

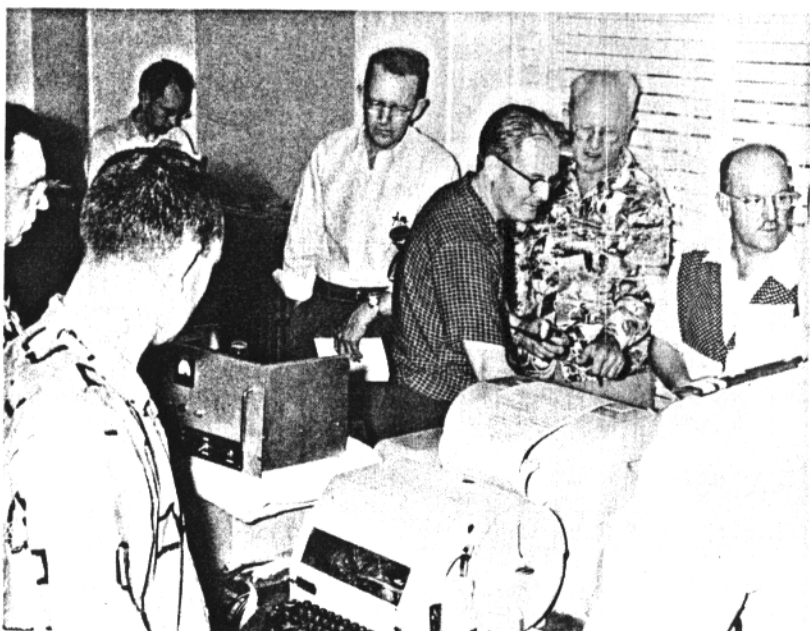


## Radio Amateur Teletypists Society

MINNEAPOLIS, MINN.

Fifteen members of the Radio Amateur Teletypists Society attended the January 9th meeting at WØBP who demonstrated fundamentals by specially prepared tapes, slow linear sweep scope, rotating neon bulb and models 14, 15 & 26 machines. After refreshments he read a paper on machine adjustments and showed by scope the instantaneous printer magnet armature positions and also various types of distortion. Very interesting discussions lasting until after midnight were participated in by the

members pictured who are employed by Bell System, Western Union, FCC, armed forces, airlines, and several communications laboratories in the Twin Cities. Similiar meetings and discussions are planned for the second Monday of each month and visitors are welcome. Officers for 1956 are: WØBP *Quick Brown Fox*, WØHZR *Lazy Dog*, and WØLFI *RY*. Several "Brother Rats" know the code but all pictured know the one hole single pulse letters and characters plus R and Y.



RTTY DEMONSTRATION  
Pacific Division Convention  
Fresno, California, 1955

## FCC Comment on Use of "Bell" Signal To Obtain Break-In Operation

FREDERICK H. WISE, W3LGK  
FRANK GIBSON, W3MHD

JANUARY 9, 1956

FEDERAL COMMUNICATIONS COMMISSION,  
WASHINGTON, D.C.

GENTLEMEN:

MANY RADIO AMATEURS ACTIVELY ENGAGED IN TELEPRINTER OPERATION WOULD LIKE TO USE A SYSTEM OF BREAK-IN IN ORDER TO OBTAIN A MORE RAPID MEANS OF EXCHANGING REMARKS AND TO SPEED UP TRAFFIC HANDLING AND OPERATION IN GENERAL.

A SYSTEM HAS BEEN WORKED OUT ALONG THESE LINES AND TESTS INDICATE THAT IT WILL FUNCTION VERY WELL. HOWEVER, THE QUESTION HAS BEEN RAISED AMONG US AS TO THE LEGALITY OF SUCH OPERATION.

A BRIEF DESCRIPTION OF THE SYSTEM FOLLOWS. A MICROSWITCH IS INSTALLED IN THE PRINTER SO THAT IT IS MECHANICALLY ACTIVATED BY THE "FIGURES" S OR "BELL" RINGING LEVER. THIS SWITCH IS USED TO OPERATE A RATCHET-IMPULSE RELAY CONNECTED SO AS TO ALTERNATELY PLACE THE TRANSMITTING AND PRINTING EQUIPMENT IN "SEND" OR "RECEIVE" CONDITION EACH TIME A PULSE IS APPLIED TO THE RELAY. AS A RESULT, TWO OR MORE AMATEUR TELEPRINTER STATIONS SO EQUIPPED MAY, BY DEPRESSING THE "FIGURES" S OR "BELL" KEY, TURN HIS OWN TRANSMITTING AND PRINTING EQUIPMENT OFF AND INSTANTLY PLACE THE TRANSMITTING AND PRINTING EQUIPMENT OF THE DISTANT STATION ON THE AIR -- READY TO TRANSMIT AT THE TOUCH OF THE KEYBOARD. PLEASE NOTE THAT THIS SYSTEM WILL ONLY TURN THE TRANSMITTER ON AT THE DISTANT POINT AND THAT THE OPERATOR MUST BE PRESENT AT ALL TIMES IN ORDER TO BREAK BACK TO THE OTHER STATION.

