Are You Identifying Properly

Recently a number of amateurs have been cited by FCC monitoring stations for improper identification procedures. (See September 1969 QST, p. 10, and October 1969 QST, p. 90) Are you idtenfiying your RTTY transmissions properly?

Under current FCC regulations, identification of RTTY transmissions in the 3- to 30-MHz amateur bands is required to be given by International Morse code (you could use voice on 10 meters if you wished, unless a future order moves RTTY operation to the lower 500 kHz of the band) at the beginning and end of each single transmission (or exchange of transmissions), and at intervals not to exceed 10 minutes of a single transmission (or exchange). No identification is required on the teleprinter, and if such identification is given, it does not alleviate the requirement for Morse identification.

In addition, informal "ground rules" were set forth in an FCC order pertaining to Docket 15267 which eliminated the former dual identification requirements effective August 10, 1964. The complete text of the FCC's accompanying letter appears in September 1964 QST, p. 82, and is quoted here in part. "This rule change will enable licensees to employ automatic devices for telegraphic station identification by International Morse code. However, the transmission of the amateur call sign automatically at more than twenty or twenty-five words per minute and/or with a frequency shift of less than about 100 cycles would make identification difficult, especially when monitoring from a mobile unit. Licensees are advised, therefore, that for telegraphic identification they will be expected to observe reasonable standards for code speed and keying methods. In the event that there are abuses in this area, the Commission will be obliged to set forth standards in the Rules."

So as far as hf RTTY operation, we're legal as long as we send our own call by Morse code at the beginning and end of each transmission or every ten minutes using either A1 or F1 emission with a shift of 100 Hz or greater, and at a speed of 25 wpm or less. . .nothing more. Keyboard identification is not required, but makes it convenient for those who may be only listening. Sort of makes "CW ID FOLLOWS" seem ridiculous, doesn't it!

****

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November 1973

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CONTENTS-

Resonating The 88mh Toroid -

WILLIAM JOHNSON, W5CBC
1808 Pomona Drive
Las Cruces, N.M. 88001

The widely available surplus 88 mh toroidal inductor has found many applications in amateur equipment, with the most common uses being in various audio filters and discriminators, particularly in RTTY equipment. Usually, the inductor is used in a simple tuned circuit with an appropriate capacitance to produce resonance at the desired audio frequency. Selection of the proper capacitance involves trial and error, but it is quite possible to resonate the toroids to a precision of plus or minus two or three Hz with a minimum expenditure of time and effort. The method described here requires the use of a receiver with a calibrator (or an audio oscillator), a VTVM (or an oscilloscope), and a digital frequency counter. A few years ago it would not have been appropriate to describe a tuning procedure that relies on the use of a counter, but it is my feeling that so many hams now own counters that practically everyone has access to one, even if only for a loan of a few hours. Of course, if you have access to a calibrated laboratory audio oscillator which is readable to 5 Hz or better, then you won't need the counter at all.

Now, a little investigation into component will give us an idea as to what we're up against. It would be nice if we could just calculate the required capacitance, buy a capacitor of that value, and insert it in the circuit. But it doesn't work that way. First of all, capacitors only come in certain "standard" values. Furthermore, the stated value is only "nominal," and can be anywhere within a specified tolerance (usually 10%). In the same manner, the toroids are usually referred to as "88 mh toroids," but this again is a nominal value and can be expected to vary a couple of mh either way, from one toroid to the next. Depending upon the type and manner of wiring of these particular surplus inductors, nominal values of 44 mh, 22 mh, and 11 mh are easily obtained, although the 88 mh and 22 mh configurations are by far the most commonly used.

As an example of the effect of the possible latitude of a 10% capacitor, let's assume that we have a perfect 88 mh coil (in other words, assume that it is exactly 88 mh), and that we parallel it with a .056 uf $\pm$ 10% capacitor. At the nominal capacitance of .056 uf, the resonant frequency is 2267 Hz. But the 10% tolerance rating says that the true value of the capacitor can actually be anywhere in the range from .0504 uf to .0616 uf. This in turn means that the resonant frequency of the circuit might fall anywhere in the range from 2162 Hz to 2390 Hz, an uncertainty of 228 Hz! And remember that since the toroid is not exactly 88 mh, the actual uncertainty is really somewhat greater.

What all this means is that when you get ready to resonate the coil, you'll need a little pile of capacitors of assorted values for trial-and-error tuning. For any particular frequency, it usually turns out that two or three capacitors (paralleled together) can be quickly found which will resonate the coil within a few Hz of the desired frequency.

Some people in the past have tuned such circuits by adding or removing turns from the toroids themselves. At best, this procedure can be described as a real pain. Besides, if you ever want to use the same coils on another project, you'll have even less of an idea what the true inductance is than you did before you messed them up. It's a lot easier to just bolt the little critters down and play with the capacitors.

Figure 1 shows the set-up I use myself for resonating the coils in parallel-tuned circuits, while Figure 2 shows the set-up for series-tuned circuits. The resistors are for isolation, and can be any value higher than, say, 25 K. With anything smaller, the inductive and capacitive effects of the audio source and the measuring device can easily alter the measured resonant frequency by 5 or 10 Hz. A value of 30 K for each resistor seems to work nicely.

For an audio source I use my receiver with the crystal calibrator turned on, since I don't have an audio oscillator. Varying the tuning varies the audio note within a range of about 150 Hz to 3500 Hz, and is quite stable, although stability is not particularly critical with the method described here. An audio oscillator can be used as the audio source if you have one.

A word of warning about the receiver-calibrator method. The speaker must remain connected, to avoid possible no-load damage to the receiver's audio output stage. Unfortunately, the audio note will quickly drive everyone in the

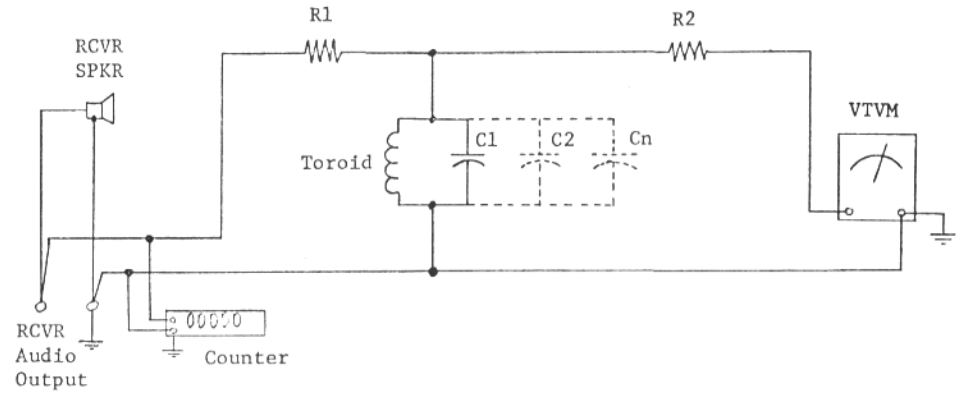

Figure 1 -- Setup for resonating the toroid in a parallel-tuned circuit. R1 and R2 are for isolation and may be any value from 25K or higher.

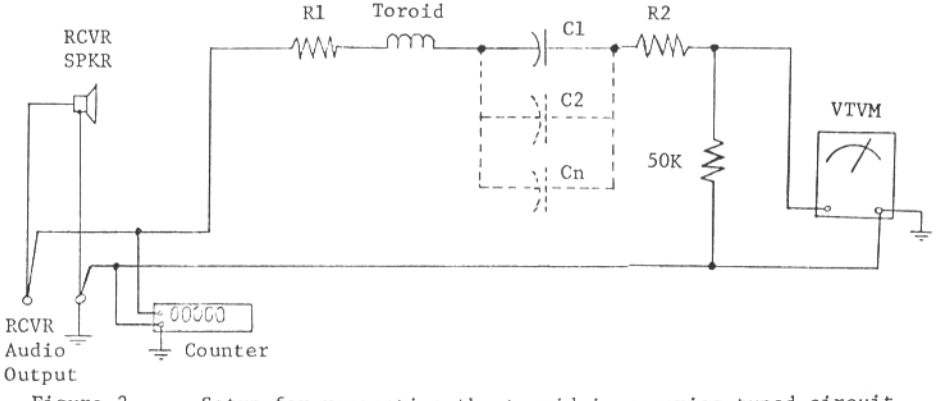

Figure 2 -- Setup for resonating the toroid in a series-tuned circuit.

house bananas (including the dog). My solution was to place the speaker between two pillows with a couple of large books on top.

With the configurations shown in figures 1 and 2, the signal displayed on the VTVM will reach a maximum peak-to-peak amplitude exactly at the resonant frequency of the tuned circuit under test. Due to the high Q of the toroids, this is a very definite peak which is very easily found by varying the frequency of the audio source. The peak amplitude is quite distinct on either a VTVM (set to measure AC voltage) or an oscilloscope.

Once you have your test equipment set up, resonating the inductors is a quick and simple matter. Remember, though, that each toroid must be resonated individually. You can't expect the same capacitance to resonate at the same frequency with different toroids. So if you're tuning several toroids, do each one individually, and solder the components into your project as soon as you finish each coil, or else mark them somehow so you won't mix them up. Incidentally, the so-called Mylar capacitors are considered the best for this type of application.

