RTTY

NEWS OF AMATEUR RTTY

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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.

WANTED—Keyboard perf and tape transmitter.....W6PGP
FOR SALE—Model 12 complete with SYNC motor.....W2MIB
FOR SALE—Model 12 without Keyboard but has dist.....W7JFU
WANTED—Minature bulletin printer, recv only.....W7JFU
WANTED—Either complete 26 or parts or keybd....W2EHW
WANTED—Perforator and 1-A tape head.....W2EHW
WANTED—Information on SFO terminal unit.....W7RGD
WANTED—Motor for 15, perfer sync.....W5WBA
FOR SALE—Model 12 typing perforator, vacuum tube keyer and 1-A tape head.....W6ZNU
FOR SALE—FRA-FRE-FRF frequency shift receiver converters.....W2ZKV
FOR SALE—Ten boxes of paper (12 rolls to box)....W2ZKV

RTTY, Inc.
3769 East Green Street
Pasadena 10, Calif.
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The W5TJE Terminal Unit

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6622 Petain Ave.
Dallas 27, Texas

This article might better be titled, "Where we stole all of these ideas." Credit will be given where we know who developed the circuit in the first place.

This is offered as the result of some six months of experimentation — not necessarily to be constructed on an "as is" basis but something to use for the generation of ideas.

The entire idea behind this Terminal Unit was to overcome all of the deficiencies in the old one. And as one might expect — a few new difficulties were uncovered as the new one progressed. Naturally we haven't found all of the answers to all the problems but we feel there is enough to start things going.

At the very beginning of the circuit is the W5HZF/W5RJG front-end switching. It aids considerably in determining the transmitter shift — in a quick and dirty manner. Feeding one scope plate is 850 cps. (Marv and Arlen built in an 850 cps. oscillator — we use an Audio Generator). Feeding the other scope plate is the output of the receiver. Turn on the low-power stages of the transmitter and tune it to zero-beat on the receiver. Depress the shift key. If the shift is 850 cps, there will be a perfect circle on the scope. In practice holding down the space-bar on the keyboard is ideal and will give a circle with a line thru it.

V1, a 12AX7, is used as a dual amplifier feeding V2, a 12AX7 Limiter. The limiter appeared in September, 1955, by W6EFT. It is a "jim-dandy" and will really do the job. Now — why all of the amplification on the output — we want enough audio to the input of the limiter to limit even though the receiver audio gain control is so low that the speakers are almost silent.

By using this method the receiver audio control can be adjusted practically independent of the level into the Terminal Unit. The Output Control on the limiter takes care of the T.U. For practical application and operation of the limiter circuit, we suggest that you read W6EFT's article.

After the limiter comes T1. This is the Thordarson Band-Pass Filter that W9BP wrote up in RTTY March, 1955. It also does an excellent job for RTTY and it is amazing the amount of good it does when properly installed in the T.U. They are still available at the price mentioned in Beeps article. One parting thought — it is designed to operate in a 500 ohm circuit and will not function properly if the impedances are otherwise.

Next is one-half of a 12AX7, V3. This tube is to overcome part of the losses caused by the insertion of the band-pass filter. Nothing fancy — just an amplifier using as few parts as possible. Note that all of the tone amplifiers have cathode by-pass condensers. These raise the gain of each stage and without them, another tube would be necessary. The unused half of V3 could be used as an 850 cps oscillator or as the oscillator for AFSK.

Up to this point everything has been handled "single channel" . . . There is a school of thought that promotes the use of limiters after a filter and the use of two sets — mark and space — while I will admit that this looks good on paper, it does not work in a practical manner. With the best set of filters we could get our hands on — voltage wise a ratio of 100 to 1, mark to space — we found that when the signal passed thru each limiter, the marks and spaces came out the same signal value, in each circuit. Then all of the filtering had to be done over again.

As pointed out by KL7CK in RTTY March, 1955, large coupling condensers tend to detune the filters. Checks were made with the Audio Generator at the Mark Frequency and we found that the .005 would pass almost as much signal as .1 — therefore, we used the .005's in all of the stages preceeding the discriminator.

