Solartron Vari-Pack SRS153S S.N. 147603
NSN: 6625-99-943-3268 Power Unit, Variable Voltage. (0 - +/- 500V.D.C.) CT.397.

Higher quality part version 'S'. Wide-range mains input taps between 90V and 240V, and 40-400Hz. Variable floating DC HV output from 0V to 500V, with 100mA capability from 0-to-350V, derating to 10mA at 450V, with ripple <170mVrms, and stabilised between 10 to 100mA with output resistance ~700Ω (so droop of ~60V). Floating 6V3 3A CT output. Switched meter for 0-600V or 0-150mA. On switch and indicator, and HT fuse. Insulated terminals allow 4mm un-insulated plugs. 16kg.

Full-wave rectified 625V with choke input filter and 2x CV428 triode-connected cathode follower regulator, using half-wave negative internal supply.

Very good general condition. Modified with IEC mains socket. Previous owner Innovonics.

Parts:

Valves	M8091 CV4044 KB/QDA 6443 7501 ?S R4F4 [Mullard Mitcham 1964, June 4]
	M8091 CV4044 KB/QDA 6443 7501 5S1 R4E1 [Mullard Mitcham 1964, May 1]
	M8091 CV4044 KB/QDA 6443 7501 5S1 R4E1 [Mullard Mitcham 1964, May 1]
	5B/254M CV428 KB FE 7525
	5B/254M CV428 KB FE 7525
Choke	L1 Parmeko 20H P480 120mA; Neptune series model 6000/55; 55 6G 3724
Transformer	T1 Parmeko – appears to be only black nameplate on side; 73 6G 2064
	Likely a Neptune series 6000/73
Capacitors	TCC Visconal 1uF 600Vdc
	Plessey Metalpack 73 46 460Meg at 500V
Resistors	R1 ~10W 68k CGC/XB 99-011 4680 - 45mm long. N
	N5.3W diss at 600Vdc. No load peak voltage diss is 11.5W, but assumes ss diodes.
Meter	Ferranti Type V2705, No. C.55427 moving coil, sealed

Issues

Oil residue on baseplate from C6 TCC cap - identified as mineral oil, and not PCB.
Cracked white plastic bushings for sockets.
3A mains fuse value.
Accidentally cracked 1x 5B/254M removing top cap clip.

Measurements

Neg and pos dc output 900Meg to chassis at 1kVdc. 3-0-3Vac >2G at 1kVdc.

Transformer T1 DCR=240; megger at 1kV >2T.
625-0-625V: 128+121 ohm DCR. 240V: 6.5 ohm DCR.

Choke L1 at 20Vac: 21.7H 132mAdc; 24.3H 102mAdc; 26.5H 52mAdc; 28H 24mAdc; 29H 12mAdc; 29.2H 6.3mAdc; 29.8H 4.6mAdc. DCR = 240Ω.

R4 and R11 are both about 1-2% high at 10.10 and 10.20.

PT energisation with tubes and LP1 removed.

- Aneng AN8009 ok to 750Vac.
- 240Vac mains; 90mAac excitation; 625Vac; 6.34Vac

PT energisation with tubes V1-V3 in place.

- If SW1 is opened then pos HT C1-3 will discharge through R1, but C4/5 won't discharge – however if mains is disconnected and SW1 turned on then C4/C5 will discharge through R2, R3, R1 path. SW1-B reconfigured with R3 connecting to switch com, and unused contact taken to 0V via a 56k resistor to allow C4-5 to then discharge.
- V4/V5 top cap connectors insulated.

PT energisation with all tubes in place, and no external load.

- V5 had an accident so not in.
- Min output setting: 8-13Vdc ~60mVac (volts), 569Vdc 0.3Vac, -214Vdc.
- Max output setting: 450Vdc ~60mVac (volts), 572Vdc 0.3Vac, -222Vdc.

External loading

- 0 to 49mA external loading; Vout set at 350Vdc ~60-80mVac
- VS1 droops from 569V to 541V, ~0.3Vrms constant;

Shunt regulator across choke-input filter raw supply.

- Set regulation for 542V, and measured <0.1V variation for external loading from 0mA to 33mA. Shunt regulator used 11k7 30W dump resistor, which dropped about 400-450V with no external load, so some margin, although resistors dissipating 17W so get hot. FET heatsink was touchable, and would have dissipated up to 34mA x 540/2 = 9.2W. Shunt reg circuit needed 4M7 (in lieu of 10M) to set for 542V.
- Step load changes using 25k6 and 10k08 loads indicated down to 400Ω output resistance for 350V and 33mA step, given only one 5B254M in operation.

No load testing – mains variac increased in steps

Mains	45	85	130	170	210	228
V-C1	100	200	300	400	500	543
V-C5	-39	-77.5	-114	-150	-185	-198
Vout	-0.9 / 13	-1.8 / 156	-2.5 / 234	-2.7 / 312	-1 / 392	1.6 / 425
Vgk – V4	-38 / 61	-76 / -4.4	-112 / -7.8	-148 / -11	-183 / -14	-199 / -16

1x 5B/254; Rectifier valves bypassed (only ss diodes in play); Output pot setting min/max.
Pre-regulator starts limiting V-C1 above ~543V. No reverse bias limiting diode.

