

R.F. Note 82

March 25, 1982
J. RiedelK800 Transmitter Calculations

Figure 1 shows the results of calculations for the grid circuit. The length (L_3) to the moving short of the 6 inch OD x 1/2 inch l.c. transmission line ($Z_0 \approx 200\Omega$) was chosen to set the nominal value of the variable condensor at reasonable values.

Figure 2 illustrates various operating conditions for the 4648 tube. #1 H-P and #2 H-P are the peak of the Fourier components of the voltages or currents. Thus the fundamental current for the first set of conditions is $41.9 \sin \omega t$ amps and the second harmonic is $24.5 \sin 2\omega t$ amps. For this first set the conduction angle is 140 degrees.

For the second set the drive was lowered so that no grid current would flow and for the 3rd set the screen voltage was lowered. This is the probable operating condition we will use.

Thus we need a drive voltage of 200 volts peak. We will design for 250 volts peak, or 175 volts rms. Figure 3 shows the instantaneous values of anode, grid and screen voltages and currents over one cycle. Figure 4 shows a plot of various quantities.

RUN
11:12 MAR 23 GRID...
GRID CNT FOR K800

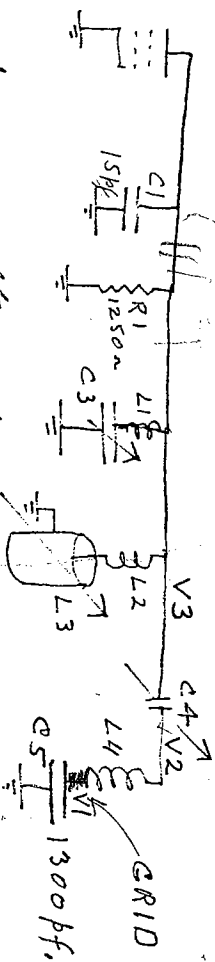
BELOW ARE THE CONSTANTS: C1, C2, C4, C5, L1, L4, L5, L6, L7, R IN ORDER
1.50E-11 1.60E-08 1.85E-10 1.30E-09 1.50E-08 1.80E-08 40.0 11.0 190. 1.25E+03
1.24467E-13 -6.32055E-06 86.8031

FREQ	C3	L3	VA	RM5	VG	RM5	C4
9.00E+06	2.82E-10	40.0	1.25E+03	157.	1.85E-10	1.85E-10	
1.20E+07	1.76E-10	28.9	1.25E+03	158.	1.85E-10	1.85E-10	
1.50E+07	1.42E-10	20.0	1.25E+03	160.	1.85E-10	1.85E-10	
1.80E+07	1.43E-10	13.4	1.25E+03	162.	1.85E-10	1.85E-10	
2.00E+07	1.52E-10	10.2	1.25E+03	163.	1.85E-10	1.85E-10	
2.20E+07	1.57E-10	7.99	1.25E+03	165.	1.85E-10	1.85E-10	
2.40E+07	1.43E-10	6.80	1.25E+03	167.	1.85E-10	1.85E-10	
2.60E+07	1.01E-10	6.61	1.25E+03	169.	1.85E-10	1.85E-10	
2.80E+07	3.71E-11	7.41	1.25E+03	171.	1.85E-10	1.85E-10	

10000 HALT

$$L3 = 0.125F^2 - 6.3F + 86$$

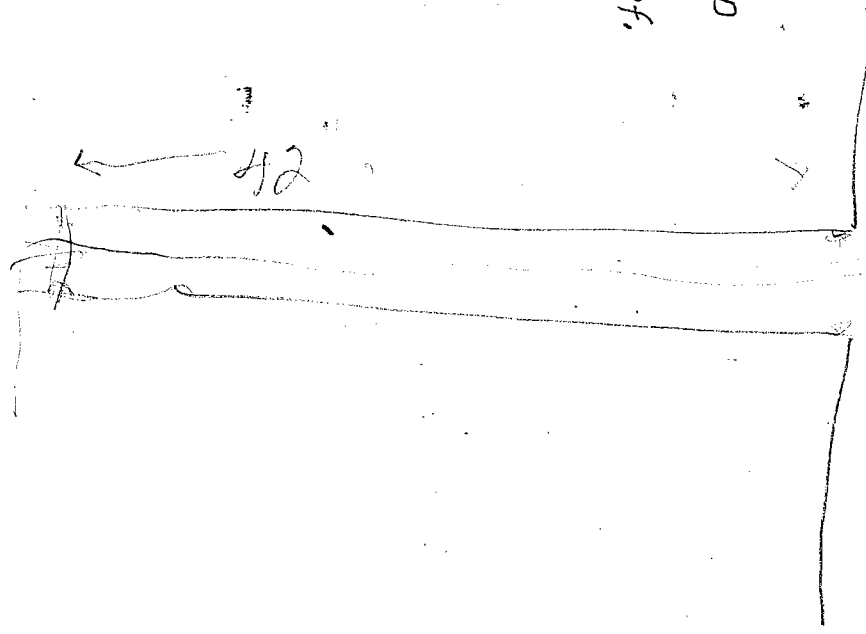
F in Mhz.



