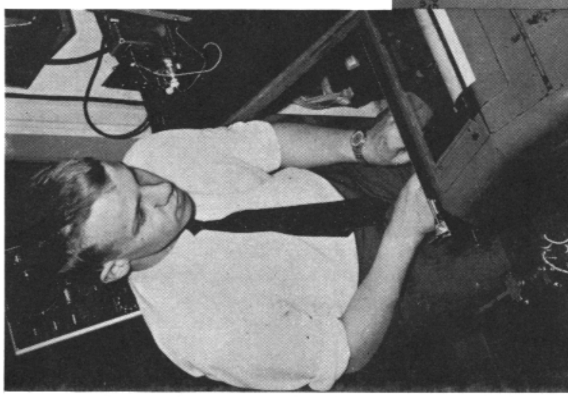
RTTY



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NEWS OF AMATEUR RTTY

JUNE 1964
30 Cents
Vol. 12, No. 6

HORSE TRADES

This page of the Bulletin is for use of amateurs who have RTTY EQUIPMENT FOR SALE OR TRADE and those looking for equipment to buy or trade. It is a free service and may be the means of getting someone on the air.

FOR SALE: RTTY Filters. Octal mount, tuned 2125/2975 cps. $5.95 pair. Collins "S" Line, $6.95 pair. WA6JGI, 3232 Selby Ave., Los Angeles, Calif. 90034

FREE: For stamped-self addressed envelope, Xerox copies of TT-63A/FGC repeater. W51FH, 1802 Edgehill, Pasadena, TEXAS 77502.

FOR SALE: 14 Typing reperfs, 14 TDs and parts, sync motors, and 15 parts. Wanted: Lab test equipment, digital counters, keytops, 14 keyboards, back-space, tape feed out and end-of-line indicators, W4NYF, 405 NW 30th Terrace, Ft. Lauderdale, Fla. 33311

WANTED: Manual for 0-73 A/URT, TM 11-5025. WA8FYF, 1171 East Hill Road, Flint, Michigan.

WANTED: 87.6 cps tuning fork for governed motor (60 wpm) K6PNW, 13150 Diericx Drive, Mt. View, Calif.

FOR SALE: TT-63A regenerative repeater. Brand new government surplus, $39.95 FOB San Francisco. Telemethods International, 3075 East 123rd, Cleveland, Ohio 44120

WANTED: TM for model 132 Teletypewriter. WA4KNO, 19621 N.W. 39th Court, Opa-locka, Florida 33054

FOR SALE: 255A Polar Relays $1.50, covers .25, Sockets .75 ppd; Covers and sockets with relays only; 14 TD; 14 Reperf; 14 Steel table; Teletype power supplies. K9MVX, 134 North Varsity Drive, South Bend, Indiana.

WANTED: Maintenance manual or other maintenance information on the model 15 Teletype. W4IPG, 138 Kentucky Avenue, Oak Ridge, Tennessee.

FOR SALE: Sync motors $10.00 each plus postage. W3WUX, 1712 Woodmere Way, Havertown, Penna. 19083

FOR SALE: 88 mhy Toroids, 50c each. 14TD sync, 60 or 100 wpm $65.00; 15 printer, excellent, rewired simplified, $100.00; 15 printer std. wiring w/auto LF/CR $125.00; 15 printer w/model 19 kybd. (tape punch) $150.00. Wanted: cover for 28 KSR. K5BQA, 11040 Creekmere, Dallas, Texas 75218

FOR SALE: Wheatstone perforator for Continental Morse. Also Boehme keying head and drive. K2MVR, 33 Laurel Place, Upper Montclair, N.J. 07043

RTTY, INC.
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Arcadia, California 91007
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MULTI-PATH—THE ENEMY OF RTTY

E. B. FERGUSON
137 Cole Street, Gardenvale, S4, Victoria, Australia

The publication of Frank Gaude's original article on the Limiterless, Two-tone, TU-D with "slide back" detection in June 1963 "RTTY", created world wide interest among the amateur fraternity using the F1 mode, particularly, in view of the references made to multi-path reception and within a short time, such stalwarts as W6NRM, K8DKC, WA9IBB and others were contributing further ideas.

There are some of us who do not wholly agree with some of the philosophy presented in some of these contributions, but all heartily agree that any means provided, which could alleviate some of the problems relating to good copy of RTY signals, is a step forward and in this respect, the basic principles of the TU-D are beneficial in some ways, as compared to what has been termed the "conventional T.U."

The referred to articles, together with queries by letter and "on the air" discussion, have prompted the writer to briefly discuss, non-technically, some tests conducted in efforts to determine cause and effect of multi-path propagation and if possible to minimize the effects upon RTY circuits and further, to describe simple means whereby two or more stations may determine the presence of, and with a degree of accuracy, the extent of multi-path propagation existing between them at a particular time.

Most amateur handbooks present a chapter devoted to radio propagation and from these it may be learned that signal reflections between the ionosphere and the earth's surface, form the backbone of H.F. communication, but the true picture of these reflections cannot be shown simply, due to the complexities and ever changing patterns of the reflecting media.

Probably many readers know, that throughout the world, a series of ionospheric sounding stations operate, often continuously and for those interested, full information on the technique adopted is contained in "Ionospheric Radio Propagation", Circular No. 463, Chapter 3, issued by the National Bureau of Standards, Washington, D.C.

Briefly, a synchronized transmitter and receiver are swept in frequency over the desired spectrum for analysis. The transmitter is pulse modulated and the reflected pulses are detected and reproduced as horizontal patterns on a C.R.O. and automatically photographed at regular intervals on strip film. Calibrated graticules on the C.R.O. face, representing reflecting height (vertical) and the swept frequency also appear on the photographs.

Observation of the strip film is usually accomplished by projecting the image on a screen, but for the purpose of this discussion, scaled drawings have been made of actual photographs for reproduction clarity. Figs. 1 and 1A illustrate a distinct change in ionospheric conditions above a particular sounding station situated in the north of Australia. Fig. 1 shows the condition at about 2100 and Fig. 1A the condition six hours later, at 0300 local time.

Specialized knowledge is required to fully interpret the significance of the display, but simply, whilst Fig. 1 tends to indicate two reflecting belts, one at about 350 kM. and the other at about 700 kM., it can usually be assumed the lower trace indicates the actual height and that the second trace is caused by a second bounce of the sounding pulse where a direct distance relationship may be shown, in this instance, 700 being a multiple of 350, so that, the information gained from Fig. 1 is that the reflecting medium is 350 kM. high and ionization density is such that at least two "bounces" are sustained up to a frequency of about 8 Mcs.

Fig. 1A is far more complex and supports the existence of more than one reflecting medium with ionization densities supporting multiple bounces not only between ground, but between layer and layer, a condition conducive to long term delays of signal elements as compared to single bounce propagation. Also of significance, is the evidence that propagation of this nature is only supported up to about 4 Mcs.

When the condition of the ionosphere is such that multiple reflections are sustained, a given element of a transmitted signal may be received a number of times and as well as being delayed in time, may be shifted in phase, giving rise to what is generally termed "selective fading" or "phase distortion" and as will be shown later, this effect can be lowered or increased to a large extent by a particular type of antenna.

There are, of course, other forms of multi-path reception. It has probably been the experience of many amateurs with beam aerials, to find a particular received signal is stronger when the aerial is orientated in a direction other than the known azimuth of the transmitting station either on the direct or reciprocal (long) path and where a non directional antenna is used in a case like this, multi-path reception is likely. These "scatter" sources of reflection are

