TELEVISION
12S CHASSIS

SERVICE MANUAL

SPECIFICATIONS

CHANNEL	FREQUENCIES
0	45-52 MHz
1	56-63 MHz
2	63-70 MHz
3	85-92 MHz
4	94-101 MHz
5	101-108 MHz
5A	137-144 MHz
6	174-181 MHz
7	181-188 MHz
8	188-195 MHz
9	195-202 MHz
10	208-215 MHz
11	215-222 MHz

Aerial input impedance	300 ohms
Turret tuner	CZ 210 977 (NT 3022)
Video I.F.	36.5 MHz
Sound I.F.	5.5 MHz
Supply Voltages	240v, 250v at 50 Hz
Picture tube	See below
Picture tube focus	Electrostatic
Picture tube deflection	Magnetic
Horizontal output transformer	CZ 355 012 (NT 3102)
Deflection unit	CZ 320 961 (NT 3200)

Picture Tubes:

12″	**A31-20W**
17″	**A44-11W**
20″	**A50-120W**
23″	**A59-11W**
24″	**A61-120W**
25″	**A65-11W**

PHILIPS

PHILIPS INDUSTRIES LIMITED
Branches in all States

APRIL 1972

VIDEO I.F. ALIGNMENT

Before making any adjustment, measure the 12 volt rail to ensure that the correct voltage is present.

Switch tuner to blank channel 12 position. Remove shield covering L56 and L57 and apply 100 ohm damping resistors to both coils. Apply a 33 ohm damping resistor to first I.F. transformer T2 (across R614 on tuner).

Using an R.C. filter connected as per Figure 1 from the (TP6) side of the contrast potentiometer, capacitor to earth,

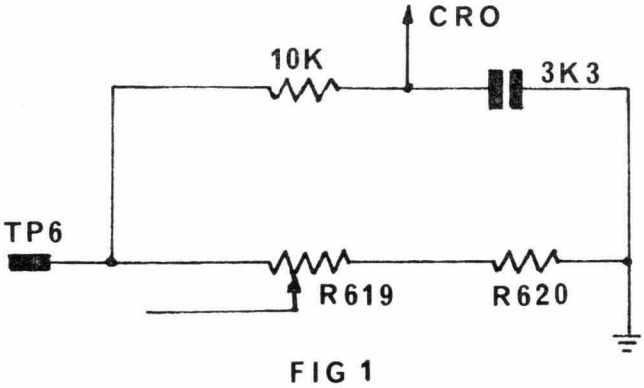


FIG 1

connect a C.R.O. to the junction of the 3K3 capacitor and the 10K ohm resistor.

Set C.R.O. to .02 v/div. and feed a sweep signal via a standard tuner probe (Figure 2) to the tuner I.F. injection point. (Note capacitor value change. 8.2pF).

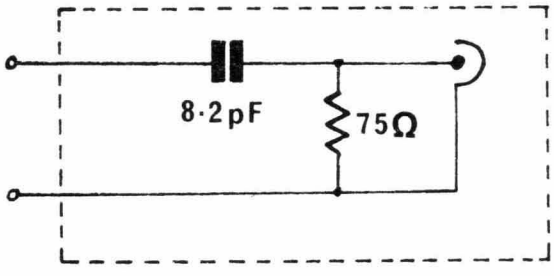


FIG 2

Adjust trap core.

L51	for maximum rejection at 38 MHz
L52	for maximum rejection at 29.5 MHz
L54	for maximum rejection at 31 MHz

With sweep generator output switched to 1V-40dB attenuation, adjust core of T51 for maximum deflection.

Adjust cores of T52 and T53 to give response curve of Figure 3. T52 will influence the shaping of the high frequency side and T53 the low frequency side.

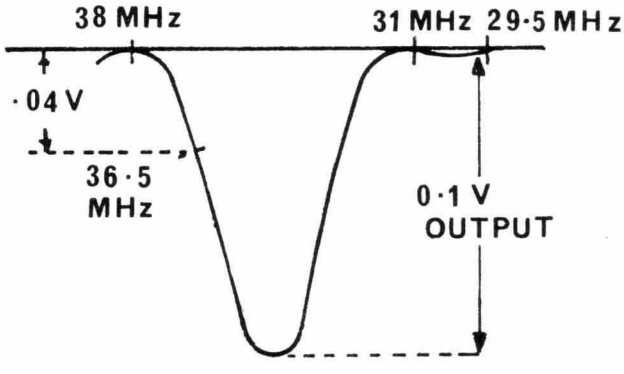


FIG 3

Remove damping resistors from L56 and L57 then replace the shield for this stage.

Set C.R.O. to the .2v/division and sweep generator output to 1v-70dB then adjust T2 for maximum deflection.

Adjust cores of L56 and L57 to achieve the response in Figure 4.

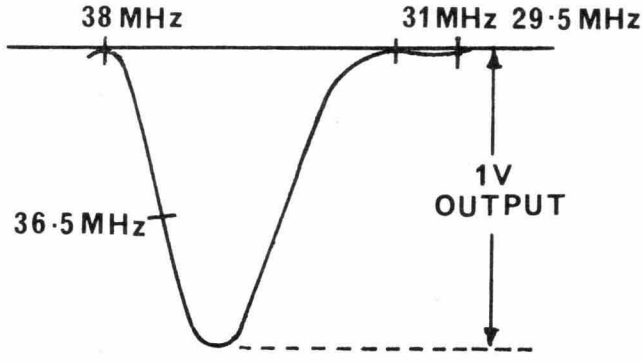


FIG 4

Remove damping resistor from T2 and adjust core to produce response curve Figure 5 and 31 MHz trap depth. Observe the shape of the response at 30-31 MHz and the depth of the 31 MHz trap.

Switch out an extra 20dB from the sweep generator to check the 31 MHz trap, i.e. generator output at 1v-50dB.

Further correction of trap depth and 30/31 MHz response can be achieved if necessary by adjusting T2 and T51. Final correction to overall curve shape can be made by slight adjustment to L56.

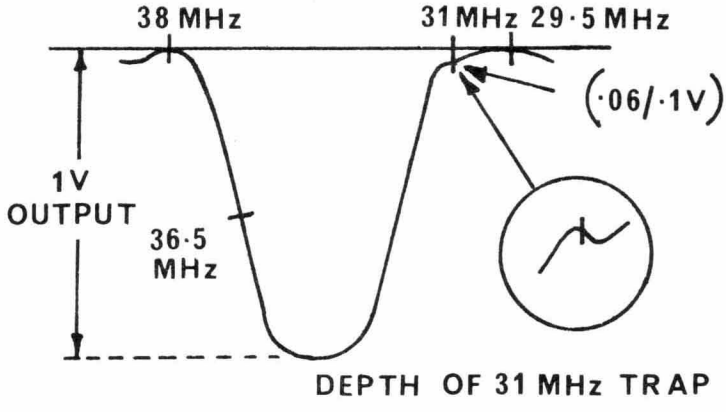


FIG 5

NOTE:

In the event of a tuner being replaced in a receiver, check the overall response curve. (Figure 5)

Make adjustments in accordance with the final stage of alignment procedure.

When remounting tuner, do not channel aerial lead along with other wiring as instability may result.

R615, R601 and R614 although mounted on the tuner are not part of its circuitry so it must be remembered to transfer these to the replacement tuner.

HORIZONTAL OSCILLATOR FREQUENCY ADJUSTMENT

Apply a transmitted picture signal to aerial terminals and set horizontal hold control R516 to its mechanical centre. Short out sync. between Pin 1 and Pin 3 of ZH001 and adjust T501 so that the picture just floats through. Restore sync. and check that the catch range is symmetrical about the central mechanical setting of the hold control.

A.G.C. PRE-SET CONTROL (R607)

This control determines the delay of A.G.C. voltage to the tuner. If the delay is insufficient, mixer noise will become apparent at moderate signals (particularly on high channels). If, however, the delay is excessive, herringbone patterning may be apparent on the low frequency channels at moderate to high signals. Factory adjustment is made for best compromise of all signal levels and should prove correct for most locations. In certain difficult localities, if herringbone patterning should occur on lower frequencies, this pre-set control may be adjusted to reduce interference without introducing excessive noise. In addition if it is necessary to replace certain components, adjustment may be necessary to compensate for any variation in performance. It is important to check the effect on all viewing channels as a good setting for one channel may not be satisfactory for another.

TUNER GAIN PRE-SET (R603)

With a weak RF signal fed to the tuner (or on an unused channel) adjust R603 for Maximum Noise on picture.

I.F. GAIN PRE-SET (R610)

With I.F. Signal fed to I.F. input point on Tuner and C.R.O. connected to Test point 7 adjust R610 for Maximum output.

SOUND I.F. AND RATIO DETECTOR

Connect a meter (20,000 ohms per volt) to test point 9. Tune receiver to a strong signal.

Adjust cores of T101 and L104 for maximum deflection. Transfer meter to test point 10.

Detune secondary T202 to give maximum deflection of meter positive or negative.

Adjust T201 for maximum deflection of meter.

Revert to T202 and adjust for zero reading on meter so that with T202 correctly adjusted, a turn of the slug, first clockwise then anticlockwise, will produce a meter deflection first negative then positive.

NOTE: A listening check should then be made for intercarrier buzz, and if present, a further adjustment to T202 may be necessary.

5.5 MHz SOUND TRAP ADJUSTMENT

To adjust the trap in the field, detune local oscillator (fine tuning) until a 5.5 MHz pattern appears on the screen, then adjust L103 to a position where patterning is visually reduced to a minimum.

FOCUS ADJUSTMENT

With picture at normal brightness, adjust focus control (ZL002) to best compromise for sharpest image overall. If best compromise is outside control range, interchange links across R364 and R366.

C.R.T. GRID 2 PRE-SET

Turn contrast control to minimum.

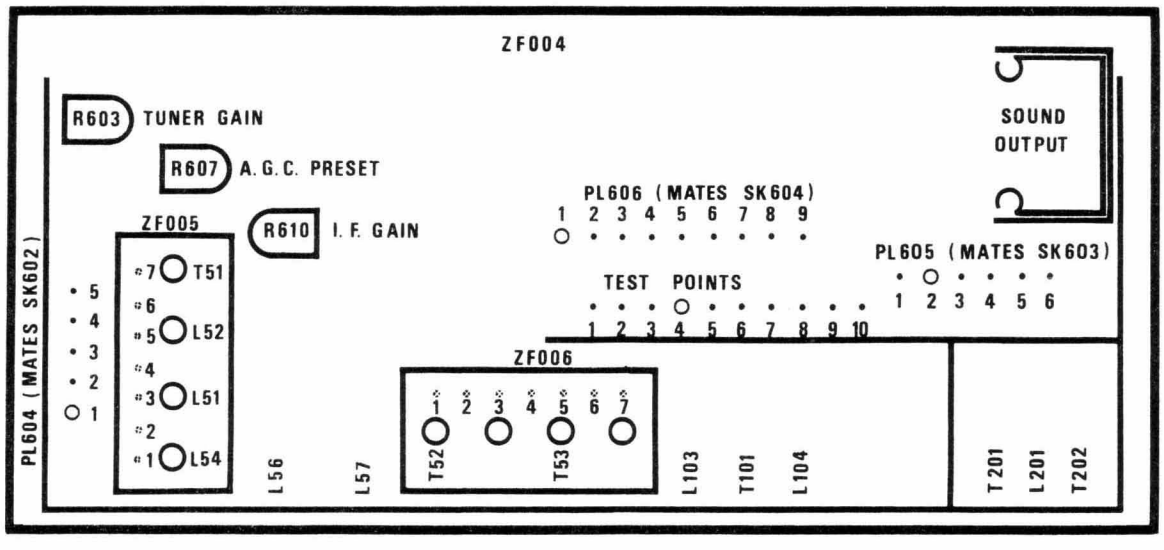
Turn brightness control to minimum.

