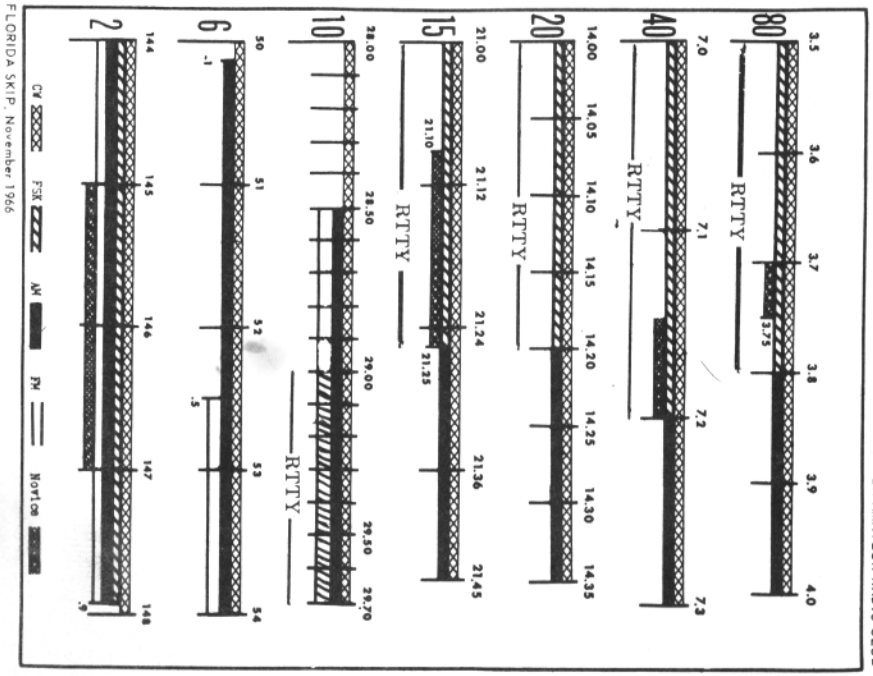

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EXCLUSIVELY AMATEUR RADIOTELETYPE

Vol. 15 No. 9 30 Cents

FCC Issues New Incentive Licensing Rules

The Federal Communications Commission this week took action in Docket 15928, the incentive licensing matter.

The Commission adopted at least the substance of many of the new rules it had proposed in April, 1965 (See May 1965 QST). The principal differences are those where the League had requested modifications -- the Advanced Class license privileges are reinstated, and the elaborate call sign arrangement for identification for class of license is dropped.

The proposed new First Class license concept is discarded. Instead, the Advanced Class is re-established. Applicants must hold a General license or pass the written exam for General before passing a code test at 13 w.p.m. and a technical exam of a level midway between the present General and Extra exams. Example study material for the new 50-question technical exam will be available as soon after November 22, 1967 as possible, and FCC offices will commence holding examinations sometime after that date. Present holders of the Advanced Class will effectively be "grandfathered" into some special privileges as outlined below.

Effective November 22, 1968, only holders of the Extra Class may operate in the sub-bands 3500-3525, 3800-3825, 7000-7025, 14000-14025, 21000-21025, and 21250-21275 kc.

Effective November 22, 1969, only the holders of the Extra Class may operate in 3500-3550, 7000-7050, 14000-14050, and 21000-21050 kc.

Effective November 22, 1968, only the holders of the Extra Class or the Advanced Class may operate in the sub-bands 3825-3850, 7200-7225, 14200-14235, 21275-21300 kc., and 50.0-50.1 Mc.

Effective Novmeber 22, 1969, only Extra or Advanced Classes may operate in 3825-3900, 7200-7250, 14200-14275, 21275-21350 kc., and 50.0-50.25 Mc.

The originally-proposed 2-meter subbands for these classes are discarded.

New Novice licensees, after November 22, 1968, will have no phone privileges on 2 meters. The 2-year license term for Novices is adopted, effective November 22, 1967.

The system of distinctive call signs with prefixes to identify the class of license is completely discarded. (The Callbook, incidentally, has plans to carry such identifications in its own listings.)

The Commission will issue 2-letter call signs to those applicants who are the holders of an Extra Class license and who have been licensed for at least 25 years. There will be no individual choice of call signs, and the $20 fee will be charged. First applications for the 2-letter call signs will be accepted November 22, 1967.

Any new applicant for Extra Class license must either hold an Advanced Class license or must pass the written examination for that license before taking the Extra Class examination. This procedure also becomes effective after November 22, 1967.

* * *

Programming a TD to "stop" for insertion of additional information.

GORDON E. WHITE
5716 N. Kings Highway
Alexandria, Va. 22303

Programming a tape transmitter to "stop" for insertion of additional information.

In using taped material for RTTY QSOs, it is often useful to have points where data can be inserted in an outgoing message, though most of the message could be pre-punched on standard paper tape.

Taking an idea from the new Teletype Model 37 ASR, now being designed, it is possible to punch a code in the tape that will automatically stop transmission and hold the tape in the T.D. while information is transmitted from the keyboard, then the tape may be restarted by pushing a start button. Any number of stops may be put on a tape for, possibly, signal reports or comments, in a prepared call-letter or CQ message.

The model 37 uses the blank (no perforations) code to stop the T.D. This may be done by adding a switch to a #28 stunt box, (most of which already contain a "blank" function bar) so that on receipt of "blank" by the printer, a circuit is momentarily closed, pulling in a relay which opens the clutch magnets of the transmitter. Either a two-step relay, or a dpdt type wired so that the second set of contacts "hold" the armature, can be used. The start button then either steps the relay to the closed position, or opens the dpdt auxiliary contacts, allowing the loop to the TD magnets to be completed.

The circuit can be wired easily into a #28 page printer, or even a #28 typing reperforator. Some #15 and #19 printers have a blank function, or it can be added. Of course this system can be used with any T.D.

This circuit of course requires that the printer be printing the outgoing message so that its stunt box receives the "blank" code to stop the T.D. It would be possible to program a logic circuit to operate the relay on receipt of "blank" from the T.D. and avoid using the page printer stunt box.

A Teletype #28 ASR was shown at the recent Armed Forces Communications and Electronics Association show in Washington, with the tape-stop feature. This set, mounted in a #37 office console (see fig. 1) contains a typing reperforator and an LXD transmitter-distributor. Retail price of the set was listed as $3,200 each.

