

**QUAD 405 I and II
Power Amplifier
Service Data**

**Extended version
DaDa Electronics
December 2010**

Contents	<i>page</i>
Circuit Description	3
Test Equipment	4
Disconnecting Clamp Circuits	4
Amplifier Circuit Testing	5
Clamp Circuit Testing	5
Fault Finding	6
Modifications	8
Clamp Circuit	9
Replacing a Clamp Board	9
Conversion of a 405 to a Mono 180 watt amplifier	10
Replacing Transformer	11
Replacing Amplifier Modules	11
QUAD 405 2	12
Assembly Diagram	13
Circuit Diagram 2 amplifier boards M12368 ISS 5 and 6	14
Circuit Diagram 3 amplifier board M12368 ISS 7	15
Circuit Diagram 4 amplifier board M12368 ISS 9	16
Circuit Diagram 5 amplifier board M12368 ISS 9 and 10	17
Amplifier Board Layout Diagram M12368 ISS 9 and 10	18
Circuit Diagram 6 amplifier board M12565 ISS 3	19
Amplifier Board Layout Diagram M12565 ISS 3	20
Circuit Diagram 7 amplifier board M12565 ISS 5	21
Circuit Diagram 8 amplifier board M12565 ISS 6	22
Circuit Diagram 9 amplifier board M12565 ISS 7	23
Circuit Diagram 10 amplifier board M12565 ISS 7	24
Monoblocking 405 1	25
Monoblocking 405 2	27
Selecting mains voltage by transformer links	29

CIRCUIT DESCRIPTION

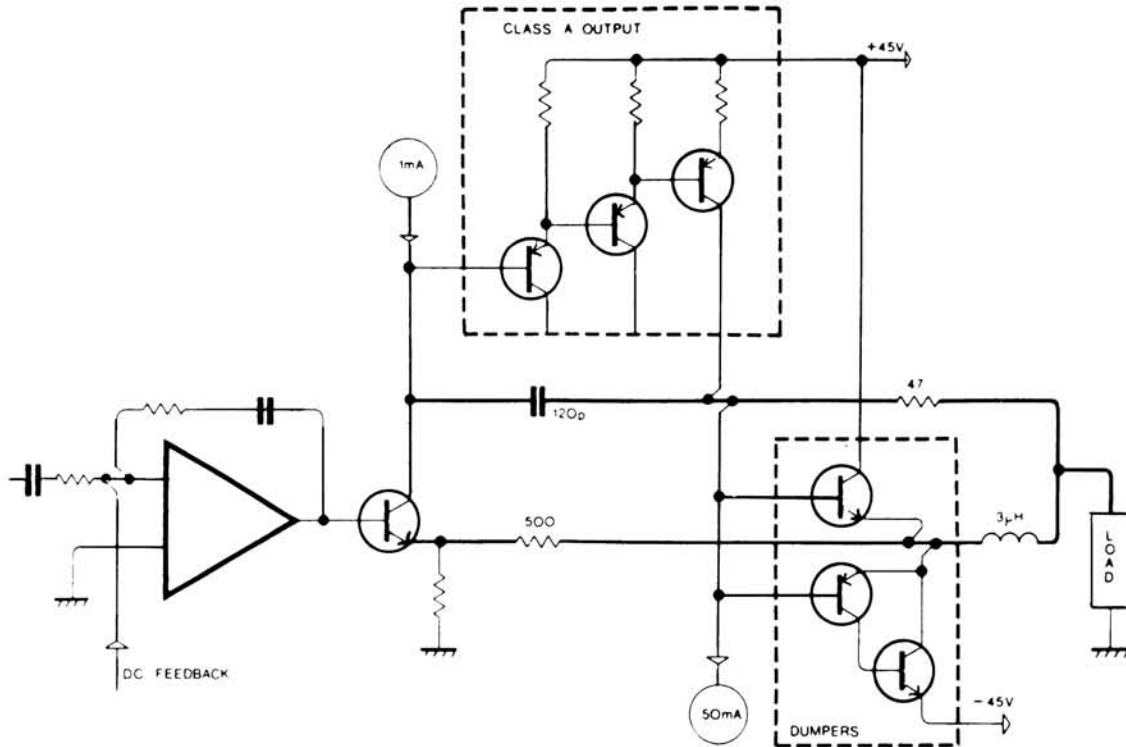
The Quad 405 is a two channel power amplifier primarily intended for use in high quality sound reproducing systems. The amplifier is usually used with Quad control units though other signal sources can readily be accommodated.

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.

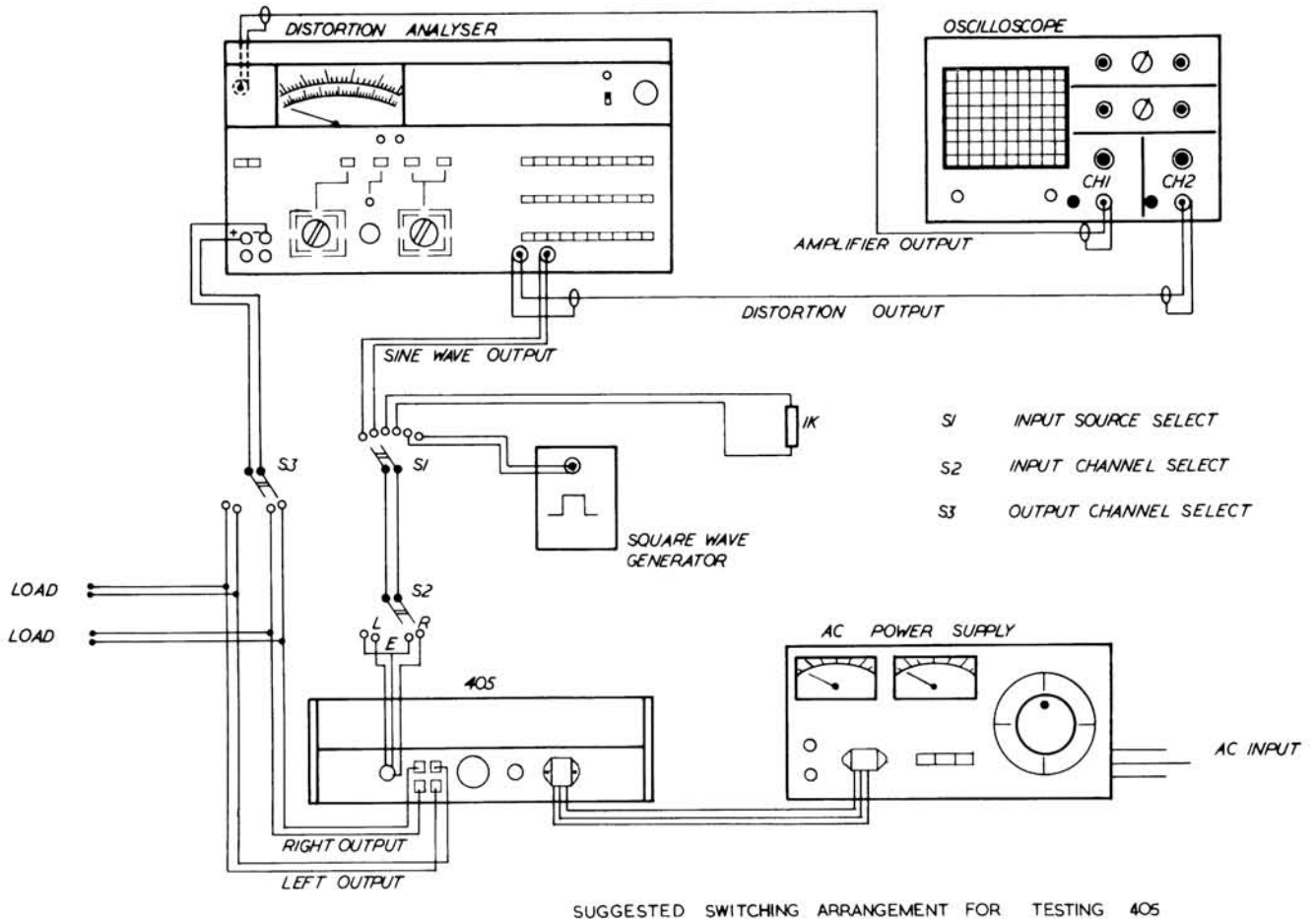


Fig. 2

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 M12368, 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 M12565, 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 8Ω**
 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 0.1 ms/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, TR2, 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

