

QUAD 405

POWER AMPLIFIER

Service Data

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CIRCUIT DESCRIPTION

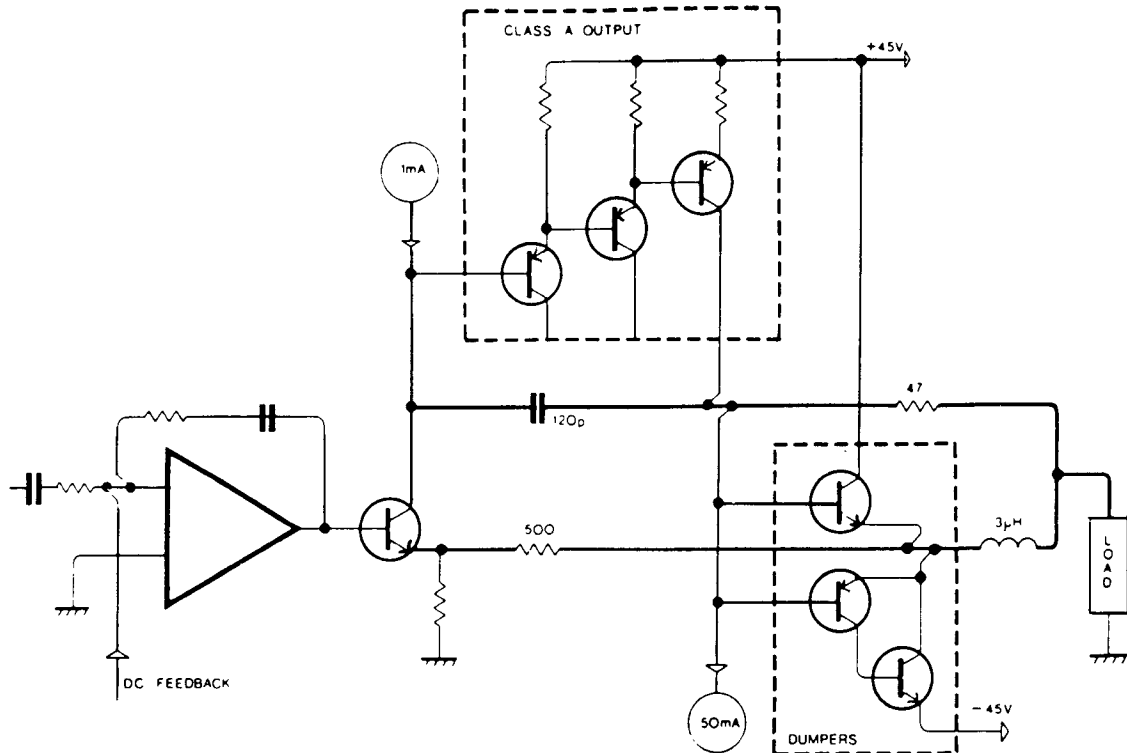
The Quad 405 is a two channel power amplifier primarily intended for use in high quality sound reproducing systems. The amplifier is usually used with Quad control units though other signal sources can readily be accommodated.

The amplifier uses a current dumping output circuit, a Quad invention which eliminates many of the problems associated with transistor amplifiers, and covered by patents in several countries.

In a current dumping amplifier there is in effect both a low powered very high quality amplifier and a high powered heavy duty amplifier. The low power amplifier controls the loudspeakers at all times, calling upon the high power section to provide most of the muscle. The small amplifier is so arranged – it carries an error signal – that provided the larger power transistors (the dumpers) get within the target area of the required output current it will fill in the remainder accurately and completely. The reproduced quality is *solely* dependent on the small amplifier which because of its low power can be made very good indeed.

Problems of crossover, crossover distortion, quiescent current adjustment, thermal tracking, transistor matching, all disappear. There are no internal adjustments or alignments and the choice of power transistor types is less restrictive.

Fig. 1



Simplified Schematic of 405 Amplifier showing Class A, Dumpers and Bridge Components.

TEST EQUIPMENT

Sound Technology Distortion Analyser 1700A (ST1700A)

Dual Beam Oscilloscope

4Ω and 8Ω loads of 100W Dissipation

1Ω load of 25W dissipation

2.5 KHz Square Wave Generator

Input Sensitivity Indicator (0 to 1V Rms)

Avometer (or similar multitester)

0 to 12V d.c. power supply

Variac AC power supply

Fig. 2 illustrates a simple switching circuit which may assist if much testing is anticipated.

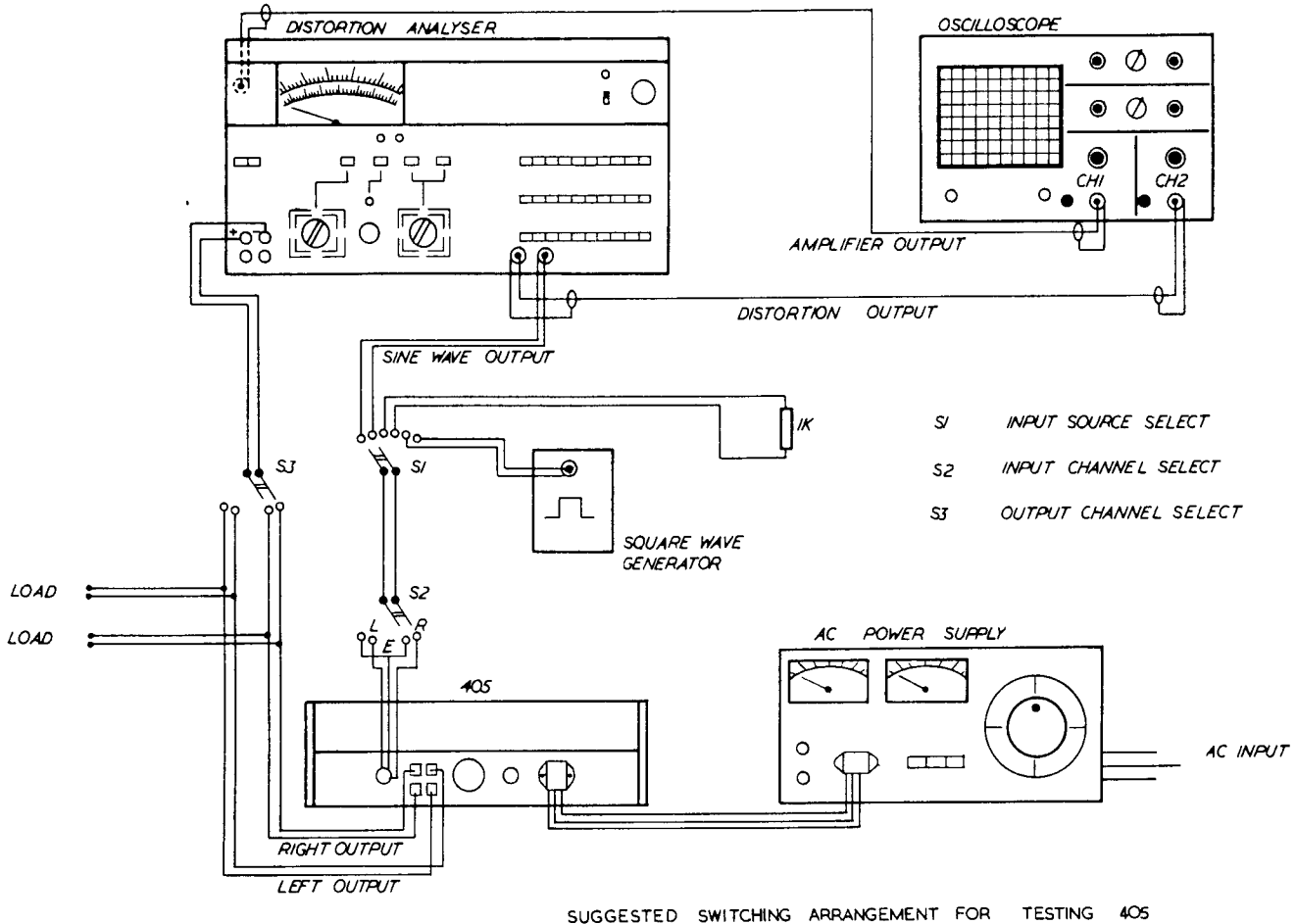


Fig. 2

Before testing, the cover of the 405 should be removed.

DISCONNECTING CLAMP CIRCUITS

When servicing a 405 fitted with a clamp circuit, it may be necessary to bypass this circuit.

For 405's fitted with amplifier boards M1 2368, this may be done by removing the push-on connectors carrying the brown wires from the amplifier boards, and connecting the loads between the black output terminals and the output terminals on the amplifier boards.

For 405's fitted with amplifier boards type M1 2565, it will be necessary to remove the side panels to gain access to the printed copper side of the amplifier boards. The three screws securing each side panel should be removed, the panel may then be slid outwards from the amplifier. If the solder is removed from the link pad shown in Fig. 18 (A), the clamp circuit will be disconnected.

Care should be taken to ensure that when testing is completed, the link pad is re-soldered.

AMPLIFIER CIRCUIT TESTING M12368 – M12565

The following test procedure is with reference to a 240V amplifier with no voltage limiters.

Select:

Controls **Y1 – 0.5V/cm DC coupled**
 Y2 – 0.1V/cm DC coupled
 Timebase 0.2 ms/cm

ST. 1700A – **Volts/power 100W RMS**
 Distortion Ratio 0.01%
 80KHz and 400Hz filters both in
 Frequency 1KHz
 Low Distortion
 Osc. level minimum

Connections **Load 8 Ω**
 S1 Sine Wave (ST1700A)
 S2 Left Input
 S3 Left Output

If the Amplifier fails any of the following tests, refer to the appropriate part of the fault finding section, page 6.

1. Check inside the amplifier for obvious faults such as burnt components, blown internal fuses etc. Each of the following checks should be repeated on the other channel.
2. Apply the **AC Supply Volts** whilst observing the current consumption which should not exceed 0.12A.
3. Increase the **oscillator level** to 0.5V Rms \pm 0.5dB. The output should be 100W with no sign of clipping.
4. Select **set level** and adjust meter deflection for zero. Select **distortion** which should be less than 0.01%. Select **volts/power**, decrease the **applied frequency** to 100Hz, remove **400Hz** filter and adjust **oscilloscope timebase** to 2 ms/cm. **Set level**, select **distortion** which should be less than 0.01%. Select **volts/power**, increase the **applied frequency** to 3KHz, select **400Hz** filter and adjust **timebase** to 50 μ s/cm. Select **distortion** which should again be less than 0.01%.
5. Select **volts/power**, increase **applied frequency** to 10KHz and adjust **timebase** to 20 μ s/cm. Adjust **oscillator level** so that output is 100W. **Set level** then select **distortion** which should be less than 0.05%.
6. Select **volts/power**, increase **applied frequency** to 20KHz and adjust **timebase** to 10 μ s/cm. Reduce **output level** to 80W. **Set level** and measure **distortion** which should be less than 0.1%.
7. Select **volts/power** and decrease **frequency** to 1KHz. Adjust **oscillator level** so that output is 100W and adjust **timebase** to 0.2ms/cm. The following checks are to monitor the low frequency roll off of the 405. Select **30Hz** and the output level should fall by approximately 0.3dB. Select **20Hz** and the output level should fall by approximately 1dB. Select **10Hz** and the output level should fall by 7dB \pm 1.5dB.
8. Increase **frequency** to 1KHz. For 405's with amplifier boards type M12368 insert 1K8 voltage limiting resistors into the mini sockets on each amplifier board. For 405's with amplifier boards type M12565-3 insert a link into these sockets. The output waveform should indicate clipping. Reduce the **oscillator level** until the clipping just disappears at which point the output level should be 20V Rms \pm 1V. Remove voltage limiters, and adjust **oscillator level** for 100W output.
9. Select **volts/power** and **square wave** input, (S1). Adjust **timebase** to 0.1ms/cm. Remove **load** and note the difference in the waveform with load and no load. There should be a slight difference in gain (10mV) but no overshoot. Re-connect 8 Ω load.
10. The following checks should be carried out with no input signal and the input to the amplifier board loaded by a 1K resistor, (S1). Remove **400Hz filter** and select **noise** which should be better than -93dB unweighted.
11. Select **volts/power 400Hz filter** and **sine wave** input at a **frequency** of 1 KHz and adjust **oscillator level** for 100W output. Select **1 Ω load**. The output should clip equally on both halves of the waveform as shown in Fig. 11.
12. Select **4 Ω load**, output level should be 70W just prior to clipping.
13. **CLAMP CIRCUIT TESTING**
In order to test the clamp circuit, the circuit should first be disconnected from its amplifier board, as described on page 4.
For 405's fitted with amplifier boards M12368 apply **6V d.c.** across the output terminals of the relevant channel with an ammeter in circuit.
For 405's fitted with amplifier boards M12565 a wire should be soldered to the back of the amplifier board as shown in Fig. 18(B). 6V d.c. should be applied between this wire and the black output terminal of the relevant channel, with an ammeter in circuit.
In both cases the current should not exceed 0.5mA. Reverse the polarity of the supply and repeat the test. The test may then be carried out on the other channel.
The complete test should then be repeated using a 12V d.c. supply with a 10 Ω resistor in series, when the current should be approximately 1A.

FAULT FINDING

The following information may assist in locating faults occurring on the amplifier boards of a 405.

In each case only the faulty channel of the 405 is driven, as in the test procedure. The input should be a sine wave of 0.5V Rms and the output should be applied to an 8Ω load unless otherwise stated. The numbers refer to the relevant test check.

*Board type M12368 only **Board type M12565 only.

