HORSE TRADES

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

FOR SALE OR SWAP: New compact FSY terminal units, mfg. by ATM in England, 3½" x 19". Complete, in original boxes, with plugs, Instruction books. See May 1959 RTTY for description. SM5KI, Hans Goldschmidt, Persikogatum 34, Vallingby, Sweden.

WANTED: Model 14 typing reperf (Recv only) or what have you? Thomas A. Davis, K7ROY, 5512 S.W., Kelley, Portland 1, Oregon.

WANTED: Kleinschmidt TT-76A Tape machine and TT-4A page printer. W9UE, 6140 N. Harding, Chicago, Illinois 60645

WANTED: To purchase a CV62/U audio TU. Please state price and condition. V .A. Jupe, W0OKH, RFD 4, Box 12, Phillipsburg, Kansas 67661.

FOR SALE: AN/FGC-1 radioteletype converters $75.00 each or two for $100.00. Heavy duty (25 amp) Teletype power supplies PEC-260 $75.00. Standard 19" x 72" Relay Racks $60.00. Value for $22.50. Send for Free List. Gulf Electro Sales, Inc., 7031 Burkett, Houston, Texas 77021.

FOR SALE: Model 15 page printer and table, sync motor. Just overhauled, excellent condition, $90.00. W6ZQY, 15975 Union Avenue, Los Gatos, California.

FOR SALE: TT-4 manuals, $5.00 post paid. Tom Lamb, 1066 Larchwood Road, Mansfield, Ohio 44907.

TRADE: Brand new National NCX-3, SSB Transceiver with HB A.C., P.S., Want HT-32A for which I will trade even up or I will go $75.00 to boot for a HT-32B. K0GXL, 6701 Hickman Road, Des Moines, Iowa 50322.

FOR SALE: Frequency Shift Converter CV-60/URR, in good working condition. Including RCA manual. Will pack and ship collect upon receipt of $125.00. K6DX, P.O. Box 56 (217 Hemme Avenue), Alamo, (Contra Costa Co.) California.

FOR SALE: 88 mhy Toroids, 50¢ each. 14 TD, $65.00 used. $95.000 new; 60 wpm, sync motor. 15 printer, auto LF/CR $125.00. WANTED: Cover for 28 KSR. K5BQA, 11040 Creekmere, Dallas, Texas 75218.

WANTED: Type wheel for model 26 machine. Looking for press type set-up, Eugene A. Holland, W3SNR, 7108 Chaucer Street, Pittsburgh 8, Pa.

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NEWS OF AMATEUR RTTY

MARCH, 1964
30 Cents
Vol. 12, No. 3

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of Amendment of Section 97.87(a)(2) of the Commission's Rules governing the Amateur Radio Service to delete a "dual identification" requirement.	DOCKET NO. 15267 RM-358 RM-435	S FCC 64-7 45119

NOTICE OF PROPOSED RULE MAKING

By the Commission:

1. The Commission has before it for consideration petitions from the American Radio Relay League (ARRL), Newington, Connecticut (RM-358), and from Edwin B. Bruening, Ann Arbor, Michigan (RM-435), both proposing to amend Section 97.87(a)-(2) [formerly Section 12.82 (a)(2)] of the Commission's Rules governing the Amateur Radio Service. The ARRL petition proposes to delete the requirement for the identification by telegraphy or telephony of the call sign(s) of the station(s) to which an amateur radio teleprinter station is transmitting.

2. Mr. Bruening submits the same proposal but only as an alternative to his primary recommendation. Primarily, Mr. Bruening proposes that all telegraphic or telephonic identification requirements for amateur radio teleprinter stations be deleted and that, as a substitute therefor, licensees be required to file prior written notice of their proposed radio teleprinter operations with appropriate Commission Field Offices.

3. Section 97.87 of the rules sets forth station identification requirements in the Amateur Radio Service. Section 97.87(a)(1) provides that identification shall include transmission of the call sign of the station being called followed by the call sign of the transmitting station. Section 97.87(a)(2) provides that this identification shall be by either telegraphy or telephony, as appropriate, and, in addition, when a method of communication other than telegraphy or telephony is being used, such as radio teleprinter, the identification shall also be transmitted by that method. The requirement for telegraphic or telephonic station identification, in addition to radio teleprinter station identificaton, is commonly referred to as the "dual identification" requirement.

4. Deletion of the "dual identification" requirement was considered by the Commission in connection with an earlier petition (RM-277), filed by the ARRL. In denying that petition by its Memorandum Opinion and Order released February 26, 1962 (FCC 62-214:22 RR 1573), the Commission stated that:

"The dual identification requirement is necessary for the Commission properly to perform its duties. Amateur stations are not assigned specific frequencies, and as a consequence, the interference resulting from the overlapping of signals makes identification difficult at best. Infraction notices are issued only upon positive identification. Without the dual identification requirement, positive identification would be very difficult for the monitoring stations, and practically impossible for the Commission's mobile units which are not equipped to receive radioteletype transmissions. It appears to the Commission that the advantage to the Amateur service as a whole in having proper and prompt enforcement of the Amateur Rules and Regulations outweighs any possible advantage to be gained from the relaxation of the present identification requirements."

5. Petitioner Bruening takes note of the Commission's comment in RM-277, but he maintains that by requiring licensees to file prior written notice of their proposed radio teleprinter operations, elimination of "dual identification" could be accomplished without detracting from monitoring efficiency. He contends that since radio teleprinter operations are conducted by very few amateurs, "Such an amendment should not, therefore, place any administrative burden upon the district offices of the Commission, and will indeed help their monitoring efforts through such special registrations. In the case of suspected interference by an amateur using a mode of operation other than telephony or telegraphy, the district Engineer-in-Charge would have immediate access to a list of amateur stations participating in special forms of transmission and communications."

We cannot agree with this contention. A filing of a notice of proposed operation would not provide the means of rapid and positive identification which s so necessary to investigative and enforcement activities.

6. The Commission does, however, feel that, notwithstanding its view with regard to deletion of the entire "dual identification" requirement, a partial relaxation of Section 97.87(a)(2) is appropriate as proposed primarily by the ARRL and alternatively by Mr. Bruening. In support of its petition, the League notes that:

". . . the Commission's identification needs will be fully met by modifying the present dual identification requirement for teletype operation only to the extent of making it unnecessary for telegraphic transmission of the call sign or signs of the station or stations being called or communicated with by a station conducting teletype transmissions. The Commission's monitoring stations and mobile units, as well as the League's Official Observer, still will be able to identify the transmitting station by the telegraphic transmission of its own call sign. Should the Commission desire to learn the identity of the station or stations called or communicated with, it need only ask the transmitting station to supply the desired information from the logs it is required to maintain."

7. For the reasons set forth by the ARRL, the Commission concludes that it does not appear that the omission of the telegraphic or telephonic transmission of the call sign of the station being called during teleprinter operations will unduly detract from the Commission's monitoring efficiency. Therefore, the Commission proposes to delete this requirement by amending Section 97.87(a)(2) as set forth in the attached Appendix.

