12AU7 or similar tube is used. Point A is the sampled voltage input to the detector. Satisfactory operation will result with any voltage between 12 and 250 volts applied at this point. Points B and C represent the B≠ and ground or common connections respectively for the vacuum tube. Maximum current required for the total circuit with a 12AU7 tube is 8 ma. with a 120 volt supply.

The first section acts as a direct coupled inverter. R1 and the 220K ohm resistor at pin 2 serve to divide the loop supply voltage down to about ≠12 volts. The value of R1 will depend on the loop supply voltage, as described in the section covering adjustments. With a positive voltage applied to the grid during no typing, conduction is heavy, keeping the plate voltage below the firing potential of the NE-2 lamp. When the positive voltage is absent, during the space condition of either the keyboard or TD, the voltage divider at pin 3 biases this section of the tube at a very low conduction point, causing the plate voltage to rise nearly to the B≠ value. This causes the NE-2 triggering lamp to fire.

When the lamp fires, a positive voltage is applied to the grid, pin 7, of the second section of the tube, and also charges capacitor C1. With a positive grid, this section conducts heavily, energizing the plate relay and the external equipment connected to its contacts. When the keyboard or TD returns to the marking condition, the charge on capacitor C1 holds the tube at heavy conduction for a time determined by the setting of R2. As typing continues, C1 is repeatedly recharged. R2 is a linear control used as a front panel adjustment for varying the holding time as desired during operation. With 120 volts B≠, a 2.5 megohm value for R2 yeilds a range of about 1/2 to 4 seconds holding time after typing ceases, at the extremes of control. Different B≠ supply voltages have some effect on the operational range of R2. Depending on your typing speed and your particular circuit requirements, you may wish to use a higher value potentiometer. Values up to 10 megohms can be used successfully, which yield a maximum delay of near 20 seconds.

The 50K ohm potentiometer, R4 provides some degree of sensitivity adjustment, and also permits compensation for tube aging. Once set, this adjustment may normally be left, so need not be a front panel control. This control setting slightly affects the operational range of R2.

ADJUSTMENT

After the circuit wiring is completed, adjust R4 at its center and close switch S1 before energizing the circuit. The final value for R1 should be determined experimentally, and will depend on the type of tube in use and on the supply voltage. (A resistor substitution box is handy for this!) Start out with a value of 1 megohm for each 100 volts of supply voltage. Then energize the loop power supply and the KOX circuit. The NE-2 lamp should be completely extinguished. If not, substitute a lower value resistance for R1. The final value for this resistor is not critical but should be the largest common value available which will completely extinguish the NE-2 lamp.

Now adjust R4 until the plate relay closes, then back off the adjustment until the relay just opens. Adjust R2 for minimum resistance, then tap the LETTERS key of the keyboard one time. The relay should close for a moment and then open. If it remains closed, back off a bit more on R4. Now advance R2 and try again with the LETTERS key. The relay

Continued on page 13

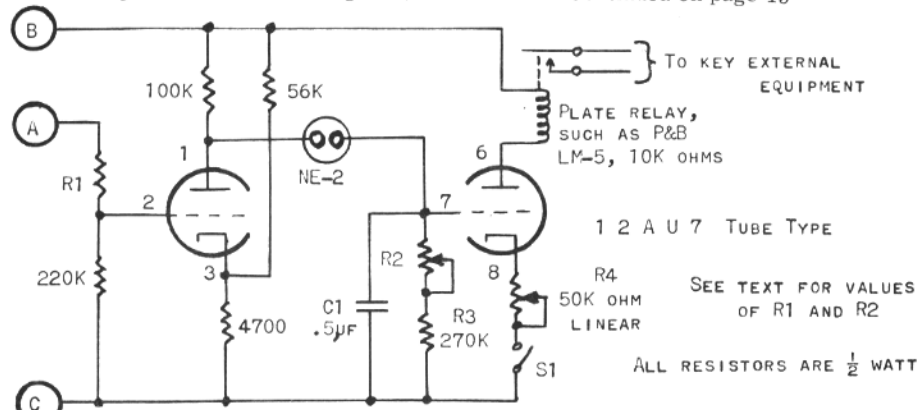


FIGURE 2. KOX DETECTOR CIRCUITRY

VHF RTTY NEWS

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

THE EFFECTS OF INDUCTIVE LOOPS ON KEYERS

Last month we described the effects of the inductance of selector magnets upon the operation of a printer. This month we would like to continue the discussion with a view to the effects of selector magnet inductance upon AFSK keyers when the selector as well as the keyboard is in the keyer loop.

First, we will take a brief look at a "typical" AFSK keyer to establish what actually keys it. We will use as a model the AFSK keyer described in this "column" last July-August.

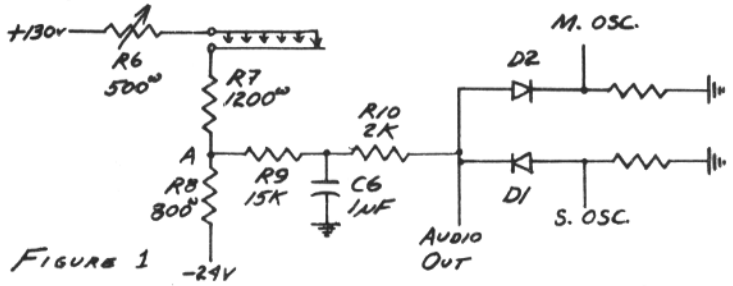


FIGURE 1

THE AFSK KEYER

The "loop" and the gating portion of the keyer are shown in Figure 1. Assume that selector magnets are not in the loop. When 60 mA loop current is flowing, the potential at point A is approximately +24 volts and diode D2 conducts "connecting" the mark oscillator to the output. When no loop current is flowing, the potential at point A is approximately -24 volts and diode D1 conducts "connecting" the space oscillator to the output.

