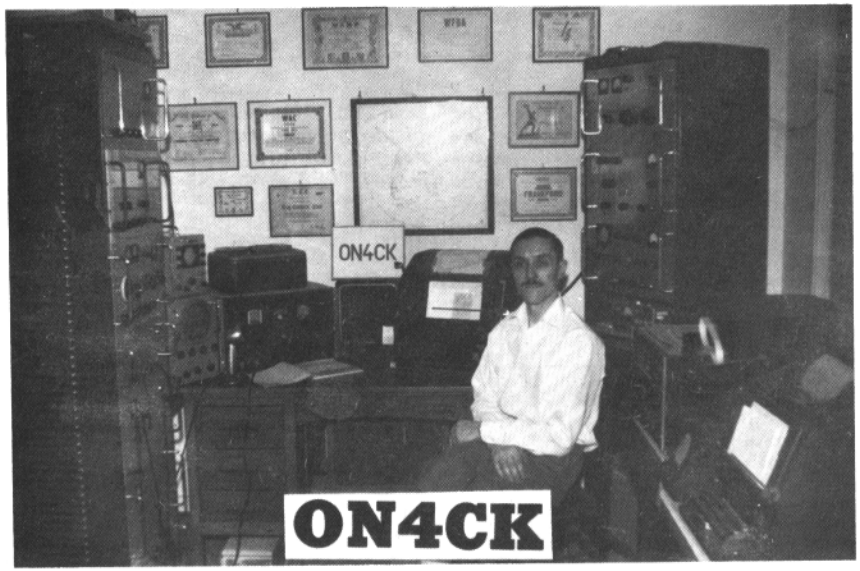

ON4CK, Robert, author of the article on page 3 runs a full KW on all modes including RTTY. All of the equipment has been hand made except for the model 15 and 19 RTTY machines. He uses a windom antenna for 40 and 80 meters and a three el tri band quad up 40 feet for 10-15-20 meters. Tape equipment is available in both 45 and 50 baud Robert is 35 years young and next time you hear him on the bands you will have something to start talking about.

• • •

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RTTY JOURNAL

MARCH 1968

EXCLUSIVELY AMATEUR RADIO TELETYPE

Vol. 16 No. 3 30 Cents

The LOST AMATEUR BAND Can We Do Something ? !

(The following article, from Jerry Hall K1PLP, is similar to a letter he sent to the ARRL requesting that 7090 Hz be designated for RTTY use. The ARRL replied that it was not their prerogative to assign frequencies for special use and that the users themselves had to make these decisions consistent to sound reasons. Jerry has some sound reasons, but the RTTY group by majority will have to decide. What is your opinion. With the wholesale changes in accustomed operating locations that will be necessary with the new rule changes, the sooner the RTTY frequencies are established the better off we will be.)

CQ RTTY DE WA8xXX! If this fellow is transmitting on forty meters, he might as well forget it, and go bowling instead. I'll wager that an hour of calling and listening would yield no QSO. On eighty, twenty, fifteen, and maybe even ten meters, it is possible to make contacts rather easily, but not on forty! Let's face it, forty meters is a lost amateur band as far as RTTY operation goes!

One possible reason for no activity in this band may be the lack of a suitable established calling and working frequency. Until May of 1961, the suggested 40-meter RTTY frequency as published in issues of QST was 7140 kc (it was not KHz in those days). Then suddenly in the August 1961 issue, with no explanation offered in that or in intervening issues, the suggested frequency was changed to 7040 kc. The exact reason for this change is apparently lost in history, being unknown even to the present A.R.R.L. Communications Manager.

But the reason is not too important now. The fact is that from a U.S. amateur viewpoint, 7040 kc is unsatisfactory for RTTY operation because of the immense popularity of this portion of the band for CW contacts. Indeed, this seems to be the national CW calling and working frequency. Normally, and RTTY activity creates QRM to the CW stations already there (and vice versa), or else a conscientious amateur is hesitant to place his FSK signal amongst the CW signals which are sometimes closer together than his own shift width. A few amateurs continue to use 7140 kc for Sunday morning RTTY schedules, but general contacts on this frequency are as scarce as on 7040 kc. Foreign broadcast signals make 7140 kc unsatisfactory at night.

Looking to the future, the present suggested 7040 kc frequency is scheduled to be restricted to Amateur Extra licensees only, effective November 22, 1969. Even if 7040 kc were a satisfactory frequency now, it would be impractical to retain it after that date.

Under some recent propagation conditions, 80-meters has been almost useless for brief periods in the daytime for RTTY work because of high absorption in the lower layers. During these periods, weak,

longer than normal skip signals can often be heard but not printed well for long. With the approaching peak of sunspot activity, such 80-meter conditions will probably become more frequent. For satisfactory short skip communications under these conditions, it will be necessary to use 40-meters. Also, less summertime static occurs on 40 than on 80. Glancing at the ESSA ionospheric predictions for March 1968, 40-meters should prove reliable for local sky wave communications from approximately 0700 to 2100 local standard time each day of the month (for the continental U.S.). These hours will lengthen during the summer months.

The most satisfactory 40-meter RTTY frequency, again from a U.S. amateur standpoint, seems to be 7090 kc. This frequency has produced some amount of general unscheduled contacts for the handful of amateurs using this band, being less subject to CW or other interference than either 7040 or 7140 kc.

A new suitable calling and working frequency for 40-meter RTTY is required. The lost band is ours merely for its reclaiming. I move that we adapt 7090 kc as the RTTY frequency. We can do this on paper if we each write (or send a message) to the A.R.R.L. Communications Manager requesting the change to this frequency. A sufficient number of requests will warrant some promise of action. But more important, we can do this in fact by making it a point to operate frequently on 7090 kc and by spreading the word to others whom we contact that this is becoming the 40-meter RTTY frequency. All in favor, don't say "I", because actions speak louder than words.

Jerry Hall, K1PLP

* * *

Get a Pencil - Please.

We have about run out of excuses, but please take a pencil, last months copy of the Journal (February) and make the following changes. We say do it now as many months from now you may loan your copy to someone and forget that we told you about our mistakes.

Page 5 - FSK for the 100-200V. Figure 1. Transpose the FSK 1 and FSK 2 jack designations. In figure 3 insert a Silicon diode in the power supply after the 22 ohm 2W resistor, arrow away from the resistor.

Page 7 - Simple TU. Figure 3, Better results will be had with the screen of V1 tied to the plate rather than the cathode. Connect 1 and 6 together instead of screen going to R1. Also the resistor in the power supply is about 10 ohms - 1 watt. The resistor running from pin 8 of the tube to pin 7 (cut off in the drawing) is 100K 1/2 W. Change R4 to 500 ohms instead of 500K.

Do it now!!! - and we are sorry!!!

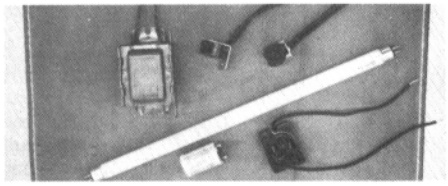
* * *

LIGHT for MODEL 15- 19

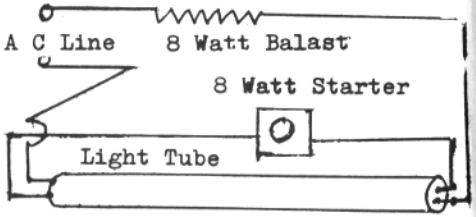
"Tru, K8JUG sends the following idea for installing a light inside a model 15 or 19 printer. The parts are available at most electrical supply houses and not expensive. We have seen one installed and it works fine. First purchase or scrounge the following parts.

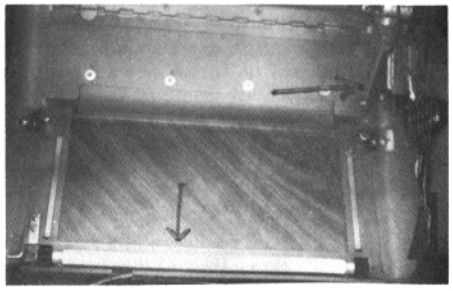
Starter - Hubbell FS-5 or any 8 watt type.
Bulb - F8T5/CW or F8T5/W Ballast - GE #89G489 Bulb sockets - GE RE 21545
Starter socket - any standard type.

The parts are shown in photo.



The photos and drawing show the method of installation, the tube is mounted parallel and near the hinge of the glass cover of the printer. The starter and ballast on the side. Arrows in the drawing show the approximate location, it is not critical.





How To Analyze That Signal - Flipping Line — Tuning Indicator —

ROBERT DESECK, ON4CK
24, LAEKEBEEKLAAN
RUISBROEK (BT) BELGIUM

See Photo on page.20

INTRODUCTION

During a multiple qso, it happens you hear a station saying to another that he is unable to copy a particular station although he can copy all others and everyone qsa are good. At other times the fellow says he must detune the receiver slightly to have good copy.

The complainer has determined the trouble lies in a bad motor speed, incorrect shift, or bias distortion, without having the ability to give an exact report.

With very modest gear however, it is possible to analyze that signal and to see what is happening.

