

RTTY JOURNAL

EXCLUSIVELY AMATEUR RADIO TELETYPE

VOLUME 18 Number 6

30 Cents

Additional Classified on Page 15

J & J ELECTRONICS WILL Custom-Build Your Mainline TT/L-2 FSK Demodulator Complete-Self-Contained-Autostart-Heavy duty loop supply-Electronic keyer stage-Single bar tuning eye-2 sets of filters for 850 & 170 shift-2 inch scope indicator with separate power supply-Motor control stage-Includes both FM (Limiter) & AM (Limiterless) with 3 section low-pass filter for optimum reception of 60-75-100 WPM-8 3/4 x 19 Gray Hammetone silkscreened front panel suitable for rack-mounting. Wired and Tested by the expert W1SOG, John F. Roache, Windham Road, Canterbury, Ct. 06331.

SOLID STATE TU/AFSK generator based on units in July 1969 73 and September 1969 QST. All circuitry including PS on 3 x 6" G10 glass PC board, 850 and 170 HZ shifts, CW ID, zener protected transistor loop switch, reversing switch, high and low impedance output FET audio. \$40.00 kit form. Cabinet \$5.00 extra. Board only \$4.50. 3 pole Butterworth filter boards, drilled 3 x 6" G10 glass, \$2.00. Write for details. HAL Devices, Box 365RJ, Urbana, Ill. 61801

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115751 AUTO CR-LF KITS (two available) for Model 15 or 19, new \$25, with installation and adjustment instructions. Send large SASE for list of TTY items for sale (have also some TTY & radio tech manuals). Want LESU-11 or 28-C Electrical Service Unit or other similar LESU. W. H. Bauer, W4NLY, 119 North Birchwood Ave., Louisville, Kentucky 40206

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'Curly' W5HDM



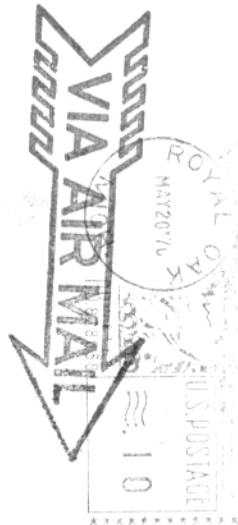
'Henry' CE3EX

Contents-

Crystal Controlled AFSK Generator	Page 2
Model 28 Modifications - Part 5	Page 7
DX Column	Page 10
WPX Award Winner	Page 11
Instant Shift for "Marauder"	Page 13

RTTY JOURNAL
P O Box 837
Royal Oak, Mich. 48066

First Class Mail --



Crystal Controlled AFSK Generator and Standard

Model XLG-2

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One of the problems that the amateur radioteletype enthusiast faces as soon as his equipment is in operating condition is that of transmitting a properly adjusted signal. Presented here is an accurate tone source that can be used as a standard or an AFSK oscillator, and needs no adjustment initially to produce the desired accurate frequencies.

First a little history on previous approaches and then a description of the last in a series of experiments that finally produced a practical system.

The first and most obvious approach that most amateur operators take in trying to set up their shift is to ask another amateur how the shift sounds at the distant receiver. This will get you in the right ball park range, but is not a truly satisfactory solution. Another, perhaps more accurate means used to determine the proper adjustment of the transmitted signal has been to employ a piano or other musical instrument as a pitch reference. This method will get you closer than the first method, but there is still room for improvement.

For those with an accurately calibrated audio oscillator, there has been no real trouble to generate standard tones that are fairly close, but not all amateurs possess such an expensive instrument.

Presented here is an inexpensive (under \$35.00) AFSK generator and frequency standard that will provide outputs of 2125, 2295 and 2975 Hz. plus others if desired. This is accomplished at a degree of stability and precision unattainable at this price level before the advent of the low-cost digital integrated circuit. The maximum expected frequency error should easily be less than a cycle per second at any selected output.

Basically this system is the last and best in a series of crystal-controlled audio standards. The first of the series consisted of an 85 KHz crystal oscillator fed to a string of J-K flip-flops that produced an output of 425 Hz. The signal at 425 Hz was then fed to a pair of high Q tuned circuits at 2125 Hz and 2975 Hz

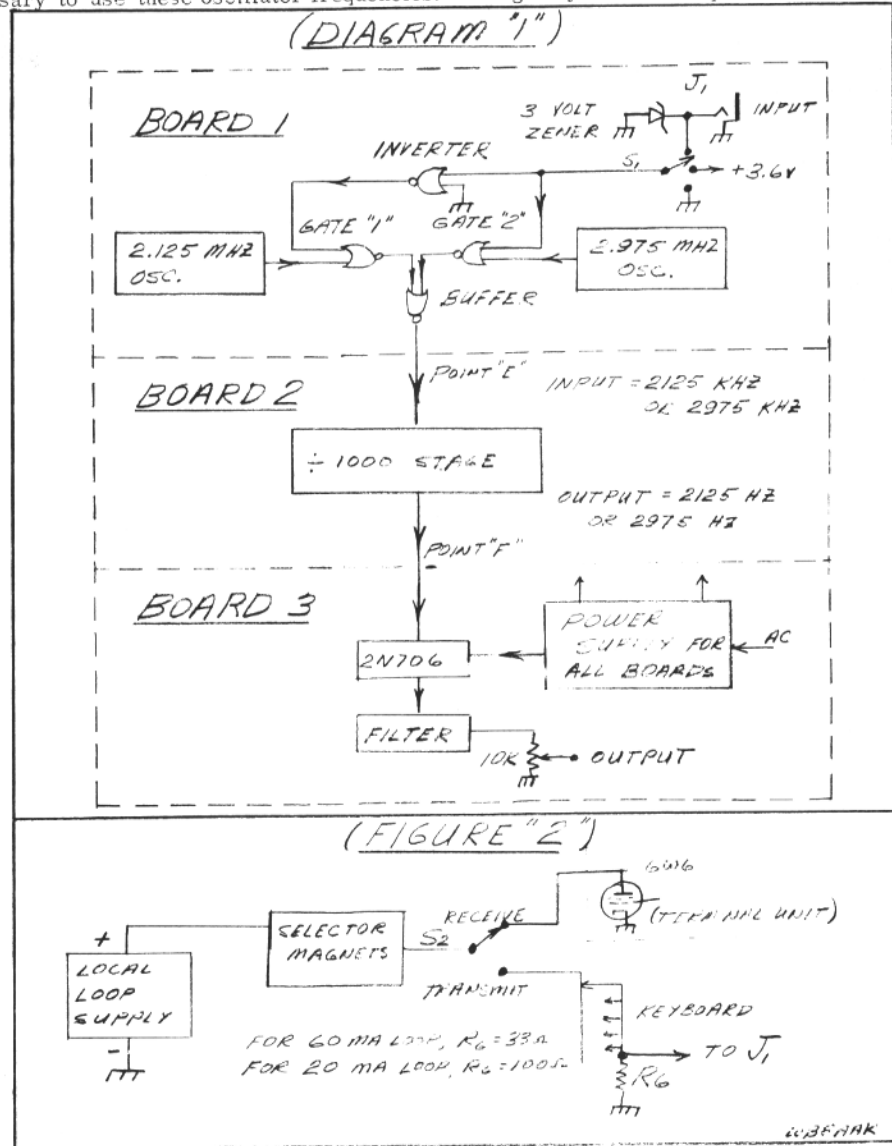
which happen to be the fifth and seventh harmonics of the 425 Hz signal. The resultant outputs at 2125 Hz and 2975 Hz were amplified and gated to produce the standard tones. The first attempt, although highly accurate, had some inherent disadvantages. The biggest disadvantage was the difficulty encountered in obtaining the 85 KHz crystal. The second disadvantage was the transient that appeared in the output when the oscillators were switched from mark to space. The third disadvantage was the fact that you were stuck with only two tones, or those tones that were harmonically related to 425 Hz.