above results are for 1 amp rms of driver tube current. Power in R1 is 1250 W.

There is considerable margin, as C3 can vary from 20pf to 500pf. C4 is the same as C3 and can be varied if necessary. However, above results show that it can remain fixed, and need only be adjusted to change the ratio of V1/V3 if necessary. The circuit is capable of being tuned to 35 MHz.
 $Q = 32$ to 189

FIG 1



	D.C.	#1 H-F	#2 H-F	MIN	MAX	W-DISS	#1 OUT	P.S.W.	W-DEL	PHASE
PLATE V	20000	17000		0	40000	137111	-1	493282	356170	-1
PLATE MA	24664	41902	24558	0	20					0
GRID V	-200	250		-1001	0	178				0
GRID MA	4279	8270		0	10					0
SCREEN V	1400	34		0	2800	2212				0
SCREEN MA	737			0	4					0

PLATE EFF.=72.2% LOAD R= 406. OHMS LOAD X=-1.12E+19 OHMS

512 HALT
>21 G9=200
RUN>
17:17 MAR 23 D4648...

FOR RCA4648 VACUUM TUBE CALCULATOR
PHASE ANGLE= 0 DEGREES

	D.C.	#1 H-F	#2 H-F	MIN	MAX	W-DISS	#1 OUT	P.S.W.	W-DEL	PHASE
PLATE V	20000	17000		0	40000	84907	0	309769	224862	0
PLATE MA	15488	26454	15749	0	20					0
GRID V	-200	200		-1001	0					0
GRID MA	0	0		0	10					0
SCREEN V	1400	34		0	2800	1348				0
SCREEN MA	449			0	4					0

PLATE EFF.=72.6% LOAD R= 643. OHMS LOAD X= 3.30E+18 OHMS

512 HALT
>24 Y0=1200,Y9=.002
>RUN
17:18 MAR 23 D4648...

FOR RCA4648 VACUUM TUBE CALCULATOR
PHASE ANGLE= 0 DEGREES

	D.C.	#1 H-F	#2 H-F	MIN	MAX	W-DISS	#1 OUT	P.S.W.	W-DEL	PHASE
PLATE V	20000	17000		0	40000	56812	0	227161	170348	0
PLATE MA	11358	20041	13366	0	20					0
GRID V	-200	200		-1001	0					0
GRID MA	0	0		0	10					0
SCREEN V	1200	34		0	2400	1051				0
SCREEN MA	350			0	4					0

PLATE EFF.=75.0% LOAD R= 848. OHMS LOAD X= 1.93E+18 OHMS

512 HALT
>22 G0=-175
>RUN
17:20 MAR 23 D4648...

FOR RCA4648 VACUUM TUBE CALCULATOR
PHASE ANGLE= 0 DEGREES

	D.C.	#1 H-F	#2 H-F	MIN	MAX	W-DISS	#1 OUT	P.S.W.	W-DEL	PHASE
PLATE V	20000	17000		0	40000	88886	0	330355	241469	0
PLATE MA	16518	28408	17329	0	20					0
GRID V	-175	200		-1001	0	25				0
GRID MA	1192	2354		0	10					0
SCREEN V	1200	34		0	2400	1444				0
SCREEN MA	481			0	4					0

PLATE EFF.=73.1% LOAD R= 598. OHMS LOAD X= 5.65E+19 OHMS

51 LT

FIG. 2

RUN
12:54 MAR 24 D4648...