Effect	Cause
1. R33 Burnt R37 Burnt* R41 Burnt* R39 Burnt R38 Burnt	Collector-base TR10 O/C L1 O/C L3 O/C R20 O/C, R21 O/C D5 or D6 O/C
2. High Current * ** Draws high current which drops to 0.1A after approx 2 seconds	TR2 O/C, TR3 O/C, TR7 O/C, TR9 S/C TR10 S/C, R7 O/C C8 S/C C3 S/C D2 O/C R8 O/C R14 O/C
3. No increase in AC supply current for increase in signal Signal is unstable and clips 100W o/p for 0.3V input Waveform trace as in Fig. 3 Waveform trace as in Fig. 4 Approximately 4W output	R3 O/C, C1 O/C, R31 O/C R6 O/C R20 O/C, R21 O/C TR8 O/C, TR6 S/C, R36 O/C, R30 O/C, C10 S/C L2 O/C R16 O/C
4. Second Harmonic Distortion Second Harmonic Distortion especially at 100Hz and on O/C load. Third Harmonic Distortion especially at 100Hz Third Harmonic Distortion Hum and noise Hum* Waveform trace as in Fig. 5* Waveform trace as in Fig. 6* Waveform trace as in Fig. 7 Waveform trace as in Fig. 8* Waveform trace as in Fig. 9	IC1, TR1, TR ² , TR3, TR4, R5, R6, R17, R18, R22, C1. C2, C7, C8 R5. L2, R3, R6, R16, R20, R21, C3. C5 O/C R37 O/C TR3 S/C R23 O/C, R5 O/C R33 S/C R8 O/C C5 S/C, R15 O/C, TR1 O/C
6. Distortion at 20KHz	D5 S/C, D6 S/C
8. Limiting resistor R11 has no effect	R10 S/C
9. Square Wave Trace as in Fig. 10	C6 O/C
10. Noise especially at 100Hz Noise with large Spikes Noise	R5 TR1 IC1, R12, R3, R4, TR2
11. Current limiting check with 1Ω load. Waveform trace as in Fig. 12 Waveform trace as in Fig. 13 Waveform trace as in Fig. 14 Waveform trace as in Fig. 8	R29 O/C, R28 S/C, R25 O/C D3 S/C, R27 O/C, R24 O/C, R26 S/C TR6 O/C C11 S/C, TR5 O/C
13. Draws high current with 6V D.C. supply	T2 S/C

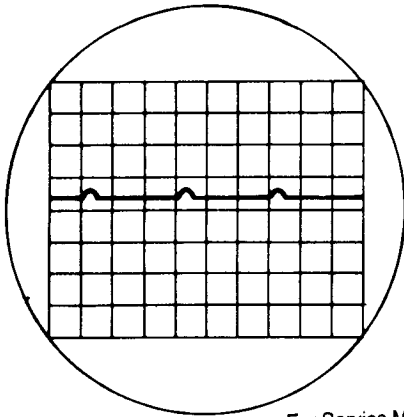


Fig. 3

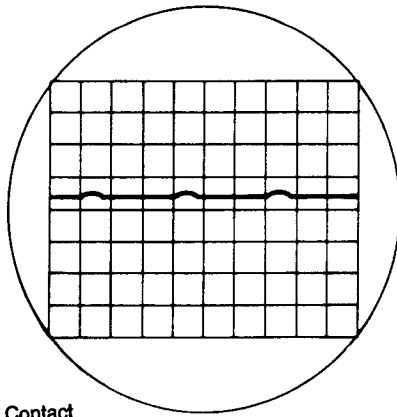


Fig. 4

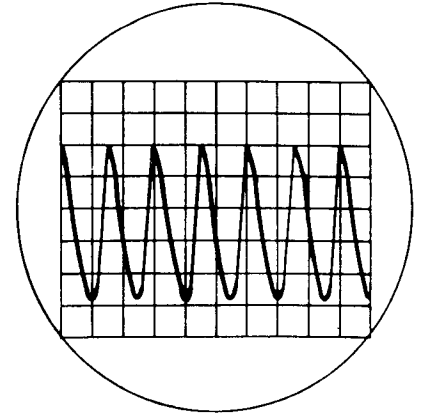


Fig. 5

For Service Manuals Contact
MAURITRON TECHNICAL SERVICES
 8 Cherry Tree Rd, Chinnor
 Oxon OX9 4QY
 Tel:- 01844-351694 Fax:- 01844-352554
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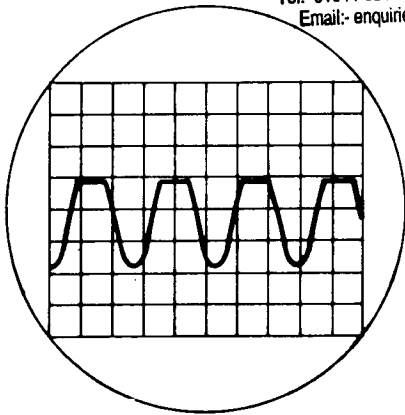


Fig. 6

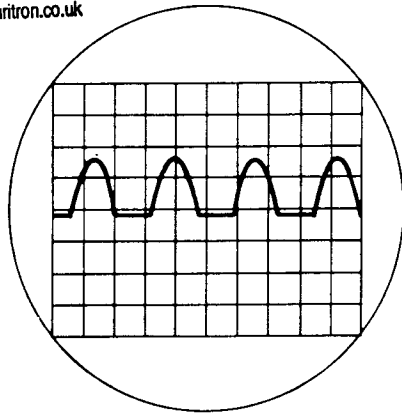


Fig. 7

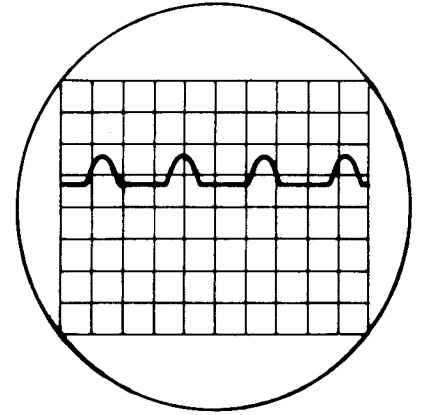


Fig. 8

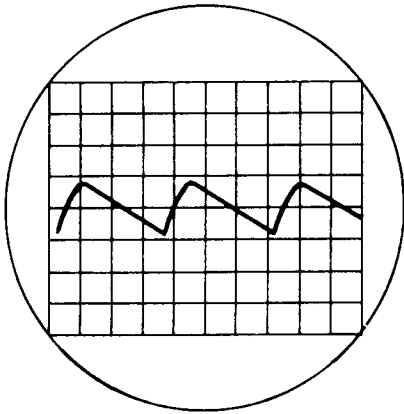


Fig. 9

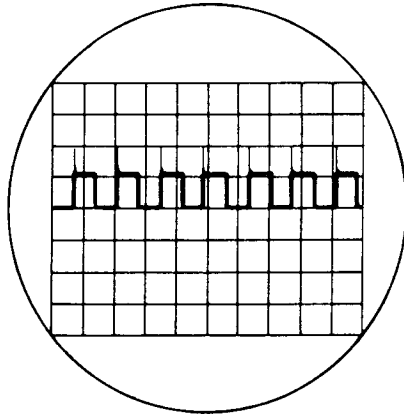


Fig. 10

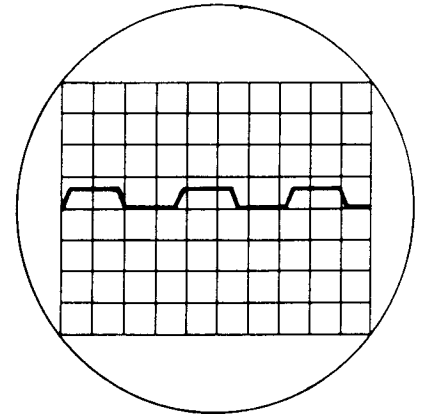


Fig. 11

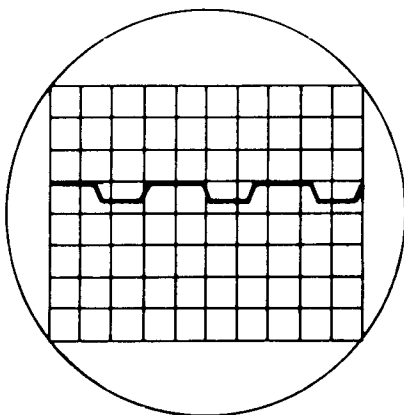


Fig. 12

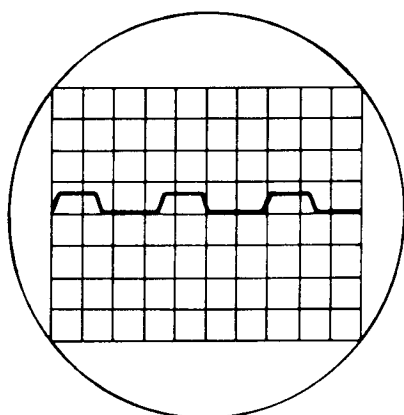


Fig. 13

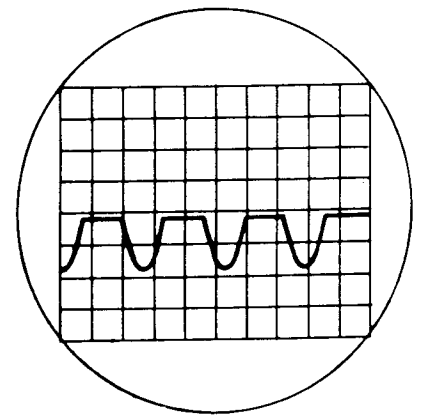


Fig. 14

MODIFICATIONS TO PRINTED CIRCUIT BOARDS.

- Amplifier Board M12368.5** originally fitted. Circuit diagram issue 2.
1. **Amplifier Board M12368.6**
Copper track layout modified component layout unchanged.
 2. **Amplifier Board M12368.7** Circuit diagram issue 3.
R4 changed from 10K to 22K
R5 changed from 10K to 4K7
R9 changed from 180Ω to 220Ω
R19 3K3 removed
R23 changed from 3K3 to 1K2
C9 330p removed
C18 47nF added as on circuit diagram
FS1 and FS2 effectively changed places
R2 changed from 2.2Ω to 10Ω
Copper track width reduced.
 - 3.(a) **Amplifier Board M12368.9** introduced at Serial Number 9000. Circuit diagram issue 4.
R41 22Ω added
L3 6.9μH added
C15 0.1μH added
C16 0.1μH added
C18 47nF removed
C19 1nF added
Copper track width reduced.
Also at Serial Number 9000 a clamp circuit, on PCB M12400, was mounted on the output terminals (fig. 15). This detects excessive DC off-set at the output and short-circuits, blowing the internal 4 amp fuses FS1/FS2, to protect the loudspeaker.
 - 3.(b) At Serial Number 29,000 the following changes occurred. Circuit diagram issue 5
R10 changed from 1K to 1K8
R27 changed from 8K2 to 15K
R29 changed from 8K2 to 15K
R35 changed from 0.08Ω to 0.091Ω
R36 changed from 0.08Ω to 0.091Ω
D1 changed from LR120C to LR150C
D2 changed from LR120C to LR150C
 4. **Amplifier Board M12368.10**
Identical to M12368.9 except for copper pads for power transistors modified for production purposes.
 5. **Amplifier Board M12565.3** introduced at Serial Number 59,001. Circuit diagram issue 6. Other 405's with this board are Serial Numbers 57,301 to 57,600 inc.
This board incorporates the clamp circuit and voltage limiter is now a link.
 6. **Amplifier Board M12565.5**, circuit diagram issue 7, was also fitted from serial number 62500 onwards but with 405 nameplates. See 405.2, page 12.

Alternatives

Transistors – on M12368 issues 5, 6 and 7 BDY77 or BDY74 may have been used for TR9 and TR10. BDY77 is a suitable replacement for both, but faster transistors may cause instability.

On M12368 issues 9 and 10 and M12565.3 the following transistors may have been used, 2SD424, 17556, 2SD676 and are interchangeable.

TR2 – BC682, ZTX304, BCX32, BC546B interchangeable

TR3, TR4 – E5458, ZTX504, BC556B interchangeable

TR7, TR8 – 40872 or 2SA740 interchangeable

L.E.D.

LP1 Hewlett Packard 5082-4850, Exciton XC5053, Toshiba TLR114A interchangeable.

CLAMP CIRCUIT

Introduced co-incident with amplifier board M12368.9 at serial number 9001. All 405's with serial numbers 9000 and under being returned for service, should be fitted with a clamp board as shown below.

At serial number 59,001 the clamp circuit was fitted as an integral part of the amplifier board M12565.3. The function of this circuit is to monitor the D.C. component of the output. In the event of a component failure which causes excessive D.C. volts, the circuit will short circuit the amplifier output and thus protect the speakers.

REPLACING A CLAMP BOARD

If it is necessary to replace a clamp board the following instructions should be followed:

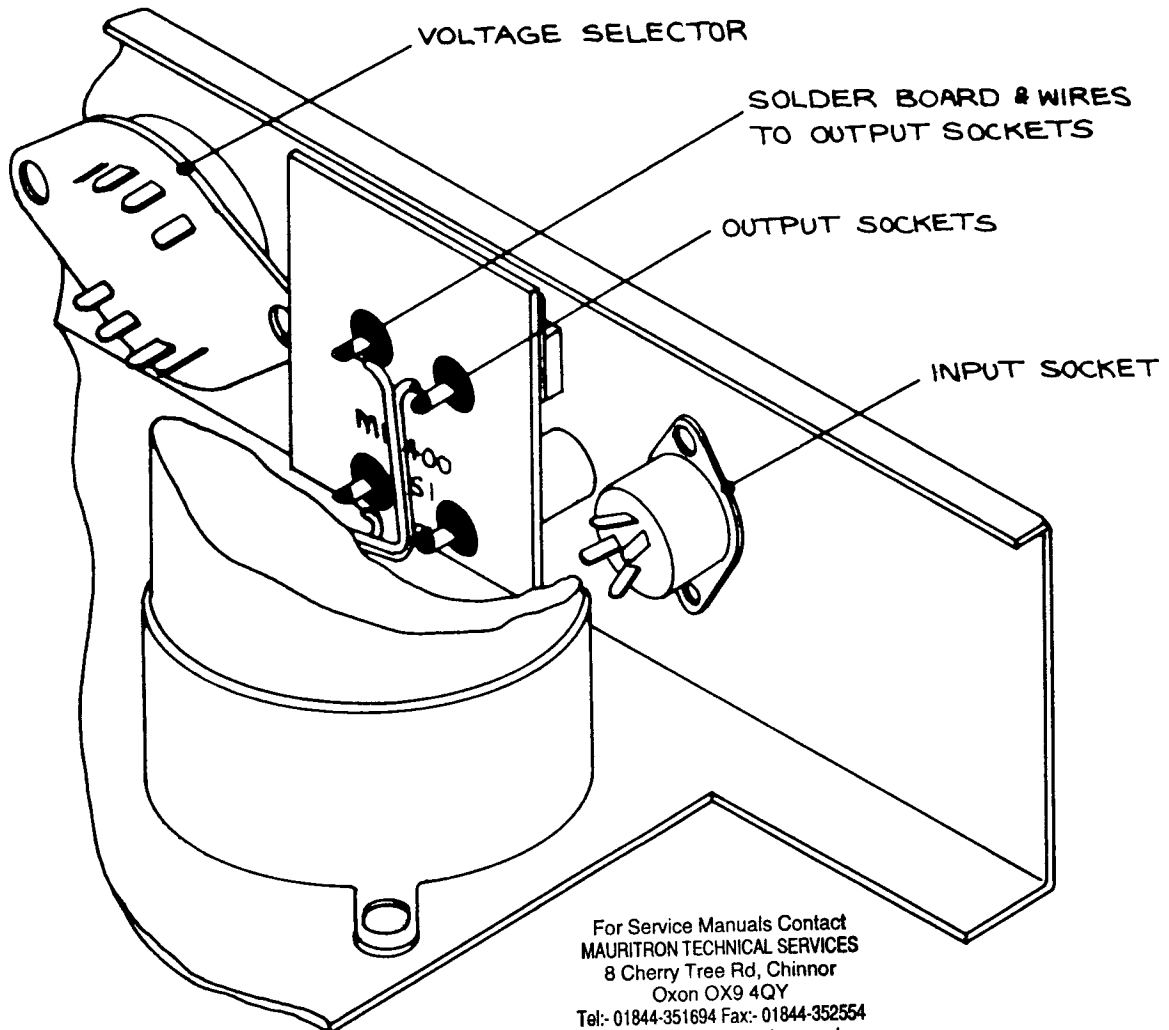


Fig. 15

1. Disconnect the wiring to the right channel circuit board and fold it back onto the transformer. Loosen the clamp holding the electrolytic capacitor next to the output terminals, and lift the capacitor out of the way.
2. Disconnect the leads to the output sockets, place the clamp board over the output connectors and re-solder. It is advisable to tin the output connector tags before positioning the clamp board. This makes soldering easier.
3. Replace the capacitor and re-connect the tags to the righthand amplifier board.