Because of symmetry within the circuit, the keyer output changes from space to mark or from mark to space when the voltage at point A is zero. This zero voltage occurs when 30 mA is flowing in the "loop" composed of R6, R7, and R8. Because the change in output occurs at 30 mA in the input loop, 30 mA can be called the decision level of the keyer. (It should be noted that the decision level going from S to M or from M to S is at the same point. This makes the operation of the keyer similar to the "ideal selector" discussed last month, and the entire discussion of the "ideal" and "semi-ideal" selectors apply to this keyer.)

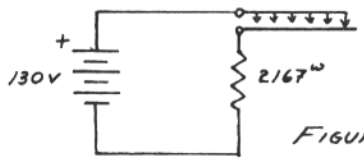


FIGURE 2

LOOP WAVEFORMS

First, consider a simple non-inductive loop such as the loop shown in Figure 2 or the "loop" composed of R6, R7, and R8 shown in Figure 1. For simplicity, assume a "dot" source is used rather than the keyboard contacts. (A dot source is simply a set of contacts opening and closing at a constant rate equal to the Baud rate of a TTY signal.) The loop current waveform is shown in Figure 3(a).

Because the keyer shown in Figure 1 switches from mark to space at 30 mA, the output from the keyer will be a mark whenever the loop current is greater than 30 mA and a space whenever the loop current is less than 30 mA, as shown in Figure 3 (b). (Note that the output from the keyer is exaggerated for clarity by showing relatively-low audio frequencies. Also, the internal switching delay in the keyer introduced by C6 has been ignored. Because the delay is equal in both the S-M and M-S transitions, it does not affect operation.)

If the output of the keyer is fed into a terminal unit, and the TU is properly adjusted, the loop current in the output of the TU will be as shown in Figure 3 (c).

Now assume that some inductive device such as selector magnets are inserted into the loop in Figure 1 or Figure 2. (The resistance of R6 shown in Figure 1 should be lowered by an amount equal to the selector magnet resistance in order to keep the loop current 60 mA during a steady mark. The total loop resistance shown in Figure 2 should remain at 2167 ohms.)

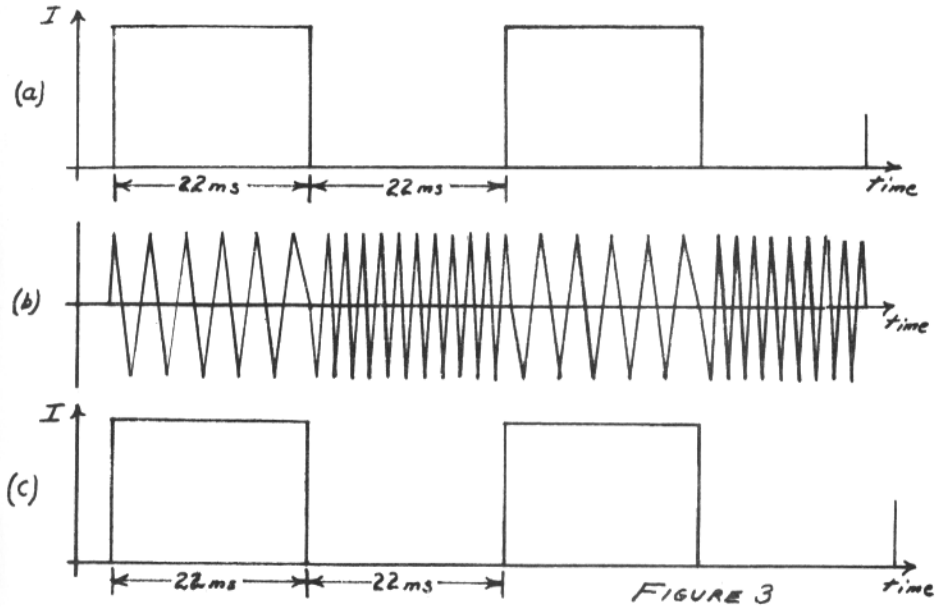


FIGURE 3

If dots or a TTY character are sent, the loop current will appear as shown in Figure 4 (a). Note that the rise time for the loop current is greater than the decay time for reasons explained last month.

Because of the long rise time and short decay time, the 30 mA point on the current wave occurs late on the way up, but in about the normal point on the way down. Consequently, the keyer remains in the spacing condition longer than it should and in marking shorter than it should as shown in Figure 4(b). If this audio signal is fed into a properly-adjusted TU, the output will be as shown in Figure 4(c). Notice that there is severe spacing bias in the output from the TU.

The bias could be corrected by somehow "fudging" the TU, but normally the TU belongs to someone else and he should not have to make up for troubles in your signal.

A method for correcting, or at least partially correcting, the problem is to lower the decision level in the keyer. For example, if R8 were increased to 1200 ohms (and R6 decreased a corresponding amount in order to keep the loop resistance constant) the keyer would switch from space to mark and from mark to space at 20 mA. This would help, but would not entirely solve the problem (for the waveshape shown in Figure 4(a). The best solution is to keep selector magnets out of the keyer loop.