There is only one set of mark-Space Filters. These are fed by V4A-B. The filters were constructed from toroids obtained from W5RJG. The filter coupling condenser for the Mark is a .003 while a .005 is used for the space. The reason for the difference is to have the same band-pass on both filters. Naturally this coupling condenser will be very critical as it controls the band-pass of the unit. We built our filters in small aluminium boxes mounted on four-pronged plugs. With the filters being plugged-in — it is much easier to "get at 'em." A word of warning — learned the hard way — tune them plugged into the Terminal Unit. We found that just any old condenser would not work in the filters. The filter coupling condensers are button ceramics and the filter tuning condensers are plastic covered papers. All were checked for capacity and leakage before being installed. Rather than prune the toroids — which is much the best — we took the easy way out and added .001 - .003 - .005's until we "hit" the frequency.

A further point discovered when tuning the filters. We haven't made up our "head" just why, but we found that the wave-shape on the discriminator output was very bad. In fact the printer was "holding its nose" at the pulses. We put the scope on the filter output with the scope still adjusted to the DC pulse rate and Lo and Behold — the waveshape here was exactly the same. So-o-o-o- we returned the filters and all of this went quietly away. It is quite possible that the peaks on either side of the center frequency on the filters were not the same and possibly caused this "fouled up" pulse. At any rate it would be a good idea to look at the filter output with the scope adjusted for the DC pulses.

R29, is a gain control in the mark channel to adjust the levels to match up. In our T.U., the mark channel has the most gain. Put it in which ever one is the "hotest." Most instructions for setting this control say to adjust for equal mark-pace signals on the scope at the front end or the discriminator. We tried this and found that the mark-space pulses to the grid of the cathode keyer tube V7 were not equal. Therefore we adjust R29 with the scope plugged into Test Point 10, viewing the individual pulses by switching SW3 from Mark to Dual to Space and back.

On the scope "Take Off" just before the discriminator are some resistors to ground. Being as we have a small scope we use it rather than build one into T.U. We were plagued with the picture jumping around for no apparent reason. This was caused by static charges building up on the long leads being operated at a rather high impedance. The resistors fixed this up just "Ginger Peachy."

V4A-B, a 6AL5, is the Discriminator (rectifier if you wish). It uses the W6AEE low-pass filter but here it begins to differ considerably. Note that the circuit is wired up backwards from the most of the Terminal Units.

The Mark signal is negative and the Space signal is positive. This is purely a personal "like". It is much handier for me to operate the BFO on the receiver on the "low" side and to make everything come out right — this is how its gotta be! If you wish to use the "high" side — reverse the discriminator plates and cathodes.

Note the IN34A Crystal Diodes connected in the discriminator. These are DC Restorers or Clampers as often referred to by the Telephone Co. They clamp the output pulses and are worth their weight in 4-250A's.

Next comes the "Function Switch" S3. Contrary to the opinion held many, this switch is very handy. And will find use quite often. The center position is for normal diversity operation. But, if say, for example, the Space pulses are arriving "dirty"— just flip it to "Mark" and get solid copy. The same goes for the "Space" side. When everything is properly adjusted the unit will make good copy in any one of the three positions. The question may arise as to why this switch was put here instead of in front of the discriminator. The reason is very simple — we couldn't make it work properly in front of the discriminator. The pulses would change level as we changed the switch. Here they stay the same. Also there is no capacity changes involved due to filter detuning as there would be on the "front" side.

Several Terminal Units of late have come out less the coupling condenser to the grid of the DC Amplifier. Now this is all well and good in theory. But in practice — we found thatthe Space voltage woud be exactly one-half that of the Mark. No matter what mode or signal was fed into the DC Amplifier. Investigation proved that when a condenser was used the signal was the same on both Mark and Space. Most units use a small .1 or so here. We used the 1.0 mfd so that the waveshape was changed a little as possible. The time constant is very important and with a large condenser it is very high and likely to cause no trouble.

Note the "Mark Hold" circuit that was in the Gates in RTTY October, 1954. On the air and in person we have had many people tell us that is was of no value. Actually the name "Mark Hold" doesn't do it justice. If your printer "bounces" several times after the station being copied stops sending during a transmission — this is just what the doctor ordered!

V6A-B 12AX7 was stolen lock, stock and barrel from W6EFT's article already mentioned. The "B" section of this tube is used as a DC Restorer. The purpose is to clamp all voltage at this point to where it is going negative only. This causes the Mark and Space pulses to be superimposed as far as the intelligence is concerned, giving a form of diversity operation.