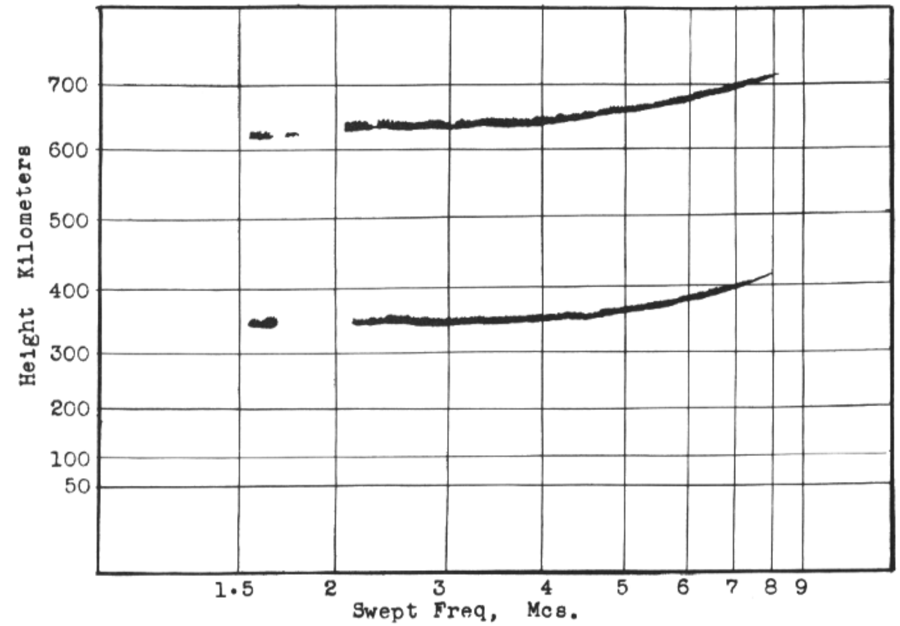


FIG.1

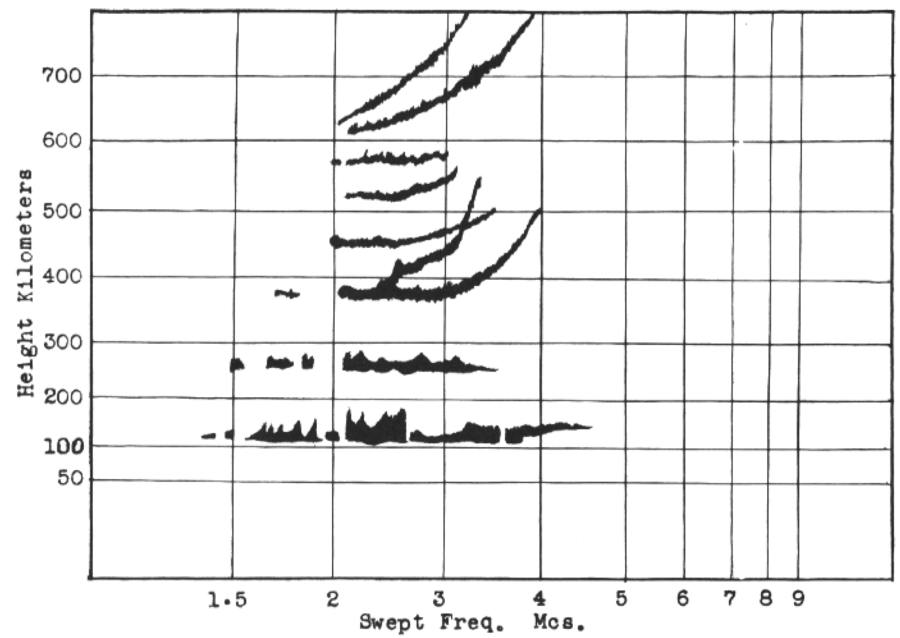


FIG. 1A.

more common adjacent to the equatorial regions and at certain times of the year, around the polar areas and when auroral displays are present, the V.H.F. men go to work in earnest. However, multi-path reception over the direct bearing between stations is by far the greater cause of failure of RTY circuits.

Of interest, may be the results of tests conducted by the author in an effort to minimize the effects of multi-path reception which was reoccurent at certain times of the year on a particular RTY circuit linking Australia with Papua/New Guinea. This circuit was supported by a number of transmitters operating simultaneously for frequency diversion, but for a period of three to four hours, mainly in the early mornings when the higher frequencies were useless due to skip and overseas QRM, only the lowest frequency of about 2.5 Mcs. was usable over the 720 miles separating the two stations.

It was this frequency which was suffering the most from multi-path, giving rise to outages when a large volume of traffic was generally handled and something had to be done about it.

The first test was to determine delay times on the particular circuit and for this purpose a transmitter was arranged to be pulse modulated by 2 millisecond pulses and at a rate of 21.7 pulses per second. The illustrations of Figs. 2 and 2A, which are also reproduced from photographs, indicate, in the former, an almost ideal reception condition, that is, only short term delays of two, or possibly at the most, three milliseconds and simultaneous RTY transmission was received "land line" copy. Fig. 2A indicates multiple reception of the single pulse, with delays well beyond 15 milliseconds. Needless to say, RTY at this time was almost complete garble.

The method used to observe the pulses at the receiving station was to connect a C.R.O. across the detector diode of a receiver whose A.G.C. was disabled and the R.F. gain adjusted to provide a suitable vertical deflection of the C.R.O. trace and the horizontal time base adjusted to provide two pulse displays. By showing two pulses having a known time interval of 21.7 milliseconds, horizontal calibration in terms of milliseconds is made possible as illustrated by the base line of Fig. 2. Finally, the C.R.O. was fitted with a camera, making possible the future study of the displayed patterns.

The illustrations of Fig. 1 correspond in time and date to those of Fig. 2 and the ionospheric sounding station beng siituated in the same area as the transmitting and receiving stations, permitted drect comparisons between the state of the ionosphere and reception of test pulse and RTY transmissions.

Taking the geographic positions of the two stations (720 miles apart) and assuming the main reflecting medium of the ionosphere to be 150 miles above ground and that conditions exist similar to those illustrated by Figs. 1A and 2A, mathematically it may be shown that one hop propagation will cover a distance of about 780 miles in about 4.2 milliseconds, but signals arriving by more than one hop must travel a greater distance and for each additional 186 miles, additional delays of 1 mS. will occur.

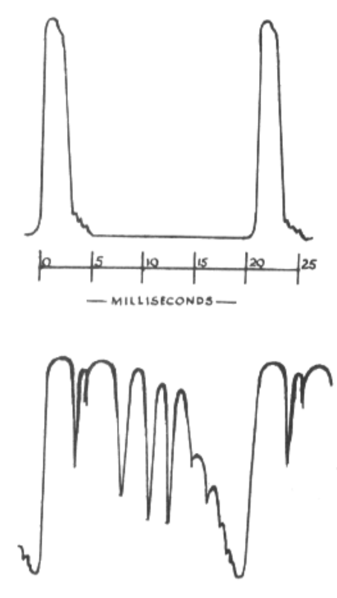
Fig. 2A supports the fact that element delays of 15 mS. and greater are possible and again, mathematically, it may be shown that 12 hops over this particular path would result in about 15 mS. delay and if twelve hops can be sustained, then any number between one and twelve are possible with consequent variations in delay times and it is shown by Fig. 2A that the amplitude of these delayed pulses are little different from the primary pulse.

There are many possible effects of multiple reception of RTY elements, such as the simultaneous reception of portions of mark and space elements or the phasing out of part of a mark or space element at the critical selecting period of the printer. In any case, confusing information may be presented to the d.c. converting circuit of the T.U. with resulting missprints.

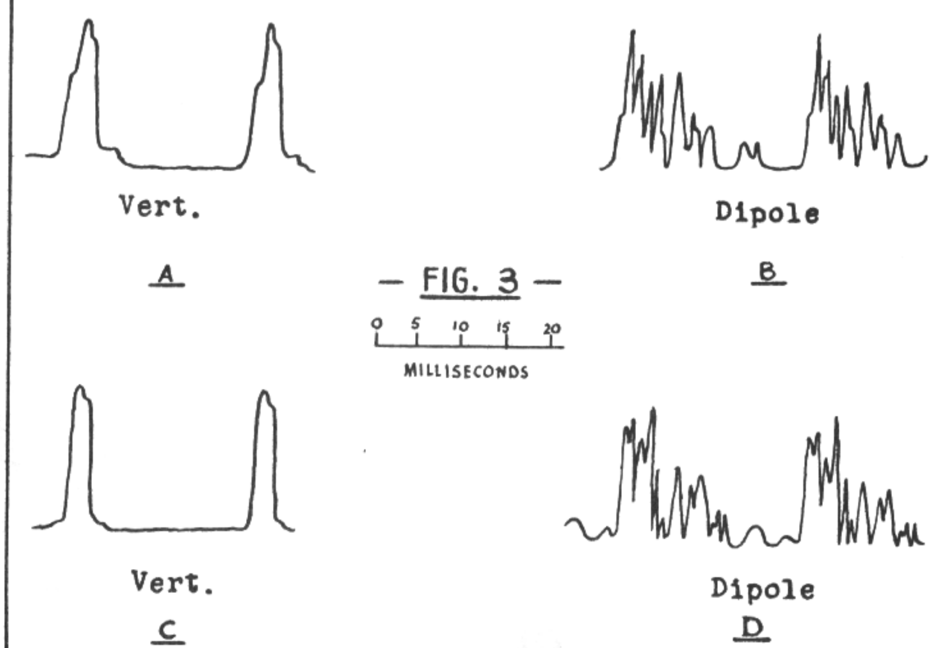
Horizontal dipole aerials a quarter wavelength above ground, not uncommon at 3.5 or even 7 Mcs., are known to support high angle radiation to the extent, that at about 25° from the horizontal, a point of half power radiation is reached and with greater degradation below this angle. On the other hand, a vertical quarter wave aerial provides little high angle radiation beyond about 70° and it may be assumed from this, under conditions supporting multi-path, there is less likelihood of long term delays due to high angle multiple hop reception.