ACTUAL RESULTS

The keyer was adjusted to give zero bias when fed from a source of zero-bias dots. No selector magnets were in the keyer loop. A TU was connected to the keyer output and the output bias of the TU was measured with no selector magnets in the TU output loop. The bias was zero.

A selector magnet was placed in the keyer loop. The output from the TU showed 5% spacing bias. Two selectors were placed in the keyer loop and the TU output loop showed 11% spacing bias.

The amount of bias introduced by the selector magnets would indicate about 4 H inductance per selector. This can be calculated as follows: 5% spacing bias (at "60-speed") is the equivalent of a 1.1 ms

delay in the space to mark transition at the 30 mA switching level (assuming zero delay in the M-S transition). This would, in turn, require about a 1.6 ms time constant. In a 2560-ohm loop, a 1.6 ms time constant would require an inductance of 4 H.

A few further checks were made with the aid of an oscilloscope. The oscilloscope was placed in a loop containing no inductance and the waveshape from a dot source appeared as shown in Figure 3(a). The selector magnets were introduced into the loop and the waveshape of Figure 5 was obtained. The rise time to the 62.3% level was measured and found to be 1.4 ms. This gives a reasonable correlation with the other measurements. The cusp in the curve shown in Figure 5 results from the physical motion of the armature. The cusp occurs above the decision level of the keyer so it does not affect operation.

A final check was made with the oscilloscope on the audio output of the keyer. The S-M transition showed approximately a 3 cycle shift of the 2125 Hz output while the M-S transition point did not shift. (Note: we mean a time shift measured in cycles and not a frequency shift in cycles/second!) A 3 cycle shift at 2125 Hz is approximately 1.4 ms.

CONCLUSION

The output of a keyer is dependent upon the current waveshape in the keying loop. So long as the current waveshpe is square, the keyer output will faithfully follow the intended keying. However, when a selector magnet is inserted into the keying loop, the keyer output may be biased. The amount of bias depends upon the keyer decision level and the keying loop waveshape. The best way to eliminate bias in the keyer output is to not use selectors or other inductive devices in the keyer loop.

The discussion can be extended to other types of keyers, both FSK and AFSK. The results will generally be the same; i.e., inductance in the keyer input loop will probably cause bias in the keyer output, and, hence, the transmitted signal.

73, ES CUL, RG.

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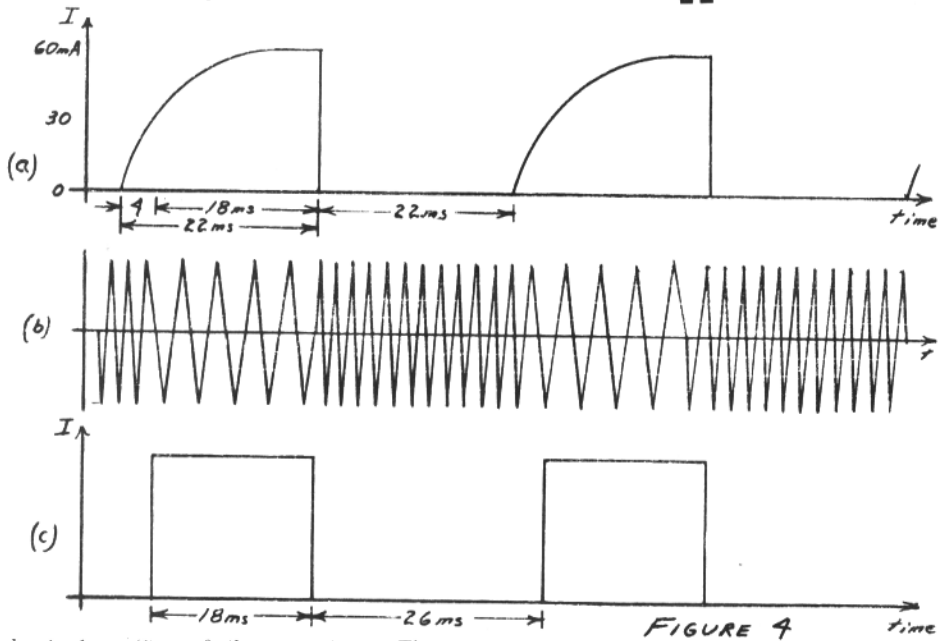


FIGURE 4

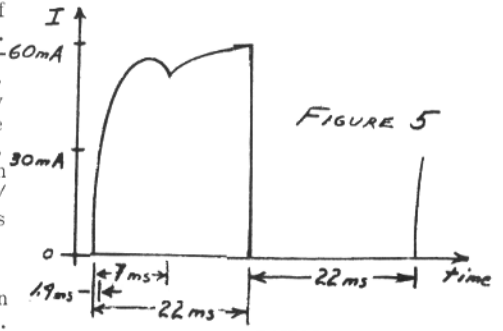


FIGURE 5

Shift or Unshift on Space-?

by W8CAT

Got trouble in printing copy of Weather Transmissions due to machine shifting and un-shifting at the wrong time?

I read with interest an Article by W8QMI on "Interpreting U.S. Weather Bureau Transmissions" in January '67 RTTY, and after printing some of the stuff, found that he was quite correct in saying that the machine had to be set so that it would not unshift on a space signal.

The following change on the machine (15 or 19), I am about to describe has been working for many months very well.

Remove the cover of the machine and then remove the four bolts holding down the typing carriage.

Now remove the typing carriage and set it on the back side with the bottom facing you.