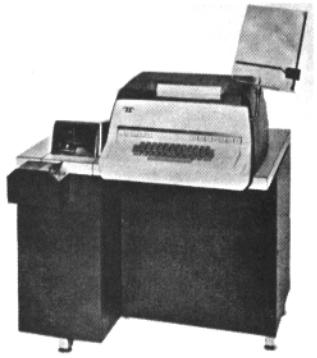

Fig. 2 is a proposed schematic of the stop feature. The operation of the stunt box contacts in the #28 is identical to the method in which the bell is activated, and if one hesitates to tinker with his machine, the momentary impulse of the bell circuit could be used to drive the relay. In this case the stop code in the tape would have to be "figs. S"

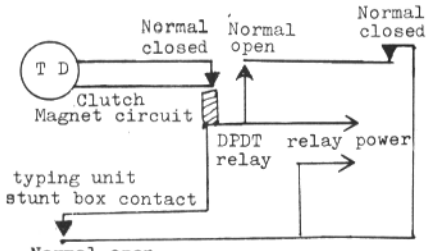

Figure 2
Circuit to stop tape on receipt of blank code.

••••

Using the Collins KWM2 on RTTY.

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

(Editor's Note: This is the first in a series of articles showing how specific receivers may be used for RTTY. A more general article by the author covering all receivers (THE RTTY JOURNAL, June , 1967) should be reviewed prior to reading this discussion.)

GENERAL

The Collins KWM-2 is a transceiver unit which combines most of the features of the 75S-1 receiver and the 32S-1 transmitter into one common unit. The KWM-2A is the same as the KWM-2, only with an extra 14 band segments (of 200 kHz each) available for MARS, WWV frequencies, or other commercial frequencies desired.

The unit was intended for SSB operation, although it is possible to use it on RTTY and/or c.w. modes. Several types of power supplies are available as are optional accessories such as remote tuning devices for operating "cross-band" for DX, etc. Other companies make accessories such as crystal-controlled transmit facilities again for DX "cross-band" operation, primarily. These accessories are intended primarily for SSB operation, but can be used for RTTY and/or c.w. modes. An interesting "novice adapter" for crystal-controlled transmit is available and will be discussed later in this article.

FILTER SELECTIVITY

The KWM-2 comes only with a 2100 Hz mechanical filter. No other filters may be conveniently added for any other purpose. Since this filter is two times as broad as is needed for 850 shift RTTY; seven times as broad as is needed for 170 shift RTTY, and 10-15 times more broad than needed for c.w., it is obvious that the KWM-2 must be regarded as somewhat less than optimum for RTTY operation. Other inconveniences in the case of both c.w. and RTTY keep the KWM-2 from being as satisfactory a unit as the combination of a separate receiver and transmitter. However, it CAN BE USED for either c.w. or RTTY with suitable results.

C. W. OPERATION

Most transmitters when used for c.w. merely put a carrier output on the air. Without becoming too technical, it becomes immediately apparent why such an arrangement would be inconvenient on a transceiver - the carrier would be "zero-beat" and if another station came back to you on the same frequency, it would not be heard at all! This is due to the audio in the receiver being limited to 300-2400 Hz. As a result, the KWM-2 does not transmit a regular carrier in the c.w. positions, but introduces an audio tone of around 1300-1500 Hz. into the audio system. In the "lock", "tune" and "c.w." positions, this audio tone is used in place of the regular microphone input. The microphone stage is biased off by introducing a large resistor into the cathode of that stage. The microphone gain control then regulates the level of audio tone that is sent to the rest of the transmitter. This controls the "drive level". Using this type of audio tone for c.w. is quite similar to using "a.f.s.k." for RTTY, and the transmitter must have outstanding carrier suppression as well as excellent sideband suppression to meet legal requirements. Otherwise you will be transmitting three different "carriers" instead of only one - although the other two will be highly suppressed.

In the "c.w." position, some audio is allowed to go directly from the internal tone generator to the loudspeaker to give a "sidetone" output. This allows the operator to monitor his c.w. transmission. That in turn allows the operator to tune in other c.w. stations for that same audio tone, thus assuring the operator of more-or-less normal c.w. operation. When the incoming tone sounds the same as the sidetone, then the KWM-2 is being operated on the same frequency as the other c.w. station. However, this tone of 1300-1500 is rather awkward for c.w. use, as most c.w. operators prefer audio tones for reception of around 800-1000 Hz. If the operator tunes the station being copied for 800-1000 Hz, then he will be in actuality transmitting almost a half kHz from the other station - a highly confusing situation in c.w. operation to say the least. It should be apparent that although the KWM-2 CAN BE used for c.w., it was never really intended this purpose at all. Many operators complain the c.w. keying is much "too soft", also.

BFO FREQUENCIES

As in other S-line receivers (and trans-

mitters), the lower sideband BFO frequency is 453.650 kHz. As this is 1350 Hz lower in frequency than 455.000 kHz, an audio range of 300-2400 Hz is then possible with the 2100 Hz filter. For all positions other than "lower" sideband, the upper sideband crystal is used. This is 456.350, and since this is 1350 Hz higher than 455.000, again an audio range of 300-2400 is obtained.

BFO FREQUENCY FOR RTTY

Assuming that 2125 (mark) and 2975 (space) will be used in the RTTY demodulator that is connected to the KWM-2, then obviously a new BFO crystal will be needed to give an audio range that would include the 2927 tone. Since the 2100 Hz. filter is about twice as broad as is actually needed for 850 shift RTTY reception, the selection of such a crystal is not critical at all. The crystal could vary from 451,950 to 452.950 and still be suitable. The 451.950 crystal would given an audio range from 2100 to 4200 Hz, and the 452.950 crystal would give an aduio range from 1000 to 3100 Hz.

However, the best symmetry of the filter with respect to the 2125 and 2975 RTTY tones would be a 452.450 crystal. This would center on 2550 Hz. and give tones from 1500 to 3600 Hz. Therefore, the operator would need to obtain this 452.450 crystal for BEST RTTY operation.

ORDERING THE NEW BFO CRYSTAL

Several companies make crystals. One such company is International Crystal Manufacturing Co., 10 North Lee, Oklahoma City, Oklahoma - 73102. Order their crystal for this purpose as follows:

A. Crystal Frequency - 452.450 kHz
B. Type - General Purpose
C. Calibration Temperature - 25 C (Room temp. inside unit)
D. Holder - Type F-700 (HC-6/U with wires for soldering rather than plug-in pins)
E. Circuit load - 32 pf.
F. Cost - $13
G. Your name and address

This gives a crystal calibrated within 0.01% (plus-or-minus 45 Hz in this case) with 0.005% temperature tolerance from -30 C to +60 C. This would be roughly 3 Hz plus or minus over a room temperature variation of 20 F, more than normal, since the crystal inside the unit would not normally vary quite as much as ambient room temperature. Another grade of crystal (the Commerical standard) is available for $15 but in this case does not offer enough to be worth the extra $2. Allow about 3 weeks for the crystal to arrive.