To support this theory, tests were conducted using the facilities of the same transmitting and receiving stations referred to earlier and for the purpose of the test, two transmitters on about 2.5 Mcs. and about 10 Kcs. apart were simultaneously pulse keyed from the same keying source, one transmitter feeding a quarter wave almost vertical antenna and the other a half wave dipole approximately a quarter wavelength above ground. Two identical receivers were used at the receiving station and switching facilities provided whereby the C.R.O. could be rapidly changed from one receiver to the other.

Fig. 3A reproduced from photographs, indicates pulse reception from the vertical aerial, whilst Fig. 3B, those radiated and received from the dipole. Evidence of multipath is shown in both examples, but note the differences in delay times. Figs. 3C and 3D are included from the same test series to



— FIG. 2. —



— FIG. 3 —

show that the primary, or one hop pulse may not always be the strongest. (Note the fourth excursion of Fig. 3D.)

When RTY test tape transmission replaced the pulse transmission and each receiver was fed to independent T.U.'s and printers, error rate from the vertical aerial was in the order of 3/1000 characters, whilst that from the dipole was at least 80% garble.

The tests conclusively proved the superiority of the vertical quarter wave over that of the dipole aerial, for this particular circuit and frequency and as a result, many dipoles have been replaced by vertical antennae, not only on this, but on many other similar RTY circuits. Changing of aerials has not completely overcome some mutilations and on important circuits, error detection and correction equipment has been installed, but as this has no application in amateur service, it will not be discussed.

The test pulse transmissions described, are by no means beyond the ability of the amateur and provided regulations as to station identification are adhered to, can be applied to any transmitter capable of being c.w. keyed. The pulse length should be in the vicinity of 3 milliseconds, shorter than this may not be possible due to key click suppression circuits usually employed in the transmitter and the pulse rate anything convenient, say 20 to 30 milliseconds and such a pulse keyer may be made up from a synchronus electric motor by fitting a disc and cam to the shaft so that at each revolution, the cam closes a pair of contacts wired in parallel with the c.w. key. Fig. 4 illustrates a simple arrangement.

The motor speed, will of course, govern the size of the cam and the pulse rate. If, for example, the motor speed is 1800 r.p.m. or 30 revs. per second, each revolution occupies about 33 mS. Now, if the cam is made to occupy 30° or 1/12th of the 360° disc, the pulse length will be a little less than 3 mS. with an interval between pulses of about 30 mS.

Observations of the received pulses should be made by connecting a C.R.O. across the diode detector of a receiver as explained earlier. It is not recommended that observations be made of the audio output of the receiver as a function of b.f.o. note and where no diode detector is incorporated, the a.g.c. diode is satisfactory, provided a.g.c. disablement does not affect the diode conduction.

Other forms of propagation analysis are possible, each contributing something to the knowledge of behaviour patterns of RTY circuits. One of these which may be of interest, is to record received signals on a magnetic tape recorder connected in parallel with the input to the T.U. This tape may be "replayed" any number of times into the T.U. itself and by repetition, causes of errors determined.

When this form of analysis is undertaken, it is necessary to know exactly what has been transmitted and for this reason, the transmitting station must transmit tape via a T.D. usually in the form of rows of single letters such as R's, Y's, V's and T's repeated for about five minutes.

Equipment at the receiving station must include, as well as a page printer and reperf. machines, a double beam C.R.O. and a set of mark and space filters corresponding in frequency to those in the T.U., which, by the way, must not be of a type employing "slide-back" or "differential" detection due to the inherent characteristic of this detector to supply assumed information in the event of element loss.

Probably this equipment line up is beyond the average amateur and really of interest to a very few, but a brief description of signal analysis will be given to indicate what may be done.

The recorded tape is fed into the T.U. and also via the mark and space filters, to the two inputs of the double beam C.R.O. and a page printer and reperf. machines connected to the output of the T.U.

The separated mark and space traces of the C.R.O. should be adjusted so that a small overlap occurs between the mark and space elements observed and the C.R.O. time base adjusted, if possible, to display all seven elements of a character. It may be necessary to "replay" the tape a few times to arrive at the proper C.R.O. adjustment.

System, or characteristic distortion in either or both the transmitting and receiving equipment may be observed as regular asymmerty in length of the element display of the R's and Y's, remembering every stop element being 1½ element in length. Propagation distortion will be displayed as random changes in the displayed pattern, usually as overlapping or breaks in continuity in the M or S pattern, or, by far the most common, by variations in amplitude.

Having become acquainted with the C.R.O. pattern, the page printer may be brought into operation and copy made of the recorded tape. At least three "replays" should be recorded on the page printer to determine the position of and repetition pattern of errors, particularly if unrelated errors appear, such as when loss of synchronization occurs.

The next part of the program is to simultaneously operate the page printer and the reperf. machines, punching tape over that portion of the recording where errors appear. This tape may be used in conjunction with the page copy to determine the particular element change which causes the printed error. To do this, one has to know the correct perforations for the given characters (the

MULTI-PATH . . . continued

four letters plus carriage return and line feed).

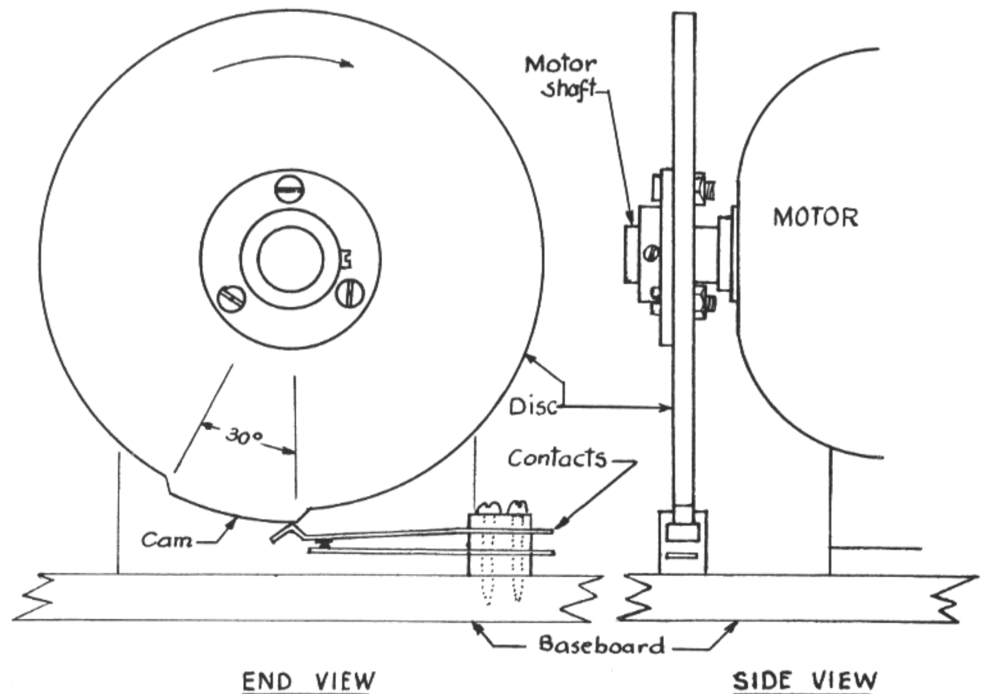
Having determined the element errors and knowing where they occur on the page copy, it is relatively simple, if the C.R.O. and the printer are adjacent to one another, to turn the eyes from the printer to the C.R.O. just prior to a known error appearing and to observe the pattern displayed during the error event. Some skill is needed, but after a little experience, one knows what to look for. In laboratory analysis, the C.R.O. pattern is photographed by a special camera synchronized with the C.R.O. time base. — Just too easy.

Such tape recordings can be used to assess comparative performance of T.U.'s or to adjust them for optimum performance under particular reception conditions, especially where more comprehensive equipment is not available.

The latter form of analysis proved that a large percentage of errors previously attributed to multiple element reception, were, in fact, the result of short term, flat fades. Characteristically, these short term fades are more prevailent on the higher frequencies (7 Mcs. and above) and can be readily identified as such by applying a suitable C.R.O. to the I.F. amplifier of a receiver and by such means, determine depth and duration. Flat fades, even to complete loss of signal, can be resolved for periods as short as ten to twelve milliseconds as different to loss of signal due to phase shifted multi-path. In view of this, it may not be correct to interpret C.R.O. patterns, popularly used as RTY tuning indicators, which sometimes indicate random loss of elements, as being due to multi-path propagation.

