Additional Classified on Page 15

WANTED - ALL KINDS of page printers. Any quantity considered, quote your price and a local representative will contact you if reasonable. Lee Brody, N.Y.-N.J. Phone TTY for the Deaf, 15-06 Radburn Road, Fair Lawn, N.J. 07410.

SALE: COMPLETE MODEL 19 teletype-writer; consists of 15 printer, model 19 key-board with counter dial, cover, sync. motor, trans-dist. steel table, power supply, $90. each. If packing required add $15. Atlantic Surplus Sales, 300 7th St. Brooklyn, N.Y. 11215.

ANYONE HAVE EXPERIENCE using an IBM Selectric (TM) typewriter for RTTY? Am particularly interested in using it for multi-speed receiving. The imput converter is my problem. Would appreciate any helpful comments and will pay for a schematic or wiring diagram or what have you. George Wollinger, 367 Tolsa Way, San Louis Obispo, Cal. 93401.

FOR SALE: General Coverage receiver, SP600JX with IF output in rear for RTTY. Good condition $175. Elmer Shafer, W8MSG, 3479 Kersdale Rd. Cleveland, Ohio. 44124.

TELETYPE PARTS - all models, relays, modification kits, hardware, power supplies (115VDC 12 MA), sequential number indicators 0 to 999 mf'd by CLARE for W.U. new and used, selector magnet drivers, M14 TD'S (W.U.) Write your needs SASE Charles R. Wall, 858 W. 2nd St., Lansdale, PA. 19446.

WANTED: DEN-35 or other type audio, RTTY TU. Please send all information in first letter. Also need information on C.A.A. - CA668 Have camera kit, BC221 and other items. Send stamped envelope for list. Michael Jones, Rte. 1 Box 532, Fortson, Ga. 31808.

I HAVE FOUND ANOTHER DEN-35 demod; for RTTY, Twinplex, Fax, with scope, all plug ins, excellent shape. This is a Security Agency special unit, $49.00 G. White, 5716 N. Kings High., Alexandria, Va. 22303

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

First Class Mail --

RTTY JOURNAL

November 1969

EXCLUSIVELY AMATEUR RADIO TELETYPE

Volume 17 No. 10 30 Cents

'Paul' W0HFX

VOLTA DX RTTY CONTEST

The 5th Alexander Volta RTTY contest will be held on December 6th and 7th. The zone chart is the same as published in the September RTTY JOURNAL for the CARTG contest.

RULES

1) TEST PERIOD
   14.00 GMT December 6 to 20. 00 GMT December 7
2) BANDS
   The test will be conducted in the 3, 5-7-14-21-28 MHz amateur bands.
3) EXCHANGE POINTS
   (A) All two-way contacts with stations in one's own zone will receive two points.
   (B) All two way contacts with stations out side one's own zone will receive the points stated in the Exchange Points Table.
4) Stations may not be contacted more than once on each band.
   Additional contacts may be made with the same station if a different band is used.
5) MULTIPLIERS
   Amultiplier of one is given for each country contacted.
   The same country may be claimed as separate multiplier, if a different band is used.
   The one's own country doesn't count as a multiplier.
6) SCORING
   Total exchange points times number of multipliers.
7) COUNTRY STATUS
   A.R.R.L. Country list-except KL7, KH6 and VO, to be considered as separate countries.
8) MESSAGES
   Stations will exchange messages consisting of:
   (A) Check (RST)
   (B) Zone number
9) LOGS AND SCORE SHEETS
   Use one log for each band.
   Free log forms and score sheets are available on request from SSB & RTTY Club, Box, 144, Como.
   These forms are not obligatory. Log should contain: band; times; NR set and received; call signs; countries multipliers; exchange points.
10) DEADLINE
    Logs and score sheets to to
    A.V. RTTY CONTEST MANAGER
    FANTI Dott. FRANCO
    Via A. Dallolio n. 19
    40139 Bo ogna ITALY
    They must be postmarked not later than January 10, 1970 to qualify.

***

CARTG-Medallion DX Sweepstakes -

CONTEST Comments - W3KV

The bands were awfully quiet on Monday. I wonder why! Well, if you were in it you enjoyed it and if you weren't you missed another good time. Conditions were not what you would call good on Twenty Meters. Signal levels to Europe were down most of the daylight hours here and peaked for an hour or so before fading out. Fifteen was quite good and supported most of the activity from Europe to the USA during the daylight hours. Ten Meters was very good and could have supported a tremendous amount of activity but the boys just didn't show up. Signals from Europe were at an S-9 level for hours at a time and the one or two stations on from that area were sending many unanswered CQ's.

No time for comments from other areas but five continents were printed here. We heard rumors that Asia was represented but don't know who or where. EL2BD did a terrific job for his first contest. Same goes for Bill, HP1XHG, who gave many a new country. Barney, in New Zealand was using his new commemorative call, ZM2ALW, and was on 3550 khz. at 0939z. Anyone make that contact?

In closing, we wish to urge you all to send in your score no matter how small. It not only helps the contest committee cross check logs and determine the winners but is also your way of telling the committee your appreciation for a good show.

FLASH

Post Contest Activity - TU2AK noted above is on 20 Meters with excellent signals. Andre, in Abidjan, is using a Mod. 15, Swan 350, and home brew linear at a KW.

***

10 Years of RTTY in Great Britain -

ARTHUR OWEN G2FUD

**

The following article is a reprint from the BARTG NEWSLETTER. RTTY in other countries is always interesting to us especially when so many familiar names and calls are involved. In many cases their problems have been the same as ours. We have often thought it would be nice for one or more of the old timers in this country to compile a short history of the progress of RTTY here. There are still many fellows active that have been in since the beginning. Any donators?

**

Believe it or not, BARTG is ten years old this June. By now, most Amateurs have come to accept RTTY as another mode of communication, but in the Spring of 1969 RTTY was merely a secret twinkle in a few eyes up and down the country. Amateurs in the U.S. had been using RTTY for some ten years - but apart from a handful of DX RTTYers - notably VE7KX, VK3KF and ZL1WB - there was no-one outside the American continent to work with.

The G's had, of course, been reading the odd article on RTTY in the U.S. journals for years, and several G's were looking for teleprinters. We were fortunate to have two very keen "prodders-on" in the form of Jim Hepburn VE7KX and Merrill Swan W6AEE (the original editor/publisher of "RTTY JOURNAL"), and they helped enormously to get G-RTTY moving with practical advice, journals, manuals, toroids, and other things no-one knew about over here.

There is no doubt about the prime movers on this side of the water - they were Dr. Arthur Gee G2UK and Bill Brennan G3CQE. G3CQE was already a force to be reckoned with on the DX bands, so it was only a matter of time before Bill was printing VE7KX's RYRYRY.

