THE CALLING FREQUENCY HASSLE

Like most other problems, this one probably has a simple but not too obvious solution. The situation we are faced with at present is this: There seems to be full agreement that we should adopt the technique of using a calling frequency on each band plus a working frequency or two. The division in thinking starts right after that agreement. At present we have proposals of calling and working frequencies from the ARRL, from the SoCal group, and those put forth as temporary stop-gaps by the Amateur Radio Teletype Society, me. It has been suggested that one sure way to wind up this matter is to call a point of order and bring the thing to vote. Hokay, we'll do just that. Nominations are in order for calling and working channels. Send in your selection before May 1st and all nominations will be listed in the May issue of the Bulletin. The frequencies getting the most votes are it.

I have listened quite a bit on 20 - 40 - 80, but have heard little activity north of 3620. So far I have worked 22 stations on that channel so it is pretty active. There is a round-table on there every evening now, usually starting around six and ending after nine (EST).

More and more stations are being reported coming on. The additions to last months list are: W1FGL, W4OYG, W4SHJ, W6CLW, W6EV, W6PNW, W9LCL, and WØCIH. Think I will list all of the active stations on 20-40-80 next month together with the bands they inhabit. Please include the band in reports of stations worked and heard. And W6QUO in Toledo.

RETURN POSTAGE GUARANTEED

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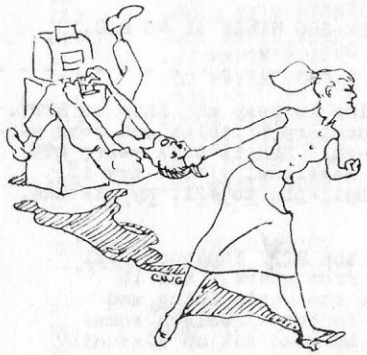

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AMATEUR RADIO TELETYPE SOCIETY

Teletype Bulletin No. 22

APRIL 1953

Ah, sweet April. Spring - warm weather - and one lousy thunderstorm after another to confound my printer. Doesn't RTTY breed anything but problems? Actually I haven't much complaint since I have been able to copy most of the eastern stations on 80 meters without too much difficulty. The puny sunspots haven't been holding up their end of the deal much lately and the band has been pretty sickly with the result that even local signals come in with an inordinate amount of fading and QRM.

Actually, the bulk of my misfortuned on receiving have been due to CW QRM when a particularly strong signal comes within the receiver pass-band and swamps it. Under this condition the poor old BFO just sits there helpless and I can't beat the FSK signal up to enough cycles to feed the converter. Any suggestions for me?

Bruce Meyer, WØHZR, has had different problems: "We've gotten a lot of copy off the air here in spite of the QRM. Selective fading seems to be the greatest bugaboo though. Its hard to believe that two signals separated by only 850 cycles can be so different in amplitude at various times. The use of heavy limiting and d.c. restoration is only part of the answer, so the quest for signal-to-noise ratio improvement goes on here."

Cecil Bastian, W2OOG, and his wife Mac were up here to dinner a few days ago and their big gripe is the early-to-bed habits of most of the eastern gang. Beats me too. I have called CQ after midnight almost every night and never gotten a single call. I'm up until about 2 a.m. almost every night, where is everyone else? Cec & Mac have a model 15 perking and have been having a picnic with it on 80.

Tom Howard, W1AFN, has been trying to get things going but has had super headaches from the local noise. I sure wish that we could get more reports on just exactly how this problem was conquored by others. I have a lot of noise myself but haven't paid too much attention to it because all of the fellows put in such a whopping signal that it didn't count.

Bill Auld, W2DXD, dropped a card from India (business trip) saying, "Found no RTTY here at all!" Bill stopped off for one hour at Rome, one at Beirut, five hours at Bahrein, & three at Karachi!

The conversion of the Collins VFO as per ARTT 4007 has been the topic of quite a few comments. Apparently most all that have tried have been able to get it to work well on 40M and higher, but they haven't been able to swing it far enough on 80. I believe that a few have been able to do the job on 80, so how about letting the rest of the gang in on what you did?

Here is the circuit and complete data on the Model CFA Frequency Shift Converter made by Technical Materials Corp. You of course won't be building this complete, but there are many interesting features in this circuit which will help you in making improvements and in building future converters. The length of this material has pushed out most of the regular news, but we'll catch up next time. Our thanks to John for the splendid job in preparing this material for publication.

