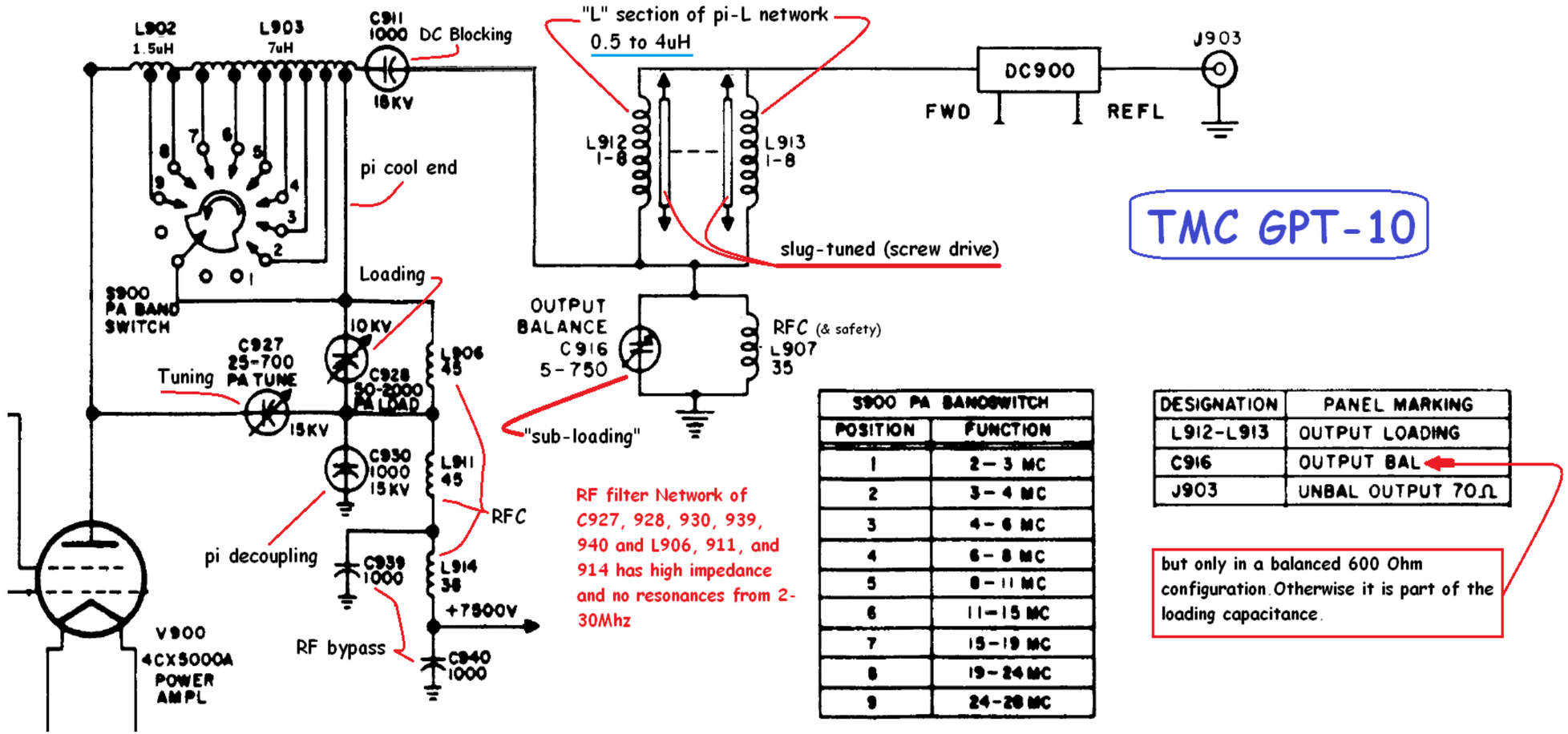
This note and opinions are about looking at the tank circuit for the GPT-10K, with the intention of using its major components in a different and home built amplifier. The GPT-10K can be switched to a 600 ohm balanced or a 50 ohm output. The change-over is done by reconfiguring a dual L section. For 600 Ohms, it is used as a balancing transformer or maybe it could be called a balun.

