RTTY

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NEWS OF AMATEUR RTTY

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30 Cents
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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: Aluminum 20/60 ma Model 15. Model 14 typing reperf. & TD. All like new. Want 28 KSR base and kybd. Swap new 28 KSR table model cabinet for good used 28 KSR console cabinet. K6PZT, 9337 Gotham Street, Downey, California.

For Sale: Heavy duty Teletype loop supplys, 85-250 VAC in, 110 VDC at 400 ma DC out, also motor control voltage, excellent condx. $1[illegible]. NAVY FRA, I.F. frequency shift receiver converter, like new, best offer or trade, DM-35 dynamotors, new $8., 836 $3. 5894 New $10. 2C39WA new $10. 6336 new $5. W2DLT, 77 North 17th Street, Prospect Park, New Jersey 07508.

Wanted: Collins F500 Model A or B mechanical filters 8., 1.4, 3.1 and 6 kc. Also, 353E or 354A-1 filter adapters. W0OKH, V. A. Jupe, RFD 4, Box 12, Phillipsburg, Kansas 67661.

Wanted: CANADIANS: Wanted RTTY tape gear. Model 14 TD and reperf. Also TT/63A regenerative repeater. VE6AJT, 3744-43rd Avenue, Red Deer, Alberta, Canada.

For Sale: One model 19 complete with TD and power supply, and metal table, very clean, and in good working condition. One Electrocom FSC-250 Terminal Unit in new condition, complete with audio input filter like new condition, for price on both or one unit write to W8UUS, 2242 Stevens Avenue, Kalamazoo, Michigan 49001. Phone FI 2-8838.

Wanted: Diode keyer for Viking I transmitter. Two FSK Converters similar to Electrocom FSC-250. William F. Coombs, XE3WC, Hotel Panamericana, Merida, Yucatan, Mexico.

For Sale: Model 15 and table $100.00. Model 19, no case $125.00; 14 TD $90.00; 14 typing reperf and keyboard $100.00; 14 typing reperf and base $50.00; all have sync motors and are in perfect condition. John Wells, K8MPU/3, 1681 Bellemead Drive, Altoona, Pa. 16602.

For Sale: Model 15 complete $100.00; model 14 TD, $50.00; single magnet reperf, non-typing, Type UA-20 $60.00; sync motor $10.00; Toroids 50c. Each item plus postage, W5EJV, 804 Shady Lane, Dallas, Texas 75208.

For Sale: Model 14 KSR typing reperf. Recently cleaned and lubricated $60.00. WA6GGJ, 26852 Shorewood Road, Palos Verdes, California 90274.

RTTY, INC.
372 Warren Way
Arcadia, California 91007
Return Postage Guaranteed

THE ZUH II TRANSCILLATOR

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The amateur who is just beginning to investigate RTTY may encounter some difficulty in obtaining equipment, or he may experience difficulty in deciding what type of equipment he shall use to prepare his station. The author was offered a model 15 as a trade item which awakened a previously dormant interest in this most fascinating method of communication. Thus, the search began for the remaining items necessary to make the printer go. Among several pieces of equipment, the strange apparatus called a TU was going to be necessary. Surplus terminal units were far too expensive, it seemed, and no one wanted to part with one besides the surplus dealer. The only alternative was to use field expediency, rationalizing away the surplus units as being worthless because they had too many vacuum tubes to feed. Thus, the need was born for the terminal unit described herein, custom made for the only application it would ever see — Amateur RTTY. The design was centered about the famous "three-legged-fuses" which are sometimes referred to as transistors.

The original model of this TU was operational in early 1963 and devoted its life to decoding press station and ham QSO's with never a mark sent intentionally in its direction. The problems of an apartment dweller are manifold and 40 M antennas are some of them. However, when VHF became somewhat active on TTY it also became apparent that antennas were not the problem anymore. Thus, a two-tone oscillator was added to the station, and it was airborn. With the new activity came new ideas to incorporate into the system. The final model of this system is presented here for all who care to use it and perhaps incorporate further refinements into it.

The system is a complete encoding and decoding device for a radioteletype station. It is relayless, yet provides complete isolation from ground of the high voltage loop supply—a safety feature which is seldom found on commercial units. Signal bias and distortion are at an all time low due to the complete elimination of troublesome relays. The terminal unit features automatic space hold and the ability to yield full copy on either a marking signal, or a spacing signal, or of course on a complete signal.

The system is completely transistorized and contains its own regulated power supply. Any loop supply voltage up to 150 volts can be used, or the unit's own supply can be used as a low voltage loop supply. The keyer when in the off state presents an impedance of approximately 180 megohms, thus, permitting a selector magnet dropout time as favorable as a vacuum tube keyer. The impedance in the on state is approximately .05 ohm, thus, a low voltage loop supply can be used with excellent results.

The channel filters and the two-tone oscillator exhibit a frequency versus temperature stability of .011 percent centigrade degree, worst case, within the range from 0 degrees to 50 degrees centigrade (32 to 122 degrees fahrenheit) which is far more stable than necessary for amateur use. Harmonic distortion in the two-tone oscillator output is .3 percent, worst case, and transition time from mark to space or from space to mark is less than one millisecond and can be as fast as 50 microseconds depending on the point in the cycle at which switching occurs.

The delay in switching from the instant of keying is 30 microseconds from space to mark and 50 microseconds from mark to space, causing a bias of only .00001 percent. Total worst case signal bias on the two-tone output is 3.5 percent but statistically is well under .5 percent since maximum delay in the transition occurs only when the switching occurs at the node of the waveform. The output level is adjustable from approximately 250 millivolts RMS to zero when working into a 50 K impedance and is compatible with nearly every type of microphone input. Difference in amplitude of the mark and space frequencies is less than one percent at the end of a ten foot length of microphone cable.

The entire system as illustrated is contained in an aluminum enclosure of dimensions 3 by 5 by 8 inches. All circuitry is on two epoxy circuit boards with tin plated conductors. Board A contains the translator, board B contains the input filter, high voltage keyer, two-tone oscillator, and power supply, less transformer. All transistors are silicon except for the emitter follower regulator in the power supply which is germanium. The do-it-yourselfer can purchase the electronic parts for the unit for approximately $85.00 or the unit as illustrated can be purchased in kit form for $88. The kit contains pre-drilled boards, assembly drawings, schematics, all components and hardware, a pre-punched chassis and cover, and detailed assembly and tuning instructions. Kit assembly time (less tuning) is about 6 hours. The kit may also be purchased with all critical components pre-tuned to better than ½% for $98. Boards and miscellaneous parts are also available, and if there is enough demand the oscillator will be made available separately in kit form. (See Parts List.)