Start out by selecting a standard capacitor which will resonate the coil slightly above the desired frequency. This will be our "base" capacitor (C1 in figures 1 and 2). For example, suppose that the circuit calls for an 88 mh coil, and is to be resonant at 2125 Hz. The nominal capacitance required would therefore be .0637 uf. A likely "standard" value you might have on hand is .056 uf, which will resonate (nominally) at 2267 Hz, and can serve as the base capacitor. Connect it into the test circuit with the toroid. You can make the connection with clips, or you can solder it in, but if you solder it, use low heat, use heat sinks on the capacitor leads, and do it quickly. The problem here is not that you are likely

to damage the capacitor, but that when you raise its temperature by a couple of hundred degrees, the value of capacitance is significantly altered until it cools back down to room temperature. What this means is simply that if you tune the circuit with hot capacitors, the resonant frequency can change quite drastically after they cool back down. I recommend doing the tuning using some sort of clips. After that you can solder them into your project, and when you're finished they'll cool down and will be operating in the finished project at a temperature closer to the conditions in existence at the time the toroid was resonated. A temperature variation of thirty or forty degrees is not particularly important, but one of three or four hundred degrees most certainly is.

Now turn up the amplitude of the audio source to a point only high enough to trigger the counter and give a reading on the VTVM. By selecting an appropriate scale on the VTVM, it isn't necessary to turn it up very high. In any case, don't turn it up high enough to distort the audio waveform or to damage the input stage of the counter. Adjust the frequency of the audio source to the vicinity of the resonant frequency of the coil and the base capacitor (in our example, 2267 Hz). Vary the frequency a hundred Hz or so both ways to find the very pronounced peak on the VTVM, and leave it at that frequency. Now watch the counter for a couple of counts to get a reading.

For the sake of our example, let's suppose that the indicated frequency is 2220 Hz. A little figuring shows that an additional .0053 uf in parallel should bring the resonant frequency very close to the desired 2125 Hz. Consequencly, we can try clipping in an additional standard value capacitor of, say, .0047 uf or .005 and re-adjust the audio source in the same manner as before to find the new resonant frequency. If resonance is below the desired frequency, then you have too much capacitance in the circuit and must try one of a smaller value, or if you're not too far off, a different capacitor, but of the same rating might do the trick. Remember that at this point you want to leave the base capacitor connected while you experiment only with the smaller one.

If you can't resonate the circuit within a few Hz of the desired frequency, select a capacitor which, when paralleled with the base capacitor, resonates the toroid as close as possible to, but above the desired frequency, and connect it in the circuit. You now have a new "total base" capacitance to work from, and the procedure described above is simply repeated using an appropriately smaller capacitance. In most cases you'll be trying capacitors of about .001 uf at this point, although Mylar capacitors are available as small as .0005 uf, if you can find them. In any case, you will very seldom have to use more than three capacitors total to resonate the toroid within 5 Hz of the desired frequency, if you have three or four of each value to choose from. Remember that it is quite possible that the first capacitor you try (the base capacitor) will resonate the coil within a few Hz of the desired frequency, and it won't even be necessary to use a second or third capacitor. It's definitely worthwhile to try several different capacitors of the same value to see if you can find a single "base" capacitor which will suffice by itself.

The process of determining the approximate values of the base capacitance and each of the successive trial capacitances requires a certain amount of math which can become somewhat wearisome after a while. Consequently, I used a digital computer to generate a complete chart of all frequencies from 5 Hz to 5000 Hz, in steps of 5 Hz, along with the capacitance required to resonate inductances of 88 mh, 44 mh, and 22 mh, at each of these frequencies. A quick look at the chart can tell me, for example, what capacitance is required to resonate a particular toroid at a particular frequency, or conversely, what the resonant frequency will be of a particular capacitor and toroid. Furthermore, while I'm tuning the circuit, I can simply take the difference between the entries for the current resonant frequency and the desired resonant frequency to determine how much extra capacitance is required to reach the desired frequency.

The chart consists of ten pages with a total of 3000 entries, and I can supply copies to interested persons for $1.00 each post-paid world-wide. The airmail cost would be $1.50 world-wide. If you prefer, IRC's may be used instead, in which case the cost would be 7 IRC's for surface mail or 10 IRC's for airmail. Address your request to:

Bill Johnston
Attn.: Resonance Chart
1808 Pomona Drive
Las Cruces, New Mexico 88001

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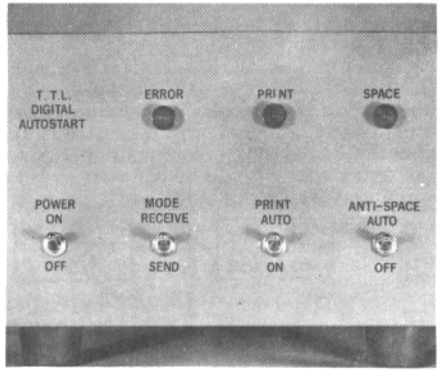
TTL DIGITAL AUTO START

BERT KELLEY,K4EEU
2307 S. Clark St.
Tampa, FL.33609



The autostart systems now in use are carrier operated with one exception (1). The equipment responds to any carrier at or near the mark frequency, or, if the signal is divided in time between the mark and space frequencies, as it is for teletype. The newer demodulators have a refinement called anti-space which prevents the printer from running "open" due to CW at any time. They still depend on the selectivity of the receiver, additional audio filtering, and the duty cycle of the received signal for what discrimination they have against unwanted signals. Carriers, slow CW and sometimes noise will turn on the printer.

This autostart features positive discrimination between teletype and any other mode. Each letter is checked seven times, and it is more difficult for any non-RTTY signal to escape detection by the digital logic. Easy duplication of this unit has been made a prime consideration. With this in mind, inexpensive TTL integrated circuits have been used, circuit boards have been made available by the author, and the unit has been packaged so that it requires only one, easy connection to the ST-3, 4, 5, or 6 Mainline demodulators without disturbing circuits. The digital logic, power supplies, meter controls, and loop circuit are all included eliminating any need for adapting these circuits in the TU. It also will convert a TU such as the ST-5 to autostart.

The start pulse is a 22 millisecond spacing condition at 60 wpm. This turns on a timing circuit or "clock" which generates pulses in step with the incoming signal. Each start and stop pulse is verified for polarity and the five information "bits" are placed in storage and examined 1.5 milliseconds later to determine if there has been any change between the stored bit and the incoming signal. There should be no change. If there is, an error pulse is generated. Two TTL NAND gates check both polarities of the incoming signal and two more gates detect errors from false starts and defective stop pulses. The outputs from these four gates are combined and trigger a pulse stretcher connected so that it discharges a capacitor each time it fires.

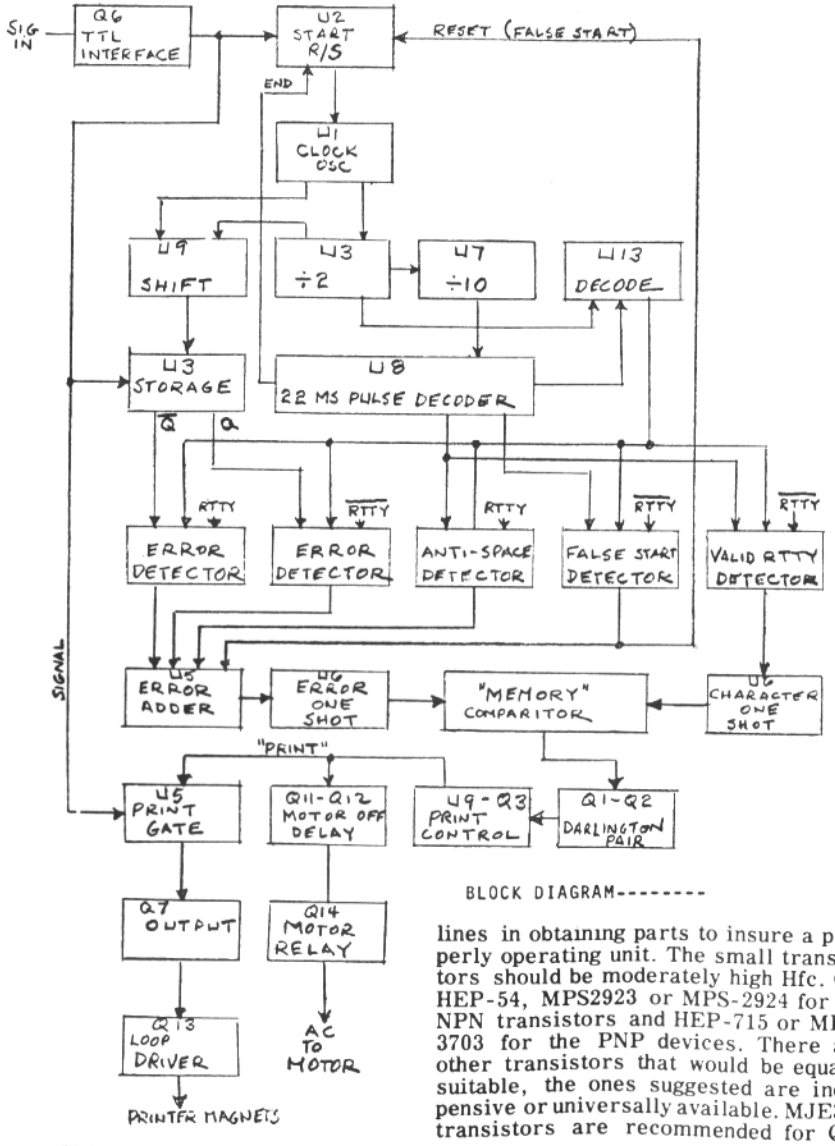
Meanwhile, the same capacitor is being charged by pulses from a similar circuit which are triggered by pulses which pass examination by both the false start detector and the character gate. A circuit monitors the voltage level on the capacitor and turns on the printer when the voltage exceeds about 1.9V. With noise input to the demodulator the error spilling out of the four gates keep the capacitor discharged to about one volt. When a signal appears, the capacitor charges in increments with each character until printer turns on at the eighth character. There is no lost print with this turn-on requirement because most operators open each transmission with several surplus characters, such as blanks, spaces, and duplication of call letters. At machine speed, the printer will come on in less than 1.3 seconds -- probably faster than most operators could reach for a manual start switch. The shut-down is equally positive, about three random characters are printed in rapid succession before printer lock-up. Emphasis was placed on RTTY vs other mode discrimination. This results in a considerable savings in paper, but, the printer will turn on when the logic recognizes an incoming signal as teletype even though it may be garbled. There will often be enough accurate print so the substance of such messages can be understood. A print hysteresis circuit has been included so that evaluation standards are changed once the system goes into print. This reduces printer motor cycling under marginal conditions.