CLAMP CIRCUIT ALTERNATIVES

T1 2N4992 or BS08A 03

T2 SC141B or TIC226B or RCA T2800.

CONVERSION OF 405 TO A MONO 180 WATT AMPLIFIER

To carry out the conversion, the modification kit Q410MOD should first be obtained.

1. Remove 405 cover and baseplate.
2. Unplug the Amp connectors from the righthand channel printed circuit board (righthand side when viewed from the front).
3. Release the clip securing the rear 10,000 μ F capacitor (C14) and lay the capacitor over the righthand channel board.
4. Unsolder the four leads from the output terminals.
For 405's fitted with amplifier boards M12368 (i.e. serial numbers 59000 and below) remove the clamp board.
To disconnect the clamp circuit on 405's fitted with amplifier boards M12565 (i.e. serial numbers above 59000) remove both of the side panels. The solder should then be removed from the link pads shown as A in fig 18. The side panels should then be refitted.
5. Remove the output terminals and replace those for the righthand channel with the sockets provided, Red at the top. Fit the blanking grommets provided in the vacant holes.
6. Fit the new printed circuit clamp board to the output sockets and reconnect the output leads. Brown/Red to the pin marked R, Brown/White to the pin marked L and both Green leads to the pin next to L.
7. Remove the 4 pin Din input socket and unsolder the leads from it.
8. Connect these leads to the new input board, White to L and Red to R and screens to the two E tags.
9. Fit the new input socket and board.
10. Refit the 10,000 μ F capacitor and Amp connectors to the righthand board.
11. Remove the output leads, Brown/White from lefthand and Brown/Red from righthand printed boards.
12. Connect a 4-8 Ω speaker between the output tags of these two boards.
13. Switch on the amplifier, inject a signal of approximately 100mV at 1 kHz at the input socket (left and right pins are now common). Remove the blanking grommet adjacent to the input socket and adjust the pre-set potentiometer through this hole for a null in the signal from the speaker, increasing the input signal level as required for final accurate setting.
14. Switch off, remove signal input, disconnect the loudspeaker, reconnect output leads, refit blanking grommet, base and cover.

REMOVING THE AMPLIFIER MODULES

1. Note the colour coding for reconnection and remove the push-on tab connectors A.
2. Undo the four fixing screws B, for each module.
3. Remove the heatsink grease from the face of the aluminium T-section and retain for use when re-fitting.

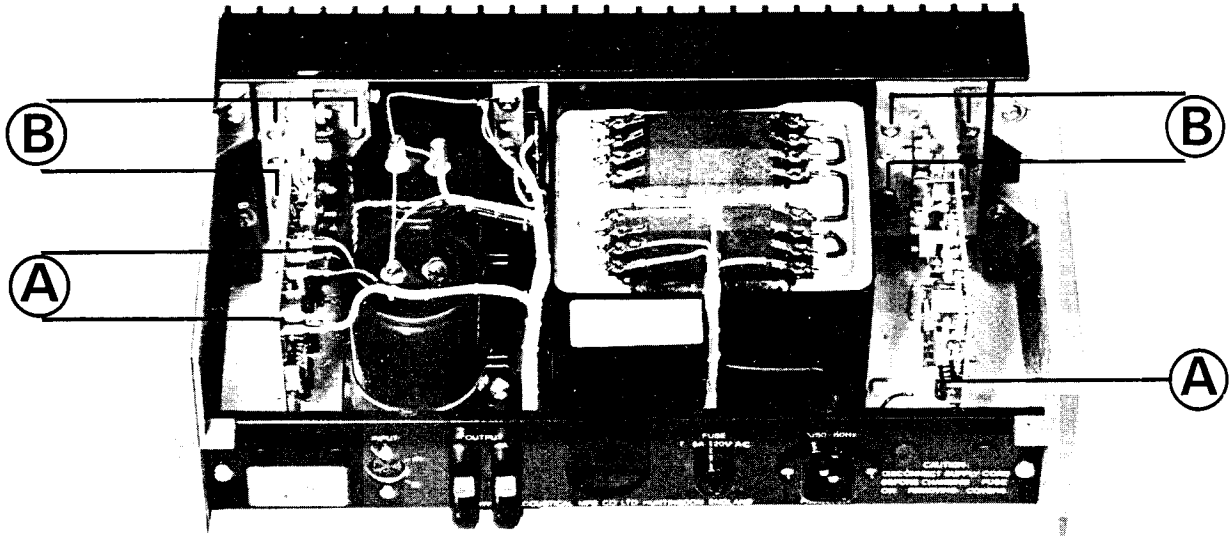


Fig. 16

REPLACING THE QUAD 405 TRANSFORMER

1. Disconnect the A.C. supply and remove top cover (2 screws) and bottom plate (4 screws).
2. Note carefully the connections and then unsolder the external wiring to the A.C. supply transformer.
3. Remove the two retaining screws through the large centre holes of the 6 in each amplifier board mounting, and then release the boards by undoing the other 4 in each. These 12 screws fasten into tapped strips located in slots in the rear of the finned heat sink sections, which now become free of the front plate.
4. Release the transformer by undoing 4 screws through the front plate and 2 through the bottom.
5. Reverse the procedure with the new transformer.

Note: It should not be necessary to remove the push-on connections from the boards but if they are removed they should be handled carefully and replaced correctly.

QUAD 405-2

The original 405 provided 100 watts per channel into load impedances between 4.5 and 8 ohms. To meet the need of 4 ohm loudspeakers and 8 ohm speakers whose impedance falls below 4.5 ohms, the 405-2 was introduced in January 1983 at serial number 65000, but the 405-2 modules had already been fitted from 62500 onwards. Many earlier amplifiers have also since been converted to 405-2 by owners and dealers, by replacing the modules.

The 405-2 has a more sophisticated current limiter circuit based on a thick film assembly N1/N2, permitting full output into loads between 3 and 10 ohms, and up to 50 watts into 1.5 ohms, provided the output transistors will not be hazarded by doing so. (See Fig. 17). As with earlier 405 models after serial number 59001, the output clamp circuit is incorporated in the main module boards and a shorting link used for the voltage limiter.

The first 405-2 circuit diagram was 12333 issue 7 and the printed board reference M12565.5.

Subsequent modifications were:

Date	Serial No.	PCB 12565 issue	Circuit Diagram 12333 issue	Changes
May 83	66700	6	8	C20 (4n7) added to avoid mild instability when switching off. D13 added in series with D5 to correct response at 20kHz. R44 added to maintain unconditional stability.
July 83	67950	6	8	Output terminals replaced by 4mm sockets.
Aug 84	72501	7	9	TR4 changed to BC556B and R18 omitted replacing both TR3 and TR4.
Dec 85	83000	7	—	Voltage selector omitted.
Feb 86	85000	7	10	New mains input connector incorporating fuseholder. Din input replaced by phono sockets. Signal earth isolated from chassis by R2 to avoid hum loop when using mains earth.

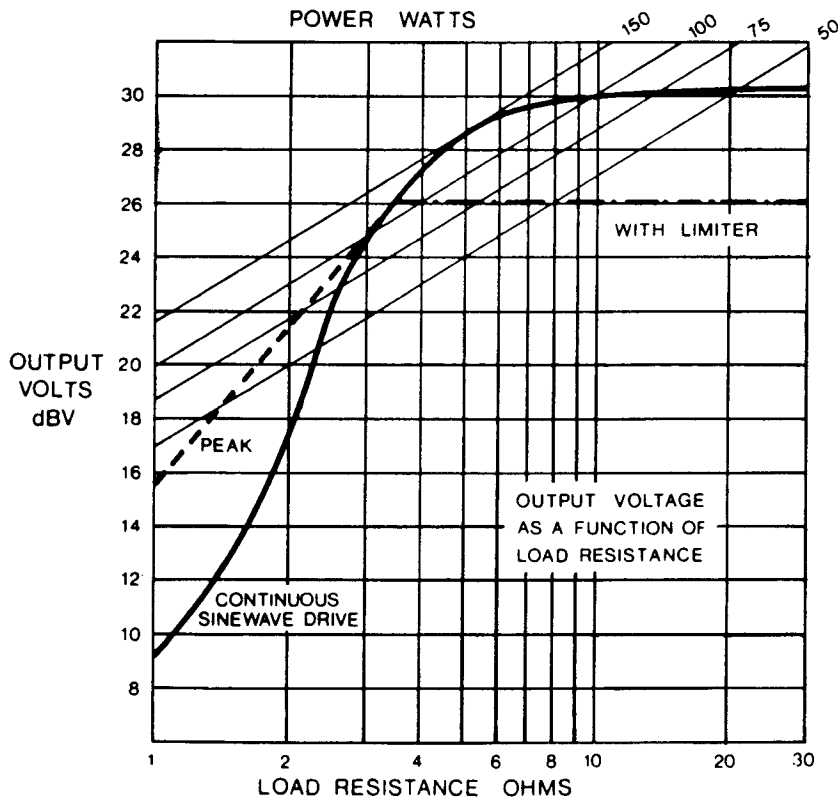


Fig. 17.

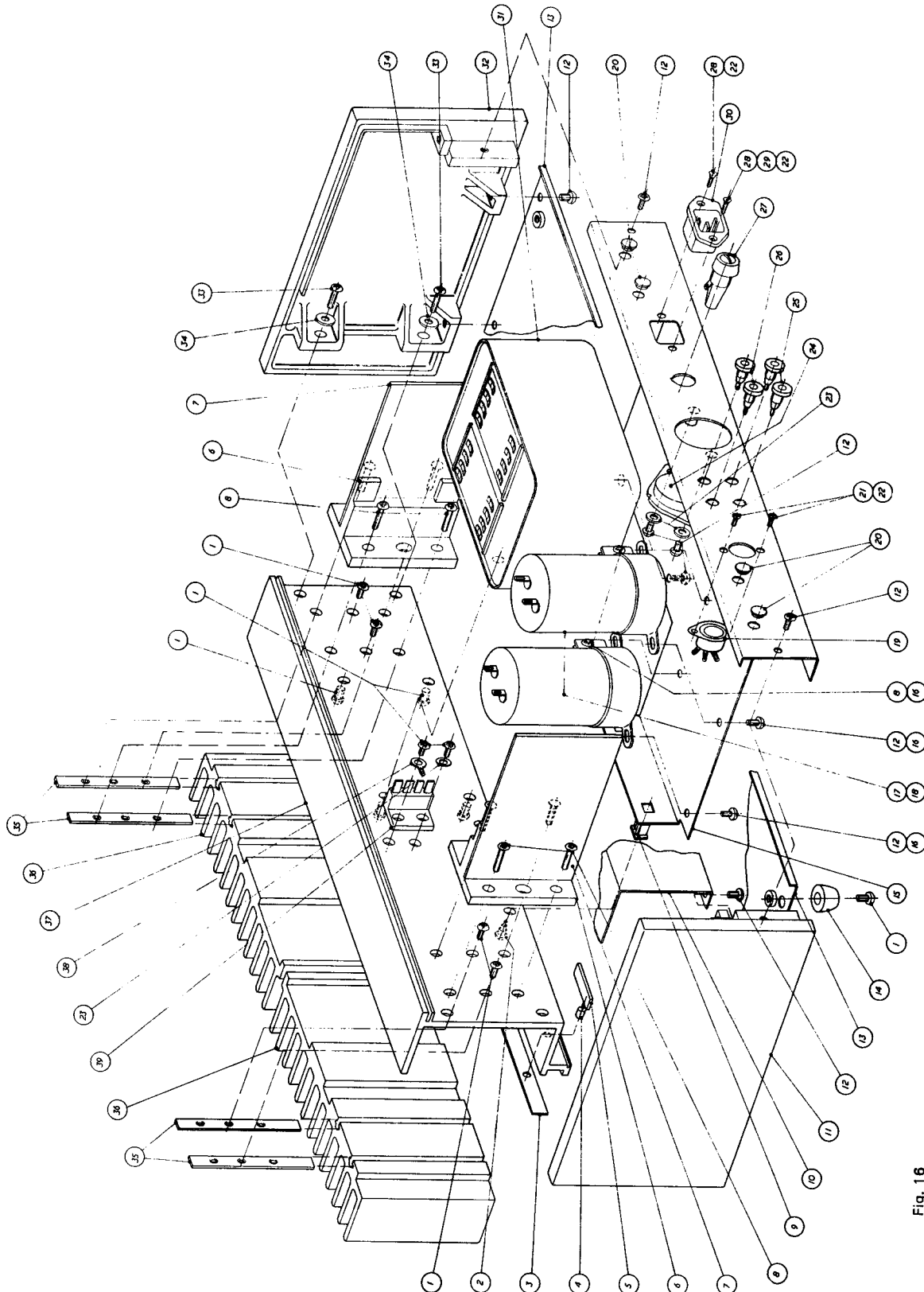


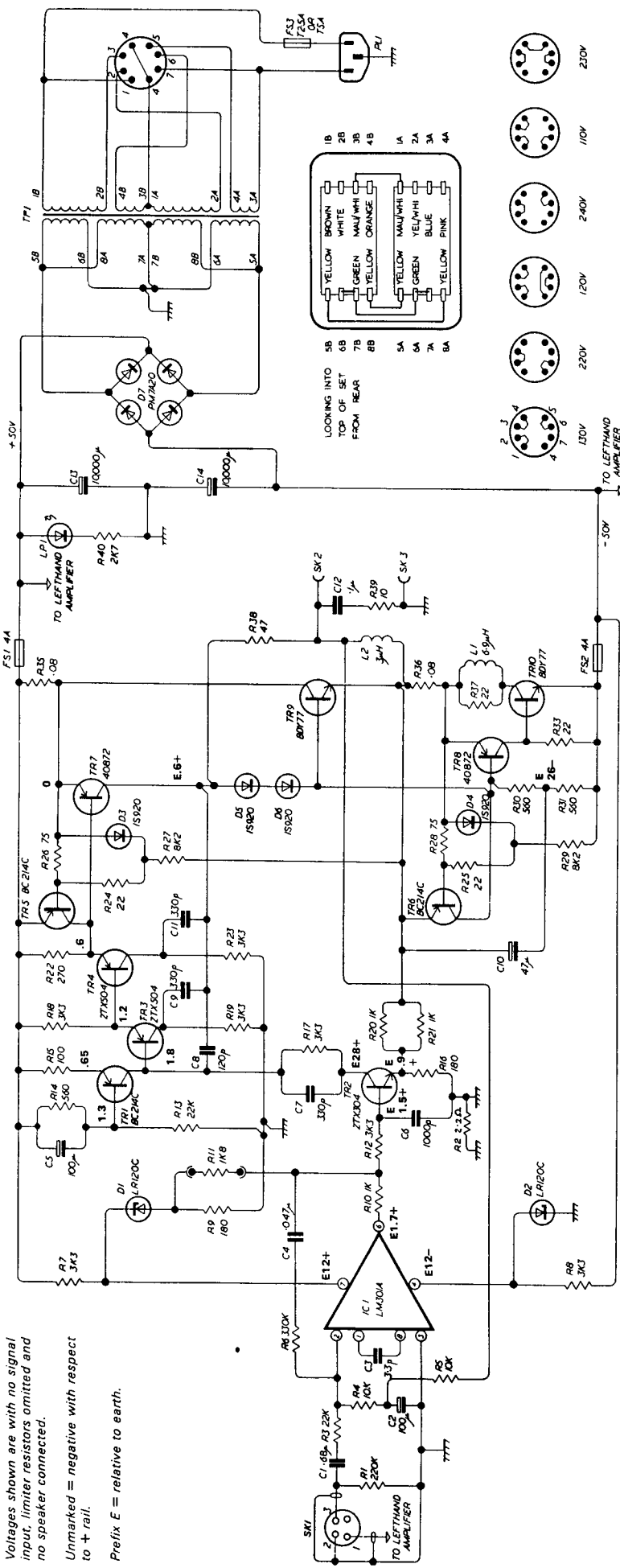
Fig. 16

Assembly Diagram.