With the first issue of the BARTG New Sheet No. 1. in June 1959, Doc G2UK announced that the Group had been formed, and that GPO permits for RTTY could be had on individual application. Doc G2UK ably led BARTG as Hon. Sec.Treasure/ Editor, for the first few years, and also wrote regular RTTY articles in "RADIO CONSTRUCTOR" and "RSGB BULLETIN". Bill Brennan G3CQE also ran a long series of RTTY articles in "SHORT WAVE MAGAZINE" which persuaded hundreds of new RTTYers to join us. By November 1959 G3CQE had worked Eric VK3KF on RTTY, and several G's were receiving or working RTTY, G2UK ran a RTTY demonstration at the November 1959 RSGB Exhibition and that also created a lot of fresh interest in the new mode. While all this was going on, Jim VE7KX had made RTTY W.A.C by July 1959.

The Yukon gold rush had nothing on the way U.S. Amateurs were searching avidly through scrap yards and surplus stores for teleprinters. Until then, there had been no interest in surplus printers - many used to be broken up for scrap. Our standards were not very high in those days - all we wanted was a printer in ANY condition, and a battered old Creed 3X tape printer was a real find. Creed 7B page-printers were like precious stones. There were a few surplus foreign machines around: Teletype 14, Lorenz or Siemens tape-printers, using the same paper slip as the 3X. G2FUD's first printer was a neat, quiet, compact Lorenz tape-printer which was still working in the shack several 7B's later! Admittedly, the first two months of experiment produced mile upon mile of tape printed in what appeared to be early Mongolian dialect, until one day it actually printed one complete word in English: - STOP. (Had we obeyed this exhortation and moved on to rug-making, or old coins, we would have had fewer grey hairs in followings years, our local sub-postmaster would not have been able to retire as early as he did - and we would have made very many fewer friends. For this was one thing about RTTY - it seems to attract a very keen type of Amateur. Even now in 1969, it must be one of the few branches of amateur radio into which you still HAVE to put some effort yourself. Also, as the RTTY world is a relatively small one, one gets to know just about everyone else who is similarly interested).

An intelligent bystander might well think that since "writing letters by radio" was what RTTY was all about, there would be a great interchange of information by RTTY. Well, there was of course, but in point of fact the road to successful RTTY always seems to have been via huge vol-

umes of postal correspondence! G2FUD had the good fortune to meet Doc G2UK and Bill G3CQE in those early days, and but for this our own RTTY progress would have been very slow. After a while, the newcomers started writing to G2FUD, as well as to G2UK and G3CQE, with startling volumes of mail coming through the letter-box, daily.

Two RTTY milestones were passed in the Autumn of 1961. The Dutch VERON Amateur HQ station PAØAA on November 26th started its first regular weekly RTTY broadcast in English, and for many years (until a recent disastrous fire in the factory housing the station) this has been copied without fail by many keen RTTYers in the U.K. and abroad. It started off on Sunday afternoons (ruining the lunch at G2FUDO, but later moved to Friday evening at 2030 GMT. That November too, at the RSGB Exhibition BARTG brought out its first RTTY MANUAL with a first printing of 300 copies. Partly composed of reprints of existing journal articles, and a few new items, this was the first source of reference available in the U.K., and it was only five shillings.

There was, of course, some opposition to RTTY in those days from other Amateurs - just as there was in the early days of SSB. Even now, every commercial RTTY station heard in the Amateur bands is blamed on the Amateur, but by now most other band users have got used to living with RTTY. There are always a few Amateurs who believe RTTY is only high speed Mores - some even claim to be able to read it in their heads!!!!

In those early days, too, RTTY was just not respectable enough for the RSGB to want to have anything to do with it. However, by April 1961, BARTG was an affiliated society of the RSGB. By today many RSGB officials are also on BARTG's Committee. Many of the RTTY Groups in European countries - many of whom have been slow in permitting RTTY operation - have modeled themselves on BARTG's example. Many of their members were already BARTG members, as we were the first RTTY Group in Europe.

By the time BART's News Sheet No. 2 was out in August 1959 G2UK had found a batch of 21 Creed 3X tape-printers to be offered to members at only $3.10 each. The lorry carrying all these printers arrived at G2UK's home while he was out, and as the driver insisted on immediate unloading, Mrs. Gee had to telephone some local Amateurs to help. When Doc got home his garage was bung full of printers.

No-one used new printer rolls or tape in those days. Geoff Bagley G3FHL staggered home one day with hundred weights of surplus multi-ply paper rolls, and proceeded to supply us with cheap paper for a long time. We all suffered from the "blue fingers" disease - thanks to the need to unroll miles of carbon paper interleaving in those multi-ply rolls. Mysterious blue fingers too, were the distinguishing marks of the 3X brigade, due to the need to keep re-inking those fiendish little ink rollers which some of the clever boys later replaced with typewriter ribbons.

RTTY operation was largely on the 80, 20 and 2 meter bands with only a very few G's on 20. While the constant hunt for teleprinters was going on, all sorts of demodulator designs were tried. The G3BST, G2UK, W2PAT, W2JAV, and Twin City designs were all popular in the "do-it-yourself" league, although some of these were more suited to the conditions met with on the VHF bands. Surplus demodulators on the market offered a much easier path to RTTY - notably the ATM FSR.1.1X and FSY.1.1 followed by the GCRE FS/10 - all these being audio type TUs. There were also some surplus IF-type TUs on the market - e.g. the Redifon CFS, and the RCA FS No. C1, but IF-type TUs were always bothersome things to get going for the newcomer, and they needed to be accurately aligned to a very good selective receiver. The ATM series of surplus TUs had a scope tuning unit the CRM-1, which made tuning in a RTTY signal very easy, but not many of us had the modern, G8LT-type, RTTY shift monitor scope in the shack, and the amount of shift used was not always what we thought it was. However, as the surplus TUs were generally of the linear discriminator type, it did not really matter what the shift was as long as it was between 200 and 1000 cycles!

No review of RTTY would be complete without some mention of the speed question. Although all U.K. machines were for 50 Baud operation, and the GPO wanted at first to restrict us to 50 Bauds, the fact that most U.S. printers were fixed on 45.45 Bauds both by synchronous motors and by FCC regulations, made BARTG press for free choice of 50 and 45.45 Bauds. Inside G, operation has been on 50 Bauds most of the time, and anyone interested in DX working has either found an extra governor, or made a dual-speed governor. Commerical RTTY speeds have standardized on 50, 75 and 100 Bauds, and by 1969 a body of U.S. RTTYers are petitioning the FCC to allow higher speeds for those who want to use them. It has never seemed to be much of a problem in the U.K. despite the constant talking about it. Either you wanted to work DX, or you didn't - and it is a pity that so few G's seem to try the DX bands - especially nowadays when sixty countries and more can be worked on two-way RTTY.