V7 6AQ5 is the Cathode Keyer. This is a "garden variety" cathode follower with the printer magnets in the cathode to ground. This tube normally draws current keeping the printer magnets closed. Along comes a Space pulse and they are opened up. The magnets are shunted by R42 to remove a portion of the inductive thump. The screen resistor R43 should be of a value to give 30 ma. in the loop to the printer. As printers will vary, experimentation is in order. Our 26 works better at 34 ma.

If you put the scope on the cathode of V7 you will be shocked at the waveform. But don't let this throw you . . . current is of main interest as that is what is operating the printer magnets. Break the "hot" line to the printer and insert a 10 ohm 2 watt resistor. Connect the scope across it — making sure that the scope is not grounded. The presentation you see on the scope is that of the current in the printer loop.

Also in the cathode of V7 is a Relay RY1. This is a Western Electric 276-G used by the Telephone Co. It is vacuum sealed and washed in mercury, built in an octal tube envelope. It is very fast and extends to near 100 cps. RY2 is the same. 45 volts is lifted out of the power supply to operate these relays thru the keyboard. Note the polarity! This gives "local copy" with the receiver shut down. RY2 contacts go to S4, a Mallory 3242J. This switch is a "little gem" and it puts either of two vfo's on FSK and shorts the FSK Jack on the unused vfo. If you use only transmitter then this can be eliminated. Please note that the keyboard jack is the "shorted" type so that everything will operate with the keyboard unplugged.

There are a considerable number of 8 mfd de-coupling condensers. Do not leave them out . . . They aid in keeping things on an even keel.

The power supply is standard. We do, however, use a double-section filter to get as clean a voltage as possible. V9-10 are to take up the "slack" on the jump in voltage that gets past V8. Possibly an electronic regulated power supply would be even better.

A handy "little jewel" not usually found in Terminal Units is the DC Test Power Supply. By changing the printer and keyboard plugs, or you could install a switch, you can test the TTy sans extra equipment, or use it as a typewriter. R47 should be of a value to deliver 30 ma. to the printer loop.

The schematic gives all DC voltages as well as peak-to-peak voltages at specified test points.

In general it is a good unit — we like it and intend to use it until someone comes out with one that will copy the signal when it fades out to where I can't see it on the Monitor Scope. And I hear that the Military have some now that will do just that!!!

Parts list for: W5TJE Terminal Unit

Resistors ¼ Watt or ds Specified

82 — R38
500 — R19 - 20
500 Pot — R1
1875 20W — R44
2.2K — R3 - 7 - 22 - 26 - 28 - 42
3.3K — R11 - 16
3.3K 2W — R47
4.7K — R8 - 13 - 24 - 31 - 40
8.2K — R43
30K 50W — R45 - 46
100K — R4 - 5 - 23 - 27 - 29 - 30 - 32 - 33 - 39
100K Pot — R25
150K — R12 - 17
180K — R37 - 49 - 50
270K — R9
330K — R2 - 6 - 10 - 15
470K — R14 - 21 - 34 - 35
500K Pot — R18
820K — R36 - 41
3.3 Meg. — R48

Condensers

.001 — C30
.003 — C20
.005 — C1 - 3 - 6 - 7 - 8 - 10 - 11 - 14 - 15 19 - 21 - 22 - 23 - 24 - 25 - 26 - 27 - 42
.05 — C40 - 41
.15 — C33
1.0 — C28 - 29
5.0 — C2 - 5 - 12 - 17 - 18
8.0 — C4 - 9 - 13 - 16 - 31
10.0 — C36 - 37 - 38
40.0 — C34 - 35 - 39
Note: There is no C32.

Transformers — Chokes

T1 — Thordarson Band-Pass T-49700
T2 — Stancor PC 8405
T3 — Stancor PA 8421
L1 - 2 - 3 — Stancor C-1001
SR1 — Federal 1004A
CR1 - 2 — GE 1N34A

Operation of Orientation Range Mechanism

Phil Caton, W2JAV and Roy Urain, W3CRO

The receiving unit of a teletypewriter is equipped with a mechanism whereby the time of selection may be changed with respect to the start signal. This is accomplished by varying the position of the latch assembly, which determines the point where the mechanism begins to rotate upon the receipt of a start impulse from the sending teletypewriter. The latch assembly may be removed mechanically through an arc corresponding to the length of a unit impulse, which permits all the selecting segments to be shifted with respect to the beginning of the start segment over a scale range equal to the length of a unit impulse (22 ms). This mechanism is known as a range finder and is equipped with a scale having divisions from 0 to 120.