The GPT-10 uses a 4CX5000A, grounded grid with standard electrode voltages, 7500VDC, about 2A maximum. The goal is to use a 3CX3000, grounded grid, zero bias, 4000-4500V, 2A maximum. One thing stands out, of course the voltage is half but the current is the same. This means the impedance match is different, but the main parts, the huge inductor and band switch, should still be usable.

If nothing else, the 3CX30000 might be run at 4500V/1.2A or 4000V/1.07A. There is no real need for 6KW output except for bragging rights and those are not worth all that much. The goal is an amp that is more or less indestructible and at the same time simple. The 3CX3000 has a 275W grid.

If that is not convincing, other large Triodes are either more costly or are now hard to find. The 3-1000 is a nice glass tube, and a pair would be OK but the cost is comparable to a 3CX3000. The same can be said for other reasonably sized ceramic Triodes used in ham or commercial service.



S900 PA BANDSWITCH	
POSITION	FUNCTION
1	2 – 3 MC
2	3 – 4 MC
3	4 – 6 MC
4	6 – 8 MC
5	8 – 11 MC
6	11 – 15 MC
7	15 – 19 MC
8	19 – 24 MC
9	24 – 28 MC

DESIGNATION	PANEL MARKING
L912-L913	OUTPUT LOADING
C916	OUTPUT BAL
J903	UNBAL OUTPUT 70Ω

but only in a balanced 600 Ohm configuration. Otherwise it is part of the loading capacitance.

Figure 1: GPT-10 output stage

The rather low given inductance figures for the GPT-10 pi coil in figure 1 are puzzling. The coil has a total inductance of 8.5uH to cover 2-28MHz, which would call for a lot of C and make the Q very high, too high. The figure is from the manual, with some notes added.

Poring through the manuals a few times uncovered that the amplifier section has not a pi section, but a pi-L output circuit when configured for 50 Ohms output. This would explain the unusually low inductance of the pi coil. The L section, in either configuration, is variable. It is apparently tuned by two long metal cylinders with enclosed blunt ends and driven in and out of the twin 1-8uH L coil lengths together by a geared screw drive. This opinion is from looking at different versions of the manual.

So instead of a simple pi network with only a plate tuning cap and loading cap with a tapped pi coil, it also uses a variable inductor as the -L section, and a capacitor there is used to either balance a 600 Ohm load if the -L coil is reconfigured for balanced output, or to be part of the loading capacitor (sub-loading) if the coils are put in parallel and is used as a 0.5-4uH L section.

