

16 March 1971

Additional ads on page 15

SALE-TELETYPEWRITER CONTROL GROUP: SN-260/FRA-42 synchronizer, electrical, and AM 2304/FRA-42 amplifier power supply both units mfg. by Sylvania Electric, 115 volts, 1 phase 60 cycle. Used, good both units for \$120.00. Model 14 transmitter-distributor, sync. motor, used, good \$20.00 each. 60 WPM set of gear new included. Reader; high speed, Ferranti model Mark III, used good \$30.00 each. Atlantic Surplus Sales, 580 3rd Ave., Brooklyn, N.Y. 11215.

WANTED: MODEL 31 Tape portable printers, 60 WPM - 110VAC. Model 32 and Model 28. Lee Brody, 15-06 Radburn Rd., Fair Lawn, N.J. 07410. Tel. 201-796-5414 evenings.

100 WPM to be legal soon - 100 and 75 wpm #28 gears, per set \$4 pp. Kleinschmidt RO printer, capable of 100 speed, \$50. AN/URR-13 receiver, 225-400 mc \$39. White, 5716 N. King's Highway, Alexandria, Va. 22303.

J & J DELUXE SOLID STATE RTTY DEMODULATOR. Auto start-motor control - anti space - band-pass input filters - lowpass filters - mark and space indicator lamps - heavy duty proven loop supply - electronically regulated power supply - write for brochure. J & J Electronics, Canterbury, Ct. 06331.

SALE - BACK ISSUES ELECTRONIC MAGAZINES - Specify needs - Superior, PO Box 9064, Newark, N.J. 07104.

**** *** **

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SALE - EXCELLENT WORKING CONDITION - HEATH HM-10A Tunnel Dipper \$20 PPD. HYGAIN DB-62 antenna \$20 FOB; AMECO nuvistor converters CNS5W and CN144W for 7-11 or 26-30 mhz if (specify) \$30 each PPD; AMECO TX62 with DOWKEY relay and homebrew mosfet vfo \$120 PPD; surplus AN/SGC-1A tu and afsk modified for 200 and 850 cps shifts \$20 FOB; BC-455B with supply \$18 PPD; TELETYPE ED58-HE portable repeat character and dot transmitter \$10 FOB will deliver any item within 150 miles Boston, Robert Boyd, 176 Green Acres Drive, Manchester, NH 03103.

SELLING OUT WAREHOUSE FULL of teletype & facsimile machines, parts and equipment. Loads of electronic equipment and computers. No fair and reasonable offer refused. No list or catalog available. Saturday or Sunday by appointment. Week days 10-4. Goodman, 5826 S. Western Ave., Chicago, Ill. 60636. (312) GR 6-8200.

MODEL 14 ROTR without cover (brand new), \$30.00 FOB; Model 28 152919 mod. kit for weather map service including a complete type box (style RE), keylevers, and stunt box parts (brand new), \$5.50 PPD. Ronald Ott, 2320 C Parker Street, Berkeley, CA 94704.

FOR SALE: TMC CFA/1 Dual diversity audio converter, 3 1/2" rack mount, Excellent condition with manual \$199.00. Lee Brody, 15-06 Radburn Rd., Fair Lawn, N.J. 07410.

RTTY

March 1971

JOURNAL

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VOLUME 19 Number 3

30 Cents



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'John' G3NTT at Imperial College

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First Class Mail --

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

B.A.R.T. SPRING RTTY CONTEST

WHEN

0200 GMT Saturday, March 13th until 0200 GMT Monday, March 15th, 1971.

The total Contest period is 48 hours but not more than 36 hours of operation is permitted. Times spent in listening periods count as operating time. The 12 hour non-operating period can be taken at any time during the Contest, but off-periods may not be less than two hours at a time. Times on and off the air must be summarized on the Log and Score sheets. The Contest is also open to SWL RTTY-ers.

BANDS

3.5, 7, 14, 21 and 28 Mhz. Amateur Bands.

STATIONS

Stations may not be contacted more than once on any one Band, but additional contacts may be made with the same Station if a different Band is used.

COUNTRY STATUS

APRL Countries List, except KL7, KH6 and VO to be considered as separate Countries.

MESSAGES

Messages exchanged will consist of:

- (A) Time GMT.
- (B) Message Number and RST.

POINTS

- (A) All two-way RTTY contacts with Stations within one's own Country will earn **TWO** points.
 - (B) All two-way RTTY contacts with Stations outside one's own Country will earn **TEN** points.
 - (C) All Stations will receive a bonus of 200 points per Country worked including their own.
- NOTE** any one Country may be counted again if

worked on another Band but Continents are counted once only.

SCORING

- (A) Two way exchange points times total Countries worked.
- (B) Total Country points times number of Continents worked.
- (C) Add (A) and (B) together to obtain your final score.

Sample Score:

- (a) Exchange points (302) x Countries (10) equal 3020
- (b) Country points (2000) x Continents (3) equal 6000
- (c) (a) and (b) added to give a score of 9020

LOGS AND SCORE SHEETS

Use one log for each Band and indicate any rest periods. Logs to contain: Band, Time GMT, Message and RST Numbers sent and received and exchange points claimed. **All Logs must be received by May 22nd 1971 to qualify.**

AWARDS

Certificates will be awarded to: The leading RTTY Stations and SW Listeners.

The final positions in the Results Table will be valid for entry in the "World Champion of RTTY" Championship.

The Judges decision will be final and no correspondence can be entered into in respect of incorrect or late entries.

Send your Contest Logs to:

Ted Double G8CDW,
B.A.R.T.G. Contest Manager,
89, Linden Gardens,
ENFIELD,
Middlesex, England

FSK for the SWAN 350

ALVIN MIERAU, VE6AVQ

Getting FSK out of a Swan 350 proved to be at first a frustrating experience, especially after the manufacturer and ARRL wrote and said to their knowledge no one had yet come up with a suitable method.

Some back reading resulted in finding an article about the Swan in the January 1969 "RTTY JOURNAL". We decided to follow this line but used a printed circuit board instead. I have not drawn the p.c. circuit board up as the circuit is so simple anyone can make this up. The P.C. board fits on top of the vfo can lid. More about this later.

CONSTRUCTION: Remove the VFO cover. Then close the plates of the grid capacitor to the right of the vfo can and cover with a piece of plastic. As can be seen in the photograph a feed through standoff insulator is mounted in the right hand side of the VFO can. The plastic is necessary to catch the metal filings when drilling the hole which was not accomplished without some few chosen words. Once the standoff is in place take some

insulated hookup wire and wrap one turn around the copper braid inside the vfo can which goes to the main tuning capacitor. Glue in place with quick dry cement making sure the wire is insulated. Be sure to use quick dry cement or the Swan will drift badly. We at first tried the circuit without the standoff insulator but it resulted in a great deal of drift.