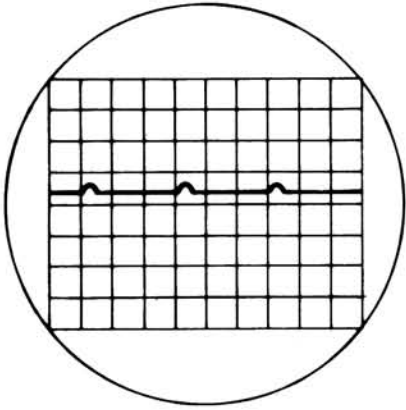


Fig. 3

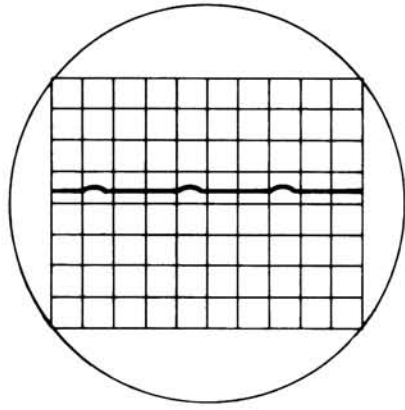


Fig. 4

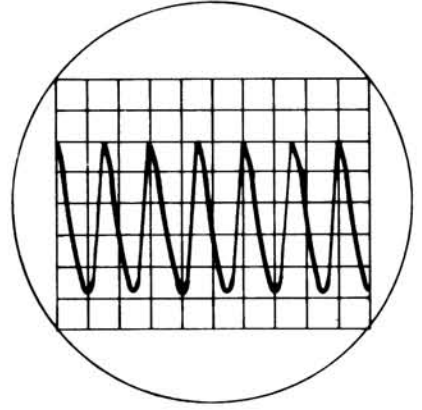


Fig. 5

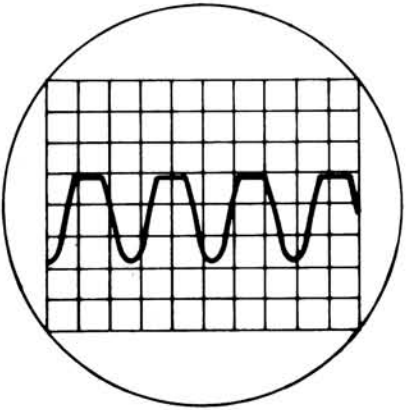


Fig. 6

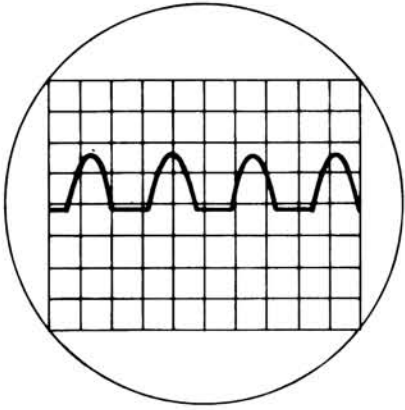


Fig. 7

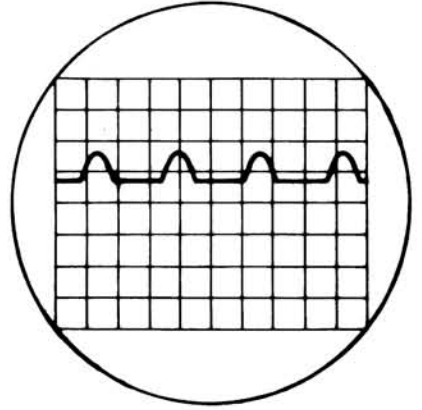


Fig. 8

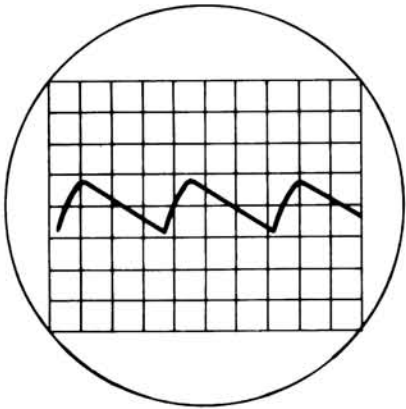


Fig. 9

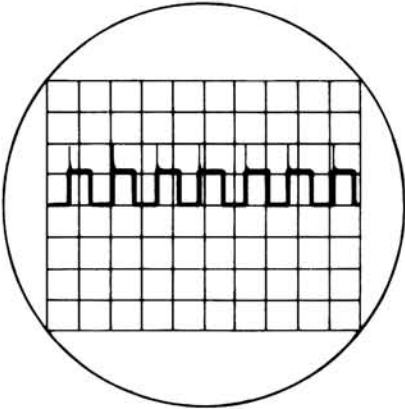


Fig. 10

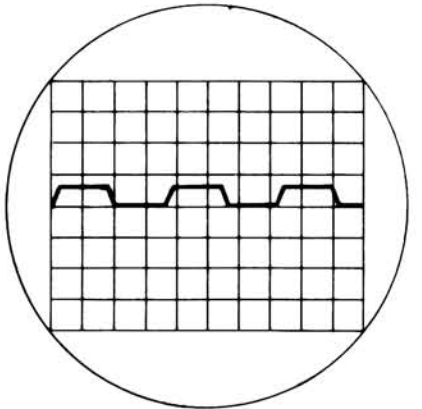


Fig. 11

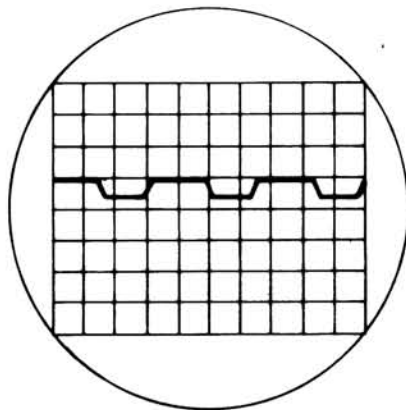


Fig. 12

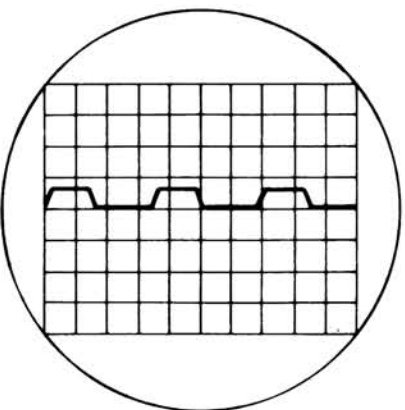


Fig. 13

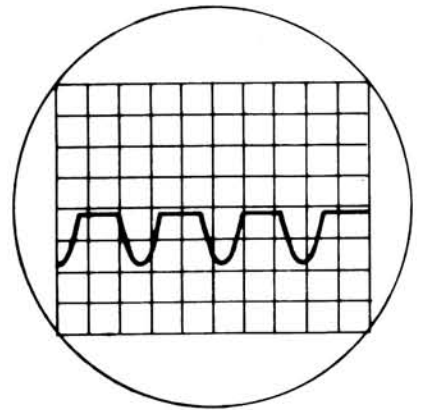


Fig. 14

MODIFICATIONS TO PRINTED CIRCUIT BOARDS.

1. **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 180 Ω to 220 Ω
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 2.2 Ω to 10 Ω
Copper track width reduced.
- 3.(a) **Amplifier Board M12368.9** introduced at Serial Number 9000. Circuit diagram issue 4.
R41 22 Ω added
L3 6.9 μ H added
C15 0.1 μ H added
C16 0.1 μ H 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 0.08 Ω to 0.091 Ω
R36 changed from 0.08 Ω to 0.091 Ω
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 or BD242C

L.E.D.

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

TR9, TR10 - MJ15003

T1 - BSD08D

T2 - BTA12600SW

Bridge rectifier - KBPC3504

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:

