Continued from page

khz i.f. filter somewhere? The only thing that happens now is that we have to be extremely careful to get the BFO right on 2550 hz center audio frequency is all -- there won't be much tolerance for error and still be properly centered. Of course the chances of your finding a good high-quality i.f. filter system of 1.0 khz are quite remote. Even certain receivers purporting to have 1.0 khz crystal filter positions usually are enough wider than the indicated figure to cause little or no problem.

For Collins owners, a lovely 1500 hz filter is available - as Collins rates filters at the -6 db. points, the filter is actually somewhat less wide than this at the -3 db. points, so it makes a beautiful filter for 850 shift RTTY. If you buy this filter, you obviously then need a BFO frequency of 452.450 (eq. 4) rather than the customary 453.650 frequency for SSB, so a new crystal must be obtained.

Let's assume the receiver now has a 452.450 crystal added, Table II gives the audio results of using such a crystal with various filter bandwidths:

Filter Bandwidth	Resulting Audio Range
3.1 khz	1000-4100 hz
2.1 khz	1500-3600 hz
1.5 khz	1800-3300 hz
500 hz	2300-2800 hz

So it becomes apparent that you ca readily exceed 2975 hz. audio by the simpl method of moving the BFO to a differen frequency, or by increasing the bandwidtl of the i.f. filter, or both. It should also b obvious from TABLE II that the 1.5 kh filter is optimum in this case for 850 shift and that the 500 hz filter would get neithe 2125 nor 2975 and thus is completely use-less for RTTY using ordinary filter frequencies on either 850 shift or 170 shif with the particular BFO frequency o 452.450 used for TABLE II.

Let's take the example of the 170 shift, now. If we want to have optimum reception, that 500 hz. filter is lovely for the purpose. Perhaps a 300 or 400 hz. filter would be even better, but they are hard to come by. The Drake R-4 receiver has such a filter position, for those interested -- a 400 hz. bandwidth excellent for 170 shift RTTY.

From TABLE I we note that the center frequency of 170 shift normal tones (212 and 2295) is 2210 hz. Well:

455.000
- 2.210
452.790 khz. (eq. 5)

So if you want optimum reception o 170 shift, using a minimum bandwidth i.f selectivity, then get a 452.790 crystal

First in a series of articles on receive tuning for RTTY. More to follow.

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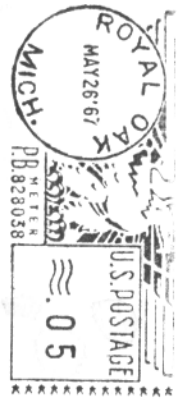


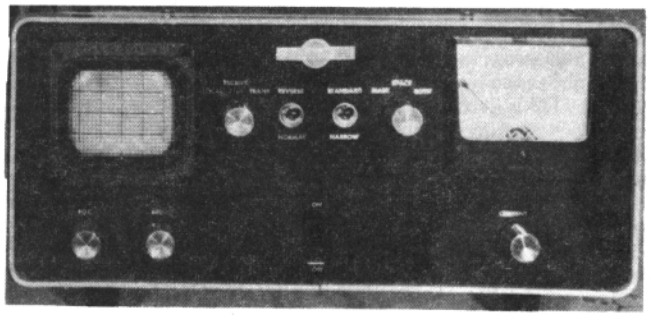
RTTY JOURNAL

JUNE – 1967

EXCLUSIVELY AMATEUR RADIOTELETYPE

Vol. 15 No. 6 30 Cents

Modified- Two-tone- Transistor Demodulator with FSK- AFSK- and Loop Supply.



E.C. Sherril, K6JFP
4745 – 49th Street
San Diego, Cal. 92115

In one of your editions you expressed a desire for an article on a very good, very small, Terminal Unit, AFSK board and FSK board. Swell, I have built everything in the "books" and I believe for the money, weight, power consumption and absolute dependability, this is the unit that you want. I have built three of these units, one here at the QTH, and two loaned out, very good results over the past three years. Here goes, pictures, schematics and talk.

First off, it's transistorized, the transistors are Texas Instruments 2N697's, cost about 50 cents each, all except the keying unit RCA 2N3440, $2.10, the loop supply is the K8DKC, as in QST Aug. 1965, the printed circuit board is the K7AWI, the FSK unit and sample I sent is the K8DKC unit, it may be made dual, for narrow shift also, it is mounted real close to the VFO, and the small wire slipped under the cathode pin of the VFO tube. The AFSK unit is sort of the empherical approach, and is made to key with K8DKC loop supply, altho it will key dry, so your choice.

Of course modifications are in order and I did just this for my convenience, and are covered, in type as well as in schematics, if followed to the "T" no trouble will be encountered. I mounted the TU board, the power transformers for

Continued on page 4

RTTY Shift Measuring Device

Merrill Swan, W6AEE
372 Warren Way
Arcadia. Calif. 91006

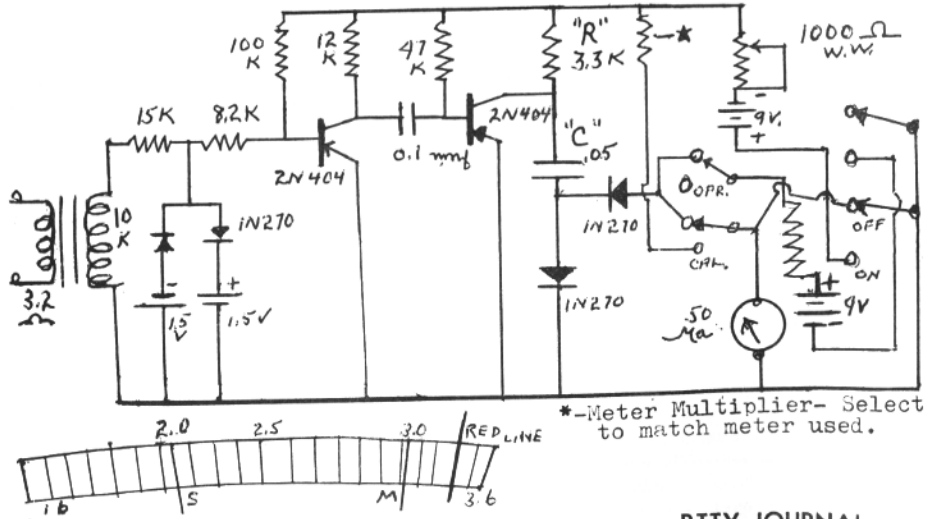
After using the "W6AEE Scope Indicator for Tuning RTTY" for some 15 years the desire for another means of checking frequencies lead to the unit is described here. Of course the H-P*521B counter is fine but is hardly justified (in cost) for this type of service, hence this simplier approach.

A recent Army Mars meeting yielded several printed circuit boards with a number of transistors and diodes, after an hour of removing parts I had several dozen good transistors and about six dozen diodes. Plenty of parts to build an indicator. Looking over an old General Radio Catalogue I found a frequency meter using tubes, so here was the start.