How? Very easy! There are only 3 Parts.
Part I - TUNING INDICATOR "FLIPPING LINE"
Part II - DISCRIMINATOR ALIGNMENT
Part III - SIGNAL ANALYSIS

PART I - TUNING INDICATOR "FLIPPING LINE"

- GENERAL

This subject is about the famous indicator "FLIPPING LINE", that is only slightly touched in many books and revues (see also QST). This process can be adapted to any T.U. having a detection giving - and + for MARK and SPACE. To be understandable the following descriptions are adapted to the universally known TT/L.

- FUNCTION

See bloc diagram fig. 1

On a cathode ray tube we apply to the vertical plates the D.C. delivered by the detection associated with the discriminator (V4). For horizontal deflection, we apply:

1- S1 - POS 1 the signals MARK and SPACE taken before the limiter
2- S1 - POS 2 a saw tooth, with very good linearity
3- S1 - POS 3 vertically and horizontally the A.F. signals, taken on the secondarys of T3 and T4, as cross indicator.

- CIRCUIT DESCRIPTION (fig. 2)

Tube 6AB4 (V1) can be replaced by 1/2 tube 12AU7 -

V1B amplify and P1 controls the horizontal deflection fore cope -

P1 is in place of the regular 330K (secondary of T1) -

V15 is a Transitron time base to deliver a saw tooth - The HT must be about 400 V DC with a few millis. The scope will be mostly full horizontally -

P2 is the rate control of the saw tooth. No synchro for simplicity -

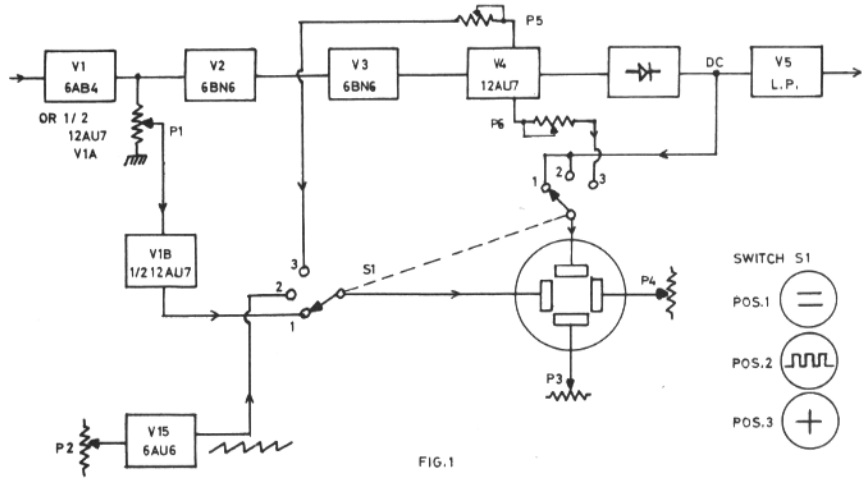


FIG.1

Linearity is excellent -

The cathode ray tube is a DG7/6 (3 inches Ø). To have the maximum of sensitivity V.S. trace tickness, the VHT (very high tension) is reduced to 500 V. Any tube able to deflect 1 inch P-P for 50V DC P-P is good (fig. 3) -

The most sensitive plates are connected in vertical (DC) -

On the screen (or a peace of mica) trace the graduations like fig. 3 -

- ADJUSTMENTS

Disconnect the imput of T.U. limiter ON, S1 POS1: adjust x and Y shift, focus and brillance until the so formed point will be sharp and in the middle of the screen.

Put S1 on POS 2; the time base should be exactly on zero line, and should cover almost all of the screen (- 1/4 inch). If the later condition is not met, adjust either the HT of the transitron, or either the VHT of the cathode ray tube.

Connect the T.U. to the receiver, S1 POS 1, adjust P1 so that the screen is almost full with a good incoming signal.

S1 on POS3, the traditional cross appears, tune P5 and P6 for normal dimensions (+ 1 inch).

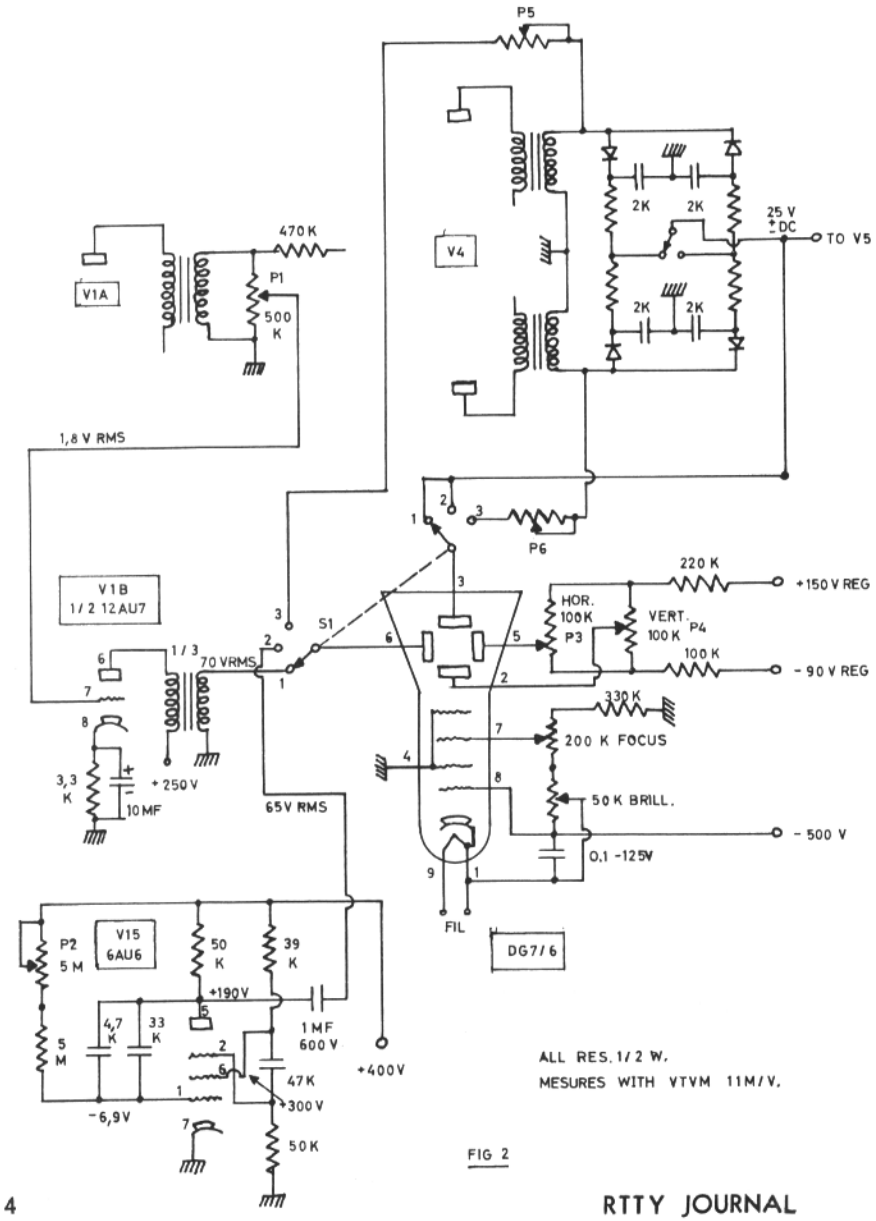
To tune P2 proceed as follow (S1 POS2)

1- First check with tuning fork, your TD and TTY for correct speed.
2- Put your VFO-ON, PA-OFF or with dummy load.
3- Transmit with your TD a tape perforated only with "LTRS"

That signal gives only a "START" (fig. 4) - Now adjust P2 for a motionless picture. On fig. 4 the solid line figures the transition from STOP to START. It is not necessary that the START be in the left, what counts is the immobility.

This tuning will vary slowly with the time because of no synchro of the time base. P2 needs a tune up to stabilize fig. 4. Initially we did it with TD, but later and with some experience we found it would be very easy on any automatic transmission.

On the screen we see now a complete train of signals, including START and STOP.



ALL RES. 1/2 W.
MESURES WITH VTVM 11M/V.

FIG 2

If from first it appears that MARK and SPACE are modulated by A.F. (fig. 5) it indicates a bad filtering after detection. To cure, raise step by step the 4 capacitors of 2.000 PF until the signal is proper, but still remain square (fig. 6). If you raise the value of capacitors too high, the filtering becomes better, but as the time constant comes too high you get fig. 7, which is bad. Find the best compromise.

- REMARKS

This tuning indicator is in use at my station for several years, and gives me full satisfaction. I am sure that many RTTY enthusiasts will not hesitate to try it.

Of course, a Tektronix with memory will be much better, but there is no comparison in price. Don't use an ordinary scope, or it must pass the DC.

To avoid any misunderstanding the "FLIPPING LINE" is only 100% rendable with a T.U. equipped with limiters.

In position limiterless, S1 POS3 should be used (cross indicator)

The power supply of the existing T.U. should be slightly adapted by association of a scope transformer, with necessary tensions.

The whole indicator can be built on a sub chassis, with the condition to carry the A.F. and D.C. (from Discri) by shielded wires.

