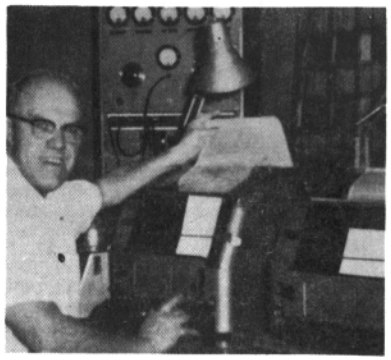
Mr. RTTY of Canada--



3C3RTT -'Sid' Burnett

CANADA'S RTTY MAN OF THE YEAR

Every organization needs a "strong man" to be a success. With the organization of the Canadian Amateur Radio Teletype Group "CARTG" we nominate Sid Burnett VE3GK as the leader that has increased RTTY interest in Canada to a new high. He has helped organize a traffic net in Canada, offered advice to any persons interested in getting on RTTY and done an outstanding job of promoting the Centennial of Canada through RTTY means. The issuance of the call 3C3RTT as a special centennial honor and the operation of this station was largely Sids effort.

The promotion of the 7th Annual DX RTTY sweepstakes was taken over by the CARTG and our feeling of "The Best Contest Yet" has been shared by everyone we have talked to. Sid, and the group arranged for special Centennial medals to be awarded the winners as well as certificates for every log submitted. We know personally that every log was checked on arrival by Sid or his active XYL, Gwen, VE3AYL, if any errors were noted the sender was notified by mail immediately. Postcards were sent to the XYLs of all submitting logs but the most outstanding feat is that soon after the deadline for logs all scores were finished and we are promised that the certificates will be mailed before the end of the Centennial Year.

1967 marks the centennial for Canada but certainly should also be remembered as the year that Canadian RTTY came of age - Largely through the tireless and unselfish efforts of Sid Burnett.

• • •

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January 1968

EXCLUSIVELY AMATEUR RADIOTELETYPE

Vol. 16 No. 1 30 Cents

PY2CQ Wins 7th Annual RTTY Sweepstakes

3 Centennial Medallion Winners

1867 1967

PY2CQ	Brazil	128,310
DL1VR	Germany	97,101
ON4BX	Belgium	82,576

COMPLETE RESULTS - COMMENTS on NEXT PAGE

DL1VR 2nd place Winner.

Scores - Comments on theDX Sweepstakes

Without doubt the 7th Annual RTTY Sweepstakes promoted by the Canadian Amateur Radioteletype Group (CARTG) was the most successful of any contest. The activity was tremendous, over 130 logs were received, a new record, 45 countries and 29 states were represented, all continents were active, a dx-epedition IS1KG, Sardinia, was activated and gave many stations a new country thanks to I1KG, propogation was excellent offering round the clock DX. A tremendous amount of work was done in publicity, arranging of special awards, and even letters to remote countries asking for participation if possible but the really outstanding job as far as we are concerned was the care, speed and detail that went into checking the logs and preparing the results after the contest, one of the things that is so often neglected in some contests. Unfortunately several logs of the higher scorers were not received in time to qualify. ON4CK with a beautiful log and 46044 points along with G3MWI and EL2F also with good scores arrived about a week after the deadline.

Only those running a contest or close to it can appreciate the amount of work, time and money that the CARTG and especially VE2GK and his XYL VE2AYL put into making this contest a success. They have set a goal that is going to be difficult to follow.

Following are the scores of the top 30 and the position of finish of all logs received.

1.	PY2CQ	128,310	16.	3C3RTT	31,275
2	DL1VR	97,101	17.	W5QCH	30,350
3	ON4BX	82,576	18.	W7ESN	29,260
4.	WA4LWE	73,249	19.	XE1YJ	28,240
5.	UA1KBW	63,320	20.	W3ISE	28,026
6.	W2RUI	51,220	21.	KZ5KR	27,406
7.	WA8BOT	47,723	22.	W9HHX	26,292
8.	DJ6ZB	41,836	23.	W8FWG	25,190
9.	VK3KF	41,767	24.	WA1DIU	25,081
10.	W1GKJ	40,512	25.	W8CQ	24,264
11.	WA6WGL	37,007	26.	HB9P	22,403
12.	K8MYF	36,223	27.	I1KBT	20,408
13.	W3KDF	34,468	28.	IS1KG	18,944
14.	YV5AVW	33,988	29.	FG7XT	18,215
15.	K5OLU	33,136	30.	OZ6OX	17,372

K8MAM, KP4JM, W1KQY, G6JF, UQ2AB, W2FAN, K4OAH, K8JTT, SVØWL, DJ9XBA, W4CQI, VE5DR, WB6ADY, W1BZT, W5DNR, I1LCL, K4VDM, WA2YVK, W7ATV, W9YB, W1MX, 3C5LG, W4EGY, W6AEE, KA9AK, SM7AZI, WB2AHF, YV1IK, W6JOX, K6EQV, W6BTV, VE2HL, F3PI, VO1DZ, WA8NGJ, W6LDA, K2YEQ, W8MSG, VE4FG, DL5PQ, PJ2CR, VK3DM, WB2JBH, K6FLO, WA8IQZ, K8YJQ, 3C3EUU, K8KAG, W6TX, VO1BL, W2AKU, WB6JSY, W8CAT, W6IWO, WA8IDP, 3C3FBP, OA4BR, W6UUS, W6FFY, W2SZ, 3C3EBR, EI6D, WB2MPZ / NØFMR, W4ULY, PAØLBN, WB2ITZ, W2NCA, SM5BJU, KC4USB, WB6QFE, WB6QJW, LX2BQ, KH6AVX, WA3CFK, G3IYG, VE6MM, WA6MLI, WA2ZVL, VE3FHQ, W9CTX, WA8BVY, LA4KF, KP4AQL, VE2BMK, W5FCP, 3C3CCY, W8HPR, W7GYO, W7MAE, VE6AOO, OZ6OB, WAØEDN, KØKRX, W2UJS, W9CAA, VE3FPJ, W9IGW, VE7AMJ, VE3CKW

Top 10 Meter Score KA9AK 7709

Top Contacts with Canada W7ESN - 20

Top Canadian Score VE5DR 11,606

Comments from Logs and XYLs

KZ5KR - Enjoyed very much. Regret we could not work other bands due to equipment failure.

DJ6ZB - I had much fun in this contest and will try and enter the next one too.

DJ9XBA - My first RTTY contest and I liked it very much. Thanks.

DL1VR - Thanks for the fun I had with the test.

G6JF - Single operator station. A fine contest but 48 hours is hard going for an old timer.

Ines. XYL of HB9P

On RTTY contests days my men (husband and son!) have good excuses for not going to church and being constantly late at meals! Wife of HB9P licenses since 1930. My son Martin will get his ticket soon.

Nellie. XYL of VO1BL

Amateur radio is an excellent hobby, providing the hobbyist does not become obsessed with this fine form of relaxation and experimentation. This is not sour grapes (obsession I mean) for my husband is a moderate ham. Best wishes to CARTG.

Vierlyn. XYL of VE3BWM

The XYL's should receive part of the award as recognition for services in the coffee making during contests. Hi!

Elfriede. XYL of DL1VR

Yes, I don't like contests because they are painstaking and keep my husband away from the family.

Doris. XYL of WA8NGJ

The latest RTTY contest was a stimulating and interesting experience for my husband and the older children as well as myself. I feel the contest is very rewarding to the participants and presents a challenge. I'm in favor of them.

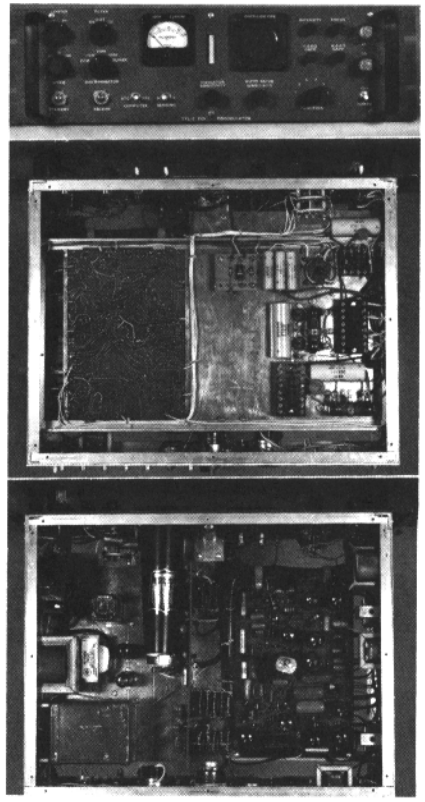
Additional Comments on Page 17

TT/L—2 Layout Ideas

With so many fellows building the TT/L-2 from the September issue we have had a number of requests for ideas on layout and arrangement of parts. Most seem to be using the printed circuit board and all of the pictures we have show this board. One change on the board is grounding of one side of the filament transformer rather than the center tap as shown in the drawing. With the center tap grounded only half of the filament supply will be in use. If any trouble is experienced with the auto-recv or motor control stages the building should try another neon. Many neons (about 20%) are not good performers so a few extra should be purchased and tried in case of trouble.