Now turn brightness control mechanically through approximately 90° rotation.

Adjust 2M2 Grid 2 pre-set so that picture is just extinguished.

ADJUSTMENT OF HORIZONTAL STABILISATION CONTROL

Ensure that the power transformer primary voltage is set for the nominal mains voltage. Connect a DC voltmeter (at least 20,000 ohms per volt) across the boost capacitor C553. Correctly synchronise the picture. Turn contrast and brightness controls to minimum.
Adjust stabilisation control R555 to obtain a reading of 600V.



MECHANICAL PARTS LIST

RECEIVER ASSEMBLY

Description	Code No.
Knob asembly x2 (Horizontal and vertical hold)	CR 524 504
Spring for above	4822 492 50209
Pivot plate (Power supply tower)	CS 242 553
Pivot plate (Horizontal output tower)	CS 242 554
Screw, wing (3/16" B.S.W. x 1/2" Lg.) (Power supply tower locking)	CS 258 883
Screw, wing (5/32" B.S.W. x 1/2" Lg.) (Hor. tower locking)	CS 258 921

SUB-ASSEMBLIES

Tuner/I.F. Assembly

Plug, 12 way, free (in cable form assembly)	CZ 365 552
Socket, 3 way, free (Video lead)	CZ 370 322
Socket, 5 way, free (Tuner cable)	CZ 370 739
Socket, 6 way, free (in cable form assembly)	CZ 370 740
Socket, 9 way, free (in cable form assembly)	CZ 370 741

Video Amplifier ZL002 (CZ 716 703)

Cooling Fin	CS 066 608
Plug, 7 way, free (Cable assembly)	CZ 365 458
Socket, 8 way (C.R.T.)	CZ 369 531

MAIN PRINTED WIRING BOARD ASSEMBLY ZF004 (CZ 715 505)

Can, with internal shield (ZF005 module)	3102 101 70011
Can, without internal shield (ZF006 module)	3102 101 70001
Cooling fin (for TR252)	CS 066 602
Cover, flanged (approx. 1-1/4" sq., with 3/8" flange)	CS 463 183
Cover, U-shaped (approx. 3-1/4" x 1-1/4" with 3/8" sides)	CS 462 866
Heat sink assembly (for TR253 and 254)	CR 062 802
Pins (McMurdo 4737-04-08)	CS 102 274
Screw x3 (Type 23, No. 2 x 1/8" Lg.)	CS 261 922
Shield (1.15" x .65" flat)	CS 117 060
Shield, earthing (between ZF005 and ZF006 cans)	CS 117 062

TUNER ASSEMBLY NT3022 (CZ 210 977)

Description	Code No.
Ball (3/16" Dia.) S.K.F.	CH 760 015
Bearing, front	CS 382 729
Bearing, rear	CS 382 730
Bush	3122 994 91532
Circlip (Rebbeck Springs)	CH 629 265
Contact, earth	CS 102 281
Contact, shield	CS 102 277
Cover	CS 462 855
Detent spring	CS 200 131
Screw (5BA x 3/16") for above	CH 496 013
Detent wheel	CS 414 045
Electrical shield (between Ch.0 and Ch.11)	CS 117 063
Fine tuning pinion assembly	CR 375 011
Fine tuning pinion	CS 354 041
Slip-clutch	CS 400 453
Tension spring (for slip-clutch)	CS 200 141
Fine tuning slug	CS 354 043
Spacer (for fine tuning slug)	CS 466 932
Front spring	CS 200 151
Hair spring	CS 200 133
Main gear	CS 354 042
Spring clip (for main gear)	CH 200 136
Rear spring	CS 200 138
Rotor assembly complete	CR 100 020
Rotor shaft assembly (shaft + Centre spider)	CR 247 228
Detent wheel	CS 414 045
Electrical shield	CS 117 063
Mounting disc	CS 233 842
Spring disc	CS 200 135
Screw (5BA x 3/16" Lg. Ch.Hd.) (Detent spring fixing)	CH 496 013
Screw (Taptite, 6-32 x 5/16" Lg., Hex. Hd.) x2	CS 261 925
Screw (Thread cutting, C2-56 x 1/8" Lg., Pan Cross Hd.)	CS 261 931
Spring, clamp (Trimmer screw assembly)	CS 200 153
Spring clip (Main gear)	CS 200 136
Spring disc (Rotor shaft assembly)	CS 200 135
Spring, front	CS 200 151
Spring, hair	CS 200 133
Spring, index (Detent mechanism)	CS 200 131
Spring, rear	CS 200 138
Spring, rear, earthing	CS 200 152
Spring, tension (Fine tuning clutch)	CS 200 141
Stator assembly	CR 100 214
Stator leaf contact x10	CS 102 268
Stator rod	CS 365 435
Stator strip	CS 100 206
Terminal (ceramic)	4822 122 70034
Trimmer screw assembly	CR 313 207
Clamp spring for above	CS 200 153
Wheel, detent	CS 414 045

MECHANICAL PARTS LIST

TOWER ASSEMBLY FOR HORIZONTAL OSCILLATOR AND OUTPUT (CZ 707 001)

Description	Code No.
Cap (E.H.T. lead assembly)	CS 462 835
Contact, insert (E.H.T. lead assembly)	CS 430 102
Cover (for tower assembly)	CS 462 506
Edge-connector assembly	CR 106 207
Edge connector	CS 116 017
Contact	CS 104 263
Pivot plate	CS 352 002
Polarising key	CS 432 848
Grid clip	CS 282 553
Knob assembly (Horizontal hold)	CR 524 504
Spring for above	4822 492 50209
Latch (Module ZH001 mounting)	CS 281 120
Pivot (Module ZH001 mounting)	CS 352 003
Plug, 9 way, free (Cable form assembly) (McMurdo 2125/036/01)	CZ 365 459
Socket, octal (C/F 733-2-11)	CZ 369 703
Socket, B9A (C/F 733-2-25)	CZ 369 718
Socket, E.H.T. (McMurdo B9W5/PSV No. 691A)	CZ 369 738
Cover (E.H.T. socket)	CS 463 124
Socket, 4 way, free (Cable form assembly) (McMurdo 4QS/NP)	CZ 370 532
Cover (4 way socket)	CS 462 833

TOWER ASSEMBLY FOR VERTICAL OSCILLATOR AND OUTPUT, AND POWER SUPPLY (CZ 707 002)

Description	Code No.
Socket, B9A (C/F 733-2-25)	CZ 369 718
Socket, 12 way, fixed (McMurdo 2127/01/02)	CZ 370 961
POWER SUPPLY MODULE ZP001 (CZ 716 800)	
Cooling fin	CS 066 607
Fuse cover	CZ 371 121
Insulating bead x4 (for mounting R409 and R402)	CS 111 247
Socket, B9A, P.W. (C/F 733-2-65)	CZ 370 718
Socket, B7G, P.W. (CF 733-2-83)	CZ 370 745
VERTICAL OSCILLATOR AND OUTPUT (CZ 716 900)	
Cover	CS 242 395
Knob assembly (Vertical hold)	CR 524 504
Spring for above	4822 492 50209
Pivot x2	CS 282 547
Plug, 9 way, free (Cable form assembly)	CZ 365 459
MODULE ZV001 (CZ 716 901)	
Socket, B9A, P.W. (C/F 733-2-65)	CZ 370 718

ELECTRICAL PARTS LIST

TUNER I.F. SUBCHASSIS ASSEMBLY

NT 3022 TURRET TUNER

CAPACITORS

C	Description	V.W.	Tol. ±%	Type or Code No.
1	3E5 trimmer			2222 801 20005
2	6E8 cer plate NPO	40	0.25 pF	2222 632 09688
3	12E feed thru	350	10	2222 700 03129
4	115E feed thru		7½	2222 702 96007
5	1K feed thru	350	+50, –20	2222 700 05102
6	27E feed thru	350	10	2222 700 03279
7	6E8 cer. plate NPO	40	0.25pF	2222 632 09688
8	3E5 trimmer			2222 801 20005
9	1K feed thrue	350	+50, –20	2222 700 05102
10	6E8 feed thru	350	1pF	2222 700 02688
11	1K feed thru	350	+50, –20	2222 700 05102
12	39E feed thru	350	10	2222 700 03399
13	6E8 cer. plate NPO	40	0.25pF	2222 632 09688
14	3E5 trimmer			2222 801 20005
15	3E5 trimmer			2222 801 20005
16	10E cer. plate NPO	40	1pF	2222 632 10109
17	6E8 feed thru	350	1pF	2222 700 02688
18	5E6 cer. plate N470		+0, –0.25pF	CZ 096 031
19	5E6 cer. plate N470		–0, +0.25pF	CZ 096 030
20	2E2 cer. plate NPO	40	0.25pF	2222 632 09228
21	5E6 cer. plate N750		–0, +0.25pF	CZ 096 032
22	2K2 feed thru	350	+50, –20	2222 700 05222
23	1K feed thru	350	+50, –20	2222 700 05102
24	10E feed thru	350	10	2222 700 02109
25	39E feed thru	350	10	2222 700 03399
27	56E feed thru	350	10	2222 700 03569
29	E82 cer. plate P100		0.25pF	CZ 096 133

RESISTORS

R	Description	W	Tol. ±%	Type or Code No.
1	2K2 Carbon	0.3	5	CR25
2	22E Carbon	0.3	5	CR25
3	68E Carbon	0.3	5	CR25
4	270E Carbon	0.3	5	CR25

RESISTORS, Cont.

R	Description	W	Tol. ±%	Type or Code No.
5	2K7 Carbon	0.3	5	CR25
6	12K Carbon	0.3	5	CR25
7	5K6 Carbon	0.3	5	CR25
8	1K5 Carbon	0.3	5	CR25
9	5K6 Carbon	0.3	5	CR25
10	1K2 Carbon	0.3	5	CR25
11	820E Carbon	0.3	5	CR25
13	1K2 Carbon	0.3	5	CR25
14	8K2 Carbon	0.3	5	CR25

INDUCTORS

	Description	Code No.
L1	R.F. Choke	CZ 322 062
T1	Input Transformer Assembly	CZ 345 621
T2	I.F. Transformer Assembly	CZ 320 563
	Collector Load Assembly (L1 + R4 + R5)	CZ 060 305