About five and one-half inches from the left side, you will now find the "cut-out" lever (a finger two and one-half inches long with a hook on one end of it).

Depending on which position this lever is in, controls the machine in its function of automatic shifting from FIGS. to LTRS.

To facilitate printing from ham print to weather print, without lifting the carriage off each time, it becomes obvious that an extension of this cut-out lever, so that it may be changed from the front of the machine with the case on, is the answer.

Now remove the cut-out lever from the machine, by removing the one bolt that the lever swivels on.

Braze or solder to this lever, back of the screw hole which leaves about a half inch of metal, a new strip of metal one and one-half inches long and approximately three-eighths inch wide.

This addition will now extend out past the front of the typing carriage.

The metal in this cut-out lever, I found to be extremely hard metal to drill for a bolt, so I ended up with soldering, which has given no trouble.

Before putting the carriage back on the base, you must now remove the multi-contact switch, which is directly behind the little drop door on the machine case cover. There were nine various colored wires on my machine. Tape the ends of each and tuck back out of the way.

Place type carriage on base-put cover on machine and your back in business.

Opening the little door, now exposes your new extended switch and with the switch pushed to the left, you will print the usual ham stuff and pushed to the right, your weather information will appear without becoming an unintelligible jumbled mess.

• • •

ELECTRONIC ULTRA-FAST BREAK ON RTTY

continued from page 9

should stay closed a bit longer. The final setting of R4 should yield positive action of the relay both on pull-in and drop-out when the LETTERS key, the shortest interruption of loop current of all the keys, is hit once, for all settings of R2.

OPERATION

There is some slight delay on pull-in of the relay, so the first character you type will come out garbled on the receiving end. The use of two LETTERS functions at the beginning of each transmission is suggested, the first to turn on the carrier, and the second to ensure that the receiving printer is in the LETTERS position.

Soon after incorporation of this circuitry, you will discover that there are times when it is undesirable to have fully automatic operation. One of these times is when you are reading the mail on another QSO with all of the station equipment fired up and zero beat, and then decide to locally make a carriage return with a few line feeds. Your carrier plopping right in on top of the QSO probably won't be appreciated. Opening switch S1 will disable the KOX circuitry and perhaps save you an embarrassing moment.

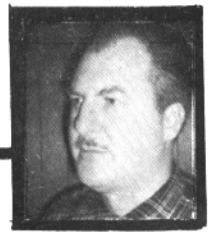
• • •

DISPLAY ADVERTISING

In the year we have been publishing the Journal we have received a number of requests for display advertising. At the time we did not feel there was room enough to accept it. Since the last two issues we have increased the size by four pages and as an experiment will accept display advertisements for one page. Ads will be limited to 1/4 or 1/2 page per advertiser. The cost will be $10.00 per quarter page. Without being dictatorial we can not promise the exact month of publishing. First come, first served, (if we get any) and it will have to be an issue that we run 20 pages. All this is an experiment with us and subject to change. Please send money with copy as we have poor facilities for billing etc. Photos are acceptable.

• • •

RTTY-DX



JOHN POSSEHL W3KDF Editor

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

Hello there. . .

I am sitting here at the rig as usual at 1200 - 1300 z to see if there is any activity on twenty meters and at the same time wondering what to put into this column this month but I seem to be coming up with "Blanks" in both cases. Band conditions have been at an all time low the past month and of course activity follows the same pattern.

Just before the gate closed on 1967 we were happy to confirm the following W A C applications and as you see, the list has now surpassed the one hundred mark, which only a year or so ago seemed to be pretty far in future. In the December issue we were a bit in error in stating that the total for the year was sixteen. As you know, there is about a months lag between when this is written and when you receive it, so a more accurate count would be twenty-two which is certainly an impressive WAC total for one year. We are grateful to Cas, KA9AK for a large percentage of this total.

Our congratulations on W A C go to . . . .

Nr. 96	C. A. Willis	K7VDD
Nr. 97	Bill Storer	VK2EG
Nr. 98	Newt Williams	K8QLO
Nr. 99	Michel Baudot	F3PI
Nr. 100	Gwen Burnett	3C3AYL
Nr. 101	Howard R. Fasold	WA6VVR

Recently Charlie W5QCH, raised a pretty good question. Having worked KC4USB, he wanted to know to which continent it counted for W A C. Well, we commonly call Antarctica the "seventh" continent but the scientific boys have some varied opinions on this so it is not an established fact. However, Antarctica does terminate three of the continents, namely South America, Africa, and Oceania and it would only be fair to give credit to what has already been based on fact. To go one step further, the Atlantic, Indian, and Pacific Oceans also touch its icy shores to emphasize the continental division. The Zone is also a clue as to what continent it would count for. Zone 12, 13, (South America); Zone 38, 39, (Africa); Zone 29, 30, 32, (Oceania). When it comes to call signs alone it is quite difficult to say where it is as there are quite a few countries represented in Antarctica with bases for various scientific research. Imagine my surprise quite recently to QSO UA1KAE in a contest (cw) and hear him sign Zone 13! As for RTTY, our immediate concern would be with KC4USB, KC4USV, and FB8YY. The former two at Marie Byrd and McMurdo Bases respectively and the latter at Terre Adele. For W A C we will credit the KC4 stations for South America and the FB8 station for Africa. They all count as the same country i.e. Antarctica. Some of you lucky ones have also worked FB8XX on Kerguelen Island but this counts as a separate country on the continent of Africa.