The latest AFSK generator overcomes all these problems and is more versatile as well. It will generate any frequency in the range of 2100 to 3000 Hz with superb accuracy and will also provide a keyed output of 2125 and 2975 Hz (or any other pair of tones in the range mentioned) in the form of a sine wave with no objectionable transients (otherwise known as clicks). Refer to diagram (1) to see how it works. Two crystal-controlled oscillators operate at 2125 and 2975 Kilohertz continuously. Their outputs are fed to gates 1 and 2, where either gate 1 or gate 2 is "opened" to allow the signal to pass. It is important to note that never will both gated outputs appear together to the input of the buffer, otherwise an undesired output from the dividers will occur. This situation is prevented by the use of an inverter, which "opens" gate 2 when gate 1 is "closed" by a signal from Switch 1, and vice-versa. From gate 1 or gate 2, depending on which is "opened", the signal is passed to a buffer and then to a divider chain, where is divided by a factor of 1000. This divider circuit, as its name implies, divides the signal of 2125 or 2975 thousand Hertz into a signal of 2125 or 2975 Hertz, which we want. Simple enough. One drawback. The output of the divider circuit is a square wave. This is fine for those who only intend to operate this device as a frequency standard however for those who need a sine wave, this is useless. This square wave at an audio frequency of 2125 or 2975 Hz is now fed to a simple 2N703 transistor, which acts as an amplifier, and then to a low-pass filter circuit which passes the fundamental

frequency of the square wave and rejects all harmonics, thereby creating a sine wave which we need.

At this point let us observe that it is not necessary to use 2975 Hz as the space frequency. Simply substitute another crystal for the 2975 KHz crystal, say 2295 KHz, and you will have 170 Hz shift rather than 850 Hz. Very handy. Let us further observe that it is not even necessary to use these oscillator frequencies.

You could, for example, use a 1062.5 KHz crystal for mark and a 1487.5 KHz crystal for space, eliminate part of the divider circuit to now divide by a factor of 500, and again have an output of 2125 Hz and 2975 Hz. The chosen divider circuit presented here and used in the latest device was most convenient to use and understand. If you do intend to use a different divider circuit, be certain that its output will give you a true square wave, with a



duty factor of 50% and an output in the range of 2100 to 3000 Hz for proper operation of the filter circuit. In many of the published I.C. divider circuits, the output is a rectangular plus. If you feed this simple filter with other than a true square wave, the output will not be a pure sine wave.

One method to assure yourself that the divider circuit you intend to use will have the desired square wave output is to have the last J-K flip-flop operate as a simple divide-by-two counter, that is, with signal applied only to the "toggle" input and no others. If you use the divider circuit shown in the diagram, there will be no problem.

A WORD ABOUT THE HARDWARE

The gates and flip-flops chosen for this system are the Motorola industrial series of plastic integrated circuits, the MC724P and the MC790P units. They are chosen because of their availability and low cost. Allied Radio in Chicago carries them as stock items, and many large electronic supply outlets also stock them. If you feel sure of yourself and have had experience with integrated circuits, feel free to substitute the Fairchild uL914 and uL923 devices in place of the Motorola units. The AFSK generator was assembled on three printed circuit boards, but Vector board number 169P59032 will also serve well, as the holes provided in this board will accept the Motorola I.C. with no drilling necessary. Which ever method of construction you prefer, use a low wattage soldering pencil and a good grade of solder. These I.C.'s may be damaged by heat, if caution is not exercised.

CONTENTS OF THE INDIVIDUAL CIRCUIT BOARDS

The first of the three boards contains the two crystal-controlled oscillators, the gating circuits, and the buffered output stage.

The second board contains only the divider circuit. This board by itself is useful for other purposes and may be borrowed from the AFSK generator at a later date.

The third board contains the filter circuit, the 2N706 amplifier, and the diodes and resistors of the power supply.

HOW IT WORKS

The twin crystal controlled oscillator circuits make use of 2 sections each of a 4 section, 2-input gate, a MC724P. The

output from each oscillator is fed to another gate, either gate 1 or gate 2, which allows the signal to pass or "gates" the signal off. When the gate associated with one oscillator is open, the other gate is closed. This prevents both oscillators from entering the divider at the same time.