Now drill two holes in the vfo lid. Mount small bolts in these two holes and fasten securely. The PC board is mounted onto these two bolts which also acts as the ground connection. Point "B" on the board will be above Point "A" the exterior of the standoff insulator once the board is put in place. We found the Swan so sensitive on shifting that we finally put a 10 Pf disc between point "B" and point "A". After your rig has been warmed up, attach a temporary ground connection from the pc board to ground. This way one can lift the pc board while it is still attached to point "B". This is necessary to realign the VFO slugs as the wire inside of the vfo can

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ELECTRONIC TELEPRINTER

SPEED CONVERSION

Laurence H. Laitinen, WA6JYJ

217 Orchard Rd.

FELTON, CA. 95018

Many RTTY operators are interested in operating their machines at speeds higher than 60 words-per-minute for punching tape (e.g., operating a model 19 at 75 wpm to get hard copy while punching), MARS, snooping around the commercial frequencies for press copy, and possible on-the-air amateur band use should a current proposal (1) before the FCC be adopted. To do this requires at least two machines - one operating at 60 wpm for normal low speed on-the-air amateur use and another dedicated to the higher speed. If more than one higher speed is of interest, more machinery must be used. Of course, most of us are interested in these higher speeds only occasionally and the dedicated machines will sit idle for most of the time. Even with a multiple speed authorization, 60 wpm will probably still be the predominant speed since the majority of machines currently in use can operate only 60 or 75 speed.

Owners of model 28 machines can use the variable or remote control gearboxes to print two or three different speeds - if their pocketbooks can stand it. These items are fairly expensive from Teletype Corp. and hard to come by through surplus sources. An alternate approach, suggested by W6JVE, is to use electronic speed conversion.

A few years ago this approach would have been difficult. Today, integrated circuits make electronic speed conversion easy and relatively inexpensive. Nine ICs and seven transistors are used in the Speed Converter (not counting power supply.)

BASIC OPERATION

The input of the Speed Converter is connected to a terminal unit and the output to a model 28 printer operating at 100 speed (a model 15 may be used at 75 speed). The Speed Converter receives slower speed teleprinter signals and temporarily stores each character (one at a time) in a shift register. It then does a parallel transfer to the output shift register and transmits the character to the

model 28 printer at a 100 wpm rate. While the Speed Converter is transmitting the character to the model 28 printer, it is ready to receive another character. The receiving speed can be anything less than or equal to the output speed of the converter. Speed selection is done by a switch which simply changes the timing resistance in the receiving section's unijunction oscillator clock.

In addition to the speed converted output, an additional output that is equal to the receiving speed is provided. This output is a regenerated replica of the input signal and can thus be used for bias-free retransmission.

DETAILED DESCRIPTION

Transistor-Transistor Logic (TTL) is used throughout, except for the receiving register's counter, which is Diode-Transistor Logic (DTL). The shift registers are five bit TTL shift registers (on one chip) plus a single Type-D flip-flop to make the registers six bits long.

The logic diagram of the Speed Converter is shown in Fig. 1. The input section consists of W6JVE's Standard Voltage Interface (2). (Alternate arrangements are shown in Figs. 3a & b.) Since the standard for mark and space is negative and positive voltage levels respectively, the output of Q1 is \bar{m} mark and is thus labeled "data". Since the input impedance of TTL logic is fairly low, the output of Q1 is buffered by two inverters. Two inverters are necessary to preserve the sense of the signal.

The input of the six bit receiving shift register is half of a MC7479 Dual Type-D flip-flop. This flip-flop is used to provide the regenerated output signal at the same speed as the incoming signal. Thus, its non-inverted "Q" output is connected to the Standard Voltage Interface output circuit. Although not shown, the collector of Q4 is returned to a negative voltage source through the Standard Voltage Interface hub. An alternate output arrangement is shown in Fig. 3c.

The receiving shift register's clock is controlled by a latch composed of a 3-input and a 2-input NAND gate cross-coupled (IC-1A & 2A). During a start pulse (space) data goes low setting the latch and thus turning off Q2, the unijunction clock control transistor. The timing capacitor C1 is now allowed to

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charge up to the firing point of the unijunction transistor through one of the switch selected timing resistor combinations. The period of oscillation is set to twice the Baud rate by the RC time constant of the network. The 50uH choke in the base-1 lead of the unijunction is used to provide an output pulse width of approximately one microsecond. The 1N270 diode prevents the output from going negative after the unijunction turns off.

Since the receiving clock frequency of oscillation is twice the Baud rate, the first pulse out of the unijunction oscillator occurs half-way into the start pulse (11 ms. for 60 speed reception). This pulse toggles the counter (IC-9) to 0000 (previously 1111) if the received signal is still spacing. If not, the counter is inhibited from toggling and "-false start" resets the latch. Assuming it is spacing, the first stage of the counter divides the output frequency of the unijunction oscillator by two and is used to provide clock pulses to the shift register. The output of the first counter stage goes from high (1) to low (0) half a bit-time into the start pulse and is inverted to provide plus-clock to the shift register. The inverter is necessary because the shift register shifts on positive transitions of the clock pulse. After the rise of the clock pulse the data at the input of flip-flop IC-5A is shifted to its output. The input data is now free to change without affecting the output of the flip-flop. The start pulse is now briefly stored by this flip-flop.

This operation repeats itself for all five selecting pulses and the stop pulse of the incoming character. Each positive transition of the clock pulse shifts the data one stage to the right. Since the start pulse is not needed in the speed conversion process it is allowed to shift out the right end of the shift register. This leaves the five selecting pulses stored in the five bit shift register, IC-7. Note that the input to shift register chip IC-7 comes from the inverted (Q) output of flip-flop IC-5A and thus the parallel output of the shift register is -data. The stop pulse is stored in flip-flop IC-5A which provides the stop pulse for the regen output.

Each clock pulse from the first stage of the counter increments the last three stages of the counter by one. (We shall ignore the first stage of the counter for counting purposes since it is not used in decoding, only for the shift register clock pulses.) The output of IC-1B (-stop) resets the clock control latch when the counter reaches 6 (110 counted from right to left in the counter). This normally

occurs during the stop pulse interval. Q2 is turned on by the reset latch and thus the unijunction clock is inhibited from producing further output.

Thus the receiving portion of the Speed Converter stops during the stop pulse interval regardless of whether or not the stop pulse is present. This is quite unlike a mechanical selector which keeps on going if the stop pulse is missing, leading to synchronization problems.

We have now received the character and the next step is to transfer it to the output register and reset the counter for the next receiving cycle.