No load testing – mains variac increased in steps

Mains	45	85	130	170	210	228
V-C1		183	296	389	487	533
V-C5		-81	-114	-148 / -153	-184 / -188	-198 / -204
Vout		-0.4/	-0.4 / 231	-0.4 / 304	-0.4 / 380	1.1 / 417
Vgk – V4		-80 /	-114 / -7.7	-148 / -11	-183 / -14	-199 / -15

1x 5B/254; Output pot setting min/max. Diode across C7 and Vgk.

231Vout for 10.3mV across 10R, so 1mA through 330k//600k=212k.
Pre-regulator starts limiting V-C1 above ~543V.

RV2 ~ 95kΩ for default setting.

25k6 load testing – 210V mains

Vout	0	50	100	150	200	250	300	350	370
V-C1	496	491	489	487	485	483	479	478	477
V4 Ik mA	0	1.2	2.2	3.1	4.1	5.0	6.0	7.0	7.4
V5 Ik	0	1.0	2.1	3.4	4.7	5.9	7.2	8.4	8.8

2x 5B/254; Output pot setting min/max. Diodes across C7 and Vgk.

25k6 load testing – 230V mains – 6.5W max output

Vout	0.7	50	100	150	200	250	300	350	400	407
V-C1	542	537	534	533	532	531	528	527	525	525
V4 Ik	0	1.2	2.3	3.2	4.1	5.0	6.0	7.0	8.0	8.1
V5 Ik	0	1.0	2.1	3.4	4.7	5.9	7.1	8.4	9.5	9.7

2x 5B/254; Output pot setting min/max. Diodes across C7 and Vgk.

10k load testing – 230V mains – 16W max output

Vout	0.2	50	100	150	200	250	300	350	393
V-C1	542	534	530	527	524	521	518	514	513
V4 Ik	0	2.7	5.0	7.3	9.7	12.2	14.7	17.2	19.2
V5 Ik	0	2.6	5.4	8.3	11.1	13.9	16.7	19.4	21.7

2x 5B/254; Output pot setting min/max. Diodes across C7 and Vgk.

3k6 load testing – 230V mains – 34W max output

Vout/ ~mVrms	0.2	50/ 37	100/ 55	150/ 45	200/ 40	250/ 45	300/ 40	350/ 40
V-C1/ Vacrms	542	530	522	513	505	496/ 0.27	490/ 0.27	482
V4 Ik	0	6.7	13.1	20.1	26.8	33.7	40.2	47.2
V5 Ik	0	7.6	14.9	22.3	29.2	36.5	43.5	51.4
Vgk	209	66	53	42	31	22	12	3.6

2x 5B/254; Output pot setting min/max. Diodes across C7 and Vgk.
Meter displays 96mA for 47.2/1.01 + 51.4/1.02 = 46.7+50.4 = 97.1mA. Mains 0.45A.

Constant voltage – load step testing – 350V nominal at 100mA
3k6 at 100mA. 4k5 at 80mA. 6k at 60mA. 7k2 at 50mA. 9k at 40mA. 18k at 20mA. 36k at 10mA.
25k6//10k08=7k23 ; 25k6//7k54=5k82 ; 10k08//7k54=4k31 ; 10k08+7k54=17k62 ;
25k6+10k08=35k68

230V mains – 350V at 100mA setting - 34W max output

Load	43k22	33k14	25k6	17k62	13k68	11k14	7k54	7k23	5k82	3k6
V-C1	524	522	521	519	517	511	503		494	482
V-out	409	406	404	398	396	391	382	377	370	350
V4 Ik	4.8	6.1	7.8	11.1	14.1	17.0	24.5	25.3	30.8	47.2
V5 Ik	5.9	7.3	9.2	12.8	16.1	19.3	27.4	28.3	34.2	51.4
-Vgk	13.3	12.7	12.0	10.8	10.0	9.2	7.4	7.0	5.8	3.6
Ik tot	10.7	13.4	17	23.9	30.2	36.3	51.9	53.6	65	98.6
-ΔR		600			820	580		614	595	

Notes: to maintain Vout regulation, Vgk needs to increase as load current decreases in order to drop more Vak. But V-C1 increases as load current decreases. The net -Vgk does go more negative, but the rise in V-C1 seems too substantial.

Top of VR1 voltage:
no load, 542V, 527V, 406V, 0.4V. Vout up to 422V.
25k6 load, 527V, 513V, 393V, 350V. 526V, 512V, 392V, 404V
7K54 load 508V, 494V, 375V, 350V. 505V, 491V, 374V, 381V
3k6 load 477V, 463V, 349V, 350V.

With V-C1 increasing from circa 481V to 524V for load change from 100mA to 10mA, there may be benefit in Zener diode regulating the positive feed to RV1. A 350V Zener on VR1 would limit Vout to 350V max, but also regulate the set load voltage for changes in output load. Zener dropper current at least (524-350)/100k = 1.8mA, so perhaps aim for 5mA (1.8W). 2x 1N5383B + 2x 1N5359.

350V 100mA load setting. 350V Zener across C7.

Load	No load	33k14	25k6	17k62			7k54		5k82	3k6
V-out	374	367	366	364			359		356	350
-ΔR		286		180			230		179	

Internal temp rise testing. M3510A with K-type located internally beside main meter is free air, with cover on but not firmly screwed up. 240Vac mains, no load, 0Vdc demand. Start at 24.0C. +3hrs 42C. Step load 7k5Ω 320V 40mA – stays about 42.4C. Side of C1 facing rectifiers, and side of T1 facing pass valves, get significantly hotter than other surfaces – so preferably shielded from direct radiation.