The scale is calibrated in percent of a unit signal impulse; one hundred divisions on the scale representing an arc equal to a unit segment. Movement of the range finder toward the lower numbers on the scale reduces the time between the start and the selecting points and thereby advances the time of selection toward the beginning of each unit impulse. Likewise, a movement on the scale towards the higher numbers retards the time of selection toward the end of the impulses. The adjustment of the range finder is known as orientation, and the readings obtained therefrom are an indication of the quality of the signals being received. It is used to adjust the receiving mechanism for operation with minimum chance for error.

READINGS ON TELETYPEWRITER RANGE FINDER			INTERPRETATION
Lower Limit		*Upper Limit*	
10	to	90	Signals are perfect.
30	to	90	Lower limit raised 20%. Total distortion is 20%. The most probable condition is that there is a spacing bias of 20%, although in certain cases this effect may be due to characteristic distortion.
10	to	70	Upper limit lowered 20%. Total distortion is 20%. The most probable conditiontion is 20% marking bias, although in certain cases this effect may be produced by characteristic distortion.

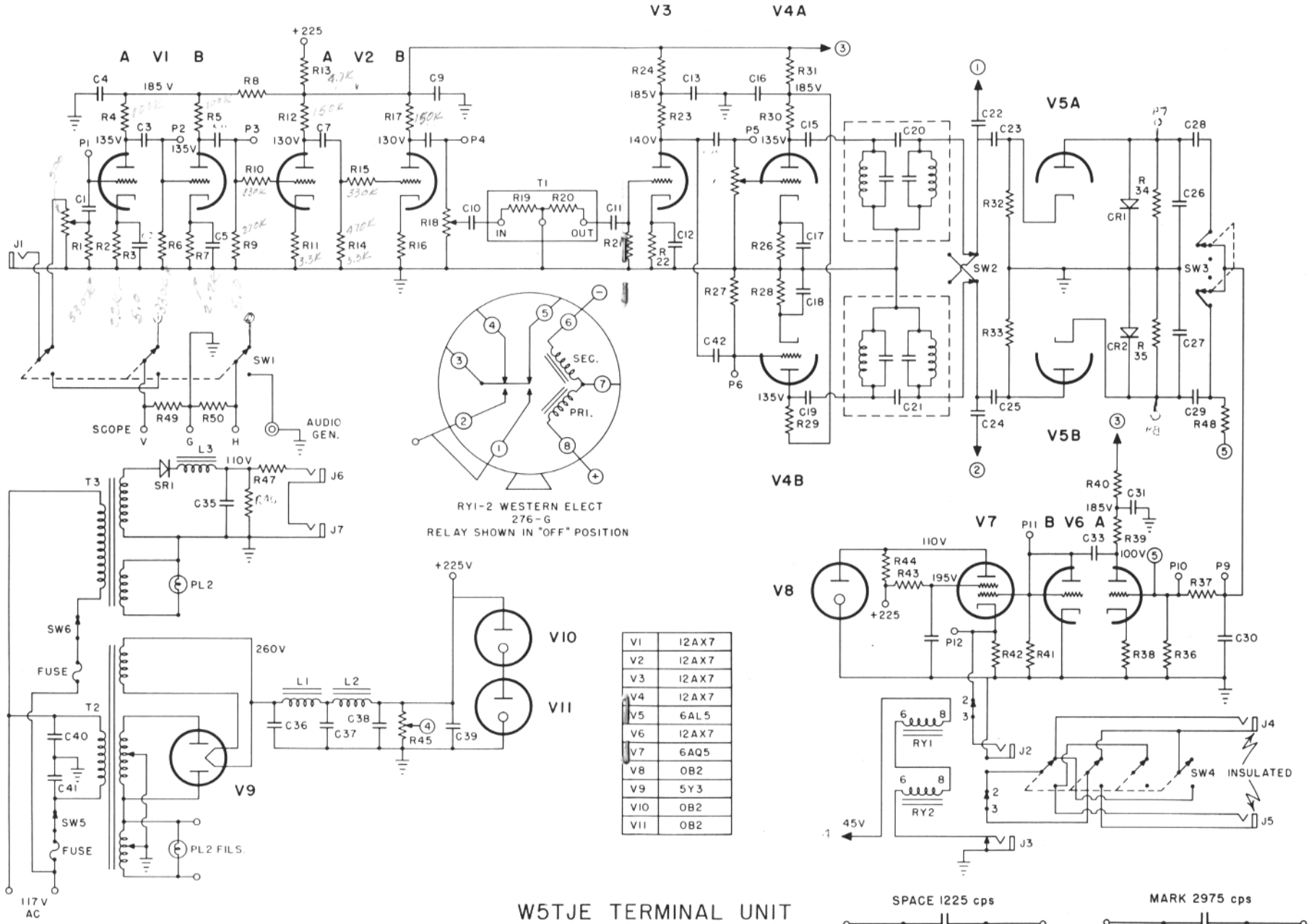
READINGS ON TELETYPEWRITER RANGE FINDER			INTERPRETATION
Lower Limit		*Upper Limit*	
25	to	75	Lower limit raised 15% and upper limit lowered 15%. Total distortion is 15%. Signal probably contains no bias. Distortion probably consists mostly of fortunitous effects, although this range may be produced by characteristic distortion.
40	to	70	Lower limit raised 30% and upper limit lowered 20%. Total distortion is 30%. Signals probably contain about 10% spacing bias and 20% fortuitous or other distortion.
20	to	100	Both limits raised 10%. Total distortion is 10%. This effect may be caused by distortion at the beginning of the start pulse, possibly caused by improper adjustment of stop pulse contact of a keyboard.
41	to	102	Lower limit raised 31% and upper limit raised 12%. Total distortion is 31%. Probably caused by sending machine being slower than the receiving machine. If no other distortion is present, the speed discrepancy would in this case be 6%.