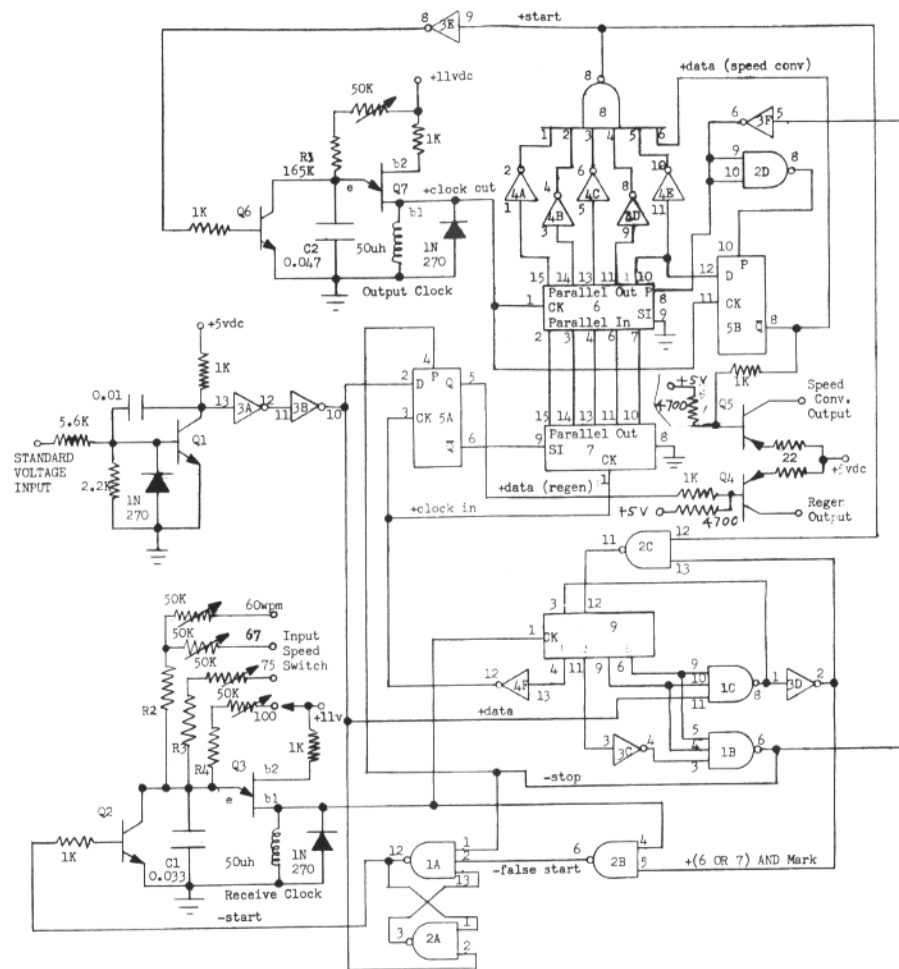
At this point assume that a normal stop pulse is present. IC-1C detects plus-mark (from the plus-data line) AND plus-6 causing its output to go low presetting the first stage of the counter to a logical "1".

The second stage of the counter is preset by a "race" pulse initiated by the -stop signal as follows: The low -stop signal presets the last stage of the output shift register (IC-5B) through two inverters (IC-2D) is used as an inverter by connecting its two inputs together). The "Q" output of IC-5B goes low which causes the output of IC-8, an 8-input (only 6 used) NAND gate, to go high. This signal, plus-start, is AND'ed together with plus-6 AND mark from IC-1C and 3D to preset the second stage of the counter to a logical "1". This completes the race loop since the output of the second stage of the counter is now high putting a low to one of the inputs of IC-1B through inverter IC-3C. This causes -stop to go high, which is where the race started.

Two inverters are used in the preset path to IC-5B in order to increase the propagation time around the race loop. This is necessary since the race pulse is used as a preset command for the output shift register (IC-6). Pin 8 of IC-6 must be high a minimum of 40 nanoseconds in order to preset it with the data from the input register (IC-7).

The receiving section of the Speed Converter is now ready to receive another character since the -stop signal has been removed from the latch and the received character stored by the input register has been loaded into the output register for transmission.

The method used to control the output section's clock is to detect space signals in the register and keep the clock on until all of the spaces have been shifted out. Even if the received character was a "Ltrs" function, there will be one space present. This is because the "Q" output of IC-5B is low



Integrated Circuits	Vcc (+5)	Vee (gnd)	Transistors (Motorola)
IC-1 Motorola ¹ MC7410P	pin 7	pin 14	Q1, Q2 & Q6 MPS 834 or equiv.
IC-2 " MC7400P	"	"	Q4 & Q5 MPS 3703 or equiv.
IC-3 " MC7404P	"	"	Q3 & Q7 2N1871
IC-4 " " " " " "	"	"	
IC-5 " MC7479P	"	"	Speed & Baud Rates
IC-6 Tex. In. SN7496N*	pin 2	pin 5	Input CK Freq.
IC-7 " " " " " "	"	"	Resistors (±1%)
IC-8 Motorola MC7430P	pin 7	pin 14	60 speed 45.45 90.90 Hz. R2 = 174K
IC-9 " MC839P	"	"	67 " 50.00 100.0 Hz. " " "
			75 " 56.67 113.3 Hz. R3 = 14.7K
			100 " 74.2 148.4 Hz. R4 = 110K

Capacitors C1 & C2 are 100V mylar, cap. tol. ±10%.
 Cap. values shown may require padding of up to 5000pF due to a wide variation in unijunction characteristics and cap. tol. (see text)

Output clock freq. = Baud rate of desired output speed
 Select C2 for desired output speed. (e.g., 100 kpm, C2 ≈ 0.047mfd; 75 wpm, C2 ≈ 0.062mfd.)

¹ 16 pin package.
 * The IC market is in a constant state of flux-- use the series 74 source with the lowest prices. Note..The MC7479P may be replaced by the SN7474N, US7474A, etc.

as a result of the race pulse. This low output provides the start pulse and also turns on the unijunction oscillator clock by causing a high on the plus-start line. In the case of a "Ltrs" function only one clock pulse is generated. The pulse occurs approximately 13 milliseconds (for 100 speed) after IC-5B is preset by the race pulse. The clock pulse shifts the data one stage to the right and shifts in a -mark at the left end (serial input is grounded, thus -mark). The start pulse has been shifted out the right end leaving all the inputs to IC-8 high which causes plus-start to go low turning off the clock. If the character "K" had been received there would be a space pulse loaded into the first (left) and the last stage (IC-5B) of the output shift register. The space pulses move one stage to the right after each clock pulse until the last one is shifted out. At this time the clock is turned off because all the inputs to IC-8 are high.

The output cycle is now complete and ready to receive another character from the input section.

CONSTRUCTION

The ICs, transistors, and other discrete components were mounted on type 169P59/047 Vectorboard. Sockets can be used to mount the ICs, but are not necessary. The pins of the ICs can be pushed through the holes in the board and the interconnection wires soldered directly to them. Use Vector T-42-1 Micro-Klips to mount the discrete components.

All NPN transistors are Motorola MPS834 or equivalent. Diodes D1 and D2 must be germanium--1N270s are preferred. Silicon diodes can not be used due to their high voltage drop which allows the output of the unijunction oscillator to go too far negative when it turns off. The counter chip does not like voltage swings below zero--if too far it will not count properly. Q4 and Q5 are Motorola MPS3703 or equivalent PNP transistors.

Although the noise immunity of DTL and TTL logic is better than RTL logic, they also generate a bit more noise. This is especially true of the counter and shift register chips. It is a good idea to solder 0.01mfd. disc ceramic bypass capacitors between the Vee and Vcc pins of the counter and shift register chips to prevent their noise pulses from being distributed to the other chips.

A suitable power supply is shown in Fig. 2. Be sure to insulate the 2N4921 from the heat sink (chassis) with the mica washers supplied with it. Verify that the

power supply is working correctly before connecting it to the logic.

Five percent resistors were originally used in the timing networks of the unijunction oscillators. However, considerable improvement in long term stability was found through the use of one percent precision resistors. Stability on the order of one or two cycles over a period of several months has been obtained with precision resistors and ten percent mylar capacitors. Unlike resistors, the tolerance of a mylar capacitor does not appear to be an indicator of its stability.

INITIAL OPERATION

Before applying power check the Speed Converter for wiring errors. This does not take much time and can eliminate a lot of problems that might otherwise be hard to track down.