Design

M8091 was special quality version of EY84: half-wave, 6.3V 1A, B9A, 1k8V PIV. from 1960 on

M8091 has Ipk=0.9A with surge limit of 3.2A (PSUD2). Voltage drop of 20V at 130mA, and 30V at 245mA, is similar to 5V4G and 5Z4 (over a bit), and 6AX4 is under a bit. PSUD2 indicates hot-start 800Vpk across caps, reducing to 650Vdc, for 68k only load (but assumes no regulated output). Id-pk up to 0.36A, and continuous choke current needs 27k loading for 550Vdc.

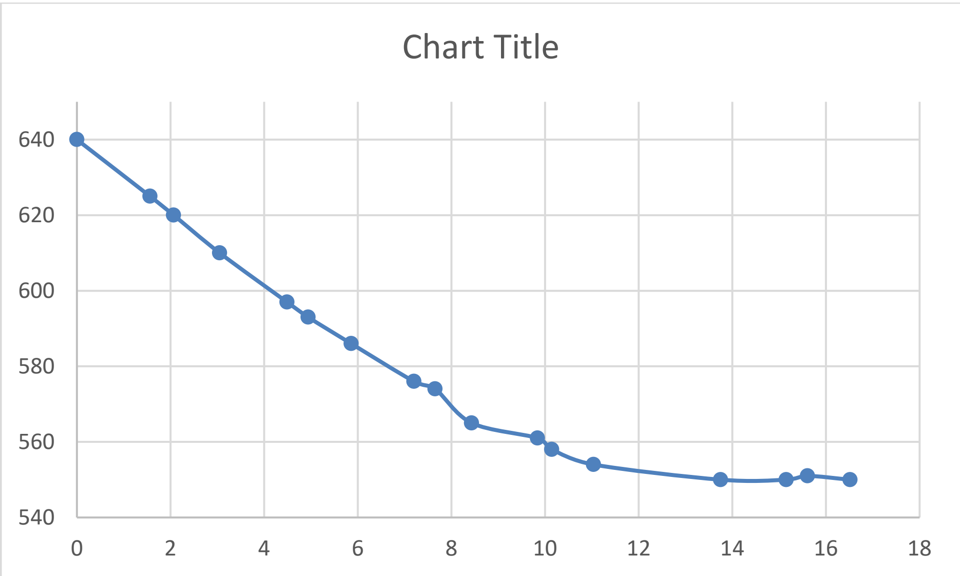
- Operator manual indicates choke critical conduction at about 450V with 10mA external load.
- Ripple trap should help with choke minimum current and no-load regulation.

- Voltage ref divider network has no-load current of ~(670+940)V/1000kΩ = 1.6mA. 68k 670Vdc provides 10mA load, but 8mA at 550V. V4/V5 conducting at minimum output voltage indicates worst-case no additional loading, and with 350Vdc output and no external loading adds 350V/330k = 1.0mA internal. At 550Vdc VS1 and 350V output, loading on VS1 is down to ~8+1.2+1=10mA (55k).
    - PSUD2 with 55k load gives 580V with 45H, and 620V with 32H, with 5V4 or 6AX4 model. Inductor model may be an issue at high Vac, including at zero current transition. Other issues like ss diodes and cap leakage should be minor.

Operator manual indicates that mains voltage tap set for 520Vdc output max with no load. Equivalent internal loading of ~ 10+1.6+1.6 = 13mA.

Minimum loading for critical inductance of 30H is R ~ 900 x 30H = 27k. A ripple trap is likely to increase R to about 50k, and increased inductance from higher Vc across choke could increase it further.

- PSUD2 with 68//68 = 34k loading (8.3 internal+8.3mA external) and 32H indicates VS1 about 565V, which is confirmed and near knee of continuous current operation with following V-I.



- Plot of external added load to just VS1 – SW1-B link removed – VS1 (across C1-C3) versus external current in mA from added loading.
- Shunt C to tune 29H L1 for 100Hz resonance requires 87nF (based on 12mAdc 20Vrms measured inductance). 82nF should allow increased inductance (~31H) from choke input higher Vac across choke. Otherwise use 100nF for better ripple reduction at 120mAdc loading (25H resonance at 100Hz).
- With 50nF+270Ω across L1, measured VS1 is close to constant from no external load (556V) , reducing to 551V with 8mA external.
- With 50nF incrementing up to 77.2nF in 6n8F steps, the no external load voltage rises slightly to 563V, and the +8mA voltage rises to 556V, and rms ripple falls from ~0.3V to ~0.18V.
- With 100nF, the no external load voltage was 570V, and the +8mA voltage was 560V, but rms ripple was higher at 0.28V. This indicates the anticipated 82nF value would be slightly better than 100nF.

- The 100nF 1kVdc WF-7 Sochin Denko Mica capacitor was fitted, as no practical 82nF available.

Preset RV2 setting is likely factory set for 520Vdc output at no load, and correct mains voltage (95kΩ), given tolerance of R2, RV1, RV2, R3, and diode on voltages.

Protection ss diodes on each CV4044 anode need circa 2kV PIV, so use 3x 1N4007 in series.

PSUD2 indicates a step load causes a (~2 cycle) damped resonant response with ~190ms period (5Hz) based on 32H 240Ω inductor, and unregulated 110mA base load. Ripple is nearly 2Vpp, and measured Vac was ~0.3Vrms.

PSUD2 indicates a 125mA IEC F fuse should suit for F2. Short duration over-current from too low a loading resistance for the demanded voltage should be ok if noticed by the current meter exceeding FS, and shouldn't stress the pass valves, but long term over-current may start stressing parts.