The 850 cycles shift was in use from the start, and 170 cycles narrow shift has taken a long while making itself popular on this side of the Atlantic, but several G's use it now both on the DX and Lf bands.

Although a few stalwarts have been with us right from the first struggling days of BARTG, membership has varied quite a lot over the years. The actually-on-the-air-with-RTTY portion of our membership has always belied the real strength of interest, and it must be assumed that, apart from our many receiving only members, even quite a lot of the licensed RTTY stations spend more time experimenting and trying out new designs and control systems than putting a RTTY signal on the air. At times one tends to draw a parallel with some of the Hi-Fi boys who are not as interested in listening to music as in the way their equipment reproduces it. But RTTY is obviously all things to all men, and there is as much attraction of a mechanical nature as there is of electronic design and construction.

The teleprinters we have in our shacks have, inevitably, improved over the past ten years. 7B page-printers in various forms, or Teletype 15 or 19, could be thought of as the most popular type of printer. Although a few of our members now have the latest Creed 75 machines, no-one has - as yet - reported having a Creed 444 (not even the Mk. 1!) but it will not be long. In addition to the teleprinter, of course, there is also a family of allied machines - perforators, reperforators, tape-readers, etc. all of which help to speed up transmission by the use of punched tape. The ideal RTTY shack must surely be an old aircraft hangar! You need both the space and the solid floor. . .

Where do we go from here? Demodulator design is changing slowly all the time. The most popular TU design of the past three years has been the DL6EQ two-tone limiterless circuit, and some of the keener types are building the TT-L/2. Integrated circuits are appearing in TU design: some of our boffins are working on them now, and we shall be telling you all about them in the NEWSLETTER soon. Printers will no doubt become more compact, and will of course feature integral tape-reader and reperforator. Mechanical printers may be on the way out in time, as the solid-state keyboard units take over - but will it be as much fun, knowing that there is no whirling machinery to catch your necktie and throttle you into the bargain? If the next ten years are going to be as much fun as the last ten years, it's going to be really hilarious.

***

Comming !

SOLID STATE TT/L

Just before we closed this issue we received a beautifully prepared article on an all solid state version of the TT/L demodulator from Ole Berland, OZ6OB.

The article includes some beautiful photographs of the equipment and also includes a complete control system. Watch for it next month.

***

TYPE CLEANER--

Dick McNutt, W8CAT suggests using "Scotch Brand Typewriter Cleaner #575. Just insert in machine in place of the paper and with the ribbon removed, type each key for several times. Much better than the old method of brush and carbon tet.

***

Modification For ST-3

Irv Hoff, W6FFC remarks that several complaints have been received on failure of the Q3 and Q4 transistors in the ST-3 demodulator (RTTY JOURNAL Sept. 1968). Motorola MPS 3394 transistors have been supplied in the kits and as they are rated for audio service should be replaced, in case of failure, with a fast switching or general purpose type such as the 2N706 or some other "NPN fast switching type. The MPS3394 are apparently unable to switch fast enough for the sharp transition needed in RTTY and have on occasion failed.

***

RTTY Tape "ART"and "MUSIC"

The following article is another in a series of reruns of popular articles from the 1967 Volume of which no back issues are available.

by ED. KOCH, SUN CITY, ARIZONA

In spite of the fact that more and more RTTY tape gear is being used on the air nowadays, its use seems to be limited to the customary "CQ" tape, a simple "brag" tape, and the taping of answers in a fast QSO. Perhaps the disappearance of QSL cards and similar tape art is because so little, if any, has been written about the procedures for preparing tapes. In the hope of encouraging you to "do it yourself", this article was written. Equipment needed is a printer, a typing reperforator, and a tape distributor -- or their equivalent.

The foremost RTTY artist (who made up those wonderful portraits of the Presidents) prefers to make up his preliminary sketches on graph paper. Since few households have a ready supply of graph paper, a much simpler approach is to print up a page, or the desired part of a page, with the letter "O". You can do this by hand if you need the exercise, but it is better to make an endless tape loop to automatically print the "O"s . . . start the tape with 3 letters shifts, a carriage return, a line feed, 70 "O"s, and 3 letters shifts. Splice the tape by gluing the 3 letters shifts perforations at the end of the tape of the 3 at the beginning. What glue to use on the oiled tape? An expert in office tape machines told me that "Elmer's White Glue" (R) is the best possible material for the purpose -- so much so that his company did not market its own glue for tape splicing. Use a very small amount of glue and carefully match the tape perforations. The tapered point of an ice pick is a help here. Check for straightness by setting the tape loop on edge on the table top -- if it lies flat all the way around, it is straight. You have a minute to make a slight adjustment while the glue is setting.

As an example, let's start out to make a tape for the QSL shown in Figure 1. Put the "O" tape in the tape distributor and use it to print a block of "O"s a little larger than the desired form. A nicety is to use a well-worn ribbon on the printer so that the "O"s will be just visible. Now roll the paper out of the printer and tear it off, leaving a generous top and bottom border. Take a soft lead pencil and sketch the desired design, using the "O"s as a spacing guide, as shown in Figure 2. Now put your sketch back into the printer; carefully realign it so that the typing you are about to do will exactly coincide with the "O"s previously printed by tape. Replace the worn ribbon on the printer with a good, black one. Start up the printer and reperforator, and type in the desired pattern and lettering, using your pencil sketch as a guide. To check your accuracy, run the tape through the tape distributor and print the result. Usually you will find two or three errors at this point; mark them so you can readily see them, and make a new corrected tape.

In making new tapes from old ones, I find it very handy to have a switch located alongside the printer keyboard -- this switch is connected across the signal output of the tape distributor. When you come to a point on the tape where deletions are necessary, just throw the switch to the shorting position, type in the correction, advance the tape to the point where you wish to copy it again, stop the tape, flip the shorting switch off, and you are ready to resume copying. You will be disappointed to learn that the switch cannot be used "on the fly" -- this results in missprints, ruining the new tape.

One part of the QSL shown in Figure 1 requires special treatment; the part calling for the filling in of data -- the other fellow's call, RST, time, date, etc. The QSL tape is punched so that it types the entire line, including the right border, followed by a carriage return without a line feed, followed by the number of spaces needed to put the carriage at the point where the call is to be typed in manually. At this point, the tape should have a bell signal followed by 8 to 12 letters shifts, ending with a carriage return and a line feed. The same technique is used on each of the other lines where data is to be typed in manually. In transmission, then, the procedure is to listen for the bell. When it sounds, quickly turn off the tape advance, manually type the entire line of data, and then without using the carriage return or line feed, turn on the tape advance and wait for the next bell signal. For the line

FIGURE 1.