•••

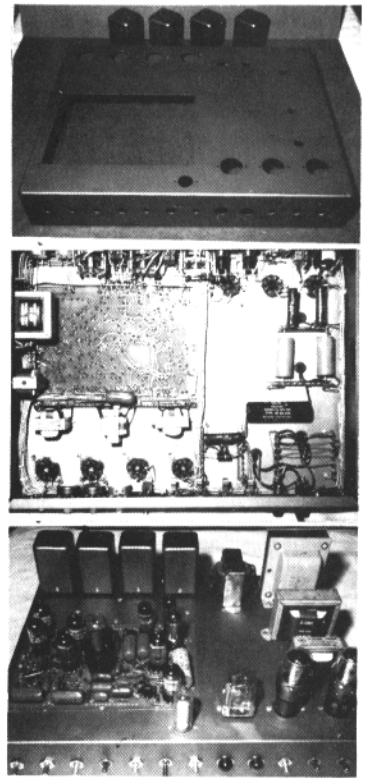
Layout used by K8JUG. The chassis is anodized a deep blue, filters at the rear in cans. Sorry we can't show this in color as it is a beauty.



The unit made by K5OLU is mounted in a rack with an aluminum top and bottom cover to the unit. Cole has built in a 2" scope built in as well as the eye tube indicator. A loop current meter is also built in the unit.

A fifth position on the discriminator imput-output switch was utilized for picking up mark and space output from an external heterodyne tuner. The tuner output is fed into jacks on the rear panel.

OA2 voltage regulator tubes were used instead of VR150 to conserve space. Two phono jacks on the rear panel offer connections to a TT/0 semicounter from the discriminator. The imput filter switch has a straight through position to allow odd-frequency tones to pass through the system when using the heterodyne tuner.



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Additional Layout on Page 7

We want to thank the builders that took the trouble to take pictures and sent them in for reference.

•••

Frequency Shift Keying the Johnson Ranger, Valiant, Navigator

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

Many different circuits have evolved for the frequency shift keying of variable frequency oscillators (VFOs). Nearly all of these circuits are based on the common principle of a diode and capacitor arrangement to slightly alter the overall VFO tuned circuit capacity through keyed current changes in the diode.

The simple circuit described here works quite satisfactorily on E.F. Johnson Company transmitters such as the Rangers I and II, Valiants I and II, Navigator, etc. The circuit is quite stable in operation, and should work equally well in other manufacturers equipment using a series-tuned Colpitts oscillator. Very few parts are required for the addition of this circuit, and the fundamental calibration of the VFO is not appreciably affected. This circuit provides a very smooth range of adjustment from absolute zero shift to shifts wider than the legal limit.

CIRCUIT DESCRIPTION

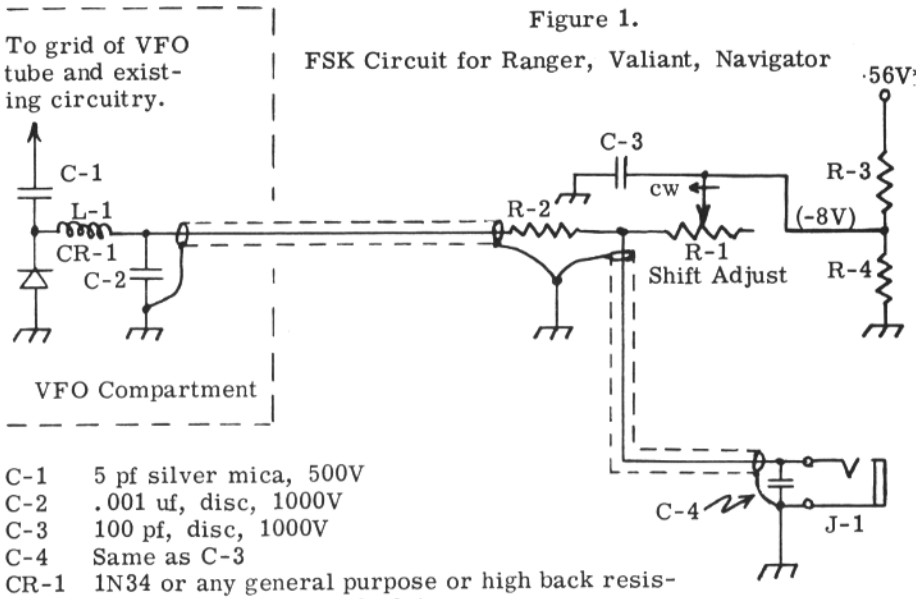
Figure 1 shows the circuit schematic. To those familiar with FSK circuits, it becomes immediately apparent that this is a form of "shift pot" circuit. Although not favored by many ardent RTTYers, the shift potentiometer is necessary in some form on any AM/CW transmitter to permit correct shift adjustment when changing bands.

The circuit operates in the following manner. One end of the 5 pf capacitor, C-1, is connected to the grid of the VFO tube. If the opposite end of this capacitor were grounded directly, it would slightly lower the VFO output frequency by adding capacity across the existing VFO tank circuit. Instead of grounding the capacitor directly, the junction capacity of a diode, CR-1, is used to provide an effective series capacitance to ground. The junction capacity of any ordinary diode will change with a change in current through the junction. Depending on the type of diode and junction current, equivalent capacities may range from approximately 2 or 3 pf to 40 pf or more. The net effect of C-1 and CR-1 is to add a slight amount of capacity across the existing VFO tank circuit.

L-1 provides r.f. isolation between the grid circuitry of the VFO tube and the remainder of the frequency shift keying circuitry. Capacitors C-2, C-3, and C-4 provide r.f. decoupling or bypassing for this remaining part of the circuit. Resistors R-3 and R-4 form a voltage divider, with -8 volts supplied at its tap point. Assume for the moment that external closed contacts are connected at J-1 (marking keyboard contacts, polar relay contacts, etc.), grounding out this negative voltage through R-1. Through rectified r.f. energy coupled through C-1, some D.C. current flows through the diode CR-1, choke L-1, resistor R-2, and the keyboard contacts. The amount of current is small, being limited by R-2, and because of the low energy pickup through the relatively small value of C-1. With low current, the junction capacity of CR-1 is small, with negligible affect on the frequency of the VFO. Now when the external contacts at J-1 are opened, as for a teleprinter space, the negative voltage from the voltage divider is ungrounded, placing a negative bias on the cathode of CR-1. With this forward bias, CR-1 conducts heavily. With increased current flow, the junction capacity of CR-1 increases, lowering the VFO frequency by some amount. The exact amount is determined by the amount of current flow, which in turn is determined by the resistance setting of R-1 (and the fixed value of R-2). Increased resistance will decrease the amount of frequency shifting by reducing the current flow through CR-1. Therefore, alternate opening and closing of contacts connected at J-1 will provide alternate frequency shifting of the VFO out-

Figure 1.

FSK Circuit for Ranger, Valiant, Navigator



C-1	5 pf silver mica, 500V
C-2	.001 uf, disc, 1000V
C-3	100 pf, disc, 1000V
C-4	Same as C-3
CR-1	1N34 or any general purpose or high back resistance germanium diode*
J-1	Phone or phono jack
L-1	2.5 mhy r.f. choke, 25 ma.
R-1	50K ohm potentiometer, linear taper, 2W
R-2	10K ohm, 1/2 W
R-3	39K ohm, 1/2 W*
R-4	10K ohm, 1/2 W*

* See text regarding polarity of diode and bias voltage. Also see text regarding values for R-3 and R-4 for other than 56 volt bias supply.