Input Filter

The input filter is simply a bandpass filter whose breakpoints are about 2000 cps and 3100 cps. It is useful in suppressing noise and QRM which would generate harmonics in the limiter and activate the translator falsely. The circuit is straightforward and has been seen many times by RTTY enthusiasts. The inductors are the famous Western Electric 632 toroids. L4 and L5 are installed with the finish of one winding connected to the start of the other winding. The remaining two leads present an inductance of 88 mhy. L3 is installed with only one winding used which has had 113 turns removed to present an inductance of 11 mhy. The filter should be fed from a 600 ohm (approximate) source for best results, although in most cases a connection directly to the receiver voice coil will be satisfactory.

Translator

The output of the filter is connected directly to the input of the translator, which is a limiter type of device. Much discussion took place concerning limiter types versus limiterless types of terminal units prior to the design of this unit. It was decided that the advantages of a limiting type of device would be desirable since the limiterless type of TU can offer only a small advantage at an increase in cost to most hams unless major modifications are performed upon the receiver. A limiterless TU has been designed and is being investigated, however, and will probably be published at a later date.

The function of the translator can be defined as follows: in the presence of a marking signal, the keying transistor shall conduct, allowing loop current to flow. In the presence of a spacing signal, the keying transistor shall not conduct, thus, the loop current shall cease to flow. In the presence of no signal, the translator shall decide whether a marking, or a spacing signal was intended and shall activate the keying transistor accordingly. This feature is made possible by the redundancy in an FSK signal and enables accurate copy in the event of selective fading, or in the event that one side of the signal is notched out to eliminate QRM. It also permits copy of narrow shift signals by tuning to either the mark or space signal. It is further required that the above action be made without introducing any appreciable signal bias or distortion that could cause misprinting, and finally in the event of loss of signal or continued space signal for a period of about 500 milliseconds the keying transistor shall conduct, thus, the loop will be held closed. The printer will not free run in this situation.

The active filters used on the ZUH II are reasonably linear at any given frequency. Thus it is possible to obtain an output from either channel with an input signal that is out of the passband. This can only happen, however, if the amplitude of the signal to the filters is quite high. In order to keep the proper degree of selectivity, the signal presented to the active filters must be kept at the proper level. This is accomplished by two limiting amplifier stages ahead of the filters. The gain of the second stage determines the bandwidth over which the filters will yield an output, and this is adjustable to some degree by varying R24. With R24 set at 3.9 K the selectivity of the channel filters will be fairly narrow, about 150 cps to a signal that is fairly free from noise. If stations with improper shifts are to be copied, it may become necessary to increase R24 to a higher value, not to exceed 5.6 K.

The limiting amplifiers are simply class A amplifiers, each with a bipolar diode clamp on its input. The clamp permits a peak excursion of about 0.2 volts in each direction. This is due to the characteristic forward voltage drop of germanium diode junctions which is about 0.2 volts. Thus a positive signal excursion would be clamped by CR7 and a negative signal excursion would be clamped by CR6. The remaining signal voltage is dropped across R16. The second limiting amplifier operates in similar fashion with CR8 and CR9 as clamps and Q8 as the amplifier.

There are a number of other considerations to be included wherever limiting is used. Obviously severe distortion of the input waveform will be the result of limiting. In the ZUH II however this is of no consequence since the fundamental frequency still exists and it is the fundamental frequency, and no other, that is of interest to the channel filter. However should the fundamental happen to be a sub-harmonic of one of the channel frequencies, it will generate a harmonic in the limiters that will excite the filter. To illustrate this problem suppose a heterodyne occurs at a frequency of 1487 cps. If this signal is presented to the limiter the first harmonic (2974 cps) will be produced and will excite the space channel. The obvious solution to this problem is to place a bandpass filter ahead of the limiters. The troublesome subharmonics of the channel frequencies will then be attenuated. Furthermore, the spectrum of noise frequencies is narrowed by the bandpass filter. There will be less problem of limiter capture by noise and other signals should the signal of inter-

EDITOR'S NOTE: This unit is highly satisfactory for Civil Defense operations as well as amateur operations.

*Mr. Prossen is with Douglas Space Center, Huntington Beach, California.

est be weak. The ZUH II is equipped with such a bandpass filter for precisely these reasons.

The signal is applied to the bases of the tuned amplifiers Q4 and Q9. The impedance of the collector circuits is low except at resonance, thus, the collector voltage swing is relatively high at the resonant frequency of the tank circuit. The diodes, CR 1 and CR 15 allow the positive peaks of the waveform to charge capacitors C2 and C11, respectively. When the voltage on either capacitor exceeds about 0.6 volts, the associated transistor, Q1 or Q12 begins to conduct. The networks R26, R27, R28, C11 and R2, R3, R4, C2 have their time constants chosen so that the associated transistor conducts about 6 milliseconds after the tuned amplifier is excited and continues to conduct for an equal length of time after excitation is removed. Thus, a 6 millisecond delay is introduced but no telegraph bias or distortion is generated. This delay should be precisely adjusted if optimum performance is desired, however, in most cases the values and tolerances designated will provide satisfactory performance with no adjustment.

The collectors of Q1 and Q12 are connected directly to the bases of Q2 and Q11 by way of the Pohl Commutator, S2. Thus, should a TTY signal be inverted, switching S2 to the inverted position will permit the unit to copy the signal and provide the proper output to the printer. With S 2 in the normal position the signal action is as follows: on receipt of 2,125 cps Q9 is excited, CR15 rectifies, Q12 conducts, and Q2 becomes saturated (collector voltage goes to zero). On receipt of 2,975 cps Q4 is excited, CR1 rectifies, Q1 conducts, and Q11 becomes saturated. We have, therefore, at the collectors of Q2 and Q11 an indication of the nature of the signal present. We may now perform logical operations on this information and use the results to operate the printer. With normal signals there exists no problem in extracting the data. With one signal (mark or space) missing we simply make the observation that if a mark, for example, was present and then no signal is present, the space must have faded. So the device must remember which signal was last present, and in the absence of that signal it must yield an output which would be indicative of the missing signal. The memory element used is a flip-flop, Q7 and Q10, and the flip-flop is driven by Q2 and Q11. When Q11 is on, Q7 is turned off, and Q10, therefore, turns on. When Q2 is on, Q10 is turned off and Q7, therefore, turns on. Diodes CR 16 and CR 17 provide emitter bias to insure reliable turn off of the flip-flop transistors. Thus, when Q2 is on (saturated) Q10 is off, (collector voltage about −10 V) and Q7 must be on. Should Q2 turn off, the flip-flop will retain its state unless it is changed by Q11 turning on. Only the presence of a signal will change the state of the flip-flop, and in the absence of a signal, the state of the flip-flop will tell which signal has most recently been present.