PART II - DISCRIMINATOR ALIGNMENT

- GENERAL

The W6FFC (ex K8DKC) articles in

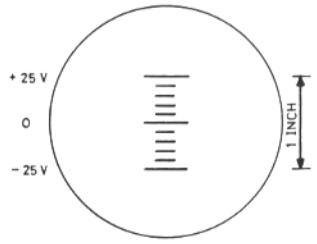


FIG 3

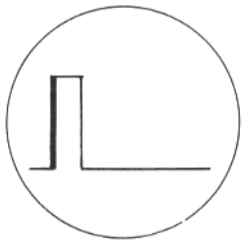


FIG 4

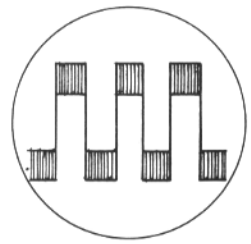


FIG 5

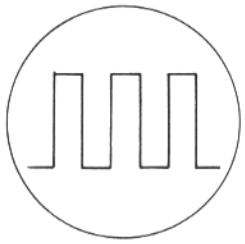


FIG 6

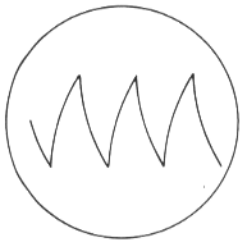


FIG 7

QST and RTTY magazine are excellent. Have a look at them for principal function. Here follows my method to reach quick and satisfying results to get a linear discriminator.

Two switchable discris (S3). One for total deviation of 1.000 cps and a second for 200 cps (fig. 8). The only added part is P7 and P8, which controls the signal and serves as calibrators.

Trace on the screen of the scope a dial like fig. 3 Part I.

I am using the same center frequency (2550 cps) but any one can be used, just transpose them all in relation.

- ALIGNMENT

The same method for the two discris. Read P7 for P8, P9 for P10, R1 and R2 for R3 and R4, P11 and P12 for P13 and P14.

1- P7 at maximum.
2- Replace momentarily R1 and R2 by trimpots of 500 ohms, P11 and P12 (fig. 8)
3- Short P11 and P12
4- Put a AF signal generator on the T.U. imput (± 0,1 VRMS)
   - S1 on POS1
   - Limiter ON
   - VTVM on output of detection (DC)
   - P9 half way
5- Adjust coils or capacitors for following resonance

DISCRI	MARK	SPACE
1000 C/S	3225	1875
200 C/S	2700	2400

The peaks are very sharp (dots fig. 9)

6- Adjust momentarily P9 for equal deviation of MARK and SPACE freq. and P7 to be in the limits of the scope.
7- Remove the shorts of P11 and P12
8- Now begins the real job.
9- Connect the T.U. on the receiver. Put ON your VFO (TX) and key it (FSK or AFSK) by means of your TD with a tape of RY.
10- Diminish the shift to 200 cps (40 cps or other discri). This value of FSK or AFSK is not critical.
11- Rock slowly forth and back the dial tuning of your receiver to move up and down the so formed flipping line on the scope. At this step, they are more near to the center than on the outer sides of the scope (fig. 10)
12- Tune progressively and at the same time P11 and P12 to obtain equal space between MARK and SPACE for all positions by mean of rocking slowly the dial tuning of the receiver.
    The amplitude goes down and the curve broadens (fig. 9 dash). Tune at the same time P7 to remain in the limits of the scope.
    The good tuning points of P11 and P12 are reached for the same amount of shift on the entire travel of the scope (fig. 11). The curve is then a solid line of fig. 9.
    Attention! During the tuning procedure remain in the straight portion of the curve, this is between 2050 and 3050 (2450 and 2650) cps because the tops are indeed flattened.
13- Measure (in ohms) P11 and P12 and solder fixed resistors of same value in place of P11 and P12
14- Tune the shift of your VFO for 1.000 cps.
15- Tune P7 and P9 to center MARK and SPACE to the zero line. P7 calibrate in amplitude and P9 thesymmetry? (fig. 12).
16- Sound complicated, but after a few trys you will find it easy and fun.

- REMARKS

After you reset your FSK for 850 and 170 cps you obtain on the scope the fig. 13 and 14, or 15 and 16 for appropriate shift, discri and POS of S1.

Each division on the scope is 100 cps (or 20 cps) which gives a good precision of reading.

Remark that the circuits of the discris are peaked for greater difference. 1350 (or 300) cps, which is normally too wide but necessary to remain in the straight portion of the curve for 1000 (or 200) cps. A good input bandpass filter will reject the undesirable part of the curve.

For indicating purposes, I do not use toroids, but other ferrox of good quality, so R1 and R2 are 1, 1 K and 600 ohms and R3, R4 each 150 ohms.

If for any reason, you desire to use your discri tuned like fig. 17, the Parts I and III remain valuable, but with the condition that the shift of the correspondent is 850 or 170 cps.

The discris are very stable. Just a dark point. If the main line varies too much, use a stabilizer (as I do).

PART III - SIGNAL ANALYSIS

What do we see on the screen?

For a good signal, without distortion, nor fading, nor QRM, we see the famous "FLIPPING LINE" very clean (S1 POS1) that we center to the zero line (fig. 13 and 15 Part II).

The lower line is the MARK, the upper is the SPACE (or reverse for reverse plate connection of the scope).

Horizontally, the amplitude follows the QSB (normal and selective).

With S1 POS2 we see fig. 14 and 16 (Part II).

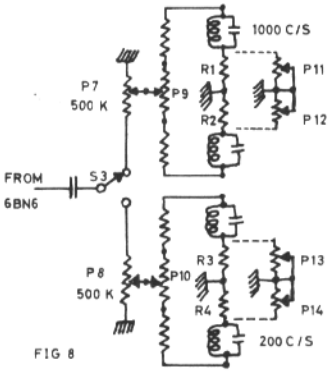


FIG 8

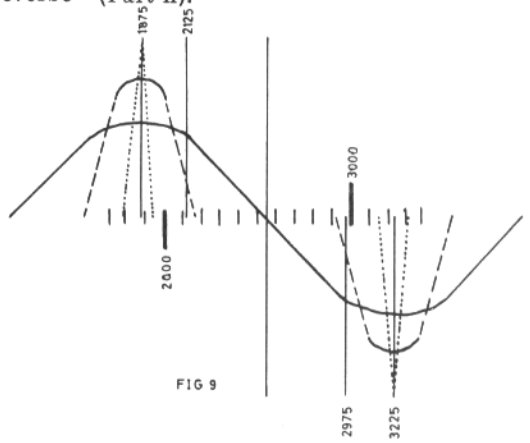


FIG 9

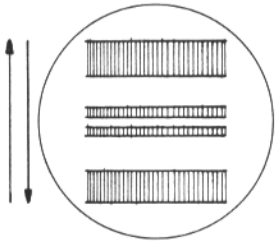


FIG 10

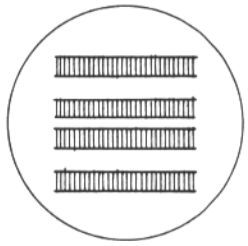


FIG 11

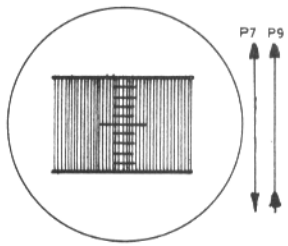


FIG 12

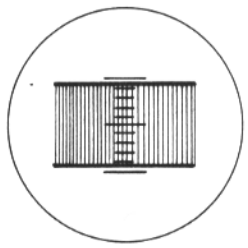


FIG 13

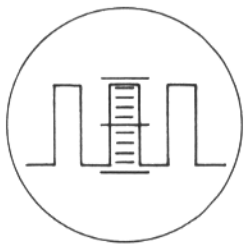


FIG 14

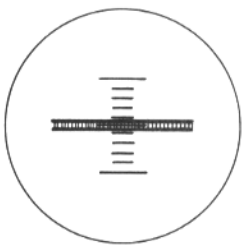


FIG 15

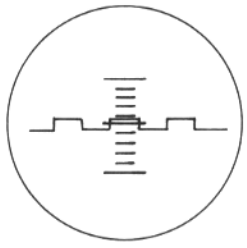


FIG 16

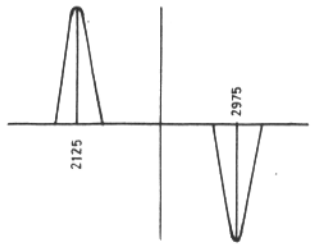


FIG 17

Now we are able to analyze that signal, our own and that of the correspondent.

So no further mystery. Here follows a few examples (very limited by space) of current controls, which I subdivided in 7 categories.

1- Motor speed control
2- Bias distortion
3- Transmitting contacts (TTY or TD)
4- Relay distortion
5- Keying system (FSK and AFSK)
6- Normal or reverse shift
7- Shift

1- MOTOR SPEED CONTROL

Proceed to tuning of P2 (see align. and fig. 4 of Part I).

Now switch to the receiving position of the station. His START-STOP must also remain stable. If not, it is moving to the left (motor too fast) or to the right (motor) too slow). (For signals with normal STOP length - as in use in amateur TTY).

2- BIAS DISTORTION

With letter Y, the fig. 18 speaks for its self. The length of the MARK and SPACE must be equal. Attention, the stop signal longer.

3- TRANSMITTING CONTACTS (TTY or TD)

This test is best made with character "LTRS".