FCC RULE 12.107 (A) DOES, I BELIEVE, PERMIT USE OF THIS SYSTEM INASMUCH AS THE RULE STATES IN PART " BUT SPECIAL SIGNALS MAY BE EMPLOYED FOR THE REMOTE CONTROL OF RECEIVING PRINTERS, OR FOR OTHER PURPOSES, IN "FIGURES" POSITION NOT UTILIZED FOR NUMERALS".

PLEASE ADVISE WHETHER OR NOT THIS METHOD OF OPERATION WOULD BE CONSIDERED A DIRECT VIOLATION OF EXISTING FCC RULES. IT IS, OF COURSE, UNDERSTOOD THAT OTHER RULES PERTAINING TO TRANSMISSION OF CALL SIGNS FOR IDENTIFICATION PURPOSES WOULD BE ADHERED TO .

VERY TRULY YOURS,

FREDERICK H. WISE W3LGK  
324 CHESTNUT ST.  
ST. MARYS, PENNA.

COPY

*Frederick H. Wise*

*FCC Comments Cont'd.*

FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON 25, D. C.

January 18, 1956

ADDRESS ALL COMMUNICATIONS  
TO THE SECRETARY

IN REPLY REFER TO:

7400

Mr. Frederick H. Wise  
324 Chestnut Street  
St. Marys, Pennsylvania

Dear Sir:

This will acknowledge receipt of your letter dated January 9, 1956, wherein you describe a method of radio teleprinter operation to provide for break-in operation.

The system described would permit the operator of the transmitting station to place his equipment on receive position and to also turn on the transmitting equipment of the other station.

There appears to be no objection to the proposed operation provided a qualified operator is in attendance at both stations at all times. Otherwise, Section 12.64(b)(6) of Part 12, Rules Governing Amateur Radio Service, would apply.

Very truly yours,

*Mary Jane Morris*  
Mary Jane Morris  
Secretary

*COPY*

# *RTTY At Southwestern ARRL Convention, San Diego, California*



NAVY RTTY TRUCK



MODEL 28 TELETYPE

# Theory And Operation Of RTTY

Roger Wixon, W6FDJ

TTY is the Synchronized Pulse Time Base System using a 5 unit code requiring 163 milliseconds per character, the machine normally typing at the rate of 60 words per minute. The time pulse of 163 milliseconds is divided up into 22 millisecond pulses and one 31 millisecond pulse. The pulse time base is divided up into seven parts. From zero time to plus 22 milliseconds is the sync or start pulse, following are five 22 millisecond pulses which contain the TTY Character Code. These pulses are followed by a 31 millisecond rest or "stop" pulse, thus totalling 163 milliseconds, ei; the letter, "Y".

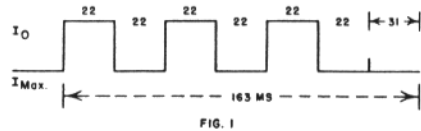


FIG. 1

As can be seen from the above wave form of the letter "Y" there are two states in which the TTY circuit can be in  $I_{Max}$  and  $I_0$ . These two conditions are known as "Mark" and "Space" respectively. When current is flowing in a TTY circuit the machine is said to be in the "Mark" condition. When no current is flowing in the TTY circuit the machine is said to be in the space condition. Thus the "Mark" and "spaces." It is the mark and spacing or, on and off, timing that is responsible for the machines operation.

Your Model 26 Machine has two main sections, the printer and the keyboard distributor. Either of these sections can be used independently or they can be wired in series and used together. This will allow you to send on a closed circuit to the printer via the keyboard distributor. The TTY circuit differs somewhat from most electrical circuits, in that, everything is wired in a closed

series circuit. This closed series circuit is known as the "Loop". The "Loop" is normally in the closed state with 30 or 60 mils flowing through it and is then in the "Mark" condition. If the circuit is opened, the "Loop" is in the "Space" condition. It is the precise timing of the opening and closing of the "Loop" that causes the machine to operate.