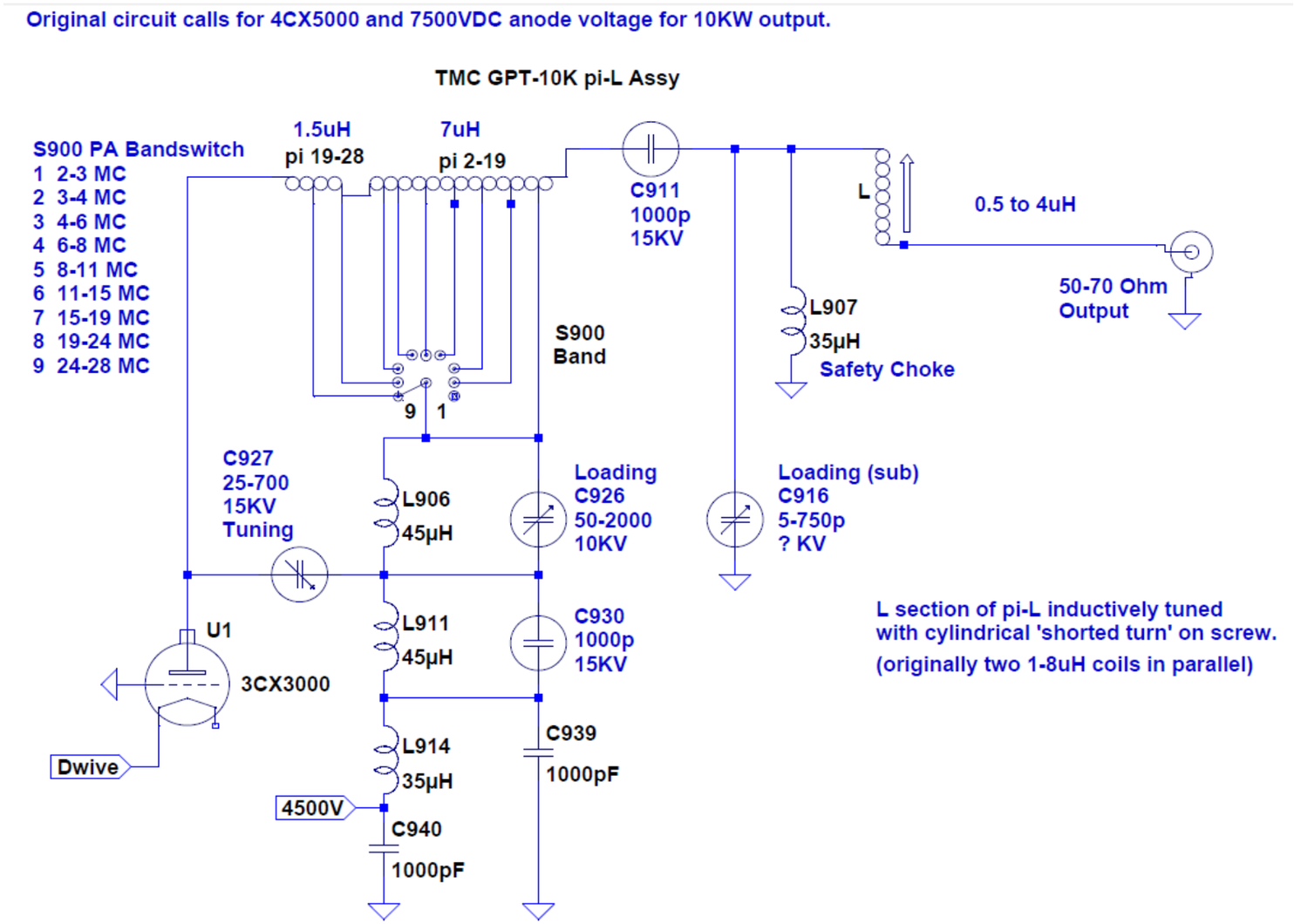


Figure 2: simplified circuit for output around 50 Ohms.

A tuning chart also was found giving the turns counter settings and this helped explain much. The chart shows two sets of dial settings for each of 14 frequencies, presumably the high and low dial setting limits inside which a set of adjustments is correct.