FIGURE 2.

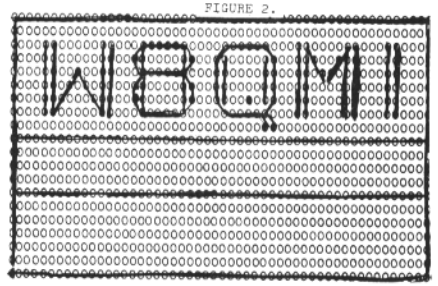
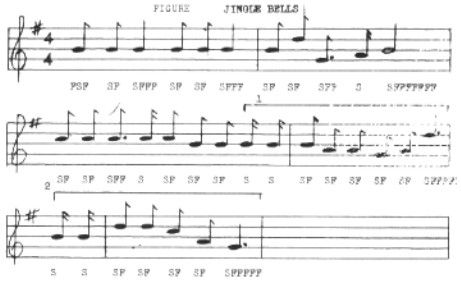


FIGURE 3.


```
                                R
                                Y
RIG HERE IS MARAUDER            R
WITH WARRIOR LINEAR             Y
TO MY-TOWER VERTICAL.           R
75-A-4 RECEIVER .               Y
RTTY -- 15  PRINTER             R
14 TD, TYPING REPERF,           Y
PRINTER, FRXD UNIT              R
W2JAV-W5ANW T U                 Y

                                7
                                7
```

FIGURE JINGLE BELLS



where you are to type in the time of QSO, you may prefer to use figure shifts instead of letter shifts -- it saves you punching the figure shift key manually -- but if you do, be sure to include a letters shift at the end of the series.

This may be a good time to mention the matter of excess carriage returns. I started out in RTTY with a Model 26 that never could quite get back to the left margin in time to properly print a tape-transmitted signal, so I got the habit of always inserting a few extra carriage returns on my tapes to make sure the printer had time enough to print properly. Now I learn that some of the fabulous 28s have an arrangement to line feed each time they receive a carriage return -- and a friend of mine sent me a page of copy to show how I was wasting his paper, hi! So watch those carriage returns for the sake of your lucky friends.

Now that we have struggled through the first QSL, it won't be necessary to start from the very beginning on the one shown in Figure 3. The trick here is to take a copy of the QSL of Figure 1, put it back in the printer, and then carefully type a line of "O"s to cover the open spaces only, followed by a carriage return with no line feed and an over-printing of "X"s. Note that this new QSL has an added feature -- a place for name and address, as on a postcard. When you run out of your printed QSLs you can easily run off a RTTY QSL card. The data can be filled in on the printer or with pen or pencil. Crease the copy at the bottom of the design and paste it to a 4" x 6" file card. After the paste hardens, trim the card to size, and it is ready for mailing.

For the RTTY contest man, the following should prove helpful. The first of two tapes is used in the situation where you have been calling "CQ Contest" and a station answers you. You manually type his call several times and then use the following tape:

(no carriage return or line feed) de W8QMI THANKS OM FOR THE CALL ~ PLSS QSL MY NR UR RST DATE-TIME BAND SECTION carriage return, line feed, signal bell, and 8 to 12 figure shifts, and a letters shift) (end of tape). When the bell sounds, stop the tape advance, manually type in the data below each heading, using dashes or periods between numbers to avoid shifting.

Continued on page 14

RTTY theory & applications.

RON 'RG' GUENTZLER, W8BBB
Route 1 Box 30
ADA OHIO, 45810

RTTY SIGNAL BANDWITH

Part 3 - Fourier Series

In the first two parts of this series we established certain requirements for AC circuit calculations and some of the terminology and principles necessary for analysis of circuits containing non-sinusoidal signals. This month we are going to discuss the Fourier Series.

The basic idea behind Fourier analysis is that any periodic signal can be "decomposed" into a series of harmonically-related pure sinusoids, and possibly a DC voltage. How to use the resulting series will be discussed next month.

Assume that a signal being applied to a circuit can be expressed analytically; i.e., it is possible to write a mathematical formula that expresses the voltage as a function of time. Call this function, v(t). If v(t) is periodic, it can ultimately be expressed in the form:

$$v(t) = a_0 + a_1 \cos wt + a_2 \cos 2wt$$

$$+ a_3 \cos 3wt + a_4 \cos 4wt + \ldots\ldots$$

$$+ b_1 \sin wt + b_2 \sin 2wt + b_3 \sin 3wt$$

$$+ b_4 \sin 4wt + \ldots\ldots$$

where, $w = 2pi/T$, T = the period of repetition or the time to complete one cycle.

The coefficients, a_0, a_n, and b_n, can be determined as follows:

$$a_0 = 1/2pi \int_0^{2\pi} v(\theta)d\theta,$$

$$a_n = 1/pi \int_0^{2\pi} v(\theta)\cos(n\theta)d\theta, \text{ and}$$

$$b_n \quad 1/pi \int_0^{2\pi} v(\theta)\sin(n\theta)d\theta$$

The limits on the integrals are somewhat arbitrary, but, usually, are chosen in a manner that will give the simplest answers.

To illustrate the process, assume that it is desired to find the Fourier Series for the voltage wave shown in Figure 1; this is a typical voltage wave that might be found in a non-inductive telegraph loop when "dots" are being sent from a test set such as the I-193-C. The loop is a 130-volt loop; the dots are at a 45.45 Baud ("60-Speed") rate.

By inspection, it can be seen that the voltage or function repeats itself every 44 ms; therefore, T 44 ms and the angular velocity or "angular frequency" w 142.7 radians/second.

Because the formulas given above are in terms of angles rather than time, it is necessary to convert the time scale of the voltage wave to an angle scale. This was done, as indicated on the lower horizontal scale in Figure 1, in terms of radians. (We could have used degrees, but since degrees are meaningless units, we have used the mathematically-meaningful radians.) Because of certain peculiarities (actually, niceties (?) of Fourier Series, we can set the zero angle point more-or-less at will; however, judicious placement of the zero radian point will result in a simpler answer. Therefore, we have chosen 0 radians to correspond with 0 time, pi radians (1/2 revolution or cycle) to correspond with 22 ms, and 2pi radians (one cycle) to correspond with 44 ms.

We now have to obtain an analytic expression for v(t) or v(θ). By inspection, it can be seen that v(θ) = 130 over the interval o to 22 ms or 0 to pi radians; v(θ) = 0 over the interval pi to 2pi radians.