If the contacts are well adjusted, you have fig. 19. If one or many contacts are out of adjustment, you find between the 2 ms signals a "pip" more or less deep in relation to the misadjustment (fig. 20 and 21). The "pip" indicates between what kind of contacts you must have a look on the machine. For fig. 20 it is between 1st and 2nd contact (the START not included).

This distortion is very frequently encountered.

4- RELAY DISTORTION

Bad or bouncing contacts are translated by a bad transition from MARK to SPACE (fig. 22) vice versa or both.

Between the case of bad relay and bad transmitting contact you have fig. 23 ("pip" during the length of MARK or SPACE).

5- KEYING SYSTEM (FSK and AFSK)

Very great diversity of figures in relations to the keying system in use (saturated diodes, varicaps, reactance tube etc.).

See here the most frequent. To reduce the number of fig. I give the same distortion on MARK and SPACE, however, they can be independently clean or distorted.

-fig 24 - Good signal, but ripple; the signal is modulated by main line frequency (RAC);

-fig 25 - Frequency unstable under keying effects. Just like chirp in CW;

-fig 26 - Overoscillation. Due to time constants of circuits;

-fig 27 - Other phenomenes due to constants of circuits.

6- NORMAL OR REVERSE SHIFT

Due to connection of the plates of the scope, you can have the MARK up or down. All our examples were given with the MARK down. This makes that for normal shift the signal "START-STOP" begins every time on the down side (fig. 28).

For reverse shift, it is reverse.

In case of automatic transmissions, it is very easy to determine the position of your "Normal-Reverse" switch.

In case of hand-speed-transmission, the position of the MARK is given the sense of the shift.

7- SHIFT

Use a linear discriminator (see Part II).

The DC tension of discri is proportional to the shift, and our screen is divided in 10 fractions of 100 cps (or 20 cps), we can read the shift with good precision.

Fig. 29 - for discri 1000 cps we read 700 cps and for discri 200 cps we read 140 cps.

- REMARKS

For all those fig. there is of course a corresponding fig of the "Flipping Line" (S1 POS1). The builder will discover them by himself.

I have analyzed the different distortions separately, but imagine a signal having the 7 categories of troubles, and see what it gives!!! Happily this case is a most rare one. On the other hand, you can state that our machines are really of good will and that the two times 40% of admissible distortion are not a utopia. But in traffic, with QSB and QRM those 40% are going quickly down. Take care, don't confuse the distortion caused by QSB or QRM with initial distortion on the signal. A little experiment will help you.

- CONCLUSION

To conclude, let me say that with this tuning indicator system and control, I am able to identify a station only by his waveform of signals which is of most interest during a contest.

* * *

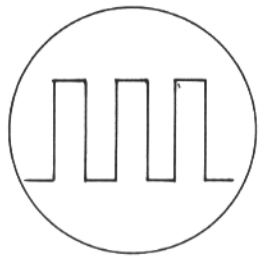
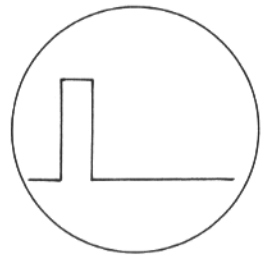


FIG 18



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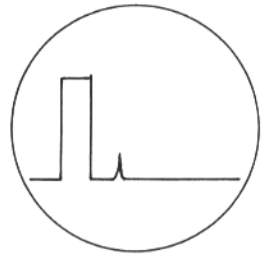

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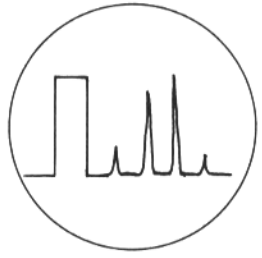

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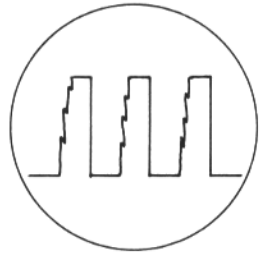

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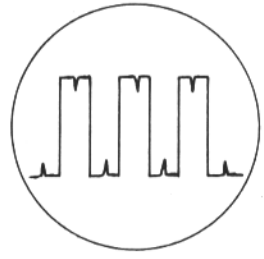
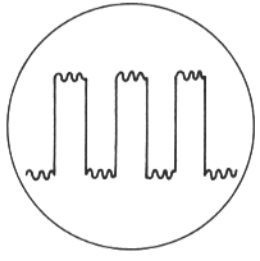


FIG 23



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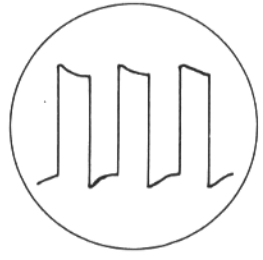
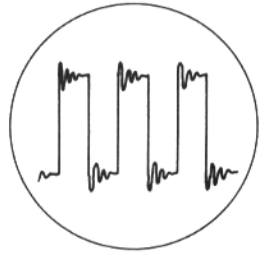


FIG 25



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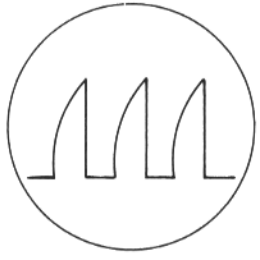

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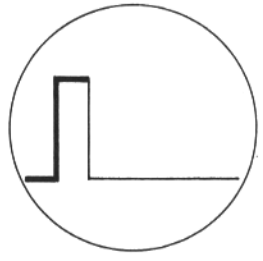


FIG 28

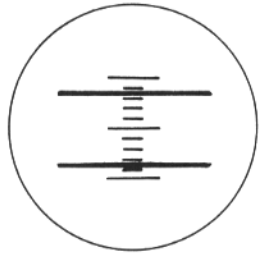


FIG 29

VHF RTTY NEWS

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

RTTY FOR THE BEGINNER

TELEGRAPH SIGNALS

Beginning with this issue, we are going to discuss some basic topics for the beginner. It is hoped that someone who never has had experience with Teletype will be able to learn enough of the "how" and "why" of it to be able to "get on the air".

We may interrupt the series periodically when matters that "can't wait" come along. Of course, news items will be presented as they are submitted, but the "text", as it were, will be devoted to basic topics.

THE TELEGRAPH

It will be an aid to understanding why present-day Teletype equipment works the way it does if some pertinent historical facts are discussed.

The telegraph was invented and in widespread use before the Teletype. The biggest problems with the telegraph are/were the relatively-slow speed of operation and the necessity for highly-trained operators at each end. The Teletype was invented for the purposes of increasing the speed of operation and using operators with less skill. Because the telegraph was in widespread use when the Teletype came along, much of the then-existing terminology and circuit features were incorporated into the Teletype. In fact, the term "Teletype" is a relatively-new term and is copyrighted. The most commonly-used term for Teletype was "printing telegraph", and it is still common to refer to Teletype equipment and circuits as "telegraph" equipment and circuits. The circuits used for wire-line telegraph and Teletype differ only in the equipment used at the ends.

If we examine a simple telegraph circuit and the "code" used with a hand-keyed telegraph circuit, certain similarities and some gross differences between hand-keyed- and printing-telegraphy will become apparent.

A SIMPLE TELEGRAPH CIRCUIT

Figure 1 shows a simple hand-keyed telegraph circuit. Whenever the key at the sending end is depressed, current flows over the loop or line, thru the sounder, and back to the sending end thru the Earth. The sounder is a simple device having the appearance of a relay without contacts. Whenever current flows in the sounder magnets, the armature on the sounder is attracted by the magnets, and as the armature strikes the stop it makes a click or a "sound".

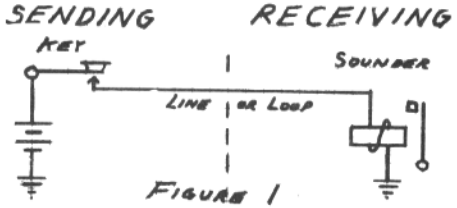


FIGURE 1

One of the objections to telegraphy as just described is the necessity for an operator to be present at the receiving end to listen to the sounder and write down what was sent as it was being sent. One solution to this problem was to have some type of device at the receiving end to make marks on a moving strip of paper in order to automatically receive a message when no receiving operator was present. The "automatic recorder" consisted of a simple arrangement containing a pen fastened to the armature of a modified sounder. Whenever the key at the sending end was depressed, the armature on the "modified" sounder would move placing the pen in contact with the moving paper and a mark was made upon the paper. When the sending key was opened, no current flowed, the armature on the "sounder" was released, and the pen was withdrawn from the paper thus making a "no mark" or a space. Because of this mode of operation the term "mark" has been used to mean the presence of current in a telegraph circuit be it hand-keyed or Teletype. No current in the circuit was, of course, called a "space". (Incidentally, the recorded message consisted of a series of "dots" and "dashes" on the paper, and someone who knew the code was required to read the message).

Before continuing with a description of hand-keyed telegraph circuits, it will be shown how a Teletype machine fits into the scheme of things.

THE TELEPRINTER

A discussion of a teleprinter requires a separate, detailed description for each model. However, such a description would, at this point, only serve to confuse the issue. Therefore, we will take an almost oversimplified approach in order to discuss what the device does without burdening the reader with the "how" details. Some poking and peering into the innards of a teleprinter should answer a lot of questions once the "what is it supposed to do?" is answered.