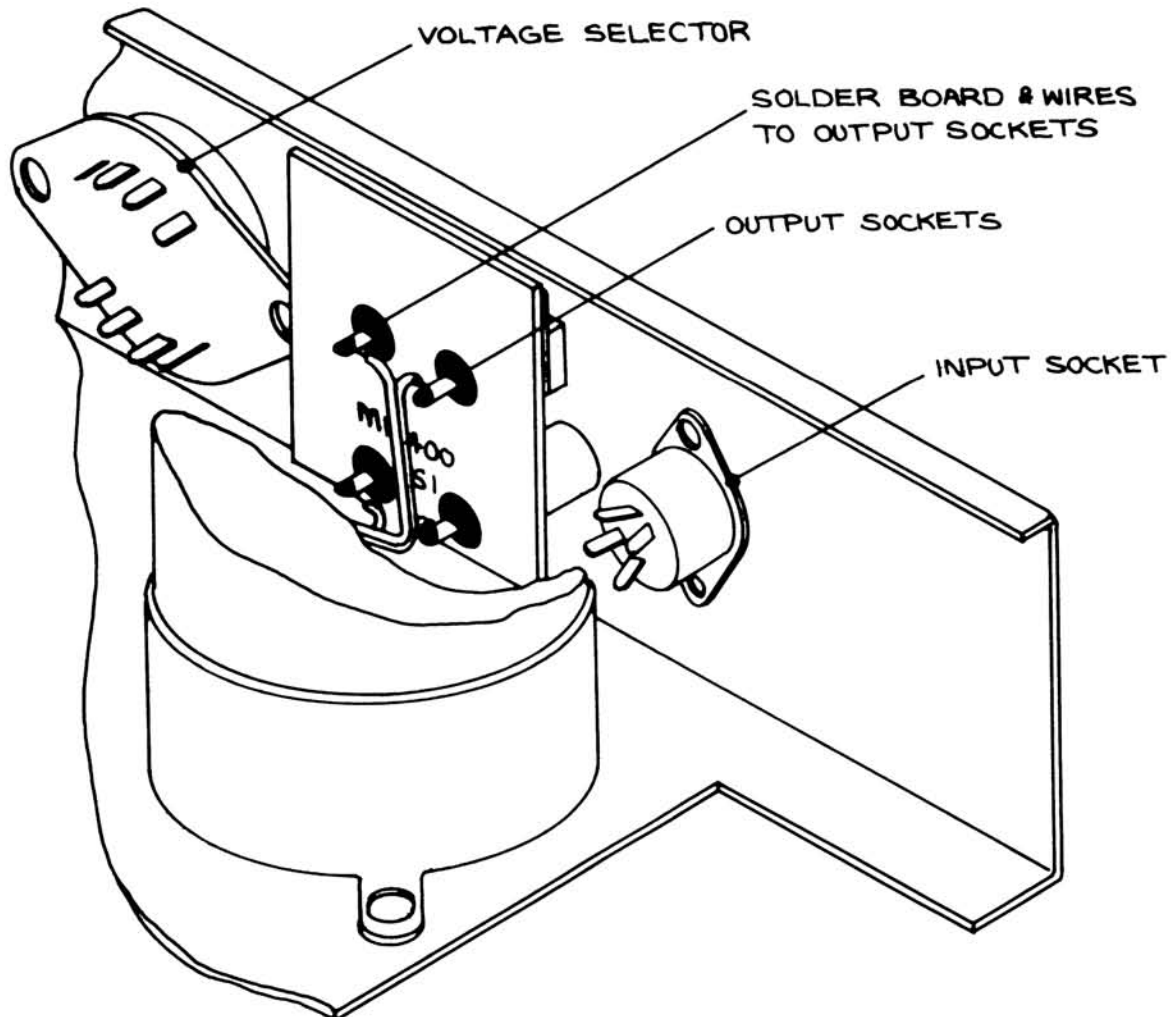


Fig. 15

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 1kHz 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.

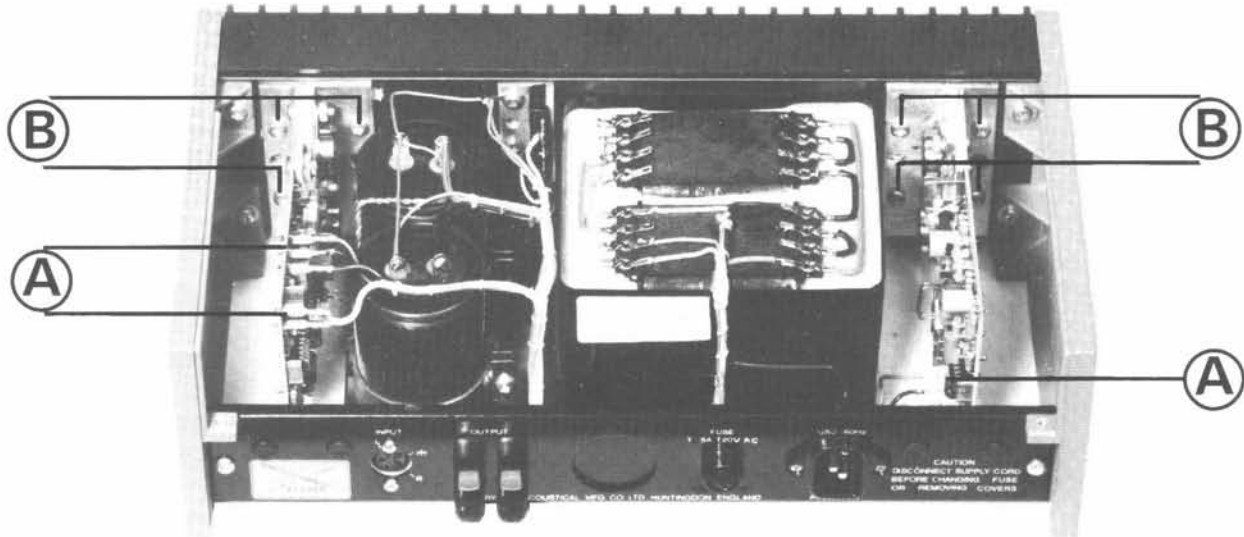


Fig. 16

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 were 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.

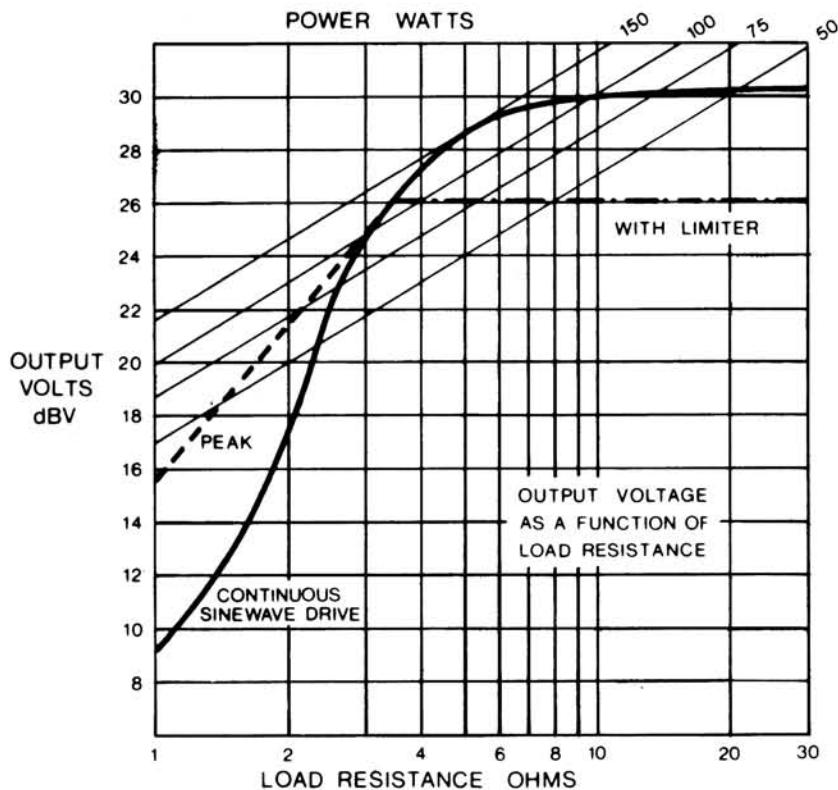


Fig. 17.

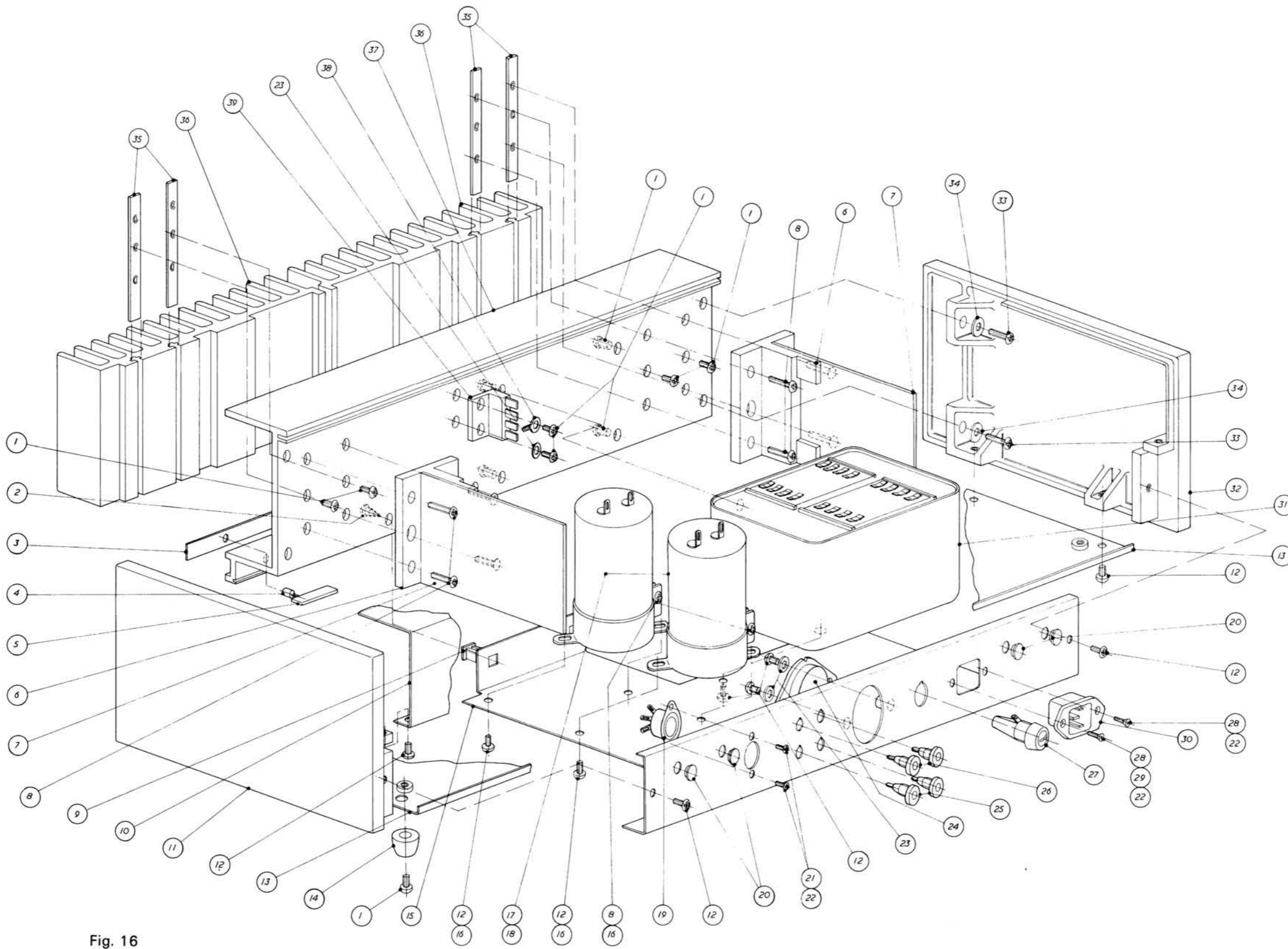


Fig. 16

Assembly Diagram.

