

F. S. K. MADE EASY

By ROY F. LA VIOLETTE, W6NYF, Los Angeles

This article describes a simple way to Frequency Shift Key (F.S.K.) any medium frequency transmitter. This is done without any relays or tricky adjustments. This circuit will key "Right Side Up," or Reversed just by the throw of a switch. As to which is which remember the old adage, L.S.M.F.T. (Low Space Makes Fine Teletype). There is no precise tuning in the unit as the one tuned circuit needs to be only approximately tuned to the 2975 cycles space frequency.

Many teletype amateurs get their start on Two Meters using Audio Frequency Shift Keying (A-F.S.K.). The writer uses a Model 26 machine with the keyboard contacts keying an audio oscillator to get A-F.S.K. This system is widely used and gives very little trouble. When Low Frequency F.S.K. was contemplated many keying systems were investigated. Careful readers of RTTY will recall many fine articles on this subject. Some of these systems required changing the method of keying the A.F.S.K. oscillator, others use keyer tubes at the output of the terminal unit and still more use relays. None of these systems seem interesting so the following approach was developed.

Since the output of the A.F.S.K. audio oscillator contains Mark and Space tones keyed by the teletype machine, why not use these tones to key an F.S.K. diode? If these tones could be changed to D.C. pulses and impressed on a diode in the transmitter, F.S.K. would result.

This unit works in the following manner: The tones from the A.F.S.K. audio oscillator are fed to the Grid of a tube, $\frac{1}{2}$ of a 12AT7. Since this tube has a tuned circuit in its plate circuit it will amplify one frequency and reject others.

Normally this circuit is tuned to the 2975 cycle Space tone. This tone is passed through a 1N34 Diode rectifier to develop a negative voltage on the Grid of the second half of the 12AT7. You will not that there is a Neon Bulb, a NE-51, from the plate of this tube through a resistance to ground.

When the teletype machine keyboard is at rest there is of course a Mark condition. This Mark tone of 2125 cycles does not get amplified by V1a since its plate circuit is tuned to the Space tone, so no negative voltage is impressed on the Grid of V1b. During this interval this tube draws about $1\frac{1}{2}$ millamperes and the plate voltage is close to 45 volts. When a Space tone comes through it is amplified by V1a and rectified by the 1N34. The Grid of V1b receives a large minus voltage thus cutting off its plate current. Naturally the plate voltage rises since there is no plate current and when it gets to about 90 volts the NE-51 fires. This results in one millampere flowing through the NE151 and the 30 K ohm resistor, giving a plus 30 volt pulse out. You will notice that V1b is not an amplifier but rather a switch tube with only two conditions, full plate current or no plate current. As long as the negative pulse on the grid is great enough for cutoff the output pulse will be the same.

In practice this unit delivers a very solid plus 30 volts on Space and zero volts on Mark. The total current drain for this unit is just over 2 millamperes at 150 volts regulated.

The inductance used can be almost any type available. The only requirement is that it resonate at the Space frequency and have a fair Q. The coil used in this unit was a surplus C-114 loading coil

of 88 Mh inductance. The NE-51 neon bulb was mounted in a standard pilot light holder on the front panel of the Terminal Unit and gives a good check on the keying. Well anyhow, it looks pretty flashing away.

The 12AT7 stage was built into a 2"x2"x4" Vector Box, with a nine pin socket at the top and an octal plug on the bottom. This box plugs into a matching socket built into the terminal unit. The C-114 toroid coil was mounted around the center post of the box, by cutting the post and slipping the coil on and reassembling the unit.

The 500 K ohm input level control was mounted under the terminal unit, as this control is adjusted when the keyer is installed and not touched thereafter. Actually this control can be replaced with two fixed resistors after the unit has been adjusted to the output voltage of the A.F.S.K. audio oscillator. The keyer needs only .25 volts to operate and most oscillators deliver several volts — hence the input control.

The F.S.K. Diode Modulator is mounted near the V.F.O. tube in the transmitter. It is a 6AL5 with both sections in parallel. The 100 K ohm potentiometer should be mounted on the front panel of the transmitter to allow setting the amount of frequency shift. On a Heathkit DX-100 I used a concentric control with two independent sections, a 500 K ohm rear section for the microphone gain and for the front section a 100 K ohm for the F.S.K. adjust. The action of the shift control is very smooth and does not change the Mark frequency appreciably, just the amount of shift. If insufficient shift is obtained increase the value of the 10 mmfd condenser going to the cathode of the V.F.O. tube. However this identical type of F.S.K. unit has been used in several types of V.F.O.'s including one built from an L.M. frequency meter, without requiring component changes.