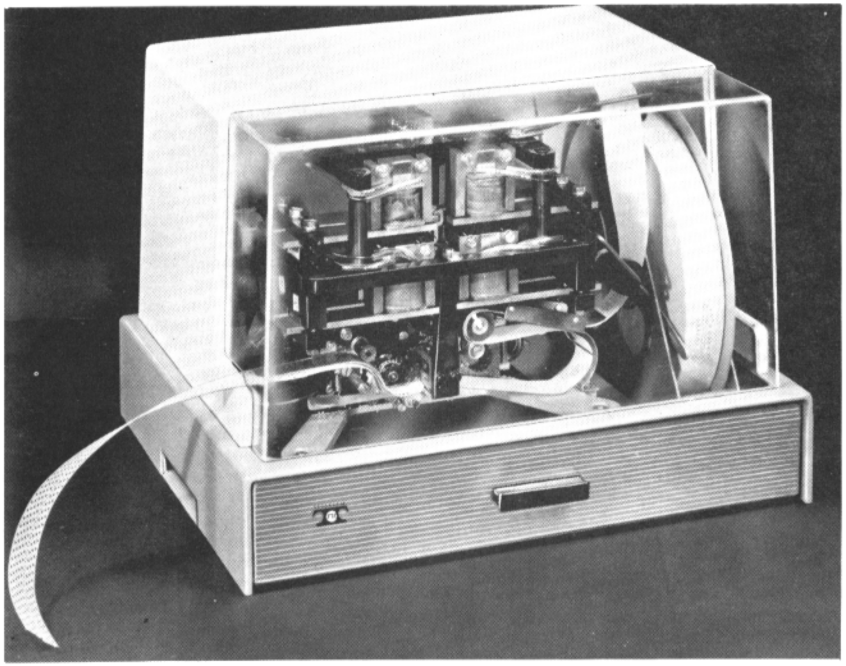
Summarizing, it may be said, nothing can be done about the ionosphere and as far as the amateur is concerned, minimization of the effects due to propagation, by the proper orientation and polarization of antennae and the intelligent choice and use of available equipment, are about all he can do.

There have been many ideas put forward concerning the adoption of narrower shift and it has been shown theoretically and practically, that considerable advantage may be gained by so doing. Unfortunately, a majority of amateurs now operating, do not have narrow shift receiving facilities, but it is this writer's opinion, that a more concerted effort should be made to brng about the scrapping of 850 c.p.s. in favor of a "standard" shift of less than half that bandwidth.



— FIG. 4. —

2,000 WPM TAPE PUNCH DEVELOPED BY TELETYPE CORPORATION



TELETYPE CORPORATION'S DRPE HIGH SPEED TAPE PUNCH OPERATES AT ANY SPEED UP TO 200 CHARACTERS PER SECOND ON PARALLEL-WIRE SIGNALS AND FEATURES A NEW TUNED REED PRINCIPLE FOR PUNCHING TAPE.

A tape punch capable of operating at any speed up to 2,000 words per minute (200 characters per second) has been developed by the Teletype Corporation.

Designated the DRPE High-Speed Tape Punch, the set functions in response to incoming parallel-wire signals.

The DRPE does not require energy from a motor to punch data into paper tape. Instead, this energy is stored in a tuned-reed while it is attracted to a magnet. A reed is linked to a punch pin for each code level. When the reed is released by its respective magnet the punch pin is driven through the tape.

Units for punching 5, 6, 7 or 8 level codes in 11/16 in., 7/8 in. or one-inch tapes will be available.

There is no movement of parts when the unit is on line and awaiting a signal, resulting in minimum maintenance and longer unit life.

Teletype Corporation manufactures this equipment for our parent company, Western Electric, as well as Bell System affiliates and others.

More information on the DRPE High-Speed Tape Punch can be obtained by writing to the Teletype Corporation, Dept. SP-39, 5555 Touhy Avenue, Skokie, Illinois 60076.

THE TRIPLE "T" CONVERTER

(TRANSISTORIZED TWO-TONE)

RENATO BELFI, DL3IR
(13b) Munchen-Neuaubing, Wisebtfelserstrasse, Germany

EDITOR'S NOTE: *Those who feel that construction of a good Terminal Unit is difficult, should study the following article. It shows what can be accomplished in a short time, after becoming interested in RTTY. DL3IR, DJ2ZJ and DL1VR are to be congratulated.*

TRANSISTORIZED TWO-TONE

This converter is essentially a two-tone converter in which the stages are completely transistorized. A scope indicator and a two tone generator for AFSK are included.

AUDIO PREAMPLIFIER

Q_1 is an audio preamplifier. Q_2, and Q_4 are also audio amplifiers. The inductors L_1, L_2 are pot core types with taps for the collectors of Q_2 and Q_4 (No. 3) and for the bases of Q_3, Q_5 (No. 2).

SLIDE BACK DETECTORS

The slide back transformers have a primary inductance of about 80 mh to give resonance with C_3 and C_4 at about 2500 cycles. Turns ratio is 1:2 (step up) with center tap.

DECISION STAGE

The transistors Q_6 and Q_7 are the decision stage combined with a low pass filter. This stage is very important and for improved stability the voltages are regulated with zener diodes. Sufficient DC feedback is also provided for good thermal stability.

THE RESHAPER

Q_8, Q_9, Q_{10} comprise the reshaper stage.

SWITCHING

Q_{11} and Q_{12} form the switching stage for actuating the printer magnet.

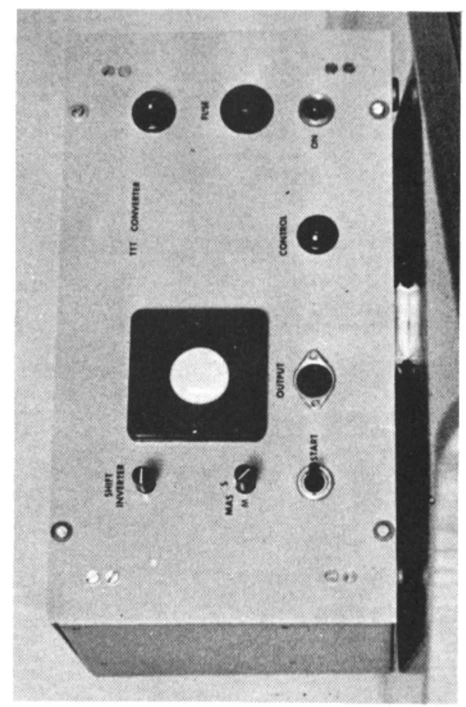
The transistors used are standard type with amplification factor of about 50 (fifty). The only exception is in the scope amplifier in which silicon types are used (for high Uce to have the necessary dc-swing for the CR-tube). The equivalent types are 2N1371 Texas Instr. or 2N586 RCA.

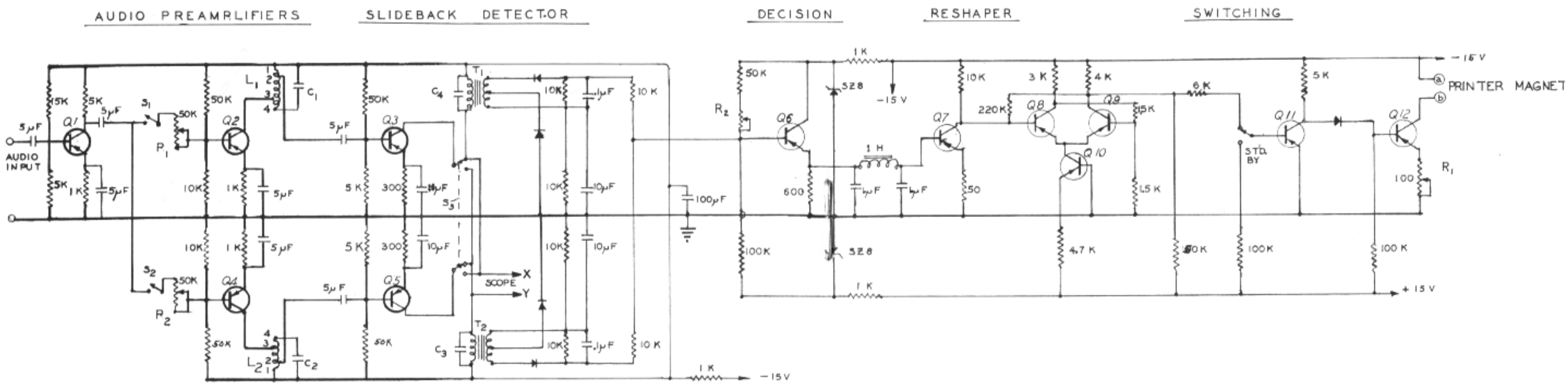
ADJUSTMENTS

1) Check wiring, function, etc. as usual
2) Check with VTM on X and Y and adjust, with an input signal of about 0.01 volt at 2500 cycles, C_3 and C_4 until there is a flat maximum
3) Adjust C_1 and C_2 for sharp maximum at 2125 and 2975 (same X and Y check point) cycles.
4) Adjust P_1 and P_2 for equal amplitudes. Start with P_1 and P_2 set at about 10 k.Ω
5) Connect printer magnet in series with a dc mA-meter (100 mA f.s.) between a and b. turn R_2 until Q_{12} is conducting.
6) Adjust with R_1 line current to the nominal value. (100 ohms is set for 40 mA).
7) Turn back R_2 until Q_{12} is switching back to zero current. Advance slowly until the switching point is reached. This is the correct adjustment.
8) Adjust p3 and p4 until the cross arms are equal on the scope.