THEORY OF OPERATION:-

THE LIMITER-AMPLIFIERS:- (V1, V2, AND V3 OR V4, V5, AND V6) SUPERIMPOSED ON EVERY CARRIER WILL BE NOISE PEAKS, THE DEGREE OF AMPLITUDE MODULATION OF THE CARRIER BY THESE NOISE PEAKS BEING A FUNCTION OF THE SIGNAL-TO-NOISE RATIO. IT IS THE PURPOSE OF THE LIMITER TO RID AN INCOMING SIGNAL OF THESE PEAKS SO THAT THE REMAINDER OF THE CIRCUITS WILL NOT INTERPRET THEM AS BEING MARK OR SPACE PULSES. THE LIMITER, BY THE SAME TOKEN, REJECTS INTERFERENCE FROM NEARBY VOICE OR MUSIC-MODULATED SIGNALS.

FOR THIS REASON, THEREFORE, A TWIN SETUP IS UTILIZED WHEREBY EACH CHANNEL FROM THE DUAL DIVERSITY RECEIVER PASSES THROUGH DISCREET DISCREET LIMITER STAGES. THE LIMITER PROPER (V2 OR V5) MAY BE BROKEN DOWN INTO TWO TRIODE STAGES, THE FIRST BEING A CATHODE-FOLLOWER AND THE SECOND BEING CATHODE-COUPLED TO THE FIRST.

WHEN A SMALL POSITIVE SIGNAL APPEARS AT THE GRID OF THE FIRST SECTION THIS POSITIVE VOLTAGE IS TRANSLATED THROUGH THE CATHODE COUPLING TO THE SECOND SECTION. THE EFFECT IS TO QUICKLY CUT-OFF THE SECOND SECTION SO THAT ANY ADDITIONAL VOLTAGES SUCH AS NOISE PEAKS DO NOT APPEAR IN THE LIMITER OUTPUT. WHEN A SMALL NEGATIVE SIGNAL SWING APPEARS AT THE GRID OF THE FIRST SECTION THE FIRST SECTION IS QUICKLY CUT OFF AND, AGAIN, THE NOISE PEAKS ARE ELIMINATED.

THE LIMITER PROPER (V2 OR V5) IS PRECEDED BY AN ADDITIONAL LIMITER-AMPLIFIER (V1 OR V4) WHICH OPERATES AT VERY LOW SIGNAL LEVELS. THE CIRCUIT IS SO DESIGNED THAT THE TUBE EASILY REACHES GRID CURRENT SATURATION AND PLATE CURRENT CUT-OFF ON POSITIVE AND NEGATIVE PEAKS RESPECTIVELY. THE CUMULATIVE EFFECT OF THESE TWO STAGES (I.E., V1 & V2 OR V4 & V5) IN TANDEM IS TO REMAIN "CHOKED UP", SO TO SPEAK, AS LONG AS AN AUDIO TONE OF BETTER THAN APPROXIMATELY 20 MILLIVOLTS IS PRESENT AT THE INPUT. THE POWER AMPLIFIER (V3) THEREFORE SES ONLY THE "PHASE" PORTION OF THE ORIGINAL NOISE.

THE POWER AMPLIFIER AMPLIFIES THE LIMITED AUDIO TONE AND FEEDS IT TO THE DISCRIMINATOR RESONANT CIRCUITS.

THE DISCRIMINATOR:- THE DISCRIMINATOR CONSISTS OF TWO RESONANT CIRCUITS, ONE RESONATED ABOVE AND THE OTHER RESONATED BELOW CENTER FREQUENCY IN SUCH A MANNER THAT MAXIMUM SHIFT AND DRIFT CONDITIONS MAY BE MET WITHOUT EXCEEDING THE DISTANCE BETWEEN THE RESONANT PEAKS. THE VOLTAGE ACROSS EACH CIRCUIT IS A FUNCTION OF THE TONE FREQUENCY.

THE DISCRIMINATOR RECTIFIERS:- (V6 AND V7) THE TONE VOLTAGE ACROSS EACH RESONANT CIRCUIT IS RECTIFIED BY THE DISCRIMINATOR RECTIFIERS AND THEN ADDED IN THE DISCRIMINATOR LOAD (R92, R93, C17 & C18). A SHIFT IN FREQUENCY FROM MARK TO SPACE WOULD THEN CAUSE A CHANGE IN VOLTAGE ACROSS THE RESONANT CIRCUITS. THIS CHANGE IN VOLTAGE, WHICH IS PROPORTIONAL TO THE AMOUNT OF SHIFT, IS RECTIFIED, DIVERSITY COMBINED, FILTERED, AND FED TO THE CLAMP. ITS FORM APPROACHES A SQUARE WAVE BECAUSE THE SHIFT FROM ONE FREQUENCY TO ANOTHER IS AN ABRUPT ONE.