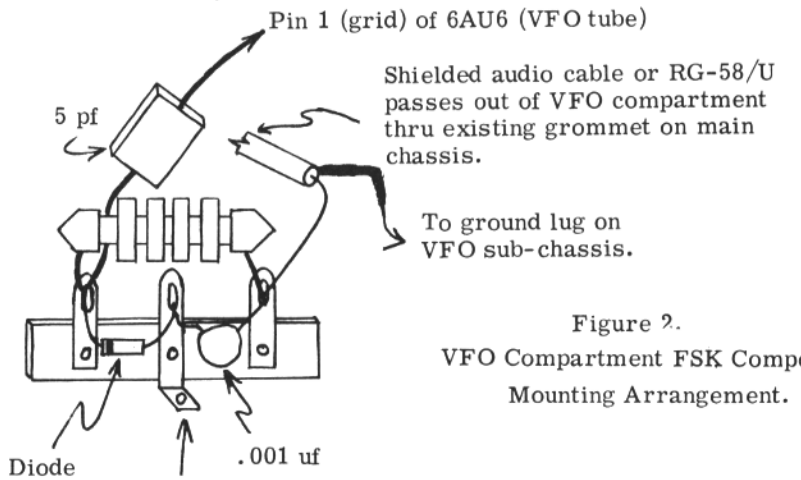


Figure 2.

VFO Compartment FSK Component Mounting Arrangement.

put from its basic frequency to some lower frequency determined by the setting of R-1.

COMPONENT INSTALLATION

Figure 2 shows in pictorial form a satisfactory mounting arrangement which provides mechanical rigidity for the VFO compartment FSK components. This arrangement is compatible with the limited space available in the Johnson equipment. This assembly should be completed on a tie point strip, and the assembly may then be mounted on the main chassis inside the VFO compartment with a single screw. Leads should be kept short, mainly to provide rigid support for components. Long leads will surely result in a "twanging" effect from even slight vibrations. Of course, protection from overheating the diode should be used during soldering operations.

The negative bias voltage was taken from the bias supply of the time-sequence keyer sub-chassis in the author's Ranger. However, a positive supply chould be used just as well if the polarity of diode CR-1 is reversed. For higher bias supply voltages, increase the value of R-3 or slightly decrease the value of R-4 (or both) to provide in the order of 10 or 11 volts at their junction. (This voltage will be loaded down slightly with R-1 connected.) The keyed current drain from the bias supply is about a half a millamphere, so a voltage divider designed from Ohm's law to draw 2 or 3 ma. current should be adequate for supply voltages up to 150 volts. For 200 or 250 volt supplies, 4 to 5 ma. divider current should be used to minimize voltage fluctuations with keyed current at various shift settings.

Depending on the severity of A.C. ripple on the bias supply voltage, some amount of 60 or 120 Hertz hum may be heard on the space tone. This hum can be reduced by placing a filter capacitor across R-4. Usually the larger the better for a value, but values greater than 0.2 uf should not be used or else sluggish shifting will result. In extremely severe cases, a capacitor of much larger value can be connected from the top of R-3 to ground, or two resistors may be put in series for R-3 (their total equaling the original value) and the center point bypassed. The latter will be the most effective.

The author chose to mount the shift adjustment potentiometer on the front panel of his Ranger, in a symmetrical arrangement with the multi-purpose meter. The use of a matching Johnson knob detracts attention from the fact that the control shaft protrudes through the manufacturers name decal, and a FREQUENCY SHIFT decal beneath the control provides the finishing touch. However, this control may be mounted remotely from the transmitter. Some individuals may prefer to mount it in a location adjacent to the teleprinter equipment. This scheme is advantageous if the individual decides to use a switch to select various potentiometers with pre-set shift width adjustments for different bands, as suggested in another paper.1

The shift width control should be wired so that minimum resistance is in the circuit with the adjustment in the full clockwise position (viewed from the shaft end). This provides for the most natural direction of adjustment - turning the control clockwise increases the shift width.

Jack J-1 is mounted on the Ranger's rear apron in the author's installation. An ordinary phone jack is used. An oversize hole in the perforated cabinet or cover provides clearance for the mounting nut.

Shielded leads are recommended for use in long runs inside the transmitter, as a precaution against introducing r.f. pickup problems. The author also uses a shielded FSK lead from the transmitter to the teleprinter equipment.

OPERATION

During operation, the mark frequency is the natural VFO frequency with the input to J-1 closed, and the space frequency is controlled by the shift adjustment potentiometer when the input to J-1 is opened. Setting the control fully clockwise should give a very wide shift, about 1500 Hertz or more on 80, and 1200 Hertz or better on 40 meters. (The exact amount of shift will varry across the band because the ratio of keyed capacity change to overall VFO tuned circuit capacitance is not constant). Rotating the control slowly counter-clockwise while frequency shift keying the oscillator should reduce the shift by moving the space frequency closer to the mark frequency. Eventually a point should be reached where the shift is zero. This will not be at the extreme end of the control adjustment. Continued rotation should produce inverted keying. Naturally, this range should be avoided during on-the-air operation.

If you cannot duplicate the above conditions, check to see that the polarity of the diode agrees with the polarity of the bias voltage as given above, and that 8 to 9 volts is present at the junction of R-3 and R-4. Too high a voltage at this point will not permit narrow shifts to be realized. (Too low a voltage increases the non-usable portion of the shift potentiometer.)

After the modification is completed, it will be necessary to keep the input to J-1 closed when CW keying the rig, especially if the -56 volt keyer supply is tapped. Otherwise, slow voltage variations at the voltage divider output from varying load with transmitter keying will quite effectively frequency modulate the oscillator with a slow chirp.

The simplicity of this general type of circuit makes it attractive to a large number of amateurs. But as the saying goes, "You don't get something for nothing." Because of the non-constant ratio of keyed capacity change and VFO capacity, it will be necessary to readjust the shift width for large frequency excursions in one band. Because frequency multiplication follows the VFO for most bands, it will always be necessary to readjust the shift when going from one band to another. Unless pre-set shift width adjustments are made for various portions of various bands, it is necessary to have an accurate means of checking the shift width during operation to obtain the proper adjustment. However, in spite of these disadvantages, this type of "shifty" operation is probably most common in the HF bands.

• • •

More Information on Automatic Receiver Freqency Control-

By VK3KF

Since publication of the Automatic Frequency Control unit ("RTTY Journal" Nov. 1967) inquiries have been made concerning it's application to receivers such as the Collins 75A-4 whose H.F. oscillator tuning components are not readily accessible. As a result, experiments have been conducted to provide a satisfactory means of adaption.

Additionally, it has been pointed out that the circuit of the A.F.C. unit as published, produces the opposite effect to A.F.C. in some receivers. This is due to single or perhaps triple conversion being employed in the particular receivers and where this applies, the control voltages must be reversed from the filters F1 and F2. This is done by reversing the connections to the grids of V1B and V2B from the filters and by-passing the cathode of V2A rather than V1A.

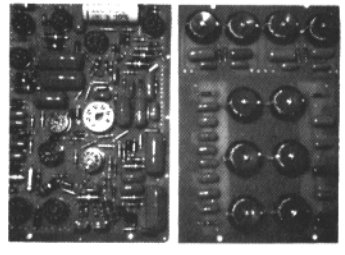
For the type 70 E-24 H.F. oscillator of the 75A-4 receiver "Cx" has a value of 10 pF. and is connected to pin 1 of V14 tube socket. This addition will alter the receiver dial calibration by approximately 3 KHz., but correction may be made by means of the slug tuning of L201.

A simple silicon junction, A.F.C. diode, such as described in the November article will exercise about ± 500 HZ. frequency control, but this may be increased to upwards of ± 1 KHz. by using a special capacity diode such as the I.R.C. type SC-20/6.8 or equivalent when it will be found that the "priming voltage" will need to be reduced, this is done by replacing the 3.9 K. resistor of the voltage divider (shown on the circuit near V3B) by one having a value of 2.7 K.

• • •

TT/L-2 LAYOUT

Layout from WA8NGJ has the filters and discriminators mounted on a circuit board that is exact size of the printed circuit board supplied by K5BQA and mounted on 1" standoff insulators directly under the main circuit board, the standoffs are metal to maintain a ground circuit continuity. The filters are home made and quite inexpensive.



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1 Hoff, "Transmitting Radioteletype", QST, May, 1965.