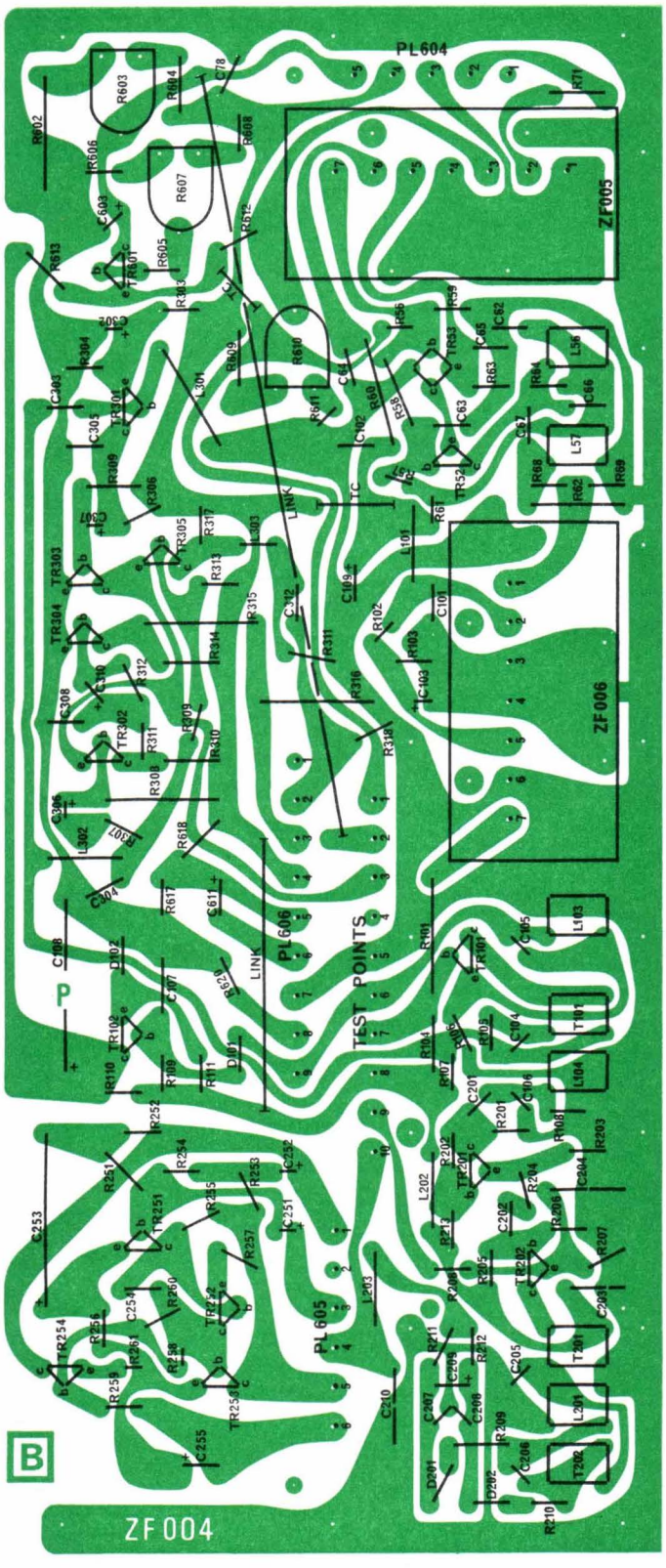
WOUND COILS

Channel	Code No.
1	CZ 322 081
2	CZ 322 082
3	CZ 322 083
4	CZ 322 084
5	CZ 322 085
5a	CZ 322 093
6	CZ 322 086
7	CZ 322 087
8	CZ 322 088
9	CZ 322 089
10	CZ 322 090
11	CZ 322 091
0	CZ 322 092

ELECTRICAL PARTS LIST

ZF004 P.W.B. ASSEMBLY

(Includes Module ZF005 CZ 715 506 and ZF006 CZ 715 507)



RESISTORS

R	Description	W @ 70°C	Tol. ±%	Type or Code No.
51	33E carbon	0.2	5	CR16
52	22E carbon	0.2	5	CR16
53	1K carbon	0.2	5	CR16
54	270E carbon	0.2	5	CR16
55	220E carbon	0.2	5	CR16
56	5K6 carbon	0.2	5	CR16
57	4K7 carbon	0.2	5	CR16
58	4K7 carbon	0.2	5	CR16
59	3K3 carbon	0.2	5	CR16
60	100E carbon	0.2	5	CR16
61	100E carbon	0.2	5	CR16
63	390E carbon	0.2	5	CR16
64	10K carbon	0.2	5	CR16
65	4K7 carbon	0.2	5	CR16
66	820E carbon	0.2	5	CR16
68	4K7 carbon	0.2	5	CR16
70	4K7 carbon	0.2	5	CR16
71	47E carbon	0.5	5	CR37
101	1K2 carbon	0.5	10	CR37
102	5K1 carbon	0.5	5	CR37
103	1K8 carbon	0.5	5	CR37
104	68K carbon	0.5	10	CR37
105	22K carbon	0.5	10	CR37
106	120E carbon	0.2	5	CR16
107	270E carbon	0.2	5	CR16
108	27K carbon	0.2	5	CR16
109	150K carbon	0.5	10	CR37
110	680E carbon	0.5	10	CR37
111	1K carbon	0.5	10	CR37
201	100K carbon	0.5	10	CR37
202	100K carbon	0.5	10	CR37
203	1K carbon	0.5	10	CR37
204	470E carbon	0.5	5	CR37
205	10K carbon	0.5	10	CR37
206	10K carbon	0.5	10	CR37
207	1K carbon	0.5	10	CR37
208	10 K carbon	0.5	10	CR37
209	1K carbon	0.2	5	CR16
210	1K carbon	0.2	5	CR16
211	10K carbon	0.2	5	CR16
212	10K carbon	0.2	5	CR16
213	100E carbon	0.2	5	CR16
251	220K carbon	0.5	10	CR37
252	22E carbon	0.5	5	CR37
253	18K carbon	0.5	10	CR37
254	100K carbon	0.5	10	CR37
255	1K carbon	0.5	10	CR37
256	3K3 carbon	0.5	10	CR37
257	27E carbon	0.5	10	CR37
258	50E N.T.C. disc	1.0	10	4822 116 30008
259	820E carbon	0.5	10	CR37
260	56E carbon	0.5	5	CR37
261	1E5 carbon	0.33	5	CR25
303	3K3 carbon	0.2	5	CR16
304	470E carbon	0.5	5	CR37
306	6K8 carbon	0.5	10	CR37
307	1K5 carbon	0.5	10	CR37
308	1M carbon	0.5	5	CR37
309	15K carbon	0.5	10	CR37
310	4K7 carbon	0.5	10	CR37
311	68K carbon	0.5	10	CR37
312	47K carbon	0.5	10	CR37
313	120K carbon	0.5	10	CR37
314	1K carbon	0.5	10	CR37
315	1K carbon	0.5	10	CR37
316	5K6 carbon	0.5	10	CR37
317	2K2 carbon	0.5	10	CR37
318	6K8 carbon	0.5	10	CR37
602	1K2 carbon	0.5	10	CR37
603	2K2 carbon preset (set tuner gain)			CZ 034 209
604	15K carbon	0.5	10	CR37
605	4K7 carbon	0.5	10	CR37
606	560E carbon	0.5	10	CR37
607	2K2 carbon preset (A.G.C. preset)			CZ 034 209
608	2K2 carbon	0.5	10	CR37
609	8K2 carbon	0.5	10	CR37
610	2K2 carbon preset (Set I.F. gain)			CZ 034 209
611	1K carbon	0.5	10	CR37
612	1K8 carbon	0.5	10	CR37
613	150E carbon	0.5	10	CR37
617	1K2 carbon	0.5	5	CR37
618	10K carbon	0.5	5	CR37
620	100E carbon	0.5	5	CR37

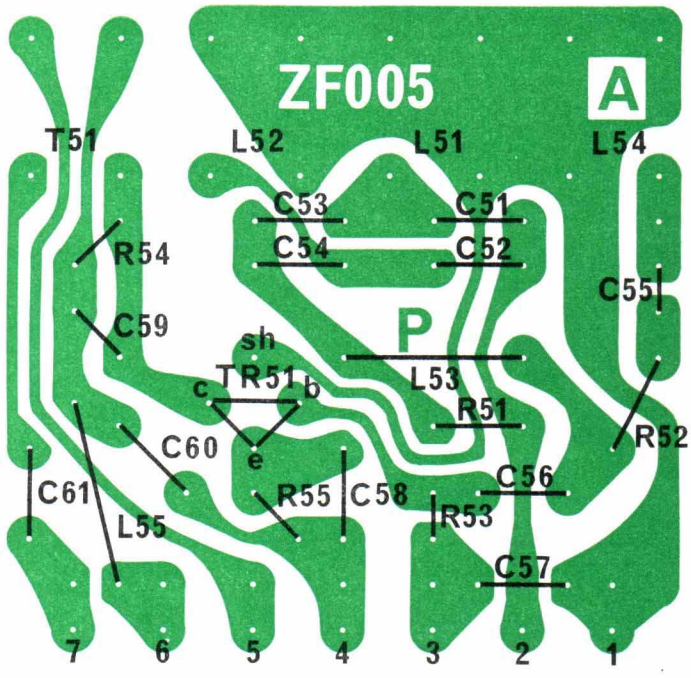
ELECTRICAL PARTS LIST

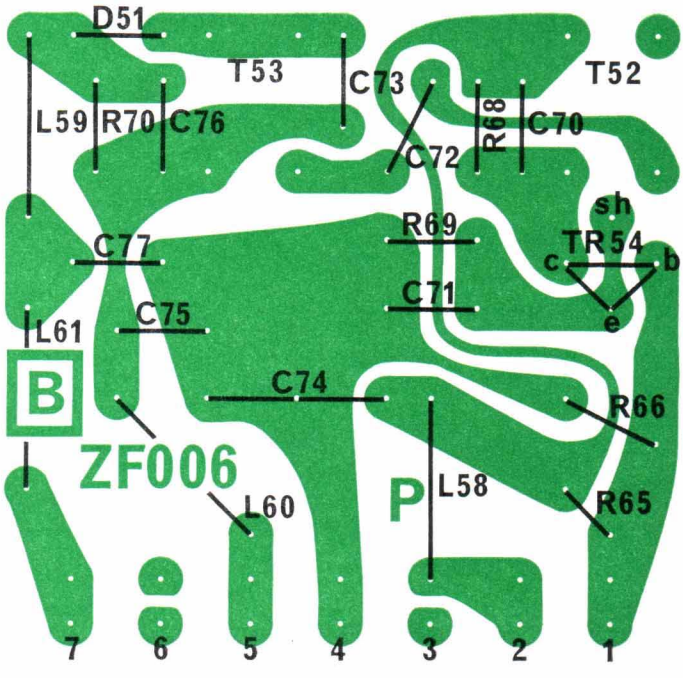
CAPACITORS

C	Description	V.W.	Tol. ±%	Code Number
51	4E7 cer. plate NPO	63	0.25pF	2222 632 09478
52	5E6 cer. plate NPO	63	0.25pF	2222 632 09568
53	4E7 cer. plate NPO	63	0.25pF	2222 632 09478
54	5E6 cer. plate NPO	63	0.25pF	2222 632 09568
55	5E6 cer. plate NPO	63	0.25pF	2222 632 09568
56	22E cer. plate NPO	63	2	2222 632 10229
57	3K3 cer. plate	100	10	2222 630 02332
58	3K3 cer. plate	100	10	2222 630 02332
59	82E cer. plate NPO	63	2	2222 632 10829
60	3K3 cer. plate	100	10	2222 630 02332
61	470E cer. plate	100	10	2222 630 02471
62	3K3 cer. plate	100	10	2222 630 02332
63	3K3 cer. plate	100	10	2222 630 02332
64	3K3 cer. plate	100	10	2222 630 02332
65	3K3 cer. plate	100	10	2222 630 02332
66	2E7 cer. plate NPO	63	0.25pF	2222 632 09278
67	3E9 cer. plate NPO	63	0.25pF	2222 632 09398
68	47E cer. plate NPO	63	0.25pF	2222 632 10479
69	120E poly.	50	5	CZ 088 058
70	15E cer. plate NPO	63	2	2222 632 10159
71	3K3 cer. plate	100	10	2222 630 02332
72	5E6 cer. plate NPO	63	0.25pF	2222 632 09568
73	15E cer. plate NPO	63	2	2222 632 10159
74	47K poly	250	10	2222 342 45473
75	3K3 cer. plate	100	10	2222 632 02332
76	15E cer. plate NPO	63	2	2222 632 10159
77	15E cer. plate NPO	63	2	2222 632 10159
78	3K3 cer. plate	100	10	2222 630 02332
101	3K3 cer. plate	100	10	2222 630 02332
102	3K3 cer. plate	100	10	2222 630 02332
103	0.64uF electrolytic	64	+100—10	2222 001 18647
104	150E poly.	50	5	CZ 088 066
105	56E cer. plate NPO	63	2	2222 632 10569
106	150E poly.	50	5	CZ 088 066
107	22K poly.	100	10	2222 342 45223
108	200uF electrolytic	16	+50—10	2222 001 14201
109	125uF electrolytic	16	+50—10	2222 001 15131
110	3K3 cer. plate	50	10	2222 630 02332
201	150E poly.	50	5	CZ 088 066
202	1K cer. plate	40	+100—20	2222 629 02102
203	10K met. poly.	250	10	2222 342 45103
204	10K met. poly.	250	10	2222 342 45103
205	150E poly.	50	5	CZ 088 066
206	150E poly.	50	5	CZ 088 066
207, 208	2 x 470E cer.	50		CZ 097 154
209	6.4uF electrolytic	6.4	+100—10	2222 001 13648
210	33K met. poly.	250	10	2222 342 45333
251	0.64uF electrolytic	64	+100—10	2222 001 18647
252	10uF electrolytic	16	+50—10	2222 001 15109
253	200uF electrolytic	10	+50—10	2222 001 14201
254	1K poly.	100	5	CZ 090 018
255	200uF electrolytic	10	+50—10	2222 001 14201
302	10uF electrolytic	16	+50—10	2222 001 15109
303	22E cer. plate NPO	63	5	2222 632 10229
304	470E cer. plate	100	10	2222 630 02471
305	470E cer. plate	100	10	2222 630 02471
306	0.64uF electrolytic	64	+100—10	2222 001 18647
307	10uF electrolytic	16	+50—10	2222 001 15109
308	22K poly.	100	10	CZ 091 616
309	150K poly.	100	10	CZ 093 215
310	0.64uF electrolytic	64	+100—10	2222 001 18647
311	2K2 poly.	250	10	2222 342 90071
312	1K5 poly.	250	5	2222 342 90068
603	32uF electrolytic	10	+50—10	2222 001 14329
611	10uF electrolytic	16	+50—10	2222 001 15109