Test - Point - Peak to Peak Voltages to Ground for W5TJE Converter

P1 — 0.5V
P2 — 5.0V
P3 — 100V
P4 — 100V+
P5 — 1.0V
P6 — 1.0V
P7 — 5.0V
P8 — 5.0V
P9 — 5.0V
P10 — 2.5V
P11 — 100V+
P12 — 40V

Jacks

J1 — Input - 500
J2 — Printer - TU
J3 — Keyboard - TU
J4 — FSK1 - VFO #1
J5 — FSK2 - VFO #2
J6 — Printer - Test
J7 — Keyboard - Test



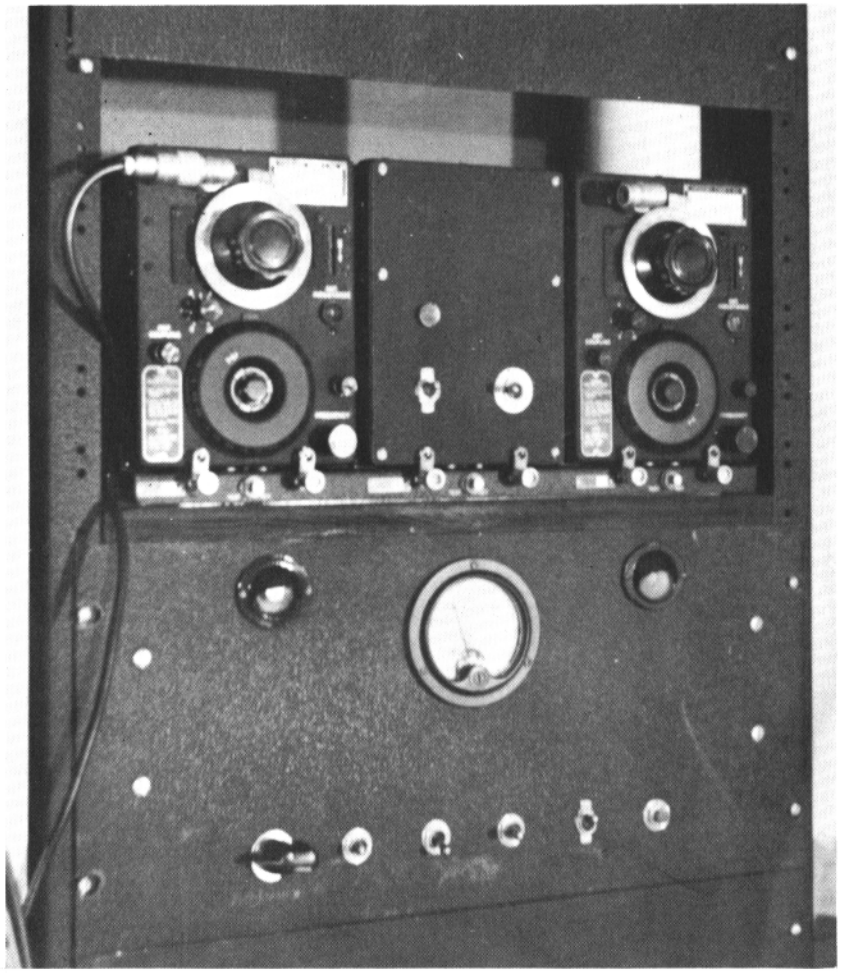
RY1-2 WESTERN ELECT
276-G
RELAY SHOWN IN "OFF" POSITION

V1	12AX7
V2	12AX7
V3	12AX7
V4	12AX7
V5	6AL5
V6	12AX7