INSTALLING THE NEW CRYSTAL

Basically there is only one fairly easy way to adapt the KWM-2 to RTTY, and that is (1) add the new BFO crystal and (2) feed audio tones for RTTY into the microphone input (F.S.K.).

Since the lower sideband position should be used for RTTY reception to achieve normal 2125 mark and 2975 space, this new crystal will have to be added in the lower sideband position. Fig. 1 shows how this can be most easily accomplished. It includes adding a small switch on the chassis of the KWM-2). The "ALCO-SWITCH" miniature switch (Allied Radio stock number 56A3201 @ $1.65) will take up very little space and not detract from the resale value. It mounts in a 1/4 inch hole. Or any other normal toggle switch will be suitable. To go from lower sideband to RTTY will merely require this new switch to be thrown one way or the other. Assuming that the KWM-2 if used on voice is normally used on "upper sideband" position, then the addition of the switch/crystal will not inconvenience normal voice operation in all likelihood. The operator could normally leave the new switch in the "RTTY" position, and then the KWM-2 would be normal for upper sideband voice operation, or for c.w. operation. For lower sideband voice operation, the new switch would be activated to the other (voice) position.

TRANSMITTING RTTY

With the addition of the 452.450 crystal and selector switch as shown in Fig. 1 normal reception of RTTY signals is possible. However, to transmit RTTY on the same frequency for good transceive operation is something else again. The EASIEST way to do this is to use audio tones into the microphone input. This is called "A.F.S.K." for Audio Frequency Shift Keying. Normally the use of A.F.S.K. is highly discouraged and only on transceive operation is it even beneficial as a rule. It adds some additional expense to the station, but does not (in this case) require any additional rewiring of the KWM-2 - an obvious advantage to proud possessors of such equipment.

Most A.F.S.K. schemes are unsuitable,

actually. They use a simple circuit consisting of one inductor (often a 88 mh toroid) with a capacitor across it to give a tone of 2975 Hz, and then for mark an additional capacitor is switched in, lowering the tone to 2125. Such simple circuits are seldom suitable although they "do work" after a fashion. They normally produce all sorts of transients that may be amplified by the audio system in the transmitter, and they also produce all sorts of undesired harmonics that can be again amplified by the transmitter's audio system. Although the mechanical filter itself will prevent the harmonics being passed, their effects can create distortion which will in many cases be passed on through the transmitter. A comprehensive article concerning A.F.S.K. should be read by the KWM-2 owner before proceeding too deeply into this subject.

HOFF, "Audio Frequency-Shift Keying for RTTY", QST June 1965, page 32.

CONCERNING AFSK

In addition to the comments in the preceeding paragraphs, some slight advantages in adding the new 452.450 crystal are realized for AFSK over and beyond NOT adding the new crystal. Since the normal placement of the 2100 Hz filter results in audio output of 300-2400 Hz for voice operation, this means the suppressed carrier frequency is approximately 20 db. down on the skirt of the mechanical filter. With the new 452.450 crystal, the audio range now becomes 1500-3600 Hz and the suppressed carrier is now so far down on the filter skirt as to be of no technical interest. In addition, the suppressed sideband should now be SO FAR DOWN that literally no unwanted sideband output should exist. This, however would not be necessarily true of other types of transceivers, since few of them use mechanical filters.

Thus it is quite obvious that the new crystal gives much better results for transmission of A.F.S.K. audio tones than most other transceivers, and much better results than keeping the KWM-2 stock and then transmitting A.F.S.K. tones of perhaps 1275 mark and 2125 space. In addition, use of THOSE tones would require special filters in the demodulator, etc. These methods would be less desirable and much more expensive than merely buying one $13 BFO crystal for best RTTY operation.

If an ordinary simple A.F.S.K. system is used, it is easily possible to introduce distortion that then might show up in the transmitter's output, and in this case, it is possible to have all sorts of things happen to the carrier suppression, unwanted sideband output, etc.

THE NOVICE ADAPTER

Collins makes a novice adapter for the KWM-2 that has very interesting possibilities for RTTY. This unit is called the 399B-5 and costs about $46. (Do not confuse it with the 399B-4 @ $40. for the 32S-3 transmitter!)

This unit plugs into the socket marked "VFO EXT POWER" on the KWM-2chassis. A small bracket containing a tube, a 5-position switch and four crystal sockets must be attached to the side of the compartment holding the 6146 tubes. This small unit allows crystal-controlled operation of the transmitter on as many as four different frequencies, or putting the switch in the fifth position reverts the unit back to normal transceive operation. This would be excellent for SSB as well as RTTY. It is particularly beneficial to RTTY, as for a nominal amount of money it gives the equivalent of a separate transmitter (that doesn't drift!) and receiver. As one can immediately visualize, this also gives an opportunity to operate on "autostart" frequencies, or wherever it is of interest to easily hit a specific frequency quickly and accurately and remain on that frequency. The internal "VOX" relay then automatically changes the voltage from the plate of the PTO (for receive) to the plate of the crystal oscillator (for transmit).

ORDERING CRYSTALS

Assuming that A.F.S.K. is being used on the KWM-2 for transmit, then it becomes apparent that an audio tone will displace the actual frequency from the normal carrier frequency by an amount equal to the audio tone. For instance if you use 2125 mark and 2975 space, then the actual transmitted frequency will be 2125 Hz. lower in frequency (if transmitting in "lower" sideband position) than the carrier frequency would otherwise be. As a result, you must actually set the dial 2125 cycles higher than you would normally do if operating SSB.

Now if the new BFO crystal of 452.450 has been added as illustrated, then obviously this will offset the audio by 1200 cycles:

453.650
-452.450
1.200 kHz.

so now you only need tune higher by some 925 Hz:

2125
-1200
925

Thus you are now receiving correct 2125 mark and 2975 space when the dial is set 925 Hz. higher than would be necessary to receive SSB on the same frequency.

As the PTO basic frequency range is from 2.5 MHz. to 2.7 mHz, and the "Ø" end of the dial corresponds to 2.7 MHz. then you merely subtract this new dial setting from 2700 kHz. to order the crystal needed for the novice adapter. Normally you would not get this involved, but you might want to know how to do this in case you want to hit an exact frequency, as for autostart, etc. where the tolerances are small.