Convert Your Old TU to a TT/L

R. J. Popkin–Clurman W2LNF
134 Wheatley Rd. Brookville
Glen Head, L.I., N.Y. 11545

RTTY addicts have their Mainline, but not everyone can afford the connection. For those who have the old fashioned "junk" like the CV 57, W2JAV (transistorized), the SGC-1A (converted to 850/170Hz operations see W. Auld, RTTY Bulletin page 11, Sept. 1964), and Twin Cities TU, the "Best of the Mainline" is designed to be all things to all men, especially those with a flat pocketbook.

Here is an adapter to be used with your existing converter losing none of the advantages of the present converter, but nevertheless, possessing the main features of the TT/L Mainline described by Hoff and Petersen in August 1965 QST. (Figure 1- Block Diagram of Adapter) The autostart, filters, limiters, drivers, and detector stages of the Mainline were deleted, as most of these functions are common to other converters.

This 4 or 5 tube (plus regulators) adapter unit has been built by W2LNP, WA2NWW, W2IDX, K2YEQ, and XE1HHX.

The units made by WA2NWW, W2IDX, and XE1HHX were built as add-on units for the CV 57. W2LNP has an add-on for a Press Wireless FSRK-2 and also for a CV 357 converter. K2YEQ has an add-on for a modified SGC-1A type. K2YEQ was so pleased with the performance of the adapter that he built a complete Mainline converter as a result.

The CV 57 (and CV357) are converters of the IF type. They were designed for general purpose military use, and as is often the case with such generalized designs, the performance under amateur conditions is rather poor. The inexpensive Mainline adapter is designed to take its output from the detector of the CV 57 at either the arm or top of the threshhold level control, R318, or the test point E609 in the keyer unit. (It may also be taken from pin 8 or 9 of the tuneoperate switch.) (Figure 2)

Since the output of the CV 57 detector is not more than 10 or 11 volts for 850 cycle shift, and the Mainliner likes to operate with a level of at least 35 volts at the input to its low pass filter, a DC coupled input pre-amplifier is added to the basic Mainline design to bring the 10 volts up to about 45 volts at maximum swing into the low pass filter input grid. This level has proven to be more than adequate for all conditions of amateur use. If the arm of the threshhold level control of E609 is taken as the take-off point, it will be necessary to turn the threshhold control full maximum when copying 170 cycle shift signals. For 850 shift, the control may be set at around #4 of the scale.

A cathode coupled 6J6 or 12 AT7 preamplifier is used. (Figure 3) Normal or reverse of the teletype signal is obtained by feeding either grid A or B of the preamplifier tube to accomplish the necessary phase inversion. Some of the adapters build deleted V3, one-half 12AX7, (page 28, August 1965 QST) with some small degradation of the ATC/DTC performance (Figure 3A). In on case however, (K2YEQ) a persistent parasitic developed which could only be cured by leaving in the one-half 12AX7. 6SN7 tubes can be substituted for 12AU7 and 12AT7. Some small juggling of the resistor values in circuits associated with these tubes may be necessary.

A 6SL7 may be substituted for 12AX7, and an 807, 6BQ6, 6L6, 6Y6, 6V6, 6F6, 6AQ5, 5881s, etc. can be substituted for 6W6 tubes.

In the transistorized W2JAV, the feed for the adapter is taken from the 100K balance pot and minus 7.5 volts (Figure 4). The Twin Cities unit (Figure 5) requires that a pair of diodes, either CR3, or CR5, CR6, be reversed in polarity. A 250K pot is then placed across their outputs, and the arm and ground is brought to the adapter. (Figure 5).

In the SGC1A, one of the diode detectors must be reversed, a common load in the form of a look pot between the outputs of the mark and space detectors, and the arm is brought to the Mainline adapter.

Adjustment of the adapter is quite straightforward. V2A grid, point C is grounded and set zero is adjusted for zero volts at the cathode of V2B, point D. The balance pot in the slicer stage is set so that it is middle of the range of "On" or "Off" for the keyer stage, as shown by current or n current in the printer loop. The short at Point C V2A to ground is now removed, and the short to ground is then brought to either grid A or grid B of the 6J6 or 12AT7 pre-amplifier. The variable resistance in the common cathode is then adjusted until the voltage at TP1, Point C, V2B is again zero. This completes the adjustment for the CV 57/357 operation.

For any of the other converters, the last adjustment will be the balance pot from the detectors, the arm of which is adjusted so that noise from the converter detectors will make the average voltage at TP1 fluctuate around zero.

If you have run with the "Best of the Mainline" for a while, you may decide to build a complete one. Skeptics who build this adapter become easily convinced that they should go all the way.

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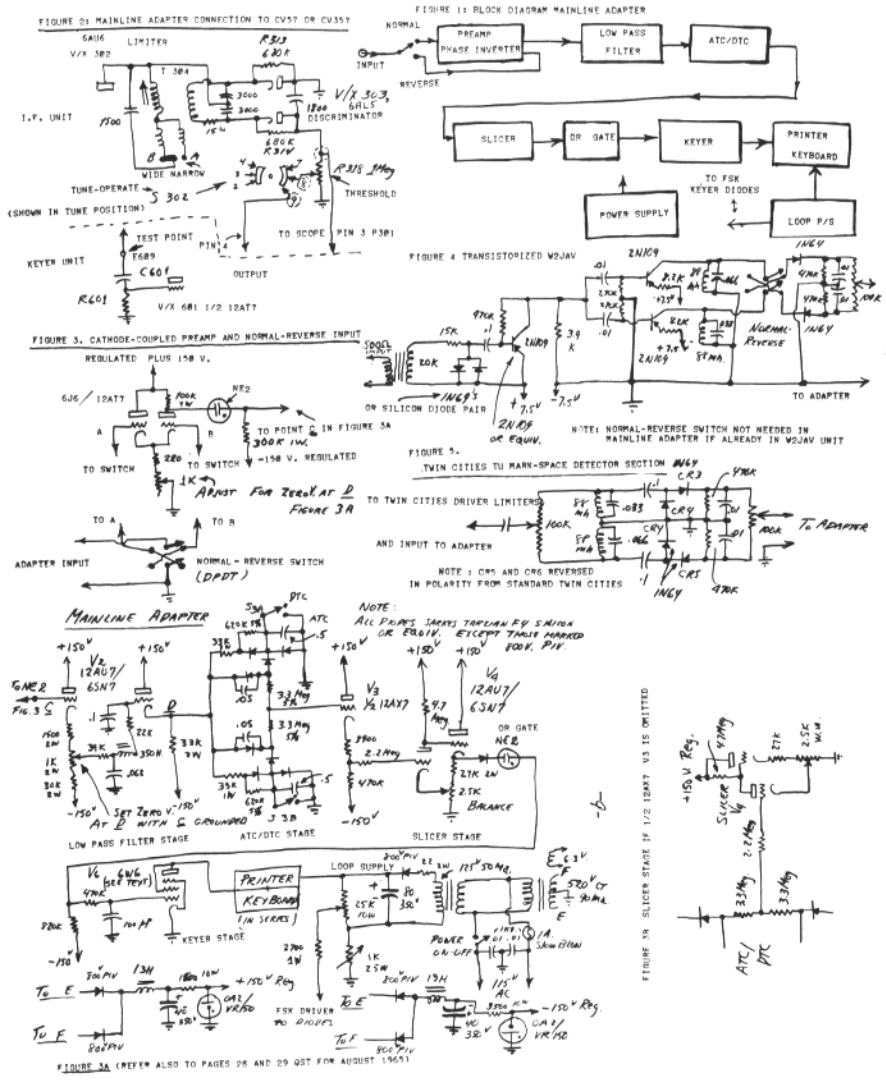


VHF RTTY NEWS

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

MORE ABOUT TELEGRAPH LOOPS or THE CARE OF RTTY SIGNALS AND THE FEEDING OF SELECTOR MAGNETS

There appears to be a common misconception about the method of driving the selector magnets in a teleprinter. Last month we described time constants and generally how they affect teleprinter operation. This month we will go into the Subject in a detailed manner describing some of the common loops and showing how each affects selector operation. The conclusion will give some simple rules for loop design or evaluation.

Probably the main reason that selectors are put into unsatisfactory loops is the close resemblance of selectors and ordinary-type relays. A run-of-the-mill relay has a coil voltage rating. Therefore, it is logical to expect that the selector magnets in a teleprinter should also have some voltage rating and so long as that voltage is applied the teleprinter will function properly. ABSOLUTELY NOT!

Selector magnets have a current rating. They should be supplied from a current source, not a voltage source. Unfortunately a real, live current source is non-existent. However, a current source can be simulated by using a relatively high voltage in series with a resistance. (The higher the voltage source and resistance, the closer will be the simulation.) The following will show how to do this and what happens if is isn't done.