As the year drew to a close a new station came on the bands from Chile. Charlie, W5QCH, reports a QSO with Henry, CE3EX in Santiago on December 29. Henry was running 50 watts with a very good signal into Texas. This will be a good one to watch for as there has been no activity from Chile for several months.

Noel, VK3NR, also reports a couple of new ones from down under that you might watch for. ZL1AAF, in Auckland and VK1GR in Canberra have recently become active with fine RTTY signals.

A nice note from Sandy Morton of the BARTG staff indicates that there is a new station on from the Turkoman Republic with the call UH8BO. He first appeared toward the end of December and has been worked by UA4KED. Sandy has printed about 55 countries the past year and he monitors all the contests closely and gives a good idea as to how conditions are in Europe during the contest periods. We hope to hear Sandy banging away at his own rig sometime this year.

On page 64 of the January issue of "73" magazine is an interesting article on RTTY conditions in Belgium and Holland that I'm sure will be interesting reading.

What with poor conditions, the general lack of activity, and the need for additional material for this issue, I decided to determine just how many countries have actually been reported on RTTY over the past couple of year. I was quite surprised at the results and I think you will be too. Here is a list of what has been reported as worked from various sources. Chile (CE), Germany (DJ DL DM), Ireland (EI), Liberia (EL), Iran (EP), France (F), Kerguelen (FB8), Corsica (FC), Guadaloupe (FG7), St. Martin (FS7), England (G), Sark (GC), N. Ireland (GI), Scotland (GM), Wales (GW), Hungary (HA), Switzerland (HB), Ecuador (HC), Haiti (HH), Dominican Rep. (HI), Colombia (HK), Korea (HL), Saudi Arabia (HZ), Italy (I), Sardinia (IS), Jan Mayen (JX), Japan KA), USA (KW), Antarctica (KC4 FB8), Guantanamo Bay (KG4), Guam (KG6), Hawaii (KH6), Alaska (KL7), Peurto Rica (KP4), Okinawa (KR6), Swan Island (KS4), Wake Island (KW6), Canal Zone (KZ5), Norway (LA), Argentina (LU), Luxenbourg (LX), Bulgaria (LZ), San Marino (M1), Baharein (MP4), Peru (OA), Austria (OE), Czechoslovakia (OK), Belgium (ON), Greenland (OX), Faroe Islands (OY), Denmark (OZ), Holland (PA), Curacao (PJ), St. Maartin (PJ), Brazil (PY), Surinam (PZ), Sweden (SM), Egypt (SU), Greece (SV), Crete (SV), Turkey (TA), Guatemala (TG), USSR (UA), Asiatic SSR (UA), Ukraine (UB5), Georgia (UF6, 4L3), Lithuania (UP2), Lativa (UQ2), Estonia (UR2), Canada (VE), Australia (VK), Newfoundland (VO), Br. Honduras (VP1), Br. Guiana (VP3, 8R1), Burmuda (VP9), Aden (VS9), India (VU), Mexico (XE), Nicaragua (YN), Venezuela (YV, 4M5), Cook Islands (ZK1), New Zealand (ZL), South Africa (ZS), Monaco (3A), Libya (5A), Mauritania (5T5), Uganda (5X5), Guinea (7G1), Malawi (7Q7). The count is eighty-nine (89) countries. Amazing isn't it? I know that I must have missed some so if anyone can fill-in please do so that we can all get a better picture. Not listed are a few countries recently mentioned but not yet active which will bring the list quite close to the "one hundred" mark.

This year the Annual Spring DX Contest sponsored by the B A R T G will be held the week-end of March 2 - 3. This event has always been well attended and seems to mark the start of DX activity again after the Winter doldrums. It will be a good opportunity to add a few new countries and perhaps get that W A C so don't miss it. Details are elsewhere in this issue.

Don't forget, next month we run the DX HONOR ROLL. Please send in your totals as there have been two contests since the last posting and I'm sure most of you have added a few countries. See you again next month.

73 de John

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A Little Late – But here they Are. . .

BARTG DX Winners 1967

Position	Station	Points
1.	WA4LWE	104,152
2.	W3KDF	95,904
3.	I1AHN	91,800
4.	W2RUI	87,480
5.	I1KG	84,240
6.	W1GKJ	75,426
7.	W3ISE	66,880
8.	VE3AYL	62,620
9.	ON4BX	58,396
10.	K5OLU	55,620
11.	I1KBT	48,384
12.	I1RRE	45,034
13.	WA6WGL	43,836
14.	K8YEK	43,686
15.	W8GPB	40,080
16.	I1KFL	38,916
17.	K2USA	34,960
18.	W4CQ1	34,464
19.	UA4KED	32,760
20.	K8JTT	32,214
21.	KL7BAJ	30,294
22.	K8QLO	29,920
23.	W6AEE	27,930
24.	VK3KF	27,216
25.	VE4FG	25,630
26.	F3P1	25,596
27.	ON4CK	24,912
28.	G6JF	24,380
29.	EL2F	23,250
30.	WB6RXM	23,112
31.	XE1YJ	22,830
32.	F2LV	22,648
33.	WB6ADY	19,852
34.	W7ATV	19,684
35.	SMOKV	18,202
36.	G6CW	16,470
37.	K2YEQ	15,782
38.	K8ILL	15,576
39.	YV5AVW	14,874
40.	W8PZS	14,040
41.	K4VDM	13,468
42.	VK2EG	12,870
43.	I1LCL	12,936
44.	SM5CLW	12,056