Simulate period in PSUD2	**20ms**	**150ms**	**600ms**	**continuous**
Simulated RMS current	0.18A	0.22A	0.15A	0.11A
Multiplier (based on 0.125A fuse rating)	1.5	1.8	1.2	0.9
IEC60127-2 Time-lag T min limit multiplier	10	4	2.75	1

Simulate period in PSUD2	**10ms**	**50ms**	**continuous**
Simulated RMS current	0.1A	0.3A	0.11A
Multiplier (based on 0.125A fuse rating)	0.8	2.4	0.9
IEC60127-2 Quick-acting F min limit multiplier	4	2.75	1

CV428 6.3V 0.9A; 25W triode connected; 8B8 base; beam tetrode similar to 807 ; 5B/254M. The 5B/254M appears to operate with significant margins:

- 125mA anode current max rating, compared to 50mA nominal max operation.
- No grid voltage max rating, but limited to 0V nominal.
- 600V anode voltage max rating, compared to 542V anode voltage max operation.
- 25W anode + screen power max rating, compared to 482V x 50mA = 24.1W max operation.
    - 0V output at 100mA is worst-case for dissipation.
    - anode/screen voltage exceeds 400V max rating, but that is for class AB1 PP operation.

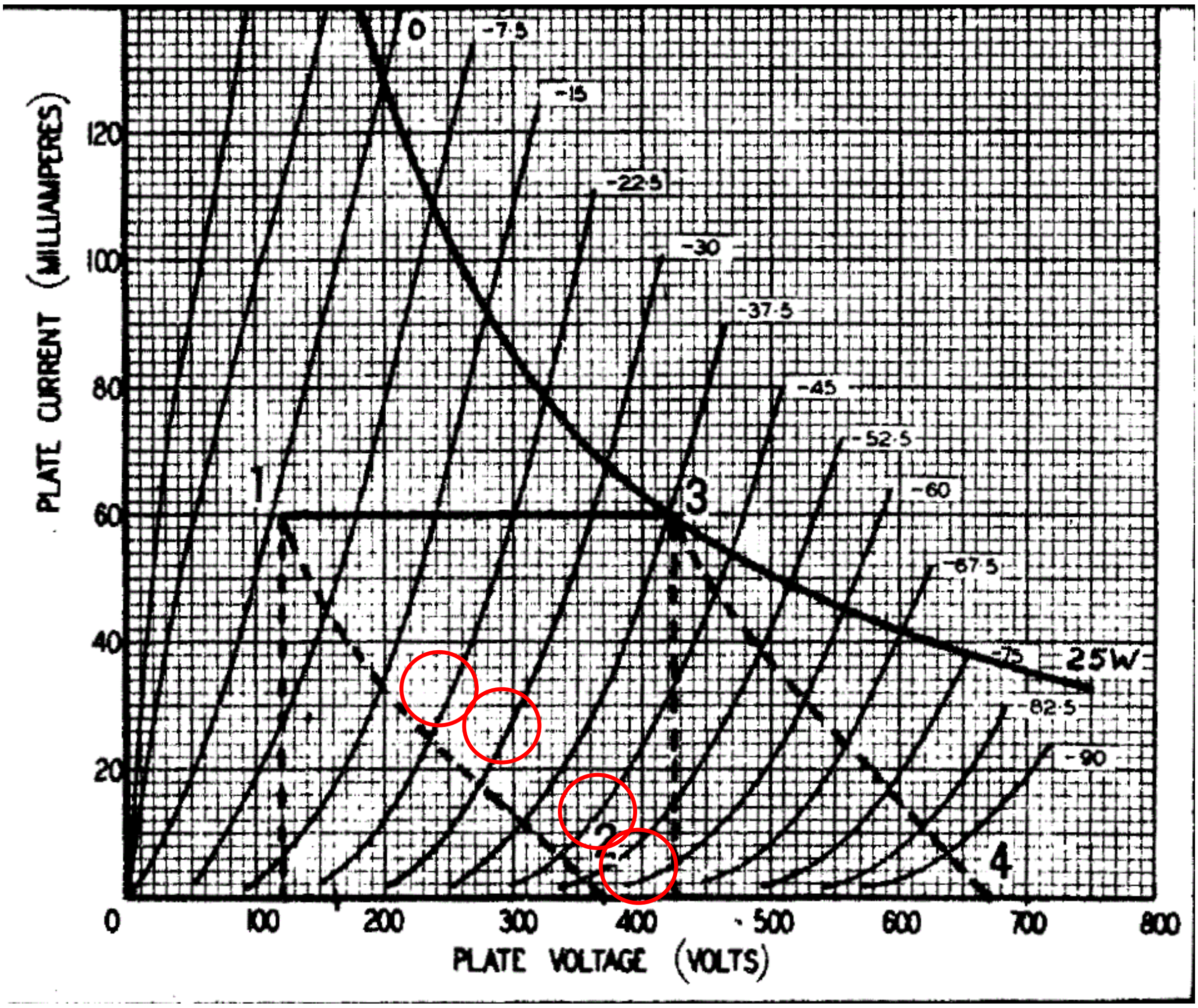
Options

Improved regulation of output voltage

- Existing regulation is mainly due to sag of VS1 with increased load current, as grid bias doesn't change positively enough. This sag is suppressed by using a choke-input filter. Output resistance is stated as approx. 700Ω from 10mA to 100mA (so ΔV=7V for 10mA step).
    - T1 has secondary DCR of ~130Ω.