V7	6AQ5
V8	0B2
V9	5Y3
V10	0B2
V11	0B2

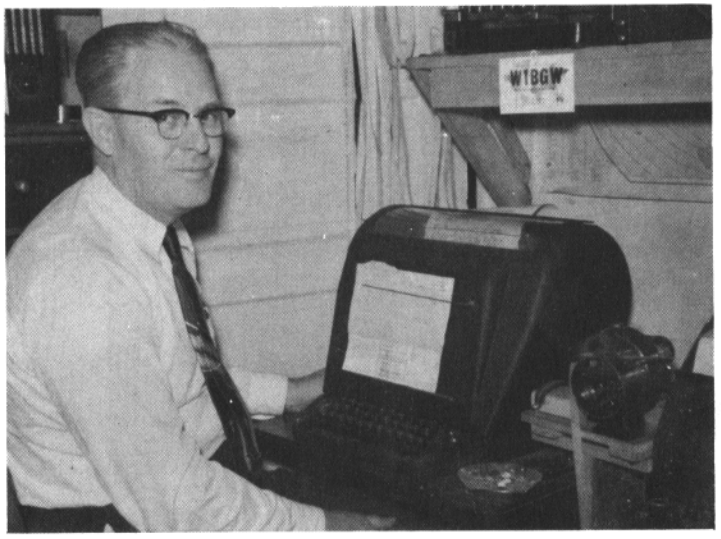
W5TJE TERMINAL UNIT

Cover Photo

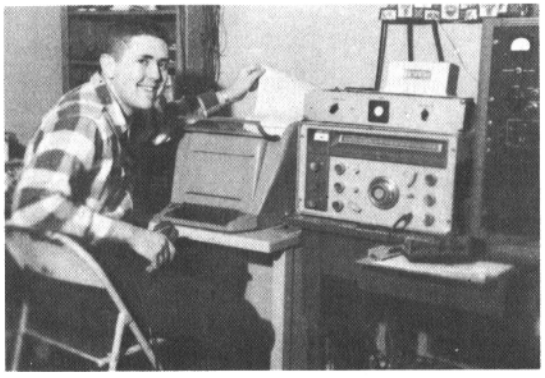
FRED HEWARD K6EER — REDWOOD CITY, CALIFORNIA



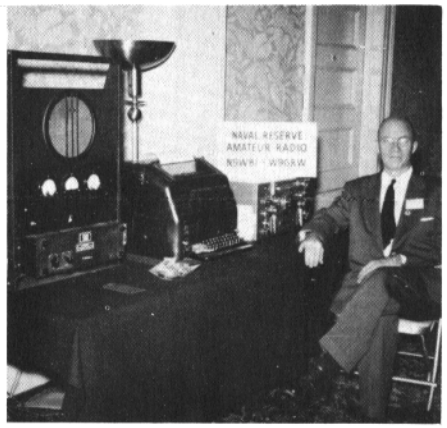
ARC-5 CONVERSION
FOR
F S K



W1BGW — with
W6AEE at PRINTER



W7ULL



W9GRW

W6AFX

Merrill The convention program says you are skeduled to give a talk on the history of Amateur RTTY and the procurement of equipment, that will be on Saturday . . .