8. As a corollary to its basic proposal, the ARRL notes: ". . . that telegraphic identification of the transmitting station might be superimposed upon the carrier without interrupting the teletype transmission. It is suggested that any notice of proposed rule making based upon this petition invite comments and suggestions on such a method of telegraphic identification." With regard to this suggestion, the rules do not now specifically preclude the use of such a method of identification, provided that the type of emission used therefor is in accordance with those specified in Section 97.61 (formerly Section 12.111). However, satisfaction of the purpose of Section 97.87(a)(2) requires that the International Morse identification be easily discernible by ear using a conventional communications receiver. To date, the experience in other radio services with such superimposed identification indicates that a method which provides clearly unmistakable identification and which is also simple and inexpensive has not yet been developed. Therefore, until a suitable method has been developed and demonstrated, amateur licensees experimenting with superimposed identification may not omit making the required identification by proven conventional methods. However, in addition to comments on the proposed amendment to Section 97.87(a)(2), the Commission invites the submission of comments and suggestions on methods of superimposed identification, including methods using (superimposed) emissions not now permitted by Section 97.61.

9. Authority for this proposed amendment is contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended.

10. Pursuant to applicable procedures set forth in Section 1.415 of the Commission's Rules, interested persons may file comments on or before March 16, 1964, and reply comments on or before April 1, 1964. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision in this proceedng, the Commssion may also take into account other relevant information before it in addition to specific comments invited by this Notice.

11. In accordance with the provisions of Section 1.419(b) of the Commission's Rules, an original and fourteen copies of all statements, briefs, and comments filed shall be furnished the Commission.

FEDERAL COMMUNICATIONS COMMISSION

Attachment
Adopted: January 8, 1964
Released: January 10, 1964

Ben F. Waple, Secretary

Appendix

Part 97 of the Commission's Rules is proposed to be amended as follows:

§97.87(a)(2) is amended to read as follows:

§97.87 Transmission of Call Signs.

° ° °

(2) The required identification shall be transmitted on the frequency or frequencies being employed at the time and, in accordance with the type of emission authorized thereon, shall be by either telegraphy using the International Morse Code, or telephony, except that, When a method of communication other than telephony or telegraphy using the International Morse Code is being used or attempted, the required identification shall be transmitted by that method and only the call sign of the transmitting station need be transmitted by either telephony or telegraphy using the International Morse Code.

Ed's Note: The above details the proposed rules relating to CW identification. Your comments should be sent in to the FCC not later than March 16, 1964 deadline.

NARROW SHIFT

OR

REDUCING RTTY ERROR RATES

Irvin M. Hoff, K8DKC
1733 West Huron River Drive
Ann Arbor, Michigan 48103

Recent developments in amateur RTTY techniques have been fascinating to observe —by the very nature of the media, some of these methods have previously been in use by commercial outlets where extensive and unlimited resources have been available for development. Most of these techniques have not been within the reach of the average individual as a result. However, thanks to the efforts of such individuals as K6IBE/4, W6NRM, K3NIO and others, we are now being appraised of these more advanced systems and circuits are being submitted that work in a superior manner to those previously known to most amateurs.

In a recent article, K6IBE/4 made the statement: "The significant thing about the last RTTY year (1963) is that errors are being reduced . . ."

Substantial progress has been made in getting better copy with fewer misprints, but it is my opinion that the field offering the greatest potential improvement has been largely overlooked. I refer to reducing errors due to man-made interference.

The newer types of converters (usually called "two-tone") have concentrated mostly upon problems created with selective fade conditions. However, many other types of interference exist; some of which are far greater irritants.

Many of these can be effectively combated without the need of special equipment.

Types of Interference

There are two general categories which might come to mind; atmospheric and man-made.

ATMOSPHERIC:
1. Flat fades
2. Selective fading
3. Rapid fading such as aurora
4. Static crashes
5. Impulse noise
6. Others

MAN-MADE
1. CW interference
2. Nearby carriers
3. Other RTTY stations
4. Foreign commercials of all types
5. Others

Other authors are attacking the atmospheric types of interference situations, but so far none of them have concentrated on reducing errors due to man-made interference. This I have attempted to do, then. Fortunately, many of the things needed to do the job in one case work equally well in the other.

CW Interference

It is my opinion that CW interference is by far the biggest problem the average individual encounters to prohibit otherwise excellent results. How many times can you remember when conditions were perhaps not the best, but you were printing no errors at all, when out of nowhere came a CW station calling CQ? With the usual type of conventional converter employing limiters ahead of the channel filters, this type of signal if even moderately strong will frequently (*seems* like nearly always!) will all but completely destroy copy. Those using the newer limiterless-type converters notice an improvement in this respect.

And how many times have you noticed that no matter how long you have been on a frequency, or how long you remain after the CW station arrives, you seemingly cannot "budge" him from the area?

Indeed on such frequencies as 7040, it often seems like more, not less, CW stations appear if one commences a RTTY contact.

Las year I was rather active in handling traffic for the SS HOPE in South America. We used 850 shift, and the mere presence of a CW station often caused many repeats which otherwise would not have been necessary. This year with 170 shift; limiterless two-tone converters and narrow filters both in the converter and in the receiver, the picture is entirely reversed—it is rare that any copy is missed as long as the band even loosely could be considered as decent.

WØHFX and W6NRM and I have noticed frequently that on 7040 regular 850 shift seems to produce worse CW interference than before we entered the scene. If we merely go narrow shift, even keeping the 2.1 kc filter on the receiver—in what appears to be an astonishingly short time the CW stations have all but disappeared. At least they are no deterrent. This has happened on too many occasions to be merely coincidental. Therefore, since we had already concluded that CW and RTTY are not compatible on the same frequency and that effective means of keeping CW at a modest distance were then needed, it now seemed like we were on the trail to our answer!

The "HNF"

Since narrow shift apparently discouraged CW operation on the same frequency, we decided to try to find out why. We think we have done so.

The human ear is a glorious device. We have the ability to selectively tune our ears to individual pitches and ignore others we do not wish to hear. If several conversations are going on around us, we can normally pick out the one most interesting and listen to just that. Novices quite soon (not usually having $600 receivers!) learn to hear just the station sending to them although there might be several or more coming from the speaker.

Two clarinet players need not be advanced musicians to know if they are or are not in tune with each other. The same for two singers in a duet.

However, give one of them a tremendous vibrato (wavering tone) and the other is hard put to stay in pitch. It is this phenomena which now interests us. Let us attempt to find the vibrato effect which is *most* annoying or difficult to work beside.

Accordingly, the receiver was tuned to the audio frequency preferred by most CW operators—around 800 to 1000 cycles. Let us use 800, then. If a CW station is being copied at 800, and the mark frequency of an RTTY station is at say 850; it was easily possible to continue to copy the CW station even though the RTTY was nearby. However, the RTTY station with its make and break sounded merely like another CW station; as the space was around 1700 cycles—so far away from the 800 cycle CW station as to be completely out of the picture.

Now start narrowing the shift on that 850 cycle RTTY station. When we hit the area of 100 cycle shift, it was discovered that the CW station could no longer be identified as such, since the ear was being attracted to the wavering tones instead, and it became all but impossible to copy the simple CW tone.

This is a simplification of the tests made, but represents an illustration of the shortcomings of the human ear. Another way to illustrate readily is to attempt to copy a normal CW station which is bothered badly by chirps. There comes a point where the chirps are so bad that little or no copy is possible. In a sense, then, an RTTY station sounding similar to a badly chirping CW station is impossible to work near.