- M8091 has effective 17V/100mA=170Ω, increasing to about 10V/50mA=200Ω, based on choke input current.
- L1 has DCR of 240Ω, and fuse has 10Ω. Nominal resistance.
- Sum of 'static' resistances for VS1 sag are 130+200+240+10= 570Ω.
- Each 5B/254M has a 47Ω anode stopper and a 10Ω cathode current sense/share, adding 60Ω per leg. The 47Ω anode stopper could be replaced by ferrite beads.

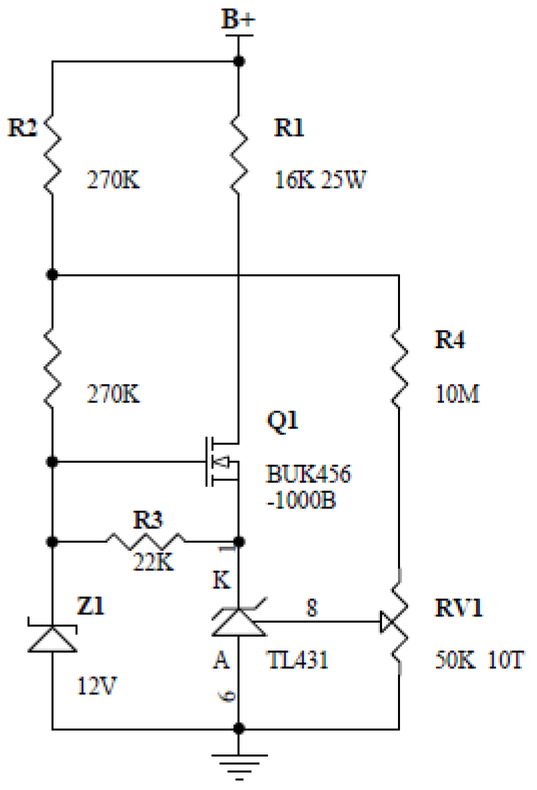
Plot from RTVH March 1960 for 807 triode mode regulator indicates 807 has a loadline of ~(370-200)/32mA=5k3Ω.



- Sample output resistance measurements show:
  - -3.2V/1.72mA= 1900Ω at 55V and 6mA; with -72Vg, VS1=564-562 (-17V)
  - -3V/5.4mA= 556Ω at 150V and 15mA; with -50Vg, VS1=555-553 (+100V)
  - -4V/9.44mA= 420Ω at 250V and 26mA; with -30Vg, VS1=549-545 (+220V)
  - -7V/11.4mA= 614Ω at 320V and 32mA; with -20Vg, VS1=547-543 (+300V)

The nominal VS1 droop is 555V at 15mA to 543V at 43mA, or 430Ω; increasing to 564V at 6mA to 555V at 15mA, or 1kΩ ~10mA.

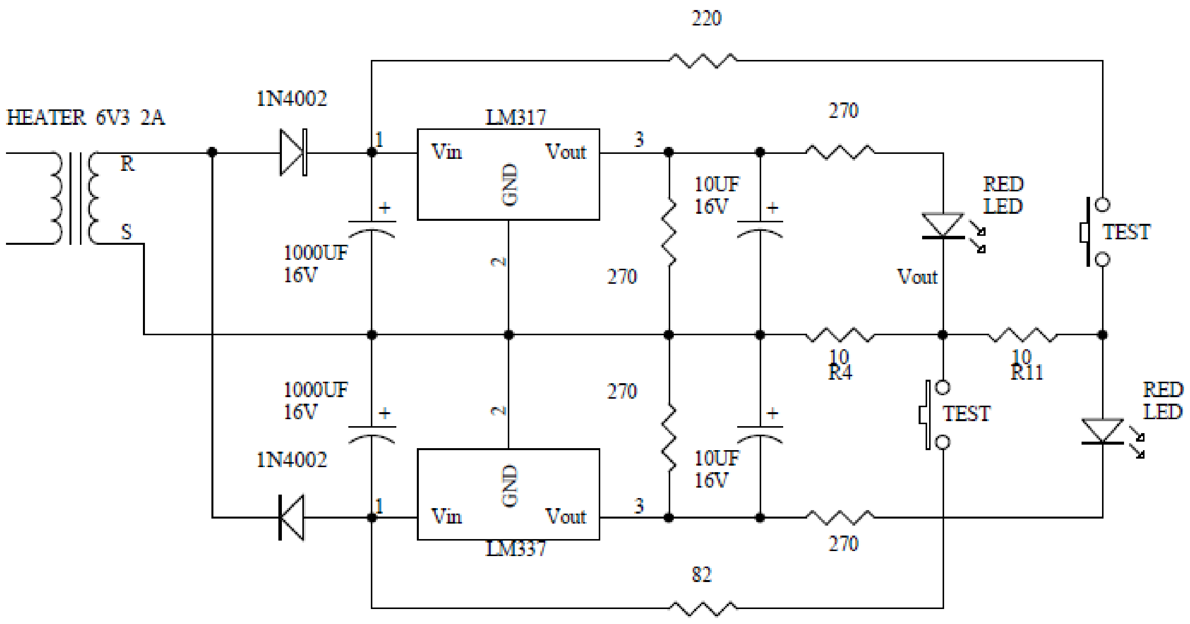
- VS1 sag can be suppressed by switching in an ss shunt regulator across VS1 to effectively increase loading on VS1 when above say 540V. Eg. negligible extra loading below say 540V, increasing to 46mA at 543V (25W 11k7Ω). This can be on V4-5 side of SW1-B.
  - Aim for 565V at 50mA, falling to 0mA at 540V, to regulate VS1 to circa 550V for external loads up to 30mA. Above about 30mA, VS1 will start to sag but regulation should be improved up to about 40mA.
  - Max FET dissipation at say 550Vx30mA/2 = 8.5W. With Rjc~1, then heatsink needs <5-6 C/W, and tab to be insulated to restrain Tj below 90C for 40C ambient. Heatsink mounted above choke using choke's threaded bosses. Thermal pad with isolated clamp on finned heatsink.
  - R1~565V/50mA=12kΩ 30W, but would not see that due to VS1 inherent regulation. Using 3x 3k9Ω 10W in series (so 11k7).
  - R4=4M7 instead of 10M to regulate at 542V.
  - Shunt regulator independent of mains voltage, which could cause a significant performance issue – eg. at high mains voltage, the regulator may be hard on for all loading, so perhaps needs to be switchable, and monitored.