To determine the gating necessary to obtain the proper signal to the base of Q5, we prepare a truth table of the functions of A, B and C where A represents the collector of Q11, B represents the collector of Q2, and C represents the collector of Q7. We shall say that we have A when the collector of Q11 is at a negative potential (Q11 not conducting) or that we have a logical 1 at point A. If Q11 is conducting its collector will be approximately at ground potential, and we will state that we have a $\overline{A}$ (not A) or that we have a logical O at point A. Similar reasoning applies to points B and C.

There are two possible states for each point, A, B and C and therefore, there are eight possible combinations of these for the group. The table contains these eight combinations and for each the desired output it should yield. Many of these combinations will be "don't care" states since they either will not occur in service or are redundant.

Line Number	A	B	C	Function
1	0	0	0	Don't Care
2	0	0	1	Don't Care
3	0	1	0	Don't Care
4	0	1	1	Space
5	1	0	0	Mark
6	1	0	1	Don't Care
7	1	1	0	Space
8	1	1	1	Mark

From this table by inspection we can write the mark equation. We see that the values of A, B and C for the mark case are 100 and 111 (Lines 5 and 8). Thus, we may write:

$$\text{MARK} = A\overline{B}\,\overline{C} + A\,B\,C$$

This statement is read "mark occurs when we have A and not B and not C or A and B and C."

This equation may be simplified. Notice that every line that contains $\overline{B}$ ($B = 0$) is a "don't care" line except for line 5 which designates the mark function. We may, therefore, design our logic to yield a mark indication whenever we have a $\overline{B}$ regardless of the states of A and C. Thus, the equation reduces to:

$$\text{MARK} = \overline{B} + A\,B\,C$$

Continuing we see that every line that contains A C ($A = 1$, $C = 1$) is a "don't care" line except for line 8 which designates the mark function. We may, therefore, design our logic to yield a mark indication whenever we have the condition A C regardless of the state of B. Our equation is finally reduced to:

$$\text{MARK} = \overline{B} + A\,C$$

which states that we desire a mark indication when we have either $\overline{B}$ or A C. Since gates always deal with logical ones in their equa-

LOGIC DIAGRAMS

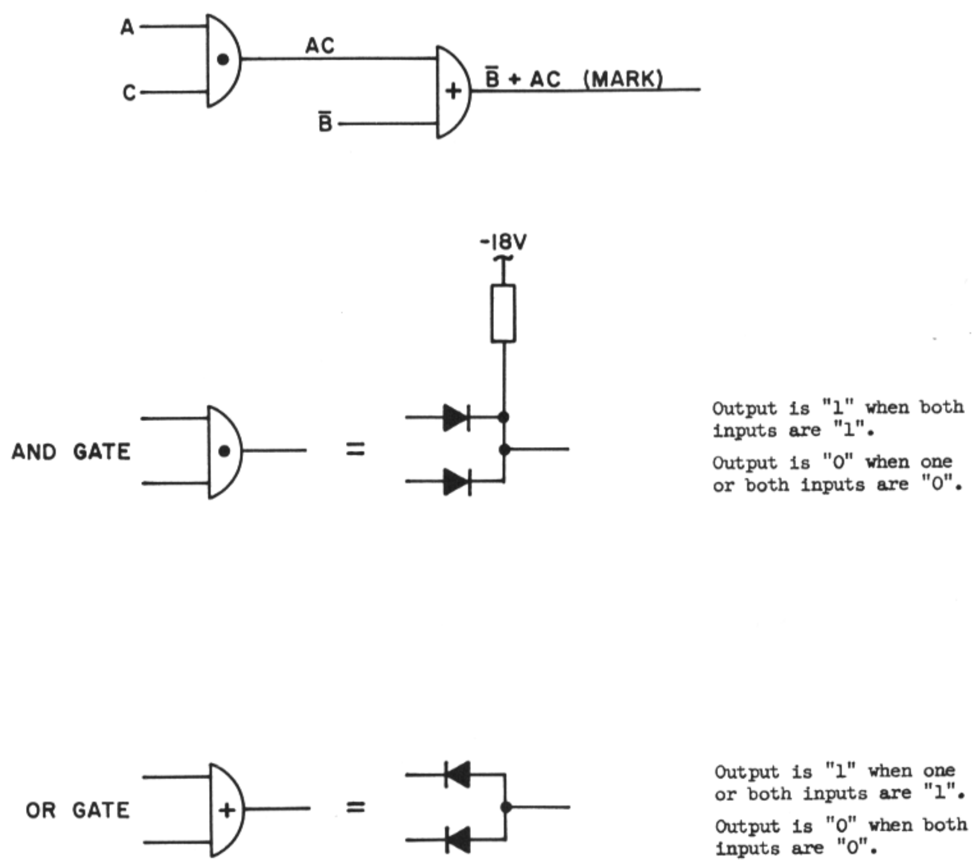


FIGURE 1

tion we must place a logic inverter at point B so that we are supplied with a logical one whenever $\overline{B}$ exists. To be consistent we will call the collector of this inverter point $\overline{B}$. Thus, when we have the condition $\overline{B}$, (B = 0) we will have $\overline{B}$ = 1. The logic diagram will illustrate the interconnections between the gates. (Figure 1.)

Thus, we have derived the circuitry for our two gates. Applying the outpup of the OR gate to the base of Q5 we have our keying signal. If Q5 be chosen as a 2N1132 or similar device with a BVceo of 50 volts or higher, capable of withstanding repeated collector breakdowns, a low voltage (18 V) loop can be keyed directly by Q5. With R6 chosen as 12 ohms a model 15 pulling selector magnet operated at 60 milliamperes can be connected between R6 and the –18 V supply. CR 3 and CR 11 provide 1.2 volts of emitter bias for Q5 to insure reliable turn off of Q5.

High Voltage Keyer

In order to be completely compatible with conventional teletype systems, the ZUH II Transcillator was designed to key the standard 120 volt loop so widely used with vacuum tube keyers. There are several worthwhile advantages to the use of a high voltage loop supply and all the dyed-in-the-wool hams who insist on living in a world of vacuum (tubes) stating that a transistor could never do the same job will have no basis for their convictions in this instance. A relatively new family of high voltage silicon transistors has been developed by Industrial Transistor Corporation of Long Island, and most of the transistors in the family are reasonably priced. The TRS 375 has a BVceo more than adequate for keying a 150 volt loop allowing for a spike of about 270 volts with a typical unit before breakdown occurs, and is priced under six dollars. The TRS 301 is adequate for 150 volt loops which have only one or two magnets to be keyed. For more rugged service, however, the TRS 350 or the TRS 375 should be used.

The keying transistor is driven by rectified AC obtained at the tertiary winding of T1. A blocking oscillator generates the AC in the primary of T1. The frequency of oscillation is approximately 200 kilocycles. This method of signal transfer allows complete isolation of the loop and is a valuable safety feature as many operators will verify. A 120 VDC bite can easily be lethal, and safety practices should be observed in setting up a station, even though a cost increase is involved.