If a frequency counter is available connect it to the base-1 lead of the output section's unijunction oscillator (Q7). Ground the base of Q6 and adjust the associated pot for a frequency of 74.2 Hz. for 100 wpm operation (56.7 Hz. for 75 wpm). Due to a wide variation in unijunction transistor and capacitor tolerances the value shown for C2 is a minimum one. It may be necessary to pad C2 with a few thousand picofarads to place the desired clock frequency in the center of the output pot's range. If a counter is not available use a calibrated oscilloscope. Lacking this, start out with the pot at maximum resistance, ground the base of Q2 instead of Q6, place a mark signal on the input of the converter and then slowly turn the pot until the receiving machine prints "Ltrs" and then something other than "Ltrs" function. Place the pot midway between these two points. Remove the ground from Q6 if still present.

The receiving clock frequency should be adjusted to equal twice the Baud rate of the selected receiving speed. Place the input speed switch to the 60 wpm position, ground the base of Q2 and adjust the 60 wpm pot for a frequency of 90.9 Hz. at base-1 of Q3. Set the speed switch to 67 wpm and adjust the 67 wpm pot for a frequency of 100.0 Hz. C1 may require some padding to get the 60 and 67 wpm clock frequencies to fall within the range of their respective pots. After this, the pots for 75 and 100 wpm may be adjusted for their respective clock frequencies.

If an oscilloscope or counter is not available the receiving clock can be adjusted by printing a teleprinter test signal of the desired speed. The test

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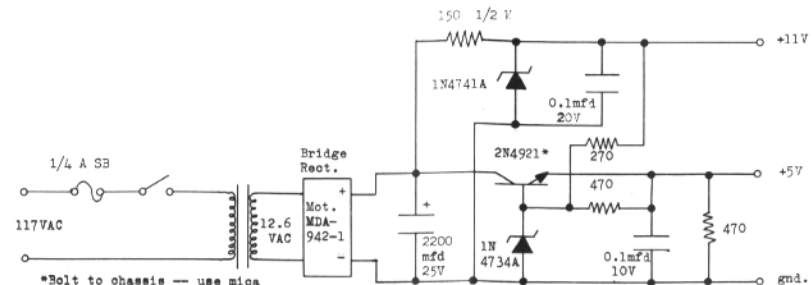


Fig. 2

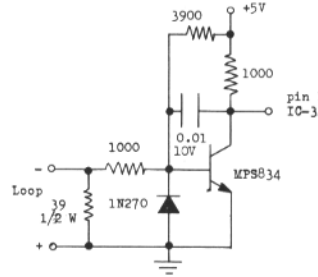


Fig. 3a

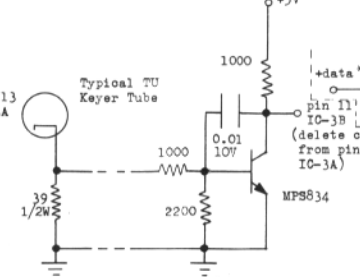


Fig. 3b

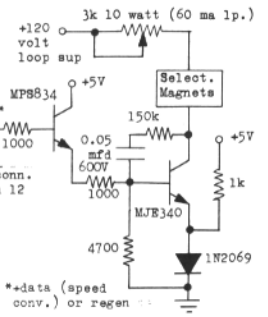


Fig. 3c

Unless otherwise specified: All resistors are 1/4 W. Capacitors <.1mfd are disc ceramic. Resistor values $\pm 10\%$ tol. All transistors are μ fgd. by Motorola.

signal should be at "machine" speed. At first the printer may print garbage because the clock is too far out. Carefully adjust the appropriate pot until the printer prints correctly. Find the minimum and maximum points of the pot that give good copy, then carefully center the pot between these two points. (Note: Neither control transistor's base is grounded with this method.)

If a frequency counter was not used to adjust the output clock's frequency the adjustment should be refined by making range measurements on the printer. Re-adjust the output clock frequency for maximum printer range while receiving a test signal.

TROUBLESHOOTING

Be sure the wiring is correct. It is sometimes helpful to have a friend double-check the wiring--you may consistently overlook a mistake.

The unijunction oscillators should free-run whenever the base of the associated control transistor is grounded. If not, check the base-2 supply voltage. Check the voltage across the timing capacitor, it will resemble a sawtooth when the oscillator is running. The oscillator may not be working due to an open charge path to the capacitor or the capacitor may be leaky. Check the control transistor by lifting its collector

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lead from the unijunction's emitter.

If the Speed Converter works partially, chances are that one or both clock oscillator frequencies are not correct. Recheck them. Also check the input waveforms--the output of Q1 should be no more than 0.3 volts for a space and greater than 2.5 volts for a mark.

Is the regen output working correctly? If so, the receiving portion of the Speed Converter is working correctly. If not, check the various logic signals with an oscilloscope.

If the trouble appears to be in the output section check to see if the clock comes on at all right after a character has been received. If the input of the Speed Converter is spacing, the speed converted output should also be spacing (running open). If not, the last stage of the shift register is not getting preset (IC-5B) or its "Q" output is not connected to IC-8. The clock should definitely run when the last stage is preset.

Check the logic levels to the output (hub driver) transistor.

If certain bits are consistently getting garbled there may be trouble in loading the output register.

CONCLUSION

Operation of the Speed Converter has proven to be quite reliable. At the

Continued on Page 9

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RTTY theory & applications.

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



SOME NOTES FOR THE BEGINNER

About three years ago, we discussed in this "column" RTTY for the beginner. We are not going to repeat the entire dissertation, but are going to give some of the very basics. Why repeat what has already been said? - because there are always newcomers. The beginner should purchase a copy of "RTTY from A to Z", Durward Tucker, W5VU, available postpaid from Cowan Publishing Co. (CQ) for \$5.

This month we are going to describe how to make a teleprinter give "local copy"; that is, how to connect the machine so that you can "type" something on it. This is an obvious first step to getting on the air.

Underneath the cover, you will find, upon close inspection, that a teleprinter is essentially two independent machines, a keyboard and a printer - the only common things between them are that one motor operates both the keyboard and the printer and the cover covers both - otherwise, you have two independent machines. (This is unlike a typewriter in which the keyboard is connected, key for key, to the typebars.)

In order to make the machine operate, you must supply power to the motor (this is probably obvious!), and you need a dc power supply capable of giving 60 mA at 130 volts or higher.

The motor power required is determined by looking at the motor nameplate. Most machines have synchronous motors made to be operated from 120V, 60 Hz. Some machines have ac operated, governor controlled motors. You can determine whether the ac motor is synchronous or governor-controlled by looking at the motor nameplate speed. Synchronous motors are rated at 1800 or 3600 RPM. Also, a governor-controlled motor will have a governor (obviously) and it will also have brushes.

Some machines have dc operated, governor-controlled motors. In general, the governor-controlled motors will create quite a bit of electrical noise and would be best replaced with a synchro-

nous motor. (When the motor is replaced, a gear and a pinion will have to be replaced. This requires tearing apart the selector mechanism - a fairly lengthy job the first time you do it.) The governor-controlled motors can be used at two meters when FM is going to be used, if some care is taken to suppress the governor and motor brush noise.

However, even if you plan to replace the motor, it would be wise to try the machine, as described below, BEFORE replacing the motor, in order to see whether the machine even works. If you don't try it first, and go ahead and replace the motor (and gear and pinion), and the machine doesn't work when you get thru, what went wrong? (Remember, replacing the gear on the selector requires disassembly of the selector.)