Let us look briefly toward the theory of this Diode Modulator. The 10 mmfd condenser from the cathode of the V.F.O. tube has little effect on the transmitted frequency as it is in series with the small internal capacity of the 6AL5. However as the keyer unit begins to deliver a plus voltage the 6AL5 begins to draw current and the 10 mmfd condenser is brought closer to ground. The larger the positive voltage the greater the effective capacity of the 6AL5. You will recall that for a Space tone the Keyer unit delivers a plus voltage, and a plus voltage causes the V.F.O. to shift lower in frequency. Remember L.S.M.F.T.?

It was stated in the beginning of this article that this system would produce "Right Side Up" or Reversed keying. The original model had a switch that would do just that, but there has been very little call for it. It is a very simple addition however. You will note that if tuned circuit in the plate of V1a were to resonate at the 2125 cycle Mark frequency rather than the Space frequency the entire operation would be reversed. The Keyer would send out a plus 30 volts on Mark and zero volts on Space. All it takes is an additional condenser to resonate the inductance to 2125 cycles connected across this coil in series with a SPST switch.

After the keyer unit is installed in the terminal unit and the diode modulator is in the transmitter, the setting of the Input Level control is a simple matter. Start with the control at zero, type on the teletype machine and advance the control while watching the NE-51 neon bulb. Note the point the bulb starts to follow the keying and turn the level control up further until the neon bulb is fired 100% of the time. Now back the control $\frac{1}{2}$ way between these points and the job is done. This keyer unit will accept input signal variations many times greater than will be developed in your A.F.S.K. audio oscillator.

See you on the D.C. bands.

W2PBG, BAYSIDE, L. I., N. Y.

ROBERT STRAUB

Machines:—Model 15

Model 14 keyboard-perforator
Western Union 1-A Tape Head
Morkorum Distributor
WU5032A Transmitter-Distributor

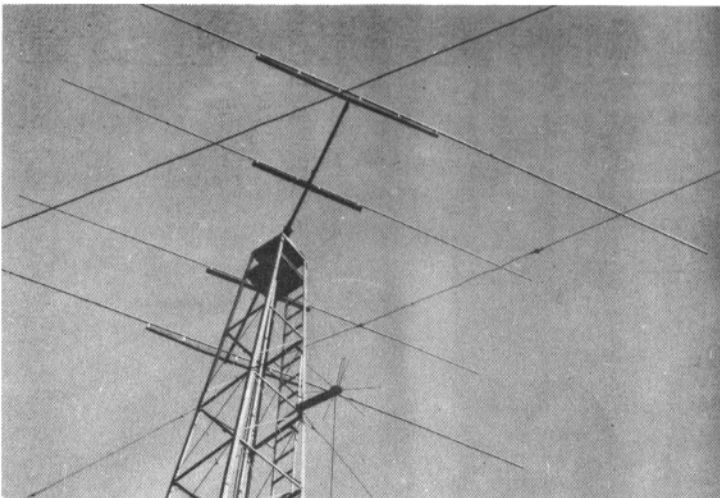
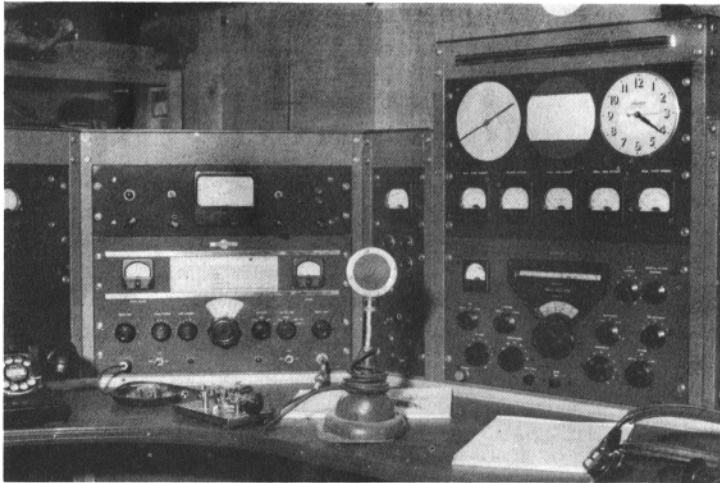
Converters:—W2PAT audio
W6UPY audio
Model FRF I-F