AN INDUCTANCE-FREE LOOP

In order to provide a point of reference, we will consider first a loop containing no energy-storage elements; i.e., no inductance or capacitance. Figure 1(a) shows such an idealized loop composed of some DC source, E, a resistor, R, and a switch, S. The voltage source and the resistor can be any value desired so long as their ratio permits a current, I=E/R, of 60 mA to flow when the switch is closed. The switch can be metallic contacts, a vacuum tube, or a transistor. (Note that at this point we are not particular about the total loop resistance or supply voltage so long as the loop current is 60 mA. However, it will become apparent later that the source voltage and loop resistance are as important as the loop current.)

The switch is assumed to be driven in such a manner that it opens and closes at even intervals of 22 ms each, corresponding to the element length of a "60-Speed" RTTY signal.

BIAS DISTORTION

Bias distortion, or, as it is usually called, bias, is the measure of the unevenness in length of mark and space elements. Usually it is expressed as a percentage, and can be calculated from the formula: %Bias=100(m - M) /M, where m is the actual length of a mark interval in units of time and M is the expected or normal length of a mark interval in the same time units.

For example, in Figure 1(b) the mark interval is supposed to be 22 ms long and it is shown as 22 ms long, therefore the percent bias in Figure 1(b) is 100 (22 - 22)/22= 0%.

In all examples to follow, the "ideal" mark will be 22 ms long, therefore in all calculations M=22ms.

RECEIVING DEVICES

In a receiving device such as the selector in a teleprinter, there are essentially two conditions or states that the device can be in, the unoperated or spacing condition and the operated or marking condition. When no current is flowing in the magnets, the armature will be unoperated or spacing. If current is slowly increased, the armature will operate when the current reaches a certain value called the operating current and at that point the armature will make a space-to-mark (S-M) transition; if the current is increased after the armature has operated, no further action will take place, If the current is slowly decreased, the armature will remain operated until a certain current value is reached, at which point the armature will release and a mark-to-space (M-S) transition will result. Once the armature has released, an additional decrease in current will cause no further action. The value of current at which the armature releases is called the release current.

The operate and release currents are dependent upon the immediate history of current within the device and upon the adjustment of the selector, especially the tension spring, if present, and the operated and non-operated air gap between the armature and the pole pieces of the magnets.

Because of the adjustment and history factors, the operate and release currents may be somewhat nebulous values. The operate current will always be more than the release current and may be several times as great. However, for illustrative purposes we will initially assume the two current values are equal and equal to 30 mA (half the normal loop current).

AN IDEAL SELECTOR IN A SIMPLE LOOP

Assume a selector could be built having no inductance in the magnets and having identical operate and release currents of 30 mA. Place this "ideal" selector in the loop shown in Figure 1(a). Because there is no inductance in the selector, the current would appear as shown in Figure 1(b). The dotted line indicates the "operate-release" currents of this idealized selector. On a S-M transition in current, the selector operates when the current goes thru 30 mA as indicated by point A. On a current M-S transition, the selector releases when the current goes through 30 mA as indicated by point B. (Point C will be considered later.)

Because the distance from point A to point B is 22 ms, the bias introduced into the selector is zero. (In this example m=22 ms, the distance from A to B.)

A SEMI-IDEAL SELECTOR

To progress one step toward a practical rather than ideal selector, assume the selector still has the same operate-release current levels of 30 mA, but that it has 4H inductance in the magnets. Insert this magnet into a simple series loop with contact protection as shown in Figure 2 (a). Note that the supply is a 130-volt source. R is the total loop resistance including the selector magnet resistance. S is assumed to be metallic contacts.

The loop current is shown in Figure 2(b). because of the magnet inductance, L, it is no longer "square." In the S-M transition, the L/R time constant due to selector magnet inductance shows up and is approximately 1.84 ms. In the M-S transition, there is some overshoot resulting from the contact protection network composed of RCP and CCP. The time for the current to decay from 60 mA to the point where it makes the axis crossing is approximately 0.66 ms.

The operating point, A, is delayed by about 1.28 ms because of the delay in current build-up due to the L/R time constant. Due to the L-R-C "time constant", the release point, B, is delayed by approximately 0.20 ms. Therefore, bias is introduced into the selector as a result of it's own magnet inductance. In order to calculate the bias, m must be determined; m=22.00 - 1.28+0.20=20.92 ms. Therefore, the bias is 100 (20.92 - 22.0)/22.0= -4.9 or 4.9% spacing bias. This is not a bad value.

If a 260-volt source were used, R would be 4330 ohms and the bias would be approximately 2.1% spacing.

A "TRIODE" SWITCH

Metallic contacts may be considered archaic. Therefore, replace the contacts with a triode-like device such asa vacuum-pentode driven into hard conduction, a bipolar transistor driven into saturation, a unipolar transistor driven into the ohmic region, or a vacuum-triode. (It is tacitly assumed that the devices can be safely turned off rapidly.)

The only difference in current waveshapes between the "triode" and metallic contact circuits would be a vertical drop in current during the M-S transition because no C.P. network is used. The bias would be 5.8% and 2.9% spacing for the 130-volt and 260-volt loops, respectively.

A "PENTODE" SWITCH

A pentode vacuum-tube operated in a "constant-current" mode as a selector magnet driver presents a complex situation that requires quite a bit of reasoning to fully explain. Therefore, we will only describe the requirements for best operation and the resulting waveshapes. (The term "pentode" is being used generically; it includes any device having a "pentode-like" characteristic. Bipolar and unipolar transistors when operated in a "constant-current" mode qualify but may not be practical because of their ratings.)

Consider the circuit shown in Figure 3(a). The "switch" marked P is a pentode with the bias set to give 60 mA loop current during a steady mark. The resistance in the loop including the selector magnet resistance and excluding the DC plate resistance of the pentode should be as