If this sounds like we are being unfair to the CW station, or will raise his ire, do not forget that with 100 cycle shift we are using some fraction of the total bandwidth we previously needed, and that although the CW station might not now work as close either to our mark or space as before, that we have left him more room to use where he will not bother us, and vice versa. Thus for the first time, we have developed an effective means of stopping CW interference! This seems a milepost in the development of RTTY to me.

The "HNF" is nothing more than a gimmick of mine to describe the effectiveness of this concept. It stands for "Hoff Nuisance Factor". Further work along this line leads me to propose the effective limits of the "HNF" as being perhaps 50 cycle shift on the one end and 200 cycle shift on the other end. Beyond this, the human ear can resume its psychological differentiation.

Filter Widths

It can be shown that each of the two channels of an RTTY station takes up only 45 cycles bandwidth, at 60 words per minute. This is the fundamental band-width. There are of course harmonics (odd) that are wider. On two-channel transmission (mark and space, or FSK) one only *needs* some total 90 cycles bandwidth, then. However, using 850 shift, we normally are forced with the average late model receiver to use a 2.1 bandwidth. This means we are only actually using about 5% of the total spectrum the receiver is able to accommodate. This is not very efficient, and certainly assists in pointing out why the CW stations are so often a nuisance.

By going to say 85 cps shift, we would then only need an IF in the receiver of some total 130 cycles! If this were possible, our utilization would rise to an astronomical 70%. Of course even more narrow shifts would still be more efficient, but a lot more problems would then be introduced such as stability; tuning ratios; channel separation; filter-ring, etc., ad infinitum.

Since very few receivers at present offer IF selectivity less than 500 cycles, then we can temper our findings against practical application.

Many converters can be constructed with no particular difficulty which will readily adapt to 170 cycle shift. In fact a somewhat surprising number of people already can receive this shift by straddle-tuning—this of course indicates in a majority of instances that the converter is not as selectve as one would normally desire, but at least will suffice to do the job until a better unit is obtained.

The ultimate would perhaps be a converter using 50 or 60 cycle channel filters—this offering an optimum signal-to-noise ratio, and offering maximum protection against undesired signals nearby. However with filters this narrow, special means must then be taken to counter-act stations whose shift is not quite the same as others. Thus K6IBE with prodding from W5HCS developed his superheterodyne tuning system. At my station, using Frank's method—we have mark at 1275 and then the space signal is fed into a mixer tube and beat against an audio tone which can be varied from about 4 kc to 5 kc; the resultant

output being at 2975; the fixed frequency of the "space" channel. This system allows use of extremely narrow and sharp filters and shifts from only a few cycles to past illegal can then be used with only two filters. This method seems to be the best developed so far for tuning many different shifts with no compromise—at least until one gets into the ridiculously narrow shifts where ease of tuning and stability become a limiting factor.

One can use plug-in filters for the various shifts, but the extra filters needed and the inconvenience in switching them seem to me to offer little in comparison—not withstanding the fact that additional filters can become somewhat expensive, and also offer little experimentally. Electrocom Industries (contact K9BRL) have indicated a desire to assist in the development of suitable filters for either plug-in or the superheterodyne system, and they have recently purchased an expensive coil-winding machine to help in making filters of any requirement.

Actual Use

Invariably once one tries 170 shift, the results are so astonishing in the reduction of errors that he wonders why more people are not using it. The answer seems to be simple—the word has never gotten around past the more radical enthusiast. However with certain pioneers such as WØBP leading the way, and continued work by W6AEE and W6NRM and others; and recent initiation by WØAJL; WØHFX; K6IBE; W5HCS; KØDOM; W4MGT and others to name a few plus a few foreign stations like VE2HY in Montreal and others, it is becoming much more popular. It is expected that this paper will convince most RTTY operators to at least seriously consider using the technique to improve copy.

Once on narrow shift, you, like me, will feel like a "German Stuka pilot over London" when returning to 850 shift—or "vulnerable".

Selective Fading vs. 170 Shift

The advent of the two-tone converter threw temporary doubt on the use of narrow shift—after all, the big advantage of the two-tone converter was its ability to print well as a semi-diversity unit when one tone would fade momentarily into the noise. Thus didn't we want to retain 850 shift to exploit this unique feature?

Wouldn't we run into "flat fading" on 170 shift rather than selective fading as on 850?

K6IBE/4 pointed out in the February issue of RTTY that the Bureau of Standards had run extensive tests on this subject and had concluded that the independent fading often was more pronounced on 170 shift than on 850, and that at least to 170 shift, the separation of the two frequencies seemed unrelated.

Although surprising, if this report may be taken as authentic, this removes the only reasonable question posed to the use of narrow shift that I have heard.

Thus we may assume that the use of 170 shift will give a much greater effectiveness from nearly any standpoint.

Use of 170 Shift

We have mentioned several means by which converters can be made to receive narrow shift—the easiest to convert existing equipment probably being to add additional filters which can be switched in or out. In new designs, the superheterodyne system will no doubt receive extensive use.

The Mainline FSK-B system outlined in the November 1963 RTTY Bulletin mentioned methods of adding keyers which could be preset to the proper shift and then quickly selected.

For those who for personal reasons insist on retaining a shift-pot system, we would like to suggest that additional shift pots can readily be installed, and a switch then selecting the correct pot—by pre-setting either the keyer (Mainline system) or the shift-pot, it is possible and practical to immediately change shifts without the usual time-consuming and frustrating method of fussing with the shift pot. It is often "painful" to observe another station attempting to whittle down the shift, as though who have tried can testify!

Summary

Narrow shift, then, offers probably the greatest single advancement in the state of the art that we can develop for some time to come.

It is highly effective in circumventing CW interference; it radically increases efficiency; it drastically decreases the band-width required by only one station; it is still as effective as wide shift for selective fading and two-tone converters; it is not overly difficult to achieve technically, and it offers tremendous potential for reduction of errors. Although only lightly touched upon, it allows use of narrow filters in both the converter and receiver, thus inherently offering substantial improvement in signal-to-noise ratio.

It should be pointed out that 85 cycle shift in the author's estimation is perhaps about the ultimate in narrow shift from all standpoints, but until we get receivers with 200 cycle filters; until we get receivers with very high tuning ratios (10 or 20 cycles is not very much, but makes a big difference on the scope in this region; until more people get receivers designed primarily with SSB reception in mind (more stable and use of product detectors, etc.) and until the majority on RTTY are using transmitters of late design that either don't drift or drift only minute amounts —until that time, 170 shift still offers nearly as much advantage in general and more in particular.