I wish to thank DJ2ZJ who did much of the work on it, and DL1VR who supplied the parts used in constructing this converter. Finally, "dulcis in fundo".

73
DL3IR





S_1, S_2 MARK-SPACE SWITCH
S_3 SHIFT POLARITY
RESISTORS: 1/4 WATT
CAPACITORS: ELECTROLYTIC 15/18V W.AC.
EXCEPT: $C_1, C_2, C_3, C_4, C_5, C_6$. PAPER 125V WDC.

TRANSISTORS: AC152 SIEMENS, (PNP)
2N1371 TEXAS INST.
2N586 RCA
Q13, Q14 = BFY14 OR TF260 SILICON (NPN)

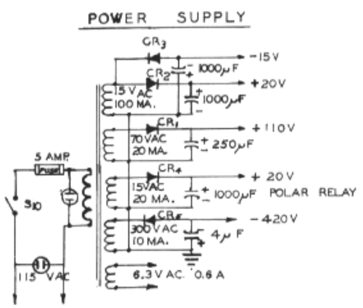
L_1, L_2 : POT CORE SIEMENS 1100 N22 AC630 23 Y 18 ø, .18mm ø WIRE TOTAL INDUCT. 55 MH
4: 295 TURNS TOTAL
3: 90 ″ COL.
2: 30 TURNS - BASE
1: START

C_1, C_2: APPROX. 0.1µF AND 0.047µF ADJUST TO RESONANCE AT 2125~ AND 2975~.

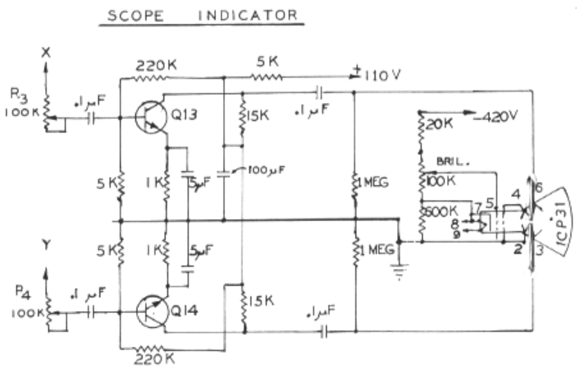
L_3, L_4 : POT CORE SIEMENS 1100 N22 AL 630
PRIM. 295 T. SEC. 40 TURNS 0.18mm ø ENAM.

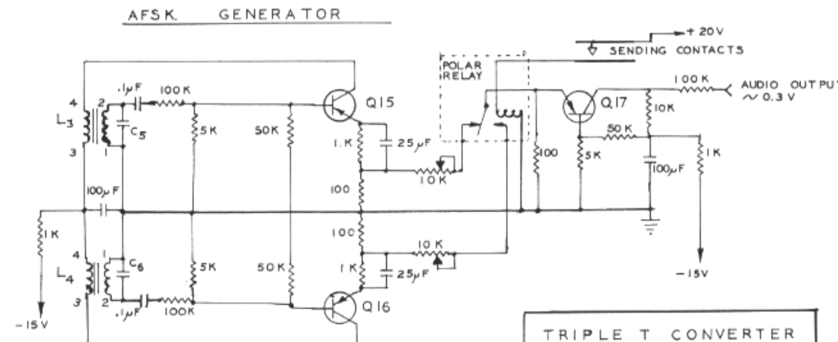
C_3, C_4: APPROX. 0.047 WITH 80 MH PRIMARY. ADJUST TO RESONANCE (VERY FLAT) ABOUT 2500~.

T_1, T_2 : TURNS RATIO 1:2 PRIM. INDUCTANCE ABOUT 80 MH



CR_1-CR_5 SILICON DIODES





TRIPLE T CONVERTER
R. BELFI DL31R

Dwg. W6JEV

WA4GTA STATION CONTROL, FOR RTTY OPERATIONS

ROY W. DANCY, WA4GTA
112 Marlboro Road, Portsmouth, Virginia

After chatting with many stations on the air I soon found out that a simple control system is needed. I hereby offer the system in use at WA4GTA as the simplest I have seen anywhere and it leaves nothing to be desired in my operation. Of course it will not suit everyone but the ideas presented should be of help to those looking for something better.

All of the TTY equipment is in a local loop with a couple of jacks in the loop so that any other equipment can be put into use with minimum trouble. The TD has been modified as per the November issue of RTTY for auto CW. The extra resistance in bauds one and five has no effect on the normal operation of the TD.

S1 selects CW or FSK operation. S1A shorts the FSK circuit in the transmitter during CW operation to prevent any shifting of the carrier during CW by RY1. S1B in the FSK position shorts the CW key putting the transmitter on the air. S1C controls the CW monitor preventing it from making noise during FSK.

RY1 is a polar relay that controls the shifted oscillator. True it operates during receive but the transmitter is not keyed so it has no effect. It is a good idea to use a relay to key the transmitter as that eliminates the possibility of dirty contacts causing chirp and gives better shielding from stray RF pickup.

RY2 is a Sigma series 72 relay in the TD that is used for auto CW ID. Many thanks to WB2CXE for seeing the simple when all I could see was the complicated! There are a pair of holes in the TD base that are just right for mounting an octal socket for the relay. RY2 does operate when the TD is in use but it affects the signal only in CW due to S1B.

To go from receive to transmit the front panel control on the transmitter is used and S1 is then used to select FSK or CW. During transmit the receiving converter has no effect on the loop as the receiver has B plus removed from it. The keyer tube in the TU conducts during transmit completing the loop.

In operating the station when I first make contact the ID is by hand and as soon as things get going and I have the time I punch a tape that has all of the ID on it. It is punched in the following manner. The first part has an inch or so of blanks to give me room to write the call for future reference. Next is the CW ID, then a few more blanks to tell when the CW is over and then the ID in TTY. Another row of blanks then the ID in TTY followed by more blanks to separate things and then the ID in CW again. In normal operation as soon as it is turned over to me I listen for a couple of moments to see if there are any breakers, then flip the switch on the transmitter. The next step is to start the TD by releasing the tight tape lever which has been holding the TD still. S1 is in the CW position and the tape starts to move thru the TD sending the CW ID. When the tape finishes the CW ID S1 is flipped to the FSK position and the RTTY ID is then sent. The tight tape lever is then picked up and the keys are put into use. If a tape is going to be sent it is put on the TD and sent in the normal manner. At the end of the transmission the tight tape lever is released and the RTTY ID goes out. When the row of blanks comes up S1 is flipped to the CW position and the CW ID is sent. It is easy to take control at any time with the tight tape lever.