Once the required motor power has been determined, connect the selector magnets, the keyboard contacts, the dc power supply, a variable resistor, and a dc milliammeter in series. The resistor should be adjusted to give 60 mA in this series circuit (called a loop). With a 130 V power supply, the resistor will have to be about 2000 ohms; with a 260 V power supply, about 4200 ohms.

A minor problem occurs at this point. Some selectors were made to operate at only 60 mA dc, and some were made to operate at either 20 or 60 mA dc. The former are called pulling type selectors, and the latter, holding-type. There is some physical difference which is hard to describe in words. One clue is to look at the way the magnet coils in the selector are wired. If they are more-or-less permanently wired in series, it is a pulling-type selector requiring 60 mA for proper operation. If all four coil leads are brought out to a switch or terminal board where they can be wired in series or parallel, it is a holding-type selector. If it is a holding-type selector, connect the coils in parallel and operate it from 60 mA dc. (The 20 mA option may seem desirable, but it has been described as a mistake!)

Once the magnets have been wired

properly and the loop current adjusted to 60 mA, turn on the motor and try "typing" something. You should get perfect copy (no mistakes). If mistakes do appear, something is wrong (obviously), and this is where you start to learn what makes a teleprinter work (or not work, really).

If all is well, you are ready to get copy "off the air." For this you will need a TU (terminal unit), or demodulator (as some call it). We'll describe how to connect one next month.

73 ES CUL RG.

VHF NEWS

John Greve, W9DGV, in Rock Island, IL, has some interesting news about VHF RTTY operation in his area: "I think that we have an interesting group of VHF RTTY hams in this area. For five years we have sustained a freq of 51.2 MHz FM for both voice and RATT. (We use NB FM approx. 5 - 6 kHz deviation.) By employing a 5 second time constant, we can hold off the RTTY autostart units so that voice transmissions can be interspersed with the RATT. We are now embarking on a 2 M FM freq. of 146.700 (7 stations now autostart on 146.700, 850 shift, 2125 - 2975). We all employ vertical polarization, narrow deviation, and 24 hour autostart. Most stations employ ground plane antennas with beams to sustain a contact after the initial contact. So we are interested in having other stations call us. The hams active on the frequencies are:

W9DGV, WA9QVB, WA9RMR, K9-DMR, K9MVJ, WB0BBM, W0EWW, WA-0ZWF, K0AAG, K0EII, K0FBV, K0FKR, K0ISK, and K0MST. A P.S. from John: "Haven't heard Chicago yet (on 146.700) on RTTY, but hear repeaters occasionally." Thank you John!

Frank Wisniewski, Jr., W2LXC, Beechhurst, LI, NY, has more VHF RTTY information (see RTTY, 1970 FEB p. 8 and 1969 JUL-AUG p.8). "I know this is no DX record, but since you ask and have no other takers, will submit this, maybe it will start the ball rolling: W2LXC to K4GLC/4 Cape Charles, VA, on Oct. 2, 1968, this was also Bill's first RTTY contact, on 2 meters.

"Tu-Boro Radio Club group is still active on AM RTTY on 145.620, and we have 3-members on 24 hour auto, W2LXC - WA2MXB - WA2IUU, and two members on limited auto, WB2OGM from 8 AM to 11PM, and WA2PMW from 9:45 till 11 PM

"Before year (1971) is out, NYCRA (New York City Repeater Association) hopes to have an FM RTTY repeater on

146.700, with input of either 146.100 or 146.250.

"W2LXC has as of this date, worked 85 RTTY stations on two meters, most of the contacts being on 145.620 AM, some on 146.700 FM, the balance scattered around the two meter band. Working on the 100 mark, which I would say does indicate lots of stations have facilities for AFSK on two, but seldom use it.

"Additional stations worked since previous correspondence with you, 146.700 FM RTTY, WA2VNV, W2INT, K2-DQC, W2NM, and W2ZSD."

Electronic SPEED CONTROL-

Continued from Page 7

beginning of the project it was feared that the unijunction clocks would not exhibit sufficient long-term stability and that crystal clocks with dividers would be in order. Such is not the case-- the unijunction clocks have proven to be quite stable with precision resistors and mylar capacitors in the timing networks.

Printing accuracy of the speed converted machine is not much different than that of a machine geared to the desired speed under adverse receiving conditions. Often times the copy is better on the speed converted machine than on the directly geared machine--probably due to the improved synchronization of the converter's receiving section to the incoming teleprinter signal.

With the possibility of multiple speed authorization by the FCC for the amateur bands the Speed Converter should be a valuable asset to any RTTY station. By suitable transistor switching the receiving speed of the converter may be changed by control signals from an electronic character recognizer or a stuntbox to allow any of the standard speeds to be programmed into the converter by the received signal. Alternatively, suitable logic could be added to recognize what speed is being received and then change the receiving speed of the converter to that of the incoming signal.

References:

1. Petersen; RTTY, March 1969
2. "Standard System for Simple Station Control"; Haynes; RTTY, 1971.

BE BROAD MINDED !

USE NARROW SHIFT --

March 1971 9

RTTY-DX

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



Hello there

At this writing, toward the end of January, activity is at a pretty low ebb. This is due largely to the poor conditions which have prevailed and also perhaps to the boys taking a breather between Contests. Somehow January slipped by without the "CQ Contest" tapes getting any use. This lull is of short duration however as the Contest calendar for February March, and April, will really get things moving again. Speaking of Contests, we all certainly would like to extend "Congratulations" to the top scorers in the CARTG Contest results published last month and a special "Well Done" to VK-2FZ for the fantastic total of over 3.4 million points. When one considers that similar scores are rarely achieved in Contests using the "other modes" it certainly speaks well of Adrian's operating ability on RTTY.

The New Year really started off well for the W A C Award and congratulations are extended to the following stations --

Nr. 147	Paul Quast	EI5BH
Nr. 148	Louis Podeswa	WA2JVB
Nr. 149	Dusty Chapman	WA3IKK
Nr. 150	Glen Kurzenknahe	K3SWZ
Nr. 151	Ronald Ott	WA6FAD
Nr. 152	James Moffat	WA0TLT

In passing we note that in the case of Dusty, WA3IKK, a newcomer to RTTY, all the contacts took place in a nine day period in December 1970, which in itself is not a record, but receiving all the cards in so short a time perhaps is for RTTY, where QSL's are usually quite hard to come by. Never give up hope however, Bob, ON4CK, recently told us that he just received a card from HR2-AFK for a 1969 QSO.

Word from Uli, DK3CU, says that the RTTY equipment he sent to Eugen, YO2AFB, is still held in customs in YO land so RTTY operations from this new country will have to wait until the gear is released by the officials. ULI was also happy to have recently worked his 49th State on RTTY and is now looking 10 March 1971

for Utah for Nr. 50 and WAS. Anyone having any information on activity from this State can pass it to Uli any week-end on 15 Meters from 1500z on.