Electrically, there are two types of functions, one is the energizing of an electro-magnet, known as the "Selector" magnet. The second is the distributor which is nothing more than a single pole, single throw switch. This switch is normally closed.

Mechanically, there are 1500 to 2000 major parts, not including nuts, bolts and pins. Fortunately most of these parts are linkages and levers and we need not be too concerned with them. The most important part of the printer is the method of electrical to mechanical conversion. First of all the drive motor must be a 1800 RPM Synchronous Motor or an 1800 RPM Governed Motor. The speed of the motor is all important. In the "Mark" condition and the machine turned on, the 1800 RPM motor running, the printer is ready to receive a TTY signal.

For the sake of simplicity we will assume the machine is receiving the letter "Y" from its own keyboard distributor. In brief, the events that follow when the letter "Y" is punched at the keyboard are:

1. Letter "Y" is punched.
2. Keyboard code bars set up distributor code contacts.
3. Distributor clutch release is actuated.
4. Distributor makes one revolution;
  - A. Space 22 MS Start Pulse.
  - B. Mark 22 MS
  - C. Space 22 MS

D. Mark 22 MS

E. Space 22 MS

F. Mark 22 MS

G. Mark 31 MS Stop Pulse, (assuming another character to follow immediately.)

Total 163 MS

5. At 4-A, the Selector Magnet on the Printer Releases and the main shaft begins its rotation.
6. During 4-B, C, D, E, and F, Typing Selector Levers are presented one at a time to the Selector Magnet Arm and are either selected or rejected, depending on whether the Selector Magnet is in Mark or Space condition.
7. The Selector Levers set up a mechanical stop which is completed and coupled to the Type Wheel, in this case the Type Wheel will stop at the letter "Y".
8. Upon completing one revolution of the Main Shaft the Type Hammer is actuated, striking the Pallett, the actual typing is accomplished during the 31 millisecond stop pulse.
9. After striking the Palette the printer automatically spaces one character and idles in the mark condition until it receives another character from a TTY distributor. The distributor shaft turns at 368 RPM. There are two types of distributors. The cam driven multi point contacts and the rotary brush and ring. The tape distributor uses the latter. All distributors are made before break switch. The main advantage of the ring brush type is no adjustment is required. The disadvantage being, they are large and bulky. Just the opposite is true of the cam type.

The contacts on the Model 26 Distributor can be separated and used as a tape distributor and additional contacts have to be installed to actuate the tape feed magnet in the tape head.

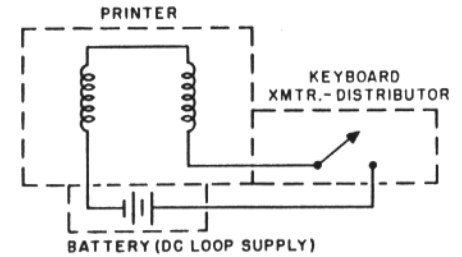


FIG. 2

## TTY CIRCUITRY.

Single machine operation, series mag-coils for 30 mil loop current. Main advantage of 30 mil operation is the use of lower voltage at the battery and on the loop. Remember magnets work on ampere turns.

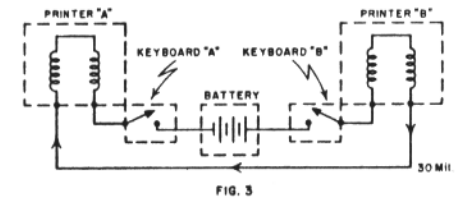


FIG. 3

Two TTY stations a short distance loop. Note 1. The term, battery is used in TTY work and refers to the power source for the loop current. Note 2. 60 mil operation requires paralleling the selector magnet coils. 30 mil operation requires seriesing the selector magnet coils. Either 30 or 60 mil operation work equally well.

RTTY

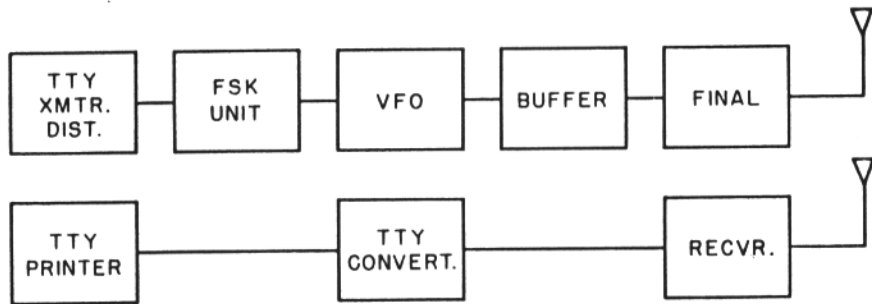
Radio Teletype, as far as the machines are concerned, is the same as Land Wire Teletype. RTTY is, therefore, a technique for converting land wire operation to RF and RF back to land wire.