FM receivers which are concerned with recovery of frequency only use limiters ahead of the detector and looking at the ARRL Handbook several diode limiter circuits were found. The output of my SX 117 has both 3.2 ohms and 500 ohms, the latter was selected as the imput to the frequency meter imput. Two small 1.5 volt batteries furnish the bias for these clipping diodes. The output of the clipper drives a grounded emmitter amplifier (which also supplies a small amount of limiting). This stage drives a second grounded emmiter limiter through capacity coupling. The signal amplitude at the base of the second transistor is large enough to cut the collector current off and into saturation. Hence a voltage to charge capacitor "C" from the collector resistor "R". This voltage at cut-off approaches the supply voltage less a small drop thru "R". Under saturation conditions the voltage drops almost to zero and "C" discharges through the series diode. The time constant of the meter is fairly long and hence integrates the charging pulse on "C" and gives a steady meter reading.

The meter used was an old VU meter, 50 microamps, from an old AM phone rig. After assembling the parts on a vector board tests were made which at first were dissappointing. The meter reading for a change of 850 cycles was very small, in fact so small that it was difficult to read much closer than 100 cycles. This was no good so a biasing scheme for the meter was tried. This required an additional 9 volt battery to reverse bias the meter. After several values of "C" and different diodes were tried the values given in the circuit proved to be suitable.

The range from 2000 to 3000 cycles occupies about two thirds of the scale. To calibrate the meter after removing the "haywire", the HP-521 counter was set to the 10.0 second range which allows the HP 202 oscillator to be read to 0.1 cycles. The scale was marked with a pencil for the preliminary calibrations with readings at every 100 cycles. The lower end of the scale is somewhat compressed but does not deter from the use in checking FSK or AFSK signals with nominal shifts of 2125 and 2975 cps.



Several calibration runs were made to check for repeatability, and an additional feature added. Another switch was added to permit using the meter (without the bias voltage) through a resistor to measure the DC voltage to the transistors. An arbritary choice of 8.5 volts for the operating potential was made and a red mark made for the voltage. When checking frequencies the switch is first thrown and the voltage adjusted with the variable resistor to the red line and then the switch is put in "operate" position and readings made.

A switch could be added to change the value of "C" and have a multiple frequency meter, but for my use the extended range used to check FSK/AFSK tones seemed to meet my needs.

The cost of the parts is quite modest even if everything were purchased new. Meters such as the 50micro amp unit can be purchased in surplus stores in most parts of the country for $3.00 to $5.00. Transistors are not critical nor are the diodes. The other components are in every amateurs junk box. Less than four hours were spent on the unit. Here is a piece of gear that will be found useful in checking your own shift, incoming signals, using steady mark and space tones, etc.

The imput impedance is approximately 10,000 ohms which does not load the receiver output. If frequency varies, due to level, a second output transformer can be used in reverse to step the receiver output up to a point where good limiting is obtained.

73, W6AEE

•••

Simple- Inexpensive Scope for RTTY.

Although most RTTY operators have a scope the following adaptation of W6NRM scope is compact, simple and lends itself well for being built in the demodulator itself. The TU illustrated in this issue has one. The unit diagram is self explanatory and drives the 902ACRT very nicely.

If you have a lot of money you can use a Millen 80072 scope bezel. However if you are like most hams go to your nearest plumbing supply house and ask for a 2" by 1 1/2" reducing spud washer. It will cost about 35¢ and makes a very attractive scope bezel. One word of caution - if no shield is used around the scope be sure to keep all transformers and magnetic devices as far away as possible. Cashion Electronics can also furnish a printed board for this scope if you want to keep everything uniform.

The 902A Cathode ray tube (CRT1) is available at surplus. Two sources we know of are Marty's Surplus, 1236 Market St., San Francisco, Cal. and from Ralph Leland, W8DLT, 118 Cambridge Blvd., Pleasant Ridge, Mich. 48069. The prices we were quoted was $3.50 postpaid.

T1 --115 to 125v 15ma. & 6.3 v@.6A Stancor PS8415
C1-2-3 -- 1Mfd 450V electrolytic
C4-5 -- .02 600 vt. Mylar capacitor
D1-2-3 -- Motorola Surmetic Diode - 1N4005
R1 --360K 1/2 watt carbon.
R2-3 --1 meg. height and width pot. MalloryMTC 16L4
R4 --120K 1/2 w. carbon.
R5 --100K Intensity pot. Mallory MTC15L4
R6 --500K Focus pot. Mallory MTC55L4
CRT-1 Cathode Ray Tube 902A- (see text)
Scope Shield- Millen 80042
Scope Bezel - Millen 80072 (see text.)

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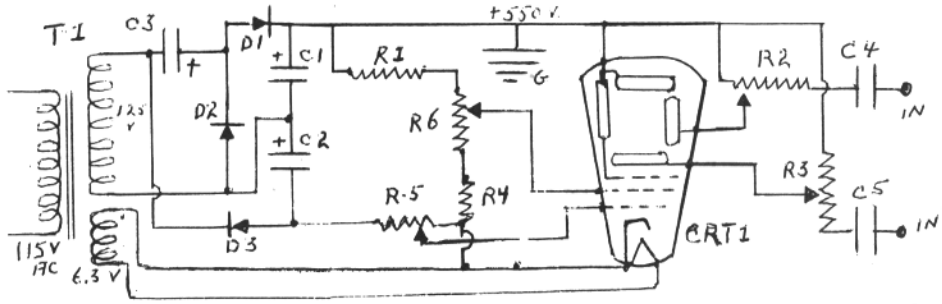


Transistor Demodulator.

Continued from page 1

both supplies on top of chassis. The loop board and the dual Zener regulated minus and plus supplies on a insulated board under the chassis. Of Course positioning of all things may be left up to the builders choice. All of the above were mounted on an aluminum 2 x 7 x 9 inch chassis, that fits perfectly in a Heath HO-10 case, available for $5.78 cents at any service center, the unit draws 5 watts and weighs less than 5 lbs. Now to the modifications:

1. On the terminal board connections, no's 2 and 3 in the original unit were shorted, I connected an O-1 DCMA in the circuit as shown this makes a mighty nice "S" meter for tuning, Schematic No. 6.

2. On the terminal board edge connector no's 13 and 14 & T#6 per schematic no. 2, I used a two wafer single pole 4 position switch, this gives mark only, space only, or mark and space only copy and hold position, this is great for ID copy, dubbing taping or editing. NOTE: The no. 6 terminal connection. This switch is half of the Xmitt/Rec switch in schematic no. 1, this gives the operator complete control over his transmitter/receiver and actually cuts no. 6 position, this stops any signals from getting back into the TU and giving false copy or garble.

3. Schematic no. 3, shows the positive and negative 9 or 10 volt zener regulated supplies for the TU. (With exception of the keying transistor.)