Let's take an example. Suppose you want to buy a crystal to operate on the interstate RTTY autostart net which is now on 7137.500 kHz. Well, first of all, this would be 137.5 on the dial of the KWM-2. Next, add 925 Hz. to this, which is 138.425, and now subtract this figure from 2700 kHz. The answer becomes 2561.575 kHz. That wasn't hard, was it? This assumes you have added the special 452.450 crystal in the BFO so you can use standard tones for transmit and receive both. If you have not added the xtal you just add whatever tone you use for mark to the frequency you would otherwise use if operating on voice. Say you were using 1275 mark and had retained the 453.650 sideband BFO crystal. Ok, in the example where you want to get on 7137.500, you first note the receiver would be set on 137.5 for voice operation, add the 1275 tone you will use for transmitting mark frequency and get a new dial setting needed of 138.775, and now subtract this value from 2700 kHz. The answer becomes 1561.225. You should be able to carry on for yourself from here. However, we hope that nobody is using audio tones of 1275/2125 into their SSB transmitter - whether Collins or other make. These tones greatly amplify the disadvantages of using A.F.S.K. and in fact it becomes very difficult to get an acceptable A.F.S.K. unit using these particular tones. It can be done but it is not likely you will do it with a home-made A.F.S.K. unit. Certainly none that I have seen described in amateur publications in recent years.

Ordering the crystals will ordinarily put you very close to the right frequency. However, if it is necessary to get "right on" a specific frequency, you must then put a trimmer capacitor on the grid of the crystal oscillator - either on the grid of the novice adapter's tube in place of the fixed 15 pf. capacitor there now, or else on the heterodyne oscillator's grid. Since the crystals on the novice adapter will be in the area of 2.5-2.7 MHz. then it becomes apparent you will not be able to "pull" that crystal frequency very much. Perhaps around 1/2 kHz. or so. Putting a trimmer on the grid of the heterodyne oscillator in place of the 15 pf. capacitor already there will enable you to pull the frequency up or down by perhaps 5-10 kHz. (depending on which band you are on), which is a substantial improvement. In either case a glass "piston" type trimmer would be easily added to the transmitter (they cost around $4 or less) and give excellent frequency adjustment. Such an addition should in no way seriously affect the resale value.

One reason why "some" variable frequency adjustment would be needed to hit a specific frequency exactly is that you have several oscillators all of which would have to be on the exact frequency for things to work out correctly. This is not likely to happen, although they will usually be within 100 Hz. or so. The mechanical filter itself is not necessarily a 455.000 kHz. frequency, but usually very close. So some frequency adjustment will be needed to get closer than a few hundred Hz.

The value of the novice adapter for crystal-controlled operation should give the operator an excellent -- in fact an outstanding -- RTTY arrangement. There is so little operation of RTTY in general it is an advantage to use the same frequency on succeeding days. One can always throw the switch on the novice adapter and go back to normal transceive operation, anyway. This gives a versatility that only a very few RTTY enthusiasts enjoy at present.

While speaking of crystal operation - if frequency stability is really important, order the International Crystal type "HA" crystals for the novice adapter - they have approximately one-tenth the drift of normal crystals, and are priced at $9 each. However, the greatest single frequency improvement can be made by buying a new "HA" crystal for the heterodyne oscillator for the band in use. For instance, on the 20M band, the modest cost crystals included in the KWM-2 can easily contribute 100 Hz drift to the receiver or transmitter all by themselves - more from a "cold unit" to a "warm one". Changing this crystal to a "HA" type can pare the warm-up drift to a fraction of what it had been, and over a period of a few hours operation can keep the drift to only a few cycles. If "HA" crystals are added to the novice adapter as well as to the heterodyne oscillator, it should be possible to have quite negligible warm-up drift of the transmitter. Of course there is a lot of heat developed in the KWM-2, so even then "some" drift will probably be experienced, but it still will be a fraction of the normal drift. Order these "HA" crystals for room temperature and 32 pf. load. No other crystal manufacturer known to the author can supply this type of crystal other than International Crystal Co. Get the "HC-6/U" holder for the right size pins.

More information can be obtained on the Novice Adapter by writing Collins Radio in Cedar Rapids, Iowa (Amateur Section) for their bulletin 523-0703-00 on the 399B-5 Novice Adapter.

If interested in ordering the novice adapter for the KWM-2, it is Collins' part number 522 1781 00 for $46.00 (price could possibly now be higher.)

SUMMARY

The KWM-2 can be used for RTTY. Transceive operation is rarely as convenient as the use of an independent transmitter and receiver. About the only remotely simple way a transceiver can be used on RTTY involves audio tones in the microphone input (A.F.S.K.) This in turn presents other problems and the customary simple A.F.S.K. units should not be used on 80-10M. An excellent A.F.S.K. unit was published in QST, JUNE 1965, (page 33). Since superior results on S.F.S.K. are obtained with audio tones of 2125 and 2975 (or 2125 and 2295 for 170 shift) especially when compared with the results of using off-beat frequencies such as 1275 and 2125, then a new BFO crystal should be added (as in Fig. 1) which will allow tones from 1500-3600 Hz to be used for both transmit and/or receive. These tones are also customary for normal demodulators, so no special filters need be obtained for the demodulator.

Other methods can be used for putting the KWM-2 on RTTY, but they are hardly worth all the extra effort involved.

Thus a good A.F.S.K. unit and a new BFO crystal of 452.450 is all that is needed for excellent transceive RTTY with the KWM-2.

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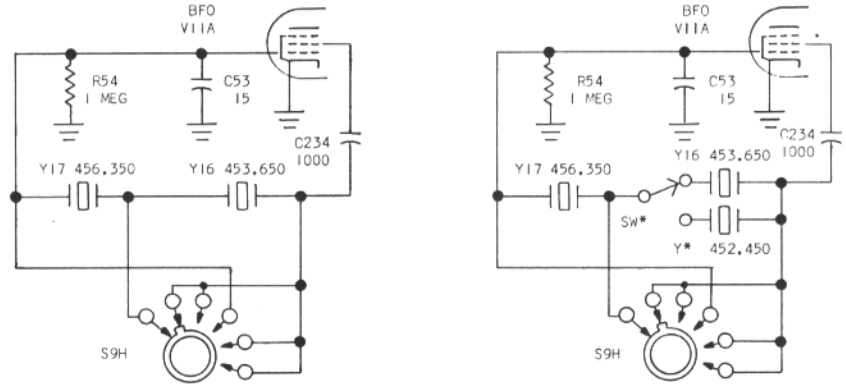


Fig. 1

MODIFYING THE KWM-2 FOR RTTY

Note the addition of a 452.450 crystal to the BFO (lower sideband position) which is selected by a SPDT toggle switch mounted on the chassis. This switch then allows normal lower sideband for voice reception, or RTTY in the other position. When on RTTY, the audio range will be 1500-3600 Hz. Normal a.f.s.k. input tones of 2125 and 2975 may now be used for transmission as well as for reception.