AS AN ADDITIONAL PRECAUTION AGAINST NOISE, A LOW PASS FILTER OR DE-EMPHASIS NETWORK IS INCLUDED IN THE FORM OF C19 AND C20.

THE CLAMP:- (V8) THE VOLTAGE PRODUCED AT THE OUTPUT OF THE DISCRIMINATOR LOAD IS SYMETRICAL TO AN AXIS WHICH MAY BE POSITIVE OR

NEGATIVE WITH RESPECT TO GROUND. THE POTENTIAL MAGNITUDE AND POLARITY REPRESENTED BY THIS AXIS IS A FUNCTION OF THE DEGREE AND DIRECTION OF DRIFT. THE OBJECT OF THE CLAMP IS, TO TREAT THIS DRIFT-PRODUCED VOLTAGE IN SUCH A MANNER THAT THE REMAINING PULSE CIRCUITS ARE UNAWARE OF ITS PRESENCE. OTHERWISE, THE QUIESCENT OPERATING POINT OF V9 WOULD BE SHIFTED OVER A WIDE RANGE THUS PRODUCING VARYING DEGREES OF BIAS DISTOTION.

OBSERVATION OF THE SCHEMATIC DIAGRAM WILL SHOW THAT THE CLAMP IS CONNECTED SO THAT IT CONDUCTS WHENEVER A POSITIVE POTENTIAL APPEARS AT ITS PLATE. IMAGINE, FOR THE MOMENT, THAT THE THRESHOLD CONTROL HAS BEEN TURNED COUNTER-CLOCKWISE TO ZERO. IT CAN THEN BE SEEN THAT, DUE TO THE PRESENCE OF THE CLAMP, NO POSITIVE VOLTAGE WILL EVER APPEAR AT THE GRID OF V9. C21 AND C22 WILL PERMIT THE PASSAGE OF NO D.C. AND THE CLAMP ALLOWS THE CHARGING OF THESE CONDENSERS IN SUCH A MANNER THAT THE WAVEFORM WHICH IS PASSED WILL HAVE ITS UPPERMOST PEAK AT GROUND POTENTIAL. WHEN THE THRESHOLD CONTROL IS PROPERLY ADJUSTED, A FIXED POSITIVE POTENTIAL WILL APPEAR AT THE GRID OF V9 AND THE WAVEFORM FROM THE CLAMP WILL BE SYMETRICALLY SUPERIMPOSED ON THIS VOLTAGE. SINCE THE CLAMP OUTPUT IS A FUNCTION OF SHIFT, THEN THE AMOUNT OF THRESHOLD NECESSARY TO SYMETRICALLY ORIENT THIS OUTPUT WAVEFORM WITH RESPECT TO GROUND WILL ALSO BE A FUNCTION OF SHIFT.

WHEN KEYING STOPS OR THE SIGNAL DROPS OUT THE THRESHOLD VOLTAGE SERVES TO BRING V9 INTO A STATE OF GRID SATURATION SO THAT RANDOM NOISE OR A NEARBY AMPLITUDE-MODULATED SIGNAL WILL NOT FORCE THE TELEPRINTER FROM ITS STANDBYCONDITION.

THE PULSE AMPLIFIER:- V9 IS A HIGH-GAIN AMPLIFIER WHICH REACHES GRID SATURATION AND PLATE-CURRENT CUT-OFF AT VERY LOW INPUT VOLTAGES. ITS OUTPUT WILL THEN BE AN ESSENTIALLY SQUARE WAVE. THE FIRST PULSE AMPLIFIER FEEDS AN INTEGRATING NETWORK WHICH SERVES TO GIVE ITS OUTPUT A "SAW-TOOTH" SLOPE.