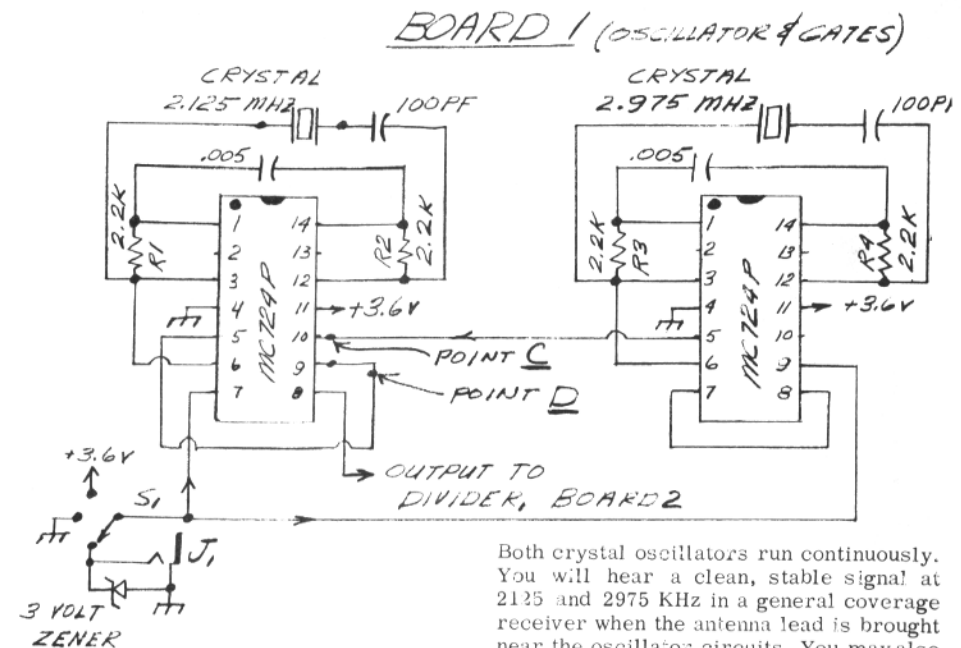
The gates, gate 1 and gate 2, are operated from a circuit which senses the condition of the local loop circuit and either opens one or the other of the oscillator gates, depending on the state of the local loop. This circuit requires a voltage from one to three volts positive on mark, and either zero or a negative voltage on space. A voltage in excess of three volts will damage the integrated circuit, so a Zener diode was placed across the input to protect the integrated circuit from either excessive positive voltages or excessive negative voltages. For test purposes, you may ignore the condition of the local loop and select either mark or space with switch S-1. A means of obtaining the necessary driving voltage for operating the gates with the local loop current is presented in Figure 2. The unit will also operate directly from the popular "Mainline output. If you find the mark and space tones are inverted, the cure is simple - swap the crystals. From the oscillator-gating board, the signal is fed to the divider board. Here the frequency is divided by 1000 and then passed to the amplifier-filter board. The amplifier-filter board removes the harmonics of the square wave, and produces a very clean sine wave at the same frequency as the incoming square wave.

A WORD ABOUT ACCURACY

The accuracy of the unit should be easily within one Hz, with no adjustment, if the circuit is built according to the schematic. Any frequency error is due to the crystal oscillator, and this oscillator, because it is crystal controlled, is highly stable and accurate. The crystal frequency must be 1000 Hz from the specified frequency before even a 1 Hz error in the output will appear. Most crystals in the 3 MHz range are within 1000 Hz of their marked frequency, many are even closer than this.

APPLICATIONS

This AFSK generator may be used in three ways. First, it can be a super-accurate AFSK oscillator for those interested in VHF RTTY, by simply feeding the



output to the microphone input of the VHF transmitter. Second, it can be used to drive the audio of a SSB transmitter. This is not a recommended means of generating FSK since the transmitter must have excellent carrier suppression and sideband rejection to prevent unwanted and illegal signals from being transmitted. The pros and cons of this system of transmitting an FSK signal have been discussed in other publications, and there is no need to go further here. Third, this generator can be used as a test instrument in itself to adjust your present setup. If you intend to use this crystal-controlled audio generator as a frequency standard, you may eliminate the amplifier and filter stages and you will find about three volts peak-to-peak at the output of the divider board with which to make your frequency comparisons.

TROUBLE SHOOTING

If you apply power to the unit and have no output, the first thing to do is recheck your wiring. After you are satisfied the wiring is OK, check the supply voltage. You should have plus 3.6 volts at point "A", and plus 6.5 volts at point "B". A variation of 10% either way is acceptable. Also check the supply voltage across each I.C. It should be plus 3.6 volts from pin 11 to ground. If the I.C.'s are receiving the proper supply voltage, begin signal tracing.

Both crystal oscillators run continuously. You will hear a clean, stable signal at 2125 and 2975 KHz in a general coverage receiver when the antenna lead is brought near the oscillator circuits. You may also use an oscilloscope to view the output of each oscillator, which should be at least two volts P-P at points "C" & "D". If only one oscillator fails to start, switch crystals to determine if you have a bad crystal. If this doesn't help, you may have to adjust the biasing resistors, R₁, R₂, R₃ & R₄ although the indicated values have worked in a number of circuits tested here.

If the oscillators are running, check for a signal at point "E", the input to the divider board. If everything checks OK so far, proceed to the output of the divider board. Connect headphones from point "F" to ground. You should hear a clean audio tone at either 2125 or 2975 Hz. If you do not hear this tone and yet you are sure there is adequate input to the divider circuit, then you have either a wiring error or a bad I.C. in the divider board. The possibility of a bad I.C. is rare, so recheck your circuit. You may also trace through the divider circuit with an oscilloscope to isolate the inoperative stage. Be cautious that you have both the oscillator board and the divider circuit connected to the power supply at all times. If one or the other is removed and power is applied to the remaining board excessive voltage will result and perhaps destroy your I.C.'s.

If you find your audio tones to be of unequal amplitude, you may attenuate the

low-frequency tone by lowering the value of R.

PERFORMANCE

The author's unit was fed with a square wave generator at a frequency of 22 Hz. to observe the switching of the tones at approximately the expected RTTY keying speeds. No objectionable spikes were seen. The frequency output was measured on a frequency counter and the frequencies were within one tenth of a Hertz before any adjustments were made to the oscillator circuits. Output level was within 1 db for

any pair of tones from 2100 to 3000 Hz. Crystals are available at five KHz intervals in FT-243 holders from JAN Crystals at a cost of less than a dollar and a quarter each including the cost of shipping, which makes it economical to have a full complement of frequencies that would normally be encountered in amateur RTTY service.

The author will extend an offer of helpful (hopefully) comments to those who have problems in construction, and would appreciate comments either pro or con on the outcome of your project.

Modifying the Model 28 Teletype

PART 5 Stunt Box Components-

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In the previous article, we explained how to remove the stunt box from the typing unit, how to convert it easily for automatic "non-overline" and how to replace it in the typing unit again.

We shall soon want to add auto CR-LF, but first a better understanding of the stunt box and its components is needed.

There are a great many special features available for the 28 printers that are of no particular interest to RTTY enthusiasts, such as form feed-out, reverse line feed-out, tabulation stops, sprocket feed, on-line reverse, etc. So keep in mind that as we explain "what is available" we are concentrating on those things of particular interest to RTTY operators.

There are 42 slots in the stunt box for various combinations of components. Viewed from the rear of the printer, these are numbered from left to right. We discussed many of the important slots and their mandatory use in article 4, so you will perhaps wish to review that section once more.

Under slots 4 and 5 is a slide (mounted on the main frame of the typing unit) that when pushed toward the front of the machine releases the carriage so it may return to the left margin stop. Another similar slide is under slots 36 and 37, and when pushed forward will lock the keyboard so the operator can no longer type. (This feature has little or no particular value to amateurs -- it was used to lock the keyboard for two consecutive "blanks" so that on land-line circuits, depressing the "break key" would lock up any keyboards being used at that instant for a priority message, or for repeats, etc. For RTTY radio circuits, it is much more of a nuisance than any advantage.)