. . . W4LMN Nashville Tenn. de W5JBW Near Lake Charles La. . . .

KH6ZD de KH6LD fine Larry, you are sure doing OK, in a few weeks you will be typing very fast, just like tape . . How much damage did the big wind do at your house? Is your beam antenna still on the roof? I wonder when my key tops and palletts are coming so I can use all the punctuation marks. You should see the house at Kaneohe with the top blown off . . .

KH6LD de KH6ZD roger. on the house, that roof sure went high, I'll bet. Lucky it wasn't our househi, the beam seems to have withstood the winds pretty well, It has been up since 1947. . .

The rtnet seems to be getting very popular these days. We had our first meeting of the Midwest rtnet last Sunday, and eleven stations reported in. On 3624.0 KCS. Let me put on a tape . . .

The following sked for QSTs . . . Wednesday 2030 and 2230 CST Friday 2030 CST Sunday 1500 CST

de W9TCJ/9

NCT NR. 19 from W6VPC, Oakland, Calif. Feb'y. '56.

To All Radio Amateurs:

Spence your VFO has drifted off this frequency pse reset QRM . . . W9LDH es W9TCJ de W8SDZ K K K

I loaned a tape with white noise on it and RTTY signals on it to the ole dog Beep . . . at the Chicago affair . . . the reel had about one third of it used for the demonstration signal . . . and when I got it back I never used more that the same area for checking the noise on various deals, well tonight after all these months, I find that the dog recorded a lot of junk on the unrecorded portions, what a guy . . . he put a mess of junk and stuff on it and some of his testings and RYRYs on it with interference on it from a supposed CW station just to demonstrate the deal of RTTY and the immunity to CW . . . The hooker was that the interfering signal was signing WN2JAV WN2JAV etc . . . W2PBG de W2JAV

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and is published for the benefit of all RTTY Amateurs and Experimenters
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For Information Regarding the Society Contact the Following:

W6CLW—Ed Simmons
W6AEE—Merrill Swan
W6SCQ—Lewis Rogerson

For Traffic Net Information:
W6FLW W6IZJ

For "RTTY" Information:
W6CL W6DEO W6AEE

The first meeting of the Northern California Chapter of RTTY Hams was held at the Oakland Radio Club on Friday February 24th. A splendid talk was given by W6FDJ on "Construction of Filters". The use of surplus Toroids was demonstrated by W6FDJ and fifteen of these were distributed as prizes.

W6EFT gave a talk and demonstration on the RTTY Converter which he has recently developed.

A demonstration and talk was given by W6VVF on the new Altronic Converter which embodies the circuit of the converter shown in the January issue, 1953, of QST. The Altronic being a commercially built converter of this type.

W6EFT, Roger Bunce, was nominated as chairman of the group to represent San Francisco, Marin County and the Peninsula Area, while W6VPC, Buck Buchanan was appointed in the same capacity for the East Bay Area.

The following hams were in attendance at the meeting; W6UQ, W6JZ, W6FSL, W6FZC, W6ACN, K6GZ, W6NKP, W6BFZ, W6FDJ, W6ZSS, K6EJM, W6EFT, W6CBF, W6BNBZN, K6EER, W6MTJ, W6MKT, W6VPC, W6WOC, W6VVF, W6ASJ, W6DNX, K6AIV, W6OWP, W6AHH, W6QJV. The meetin adjouned with the prize drawing and serving of refreshments. It was voted that the next meeting of the group would be held on the San Francisco side of the Bay on Friday, April 20th at a time and place to be selected by the chairman, W6EFT. Due notice will be given. An invitation is extended to all hams now operating RTTY or those interested in RTTY to attend the next meeting. Mail your advance registrations to W6EFT or W6VPC. BT

Letter by W9TCJ

"Multipath Propagation" is a phenomenon that is strikingly shown by the failure to obtain consistent printing on such "strong" signals as those from Barranguilla - Bogota South American RTTY stations. Sometimes their signanls are printable and will print solid copy for hours. Other times however the printing is erratic even though the signals apparently is as strong as ever. Simultaneous appearance of both mark and space tones have been observed on the indicator tubes thus confirming the variation in timing on both signals as received on frequencies even only 850 cycles apart. This is one of the reasons for our efforts to obtain short-shift authorization. It is felt that if we operated on shifts one quarter the 850 cycle value, multipath timing disruptions would be reduced to matter of one or two milliseconds instead of six milliseconds as stated in the teletech acticle.