VHF RTTY NEWS

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

A SIMPLE VERTICAL 2 METER ANTENNA

We are going to describe a simple ground plane antenna suitable for use on 2 Meters. Total construction cost should be less than $2.00 if you have to buy everything, and down to $0.00 if everything is on hand.

Before starting we want to make two apologies: 1) We are sure that we have seen this antenna described in print somewhere, but don't remember where. A quick check of three of the best-known amateur publications did not reveal the source. We first saw an antenna constructed in a manner similar to the one to be described built by Dave Goodman, WA8UIT, about 10 years ago. If anyone knows of a description of this antenna in some amateur publication, please let us know and we will give credit for it here. 2) We are a poor artist and will therefore try to describe in words the manner of construction. We can't take a picture of the antenna because it is 55' overhead!

REQUIRED MATERIAL

The following material is needed for construction: 1) A chassis-mounting coaxial connector such as the Amphenol 83-1R (SO-239); 2) Five pieces of 20-inch long bare #10 solid copper wire; this can be easily obtained by buying some 10-TW wire and removing the insulation; 3) Four 1/2" long 4-36 or 4-40 brass machine screws and nuts; and 4) An epoxy resin. The epoxy resin can be obtained at most hardware stores. Typically, it comes in two small tubes, at a price of $1.00 for two tubes.

CONSTRUCTION PROCEDURE

Take four of the pieces of #10 wire and bend a small loop in one end of each piece; the loop should be just large enough to pass a #4 machine screw. In the following description, it will be assumed that the coaxial connector is always held with the mounting flange horizontal and the threaded end downward. Place the "looped" end of one piece of wire on the top surface of the flange and place a #4 machine screw thru the loop and the flange; put a nut on the machine screw from the bottom of the flange and tighten. Repeat for the other three pieces of wire, always placing the wire on the top surface of the flange. Adjust the position of the four pieces of wire so that they are at 90 angles to each other. Now bend them downward so that they are about 20 below horizontal.

Solder the radials and the machine screws to the connector flange. This can be done best by means of a torch, but a large soldering iron or gun may be suitable. Be careful to not get too much solder on the connector so that it flows down onto the threads of the connector; also, be sure to not get the connector too hot.

Take the remaining piece of #10 wire and solder it to the center conductor of the coaxial connector, making sure that the wire is vertical. For convenience in adjustment later, it is advisable to put a small loop in the other end of this wire.

The remaining construction steps are concerned with applying the epoxy resin to the top side of the connector in order to strengthen the support given to the center conductor and to weatherproof the "top side".

Obtain some 1/2" wide, or wider, cellophane ("Scotch") tape. Build a dam or mold around the outside edge of the connector flange. This mold should be about 1/2" high. The sides of this mold should be as straight and as vertical as possible. Also, it is mandatory that the tape contact the flange at all points around the edge of the flange. Because the antenna radials were fastened to the upper surface of the connector, they will be in the way. It may require a bit of strong language to do a good job at this point. Mix up a batch of the epoxy resin and pour it into the mold. It will probably take about 24 hours for the epoxy to set. It is wise to inspect the antenna every half hour for the first few hours after the epoxy was poured into the mold. The

inspection is necessary because although the epoxy appears very viscous, it has a nasty habit of flowing thru very small openings and down over the threads of the connector. (It can be removed from the threads once it has set, but it is best to avoid having to remove it.) The curing process can be shortened by applying heat, but the adhesive on the cellophane tape is heat sensitive, and too much heat and tape let go - this gets messy.

Once the epoxy has cured, the tape can be removed. Make a 2" long, 1/2" diameter cylinder out of a sheet of paper. Place this over the center conductor of the antenna and fasten it to the epoxy by means of cellophane tape. If you want to get fancy, make the cylinder in the form of a truncated cone with the wide end downward. Mix up another batch of the epoxy resin and fill the cylinder/cone. Let it cure for 24 hours with the usual inspections at first. Once the epoxy has cured, remove the form. Part of it will stick to the epoxy and can be removed by filing. The antenna is now complete.

ADJUSTMENT

Suspend the antenna from the ceiling using a piece of string thru the loop on the end of the center conductor. Connect the antenna to a transmitter and adjust the antenna for the lowest SWR by bending the radials and by cutting off the end of the center conductor. The SWR should be about 1.4:1 at a minimum. The antenna should be optimum as constructed, so chop off the center conductor slowly!

MOUNTING

The mounting method is relatively simple. Use a hollow 1 1/4" or 1 1/2" O.D. mast. Run a coaxial cable having an Amphenol 83-1SP (PL-259) or the equivalent on the antenna end up the center of the mast. Connect the cable to the antenna and thoroughly tape the underside of the antenna and the coaxial connector on the cable. A thin vinyl electrical tape is best. Obtain a sealing compound such as "Mortite". This is a putty-like material obtainable in hardware stores. It is used for sealing (not glazing) windows and doors. It has most of the characteristics of putty, but ostensibly never hardens. Liberally apply the "Mortite" to the underside of the antenna thoroughly covering the cable connector. The "Mortite" and the weight of the coaxial cable will hold the antenna in place.

MISCELLANEOUS NOTES

The radials appear to be too short. The first antenna we built used the dimensions given above because that was all the wire we had on hand. We were disappointed when we could not get the SWR lower than 1.4:1. The optimum position for the radials was about 20° below horizontal. We proceeded to build another antenna identical to the first but with longer radials. The new antenna gave an SWR as near to 1.0:1 as we could detect. However, a rather exhaustive series of tests showed that the one described always outperformed the one with the longer radials and lower SWR.

SO WHAT'S NEW?

We recently had a letter from Roy Robinson, K4EDU, in Augusta, GA., saying, in part: "We are working at putting in a 2M net here in Augusta. Will be on 146.7 40F2 vert. -- Also considering a 2nd on A.M. freq. & ant. undecided. Would like to know if anyone has a good conversion for the TH5 Signal Corps. teletype unit. The freq. & shift are not compatible with standards."

John, W3KDF, our "DX" friend sent along the following information from Cas: "Plan to run a beacon from KA9AK from 2230Z to 2330Z simultaneously with activity on ten meters. Have a separate set up for six from the HF gear so I can do it with no interaction, until switching on tty, then I have to use the same TU. I have not been able to promote much interest in spanning the ocean on six meters except for Hank Glover, W8GJM and FG7XT. Since I am limited to 50 watts output on six meters would like to get some West Coast RTTY station interested in giving it a try. Australia was coming in up here pretty good last year and this year should be able to make it across the pond. KA7AB claims he heard a PY5 talking "cross town" in April this year so F2 hop is in, but since he is about 1100 miles south of me, whether it is in this far north is questionable. Oh yes, the beacon will be on 50.505 kcs. Will run it on CW and switch to FSK upon someone alerting me on ten meters that it is heard."