All TTY operates on a make-break, on-off or mark-space, whichever you choose to call it. A most obvious way, then, to accomplish this would be to just key the RF via the keyboard transmitter distributor. At the receiving end allow the output of the receiver to acuate a relay which, in turn, could servo the battery and printer magnet. This system is being used in some parts at the present time and is known as the MBK Method.

This system has one big disadvantage

and that is that during the "break", off or space condition the system is wide open for interference which might be seen by the TTY machine as a marking impulse. This disadvantage was partly cleared up by using AFSK, Audio Frequency Shift Keying. AFSK utilizes two tone difference in frequency of 100 cycles or more. One tone represents a mark condition, the other tone represents a space condition. This system proved very successful for short distances. Phase distortion and fading made AFSK unsuitable for long distance RTTY.

FSK, Carrier Frequency Shift Keying proved to be the answer and is the most widely used method today. It is this FSK system that we will discuss in some detail here.



SIMPLIFIED BLOCK DIAGRAM OF FSK RTTY SET-UP

FIG. 4

A standard FS of 850 cycles has been adopted by most commercial stations and so, for the present, we will use that figure. In theory we assume that we are shifting about a center frequency, plus and minus 425 cycles.

SPACE	MINUS	CENTER FREQUENCY	PLUS	MARK
7139.575	= 425	— 7140KC	+ 425 =	7140.425
+		+		+
6685		6685 Local OSC. KC		6685 KC
"		"		"
454.575 KC		455 IF		455.425 KC
+		+		+
457.550		457.550 BFO KC		457.550
"		"		"
2975 Cycles				2125 Cycles
Space Signal				Mark Signal

The 2975 and 2125 cycle audio frequencies are sent from the receiver output to a frequency discriminating circuit and the 2975 tone is rectified to produce a negative pulse to the keyer tube and cause the tube to cut off, thereby, producing a space condition. The 2125 tone is rectified to give a positive pulse to the keyer tube and cause the tube to conduct, thereby, producing a mark condition.

The big advantage of this system is that the KF carrier is always present at the receiver, thus, allowing AVC to operate normally, minimizes QRN and ORM and offers a fairly high degree of selectivity.

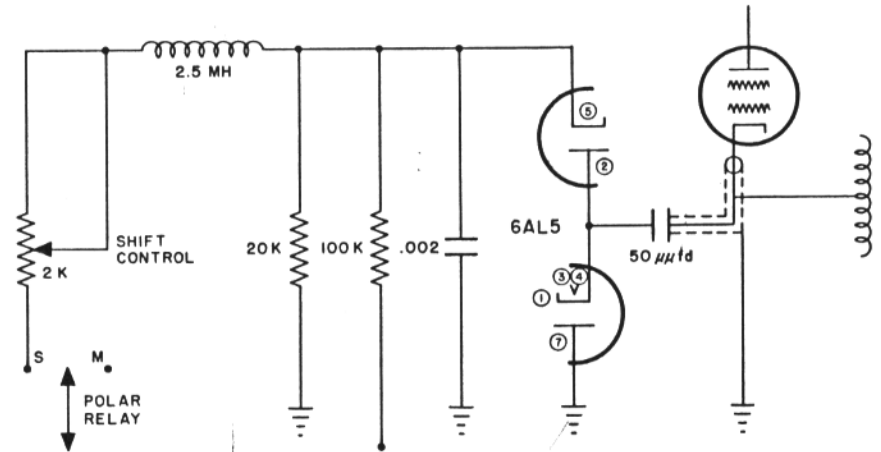


FIG. 5

FSK'ING YOUR TRANSMITTER VFO.

This circuit works very well with Collins and Viking VFO.

The only precaution in the FSK unit

is to shield the lead from the Cathode of the VFO to the FSK unit. Keep RF leads short and use a good wire wound pot.

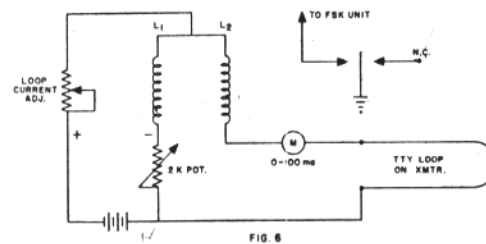


FIG. 6

POLAR RELAY CIRCUIT FOR F.S.K.