Additional activity continues from South Africa as more machines become available. We were recently the second RTTY QSO for Roger, ZS6BKX. Roger puts out excellent signals using a Ranger and a vertical antenna. It was also a pleasant surprise to contact Bill, ZS6UR, after quite a few years. Bill got back on in early January with a hastily constructed ST-5. In fact it was made using a piece of cardboard as a chassis and hanging from its leads at the time we worked him. Years ago Bill was PA0RU and along with Paul, EI5BH, and Simon, IICSE, they have the makings of a "former Dutch Amateur Net". Bill is no newcomer to the mode as his WAC on RTTY dates back to 1962.

We received word from Merrill, W6-AEE, that OA3Y was now QRV on RTTY and a day or so later we did find Olle for a fb QSO. As you may recall, we earlier mentioned the fact that Olle, SM-0KV was in Peru on behalf of the Swedish Government assisting in restoring communications after the earthquake disaster of some months ago. The correct gears for the machine were finally obtained and now Olle at OA3Y can be found on the bands over the week-ends. QSL cards can go via his son, SM0FO. It is interesting to note that over the years Olle has operated a ham station from all Continents except Oceania at various times. When he leaves Peru he will make stops at VP2-AHA and G3HCT before going home. Of course we questioned the possibilities of a VP2 operation on RTTY but unfortunately this is not possible at this time.

I would suppose that many of you had an opportunity to say hello to Venkat during his recent DXpedition to the Lacadives. On CW or SSB that is. Venkat was sorry that he could bring only a minimum of equipment to this rare spot and this limitation precluded lugging any "machinery" along. Venkat was there for about a ten day stay signing VU5KV.

Dusty, W8CQ, received a note from
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Carl, HB9P, stating that he would be operating from LIECHTENSTEIN as HB-0D during the WAE Rtty Contest. This is certainly great news and a "first" on RTTY. You are reminded that the WAE Contest takes place on April 24-25. Carl also transmits RTTY Bulletins every Sunday morning at 0745z on 3590 khz. He began with Nrl on August 18, 1968 and recently sent Bulletin Nr. 100.

Kermit, W9BT, recently took up the gavel as President of the Chicago Area Teleprinter Society (CATS). This society is about as old as amateur RTTY itself and Kermit says that the members would welcome any RTTY amateur from foreign lands to one of their meetings to give a short talk on RTTY operations in their particular country. If you plan to be in the Chicago area get in touch with Kermit Slobb, 1605 Oakwood Rd., Northbrook, Ill, a suburb of Chicago and I am sure that you will be well taken care of and have an interesting visit.

Kermit also sent some copy of a QSO he had with LX1JW - and some of the comments will, I am sure, be of interest to you "old timers" in ham radio. It seems that Jean is 67 years old and has been a ham for 52 of those years and was active in the days when amateur activity was centered around 200 Meters!

After more than a year of preparation the efforts of Paul, EI5BH, and Tom, PA0PIM, were finally rewarded with the launching of a new organization called, Europa Amateur Radio Teletype Group (E.A.R.T.G.) The growth of RTTY has increased in tremendous strides in the past few years both here and abroad and you have perhaps noticed on these pages the formation of National Societies in various European countries to collect information and pass it on to their members to keep them aware of what is going on in this mode of amateur radio. The EARTG carries this concept one step further, it is not designed to supersede any existing organization but more important to act as a rallying point so that all ideas and future planning can go thru a central point with all in agreement toward the goal that has been set. It would be better if I briefly outline some of the AIMS of the EARTG and you will perhaps acquire a better understanding as to why it was formed.

-- To further the interest of RTTY internationally within Europe.

-- To assist its members with technical advice and information.

-- Represent the RTTY Amateur at International Conferences and Conventions.

-- Strengthen the bond of International Friendship.

RTTY JOURNAL

ional Friendship.

-- To make it "The RTTY Society or Group" for those amateurs who have not, or cannot have, for practical reasons, their own National Society or Group.

There is much more but the above is to acquaint you with some of the highlights and full information can be obtained from any of the members of the Operating Committee. Some of these members presently active in the E.A.R.T.G are; OK1MP, UA4KED, IIR0L, PA0PIM, EI5BH, DL8VX, LX2BQ, ON5WG, HA5KFB, and OE8HFL. You can direct inquiries to any of the above or to the Committee Chairmen, EARTG.

Paul Quast, EI5BH Ton Hoek, PA0PIM
P.O. Box 73 v/h Het Wapen van
Athlone, Ireland Woerden
Woerden, The Netherlands

As mentioned last month, there is a new Award available for RTTY and it is offered by the German Society, I.E., DARC. It is called EURD (European RTTY Award) and the RULES follow --

The DARC issues the "Europaisches RTTY Diplom" to promote amateur RTTY activities. The award is available for all radio amateurs and club stations holding an official RTTY license. It is based on two way RTTY contacts with different European countries and European prefixes.

1. The EURD will be issued in three classes: EURD III, EURD II, and EURD I.

2. EURO III requires written confirmations (QSLs) from at least 20 different countries (regardless of the band used) and a minimum of 100 prefix-points. a) The European Countries are determined by the WAE country list given below. b) Each official European prefix counts one (1) prefix-point per band. EURD II: 150 prefix-points in 30 European countries. EURD I: 200 prefix-points in 40 European countries.

3. All amateur bands (incl. VHF) may be used.
4. All QSLs must confirm "Two Way RTTY" and be dated after Jan. 1st, 1965. Any altered or forged confirmation will result in disqualification of the applicant.

5. Contacts during the RTTY WAE DX Contest can be used for EURD endorsements provided the log of the requested station is also received. Therefore claims should not be made before the publication of the contest results. Request must be made within two years after the contest.

6. The fee for each certificate is DM 5,- or 10 IRCS.

7. Send application, QSLs, and fee to:
Uli Stolz, DJ9XB
In der Ostert 3
D-597 Plettenberg
Germany - West

WAE Country List - C31 - CT1 - CT2 - DL/DJ/DK/DM - EA - EA6 - EI - F - FC - G - GC - GD - GI - GM - GM (Shetland) - GW - HA - HB - HV - I IS - IT - LA - LA (Bear Is.) - JX - SV - (Crete) - SV (Rhodes) - TA (Europe) - TF - UA/UV/UW 1 thru 6 - UC - UN - UO - UP - UQ - UR - UA (Franz Josef) - YO - YU - ZA - ZB2 - 3A - 9H - 9A1/M1 - HB0 - (4UI-HB)

73 de John
March 1971 11



HITS & MISSES

From The Editor
and
his Mail



We hope to meet a lot of you at the Dayton Hamfest, week end of April 24th. We hope to have the same suite as last year - 908-9-10 at the Dayton Sheraton. (garage adjoining and bus service to the hamfest) and everybody is invited to visit and stay as long as you wish. If you have never been to Dayton you have missed one of the outstanding hamfests of the year. For information on the Hamvention write Dept. R. Box 44, Dayton Ohio 45401.

are returned in such a manner, and funny part is we never hear from them.

Blizzards and the cold weather have grounded us on the frequencies, the blizzard bent the quad and the cold weather keeps us from getting it repaired. We love a quad but someone should build them in the shape of a Yagi so we could keep them in the air.

BACK ISSUES---

The list below should be current for a while. Copies are 30c each and we are sorry as you that we do not have a complete file of back issues, it seems that about half of the new subscribers want all or a great many of those available. The January Ham Radio, 75c from the publisher, has a very good article on the ST-6 which takes care of the popular demand we had for the September and October 1970 issues.

The following are the only issues we have in stock.