So there is a challenge. Unfortunately it takes two to make a contact, but at least one is ready. How about it?

73 ES CUL, RG

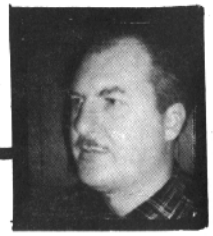
* * *

ARRL BULLETINS

Teletype Bulletins are sent by W1AW daily except Monday at 0300 GMT and on Wednesdays at 2300 GMT simultaneously on 3625-7045-14095 and 21095 Kc.

* * *

RTTY-DX



JOHN POSSEHL W3KDF Editor

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

Hello there. . .

This month our congratulations for W A C go to. . .Nr. 92 E. E. St. John W6LDA

Apparently a mid August qso with Howie at KR6FQ turned the trick for Edd. It also indicates that Okinawa is on the active list and one to look for on Twenty meters for an Asian contact.

In a note from KA9AK, Cas states that he has made his first contact across the Pacific on Ten since last May. This was into California and on C.W. but it does have significance in that last year it was mid October before Cas heard anything and this year his first contact was in August. The path was also open to Europe but no qso at this writing.

A few items from Newt, K8QLO. It seems that Rtty'ers are on the move again. K8JTT flew to Europe in early September for a few weeks in London and Paris and Newt was to meet him in Amsterdam in mid September. Hope that the boys were able to visit some of the stations over there and listen to things from the other end of the line.

For you certificate hunters, there is a very nice one available via the A.R.I. for contact with three stations from the Brescia area of Italy. IICKR and IIPET are two of them, as for the third, well, you let me know when you find him. The certificate is called the "Diploma Leonessa D'Italia". Futher details can be obtained from either of the above stations.

This next item may not quite make it in time to be of use but there is a chance, so here it is. Norm, W1GKJ is going to operate the W/VE contest from Prince Edward Island the week-end of September 23-24 (cw) but also hopes to get on RTTY a few days before and after this date to give the RTTY gang a contact from there.

Apparently there were two independant RTTY efforts going on in Colombia at the same time. Many of you have perhaps worked Fred, HK3SO who has been on for several weeks from Bogota. However, just recently, HK7XI at Bucaramanga has been on with very excellent signals. Hernando is using a Model 15, a Mohawk receiver, and a home brew transmitter and TU. Neither was aware of the others operation and probably were inside the skip on twenty and not able to hear each other. I would imagine they have been in contact by this time for a "new" country.

Early in August there was some excitement on the activity of UA/FM on Sakhalin Island, and in fact Josef, DJ6ZBA, had a contact with this station. I have not been able to get any additional information since then. I have copied Vlad on C.W. and started a qso which we were never able to complete to the point of finding out about his present RTTY activities. Any further information on this station would be appreciated.

LX2BQ continues to be very active and after some early shift problems now has a very fine signal. Willy was formerly ON4BQ and only recently came back on the bands after about an eight year QRT. Willy also explains that the LX2 prefix is issued to those that are not citizens of Luxenbourg. Your QSL will reach him as follows -- Willy Bonblet, LX2BQ 9 rue des Pres, Contern, G-D, Luxenbourg.

GB2 SM has been quite active from time to time and some of the fellows have asked if this was a new country. Sorry, but the answer is no. The station is located at the Science Museum in London. The GB prefix is issued by the British Postoffice for special events and also to clubs and societies under certain conditions.

While in the midst of writing up this copy I tuned the band and had a QSO with Joe, OZ7OF. He told me some interesting news that I must pass along to you. At an International Summer Camp meeting in Denmark recently Joe met with YO3RF, Georg, of Bucharest. The discussion got around to RTTY (what else) and Georg was very interested and promised to let OZ7OF know the situation in Rumania as far as operating in this mode is concerned. Joe says that he can send a Model 15 as soon as he gets information regarding custom regulations and shipping information from Georg. Joe will keep us informed on the situation as it progresses. Joe also says that a large number of page printers, reperfs, and TD's have recently become available there at very reasonable cost.

If any of you have the opportunity to get to the Sept. issue of QST take a look on page 73 and see our old friend "Klondike Bill", KL7BAJ at the controls of the Alaskan Centennial Station. I recognize the Model 19 next to Bill but what is that "potatoe masher" he has in his hand?

A Model 15 has been shipped from Michigan to "Chepi" HR2JJC so a new country from Central America should be appearing any day.

The 7th World Wide RTTY Sweepstakes will be upon us shortly after you receive this issue so perhaps we should take a little time here and discuss a few things that may make it a more pleasant weekend for all concerned. I would say that it is pretty much accepted practice now that RTTY is conducted with a standard shift of 850 cycles at a pulse rate of 45 baud, in most cases. What constitutes the correct shift and correct machine speed seems to vary considerably from station to station. However, there is a lot of built-in tolerence in the system and one can usually make slight adjustments to his equipment to accomodate the other fellow when there is no QRM and band conditions are good. This will never do however for the fast exchanges required in the contest. So for a starter I think that we should check our gear and satisfy ourselves that it is operating as close as possible to the established standards.

We all know what happens when several 850 cycle shift stations all get on the same frequency calling the same station. The fellow on the receiving end reads none of them. Make short calls. The other fellow knows what his call is, he wants to know yours, so send his call only once or twice and yours a few time then listen. He may already have come back to someone and if not give another short call. If the station you are calling is a much sought after DX station listen to his instructions instead of calling indiscriminately. He will usually try to control the situation by asking stations to call him up or down several kc. Keep clear of his frequency when he is QSO. Don't call blindly, you will only foul up a qso already in progress. A great step forward in the reduction of QRM can be realized by having the capability for narrow shift (170 cy.) transmitting and receiving. The end result is beyond describing, you must hear it and see it to believe it. By narrowing the receiver band pass to true c.w. single signal reception you still realize the cross pattern on the scope monitor and perfect copy in what seems to be a solid mess of QRM.