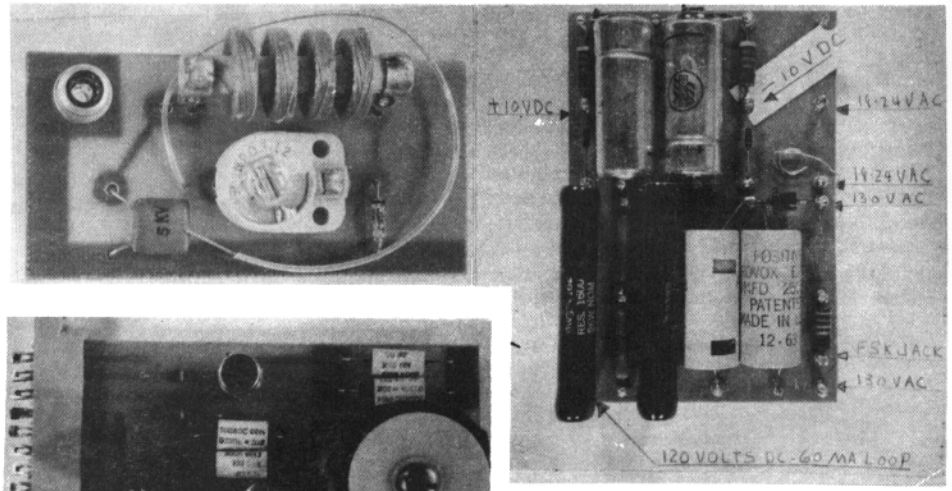
4. Schematic no. 4, shows the dual FSK board, this can be made into a single or double board, per the builders choice. The printed circuit board is homemade.

5. Schematic no. 5, shows the AFSK board, this is only for 2125 and 2975, the printed circuit board is homemade also.

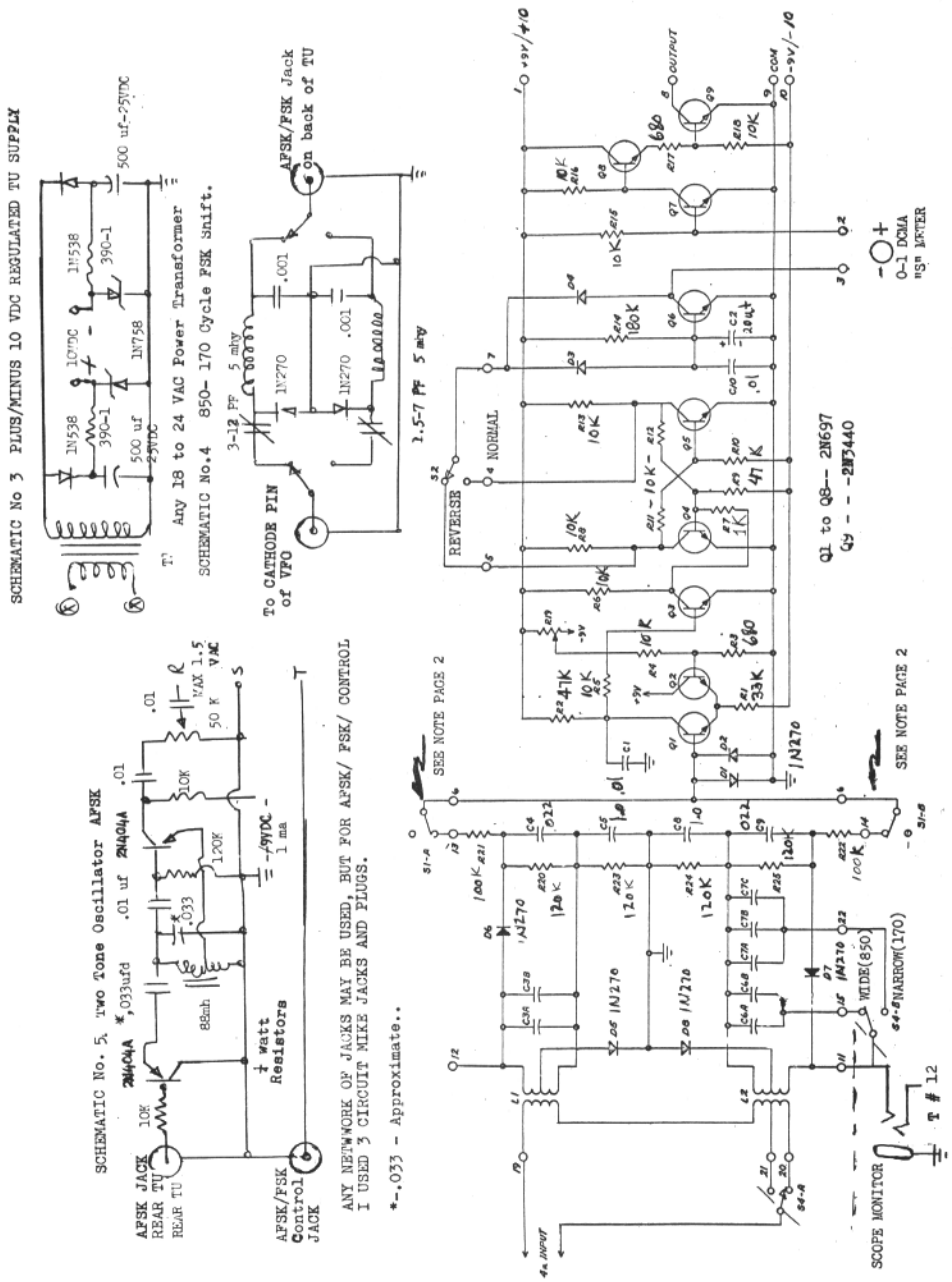
6. Schematic no. 6, shows K7AWI's, Terminal Unit, with K6JFP modifications, incorporated into it.

Pictures are self explanatory, I think, if any troubles, give me a quick letter and I will explain further . . . The unit is cabled to the transmitter and receiver with shielded leads and/or 2 circuit or three circuit plugs and jacks, as shown. On the front panel of the Heath HO-10 box I mounted the Monarch 0-100 DCMA meter top left side, the "S" meter monarch top right side, and the 2 pole 4 position wafer switch centered between these meters. On the front panel across the bottom of the unit, I placed XMITT/REC switch, REV/ NORM switch. Wide/NARROW switch, AC

Continued on page 7

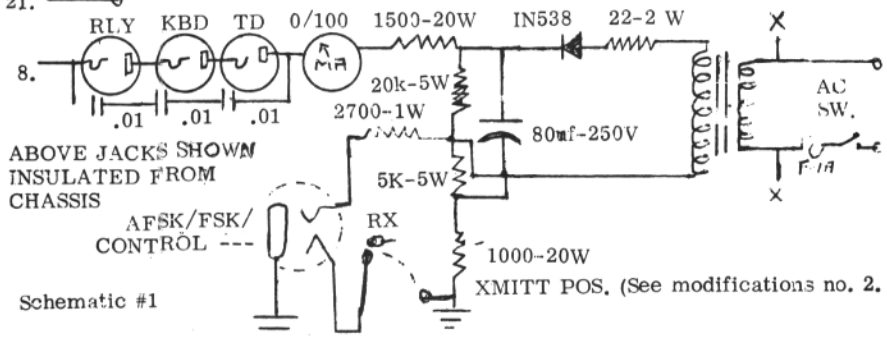


Above - Loop Supply board.
Upper Left - 170-850-CPS FSK
Lower Left - AFSK Board.