I hope that this will allow you to make the operation of your station as much of a pleasure as mine is to me. 73

WA4GTA

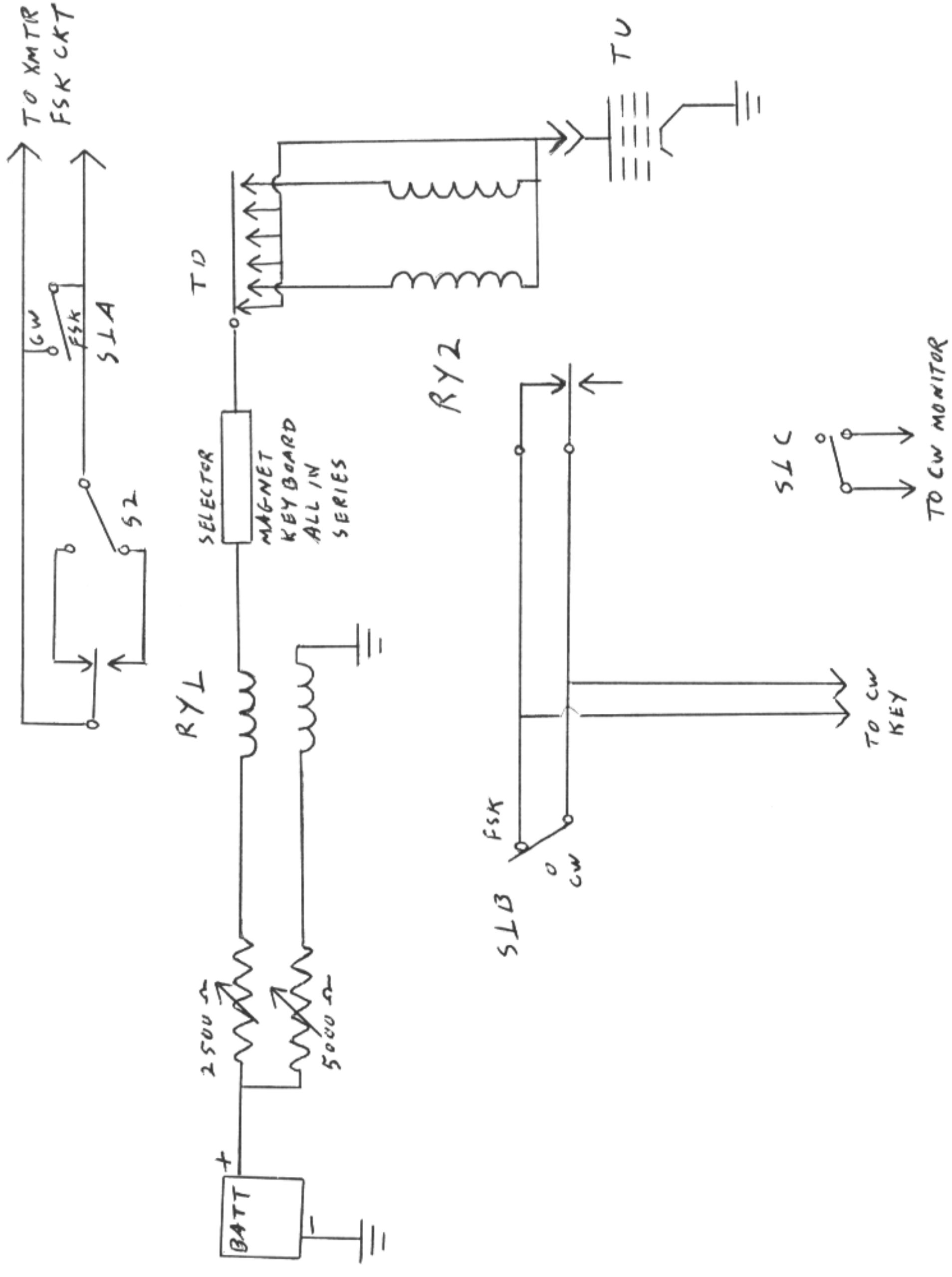
COMMENT ON TT-63A FROM DAVID GOODMAN

3075 East 123 Street, Cleveland, Ohio

The TT-63A also serves as a very satisfactory method of copying 67 wpm (European standard speed) on a 60 wpm machine. The front panel range control is advanced to about 10 on the zero to 100 scale and the speed error is treated as bias and eliminated.

The unit may also be used to provide perfect signals (regardless of keyboard or tape transmitter adjustment) for transmitting, by exchanging input and output, that is, putting the local loop into the unit and letting the output (relay) key the oscillator of your transmitter. A polarity reversing switch is located on the front panel to provide the desired polarity of output, regardless of input polarity.

1) Audio, consisting of 600 ohms, 400 to 5000 cps broadband on/off; 2) DC Neutral (keyed loop); 3) Polar (plus and minus).



WA9IBB5 Reviews . . .

BAND PASS FILTERS WITH LINEAR PHASE

by Robert M. Lerner of MIT's Lincoln Laboratory
Proc. I.E.E.E.; March 1964; pp. 249-268.

JIM HAYNES
966 Chestnut, Deerfield, Ill. 60015

The ideal filter would have zero attenuation in the pass band, infinite attenuation everywhere else, and uniform delay for all frequencies within the pass band. Such a filter cannot be built; these characteristics are impossible even in theory. Filter designers therefore must approximate these characteristics as best they can. For many years the main use of filters was in speech transmission; an exhaustive literature details the filter design procedures which evolved during this period. As the human ear is not in the least sensitive to phase distortion very little attention has been given to the phase properties of filters. It turns out that the best filter equations from the amplitude response standpoint produce pretty lousy phase performance, tending to delay frequencies at the extremes of the pass band much more so than those near the center. This state of affairs is not very happy when we wish to transmit such things as pulsed tone telegraph signals. The signals come out of the filters with poor rise and fall times, overshoots, ringing, and a number of other defects. Consequently for pulsed tone transmission it has been found necessary to tack phase equalizers on to the ends of the conventional filters to improve the phase properties of the composite filters. A phase equalizer is a circuit which produces the same attenuation at all frequencies, but which delays some more than others. As you might expect, a phase-equalized bandpass filter can get to be a rather complicated black box.

It is possible to design filters having rather nice phase properties over a specified band of frequencies using conventional design equations. We are disappointed to find, however, that such filters have quite bell-shaped amplitude responses which are not at all well suited to the degree of selectivity we wish to achieve. Thus it has seemed that we cannot have good amplitude and phase characteristics and reasonable simplicity all in the same filter.

Mr. Lerner has taken a fresh approach to filter design with results which appear to be startlingly successful. He proposes a filter circuit having the following agreeable properties:

(1) Amplitude and delay are quite flat over the passband.

(2) All the inductors are the same size, except for two which have twice the inductance of the others.

(3) The filter is relatively tolerant of non-ideal component parts.

(4) Additional out-of-band attenuation can be obtained by adding simple networks. Their presence does not upset the design of the main filter section.

(5) The filter is relatively tolerant of incorrect sources and load impedances, and of incorrect component values.

(6) The design procedure is applicable to crystal filters as well as to LC circuits.

The basic filter circuit is illustrated in Fig. 1, while the impedances Z_a and Z_b are detailed in Fig. 2. The circuit of Fig. 1 is the familiar half-lattice which so often appears in amateur crystal filters. The two lattice elements are seen to be networks of simple series resonant circuits in parallel. f_0 is the lower cutoff frequency at which the response of the filter is 6db down. f_1 on the opposite lattice arm is higher than f_0 by the parameter Δf. f_2 is spaced from f_1 by $2\Delta f$. f_3 is spaced above f_2 by an equal amount, and so on up to the last resonator f_{n+1} which is higher than f_n by Δf. The two out-of-band resonators f_0 and f_{n+1} are termed *corrector resonators.* Fig. 3 perhaps illustrates the situation a little more clearly. Calculation of the various component values is relatively simple since the frequencies of the resonant circuits are explicitly specified. The one fly in the ointment seems to be the source and load impedance R/2, which is specified as $4/\pi$ times the calculated impedance of L at a frequency of $2\Delta f$ cps. For the usual inductors this results in a rather low value of R.

Perhaps one way out of this problem is to use an ordinary plate to voice coil (multi-tapped) transformer for the input transformer and a similar transformer (tap not needed) at the other end, although the characteristics of the ordinary transformers may be too poor in the application. Mr. Lerner promises a future paper which deals specically with design of practical filters, whereas the present paper is primarily theoretical in tone.

The one remaining design problem is to determine how many resonators are needed to make a good filter. No doubt this information is to be found with one of the many equations in the later sections of the paper.

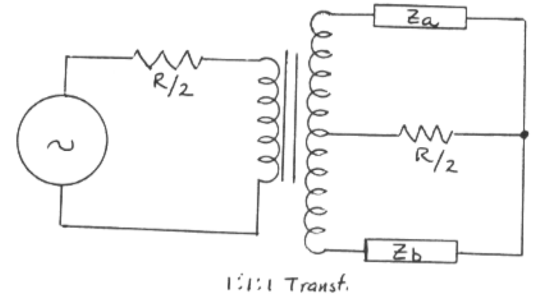


Fig. 1

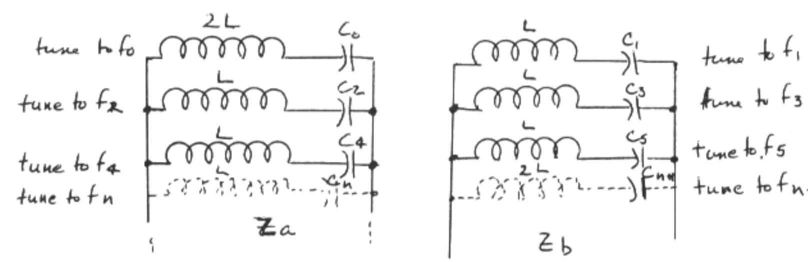


Fig. 2

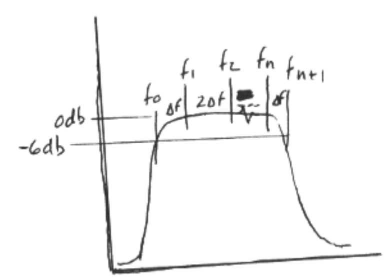


Fig. 3

f_0: lower 6db down freq
$f_1 = f_0 + \Delta f$
$f_2 = f_1 + 2\Delta f$
$f_3 = f_2 + 2\Delta f$ } in-band resonators
- - - -
$f_n = f_{n-1} + 2\Delta f$
$f_{n+1} = f_n + \Delta f$ = upper 6db down freq.