Over-current indicator to alert operator of >100mA, as meter may be set to voltage.

- Overload when R4 and R11 > 50-60mA each, so >0.5-0.6V.
- Add two front panel red LEDs.
- Use S-R heater, with S as the common 0V, and two half-wave supplies to provide +/- 7Vdc, then LM317 and LM337 for +/-V regulated rails. V is adjusted to just turn on a red led for >5.6V difference from pos and neg 5V rails.
- When V4 current exceeds 60mA, then R4 > -0.6V below 0V turns on the LED from the +V rail.

- R11 > +0.6V above 0V turns on LED from the -V rail when: V4 out of socket or doesn't conduct and V5 current exceeds 60mA, or V5 cathode current exceeds V4 current by 60mA.
- Red 1mA/1.74V; 2mA 1.79V. Set reg output to 1.8-0.6=1.2V.
- LM317 Vout is at least 1.25V so aim for 1.25V and then only a need for a load resistor. LM337 is -1.23V.
- Test resistor needs to pull the LED about 0.5V below/above 0V, so 50mA through 10R and 25mA through 20R. The raw dc will sag, so perhaps 4V at 50mA (82R), and 5V at 25mA (220R). Pos LED displays on when button pressed, and Neg LED flashes when button released.
- Test Switch is DP NO CK 8225 with 1kVrms withstand.



Current monitoring of R4 and R11 to indicate balanced V4/V5 conduction.

- R4=10.206Ω ; R11=10.252Ω.
- Monitoring terminals – risky due to floating output and high voltage.

Pentode-mode operation of output stage to raise maximum output voltage range whilst maintaining 100mA capability.

- Capacitor input doubler of S-R heater to derive nominal 12Vdc. S-R heater has 0.2A margin on 2A rating (more if only one output valve is used).
- Use lowish power ebay smps inverter configured for about 220-300Vdc output for semi-fixed screen supply with common cathode 0V node.
- Retain existing setting control. Triode mode grid circa -50V or more for cut-off, and pentode mode likely less.

Modifications

- separated mains wiring from touching chassis.
- C1-C3, C5-C7 tested ok to 500V
- C4 tested ok and taken to HT CT

- C6 replaced by 0.47uF 630Vdc MKP10, and neg taken to C3 neg.
- R2=565k and has ~500V, so replaced with 180k+180k+110k.
- VE17 2750K MOV across mains primary
- added 3x series 1N4007 to each anode of V1, V2, and to cathode/heater of V3.
- 2x series 10D681K MOV across L1 choke
- fitted replacement 3AG front panel fuse holder for F2 HT and 250mA F Buss BS2590A 3AG TDC10 (lowest available rating on shelf).
- replaced R3 with PRO2.
- replaced cracked front panel socket bushings.
- reconfigured SW1-B and added 56k to 0V on spare contact, to discharge C4/5 when SW1 is off.
- added 100nF 1kVdc Sochin Mica and series 270Ω 3W across L1. MOV protection now redundant but left in place.
- Added HV shunt regulator across C1-3 supply and set to regulate to 542V with 12k 30W load.
- Added negative output limit with 1N4007 diode across C7. With gassy/shorting rectifier diodes (only ss), and no load, and low mains, and min output pot setting, the output can go negative a bit. Avoids any chance of reverse biasing external e-caps connected to supply.
- Added protection diode from triode grid to cathode to suppress grid conduction:
  - Suppresses anode current increase if output is shorted and grid becomes more positive than cathode.
  - Grid conduction could occur when RV1 wiper forced more positive than common cathode, and shorted output current would flow through R3-RV2-RV1-diode, so up to 540V/110k = 5mA (2.7W) if valves didn't conduct.
  - With low mains, and gassy/shorting rectifier diodes (only ss), and output pot on high setting, Vgk can be pushed >0V.
  - Diode current would flow through R3-RV2-RV1-diode-R4/11-R12/load, so up to 540V/110k = 5mA (2.7W) if valves didn't conduct.
- Added front panel over-current indicator red LEDs and test pushbutton, with protoboard mounted underneath.
- Mains fuse rating – reduced to 1.5A 3AG UL 313 S.
- Added 350V Zener (2x 1N5383B + 2x 1N5359) across C7 to reduce sag, but limits max output to 375V no load. So disconnect if not applicable.
- Fitted Nomex sheets to side of C1, and side of T1, facing the valves.

To do

Check step load change influence for fixed output voltage control settings.

See what can be done.