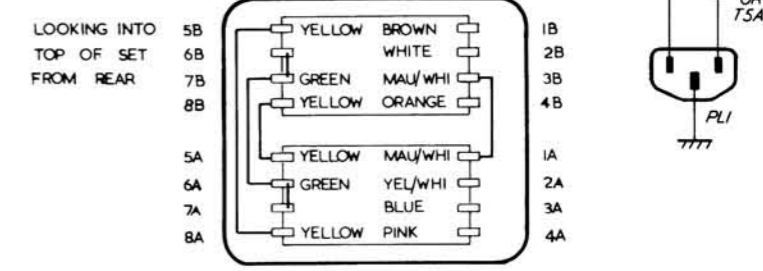
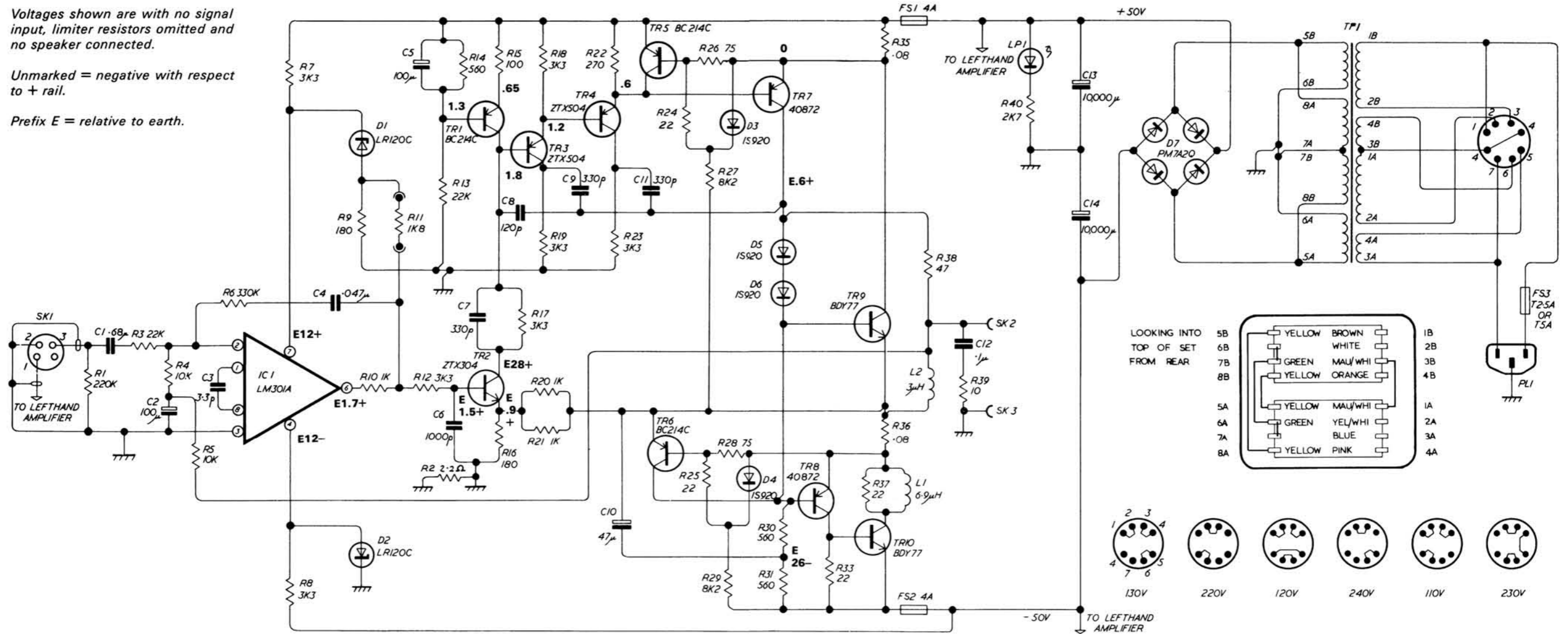
No	DRAWING No	DESCRIPTION	STOCK No.
1		SCREW M4 x 6 mm POSIDRIV	
2		SCREW No 6 x 375 POSIDRIV	
3	A3/12366	NAMEPLATE	
4		L.E.D HEWLETT PACKARD	
5	A4/12377	PRINTED WIRING BOARD	
6	A3/12348	AMPLIFIER MOUNTING BRACKET #	
7	M12368	PRINTED WIRING BOARD #	
8		SCREW M4 x 14mm POSIDRIV	
9		LOKUT NUT ITW 212-160402-07	
10	A2/12357	COVER	
11	A1/12353	RIGHTHAND END COVER	
12		SCREW M4 x 6mm POSIDRIV	
13	A2/12358	BASE PLATE	
14		FOOT COW B8/508	
15	A1/12355	CHASSIS	
16		NUT M4 FULL HEX	
17		CAPACITOR 1000µ 63V ERIE	
18		CAPACITOR CLIP ERIE V4	
19		INPUT SOCKET	671/F
20		SOLID GROMMET HV3758 1/4 RM	
21		SCREW M3 x 6mm POSIDRIV	
22		NUT M3 FULL HEX	
23		WASHER M4	
24		VOLTAGE SELECTOR 71-007	
25		OUTPUT SOCKET B&L L4145 BLACK	671/0
26		OUTPUT SOCKET B&L L4145 RED	671/0
27		FUSEHOLDER BULGIN F296/5	
28		SCREW M3 x 6mm INSHD POSIDRIV	
29		SOLDER TRG M3 TUCKER T558	
30		MAINS PLUG OTTO HEIL 6062-2	
31	A3/12362	MAINS TRANSFORMER	
32	A1/12352	LEFTHAND END COVER	
33		SCREW M4 x 12mm POSIDRIV	
34		WASHER M4 12mm O/D	
35	A4/12356	HEATSINK FIXING STRIP	
36	A3/12351	HEATSINK	
37	A2/12354	FRONT PANEL	
38		SOLDER TRG M4 TUCKER 5262	
39		RECTIFIER AEL PM7A2Q	
#		SUB-ASSEMBLY TO DRS A3/12378	

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.
R1	220K	± 10%	Resistor	R220KJ1
R2	2.2	± 5%	Resistor	R2R20DS
R3	22K	± 5%	Resistor	R22K0J1
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

No.	Value	Tol	Reference	Stock No.
R27	8K2	± 5%	Resistor	R8K2RJ1
R28	75	± 5%	Resistor	R75R0J1
R29	8K2	± 5%	Resistor	R8K20J1
R30	560	± 10%	Resistor 2.5W	R560RJS
R31	560	± 10%	Resistor 2.5W	R560RJS
R33	22	± 10%	Resistor	R22R0J1
R35	0.08		Resistor Acoustical DRG A4/12383	RR091JY
R36	0.08		Resistor Acoustical DRG A4/12383	RR091JY
R37	22	± 10%	Resistor	R22R0J1
R38	47	± 5%	Resistor	R47R0J1
R39	10	± 10%	Resistor	R10R0J1
R40	2K7		Resistor 1.6W	R2K70JR
C1	0.68μ		Capacitor 100V	C680NKS
C2	100μ	± 10%	Capacitor 3V	C100UME
C3	3.3P	± 20%	Capacitor	C3P30KJ
C4	0.047μ		Capacitor 250V	C47N0JS
C5	100μ		Capacitor 6V	C100UZB
C6	1000P		Capacitor 400V	C1N00KK
C7	330P	± 20%	Capacitor	C330PKJ
C8	120P	± 5%	Capacitor	C120PJI
C9	330P	± 20%	Capacitor	C330PKJ
C10	47μ		Capacitor 40V	C47U0ZB
C11	330P		Capacitor	C330PKJ