To obtain the a_0 coefficient, integrate by parts as follows.

$$(a_0) = 1/2pi \int_0^{\pi} 130d\theta + 1/2pi \int_{\pi}^{2\pi} 0d\theta;$$

therefore, $a_0 = 1/2pi \times 130pi = 65$ volts. It should be noted that a_0 is simply the average or DC value of the voltage wave given in Figure 1.

To obtain a_1, set n = 1, plug in v(θ), and:

$$a_1 = 1/pi \int_0^{\pi} 130\cos\theta d\theta \quad 1/pi \int_0^{2\pi} o\cos\theta d\theta.$$

Since the second integral equals zero (this was part of the judicious selection of the zero angle point), only the first integral has to be evaluated.

$$a_1 = 1/pi\ (130 \sin\theta)\pi = 0 \text{ !!!}$$
$$0$$

This is a bit disappointing; all that work for zero! However, actually it is good, and, again, results from proper selection of the zero angle point. When all other a_n are evaluated it will be found that they are also equal to zero.

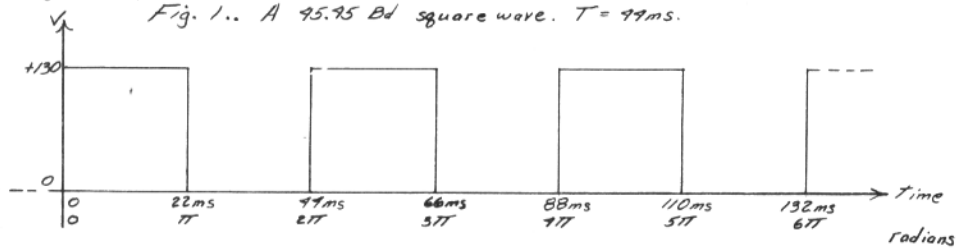
The b_n terms are evaluated in much the same manner as were the a_n terms. The terms are found to be: $b_1 = 260/pi$, $b_2 = 0$, $b_3 = 260/3pi$, $b_4 = 0$, $b_5 = 260/5pi$, $b_6 = 0$, $b_7 = 260/7pi$, etc. The series is, therefore, a DC term equal to 1/2 the maximum value of the voltage wave, and a series of sine waves that include the fundamental and all odd harmonics. The odd harmonics decrease as the order of the harmonic; i.e., the third harmonic is 1/3 as large as the fundamental, the fifth harmonic is 1/5 as large as the fundamental, etc.

The actual series is: v(t) 65 83 sin 143t 28 sin 428t 17 sin 714t 12 sin 1000t 9 sin 1285t .....The coefficients of the sine terms are peak values; because the terms are all simusoids they can be converted to rms values by dividing by 1.414. The coefficients of t are "angular frequency" in radians per second; they can be converted to the frequency in Hz by dividing by 2pi.

Therefore, the series can be expressed as: v(t) 65V DC 58.5V rms at 22.7 Hz 19.5V rms at 68.2 Hz 11.7v rms at 113.7 Hz 8.36V rms at 159.2 Hz ... all at zero relative phase. Another way to look at the results is that the sum of all these terms is a square wave of 130V amplitude and a period of 44 ms.

A graphic description of this result is

Fig. 1.. A 45.45 Bd square wave. T = 44ms.



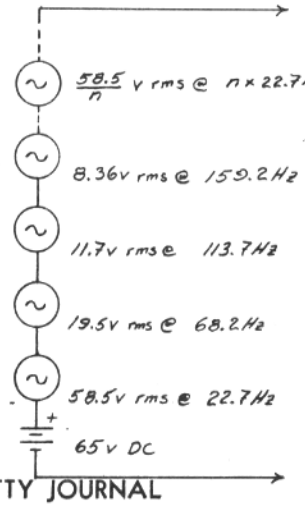


Fig. 2.. A group of generators that will produce a 130v, 45.45 Bd square wave as shown in Fig. 1.

shown in Figure 2. If a group of audio oscillators were connected in series along with a DC power supply and the oscillator outputs were adjusted to the frequencies and voltages shown, the voltage appearing at the arrows would be that shown in Figure 1. Don't collect a bunch of audio oscillators from friends and try this unless you can obtain good oscillators that are capable of being phase-locked because the oscillators must have the phase angles exactly right or the output will not be a square wave.

In Figure 3 we have shown, graphically, that the sum is a square wave, or at least looks like it may approach a square wave. The fundamental, 3rd harmonic and the 5th harmonics are drawn using the voltage scale on the left and the horizontal axis in the middle of the sheet. The curves are drawn as they would appear on an oscilloscope if each were obtained separately and then superimposed. The sum of the three can be obtained by adding all three curves (including sign) at various points along the time scale. We added them at 33 separate places. (to add, simply draw a vertical line and add the values of the three curves at the place where they cross the line you have drawn; repeat this process for other vertical lines until enough have been used to obtain a good outline for the curve that forms the sum.)

The curve that forms the sum is indicated. Although it does not appear to closely resemble a square wave, it does have characteristics that are similar to one. If the seventh harmonic is added, the "ripples" will be partially filled in and the corners will "square-up". As more of the higher harmonics are added, the result will more closely resemble that of a square wave. The interested reader should try adding at least the seventh harmonic to notice the effect it has upon the overall wave shape. (We have some approximately 8 1/2 x 11" copies of this figure that we will be happy to supply upon request.)

The DC (a_0) term can be added, simply, by shifting the horizontal axis downward by 65 V. This has been done in Figure 3 as indicated by the horizontal axis near the bottom of the figure; the voltage scale on the right is for use with this axis.

There are a large number of non-RTTY applications for Fourier Series. They encompass such things as clicks on CW signals, audio amplifier testing, and the difference in sound between such electronic musical instruments as the Allen and Hammon organs. The RTTY applications will be left for next month.

For an excellent discussion of Fourier Series see: MATHEMATICS FOR SCIENCE AND ENGINEERING, Philip L. Alger, McGraw-Hill, 1957, Ch.10.

Next month we will begin to apply our results to RTTY.

--73, ES CUL, RG

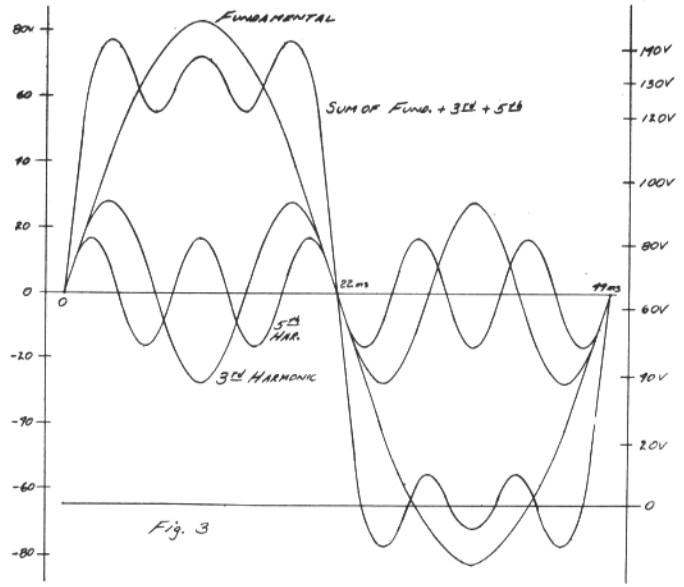


Fig. 3

RTTY-DX

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

Hello there. . . . .