In reference to the double-doubler. Previous tests with this circuit as developed by W9TCJ & WOBP were of necessity under laboratory conditions with perfect signals, no QSB, and no drift. One possible defect in this double doubler circuit is the lack of input limiting on the front end. However, this is only one of a number of related factors that work to its detriment. Its prolific generation of Harmonics is a case in point. For instance, while 531 cycles produces a fourth Harmonic of 2125 CPS, if the receiver should happen to be somewhat mistuned, resulting in a frequency of 496 CPS, the sixth Harmonic of that frequency is 2975 CPS, the space freq!

The most successful method of making present (850-cycle shift) terminal units work properly on narrow shift signals is the "straddle" system. The mark and space tones are "bracketed" about the "crossover point" in the discriminator characteristic. This assumes that the mark and space filters are broad enough so that there is some decent slope for the discriminator at the 2550 CPS point. This is being done at present at W9TCJ, using the same "Little-Gems" terminal unit described in April 1953 "RTTY". This is the circuit using a flipflop DC amplifier between the detector output and the magnet keyer. To make the story short, it has been determined that this converter will copy shifts as short as 30 to 40 cycles directly ! ! ! Of course this was done under laboratory tests, but at least successful receptions of WOBP's short shift Signals have been done here, using 212.5 CPS shift as set up there. No particular difficulty was found using the converter "as is", without benefit of additional special circuitry to help its ability to copy short-shift signals.

Success of any given terminal unit to copy short shift apparently depends on whether there is "enough" DC voltage output from its dectector to swing the Polar Relay Armature from mark to space and back with little or no bias, or to swing a magnet keyer tube from cut off to full on with like characteristics. TU's employing toroidal filters may be expected to be "too sharp" for the straddle method to work. Likewise there are other factors which make it hard to say definitely the causes.

In short, try the straddle method with your terminal unit. It may work and if so it is a fine interim method so hams can copy short-shift RTTY until a later date when we decide on a "permanent value of narrow-shift."

Let us continue our tests with narrow shift. This not only helps us perfect our equipment to work through QRM and QSB, also to improve our transmitters and receivers in stability, to the benefit of the whole radio art.

Cordially,
Bob Weitbrecht W9TCJ

PROPOSED RTTY ACTIVITY

ARRL Convention to be Held in San Francisco July 6, 7, 8, 1956

There will be a continuous demonstration of amateur radio teletype showing traffic being sent and received by RTTY. Mock up messages will be sent and received by low frequencies and relayed by VHF. Message traffic will eminate from California National Guard Mobile Unit then will be received in Larkin Hall, reperforated and delivered on two meters using AFSK. The two meter stations would represent local distribution within a city. The low frequencies station would be the Inter-town or State Link. Participants would present Amateur RTTY as used in traffic nets, MARS, and Civil Defense.

A two hour session featuring talks by Merrill Swan W6AEE and Roger Bunce W6EFT will be held in the morning. The session will be held in two parts. The first part will be a talk given by Merrill Swan "The Story of Amateur Teletype." Merrill will give the historical background of teletype and what has been done for the amateur in procuring the necessary machines and equipment used in RTTY. He will also tell of RTTY Net activities in Southern California and activities in the east. Following Merrill's talk there will be a ten minute

The second one half of the program will feature a talk given by Roger Bunce who will preent a technical talk on RTTY Terminal units and frequency shift terminal units.

Reading material and circuit diagrams of RTTY equipment will be given for the asking. Other technical matter will be discussed, time permitting.

JULY 8, 1956

There will be a RTTY Breakfast and a talk by "Bart" W6OWP on commercial RTTY. A field trip will follow the breakfast and talk for those interested. The trip will tour the San Francisco and Belmont facilities of press wireless.

Comments on this proposal are in order and would be greatly appreciated.

R. L. Wixon W6FDJ
3018 Berlin Way
Oakland 2, California
Phone NR. AN 1-3663

Above as perforated at WOBP April 29, 1956 (The Black Out Period ! ! !)