- 1966-August - September - October - November - December - (5).
- 1968-February - March - May - June - September - (5)
- 1969-January - February - April - May - June - July - August - September - October - November - December - (10).
- 1970-January - February - March - April - June - (5).
- 1971-January-February, (2)

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

DUSTY DUNN - W8CQ
Editor and Publisher

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Funny things happen when you mail out a couple of thousand pieces of mail a month. We will send a subscription for a number of months and then all of a sudden it is returned with - No such address - addressee unknown - or some other such notation from the postoffice. If you are reading this obviously you are not concerned but we often wonder what happens to the half dozen subscribers whose copies 12 March 1971

SWAN 350 FSK

Continued from Page 2

knocks alignment off by around 500 kcs. Once you have the vfo realigned fasten down the pc board onto the two small bolts making sure that none of the circuit underneath the board is grounding out.

You will notice I have used a three way position switch S-1. We found that without a neutral position that we had audio distortion on SSB if the TU happened to be on.

S-1 is mounted on the rear of the Swan as is the driver input jack, the keyer jack and the 500 ohm pot. We found no way of using the Swan as a transceiver for RTTY, so a Drake 2B is used. An extra coax plug is mounted into the Swan as can be seen in the photograph. A Dow Relay is put onto this jack so the same antenna can be used for all rigs.

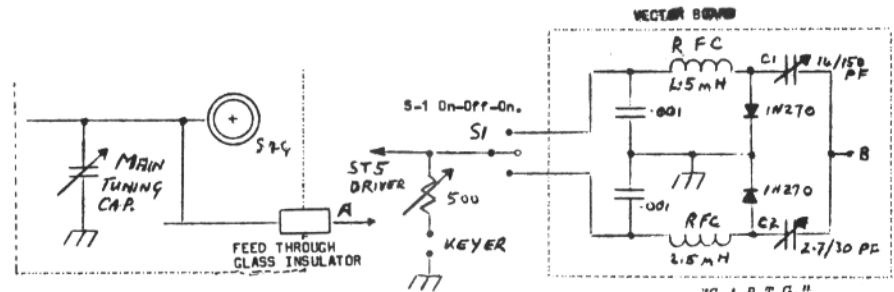
We have used the Swan for several months in this fashion with excellent results. The Swan is run in the AM position. (Carrier inserted). It is tripped into the transmission mode by inserting a jack into the mike socket and using only the tripping circuit. We have a miniature

toggle switch mounted right on the 32 printer deck thus we do not have to leave our operating position save to tune an incoming signal. Running the Swan at 100 mls into an 813 final gives us about 200 watts which seems to be plenty for RTTY.

Drift on 14 mHz is only several cycles. Narrow or wide shift is available without any fuss or worry about tuning by using S-1. The shift stays the same from band to band. Different values of C1 and C2 were tried in order to get the two shifts. Having a digital counter on hand made this an easy process. A slight allowance must be made when adjusting the shift as when you put the cabinet back onto the rig the added capacitance changes the shift slightly.

For those fellows not using the ST-5 or TTL/2 Mainliner method of driving an external relay (Fast Acting) can be put in series with the local loop. The relay can then be used to apply say a 1.5 volt battery to the diodes on the PC board. Any amount of voltage will shift this circuit. In our case we use around 10 volts.

Al Mierau, VE6AVQ will be happy to supply the photographs to anyone interested. Write him at 18 Fremont Close, Red Deer, Alberta.



DRILL SIZES

It seems that the listing of drill sizes for PC boards published in the September Journal were a bit small for some of the bent or tarnished leads so Cole, W2FLG has furnished us with an adjusted size list.

- For 1/4 watt resistors . . . #70
- For 1/2 watt resistors . . . #64
- For 1 watt resistors . . . #57
- For 2 watt resistors . . . #55

The #70 drill is the same size as for drilling boards for Molex pins and there is no reason why this same #70 drill could not be used for OP AMP leads as well.

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INSTALLATION of TO-5 IC's.

Ever have trouble getting all the leads of a TO-5 integrated circuit to line up with the PC board holes? It can be a rather frustrating experience especially if the PC mounting holes are drilled for snug fit as they should be. Try preparing the IC by trimming the leads about 1/32" progressively shorter as you go around. By doing this, you can start by inserting the longest lead in its appropriate hole and working right around to the last and shortest lead without previously inserted leads coming out.

DRAKE 2B RECEIVER - Revisited

By: R. H. Weitbrecht - W6NRM
1966 Woodside Road
Redwood City, Cal. 94061

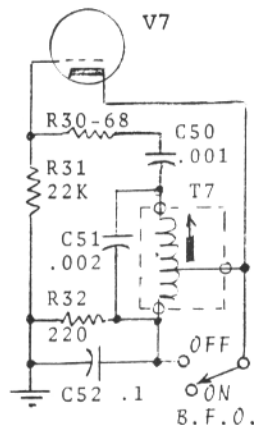
An article appeared in the July, 1962 issue of RTTY, p.7, describing the Drake 2-B Communications Receiver. Inquiries are still coming in, in regard to the modification of this very fine piece of radio equipment for more optimum RTTY reception. Hence, this short article was written, in order to accompany the drawing, shown on this page. It should be largely self-explanatory.

The modification permits centering the passband tuning control, whether operating "USB-RTTY" or "LSB-RTTY"; that is, giving normal audio-shift sense or inverted audio-shift sense.

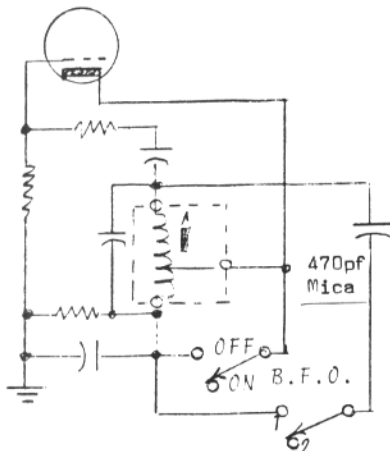
All that is necessary is to shift the BFO FREQUENCY SWITCH, in order to accomplish the inverting. The receiver tuning is almost unaffected; whereas, in the original set, it was necessary to move the tuning 5 kHz and possibly losing the RTTY signal.

It is of interest to mention that the two Drake 2-B receivers, at W6NRM, are still in excellent operating condition, albeit after 9 years of use. One 6BE6 tube needed replacement; this was on account of a leaky grid, which upset the high-resistance AGC system. On another occasion, the dial drive needed restringing. All in all, the stability of both receivers continues to be highly satisfactory, and either receiver is well usable for narrowshift RTTY.

ORIGINAL CKT OF BFO



REVISED CKT OF BFO



1: 47.5 kHz
2: 52.5 kHz BFO FREQUENCY SWITCH

NOTES: Unscrew (rotate CCW) the slug in bottom of T7 until it stops.

This raises the BFO to 52.5 kHz with BFO Freq. switch in 2. Original BFO switch (ON/OFF) converted to BFO Freq. Switch. BFO ON/OFF Switch in place of either POWER ON/OFF Switch or CAL ON/OFF Switch.
By W6NRM...

ZENER DIODES

With the advent of solid-state, and the need for voltage regulation, the Zener Diode is coming into common use. However, if you are a VHF'er, you should use them with care and discretion.