NOTE 1. Adjust the current through L-1 to equal 1/2 the current through L-2. Assuming the polar relay is properly adjusted. When the relay is working right, good crisp keying will result.

NOTE 2. Battery voltage should be adjusted to give 30 mils loop current.

AFSK CONVERTERS FOR RTTY

There have been as many converters designed and built as there are RTTY amateurs. There are two classes of converters, poor and good. Nothing is more annoying than poor copy on TTY. There have been two real good converters ap-

(Continued on Page 14)

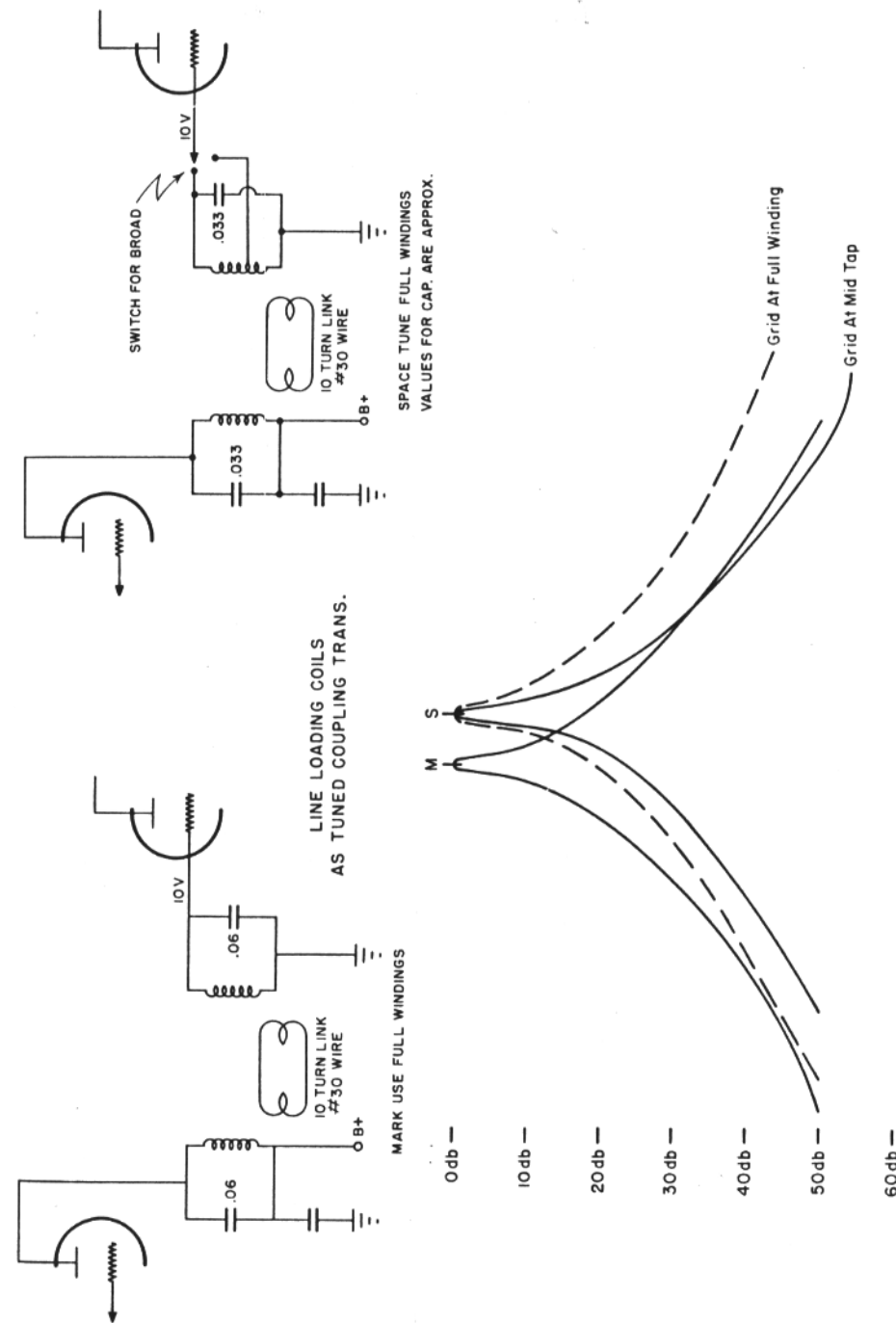
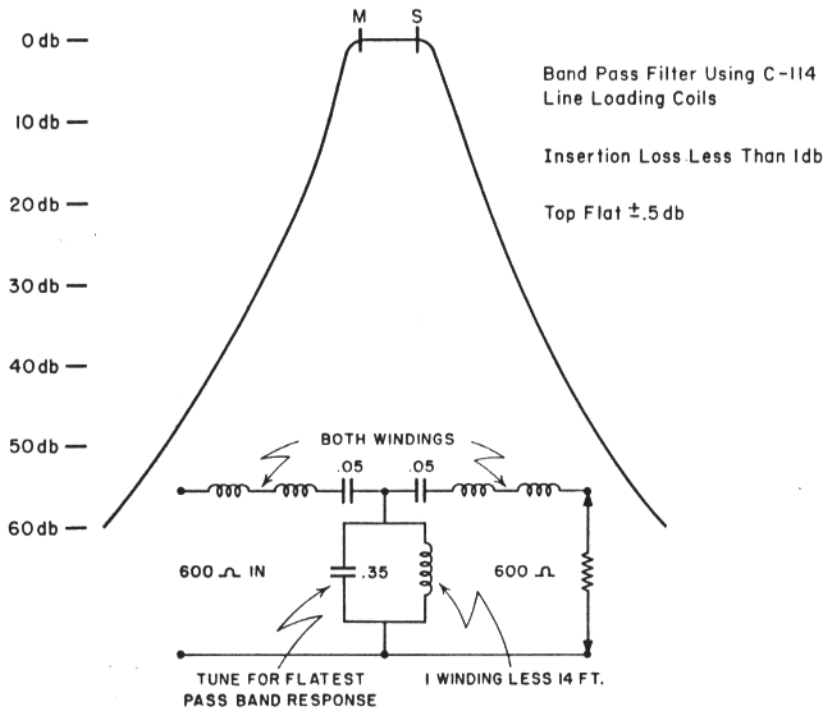
# Band Pass, Mark, Space Filters From The C-114 Toroids