Under slots 30 and 40 is yet another slide, this one operates the line feed clutch.

The important thing to remember on any of these slides is that they may be operated by ANY function bar placed in one of the slots, regardless of what it is coded for. That is, we could put a "M" function bar in slot 40, for instance, and get a line feed each time the "M" character came along. Of course we would never

get any line feeds for a normal "line feed" character then, unless we put it in slot 30, for instance.

Thus in the simple conversion to automatic non-overline, we removed the normal "carriage return" function bar from slot 5 and instead put in a "line feed" function bar -- now the carriage comes back on a "line feed" character. Since a "line feed" function bar remained in slot 40, both actions occur simultaneously, making it impossible to get accidental carriage return action without turning up a new line at the same time.

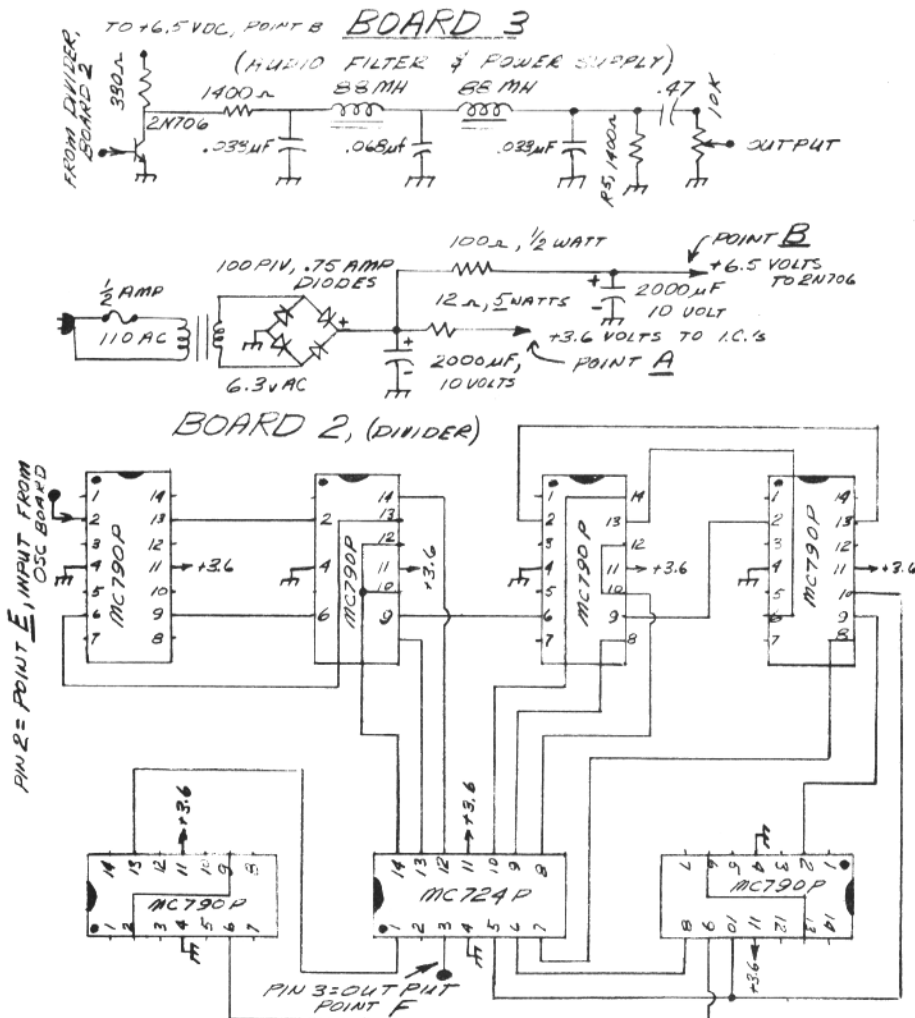
WHAT IS IN A SLOT?

Fig. 10 shows the typical parts in a slot. The slender item at the top is the "function pawl". The large item below it is a "function bar". The vertical piece is called the "function lever" and the small item to its left is the "spring plate". To the right of the function lever are three springs. The one item between the springs and the large function bar is a cotton wick that slips into the spring for the function pawl. This spring is immediately recognized as it is canted at one end, although this hardly shows up in the photograph. The longest spring of the three (middle one) is for the function bar, the shortest is for the function lever and spring plate.

HOW DO THEY WORK?

This is rather difficult to show. Teletype Corp. had a marvelous booklet available with colored drawings showing the operation of the various components. Unfortunately this is no longer available, and perhaps you can tell to some extent from Fig. 11 and 12 what is going on, and then later on when you install the parts for auto CR-LF you will be able to better see what is happening.

Fig. 11 shows the components mounted approximately as they would be in the slot in the stunt box. It shows everything "at rest". Fig. 12 then shows what happens next. If the proper code bars are moved in the typing unit, then the function bar can jump forward (toward the keyboard), its rear projection no longer is in the way of the rear of the function pawl which then



These are TOP VIEWS of the I.C.'s. Note the mechanical indexing marks on top of the case and align the IC's accordingly.

due to spring pressure falls down. Now as the motion of the typing unit continues, the bail reset pushes the bottom of the function bar to the rear, resetting it. However, the rear of the function bar is now caught on the rear of the function pawl which has fallen down so as the function bar is moved back, the function pawl goes with it. On the side of the function pawl, about in its middle is a projection off to its left side. As the function pawl is pushed to the rear, this projection knocks into the function lever near the top of the function lever, and causing it to tilt toward the rear. As the function lever tilts, it may accomplish various things either with the very top, with the middle or with the bottom -- we'll go into that in a moment. The function lever will remain tilted (for about 54 milliseconds at 60 speed) until the "stripper blade" at the rear of the stunt box raises and lifts the rear of the function lever high enough to clear the rear of the function bar, allowing the function pawl to return to its normal position. This in turn allows the function lever to return to normal.

The only purpose of the "spring plate" is to anchor the spring for the function lever to enable it to return to its normal place.

There are some rods running the length of the stunt box to keep things in their proper positions, once installed. That is not too important now.

LATCHES

Fig. 13 shows three items:

1. 152660 Spring Plate
2. 152039 Latch, released by stud or rod only
3. 154613 Latch, released by stripper blade on next character.

It is the no. 3 type latch that is used for "sequential" operation. The no. 2 type latch is used where you wish to keep a function lever latched down indefinitely so it can keep a switch open or a slide in position etc. (as for "Sel-cal" and other purposes.)