Simple digital counter storage systems have a definite capacity, that, when exceeded, begins again at count zero instead "remembering" a high error count. Capacitor error storage is superior because it is simple, can not overflow, and has the bonus feature of an idle line turn off. With a quiet carrier, after one min-

ute the capacitor discharges and the printer goes off. This accepts the slowest typists, but turns off the printer in a reasonable time if a quiet carrier appears after start-up.

The unit is enclosed in a 7 X 4 X 12 minibox with the two circuit boards mounted on leg machine screws obtained from toggle bolts. The power supply is mounted on top for heat considerations, and extra wire should be allowed so this board may be swung aside while probing or testing in the logic board. The loop circuit is very similar to the ST-5/6 and has the known advantages of magnet overdrive, freedom from relays, and positive-negative FSK voltages. The motor control circuit operates from the same voltage that turns on U5, the print gate. A diode and capacitor at Q11 base provide turn-off delay to keep the motor running for a short time after the print has ended and the logic has switched to mark hold.

It is important to follow a few guide-

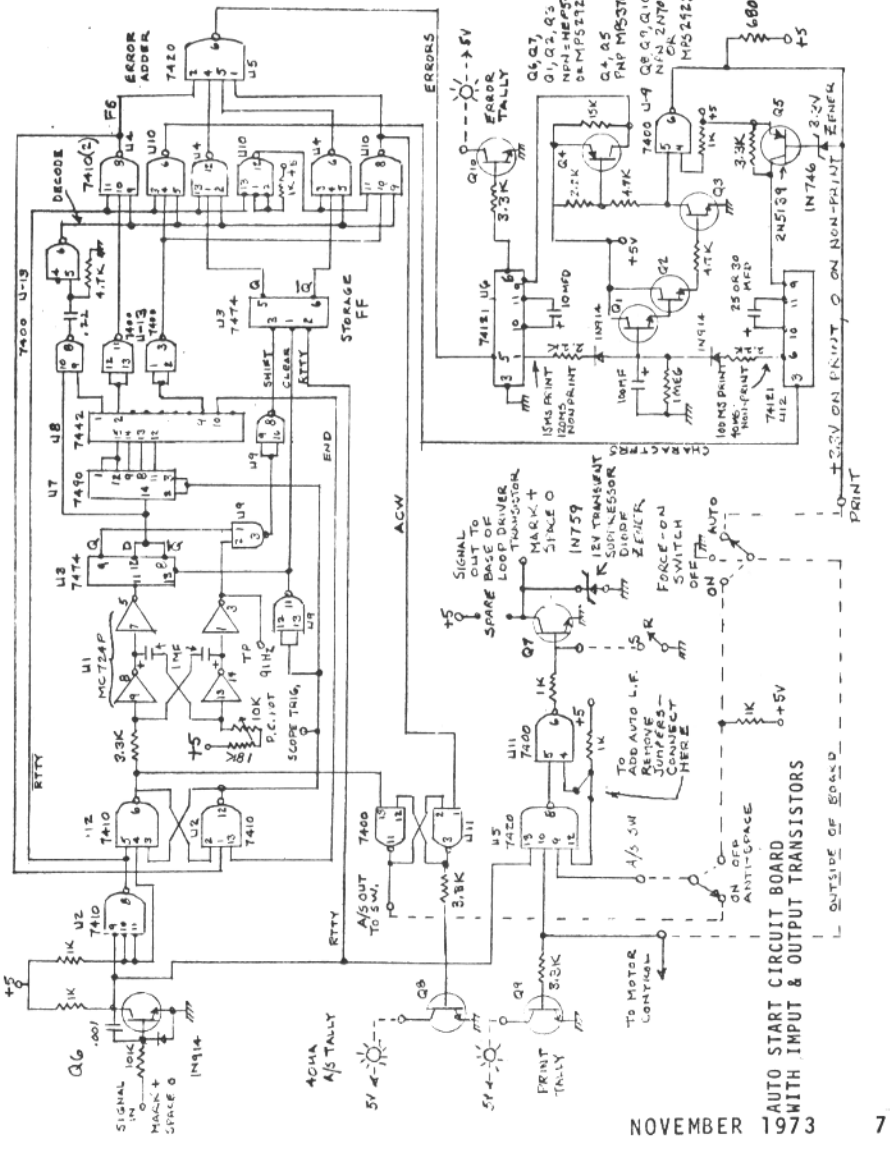


BLOCK DIAGRAM--------

lines in obtaining parts to insure a properly operating unit. The small transistors should be moderately high Hfc. Get HEP-54, MPS2923 or MPS-2924 for the NPN transistors and HEP-715 or MPS-3703 for the PNP devices. There are other transistors that would be equally suitable, the ones suggested are inexpensive or universally available. MJE340 transistors are recommended for Q13 and Q14. The motor relay should not have a coil resistance less than 120 ohms. Pilot lights should be low current types or from 20 to 40 ma. 6V lamps operated at 5V were used in this unit, but even 24V lamps could be used if operated from the 18 volt supply.

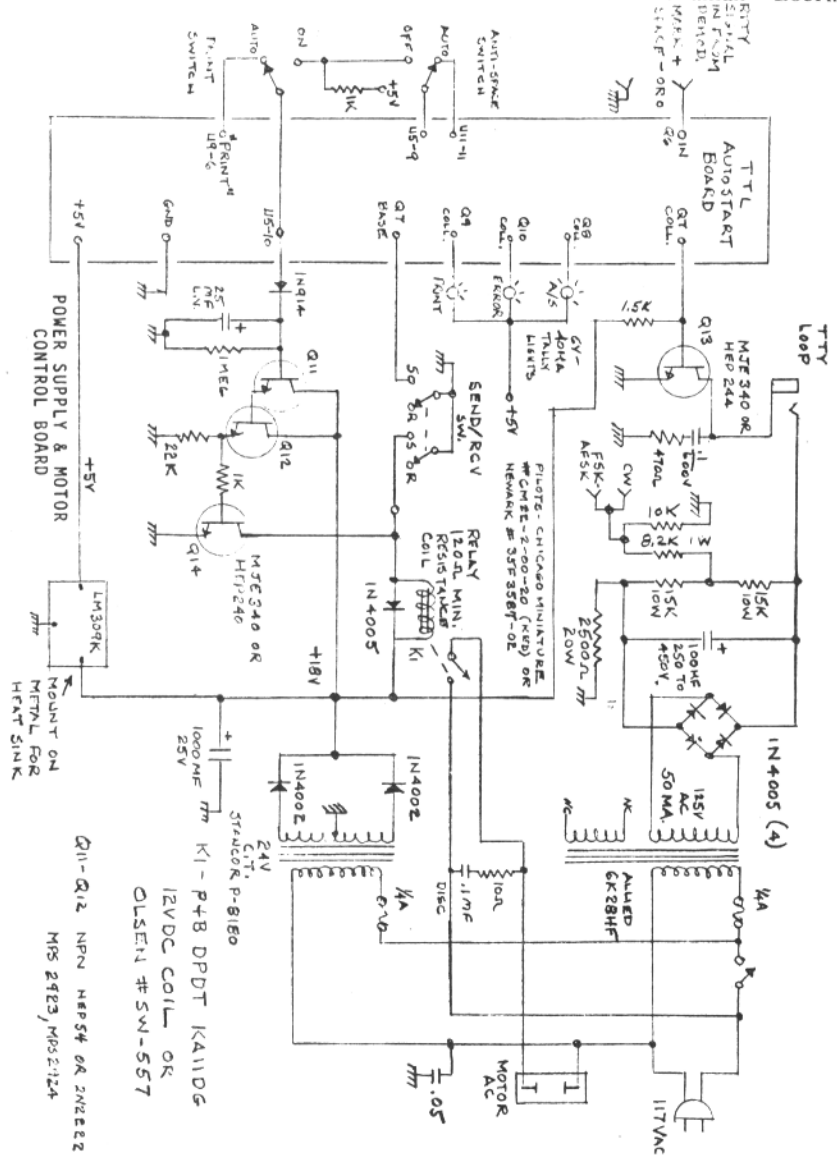
The connection to the demodulator should be where the signal is unmuted during standby, of the proper polarity and voltage swing. The ST-3/4 connection point is at the collector of the PNP transistor Q2 with Q10 removed, or disabled. The connection point for the ST-5 and ST-6 is at pin 6 of the "slicer" op amp. A phone type jack makes a convenient external connection point and it would be advisable to add a resistor in series with the connection to prevent any possible damage to the op amp by external wiring shorts. The 10K resistor located in the input lead at the logic board could be used for this purpose.