INDUCTORS

L	Description	Code Number
51	Inductor—38 MHz trap	CZ 660 024
52	Inductor—29.5 MHz trap	CZ 660 025
53	Inductor—30.5 MHz trap	CZ 322 100
54	Inductor—31 MHz trap	CZ 660 026
55	R.F. choke 22$_{\mu}$H	CZ 322 078
56	Inductor—2nd video I.F.	CZ 660 028
57	Inductor—2nd video I.F.	CZ 660 029
58	R.F. choke 22uH	CZ 322 078
59	R.F. choke 22uH	CZ 322 078
60	R.F. choke 6uH	CZ 322 062
61	R.F. choke 6uH	CZ 322 062
101	R.F. choke 22uH	CZ 322 078
103	Inductor—5.5 MHz trap	CZ 660 034
104	Inductor—sound I.F.	CZ 660 013
201	Inductor—coupling	CZ 660 015
202	R.F. choke 22uH	CZ 322 078
203	R.F. choke 22uH	CZ 322 078
301	R.F. choke 175$_{\mu}$H	CZ 321 923
302	R.F. choke 22uH	CZ 322 078
303	R.F. choke 1 mH	CZ 322 074





TRANSFORMERS

T	Description	Code Number
51	Transformer—1st I.F.	CZ 660 027
52	Transformer—3rd I.F.	CZ 660 030
53	Transformer—video det.	CZ 660 030
101	Transformer—sound I.F.	CZ 660 032
201	Transformer—sound I.F.	CZ 660 033
202	Transformer—ratio detector	CZ 660 016
FX		
51	Ferrite bead	4822 532 50328

ELECTRICAL PARTS LIST

VIDEO AMPLIFIER ZL 002 (CZ 716 703)

CAPACITORS

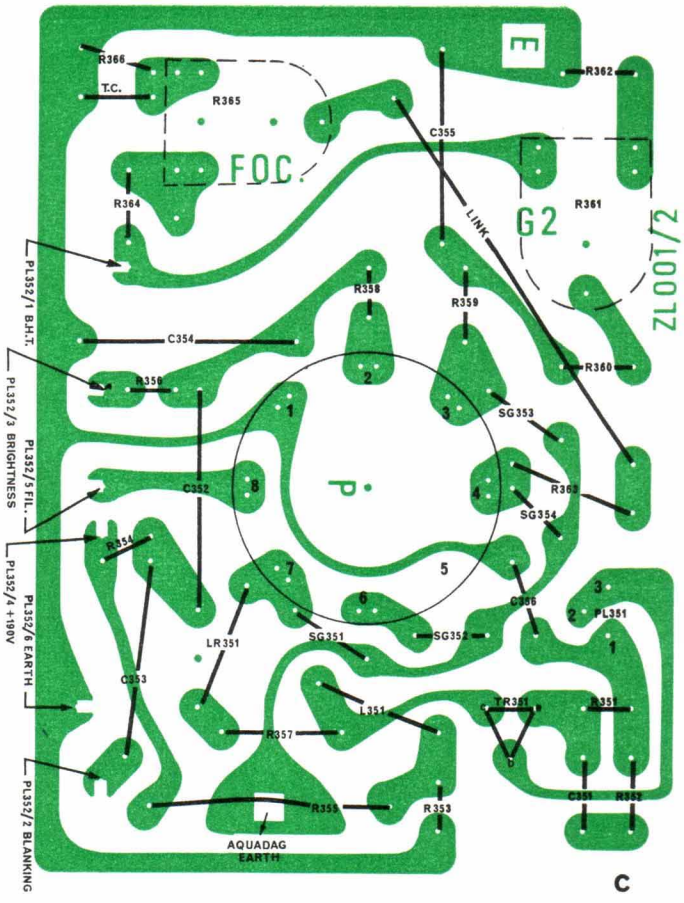
C	Description	V.W.	Tol. ±%	Code Number
352	47K poly	400	10	2222 315 51473
353	4K7 poly	400	10	2222 315 51472
354	1K poly	400	10	2222 315 51102
355	100K poly	630	10	2222 342 61104
356	4K7 ceramic	500	+50—20	2222 563 03472

RESISTORS

R	Description	W.	Tol. ±%	Style or Code No.
351	100E carbon	0.5	5	CR37
353	22K carbon	1	10	CR52
354	390K carbon	0.5	10	CR37
355	10K met. oxide	4	5	CZ 020 856
356	1M carbon	0.5	5	CR37
357	1K5 carbon	0.5	10	CZ 002 706
358	10K carbon	1	10	CR52
359	47K H.V. carbon	0.5	10	CZ 003 908
360	3M3 H.V. carbon	0.5	10	CZ 006 311
361	2M2 carbon pot. (G.2 preset)			4822 101 10047
362	2M2 HV. carbon	0.5	10	CZ 006 308
363	3M3 H.V. carbon	0.5	10	CZ 006 311
364	1M H.V. carbon	0.5	10	CZ 005 109
365	2M2 carbon pot. (Focus preset)			4822 101 10047
366	1M H.V. carbon	0.5	10	CZ 005 109

INDUCTORS

	Description	Code Number
L351	Peaking coil 175uH (green spot)	CZ 321 923
LR351	Peaking coil 175uH (red spot)	CZ 321 957



R352 and C351 deleted in ZL002

MISCELLANEOUS CIRCUITRY

See appropriate model data for details of loudspeaker, controls, etc.

ELECTRICAL PARTS LIST

TOWER ASSEMBLY (CZ 707 002)

(Comprising Power Supply and Vertical Oscillator and Output Circuits)

1. POWER SUPPLY CIRCUITRY

CAPACITORS

C	Description	V.W.	Tol. ±%	Code Number
401	100M electrolytic	300	—	4822 124 70083
402	1G electrolytic	25	+50–10	4822 124 40096
403	200M electrolytic	300	—	part of C401
405	50M electrolytic	300	—	part of C401
406	1G electrolytic	25	+50–10	part of C402
407	25M electrolytic	300	—	part of C401
408	32M electrolytic	250	+50—10	2222 040 13329

RESISTORS

R	Description	W.	Tol. ±%	Style or Code No.
401	150K carbon	1	10	CR52
406	100E carbon	1	10	CR52

INDUCTORS

T	Description	Code Number
401	Mains transformer	CZ 344 160

FUSES

FS	Description	Style or Code No.
401	2 amp. (Mains)	Australux 3AG
403	500mA (H.T. supply)	Australux 3AG
404	300 mA (+12V. reg. supply)	Australux 3AG

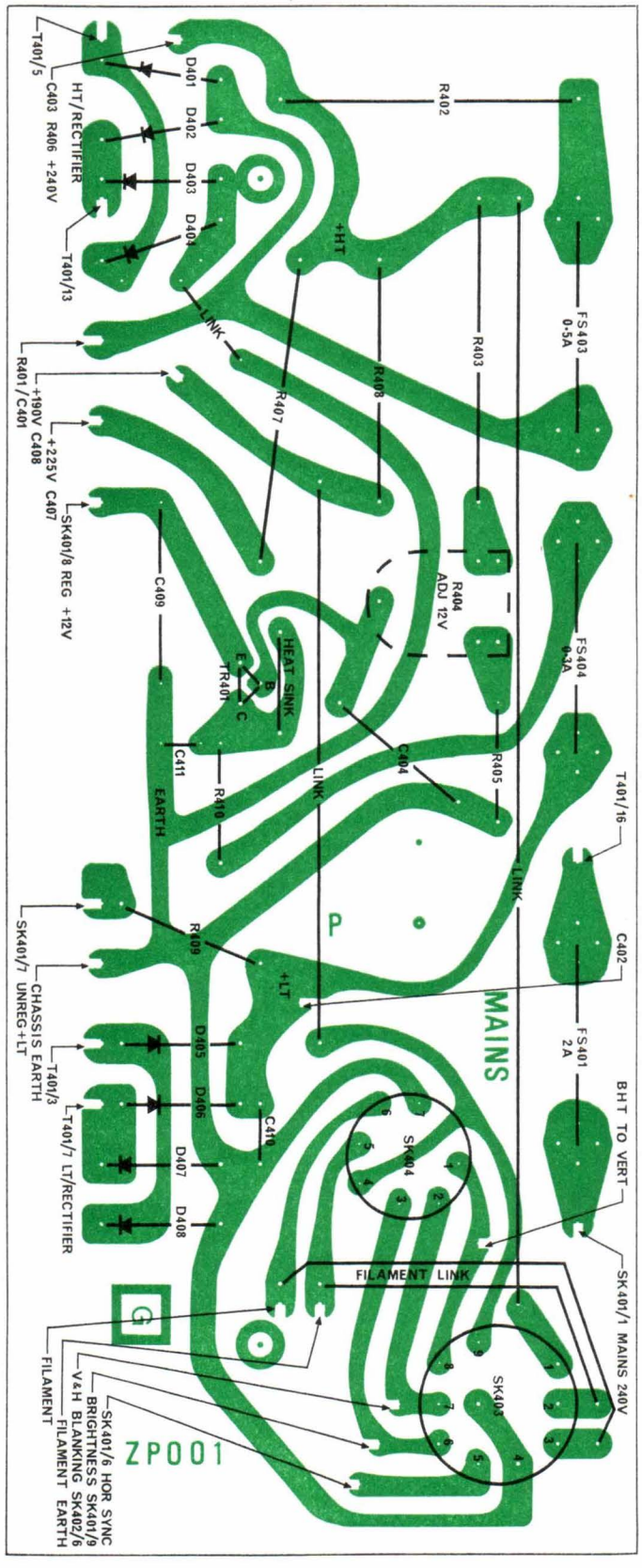
ZP001 POWER SUPPLY MODULE CZ 716 800

CAPACITORS

C	Description	W	Tol. ±%	Style or Code No.
404	40M electrolytic	16	+50—10	2222 001 15409
409	125M electrolytic	16	+50—10	2222 001 15131
410	1K ceramic	500	+80—20	2222 563 03102
411	1K ceramic	500	+80—20	2222 563 03102