Receiver:—Collins 75AZA

Transmitter:—Kilowatt, using 4-250's
in final

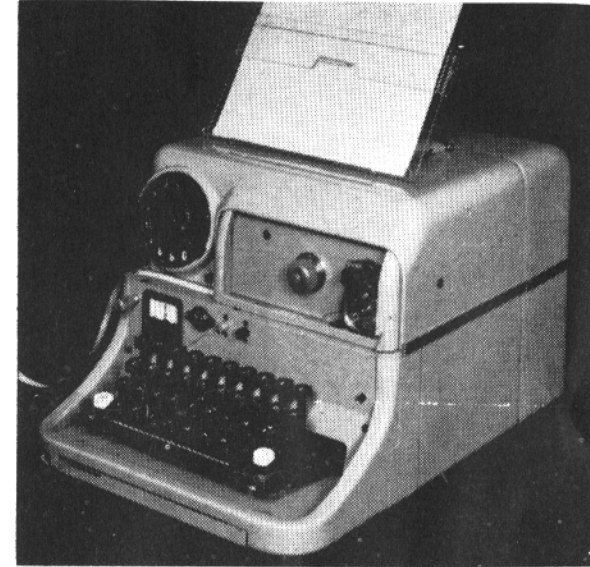
Antennas:—Half-wave center-fed di-
pole for 80. Combination 40-20-15
meter beam on a tower.

Misc.:—W2JAV Frequency Meter



MODULATOR DESIGN TELEWRITER

TYPES FROM ROTATING WHEEL*



BRNO, CZECHOSLOVAKIA—Simplicity and ease of maintenance characterize a tape-style teletypewriter which features a continuously rotating type wheel. Complete separation of electrical and mechanical components is achieved in this design by sealed, self-contained units which plug in or clamp on inside the machine housing.

In this Dalibor unit the usual clutch arrangement for actuating type keys is replaced by a system utilizing a detachable wheel carrying type on its circumference. A message tape fed through the machine and beneath this wheel is struck by a hammer at the instant the desired type character appears opposite it. This hammer blow is of such short duration that no noticeable smearing results in

spite of the wheel's uninterrupted rotation. Timing is achieved automatically by a selection mechanism which picks out, from a cluster, the particular actuating dog associated with the character to be written, causing it to strike the hammer. Almost the entire duration of one wheel rotation is available for accomplishing selection, a feature which permits this instrument to accept a wider range of distortion in signal pulses.

Produced by Zavody Jan Svermy, this telewriter may be coded from a remotely located keyboard which connects to it by an eight-conductor cable. Servicing operations are facilitated greatly by the consolidation of elements into easily removable "package" units.

W0USQ — Davenport, Iowa



Have enclosed a picture of the shack. Left to right — Ranger, Collins 75-A3, Viking 6N2, BC-459 VFO for 6 and 2 meters, Model 26. Antennas are an 8/8

long john Telrex yagis on 2 meters, 3/3 Telrex on 6, Dipole on 80 and 40 and Vertical ground plane on 20, 15 and 10.

—73 Claude, W0USQ

W6JAU — Arcadia, California



Am enclosing a photo of the station showing the model 26 with mechanical carriage release added. The terminal unit is 6AEE with some minor variations. Receiver in upper right is a variable tuned 522 and 522 companion transmitter at bottom. Antenna is a ground plane. Oper-

ation is confined to 2 meters at present time.

Low frequency gear is on desk to left with Johnson Viking-LM freq. meter etc.

Received letter of acknowledgement for perfect copy of Armed Forces Day Message from NDW.

Traffic Net News

By EMILE DUVAL, W6FLW

The RTTY Society of Southern California Net operates every Tuesday evening at 8:00 p. m. on 147.85 mc.

ACTIVITY FOR THE MONTH OF DECEMBER, 1956

Dec. 4—W6DYB, N. C.—28 Checkins

W6ADD	K6JDN
W6AEE	W6KUM
K6BPI	W6LDG
K6BTK	W6OJF
W6CAP	W6ORF
K6CHU	K6QFY
W6CKS	KN6QQV
W6CMQ	W6QHR
W6DEO	W6SCQ
W6DYB	W6SQM
W6FLW	W6VAD
W6ICS	W6WYH
K6IHG	W6ZBV
W6IZJ	W6ZVO

Dec. 11—W6DYB, N. C.—23 Checkins

W6ADD	W6JAU
W6AEE	K6JDN
K6BPI	W6LDG
K6BWJ	W6OJF
K6CHU	W6PZV
W6CKS	KN6QQN
W6CMQ	W6SCQ
W6DEO	W6SQM
W6DYB	W6FLI
W6FLW	W6ZBV
W6ICS	W6CAP
W6IZJ	

Dec. 18—W6DYB, N. C.—26 Checkins

W6ADD	W6IZJ
W6AEE	W6JAU
K6BPI	K6JDN
K6BTK	W6KUM
W6CAP	W6LDG
K6CHU	W6ONB
W6CSS	W6OJF
W6CLW	K6QFY
W6CMQ	KN6QQV
W6CZ	W6SCQ
W6DYB	W6SQM
W6ICS	W6WYH
K6IHG	W6ZBV

Dec. 25—No Checkins—Holiday.