The automatic space hold circuit consists of Q14, R36, R37, R44 and C14. The presence of a mark signal at the anodes of CR 24 and CR 25 places the potential at the base of Q14 at about –1.4 volts. The emitter-base junction of Q14 is reverse biased, since the emitter is biased at about –6 volts, and Q14 is not conducting. A spacing signal (or no signal) at the anodes of CR 24 and CR 25 allows C14 to begin charging through R44. In a period of about 500 milliseconds the emitter base junction of Q14 becomes forward biased, and Q14 conducts. Q18 is, therefore, turned on and current is supplied to Q13, the blocking oscillator. Q16, therefore, closes the loop. In normal service, Q18 is keyed for marking signals directly through R41 and CR 24, and in the transmitting mode, it is held on by current flowing through R35 to ground. The power input and loop output are decoupled by RF chokes and the loop output is brought outside the chassis through 1000 pf feedthru capacitors to prevent RFI from the harmonics of the oscillator. The keyer may be placed at any position in the loop, but to avoid confusion which could destroy the transistor by polarity reversal it is suggested that the negative terminal of the loop supply be connected to the KEYER–post and the magnets be connected between the KEYER + post and the positive terminal of the loop supply. The current limiting resistor of about 2,000 ohms must be used with a 120 volt loop supply and should be adjusted for the proper loop current, either 60 ma or 20 ma.

Two Tone Oscillator

The two tone oscillator provides a marking frequency of 2,125 cps and a spacing frequency of 2,975 cps. The tuned collector circuit of Q20 establishes the oscillator frequency and C28 and C29 provide the proper amount of positive feedback for a good waveform. C28 must always be slightly larger than C29 since feedback through C29 is negative. Q20 was chosen as an NPN transistor to eliminate the need to capacitor couple out of the oscillator. The collector of Q20 is at DC ground, and power is supplied to the emitter. Voltage at the emitter should be approximately 1.5 to 2 volts negative. Frequency shift is accomplished by the low-leakage type 2N3537 in the Q17 position. The presence of base current in Q17 provides a path to the lower end of L6 for positive voltage excursion through conventional transistor action and for negative excursion through conventional transistor action and for negative excursion by the forward conduction of the collector base junction. Thus, C24 and C25 are keyed in parallel with C26 and C27. Two capacitors are shown in each position since exact timing is done by trial and error, and it is unlikely that one capacitor can be found for each position that will set the frequency with sufficient accuracy.

Q17 obtains its drive from a transformer coupled blocking oscillator as did Q16 of the high voltage keyer. A current of 60 milliamperes flowing between the input terminals will cause only a 6 volt drop which will not cause a noticeable change in the loop current of a system which is already in service if the

oscillator generates a 2,125 cps tone and when no loop current flows the oscillator generates a 2975 cps tone. R49 and the potentiometer R58 provide an adjustable divider to reduce the signal level to that required by a microphone input. R49, C7 and RFC6 and the capacitance of a few feet of microphone cable comprise a two section filter to suppress RFI from the harmonics of the blocking oscillator. Likewise, the input lines to the blocking oscillator are decoupled with RF chockes and brought out through feedthru capacitors. Switch S4 switches R57 out of the circuit for operation on 20 ma loop current.

Power Supply

The power requirement for the entire system is a voltage of 18 volts ± 10% and a current of approximately 40 milliamperes. The voltage must be regulated, however, at whatever value is used to prevent noise feedback within the system. The flip-flop is perhaps the most sensitive portion of the system to noise. The regulated emitter follower supply provides better than 3 percent regulation from 10 milliampere to 100 milliampere output current, and ripple is less than 100 millivolts peak-to-peak.

Power line variations 110 to 120 volts cause only a .5% change in output voltage from a nominal value at 115 volts. The supply can provide 60 milliamperes loop current in addition to the demands of the Transcillator if a low voltage loop supply is desired.

Operating the Transcillator

The channel filters should be tuned by adjusting the capacitors C1 and C10 and/or adjusting the number of turns on L1 and L2 until the maximum DC voltage across C2 and C11 occurs at the proper input frequency. The values given for C1 and C10 are approximate. The two tone oscillator should be adjusted in a similar manner for the proper frequencies.

If a single loop is used, the OSCILLATOR (–) post can be strapped to the KEYER (+) post and the loop equipment can be connected between the OSCILLATOR (+) post and the positive terminal of the loop supply. The negative terminal of the loop supply is connected to the KEYER (–) post. Any loop supply voltage can be used (up to 150 volts) as long as the proper current limiting resistor is in the loop (60 ma.). The TR post is brought out so that one switch can change over both the transmitter and the keyer. In practice it may not be necessary to place the Transcillator in the Transmit mode unless noise is expected in the receiver which might key the loop and spoil the transmission.

For net operation it may be more convenient to use two loops, one for transmitting and one for receiving. Also, for relay traffic an incoming message could be reperforated and retransmitted while it is being received, or duplex operation can be carried out. If the signal received is reasonably clean and not biased, the oscillator can be effected without reperforating. When simultaneous transmit and receive is being carried out, the TR switch S3 must be left in the receive position. Naturally it is assumed that simultaneous operation would involve two frequencies.

For use on the FSK bands, two output posts are provided for scope monitoring. To recover signals that are severely covered with noise and QRM it is suggested that a comb filter with response peaks at 2,125 cps and 2,975 cps be inserted ahead of the limiters.