RESISTORS

R	Description	W	Tol. ±%	Style or Code No.
402	150E wire-wound	15	10	CZ 010 219
403	56K carbon	2	10	CR93
404	4K7 carbon pot. (voltage adjust)			4822 101 10026
405	2K7 carbon	0.5	10	CR37
407	4K7 carbon	2	10	CR93
408	1K5 metal oxide	4	5	CZ 020 855
409	12E carbon	0.5	5	CR37
410	10E carbon	0.5	10	CR37



ELECTRICAL PARTS LIST

2. VERTICAL OSCILLATOR AND OUTPUT CIRCUIT CZ 716 900

RESISTORS

R	Description	W	±%	Style or Code No.
472	390E carbon	0.5	10	CR37
473	130E N.T.C. disc	1	10	4822 116 30016
474	33K carbon	0.5	10	CR37
475	1K5 carbon	1	10	CR52

INDUCTORS

T		Code Number
451	Vertical output transformer	CZ 344 823

ZV 001 VERTICAL OSCILLATOR AND OUTPUT MODULE CZ 716 901

CAPACITORS

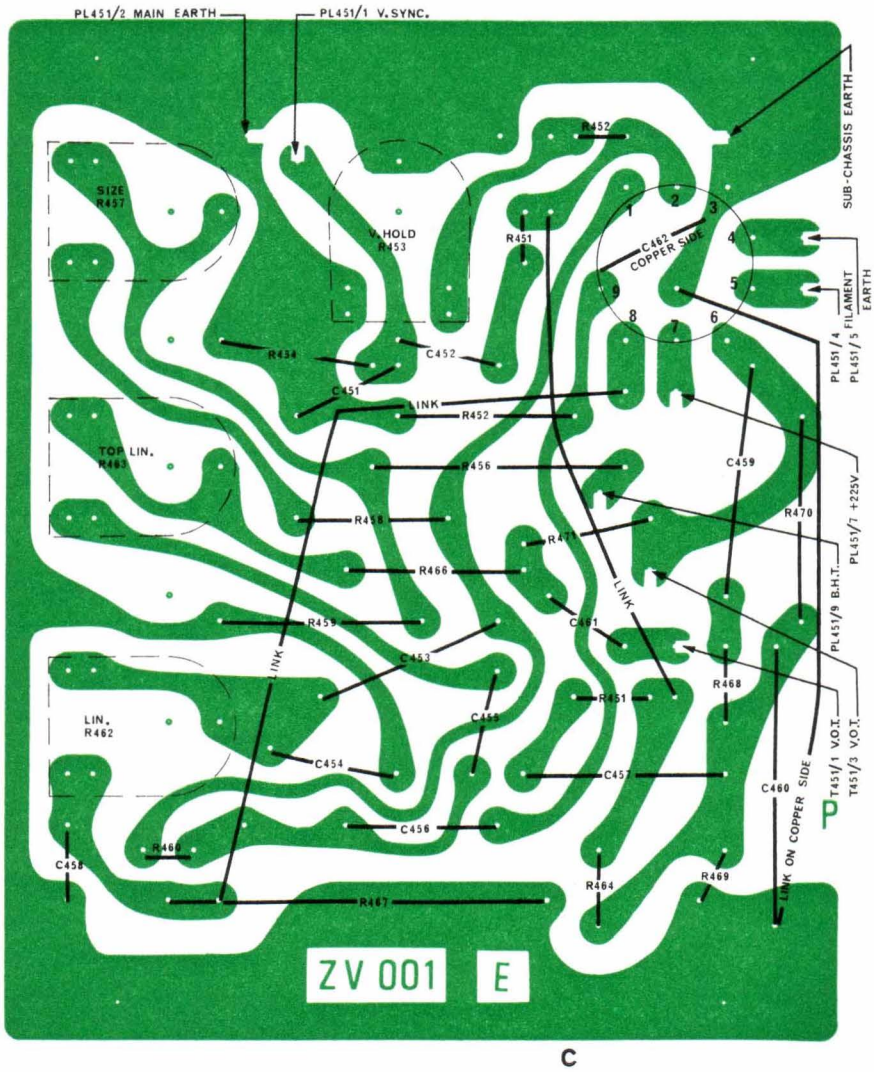
C	Description	V.W.	Tol. ±%	Code Number
451	47K poly	250	10	2222 342 45473
452	10K poly	250	10	2222 342 45103
453	56K poly.	63	10	2222 342 61563
454	2M5 electrolytic	64	+50—10	2222 001 18258
455	2K2 poly	400	10	2222 315 51222
456	100K poly	400	10	2222 342 51104
457	12K styro	630	10	CZ 091 807

(CAPACITORS Cont.)

C	Description	V.W.	Tol. ±%	Code Number
458	80M electrolytic	25	+50—10	2222 001 16809
459	33K poly	400	10	2222 315 51333
460	15K paper	600	20	CZ 076 219
461	22K poly	400	10	2222 342 51223
462	220E ceramic N750	500	5	2222 555 56221

RESISTORS

R	Description	W	Tol. ±%	Style or Code No.
451	10K carbon	0.5	10	CR37
452	180K carbon	0.5	10	CR37
453	220K carbon pot. (Vertical hold)			4822 101 10064
454	47K carbon	0.5	10	CR37
456	470K carbon	1	10	CR52
457	2M2 carbon pot. (Size preset)			4822 101 10047
458	1M carbon	0.5	5	CR37
459	VDR rod	0.7	10	2322 564 90016
460	220K carbon	0.5	10	CR37
461	4K7 carbon	0.5	10	CR37
462	2K2 carbon pot. (Linearity preset)			4822 101 10023
463	470K carbon pot. (Top linearity preset)			4822 101 10068
464	560K carbon	0.5	5	CR37
465	2M2 carbon	0.5	10	CR37
466	680K carbon	0.5	5	CR37
467	470E carbon	2	10	CR93
468	39K H.V. carbon	0.5	10	CZ 003 920
469	8K2 carbon	1	10	CR52
470	VDR rod	0.7	10	2322 564 02602
471	100K H.V. carbon	0.5	10	CZ 003 910



C

TOWER ASSEMBLY (CZ 707 001)
(Comprising Horizontal Oscillator and Output Circuits)

1. ZH 001 PHASE COMPARATOR AND HORIZONTAL OSCILLATOR MODULE CZ 715 900

CAPACITORS

C	Description	V.W.	Tol. ±%	Code Number
501	3K3 poly	400	10	2222 315 51332
502	22K poly	250	10	2222 342 45223
503	22K poly	250	10	2222 342 45223
504	18K poly	250	10	2222 342 45183
505	18K poly	250	10	2222 342 45183
506	47K paper	400	10	CZ 075 705
507	220E poly	500	5	2222 555 56221
508	10K poly	400	10	2222 342 51103
509	6M4 electrolytic	6.4	+50—10	2222 001 13648
510	20M electrolytic	16	+50—10	2222 001 15209
511	39K poly	160	10	2222 315 31393
512	22K styro	50	5	CZ 091 276
513	2K2 styro	50	5	CZ 089 656
514	2K2 poly	400	10	2222 315 51222
515	220K poly	250	10	2222 342 45224
516	330E styro	630	10	CZ 088 602
517	4K7 poly	400	10	2222 315 51472
518	12E ceramic	700	10	2222 562 01129

RESISTORS

R	Description	W	Tol. ±%	Style or Code No.
501	4K7 carbon	0.5	10	CR37
502	100K carbon	0.5	10	CR37
503	100K carbon	0.5	10	CR37
504	22K carbon	1	10	CR52
505	22K carbon	1	10	CR52
506	1K8 carbon	0.5	10	CR37
507	1K8 carbon	0.5	10	CR37
508	120K carbon	0.5	10	CR37
509	10K carbon	0.5	10	CR37
510	10K carbon	0.5	10	CR37
511	VDR disc	0.8	10	2322 552 03462
512	47K carbon	0.5	10	CR37
513	820E carbon	0.5	10	CR37
514	3K9 carbon	0.5	10	CR37
515	15K carbon	0.5	10	CR37
516	2K2 carbon pot. (Horizontal hold)			4822 101 10023
518	VDR disc	0.8	10	2322 552 02201
519	2M2 carbon	0.5	10	CR37
520	470K carbon	0.5	10	CR37
521	39E carbon	0.5	10	CR37
522	120E carbon	0.5	10	CR37

(RESISTORS Cont.)

R	Description	W	Tol. ±%	Style or Code No.
523	68K carbon	1	10	CR52
524	56K carbon	0.5	10	CR37
525	180K carbon	0.5	10	CR37
526	27K carbon	0.5	10	CR37
527	12K carbon	0.5	10	CR37
528	18K carbon	0.5	10	CR37
529	47K carbon	0.5	10	CR37

INDUCTORS

T	Description	Code Number
501	Horizontal oscillator coil	CZ 320 389

2. ZH 002 HORIZONTAL OUTPUT CIRCUIT

CAPACITORS

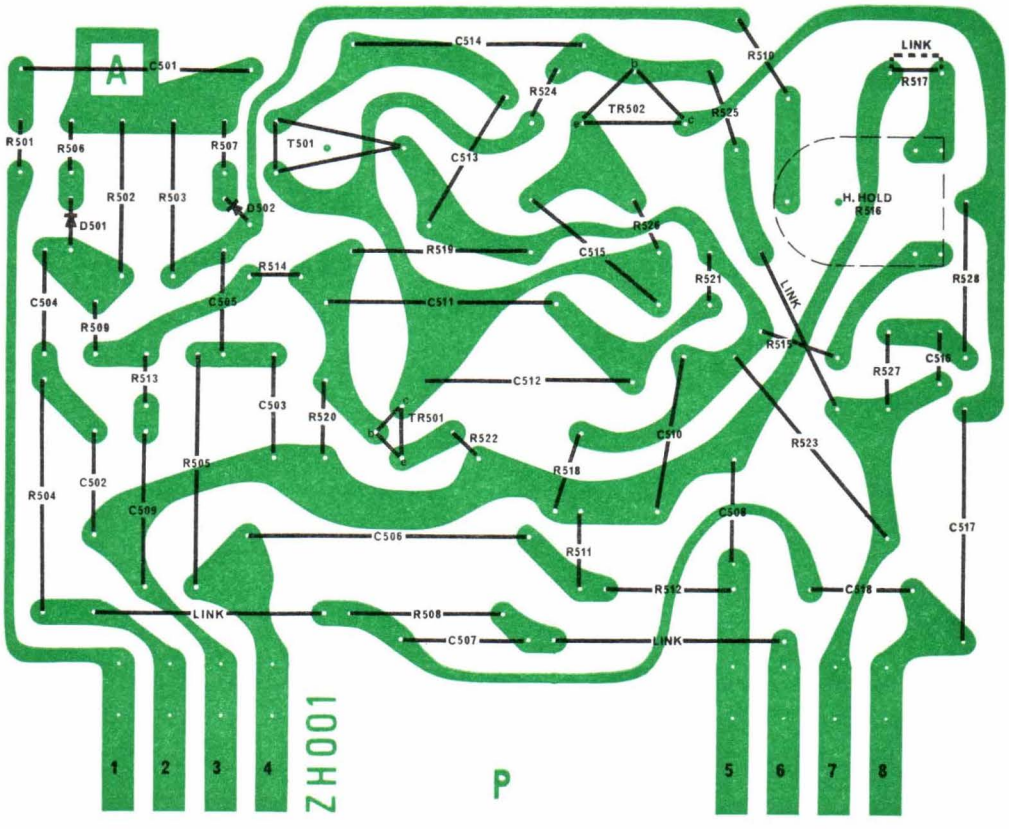
C	Description	V.W.	Tol. ±%	Code Number
551	4K7 ceramic	500	+50—20	2222 563 03472
552	4K7 poly	400	10	2222 315 51472
553	56K paper	1000	10	CZ 076 218
554	270E ceramic	2000	20	CZ 097 158
555	180E ceramic	700	10	part of T551
556	18K poly	400	10	2222 315 32184