As a final adjustment, the clock oscillator must be set at 91 Hz with a counter. Remove the circuit board jump-

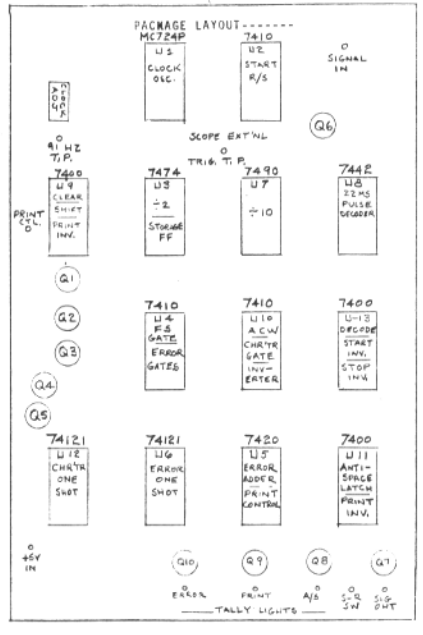


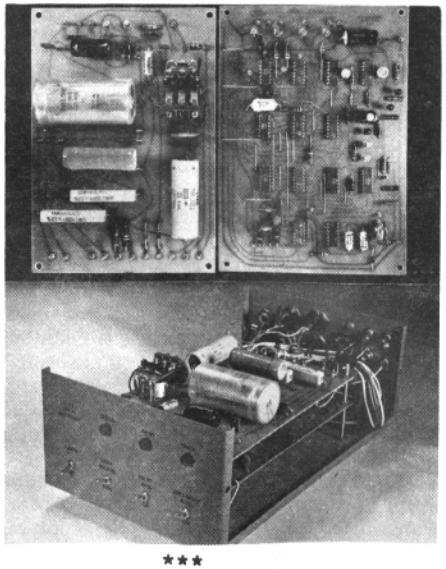
er between U 8 and U2-13, set the frequency and restore. If all is well, the autostart will be in operating condition. It should require a seven or eight character start-up, go into non-print about one minute after typing stops with a quiet carrier, and go into non-print almost immediately after the end of the transmission. Assuming no problems in the logic, the start-up time is determined by the length of pulses from U-12. These are set by the actual capacity of the 25 mfd cacacitor, and by the resistance connected to pin 9. This resister, 3.3K, is shorted out of the circuit in non-print by Q5, and the timing is set by a 2K internal resistor in the IC. A short idle line turn-off time is caused by any leakage across the 100 mfd memory storage, defective 1N914 diodes, and low beta Q1 and Q2.

"A set of two epoxy, plated, undrilled 5 1/2" X 8" circuit boards is available from the author for $12.00 postpaid in USA. The set consists of a logic board, and a power supply-loop-motor control board. A complete parts kit, less boards, is available from Truman Boerkoel, K8JUG, Stotts-Friedman Co., 108 N. Jefferson St., Dayton, Ohio 45402. Additional construction information and waveform photos will appear shortly in Ham Radio magazine."



(1) Stewart, K5ANS, Digital Autostart for RTTY Journal Nov. '70.
(2) Hoff, W6FFC, ST-3/4, 5, and 6 terminal units published in RTTY Journal.





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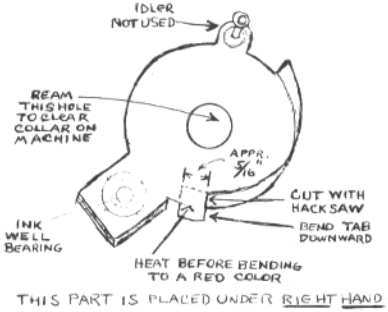
Modifying Relnker Kit for WU Model 100 Printers-

FRANK OBERLANDER, W9YPS
110 N. Tremont St.
Kewanee, IL. 61443

As shown in the sketch, a tab is bent from the existing material in order that the tab can be inserted in the slot usually used to hold the ribbon reel cover. No other means of support is needed. This modified part merely floats under the ribbon reel. (Naturally, the cover can not be used after this part is put in place) . . . A small sacrifice considering the advantages of good black copy . . .



THIS PART IS PLACED UNDER RIGHT HAND REEL

If one is a bit squeamish about heating and bending the tab, without breaking it off, another means would be to drill a small hole in the center of the material that is shown bent down, and rivet a small piece of hard metal so that the tab is provided, care being taken to see that the rivet head does not interfere with the easy rotation of the reel. The ribbob is routed in the normal manner but also passing around the inker well. A note of caution--in heating the part for bending the tab, care must be taken to not heat up the inker well bearing, (a small ball bearing), too much. Bending the tab instead of making one and fastening it to the metal side is preferable. This provides an extra opening for the ribbon to travel without passing around this edge causing some binding. If drag on the wheel is experienced, please a small washer under the ribbon reel.

***

RTTY theory & applications.

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ADA OHIO, 45810

RTTY for Beginners- Part 7

RECEIVING RTTY SIGNALS----

A few months ago we described how an RTTY signal is transmitted. This was done before describing how to receive a signal because it was felt that it is easier to understand how to receive something if one knows what that "something" is. We will review the transmitting process and then describe the receiving process.

There are two methods used to transmit an RTTY signal. Both involve frequency shifting a signal. One method employs frequency shifting the carrier from a CW transmitter. The other method involves frequency shifting an audio tone which is applied to the microphone input of a voice transmitter (FM or DSB AM). The former method is called FSK and the latter method is called AFSK. Which method is used is dependent upon legal restrictions and/or technical problems. Generally, FSK is used on 10 meters and below, and AFSK is used on 6 meters and above.

FSK is obtained by connecting the keyboard contacts to the oscillator circuit in a CW transmitter. The connection is made thru a simple circuit consisting of a diode, an RFC, and a few resistors and capacitors. This shifting circuit is placed physically close to the oscillator in the transmitter. When the keyboard contacts are closed (Mark), the output from the transmitter is a particular desired frequency (for example, 3.600 MHz). When the contacts open (Space), the frequency of the oscillator is shifted downward by some desired amount; when "wide-shift" is being used, the frequency is shifted downward by 850 Hz during a Space. (If 3.600000 MHz were used for Mark, the space frequency would be 3.599150 MHz.)

It should be emphasized that something is always being transmitted; i.e., regardless of whether a mark or space is being sent, the transmitter is "on the air" and RF is being fed into the antenna. The only difference between Mark and Space is that the output or transmitted frequency is slightly different.

AFSK is obtained by building (or buying) an audio oscillator that contains a shifting circuit similar to the one that was used in the FSK transmitter oscillator circuit. When a Mark is to be sent, the output from the audio oscillator is a given frequency (typically 2125 Hz). When a space is to be sent, the output from the audio oscillator is shifted upward in frequency. Usually, a shift of 850 Hz is used; therefore, if the Mark frequency is 2125 Hz, the Space frequency is 2975 Hz. The audio oscillator and its shifting circuit are called, collectively, an "AFSK Keyer" and this keyer is housed in a box that is physically separate from the transmitter. (That is, with FSK the shifting circuit is built into the transmitter, while with AFSK the shifter and its oscillator are located external to the transmitter.) The output from the AFSK keyer is connected to the audio input of an FM or DSB AM transmitter.

THE BASIC RECEIVING PROCESS

Whether the signal to be received is FSK or AFSK, there are certain similarities in the receiving process. In the case of AFSK there are essentially two steps and with FSK there is an additional step. We will describe the AFSK situation first.

The two steps to receiving an AFSK signal are: 1) Tune the receiver so that the AFSK tones are heard in the loudspeaker, and 2) Apply the tones coming from the receiver to a "terminal unit" (TU), or a "receiving converter", or a "decoder", whichever you prefer to call it, and connect the output of the TU to the selector magnets in the printer.

The receiver tuning process for AFSK is quite simple. Because the signal being transmitted was generated by applying audio-frequency tones to the microphone input of an FM or DSB AM transmitter, the receiver is tuned in exactly the same manner as it would be for a voice signal.

The TU and the process within it will be described briefly in order to present the basic processes taking place within it. A more detailed description will be given next month.

As mentioned above, the audio output from the receiver is fed into the TU. This audio signal is composed of two tones one at 2125 Hz representing a Mark and one at 2975 Hz representing a Space. Only one tone is present at any one time. Inside the TU is a pair of tuned circuits; one circuit is tuned to the Mark audio frequency and the other to the Space audio frequency. When a Mark tone is received there is an output from the Mark tuned circuit and none (or very little) from the Space tuned circuit. When a Space tone is received, there is an output from the Space tuned circuit and none from the Mark tuned circuit. The output from these tuned circuits is an audio frequency voltage (AC). These AC voltages are rectified (converted to DC) by a circuit similar to that used in a power supply. There is one rectifier circuit connected to each tuned circuit. The diodes in one of the rectifier circuits are reversed from the way those in the other circuit are connected. Therefore, for example, when a Mark tone is received a positive DC voltage results whereas when a Space tone is received a negative voltage is produced. This DC voltage is too weak to directly operate selector magnets and is amplified. The amplification can be accomplished by means of a polar relay, a vacuum tube, or a transistor. The amplified voltage is applied to the selector magnets.