Thus I suggest that we now start to use 170 shift exclusively wherever and whenever possible—it might be pointed out also that if one is using crystal shift it is much easier to

"EL SIMPATICO I" AFSK DECODER

Bradford O. Van Ness K7HJO
4640 East Edgemont Ave.
Phoenix, Arizona 85008

The "El Simpatico I" AFSK Decoder was designed and built to provide AFSK reception on local QSO's at minimum cost and avoids the use of a polar relay by driving the printer selector magnet directly by use of a transistor. Power is supplied to the drive circuit by a very simple 24-volt D.C. supply consisting of a full-wave center-tapped silicon rectifier circuit and a single-section filter. The power transformer used, T1, was a Triad F-90x but any similar transformer capable of delivering the required selector magnet current plus a bit to spare for a safety margin will serve. If an untapped secondary unit is available, such as some of the 24 to 28 volt filament transformers, a bridge rectifier can be used as shown in the lower part of the schematic. The silicon diode rectifiers are the inexpensive replacement type and a rating of at least 100 piv and 100 milliamps is satisfactory. A single 500 ufd filter capacitor, C1, provides sufficient ripple reduction to prevent selector magnet buzz and a surge protective resistor R1 is included to protect the rectifier diodes. It will be noted that the output of the supply is negative with respect to ground so that if a metal-case filter capacitor is used it should be insulated from the chassis as these types generally have the negative terminal connected to the case.

The negative supply voltage feeds to the selector magnet of my model 15 printer and then back to the collector of a 2N675 transistor through an adjustable 1000 ohm resistor R2 which may be a slider-type or a fixed unit may be used once circuit adjustments have been made. The best circuit sensitivity is obtained with a transistor of high gain and at a minimum collector current; for this reason I rewired my selector magnet for "series" or 20 ma loop operation. On some machines this may not be possible so that a 60 ma loop is required; under this condition a high-gain transistor must be used. With the 20 ma loop and a 24-volt supply I achieved 80 point operation which is more than sufficient for local operation.

Since the selector magnet consists of an inductance, some means must be used to protect the transistor against voltage spikes induced by the magnet when the current is cut off by the transistor. I tried using a capacitor shunted from collector-to-ground but lost two transistors in such a manner; a much more foolproof scheme is shown using a Zener diode which conducts as a low impedance only when its rated reverse breakdown voltage is exceeded, much like a VR tube. For proper operation, the Zener voltage should be twice the supply voltage so that equal "on" and "off" times are obtained at the selector magnet; a 50-volt unit rated at ¾ to 1 watt does the job very nicely. Note that the diode is connected in "reverse," that is, the anode goes toward the negative supply and the cathode is grounded.

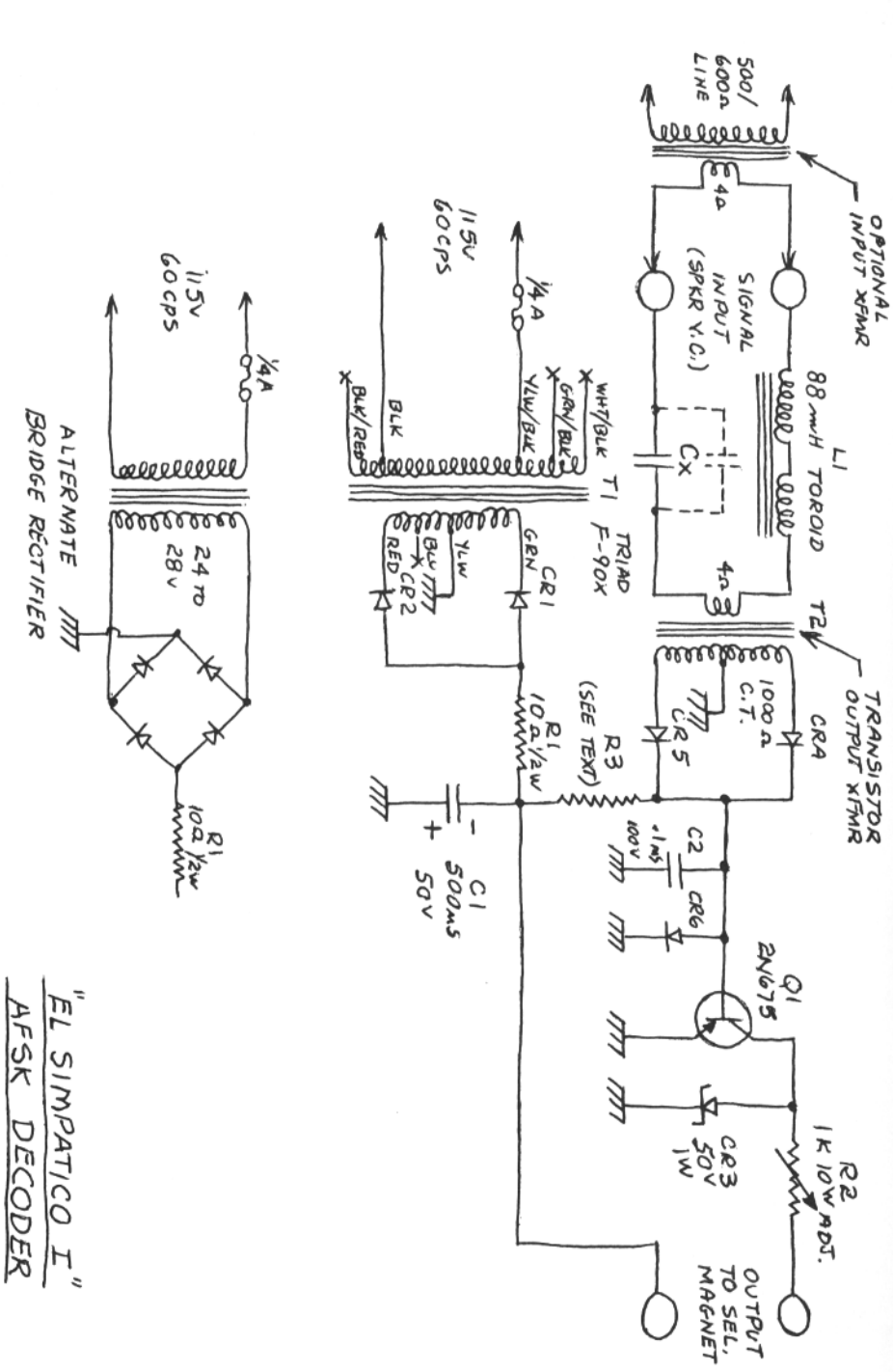
The Zener diode voltage determines the voltage rating of the transistor; an inexpensive Zener usually has a tolerance rating of 20% so that the transistor should be rated higher. The one I used carries a 75-volt rating and I would not suggest going below 60 volts. The 2N675 is a small stud-mount unit capable of 1 watt dissipation and a maximum collector current of 2 amps. Since this circuit is essentially a switching operation rather than "Class A" (unless it is misadjusted!) rather small transistors may be used if they have the proper voltage rating. The 2N675 also has its emitter connected to its case which simplifies the mounting problem. I would suggest, for the sake of economy, that one of the popular TO-3 (diamond-shaped case) type of transistors be used unless one has access to other types. Generally it will be found that the collector is internally connected to the case so that the transistor must be insulated from the chassis, but the power dissipation is low so that no fancy heat sinks are necessary.

For use on a 60-ma loop, the transistor should have a minimum gain of at least 50; for a 20-ma loop a gain as low as 25 should perform but I would suggest something higher. This gain determines the value of R3, the base-bias resistance. The value of this resistance must be sufficiently low to normally keep the transistor in full "on" or saturated conduction, not "half-on" as in class "A" circuits. It may be calculated as follows:

1. Measure the D.C. gain (beta) of the transistor to be used at the loop current required, or check the transistor specs and use the *minimum* gain figure given.
2. Divide this gain figure into the loop current required, using milliamps.
3. Divide the result into 24 volts; the answer will be the base resistance required in K ohms.