There is a great similarity in outward appearance between a teleprinter and a typewriter. There are some things in common between these two devices, but the similarity soon ends when the innards are examined. In a typewriter, there is a more-or-less direct connection between each key on the keyboard and the type bar in the typebasket. When a key is depressed, the corresponding type bar is actuated.

An inspection of a teleprinter will reveal that for all practical purposes, a teleprinter is two separate machines having in common only the motor, the base, and the cover. One of the "machines", called the "keyboard" or the "keyboard-base", is composed of the keys and some device for translating the characters on each key into an electrical signal. The translation is done, commonly, by means of a mechanical arrangement that "tells" the distributor which key has been depressed. The distributor is, in effect, nothing more than a set of contacts operated by a motor. The contacts open and close at a fixed rate dependent upon the "speed" of operation (which is determined by the motor speed), and in a pattern depending upon the character or letter being sent. The distributor simply replaces the telegraph key in the circuit shown in Figure 1, as shown in Figure 2.

The keyboard essentially replaces the telegraph key, but in addition, the "code" to be used is "stored" in the keyboard rather than in the operator's head. For example, when a manual-telegraph operator wants to send the letter "R", he must translate "R" into a code combination of dots, dashes, and spaces and then operate the telegraph key in that code sequence. When using a teleprinter, the operator only has to know where the "R" key is located. He then depresses the "R" key and the teleprinter takes over from there; it translates "R" into the code corresponding to that letter and opens and closes the contacts corresponding to that code. (Incidentally, lest the reader be misled, the code used for hand-keyed telegraphy and the code used for Teletype are not the same. This will be discussed later).

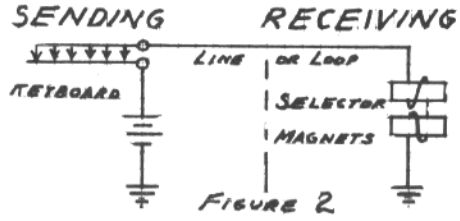


FIGURE 2

The "other machine" under the cover is a decoding and printing mechanism. It is driven by a motor and operated by means of an electrical signal applied to the windings of a magnet. This magnet simply replaces the sounder in a manual circuit. The magnet operates, mechanically, a device known as a selector that translates or "decodes" the incoming signal and determines what letter or character is to be printed. Therefore, in effect, the printer receives the code, decodes it, and prints the corresponding character automatically, whereas with a manual system an operator is required to receive, decode (mentally), and write the character.

Again, it should be stressed that a teleprinter is essentially two independent devices. In fact, it is possible to "split" the machine and send something from the keyboard while receiving something else on the printer. (Of course, it is also possible to have the two portions connected and have the printer print something other than what is being "typed" on the keyboard; this is known as "trouble"!)

Thus far we have a great similarity between manual and "printing" telegraphy. There is one major difference however: The code that is used.

THE CODE

Perhaps a little insight into why the teleprinter code is the way it is, or at least why it is not the same code that is used for manual telegraphy can be obtained as follows.

Figure 3(a) shows two manual telegraph characters and Figure 3(b) shows

what they would look like when viewed on an oscilloscope.

In Figure 3(a) the letters "E" and "Q" are shown. They appear as a combination of "marks" and "spaces" between the marks. In Figure 3(b), the corresponding pattern as viewed on an oscilloscope is shown where current flowing corresponds to a "mark" and no current flowing corresponds to a "space".

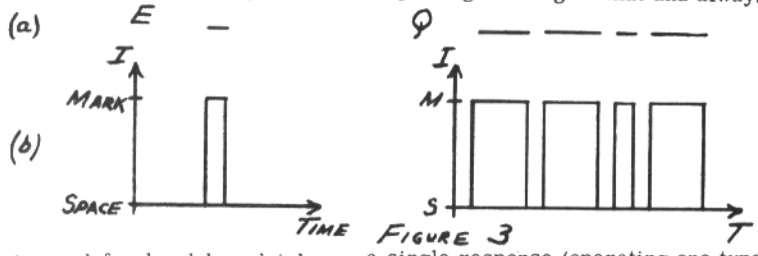


FIGURE 3

The code used for hand-keyed telegraphy is a rather ingenious combination of short and long "marks" and "spaces". The long marks are called dashes and the short marks, dots. Short spaces are used between the marks within a single character, medium-length spaces are used between characters (letters), and long spaces between words. Also, the code is set up in such a way that the more-frequently-used letters are composed of relatively-short combinations of marks and spaces (the letter E is just one short mark) while the infrequently-used characters are composed of many long and short marks and short spaces (the letter Q is composed of one long mark, one short space, one long mark, one short space, one short mark, one short space, and one long mark; no wonder it was so hard to get that CW speed up!).

This code used for hand-keyed telegraphy is suitable for operation by a person when sending to a person, but if it were to be used between two machines a major problem would develop. As mentioned, the hand-keyed characters are composed of many different-length combinations of marks and spaces and the overall character length (the time to send a complete letter) varies greatly from letter to letter; for example, the letter "Q" requires 13 times as long to send as does the letter "E". This variable-character length is a desire (or at least a not undesirable) situation when people are doing the operating, but think of the problem in devising a machine to do this! Actually, the sending "machine" would be relatively easy to construct, but the receiving "machine" would be something else. Why? Mechanical devices inherently are easiest to construct and work best when a constant, fixed length of time is required for the machine to do something. Feeding a mechanical thing a source of information that may vary over a 13:1 range (actually more if the digit is considered) and then expecting it to digest that and always give a single response (operating one type bar) is a bit much! Therefore, the answer was/ is a completely different type of code that always uses the same length of time to send a character regardless of the particular character being sent.

A code that always uses the same length of time to send a character regardless of the character is the Baudot code (the code used by teleprinters). It consists of five even-length marks and spaces, and always five even-length marks and spaces regardless of the character. Because every character is always composed of five marks and/or spaces of even length it is "naturally" suited to operation from/to a mechanical device. Because there are five portions to the signal, there are only 32 characters possible. (2X2X2X2X2 = 32). This explains why a teleprinter has only 32 keys and why the arrangement of keys has to be somewhat different from that of a typewriter.

We will continue next month by discussing the Baudot code.

* * *

Dave Chapman, W9DPY, sent to us the following list of stations operating in the Chicago area on 146.700 MHz, vertical, 40F2 (the list originated with WA9NEP): W9FQV, WA9MPG, W9BGX, WA9MKQ, K9USR, W9ANK, W9DPY, W9BUB, K9BHM, W9FUL, WA9JSI, W9HYI, W9DRN, WA9NEP, WA9SVY, K9KRE, and K9AHX. That makes 17 stations in Chicago on 146.700 MHz AFSK FM and 24 stations on 145.51 MHz AFSK AM! Dave also lists 8 more stations that are expected on 146.700 MHz in the near future.

73, ES CUL, RG

SPOTTING Auto Start Frequencies

IRVIN HOFF, W6FFC
12130 Foothill Lane
LOS ALTOS, Cal. 94022

Various groups are currently using unattended autostart on such h.f. bands as 80m, 40m and 20m. Another group is using 15m. So far nobody is using 10m, but there is no reason 10m would not work as well as other bands.

Several stations are even using 20m for international autostart - certainly this feature of RTTY offers unlimited possibilities to communicate with other stations at times of day when conditions are good but it is just not convenient for both parties to be present. For instance, Australia comes in with excellent copy, but usually after most Americans are in bed. Conversely, the band is still open at hours when we could transmit to those "down under", but they are in bed. So with the exception of week-ends when one of the two parties has to stay up very late, communications are spotty - but not because of band conditions!

At any rate, some means is needed to find the correct frequency. Since most autostart groups have found that superior results may be achieved by the use on 170 shift, this requires a quite accurate means of finding the frequency -- both for setting your transmitter and also for setting the receiver.

Originally K3NIO and myself started out using "divide by 9" frequencies where a little unit would put out a marker every 11.111 kHz. We used cheap Heathkit 100 kHz. calibrators into which were built a two-transistor multivibrator to divide by 9 for 11.111 kHz. markers. Then W8SDZ talked us into using 3637.500 as the 8th harmonic of this would be 29.1 MHz. and he could use his receiver on 100 kHz. check point to set his crystal-controlled transmitter quite accurately (from which he would then in turn set his receiver after moving it back down to 80m!)

Only on 80m does this work, but the die was cast and now we all are using frequencies that are "divide by 8" or 12.5 kHz. markers. This has some advantages and some disadvantages, but with the newer integrated circuit flip-flops, etc. it is very easy to use a binary string to divide by 8 for 12.5 kHz. markers so we have stuck with this type of frequency.

Thus one group was using 3637.500, another group is at present using 7137.500, another bunch is on 14075.000 and yet another group is on 14087.500. There is nothing magical about the "divide by 8" other than if everybody uses one of these frequencies, then "anybody" can find your frequency if they like. If you are not interested in contacting any of these other people or having them contact you, then all that is needed is for you and your group to be on the same frequency, whatever that happens to be -- it need not be anything special at all as long as one of you can keep the rest lined up -- in this case you could all be on say 3621, etc. and no problems would arise although nobody else could probably find your frequency with any accuracy unless they heard you on the air.