To summarize the AM or FM AFSK receiving process: The tones are received on an "ordinary-type" AM or FM voice receiver as would a voice signal. The tones coming from the receiver are fed into a terminal unit (TU). The TU separates the two tones, converts them to DC, and then turns on and off a DC loop connected to the selector magnets. The DC loop is turned on when a Mark tone is received and off when a Space tone is received.

RECEIVING FSK

The FSK receiving process involves three steps: 1) Tuning in the FSK signal, 2) Converting the FSK signal into an AFSK signal, and 3) Converting the AFSK signal into a DC loop signal by means of a TU.

The last step will be considered first because we have already discussed it. The TU used for FSK can be the same one used for AFSK so long as the tones applied to it are AFSK tones of the proper frequencies.

How do you get AFSK tones from a receiver tuned to an FSK signal? The answer is the same as the answer to the question: How do you get a tone from a receiver when receiving a hand-keyed CW signal? The answer is: Use the BFO in the receiver. When receiving a hand-keyed CW signal you are trying to listen to a single carrier or RF signal that is simply going on and off. By means of the BFO you (or, rather, the receiver) converts that single carrier frequency to an audio frequency. The pitch (or frequency) coming from the receiver is dependent upon the difference between the transmitted frequency and the frequency of the BF oscillator within the receiver. If the carrier frequency of the received signal varies, the pitch of the tone from the receiver varies. If you tune in an FSK RTTY signal, the tone coming from the receiver will change as the transmitted signal changes frequency. Therefore, the first two steps involved in receiving an FSK signal are more-or-less accomplished simultaneously.

Now come some problems that occur with FSK that do not occur with AFSK. In order to describe and understand these FSK problems, let's look at AFSK again. When a person is transmitting voice or AFSK on an FM or DSB AM transmitter, the audio frequencies he sends are determined by him. When you tune your receiver to hear his signal, you tune for maximum signal or least noise but in the tuning process you do not change the frequencies being heard. You merely optimize what you are hearing. In the TU the tuned circuits are tuned so that one gives maximum response to Mark tone and the other to Space tone. In order to greatly simplify what could become a messy tuning problem, certain standards have been set up for AFSK RTTY and one of them is that when using "850-shift" the Mark tone is always 2125 Hz and the Space tone is always 2975 Hz. Therefore, once you have built your TU you should not have to retune it everytime you receive an AFSK signal because "everyone" uses 2125 Hz for Mark and 2975 Hz for Space.

When you tune a CW signal, you tune for a combination of things including maximum signal and least noise. When tuning you also change the pitch of the signal. This pitch is not particularly important because your head contains a rather broadly-tuned circuit that will accept almost any pitch. When you tune an SSB signal you have a slightly tougher situation than with CW because you have to tune to get the voice frequency components in approximately their proper range in order to understand what the person is saying, but there is still some room for error and your head will compensate for it. However, the tuning is more critical than it is with CW.

Now back to FSK. When you tune in an FSK signal, your tuning determines the pitch of the received tones. If his transmitter or your receiver drifts, the pitch of the received signal changes as it does with CW or SSB. However, because the TU contains rather sharply-tuned circuits, the audio tones presented to the TU must match rather closely the frequencies to which the circuits are tuned. Therefore, when you receive an FSK signal you must tune for the proper pitch of tones and a slight drift in frequency at the transmitter or receiver may alter the frequency of the received tones enough to cause errors in the printed copy or prohibit copy.

For example, if either end drifts by 100 Hz, the tones will change by 100 Hz, and this may be enough to prohibit copy. A change of 100 Hz at a frequency of 3.600 MHz is a change of one part in 36 thousand or approximately 0.003%. At ten meters a change of 100 Hz is approximately 0.0003%. This represents a pretty tight frequency tolerance.

Again, a problem with FSK reception is that the person receiving determines by his tuning what audio tones will appear from the receiver. This means that the tuning process is more difficult than with AFSK. Also, any drift in frequency at either end will directly result in an error in the tone output frequency from the receiver. With AFSK a tuning error is either totally unnoticed, or, at worst, may result in a change in noise level from the receiver.

Another problem with FSK, although not as serious, is that by improper tuning you may end up with an "upside-down" signal. This is analogous to what happens when an SSB signal is tuned on the "wrong" side (trying to receive with the mode switch in "LSB" when it should be in "USB"). You might tune in the signal so that one tone is exactly 2125 Hz and the other is 2975 Hz but get nothing but "garbage" from the printer. The problem is that space is 2125 Hz and Mark 2975 Hz! (Incidentally, this could also be the fault of the transmitting station.) A simple remedy for this situation is to incorporate within the TU a "reversing" switch that permits the interchange of Mark and Space signals.

SUMMARY

We have briefly reviewed the two methods of transmitting RTTY signals. It was pointed out that when AFSK is received a voice type receiver is used and the tones being transmitted are heard in the loudspeaker. Tuning the receiver optimizes reception of the tones but does not change their pitch or frequency. The tones are fed from the receiver into a terminal unit (TU). The TU separates the tones by means of two filters or tuned circuits, converts the outputs of these filters into DC, and applys the DC to a loop keyer which operates the selector magnets in the printer. The loop keyer may be a polar relay, a vacuum tube, or a transistor.

When FSK is to be received, the receiver must receive the signal (obviously) and convert the FSK signal to audio tones or AFSK. (The conversion to AFSK is the same process used to receive CW or SSB.) Once the AFSK signal has been generated within the receiver a TU is connected to the output of the receiver as it was for a pure AFSK situation. The prime difficulty with receiving FSK is that the frequency of the tones appearing at the receiver output is dependent upon the tuning of the receiver, and precise tuning is required compared with the rather sloppy tuning required with AFSK. Also, any drift of the receiver or transmitter when using FSK will result in a shift of the frequency of the tones coming from the receiver, and even a relatively minor drift (when compared with AFSK or DSB AM voice) will result in loss of copy.

Next month we will describe TUs in more detail.

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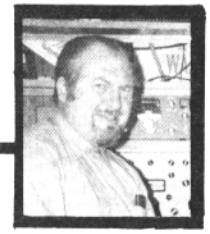
RTTY-DX



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

Hello there. . .

The big event for the month of September was the DXpedition to St. Pierre et Miquelon by George, FPØAO (W2JNO) and Dave, FPØSS (WA2EXP). Most if not all the RTTY contacts were made by FPØSS while FPØAO concentrated on SSTV and the other modes. Available gear consisted of a KWM-2, FT-101, Mite printer, and a dipole. There were plans to use a vertical looping wire suspended from helium filled balloons but the boys had many other problems and we are not sure if they were able to try this unique antenna system. The big problem for the RTTY operation was encountered soon after getting things set-up. The regulation on the A.C. mains was practically non existent and was down around 85 volts at times. With a syncronous system of communications like RTTY you can imagine that things were not being printed or understood on the receiving end. The first few days of operation on RTTY were confined to hours when the line load was at a minimum but later the situation was considerably improved by the loan of a line regulator by one of the local hams on St. Pierre. As this was being written the station had just closed down so complete details are not yet available. Needless to say, at the rate we observed Dave making contacts there can hardly be a DX'er that does not have a new country in the log. One thing we would like to point out which may be of assistance to others planning a DXpedition, or for that matter, any station using machines equipped with 60 hz sync motors. Many countries outside the U.S.A. use 50 hz power line frequency. The Mite machine the boys were using had a 60 hz sync motor and the line frequency on St. Pierre was 50 hz. The Mite is equipt with quick change gears for 60, 67, and 100 WPM. In this instance Dave used the 67 speed gear (normally 50 baud with 60 hz) and the net result was that the machine was running so close to 45.45 baud that any slight difference in speed could not be detected in operation. Jan, A2CAK, also used this neat trick on his Mite when on his trip to Botswana. QSL cards can go to WA2EXP- - -

David A. Minott
352 Arkansas Dr.
Valley Stream, N.Y. 11580

John, 5T5LO, is again back in business and has been on just about every day from about 2000z. Bud, W2LFL, rushed him a repair manual by air which accounts for his rapid return to RTTY.

Activity from "down under" should be on the upswing very shortly. In a recent QSO with Ian, VK5IF, we suddenly found ourself saying hello to six other VK5 hams that were in the shack. Ian was showing them the mysteries of RTTY and all either have machines or are getting one soon. VK4MJ shows up during the morning hours around here as does VK-6PG. Arthur, ON4BX, recently had one of the very first contacts with a new station in Papua Territory. Graham, VK9DJ, is a new one on from this rare spot. There is a sad item to report from this area also. We were grieved to learn of the passing of Dr. J.R. Goding, VK3DM. Jim was very active for either a rag chew or a contest exchange. Many of the RTTY boys met him personally during his frequent trips to the States and Europe and know what a fine gentleman he was. We shall all miss VK3DM.