Part No.	Quantity	Description	Part No.	
1	1	SCREW 1/4" x 3/16" PHOSPHOR	17	CONTRACTOR 00000-03V 8716
2	1	SCREW 1/4" x 3/16" PHOSPHOR	18	CONTRACTOR CLIP 8716 V4
3	1	SCREW 1/4" x 3/16" PHOSPHOR	19	INPUT SOCKET
4	1	SCREW 1/4" x 3/16" PHOSPHOR	20	SOLD BRUSHING 1/2" x 1/4" PHOSPHOR
5	1	SCREW 1/4" x 3/16" PHOSPHOR	21	SCREW 1/4" x 3/16" PHOSPHOR
6	1	SCREW 1/4" x 3/16" PHOSPHOR	22	NUT 1/4" x 3/16" PHOSPHOR
7	1	SCREW 1/4" x 3/16" PHOSPHOR	23	WASHER 1/4" x 3/16" PHOSPHOR
8	1	SCREW 1/4" x 3/16" PHOSPHOR	24	WASHER 1/4" x 3/16" PHOSPHOR
9	1	SCREW 1/4" x 3/16" PHOSPHOR	25	WASHER 1/4" x 3/16" PHOSPHOR
10	1	SCREW 1/4" x 3/16" PHOSPHOR	26	WASHER 1/4" x 3/16" PHOSPHOR
11	1	SCREW 1/4" x 3/16" PHOSPHOR	27	WASHER 1/4" x 3/16" PHOSPHOR
12	1	SCREW 1/4" x 3/16" PHOSPHOR	28	WASHER 1/4" x 3/16" PHOSPHOR
13	1	SCREW 1/4" x 3/16" PHOSPHOR	29	WASHER 1/4" x 3/16" PHOSPHOR
14	1	SCREW 1/4" x 3/16" PHOSPHOR	30	WASHER 1/4" x 3/16" PHOSPHOR
15	1	SCREW 1/4" x 3/16" PHOSPHOR	31	WASHER 1/4" x 3/16" PHOSPHOR
16	1	SCREW 1/4" x 3/16" PHOSPHOR	32	WASHER 1/4" x 3/16" PHOSPHOR
17	1	SCREW 1/4" x 3/16" PHOSPHOR	33	WASHER 1/4" x 3/16" PHOSPHOR
18	1	SCREW 1/4" x 3/16" PHOSPHOR	34	WASHER 1/4" x 3/16" PHOSPHOR
19	1	SCREW 1/4" x 3/16" PHOSPHOR	35	WASHER 1/4" x 3/16" PHOSPHOR
20	1	SCREW 1/4" x 3/16" PHOSPHOR	36	WASHER 1/4" x 3/16" PHOSPHOR
21	1	SCREW 1/4" x 3/16" PHOSPHOR	37	WASHER 1/4" x 3/16" PHOSPHOR
22	1	SCREW 1/4" x 3/16" PHOSPHOR	38	WASHER 1/4" x 3/16" PHOSPHOR
23	1	SCREW 1/4" x 3/16" PHOSPHOR	39	WASHER 1/4" x 3/16" PHOSPHOR
24	1	SCREW 1/4" x 3/16" PHOSPHOR		
25	1	SCREW 1/4" x 3/16" PHOSPHOR		
26	1	SCREW 1/4" x 3/16" PHOSPHOR		
27	1	SCREW 1/4" x 3/16" PHOSPHOR		
28	1	SCREW 1/4" x 3/16" PHOSPHOR		
29	1	SCREW 1/4" x 3/16" PHOSPHOR		
30	1	SCREW 1/4" x 3/16" PHOSPHOR		
31	1	SCREW 1/4" x 3/16" PHOSPHOR		
32	1	SCREW 1/4" x 3/16" PHOSPHOR		
33	1	SCREW 1/4" x 3/16" PHOSPHOR		
34	1	SCREW 1/4" x 3/16" PHOSPHOR		
35	1	SCREW 1/4" x 3/16" PHOSPHOR		
36	1	SCREW 1/4" x 3/16" PHOSPHOR		
37	1	SCREW 1/4" x 3/16" PHOSPHOR		
38	1	SCREW 1/4" x 3/16" PHOSPHOR		
39	1	SCREW 1/4" x 3/16" PHOSPHOR		

BOARD NUMBER M12368 ISS 5 AND 6

Voltages shown are with no signal input, limiter resistors omitted and no speaker connected.
 Unmarked = negative with respect to + rail.
 Prefix E = relative to earth.



No.	Value	Tol	Reference	Stock No.
L2	3μH	± 5%	Inductor ANCO 440/D	L12405A
F51	4A			UM0440A
F52	4A			UM0440A
F53	T2.5A		220-240V	UM2460A
	T5A		110-130V	UM0560A
LP1			Hewlett Packard 5082-4850 Red	BL5053R
TF1			Acoustical DRG A31/2382	L12382A

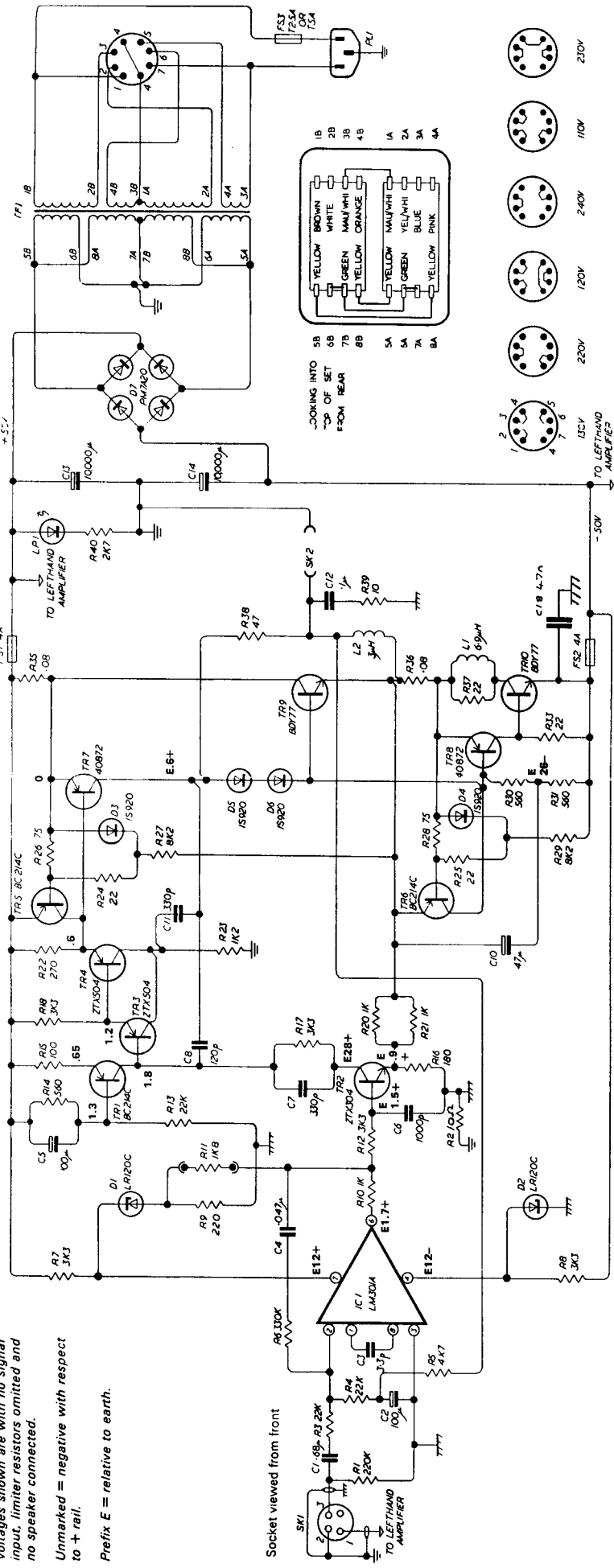
No.	Value	Tol	Reference	Stock No.
C12	0.1μ		Capacitor 250V	C100KAC
C13	10,000μ		Capacitor 63V	C10KUTA
C14	10,000μ		Capacitor 63V	C10KUTA
TR1			Transistor BC214C	DB214C
TR2			Transistor BC682 or ZTX304 or BCX32	DZTX304
TR3			Transistor E4548 or ZTX604	DZTX604
TR4			Transistor BC214C	DZTX604
TR5			Transistor BC214C	DB214C
TR6			Transistor BC214C	DB214C
TR7			Transistor 40B72 or 2SA740	D40B72X
TR8			Transistor 40B72 or 2SA740	D40B72X
TR9			Transistor 80Y74 or 80Y77	DB0Y77Q
TR10			Transistor 80Y74 or 80Y77	DB0Y77Q
D1			Zener Diode LR120C	DZ12VAA
D2			Zener Diode LR120C	DZ12VAA
D3			Diode 1S520	DIS520B
D4			Diode 1S520	DIS520B
D5			Diode 1S520	DIS520B
D6			Diode 1S520	DIS520B
D7			Bridge Rectifier	DPM1A20
IC1			LM301A	DM1301A
L1	6.9μH	± 20%	Inductor ANCO TC1/65	L12406A

No.	Value	Tol	Reference	Stock No.
R27	8k2	± 5%	Resistor	R82RJ1
R28	75	± 5%	Resistor	R75RJ1
R29	8k2	± 5%	Resistor	R82RJ1
R30	560	± 10%	Resistor 2.5W	R560RJ5
R31	560	± 10%	Resistor 2.5W	R560RJ5
R33	22	± 10%	Resistor	R22RJ1
R35	0.08		Resistor Acoustical DRG AM12383	R08RJ1Y
R36	0.08		Resistor Acoustical DRG AM12383	R08RJ1Y
R37	22	± 10%	Resistor	R22RJ1
R38	47	± 5%	Resistor	R47RJ1
R39	10	± 10%	Resistor	R10RJ1
R40	2k7		Resistor 1.0W	R2k7RJ1
C1	0.68μ		Capacitor 100V	C680NKS
C2	100μ	± 10%	Capacitor 3V	C100UME
C3	3.3P	± 20%	Capacitor	C330KJ
C4	0.047μ		Capacitor 250V	C47N0J5
C5	100μ		Capacitor 6V	C100JZB
C6	1000P		Capacitor 400V	C1000KK
C7	330P	± 20%	Capacitor	C330PKJ
C8	120P	± 5%	Capacitor	C120PJ1
C9	330P	± 20%	Capacitor	C330PKJ
C10	47μ		Capacitor 40V	CA47U2B
C11	330P		Capacitor	C330PKJ

No.	Value	Tol	Reference	Stock No.
R1	20k	± 10%	Resistor	R20KJ1
R2	2.2	± 5%	Resistor	R22R00S
R3	2k	± 5%	Resistor	R2kR0J1
R4	10k	± 10%	Resistor	R10K0J1
R5	10k	± 10%	Resistor	R10K0J1
R6	330k	± 5%	Resistor	R330KJ1
R7	3k3	± 10%	Resistor	R3k30J1
R8	3k3	± 10%	Resistor	R3k30J1
R9	180	± 5%	Resistor	R180RJ1
R10	1k	± 5%	Resistor	R1k00J1
R11	1k8	± 10%	Resistor	R1k80J1
R12	3k3	± 10%	Resistor	R3k30J1
R13	22k	± 5%	Resistor	R22k0J1
R14	560	± 10%	Resistor	R560RJ1
R15	100	± 10%	Resistor	R100RJ1
R16	180	± 5%	Resistor	R180RJ1
R17	3k3	± 10%	Resistor	R3k30J1
R18	3k3	± 10%	Resistor	R3k30J1
R19	3k3	± 10%	Resistor	R3k30J1
R20	1k	± 5%	Resistor	R1k00J1
R21	1k	± 5%	Resistor	R1k00J1
R22	270	± 10%	Resistor	R270RJ1
R23	3k3	± 10%	Resistor	R3k30J1
R24	22	± 10%	Resistor	R22R0J1
R25	22	± 10%	Resistor	R22R0J1
R26	75	± 5%	Resistor	R75R0J1

BOARD NUMBER M12368 ISS 7

Voltages shown are with no signal input, limiter resistors omitted and no speaker connected.
 Unmarked = negative with respect to + rail.
 Prefix E = relative to earth.