JH 22 Mar 64

INSTRUCTIONS FOR HAND OPERATED TYPEWRITER RIBBON REINKING DEVICE

WALTER NETTLES, WOAJL
201 South Eudora Street, Denver, Colorado

In addition to the reinker, the user will require an eye dropper and a suitable ink pigment suspended in a solution thin enough to easily penetrate the exposed side of the ribbon on the main reel. Stencil ink as used for addressing cartons and sacks is suitable for this purpose. Also, stamp pad ink thinned with wood alcohol (methanol) is satisfactory. Another good pigment is obtained from mimeograph or duplicator ink thinned with either naptha or turpentine. Stamp pad ink has a glycerin base in order not to harm the rubber in hand stamps. Duplicator ink and stencil ink has an oil base. Regardless of which type ink is used, make use of it sparingly until you acquire the knack of reinking. Most users are prone to use too much ink pigment in the beginning. Three or four suctions of the eye dropper, evenly applied over the exposed side with special attention given to the inner and outer layers of ribbon, is usually adequate. The exposed side of the ribbon will absorb the ink pigment solution like a sponge absorbs water. Allow at least 24 hours for the ink to soak into the ribbon and partially dry out before using the ribbon on any machine. By keeping a roll of ribbon inked in advance, there is never a delay when a freshly inked roll is needed to assure good legible copy.

1. Place the typewriter ribbon roll on the long rod and replace the knurled braking and winding key.
2. Insert the small key peg in the 1/16th in. hole in line between the small storage hole for the key peg and the center of the bearing for the main reel after rotating the main reel so that the notch in the lower half of the reel is over the small peg hole. Unscrew by turning counter clockwise the top flange of the main reel. Use only the the knurled braking and winding shaft for tightening or loosening the top flange to insure not getting it so tight that it binds.
3. Thread the ribbon around the shorter center rod and hook on to the sharp needle of the main reel. Replace the top of the main reel by screwing back on in a clockwise direction.
4. Using a gentle braking action with the fingers of one hand on the winding key for the typewriter ribbon reel, wind the entire ribbon on the main reel, using a spinning action with the fingers of the other hand. Use only enough braking action to assure a snug roll on the main reel.
5. Using the small key peg once more, unscrew the top of the main reel, leaving exposed the entire side of the ribbon. Carefully apply three or four suctions of ink pigment from an eye dropper to the entire surface as evenly as possible paying special attention to the inner and outer layers which are most easily neglected.
6. Replace the top flange of the main reel and using a gentle braking action, roll the entire ribbon back on the regular typewriter reel. Remove from the reinker and store with the wet side up for a period of 24 hours or more, permitting the entire ribbon to become saturated and the excess fluid carrier for the pigment to dry out. Reinked ribbons can lay around for several weeks in an ordinary typewriter ribbon box and still remain adequately moist.
7. Ribbons normally come in three grades—cotton, silk and nylon. Even a cheap cotton ribbon is good for many, many reinkings before developing loose and broken threads. The actual life will be determined by the force with which the type strikes the ribbon and on properly adjusted or operated equipment permits a very long ribbon life.
8. If you happen to have on hand old typewriter ribbons that have simply dried out from age but still have all the original ink pigment, a rather exotic mixture of four oils applied will make such a ribbon as good as new. The mixture consists of equal parts of oil of cloves, oil of cassia, oil of amber and oil of paraffin (kerosene as it is commonly known) and should be applied in the manner as described above. The oils are available at most drug stores.
9. When directions are followed in a proper manner, you should get no ink smudges on your fingers than would be expected in changing to a new ribbon. Many find it an advantage to make use of a small tweezers in changing ribbons on any sort of equipment.

Typewriter ribbon renikers are available to the amateur fraternity at a special price of $3.00 each postpaid in the Continental U.S.A. from WØAJL, Walter E. Nettles, 201 South Eudora Street, Denver, Colorado, 80222. Stencil ink is available at most stationery stores. Mimeograph ink and stamp pad ink both of which require thinning are also readily available in stationery stores as well as many drug stores, etc.

RTTY DX

EDWARD CLAMMER, K3GIF
5940 Avon Drive, Bethesda, Maryland 20014

ASIA AGAIN!!

The hottest news in recent weeks has been the news of the activity of Joel, KA5MC from Hiroshima, Japan. The first news about Joel's presence came from Herbert, DL1VR in Munich who worked him for what is probably Joel's first QSO. Recently KA5MC also worked LA6VC, DL3IR and K3GIF. Joel is a W4 from Georgia now in the Navy and he will be returning to the States in July. He comes into the East Coast USA in fine style at about 1200 GMT. on 14090 Kcs. He has a strong, solid signal and this should be your best bet for Asia for the next month.

CANTO ISLAND, OCEANIA

Clyde, KB6EPN, has put Canton Island on the RTTY map with a bang. This is a rare spot even for C.W. and we are very lucky to have an active RTTY station on there. Clyde has worked into Europe with DL3 IR and others. His wife is also a ham and Postmistress of the Island so he can be reached by mail as: KB6EPN, Canton Island via Honolulu.

SEYCHELLES ISLANDS

Herbert, DL1VR, reports that VQ9HJB, Seychelles Islands, Indian Ocean, told him on SSB that he had RTTY equipment available and would try to work Herb on RTTY very soon.

BOLOGNA, ITALY

Three new RTTY stations from Bologna, Italy have come on the air almost at the same time. They are I1LCF, I1AIJ and I1VN. All use 50 bauds and reversed shift but one—I1VN whose name is Gianc has found a way to copy 45 bauds so he and K3GIF have had a number of pleasant QSO's.

PARIS

F8KI, Jean of Paris was overheard working KR6BQ in Okinawa. Jean still needs Oceania and South America for his RTTY WAC. F8KI is reported to be running 20 watts.

RTTY DXPEDITION

Jean, FG7XT, was able only to operate on SSB from St. Martins Island/FS7. The reason for this was the poor frequency control on the power plant at the hotel that was his QTH. He is now building an engine driven generating plant which he hopes to ship together with his model 28 KSR, less cover, by means of a Piper Apache owned by a friend of Jean's. So please look for FG7XT from St. Martin's and St. Barthol-mews in June. Jean reminds us that he is very active on six meter RTTY and complains that he hears many Stateside six meter RTTYers but they are in local QSO's and he cannot break them. He worked 600 different stations in the States last season on phone. He would like to work as many RTTY men on six as possible. The season for this begins now.

THE MILAN STORY

Giuliano, I1GMF, reminded Merrill by mail about the time, money and effort which Bruno Riffeser, I1RIF, has expended to spread the RTTY bacillus throughout Italy. He succeeded in having Ollivetti turn over used and trade-in machines to the hams at reasonable prices and he sent numbers of RTTY magazine and RTTY handbooks to interested hams. I have just completed an unusual QSO with him which I think illustrates this trait – He was transmitting to I1GMF on 20 meters while receiving Giuliano on 144 Mcs. He was doing this to help I1GMF get his gear properly adjusted. This on a Saturday evening when most of us would be out on the town. I learned all this accidentally when I called him on 14 Mc. and he heard me thru I1GMF's 144 transmitter and we QSOed that way. We have counted about twenty active RTTY stations in Italy of which most owe their start to Bruno. We need more hams in RTTY like him. His trip to the States had to be postponed due to all three of his children coming down with the mumps at the same time.

50/45 – WHY FIGHT?

Many Europeans have machines which will operate at either 45 or 50 bauds. This gives them the convenience of being able to work stations who have only 50 baud machines. More and more of the new stations coming on in Europe are using fifty baud machines because they are readily available. You can obtain very good copy when receiving fifty bauds by setting the ranging control at about 20 on a 45 baud machine and receive 45 bauds by setting the control to about 110 on the fifty baud machine. Since American hams are licensed to use 45 bauds and some of the Europeans to use only 50 – this is one way to beat the system. AND IT WORKS!! I have worked I1VN a number of times this way.