Phil Catona, W2JAV

Shown is the circuit and values used to obtain the response curves given. The Band Pass filter should help some, considering the cost vs performance, it does very well. Three coils are required, two of the coils used with out removing any wire. The third coil should have approximately fourteen feet removed from one coil. Note that only one coil is used for the parallel tuned circuit. The values given are for a 600 ohm line. Further data on this type of filter may be found in the 1954 Edition of the

ARRL Handbook on page 541. It is shown as a Constant-k T section.

The tuned stages illustrated, have some merit, but such sharp response is difficult to use, since most signals are not that stable or set that close on frequency. The response is aprox 300 cycles at the 6 DB points. I find that two of such stages is about all the rise time of the transmitted pulse will stand. You will note a switch on the Space filter, which provides additional selectivity. The tuned stages operate with the usual type of triodes, that is, 6SN7 6SL7 etc. Coupling is obtained by the 10 turns wound over the top of the original coils.





## General Message To All Midwest RTNet Members

After some time of inactivity, the Midwest RTNET is now being reactivated and it is proposed to hold this every Sunday afternoon at 1600 CST on Mark-High Frequency of 3624.000 kc. The shift will be 850 cycles.

Due to the number of members likely to report in, it is suggested that operating procedures be "streamlined" and designed so as to conserve operating time and to expedite traffic handling to the maximum possible with the least expenditure of time in calling and general "Chit-Chat." Of course this idea is summed up as "Net Discipline". Some suggestions as to operating procedure follow.

(1) All stations are to zero in on 3624.000 kc Mark-High Frequency. The NCS will have this 3624.000 kc frequency set up and to serve as a reference for all members to zero-on. This procedure will enable all stations to intercommunicate with each other with a minimum of tuning and re-tuning required. It would be desirable to have all transmitter and receiver oscillators well warmed up in order to reduce drift to a minimum.

The FCC rules permit us to communicate with each other without signing calls—at least in CW—if each transmission is less than three minutes in length—but at least to the extent that station identifications are required in

both CW and RTTY modes every ten minutes. On this basis, after initial reporting on using calls on CW and RTTY, it is permissible to work almost the equivalent of "break-in"—that is, rapid switching between stations. One station calls another station in the net using a "one de one" call group, then asks a question, then sends "one de one" call group, and finally "BK." The answering station sends "one de one," answers the question, and then "one de one," finally "BK." This means all RTTY gear in the net should be capable of rapid send-and-receive switching—one switch is that is needed. It would be very convenient to have all member stations set up in this way.