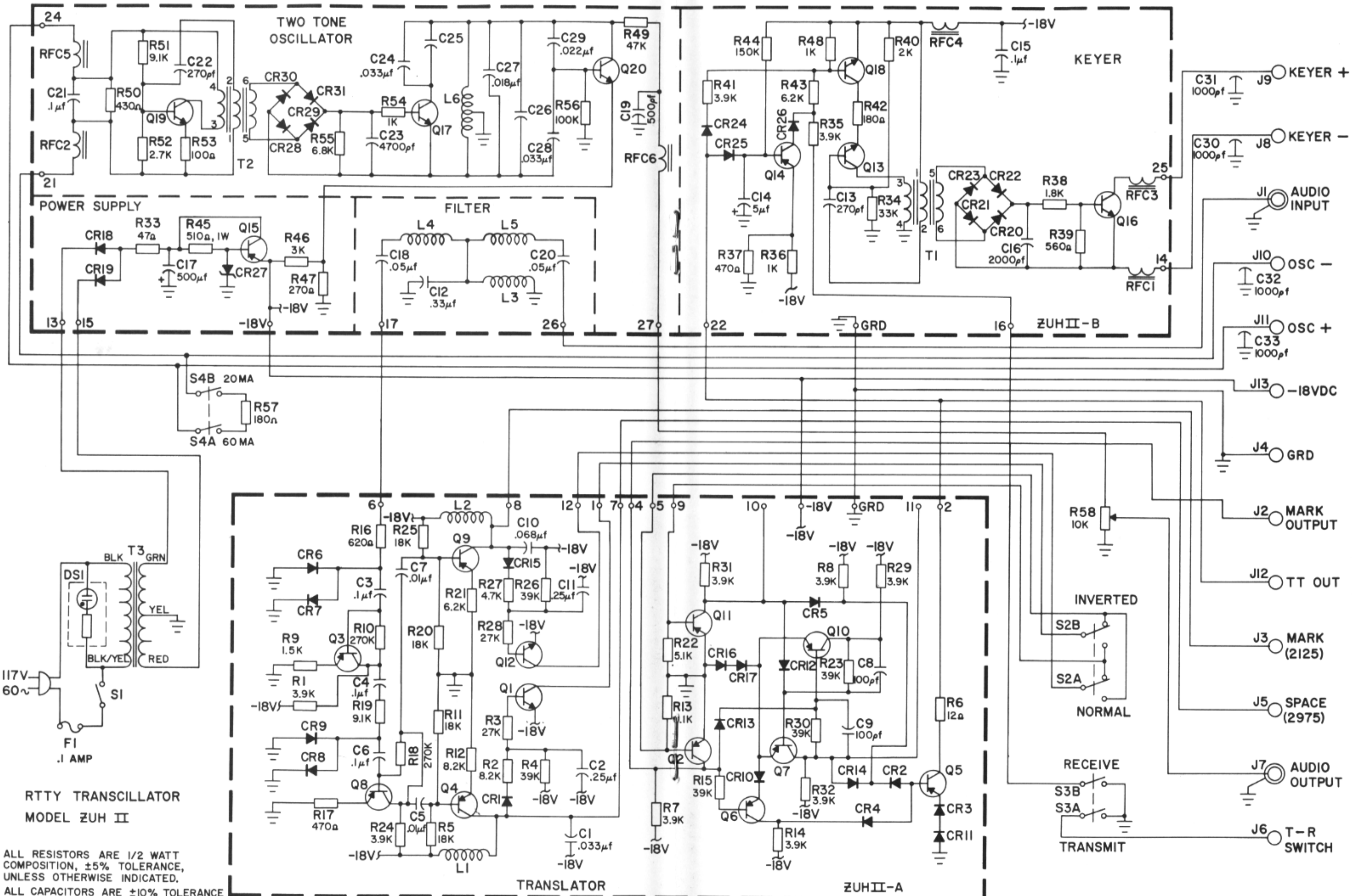
The Transcillator will operate satisfactorily with either 60 ma loop currents or 20 ma loop currents, provided S4 is in the proper position. However, for best overall system performance, a 60 ma loop will probably be preferred by most operators.

Time devoted to experimenting will enable the operator to make proper use of the RF and AF gain controls to recover a signal which the inexperienced operator may be unable to copy.

The imagination of the operator is the only obvious limit to the facility of the installation. But the Transcillator can be expected to translate and oscillate with solid state reliability. It will probably give trouble free service for at least 40 years after which time it should be traded in on a more up to date model.

PARTS LIST

Item	Value	Part No.	Mfgr.
C1	.033 μf	PVC1133	10
C2	.25 μf	PVC1025	10
C3	.10 μf	PVC101	10
C4	.10 μf	PVC101	10
C5	.01 μf	811Z5V103P	4
C6	.10 μf	PVC101	10
C7	.01 μf	811Z5V103P	4
C8	100 pf	831X5R101K	4
C9	100 pf	831X5R101K	4
C10	.068 μf	PVC1168	10
C11	.25 μf	PVC1025	10
C12	.33 μf	PVC1033	10
C13	270 pf	831X5R271K	4
C14	5 μf	62F207	6
C15	.10 μf	PVC101	10
C16	2000 pf	801Z5V202P	4
C17	500 μf	TVA1315	13
C18	.05 μf	PVC215	10
C19	500 pf	801X5R501K	4
C20	.05 μf	PVC215	10
C21	.10 μf	PVC101	10
C22	270 pf	831X5R271K	4
C23	4700 pf	811Z5V472P	4
C24	.033 μf	PVC1133	10
C25	°°	°°	
C26	°°	°°	
C27	.018 μf	PVC1118	10
C28	.033 μf	PVC1133	10
C29	.022 μf	PVC1122	10
C30	1000 pf	FT-1000	2



RTTY TRANSCILLATOR
MODEL ZUH II

ALL RESISTORS ARE 1/2 WATT COMPOSITION, ±5% TOLERANCE, UNLESS OTHERWISE INDICATED.

ALL CAPACITORS ARE ±10% TOLERANCE WITH VOLTAGE RATING OF 50V MIN.

Item	Value	Part No.	Mfgr.
C31	1000 pf	FT-1000	2
C32	1000 pf	FT-1000	2
C33	1000 pf	FT-1000	2
R1	3.9K	RC20GF392J	1, 9, 12
R2	8.2K	RC20GF822J	1, 9, 12
R3	27K	RC20GF273J	1, 9, 12
R4	39K	RC20GF393J	1, 9, 12
R5	18K	RC20GF183J	1, 9, 12
R6	12Ω	RC20GF120J	1, 9, 12
R7	3.9K	RC20GF392J	1, 9, 12
R8	3.9K	RC20GF392J	1, 9, 12
R9	1.5K	RC20GF152J	1, 9, 12
R10	270K	RC20GF274J	1, 9, 12
R11	18K	RC20GF183J	1, 9, 12
R12	8.2K	RC20GF822J	1, 9, 12
R13	5.1K	RC20GF512J	1, 9, 12
R14	3.9K	RC20GF392J	1, 9, 12
R15	39K	RC20GF393J	1, 9, 12
R16	620 Ω	RC20GF621J	1, 9, 12
R17	470 Ω	RC20GF471J	1, 9, 12
R18	270K	RC20GF274J	1, 9, 12
R19	9.1K	RC20GF912J	1, 9, 12
R20	18K	RC20GF183J	1, 9, 12
R21	6.2K	RC20GF622J	1, 9, 12
R22	5.1K	RC20GF512J	1, 9, 12
R23	39K	RC20GF393J	1, 9, 12
R24	3.9K	RC20GF392J	1, 9, 12
R25	18K	RC20GF183J	1, 9, 12
R26	39K	RC20GF393J	1, 9, 12
R27	4.7K	RC20GF472J	1, 9, 12
R28	27K	RC20GF273J	1, 9, 12
R29	3.9K	RC20GF392J	1, 9, 12
R30	39K	RC20GF393J	1, 9, 12
R31	3.9K	RC20GF392J	1, 9, 12
R32	3.9K	RC20GF392J	1, 9, 12
R33	47 Ω	RC20GF470J	1, 9, 12
R34	33K	RC20GF333J	1, 9, 12
R35	3.9K	RC20GF392J	1, 9, 12
R36	1K	RC20GF102J	1, 9, 12
R37	470 Ω	RC20GF471J	1, 9, 12
R38	1.8K	RC20GF182J	1, 9, 12
R39	560 Ω	RC20GF561J	1, 9, 12
R40	2K	RC20GF202J	1, 9, 12
R41	3.9K	RC20GF392J	1, 9, 12
R42	180 Ω	RC20GF181J	1, 9, 12
R43	6.2K	RC20GF622J	1, 9, 12
R44	150K	RC20GF154J	1, 9, 12
R45	510 Ω	RC32GF511J	1, 9, 12
R46	3K	RC20GF302J	1, 9, 12
R47	270 Ω	RC20GF271J	1, 9, 12
R48	1K	RC20GF102J	1, 9, 12
R49	47K	RC20GF473J	1, 9, 12
R50	120 Ω	RC20GF121J	1, 9, 12
R51	9.1K	RC20GF912J	1, 9, 12
R52	2.2K	RC20GF222J	1, 9, 12
R53	100 Ω	RC20GF101J	1, 9, 12
R54	1K	RC20GF102J	1, 9, 12
R55	6.8K	RC20GF682J	1, 9, 12
R56	100K	RC20GF104J	1, 9, 12
R57	10K	B-14	2