FUNCTION LEVERS

There are many different types of function levers. Twenty-seven types are shown in the current parts catalog 1149B for the 28KSR. (Section 573-115-800TC page 61). We have attempted to show most of the more useful ones in Fig. 14: (From left to right in the top row and then left to

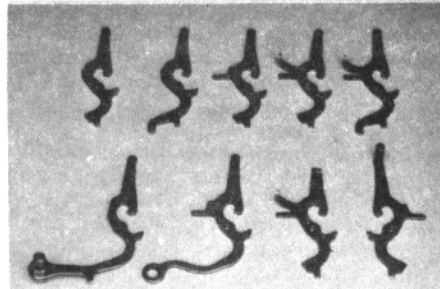
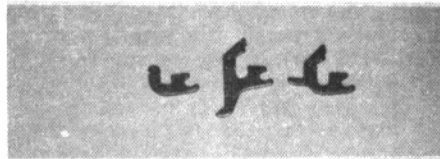
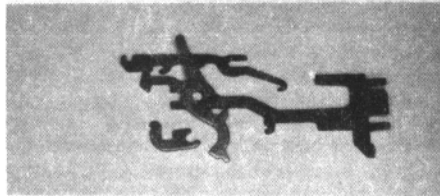
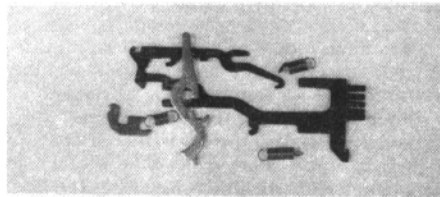
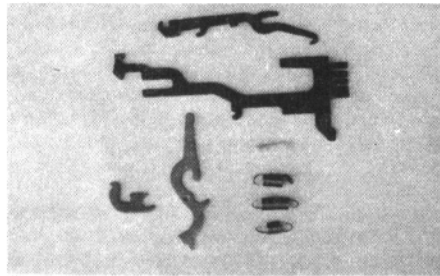


Fig. 10 Various components in each stunt box slot that is in use

Fig. 11 Showing stunt box components in approximately their "idling" position

Fig. 12 Showing stunt box components in approximately their "being used" position.

Fig. 13 Types of latches

Fig. 14 Typical types of function levers.

right on the bottom row).

1. 152642 -- may operate a slide
2. 152641 -- may operate a slide and suppresses spacing
3. 152298 -- may operate a slide and may be latched down
4. 15212 -- may operate a slide, may be latched down, and prevents the adjacent slot from operating until this lever is first latched down. (The adjacent slot has to be to the left of this function lever, called a "next higher numbered slot" - these levers are called "sequential" by some people to simplify their purpose)
5. 152659 -- similar to no. 4, but also suppresses spacing
6. 154647 -- suppresses spacing, holds a stud (as shown) or may hold a rod
7. 153670 -- may be latched, holds a stud or rod
8. 157207 -- may operate a slide, sequential, has a short top
9. 163943 -- may operate a slide, may be latched, and has a special top with a stud to the left which will operate two electrical switches at the same time. (Must be used with a function lever with a short top in the next higher-numbered slot)

There are a great many more, but these show nearly all the special features that are available. They will give you an idea of some of the things that may be accomplished, later.

FUNCTION BARS

There are well over 264 different combinations available if my mathematics are correct. Consequently we have not bothered showing any of these other than in Fig. 10. The 153440 "uncoded" (universal) function bar has some 16 tyne on it originally. There is a left row of 8 and a right row of 8. The end of the code bar housing (Fig. 1, Feb. RTTY JOURNAL, pg 5) tells what they are for if you want to look at your machine. The top one is for print or non-print, the next five are the "information" tyne for the various characters, the next to the bottom is the "Zero level" used by RTTY enthusiasts only for auto CR-LF normally, and the bottom ones are for upper-case (Figs.) or lower-case (Ltrs.)

You can see how these are coded by looking at them in your own stunt box when you have an occasion to take it out again. The "blank" in slot 22 has only

five tyne left on it, the five "information" tyne on the right side for "spacing" only. Yet the "blank" in slot 28 has been coded for "upper-case" and has an additional tyne on the bottom left side for this purpose. The "upper-case S, print only" for the bell in slot 30 is quite interesting -- it will have the top right tyne, then the five information tyne arranged to respond to "S", and finally the bottom left tyne for upper-case. These are various examples of how function bars are coded. Additional information is shown in the chart on page 65 of section 573-115-800TC of the 1149B parts manual. If buying function bars, it is cheaper to buy a "pre-coded" one (normally \$1.20 as of this writing) rather than the "un-coded" one which you then modify to suit yourself by snapping off the appropriate tyne (\$1.85).

FUNCTION PAWLS

For all practical purposes there is only one function pawl. However for an occasional special purpose there is a special pawl available that has an extra long projection on the side. This allows one pawl to operate two function levers simultaneously. It must be used in conjunction with a matching pawl. The pair cost \$3.30. While a normal pawl costs only 10¢ (part 152653). Thus you can see that only in the most unusual circumstances would you (as an amateur buying his own parts!) want to go this route. It is normally possible to substitute other methods whose end results are similar, and much cheaper.

SWITCHES

Various switch block assemblies are available, but most look quite similar to the one already in your mouse machine. That is a 4-switch block, but only two switches are being used. You can buy the small spring contacts needed to fill out the block if needed. The switch contacts are available for normally open or normally closed operation. In the one case (normally open) they look like those presently in your machine. In the other case the top of function lever pushes the switch contact up instead of letting it down as the lever is moved.

SWITCH CURRENT

This little bit of information is very important to keep in the back of your mind,

Continued on page 14

RTTY-DX

JOHN POSSEHL - W3KV
Box 73 Blue Bell, Pa., 19422



Hello there . . .

Applications for W A C usually come in every other month or so and maybe two will show up some months, but to have four at one time is really something. The certificate making department of this enterprise was taxed to the limit but we did manage to get them all out, and our congratulations go to . . .

Nr.125 Lawrence Petry K9BJM
Nr.126 Andre Charcochet F9RC
Nr.127 Charles Halle W1KJL
Nr.128 Heinz Muller DL8CX

In each instance, EL2BD, JA1ACB, or both were a factor in furnishing confirmations to the boys from those hard to get Continents. As of this writing Leo, EL2BD is preparing to QRT at Monrovia and return to the states. He can be reached at his home call of K4AGC after June 1st. He certainly did a terrific job with his 'b narrow shift signal' on all the H.F. DX bands and was very active, particularly during all the Contests when he was the ONLY contact available from Africa. The only station now active is Chris, ZS6BCT who has been showing up from time to time. There may be additional RTTY signals emanating from that Continent shortly but more of that further down the page.