A second method of determining R3 will be discussed under adjustments.

With the transistor always in normal full conduction, loop current will flow and the printer may be connected in series with its keyboard for a complete local loop if desired. To perform decoding functions, the selector magnet must be made to respond to either



"EL SIMPATICO I"
AFSK DECODER
1-20-64 B. VAN NESS

2975 cps or 2125 cps (depending on which frequency is used as the "space" frequency in the local area) but not respond to the other frequency. This frequency selection is accomplished by means of a series tuned circuit L1 and Cx connected between the input terminals and a step-up transformer T2. The inductor used is the old standby 88 mh toroid with both sections connected in series aiding. To obtain sufficient "Q" to reject all but the desired tone the series resonant circuit must be fed and terminated in low impedances; thus the input should connect to a low impedance speaker line (4 to 8 ohms) and the input to the step-up transformer is likewise a 4-ohm winding on a small transistor output transformer connected backwards. If the available audio line is 500 or 600 ohms, such as is available from most signal generators and military receivers, a step-down transformer is required at the input terminals. The value of Cx must be obtained by trial to obtain maximum response at the desired frequency and may be roughly calculated by the following formula:

$C = .2865/f^2$ where C=capacity in ufd and f=frequency in kc. Thus, for 2975 cps (2.975 kc) C will be about .03 ufd.

The energy coupled from the input to transformer T2 by the tuned circuit is stepped up by T2 to a higher voltage and rectified by two diodes CR4 and CR5 to generate a positive cut-off bias to transistor Q1 when the proper signal frequency is present. The transformer should be a 1000 ohm C.T. output type, although a 500 ohm C.T. or a 2000 ohm C.T. may operate successfully. Since only low power is involved, it may be one of the inexpensive transistor types. The diodes are of the detector type and I have found that silicon units are best since they have somewhat more "threshold" voltage than germanium, but germanium types such as the 1N34 could be used. A capacitor C2 filters out the audio-frequency ripple from the detector diodes and another diode similar to that used in the detector is connected between the base to emitter of the transistor to prevent excessive reverse bias potentials from developing which might cause transistor breakdown.

This completes the circuit description; the type of construction is a matter of personal choice. Since there are no high-gain or extremely sensitive circuits involved, layout of the parts is not critical although resistor R2 should be kept away from the transistor to prevent heating of the transistor. Construction and test of the unit should proceed as follows:

1. Wire in the power supply, R2, CR3, and Q1.
2. Connect a jumper across CR3 and connect output to selector magnets placing a 100 ma meter in series with one of the selector magnet leads.
3. Adjust R2 to maximum resistance and energize the power supply.
4. Adjust R2 for loop current required (20 or 60 ma) as shown on the milliammeter.
5. Connect a 1000-ohm resistor and a 100 k-ohm pot in series for R3 temporarily.
6. Adjust 100 k-ohm pot for minimum resistance (1000 ohms total for R3) and remove jumper across CR3.
7. Connect a voltmeter (d.c.) across CR3. The voltage should be no more than 1 volt and may be as low as .2 volt.
8. Slowly increase the value of R3 by rotating the 100 k-ohm pot until the voltage across CR3 begins to increase rapidly. When this voltage is double the original value, but not over 1 volt, turn off the power and remove the temporary resistor and pot without disturbing the setting.
9. Measure the total resistance of the pot and resistor removed and select the closest lower standard value of resistor as a permanent R3. Install this resistor, turn on the power supply, and recheck the voltage across CR3.
10. Install the remainder of the circuit as shown. Leave room for about 3 capacitors for Cx.
11. Connect an audio generator to the input using a 600/500: 4 ohm stepdown transformer if necessary. Connect a value of Cx as calculated by the previous formula.
12. Connect a V.T.V.M. between the base of Q1 and ground, energize the audio oscillator but not the 24 v supply of the unit.
13. Adjust the frequency of the oscillator for maximum voltage on the V.T.V.M. If the reading is above about .5 volt, diode CR6 will conduct and cause a "flat top" to occur; reduce the audio generator output for no more than about .3 volt to find the peak response versus frequency.
14. Read the audio generator frequency at peak response; if high a larger Cx must be used, if low a smaller Cx is required. It may take quite a few trials and several smaller capacitors to trim Cx to the right value, and of course the audio generator should be checked for proper dial calibration or the unit will be off frequency.
15. Reduce the signal generator output to zero and energize the 24 volt supply. Selector magnet current should flow but R2 may have to be trimmed a bit to compensate for the drop in Q1.
16. Increase the audio generator output until the selector magnet current decreases to zero or goes to some fixed low value. If a transistor of the larger sizes is used, this minimum value of current may not be much lower than 20 ma due to leakage currents and the transistor should be replaced and the adjustment of R3 repeated.
17. Measure the a.c. input voltage to the circuit with the V.T.V.M. This value is the minimum signal required to operate the circuit which must be obtained from the receiver audio output.
18. Adjust the audio generator to the "mark" frequency and increase its output

W8YFE REPERF SWITCHING ARRANGEMENT

James Brinn
7013 Crestwood Drive, Dearborn Heights, Michigan

The following description and schematic shows a very easy way to use your Model 14 Reperf in the following modes. It is assumed the Reperf has a keyboard and that the station is using a local loop with all printers and keyboards in series.

1. The number 1 switch position allows the operator to cut tape on the 14 Reperf and at the same time receive incoming signals on a second printer.
2. The number 2 switch position allows the operator to use the Model 14 Reperf to cut tape and transmit at the same time. This position also allows one to make tape from an incoming signal as received on your regular TU.
3. The number 3 switch position allows the operator to lock out the tape punch and at the same time use the keyboard for normal transmitting. This saves a lot of tape in my particular set-up as I use the Model 14 for transmitting most of the time.

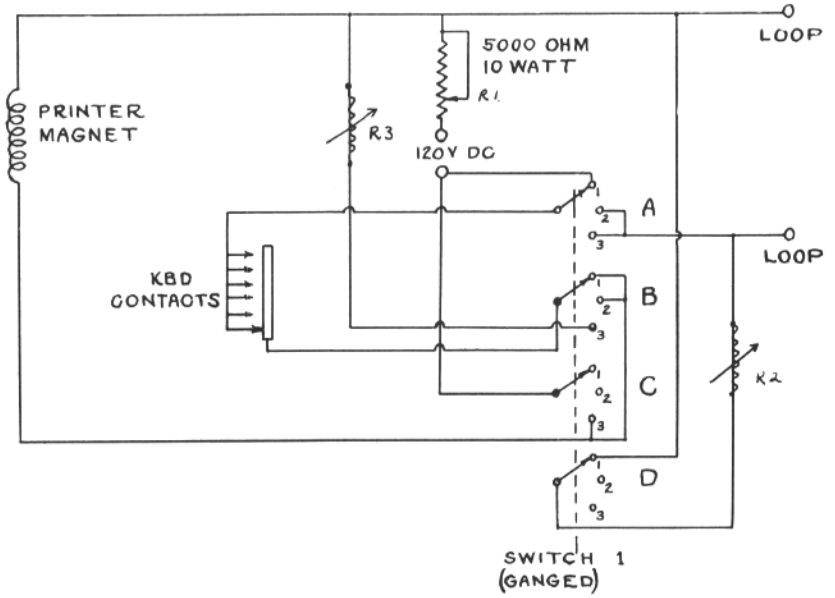
The schematic below is more or less self explanatory, however the following comments may help in understanding the circuit. The printer magnets are electrically separated and can be connected in series or parallel, depending upon the particular station requirements. The printer magnets, so connected, are separated from the keyboard contacts wired in as shown on the schematic.