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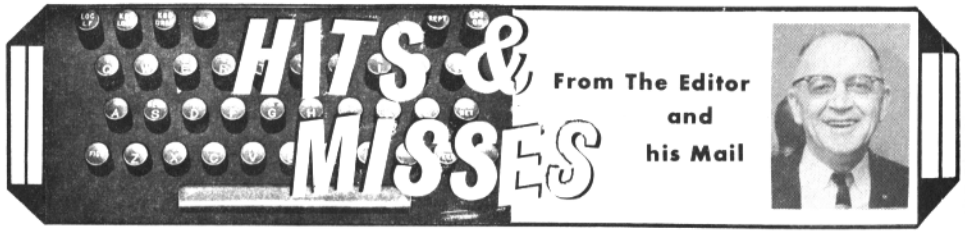

Jerry Hall, K1PLP has very generously supplied us with a number of Xeroxed copies of the TT/L-2 article, rearranged and in booklet form slightly larger than the original print. Copies may be obtained from us or Jerry for 25¢ each.

In laying out the magazine the copy and photos are marked separately, in the past three issues we have had problems of the camera man not following directions, one goof caused a rerun of 8 pages, but we hopefully believe that conditions will change for the better now. To err is human and your indulgence has been divine.

We do not have the facilities for notifying anyone of the expiration of their subscription. We do mail one extra copy after expiration but otherwise assume the subscription is to be cancelled. Check the mailing information on your copy - the last copy you receive will be marked by an abbreviated month and last digit of the year. Feb. 8 - means that the last issue you will receive is the February 1968 issue.

As an answer to continuous requests - the only back issues available are March, April, December 1967, January 1968 and June through December 66.

One comment we received in a letter was the desire of some method of testing various demodulators, comparison tests such as dynamic range, ability to copy through noise and fading, with varying Mark to Space ratios etc. Has anyone made a complete and honest test of the various TUs of popular use, is there any equipment available for these tests. Quite a comprehensive question but we have discovered that among our readers almost anything can be answered. This sounds like an interesting subject and maybe one or more of you can come up with some kind of an answer.

The only comment we have had on narrow shift is "nobody uses it." This is obviously a "chicken and egg" problem, but not the answer. I am quite sure many are equipped for narrow shift, just for kicks lets make February a test month. Everyone that can work narrow shift make a little effort during that month to use it exclusively, if you find someone that can not use it, do some sales talking. Lets find out how many are equipped and lets hear from those that have any ideas - pro or con. Single Side Band was slow in getting started but has proved it's superiority, Narrow RTTY shift has just as many features and much easier to change to - when do we get busy? . . . . .

After the outstanding job done by Sid Burnett and the CARTG on the last RTTY DX Sweepstakes it is rather difficult to find any group willing to take on the sponsorship of this contest. Personally we just do not have the time for the detail work required, especially the checking of logs etc. We have had some interest in a WAS certificate award and at one time thought of holding this contest similar to the ARRL Sweepstakes, primarily for US and Canadian scoring with states as a mulitplier rather than countries. Our hopes in this was increased activity from those not able or inclined to work DX. Foreign countries could compete and look for needed states but the main interest would be stateside. Possibly there is some RTTY group that would like to sponsor either a DX or a WAS contest and willing to do the detail work. If so we will appreciate hearing from them and also your comments on the type of a contest you would like. We hate to see such a popular contest discontinued, we can't do it ourself but surely some group has the manpower and leadership to carry on.

Over a period of time we have received a number of RTTY pictures. Unfortunately most of them are so large that when reduced to fit the room available all the detail is lost. However as a suggestion to some of you fellows that like to compose RTTY pix, how about one that we could use as a Christmas cover next year....

WAYNE OAKLAND BANK
Royal Oak, Mich.

Dear Sir:

I am an employee of the Wayne Oakland Bank in Royal Oak, and upon occasion have come across your deposit with our bank. Each time my curiosity increases as to what exactly the RTTY JOURNAL IS. As I look over your deposit I see checks from all across the world.

Please, what is the RTTY JOURNAL?

Sincerely,
Cheryl
Distribution

The above letter was received several weeks ago. We answered and hope that one more person knows what RTTY is. We didn't tell Cheryl however that the checks she sorts come from 43 different countries. In the U.S. the 6th call area leads in subscribers closely followed by the 8th district The 2s - 4s and 9s are grouped below them and the 7s, 5s, 3s follow with the first call area at the end. There are 59 copies mailed to Great Britian, 53 to Canada and 19 to Italy among the foreign subscribers. Nor did we tell her that the checks come from the greatest group of hams in the entire fraternity, but we could have said all this without stretching a thing.

HasYour Subscription

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The following letter was received from Ernie Pilgrim, VE3FBP and is self explanitory. We will be happy to hear of any other groups forming with details of their operation.

In this letter I will outline the operation of a newly formed group of RTTY amateurs. I am the sponsor of the group and have just recently been issued the call sign VE3RTY.

The group is presently monitoring 3600 kc/s 850 shift for auto-start messages from 2200Z to 2345Z. The frequency 3600 kc/s has been chosen so that members of the group, and others, will be able to align receiver calibrators with WWV, and be reasonably close to the net frequency. The above operation of the group is to enable all to call into the net with simple equipment.

Each Sunday the group will feature a swap club, RTTY gear and other equipment will be listed. The time of the swap club is 1730Z and the frequency is 3600 kc/s 850 shift. Sunday swap club transmissions will be alternated by VE3CCY and VE3FBP.