No.	Value	Tol	Reference	Stock No.
C12	0.1μ		Capacitor 250V	C100NKC
C13	10,000μ		Capacitor 63V	C10KUTA
C14	10,000μ		Capacitor 63V	C10KUTA
TR1			Transistor BC214C	DBC214C
TR2			Transistor BC682 or ZTX304 or BCX32	DZTX304
TR3			Transistor E5458 or ZTX504	DZTX504
TR4			Transistor E5458 or ZTX504	DZTX504
TR5			Transistor BC214C	DBC214C
TR6			Transistor BC214C	DBC214C
TR7			Transistor 40872 or 2SA740	D40872X
TR8			Transistor 40872 or 2SA740	D40872X
TR9			Transistor BDY74 or BDY77	DBDY77Q
TR10			Transistor BDY74 or BDY77	DBDY77Q
D1			Zener Diode LR120C	DZ12VAA
D2			Zener Diode LR120C	DZ12VAA
D3			Diode IS920	DIS920B
D4			Diode IS920	DIS920B
D5			Diode IS920	DIS920B
D6			Diode IS920	DIS920B
D7			Bridge Rectifier	DPM7AZQ
IC1			LM301A	DML301A
L1	6.9μH	± 20%	Inductor ANCO TC1/65	L12406A

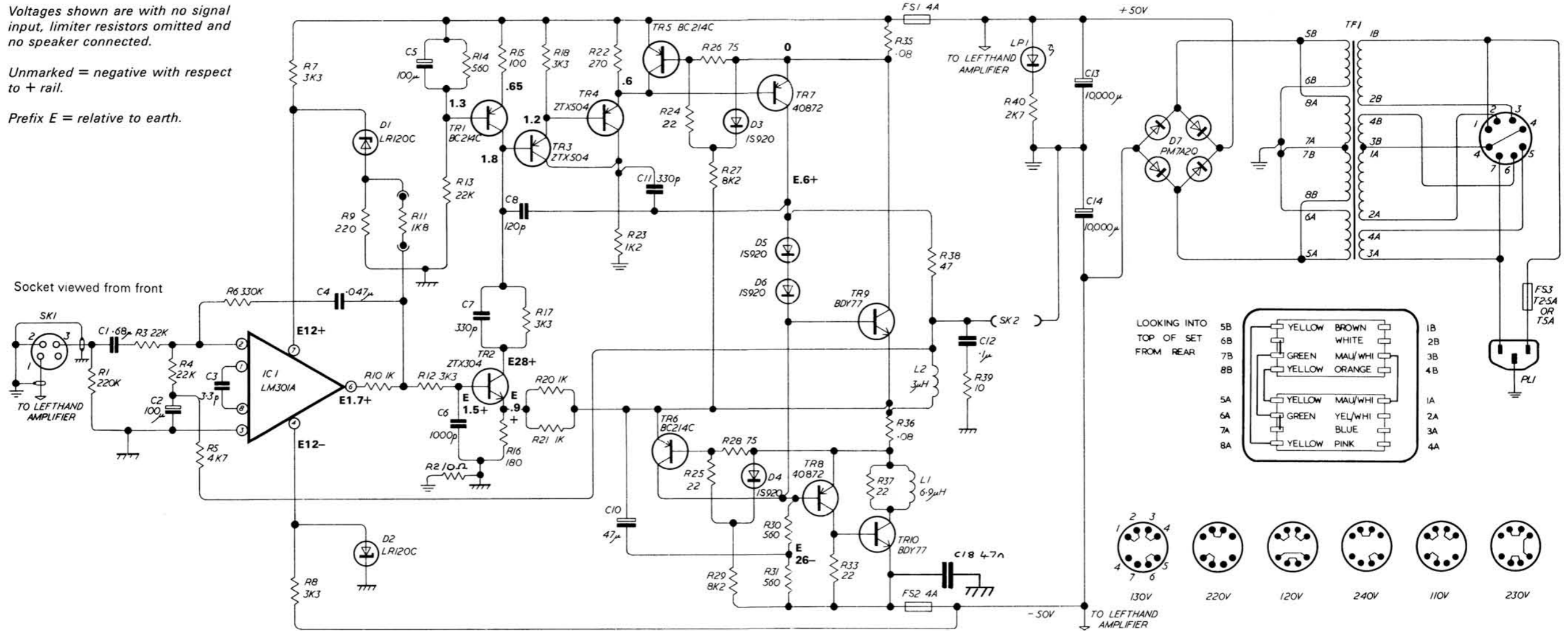
No.	Value	Tol	Reference	Stock No.
L2	3μH	± 5%	Inductor ANCO 440/D	L12405A
FS1	4A			UM04AQA
FS2	4A			UM04AQA
FS3	T2.5A		220-240V	UM2A5DA
	T5A		110-130V	UM05ADA
LP1			Hewlett Packard 5082-4850 Red	BL5053R
TF1			Acoustical DRG A3/12362	L12362A

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	± 2%	Resistor	R22K0J1
R4	22K	± 2%	Resistor	R22K0J1
R5	4.7K	± 10%	Resistor	R4K70J1
R6	330K	± 5%	Resistor	R330KJ1
R7	3K3	± 10%	Resistor	R3K30J1
R8	3K3	± 10%	Resistor	R3K30J1
R9	220	± 5%	Resistor	R220RJ1
R10	1K	± 2%	Resistor	R1K00J1
R11	1K8	± 10%	Resistor	R1K80J1
R12	3K3	± 10%	Resistor	R3K30J1
R13	22K	± 2%	Resistor	R22K0J1
R14	560	± 10%	Resistor	R560RJ1
R15	100	± 10%	Resistor	R100RJ1
R16	180	± 2%	Resistor	R180RJ1
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	R270RJ1
R23	1K2	± 10%	Resistor 1.6W	R1K20JR
R24	22	± 10%	Resistor	R22R0J1
R25	22	± 10%	Resistor	R22R0J1
R26	75	± 5%	Resistor	R75R0J1

No.	Value	Tol	Reference	Stock No.
R27	8K2	± 5%	Resistor	R8K20J1
R28	75	± 5%	Resistor	R75R0J1
R29	8K2	± 5%	Resistor	R8K20J1
R30	560	± 10%	Resistor 2.5W	R560RJS
R31	560	± 10%	Resistor 2.5W	R560RJS
R33	22	± 10%	Resistor	R22R0J1
R35	0.08		Resistor Acoustical DRG.A4/12383	RR091JY
R36	0.08		Resistor Acoustical DRG.A4/12383	RR091JY
R37	22	± 10%	Resistor	R22R0J1
R38	47	± 5%	Resistor	R47R0J1
R39	10	± 10%	Resistor	R10R0J1
R40	2K7		Resistor 1.6W	R2K70JR
C1	0.68μ		Capacitor 100V	C680NKS
C2	100μ	± 10%	Capacitor 3V	C100UME
C3	3.3P	± 20%	Capacitor	C3P30KJ
C4	0.047μ		Capacitor 250V	C47N0JS
C5	100μ		Capacitor 6V	C100UZB
C6	1000P		Capacitor 400V	C1N00KK
C7	330P	± 20%	Capacitor	C330PKJ
C8	120P	± 5%	Capacitor	C120PJ1
C9				
C10	47μ		Capacitor 40V	C47U0ZB
C11	330P		Capacitor	C330PKJ

No.	Value	Tol	Reference	Stock No.
C12	0.1μ		Capacitor 250V	C100NKC
C13	10,000μ		Capacitor 63V	C10KUTA
C14	10,000μ		Capacitor 63V	C10KUTA
C18	0.047μ		Capacitor	C47N0J1
TR1			Transistor BC214C	DBC214C
TR2			Transistor BC682 or ZTX304 or BCX32	DZTX304
TR3			Transistor E5458 or ZTX504	DZTX504
TR4			Transistor E5458 or ZTX504	DZTX504
TR5			Transistor BC214C	DBC214C
TR6			Transistor BC214C	DBC214C
TR7			Transistor 40872 or 2SA740	D40872X
TR8			Transistor 40872 or 2SA740	D40872X
TR9			Transistor BDY74 or BDY77	DBDY77Q
TR10			Transistor BDY74 or BDY77	DBDY77Q
D1			Zener Diode LR120C	DZ12VAA
D2			Zener Diode LR120C	DZ12VAA
D3			Diode IS920	DIS920B
D4			Diode IS920	DIS920B
D5			Diode IS920	DIS920B
D6			Diode IS920	DIS920B
D7			Bridge Rectifier	DPM7A2Q
IC1			LM301A	DML301A