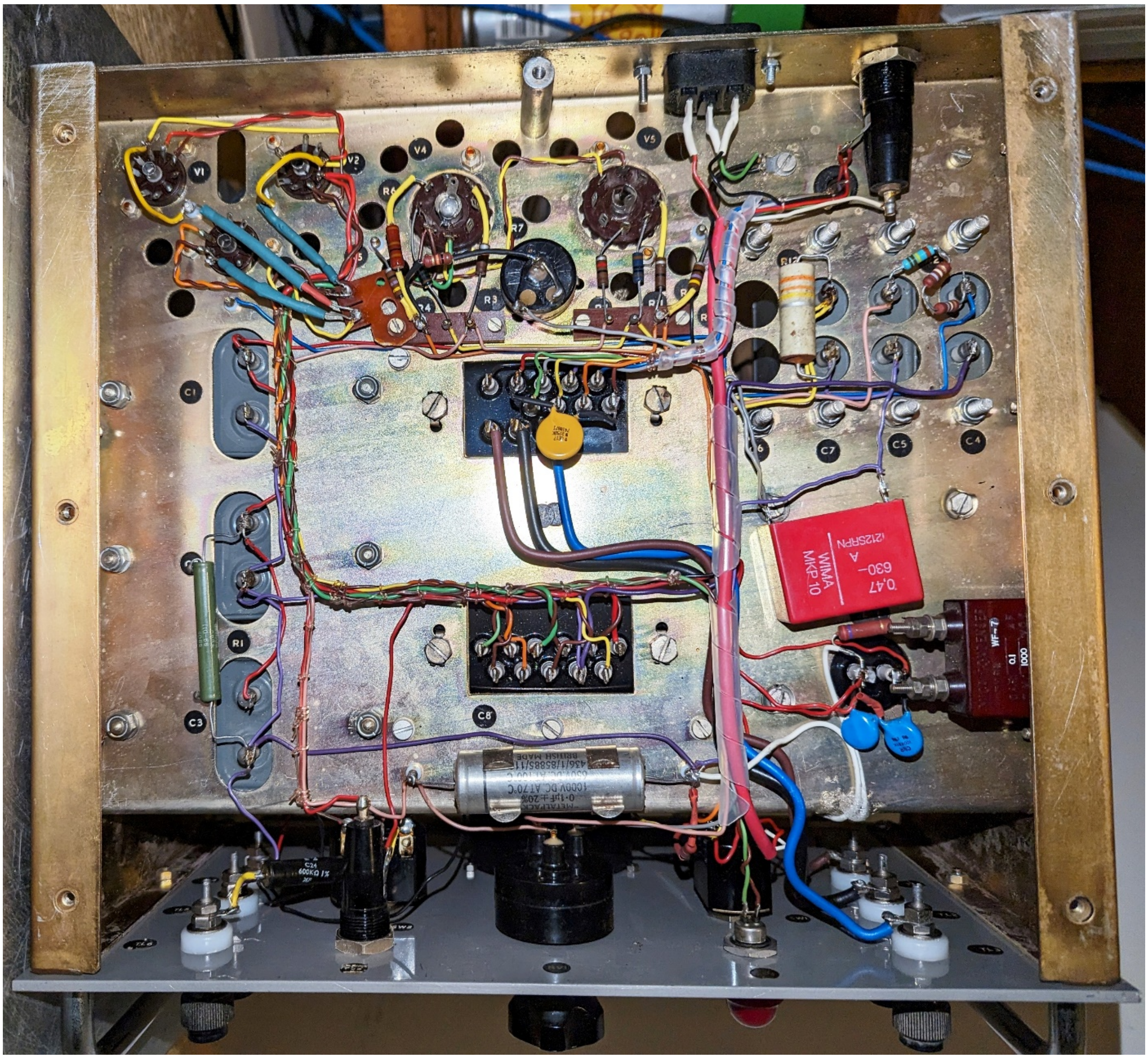
Add protection for RV1 wiper loss of contact - diode to top of pot

- grids can't go more positive than top of pot.

Check internal ambient when loaded – louvres seem marginal.

1kVac 50-100nF cap from choke input to CT.


NEPTUNE SERIES
PARMEKO
CAT. REF.
P.480
20H 0-12A
MODEL NO.
6000 / 55


V1
V2
V4
V5
R3
R7
C1
R1
C3
C8
C7
C5
C4


NOT CALIBRATED
NOT FOR FINAL TEST
VARI-PACK
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SERIAL NO. 147603
6625-99-943-3268
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DATA SHEET

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(CT397 Joint Services Catalogue No. 6625-99-943-3268)

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- "Student-proof".
- Continuous control 0—500 volts.

APPLICATIONS

The Varipack can be used for testing of components, valves and similar devices, also for supplying research and prototype equipments.

It is, however, most suitable for use in educational establishments—where its rugged construction and simple operating procedure give it a great advantage in safety and certainty.

DESIGN FEATURES

A controllable output voltage of from zero to 500 volts is obtained using only one control, by employing a grid-controlled series valve circuit of novel form.

The output voltage is normally isolated from earth, but by earthing the appropriate output terminal either a positive or a negative supply is obtainable. An important characteristic of the instrument is its basic simplicity, which in conjunction with the use of paper capacitors and other high-grade components provides a good performance with inherent reliability.

Two units may be used in series to provide supplies at higher voltages.

An A.C. output of 6·3 volts at 3 amps is provided for supplying valve heaters.