A letter from Gin, JA1ACB brings some additional news of activity in Japan and the Far East. Fred, JA1ADN is now going full blast and both he and Gin were active in the recent W A E Contest. Gin has obtained a machine for JA1EYP, and also, JA1ZZ has Gin's old model 15 with governed motor. Gin recently got a sync motored 15 going on 45 baud with a big assist from W6AEE on the gearing for it. He too recently received a QSL from 9V1PG and is trying to induce Sam to be more active from that rare spot. Bill at KR6MH will be QRT in June to return to the States and this will leave Okinawa activity completely in the hands of John KR6JT, who, fortunately, has been very active. To top it all off, Gin has generously

10 JUNE 1970

offered his services to assist anyone in the Far East overcome any technical or mechanical problems they may be having that is preventing them getting on RTTY.

More activity from Asia. Word from Uli, DJ9XB, informs us that OD5ER is now active and that his very first QSO was with DJ8BT. It is reported that he has an excellent RTTY signal. His QTH is listed as . . .

Rainer Engel
P. O. Box 235
Beirut, Lebanon

Ted, G8CDW, Contest and Awards Manager of B A R T G had kindly forwarded the most recent list of holders of the Quarter Century Award. The list follows with the number following the call indicating the number of countries confirmed.

ON4BX	76	W2RUI	27
G6JF	53	DJ9XBA	26
HKG	51	DJ8BT	25
K8YEK	50	#HVR	25
W3KV	50	G3CQE	25
W5QCH	50	G3IYG	25
W8CQ	50	HCORS	25
WB6ADY	38	ON4CK	25
FG7XT	35	VE3AYL	25
G2HIO	32	VE4BJ	25
K4VDM	31	W1GKJ	25
W6AEE	31	W2UGM	25
W6CG	31	W5VJP	25
VU2KV	30	WA6WGL	25
W8GPB	30	W8CAT	25
DL1TV	27	WA8BOT	25
HCQAQ	27	WB6QFE	25
K8MYF	27		

Ted continues that the highlight of the past 12 months was the claiming of the Award by VU2KV who became the first Asian station to qualify. It is hoped that this year it will be possible to make the Award to stations in South America, Africa, and Oceania. An important point to remember is that your BARTG Contest Score can be used as a basis for qualifying for the Award. Have you sent in your score! For the record, the full rules appeared in the

RTTY JOURNAL

May, 1969 issue on these pages.

From Uli, DJ9XB, RTTY Manager for the DARC we have received some interesting information on activity in Czechoslovakia that we would like to pass along. As you probably know, OK1MP has been the one active station lately. In addition, the following stations are licensed for RTTY and most have machines. OK1KUL, OK1QP, OK1AHH, OK23MC, OK3PQ, and OK3CBR. Of the group, Milos at OK1KUL had been quite active a year or two ago. The OK hams can use the following frequencies for F-1 or F-2. 3613-3627; 7020-7040; 14080-14110; 21030-21100; 28080-28150 khz. and are allowed any shift up to 850 hz. We sure hope that a few more of the boys show up in the near future.

We unfortunately missed the W A E Contest held the last week-end in April but thanks to ON4BX and KG6NAA we were able to piece together a brief resume of activity before publication time. This was the last Contest for Larry from Guam and although he printed all six continents he managed to work four with a total of 56 QSO's. Arthur had 33 QSO's with W A C. It was indicated that activity was down somewhat possibly due to only fair conditions and possibly also due to some of the boys being away that week-end. The Dayton Hamvention accounts for the absence of Dusty and myself as this is the one yearly affair that a good many of the RTTY boys over here attend. I understand Dusty arrived home in time to make about one QSO, which shows that flying sure beats driving as the Contest was long gone when I arrived on the scene. Well anyway, it again looked like EL2BD was the only African possibility. Asia was very well represented by JA1ACB, JA1ADN, and KR6JT. PY2CBS and a new one, PY7TS put South America in there. There was quite a bit of activity from Oceania with VK2FZ, VK3DM, KH6AX and KG6NAA giving out numbers. Then there were SV0WO, XE1OE, KL7EBK, and KZ5LF. These fellows are always a good catch in any contest as they are usually the only representative on from their respective countries. Then the bulk of the contacts being made up of the European and USA activity. A full report will shortly be available from Uli, DJ9XB, when the results are published. Send him YOUR score.

Now is a good time to mark October 17-18 on your calendar. These dates have been fixed as the week-end for the 10th World Wide RTTY Sweepstakes sponsored

RTTY JOURNAL

by the C A R T G. Sid, VE3GK, says that full details will follow in due course.

Dusty recently received a letter with some exciting news from Africa. Jo, CR6CA, writes that he is just about all set to start RTTY operations from Angola. He will be using a complete Drake Line including Linear into a TH6-DX beam so there should be no difficulty hearing him. The machine is Olivetti. Jo was due to start up on the last week of April and perhaps by this time he has already been working by many of you. And if that were not enough, Jo says that his friend CR7DB in Mozambique is also getting set-up with similar equipment and will soon be QRV. If he has any problems in getting things going CR6CA will monitor the following frequencies on SSB for assistance. 1730-1830z on 23575 khz and 2200-2400z on 21310 or 14195 khz.

Paul, EI5BH, of the "EI" QSL Bureau tells us that all QSL's for USA/EI RTTY contacts from Ireland will be forwarded to Newt, K9QLQ for distribution. USA hams are reminded that the details on how to do this appeared in last month's column. All parties are agreed that this is the fastest and most economical way of handling the cards.

73 de John

*** W5VPJ WINS WPX AWARD

Bob Wagner, W2VPJ is the winner of the WPX contest for 1969. Bob had a total of 70 different prefixes, a very nice score, but the only one to be turned in. Bob will receive a plaque for his excellent work but because of the lack of interest the award will be discontinued. Bob was also the first winner of the W.A.S. in one year, award. Except for the W.A.C, RTTY operators just don't seem to care for awards.

*** Operating Hint--

Jim Goding, VK3DM, suggests that, especially during contests, sending a 0 before a number can cause confusion if it misprints, instead of 0/25 a number such as 125 may appear under noisy conditions. He suggests and we agree that the best way is to send a string of 25 spaced with dashes such as 25--25--25--25. We also might mention that as most foreign machines are not set to unshift on space while most stateside machines are that dashes be used instead of spaces for all number sequences. It is also faster to use dashes and the extra speed many times makes better printing.