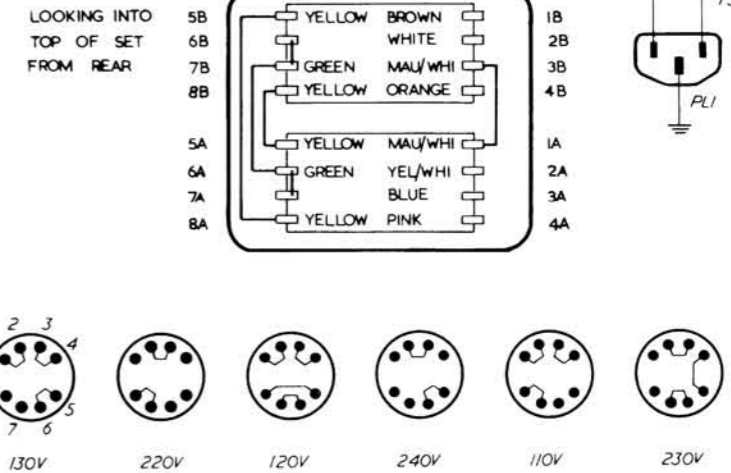
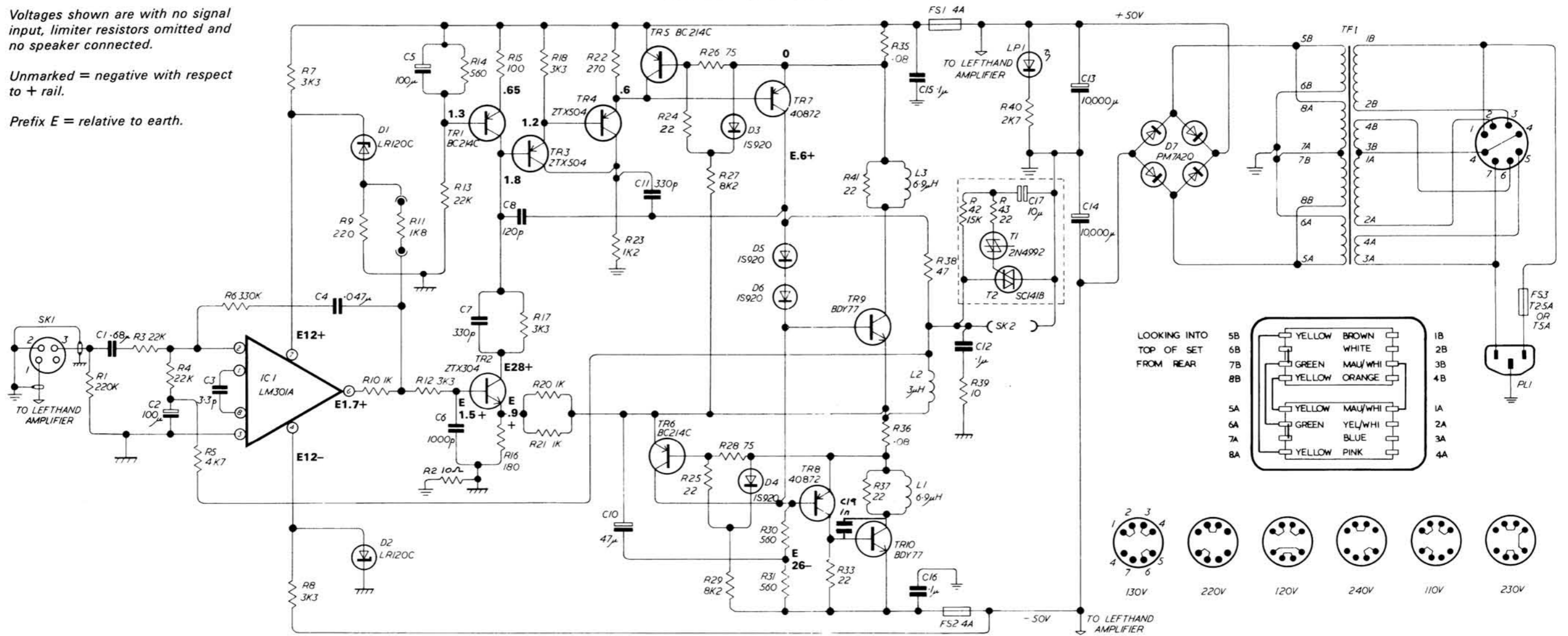
No.	Value	Tol	Reference	Stock No.
L1	6.9μH	± 20%	Inductor ANCO TC1/65	L12406A
L2	3μH	± 5%	Inductor ANCO 440/D	L12405A
FS1	4A			UM04AQA
FS2	4A			UM04AQA
FS3	T2.5A		220-240V	UM2A5DA
	T5A		110-130V	UM05ADA
LP1			Hewlett Packard 5082-4850 Red	BL5053R
TF1			Acoustical DRG A3/12362	L12362A

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	R10ROJ1
R3	22K	± 2%	Resistor	R22KOJ1
R4	22K	± 2%	Resistor	R22KOJ1
R5	4.7K	± 10%	Resistor	R4K70J1
R6	330K	± 2%	Resistor	R330KJ1
R7	3K3	± 10%	Resistor	R3K30J1
R8	3K3	± 10%	Resistor	R3K30J1
R9	220	± 5%	Resistor	R220RJ1
R10	1K	± 2%	Resistor	R1K00J1
R11	1K8	± 10%	Resistor	R1K80J1
R12	3K3	± 10%	Resistor	R3K30J1
R13	22K	± 2%	Resistor	R22KOJ1
R14	560	± 10%	Resistor	R560RJ1
R15	100	± 10%	Resistor	R100RJ1
R16	180	± 2%	Resistor	R180RJ1
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	R270RJ1
R23	1K2	± 10%	Resistor 1.6W	R1K20JR
R24	22	± 10%	Resistor	R22ROJ1
R25	22	± 10%	Resistor	R22ROJ1
R26	75	± 5%	Resistor	R75ROJ1

No.	Value	Tol	Reference	Stock No.
R27	8K2	± 5%	Resistor	R8K20J1
R28	75	± 5%	Resistor	R75ROJ1
R29	8K2	± 5%	Resistor	R8K20J1
R30	560	± 10%	Resistor 2.5W	R560RJS
R31	560	± 10%	Resistor 2.5W	R560RJS
R33	22	± 10%	Resistor	R22ROJ1
R35	0.08		Resistor	RR091JY
R36	0.08		Resistor Acoustical DRWG A4/12383	RR091JY
R37	22	± 10%	Resistor	R22ROJ1
R38	47	± 5%	Resistor	R47ROJ1
R39	10	± 10%	Resistor	R10ROJ1
R40	2K7		Resistor 1.6W	R2K70JR
R41	22	± 10%	Resistor	R22ROJ1
R42	15K	± 10%	Resistor	R15KOJ1
R43	22	± 10%	Resistor	R22ROJ1
C1	0.68μ		Capacitor 100V	C680NKS
C2	100μ	± 10%	Capacitor 3V	C100UME
C3	3.3P	± 20%	Capacitor	C3P30KJ
C4	0.047μ		Capacitor 250V	C47NOJS
C5	100μ		Capacitor 6V	C100UZB
C6	1.000P		Capacitor 400V	C1N00KK
C7	330P	± 20%	Capacitor	C330PKJ
C8	120P	± 5%	Capacitor	C120PJ1

No.	Value	Tol	Reference	Stock No.
C9				
C10	47μ		Capacitor 40V	C47U0ZB
C11	330P		Capacitor	C330PKJ
C12	0.1μ		Capacitor 250V	C100NKC
C13	10,000μ		Capacitor 63V	C10KUTA
C14	10,000μ		Capacitor 63V	C10KUTA
C15	0.1μ		Capacitor 100V	C100NKS
C16	0.1μ		Capacitor 100V	C100NKS
C17	10μ		Capacitor 40V	C10U0ZR
C19	1000P		Capacitor	C1N00SA
TR1			Transistor BC214C	DBC214C
TR2			Transistor BC682 or ZTX304 or BCX32	DZTX304
TR3			Transistor E5458 or ZTX504	DZTX504
TR4			Transistor E5458 or ZTX504	DZTX504
TR5			Transistor BC214C	DBC214C
TR6			Transistor BC214C	DBC214C
TR7			Transistor 40872 or 2SA740	D40872X
TR8			Transistor 40872 or 2SA740	D40872X
TR9			Transistor 2SD424 or 2SD676 or 17556	D17556X
TR10			Transistor 2SD424 or 2SD676 or 17556	D17556X
T1			DIAC 2N4992 or BS08A-03	DBS08AA
T2			TRIAC SC141B or T1C226B or T2800	DT2800B