TABLE 3-2. TRANSMITTER TUNING CHART (TYPICAL), UNBALANCED OPERATION

SBG			IPA STAGE						PA STAGE					TEST RESULTS			
FREQ MC	IPA BAND	DRIVER BAND	1ST AMP TUNING	IPA GRID TUNING	IPA TUNING	IPA LOADING	IPA LOAD POS	IPA PLATE CURRENT	FINAL BAND	PA TUNE	PA LOADING	OUTPUT BAL	OUTPUT LOADING	PA OUTPUT KW(PEP)	DC PLATE CURRENT	DC SCREEN CURRENT	PA PLATE RF
2	2-2.5	2-4	0	0	012	125	1	400	2-3	551	361	300	900	10	1.3	30	2.0
2.5	2-2.5	2-4	3	5	053	100	2	390	2-3	316	404	300	900	10	1.3	34	2.2
2.5	2.5-3	2-4	3	5	036	065	2	390	2-3	313	404	300	900	10	1.3	30	2.2
3	2.5-3	2-4	5	6	062	100	2	325	3-4	278	608	300	800	10	1.4	25	2.5
3	3-4	2-4	5	6	053	063	2	330	3-4	282	633	300	800	10	1.4	28	2.5
4	4-6	2-4	4	9	073	070	2	320	4-6	276	669	300	800	10	1.2	26	2.7
4	4-6	4-8	0	0	074	070	2	330	4-6	280	669	300	800	10	1.2	30	3.4
6	4-6	4-8	5	7	097	051	3	235	4-6	179	120	300	800	10	1.3	16	3.6
6	6-8	4-8	5	7	075	000	3	310	6-8	243	208	300	800	10	1.2	20	4.2
8	6-8	4-8	9	9	092	052	3	250	6-8	173	074	300	800	10	1.1	22	5.0
8	8-12	8-16	0	0	076	004	3	320	8-11	251	132	300	800	10	1.2	24	5.1
11	8-12	8-16	4	6	093	061	3	290	8-11	163	057	003	700	10	1.4	22	5.7
11	8-12	8-16	4	6	093	061	3	290	11-15	209	091	003	700	10	1.4	24	5.6
12	8-12	8-16	5	6	098	050	3	250	11-15	188	073	003	600	10	1.3	16	5.0
12	12-16	8-16	5	6	087	005	3	260	11-15	188	073	003	600	10	1.3	16	5.0
15	12-16	8-16	7	8	097	040	3	250	11-15	149	029	003	500	10	1.2	11	4.1
15	12-16	8-16	7	8	097	040	3	250	15-19	197	061	003	500	10	1.1	12	4.4
16	12-16	8-16	9	9	105	036	3	240	15-19	185	048	003	500	10	1.2	12	4.0
16	16-20	16-20	5	6	086	034	3	300	15-19	185	048	003	500	10	1.1	12	4.0
19	16-20	16-20	7	8	094	014	3	300	15-19	144	029	003	500	10	1.3	16	5.2
19	16-20	16-20	7	8	094	014	3	300	19-24	183	059	003	500	10	1.3	18	5.4
20	16-20	16-20	8	8	096	034	3	320	19-24	162	069	003	200	10	1.2	14	5.0
20	20-28	20-28	4	6	089	008	3	360	19-24	162	069	003	200	10	1.2	14	5.0
24	20-28	20-28	6	7	092	023	3	290	19-24	124	038	003	200	10	1.1	10	4.3
24	20-28	20-28	6	7	092	023	3	300	24-28	195	099	003	200	10	1.0	12	5.1
28	20-28	20-28	9	9	099	053	3	285	24-28	156	085	003	200	10	1.0	20	6.3

TEST CONDITIONS:

50 OHMS

MODEL: GPT( )10K

Figure 3: Tuning Chart from the manual.

The following seem to be indicated by the chart:

- The OUTPUT BALANCE capacitor C916 (*serves as a '**sub-loading**' capacitor when the TX is configured for 50 Ohms output*) is set to one value or another, depending on whether the amp is below 8 or above 11 MHz. So somewhere in that undocumented range, it is like switching in another capacitor in parallel with the PA LOADING cap C926.
- The combination of the OUTPUT BALANCE cap C916 and the -L coil OUTPUT LOADING setting influences the PA LOADING cap C926 setting. They might as well be combined into one unit for the purpose.
- The pi coil FINAL BAND L902+L903 has the bandswitch and has nine possible inductance values.
- The OUTPUT LOADING 'L coil' L912+L913 is variable but has six chart settings roughly aligned with frequency.
- The OUTPUT BALANCE cap C916 has two settings, more or less what I call 'in' or 'out'. The dial is charted to be at 300 or 003. Might be turns; 3 or 30.
- The PA LOADING cap C926 seems to vary a bit but is kept in a small range by the other variations except for that the 'in' or 'out' setting of the OUTPUT BALANCE cap C916 calls for it to be toward the higher or lower end.
- The PA TUNE cap C927 varies rather linearly with fequency as might be expected, that is, no surprises there.

The other unusual part of this is the plate choke and bypass arrangement. LTspice shows this to be pretty good, at first look.