JUNE 1970 11



With over 4000 paid registrations this past year the Dayton Hamfest must be at the top or close to it for attendance. Over 150 attended the RTTY sessions where Keith Petersen, W8SDZ and Ron Guentzler, W8BBB talked, our hospitality suite was full most of the time and many states were represented. The flea market literally covered over an acre and with perfect weather everybody had a perfect time. The only fault is the lack of time to see and do all the things possible. Start your plans now for next year. Usually the last week end in April. (We didn't win any prizes).

One of the most frequent requests is for a list of stations sending commercial RTTY at 60 or 75 WPM in English. Can anyone come up with a current list of any such stations?

We have mentioned it before, and unfortunately our subscribers are not the ones we would like to reach, but we regret we have no facilities to send bills for subscriptions or ads. This especially applies to overseas amateurs using a subscription agency to request subscriptions. It is not that we are independent and on request we will always send a copy of the magazine first class anywhere but as the rates are printed in every issue we would appreciate payment in advance to keep our bookkeeping at a minimum.

Some months ago we had an article on the use of teleprinters, connected to telephone lines, by the deaf. At that time a request for machines and aid in getting them working order was made. We have not heard of any response although there may have been some. Anyone in the Michigan area wishing to sell or donate printers to a worthy cause can get in touch with Dudley Cutshaw, 30937 Sutherland, Warren, Mich. 48093. He is with the Michigan Deaf Teletype Communication Inc. Dudley is also anxious to buy surplus converters, which

they convert to telephone line use, and help from anyone in lining up tones and converting machines. 60 WPM is the speed used. The society is willing to pay for machines or converters and this is a wonderful opportunity for RTTY fans to help someone else. Dudley may be reached by phone (313) 772-9349 where his XYL will take and forward any information.

We temporarily ran out of RTTY JOURNAL binders. More were ordered about the middle of April and should be available about the time you read this. What with all the strikes however we make no promises.

BACK ISSUES---

THE ONLY back issues available are: July through December 1966. No issues of 1967. All issues of 1968 except for January and November. (July-August is one issue). All issues of 1969 and 1970 to date. All copies are 30¢ each.

RTTY Journal Binders are \$2.50 each in USA, \$3.00 in Canada or Mexico. Custom regulations make it impractical to ship binders overseas.

All copies of the TT/L-2 reprint are exhausted and as this article was reprinted in QST, May and June 1969, we plan no future supply.

RTTY JOURNAL

P.O. Box 837 Royal Oak, Mich. 48068

"Dusty" Dunn — W8CQ

Editor & Publisher

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RTTY JOURNAL

Instant FSK Shift for the Marauder--

EV HAWLEY, K8JTT
790 S. OXFORD RD.
Grosse Pointe Woods, Mich. 48236

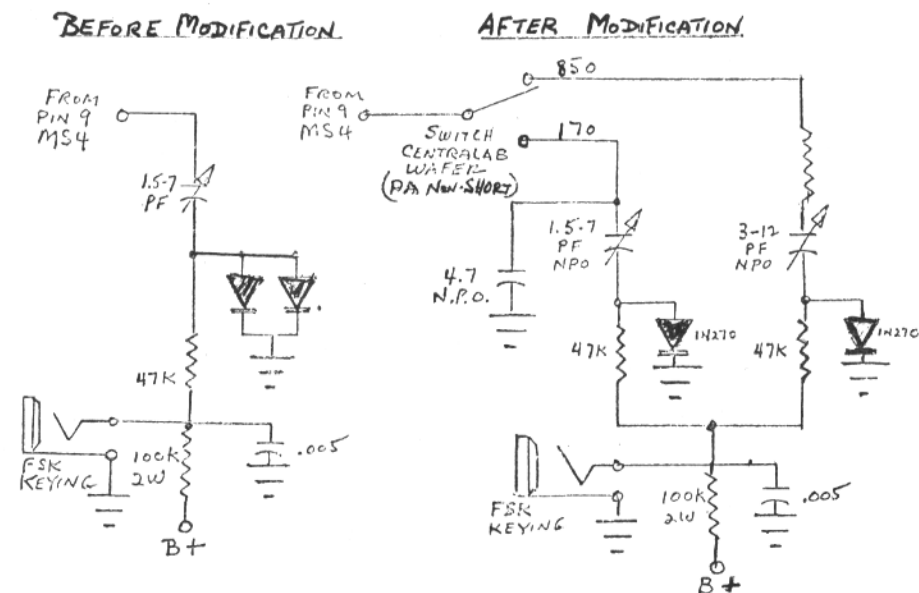
A number of transmitters, such as the Heath Marauder, have built-in frequency shift capabilities as a selective mode. This feature generally offers better than average stability and good balanced signal output since the frequency is almost always shifted by keying one of the early oscillator stages rather than the VFO. One of the best of these systems is found in the HX-10 Heath Marauder where the lower sideband oscillator is unbiased and its frequency shifted capacitively by keying a diode circuit to adjust the lower sideband oscillator to the desired point from the normal output frequency of that stage as used in other modes. Adjustment of the width of the shift is made with a small ceramic trimmer capacitor accessible from the top of the chassis.

With the increasing acceptance of nar-

use of scope or frequency counter measurements for any degree of accuracy. Consequently, change of shifts to meet consecutive contacts is impossible.

To meet the problem, the Marauder FSK circuit may be easily modified with minimal construction changes to provide a dual circuit which then may be permanently set for both the wide and narrow shift widths. (see illustration) New parts consist of an additional ceramic trimmer capacitor (3-12 pf - available at Heath stores or plant), a small NPO capacitor (about 4.7 pf), two 1N270 diodes replacing the old (the 1N270's have lower forward resistance) and some sort of double pole single throw switch.

Placement of the parts in the circuit is always a bit critical and neither the new trimmer nor the switch can be located any appreciable distance from the sideband oscillator section. I found room for the added trimmer on the chassis top a half



row shift (generally 170 hertz) together with the continued common use of the wide shift (850 hertz), the built-in FSK circuits offer no convenient way of maintaining more than one pre-tuned shift. The trimmer, of course, can be adjusted to alter the width, but this takes time and the

inch or so from the existing trimmer, drilling a new hole for mounting. This allows adjustment from the top after the rig is back in its cabinet.

There is still room for another small hole drill for mounting a toggle switch accessible on the chassis top and reached

RTTY JOURNAL

JUNE 1970 13

through the cabinet lid. Many stations have their operating gear on shelves or semi-consoles, as I have, making it inconvenient or impossible to open the cabinet lid wide enough to reach a switch on the chassis. So I substituted a wafer switch, adjusted to cover two positions only, mounted below the chassis supported with an angle bracket to the nearest compartment wall. A long control rod was brought up through a bushing in the chassis to a point an inch or so below the top of the cabinet and on which I mounted a three inch lever of the type used for push-to-talk on intercoms. This lever can be flipped back and forth with two fingers reaching under the edge of the cabinet lid when it is only slightly raised.