We had hoped to include some observations of the contest in this months column but due to the complexities of meeting publication deadlines we must get this to Dusty before the big show starts. However, like your favorite inter-city commuter train, we will try to rush out a "second section" with some contest info that may still make publication. We know this section will be on time, the second section may not even show up at all until next month. It depends upon how exhausted we are the morning after the hectic (contest) week-end before.

There certainly has been no lack of activity this past month. There was something new and surprising going on almost every time you tuned the bands. The pending contest was a popular subject of discussion and if all the stations show up that indicated an interest we can predict that the contest was a huge success.

Many of you have no doubt contacted Cliff, W4CQI, at one time or another as he was real active from down Virginia way and an avid DX hunter. Well, now Cliff is one of the hunted and will get a lot of finger exercise for the next few years. Cliff is now signing SV0WO from Athens. He and his family arrived there in June. He got the gear set up and received his license in early September and has been active ever since. In a letter describing his operating conditions Cliff tells about the vast line voltage excursions requiring constant Variac control and the spurious signals generated over the Twenty Meter band by local high powered commercial rigs. His location is in the suburbs of Athens several hundred feet above sea level and he is presently using a Trap Vertical on 15 and 20 fed by a SB-401 Transmitter. The printer is a Model 15 in which he wisely installed a governed motor before leaving the States. Due to the QRUM from the local commercial stations on 20 Cliff indicates he may do most of his operating on 15 Meters. He says that conditions for RTTY are ideal on that band and like many others deplores the fact it is not used more often. Cliff fully expected to be in the contest and no doubt many of you have worked him by now. His QTH is as follows--

C.W. Pittelkau SV0WO
American Embassy (ATO)
APO New York, 09223 (for W & VE)
Athens, Greece (for DX stations)

When Orbra, EL2F, EL2N, left Liberia last Spring RTTY activity from this area, and from Africa for that matter, came to a halt. We are now happy to say that activity was renewed the last week of September with fb RTTY signals from EL2BD. Leo, whose home call is K4AGC, (these Virginia boys get around) is using low power into a dipole but hopes to put up his Quad as soon as the stormy season quiets down. He also plans to operate narrow shift soon. QSL's go to --

Leo J. Small, EL2BD
Box 98
Monrovia, Liberia

From Jean, FG7XT, via ON4BX, comes some additional interesting news from the African Continent. Jean has been in QSO with 9U5CB, in Burundi, and says that TU2AK, Ivory Coast, is receiving RTTY at the moment and hopes to be transmitting in the near future. These two countries are extremely rare in any mode and a real first for RTTY.

In addition to the above, Vic, ZS6OY, continues activity from South Africa and comes into the East Coast USA very well via the long path at about 12-1300z on 14 Mhz.

One station we have not heard on the bands for quite a long time is back with his usual fb signal. Jim, VP9BY, promises to be more active from down in Bermuda and hopes to meet some of his old RTTY buddies again. That same evenining there were some loud noises coming in from the South that turned out to be KC4USB at Byrd Sta-

tion, Antarctica. Keith said that he hoped to be in the contest but what discourages him most is to have the whole band calling him on his frequency. The next result is that he cannot copy anyone and shuts down. He says that his Rx is equipped with a tuning knob, so spread out a bit fellows.

After the clean sweep Jose, PY2CQ, made in last years contest Brazil stations have been few and far between. Imagine my surprise the other night to be involved in a four way QSO, with the other three stations being in PY. They were Mario, PY2BXV; Elby, PY2DGB; and Jaurez, PY1NBF. The former two in Sao Paula and the latter in Rio de Janeiro. Fortunately their excellent English was superior to my non existing Portugese so a good QSO was had by all. They said they would be in the contest.

It is about that time of the year again to look for the VK's long path from the Eastern USA. VK3NR and VK2FZ have been booming in as late as 0000z and after. Den, VK7DK has been very consistent the short way at 1200z with amazing signals considering he is running only 30 watts. From this same part of the world there may shortly be RTTY activity from VR1L, according to Jean, FG7XT.

A letter from Ven, VU2KV the day before the contest told the sad tale of a broken co-ax at the top of his 120 ft tower. The poor weather had made repairs impossible but he still hoped to be on for the contest. (We listened and don't think he made it). If not he will be back as soon as possible. He also states that all VU2 calls will be changed to VUØ in October. Another one for the PX boys.

"Larry" K1LPS is now in Guam ready to operate as/KG6 when he can get all the equipment together. Larry has joined the Navy Mars and hopes to operate some of the navy equipment also. We could sure use some more activity from KG6 Larry.

DU1DBT continues to be active mainly for the European area and is putting in good signals around 17-1800z. Bob, ON4CK had a good contact with him at the end of September. That bit of info was relayed by SVOWO who has printed him well also.

We had been spending time on 15 Meters before the contest and was pleasantly surprised to see that there really IS activity there. In a few hours SM5PL, DL3II, OZ9SL, and YV5CIP were contacted, and this was all with the 100 watt exciter. It is a pleasure to operate under practically QRM 'less conditions after the mess of fones, commercials, and QRM in general that one encounters on 20 Meters. WA8YUU/OA8 hangs out on 21100 Khz, handling traffic with the states but you can get a QSO when he is not busy.

After a few years of operation as DL5PQ, Jim Don Carlos is now back with his home call of WOITU at Colorado Springs Colo. Jim was always active in the contests and now he will get an opportnity to sample things from this end again. Jim included some excellent technical articles in his correspondence which we have forwarded to Dusty for possible inclusion in some future issues.

A couple of new prefixes showed up in September. First there was PD3GKO, who is of course, Gerard PAOGKO. The PD3 prefix was for a Dutch commemorative event and used for a two week period only. The other was EI2THF and although we did not QSO him we were told that it is Paul, EI5BH. We will fill you in later when we get in contact with Paul.

I have some more background on that C31BT station mentioned last month. It was a Dxpidition by a club station F5KAE on CW, SSB, and apparently RTTY. This information was gathered from the "How's DX" column in the September QST. F5KAE had been quite active on RTTY for some weeks before going to Andorra.