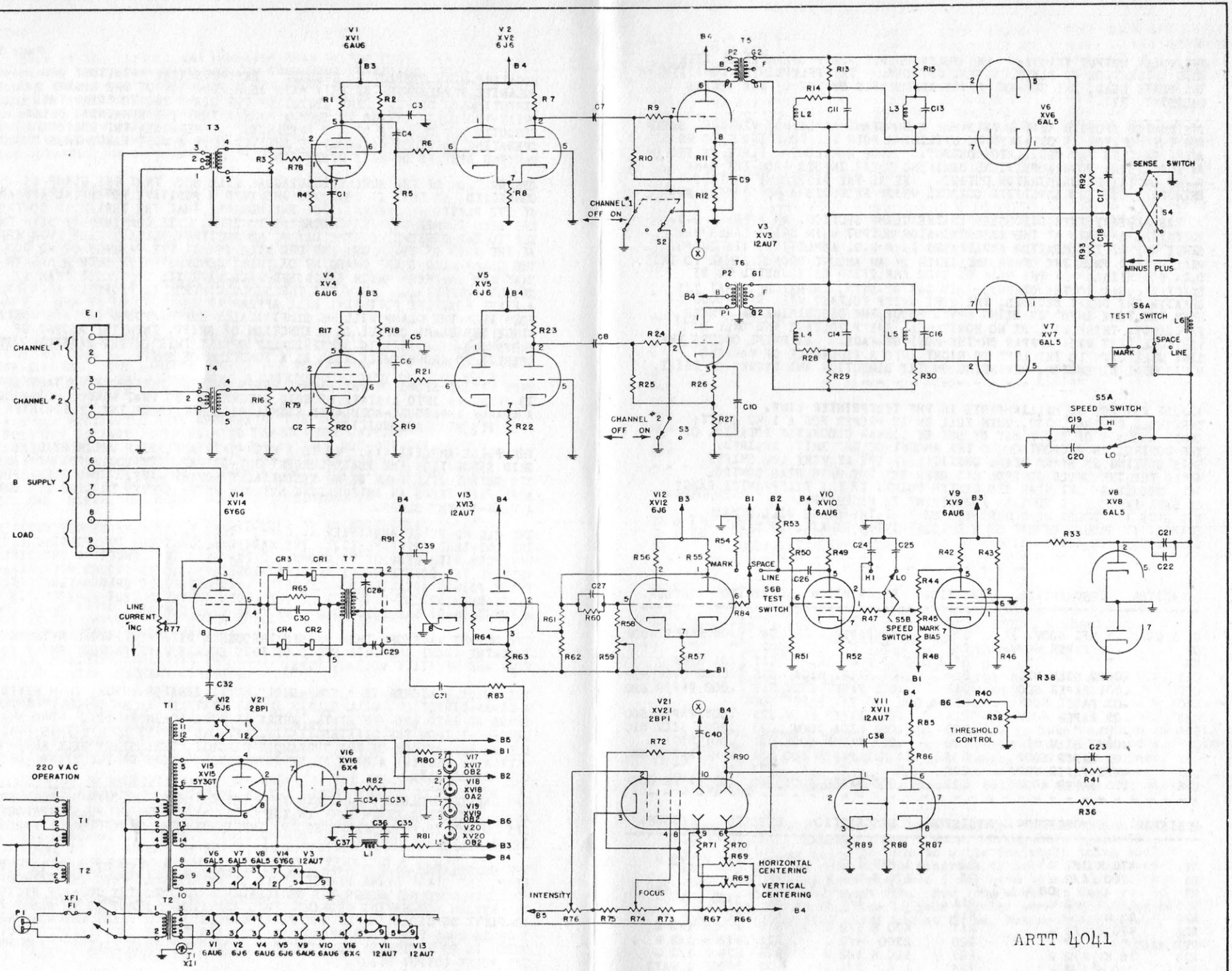
THE SECOND PULSE AMPLIFIER (V10):- THIS TUBE OPERATES ESSENTIALLY LIKE THE ONE THAT PRECEDES IT. THE MARK BIAS CONTROL, BY SHIFTING THE INPUT WAVEFORM WITH RESPECT TO GROUND, DETERMINES THE LENGTH OF THE TIME AXIS BETWEEN THE POINTS WHERE THIS WAVEFORM APPROACHES GROUND POTENTIAL. THESE POINTS ARE VERY NEARLY WHERE V-10 GOES INTO GRID SATURATION AND PLATE CURRENT CUT-OFF SO THAT THE WIDTH OF THE OUTPUT WAVEFORM IS THEN A FUNCTION OF THE SETTING OF THE MARK BIAS CONTROL.