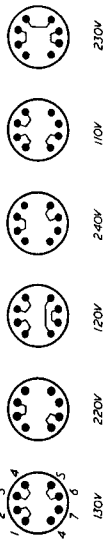
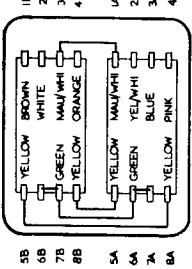
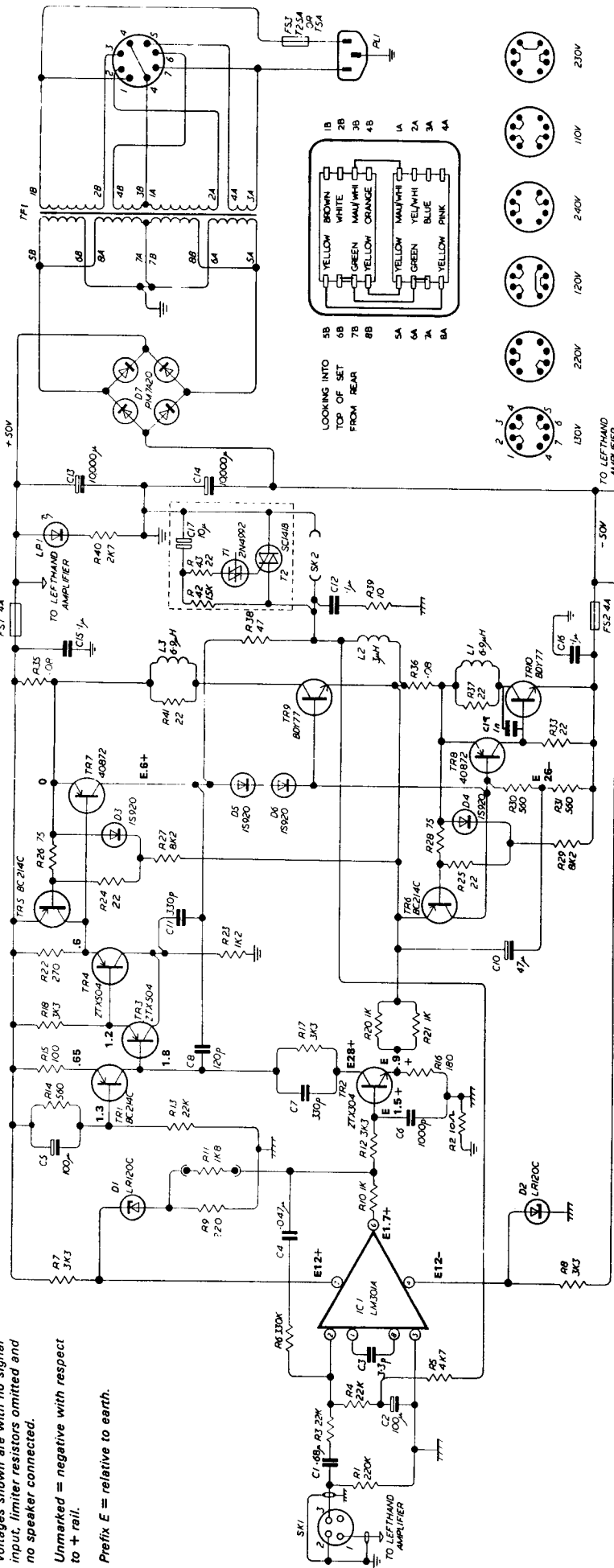


No.	Value	Tol	Reference	Stock No.
R1	220K	± 10%	Resistor	R220KJ1
R2	10	± 5%	Resistor	R10R0J1
R3	22K	± 5%	Resistor	R22K0J1
R4	22K	± 5%	Resistor	R22K0J1
R5	4.7K	± 10%	Resistor	R4700J1
R6	330K	± 5%	Resistor	R330KJ1
R7	3K3	± 10%	Resistor	R3300J1
R8	3K3	± 10%	Resistor	R3300J1
R9	220	± 5%	Resistor	R220R0J1
R10	1K	± 5%	Resistor	R1000J1
R11	1K8	± 10%	Resistor	R1800J1
R12	3K3	± 10%	Resistor	R3300J1
R13	22K	± 5%	Resistor	R22K0J1
R14	500	± 10%	Resistor	R500R0J1
R15	100	± 10%	Resistor	R100R0J1
R16	180	± 5%	Resistor	R180R0J1
R17	3K3	± 10%	Resistor	R3300J1
R18	3K3	± 10%	Resistor	R3300J1
R19	1K	± 5%	Resistor	R1000J1
R20	1K	± 5%	Resistor	R1000J1
R22	270	± 10%	Resistor	R270R0J1
R23	1K2	± 10%	Resistor	R1200J1
R24	22	± 10%	Resistor	R22R0J1
R25	22	± 10%	Resistor	R22R0J1
R26	75	± 5%	Resistor	R75R0J1
C1	0.047µ		Capacitor 100V	C047µE
C2	100µ	± 10%	Capacitor 3V	C100µE
C3	3.3P	± 20%	Capacitor	C3300J1
C4	100µ	± 20%	Capacitor 250V	C100µE
C5	100µ	± 20%	Capacitor 6V	C100µE
C6	1000P	± 20%	Capacitor 400V	C1000P
C7	330P	± 20%	Capacitor	C330P
C8	120P	± 5%	Capacitor	C120P
C9	120P	± 5%	Capacitor	C120P
C10	47µ		Capacitor 40V	C47µE
C11	330P		Capacitor	C330P
D1			Zener Diode LR120C	DZ12VAA
D2			Zener Diode LR120C	DZ12VAA
D3			Diode 6SR20	D6S20B
D4			Diode 6SR20	D6S20B
D5			Diode 6SR20	D6S20B
D6			Diode 6SR20	D6S20B
D7			Bridge Rectifier	BRM7A20
IC1			LM301A	LM301A
L1	6.9µH	± 20%	Inductor ANCO TC1/65	LI2406A
L2	3µH	± 5%	Inductor ANCO 440/D	LI2405A
FS1	4A			UM040A
FS2	4A			UM040A
FS3	T2.5A		220-240V	UM2450A
			110-130V	UM050A
U1			Hewlett Packard 6082-4880 Red	BL5053R
TF1			Acoustical DRG A27/2362	LI2352A

Stock numbers listed for replacement parts, may be equivalents for original parts which are no longer available, therefore manufacturers and tolerances may vary.

BOARD NUMBER M12368 ISS 9

Voltages shown are with no signal input, limiter resistors omitted and no speaker connected.
 Unmarked = negative with respect to + rail.
 Prefix E = relative to earth.



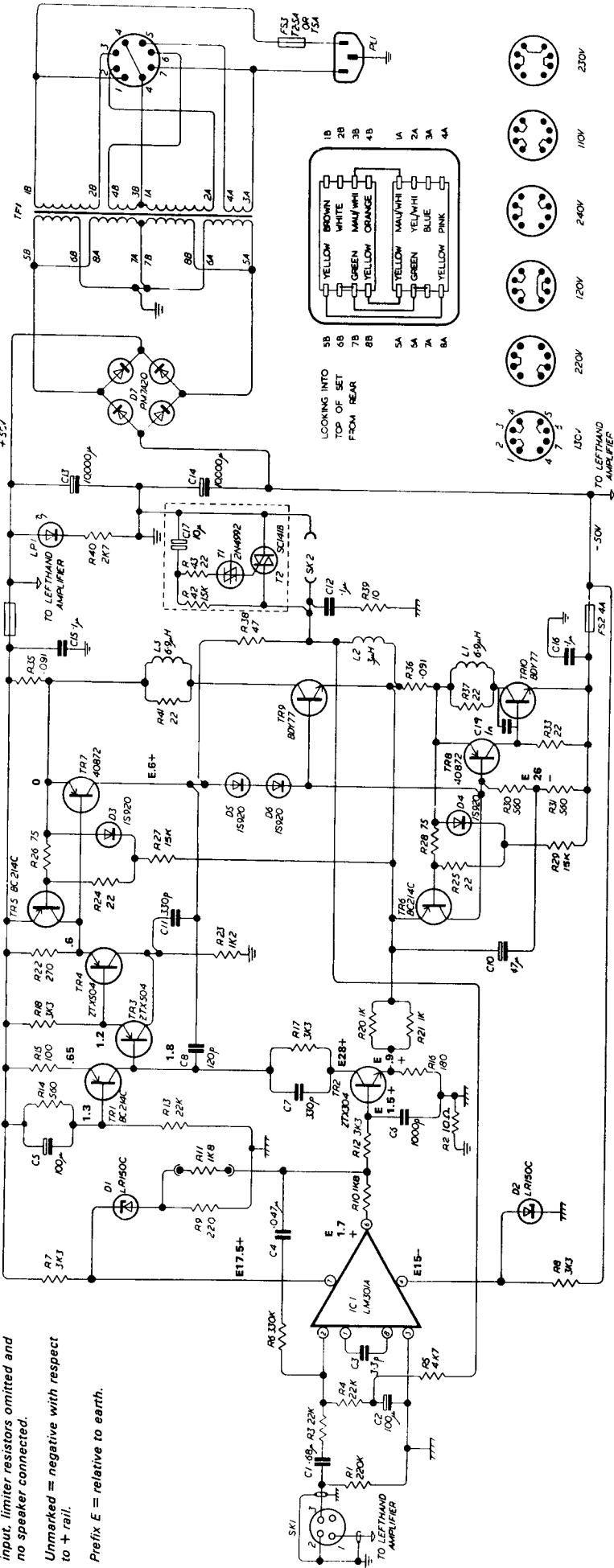
No.	Value	Tol	Reference	Stock No.
R1	220K	± 10%	Resistor	R220KJ1
R2	10	± 5%	Resistor	R10R0J1
R3	22K	± 5%	Resistor	R22K0J1
R4	22K	± 5%	Resistor	R22K0J1
R5	4.7K	± 10%	Resistor	R4700J1
R6	350K	± 5%	Resistor	R350KJ1
R7	3K3	± 10%	Resistor	R3K30J1
R8	220	± 5%	Resistor	R220R0J1
R9	1K	± 10%	Resistor	R1K00J1
R10	1K8	± 10%	Resistor	R1K80J1
R11	3K3	± 10%	Resistor	R3K30J1
R12	22K	± 5%	Resistor	R22K0J1
R13	22K	± 5%	Resistor	R22K0J1
R14	500	± 10%	Resistor	R500R0J1
R15	100	± 10%	Resistor	R100R0J1
R16	180	± 2%	Resistor	R180R0J1
R17	3K3	± 10%	Resistor	R3K30J1
R18	3K3	± 10%	Resistor	R3K30J1
R19				
R20	1K	± 2%	Resistor	R1K00J1
R21	1K	± 2%	Resistor	R1K00J1
R22	270	± 10%	Resistor	R270R0J1
R23	1K2	± 10%	Resistor	R1K20J1
R24	22	± 10%	Resistor	R22R0J1
R25	22	± 10%	Resistor	R22R0J1
R26	75	± 5%	Resistor	R75R0J1
R27	8K2	± 5%	Resistor	R8K20J1
R28	75	± 5%	Resistor	R75R0J1
R29	8K2	± 5%	Resistor	R8K20J1
R30	500	± 10%	Resistor	R500R0J1
R31	500	± 10%	Resistor	R500R0J1
R32	22	± 10%	Resistor	R22R0J1
R33	22	± 10%	Resistor	R22R0J1
R34	0.08		Resistor	R0080J1
R35	0.08		Resistor	R0080J1
R36	0.08		Resistor	R0080J1
R37	22	± 10%	Resistor	R22R0J1
R38	47	± 5%	Resistor	R47R0J1
R39	10	± 10%	Resistor	R10R0J1
R40	2K7	± 10%	Resistor	R2K70J1
R41	22	± 10%	Resistor	R22R0J1
R42	18K	± 10%	Resistor	R18K0J1
R43	22	± 10%	Resistor	R22R0J1
C1	0.05µ		Capacitor 100V	C0050J1
C2	100µ	± 10%	Capacitor 3V	C1000J1
C3	3.3P	± 30%	Capacitor	C3300J1
C4	0.047µ		Capacitor 250V	C0047J1
C5	100µ		Capacitor 8V	C1000J1
C6	1.000P		Capacitor 400V	C1000J1
C7	330P	± 30%	Capacitor	C330P0J1
C8	120P	± 5%	Capacitor	C120P0J1
C9	47µ		Capacitor 40V	C4700J1
C10	330P		Capacitor	C330P0J1
C11	0.1µ		Capacitor 250V	C0100J1
C12	10.000µ		Capacitor 83V	C10000J1
C13	10.000µ		Capacitor 83V	C10000J1
C14	10.000µ		Capacitor 83V	C10000J1
C15	0.1µ		Capacitor 100V	C0100J1
C16	0.1µ		Capacitor 100V	C0100J1
C17	10µ		Capacitor 40V	C1000J1
C18	1000P		Capacitor	C1000J1
C19			Capacitor	
TR1			Transistor BC214C	TR214C0J1
TR2			Transistor BC107 or 2N3904 or BC107	TR1070J1
TR3			Transistor BC107 or 2N3904	TR1070J1
TR4			Transistor BC107 or 2N3904	TR1070J1
TR5			Transistor BC214C	TR214C0J1
TR6			Transistor BC214C	TR214C0J1
TR7			Transistor 4082 or 2SA740	TR4082J1
TR8			Transistor 4082 or 2SA740	TR4082J1
TR9			Transistor 2SD424 or 2SD876 or 17556	TR4240J1
TR10			Transistor 2SD424 or 2SD876 or 17556	TR4240J1
T1			DIAC 2M4982 or 8509A-03	T1000J1
T2			TRIAC SC1418 or TC1228 or T2800	T28000J1
D1			Diode 1N4001	D1000J1
D2			Diode 1N4001	D1000J1
D3			Diode 1N4001	D1000J1
D4			Diode 1N4001	D1000J1
D5			Diode 1N4001	D1000J1
D6			Diode 1N4001	D1000J1
D7			Diode 1N4001	D1000J1
D8			Diode 1N4001	D1000J1
IC1			LM301A	IC3010J1
LI1	6.9µH	± 20%	Inductor ANCO TC1/65	LI2406A
LI2	3µH	± 5%	Inductor ANCO 440/D	LI2405A
LI3	6.9µH	± 20%	Inductor ANCO TC1/65	LI2406A
FS1	4A			UM9040A
FS2	4A			UM9040A
FS3	7.5A			UM2450A
TBA				UM9540A
LP1			Hewlett Packard 6082-4850 Red	BL6082R
TF1			Acoustical DRG A312382	L12382A

BOARD NUMBER M12368 ISS 9 AND 10

Voltages shown are with no signal input, limiter resistors omitted and no speaker connected.

Unmarked = negative with respect to + rail.

Prefix E = relative to earth.



No.	Value	Tol	Reference	Stock No.	No.	Value	Tol	Reference	Stock No.
R1	220K	± 10%	Resistor	R220KJ1	C9	47µ		Capacitor 40V	C47L02B
R2	10	± 5%	Resistor	R10R0J1	C10	330P		Capacitor	C330PAJ1
R3	22K	± 2%	Resistor	R22K0J1	C11	0.1µ		Capacitor 250V	C10NKC
R4	22K	± 2%	Resistor	R22K0J1	C12	0.1µ		Capacitor 63V	C10KUTA
R5	4.7K	± 10%	Resistor	R47K0J1	C13	10,000µ		Capacitor 63V	C10KUNAS
R6	330K	± 2%	Resistor	R330KJ1	C14	10,000µ		Capacitor 100V	C10DNKS
R7	3K3	± 10%	Resistor	R3K30J1	C15	0.1µ		Capacitor 40V	C10J02R
R8	3K3	± 10%	Resistor	R3K30J1	C16	0.1µ		Capacitor	C10NCSA
R9	220	± 5%	Resistor	R220R1	C17	10µ		Capacitor	C10NCSA
R10	1K8	± 10%	Resistor	R1K80J1	C18	1000P		Capacitor	C10NCSA
R11	1K8	± 10%	Resistor	R1K80J1	C19	1000P		Capacitor	C10NCSA
R12	3K3	± 10%	Resistor	R3K30J1	TR1			Transistor BC214C	DBC214C
R13	22K	± 2%	Resistor	R22K0J1	TR2			Transistor BC682 or 2TX304 or BC332	DZ7X304
R14	560	± 10%	Resistor	R560R1	TR3			Transistor EM488 or 2TX804	DZ7X504
R15	100	± 10%	Resistor	R100R1	TR4			Transistor EM488 or 2TX804	DZ7X504
R16	180	± 2%	Resistor	R180R1	TR5			Transistor BC214C	DBC214C
R17	3K3	± 10%	Resistor	R3K30J1	TR6			Transistor BC214C	DBC214C
R18	3K3	± 10%	Resistor	R3K30J1	TR7			Transistor BC214C	DBC214C
R19				C1	0.68µ			Capacitor 100V	C8B0NKS
R20	1K	± 2%	Resistor	R1K00J1	C2	100µ	± 10%	Capacitor 3V	C100UME
R21	1K	± 2%	Resistor	R1K00J1	C3	3.3P	± 20%	Capacitor	C3P30KJ
R22	270	± 10%	Resistor	R270R1	C4	0.047µ		Capacitor 250V	C17N0J5
R23	1K2	± 10%	Resistor	R1K20R1	C5	100µ		Capacitor 8V	C100U2B
R24	22	± 10%	Resistor	R22R0J1	C6	1000P		Capacitor 400V	C1000K
R25	22	± 10%	Resistor	R22R0J1	C7	330P	± 20%	Capacitor	C330PAJ1
R26	75	± 5%	Resistor	R75R0J1	C8	120P	± 5%	Capacitor	C120PJ1
D1				D1				Zener Diode LR150C	LR150C
D2				D2				Zener Diode LR150C	LR150C
D3				D3				Diode BS220	BS220B
D4				D4				Diode BS220	BS220B
D5				D5				Diode BS220	BS220B
D6				D6				Diode BS220	BS220B
D7				D7				Bridge Rectifier	DM1742C
IC1				IC1				LM301A	LM301A
L1	6.9µH	± 20%	Inductor ANCO TC196	L1				Inductor ANCO TC196	LI2406A
L2	3µH	± 5%	Inductor ANCO 440D	L2				Inductor ANCO 440D	LI2405A
L3	6.9µH	± 20%	Inductor ANCO TC196	L3				Inductor ANCO TC196	LI2406A
FS1	4A			FS1					UM1040A
FS2	4A			FS2					UM1040A
FS3	72.5A			FS3				220-240V	UM1245DA
TF1				TF1				110-130V	UM105ADA
LP1				LP1				Hewlett Packard 5062-4850 Red	BL5063R
TF1				TF1				Acoustical DRG A31/238Z	L12362A