As was mentioned last month, Bob, YA10S was active in the SARTG contest, and those that did make contact can consider yourselves fortunate indeed. In a recent letter Bob tells us that right in the middle of the contest the authorities shut down all amateur activity and actually came and physically removed the equipment. As it stands now it is even forbidden to have an antenna or a short wave receiver. Bob requests that NO - QSL cards be sent to his Kabul address. Send any QSL's to his home station SMØOS and they will be answered in due course. We hope that the situation clears up soon and that Bob gets his equipment returned.

Some recent news on the activities of Emile and Tara, 9G1WW/9G1YA. Emile says that upon his return to the States he found that he had some 2000 QSL cards to be answered as his manager had

some personal problems and was not able to process them. He is all caught up now but says that anyone still lacking a card can receive one by sending a SASE to his present QTH, which is --

Emile Allaine, WA5WUJ
1119 Pennsylvania
Slidell, La. 70458

Emile has no immediate plans to fire up from a new DXlocation at this time but may surprise us all one of these days.

As you perhaps know, we are guided by the ARRL DXCC listing when it comes to crediting countries toward the 100 - DXCC - RTTY Award. In line with this we are pleased to announce that as of 1 September 1973 contacts with the "East German Democratic Republic" (-DM-) will count as a separate country. We would imagine that any Contests held after September would also count DM as a separate multiplier, although we cannot officially speak for the various Contest Committee's at this time.

The prefix hunters will be pleased to learn that there have been a few more new ones around lately. HA25FE, HA25KCC, and HA100KFN have all been active recently although we are at a loss to explain what the numbers mean. WQMT tells us that his QSL for HG5A has been returned to him by the 'HA' Bureau saying that there are no single letter calls issued. We also notice in the Call Book that the HG prefix are for VHF stations only!!

A few calls logged recently that are not too common on RTTY are: CI1AK (Prince Edward Island), GM3XWJ, UK3-DAA, UK3XAB, UB5SR; A2CCY, **DMØFS**, VP9GE, EL2F, WB4MIZ/HK3, and LU7-DDG.

We had received word that Marcus Island was all set to go QRV the weekend of 22 September. At this writing he has not been printed here and we have had no reports of anyone working him. However, there was a bad solar disturbance around that time and the week following and conditions are just getting back to normal so no doubt he has been printed by this time. He is due to be there until December so there should be a good chance for all to log this rare prefix.

Now it is our pleasure to present the most recent recipient of the 100 - DXCC - RTTY Award.

Nr. 7 Dusty Chapman WA3IKK
100 Countries Confirmed

Dusty managed to accomplish this difficult feat in the relatively short span of 2 years, 9 months, and 9 days. The equipment in use during most of this time was the Drake Line driving a homebrew linear, a ST-6, a Model 28 KSR, and perhaps most important of all, a 5 element 14 mhz Yagi on a 36 foot boom. Dusty did not leave those hard earned QSL's to the mercy of the post office but drove well over 100 miles to deliver them to this QTH. We will lift our glasses in a double toast to Dusty as he also won the Volta RTTY Contest of last year. To our knowledge this is the FIRST time a U.S.A. station has won ANY of the several RTTY DX contests made available over the past several years. Nice going OM.

We plan to publish the RTTY - DX Honor Roll in the December issue. To up-date your standing please have your Worked/Confirmed totals to me by November 1st. The totals are really getting close to the 100 confirmed in a few areas of the world so it should be an interesting listing to see.

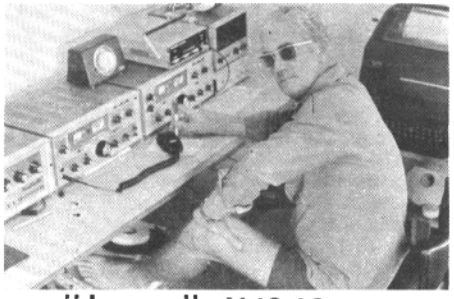
RTTY - DX November 1963

Henry, ZS1FD, really liked those Creed Model 76 machines he recently saw on a trip to the U.K. Bruno, I1RIF, winner of last years DX Contest will award a Olivetti typewriter to the winner of this years Contest. Eric, VK3KF, has moved to a new shack and Bill, VK-2EG, is looking for a Model 15 printer.

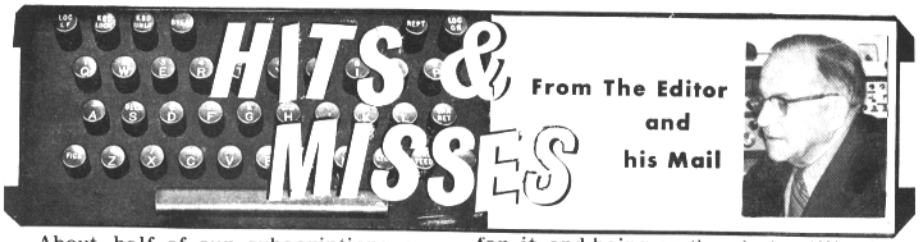
In closing thanks to W2LFL, W5EUN, ON4BX, DK3CU and JA1ACB for their assistance.

73 de John

"Frank" WA2YVK
"Paul" EI5BH



"James" YJ8JS



About half of our subscriptions expire with the December issue. This creates a lot of extra work in one month and with the busy Christmas season on hand many who intend to renew, forget, until after the January issue has been mailed. If you intend to renew, check your address stencil NOW, if it is marked Dec. and a 3, why not send the renewal now, saves us a lot of work and assures you do not miss any copies.

***

The Dayton Hamvention (Worlds Largest) has been extended this coming year to two and a half days. Friday noon to Sunday PM. An excellent idea, we feel, as there has just been too many visitors and too many things to do in one day. April 26-28 - We plan on having our RTTY JOURNAL hospitality room as usual, probably at the Imperial House North. More information later but start making plans to attend now.

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The "Fun Hamvention" SAROC is January 3-6-1974. Lots of things planned. For full information write SAROC PO Box 73, Boulder City, NV, 89005.

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A LETTER of WOE and PERSISTENCE...

Dear Dusty:

Thanks for sending the copy of Ed's Jingle Bells tape. Soon as my equipment becomes operational I'll play it for my wife and daughter and let you know what their reaction was. Too bad I'll never hear it. I presume you know that I am entirely deaf.

Because of my lack of hearing I had been off the air for more than 15 years. Though the idea of setting up an RTTY station had been in my mind for a long time. The present circumstances are such that I can now go ahead with these long dreamed of plans, and the past several months have been devoted to that purpose.

Unfortunately, I've probably done everything in the book, and all of it all wrong. Despite considerable expenditures there is very, very little to show for it and being on the air is still a long way off. Perhaps I should start from the

Continued on Page 16

BACK ISSUES

New subscriptions and classified ads are cash in advance as we have no method for billing. New subscriptions will be started with the current issue and one back issue, if requested. Please do not ask us to start any further back than this. Back issues - if available - may be ordered at 30¢ each at time of subscription. The JOURNAL is mailed about the 20th of the month preceding the dated month. May and June are a combined issue and July-August is a combined issue.

The ONLY back issues available are listed below. 30¢ each.

1966-Oct.-Nov.-Dec.- [3]
1969-Oct.-Nov.-Dec.- [3]
1971-May -June -July-Sept.-Nov.- Dec.- [6]
1972-Feb.-Apr.-May -July-Sept. Oct.-Nov.-Dec.- [8].
1973-Jan.-Feb.-Mar.-Apr.-May - July- Sept.-Oct.- [8]

RTTY JOURNAL
Box 837
Royal Oak, Mich. 48068
Editor & Publisher 'Dusty' Dunn, W8CQ

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Letter- cont.

Continued from Page 15

beginning and relate what has happened so far.

As soon as I had decided that the time was "now", I went to the public library, got hold of a copy of the latest (?) ARRL handbook, I think it was the 1969 edition, and read up on all they had to say about RTTY. Not much, to tell the truth. In one part of the text, however, the reader was invited to write to their Technical Information Service at 225 Main Street, Newington, Ct. 06111, for information on how to obtain the necessary teletype equipment, who dispensed it, and a bibliography of RTTY articles over the years in QST magazine. I immediately fired off a letter and in due time received a reply that informed me who the local source for retired Western Union equipment **used to be** since W.U. had discontinued releasing their equipment to hams more than a year ago! They also sent a list of four dealers in Teletype equipment and suggested they be contacted for their most recent catalog or price list.

I wrote to all, including the ham who used to act as go between with W.U. All answered except the ham. I was most disturbed about that. The least the ham could have done is tell me he no longer was able to obtain RTTY units and offer alternate sources of equipment. I can't help wondering why I got no reply.

Anyway, the most interesting list and the lowest prices were from a firm right here in Brooklyn (all names and addresses omitted to protect the innocent reader; but will be supplied upon request). The owner is semi-retired and entertains prospective purchasers by appointment only, or via mail order through his ads in the RTTY Journal. I wrote to him and asked about some of the items on his list, which included a Kleinschmidt page printer offered as being in "excellent" condition for $40 (down from $75!). A Kleinschmidt reperforator, also offered as "excellent" for $30. And a lot of other such equipment, enough to make a raw novice in the TTY game drool all over the floor, meaning me, of course. Best of all, to my inexperienced mind, was a model 28 combination reperforator and TD on a 36" high stand, with motorized take up reel and holding bin for only $85 in next door to new condition (down from a former $150).