Each RTTY station will be expected to reply to the NCS Roll Call first in CW and then RTTY when entering the net for the first time during the session. Then afterwards no further CW calls be necessary for any one concerned until his time limit of ten minutes is up if all transmissions are kept to less than three minutes in length.

On initial reporting-in, each station is expected to state how many messages he has on hand to be sent, and to where. If no messages, say so. Then the NCS will acknowledge by "BK" and proceed with the next station on roll call. Finally at end of roll, General Call will be made for other stations who wish to report in.

Then —

All messages will be exchanged, using standard procedures as formulated for CW traffic net work.

Then the net will be closed down by the NCS, and then all members may engage in general QSO'ing—whether on frequency or slightly to either side of channel as circumstances necessitate.

Any suggestions and recommendations from any member concerning operating procedures will be very much appreciated and incorporated insofar as possible to increase the convenience and speed of net operating.

(SIG) Bob Weitbrecht W9TCJ NCS

Here is sample of tape for OBS bulletin service.

QST DE W9TCJ Williams Bay, Wisconsin

TO ALL RADIO AMATEURS

I have received an appointment as Official Bulletin Station and will transmit official bulletins from the ARRL Headquarters on the following schedules:

Wednesdays 2030 and 2230 CST on  
Frequency of 3617.5KC/S

Fridays 2030 CST on Frequency of  
3617.5KC/S

Sundays 1500 CST on Frequency of  
3617.5KC/S

(Sunday schedule subject to occasional interruptions)

All transmissions will be VIA Radioteletype (RTTY) using a frequency shift of 850 cycles/sec. The above frequency (3617.5 KC/S) is Mark-High and will be held to within a few cycles. All radio amateurs equipped with radioteletype equipment are invited to tune on these schedules and copy transmissions from this station for the latest ARRL bulletins, news, and information of general interest to all amateurs, and, furthermore, effort will also be made to get information of particular interest to RTTY amateurs.

AR SK W9TCJ Williams Bay, Wis.

Subscription Rate \$2.50 Per Year  
RTTY is the Official Publication  
of the  
**RTTY Society**  
of Southern California  
and is published for the benefit of all  
RTTY Amateurs and Experimenters  
Permission to copy is granted  
provided credit is given.

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

## RTTY Theory Cont'd.

pearing in RTTY which I have built. Basically they are the same converter, the W6AEE, converter and a modified version of the Swan Converter written up by William M. Gates in RTTY for OCTOBER 1954, "this is a terminal unit." Gates supplies filters at a reasonable price for his converter.

One thing for sure that your converter must have and that is a "scope" for tuning, This is a *must!* If you want satisfactory results essentially, a converter or terminal unit, as it is often called, is designed to limit, amplify, discriminate and electronically key the TTY loop. The only special parts about any TTY converter are the filters. Normally the filters used are of the band pass type. There are two basic configurations of band pass filters; the "T" and "TT." Design data can be had on page 539 of ARRL Handbook for 1955. Toroidal coils are the best inductances to use. In the equations, F-1, minus F-2 equals 200 cycles. R should equal 600 cycles for the low impedance "T" type filter and R should equal about 100 K for the "TT" or high impedance type filter.

There are two schools of thought on limiting. The gates terminal unit works very well without a limiter stage. The simpler the terminal unit, the better. Back issues of RTTY can be obtained from RTTY, Inc., 3769 East Green St., Pasadena 10, Calif. RTTY is the only publication that I know of devoted strictly to RTTY.

Some of the desired features of any converter are: 500 OHM input impedance, good selectivity between Mark

and Space signal, normal reverse switching, mark, space and FSK switching. Visual indication, (scope) and output voltage regulation.

### FILTERS FROM TELEPHONE

#### LOAD COILS

	Mark Filter	
L-1,	22.5 MH	
L-2,	20.5 MH	
C-1,	.250	.002
C-2,	.250	.002
C-3,	.005	.0002

#### Space Filter

L-1,	19.1 MH	
L-2,	17.8 MH	
C-1,	.150	.002
C-2,	.150	.002
C-3,	.005	.0002

### LOAD COIL MODIFICATIONS

- For L-1 remove 6 turns.
- For L-2 remove 22 turns.
- For L-1 remove 33 turns.
- For L-2 remove 50 turns.

NOTE: Use only ½ of the loading coil. Tape up the unused ends of the toroid and be sure they don't short.