The 5000 ohm resistor is a 10 watt slider type. This resistor once adjusted for the required printer current can be locked in place and forgotten.

The switch used is a four pole, three position, rotary type.

The 120 volts DC can be obtained from the regular station loop supply or a small DC supply could be built for this particular application.

R2 and R3 are compensating resistors and should be a value the same as the printer magnet resistance of the Model 14. These resistors are in series with the loop and should be the same power rating as R1 which is conservative. These resistors can be the slider type and will be between 200 and 300 ohms. If you are using saturated diodes to shift your VFO these resistors can be omitted. If you are using the usual shift pot arrangement the resistors should be included as they will keep the loop resistance constant regardless of the switch position used.



Change-Over Sw
Model 14 Reperf

Jim Brinn

TRANSMITTING SCHEMATICS VIA RTTY

Victor D. Poor, K3NIO
430 Center Street
Frederick, Maryland 21701

After a couple of frustrating experiences trying to discuss circuits with fellow amateurs on RTTY, it occurred to me that some type of tabular notation for transmitting schematics would be nice to have. Once a scheme was worked out and generally agreed upon among the fraternity it would be possible to explain one's favorite electronic breakthrough without resorting to the mail system. In fact, since schematics would become reproducible right on the teletype machine, those less fortunate amateurs that do not have access to conventional blue print machines would have a handy way to keep reproducible "masters" of circuits.

Once a few false starts were disposed of, the following set of rules were evolved which anyone at all familiar with circuit diagrams could encode schematics into tabular form or decode back to a schematics. I have tried the system on my wife (who, I can assure you, does not know what schematics are supposed to look like) and she was able to work the system in a few minutes. The limitation on how fast you can convert a schematic into list form is simply how fast you can type. In converting back to a schematic it helps to know a little bit about what the circuit will look like in order to get your layout off on the right foot. But even if you don't know you probably won't have more than one false start.

The rules go something like this: Look at your schematic as a whole and note all the connections that are made external to the it (inputs, outputs, power connections, ground connections, etc.) and write them down. Assign a number to each external connection. Now, assign a circuit designator (symbol) to every component (if it does not have one already). Then, wherever components connect on your schematic, assign a number following the sequence you started with the external connections. As a general rule you would assign the numbers for junctions along the schematic in the direction of signal flow. This is usually from left to right, top to bottom ,and this would be the way someone would go about drawing your schematic from your list. Unusual schematics may not lend themselves to this simple approach with the result it would take a little longer to reconstruct it. Common sense is your greatest asset at this point.

As an example, look at the schematic in figure one and compare it with its list form below.

SCHEMATIC: Transistor audio amplifier (from figure one)

EXTERNAL TERMINALS:
Audio input – 1
Negative 12 volts – 2
Ground – (GND)
Positive 12 volts – 3
Audio output – 4

CKT SYM	Component Value	Terminal Points	Notes
C1	1MFD	1 - 5	Paper
R2	4.7K	5 - 6	
R3	22K	3 - 5	
Q1	2N652	B5 - E(GND) C7	
C2	10MFG	N6 - P(GND)	Electrolitic - Observe Polarity
R1	4.7K	6 - 7	
R4	1K	7 - 2	
C3	10MFD	N7 - P8	Electrolitic - Observe Polarity
R5	10K	8 - 9	
R6	22K	8 - 3	
Q2	2N652	B8 - E(GND) C9	
R7	1K	2 - 9	
Q3	2N652	B9 - C2 - E10	
R8	500 Ohms	CW10–ARM11 CCW(GND)	Carbon Pot
C4	10MFD	N11 - P4	Electrolitic - Observe Polarity

ABBREVIATIONS USED IN TERMINAL POINTS COLUMN:
For transistors – E, Emitter – B, Base – C, Collector. For Capacitors – N, Negative Terminal – P, Positive Terminal. For Pots – CW, Clockwise Terminal – Arm, Wiper Arm. Terminal – CCW, Counter Clockwise Terminal.

Note that the list is in order of terminal points and that each terminal point is exhausted of all components before going on to the next. Components such as transistors, electrolitic capacitors, pots, etc., that can only be connected one way into the circuit have additional information in the terminal points column to show proper connection. Figure two illustrates a circuit containing a rather complicated component in the form of a transformer and the accompanying list show how it can be handled.

SCHEMATIC: Power Supply (From figure two)
EXTERNAL TERMINALS:
Input 117 VAC – 1-2
Output Plus 320 VDC – 3
Output Minus 360 VDC – 4
Output 6.3 VAC – 5-6

TRANSMITTING SCHEMATICS VIA RTTY . . .

CKT SYM	Component Value	Terminal Points	Notes
S1	SPST Switch	1 - 7	Toggle Switch
T1	Stancor	2 - 7	117 VAC Primary
	PC-8419	5 - 6	6.3 VAC Secondary
		8 - CT(GND) - 9	480 VAC Centertapped Secondary
CR1	5E4	A8 - C10	
CR2	5E4	A10 - C13	
CR3	5E4	A9 - C11	
CR4	5E4	A11 - C13	
CR5	5E4	C9 - A12	
CR6	5E4	C12 - A4	
C1	12MFD	P13 - N(GND)	450 Volt Electrolitic
L1	4HY	13 - 3	4 Henry 50 MA Filter Choke
C3	80MFD	P3 - N(GND)	450 Volt Electrolitic
C4	12MFD	N4 - P(GND)	450 Volt Electrolitic

ABBREVIATIONS USED IN TERMINAL POINTS COLUMN:

For Transformers – CT, Center Tap Connection. For Diodes – C, Cathode – A, Anode. For Capacitors–N, Negative Terminal–P, Positive Terminal.

The most difficult component I found to work with was the multi-pole multi-position rotary switch. Figure three is a schematic of a 3-pole 4-position switch as it might appear in a schematic. The following list shows how you could handle it.

CKT SYM	Component Value	Terminal Points	Notes
S1	3-Pole	1	FIRST POLE
	4-Position	3	First Position
		4	Second Position
		5	Third Position
		6	Fourth Position
		1	SECOND POLE
		7	First Position
		NC	Second Position
		7	Third Position
		NC	Fourth Position
		2	THIRD POLE
		5	First Position
		NC	Second Position
		NC	Third Position
		8	Fourth Position

ABBREVIATIONS USED IN TERMINAL POINTS COLUMN:

NC, No Connection.

When laying out a schematic from the list, I find it easier to look through the whole list and find all the transistors (or vacuum tubes) and lay them out first. The required space between these can be approximated by counting the number of other components falling between them on the list.