HIGH POWER AND DX

Many RTTY hams feel they cannot work DX because they don't have a KW rig. That

RTTY DX . . . continued

this ain't necessarily so is demonstrated by Chuck, WØABA of Coon Rapids, Minn., who with 40 watts from an A54-H and a two element beam has worked Clyde, KB6EPN and VK3KF, all with no great difficulty. He was Clyde's second RTTY QSO. The A54H has a stabilized RTTY exciter driving it. If a kilowatt is a gallon then Chuck is running about 1/3 of a pint – and doing a fine job.

PATIENCE

Hans, DL1IN, of Cuxhaven, near Hamburg, tried for eight weeks to raise someone on RTTY. Hans is a well known DX sidebander. Cuxhaven is about 300 miles from the nearest RTTY ham so Hans had to appeal to Rene, DL3IR in Munich for assistance. Rene sent him an AFSK oscillator by means of which Hans was able to have his first RTTY QSO with K3GIF. Hans will one day be an outstanding European RTTY station since he runs an HT32 and HT33 combination with a wopping signal.

WAC RTTY AWARDS

It may not be generally well-known that it was Mary Schulz, K6OWQ, who handled the WAC Awards processing. At the time of her death she was in the process of transcribing the records into a new filing system. Bud, W6CG, reports that there may be some delay in getting out the awards for a while but that he will credit them based on the date they are received by him. You can be sure Bud will do his best to avoid any undue delays.

DENMARK

Both OZ4NV of Copenhagen and OA7OF of Silkeborg, Denmark expect to be on RTTY soon.

COUNTRIES WORKED LISTING

I would like to see this column start a listing of countries worked by the various operators. Perhaps this interest is occasioned because I have worked quite a few. To start the ball rolling here is the list for K3GIF:

Norway, Sweden, Denmark, Scotland, Wales, England, Holland, Belgium, Germany, France, Switzerland, Italy, Crete, Lybia, Eritrea, Saudi-Arabia, South Africa, Brazil, Argentine, Peru, Ecuador, Venezuela, Canal Zone, Guatemala, Mexico, Guadeloupe, Puerto Rico, U.S.A., Canada, Alaska, Hawaii, Midway, Wake, Cook Islands, Australia, New Zealand, Okinawa and Japan (38). – 30 –

NEWS

Have been appointed O B S here and I am now transmitting the ARRL Official Bulletins on 3625 kc Mon. 0000, Wed. 0100 on 3625, Fri. 0000 on 3625, Sat. 1900 on 14090, Sun. 1900 on 14090. W8UUS

––––0––––

The 8th Annual San Fernando Valley Radio Club HAMFEST - PICNIC will be held on June 21, 1964 at the Sunset Farms in Sylmar, California.

This year's HAMFEST - PICNIC will be a family affair including free all day kiddieland rides for the children, women's attractions and free gifts. The main door prize will be a 21 inch color television complete with factory installation. There will be plenty of free parking, picnic tables, volleyball, ping pong and swimming. T-Hunts, MARS exhibits, displays and contests will also be available to those attending. Adult admission will be one dollar and children under twelve, seventy-five cents. Tickets, maps, and further information are available by writing; W6SD Hamfest, Box 3151, Van Nuys, California.

K6UMV

NEW SAMS BOOK SHOWS HAMS HOW TO BUILD UNIQUE TRANSISTORIZED GEAR

Transistor Transmitters for the Amateur by Donald L. Stoner (W6TNS) is a book written for all amateurs, whether they want to build some of their own gear or merely acquaint themselves with transistor equipment theory. Starting with a brief introduction on the use of transistors in communications equipment, the content progresses through transistor oscillators, RF amplifiers, modulators, and simple antennas, Each construction project contains photographs, schematic diagrams, chassis - layout drawings, tuning procedures, and operating instructions.

The numerous projects described include: tickler-coil oscillators, a crystal checker and calibrator, an 80/40 meter "Peanut Whistle", the "CB Cyclone", the "Novice Powerhouse", several modulators, a 60-second transmitter, and a high power unit for CB or 10 meters.

The latest design and construction techniques are incorporated throughout, including transistor circuitry and circuit-board layouts. Every piece of equipment has been built and thoroughly tested on the air by the author.

Transistor Transmitters for the Amateur is available from electronic parts distributors and bookstores throughout the country, or from Howard W. Sams & Co., Inc., Indianapolis, Indiana 46206.

HORSE TRADES

FOR SALE: Model 19ASR complete, $175.00; Model 15KSR complete $100.00. Will pay freight as far as Seattle. TRADE: two model 28 printing units, less motor, base, keyboard. Will trade one for sync motor and kybd, or what have you? KL7AKD, 2 Eleanor Ave., Fairbanks, Alaska 99701

FOR SALE: Twenty TT-63 A regenerative repeaters, $29.95 FOB, Modesto, Calif. (Schematic with each unit, complete instruction books $5 each). W6AJU, P.O. Box 3716, Modesto, Calif. 95352

FOR SALE: Converters: CV 59 (URA8A) audio type, $200.00 each. P. J. Amico, 188-05 50th Avenue, Flushing, N.Y.

FOR SALE: Model 26 with table, excellent mechanical condition, $60.00, W6IMQ, 1390½ Kelton Avenue, Los Angeles,

FOR SALE: Circumstances force me to sell, new 14TR and 14TD, used about two hours in ham work. $150 for both as a unit. Also, perfect model 19 and TD, also wooden table, $130.00. Two 15s [redacted] each including tables. One 14 strip printer with table $25. All have perfect covers, reels, 60 wpm gears-sync motors and comm. type. Some 255 relays $2.00. One RA87 400 mil power supply, two 800 mil power supplies, one needs diodes. HQ-150 general coverage receiver, Amico six meter converter, RCA 6M xmtr with 6164 in final. K9FNX, 336 West Washington Blvd., Fort Wayne, Indiana.

FOR SALE: Model 14 typing reperforators, 60 wpm, sync. motors, excellent condition and exceptionally clean, with tape reels, separate polar relay deck and gliders for mounting in rack or desk or table but less covers—$25.00 each. Same but with tape windup reel driven with separate motor—$35.00 each. Late model teletype power supplies $15.00 each. Action Surplus, 1200 West Mississippi Ave., Denver, Colorado 80223

FOR SALE: Complete Model 19, power supply, keyboard, TD, printing unit, table, original packing, ready to go, first class condition, A. T. Corbin, 6511 Aberdeen, Dallas, Texas.

FOR SALE: Tone Converter: dual frequency shift type 152, model 2, 110-220 volts, single phase 50 to 60 cycles. O/A dim. 17"X3½"X19". Mfd., by Northern Radio Co. All tubes included, used excellent $55.00 each. Atlantic Surplus Sales, 181 Sackett Street, Brooklyn, N.Y. 11231

FOR SALE: AN/FGC-1 Radio Teletype converters $75.00 each or two for $100.00. RA-87 Teletype power supplies $9.00. Heavy duty 19"X72" Relay racks $22.50. Send for free list. Gulf Electro-Sales, 7031 Burkett, Houston, Texas 77021

FOR SALE: Two Model 14 TDs, sync motors $65.00 each. Two Model 26s with tables, $65.00 each. RTTY, INC. 372 Warren Way, Arcadia, Calif. 91007

FOR SALE: Ribbon re-inkers, $3.00 PP. See write-up this issue. W0AJL, 201 South Eudora Street, Denver, Colorado

WANTED: Used HAM-M or TR 44 antenna rotor with brake. DL3IR, (13b) Munchen-Neuaubing, Wisebtfelserstrasse, Germany.

FOR SALE: Model 14 typing reperf with end of line indicator. Top shape—just been overhauled. $50.00 FOB Oxnard. WB6DRY, 2135 North Oxnard Blvd., Oxnard, California.

FOR SALE: 88 or 44 mhy Toroids, five for $2.50, 35c for postage. Sync motors, $10.00 plus postage. Model 15, power supplies, 125 and 200 mils @ 120 volts DC. $5.00 plus postage. Model 14 typing reperf. with keyboard, 60 wpm series motor, repairable, $50.00 plus postage. W5EJV, 804 Shady Lane, Dallas, Texas 75208

WANTED: Model 5-C Boehme FSK Converter. State Details and Price. All Inquiries Answered. J. D. Gardner, K5LEP, 1709 Parana Street, Houston, Texas 77055

Subscription Rate $3.00 Per Year

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