When it comes to which frequencies to operate on we had best review the various bands. In some cases it is pretty well established on some bands but on others different countries have different regulations regarding RTTY. On Twenty meters it is usually centered around 14.090. Or Fifteen around 21.090. On Eighty it is from 3620 to about 3640. On Forty I would say we should look around 7040. Although some RTTY stations operate above 7100 many countries do not allow amateur operation of any kind above 7100. On Ten meters we have quite a problem. As an example. The U.S. hams must operate above 29 mc. as does Japan. Canada cannot operate above 28,100 for F-1, yet Australia can operate up to 29 mc. So you see, Ten meters requires quite a bit of tuning. I would suggest that we all monitor 28.025 and 29.025 plus and minus ten kc.

What follows is a series of calls that have been printed in the past month.

DJ6ZBA - DL3RNP - DL3IR - DJ8WAA - DJ9ETA - DJ9XBA - DL4ZZ - DL0IB - EI6D - F3PI - G3IYG - G3NYY - G6JF - GB2SM - HK3SO - HK7XI - HB9P - I1AHN - I1CAQ - I1CTE - I1EVK - I1FDC - I1ii - I1KG - I1KFL - I1LCL - I1MKG - I1TLM - KP4JM - KR6FQ - LU7EBB - LU8DR - LX2BQ - ON4BX - ON4CK - OZ7OF - SM3BCV - SM5BJU - UA1KBW - UA4KED - UAOFM - UQ2KAX - VE4FG - VE7UBC - K3IWW/VO2 - VK3KF - VK3NR - YV1IK/5 - 3C3FBP.

As this goes to press we received notice of the 3rd Alexander Volta RTTY DX Contest to be held December 2-3. Basic rules are the same as last year but the operating period has been shortened to 30 hours and there will be special awards for the three top scorers with power under 100 watts. More will follow in the next issue. In the meantime log and score sheets are available from--SSB & RTTY CLUB, Box 144, Como, Italy.

Will see you ALL in the contest, October 14-16. Good Luck.

* * * 73 de John

HITS & MISSES

From The Editor and his Mail

Some time ago the FCC came up with a pot on the stove entitled "incentive licensing". After stewing this pot for several years over the fire of - petitions - threats - polls and thousands of heated discussions they finally unveiled their results in a sort of a Mulligan Stew - something for everybody. Not as much as first suggested but still a number of changes from present regulations.

Regardless of our personal feelings on the changes this is the way it is going to be, at least for some time, and we might as well accept the new regulations and start planning operations under them. The 25 kcs allotted the extra grade class on the CW portion is going to crowd the rest of the CW portions although only time and experience can segregate the various portions of any band into "typical use" segments.

In any event everybody keeps their same call and if we can not work among the "brains" at least they can recognize us down among the "prolitariat" and even slide up or down and say hello. In fact if we want to make a career of it we might even pass the extra exam and zero in on the "brains".

* * *

Jim Salter, K5BQA, writes that his new circuit board for the TT/L-2 is being laid out now. The additional and very desirable circuits will require a larger board than the original TT/L-1 so the final price is undetermined. Jim wants those who ordered a board before the new circuit was published to know that they will get the new circuit unless they specifically request the old one. Six dollars is the tentative price pending location of surplus priced board materials. Anybody have some?. . . let Jim know.

* * *

With the 7th RTTY DX Sweepstakes due soon after you receive this issue the winter season should break out in great force. We hope and anticipate one of the greatest contests so far. Complete rules are in last months issue.

QRM will be terrific! Newcommers may be discouraged but really with a little perserverance - private swearing - and patience you will find that everyone can work their share. With our limited experience in past contests we might offer these suggestions.

Keep CQs short, especially stateside stations, listen and make short calls, spread out over the band - during this week end lets not worry about enroaching on the CW boys - they take over during their contests.

When working a DX station the W station should move off frequency and not end up the contact with a long CQ. Give the other stations a chance.

Watch ten meters! RTTY operation among Stateside stations will be from 29000 to 29050. Cas KA9AK will be on any time the band is open around these frequencies, however Canadians and many other foreign countries will be operating from 28000 to 28050 because of different regulations. Hopefully they will monitor our frequencies and we should tune their portion of the band for contacts. In calling a CQ it might be a good idea to mention where you are tuning. Check this band and call a few CQs, with everybody listening nothing happens. . .

* * *

We have just received notice of the 3rd Alexander Volta RTTY DX contest, December 2 - 3rd. Full details in the next issue.

New Subscriptions - Back Issues

As we are out of some recent back issues all new subscriptions will be started with the current issue. Back issues if available will be furnished at 30¢ per copy.

Back issues now available are May - July through December 1966 and March through June and September 1967.

* * *

HINTS FROM OUR READERS

COPYING NARROW SHIFT ON A W2PAT TU from WA3CFK

I found by accident that 170cps shift can be copied on the W2PAT TU by simply turning the balance control fully clockwise or counterclockwise so it picks up only the mark or space. By carefully tuning the signal can be placed on the edge of the filter, so that it will conduct on mark and not space. The best way to find the spot is to tune through the signal with the printer running, tuning for best copy. Although this will only work on good signals it is effective enough to make a contact and ask the other station to use a wider shift.

A HANDY OILER from W8IS

Obtain one of the inexpensive hypodermics from the drug store, the kind which doctors use once and throw away, and use it to oil those hard to reach spots on the printer. A little practice will allow you to "shoot" just the right amount of oil on any spot without danger of having it drop off the end of a fine wire usually used for such a job. A doctor friend says these are available for about 10¢ and are officially called syringes. There is a choice of diameter of points but I am still using some that he gave me so haven't had to buy any.

(Sequal) Since writing the above we received a package in the mail from Ralph, W8IS, containing one of these syringes. Said his first samples had been given to him and he had become a little fearful that they were not available for so low a price. Bought this one in a Revco Drug store for a dime - believe me its worth a dime just to hang on the wall to impress visitors. More scary than a WoufHong and very professional looking, one of the few remaining bargains for a dime even if you can't use it.

* * *

RTTY JOURNAL
P.O. Box 837 — Royal Oak, Michigan 48068
"Dusty" Dunn — W8CQ
Editor & Publisher
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"Irv" Hoff, W6FCC (ex W8DKC) and XYL

Arlene is not short -- Irv is 6 ft. 4.
Keith Petersen W8SDZ

Keith has a nice XYL,Bev, but unfortunately we have no picture.

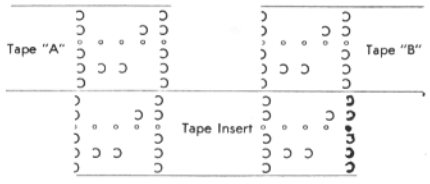
"Alright, so its a new altitude record for RTTY!"
"How the heck do we survive the contest weekend?"