Ted Double, G8CDW, Contest and Awards Manager of the BARTG writes to say that there are at least two stations that can claim their "50" sticker for their QCA Award and about a dozen that can get the basic QCA Award Certificate. This is based on Ted's perusal of the last RTTY-DX HONOR ROLL listing. So count 'em up fellows and apply to Ted. Full information on how to go about this appeared in this column in the May, 1969 issue.

***

RTTY Contest Calendar

Volta DX Contest - Dec. 6-7, 1969
Rules in this issue.

DARA WAE RTTY Contest - last week end of April 1970

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BROAD MINDED

USE NARROW SHIFT

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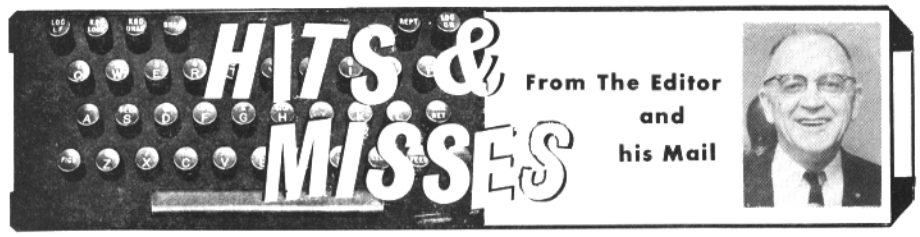

The United Fund drive comes regularly every year. Our drive for articles and pictures seems to go on forever. We are particularily interested in uses of transistors and ICs in any RTTY application but ANYTHING you think might be of interest is welcome. Short or long, technical or otherwise, we will be glad to see it. We do appreciate articles typed with regular typewriter type as otherwise we have to have them re-typed, this is a long job for us and besides it is very easy to make mistakes. Drawings should be black on white with no grey lines. . If it is not easy to meet these requirements send it anyway and we will do our best if the article is of interest.

Our thought on pictures is that we would rather have the operator without a station than the station without the operator, so if you are taking a picture of the rig crawl in it somewhere, black and white pictures are best. A contrasty color pix can be used but flat underexposed color pictures are reproducedvery poorly and we will use them only in a pinch. A good B & W Polaroid is fine.

Remember what we said several months back about getting "only money" in the mail. We would like to change that to "money and articles". . . . .

***

Sure be nice if some budding artist on the green keys would design and send us a RTTY picture for the Xmas or New Years cover. If we do have an ambitious subscriber, white paper with black ink will make the best reproduction, but yellow paper will do in a pinch.

***

And speaking of pictures, John Greve, who is advertising a book of RTTY pictures advises that he expects to ship all orders about November 1st. Pictures were still arriving and he delayed publication for a month. His ad is in the classified section.

***

We have notice of the Fifth Annual Fun Convention, SAROC in Las Vegas, Nevada on February 4-8. This year there will be three cocktail parties hosted by various electronic companies along with the large display of hamgear and an interesting program with the usual complement of free prizes. HOWEVER, if you can't win a prize in the drawings there are always the tables. Just think one lucky throw and you might bring home a new Signal One exciter, only catch is that if you are not lucky you might not come home at all. Special rates are offered at the Stardust Hotel so write for full particulars to Saroc. PO Box 73, Boulder City, Nev. 89005.

***

Last months issue was held up several days waiting for a final OK on the offer of Model 28 Teletypes. It is not often that so many of these machines have been available at such a reasonable price and some 150 to 200 hams should be happy. The last word we have is that the quota was oversubscribed soon after the mailing and the machines should be shipped very soon.

***

BACK ISSUES —

The ONLY back issues available are: July through December 1966 - February 1968 to date. (July-August is combined issue.) Copies are 30¢ each. The TT/L-2 reprint is 30¢. RTTY JOURNAL binders are $2.50 each in the USA and $3.00 in Canada.

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

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All Others - Air Mail - - - - - $5.50

Tape -ART - MUSIC

Continued from page 7

The second contest tape is used in the situation where the other fellow has called "CQ contest" and you are answering him. When he returns, giving his text, use the second tape (similar to the first one, except for the headings which are as follows:
QSL UR NR UR RST DATE-TIME BAND PSE QSL MY NR
FROM MICHIGAN SECTION BK BK

In use, the contest tapes should be clearly marked with a heavy lead pencil to avoid mixups in operation. They can be endless, but I prefer to have them repeated several times on a strip. If you are a slow typist, you can include considerably more routine material -- "thanks for the contact, hope you have good luck in the contest, name here is Ed, etc. etc., and W8QMI is standing by on the frequency for any other contest call." Use of these tapes makes for extremely rapid operation and assures you of transmitting all necessary contest data on your first transmission. If things are rough, you may want to make a reperf of your transmission so you can repeat it completely by using the reperfed tape.

Music on RTTY? Percussion is probably a better term for it. I am sure you have all heard that old refrain "Shave and a haircut" banged out on the bell signal, but I wonder if you have ever tried to do it on tape? Try this ("F" indicates a figure shift, "S" is the letter "S"):

FSFFFSSSFSFFFSFFS

If you are musically inclined, the basis for this is as follows:

one half note
bell and seven shifts
one quarter note
bell and three shifts
one eighth note
bell and one shift
one sixteenth note bell

Figure 4 shows the application of this to "Jingle Bells", which you may want to try for yourself. A far more interesting and "hep" version gives it a catchy New Orleans jazz beat and combines with it the typing of "Merry Christmas and a Happy New Year to All". Its reproduction is tedious but worthwhile. The hardest part is keeping track of what you have typed and what comes next. In addition to "F" and "S" as above, now "X" indicates a letters shift, and "Z", a space. Spaces shown here between symbol groups are aids in reading only -- do not include them in your tape:

Carriage return and line feed
FSFSFSXMFS FSFSXEFSFS FSFFSSXRRY
ZFFSFSFSFF SSFSFSFSSS
FSFSFSFSXC FSXHFSFSFS XRFSFSFSXI
FSFSFSFFSS XSTMASFSFS
FSFFSSFSFS FSSSFSFSFS FSXZANFSSS
FSFSFSFSXD ZAFSSSFSFS
FSFSXZHAFS SSFSFSFSFS FSFSFSSSFS
FSFSFSXPFS XPFSFSFSXY
FSFSFSFZFS FSFSFFSSXN EWZYFSFSFS
FFSSFSFSFS SSFSFSFSFS
XEFSXAFSFS FSXRFSFSFS XZ FSFSFSFF
SSXTOZALFS FSFSFFSSFS
FSFSSFSFS, FSFSFXL
Carriage return and line feed

***

that Dual Russian Keyboard

brings more information from Hans Napfel, WB2ZZB, ex DL9KY, and is reproduced below. The drawing is from the book he mentions, all in German. As our German is no better than our Russian all we can understand is the picture. At least we do know now partially how they use all those keys with a five level code.