MECHANICAL CONSTRUCTION

A six-pin socket is mounted to the rear of the chassis and is wired in parallel with the output terminals, so that alternative connections may be made for rack-mounted equipment. The $2\frac{1}{2}$ in. meter, terminals and controls are mounted on the anodised duralumin front panel, the complete instrument being housed in a steel case. A 19 in. panel model for rack mounting is available to order at extra cost.

SPECIFICATION SRS153.2

Mains Input:	220V or 110V±20V in 5 and 10V taps. 50 to 400 c/s. Consumption 140 VA.
H.T. Output:	0—350 volts/100 mA positive or negative. 0—400 volts/50 mA ,, ,, ,, 0—500 volts zero load ,, ,, ,,
A.C. Output:	6·3 volts/3 amps centre tapped.
Ripple Content:	Less than 150 mV r.m.s.
D.C. Resistance:	Approx. 700Ω from 10 mA to 100 mA.
Dimensions:	13 in. × 8 in. × $13\frac{1}{2}$ in. (33 cm × 20·3 cm × 34·3 cm).
Weight:	35 lb. (15·8 kg).

THE SOLARTRON ELECTRONIC GROUP LTD.
(Instrument Division)

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Cables: Solartron Farnborough.

John Drew (Printers) Ltd., Aldershot. G63/IK

R	R2 R1 R3 RV2.RV1. R6 R5 R4 R7 R9 R8 R10 R11 R12 R13
C	C1 C4 C2 C3 C5 C6 C8 C7
MISC.	F1 SW1,A. PL.1. T1 LP.1. V2 V1 V3 F2 L1 SW1,B. V4 V5 M1 SW2 TL1–6

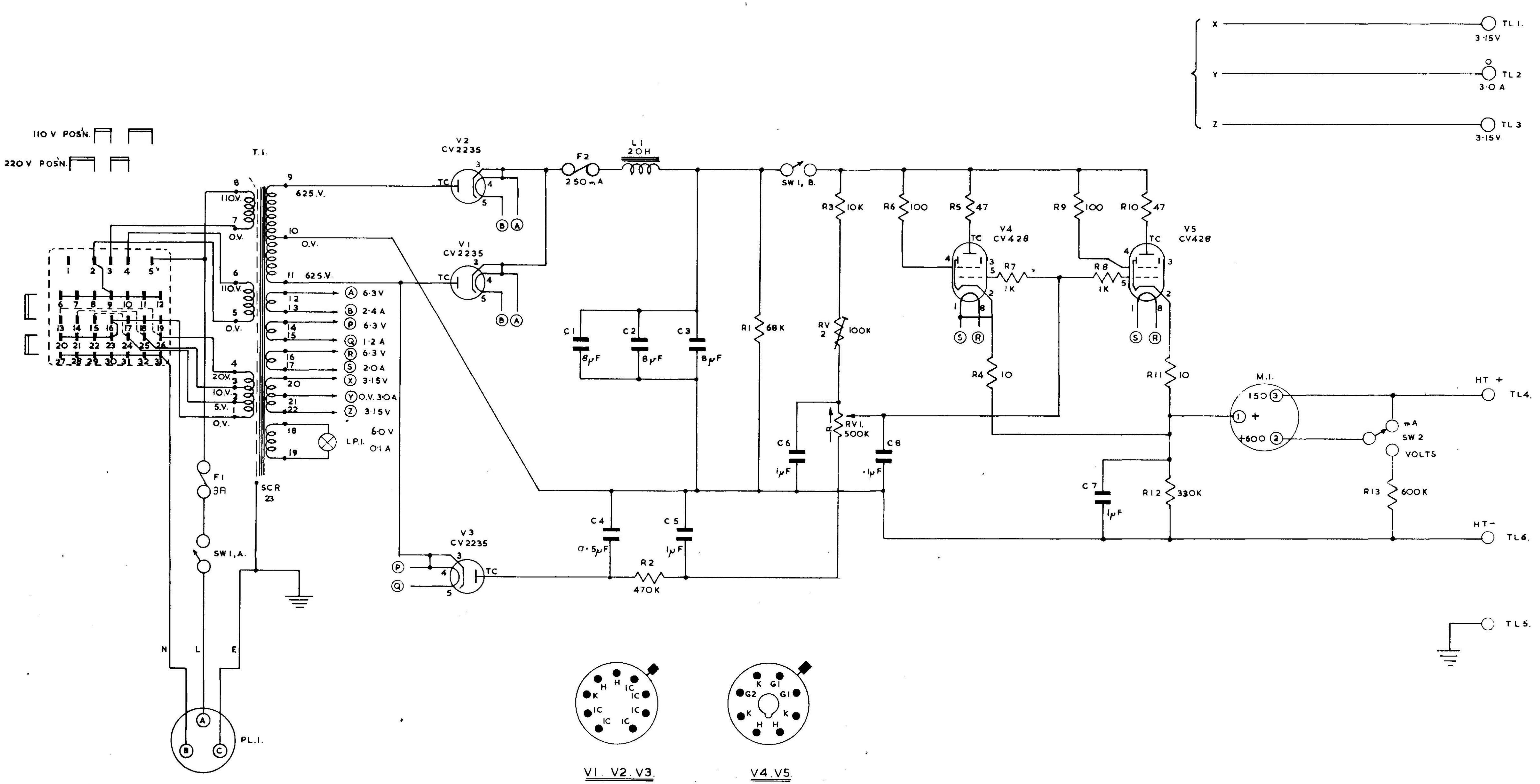

Fig. 5 Circuit Diagram SRS153.S