Instead of assigning a number to the circuit ground, it seems to help when laying out the schematic from the list, to use "(GND)" in the terminal points column. Just by looking at where ground occurs in the list can give you a feel for how the circuit is going to "lay out". In the case of large schematics it is helpful to break it down into major functional circuits and treat each one separately showing the interconnections as "external terminals".

An interesting by-product of putting the schematic in list form comes when you go to build the circuit. The list becomes a foolproof step-by-step assembly procedure and provides an excellent means of checking your work.

One final word, when punching tape for a schematic, remember that some machines will letter-shift on space and some won't. Be sure to punch your tape so that it will come through correctly on either machine.

NARROW SHIFT . . .

shift easily 170 cycles than 850—and the use of 170 shift on VHF with AFSK is perfectly feasible also.

So onward toward the ultimate goal of perfect copy with 170 shift leading the way!

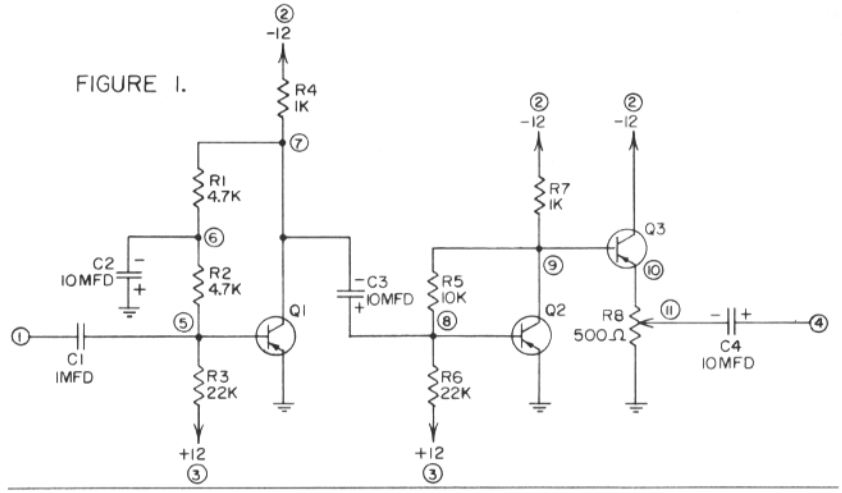
73's K8DKC

Editor's Note: Mark only or space only copy offer possibilities for narrow shift, when using either a normal converter or the two-tone type. Additionally, narrow channel filters can be used to advantage. The proposed TU-E which is a hetrodyne type of converter, uses narrow filters with one, direct and the incoming shift is "fitted to the other by hetrodyning the incoming signal correctly. More of that to come in future issues.

"EL SIMPATICO I" AFSK DECODER . . .

until the selector magnet current starts to decrease. It may not be possible to accomplish this if the generator output is low or the unit's tuned circuit "Q" is high. The value obtained in this step indicates the maximum audio signal which can be used before the circuit can no longer distinguish between marks and spaces. The receiver audio gain should be adjusted for a value half-way between these two figures for best results.

Since this unit does not use a "discriminator" detection system, which is a great deal more complex, nor audio limiter stages, it is obviously inferior to more sophisticated designs for DX chasing. However, for local operations at good signal levels it will perform well at minimum cost which by junkbox raiding and a bit of scrounging can be quite low.



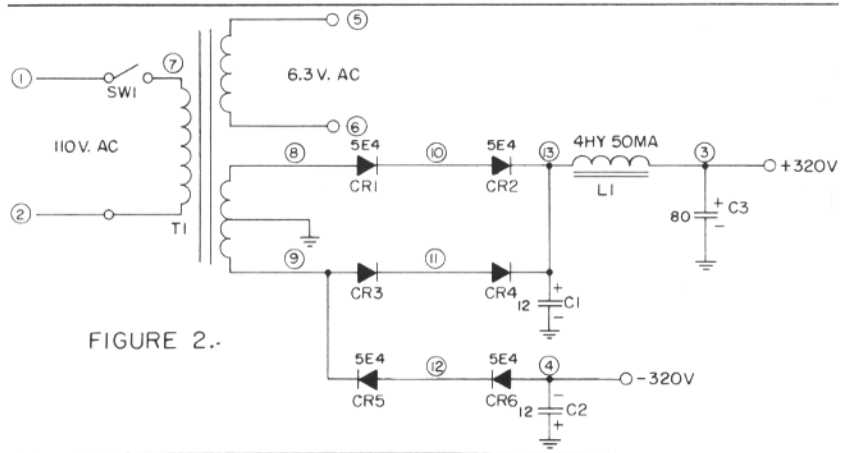


FIGURE 2.

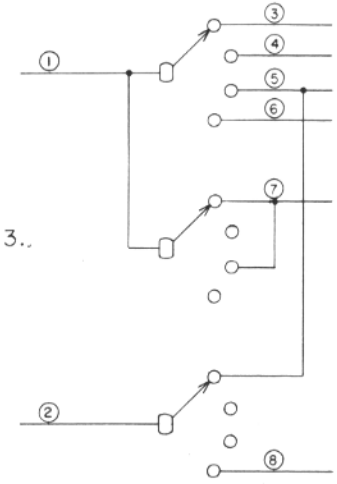


FIGURE 3.

DX-RTTY

Bud Schultz, W6CG
5226 N. Willmonte Ave.
Temple City, California. 91780

Howdy Gang:

Another month—another new country on RTTY. Last month it was France and this time it's Sweden. Russ, W6ZBL, and some of the typers in the Bay Area got together and sent a Model 15 to SM6CSC and the project really paid off!! SM6CSC made his first two way RTTY contact with DL41A and is now ready for business. He reports that the SM hams may now officially use FSK—any speed —any shift in the frequency range—14.100 to 14.110 MC/S. SM6CSC writes—"please tell the boys that I will be on those frequencies and not on the American RTTY freqs. but will listen there also, of course." He also says that on week-days he will not go on the air before 1600Z because of the University interference he makes. The same word concerning the official use of FSK comes from Hans, SM5KI, who has been interested in RTTY for some years. Hans reminds us that the old complaint of a shortage of printers is plaguing the SM group and is hoping to trade for some in the U.S. He has a few of the famous FSY TU's made by ATM in England, brand new in the original cases (with manuals) to trade for RTTY or SSB gear. These units are space diversity jobs, 110-250V, 50-60 Cycles. They are very compact—only 3½" x 19" and are a very excellent piece of gear. There is a description of these units—complete with photos in the May '59 issue of "RTTY." If interested see the "Horse Trades" in this issue for info on getting in touch with SM5KI.

Sad news from "down under" this month. Bruce, ZL1WB, writes that Eric, VK3KF, has suffered a heart attack and is confined to bed for at least a month. Eric was one of the first RTTY landmarks for DX'ers and was one of the influences that started this DX department in "RTTY." Please do me a favor and drop him a few "get well" lines on a QSL card just to let him know that his friends wish him a speedy recovery. It may help him to pass those long hours in bed. Speaking of ZL1WB —here's his final tally for 1963: 251 RTTY contacts as against 63 in 1962 and 64 in 1961. He notes that he is seven QSO's short of hitting the 1000 mark since he started back in 1956!! Bruce says he is going to scratch up a suitable QSL card for whoever is lucky enough to be nr. "one grand." He also writes that he is working on a 2 meter link to control the gear at his hilltop location ("Bellyacres") from his Mason street QTH. His first attempt to use a hot wire switch to control the "Big Switch" ended up in a tremendous display of fireworks akin to the first Vanguard Rocket, so it's beck to the drawing board for Bruce's remote control project.