Item	Part No.	Mfgr.
CR1	1N270	14, 17
CR2	1N270	14, 17
CR3	1N914	3, 16
CR4	1N270	14, 17
CR5	1N270	14, 17
CR6	1N270	14, 17
CR7	1N270	14, 17
CR8	1N270	14, 17
CR9	1N270	14, 17
CR10	1N270	14, 17
CR11	1N914	3, 16
CR12	1N270	14, 17
CR13	1N270	14, 17
CR14	1N270	14, 17
CR15	1N270	14, 17
CR16	1N270	14, 17
CR17	1N270	14, 17
CR18	HG R-2	7
CR19	HG R-2	7
CR20	1N270	14, 17
CR21	1N270	14, 17
CR22	1N270	14, 17
CR23	1N270	14, 17
CR24	1N270	14, 17
CR25	1N270	14, 17
CR26	1N270	14, 17
CR27	1N967	5, 7
CR28	1N270	14, 17
CR29	1N270	14, 17
CR30	1N270	14, 17
CR31	1N270	14, 17
Q1	2N3567	5
Q2	2N3638	5
Q3	2N3638	5
Q4	2N3638	5
Q5	2N3638	5
Q6	2N3638	5
Q7	2N3638	5
Q8	2N3638	5
Q9	2N3638	5
Q10	2N3638	5
Q11	2N3638	5
Q12	2N3567	5
Q13	2N3567	5
Q14	2N3638	5
Q15	2N555	19
Q16	TRS325	8
Q17	2N3567	5
Q18	2N3567	5
Q19	2N3567	5
Q20	2N3567	5

Item	Value	Part No.	Mfgr.
L1	88 mh	°	
L2	88 mh	°	
L3	11 mh	°	
L4	88 mh	°	
L5	88 mh	°	
L6	88 mh	°	
RFC1	2.5 mh	R50-2.5	11
RFC2	2.5 mh	R50-2.5	11
RFC3	2.5 mh	R50-2.5	11
RFC4	2.5 mh	R50-2.5	11
RFC5	2.5 mh	R50-2.5	11
RFC6	2.5 mh	R50-2.5	11
T1	12.5 mh 2:1:1	21UGA	15
T2	12.5 mh 2:1:1	21UGA	15
T3	115/40 VCT	F-90X	18

MANUFACTURERS°°°

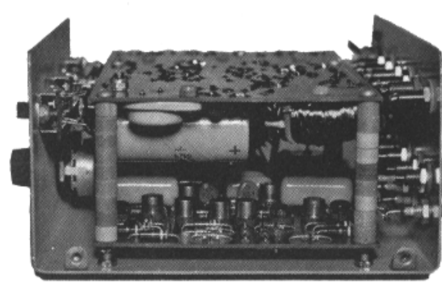
1. Allen-Bradley
2. Centralab
3. Continental Devices
4. Erie
5. Fairchild
6. General Electric
7. Hoffman
8. Industrial Transistor
9. I. R. C.
10. Mallory
11. National
12. Ohmite
13. Sprague
14. Sylvania
15. Technitrol
16. Texas Instruments
17. Transitron
18. Triad
19. Motorola

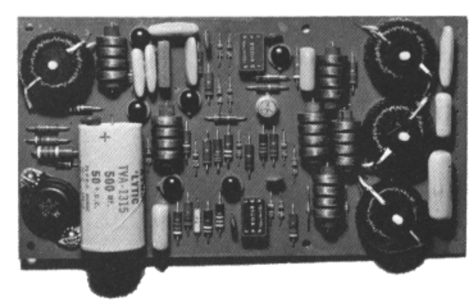
The Western Electric #632 Toroidal Telephone loading coils are available from many sources, most of whom advertise in various amateur radio publications.

C25 and C26 have no definite value. They are chosen as whatever value is necessary to tune the oscillator and generally fall in the range about 2000 pf. The boards are designed to accommodate a CM15 style mica capacitor, but C25 and C26 are not supplied with kits that are not pre-tuned.

°°° The manufacturers and values listed are those used in the kits. The individual builder may choose to purchase equivalent or similar parts. and in many cases may do so profitably. The designer wishes to discourage the use of so called "surplus" semiconductors available from various mail order firms, as these devices are generally dropouts from a particular family of semiconductors, and still bear the identifying marks of that family. Such devices will seldom perform satisfactorily if at all.

The complete ZUH II Transcillator kit can be purchased for $88. The kit, with oscillator and channel filters pre-tuned to ± 0.5% accuracy is available for $98. Circuit boards are available separately, as well as the various components. If the demand is sufficient to warrant sale of the two-tone oscillator separately in kit form, it will be made available for approximately $16. Orders or requests for additional information should be directed to P. J. Prossen, WA6ZUH, P. O. Box 537, Westminster, California 92683. Demonstrator units may be made available to nets and other organized groups for limited lengths of time.





MODIFICATION FOR NORTHERN RADIO MODEL 152 No. 2

Glenn Malone, W6OJF
9337 Gotham, Downey, Calif.

With the availability of the Northern Radio Model 152 No. 2 FSK converter in surplus and in Mars distribution channels some conversion for amateur use for this excellent late equipment (1960) would be of interest. As the unit comes, and most are brand new, no filters are supplied, and the filter section is a big wide open space, which is precisely the location for the toroids or TV width coils to make it complete. A thin sheet of aluminum cut the size of the opening makes the mounting board for the needed filters and associated parts.