Recommended (by K6ZBL) Standard Operating Procedure for Teletype Transmission and Tape Perforation

To facilitate reading, editing, and splicing tapes, it is recommended after the last character of each line to use the following in order:

1. One Letters (LTRS) Function
2. Two Carriage Return (CR) Functions
3. Line Feed(s) (LF) Function as required
4. One Letters (LTRS) Function

— TAPE SPLICING DIAGRAM —



The tapes to be spliced are cut as shown and the front end of "Tape Insert" is placed on top of the end of "Tape A" in the alignment indicated (done on the tape head) and run through the TD. This drives the available "lids" through the holes and fastens the splice together. "Tape B" is placed on top of end of "Tape Insert"..... etc.

Note that the "Style" of the tape is not altered; the splice is undetectable after transmission and no string of ineffective LTRS are transmitted. At least five characters of overlap is provided, with full perforations at each end for maximum strength and dependability.

HINT: Trim off the sharp corners of the tape at a 45-degree angle to prevent "dog ears" and the possibility of catching when entering the tape head.

ITEM 1 causes three desirable conditions: (1) Provides five lids to cover the leading edge of the splice and prevents catching and tearing of the splice as it enters the tape head; (2) sets off the machine function symbols from the text to aid in editing tape; (3) causes the machine function symbols to be always printed in the upper (letters) alignment on the tape, leaving the lower portion clear for writing in "line number index" which is of special interest to designer of "art works" wherein the printed characters are usually only meaningless symbols rather than plain English, which makes it difficult if not impossible to locate a particular line in the tape.

ITEM 2. The double CR provides additional time for the carriage to reach the left hand margin. This may not be of much consequence in hand keying, but when running full speed from a tape, insufficient time can cause overprints and errors in the received copy.

ALWAYS USE 2 CR---Even by Hand Keying

ITEM 3. The Line Feed Operation can be performed while the carriage is in motion, therefore should FOLLOW the CR signals and will also allow more carriage return time.

ITEM 4 causes four desirable conditions: (1) Provides five lids to secure the trailing end of the splice; (2) sets off the machine function symbols from the text; (3) assures that the new line will be printing in Letters, not Figures; (4) provides more carriage return time and/or serves to relock the carriage escapement.

Good luck on your Teletyping with cleaner tapes and more flexible operations!

* * *

CLASSIFIED ADS

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

FOR SALE- WHEATSTONE OILED 15/32 perf tape for CW Boehme keying heads. Any quantity. P.L. Lemon, W6DOU, 3154 Stony Point Rd. Santa Rosa, Cal. 95401.

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.

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 stype, 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

TUNABLE FREQUENCY CONVERTERS. Continuous tuning of shift from 100 to 900 Hz. allows tuning of non-standard shifts, allows instant changing from wide shift to narrow shift and vice-versa. Tuning lights give fast, positive indication of signal being tuned in. 250Hz @ 6DB selectivity each channel. Built in loop supply adjustable 20 to 120 MA. Metering circuit shows loop current and mark/space state. Built in band pass filter. All solid state. 20 semi-conductors and 1 integrated circuit. No converter on the market can match the Pioneer 900. Price $189.50 wired and tested. Guaranteed for one full year. Write to Pioneer Electronics, 738 Pacific St. San Luis Obispo. Calif. 93401.

MODEL 15 KEYBOARD and PRINTER plus FF-1 TU (850 cps shift, band pass filters and Mainline channel filters), sell as unit. 425 cps0.05% tuning fork, $3.00 Health kit model HG-10 VFO $25.00. K8ZQB, 3713 Orchard Dr. Midland, Mich. 48640

TOROIDS, 88mhy. center-tapped, unpotted, new, 5/$1.50 POSTPAID. Ameco CN-144W two meter converter, with P.S. and Xtal; $35. Like new Johnson 250-23-3 matchbox: $65. Northern Radio 104 converter $30. Gears for all speeds: Write. Sync motors $10. Drake lo-pass TV100LP filter; $7.50. Page printer paper (almost gone!!!) 12 roll case; $5.50. Heath VF-1 VFO $10. Unconverted SCR522 transmitter $15. Valiant $130. WANTED: Model 15 or 26. CDR Rotator. Tri-band beam. audio oscillator. capacitor decade. SX-28 receiver. Stamp for list. W2DLT 302R Passaic Stirling, N.J. 07980

FOR SALE 255A polar relays $2.50 postpaid. 255A sockets $1.00 postpaid. 14TD with 60WPM sync motor $35.00. 14 Strip printers complete with kbd EOL, and cover 60WPM $50.00. TT/L in perfect working condition $75.00. Viking II with Heath VFO with built in FSK $69.00. Brand new Johnson SSB adapter $150.00 K8CRE Richville, Michigan 48758

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.

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.

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; teletype test tape, either 11/16 punched paper or 1/4 inch magnetic AFSK (3.75ips) runs 7 min.: $2.00, all items above postpaid in USA. K5BQA, 11040 Creekmere, Dallas, Texas, 75218.

TT63A REGENERATIVE REPEATER complete with tubes, cable, instructions and schematic - like new $20. each. RTTY Dual frequencyshift tone converter, Northern Radio type 152, each tone converter is self contained with power supply, conversion details and schematic included, used good condition $20.00 each. Model 14 TD with synchronous motor - used - good - $25.00 each. Squelch Adaptor Mofification kit used on Hammarlund radio receivers, SP600 kit includes adaptor unit, name plate, knob, skirt assembly, tubes and cable clamps, new $7.00 each. We buy and sell parts. Write us. . .Atlantic Surplus, 250 Columbia St., Brooklyn, N.Y. 11231

88 mh TOROIDS FOR SALE, 5/$1.50.pp. Merc wetted relays 276G or 276F $1.50. pp. 2 inch 3.6 ohm 88mh toroids 50¢ pp. Four winding repeat coils $1.00 pp. W9FTE, 5665 N. 38th St. Milwaukee, Wisc. 53209

FOR SALE: 2125 and 2975 CPS dual tuning fork assembly $33.00, .05% stability, 68 to 86 degrees F. Transistor fork drive circuit kit, $10.00, assembled circuit $16.00. Data available Riverbank Laboratories, Box 65, Geneva, Ill. 60134.

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.

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)

COLLINS 75S-1, waters rejection tuning, 2.1 and 1.5 Kc mechanical filter with BFO crystal for standard RTTY tones (cost $100. factory installed) Mint condition - $295.00 firm. D. M. Burns, 4410 Reading Rd., Dayton, Ohio. 45420

BOEHM REPEATER new $35.00. CU89A monitor scope module new $30.00. Want late late Electrocom TU or 51J4. I also collect old violins, who has any? Joseph Szabat, W3LST, 228 Plummer, Oil City, Pa. 16301

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