THE OUTPUT WAVEFORM THEN PASSES THROUGH A DIFFERENTIATING NETWORK SO THAT THE FRONT AND BACK EDGES OF THIS SQUARE WAVE PRODUCE SHARP POSITIVE AND NEGATIVE VOLTAGE PIPS.

THE PULSE RESTORER IS A "ONE-SHOT" MULTIVIBRATOR WHICH, WHEN KEYED IN A GIVEN DIRECTION, WILL REMAIN IN ONE STATE UNTIL AN OPPOSITE IMPULSE SENDS IT INTO ANOTHER STATE, WHERE IT WILL AGAIN REMAIN. THE SHARP WAVEFRONT FROM THE DIFFERENTIATING NETWORK SERVES TO KEY THIS STAGE. DUE TO THE ACTION OF THE THRESHOLD CIRCUIT, THIS STAGE WILL AUTOMATICALLY RECEIVE A MARK PULSE WHEN KEYING STOPS OR THE SIGNAL DROPS OUT COMPLETELY.

THE CATHODE FOLLOWER (1/2 V13):- THE CATHODE FOLLOWER SIMPLY SERVES AS AN ISOLATING STAGE BETWEEN THE OSCILLATOR AND THE PULSE RESTORER. ITS OUTPUT IS PRECISELY LIKE ITS INPUT WITH THE EXCEPTION OF A LOSS IN SIGNAL AMPLITUDE.

THE OSCILLATOR (1/2 V13):- A CONVENTIONAL HARTLEY CIRCUIT IS USED HERE, THE STAGE BEING PERMITTED TO OSCILLATE ONLY WHEN THE CATHODE FOLLOWER DOES NOT FORCE THE OSCILLATOR GRID INTO THE CUT-OFF REGION. THE REASON FOR HAVING PROVIDED THIS ADDITIONAL STAGE IS TO ALLOW FOR COMPLETE DC ISOLATION OF THE PULSE CIRCUIT WHICH FEEDS THE TELEPRINTER. THIS IS DONE THROUGH TRANSFORMER-COUPLING TO THE OSCILLATOR OUTPUT (T7) WHICH IS RECTIFIED BY FOUR CRYSTAL DIODES AND THEN FILTERED AND FED TO THE PULSE OUTPUT STAGE.


V1 XV1 6AU6
V2 XV2 6J6
V3 XV3 12AU7
V4 XV4 6AU6
V5 XV5 6J6
V6 XV6 6AL5
V7 XV7 6AL5
V8 XV8 6AL5
V9 XV9 6AU6
V10 XV10 6AU6
V11 XV11 12AU7
V12 XV12 6J6
V13 XV13 12AU7
V14 XV14 6Y6G
V15 XV15 5Y3GT
V16 XV16 6X4
V17 XV17 OB2
V18 XV18 0A2
V19 XV19 OB2
V20 XV20 OB2
V21 XV21 2BP1
T1
T2
T3
T4
T5
T6
T7
CHANNEL #1
CHANNEL #2
B SUPPLY
LOAD
OFF ON
S1
S2
S3
S4
S5A SPEED SWITCH
S5B SPEED SWITCH
S6A TEST SWITCH
S6B TEST SWITCH
SENSE SWITCH
MINUS PLUS
SPACE LINE
MARK
HI
LO
LINE CURRENT INC
220 VAC OPERATION
THRESHOLD CONTROL
HORIZONTAL CENTERING
VERTICAL CENTERING
INTENSITY
FOCUS
MARK BIAS
B1
B2
B3
B4
B5
B6

ART 4041

THE PULSE OUTPUT (V14):- THE PULSE OUTPUT STAGE OPERATES AT EITHER GRID SATURATION OR PLATE CURRENT CUT-OFF. THE TELEPRINTER CONSTITUTES THE PLATE LOAD, THE CURRENT BEING ADJUSTABLE BY USE OF THE SERIES RHEOSTAT, R77.

THE MONTOR SECTION (V11 & V21):- A CONSTANT-AMPLITUDE VERTICAL SWEEP FOR THE MONITOR IS OBTAINED BY UTILIZING BOTH THE TONE INPUT TO V3 AND A PART OF THE OSCILLATOR OUTPUT. EACH HORIZONTAL PLATE IS FED BY AN AMPLIFIER, BOTH AMPLIFIERS DERIVING THEIR INPUTS FROM THE SAME POINT ON THE DISCRIMINATOR OUTPUT. IT IS THE DIFFERENE VOLTAGE BETWEEN THESE TWO AMPLIFIER OUTPUTS WHICH PRODUCES A HORIZONTAL SWEEP.