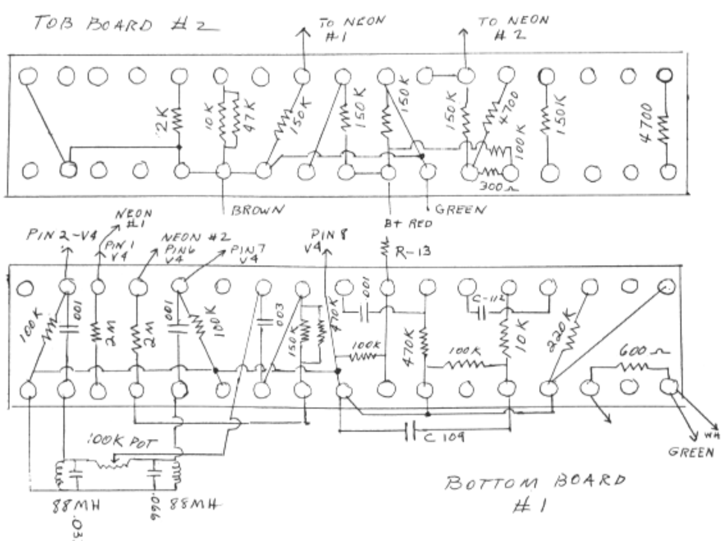
The Model 152 was designed for line service, hence no provision for tuning was designed, such as a scope, tuning eye or neon bulbs. This conversion fills this need the cheapest way, by means of neon bulbs, the type that are the same size as the pilot light bulbs. One bulb fires on mark, the other on space signal. Properly tuned in, both bulbs fire intermittently.

There have been a number of conversions offered for this unit but unfortunately all of them have had major errors which would prevent the unit from working. Therefore while the author claims no primary ingenuity for the conversion, the conversion offered is correct and will work beautifully.

The Northern Radio units are mounted on a three by 19 inch rack panel, two identical units side by side, each with its own built in power supply. The unit was designed to be used with a similar tone keyer unit for AFSK. If the user intends to use AFSK, there is ample room on the unit for the tone generator, and in the same cavity in which you will install the filters.

Twist lock covers, when removed expose two 17 pin terminal boards. The conversion shows the changes that you make to some of the pins, ignoring the connections which are also on the boards and not shown in the diagram. With the unit facing you, the pins number from left to right, 1-17. What ever connections are presently on these terminal board between the pins shown in the diagram should be removed. The removed parts will supply some of the components needed for the conversion, as indicated. Manuals come with these units, which will simplify the work which should not take more than a few hours time. If you can't get one of these units from Mars check your surplus store. Prices in Los Angeles for these units run around $50. The manufacturer advises that they sold for in excess of $600, so they are real late model goodies.

Credit to AF7DVK for original concept.



A NEW LOOK FOR THE MODEL 15

VICTOR D. POOR, K3NIO
430 Center Street
Frederick, Maryland

The Model 15 printer is probably the most commonly used Teletype machine in existence. Although Teletype no longer manufactures the machine, the number of machines in existence is so large that it will be a very long time indeed before the last machine is retired from service. The reliability of the Model 15 is so good that even in commercial service, the old machines have many years of life left in them.

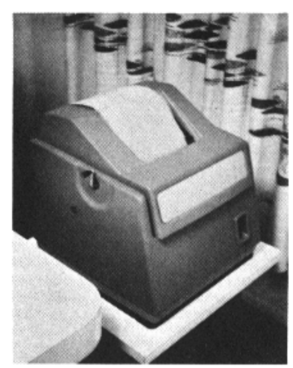
The Model 15 has two major faults, however. It is ugly and noisy. (This may be a matter of taste, to some amateurs I know it is a thing a beauty and the sound of a 15 clattering away is not unlike a Brahms symphony. To the XYL, however, this is seldom the case.)

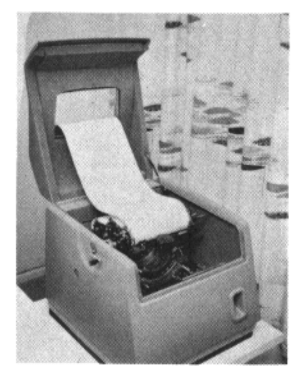
United Press International is probably one of the largest users of the Model 15 and due to the nature of its business, it has to place the machine on the premises of radio stations, newspapers, etc., throughout the world. In order to improve the appearance and sound of the machine (and to insure satisfied customers), UPI had Butler Associates of New York, a noted industrial design firm, design for them a new attractive noise reducing cover for the machine. The cover is now being manufactured by Speck Plastics, Inc. for UPI and is also available to anyone for about $85.00, (quantity discounts for big spenders). The cover is an attractive light weight plastic with a sound proofing internal liner. Included with each cover is antistatic wax for the cover, a cork pad base, and a larger fan blade for the motor to keep it cool in its now tighter cover.

I have one of the covers in my shack and find that it does a fine job of "housebreaking" the machine. The noise level and appearance are easily equal to that of my Model 32, and needless to say—much cheaper.

At the moment only a cover for a 15 without keyboard is available. A representative of Speck Plastics has informed me that they will soon have additional models for a 15 with keyboard and also covers for the 14 and 19.

For additional information or to place an order, write directly to Speck Plastics, Inc., RFD No. 3, Nazareth, Pa. 18064.





DX-RTTY

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

Seasons Greetings:

This month's effort will necessarily be short and quick due to the urgency of winding up the Contest results in time for publication in the several RTTY columns throughout the World. If some of you erstwhile typers would like a real challenge sometime, try organizing a World-wide RTTY Jamboree. I'll guarantee it will have you talking to yourself in a matter of hours! Suffice to say the Sweepstakes was a big success and exceeded our fondest expectations.

Congratulations are in order this month for W6MTJ, W6LVQ and W8CAT for achieving WAC-RTTY. This brings the membership in this exclusive group up to 43. Congratulations to all three for a fine job!