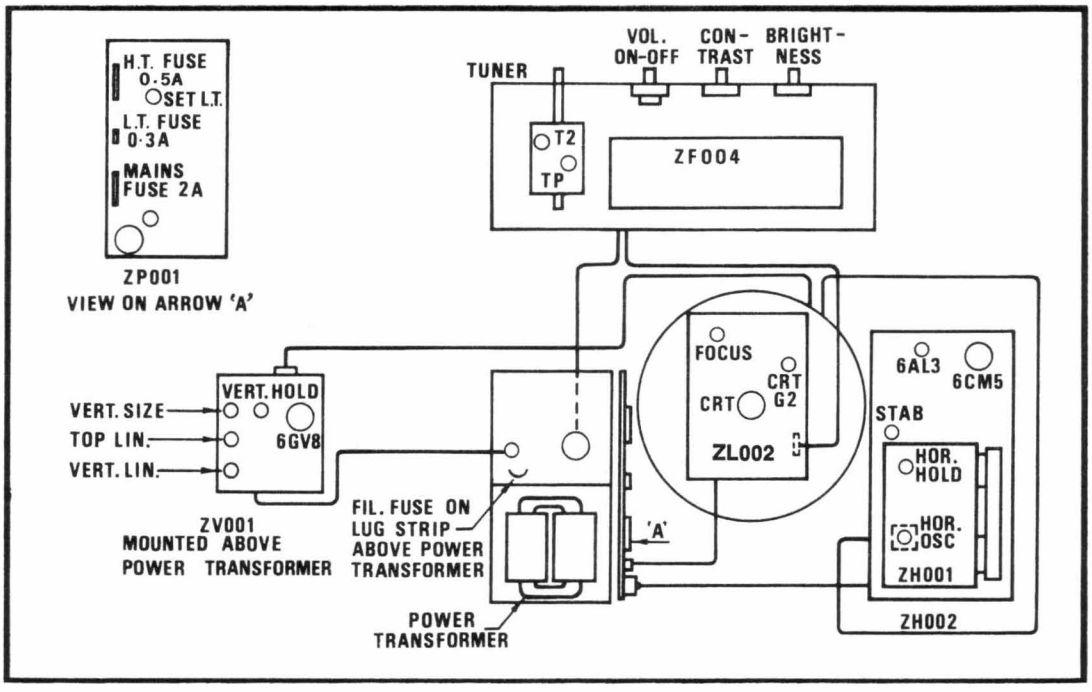
RESISTORS

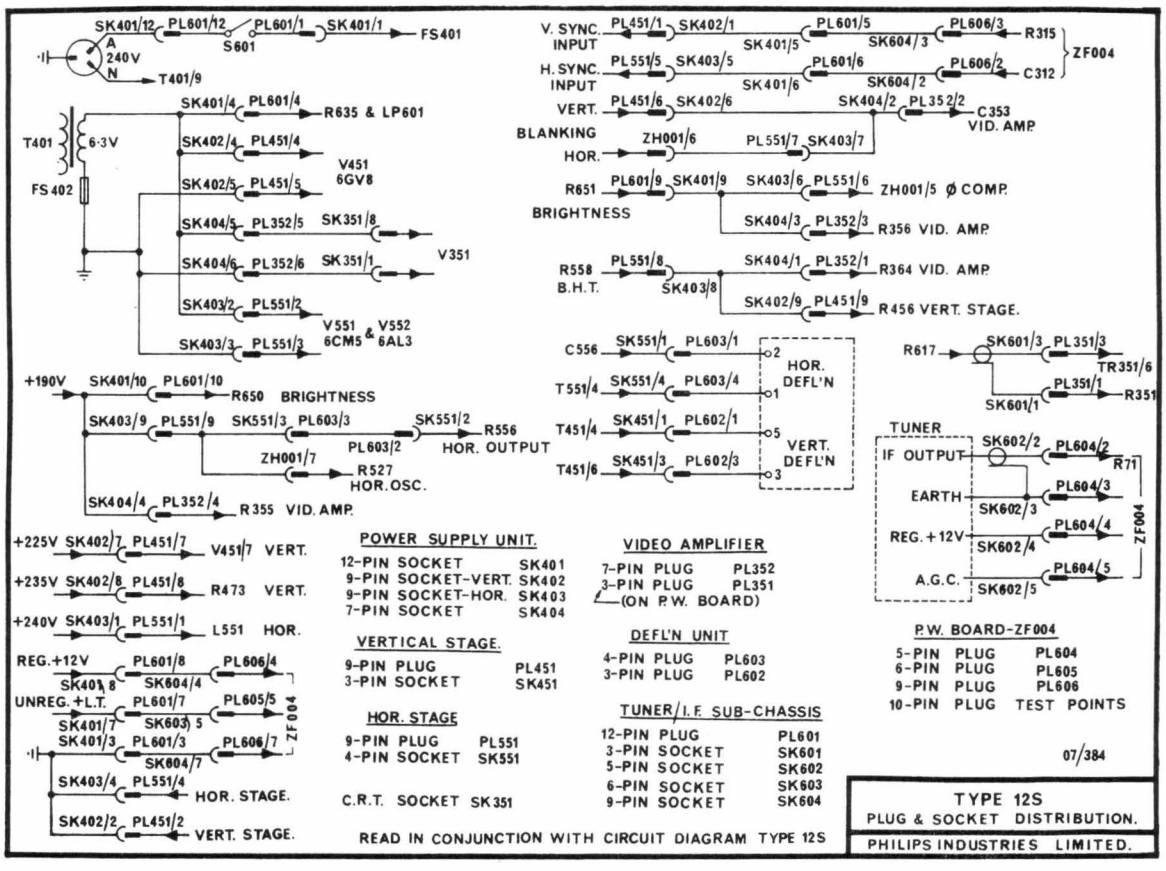
R	Description	W	Tol. ±%	Style or Code No.
551	2M2 H.V. carbon	0.5	10	CZ 006 308
552	VDR rod	0.7	10	2322 564 90005
553	1K carbon	0.5	10	CR37
554	1M H.V. carbon	1	10	CZ 005 205
555	1M carbon pot. Taper A (Stabilisation preset)			CZ 029 352
556	1K8 wire-wound	5	10	CZ 011 711
557	820K carbon	1	5	CR52
558	100K H.V. carbon	0.5	10	CZ 003 910
559	part of L553 (E.H.T. rectifier heater-lead)			
560	1K5 carbon	1	10	CR52

INDUCTORS

L	Description	Code Number
551	R.F. choke 7.5uH	CZ 321 945
552	R.F. choke 7.5uH	CZ 321 945
553	E.H.T. heater lead	CZ 358 218
554	Linearity coil	4822 150 50007
555	R.F. choke 7.5uH	CZ 321 945
T		
551	Horizontal output transformer	CZ 355 012




H.T. FUSE 0·5A
SET L.T.
L.T. FUSE 0·3A
MAINS FUSE 2A
ZP001
VIEW ON ARROW 'A'
TUNER
VOL. ON-OFF
CON-TRAST
BRIGHT-NESS
T2
TP
ZF004
FOCUS
CRT
CRT G2
ZL002
6AL3
6CM5
STAB
HOR. HOLD
HOR. OSC
ZH001
ZH002
VERT. HOLD
6GV8
VERT. SIZE
TOP LIN.
VERT. LIN.
ZV001
MOUNTED ABOVE POWER TRANSFORMER
FIL. FUSE ON LUG STRIP ABOVE POWER TRANSFORMER
'A'
POWER TRANSFORMER


SK401/12 PL601/12 PL601/1 SK401/1 FS401
S601
A 240V N
T401/9
T401
6·3V
FS 402
SK401/4 PL601/4 R635 & LP601
SK402/4 PL451/4
V451 6GV8
SK402/5 PL451/5
SK404/5 PL352/5 SK351/8
SK404/6 PL352/6 SK351/1 V351
SK403/2 PL551/2
SK403/3 PL551/3
V551 6CM5 & V552 6AL3
+190V SK401/10 PL601/10 R650 BRIGHTNESS
SK403/9 PL551/9 SK551/3 PL603/3 SK551/2 R556
PL603/2 HOR. OUTPUT
ZH001/7 R527 HOR.OSC.
SK404/4 PL352/4 R355 VID. AMP.
+225V SK402/7 PL451/7 V451/7 VERT.
+235V SK402/8 PL451/8 R473 VERT.
+240V SK403/1 PL551/1 L551 HOR.
REG.+12V PL601/8 PL606/4
SK401/8 SK604/4
UNREG. +L.T. PL601/7 PL605/5
SK401/7 SK603/5
SK401/3 PL601/3 PL606/7
SK604/7
ZF004
SK403/4 PL551/4 HOR. STAGE.
SK402/2 PL451/2 VERT. STAGE.
V. SYNC. INPUT PL451/1 SK402/1 PL601/5 PL606/3 R315
SK401/5 SK604/3
H. SYNC. INPUT PL551/5 SK403/5 PL601/6 PL606/2 C312
SK401/6 SK604/2
ZF004
VERT. PL451/6 SK402/6 SK404/2 PL352/2 C353 VID. AMP.
BLANKING
HOR. ZH001/6 PL551/7 SK403/7
R651 PL601/9 SK401/9 SK403/6 PL551/6 ZH001/5 Ø COMP.
BRIGHTNESS
SK404/3 PL352/3 R356 VID. AMP.
R558 PL551/8 SK404/1 PL352/1 R364 VID. AMP.
B.H.T. SK403/8
SK402/9 PL451/9 R456 VERT. STAGE.
C556 SK551/1 PL603/1
T551/4 SK551/4 PL603/4
T451/4 SK451/1 PL602/1
T451/6 SK451/3 PL602/3
HOR. DEFL'N
VERT. DEFL'N
R617 SK601/3 PL351/3 TR351/6
SK601/1 PL351/1 R351
TUNER
IF OUTPUT SK602/2 PL604/2 R71
EARTH PL604/3
SK602/3
REG. +12V PL604/4
SK602/4
A.G.C. PL604/5
SK602/5
ZF004
POWER SUPPLY UNIT.
12-PIN SOCKET SK401
9-PIN SOCKET-VERT. SK402
9-PIN SOCKET-HOR. SK403
7-PIN SOCKET SK404
VERTICAL STAGE.
9-PIN PLUG PL451
3-PIN SOCKET SK451
HOR. STAGE
9-PIN PLUG PL551
4-PIN SOCKET SK551
C.R.T. SOCKET SK351
VIDEO AMPLIFIER
7-PIN PLUG PL352
3-PIN PLUG PL351
(ON P.W. BOARD)
DEFL'N UNIT
4-PIN PLUG PL603
3-PIN PLUG PL602
TUNER/I.F. SUB-CHASSIS
12-PIN PLUG PL601
3-PIN SOCKET SK601
5-PIN SOCKET SK602
6-PIN SOCKET SK603
9-PIN SOCKET SK604
P.W. BOARD-ZF004
5-PIN PLUG PL604
6-PIN PLUG PL605
9-PIN PLUG PL606
10-PIN PLUG TEST POINTS
07/384
READ IN CONJUNCTION WITH CIRCUIT DIAGRAM TYPE 12S
TYPE 12S
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PHILIPS INDUSTRIES LIMITED.