The accompanying schematic shows a simple 100 kHz. calibrator with 12AU7 multi-vibrator to give 12.5 kHz. markers. Actually by varying the pot or otherwise changing the resistor value in the grid of the second section of the 12AU7, you can divide by 7, by 8, by 9, by 10, etc. to give frequencies on any combination you like...

The multi-vibrator shown can be easily built on a printed circuit card offered by:

P/M Electronics
Box 6288
Seattle, Washington 98188
MG-15 $2.20

Almost no modification of their board is necessary, although it was intended for a very slightly different purpose. The only moderately difficult modification of the board recommended is the addition of the DC-blocking capacitor (a 0.005) in the screen circuit between the screen of the 6AU6 and the 100 kHz. crystal.

This is not used in many crystal circuits and if you find it too much effort to drill two new holes for this capacitor and cut away a slight amount of the printed circuit, ignore that 0.005 capacitor -- its only purpose is to keep DC voltage off the crystal

Two capacitors are shown in the grid of the 6AU6 and the one should be a small 1.5-7 pf trimmer such as the Erie type 557 for instance. If you use a 3-30 pf. you will find it way too difficult to adjust the unit accurately against WWV. By beefing up the 1.5-7 pf. with a fixed capacitor in parallel, you can then easily adjust the unit with good precision. A little glass piston trimmer such as the JFD VC20GY ($3.60 each) will give an excellent vernier action to really accurately set the calibrator.

By selecting the proper resistor to go in series with the 100K pot in the grid of the section, you can get the unit to divide by any nominal you like -- but again most autostart groups at present are on "divide by 8" frequencies separated by 12.5 kHz. This will also give you markers on 12.5, 25.0, 37.5, 50.0, 62.5, 75.0, 87.5, and 100 kHz. If these are not enough and you want to start your own group on some other frequency, then you could adjust the resistor/pot to give say "by 9" and then get frequencies of 11.111, 22.222, 33.333, 44.444m 55.555, 66.666, 77.777, 88.888, 99.999 and 100.0 kHz. This will give many additional groups of frequencies.

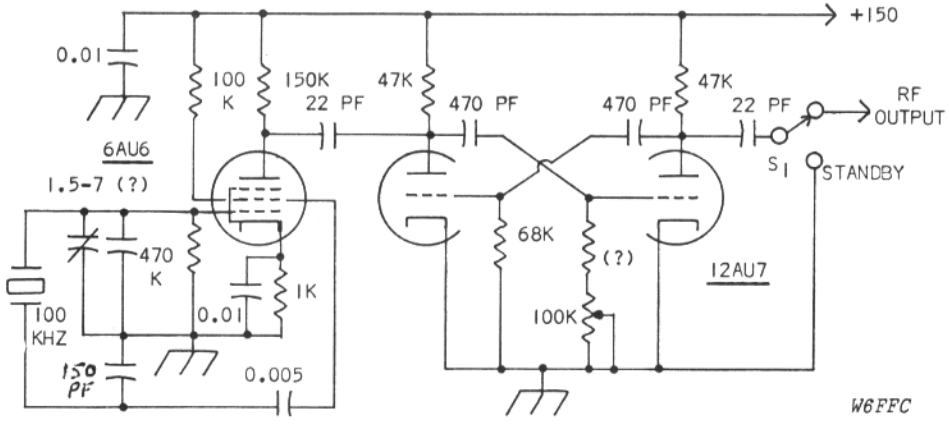
There is no particular need for a pot in the grid of the second section, and in fact I used a 250K pot, found the point at which the unit was dividing by 8, moved the pot either side until it went into another division, centered the pot between these two settings, removed it and read its value with an ohmmeter, and replaced the pot with a fixed resistor. It has been running 4 months now and has not "slipped" into any other divisions.

There is one word of caution before you start to build this unit -- you may/may not be surprised to learn of the drift of nearly any 100 kHz. oscillator. A typical 100 kHz. crystal costing even as much as $13 will have a temperature stability of around 0.005% from - 30°C to +60°C. Converted to practical application this means about 75 Hz. change in freq. at 15 MHz for a room temperature change of 10°. This is a whole lot of drift and not much room temperature change. Many rooms warm up much more than this from the time you start operating until a short time later, or many rooms change much more than this in the heat of the afternoon sun, etc. Thus if you keep in mind these simple oscillators - even with a $13 100 kHz. crystal (and you are not likely to have one of this type) will drift a considerable amount, you'll be ok. Just remember not to trust any 100 kHz. oscillator more than 5-10 minutes after you checked it against WWV and you'll be fine. After all it's just a guide, not an oven-controlled secondary frequency standard, etc. But it serves the purpose quite well if you keep in mind its limitations.

The oscillator should also be allowed to run "all the time" or you can really expect uncertain results. The switch shown shorts the output of the multi-vibrator to ground when not in use and it will not leak through to the receiver.

With the autostart facilities of the TT/L, and the advantages of the new integrated "Sel-Cal" unit developes by WA8PCK, this little unit "polishes off" your ability to find the frequency and then copy stations via autostart.

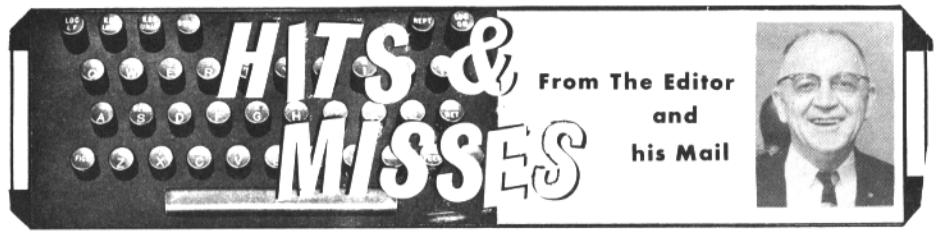
* * *



100 KHZ CRYSTAL OSCILLATOR AND 12.5 KHZ MULTIVIBRATOR

The value of the capacitor in the grid of the 6AU6 marked (?) will be selected to fit the tube and will be around 20 pf. The value of the resistor (?) in the grid of the 12AU7 will be selected to allow the multivibrator to give 12.5 KHz markers when the 100K pot is set. The 12.5 KHz markers are used to spot autostart RTTY frequencies.

* * *



The response to using narrow shift has been very encouraging. Seems that everybody has been waiting for the other fellow to get started. The CARTG association has a cartoon on their letterheads advocating it, we have received several slogans from readers promoting it, results should add to the momentum and we personally know of several fellows that have made any changes necessary to use it. Lets keep up the promotion, lets talk it on the air and most of all lets USE it.

•••

We know there are a large number of hams interested in VHF RTTY, but not from the letters that our VHF editor receives. Admittedly VFH activity is local and hard to cover on a national basis but this makes it harder for an editor to cover unless he receives information from various localities of their operation. Ron has had some very interesting technical articles, those of you who skip the VHF column might well go back and read some of them as they apply to all types of RTTY operation, we have had lots of nice comments on them but not from the VHF group. Why not drop Ron a line and tell him what you would like to see in his column.

•••

Another RTTY net has been formed in Western Canada operating at approximately 3610KC., called the Westcan RTTY net. The area covered is Manitoba, Saskatchewan, Alberta and British Columbia. Anyone printing the net is more than welcome to call in with or without traffic. This net is in addition to the CARTG net we mentioned last month operating about 3600 Kc. The Westcan net meets at 0330 GMT.

•••

We have had an offer from XE1YJ to take care of the next RTTY DX sweepstakes, it is quite a job for one person however and maybe some group will still come forward with an offer. Our thanks to Pierre however and maybe he has a job.

•••

We are expecting word and prices for a binder to take a years copy of the RTTY JOURNAL. As soon as we receive this information we will pass it along.

For any of those able to make the Dayton Hamvention this year, April 27th, be sure to make your headquarters at the RTTY JOURNAL suite. Probably at the Sheridan Biltmore Hotel. More about it next month. This is one of the largest ham gathering in the country, over 2000 registered last year and a live bunch of RTTY fans are always on hand. Friday night April 26th is the big night for hospitality so plan on arriving that night.

•••

We received a sample copy of a new manual, prepared by the Navy Electronic Command, entitled Principles of Telegraphy (Teletypewriter) It is an excellent handbook for RTTY and particularly for those interested in the mechanical end. There are over 200 pages, over 110 illustrations. It is available for $1.50. Ask for NAVSHIPS 0967-255-0010. Superintendent of Documents, US Government Printing Office, Washington, D.C. 20402. We highly recommend it.

•••

When sending a renewal we would appreciate a word to that effect as this makes it easier to check out. Also please include your call if it appears on the stencil.

•••

We still get requests - and here is the answer again - Back issues are available only for June through December 1966, March-April-December 1967 and all issues in 1968. The TT/L-2 reprint is available also. Back issues are 30¢ each.

•••

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P.O. Box 837 — Royal Oak, Michigan 48068
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RTTY-DX

JOHN POSSEHL W3KDF Editor

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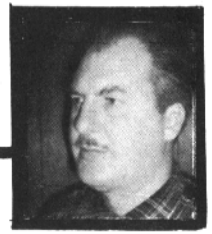

Hello there. . .