AS HAS ALREADY BEEN DISCUSSED IN THE CLAMP SECTION, AN AVERAGE D.C. POTENTIAL APPEARS AT THE DISCRIMINATOR OUTPUT WHEN DRIFT TAKES PLACE. SINCE ONE OF THE MONITOR AMPLIFIERS IS A D.C. AMPLIFIER, ITS OUTPUT WILL DIFFER FROM THE OTHER AMPLIFIER BY AN AMOUNT PROPORTIONAL TO THIS D.C. POTENTIAL. (THE GAIN OF EACH AMPLIFIER IS ADJUSTED TO BE EXACTLY EQUAL TO THE OTHER). IT CAN BE SEEN, THEREFORE, THAT THE GREATER THE DRIFT BECOMES, THE MORE SWEEP VOLTAGE WILL BE PRODUCED. WHEN THE TONE INPUT IS BEING KEYED ABOUT THE DISCRIMINATOR CENTER FREQUENCY, THERE WILL BE NO HORIZONTAL SWEEP VOLTAGE AND ONLY A VERTICAL LINE WILL APPEAR ON THE MONITOR FACE. AS DRIFT OCCURS THE LINE WILL OPEN TO THE LEFT OR RIGHT INTO A RECTANGLE OF VARYING HORIZONTAL DIMENSION, DEPENDING ON THE DIRECTION AND DEGREE OF DRIFT.

ADJUST R77 FOR 60 MILLIAMPERES IN THE TELEPRINTER LINE.
THRESHOLD CONTROL, R32, WHEN FULL ON IS PROPER FOR A 1 KC SHIFT; OTHER AMOUNTS OF SHIFT MAY BE SET BY LINEAR CLOCKWISE ROTATION OF THE CONTROL IN PROPORTION TO THE AMOUNT OF THE SHIFT DESIRED. THIS SETTING IS BY NO MEANS CRITICAL EXCEPT AT VERY LOW SHIFTS. AFTER THE THRESHOLD CONTROL HAS BEEN SET THE MARK BIAS CONTROL R45, SHOULD BE SET NEAR ITS CENTER POINT. IF THE TELEPRINTER RANGE IS SATISFACTORY NO FURTHER ADJUSTMENT IS NECESSARY.
R59 SETS THE PULSE RESTORER BIAS SO THAT THE STAGE WILL REMAIN STABLE. IT SHOULD BE SET SO THE TELEPRINTER REMAINS IN MARK CONDITION WHEN KEYING STOPS.

CAPACITOR	DESCRIPTION	CAPACITOR	DESCRIPTION	CAPACITOR	DESCR.
C1 & C2	.5 MFD 600V. EA.	C3	.05 PAPER 400V	C4	.05 PAPER 400V
C5	.05 PAPER 600V	C6	" " "	C7	" " "
C8	" " "	C9 & C10	.5 600V EA.	C11	.01 MICA
C13	.0022 SILV MICA	C14	.01 SILV. MICA	C16	.0022 SILV MIC
C17	.001 PAPER 600V	C18	.001 PAPER 600V	C19	.002 PAPER 600
C20	.02 PAPER 600V	C21 & C22	.05 EA. PAPER 600V		
C23	.05 PAPER 600V	C24	.001 PAPER 600V	C25	.005 PAPER 600
C26	.001 " "	C27	.001 MICA 500V	C28	.0002 SILV MIC
C29	.0002 SILV MICA	C30	.001 PAPER 600V	C31	.001 MICA
C32	.02 PAPER 600V	C33	4 MFD PAPER 600	C34	4 MF PAPER 600
C35	4MFD PAPER 600V	C36	" " "	C37	" " "
C38	.05 PAPER 400V	C39	.005 PAPER 600V	C40	.05 PAPER 600V