Activity thru-out the World is picking up like a snowball and each week's mail brings news of new ones coming on from all over. Jan, PAØFB, writes that interest in Holland is increasing. He reports that PAØWX, PAØXW, PAØVDZ and PAØTED are organizing an autostart net which should be in operation by the time this issue is in the mail. Jan also reminds us that PAØAA is continuing to put out the weekly RTTY DX news bulletin on 80 and 20 every Friday night. PAØFB included a fine piece of copy he made on an RTTY transmission from VK2EG. Speaking of VK2EG; Bill writes to say he made his first Stateside contact with W7BAJ and is anxiously waiting for a QSL to confirm it. He says that he and VK3KF are quite active on 40 meters and are watching for any Stateside typers who would like to make an Aussie contact on that band. Bill has been printing signals from SM, GM, G, I, LA and DL on 20 with good copy. Bruce, ZL1WB reports that his Stateside contacts are way down from what he accomplished last year due to peculiar propagation conditions but he still is running a tape every day at 0445 GMT "just in case." My spies tell me that VK3KF comes thru on 40 nearly every night starting about 0730 with fine signals. Give him a listen! From Britain-Alan, G2HIO, sends word that he received a report on his RTTY from a radio club in Hungary. This is third report we have received of RTTY interest in this part of Europe. Rudi, DL6EQ, writes that he is helping LXIDE get a model 19 set-up going in Luxembourg. This is one that should shake up the DX stalwarts on this side of the Atlantic! LX is still considered a good "catch" on SSB and CW so for RTTY'ers it should be a real prize.

KC4CG has been giving some of the lads a new one for their lists. At the moment he is building up a new TU so exidently he will soon become one of the "regulars." Another rather scarce country turning up on many of the contest logs was 5A5TR in Libya. Evidently he operates all bands because he showed up on many of the logs on several different ones. 5A5TX is another new one showing up in some of the reports. Sorry I have no more details on these two but will try and dig up something for next month. South and Central America are now represented by a real gang of "solid citizens" including such as LU1AA, YV5AVW, YV1EM, FG7XT and a number of others.

In looking back over the past year we have come a long way in the number of new countries and new stations making a start on RTTY. 1964 has been by far the biggest year for DX activity since the advent of the teleprinter mode. Even a young punk like myself can remember back just a few years ago when KR6AK, ZL1WB and KA8RA were the only regularly active stations a DX'er could chase on RTTY!! The next wave included such as VK3KF, ZL3HJ, G3CQE and PAØFB. Now-a-days if you can't work twice that many in an hour during a DX contest you are out of the money! It's amazing how times change. Please excuse me for becoming nostalgic at this point but I just couldn't resist the chance to do a bit of day dreaming. Well, Gang, it's back to the Contest statistics again for this Editor but hope to have some real juicy ones for you to fight over next month.

Seasons' Greetings to you all and thanks to everyone for their loyal support during the past year. Hope '65 is a real good one for all of you.

Loads of DX–73

Bud, W6CG

FLASH

Save February 20th and 21st, 1965, for Anniversary RTTY Contest. See February issue for details and complete rules.

HORSE TRADES

For Sale: MARK IV Terminal Unit complete with 850 cycle filters per March 1963 RTTY Built into rack mount RCA URA cabinet, photo of unit and shack in CQ Sept. '64 $135.00 crated or will take an SP-44 Panadapter or equivalent on part trade. W2HWH, 12 Maplewood Avenue, Maplewood, N.J.

Wanted: 60 WPM gears for model 14 TD also tape readers for same. K1ZXH, 15 Minivale Rd., Springdale, Conn. 06879

For Sale: M.D.1 polar relays, tube octal socket, $4.50 each, 3 for $10.50. K1ZXH, 15 Minivale Rd., Springdale, Conn. 06879.

Wanted: Information leading to a schematic diagram for the MT-1317/FGC-39 Base Transmitter Distributor. K2SFS, 65 Southgate Road, Valley Stream, N.Y. 11581.

Wanted: Keyboard base for 28, and cover or cabinet for 28ASR with keyboard base. Also 28 LPR reperf. VE2SG, 2190 Johnson Street, St. Laurent, Quebec, Canada.

Wanted: Top value stamps, will trade radio equipment and parts of Army technical manuals. Send 25c or stamped addressed envelope and want list for more information. Also Collins 51-J3, Teletype equipment and parts, tubes, and electronic parts to be sold or traded for Top Value stamps or coin collections. Send 25c or SASE and your want list. K8BBW, RD 2, Ashland, Ohio 44805.

For Sale: RTTY Toroidal filters, mounted on octal plugs. Specify frequency, $3.00 ea. 88 mhy toroids, uncased, like new, 5 for $4.00, postpaid. WA6JGI, 3232 Selby Avenue, Los Angeles, California 90034.

For Sale: Clearing out sale AN/FGC-1 Radio Teletype Converters $50.00 Used. New with spare parts $125.00. ALA-2 Panadapters with free conversion instructions $29.95. 19" x 72" Open racks and enclosed racks, new and used, as low as $12.50. Write for free list. Gulf Electro Sales, Inc., 7031 Burkett, Houston, Texas 77021.

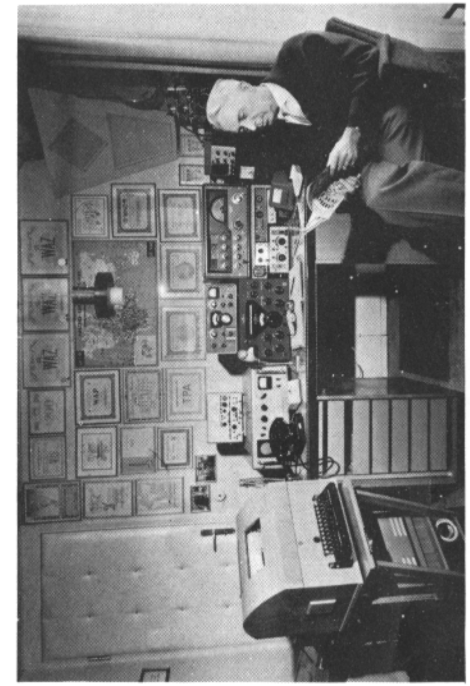
For Sale: Model 26, no waiver $60.00, Mowawk receiver $175.00. Both in good condition and working order. WA2RKW, 1320 Abington Place, North Tonawanda, New York, 14120.

For Sale: Model 15, 19, 26, printers. 14 TD, and 14 typing reperfs. Also few model 28s. Send for list. W6VPC, 1067 Mandana Blvd., Oakland, California 96610.

FOR SALE: Typewriter Ribbon Reinkers $3.00 Postpaid Continental USA. Walter E. Nettles, W7ARS, 8355 Tanque Road, Rt. 2, Box 694R, Tucson, Arizona 85715.

WANTED: IF input module for CV-89 converter (500 kc input) part of URA-8 group. Will buy, or trade suitably for similar module for CV-71 (50 kc input) in brand new condition. W2BSA/1, River Road, RFD 1, Essex, Conn.

DL1IN HANS HEIFER, CUXHAVEN GERMANY



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CORRECTION to November 1964 RTTY, page 10. Band-Pass Input Filter C 21 should be 0.01 ufd per K8DKC. (Error in original drawing.)—Editor

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NOTICE—RENEWALS AND SUBSCRIPTIONS ACCEPTED THROUGH DECEMBER 1965 ONLY

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