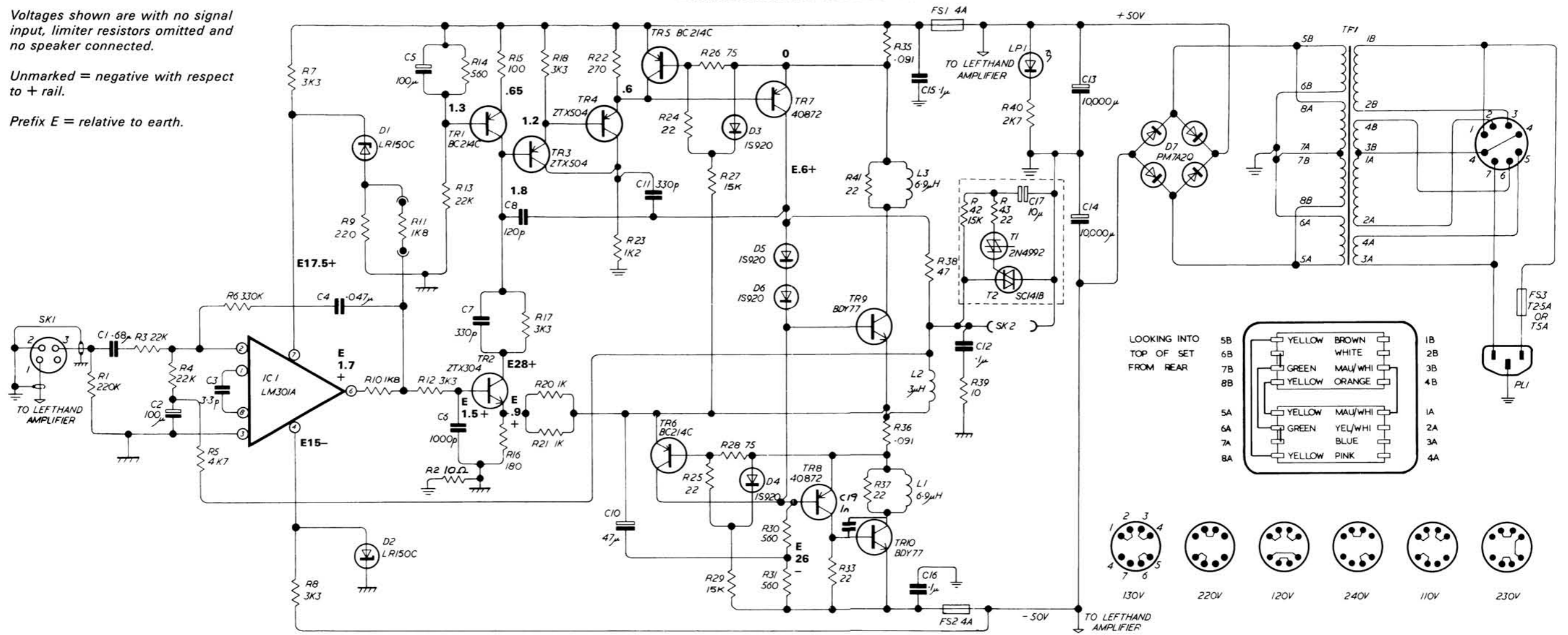
No.	Value	Tol	Reference	Stock No.
D1			Zener Diode LR120C	DZ12VAA
D2			Zener Diode LR120C	DZ12VAA
D3			Diode IS920	DIS920B
D4			Diode IS920	DIS920B
D5			Diode IS920	DIS920B
D6			Diode IS920	DIS920B
D7			Bridge Rectifier	DPM7A2Q
IC1			LM301A	DML301A
L1	6.9μH	± 20%	Inductor ANCO TC1/65	L12406A
L2	3μH	± 5%	Inductor ANCO 440/D	L12405A
L3	6.9μH	± 20%	Inductor ANCO TC1/65	L12406A
FS1	4A			UM04AQA
FS2	4A			UM04AQA
FS3	T2.5A		220-240V	UM2A5DA
	T5A		110-130V	UM05ADA
LP1			Hewlett Packard 5082-4850 Red	BL5053M
TF1			Acoustical DRG A3/12362	L12362A

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.
R1	220K	± 10%	Resistor	R220KJ1
R2	10	± 5%	Resistor	R10ROJ1
R3	22K	± 2%	Resistor	R22KOJ1
R4	22K	± 2%	Resistor	R22KOJ1
R5	4.7K	± 10%	Resistor	R4K7OJ1
R6	330K	± 2%	Resistor	R330KJ1
R7	3K3	± 10%	Resistor	R3K3OJ1
R8	3K3	± 10%	Resistor	R3K3OJ1
R9	220	± 5%	Resistor	R220RJ1
R10	1K8	± 10%	Resistor	R1K8OJ1
R11	1K8	± 10%	Resistor	R1K8OJ1
R12	3K3	± 10%	Resistor	R3K3OJ1
R13	22K	± 2%	Resistor	R22KOJ1
R14	560	± 10%	Resistor	R560RJ1
R15	100	± 10%	Resistor	R100RJ1
R16	180	± 2%	Resistor	R180RJ1
R17	3K3	± 10%	Resistor	R3K3OJ1
R18	3K3	± 10%	Resistor	R3K3OJ1
R19				
R20	1K	± 2%	Resistor	R1K0OJ1
R21	1K	± 2%	Resistor	R1K0OJ1
R22	270	± 10%	Resistor	R270RJ1
R23	1K2	± 10%	Resistor 1.6W	R1K2OJR
R24	22	± 10%	Resistor	R22ROJ1
R25	22	± 10%	Resistor	R22ROJ1
R26	75	± 5%	Resistor	R75ROJ1

No.	Value	Tol	Reference	Stock No.
R27	15K	± 5%	Resistor	R15KOJ1
R28	75	± 5%	Resistor	R75ROJ1
R29	15K	± 5%	Resistor	R15KOJ1
R30	560	± 10%	Resistor 2.5W	R560RJS
R31	560	± 10%	Resistor 2.5W	R560RJS
R33	22	± 10%	Resistor	R22ROJ1
R35	0.091		Resistor	RR091JY
R36	0.091		Resistor	RR091JY
R37	22	± 10%	Resistor	R22ROJ1
R38	47	± 5%	Resistor	R47ROJ1
R39	10	± 10%	Resistor	R10ROJ1
R40	2K7		Resistor 1.6W	R2K7OJR
R41	22	± 10%	Resistor	R22ROJ1
R42	15K	± 10%	Resistor	R15KOJ1
R43	22	± 10%	Resistor	R22ROJ1
C1	0.68μ		Capacitor 100V	C680NKS
C2	100μ	± 10%	Capacitor 3V	C100UME
C3	3.3P	± 20%	Capacitor	C3P30KJ
C4	0.047μ		Capacitor 250V	C47N0JS
C5	100μ		Capacitor 6V	C100U2B
C6	1000P		Capacitor 400V	C1N00KK
C7	330P	± 20%	Capacitor	C330PKJ
C8	120P	± 5%	Capacitor	C120PJ1

No.	Value	Tol	Reference	Stock No.
C9				
C10	47μ		Capacitor 40V	C47U0ZB
C11	330P		Capacitor	C330PKJ
C12	0.1μ		Capacitor 250V	C100NKC
C13	10,000μ		Capacitor 63V	C10KUTA
C14	10,000μ		Capacitor 63V	C10KUTA
C15	0.1μ		Capacitor 100V	C100NKS
C16	0.1μ		Capacitor 100V	C100NKS
C17	0μ		Capacitor 40V	C10U0ZR
C19	000P		Capacitor	C1N00SA
TR1			Transistor BC214C	DBC214C
TR2			Transistor BC682 or ZTX304 or BCX32	DZTX304
TR3			Transistor E5458 or ZTX504	DZTX504
TR4			Transistor E5458 or ZTX504	DZTX504
TR5			Transistor BC214C	DBC214C
TR6			Transistor BC214C	DBC214C
TR7			Transistor 40872 or 2SA740	D40872X
TR8			Transistor 40872 or 2SA740	D40872X
TR9			Transistor 2SD424 or 2SD676 or 17556	D17556X
TR10			Transistor 2SD424 or 2SD676 or 17556	D17556X
T1			DIAC 2N4992 or BS08A-03	D8S08AA
T2			TRIAC SC141B or T1C226B or T2800	DT2800B

No.	Value	Tol	Reference	Stock No.
D1			Zener Diode LR150C	DZ15VAA
D2			Zener Diode LR150C	DZ15VAA
D3			Diode IS920	DIS920B
D4			Diode IS920	DIS920B
D5			Diode IS920	DIS920B
D6			Diode IS920	DIS920B
D7			Bridge Rectifier	DPM7A2Q
IC1			LM301A	DML301A
L1	6.9μH	± 20%	Inductor ANCO TC1/65	L12406A
L2	3μH	± 5%	Inductor ANCO 440/D	L12405A
L3	6.9μH	± 20%	Inductor ANCO TC1/65	L12406A
FS1	4A			UM04AQA
FS2	4A			UM04AQA
FS3	T2.5A		220-240V	UM2A5DA
	T5A		110-130V	UM05ADA
LP1			Hewlett Packard 5082-4850 Red	BL5053R
TF1			Acoustical DRG A3/1236Z	L12362A