ACTIVITY FOR THE MONTH OF JANUARY, 1957

Jan. 1—No Checkins—Holiday.

Jan. 8—W6FLW, N. C.—26 Checkins

W6ADD	W6KUM
K6BTK	W6LDG
K6BWJ	W6ONB
W6CAP	W6OJF
K6CHU	W6PWB
W6CKS	K6QFY
W6CMQ	KN6QQV
W6DYB	W6QHR
W6EV	W6SCQ
W6FLW	W6SYP
K6IHG	W6TLI
W6IZJ	W6TFS
K6JDN	W6ZBV

Jan. 15—W6ADD, N. C.—30 Checkins

W6ADD	W6JFZ
W6AEE	W6KUM
K6BWJ	W6LDG
W6CAP	W6OJF
W6CKS	W6ORF
W6CLW	W6PWB
W6CMQ	W6PZV
W6DYB	K6QFY
W6EV	KN6QQV
W6FLW	W6SCQ
K6CHU	W6SYP
K6IHG	W6TLI
W6IZJ	W6VAD
W6JAU	W6ZBV
K6JDN	W6ZLU

Jan. 22—W6ADD, N. C.—32 Checkins

W6ADD	K6JDN
W6AEE	W6KUM
K6BTK	W6LDG
K6BWJ	W6OJF
W6CAP	W6PZV
K6CHU	K6QFY
W6CK	KN6QQV
W6CKS	W6SCQ
W6CLW	W6SYP
W6CMQ	W6TFS
W6CZ	W6TGM
W6DYB	W6TLI
W6FLW	K6WAH
K6IHG	W6WYH
W6IZJ	W6ZBV
W6JAU	W6ZVO

Jan. 29—W6FLW, N. C.—32 Checkins

W6ADD	K6JDN
W6AEE	W6KUM
K6BPI	W6LDG
K6BWJ	W6ONB
W6CAP	W6OJF
W6CK	W6PWB
W6CKS	W6PZV
W6CLW	K6QFY
W6CMQ	KN6QQV
W6CZ	W6SCQ
W6DEO	W6SYP
W6DYB	W6TFS
W6FLW	W6TLI
K6IHG	W6VAK
W6IZJ	K6WAH
W6JAU	W6ZBV

ACTIVITY FOR THE MONTH OF FEBRUARY, 1957

Feb. 5—W6CMQ, N. C.—27 Checkins

W6ADD	W6KUM
W6AEE	W6LDG
K6BPI	W6ONB
K6BWJ	W6OJF
W6CKS	W6PZV
W6CMQ	K6QFY
W6CZ	KN6QQV
W6EV	W6SCQ
W6FLW	W6SYP
W6ICS	W6TLI
K6IHG	W6TGM
W6IZJ	W6WYH
W6JAU	W6ZBV
K6JDN	

Feb. 12—W6CMQ, N. C.—33 Checkins

W6ADD	W6ONB
W6AEE	W6OJF
K6BTK	W6PWB
K6BWJ	W6PZV
W6CAP	K6QFY
K6CHU	KN6QQV
W6CKS	W6SCQ
W6CLW	W6SQM
W6CMQ	W6SYP
W6DEO	W6TLI
W6EV	W6TFS
W6FLW	W6TGM
W6IZJ	W6VZV
W6JAU	W6WYH
K6JDN	K6WAH
W6KUM	W6ZVO
W6LDG	

Feb. 19—W6CMQ, N. C.—31 Checkins

W6ADD	K6JDN
W6AEE	W6LDG
K6BWJ	W6OJF
W6CAP	W6ONB
K6CHU	W6PZV
W6CK	KN6QQV
W6CKS	W6QYZ
W6CLW	W6SCQ
W6CMQ	W6TLI
W6CZ	W6TGM
W6EV	W6WYH
W6FLW	K6WAH
W6ICS	W6ZBV
W6ILW	W6ZV
W6IZJ	W6ZVO
W6JAU	

Feb. 26—W6LDG, N. C.—33 Checkins

W6ADD	W6KUM
W6AEE	W6LDG
K6BPI	W6OJF
K6BTK	W6ONB
K6BWJ	W6PZV
W6CAP	K6QFY
K6CHU	W6QYZ
W6CKS	W6SCQ
W6CLW	W6SQM
W6CMQ	W6SYP
W6DYB	W6TFS
W6EV	W6TGM
K6EAA	W6TLI
W6FLW	W6WYH
K6IHG	K6WAH
W6IZJ	W6ZBV
W6JAU	

FLASH!!

NEXT MONTH

SPECIAL

MID-WEST

ISSUE

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