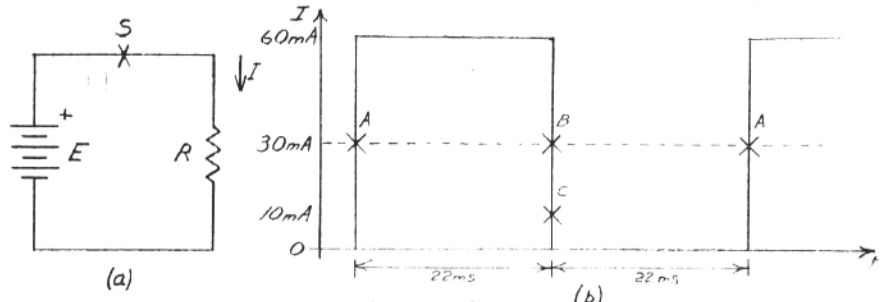


Figure 1

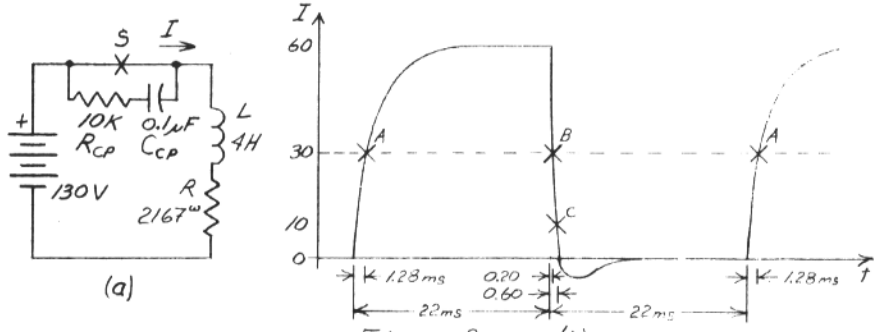


Figure 2

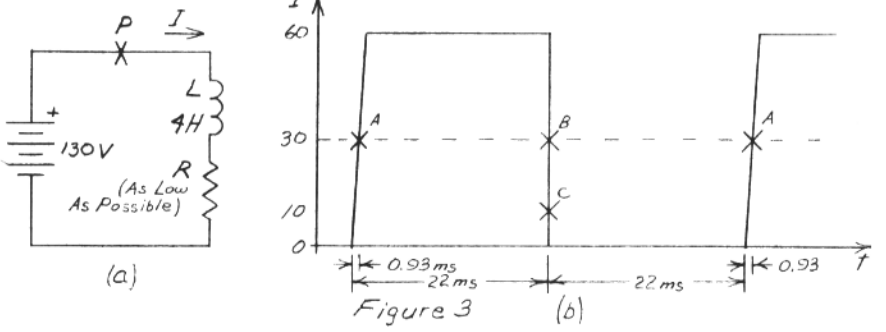


Figure 3

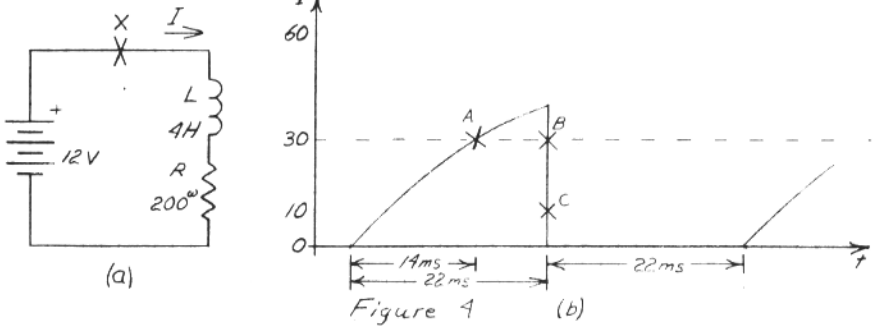


Figure 4

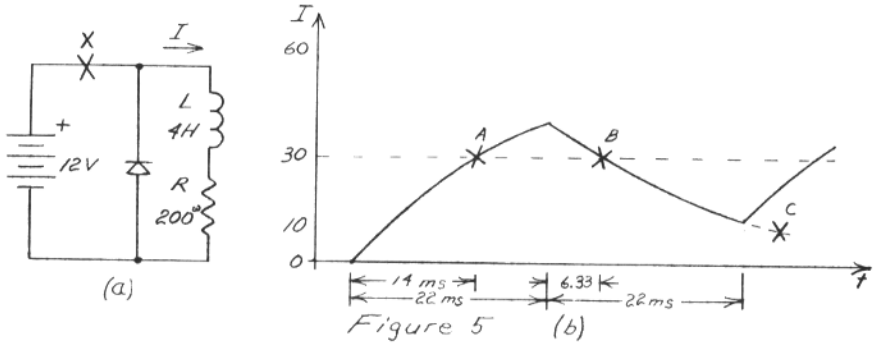


Figure 5

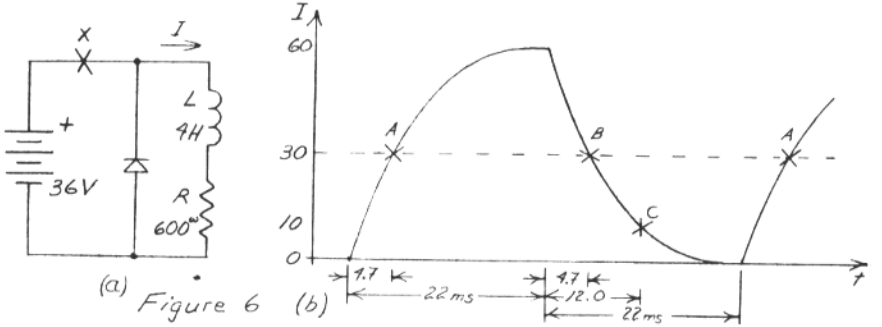


Figure 6

low as possible. It may appear that a low loop resistance is contrary to what has been said about time constants; however, in this case it is indeed desireable. An explanation of why it is true with pentodes and only pentodes is lengthy and will be omitted.

During the S–M transition, the current will rise linearly as shown in Figure 3(b). The rise time (the time to go from 0 to 60 mA) is dependent upon the supply voltage and the inductance, L, and not upon the loop resistance so long as the resistance is kept low. Note that the rise in current is linear rather than exponential as in all preceeding and all following examples. The rise time for a 130-volt source and L-4 H is 1.85 ms placing point A about 0.93 ms delayed, and for a 260 volt source the rise time is about 0.92 ms, delaying point A by 0.46 ms.

During the M-S transition, the resistance of the tube is nebulous, but is very high giving a very short time constant. Therefore point B will be undelayed. As a result, the bias will be 4.2% spacing and 2.1% spacing for the 130-volt and 260-volt cases, respectively.

LOW-VOLTAGE TRANSISTOR DRIVERS

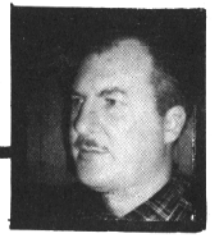
Figure 4(a) shows a loop consisting of a 12-volt supply and a "switch," X, which represents the C-E "junction" of a bipolar transistor. In this circuit the total loop resistance, R, will probably be composed of only the winding resistance of the selector magnets. Because of parameter variation problems the transistor will probably have to be operated in the saturated mode. Therefore the transistor will act very much like a switch. If this is true, the loop current waveforms will appear as shown in Figure 4(b).

The time constant of the circuit, assuming 4 H inductance and 200 ohms resistance, will be about 20 ms. Therefore, even if the steady-state loop current is set to 60 mA, the current rises so slowly that it never reaches steady-state during a typical mark interval. However, if three marks are sent in succession, the current will reach 60 mA by the end of the third mark. This is intolerable, but if it is ignored, other problems will show up. (The situation in which steady-state current is not reached when rapid reversals are sent such as in the letter "R", but steady-state is reached during the letter "M", results in characteristic distortion, a most undesirable situation.)

The operating point, A, has been shifted approximately 14 ms. If the transistor

Continued on page 16

RTTY-DX



JOHN POSSEHL W3KDF Editor

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Hello there. . .

The results and comments of the 7th Annual DX Sweepstakes are covered in a separate article in this issue. It was without doubt one of the best RTTY DX contests we have ever participated in.

Another Volta RTTY DX Contest is now history amid what must be considered the worst band conditions this writer has ever experienced in any contest, and he has been in quite a few, in all modes over a good many years. The conditions were in sharp contrast to the week prior to the test when stations from all points were pounding in over both the long and short paths at all hours of the day. At times the bands were so completely dead that it took listening on three receivers and a check of the antenna system to assure myself that what I was (not) hearing was for real. Of course the better equipped stations came through quite consistently even though greatly attenuated, but in a contest you must depend upon the vast majority of stations with low power and a dipole to build up points, and these were just not coming through.

The end of the contest and the deadline for this column overlapped so we did not have an opportunity to make too many comparisons from different areas. An over the air report from Arthur, ON4BX, however, gives an excellent picture of the conditions as printed in Europe during the contest and the following is a summary of his report. A total of 76 different calls in 25 different countries were logged. An idea of activity by country is as follows. Italy, 19 different stations; Germany 13; England 3; France 3; Sweden 2; Denmark 2; Luxembourg 2; USA 20; and one station representatives from PAØWQ, GI3HCP VU2KV, HB9P, VO1DZ, ZS6UR, FG7XT, PJ2MI, PJ2CR, HA5KFZ, UQ2AN, UA4KED, VK3NR, and 7Q7JO. As a comparison, here on the east coast we only printed 5 stations from Italy and 5 from Germany and very very few of the others. The boys on the west coast said they only heard at the most, three stations from Europe during the whole contest and were fortunate to work one. However, on the other hand, they did report a few more VK stations, a ZL station, and Cas, KA9AK. To be added to the above, as heare on this side of the pond are, ON4BX, KH6FOX, LU7EBB, and KP4JM. Sheer determination (and stamnia) enabled Giovanni, I1KG, to make 98 contacts in 35 band/countries which I am sure will be one of the top scores. Herbert, DL1VR, must be right up there too as he was the most consistent station heard on all bands in spite of conditions. On the west coast some of the boys, i.e., W6LDF, WA6WGL, and WB6ADY, seemed to be having a contest within a contest, they certainly were consistent and at last reading were within about a QSO of each other. Who won that one Bob? In general, activity could have been better but many fellows intending to participate probably tuned in, and not hearing anything, pulled the switch and went out for a Sunday drive. Next year should be a different story, but we can only wait and see.

A last minute item in the last issue was the news of RTTY operation from India. Venkat, VU2KV, has been extremely active the past month and has given many a contact from a really rare area of the world. It is really hard not to hear Ven if you listen at 1200 - 1330 and 0100 - 0230 GMT almost daily. He may be best over either the long or short path so if you have a beam try both directions.