DESCRIPTION OF OPERATION

The 12S chassis is a modified version of the 12U chassis and combines the functions previously performed by modules ZF001/ZF101, ZF002/ZF102, ZJ001, ZJ002/ZJ102, ZF003 and ZA001 into one single board (ZF004). This board is used in conjunction with a new Miniature Turret Tuner NT3022. The function of the remaining circuitry is similar to that of 12U chassis. Main changes in circuitry apply to the Passive Filter and I.F. Amplifier, Video and Intercarrier Detector and the Video Preamplifier. Minor differences occur in the Sound I.F. input and the Noise Amplifier.

WOUND COIL MINIATURE TURRET TUNER

The NT3022 is a three transistor tuner. Channel selection is achieved by direct knob control of the selector shaft. The memomatic fine tuning is operated via a main gear concentric with the selector shaft. This main gear is engaged with either a concentric fine tune knob system or via a gear train to a separate fine tune knob. The incoming signal is fed via a bandpass filter to the R.F. amplifier (BF200) in common emitter configuration with forward gain control. The R.F. signal output of the BF200 is fed via a second bandpass filter to the mixer transistor, (BF182) also in common emitter configuration. The oscillator signal derived from the Colpitts type oscillator with the BF183 as transistor is fed both inductively and capacitively to the base of the mixer.

The output is transformer coupled to the output terminal as a low impedance link coupling. The tuner requires an adjustable bias setting (R603) to achieve maximum gain.

ZF004 MAIN PRINTED WIRING BOARD

PASSIVE FILTER

The output of the tuner is link-coupled via the passive filter to the base of the first I.F. amplifier TR51 (BF196/01). This passive filter consists of the adjacent channel traps C51, L51, C53 (38MHz) and C52, L52, C54 (29.5MHz) with the resistor R51 common and the soundtrap (31MHz) L53, R52, C55 and L54. L53 provides for a flat portion over about 0.5MHz on the response curve for the purpose of preventing split tuning under weak signal conditions.

I.F. AMPLIFIER

The signal is fed via C56 to the base of TR51. The low value of C56 reduces the effect of the varying input capacity of the automatic gain controlled transistor TR51, on the I.F. response. This stage has a broad single tuned filter, T51 with C59 damped by R54, the output signal of which is fed to the next stage via a link. This second I.F. amplifier is a cascode stage, the input being to TR53 (BF196/01) and the output from TR52 (BF194). L56, C66 damped by R64, which is capacitively coupled via C67 to L57, C68 and C69 forms a bandpass filter. This feeds the last amplifying stage via a capacitive divider (C68, C69). This divider limits the loading of the secondary of the bandpass filter. The last stage, bandpass filter T52, C70 with damping resistor R68 is capacitively coupled via C72 to T53, C73. Both these circuits are tapped halfway to prevent harmonic products of the detector stage, from reaching earlier amplifying stages. The inductances of each branch of T52 and T53 form high frequency signal barriers.

DETECTOR STAGE

A combined video and inter carrier detector, D51 (OA90) is used. R70 and C76 form the detector load while the self resonating L59 and L61 are used as effective filters for interfering harmonics in the T.V. reception band. C77 in conjunction with L59 provides additional filtering for another portion of the same band.

SOUND I.F. AND RATIO DETECTOR

The signal is taken from the inductively coupled bandpass filter T101, C104 and L104, C106 with damping resistors R105, R108 providing for correct sound I.F. bandwidth. TR201 is an emitter follower so that the input and output signals can be in phase to minimise the possibility of instability by radiation. The signal is directly coupled without further filtering to TR202 which provides limiting action. From the collector of this limiter the signal passes to the primary of T201 which drives the balanced ratio detector. In this circuit the tertiary connection is made direct to the centre tap of the secondary winding. The coupling between primary and secondary is made by a top inductance coil L201. Amplitude modulation is reduced by the ratio detector action and in particular C209 which is on the output side of the detector. A shield is provided to minimise radiation from the detector stage back to the I.F. circuits. Finally, a test point is provided so that the I.F. response can be observed by a normal sweep method.

SOUND OUTPUT STAGE

The audio signal from the ratio detector is fed via the volume control R627 to the input of the audio stage. TR251 (N.P.N.) preamplifier and driver TR252 (P.N.P.) form a D.C. coupled complementary pair driving directly a complementary pair of emitter followers, N.P.N. TR253 and P.N.P. TR254. The loudspeaker, via the coupling condenser C255, forms the common emitter load. This output stage is working near cut-off — class B; TR253 taking care of the positive and TR254 of the negative half of the output signal.

R256 provides D.C. negative feedback keeping a constant voltage difference between the D.C. input voltage = bias voltage (derived via filter R253, C252) and further voltage divider (R254, R251), and the voltage at the output; thus the voltage at the output is kept close to half the supply voltage.

R252 via C253 forms with R256 a voltage divider applying part of the output back to the input, inverted in phase so that the feedback is negative. The collector resistance (R259 of the driver TR252) is not directly returned to the negative rail (ground) but is "bootstrapped" to the output load: the additional supply voltage enables TR254 to be fully bottomed.

The NTC R258 in parallel with R260 gives temperature compensation by reducing the bias voltage with increasing driver transistor function temperature.

VIDEO PREAMP AND A.G.C.

The video preamp is an emitter follower TR101 (BC148) and provides for a low impedance output. R101 in the base of TR101 prevents possible ringing in the emitter follower circuit. The bias is derived from the voltage divider R103 and R102 (5% resistors) eliminating the white preset circuitry used with the original No. 12 Chassis video preamp. The bias is applied via the detector circuit and the voltage drop across this circuit is compensated by R104. The video preamp is also used as a moderate gain amplifier for the sound I.F. signal at intercarrier frequency (5.5MHz) and also to give an amplified positive going sync. signal. Because of its use as a sound I.F. amplifier the 5.5MHz trap, L103, C105 is moved to the output (emitter) side and is now located in the feed line to the contrast control. In the

DESCRIPTION OF OPERATION (Cont.)

original No. 12 Chassis this trap was located at the input (base) of the video preamp. This detected voltage is applied to the base of the A.G.C. amplifier transistor TR102. If the ingoing signal strength into the receiver increases, then this voltage tends to fall, causing the collector voltage to rise. This collector voltage feeds away to I.F. and tuner to effect the appropriate gain reduction. If the ingoing signal reduces, then the voltage at base of TR102 rises, causing collector voltage to fall, which results in increase of gain of I.F. and tuner. When the ingoing signal falls below the threshold of operation of the A.G.C. system the transistor bottoms or saturates such that the collector voltage is a small fraction of a volt more positive than the emitter which is already held to a potential of approximately 0.8V above earth.

NOISE AMPLIFIER

The noise take-off and the sync. signal take-off is now combined and comes from the collector resistor R107 in the video preamp. C303 and L301 act as a filter tuned to approx. 2.5MHz via which noise pulses are fed to the noise amplifier TR301 (BC148).

This amplifier has been given a threshold voltage applied to the emitter by means of the divider R303, R304. This threshold voltage allows only pulses in excess of the sync. tips to be processed by the noise amplifier. When this amplifier is activated by a pulse, the gate TR303 (BC148) will be opened, consequently, TR303 is normally fully conductive providing an earth return for the sync. separators TR302 and TR305. The opening of the gate transistor TR302 disables the sync. separators preventing any noise pulses being passed on via these transistors. In this way, noise immunity of the sync. separator circuit is greatly increased.

SYNC. PULSE SEPARATOR

The composite video signal is coupled simultaneously to separate horizontal and vertical sync. separator transistors TR305 and TR302 respectively. The operation of these is as follows:

The coupling condenser to the transistor base charges rapidly through the base-emitter diode junction during the positive sync. pulse peaks, while its discharge time is controlled by the base resistor. This tends to clamp the positive sync. tip peaks at the base potential thereby cutting off the transistor during picture information. The collector output will normally only contain the amplified negative sync. pulses.

The phase of the horizontal sync. output pulse is shifted by means of the tuned circuit L303 and C311 which permits correct centring of the picture in the raster. The collector of TR302 contains both horizontal and vertical sync. pulses but due to the time constant in its base circuit the vertical pulses have greater amplitude. Horizontal sync. pulses are rejected by the integrating circuit R311 and C308 feeding TR304 which amplifies and inverts the vertical sync. pulses.

VIDEO OUTPUT BOARD ZL002

This board is mounted on the picture tube neck and provides video drive, brightness control, grid 2 and focus adjustment. The cathode is fed with negative going video via the common emitter BF178 output stage, giving a voltage gain of about 60 at a bandwidth of 4.0 MHz. Peaking is achieved by coils L351 and LR351.

Contrast range is about 5:1 by means of R619 mounted on the receiver control panel, the operation of this control unaffecting the sync. and A.G.C. take-off points in ZF004. Black level constancy is achieved by means of R618 and R617. The pre-set R361 located on the top right hand side of the board adjusts G2 while the focus is adjusted by R365 on the top left hand side of the board.

Spark gaps SG351 - SG354 protect the BF178 from picture tube flashover.

POWER SUPPLY ZP001

This board supplies both the L.T. and H.T. requirements of the set. The H.T. is obtained from a full wave diode bridge giving a main H.T. of 240V. Further filtering from the 240V line provides another three H.T. supplies of 235V, 225V and 190V. FS403 rated at 500mA protects the H.T. supply.

The L.T. supply consists of another full wave bridge and a series regulator TR401 which supplies 11-12V at approx. 110mA. The 12V is adjustable by means of R404. FS404 of 300mA rating protects the regulated supply. The supply to the audio stage is unregulated and is protected by the "special" resistor R409 which will fuse if the audio stage draws excessive current. The 6.3V A.C. heater supply is protected by FS402 which is a tinned copper wire link.

The power transformer is of the balanced C-Core type to minimise radiation. Voltage taps exist enabling the receiver to work from 240V or 250V.

The mains is fused for 2 amps, the H.T. for 500mA and the 12V supply for 300mA.

VERTICAL OSCILLATOR AND OUTPUT MODULE ZV001

The vertical stage consists of a triode-pentode multivibrator.

Capacitor C453 is charged from the BHT supply to a potential determined by the VDR, R459, via R457 and R458. The variable R457 controls the vertical size. The triode section acts as a switch discharging the capacitor during the fly-back period.

Due to the magnetisation current of the vertical output transformer, a parabolic component is required in the anode current of the output valve. This is obtained by superimposing a parabolic voltage waveform over the saw-tooth grid voltage drive waveform. The voltage appearing across the primary of the V.O.T. during scan is a negative going saw-tooth, preceded by a positive fly-back spike. The integrating network R471 and C461 removes the spike and generates an inverted parabolic waveform (14). To remove the negative going saw-tooth component and reverse the parabola this waveform is differentiated by C455 and R465. The mixing of the saw-tooth and parabolic waveforms takes place at the junction of R460, C455 and C456. The proportion of parabolic component is controlled by the top linearity control R463.

The parabolic waveform developed across C458 and R467 is integrated by R462 and C454, generating an S-shaped waveform across the latter, which is now in series with the saw-tooth generating capacitor C453. The amplitude of the S-shaped waveform is controlled by the setting of R462 which serves as an overall linearity control. The feedback path for the vertical oscillator is from the plate of the pentode to the grid of the triode section. The output signal is attenuated by R468 and R469. C459 removes the

DESCRIPTION OF OPERATION (Cont.)

saw-tooth component and in conjunction with R468 controls the threshold of the fly-back period. This pulse charges the timing capacitor C457, whose discharge time controls the scan period and is mainly by R452, R455 and the setting of R453, acting as a hold control.

R472 and NTC R473, stabilize the size during warm up of the vertical output transformer, T451.