I made an appointment to be at his shop the Saturday following his reply to my inquiry, wherein he wisely suggested I start off with a page printer, and possibly, a model 14 reperforator plus a model 14 TD to use with it. But no, instead I bought the model 28 reperf and TD combo, thinking I would add a model 15 page printer later. Is it not amazing how we, who know so little, think we are so smart! I got the beastie home and plugged it into the AC and couldn't understand why, though it ran OK, all it did was print and punch spaces. Why didn't it stop? What was wrong with it? Why only spaces? And how the heck would I go about getting it to do more than spew spaces (only) all over the living room floor? The XYL made a couple of suggestions which I brushed aside and I heard no more from her and her snide remarks after the word "divorce" was tossed back and forth a couple of times. There were other words but since this is a (sort of) family magazine I better not mention them.

Anyway, to appease the wife (and my conscience) I wrote to the dealer again and asked him why his stuff didn't work, and would he take it back in exchange for a bunch of other stuff on his list? He answered he would, even though he didn't have to (didn't I know what I was buying?) and provided I hadn't "ruined" the machine.

Next week-end, again, he not only took it back, but picked me and it up in his king size station wagon, exchanged it for the items he had first suggested and carted me and them home again. There was some extra stuff involved that raised the ante 75 more dollars, but let's not mention THAT to the XYL!

One of the extras was a pretty well banged up CV89A terminal unit with 2" CRT tuner built in. First crack out of the box that failed to work. First off some of the tubes were missing. I got those and tested the rest. Several were NG in one way or another. All were replaced or obtained and, finally, it lit up (without smoking) except for the scope tube. After all, what could you expect for $35? Fortunately, one of the classified ads in the RTTY Journal offered a brand new replacement scope module for the CV89A at $15 which I immediately ordered. That arrived in a little while and, lo, and behold! I got a trace on the scope tube. It worked!

Did I forget to say that the ARRL handbook also suggested I subscribe to the RTTY Journal? It did, and I did. Best investment made so far. At least **that** works!

Next, I plugged in the M-14 reperf and, again, all it did was cut spaces without stop. What the heck is the matter with these machines? I put the tape with all the spaces in the M-14 TD and, at least, that ran - and stopped when the tape ran out. Eaureka! Something works right (or did it?). I plugged in the Kleinschmidt page printer and that ran. For a change, this one did NOT print spaces. It printed nothing but "E". A full line of EEEs, carriage returned, line went up one space and more EEEs. Line after line of them. I poked my finger into the guts of the evil device only to have the carriage return, right smartly, against my index finger nail, leaving a nice triangular indentation on it that didn't bleed too much. I pulled the plug and said a few words, while dancing around holding my finger, that I'm quite certain my daughter had not ever heard before.

Just about at this point I decided I better find out more about these machines. That called for a trip to the local radio shops where books were sold. I visited a number of them including two branches of Lafayette Radio, Harvey Radio, Arrow Radio, Harrison Radio and the N.Y. show room of Heathkit. One of the Lafayette stores had a copy of Wayne Green's brand new RTTY handbook which I bought. Also bought copies of QST, CQ ($1.00!), Ham Radio, which was new to me, and 73 magazine. CQ advertised two RTTY books. The New (1963) RTTY handbook and RTTY From A to Z, both of which I ordered through the mail. Finally, I was doing something right.

Meanwhile, I had written to Jim Cooper, W2BVE, of BVE Enterprises, who sent me his latest price lists. One of the entries was for a model 19 complete with table, power supply, the works, for about $100. I ordered it and Jim asked if I could wait until a mild or dry weekend when he could dig it out from way in back of the garage where it was stored along with much of the other items on his list. I'm still waiting, but I don't mind too much. It is cold, and it has been wet for the past several weekends, and besides, I don't yet have a receiver or transmitter. Jim, from his grand letters, seems to be a real nice guy and there's no use in putting him out for no real good reason, but I am anxious and wondering if the model 19 will work! It probably will. Jim says the set was taken right out of active commercial service and is in remarkably good and clean condition. Of course the speed will be wrong and it will need 60 WPM gears, but that should be easy to correct without too much trouble. I got a model 15 technical manual from Tapetronics in Florida which will help, and a model 14 TD manual from Jim which will also help. And the information in the three RTTY manuals tells me why plugging AC only in will run spaces and nothing else, except for the Kleinschmidt that prints nothing but EEEs and smashes fingers. Nothing in the books about that.

That's where it stands now. Still no transmitter. Still no antenna. Still no model 19 though its fully paid for. Still nothing of a teletype nature printed on tape or paper. Will I ever see the day? Soon as I do you will be the first to know.

Cordially and very best 73's,
Mack O. Santer, W2ZPW

P.S. Any questions about my experiences? I'll be glad to answer them. Incidently, all are true.

Mack

The above letter from Mack Santer, 2114 83rd St., Brooklyn, N.Y. 11214 may not be typical of all ham experiences, we hope not -- but does show that where there is a will there is a way --. As a PS we might add that a later letter from Mack states that he is now printing and hopes to be on the air soon.

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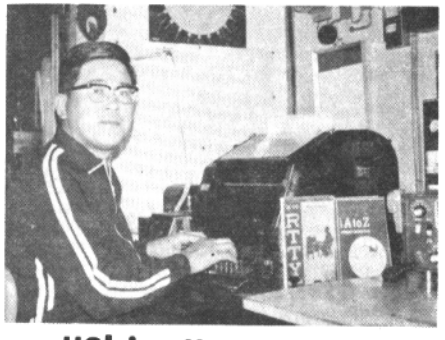

"Shige" JA8ADQ

"Carlo" I5CLC

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TELETYPE, KLEINSCHMIDT, MITE, gears, ribbons, supplies, parts, manuals, tuning forks, motors; tape $9.00 per case. Mite 66 wpm printer set, ditto. SASE for list Typetronics, Box 8873, Ft Lauderdale, Fl. 33310. W4NYF. Wanted- Northern Radio 107 teleprinter parts.

BACK ISSUES OF RTTY JOURNAL - I have a complete file of all issues from Vol. 1 No. 1 to date. Will reproduce any issue for $1.10 pp. Add 25¢ for air mail delivery. John Isaacs, 3175 Val Verde Ave., Long Beace, CA. 90808.

TYPEWRITER RIBBON RE-INKER; Hand operated model now only $3.50. K575 or K764 ink available at all National Cash Register Stores. 75¢ per tube. Walter Nettles, W7ARS, 8355 Tanque Verde Rd., Tucson, AR 85715.

NEWS-NEWS-NEWS - Amateur Radio's Newspaper, "Worldradio", Trial subscription - Two issues for one dollar. "Worldradio". 2509-F Donner Way, Sacramento, Calif. 95818.

CIRCUIT BOARDS. AFSK April 73 Journal $8; Monitoring Receiver Sept 72 Journal $10; Digital Autostart, June 73 Ham Radio $12; Automatic line feed modified with carriage return, January 73 Ham Radio $7. All boards are G-10 epoxy, plated, undrilled with parts values screened on; photos and parts list included. Bert Kelley, 2307 S. Clark Ave., Tampa, Florida 33609.

KLEINSCHMIDT TT-4A/TG printer, keyboard, used, good, $60.00 with 60-100 gears. Freight $20. east of Miss. $10. west of Miss. Also have ASR, KSR typing punches. Mark/Space Systems Co. 3563 Conquista, Long Beach, CA. 90808. (213) 429-5821.

WANTED. Model 33 & 35 equipment. Complete or partial units, any quantity. Will pay shipping. Terminal Systems, Inc., 11300 Hartland St., North Hollywood, CA 91605 (213) 769-6772.

RTTY-VIDEO DISPLAY UNIT. 1,000 characters, Plugs into loop or logic circuits. ASCII or BAUDOT available. Works with any TV set. Leland Associates, 18704 Glastonbury Rd., Detroit, Michigan, 48219

DESK-FAX TELEFAX TRANSCEIVERS: Several machines, $14 each, shipping collect. Desk-Fax Western Union shop manual, $3.80 each postpaid. Bill Johnston, 1808 Pomona Drive, Las Cruces, New Mexico 88001.

"RTTY SPEED CONVERTER" A drilled, fiberglass 4" x 6 1/2" printed circuit board now available for the WA6JYJ speed converter in the DEC 71 issue of HAM RADIO. $6.00 postpaid. Complete parts kit including PCB, $40.00, postpaid. P & M Electronics, 519 South Austin, Seattle, WA 98108.

COLLECTOR wants back issues of RTTY Journal before 1969. W6ISQ, 82 Belbrook Way, Atherton, Cal. 94025

FOR SALE: ENTIRE RTTY STATION; Full station except receiver. 28KSR, clean, perfect mechanically; TT/L2 with scope, Mainline keyer; Globe 300 watt RTTY transmitter, etc. SASE for list. Louis VanDyek, K2LNG, RD 1, Rensselaer, N.Y. 12144, (518) 283-6471. Pick up or nearby delivery only.

WANTED: HIGHEST PRICES PAID for M32 KSR printers and parts in ANY quantity - Prefer within 150 miles - Lee Brody, NY-NJ Phone - TTY for the Deaf, 14-25 Plaza Rd. Fair Lawn, N.J., 07410.