BARTG DX RTTY CONTEST

March 2—3rd

Full Details Next Month

Activity is really picking up from Africa these days. As mentioned last month, ZS1 FD has been showing up on Fifteen from time to time, Bill, ZS6UR was on for the contest, and Chris, ZS6CNT, is back on

bands after a long layoff. On Tuesdays and Thursdays at about 12-1300 z you can find Orbra on Fifteen meters operating out of EL2N. Don't break in as he is working a schedule at this time but he will usually be around for a while when he is finished if you need a contact with Liberia. Mike, F3PI, and Newt, K8QLO, reported the activity 7Q7JO who is now active from the Republic of Malawi. He has also been printed here with good signals from his 60 watt rig and he also uses tape gear. He can be found quite often at around 20-2100 z on Twenty meters.

Arthur, ON4BX, reported working a really rare one that was on over the week-end of Nov. 26th. This station, 4L3A, was operating from the Soviet Republic of Georgia using a special call sign. It was set up by a group of hams from Riga, Latvia specifically for the CW portion of the CQ WW DX Contest that was held on that week-end. They also had RTTY capabilities and put out a beautiful signal before and after that contest period. They were still operating RTTY on Monday, November 27th but then packed up and went home.

Recently Jean, FG7XT, was tell some of the boys about some possible activity from two new countries. One is FK8AZ, Louis, on the island of New Caledonia and the other is FM7WQ. Pierre on the island of Martinique. Jean mentioned that they were trying to get on for the contest, but if not, to watch for them early in December. There were no reports of them being on for the contest so it could possibly be any time now, perhaps by the time you read this. While on this subject of new ones, Dusty informs me that there is now a Teletype machine in Honduras (HR) and that a chap in the Republic of Panama (HP) has a Model 15 and a Swan tranceiver and appears anxious to get things going.

Some interesting items from Noel, VK3NR. At the moment Noel is rebuilding to a TT/L2 including the auto-start and motor control. Vic, VK6VK, whom you may recall was quite active from Zone 29 a few months ago will be headed for Antarctica shortly for a stay at the Mawson Base (VKØ). He will of course do his best to get things going on RTTY while there. Noel also reports that VK2BPY has a Creed machine and should be on from Sydney soon, perhaps also as /mm as he is "sparks" on a coastal tanker. The interest seems to be increasing rapidly down there but there remains a critical lack of machines.

Several months ago we noted that OX3LY had RTTY capabilities up there in Greenland. Well, recently Peter, K8YEK, reported a QSO with him and also has his QSL. The operator is Bert Anderson and he is using some nice equipment like a Collins R-390A receiver and a Model 28 ARS machine. A couple of "old timers" that we hadn't heard for quite a while seem to be back on the bands again. Ken at GM3ENJ and Roger at G3LDI. Roger became a benedict not too long ago and is now at a new QTH with a Heath SB-30/SB-401 combination and all sorts of antennas. Also heard old Jan, PAØFB tuning up things before the contest.

Some new stations that were heard while tuning around the bands the past month. KL7FRX, KL7DFU, PAØWQ, F3DD, DL3II, DL9XBA, DJ6MA, DL4RD, I1RKY, I1KPK, I1EVK, and KP4QM.

Recently received a batch of cards from Cas, KA9AK for a lot of the stateside boys and by this time all have been distributed. I will be happy to be acting as Cas' stateside manager from now on. Your card and a SASE to the above QTH should do the trick but patience please.

In closing I want to wish you all the very best in the coming New Year, both in your personal endeavors and in our mutual interest -- RTTY.

73 de John

(Note) After receiving this column from John we had an air mail letter from Ven VU2KV. He is checking the band nearly every day from 1200-1600 and 0200-0300 GMT. usually around 14095. Ven says he has no tape equipment and sending CQs by hand is a laborious job so he listens mostly but is hearing a lot of fellows and calling them with no reply so asks stations to tune his direction for a possible weak signal. ON4BX was his first RTTY contact but since then has worked 13 different countries. At the time of writing Ven has worked W8CQ, W2LNP, K3KDF, W8UAN, K8QLO, W3HYH and K4BUR from the states. An excellent start and our compliments to Ven. He has permission to use 15 and 10 meters and hopes to have a quad up over 100 feet by the time you read this. Turn the beam on India and give Ven a call, he has done a wonderful job putting a rare DX country for RTTY on the air.

Ven says his QSL chores are handled by W6BCT, send your cards to him. (Dusty)

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V H F NEWS

continued from page 1 3

can be safely turned off with no protection, the M-S transistion will be as shown, and the release point, B, will be in its normal position. Therefore, m=22 - 14-8 ms; the %Bias-100 (8-22)/22- -63 or 63% spacing bias! This is also intolerable.

The inductive kick occurring when the transistor is turned off may damage the transistor. This can be prevented by placing a diode in the circuit as shown in Figure 5(a).

If we can assume that the diode when conducting has the same characteristics as the transistor when it is conducting, the waveshapes will appear as shown in Figure 5(b). Again, we have the problem of characteristic distortion resulting from the time constant being so long that steady-state is never reached when alternate marks and spaces are being sent, but steady-state is reached when several marks or spaces are sent in succession. For this example the bias is 35% spacing.

If the supply voltage is raised to, say, 36 volts, the loop resistance would be 600 ohms and the time constant would decrease to 6.7 ms. This is shown in Figure 6. Point A and point B are shifted about 4.7 ms each so that no bias is present and the time constant is sufficiently short to allow steady-state conditions to be established by the end of each unit. (This circuit appears to be satisfactory, but when an actual selector is considered, severe bias will exist.)

OPERATE AND RELEASE CURRENTS

As mentioned earlier,the selector operate current has to be higher than the release current and may be several times as great. To illustrate this consideration we will repeat the whole discussion (in abbreviated form, thank goodness!) Let us assume the operate current is 30 mA, and the release current is 10 mA. The point of operation, A, on all the diagrams will still apply, but the release point, B, will have to be replaced by point C.

In the simple contact-operated 130-volt DC loop shown in Figure 2(a), the shifting of the release point from B to C will slightly decrease the bias because point C is delayed by about 0.6 ms; the bias will be 3.1% spacing. Using a 260-volt source give 0.6% spacing bias.

When using the "constant-current" pentode with a practical selector, the bias will be the same as it was with the "semi-ideal" selector, 4.2% and 2.1% spacing. Although points B and C are at different current levels, they are in the same time position because of the vertical nature of the M-S transition. This has a very important consequence: If the M-S and S-M transitions in the current supplied to the selector magnets are nearly vertical, i.e., have very short time constants or rise times, the operate and release current values will not in themselves affect selector operation. As a corollary, when rise times are long, selector operation is very dependent upon the selector operate and release current values

In the case of the 12-volt loop with a transistor and diode (Figure 5), the selector magnets will never release the armature! This phenomenon may manifest itself in a subtle manner. Assume a solid-state TU having this type output circuit is being tested. With a steady mark at the input the output loop current is 60 mA, with a steady space it is 0 mA. When characters are sent the printer will copy infrequent-transition characters such as I, M, and O but will be unable to cope with frequent-transition characters such as J, R, and Y.

The transistor and diode with a 36-volt source (Figure 6), although showing no bias previously, will now show A delayed by 4.7 ms and C delayed by 12.0ms; this gives: m=22 - 4.7 + 12.0= 29.3 ms. Therefore the bias is: 100 (29.3 - 22)/22= +33.1 or 33.1% marking bias!

MULTIPLE SELECTOR MAGNETS

If more than one selector is inserted into the loop, as in the case where a page-printer and a reperforator are being operated simultaneously, the circuit analysis can be made with little additional effort. Essentially, in all the previous examples the time constants would be doubled; the bias would also double. This means that a circuit that is marginal with one selector in the loop (say 33% bias) will become inoperable with two in the circuit (66% bias). However, if the bias is only 1% initially, even four selectors will only result in 4% bias..

As selector magnets are added, the loop resistance will increase lowering the loop current. The normal prodedure for compensation is to employ a rheostat that is manually adjusted whenever a machine is added or removed. However, the change in loop current is smallest when the highest voltage source is employed. With a "constant-current" pentode no adjustment should be required.

HIGHER SPEEDS

Although speeds higher than 65 WPM are not presently permitted in amateur service, it might be desired to monitor higher speed commercial stations. The time constants of a loop are not dependent upon the speed of operation, but the length of a unit interval is. With higher speeds the length of a mark (and space) are shorter making the time constant a larger fraction of a unit. This has the effect of increasing the bias as the speed is increased.