PHASE COMPARATOR AND HORIZONTAL OSCILLATOR ZH001

The horizontal oscillator consists of the high voltage transistor TR502 with associated bias network and the tank circuit T501 with tuning capacitors C513 and C512. The latter forms with R521 the phase shifting network of the reactance stage TR501. The controlling D.C. voltage is obtained via R514, R509 from the phase comparator. These resistances form with C509, R513 and also C511 the anti-hunt filtering system.

The terminals 1 and 6 of the centre tap winding of the horizontal output transformer provide the comparison signals which are changed into the required complementary saw-tooth wave forms by means of the integrating networks R504, C502 and R505, C503. These comparison signals are applied via C504 and C505 to the phase comparator. The sync. pulse is fed via the phasing network R501 and C501 and switches the diodes on during the flyback period of the saw-tooth wave forms clamping these signals at this particular instant. Depending on when the centre of the flyback period occurs, earlier or later than the sync. pulse an error voltage will occur which respectively adds to or subtracts from the applied hold control voltage derived via R510, from R515 and R516.

The resultant voltage controls the capacitive A.C. current of the reactance stage — an increase of voltage will provide a higher A.C. current, i.e. the reactance stage acts as a larger capacity slowing down the oscillator. Conversely a late comparison signal will give a decrease in voltage — reducing the reactance stage A.C. current with a lowering of apparent capacity and a consequential speeding up of the oscillator. The collector of the oscillator TR502 provides the drive for the horizontal output stage. C516 tapped from the junction of the collector load R527, R528 furnishes the correct drive wave form.

The flyback pulse from the horizontal output transformer is fed via the small capacity C518 to the grid of V551 (6CM5) neutralising the pulse passed on via anode-grid capacity from the anode of V551 during its cut-off period. The voltage divider R523 and the stabilising VDR R518 with the filter condenser C510 provides the voltage supply for the reactance stage.

HORIZONTAL OUTPUT STAGE ZH002

The drive voltage to the 6CM5 is arranged to cut off the current flow in the valve at the end of the scan. When cut off sharply, the magnetic field that has been established in the horizontal output transformer during the scan collapses and the oscillatory circuit comprised of the transformer inductance and stray and physical capacitances will start to oscillate. However, after one-half cycle of oscillation the damping diode, 6AL3, starts to conduct. During the "flyback" time the magnetic energy has reversed direction and the picture tube spot has returned to the left-hand side of the screen.

When the booster diode conducts, it permits current to flow at a controlled rate through part of the transformer. This current, passed by the auto-transformer into the deflection coils, forms approximately the first half of the horizontal scan.

As the booster diode ceases to conduct the 6CM5 valve takes over and supplies the necessary current from the power supply, via the boost capacitor C553 to complete the scan. The current flow in the auto-transformer and deflection coils is now in the opposite direction to that flowing during the first half of the cycle. The circuit is now ready to repeat its cycle.

The high voltage pulse produced during "flyback" is stepped up by the horizontal output transformer before being half-wave peak rectified by the E.H.T. rectifier, 1S2, and then smoothed by the capacitance formed by the inner and outer bulb coatings of the picture tube. The E.H.T. can vary between 14,000 and 18,000 volts depending on the load. It is highly desirable that the size of the picture should be independent of the load current delivered by the E.H.T. supply to the picture tube. Such variations of beam current occur when the average picture brightness varies or the brightness control is operated. The stabilisation operates as follows: A positive D.C. voltage proportioned by R557, R555 and R554 sets the operating point of the VDR, R552 on the non-linear portion of its characteristics. The positive "fly-back" pulse applied to the VDR, via C554, is thus clamped at its peak. An increase in the "fly-back" pulse amplitude now will result in a more negative bias for the 6CM5 thus reducing the plate current flow.

AUXILIARY CIRCUITRY CONTAINED ON ZH001

HORIZONTAL BLANKING

The negative going flyback pulse is fed via R508 and the speed up condenser C507 to terminal 6 where it combines with the vertical blanking pulse. Blanking is done on the picture tube control grid.

SPOTKILLING

The postive going flyback pulses (from terminal 6 of the H.O.T.) applied via C506 to VDR R511 are sufficiently high to render the VDR more conductive in the pulse direction and turns it into a rectifying diode with cathode connected to ground. The developed negative voltage is fed via filter R512, C508 as a backing off voltage to the brightness control.

During the early stages of switch-off the flyback pulses diminish in height and are not able to bring the VDR 511 into its more conductive state, and the backing off negative voltage disappears. Consequently the picture control grid receives a much more positive voltage resulting in a substantial increase in beam current discharging the picture tube.

RECENT MODIFICATIONS

R609 — Value changed from 8K2 to 3K9

R611 — Value changed from 1K to 680E

Reason — To provide increased range of adjustment to I.F. gain preset pot.

R615 — Value changed from 3K3 to 1K8

Reason — To minimise instability.

FX51 Bead added to collector of TR54 in some receivers displaying parasitic oscillations.

R403 — Delete 56K

R404 — Delete Preset Pot

R405 — Delete 2K7

C404 — Delete 40uF 16V

R403 — Add 390E ½W 10%

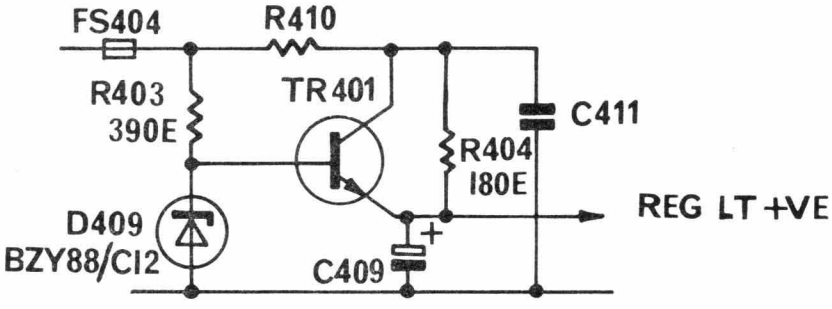
R404 — Add 180E ½W 10%

D409 — Add Zener BZY88/C12

} Refer Fig. 1 for Modified Circuitry

Reason — With mains set 10% high possibility of crooked vertical lines and loss of interlace due to spreads within ZF004.

FIG. 1



R452 — Value changed from 180K to 220K

Reason — To improve vertical hold range.

R261 — Changed to IE5 Carbon 0.5W 5% CR37

R262 — Add 1E5 carbon 0.5W 5% CR37 to TR253 emitter.

Reason — To improve thermal stability in the audio stage.

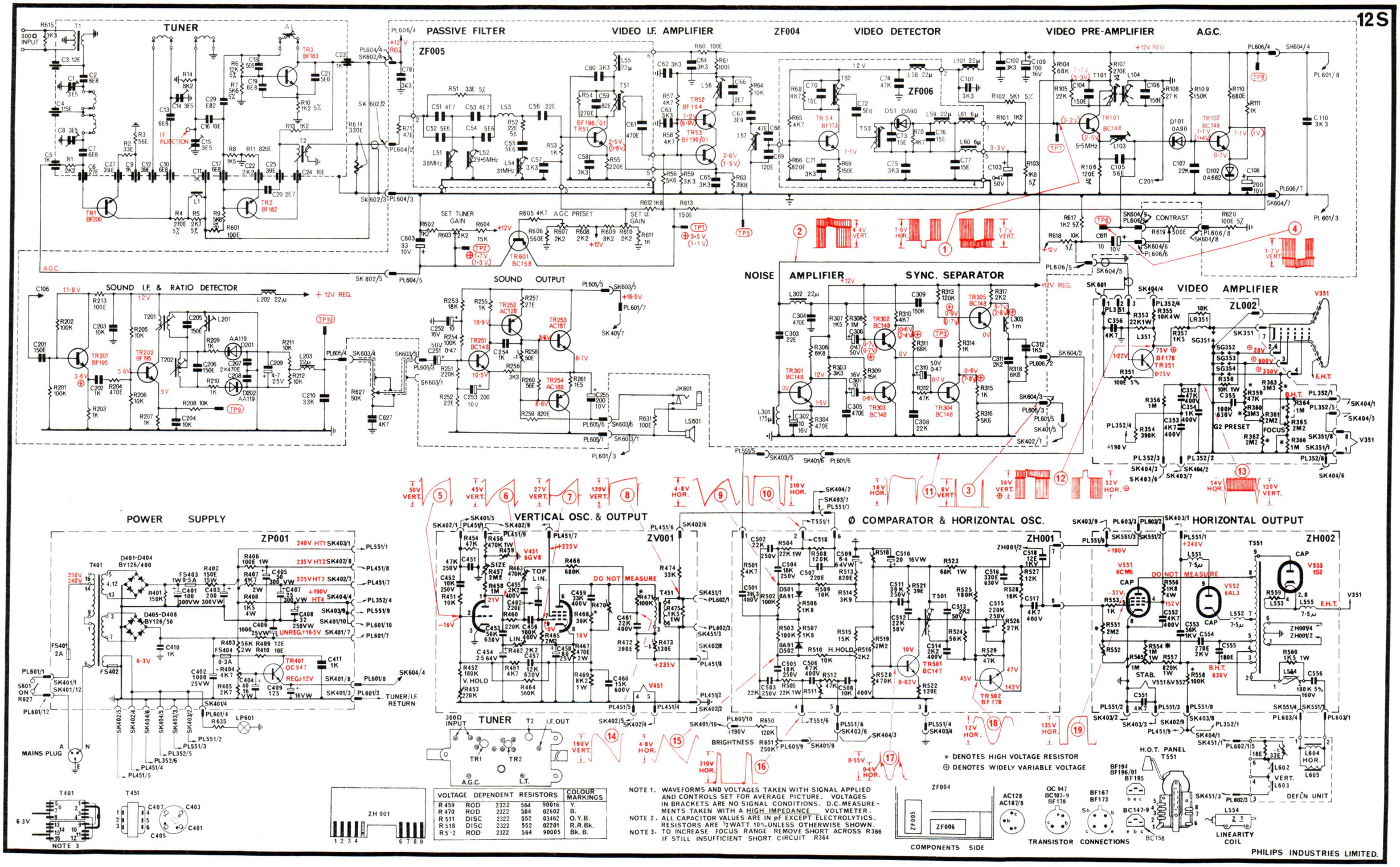
C252 — Value changed from 10uF to 100uF—100M electrolytic 16V +50—10 CZ100 174

Reason — To eliminate switch on transients which may damage audio output transistors.

SERVICE AID

Description	Code
Test Point In-line Socket	CZ 370 744

HYDE PARK PRESS PTY. LTD.



VOLTAGE DEPENDENT RESISTORS					COLOUR MARKINGS
R 459	ROD	2322	564	90016	Y.
R 470	ROD	2322	564	02602	B.
R 511	DISC	2322	552	03462	O.Y.B.
R 518	DISC	2322	552	02201	R.R.Bk.
R 512	ROD	2322	564	90005	Bk.B.

NOTE 1. WAVEFORMS AND VOLTAGES TAKEN WITH SIGNAL APPLIED AND CONTROLS SET FOR AVERAGE PICTURE. VOLTAGES IN BRACKETS ARE NO SIGNAL CONDITIONS. D.C. MEASUREMENTS TAKEN WITH A HIGH IMPEDANCE VOLTMETER.

NOTE 2. ALL CAPACITOR VALUES ARE IN pF EXCEPT ELECTROLYTICS. RESISTORS ARE ½WATT 10% UNLESS OTHERWISE SHOWN.

NOTE 3. TO INCREASE FOCUS RANGE REMOVE SHORT ACROSS R366 IF STILL INSUFFICIENT SHORT CIRCUIT R364