At the time of writing a more advanced system is in an experimental stage by VE3CCY and VE3FBP, crystal controlled transmissions are being made using both 850 and 170 shifts. Later it is hoped that "Sel-Cal" will be used.

Plans are being made now to operate a second frequency 3612.5 kc/s 170 shift and crystal controlled transmitters, for auto-start messages.

In the very near future it is hoped to have an efficient traffic net that is tied-in with the National Traffic System.

Breakers on the net are cordially invited.

On the cover of the March 67 issue we printed a poem on RTTY set to the Battle Hymn of the Republic. It seems that the original author was lost in the shuffle as the poem was printed, reperfed and again sent out among various hams, when turned in to us the original credit was long lost. Ken, W5FIH, the originator is not complaining but this time he has sent us a typed copy direct of his latest. Any of the readers that are familiar with Edgar Allen Poes - Raven can appreciate this poem. If Ken spent as much time designing a TU we would have the TT/L-15 to present. Instead we think this is pretty good reading for RTTY fans.

The RAVIN

Ken Thompson. W5IFH

Once upon a midnight dreary, as I labored, weak and weary,
Over a battered Model 15 purchased at the surplus store -
While I nodded, nearly napping, suddenly there came a tapping
Of the armature a-rapping, rapping at the magnet's core.
"'This receiver noise," I muttered, "pulsing in my magnet's core -
Only this and nothing more."

Ah, distinctly I remembered it was in the bleak December;
And the main shaft's driven member lay in fragments on the floor.
RTTY contest was tomorrow; vainly had I sought to borrow
From this junk surcease of sorrow, sorrow for my sweepstake score -
Working rare and radiant stations to upgrade my sweepstake score -
Zeroed here for evermore.

Now unto my TU turning, all my soul within me burning,
Soon again I heard a tapping somewhat louder than before.
"Surely," said I, "surely that is signal at my crystal lattice;
Let me see, then, what threat is, and this mystery explore -
Plug the speaker in a moment and this mystery explore; -
'Tis the RTTY I adore!"
I inserted one connector, pow'ring up the cross inspector.
There appeared a tape-sent signal which did make my heartbeat soar.
Not the least QRM frayed it, not one moment stopped or stayed it;
Pausing just for car ret / line feed, it ran RY's by the score -
Like a little kitten purring, running RY's by the score.
My trained ears these sounds adore.

Then the cross on scope face twitching set my finger tips to itching
To attempt to print the characters this warbling held in store.
"Now thy works are oiled and greasy, to print this should be quite easy.
Now upon that paper sleazy print the RY's I adore.
On that yellow surplus paper type the RY's I adore!"
Typed the printer, "464".

Much I marvelled this ungainly old machine to type so plainly,
Though the alternating figures quite a hint of trouble bore,
For we cannot help agreeing that, the typebar carriage being
shifted upwards, I was seeing in rotation 6 and 4 -
The upper case of RY, alternating 6 and 4.
Only this and nothing more.

But the carriage, sitting lonely on the greasy rails, typed only
These two numbers, which was all the flying typebars did outpour.
Nothing other then it uttered, as the printing bail it fluttered -
Till I sacrcely more than muttered, "It needs run a little more,
Till the oil and grease have worked in, then assuredly no more
Shall it type that '464'."

Then, methought, the air grew denser, perfumed by my oil can's censer,
Pumped until the viscous fluid trickled on the pock-marked floor.
"Oil," I cried, "a friend has sent me, this repairman he hath lent thee
Respite - respite and nepenthe from this ill I so deplore.
Soak, o soak this magic liquid and type upper case no more!"
Typed the printer, "464".

"Rubbish", said I, "Thing of evil! Rubbish still, designed by devil!
Whether Bell hath sent, or Western Union tossed the here ashore,
By a legal waiver granted, with thy sixth bane firmly canted,
On this shack by horror haunted, - tell me truly, I implore -
Is there - is there sense in Teletype - tell me - tell me, I implore!"
Typed the printer, "464".

But the carriage, never shifting, still is drifting, still is drifting
O'er the fourteenth roll of paper it has gobbled to the core.
To attempt to break its fetters, I've worn out the key marked "LTRS",
And by now the sweepstake-getters have run up an awesome score.
And my spirits from that pile of paper snaking on the floor
Shall be lifted - nevermore!

CLASSIFIED ADS

Rates - $1.00 30 words - Additional words 2¢ ea. Closing date 1st of month.

RTTY GEAR FOR SALE. List issued monthly. 88 or 44 mhy toroids-5 for $1.50 postpaid. Elliott Buchanan and Associates, Inc. 1067 Mandan Blvd. Oakland, Cal. 94610.

SALE or SWAP; Complete Diversity, one comparator and two terminal units (URA8-CV89). TT76, needs motor brushes. Make offer, want second receiver, frequency meter, 28KSR, etc. K6ROR, Phil Schultze, 2333 Maelee Dr. Vista, Calif. 92083. 714-724-0098

TYPEWRITER RIBBON REINKER, Hand operated model now only $3.00. K575 or K764 ink available at all National Cash Register Co. stores at 75¢ per tube. Walter Nettles W7ARS-8355 Tanque Verde Rd. Tucson, Ariz. 85715.