Arnold, KW6DS, is coming thru once again with fine signals and is looking for customers each week-end. Arnold asked permission to have access to the logs of the last SS contest so he could work up a propagation study on the DX material that appears on them. The committee has agreed to his request and I hope his results will be available to all interested DX'ers through this column in the future. It should make very interesting reading.

As usual K3GIF comes up with a peck of drooling material in the DX category. Ed learned by way of DL4IA that two SVØ Stations are coming on RTTY—one from Greece and the other from Crete. No details as to the calls or when we can expect them to put in an appearance but I will keep in touch with this story and let you know as soon as I get some definite word. K3GIF and ZS1FD have been keeping their skeds as usual and it would appear that conditions to Africa are gradually starting to improve again. Ed reports that he was the first FSK QSO for a new German typer, DL1LK. Jean, F8KI, has now joined the "regulars" and is giving lots of the gang a new country for their RTTY DX list. G2HIO seems to be the outstanding signal from England these days. Alan is transmitting the new BARTG news tape with all the news of the UK on a regular schedule now. I had hoped to have a copy to use this month but it failed to arrive so perhaps we can get a look at it next month. XE1YJ and DL4IA had a rather scratchy QSO on RTTY which appears to be another "first." John, FG7XT, continues to be very consistent on 14,090, 7040, and 3620 kcs with a terrific signal and is making many a DX'er happy these days. KP4GN is back in the RTTY corral once again with new gear and a fine signal on both 14,090 and 7040 kcs. He has been taking the 7040 freq. by storm during the past week!

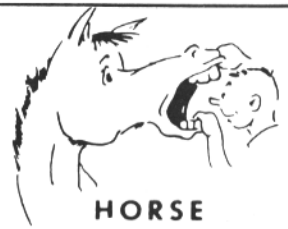
All the award certificates for the winners of the World-Wide SS Contest are in the mail and congratulations once again to the winners. Also Congrats are in order for W5SH who came up with Nr. 40 on the WAC-RTTY list. Who's next? I received a new bunch of certificates and I'd sure like to start sending them out. Just finished reading G3CQE's RTTY column in the current issue of the "Short Wave Magazine" and as usual it was great! To those of you who enjoy a good all around ham magazine, I can honestly recommend SWM as one of the best. Nice going, Bill!

In the mail bag this week was an invitation from Pierre Wolf, XE1YJ, asking me to make a brief talk at the RTTY meeting during the First Pan American Congress of Radio Amateurs in Mexico City to be held April 15-18. This is a privilege that is very hard to refuse so I find myself at this moment frantically trying to arrange my affairs so I can avail myself of it. As Pierre points out—one of the main features of this Pan American Congress will be the creation of Region II of the I.A.R.U. Representatives from nearly all of the Pan-American clubs and radio societies will be in attendance as well as Mr. Hoover—W6ZH, President of the ARRL and members of his staff. The headquarters of the Congress will be at the Alameda Hotel in Mexico City and XE1YJ has asked me to invite all you RTTY'ers to attend. You can get all the information as to the fine program, reservations, etc. by dropping a line to Pierre Wolf, Apartado 31541, Mexico 20, D.F. This will be a very important meeting concerning the future of Amateur Radio in this hemisphere so plan to attend if you possibly can. This meeting would be a fine excuse for you to get a short vacation in a wonderful spot after the long tough winter you just went through!! Give it some serious consideration. Hope to see all of you right here again next month.

73,
Bud, W6CG

P.S.—Just received work from K3GIF that John, FG7XT, has put up a motor tuned dipole 110 feet high for forty and eighty and that he runs 20 db over S-9 on both 7040 and 3610 kcs. YV5AVW has also been over S-9 on eighty. These lads have set up a series of transatlantic tests on eighty meters with G2HIO and DL4IA for the first part of March.

XE1YJ is setting up a regular operations schedule for the Caribbean stations on 7040 kcs—keep your ears open for these lads.



HORSE TRADES

FOR SALE: BC-348-Q Receiver. Converted to AC power. Good condition, $70.00. 255A polar relays with sockets $2.00, add 50¢ postage. G. Murphy, 2547—18th Avenue, San Francisco 16, California.

WANTED: Working RTTY page printer to build station in VE3 land. Would prefer working model ready to go as parts are scarse in Canada. John A. John, Box 4768, Tyndall AFB, Florida.

WANTED: Have two reperf-transmitters TT-179. Looking for some one with two teletypewriters TT-117, and willing to swap one so we will both have an AN/FGC-25. R. K. Margeson, W1JBC/4, 31 State St., Charleston, S.C. 29401.

FOR SALE: Model 15, rebuilt, new, Model 19, including table, TD, pwr supply, 14 TDs, 14 typing reperfs, 14 keyboard perf. Model 28 KSR, mark 2 and mark 3. Model 28 ASR. This equipment is in excellent condx. Other misc. Teletype equipments, send for list. 88 mhy toroids, five in can $1.50 post paid. 44 mhy toroids in can $1.50 post paid. Elliott "Buck" Buchanan, W6VPC, 1067 Mandana Blvd., Oakland, Calif. 94610.

FOR SALE: Panoramic Adaptor, Mil model BC-1031C, New with manual $75.00. BC-221D in new condition, with tables and built in regulated power supply. $60.00. W6UQL, 2729 Winthrop Avenue, Arcadia, Calif.

FOR SALE: Model 14 with keyboard, good working condition, $29.95. W5MAA, 501 East Wm. David Parkway, Metaire, La. 70005.

FOR SALE: Tape Puller TT-106U 110V AC, $15. Copy Holders, Walnut finish $2.50, FOB Tampa. Unused JAN. Trade TTY and KLI parts for TTY Upper Case H Motor start-stop kit. W4BNI, 2903 Bay View Ave., Tampa, Fla. 33611.

FOR SALE: Two Model 14 TD, sync motors, excellent condx. $50.00. RTTY. INC., 372 Warren Way, Arcadia, Calif. 91007.

FOR SALE: O5 fr $25.00, packing $15.00; 28TD $125.00; 28 KSR $250.00, packing $15.00. From Estate of W9COW. Write W9GRW, 8029 Keller, Skokie, Illinois.

FOR SALE: 88 mh Torids, 50¢ each. WANTED: Model 28 KSR cover. K5BQA, 11040 Creekmere, Dallas, Texas 75218.

NEW YORK RTTY DINNER

The RTTY gang will meet once again during the IEEE Show. The dinner is scheduled for Monday, March 23, at the Patricia Murphy Restaurant, 260 Madison Avenue, New York City. Ala carte cocktails and informal rag chewing commences at 5:30 p.m. with the dinner at 7:00 p.m. followed by some excellent technical discussions. For reservations send a check in the amount of $6.50 each to Elston H. Swanson, W2PEE, Instruments For Industry, Inc., 101 New South Road, Hicksville, New York 11802.

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