Dear Dusty,

The picture of the Russian keyboard in the September issue apparently raised many questions as to how one can use many more characters with a 5 level code.

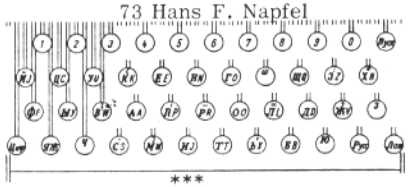
The Russian system use a 3 level shift in contrast to our 2 level. During the 1930's, the Morkrum-Kleinschmidt teleprinter was used in Russia. It was modified for 3 levels, consequently having 3 characters on each printing arm. The 3 levels are: Russian, Latin and numerals, etc.

The picture I believe shows such a model, CT-35.

There is an outstanding book describing all known teleprinters (I believe it is the only one in the world). FERNSCHREIB TECHNIK is written in the German language by Mr. F. Schiweck. It contains 900 pages and 600 pictures and costs approximately $24.00. I should be glad to obtain copies for anyone interested.

For your information, enclosed are sample copies of a few pages. Dusty, hope your German is not too "rusty".

73 Hans F. Napfel



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

NO GLARE WINDOWS for Model 15 & 19 Printers. Cadinum plated & Gold iridite finish. $12.50 P.P. Check or M.O. Bud WA6UEF, 17114 Sunderland Dr., Granada Hills, Calif. 91344.

RTTY GEAR For Sale; List Issued monthly. 88 or 44 mh toroids - 5 for $2.50 postpaid. Elliott Buchanan and Associates. 1067 Mandana Blvd., Oakland, Calif. 94610

TYPEWRITER RIBBON REINKER, Hand operated model now only $3.00. K575 or K764 Ink available at all National Cash Register Co. stores at 75¢ per tube. Walter Nettles W7ARS-8355 Tanque Verde Rd. Tucson, Ariz. 85715.

KLEINSCHMIDT TT - 119/FG and TT-4A/TG both in excellent condition with governed motors. $150.00 plus shipping each. WA5OVG, P.O. Box 38368, Dallas, Texas 75238.

TELETYPE PICTURES FOR SALE. Suitable for making your own tapes. 50 pictures for $1.00. Perforated and audio tapes also available. Pictures for volume two solicited. W9DGV, 2210-30th. St. Rock Island, Illinois 61201.

VECTOR C12 PLUG IN UNITS, octal, alum case 3" high, 2" square. Ideal for RTTY filters. New, 75¢ each. Howard Fasold, WAOVQM, 138 Palisade Cir., Manitou Springs, Col. 80829

LET J & J CUSTOM BUILD you a Mainliner TT/L2 FSK demodulator exactly as described in the May issue of QST with sharp filters for 850 and 170 shift tuned and adjusted in your unit for excellent performance. Also available TT/L2 filters. J & J Electronics, Canterbury, Conn. 06331

TT100B/FG Teletypewriter, Send-Rec. Kleinschmidt Lab. Sprocket or friction feed as desired, 115 VAC-DC, 50-60 cys. used, good $170. each. Atlantic Surplus Sales, 300 7th St. Brooklyn, N.Y. 11215.

SALE: MODEL 15 teletype machines, complete with sync. motor, cover, keyboard, spindle and crank, excellent. $70. each. Model 14 typing reperforator; send, receive complete with sunc motor, keyboard, holding magnet, tape retainer, cover and end of line indicator, excellent, $40. each. Model 14 typing reperforator, receive only, sync motor, tape retainer, cover, excellent, $30. each. FRXD-10 combination; (reperf-reader and transmitter) with sync motor. Used with model 15 will provide all the functions of a model 19 with much more flexibility, excellent, $28. each. Here-is-Answerback keyboard; for model 15, 21 characters to set up identification. Excellent $12. each. Send for teletype catalog - Atlantic Surplus, 300 7th Street, Brooklyn, N.Y. 11215

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

RTTY GEAR; Model 15, comm. keyboard and letters, sync. motor, 60wpm and 75 wpm gears, floor standing case, power supply, paper, excellent condition, $100.00. Model 14 typing reperf with keyboard, case, sync motor, tape, end of line indicator, excellent condition. $75.; Model 14 TD, sync motor, excellent $25.; Prefer Northeast deal. W2CVR, Box 472, Schenectady, N.Y.12301. Phone 518-393-8754.

TOROID COILS 88 mh, uncased, postpaid, 5 for $2.00. LaVon Zachry, PO Box 845, Apple Valley, Calif. 92307

TOROIDS 88 or 44 mhy. center tapped, never potted, 5/$2.00 postpaid. 11/16th oiled Fresh reperferator tape $3. box/10. Model 32KSR complete $200. German Model 15KSR with table $75. Model 15 with tape punch and TD, Table, complete $120. (Just like model 19 set but only size of a 15 printer). Gears for most speeds, most machines $6. a set. postpaid. Polar relays $3. Sockets $1. Drake 2B & 2BQ $175. New Clegg 66er $160. GE portables and mobiles - write. Wanted Ham-M rotator, Bird Thruline watt meter and elements. Stamp for list. Van, W2DLT, 302R Passaic Ave. Stirling, N.J. 07980

SAROC NEW QTH Stardust Hotel new QTR February 4-8, 1970. Cocktail parties hosted by Ham Radio Magazine, SWAN and GALAXY. Additional information and Stardust Hotel special SAROC room rate card QSP SASE SAROC, Box 73 Boulder City, Nevada 89005.

SALE: MODEL 32 Telewriters in console, used, excellent, $190. each. Teletype synchronous motor with fan and base, used, excellent, $7 each. Atlantic Surplus Sales, 300 7th St., Brooklyn, N.Y. 11215

FOR SALE MODEL 19, complete, with Auto LF/CR and non overline (as per RTTY) Ribbon, re-inker, electrically modified, regular table, no power supply, model 14 typing reperf with keyboard and end-of-line indicator. W2JAV (tube) converter with 2" scope and AFSK, in 11" table cabinet. All sync motors and very nice condition, $180. for package FOB. Ed Brums, W3EKT, 5711 84th Av. New Carrollton, Md. 20784. Ph.: 301-459-5325.

SURPLUS MACHINES from Michigan Bell many parts and 60 WPM gears, Type pallets and keys. Machines must be picked up. Fay Wilson, WA8KJH, 409 Nottingham Dr. Brooklyn, Mich. 49230.

ADDITIONAL CLASSIFIED on NEXT PAGE