The Zener Diode is an excellent noise generator. In fact, a conducting diode

is the heart of most "noise measuring" equipment!. As a precaution, such devices should be well isolated from low-level circuits. Especially those in the VHF range.

Frank Greene,
K5IQL

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PERFORATOR TAPE 7/8 WIDTH. Fresh box of 32 rolls \$10. - 48 lbs. include postage. Page printer paper, three copy, twelve rolls to a box \$5.00. 48 lbs. include postage. Heathkit sixer, good condition, \$20.00. Heathkit HG 10 VFO, good shape, \$20.00. Hewlett Packard 415 BRSWR indicator \$50.00. Manuals included with above pieces of equipment, Lou Carbaugh, WA3OJF. PO Box 398, New Cumberland, Pa. 17070

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

MORE RTTY! THAT'S RIGHT. In 1970 there were more feature RTTY articles in HAM RADIO Magazine than any other general amateur magazine. You need RTTY Journal, but you need HAM RADIO also. \$6.00 per year; \$12.00, 3 years. Ham Radio, Greenville, N.H. 03048

THE 20th ANNIVERSARY DAYTON HAMVENTION will be held on April 24, 1971 at Wampler's Dayton Hara Arena. Technical sessions, exhibits, hidden transmitter hunt, an interesting program for the XYL, awards and banquet. For information write Dayton Hamvention, Dept. R, Box 44, Dayton, Ohio 45401.

TELETYPEWRITER: KLEINSCHMIDT TYPE TT 271/FG, 60-75 100 wpm page printer with std. comm. kbd. English characters. It is capable of 66 wpm operation, friction and sprocket feed. Used good, \$65 each. Teletypewriter Receiver; Kleinschmidt model 155R, teleprinter speed 60, 100 or 115 wpm. 1/20 HP synchronous motor. With table and power supply, used good, \$70. each. TT268/UG Distr. @ Xmttr, Reperf; % automatic TTY perf (made by Soroban Engineering) and a TTY reader (made by Teletype Corp. Model 28 typw) mounted on a common panel and housed in a common electrical equipment cabinet. It can be operated rack or table mounted, used, good, \$90.00 each. Model 28 Apparatus Cabinet (LBAC) - Monitoring; housing six typing reperator units, tape winders and motors multiple mounted, used good, \$480.00 each. Send us your requirements on teletype equipment. Atlantic Surplus Sales, 580 3rd Ave., Brooklyn, N.Y. 11215

TOROIDS: LOWEST PRICE ANYWHERE. 40/\$10. POSTPAID, (5/\$2.00) 44 or 88 mhy center tapped. 32KSR Page printer, reconditioned, perfect; \$225. MITE UGC41KSR Page printer, perfect; \$250. Mod28 Sprocket to Friction Kit \$25. 28LBXD TD \$70. 28LPR reperf with gear shift; \$170. 33 parity Keyboard with cables, excellent; \$38. Model 15KSR, reconditioned; \$65. Matching RA87 P.S., Unused; \$7. Lorenz 15KSR, newest, many features; \$75. Sync motors \$7. GEARS for most machines: List for stamp. 14TD \$20. DPE tape punch \$14. HP200CD Audio Oscillator \$95. R390URR receiver \$550. 11/16" tape; 40rolls/\$10.00. 33ASR, complete, excellent; \$700. Stamp for complete listing. Van W2DLT 302R Passaic Stirling, N.J. 07980

BACK ISSUES, RTTY JOURNAL - Have all issues from Vol. 1 No. 1. Will reproduce any issues for \$1.00. Postpaid. John Isaacs, 3175 Val Verde Ave., Long Beach, CA. 90808

MODEL 14 Transmitter-Distributor, synchronous motor, 60 WPM, used, good, \$20.00 each. Model 14 reperforator, receive only, synchronous motor, 60 WPM. Receive only, used, good, \$30. each. Synchronous motor for model 14 TD, reperforator or model 15, used, good \$7.50 each. Atlantic Surplus Sales, 580 3rd Ave., Brooklyn, N.Y. 11215

CHANNEL FILTERS FOR TWO-TONE/TU. Brand new Northern Radio 85hz bandwidth. For 170hz shift: 2125 and 2295 hz filters, \$6.95/set. Include postage for six pounds. Laurence H. Laitinen, 217 Orchard Rd., Felton, Calif. 95018.

THE MAINLINE TT/L-2 FSK DEMODULATOR custom built - 850 & 170 shift - with/without scope indicator - all latest features - wired and tested exactly as described in May-June 1969 QST. J & J Electronics, Canterbury, Ct. 06331.

RCA FSK CONVERTER-COMPARATOR group AN/URA-6 (Navy), excellent condition, includes CV-57/URR frequency shift converter, CM-14/URR comparator, Original instruction book. Requires 395 to 470 KHz receiver IF. \$70. Stanley Coutant, WB6WFI, 248 San Gabriel Ct., Sierra Madre, Ca. 91024

FOR SALE: FREQUENCY COUNTER - built from Popular Electronics, April 69, Counts to two megas. Looks and counts like a first class counter. IC sockets used throughout. Scaler will carry it to 20megs. First \$100.00 takes it. Robert Zelenka, W8TMO, 14446 Swanee Beach Rd., Fenton, Mich. 48430.

SPACE/ONE SOLID STATE RTTY DEMODULATOR with 850 & 170 shift, meter tuning or mark and space indicator lamps-heavy duty proven loop supply -- electronically regulated power supply with reserve capacity - motor control - auto start-electronic keyer stage supplying plus and minus voltages with provisions for adjusting to 1MA when driving diodes. Write for brochure. J & J Electronics, Canterbury, Ct. 06331.

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

MEDEL 28 ASR with dome-mounted typing reperforator, three speed gear assembly, synchronous keyboard and many more features. This machine is the latest Navy model with a very high serial number and very little use and is in excellent condition. Please write for further info and price. Ronald Ott, 2320 C Parker Street, Berkeley, Calif. 94704.

SALE: URR-13 UHF RECEIVING set, tunable 200-400 mHz, ideal for UHF ham bands and monitoring air force and astronaut frequencies, A2, A3 type of emission received. Provided with 115/230 V power supply for 60 cycle AC. Also provided with panadaptor jacks for an I.F. of 18.6 Mz allowing scanning of a 600 Kz bandwidth. Superhetrodyne crystal controlled O/A dimensions 8x17x19, used good - \$45.00 each. Model 14 reperforator, synchronous motor, rec. only, used good, \$28.00 each. Catalog available no charge. Atlantic Surplus Sales, 580 3rd Ave., Brooklyn, N.Y. 11215

EPOXY DIODES - 1000 Volt PIV at 1.5 Amp, 24c each ppd. 88 Mhy Centertapped unpotted toroids, \$1.50 for 5 ppd. Send stamp for list. M. WEINSCHENKER BOX 353 IRWIN, PA 15642.

FOR SALE OR TRADE: HIGH SPEED (BRPE) Tape Punch, 60 cps, mint. Model 32KSR with auto LF/CR, 60/100 WPM, complete with IC TU. Let's trade! Hank, W6SKC, 213-255-8724 or 213-799-5886.

WANTED - MODEL 15 TABLES and electrical service units. All types of NEW parts. Telemechanics, Inc., 85 Shields Avenue, Williston Park, L.I. 11596

Additional Classified on NEXT PAGE

RTTY JOURNAL