Boy! There are a lot of things going on these days and it almost requires around the clock listening to take advantage of them. Take the morning of January 31st for instance. While tuning around a pretty dead band an excellent signal suddenly came on sending CQ at tape speed and signing EA4AH. By the time your scribe recovered from the shock and threw the proper switches the station had already worked Arthur, ON4BX for the very first contact from Spain, and next was Mike, F3PI for the second. The operator at EA4AH turned out to be none other than Herbert, DL1VR, that A-1 contest operator whom everyone on RTTY must have worked at one time or other. Herbert was on a short visit to Madrid and unfortunately the operation lasted only for one day. He also indicated that he would be operating from Turkey, possibly for a repeat of his 1965 Dxpidition as TA1AH. As Herbert is only at these rare spots for a very short time the whole operation could possibly be over by the time you read this.

On January 11th, WA2IUP was in qso with CX1BS in Montevideo. This is believed to be the first RTTY operation from Uruguay. The operator is Guillermo and he has a big signal from excellent equipment, including tape gear. At that time his shift was about 450 hz. which no doubt has been corrected by now.

Last month Edd, W6LDA, sent some important news of a Dxpidition which unfortunately arrived a bit too late to get into the February issue, by the time I got the information to Dusty the presses were already rolling. As there is a very good change that the station will still be active by the time this reaches you here is the dope. Commencing the 3 of February and possibly for the entire month there is RTTY activity planned from Fanning Island with the possible call, VR31. I have no doubt that this station will be pretty active during the cw and phone portions of the ARRL DX CONTEST, however look

DX HONOR ROLL

		Wrkd/comfd			Wrkd/comfd
1.	ON4BX	67/64	19.	WB6ADY	30/27
2.	FG7XT	75/61	20.	KL7BAJ	28/27
3.	I1KG	67/60	21.	W4EGY	31/26
4.	W3KDF	64/55	22.	VK2EG	33/24
5.	W4AIS	62/53	23.	W8CAT	29/23
6.	K8YEK	55/48	24.	W6LDA	25/21
7.	W8CQ	53/48	25.	VP9BY	26/18
8.	W6CG	51/46	26.	K9QNV	24/17
9.	ON4CK	54/44	27.	OA4BR	22/15
10.	EV3AYL	48/40	28.	G3LDI	25/14
11.	WA6WGL	43/38	29.	K4VDM	23/14
12.	W1GJK	45/37	30.	VK3NR	32/13
13.	UA1KBW	36/33	31.	W4FUI	33/11
14.	W3ISE	41/29	32.	PJ2CR	19/10
15.	WA8BOT	43/28	33.	FG7XT/FS	9/9
16.	K8QLO	40/28	34.	K6YUI	8/7
17.	K8JTT	36/28	35.	IS1KG	25/4
18.	VE4BJ	28/28	36.	K9SLQ	15/4

As you see, the positions are beginning to change around a bit. Our congratulations to ON4BX on reaching the top. Next listing will be in the June issue. Please have your listing in by 1 May at the latest.

* * *

for him the rest of the time on 7045 kc. (normal shift) and on 14095 (reverse shift). He requests calling on frequency and he will sked RTTY if you raise him on other modes. The organizer and chief op of this Dxpidition will be KP6AP (K6CAA). By the way, the normal/reverse mentioned above applies to his transmitted signal. He will be capable of receiving narrow and standard shift and most anything in between.

It has been reported that the first cross mode qso has taken place between F5BH and Louis, FK8AZ. This was an RTTY/SSB qso but as previously reported by Jean, FG7XT, Louis was getting ready for RTTY and now has the receiving end in fine shape and is proceeding to get the transmitter to FSK. The path and times would be pretty much the same as VK so it might pay off to do a little extra listening for this really rare station when it comes on RTTY.

A little closer to home, we have re-

cently had some renewed activity from Guantanamo Bay with Herb, KG4CX showing up quite regularly at about 2300z on twenty meters. He has very good signals and hopes to be there for a while. The last activity from that area was from Gus, KG4CG and that seems like a long time ago. Herb indicates that Gus is now somewhere in Georgia and back on the air.

In a recent qso with Ike, PJ2CR, he indicated that there would soon be more activity on RTTY from Curacao. In fact, one of the fellows was in his shack at the time; Jonas, PJ3CD. Jonas has a Model 15 on the way and hopes to be on shortly after its arrival. The other station is Max, PJ2CE, who hopes to get a machine soon. Congrats to Ike for encouraging this increased activity from the Antilles.

From Stan, WB6QFE, comes word of a new station on in Mexico City. Dave, XE1OE, came on RTTY for the first time on January 18th with an excellent signal. Also Don, XE1HHX, has been quite active again after returning from a trip to the states.

Ev, K8JTT, reports that 7Q7JO is quite active on weekends with very good signals. Qs1s for this station may be directed to - J.A. McElvenney, Northern Division Police Hq., P.O. Box 16, Mzuzu, Malawi. G311v is his call when on leave in England.

A nice letter from Bill, KL7BAJ, throws some new light on activity up Alaska way. The letter came from Texas, but that is somewhat explained by the fact that "after the flood" and Bill got things dried out again he went on an extensive trip that took him to Expo, through the states down to New Orleans, and he will be traveling through Mexico before heading back toward the Artic Circle.

The 49th state is pretty well represented on RTTY and here are some of the fellows you are likely to meet from time to time. KL7DFU, Hugh at Fairbanks - KL7DRZ, John at Auke Bay - KL7ELR, John at Fairbanks - KL7FHX, Teil at Fairbanks - KL7FRX, Jim at FT. Wainwright - KL7FRZ, Larry at Haines. Most of these boys are either in the military or some branch of aviation maintenance which is the main method of transportation up there. I guess that aside from Bill the most active lately have been KL7FRX and KL7FRZ who have been printed regularly down here.

Well, thats about it. Soon after you get this the B.A.R.T.G. Contest will be about to start. Conditions and activity seem to be on the upswing so let's all get in there and start out the season in a big way.

When all else fails, narrow shift comes through, so stay with it.

73 de John

* * *

Results VOLTA DX Contest

Considering the horrible conditions that existed during the last Volta contest a large number of logs were received and the contest committee has done a fine job in checking and submitting the results. Scores were low due to conditions but in looking over the detailed results we note a lot of activity on fifteen and ten meters. Hopefully during the coming BARTG contest March 2-3 these bands will continue to find even greater use. The numbers following the call of some of the stations is the order of finish of those using 100 watts or less. The SSB and RTTY Club of Italy has done a lot to promote this contest and hopefully next year will have better luck with propogation conditions.

	CALL	SCORE		Call	score
1)	DL1VR	49071	27)	i1KBT(5)	2380
2)	I1KG	43416	28)	i1LCL(6)	1876
3)	I1KPK	15140	29)	WB6RXM	1775
4)	W2RUI	1375	30)	LA60I	1568
5)	W6LDF	11508	31)	W8FWG	1410
6)	W4AIS	11203	31b)	3C3RTT	1287
7)	W5QCH	10830	32)	DMØGST	1118
8)	HB9P	9968	33)	WA2IUP	1055
9)	WB6ADY	9624	34)	i1EVK	1000
10)	W4CQI	9300	35)	W6AEE	976
11)	I1 CAQ	8246	36)	SM5CLW	935
12)	W3ILZ	8160	37)	VE4FG	918
13)	WA6WGL	7630	38)	VO1DZ	840
14)	W3KDF	7520	39)	DL4XG	693
15)	i1KFL(1)	7277	40)	OZ6EDR(3)	660
16)	WA4GTA	6664	41)	DM3DD(7)	665
17)	VE2HL	4908	42)	WØHAH(8)	560
18)	VK3DM	3825	43)	ON4BX	460
19)	DJ3BW(2)	3600	44)	WA8IQZ	450
20)	DJ6MA	3405	45)	F3PI (10)	385
21)	ZS6UR(5)	3248	46)	W8CAT	234
22)	LU7EBB	3120	47)	G3LDI	222
23)	G6JF	3094	48)	i1MKG	100
24)	VU2KV(4)	2826	49)	W5BOT	68
25)	K4VDM	2610	50)	W7FEN	24
26)	DJ9XBA	2600			

BARTG DX RTTY CONTEST

March 2—3rd

See Last Month for Details.

Inter-State Auto-Start Net.

Auto-Start nets are not new in RTTY, many have existed especially on the VHF frequencies for years, but most have been rather simple with a time clock turning the machines off and on during stated hours and no method of selective call up used. The one advantage of this was that you printed everything going on, you read ALL the mail and got all the gossip. The disadvantage was the large amount of paper on the floor, the necessity of reading a lot of copy that was of no interest, plus the fact that with the variancies in frequency stability of net stations the messages wanted were often lost.

It is only natural that with the state of the art improving so fast that attention would be turned towards better and more reliable auto-start nets. The past several years has seen the switch to narrow shift to conteract QRM, crystal controlled transmitters with accuracy of a few cycles in frequency. Auto start and auto receive relays in the modern demodulators for accurate turn on and off of printers and finally the development of the selcal which reads a pre-set code set of characters to start and stop printers.