BOARD NUMBER M12368 ISS 9 AND 10

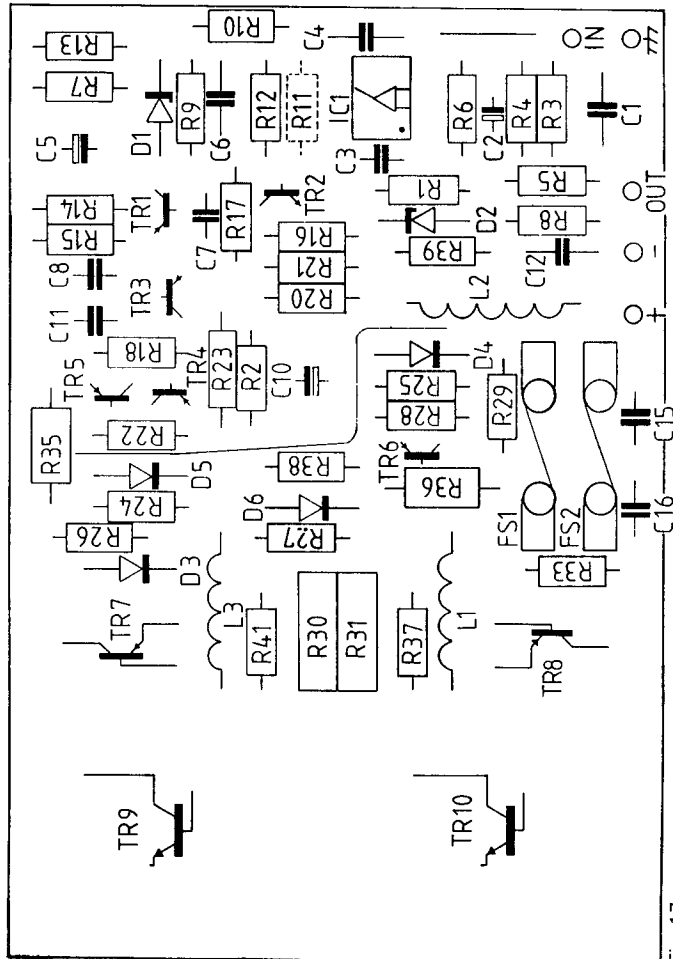


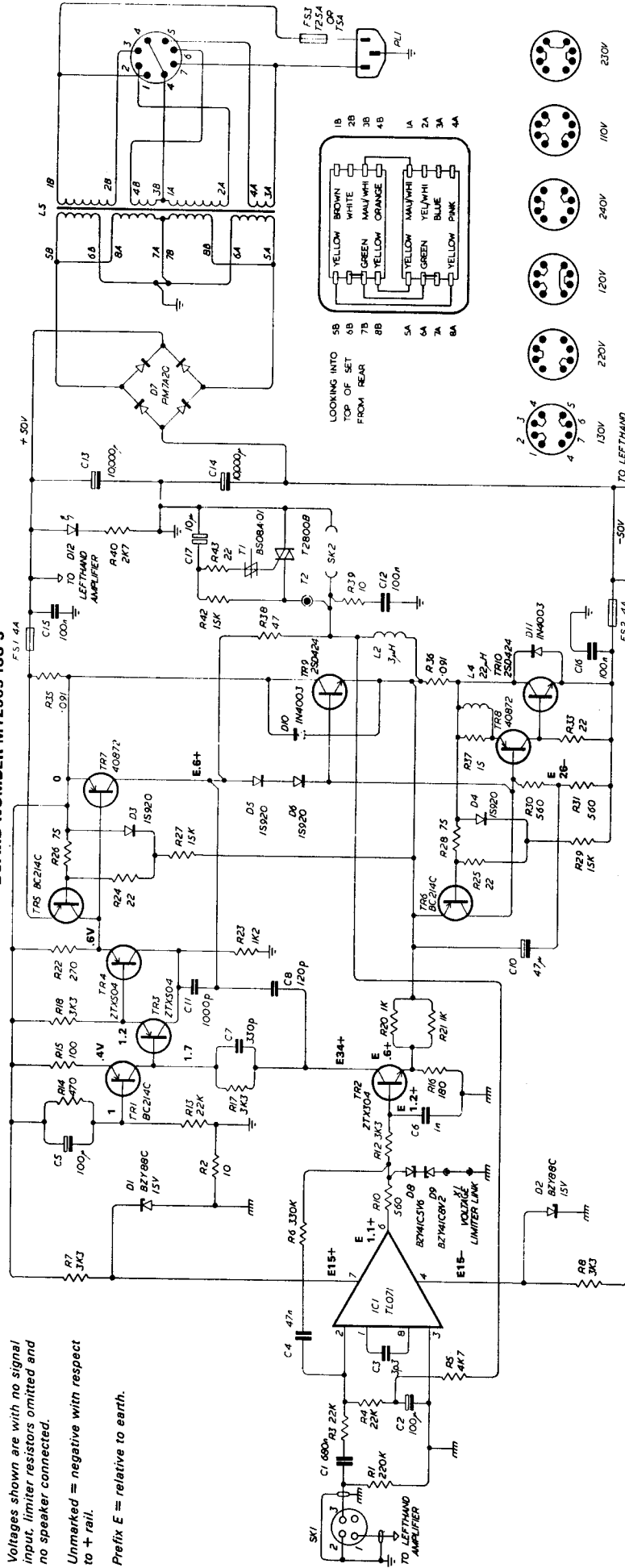
Fig. 17

BOARD NUMBER M12565 ISS 3

Voltages shown are with no signal input, limiter resistors omitted and no speaker connected.

Unmarked = negative with respect to + rail.

Prefix E = relative to earth.



No.	Value	Tol	Reference	Stock No.
R1	220K		Resistor	R220KJ1
R2	10		Resistor	R10R0J1
R3	22K	± 2%	Resistor	R22KOG1
R4	22K	± 2%	Resistor	R22KOG1
R5	4K7		Resistor	R4K70J1
R6	330K	± 2%	Resistor	R330KG1
R7	3K3		Resistor	R3K30J1
R8	3K3		Resistor	R3K30J1
R10	560		Resistor	R560RJ1
R12	3K3		Resistor	R3K30J1
R13	22K	± 2%	Resistor	R22KOG1
R14	470		Resistor	R470RJ1
R15	100		Resistor	R100RJ1
R16	180	± 2%	Resistor	R180RJ1
R17	3K3		Resistor	R3K30J1
R18	3K3		Resistor	R3K30J1
R20	1K	± 2%	Resistor	R1K00G1
R21	1K	± 2%	Resistor	R1K00G1
R22	270		Resistor	R270RJ1
R23	1K2		Resistor	R1K20RJ1
R24	22		Resistor	R22RJ1
R25	22		Resistor	R22RJ1
R28	75		Resistor	R75RJ1
R27	15K		Resistor	R15K0J1
R28	75		Resistor	R75RJ1
R29	15K		Resistor	R15K0J1
R30	560		Resistor	R560RJ1
R31	560		Resistor	R560RJ1
R33	22		Resistor	R22RJ1
R35	.091		Resistor	R9091JY
R36	.091		Resistor	R9091JY
R37	15		Resistor	R15RJ1
R38	47		Resistor	R47RJ1
R39	10		Resistor	R10RJ1
R40	2K7		Resistor	R2K70RJ1
R42	15K		Resistor	R15K0J1
R43	22		Resistor	R22RJ1
C1	800n		Capacitor	C800NS
C2	100µ		Capacitor	C100UJ
C3	3p3		Capacitor	C3P30C1
C4	47n		Capacitor	C47NS
C5	100µ		Capacitor	C100UJ
C6	1n		Capacitor	C1N00K
C7	330p		Capacitor	C330PJ1
C8	100p		Capacitor	C100PJ1
C9	100p		Capacitor	C100PJ1
C10	47p		Capacitor	C47PJ1
C11	1000p		Capacitor	C1000PJ1
C12	100n		Capacitor	C100NJ1
C13	1000µ		Capacitor	C1000UJ
C14	1000µ		Capacitor	C1000UJ
C15	100n		Capacitor	C100NJ1
C16	100n		Capacitor	C100NJ1
C17	10p		Capacitor	C10PJ1
TR1			Transistor BC 214C	TR1BC214C
TR2			Transistor 2N3044	TR22N3044
TR3			Transistor 2N3044	TR32N3044
TR4			Transistor 2N3044	TR42N3044
TR5			Transistor BC214C	TR5BC214C
TR6			Transistor BC214C	TR6BC214C
TR7			Transistor 40872	TR740872
TR8			Transistor 40872	TR840872
TR9			Transistor 7556 or 2SD424	TR97556
TR10			Transistor 7556 or 2SD424	TR107556
T1			DIAC 8508A-01 or 2M4892	T18508A
T2			TRIAC T2800B	T2T2800B
D1			Zener Diode BZ78BC 15V	D1Z78BC
D2			Zener Diode BZ78BC 15V	D2Z78BC
D3			Diode 1S920TB	D31S920TB
D4			Diode 1S920TB	D41S920TB
D5			Diode 1S920TB	D51S920TB
D6			Diode 1S920TB	D61S920TB
D7			Bridge Rectifier PM7A2Q	D7PM7A2Q
D8			Zener Diode BZV41CBV2	D8BZV41CBV2
D9			Zener Diode BZV41CBV6	D9BZV41CBV6
D10			Diode 1N4003	D101N4003
D11			Diode 1N4003	D111N4003
D12			LED XC5053R	D12XC5053R
IC1			Int. Circuit TL071, MESS34, LM85, LM301	IC1TL071
L2	3µH	± 5%	Choke	L23µH
L4	22µH		Choke	L422µH
L5			Transformer	L5TRANSFORMER
F1	4A		Fuse	F14A
F2	4A		Fuse	F24A
F3	T2A5		Fuse 220-240V	F3T2A5
X1			Fuse 110-130V	X1FUSE
X1			Link	X1LINK

Stock numbers listed for replacement parts, may be equivalents for original parts which are no longer available. therefore manufacturers and tolerances may vary.