In closing, it is urged that anyone desiring to dispose of their TTY equipment, notify W6AEE, Merrill Swan, RTTY 3769 East Green St., Pasadena 10, Calif., in order that those now on list may have the opportunity of securing such equipment. Any one desiring TTY equipment should, likewise, notify RTTY, in order that they may be placed on the list in proper rotation.

When machines are released you will be notified.

## 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 JANUARY, 1956

#### JAN. 3 — W6SCQ, N. C. — 31 Checkins

W6ADD	W61ZJ
W6AEE	W6JAU
W6AFX	W6KMT
W6BPG	W6LDG
K6BPI	W6NUY
K6BTK	W6OJF
W6BWG	W6RCM
W6BWQ	W6RL
W6CKS	W6SCK
W6CMQ	W6SCQ
W6CZ	W6SQM
W6DYB	W6VAD
W6EV	W6VYH
W6FLW	W6ZBV
W61CS	W6ZVO
K61HG	

#### JAN. 10 — W6SCQ, N. C. — 26 Checkins

W6ADD	W61CS
W6AEE	W61ZJ
W6AFX	W6JAU
W6BPG	W6KMT
K6BPI	W6LDG
K6BTK	W6NUY
W6BWG	W6OJF
W6BWQ	W6RCM
W6CKS	W6SCQ
W6CMQ	W6SQM
W6CZ	W6VAD
W6EV	W6ZBV
W6FLW	W6ZVO

#### JAN. 17 — W6SCQ, N. C. — 24 Checkins

W6ADD	W61ZJ
W6AEE	W6JAU
W6AFX	W6KMT
K6BTK	W6LDG
W6BWG	W6NWM
W6BWQ	W6OJF
W6CMQ	W6RCM
W6CZ	W6SCK
W6EV	W6SCQ
W6FLW	W6SQM
W6GHC	W6VAD
K61HG	W6ZBV

#### JAN. 24 — W6SCQ, N. C. — 29 Checkins

W6ADD	K61HG
W6AEE	W61LJ
W6AFX	W61ZS
W6BJR	W6JAU
W6BPG	W6KMT
W6BTK	W6NWM
W6BWG	W6OJF
K6CHV	W6ORF
W6CKS	W6RCM
W6CMQ	W6SCK
W6CZ	W6SCQ
W6EV	W6SQM
W6FLW	W6VAD
W6FNW	W6ZBV
W61CS	

#### JAN. 31 — W6SCQ, N. C. — 35 Checkins

W6ADD	W61LJ
W6AEE	W61ZJ
W6AFX	W6JAU
W6BJR	W6KMT
W6BPG	W6LDG
K6BTK	W6NUY
W6BWG	W6NWM
W6BWQ	W6OJF
W6CK	W6QHR
W6CKS	W6RCM
W6CMQ	W6SCK
W6CND	W6SCO
W6CZ	W6SQM
W6EV	W6TRY
W6FLW	W6VAD
W6FNW	W6ZBV
W61CS	W6ZVO
K61HG	

## Mid-West Traffic Net

The Midwest RTNET is now in full swing and meets every Sunday at 1600 CST on 3624.0 kc RPT every Sunday at 1600 CST on 3624.0 kc. The NCS is W9TCJ, and the Alternate NCS is W9BGC. The first Midwest RTNET meeting was held last Sunday, the eighth of January, and the following stations reported in: Eleven stations in all —

W9BGC Joe—Northlake, Ill.  
 W9IQS Bob—Downers Grove, Ill.  
 W9LDH Spence—Racine, Wisc.  
 W9OCV Bert—Western Springs, Ill.  
 W9OKS ??, Ill., Sorry, no info as yet  
 W9ROQ Brownie—Southern Illinois  
 W9SPT George—Chicago, Illinois  
 W9TCJ Bob—Williams Bay, Wis.  
 W9WMR Don—Aurora, Ill.  
 WOBP Beep—Minneapolis, Minn.  
 WOMTR Bob—Cedar Rapids, Ill Iowa  
 Surely a fine turnout for a starter.

Let's have more report in succeeding RTNETS. Remember every Sunday at 1600 CST on 3624.0 kc. Conditions seem ideal for RTNET work up to several hundred miles in all directions from here—which includes Iowa, Illinois, Wisconsin, Minnesota, and—presumably—Michigan. Would be nice to have somebody in Detroit report into the Midwest RTNET . . .

Best Wishes for continued success of Midwest RTNET, ARSK W9TCJ Williams Bay, Wis. And, for the ARRL Bulletin.