I am sure that there are many ingenious ways to switch the dual circuits. The one handicap in switch placement is that any substantial extension in location must be mechanical rather than electronic due to the effect of line capacitance on the side-board oscillator circuit. Of course, if one does not mind drilling the front panel, a switching knob could be placed there. On the Marauder, however, I decided the panel placement could not be made in such a position that the rig would not look butchered.

This method of width changing is worth the effort and should be no great problem to perform a similar modification on any exciter offering comparable FSK capabilities.

BE BROAD MINDED-----

TRY NARROW SHIFT-----

28 Modifications -

Continued from page 9

tucked away for further reference at some time:

THE SWITCH CONTACTS ARE RATED AT 100 MILLIAMPERES MAXIMUM CURRENT. THEY REMAIN CLOSED FOR NO MORE THAN 54 MILLISECONDS. AT 60 SPEED UNLESS LATCHED DOWN BY THEIR ASSOCIATED FUNCTION LEVER.

SPACING SUPPRESSION

A bar runs the length of the stunt box, but is slightly below it, and not a part of it. This bar, when pulled toward the front

of the typing unit prevents the spacing clutch from moving the type box along the page. Any of the 42 slots can be programmed to prevent spacing. Certain slots like those used for non-typing functions such as "LTRS", "FIGS", "BELL", "CARRIAGE RETURN", "LINE FEED", etc. are fixed in this manner.

SHIFT FORKS

Various types of shift forks and shift fork slides are available. One excellent example is already in each mouse machine above the first three slots. This particular shift fork operates the bottom "FIGS-LTRS" code bar via a vertical post which goes up to meet that shift fork.

CONCLUSION

We have given you an inkling of how the components in the stunt box work in an individual slot. We have given you at least a vague idea of how various components are already in your present stunt box.

You are probably ready now (at least as much as you ever will be) to take the plunge for dismantling the stunt box so you may install the auto CR-LF system. This is not particularly difficult, just somewhat time-consuming, but tremendously interesting if you have any mechanical talent at all, and quite personally satisfying to realize you have accomplished it yourself.

NEXT ARTICLE

The next article will cover installing the components in the stunt box for auto CR-LF

VHF COLUMN--

We had planned on a rerun of a previous article on filters for this popular column this month but just ran out of space. Ron will be back next month as usual.

Italian RTTY Group--

Italy, one of the active countries on RTTY outside of the United States and Canada is well represented by the A.R.I. (Association Radio Italiana) and official magazine "Radio Rivista". Mr. Lamberto Rossi, IIROL, PO Box 50, I 56021 - Cascina, Italy is the official representative for RTTY and is happy to co-operate in any way with other RTTY information.

PARTS - ALL MACHINES - fast service on all machines from 14s thru 35s. SASE for list. Sell Fred your surplus TTY for highest cash or trade. Typetronics, Co 8873, Ft. Lauderdale, Fla. 33310 W4NYF

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WANTED: Teletype Models 28, 32, 33, and 35 and accessories, printers, etc. We pay highest prices - and freight. Cash or trade. AMBER INDUSTRIAL CORPORATION, P.O. Box 2129, South Station, Newark, N.J. Tel: 201-824-1244.

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RTTY RIBBON INK: economical (ribbon lasts for years), deep (easy-to-read) black. Widely accepted. Large 2 ounce size \$1.25 Postpaid, U.S. Marv. Cook. WA2RDC, 1932 Windsor St., Westbury, N.Y. 11590

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WANTED: TELETYPE Model 28 in good condition reasonable price.

Tom Chittim W8LSN 3375 Byron Road, Howell Michiga. 48843

FOR SALE: TT-117B, \$175.00; TT-98A, \$100.00; TT-119/FG, \$100.00; TT-4A/TG, \$100.00; Model 19, \$85.00; Model 14 TD, \$25.00 TS-2B/TG "Fox" Machine, \$35.00; Mite machine, write. All plus shipping costs. Will consider swaps. WA5OVG, P.O. Box 38368, Dallas, Texas 75238.

BACK ISSUES RTTY JOURNAL for 1967-1968 and 1969, complete in 3 ring binders. By year only - \$3.00 per year. H.W. Lingenfelter, 21352 Kenwood Ave., Rocky River, Ohio 44116

THE BTI LK-2000HD is built to take the tough service of RTTY. Not for just a few minutes but on an all day basis even with 2 KW input. Clean signal with minimum harmonics too. About 20 db more suppression than most linears. Write W6KNK c/o HT Products, 4616 Santa Fe St., San Diego, Calif. 92109 for technical information.

WANTED: #28,32,33,35 ASR & KSR page printers, complete or parts. We pay cash and freight, or trade for new ham equipment. Alltronics-Howard Co. Box 19, Boston, Mass. 02101. (Tel: 617-742-0048)

RTTY PC BOARDS - Terminal unit July '69 73. AFSK generator Sept. '69 QST. Wide-narrow shift. Plug in type, epoxy, drilled, tinned. \$3 ea., or \$5.50 PP for both. RMV Electronics, PC Box 283, Wood Dale, Illinois 60191.

TOROIDS; LOWEST price anywhere. 40/\$10 postpaid. Center tapped 88 mhy or 44 mhy. 32KSR printer reconditioned, perfect \$200. Lorenz ASR page printer (all 60 speed) \$100. Fresh perf tape 11/16 \$10/case 40. Electro-sensitive facimile paper \$3. box/250. Stamp for list. Van, W2DLT, 302 R Passaic Ave., Stirling, N. H. 07980

SELLING OUT. No time for hobby. Drake T-4XB, \$335. Drake AC-4, \$75. Drake MN-2000, \$130.00. Will accept \$500 for all three units. All units in perfect condition and used less than 5 hours air time. Ed Brackin, W8VAS, 3390 Higley Road, Rocky River, Ohio 44116

TELETYPE PARTS and Supplies; DC supply new \$7. Wheatstone perforator with keyboard, accepts 5 unit teletype tape and converts to morse code for automatic keying of CW signal, \$75. WE polar relay 255A, \$2.50. Polar relay socket for 255A, \$2.50. Teletype page printer paper, 3 copies, case of 12 \$5.00. Single roll, \$.59. shipping weight 50 lbs. per case. Miscellaneous teletype parts and tools. Send SASE for list. L & L Electronics, PO Box 1327, Harrisburg, PA 17105.

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CASH FOR BACK ISSUES of radio magazines. Especially want April 1953 RTTY. Orville Magoon, K6DZN, 1941 Cakdel Dr., Menlo Park, Calif. 94025

ADDITIONAL CLASSIFIED on NEXT PAGE