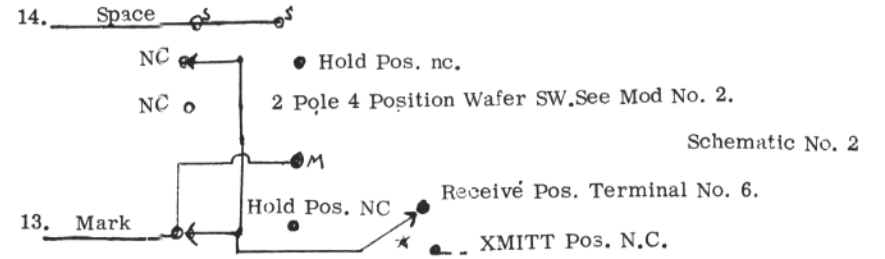
TERMINAL BOARD EDGE CONNECTIONS

1. Plus 10 volts DC from regulated power supply.
2. Plus terminal of the O-1 DC MA tuning meter.
3. Minus terminal of the O-1 DC MA tuning meter.
4. 5. 7. Normal/reverse switch no. 2.
6. 13. 14. See Schematic No. 2.
9. Ground Connection.
10. Minus 10 VDC from regulated power supply
11. 15. Vertical scope input-switch no. 4 B
22.
12. Horizontal scope input.
16. No connection
17. No connection
18. No connection
19. 20. 21. Receiver 4 OHM input, switch 4 A



Schematic #1

This loop supply is from K8DKC (W6FCC) TU, QST-Aug. 1965
Transformer is triad R-30 or equivalent.



★ DPDT switch shown 1/2 of XMITT/receive switch, see schematic no. 1

continued from page 4

switch, Fuse and MONITOR JACK for external scope. On the rear is the REC input jack, THREE INSULATED JACKS, KBD, TD, and PRINTER RELAY, the ID JACK, the AFSK/FSK/CONTROL jack and the AC cord input.

(Editor Note) Although a few hams may prefer to build from scratch, we would strongly advise that the printed circuit board for this TU be purchased. Cashion Electronic, Box 7307, have one available at only $8.00 drilled. A complete parts list and instructions for tuning etc. are included. Boards for the scope and power supply are also available as well as wired units. I am sure a letter will bring all details.

* * * *

Tuning RTTY Signals

Irvin M. Hoff W6FFC (ex-K8DKC)
12130 Foothill Lane
Los Altos Hills, California 94022

From comments heard over the air and received in the mail, it seems that a number of RTTY enthusiasts are not familiar with the concepts involved in tuning RTTY signals properly. Some receivers "do not get 2975" audio tones so instead of taking appropriate steps to remedy this problem, many individuals either do not buy that item, or else try to convince the designer(s) of RTTY demodulators to include filters that will accomodate such receivers.

Although designing filters for audio tones other than 2125 and 2975 frequencies can be readily accomplished it is normally much easier to adapt the receiver to the normal demodulator instead of altering or modifying the frequency of the filters used.

Before we go any further, let's look at a table showing various things a receiver might be expected to do. Look at Table 1.

MODE	BANDWIDTH	FREQUENCY RANGE	CENTER FREQUENCY
AM	6000 hz	3000-0-3000 hz	0
SSB	2100 hz	300-2400 hz	1350 hz
CW	200 hz	800-1000 hz	900 hz
RTTY 850	1000 hz	2050-3050 hz	2550 hz
RTTY 170	300 hz	2060-2360 hz	2210 hz

This table necessarily has to be somewhat flexible as different individuals and manufacturers will have slightly differing opinions. For instance the "SSB" line shows a bandwidth of 2100 hertz - this is a typical bandwidth but until recently many manufacturers offered 2500 hertz or even 3100 hertz as in the Collins 75A-4 series. Some manufacturers at present are offering 1200 and 1500 hertz selectivity, but this is primarily for DX enthusiasts or even for RTTY purposes. You will of course realize that a "2100 hertz" selectivity is the same as "2.1 khz" that all Collins S-line receivers have as standard SSB bandwidth.

In the "AM" position, no b.f.o. is used and the i.f. bandwidth is increased therefore to around 6000 hz to give pleasing audio results. The earlier SSB receivers had filters giving selectivity around 3100 hz but nearby QRM would make reception difficult, so current receivers have somewhat standardized on 2100 hz selectivity.

You will note that the bandwidth needed varies a lot depending upon what mode of communications you are receiving, as does the audio frequency range shown in the second column. The audio tones of 800-1000 for c.w. are quite flexible, and this seems to be a good compromise, although some operators will disagree -- that is rather unimportant at this time as we are merely illustrating a trend, not recommending any standards.

The RTTY tones for 850 shift are figured on the basis of MARK 2125 and SPACE 2975, and for 170 shift RTTY tones of MARK 2125 and SPACE 2295. Other tones may be used, and after reading this article the operator should then be in a position to determine how to proceed for whatever receiver and/or demodulator combination he wishes to use.

By studying TABLE 1, certain differences in various modes are immediately seen - for instance a SSB receiver needs 300-2400 hz audio while RTTY for 850 shift needs 2050-3050 hz tones. It doesn't take an Einstein to see that these differing requirements pose a minor problem in the selection and operation of a receiver. Of course if a receiver had a 3100 hz selectivity position for SSB, then it would probably be adjusted to receive tones of 300-3400 and this would catch AM (via "exalted sideband" reception listening only on one side) as well as SSB, CW, RTTY-850 and

Continued on page 13

VHF RTTY NEWS

RON GUENTZLER W8BBB Editor

988 Chelston Rd. South Euclid, Ohio. 44121

AFSK KEYERS

This is probably a poor way to start, but we had planned to have developed and in operation by this date an AFSK keyer that would meet most of the requirements for a simple but adequate unit. However, we have run into a severe time shortage. We could have delayed this discussion, but felt that perhaps if we mentioned what was desired this might get someone else going.

We have been using a slightly-modified form of the AFSK keyer described by Byron Kretzman, W2JTP, on P.116 of his "The New RTTY Handbook". It has generally been satisfactory, especially when one considers that it requires only one twin-triode. However, it does have some shortcomings and we would like to use it as a basis for a critical discussion of AFSK keyers and by so doing indicate what a keyer being designed "from scratch" should have. (We are not saying that it will not give satisfactory service and we are not recommending that it not be built.)

The diagram of the unit we use is shown in the figure. Basically, the keyer is a single tube Hartley oscillator followed by a cathode follower. The oscillator is tuned to the space frequency. The frequency is shifted to mark by placing additional capacitance across the tuned circuit. The placement of the additional capacitance across the tank is done by means of the pair of diodes. This method of keying or frequency shifting is referred to as "dry keying," because a relatively small voltage and current are present in the diode circuit and therefore in the keyboard contacts on the teleprinter.

The first objection to the circuit is the so-called "dry keying." The contacts on a teleprinter keyboard are designed to work in a 130-volt, 60-ma loop. One advantage of this relatively high voltage and current in the contacts is that it tends to clean the contacts by burning out the oil film that gets on them. Another disadvantage of the "dry keying" is that the space frequency is dependent upon the capacitance of the leads from the keyboard to the keyer. Therefore, the space frequency has to be adjusted with the keyboard contacts connected (but open), and, if the lead length is changed, the frequency must be readjusted.