MISCELLANEOUS

The voltage appearing across the selector magnets has been totally ignored. Its magnitude is useless except as an indirect indication of the steady-state loop current flowing in the magnets.

Traditionally, polar relays were used for many reasons; two reasons are: (1) The operate and release currents are nearly equal, and (2) The inductance of the relay winding is relatively low.

Because of these two characteristics, the relay will approach, closely, the "ideal" selector originally discussed, and as a result, will give better performance that a "barefoot" selector in a poor loop as well as not additionally "fouling up" the loop by adding a lot of inductance. This is why so many Model 15s came with a 255-A inside.

The selector within a Model 32 is driven from a solid-state unit built within the machine. When inserted into a loop it does not reflect the selector inductance back into the loop. The solid-state driver does for a Model 32 what the 255 -A did for a Model 15.

CONCLUSION

The inductance of the selector magnets introduces time delays into a telegraph loop. These delays can affect operation to the point of total failure. The amount of delay is dependent upon the inductance of the selector magnets and the resistance of the loop. The larger the inductance, the greater the delays; the larger the resistance, the smaller the delays. Thus resistance can be used to offset the effect of inductance.

Because the loop resistance is directly proportional to the loop supply voltage, a good (but not infallible) figure-of-merit for telegraph loops is the DC supply voltage. The higher the supply voltage, the better the loop.

The actual effect of the time delays is dependent upon the operate and release currents of the selector; these values are dependent upon the design of the machine as well as the adjustment. However, the shorter the delay, the less the effect it will have upon the performance of the teleprinter regardless of the design and adjustment.

The best loop is one containing a 260-volt DC supply and a "constant-current" pentode. Second choice is a 260-volt DC loop containing metallic contacts or a triode. Any loop containing less than a 130-volt DC supply should be viewed with suspicion unless that "loop" was designed by the manufacturer of the teleprinter upon which it is used.

For those interested in experimentation, waveshapes similar to those described can be viewed on an oscilloscope. Use a good signal source; the best for this application is the I-193 Polar Relay Test Set because it supplies a continuous series of alternate marks and spaces at "60-speed." Place a low value non-inductive resistor in series with the loop at the ground end of the loop; place the oscilloscope across the resistor.

We would like to thank Doug Kerr, W2AIE, for many comments and suggestions.

73,ES CUL, RG

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Additional DX Comments.

PJ2CR - Sorry I could not take advantage of full hours (busy with work). Hope to participate again in the future.

WA8BOT - Great Contest, but I sure was glad to see it end.

PAØLBN - Hope to do better next year. Hope to read the results some day.

W5QCH - Well planned and successful contest. Bonus point system was excellent and stimulated activity on higher bands.

HB9P - Make shorter messages, combine number etc. -73-599-1810-14. Would permit short contacts and more QSOs/

K5OLU - The 100 point bonus very effective in encouraging multi-band operation. Where were the ZL and KL7 stations? Contest lot of fun, and worked three new countries.

VO1BL - Congratulations for the success of the big effort to CARTG.

SM7AZI - I do not understand the summary of the points, so please help me out with this. Thanks.

3C3FBP - Thanks to you for a terrific job well done. Most enjoyable contest.

ON4BX - Exchange points table is a handicap for Zone 14. 48 hours is really long and hard. Tnx to the Canadian Group.

VO1DZ - Enjoyed the contest more than I thought I would as only enter re your letter.

W6AEE - Ten meters was great, no QRM and better "MANNER" on part of the operator.

HITS & MISSES

From The Editor and his Mail

Tempus Fugit-and here we are starting the second year- Maybe because we are getting older- or maybe because it was such an interesting job but it seems like yesterday that we were typing out our first "Hits and Misses" column and worrying about filling up a magazine in the future.

With the help of the most loyal subscribers any magazine ever had and the contributions of many of these subscribers the job has been easy and fun although it does take some time. We especially thank our authors, we are proud of many of the articles submitted and remember these are not paid for- in fact the authors even pay their own subscription. It takes time to write an article, some of the other magazines offer payment, most of them offer more publicity at least, yet we have received many outstanding articles, If any credit is due for a successful year we want to give it to these authors that supported RTTY JOURNAL with their time and effort but very little reward. We especially want to thank the column writers W3KDF and W8BBB for such a good job month after month.

As for the coming year-one of our subscribers discovered that 4 more pages still weighed less than an ounce, (we thought it weighed over that) so we plan on running 4 more pages whenever we have the material available. We have had a number of requests for display advertising space and we may use one of these pages for that, a couple of months trial should give us a little experience and we may alternate from 16 to 20 pages depending on how things work out, and what material we receive.

Our only regret this past year is the lack of back issues. When we started, we printed what we thought was a fair supply of extra copies but the subscription list grew so fast, especially during the past six months, that with most of the new subscribers wanting all the back issues available we soon ran out. We hope to either publish a handbook for RTTY, especially slanted for the beginner but also including more advanced articles or at least to run a reprint of the most popular articles in one issue. This is planned for after the renewal rush is over this winter.

The nice comments from the readers have been wonderful, we wish we could say thank you personally or with a note but answering eveyone is not possible. We do take this opportunity to wish everyone the best of the everything in the New Year and once again salute our authors for a wonderful job. Without them there would be no magazine.

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A notice in the ELECTRON, a radio publication from Holland announced that through the co-operation of the government owned Postal & Telegraph Services, Siemans model 37 Teletype machines will be made available to any amateur in Holland at a reasonable price, if proof of possession of a license for operation of Teletype is given.

This should encourage much greater operation from this country and we hope is an indication of other countries to recognize the value of amateur RTTY operations.

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If we could start a campaign of any sort our nomination would be NARROW SHIFT. We can well remember the "Donald Duck" cracks when single sideband arrived, There is no question that narrow shift is better, much easier to print through QRM and not difficult to use. Also anyone using narrow shift can copy any shift so those that are slow to change are not left out. Lets make 68 the year that RTTY goes modern. Any ideas??..

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We have a copy of a letter sent by Jerry K1PLP to the ARRL asking for the designation of the area around 7090 as the recognized RTTY frequency for forty meters. Jerry presents some good ideas for using this area and comments would be appreciated.

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To those that sent WA2YJD a nickle for a weather code card, have patience, Jerry is still waiting for his supply from the government.

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.

FOR SALE - Two Tone Transistor Demodulator as described in cover article June RTTY JOURNAL 1967-glass-epoxy PC board, drilled, $8.00 postpaid with all instructions for building and adjusting. Cashion Electronics, P.O. Box 7307, Phoenix, Ariz. 85011.

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)

SELL- PAGE PRINTER PAPER, 3 ply, $7.50. case. Model 14 TD, sync motor, excellent condition $25.00. DXD test set, $160.00. WB2PLY, Box 207, Princeton Jct. N.J. 08550

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

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) 982-0685.

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.

BUY - 28 TYPING units, etc., and all parts. Sell 14s 15s 28KSR. (28ASR) parts. W4NYF, 405 NW 30th Ter., Ft. Lauderdale, Fla. 33311. phone 305-583-1340 after 9.

MODEL 28 GEARS (2 per set) for KSR or ASR; 60, 75, or 100 wpm, $5.50 pp in U.S. Model 14 Typing Reperforator, $50. 14 TD, $50 with sync motor, $40 with governed motor. Model 19 Table. T-23/ARC-5, $15. TM 11-352, covering TG-7 & TG-37 (Model 15) $4.25 pp in U.S NAVSHIPS 93241, covering Model 28 Page Printer, $7.50 pp in U.S. Wanted: Model 15 Typing Unit, 15 or 19 cover. R-19-/TRC-1, DM-21-AX, DM-66. Trade TS-174/U Frequency Meter for CV-89/URA-8A. Send SASE for list of TTY and other items for sale or trade. W4NZY, 119 North Birchwood Avenue, Louisville, Kentucky 40206

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, Ohic

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.

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

WANTED MODEL 28 page printer, any condition, need not be operational as will be used for parts. Write Bruce Henderson, 4261 Ottawa Ave. S., St. Louis Park, Minn. 55416

FOR SALE; MODEL 9220B solid state neutral relays with octal base. Does not require periodic adjustment. Have one (1) solid state polar relay with octal base, either $12.50 each. K4UCF, 57 Wisteria Dr. Melbourne, Fal. 32901

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

HAS Your Subscription Expired ? ?