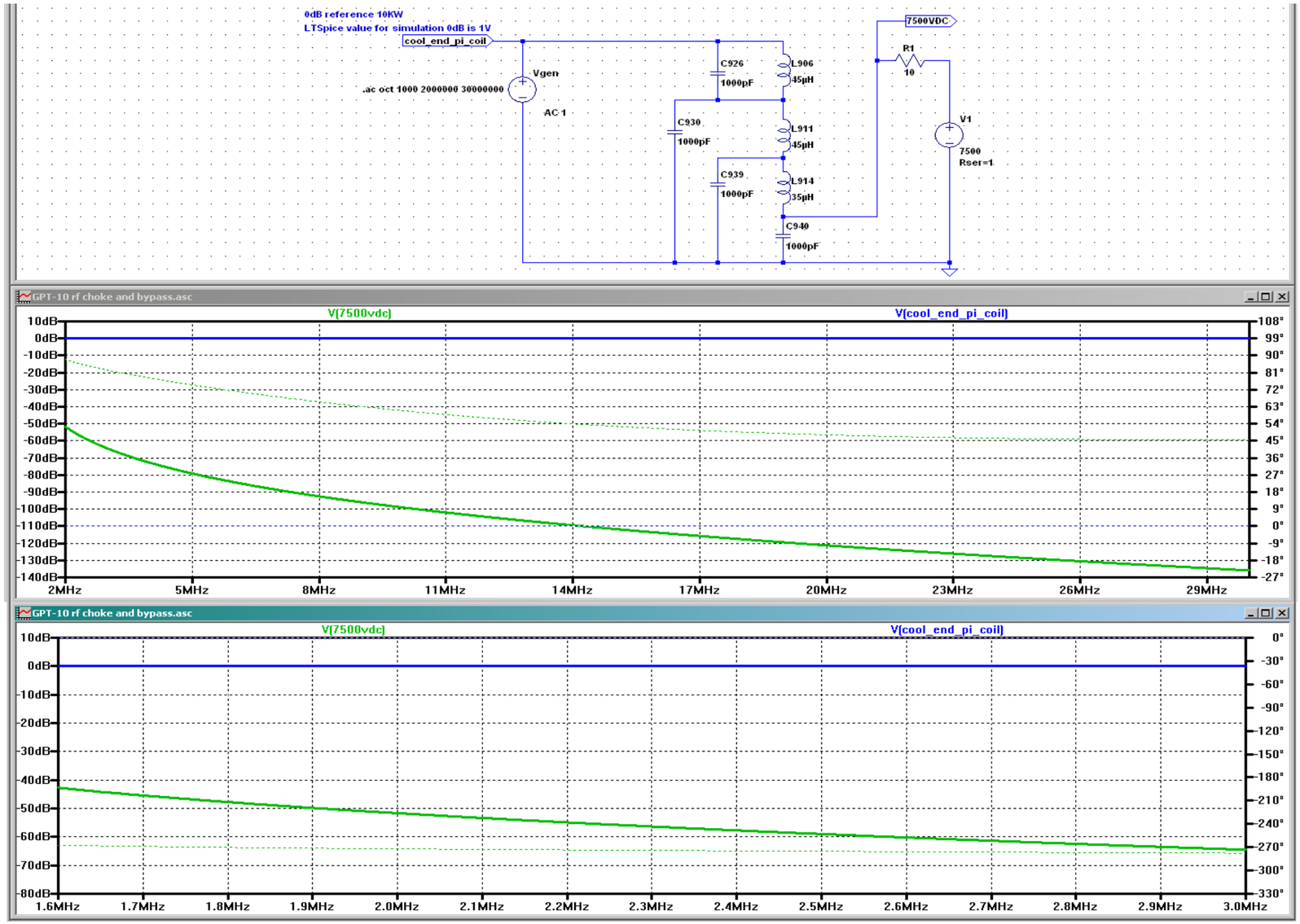


Figure 4: Plate RF, dB down from “cold” end of pi coil.

Something to consider is the pi coil is at B+ in this circuit. There is nothing wrong with that but worth mentioning. No doubt it un-complicates matters around the plate choke and lowers its voltage burden.

What is actually on hand is a pair of the large pi section coils, each with the integrated band switch. It should be possible to use one as intended for the pi section and reconfigure the taps on the second one to set up the right L inductance for each band switch position. The other alternative would be to use maybe a ¼' copper tubing coil with a switch but no large switch is on hand and the second pi coil is. Having identical shafts they could be mechanically coupled without too much trouble.

..PURE OPINION..