Both of these objections can be eliminated by using a polar relay to do the keying (the diodes are not needed in this case). However, a polar relay has the disadvantage that most people don't know how to adjust one. This does have a simple solution: use the I-193-C Polar Relay Test Set (see RTTY, April 1965). (There is some objection to polar relays because they are mechanical devices. We have not yet seen a teleprinter that did not have a slight resemblance to something mechanical; therefore, we won't buy the anti-polar relay pitch based upon mechanical arguments until all-solid-state teleprinters are available.)

The keyer suffers from rather serious transients in about the first 5 mS after switching from one tone to the other. This is a natural result of the frequency changing used; i.e., adding and removing an energy storage element from an oscillating tank circuit. For use in a QSO, this transient does not appear to have any deleterious effects; however, when using the keyer for test purposes, the keying transients cause quite a bit of "jitter" that make some tests difficult. It should be possible to reduce the transients by using two separate continuously-running oscillators and switching their outputs.

Because of the nature of a single ocsillator whose frequency is switched, the mark frequency is dependent upon the space frequency. This interdependence is a real nuisance when adjusting frequencies because any time the space frequency is changed, the mark frequency also changes. The solution is two separate oscillators.

Next problem: because of the frequency response of the audio input circuit in the transmitter, it may be necessary to make the two frequencies coming from the keyer have two different levels. Also, for test purposes, it may be desirable to have the two tones at some other levels. The keyer being discussed can have the two tones set over some range of values, but the levels are quite interdependent. A simple solution is two separate oscillators with separate output level controls in each oscillator as well as a master level control.

One additional note: The output from the keyer should be derived from a transformer so that hum and noise pickup is minimized by using an ungrounded output pair.

So, the new keyer should have the following: two separate oscillators permitting independent frequency and level adjustments, a floating output, and an input from the keyboard that is compatible with a 130-volt, 60-mA loop.

The oscillators should be of simple design consistent with good waveshape and relatively small ambient temperature and supply voltage dependence. A single junction - FET in a Hartley circuit should be suitable for each oscillator. We have looked into RC circuits (rather than the LC such as the Hartley) and have found shortcomings in each type investigated.

The switching between oscillators for the output can probably be done by means of simple diode gates driven from the keyboard loop. The output from the gates should go thru a simple low-pass filter to reduce switching transients as well as harmonics from the oscillators. A single stage of amplification into an output transformer should finish up the keyer.

SO WHAT'S NEW?

We have recently received the following information from Bill Karraker, W9AVE: The stations listed below are located in the Chicago area operating 6A2, horizontally polarized, on or near 145.51 MHz: W9ZGS, WA9RSN, WA9RLA, K9UXW, WA9LTJ, W9FUL, WA9QGW, W9AVE, W9GQY, W9BOD, WA9LTF, K9ZGT, K9RPX, K9QMJ, W9LDS, K9IVB, W9AZW, K9INR, K9WFY, W9DRN, K9AQJ. W9TKR, K9QNV, W9JCE. Twenty four is a respectable quantity and makes Chicago the most active VHF city to date.

Art Glaeser, W8VAJ, has recently joined the 40F2 group here in Cleveland.

That's all for this month. 73, RG.

* * * *

— RTTY NETS —

The nets listed are primarily lower frequencies, but usually have connections to VHF nets in the more populous areas. The VHF nets will be covered in W8BBB's column on VHF.

Northeastern Net - Summer schedule - Monday thru Friday at 2100 EDST (0100 GMT) approximately 3635 KCs.

Canadian Auto Start net - 3612 KCs.

Canadian Centennial Net - Tuesdays and Thursdays at 1930 EST, 3630 kcs.

FATT Net (Florida) 3700kc 1900 EDST Daily.

Florida RTTY Net 3700kc. 1100 EDST Sundays only.

The Auto start Net (170 shift on 3637.5) is changing to forty meters for the summer months effective immediately. The new frequency will be 7137.5 - 170 shift. Summer static and a desire for a longer range during the days as well as nights led to a number of tests on this new frequency with much better results than 80 meters. Present plans are to return to the old frequency in late fall as conditions change. Everybody talks about 40 meters and it is nice to finally have action again on that band.

Readers - We still need articles- hints and kinks and good photos of you and your rig. Short articles are especially appreciated.

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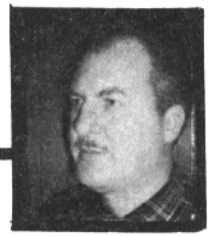
RTTY-DX



JOHN POSSEHL W3KDF Editor

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

Hello there. . .

When I first became involved in this column our good friend, and my mentor, Bud, W6CG, warned me that there would be times like these. Little if anything in the mail bag, poor conditions, low activity, and I guess I blinked my eyes a few times and any hard copy I had went down in back of the machine. When that happens either the mice chew it up or the kids tear it off and use the back of it for scratch paper. I suppose that in doing a job like this I should have a few cards up my sleeve for these special (?) non productive occasions. Unfortunately, the day is warm and the sleeves are short so we'll deal them right off the top of the deck. Here goes!

Band conditions have not been too good in general and in particular Ten meters have suffered quite a bit in these parts with the coming of the Summer months. What few openings that do occur are usually to the south. Nothing at all like a month or two ago when KA9AK was S-9 almost every day in the week. We haven't heard Cas here in weeks. Twenty and Fifteen meters are still in good shape only they seem to open much later in the day. For those interested in the long haul DX from these latitudes in the next few months would do well to consult some of the propagation charts currently available. A widely read analysis is published in CQ magazine monthly and has been very accurate in its predictions over the years. At least consulting something of that sort saves a lot of time tuning across dead bands.

This month we are pleased to confirm the following W A C Award.

Nr. 90 Bill Holman III K L 7 B A J

In an accompanying letter Bill points out that Alaska is celebrating its 100th year as a U.S. Territory (now State), and that to remind you all that there will be big doings up there this Summer. A special Centennial Fair and Exposition grounds have been constructed and Bill is in charge of the Ham Shack that will be in operation throughout the Exposition period. The shack will be located on board a completely refurbished old river stern-wheeler used back in the early days of Alaskan development. With Bill in charge you can be sure that RTTY gear will be available and the special call to be used will be K L 7 Alaska Centennial Station. Bill says, "Come on up and join in the celebration".

Howie, operating KR6FQ has been on fairly often at around 12-1300z on the 20 meter band with real good signals. This station is at a Marine Corps base and QSLs can go via Okinawa Amateur Radio Club, APO San Francisco, Calif. 96331.

Dusty has sent me a letter he received from V U 2 K V in Calcutta and I'm sure the contents will be of interest to all. Venkat has a Model 15 in operation and has applied for, and is now awaiting permission to use F-1 on the HF bands. He seems extremely interested in knowing about the activity to be found on Twenty meters and also I'm sure would appreciate any general information about RTTY. If anyone would care to drop him a line and keep up the interest from this really rare spot, he can be addressed as follows: K. Venkataramanan, V U 2 K V, 34 Chowringhee, Calcutta-16, India.