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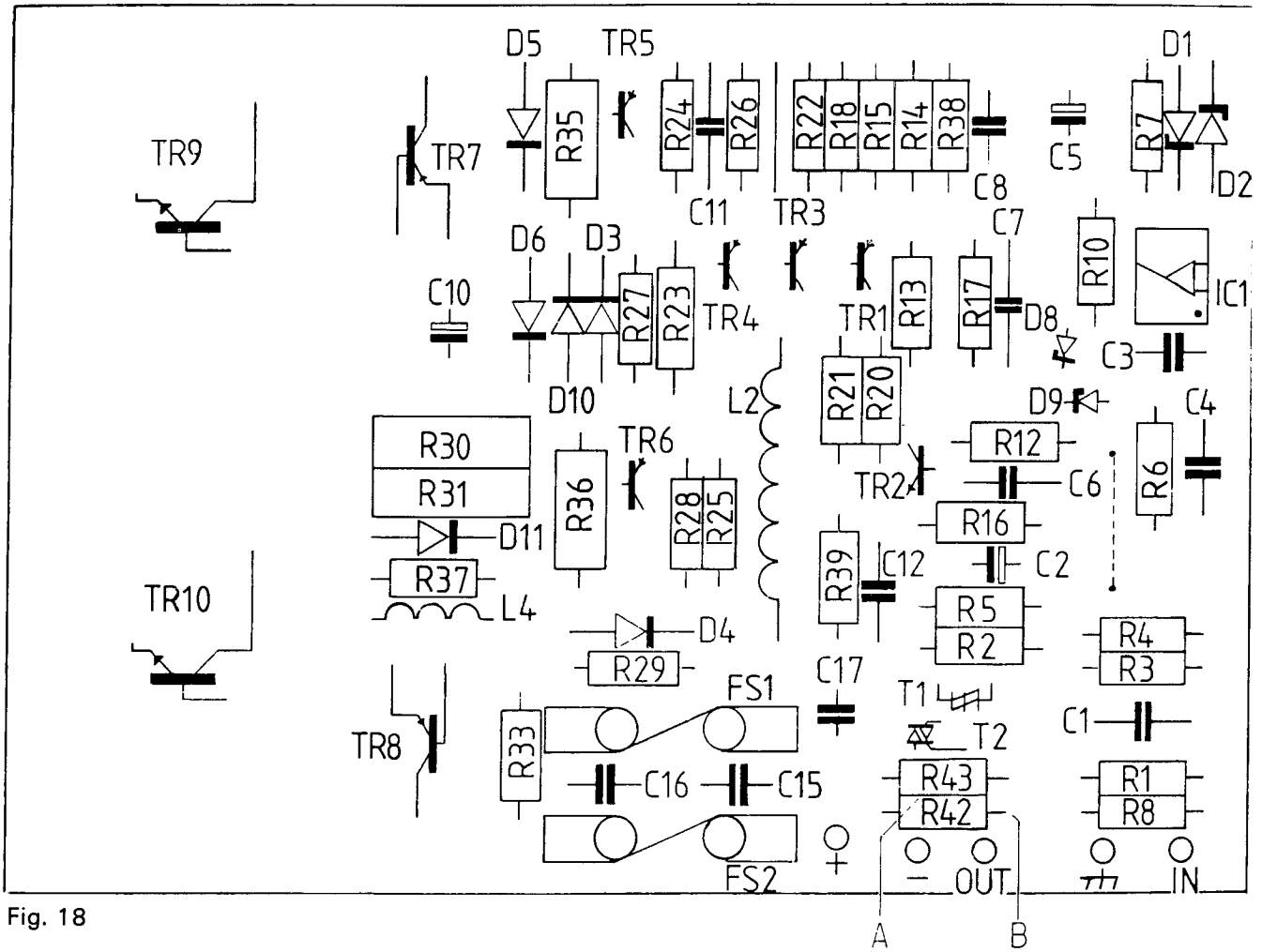
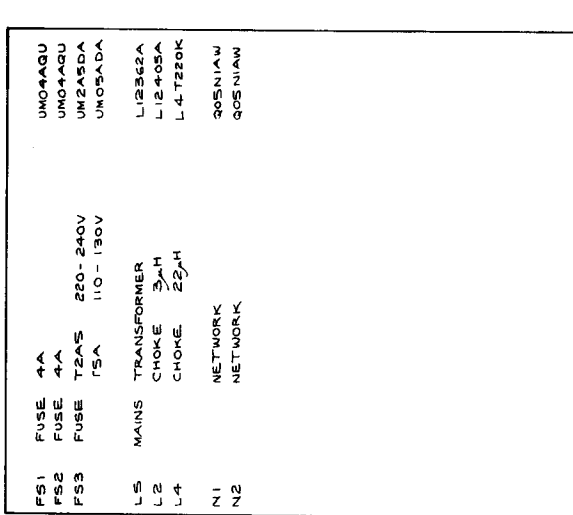
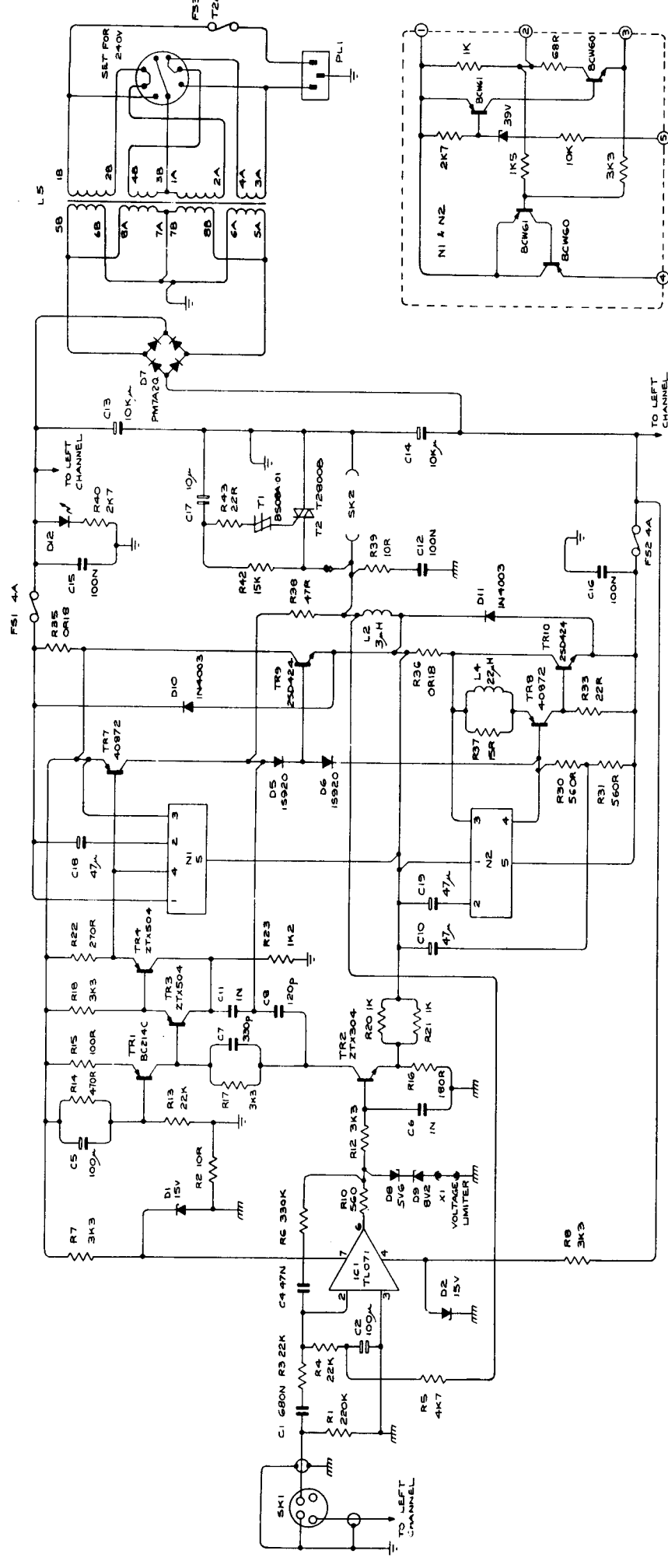


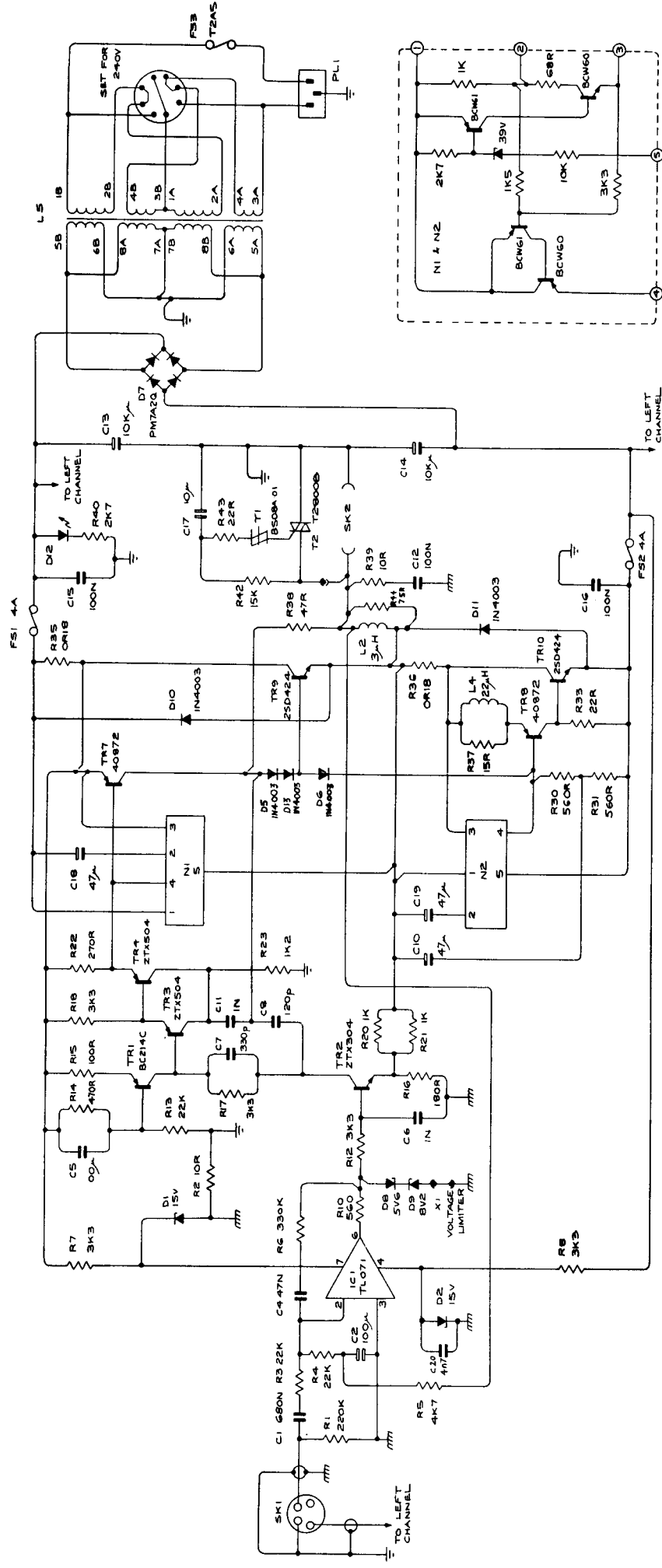
Fig. 18



FS1	FUSE	4A	UM04AQU
FS2	FUSE	4A	UM04AQU
FS3	FUSE	250-240V	UM2A50A
L5	MAINS TRANSFORMER	110-130V	UM05ADA
L2	CHOKE	3mH	L12362A
L4	CHOKE	22mH	L12405A
N1	NETWORK		L4T220K
N2	NETWORK		Q05N1AW
			Q05N1AW

TR1	TRANSISTOR	BC214C
TR2	TRANSISTOR	ZTX304
TR3	TRANSISTOR	ZTX504
TR4	TRANSISTOR	ZTX504
TR7	TRANSISTOR	40872
TR8	TRANSISTOR	40872
TR9	TRANSISTOR	2SD424
T1	DIAC	B50BA-01
T2	TRIAC	T2800B
D1	ZENER DIODE	BZY88C 15V
D2	ZENER DIODE	BZY88C 15V
D5	DIODE	1S920
D6	DIODE	1S920
D7	BRIDGE RECTIFIER	PM7A2G
D8	ZENER DIODE	BZY41C 5V6
D9	ZENER DIODE	BZY41C 8V2
D10	DIODE	1N4003
D11	DIODE	1N4003
D12	LED	XC5053R
X1	SHORTING LINK	
IC1	INT. CIRCUIT	TL071

R1	RESISTOR	220K	±5%
R2	RESISTOR	10K	±5%
R3	RESISTOR	22K	±2%
R4	RESISTOR	220K	±2%
R5	RESISTOR	4K7	±5%
R6	RESISTOR	330K	±2%
R7	RESISTOR	3K3	±5%
R8	RESISTOR	3K3	±5%
R9	RESISTOR	560R	±5%
R10	RESISTOR	3K3	±5%
R11	RESISTOR	22K	±2%
R12	RESISTOR	22K	±2%
R13	RESISTOR	470R	±5%
R14	RESISTOR	470R	±5%
R15	RESISTOR	100R	±5%
R16	RESISTOR	100R	±5%
R17	RESISTOR	3K3	±5%
R18	RESISTOR	3K3	±5%
R19	RESISTOR	1K	±2%
R20	RESISTOR	1K	±2%
R21	RESISTOR	270R	±5%
R22	RESISTOR	1K2	±5%
R23	RESISTOR	560R	±5%
R24	RESISTOR	560R	±5%
R25	RESISTOR	22R	±5%
R26	RESISTOR	OR18	±5%
R27	RESISTOR	OR18	±5%
R28	RESISTOR	15R	±5%
R29	RESISTOR	15R	±5%
R30	RESISTOR	15R	±5%
R31	RESISTOR	15R	±5%
R32	RESISTOR	15R	±5%
R33	RESISTOR	15R	±5%
R34	RESISTOR	15R	±5%
R35	RESISTOR	15R	±5%
R36	RESISTOR	15R	±5%
R37	RESISTOR	15R	±5%

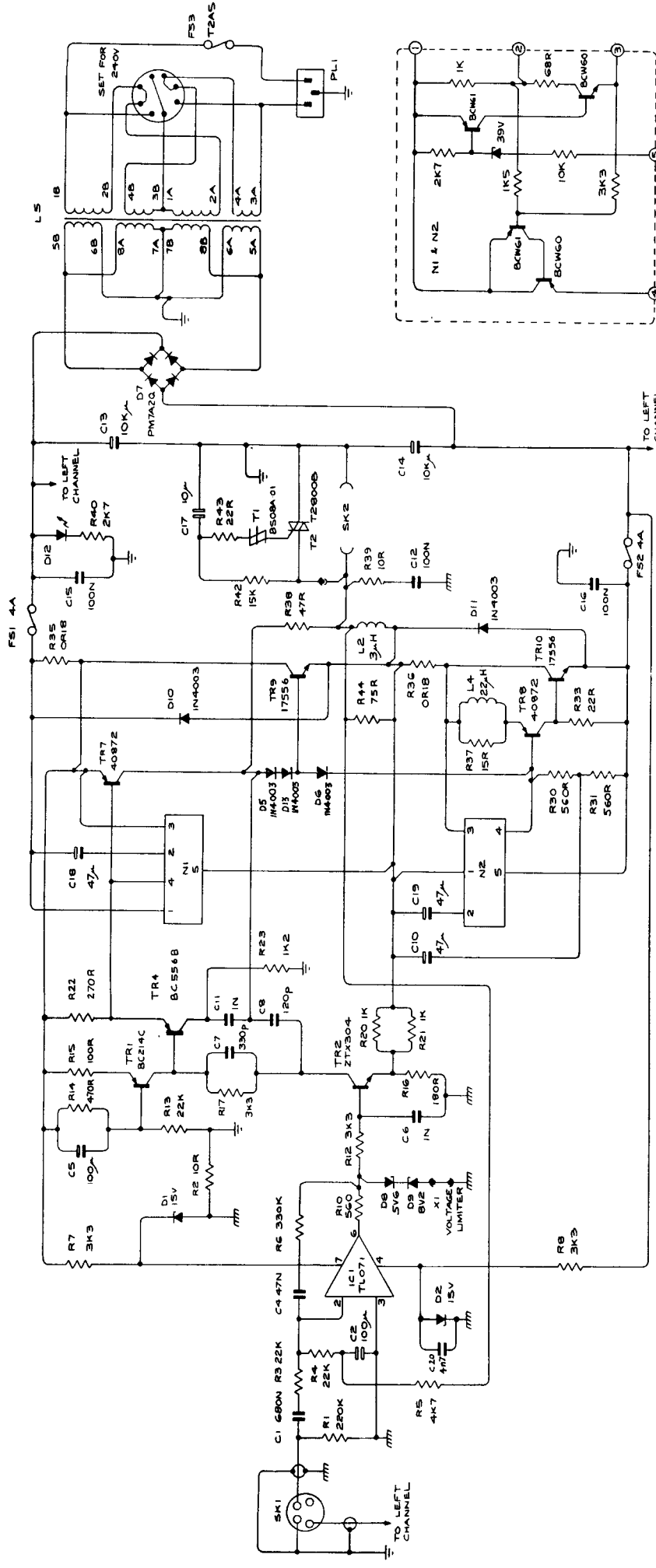


F51	FUSE	4A
F52	FUSE	4A
F53	FUSE	220-240V
L5	TRANSFORMER	110-130V
L2	CHOKER	2.5mH
L4	CHOKER	2.2mH
N1	NETWORK	
N2	NETWORK	

TR1	TRANSISTOR	BC214C
TR2	TRANSISTOR	ZTX304
TR3	TRANSISTOR	ZTX504
TR4	TRANSISTOR	ZTX504
TR7	TRANSISTOR	40B72
TR8	TRANSISTOR	40B72
TR9	TRANSISTOR	2SD424
TR10	TRANSISTOR	2SD424
T1	DIAC	B508A-01
T2	TRIAC	T2900B
D1	ZENER DIODE	BZY88C 15V
D2	ZENER DIODE	BZY88C 15V
D6	DIODE	IN4003
D7	BRIDGE RECTIFIER	PM7A2Q
D8	ZENER DIODE	BZY41C 5V6
D9	ZENER DIODE	BZY41C 5V2
D10	DIODE	IN4003
D11	DIODE	IN4003
D12	LED	XC5053R
D13	DIODE	IN4003
X1	SHORTING LINK	
IC1	INT. CIRCUIT	TL071