RESISTOR	DESCRIPTION	RESISTOR	DESCRIPTION	RESISTOR	DESCR.
R1	470 K 1/2 W	R2	1 MEG 1/2 W	R3	470 K 1/2 W
R4	2200 1/2 W	R5	470 K 1/2 W	R6	" "
R7	100 K 1/2 W	R8	10 K 1/2 W	R9	220 K
R10	220 K 1/2 W	R11	1 K 1/2 W	R12	3900 1 W
R13	33 K 1/2 W	R14	" "	R15	82 K 1/2 W
R16	470 K 1/2 W	R17	470 K 1/2 W	R18	1 MEG 1/2 W
R19	" "	R20	2200 1/2 W	R21	470 K 1/2 W
R22	10 K 1/2 W	R23	100 K 1/2 W	R24	220 K 1/2 W
R25	220 K 1/2 W	R26	1 K 1/2 W	R27	3900 1 WATT
R28	1 K 1/2 WATT	R29	33 K 1/2 W	R30	83 K 1/2 W
R33	2.2 MEG 1/2 W	R36	470 K 1/2 W	R38	10 MEG 1/2 W
R40	10 K 1/2 W	R41	10 MEG 1/2 WATT	R42	470 K 1/2 W
R43	82 K 1 WATT	R44	470 K 1/2 W	R46	10 K 1/2 W
R47	2.2 MEG 1/2 W	R48	2.7 MEG 1/2 W	R49	470 K 1/2 W
R50	82 K 1 WATT	R51	22 K 1/2 W	R52	1 K 1/2 W
R53	1 MEG 1/2 W	R54	1 MEG 1/2 W	R55	56 K 2 WATTS
R56	27 K 2 WATTS	R57	22 K 2 WATTS	R58	1 MEG 1/2 W
R60	3.9 MEG 1/2 W	R61	30 K 1/2 W	R62	470 K 1/2 W
R63	68 K 1 WATT	R64	220 K 1/2 W	R65	220 K 1/2 W
R66	2.2 MEG 1/2 W	R67	2.2 MEG 1/2 W	R70	2.2 MEG 1/2 W
R71	1 MEG 1/2 W	R72	1 MEG 1/2 W	R73	1 MEG 1/2 W
R75	470 K 1/2 W	R78	220 K 1/2 W	R79	220 K 1/2 W
R80	1 K 2 WATTS	R81	3 K 10 WATTS	R82	3 K 10 WATTS
R83	1 MEG 1/2 W	R84	2.2 MEG 1/2 W	R85	56 K 1/2 W
R86	39 K 1/2 W	R87	10 K 1/2 W	R88	5.1 MEG 1/2 W
R89	10 K 1/2 W	R90	47 K 1/2 W	R91	2200 1/2 W
R92	220 K 1/2 W	R93	220 K 1/2 W		

VARIABLE RESISTOR	RESISTANCE	TAPER
R32	100 K 2 WATTS	LINEAR
R45	1 MEG 2 WATTS	LINEAR
R59	" "	"
R68	" "	"
R69	" "	"
R74	" "	"
R76	500 K "	"

TRANSFORMERS:-

T3 & T4	PRIMARY BALANCED 600 OHMS, SECONDARY 80,000 OHMS
T5 & T6	PRIMARY 30,000 OHMS, SECONDARY 80,000 OHMS C.T.
T7	OSCILLATOR TRANSFORMER 500 KC.

MISCELLANEOUS:-

R77	LINE RHEOSTAT 2500 OHMS WIREWOUND 25 WATTS
CR1, CR2, CR3, & CR4	150 VOLT CRYSTAL DIODE, GERMANIUM 40 MA MAXIMUM ANODE CURRENT
L1	FOLTER CHOKE 15 HENRY 85 MA 270 OHMS D.C.
L2, L3, L4 & L5	TOROID COIL .75 HENRY
L6	CHOKE FOR DISCRIMIMINATOR FILTER 300 HENRY AT NO D.C. 50 HENRY AT 3 MA D.C. 6000 OHMS D.C.

I hope you haven't missed the two articles in Swap and Shop on RTTY. Both the March and April issues had introductory articles and some cartoons by CWG that will give you a good laugh. S&S is $1 a year; QTH: 1 Park Avenue, Natick, Mass. Nice little magazine, y'otta try it.
Say, change the number on the "Grouch" Bulletin to #21. My mistake.

WØRSL, Bob Miedke, wants to know when the RTTY Handbook will be available. Shucks, I don't know. From where I sit it looks like I am going to have to write the whole thing and may have to draw most of the diagrams to boot. Unless someone sends in some good pictures I may have to set up a studio and photograph equipment too. How long would it take you to do all this? In addition to your regular work and hamming of course. Looks like about August to me, but we shall see.