RTTY-DX HONOR ROLL

		COUNTRIES WORKED	COUNTRIES CONFIRMED
1.	FG7XT	73	58
2.	W3KDF	58	52
3.	I1KG	60	49
4.	ON4BX	57	46
5.	W6CG	51	46
6.	W8CQ	46	40
7.	W1GKJ	40	36
8.	K8YEK	46	34
9.	UA1KBW	36	33
10.	W3ISE	33	28
11.	VE4BJ	28	28
12.	K8JTT	30	24
13.	W8CAT	24	23
14.	KL7BAJ	26	22
15.	K8QLO	31	20
16.	WB6ADY	24	20
17.	VP9BY	26	18
18.	K9QNV	24	17
19.	W6LDA	23	13
20.	K6YUI	8	7

The next listing of the DXHONOR ROLL will appear in the September issue. Please keep in mind that I must have your figures by the 5 th of August to be included.

• • •

While on the subject of potential new ones, P J 2 C R in Curacao is trying to get on with assistance from Jose, P J 2 M I but at this time we do not know how far they have progressed. Jean, F G 7 X T, has informed me that M P 4 B E U on Bahrain will be on as soon as he finishes a convertor. A letter to Dusty from K R 6 K R indicates that Jim will be on RTTY shortly. Jim is with the Voice of America and expects to be at that location for several years. Some of you may remember Jim as W 9 N T V and W 8 H K R.

Tom, V R 6 T C, will be in this country for about three months and by coincidence he will be visiting with some people right across the street from Dusty. You can be sure that Dusty will be in contact with him and who knows, perhaps one day soon we will have authentic operation from Pitcairn Island.

From down under K 8 Q L O reports V K 3 N R helping a new station to get going; V K 3 D M. Both stations were twenty over nine in Michigan. Noel, V K 3 N R now has narrow shift installed in his TT/L so he is ready for any type of conditions likely to come along. I had a short contact with Bill, V K 2 E G lately and he is quite busy and not able to get on as much as he would like to. Bill is to be congratulated on the arrival of a new jr. op. at his QTH some eight weeks ago. Bill also reports on the world travels of Doc, W 6 N K P. Seems that Doc was in Sydney for a short time after being in New Zealand for two weeks. From Sydney he was going to Singapore, Siam, and Japan and then back to the states. It sure would be great if Doc could exercise his fingers at a couple of the places mentioned above.

Lou, I1 O R S, reports a QSO with JX6XF, on Jan Mayen. He is reported as having good signals and should be found on 14 mc. from about 2200z. Alf is using a tape printer so it would be best to be ready with local LF/CR. This station has since been worked by F G 7 X T, W 2 L N P, and others so apparently is quite active. Several weeks ago O N 4 B X reported a contact with J X 5 C I. This station uses 50 band so will require a little range control adjusting. I'm just thinking, it took me over thirty years just to find a station on Jan Mayen to work on CW.

There have been a couple of excellent signals coming from Latvia recently. U Q 2 A B and U Q 2 A N have been quite active from this area.

K 8 Q L O reports P A Ø Q J and P A Ø Y Z and I had a contact with P A Ø P I M for his first stateside. P A Ø C D V is also quite consistant with very good signals.

We have a letter from someone in Bologna, Italy on the Alexander Volta committee but unfortunately neither return address or call were included so we are unable to send a reply at the moment. This year the Alexander Volta RTTY Contest will be held in December, the exact dates to be announced later. In the meantime the contest committee would like reader opinion on how you like the present scoring system and any suggestions you may have for improving the contest. I am sure that Lou, I1 O R S will be glad to accept any comment you may have and will see that it gets to the proper person on the Volta committee. This has always been a very popular contest and the Volta group came up with a very unique and fair scoring system that has since been used in all RTTY contests. It is hard to improve on the basic scoring system but there are some areas where some additions might be made for added incentive. I'm sure you have

From Italy some of the newer stations reported are I1 M I G, I1 M Y, I1 T O L, I1 W T, I1 P E T, I1 K B T, and I1 I D O. It looks like machines are really becoming available over there. I1 I I is operating narrow shift and it is a pleasure to copy Tino thru the usual evening QRM.

Besides an old reliable like D L 3 I R, a couple of new signals such as D J 5 M X and D L 8 U D have been printed from Germany.

A scattering of others printed recently were E I 6 D, O E 5 A C L, S M 5 B J U, O N 4 L I, L A 2 Y E, and L A 6 J.

At this point I would like to say a word of THANKS to you fellows that have been supporting this column for the past few months with your letters and on the air reports. At times it is hard to acknowledge each one individually but believe me every little bit helps and I welcome anything you have to say for the benefit of the RTTY DXer.

73 de John

HITS & MISSES

From The Editor and his Mail

As stated in our first issue we will have only one summer issue, a combined July-August number. Under present plans we hope to have this issue mailed about the middle of July and the September issue will be mailed about the 20th of August with the future mailing date the 20th of the preceding month for all issues. This will move the classified ad deadline to the 5th of the month.

• • •

If we seem to be "promoting the sale" of a certain item in an article, maybe we are... Anyone supplying printed boards or other special items for RTTY are doing it largely as a labor of love. The profit from their entire output might not pay for an ad in QST yet they are offering a real service to the RTTY fraternity. We also feel it is a service to let you fellows know about it. There is nothing published that can't be done the hard way so you always have a choice. If there are competing products available we are always happy to hear of them and offer the same publicity.

• • •

EST, EDST, CST. CDST. MST, MSDT, PST, PDST- vs GMT. Isn't it kinda silly to use 8 or more different time designations and confuse everyone when it is always midnite at 0000 GMT or Z time? Any hams working DX have long ago gone to GMT as a universal time designation. Why can't everyone?

When I keep a schedule at 2200 GMT (or Zulu) I know when I am supposed to be there regardless of the time zone another party may be using.

• • •

Anyone having problems with Heathkit equipment on RTTY might write to - "Jerry" Tolsma, Technical Consultant, Heath Co. Benton Harbor, Mich. Jerry, W8GPB, is a RTTY fan and will answer the questions on his own time so please send a SASE envelope with any inquiry. (The practice of enclosing a self addressed stamped envelope should be followed in all cases of inquiries to individuals for information.)

• • •

The Canadian Amateur Radio Teletype Group are going all out in promoting the Annual DX RTTY Sweepstakes, this coming October 14-15 weekend, in honor of the Centennial Celebration this year in Canada. Special certificates and medals will be awarded. Full details will appear in the next issue but mark your calendar now.

And somewhat lost in all the publicity of Exo 67 is our own Centennial Celebration of Alaska being held this summer. Bill Holman, KL7BAJ who is very active on RTTY is in charge of the amateur radio activities of this celebration. A special Centennial station will be in operation from Fairbanks using the call KL7ACS. This station will monitor 3866 and 145350kcs for any mobile calls. Special QSL cards will be sent and as Bill will be in charge of the hamshack he assures that RTTY will be available. The dates are from May 27th to September 21 Alaska has spent a lot of money on exhibition grounds and offers a vacation that you will never forget with a royal welcome to all and especially hams attending. You can drive - fly or go by boat and it is a trip you will never forget.