R36	RESISTOR	47R	±5%
R39	RESISTOR	10R	±5%
R40	RESISTOR	2K7	±5%
R42	RESISTOR	15K	±5%
R43	RESISTOR	22R	±5%
R44	RESISTOR	75R	±5%
C1	CAPACITOR	680N	
C2	CAPACITOR	100μ	
C4	CAPACITOR	47N	
C5	CAPACITOR	100μ	
C6	CAPACITOR	IN	
C7	CAPACITOR	330P	
C8	CAPACITOR	100P	
C10	CAPACITOR	47μ	
C11	CAPACITOR	IN	
C12	CAPACITOR	100N	
C14	CAPACITOR	10μ	
C15	CAPACITOR	100N	
C16	CAPACITOR	100N	
C17	CAPACITOR	10μ	
C18	CAPACITOR	47μ	
C19	CAPACITOR	47μ	
C20	CAPACITOR	47μ	

R1	RESISTOR	220K	±5%
R2	RESISTOR	10K	±5%
R3	RESISTOR	22K	±2%
R4	RESISTOR	22K	±2%
R5	RESISTOR	4K7	±5%
R6	RESISTOR	330K	±2%
R7	RESISTOR	3K3	±5%
R8	RESISTOR	560R	±5%
R9	RESISTOR	3K3	±5%
R10	RESISTOR	560R	±5%
R12	RESISTOR	3K3	±5%
R13	RESISTOR	22K	±2%
R14	RESISTOR	470R	±5%
R15	RESISTOR	100R	±5%
R16	RESISTOR	180R	±2%
R17	RESISTOR	3K3	±5%
R18	RESISTOR	3K3	±5%
R20	RESISTOR	1K	±2%
R21	RESISTOR	1K	±2%
R22	RESISTOR	270R	±5%
R23	RESISTOR	1K2	±5%
R30	RESISTOR	560R	±5%
R31	RESISTOR	560R	±5%
R33	RESISTOR	22R	±5%
R35	RESISTOR	0R18	±5%
R36	RESISTOR	0R18	±5%
R37	RESISTOR	15R	±5%
R20KJ1	RESISTOR		
R10K0J1	RESISTOR		
R22K0G1	RESISTOR		
R22K0G1	RESISTOR		
R4K70J1	RESISTOR		
R330KJ1	RESISTOR		
R3K30J1	RESISTOR		
R560R1	RESISTOR		
R3K30J1	RESISTOR		
R22K0G1	RESISTOR		
R470R1	RESISTOR		
R100R1	RESISTOR		
R180R1	RESISTOR		
R3K30J1	RESISTOR		
R3K30J1	RESISTOR		
R1K00G1	RESISTOR		
R1K00G1	RESISTOR		
R270R1	RESISTOR		
R1K20R1	RESISTOR		
R560R1	RESISTOR		
R560R1	RESISTOR		
R22R0J1	RESISTOR		
R0R18J1	RESISTOR		
R0R18J1	RESISTOR		
R15K0J1	RESISTOR		

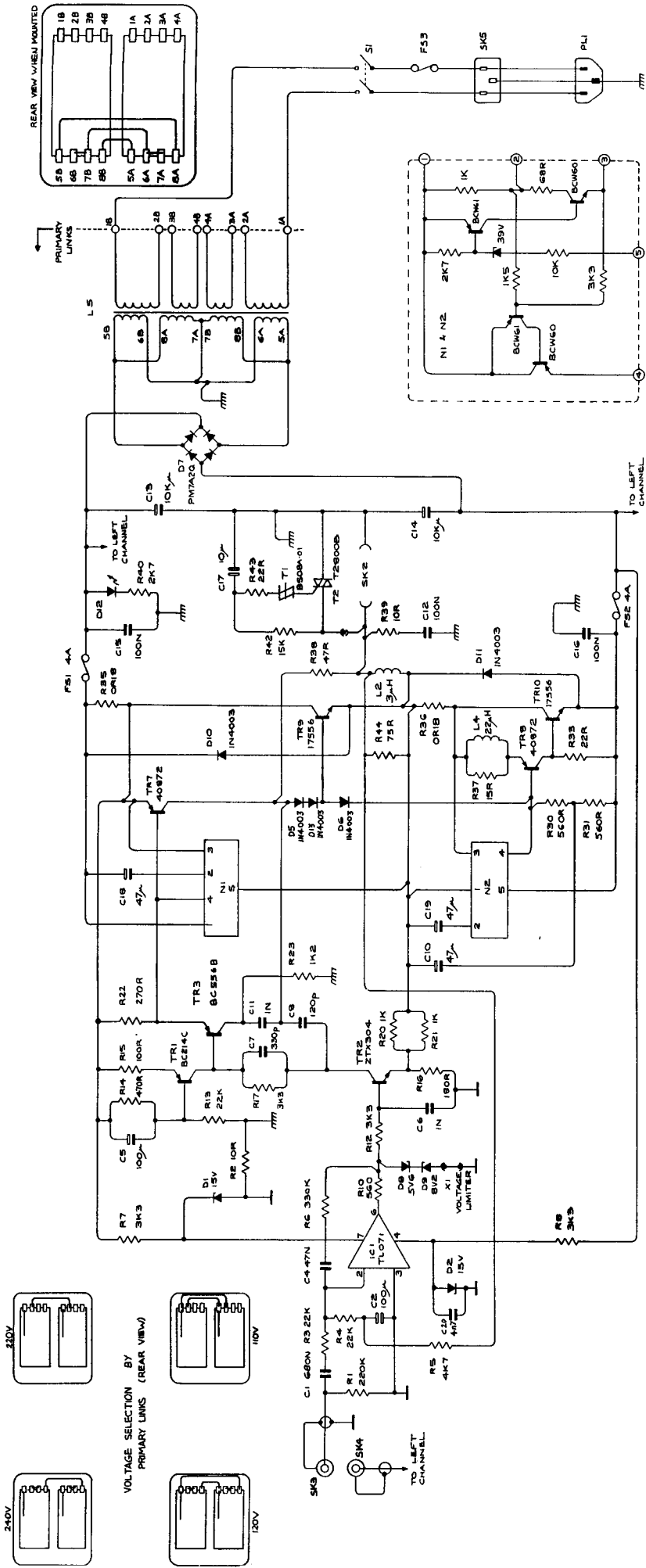


F51	FUSE	4A	UM04AQU
F52	FUSE	4A	UM04AQU
F53	FUSE	TEAS	UM2ASDA
L5	MAINS	TRANSFORMER	UM05ADA
L2	CHOKE	3H	L12362A
L4	CHOKE	22H	L12405A
N1	NETWORK		L4-T230K
N2	NETWORK		Q05NIAT
			Q05NIAT

TR1	TRANSISTOR	BC214C	DE2R14C
TR2	TRANSISTOR	ZTA304	DZTA304
TR4	TRANSISTOR	BC556B	DB556B
TR7	TRANSISTOR	40872	D40872X
TR8	TRANSISTOR	40872	D40872X
TR9	TRANSISTOR	17556	D17556X
TR10	TRANSISTOR	17556	D17556X
T1	DIAC	BS08A-01	DBS08A
T2	TRIAC	T2800B	DT2800B
D1	ZENER DIODE	BZY88C 15V	DBZ15VA
D2	ZENER DIODE	BZY88C 15V	DBZ15VA
D3	DIODE	IN4003	DI4003
D6	DIODE	IN4003	DI4003
D7	BRIDGE RECTIFIER	PM7A2G	DPM7A2G
D8	ZENER DIODE	BZY41C 5V6	DZ5V6AA
D9	ZENER DIODE	BZY41C 8V2	DZ8V2AA
D10	DIODE	IN4003	DI4003
D11	DIODE	IN4003	DI4003
D12	LED	X45053R	DL5053R
D13	DIODE	IN4003	DI4003
X1	SHORTING LINK		Q05LINK
IC1	INT. CIRCUIT	TL071	DOT7CPX

R38	RESISTOR	47R	# 5%	R470J4
R39	RESISTOR	10R	# 5%	R10R0J1
R40	RESISTOR	2K7	# 5%	R2K70J2
R42	RESISTOR	15K	# 5%	R15K0J4
R44	RESISTOR	75R	# 5%	R75R0J4
C1	CAPACITOR	680N		C680KA
C2	CAPACITOR	100µ		C100UJ
C4	CAPACITOR	47N		C47N0J5
C5	CAPACITOR	100µ		C100UJ
C6	CAPACITOR	IN		C100UJ
C7	CAPACITOR	330P		C330PJ3
C8	CAPACITOR	120P		C120PJ1
C10	CAPACITOR	47µ		C47U0ZB
C11	CAPACITOR	IN		C100UJ
C12	CAPACITOR	100N		C100N2S
C13	CAPACITOR	10µ		C10U0T8
C14	CAPACITOR	10µ		C10U0T8
C15	CAPACITOR	100N		C100N4S
C16	CAPACITOR	100N		C100N4S
C17	CAPACITOR	10µ		C10U0ZL
C18	CAPACITOR	47µ		C47U0ZE
C19	CAPACITOR	47µ		C47U0ZE
C10	CAPACITOR	47µ		C47U0ZT

R1	RESISTOR	220K	# 5%	R220KJ4
R2	RESISTOR	10R	# 5%	R10R0J1
R3	RESISTOR	22K	# 2%	R22K061
R4	RESISTOR	22K	# 2%	R22K061
R5	RESISTOR	4K7	# 5%	R4K70J4
R6	RESISTOR	330K	# 2%	R330K0J1
R7	RESISTOR	3K3	# 5%	R3K30J1
R8	RESISTOR	3K3	# 5%	R3K30J1
R10	RESISTOR	560R	# 5%	R560R0J4
R12	RESISTOR	3K3	# 5%	R3K30J1
R13	RESISTOR	22K	# 2%	R22K061
R14	RESISTOR	470R	# 5%	R470R0J4
R15	RESISTOR	100R	# 5%	R100R0J4
R16	RESISTOR	180R	# 2%	R180R0J1
R17	RESISTOR	3K3	# 5%	R3K30J1
R20	RESISTOR	1K	# 2%	R1K0061
R21	RESISTOR	1K	# 2%	R1K0061
R22	RESISTOR	270R	# 5%	R270R0J4
R23	RESISTOR	1K2	# 5%	R1K20J2
R30	RESISTOR	560R	# 5%	R560R0J4
R31	RESISTOR	560R	# 5%	R560R0J4
R33	RESISTOR	22R	# 5%	R22R0J4
R35	RESISTOR	OR18	# 5%	ROR18J3
R36	RESISTOR	OR18	# 5%	ROR18J3
R37	RESISTOR	15R	# 5%	R15R0J4



F51	FUSE 4A	UM04AGU
F52	FUSE 4A	UM04AGU
F53	FUSE T2A5	UM2ASDA
L5	MAINS TRANSFORMER	UM05ADA
L2	CHOKES 5A-H	L12362A
L4	CHOKES 22A-H	L12405A
N1	NETWORK	L14720K
N2	NETWORK	Q05NIAT
PL1	AC POWER IN/FUSEHOLDER	Q05NIAT
S1	SWITCH	PRF12AA
SK2	OUTPUT SOCKETS	S405OFF
SK3	INPUT RIGHT	PSR5JAC
SK4	INPUT LEFT	PSR5JAC
SK5	AC POWER OUTLET	PSPH0N2
		PSP6925

TR1	TRANSISTOR BC14C	DBC214C
TR2	TRANSISTOR 2TX304	D2TX304
TR3	TRANSISTOR BC158B	DBC558B
TR7	TRANSISTOR 40B72	D40B72X
TR8	TRANSISTOR 40B72	D40B72X
TR9	TRANSISTOR 17556	D17556X
TR10	TRANSISTOR 17556	D17556X
T1	DIAC B508A-01	DB508AA
T2	TRIAC T2800B	DT2800B
D1	ZENER DIODE BZ78C 15V	DB819VA
D2	ZENER DIODE BZ78C 15V	DB819VA
D3	DIODE IN4003	DM4003
D4	DIODE IN4003	DM4003
D7	BRIDGE RECTIFIER PM7A-2Q	DM7A2AQ
D8	ZENER DIODE BZY41C5V6	DZ5V6AA
D9	ZENER DIODE BZY41C5V2	DZ5V2AA
D10	DIODE IN4003	DIN4003
D11	DIODE IN4003	DIN4003
D12	LED XCB053R	BL5053R
D13	DIODE IN4003	DM4003
X1	SHORTING LINK	Q05LINK
IC1	INT. CIRCUIT	TL071
		D071CPX

R38	RESISTOR 47R ±5%	R47R034
R39	RESISTOR 10R ±5%	R10R031
R40	RESISTOR 2K7 ±5%	R2K7037R
R42	RESISTOR 15K ±5%	R15K034
R43	RESISTOR 22R ±5%	R22R037
R44	RESISTOR 75R ±5%	R75R037
C1	CAPACITOR 680N	C680NKA
C2	CAPACITOR 100µ	C100µJJ
C4	CAPACITOR 47N	C47N003
C5	CAPACITOR 100µ	C100µJH
C6	CAPACITOR IN	CIN000J
C7	CAPACITOR 330P	C330PJ3
C8	CAPACITOR 120P	C120PJ1
C10	CAPACITOR 47µ	C47µ028
C11	CAPACITOR 47µ	C47µ028
C12	CAPACITOR 100N	C100N25
C13	CAPACITOR 10µ	C10µ014
C14	CAPACITOR 10µ	C10µ014
C15	CAPACITOR 100N	C100N25
C16	CAPACITOR 10µ	C10µ014
C17	CAPACITOR 10µ	C10µ014
C18	CAPACITOR 47µ	C47µ028
C19	CAPACITOR 47µ	C47µ028
C20	CAPACITOR 47µ	C47µ028

R1	RESISTOR 220K ±5%	R220KJ4
R2	RESISTOR 10K ±5%	R10K031
R3	RESISTOR 22K ±2%	R22K061
R4	RESISTOR 22K ±2%	R22K061
R5	RESISTOR 4K7 ±5%	R4K7034
R6	RESISTOR 330K ±2%	R330K01
R7	RESISTOR 3K3 ±5%	R3K3031
R8	RESISTOR 3K3 ±5%	R3K3031
R9	RESISTOR 560R ±5%	R560R34
R12	RESISTOR 3K3 ±5%	R3K3031
R13	RESISTOR 22K ±5%	R22K061
R14	RESISTOR 470R ±5%	R470R34
R15	RESISTOR 100R ±5%	R100R34
R16	RESISTOR 180R ±2%	R180R01
R17	RESISTOR 3K3 ±5%	R3K3031
R20	RESISTOR 1K ±2%	R1K0061
R21	RESISTOR 1K ±2%	R1K0061
R22	RESISTOR 270R ±5%	R270R34
R23	RESISTOR 1K2 ±5%	R1K2037
R30	RESISTOR 560R ±5%	R560R34
R31	RESISTOR 560R ±5%	R560R34
R32	RESISTOR 22R ±5%	R22R034
R33	RESISTOR 22R ±5%	R22R034
R34	RESISTOR 22R ±5%	R22R034
R35	RESISTOR 22R ±5%	R22R034
R36	RESISTOR 22R ±5%	R22R034
R37	RESISTOR 15R ±5%	R15R034