FOR RCA4648 PHASE ANGLE= 0 DEGREES
VACUUM TUBE CALCULATOR

IP IS IG
I-MMA S-MMA H-MMA

0	37000	-426	1234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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PLATE EFF.=74.5%

LOAD R= 628.

OHMS

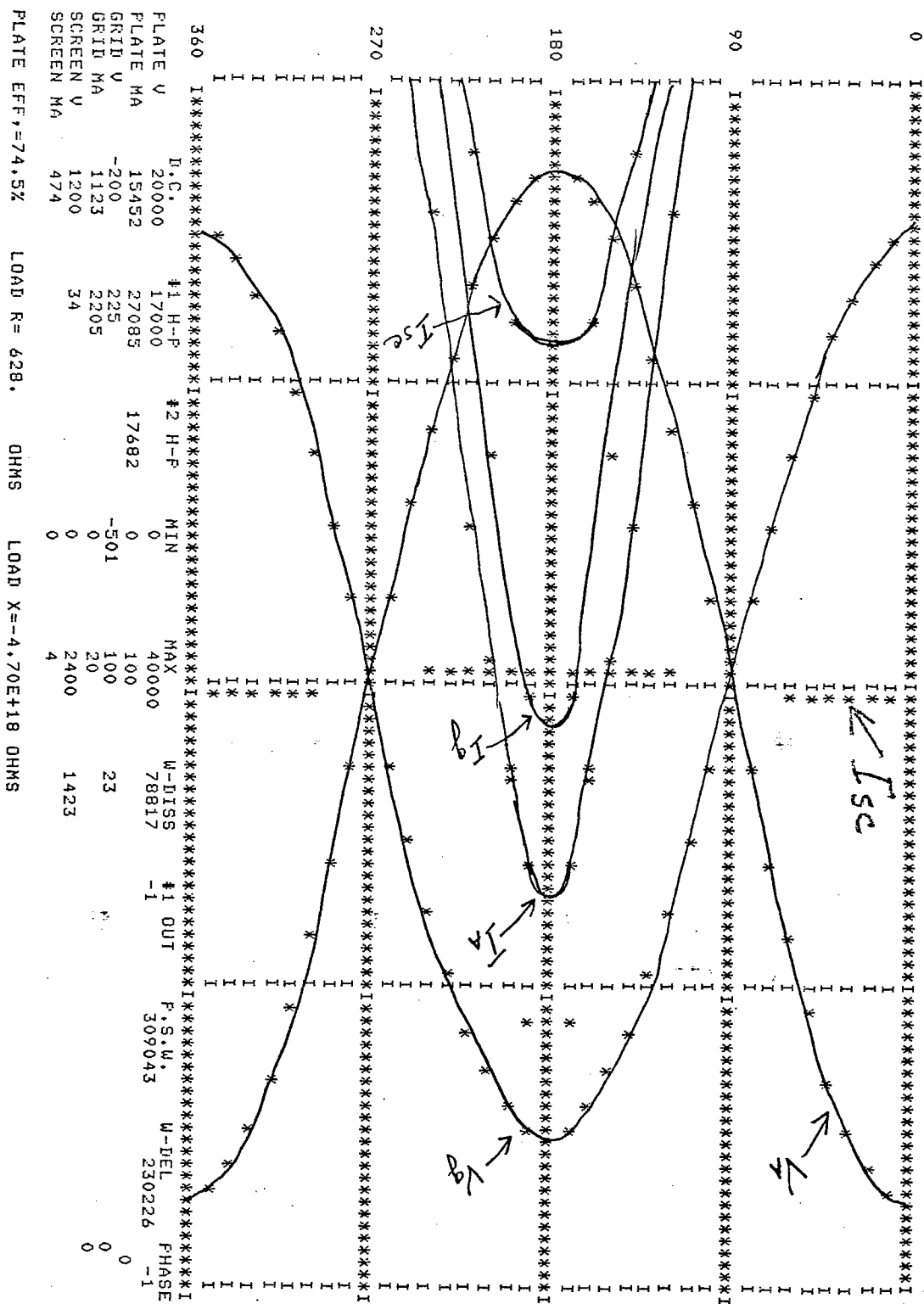
LOAD X=-4.70E+18 OHMS

512 HALT

LIST 180
180 A6=1
>180 A

F1.G.3

VACUUM TUBE CALCULATOR
FOR RCA4648 PHASE ANGLE= 0 DEGREES



512 HALT

417