• • •

The recent Air Mail rate increase to European and Northern African countries adds 10¢ per copy per issue or $1.10 per year. At present we are able to absorb some of this cost in the interest of serving our foreign subscribers but effective with the September issue the Air Mail rate will be increased to $5.50 per year. The first class rate remains $3.50 per year and offers much lower rates with only a week or so longer delivery date. All present subscriptions will of course be honored at the old rate.

• • •

There was a big Frenchman
from Guadeloupe
Too big to land in a parachute
But he flew from island to island
here and there-
Putting new RTTY counties for all
on the air.

• • •

While most nets are primarily for traffic, general news and information is also exchanged.

• •

Walt, W7ARS, says that KC4USV although busy with traffic will be able to work some of the RTTY boys as soon as their antenna situation is fixed.

Tuning RTTY Signals

continued from page 7

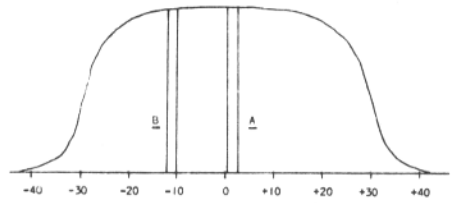
RTTY 170. HOWEVER. this all-inclusive selectivity position would be THREE TIMES as broad as needed for RTTY-850 shift, TEN TIMES as broad as needed for RTTY-170 shift, and FIFTEEN TIMES as broad as needed for CW. So that is not the answer for the true enthusiast.

Before going into how a receiver works, we can easily draw a conclusion at this point: AM, SSB, CW, RTTY-850 and RTTY-170. EACH HAVE DIFFERING REQUIREMENTS AND FOR OPTIMUM RECEPTION OF ANY OF THESE MODES SOME CHANGES WILL NEED TO BE MADE IN RECEIVING TECHNIQUES AND ADJUSTMENTS. Now to proceed.

The signal comes into the first mixer from the antenna and is combined with the output of a heterodyne oscillator sometimes called the "high frequency oscillator". In our illustration a 14.0 mhz signal from the antenna is combined with a 17.0 mhz signal from the heterodyne oscillator to produce a difference of 3.0 mhz. The 2nd mixer then combines this 3.0 mhz frequency with the output of the v.f.o. a difference of 455 khz (approximately -- these figures were rounded off for illustration) results. This is then fed to the i.f. filter to reduce the bandwidth to that desired, then the 455 khz signal is beat against a b.f.o. to produce an audio difference, fed into a product detector and comes out as audio to operate a speaker or the RTTY demodulator.

One of the difficult things to visualize unless somebody points it out is the bandwidth of the receiver prior to the i.f. filter section -- many readers have used or at least heard of "panadaptors" that show the r.f. spectrum in the vicinity of the signal you are hearing -- these panadaptors usually have a variable bandwidth so you can look at a few kilohertz or at several hundred kilohertz. Thus the bandwidth of most receivers prior to the i.f. filter is often several hundred kilohertz wide. Sometimes less. This is important to our discussion. If your receiver has a 2100 hertz i.f. filter, this MEANS THAT YOU COULD MOVE THAT FILTER AROUND TO RECEIVE DIFFERENT AUDIO TONES AND STILL HAVE SATISFACTORY OPERATION. For instance there is no reason you could not move that 2100 hertz filter to receive audio tones of say 13,000 to 15,100 hertz. The important thing to realize is that the pre-filter i.f. bandwidth is rather staggering, and can be utilized if desired to receive audio tones OTHER THAN THOSE NORMALLY USED.

Let's see how this may be done.



Note Fig. 2 -- the pre-filter bandwidth is shown here to be around 50 khz which is not unreasonable for many receivers. The 2100 hz filter is shown in two different positions in that broad pass-band -- position "A" is a normal upper sideband position approximating an audio response of 300-2400 cycles. No filter would have skirt response perfectly vertical as shown, but again this simple drawing is to show how these things work. The filter is also shown as position "B" which is a second condition -- we could have shown two separate drawings, so don't be confused by the filter being shown twice.

At position "B", the audio response now is roughly 10,000 to 12,100 hz. This is for all purposes of no use to anybody, but shows that it can be accomplished readily enough if needed for some special purpose.

How do you move the filter around like this? THAT IS THE WHOLE POINT OF THIS ENTIRE ARTICLE - BY MERELY VARYING THE BFO FREQUENCY!

We could quit right here except there are going to be a lot of readers who are going to say "I have a fixed-frequency BFO - how can I move it?" Fine -- this article was intended for you in the first place.

Let's talk for a moment about "upper" and lower" sidebands. This is something we had a long time before "single sideband", but only in recent years have receivers been marked "upper" or "lower" - all this refers to is the position of the i.f. filter with respect to the center frequency -- in this case 455 khz for our illustration. On Fig. 2, position "A" would be called "upper" sideband since we have

shown it on the "high or plus" side of center frequency, and position "B" would be "lower" sideband since it is shown on the "bottom or minus" side of center frequency.

Now receivers can obviously use the same filter for either upper or lower sideband, but it would be a pretty good task to use it for both at the same time -- the way to accomplish that is to use a filter a lot wider and then place it to ride equally on both sides of center -- hence our 6000 hz filter for AM purposes that goes from +3000 hz to -3000 hz.

In the case of a 2100 hz filter for SSB, however, we usually place it with respect to center frequency so that it gets +300 to +2400 hz for "upper" sideband or else -300 to -2400 hz for "lower" sideband. That is simple to accomplish. The AM filter for plus-and-minus 3000 cycles straddled center so the bfo was placed at "zero" or 455 khz in this case. Since AM has a carrier, you don't even use a bfo, actually, but you "could" in order to tune in the station properly. You know that a station being tuned on an AM receiver can be heard up and down the band quite a bit, but there is only one "correct" spot and you need to set the BFO on "zero", turn it on, tune the signal so the carrier is "zero-beat", then turn the bfo off and you are correctly tuned. That is the only way you can be certain you have tuned an AM station in an optimum manner. However, I doubt if 1% of the operators listening to AM signals use this technique -- with a 6000 hz. filter, who cares if you are off 100-200 hz or even a kilohertz or two?

For RTTY and SSB we certainly care -- on SSB if you miss the correct frequency more than 50-100 hz, it becomes quite difficult to understand the station talking. On RTTY, if you miss the frequency more than 100-200 hertz, chances are you won't even print him correctly, depending on the type of demodulator, the shift being used, the sharpness of the audio filters in the demodulator, etc.

Back to SSB a moment. Let's assume we want 300-2400 hertz "upper" sideband with a 2100 hz filter. The center frequency of that audio range (TABLE 1) would be 1350 hz. That was obtained as follows:

$$\begin{array}{r} 300 \\ +\,2400 \\ \hline 2700 \\ \hline 1350 \text{ hz.} \end{array} \quad \text{(eq. 1)}$$

Thus to get upper sideband we merely put the BFO frequency 1350 hz HIGHER than center -- if center (as in our illustration) was 455.000 khz, we then want the BFO on:

$$\begin{array}{r} 455.000 \\ +\,1.350 \\ \hline 456.350 \end{array}$$

Simple, huh? If you have a receiver with 455.000 khz i.f., check and see if they aren't using a 456.350 upper sideband crystal.