WANTED: INFORMATION ON FULL & part-time teletype repairman or organization able to work on subcontract basis. Contact Terminal Systems, Inc., 11300 Hartland St., North Hollywood, CA 91605 (213) 769-6772.

FOR SALE: ONE MODEL 28 ASR with upper reperf, 60/75/100 WPM gears, non-chad, auto carriage/line feed, two TD's, stunt box, spare motor, three spare type boxes, spare parts and schematics. One Model 28 Rec. Only Unit. Both Typing Units just overhauled and cleaned. One KY463A Converter. Asking $1000 for all, F.O.B. Laurel, Maryland. Also one R-390A/URR receiver. For more info write Dave Nixon, K3ZNJ, 16101 Roblynn Ct., Laurel, MD. 20810.

BAUDOT LOOP TO ASCII CONVERTER connects right into your loop and delivers 8-level or 6-level ASCII for electronic readouts or ASCII-coded c.r.t. display systems. Loop interface features bridge rectifier and opto-isolator: connects anywhere in your loop trouble-free. Internal latch recognizes LTRS and FIGS codes for correct translation of all RTTY symbols; unshift on space available with one jumper wire on p.c. board. Wired and tested, complete except for 5 volt power supply and one potentiometer, on one 4X6 inch circuit board: $120. Petit Logic Systems, P.O. Box 51, Oak Harbor, Wa. 98277.

WANTED FOR MODEL 26 TELETYPEWRITER, four new or near-new letter cylinder drums with full sets of letters, numerals, and punctuation marks. Also interested spare parts same machine and possible buyer of near-new condition Model 26s. M. Williams, 2139 North Angus St., Apt. A, Fresno, Calif. 93703.

R390A-ULTIMATE RECEIVER FOR RTTY-mint condition - $850.00.M28 ASR (3 speed) with dome reperf (3 speed). Professional condition - $1,200.00 - Phone evenings - 201 - 796-5414. Will deliver within NYC area.

WANTED - 33ASR, B. A. THUNMAN, W8ISG, 71 McCollum Street, Galesburg, Michigan 49053. Phone 616 665-7071 or 731-5164.

GOING OUT OF BUSINESS SALE: Model 28 typing reperforator, TT315/UG code LPR 35, tape date 11/16 wide, chadless or fully perforated, excellent - $12.00 ea. Model 28 typing reperforator TT317/UG code LPR 37, tape data - 11/16 wide, chadless or fully perforated, excellent, $12.00 ea. 60 WPM gear set for model 14 trans-dist- unused - $3.00. 60 WPM gears for model 14 Typing - reperf, pinion unused-gear used - $3.00 set. Synchronous motor for M 14 TD - typing reperf or model 15 - excellent $4.00 ea. P.D. 82/V synchronous motor for Mite teleprinters or Teletypwriters, 115 VAC, 60 Cy. 1 ph, unused $9.00 ea. Tuning forks, 96.19 VPS or 120 VPS unused, 3 for $5.00. Here Is" answer back keyboard for model 15, with attachments to set up identifications, 21 characters, excellent $6.50 ea. TT107B/FG reperf, TTY receive only, 60-75 or 100 WPM Kleinschmidt. for automatic typing and reperforating of TTY messages, excellent $17.00 ea. Reader-High speed Feranti model Mark 11 or 111, excellent $10.00 ea. Send us your requirements for unused parts for TD-Typing reperfs-model 15, 28, Kleinschmidt and Mite machines. Atlantic Surplus Sales, 580 3rd Ave. Brooklyn, N.Y. 11215

CLASSIFIED ADS-

MODEL 32ASR; EXCELLENT CONDITION. $325.00. Boehme converter 5-C, new $65.00. Model 14 reperf/keyboard $25.00. 314 Polar relays $3.00. 3 in. Scope RCA - $20.00. 28 ROTR cover, $25.00. WA-2HWJ, 205 Powell St. Central Islip, N.Y. 11722 - (516) 582-9364.

RTTY FREQUENCY STANDARDS --- Three brand new Tuning Forks, better than 0,0005 accuracy, especially designed for complete adjustment of TU filters and/or AFSK oscillators at 2125, 2295 and 2975 --- available separately at $7.40 each or set of three $19.90 postpaid. Henry Frankel, Box 535, Bellmore, NY 11711.

FOR SALE Model 28 A.S.R. and TT/L Terminal Unit T.U. is custom built in a Collins "S" line cabinet and has matching Collins knobs and is painted and lettered to match the "S" Line exactly. Includes built in scope for tuning and loop current meter. Copies both shifts. 28 A.S.R. has 2 T.D.'s. One external for torn tape operation and one-internal with climbing head feature that reads last character punched by built in typing reperf. Has automatic tape winder, paper winder and tape stuffer. Machine is set up with non-overline and auto carriage return. Has automatic C.W. indentifier that can easily be programmed for any call sign. Have many spare parts to use in stunt box and gears for 100 WPM. Includes external 14 typing reperf. Price $1,100.00. Pick up or you pay for crating and shipping
WA8BOT, Bob Spaith 3 W. Sunrise Ave., Trotwood, Ohio 45426 Area code 513 Days 837-4188 Evenings 837-5685

RE-LIVE RADIO/WIRELESS HISTORY, JUST OFF THE PRESS NEW Reprinted 1860-1866 History, Theory, Practice of Electric Telegraph 500 pages. HB-First Complete Book, A must for any Ham, Specially RTTY, $8.00 1887-1927 Vintage Radio Book, $4.95, Deluxe Library Copy $6.95. 1921-32 Radio Guide Book New 260 P, $3.95. 1973-74 Radios/Wireless Antiquers Directory, $5.00. 1890 Edison Electric Light Plaque Replica, For the Shack, Home, Office, $4.95. FREE 1858 World Telegraph Map with Telegraph Book, Collectors Catalog No. 2 with any purchase. All Postpaid. Ten Day Money Back Guarantee. Order MIDCO RJ11 Box 15370 Long Beach, Ca. 90815.

MODEL 32ASR; EXCELLENT CONDITION. $325.00. Boehme converter 5-C, new, $65.00. Model 14 reperf/keyboard $25.00. 314 Polar relays $3.00. 3 in. Scope RCA - $20.00. 28 ROTR cover, $25.00. WA2HWJ, 205 Powell St. Central Islip, N.Y. 11722 - (516) 582-9364.

BEGINNER NEEDS EQUIPMENT: Am fascinated by RTTY but short on equipment. Looking for good deals on 14 reperf and 14 TD. (60 wpm, sync motor), TUs etc. Am not too proud to accept tax deductable donations. I pay shipping. WB9HIP, Joe Harmon, 276 Lakeshore Lane, Bloomingdale, IL. 60108

100KHZ CRYSTALS. octal base. $2.50 postpaid. Limited supply. Nat Stinnette Electronics, Tavares, FL 32778

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RTTY BINDERS - $3.50 pp.

Stiff Red Cover with Gold Printing

RTTY JOURNAL

Box 837

Royal Oak, Mich. 48068

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WESTERN UNION DESK-FAX TELEFAX TRANSCEIVER MANUAL: Complete theory of operation, adjustment, lubrication, preventive maintenance, troubleshooting, parts list. Includes all schematics and mechanical parts drawings. $3.80 postpaid. Bill Johnston, 1808 Pomona Drive, Las Cruces, New Mexico 88001.

HAL COMMUNICATIONS CORP: Announced the revolutionary new RVD-1002 and RKB-1 solid state RTTY system. Provides the ultimate in noiseless, reliable reception and transmission of Baudot coded TTY. The RVD-1002 visual display system receives demodulated TTY pulses from the ST-6 and provides video output to a video monitor, or modified TV set. One thousand (1000) characters are displayed in a 20 line, 50 character per line format, at 60, 75, and 100 WPM if your TU will copy it. The RKB-1 combines reliable TTL circuitry, a high quality commercial keyboard, and a rugged case to provide the best Baudot TTY keyboard available. The electronics is arranged so that you type as if you were using a typewriter. See them on display
Get the details from HAL Communications Corp., Box 365RJ, Urbana, Il 61801. Phone 217 - 359-7373.

CHANGES- ***

COMMERCIAL FREQUENCIES

ROBERT ALLEN, Regional Dir.
Agency France Presse.

We notice a few errors in the AFP frequencies published in the July-August 1973 issue of RTTY Journal. Rather than correct these, we enclose an accurate listing of present and near-future frequencies for the AFP Spanish service.

We also operate RTT from Paris, Manila, Singapore and Tananarive in English, French and Arab with transmissions beamed to the U.S. and Canada, Eastern and Western Europe, Africa and Asia. I will try to get you a complete list of frequencies.

Agence France-Presse news transmissions beamed to Latin America, in **Spanish**, daily 1000 - 0600 GMT, 50 Baud (66 WPM). (At least one frequency in each group always operating).

From France (Toulouse)	
FTJ-98	9,985.2 khz
FTK-94A	10,942
FTP-65	15,651.33
FPQ-8	16,184.6
FTU-31A	20,318
FTV-82	21,822
From Martinique (Fort-de-France)	
FZF-75	7,535 (operative late 1973)
FZF-63	16,442.5 (operative late 1973)
FZF-	11,016
FZG-4	20,504.5
From Peru (Lima)	
OAB-22	9,165.5
OAA-27	13,429
OAB-76	16,249

rfa/afp/mexico