Several such nets are now in operation. The most active is the Inter-State Net on 80 meters at 3637.5 kcs. 170 shift is used exclusively. It is not necessary to have all the latest gadgetry to get on this net although narrow shift is a must. Many stations can zero the frequency and do break in for a QSO and are very welcome. The main purpose and value of the net however is the ability to call any of the member stations and leave a message any time the frequency is clear, without printing the message on all the members machines.

To send a message to any of the members of the Interstate auto-start net send the "call up code (usually the call) several times then sign- send the message- with time and date- sign as for a regular transmission then return the carriage to the left margin and send a string of NNNNNNN. This will shut off the machines. In case a message to all members is desired the code (for most members) for a general call up is LTRS N LTRS N LTRS N LTRS N. This will start the machines and the signature is the same followed by the shut off NNNNNNN.

Hopefully more nets using sel-call up will be in operation soon. RTTY is an ideal method for handling traffic but from our observation of most nets those with other uses and interests seem to be more active. Surely there must be some items of general interest to a group other than traffic which is hard to find and often gets bogged down anyway. Practice in traffic handling is good in case of emergency but an active net is just as important. How can it be made active???

The following is a list of the Inter-State net that maintain regular monitoring hours. The list is alphabetical according to the first letter of the call. *-W8BZB/3 monitors through K3NIO so it is necessary to select K3NIO to send to Jon.

* * *

STATION	NAME	LOCATION	MONITORING HOURS All EST.
W7AHW/4	BERNIE	ALEXANDRIA, VA.	2ØØØ-Ø13Ø
W8BZB/3	JON	FREDERICK, MD.	(-) CONTINUOUS
K8ERV	TOM	MANSFIELD, OHIO	173Ø-Ø1ØØ
WA8FYF	STU	FLINT, MICH.	18ØØ-21ØØ
VE3GK	SID	TORONTO, ONTARIO	17ØØ-24ØØ
K8GVY	JON	WARREN, OHIO	2ØØØ-Ø7ØØ
WA3JGV	BILL	YARDLEY, PA.	16ØØ-Ø2ØØ
K8JUG	TRU	GRAND RAPIDS, MICH.	16ØØ-Ø8ØØ
WA8NGJ	DOUG	GRAND RAPIDS, MICH.	17ØØ-23ØØ
K3NIO	VIC	FREDERICK, MD.	CONTINUOUS
KØOJV	HAROLD	ST. LOUIS, MO.	CONTINUOUS
W2QDM	JOE	CENTRAL ISLIP, N.Y.	19ØØ-23ØØ
W8RRE	HARRY	ROCHESTER, MICH.	18ØØ-Ø13Ø
W2SAR	GEORGE	MURRAY HILL, N.J.	16ØØ-23ØØ
W8SDZ	KEITH	ROYAL OAK, MICH	17ØØ-24ØØ
W8TMO	BOB	FENTON, MICH.	17ØØ-Ø1ØØ
WA2YJD	GERRY	GREAT NECK, N.Y.	CONTINUOUS
WØZKN	BERNIE	ST. LOUIS, MO.	2ØØØ-24ØØ

RTTY GEAR FOR SALE. List issued monthly. 88 or 44 mhy toroids-5 for $1.50 postpaid. Elliott Buchanan and Associates, Inc. 1067 Mandan Blvd. Oakland, Cal. 94610.

DAYTON HAMVENTION April 27, 1968. Wampler Arena Cener, Dayton Ohio, sponsored by the Dayton Amateur Radio Ass. Informative sessions, exhibits and Ladies program for the XYL. Watch the ham ads for information or write Dayton Hamvention, Box 44, Dayton, Ohio

SERVICE-BUY-SELL-TRADE, RTTY - Cleaning and repair of Teletype Machines. Have in stock every part for model, 14, 15, 19, and many parts for 12, 26, 28, 32, 33, 35. Stock com. type pallets for the model 26 $ .35 each p.m. Teletype machines all models, in any style, and all special features available. Will buy, trade or sell teletype parts and machines. 88 mhy toroids 5 for $1.25 postpaid, and quantity discounts. Call or write, Martin Geisler, 8926 Kester Ave., Van Nuys, Calif., 91402. Phone (213) 892-0685.

FOR SALE - 255A Polar relays, $2.50 each. Postpaid. 255A Socketts - $1.00 postpaid. Brand New Johnson SSB adapter $150. Model 14 TD 60 speed sync motor $25.00 K8CRE, Richville, Michigan 48758

HEATHKIT IO-21 OSCILLOSCOPE. Excellent condition. $50 or trade for Model 26, table, and loop supply in operating condition. Send inquiries to Dennis Anderson WA7IEL, Glenwood, Utah 84730.

WANTED - SP-600-JX Receiver. Must have provision for crystal controlled rec. Must be in good condition. Wanted: Instruction book for SP-600 or a good copy of one. Wanted: Model 28 typing unit, motor, receive only base, cabinet, "Call controler", call controler bolts on side of 28 cabinet. It has six push buttons and a telephone dial. (Picture on cover of April 1966 RTTY)

K3AUD-Box 524 - Republic, Penn. 15475. Phone (412)-785-6320 after 4 PM or all day weekends.

MOVED TO LARGER QUARTERS, Atlantic Surplus now at 300 7th St. Brooklyn, N.Y. 11215. For Sale-RTTY dual freq. shift tone converter, Northern Radio type 152. Each tone converter is self contained including power supply, 110-220 vts, 50-60 cycles, narrow shift. dim. 17x3 1/2 x 14. Complete with tubes and conversion information for ham use, used good - $30.00 each. Equipment spares for above set, consists of 10 RCA tubes, capacitors, fuses, lamps, connectors etc. New $6.00 set. Three headed trans-distributors with syncronous motors used, good, $30. each. Western Electric wetted relays, used, good $1.25 each. Keyboard for model 19 teletypewriter with dial, used, good $30.00 each.

MODEL 19 SET, complete, $150. Also, need help repairing a Model 26. Jack, WA2HWJ 7 Elmtree Lane, Huntington Station, NY 11746.

WANTED: MODEL 14 Typing reperferator. K8OXO, Ed. Galovic, 86 Egbert Road. Bedford, Ohio 44146

WANTED - Teletype Parts for all machines. Models 14, 15, 19, and 28 etc. Must be new in Teletype Corp. pack or military with 5815FSC ....Phil, K2HJC, Box 96, Morrisonville, New York 12962.

SPECIAL SALE - Teletype Model 14TD. New; $25.00, Good Used $14.00, Specify 65 or 75 wpm. FOB Detroit. Keith Petersen, W8SDZ, 1418 Genesee Ave., Royal Oak, Mich., 48073

WANTED: TELETYPE EQUIPMENT & parts; R388, R-390A, SP600, 51J-4, Cash or trade for new radio equipment. Alltronics-Howard Co. Box 19, Boston, Mass. 02101. Tel - (617-742-0048)

TOROIDS, 88mhy. center-tapped, unused, 5/$1.50 POSTPAID. . .RTTY Page printer paper, $5.50/case. Gears for all machines; write. Tee Dee's, sync: $35. NEW Model 28LP page printer with full stunt box: $180. New Heath DX-60A: $55. Johnson 250-39 TR switch $15. New National NCXD 12VDC universal mobile supply $40. Super-Pro with power $50. A.B. Dick 430 Mimeograph (like-new) $40. Three head Tee DEE with sync: $50. Typewriter $30. Apeco photo-copier with paper supply: $40. Knight SWR bridge $10. Polar relays, sockets etc. WANTED: Matchbox, NC-300, Model 15, Model 28, complete. Stamp for list: Van W2DLT, 302R Passaic, Stirling, N.J. 07980

MODERN POLAR RELAY: Western Electric #314-A, mercury-wetted contract type; direct replacement for 255A, with socket and diagram, $4.75 postpaid. WANT #35 KSR cabinet. Gordon White, 5716 N. King's Highway, Alexandria, Va. 22303.

TELETYPE TEST SET 1-193C. Ideal source of perfect teletype elements for testing keyers, T.V.'s, etc. More accurate than keyboard. See RTTY Journal, April, 1965; September, 1967. Cost U.S. Gov't. over $600.00. Brand new, with manual, four polar relays, tools. $24.95, F.O.B. Harrisburg, Pa. Telemethods International, Box 18161, Cleveland, Ohio 44118.

TRADE-MODEL 28 receiving only typing reperforator set, rack or cabinet mounting and three maintenance manuals for surplus CV89/URA-8A audio-discriminator converter. Stan Wesolowski, 810 Witter, Pasadena, Texas. 77502

SALE or TRADE-BERKLEY model 5510 universal counter and timer -- Would trade for 51J3 or 75A3 MMM. Bob Wagner P.O. Box 582, Fairview, New Mexico 87532

WANTED; MANUAL for CV57. Write Bill Handel, Box 379 Cary Quad, West Lafayette, Indiana

AN/FCC-3 TELEGRAPH CARRIER RECEIVER. Converts easily to excellent RTTY demodulator. Brand new in original cartons with cables and slides $39.50 each. Corresponding Transmitter units $27.50 each. Both come minus frequency elements. Write J. Beeby, 4 Corte Nueva, Millbrae, Calif. 94030.

LARGE TT/L-2 schematic - 15 x 30, $1.00 postpaid W8SDZ, 1418 Genesee, Royal Oak, Mich. 48073. Phone 313-585-4431