WANTED: TELETYPE EQUIPMENT & parts; R388, R-390A, SP600, 51J-4, Cash or trade for new radio equipment. Alltronics-Howard Co. Box 19, Boston, Mass. 02101. Tel - (617-742-0048)

FOR SALE-CONVERTER UNIT-CV57ARR (IF Converter) Complete. Rack, Type manual included. W7HQS, 659 Ave. C, Boulder City, Nevada, 89005

The PIONEER 900 is a tunable frequency shift converter. It will accommodate any shift from 100 to 900 HZ. The tuning is continuous and non-standard shifts are readily received. It's tuning lights give positive indication when receiver is properly tuned. The unit is completely solid state with 20 semiconductors and one integrated circuit. Unlike most transistor converters on the market, the PIONEER 900 utilizes a high voltage keyer stage which will switch up to 300 volts. This high voltage feature allows a full printing range to be obtained. The PIONEER 900 has a built-in bandpass filter, 250 HZ selectivity per channel, complete metering, and consumes less than 10 watts. The input impedance is 4 ohms (others on request). The converter is normally packaged in a 5 3/4" high, 11 3/4" wide, 3/4" deep perforated cabinet, but can be supplied as a rack mounted unit for an additional $15. For more information write. Prices: Amateur model $189.50 - Commercial model $269.50 - Military model $314.00. Wired and tested, guaranteed for one year. Availability: four to six weeks. Pioneer Electronics, 738 Pacific Street, San Luis Obispo, California, 93401. Telephone: 805-543-0930

TT-63A REGENERATIVE REPEATER with all tubes, instructions, schematic - good condition - $15.00. 2- WE255A polar relays with Robert Boyd, PO Box 3, Orrington, Maine 04474

WANTED-MANUAL for Stelma TDA-2 Distortion Scope test set TS-917A/GG. KØOrc, 9344 Riggs. Overland Park, Kansas 66212

SPECIAL SALE - Teletype Model 14TD. New; $25.00, Good Used $14.00, Specify 65 or 75 wpm. FOB Detroit. Keith Petersen, W8SDZ, 1418 Genesee Ave., Royal Oak, Mich., 48073

LARGE TT/L-2 Drawings - 15 x 30, $1.00 postpaid W8SDZ,1418 Genesee, Royal Oak, Mich. 48073. Phone 313-585-4431

WANTED - Teletype Parts for all machines. Models 14, 15, 19, and 28 etc. Must be new in Teletype Corp. pack or military with 5815FSC ....Phil, K2HJC, Box 96, Morrisonville, New York 12962.

PRINTED CIRCUIT BOARD, TT/L2 with schematic, pictorial, voltage chart and construction tips: $6.00; Precision Tuning Fork 400 hz. with electronics less 2-6AU6, small pwr. supply, modify to 425hz: $5.00; standard 44 or 88 mhy. toroids, unpotted: 5/$2.00 pp. USA; special larger, low resistance 88mhy. toroids, 1.5": 50¢ each; all items above postpaid in USA. K5BQA, 11040 Creekmere, Dallas, Texas, 75218.

WANTED-UNITS FOR CV57 and CV71 RTTY Navy converters. Also Collins novice Adaptor, 399B-4 E. Shafer, W8MSG, 3479 Kersdale Rd., Cleveland, Ohio 44124

WEATHER EQUIPMENT: trade for RTTY gear. Thermographs, barographs, aerovanes, Bristol recorders, etc. Thompson Associates. 5 Palmer, Gorham, N.H.

HANDY RTTY LOG -- Every RTTY station needs one. Permanent record of every station you work-call, location, operator's handle, indexed by districts-even DX. 75¢ Postpaid. Tom Serur, W5APM, Box 2309, San Marcos, Texas

20 EACH MODEL 14TDs, $15.00, 5 each 19 tables $20.00, 50 each sync motors $5.00, digital counter 115 volt with lamps and switches $2.00, tape rewinder $5.00. FOB. Richard Holmes, 1403 Adona Lane, Chattanooga, Tenn. 37412

DAYTON HAMVENTION April 27, 1968. Wampler Arena Cener, Dayton Ohio, sponsored by the Dayton Amateur Radio Ass. Informative sessions, exhibits and Ladies program for the XYL. Watch the ham ads for information or write Dayton Hamvention, Box 44, Dayton, Ohio

SERVICE-BUY-SELL-TRADE, RTTY - Cleaning and repair of Teletype Machines. Have in stock every part for model, 14, 15, 19, and many parts for 12, 26, 28, 32, 33, 35. Stock com. type pallets for the model 26 $ .35 each p.m. Teletype machines all models, in any style, and all special features available. Will buy, trade or sell teletype parts and machines. 88 mhy toroids 5 for $1.25 postpaid, and quantity discounts. Call or write, Martin Geisler, 8926 Kester Ave., Van Nuys, Calif., 91402. Phone (213) 892-0685.

TOROIDS, 88mhy. center-tapped, unused, 5/$1.50 POSTPAID. Page printer paper $5.50/case of 12. Gears for all machines, WRITE. New model 28LP page printer with FULL stunt box, perfect, $200. New Heath DX-60A $55. New HG-10A VFO $20. Johnson 250-39 TR switch, $15. New National NCXD 12VDC universal mobile power supply $40. Heath Sixer $25. Globe Chief 90A $30. Harmon-Kardon Melody II Hi-Fi Amplifier $10. Super-pro with power supply $55. Mimeograph $40. Typewriter $30. Three head TD with sync. $50. WANTED: Gonset 2 meter communicator for local CD. Johnson Matchbox. Audio generator. Stamp for list. Van W2DLT 302R Passaic. Stirling, N.J. 07980

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