For lower sideband, the same technique is used, only now you SUBTRACT from 455.000 instead of adding. Thus for LOWER sideband:

$$\begin{array}{r} 455.000 \\ -\,1.350 \\ \hline 453.650 \end{array} \quad \text{(eq. 3)}$$

Look at your BFO frequency for LOWER sideband and see if you don't have a 453.650 khz. crystal!

Well, that's the way it's done. You can now easily (?) figure your own requirements. Let's take another example. First, KEEP IN MIND THAT ONLY ON LOWER SIDEBAND DO YOU RECEIVE RTTY IN A NORMAL MANNER WITH MARK SOUNDING LOWER IN AUDIO FREQUENCY THAN SPACE. THIS ASSUMES YOU WANT MARK TO SOUND LIKE 2125 HZ AND SPACE TO SOUND LIKE 2975 HZ. IF YOU USE UPPER SIDEBAND, THEN THINGS WILL COME OUT BACKWARDS.

Getting down to RTTY requirements, now, let's assume we are going to use the same 2100 hz. filter for 850 shift RTTY. If we put it 1350 hz. off center frequency as we did for SSB, it will only get 300-2400 hz, so it obviously must have a different center frequency if we wish to receive 2125 and 2975 tones equally well. The center of these two tones is 2550 hz, using the same technique as in eq. 1. Now, assuming we want "lower" sideband for all RTTY reception, we get a new BFO frequency of:

$$\begin{array}{r} 455.000 \\ -\,2.550 \\ \hline 452.450 \end{array} \quad \text{(eq. 4)}$$

and we find we need a frequency of 452.450. So we either make the BFO tune that far off center frequency on the low side if it is a variable BFO, or else we buy a new crystal for this frequency. Just that simple.

Now that we have the technique for finding the center frequency of any audio required range (eq. 1), we can next look at Table 1 again -- it says we only need a total bandwidth of 1000 hz. for 850 shift. What happens if we now get a sharp 1.0

Continued on page 16

CLASSIFIED ADS- Rate $1. — 30 words. Additional words 2¢. Closing date 10th of month.

TT63A REGENERATIVE REPEATER, helps receive biased, distorted signals, also serves as RTTY converter, complete with tubes, cable, and instructions for using the unit. Like new $25. FOB Brooklyn. RTTY Dual Frequency Shift Tone Converter: Northern Radio type 152, each tone converter is self contained w/ power supply, tubes, conversion details and schematic. Used-good-$32.00 each. Model 2A perforator used good $30.00 each. Send us your RTTY requirements. Altantic Surplus, 250 Columbia St. Brooklyn, N.Y. 11231.

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.

TOROIDS-88mhy., center tapped, unpotted, 5/$1.50 Postpaid. . .Model 19 set complete $100.00. Model 26, $55.00. Brand New (never out of boxes) CDR Ham-M and TR4A Rotators, $85. and $24...Page printer paper $5.50/case. 11/16" oiled perf tape $3./ box... MITE 104 printer $200. Hammarlund HQ-14OXA-$125... NC300-$110. ..Heath VF-1 VFO $10... WANTED: Gonset 2 meter communicator. Model 15.. Capacitor Decade Box and Audio Ocsillator, tri band beam.. List for stamp; what have you?.. W2DLT, 302R Passaic. Stirling, N.J. 07980.

FOR SALE Mdl-14 RO reperfs. These units have been removed from AN/TGC-1 comm center equipment. These units come without cover or standard base; however, no modifications are required. Just plug into your loop and operate. I have one wired up as described in the article by K9IUG in the April RTTY issue. These units come with a sync motor and 60 wpm gears. These units are in excellent condition. $40.00. B. L. FERRIS, P.O. Box 672, East Flat Rock, N.C. 28726.

FOR SALE Mdl-14, 15, 19 Sync motors with fan $10.00; 255 Polar Relays $2.50; Three headed TD's $60.00; B. L. FERRIS, P.O. Box 672, East Flat Rock, N. C. 28726.

HEATH MARAUDER HX10 excellent condition $200. W9IBX, W.D. Fulton, 624 W. Arbor Ave. Wheaton, Ill. 60187.

WANTED. MAINLINER TT/L demodulator. Must be in top working condition. Can pick up in Eastern USA. All letters answered. B. Arnold, 372 Senaca St., Niagara Falls, Ontario,

FOR SALE - BRISTOL model 560 chart recorder, $75. Servo amplifier, Bristol type J and Holtzer-Cabot motor $15.; B&W 850A Pi-networks $15.; 300 vdc plus-minus 1% 100ma regulated power supply $10.; 600 vdc @200 ma power supply $10. R. Doersam, W80EM, 2745 Bristol Rd. Columbus, Ohio 43221.

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.

FOR SALE - Two-tone limiterless TU as described in August 1965 RTTY phenolic PC board $3.50 postpaid, write Cashion Electronics, Box 7307, Phoenix, Ariz. 85011 for brochure.

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.

RTTY GEAR for sale. List issued monthly. 88 or 44 mhy toroids 5 for $1.75 postpaid. Elliott Buchanan W6VPC, 1067 Mandana Blvd., Oakland, Calif. 94610.

SERVICE-BUY-SELL, 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. 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 $1.50 postpaid. Call or write, Martin Geisler, 8926 Kester Ave., Van Nuys, Calif., 91402. Phone (213) 892-0685.

WANTED - Your extra teletype gear-need 28 parts, sub assemblies and machines (ASRs-KSRs-ROs-TDs-etc.). Also need some Model 15s, TUs or what you have. M. Geisler, 8926 Kester Ave., Van Nuys, Calif. 91402. Phone (213) 892-0685.

MODEL 14 TDs FOR SALE, with sync motors - end of tape sensing, tight tape levers. Specify 65 or 75WPM. New; $37.00 Good Used; $20.00. FOB Detroit, Mich. Satisfaction guaranteed. Keith Petersen, W8SDZ, 1418 Genesee, Royal Oak, Mich. 48073.

PRECISION TUNING FORK 400 cycles with electronics less 2-6AU6, fil. B-plus, modify to 425; $5.00; Standard 44 or 88mhy toroids - 5/$2.00. Printed circuit board with schematic, pictorial and voltage chart for famous Mainline (Hoff) converter-$5.00; K5BQA, 11040 Creekmere, Dallas, Texas. 75218.

44 and 88 mhy TOROIDS, 50¢ each. 255A polar relay sockets 75¢. Polar relays type 255A, $2.00. Sync motors, $10.00 Model 14 TD, $30.00. Polar relays type 314B, $3.00 L. Wanja, W5EJV, 804 Shady Lane, Dallas, Texas 75208

FAIRBANKS, Alaska Centennial Exposition, KL7ACS official station. Visitors call on 3866 or 145350. Informal get togethers, KINGS KUP, Noble Street, noon Saturdays. Commemorative SL'S sent. RTTY.

SELCAL- Next Month

We expected to have the second part of the Selcal article for this issue. When the authors found addition uses and applications for this piece of equipment they wanted to include them along with complete information on the operation and the article was not ready for this issue. It will run in the next July-August issue. In the meantime if anyone is in a hurry to build one, KØOJV has boards and complete wiring diagrams available for $10.00.