BOARD NUMBER M12368 ISS 9 AND 10

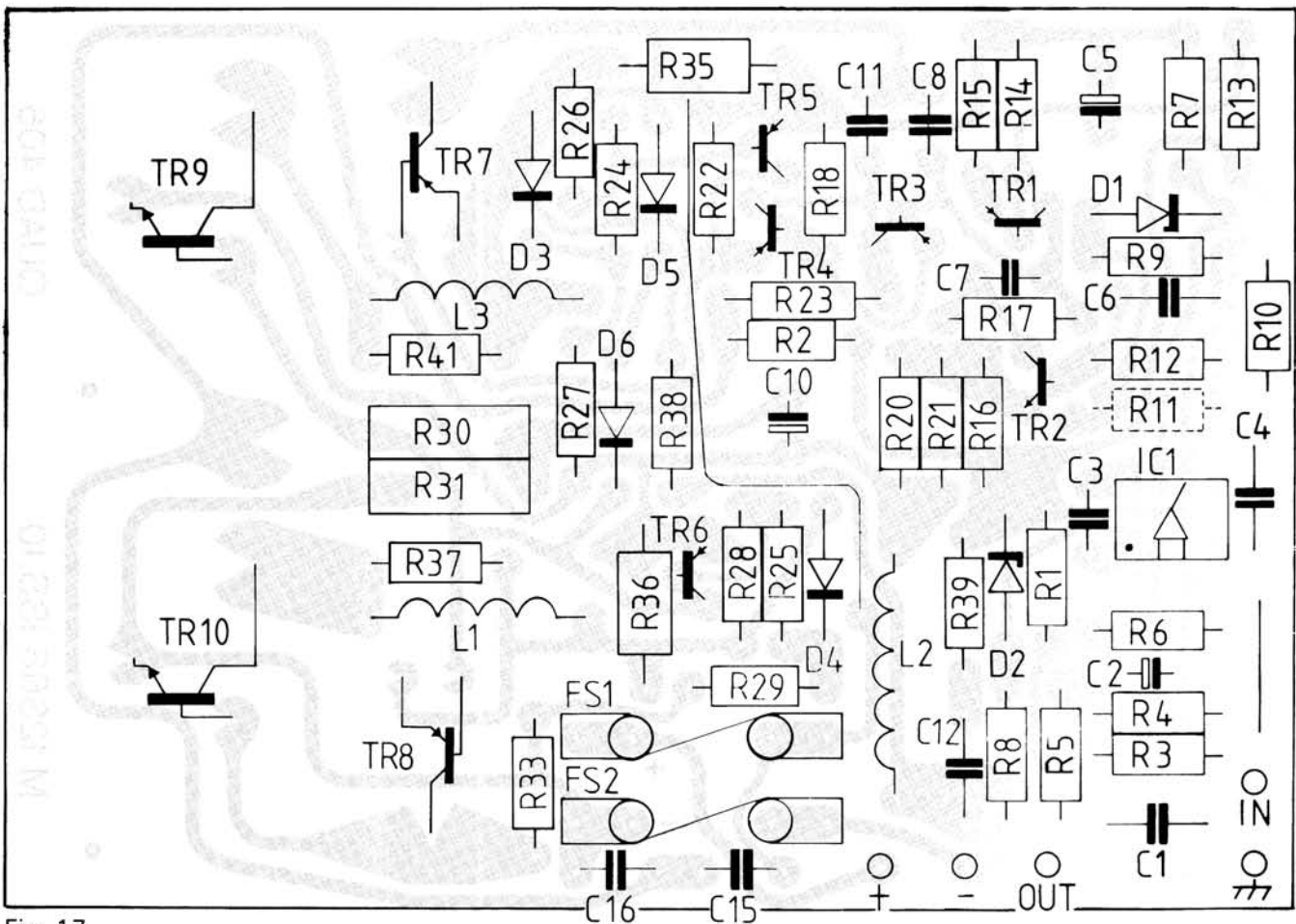


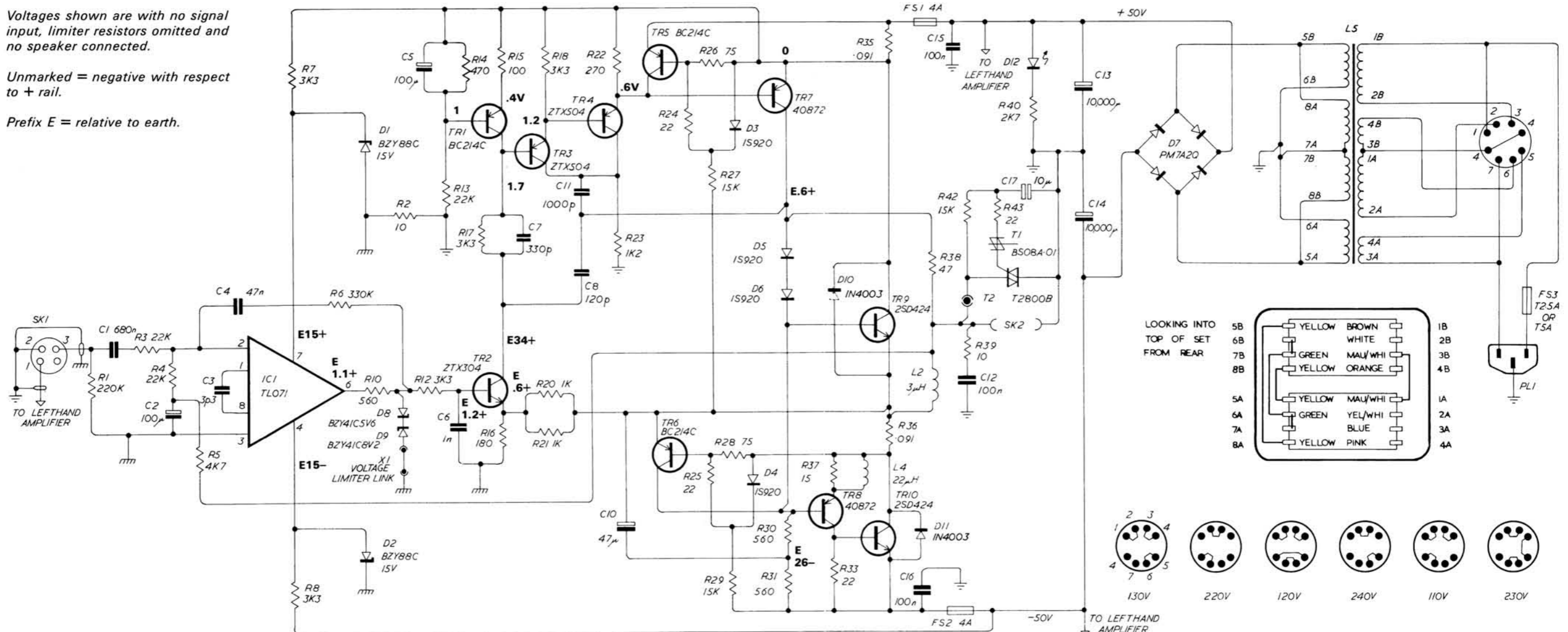
Fig. 17

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.	No.	Value	Tol	Reference	Stock No.	No.	Value	Tol	Reference	Stock No.	No.	Value	Tol	Reference	Stock No.	
R1	220K		Resistor	R220KJ1	R27	15K		Resistor	R15K0J1	C8	120p		Capacitor	C120PJ1	D2			Zener Diode BZY88C 15V	DZ15VAA	
R2	10		Resistor	R10R0J1	R28	75		Resistor	R75R0J1	D3			Diode 1S920TB	D1S920B	D4			Diode 1S920TB	D1S920B	
R3	22K	± 2%	Resistor	R22K0G1	R29	15K		Resistor	R15K0J1	D5			Diode 1S920TB	D1S920B	D6			Diode 1S920TB	D1S920B	
R4	22K	± 2%	Resistor	R22K0G1	R30	560		Resistor	R560RJS	D8			Zener Diode BZV41C8V2	DZ8V2AA	D9			Zener Diode BZV41C5V6	DZ5V6AA	
R5	4K7		Resistor	R4K70J1	R31	560		Resistor	R560RJS	D10			Diode 1N4003	D1N4003	D11			Diode 1N4003	D1N4003	
R6	330K	± 2%	Resistor	R330KG1	R33	22		Resistor	R22R0J1	D12			LED XC5053R	BL5053R	IC1			Int. Circuit TL071,ME5534,LM351,LM301	D071CPX	
R7	3K3		Resistor	R3K30J1	R35	.091		Resistor	RR091JY	L2	3μH	± 5%	Choke	L12405A	L4	22μH		Choke	LSC1022	
R8	3K3		Resistor	R3K30J1	R36	.091		Resistor	RR091JY	L5			Transformer	L12362A	FS1	4A		Fuse	UM04AQU	
R10	560		Resistor	R560RJ1	R37	15		Resistor	R15R0J1	FS2	4A		Fuse	UM04AQU	FS3	T2A5		Fuse 220-240V	UM2A5DA	
R12	3K3		Resistor	R3K30J1	R38	47		Resistor	R47R0J1	FS3	T2A5		Fuse 220-240V	UM2A5DA	T5A			Fuse 110-130V	UM05ADA	
R13	22K	± 2%	Resistor	R22K0G1	R39	10		Resistor	R10R0J1	X1			Link	PP37712						
R14	470		Resistor	R470RJ1	R40	2K7		Resistor	R2K70JR											
R15	100		Resistor	R100RJ1	R42	15K		Resistor	R15K0J1											
R16	180	± 2%	Resistor	R180RG1	R43	22		Resistor	R22R0J1											
R17	3K3		Resistor	R3K30J1	All Resistors ± 5% except where shown					C1	680n		Capacitor	C680NKS						
R18	3K3		Resistor	R3K30J1	C2	100μ		Capacitor	C100UKT											
R20	1K	± 2%	Resistor	R1K00G1	C3	3p3		Capacitor	C3P30C1											
R21	1K	± 2%	Resistor	R1K00G1	C4	47n		Capacitor	C47N0JS											
R22	270		Resistor	R270RJ1	C5	100μ		Capacitor	C100UZB											
R23	1K2		Resistor	R1K20JR	C6	1n		Capacitor	C1N00KK											
R24	22		Resistor	R22R0J1	C7	330p		Capacitor	C330PKJ											
R25	22		Resistor	R22R0J1																
R26	75		Resistor	R75R0J1																

BOARD NUMBER M12565 ISS 3

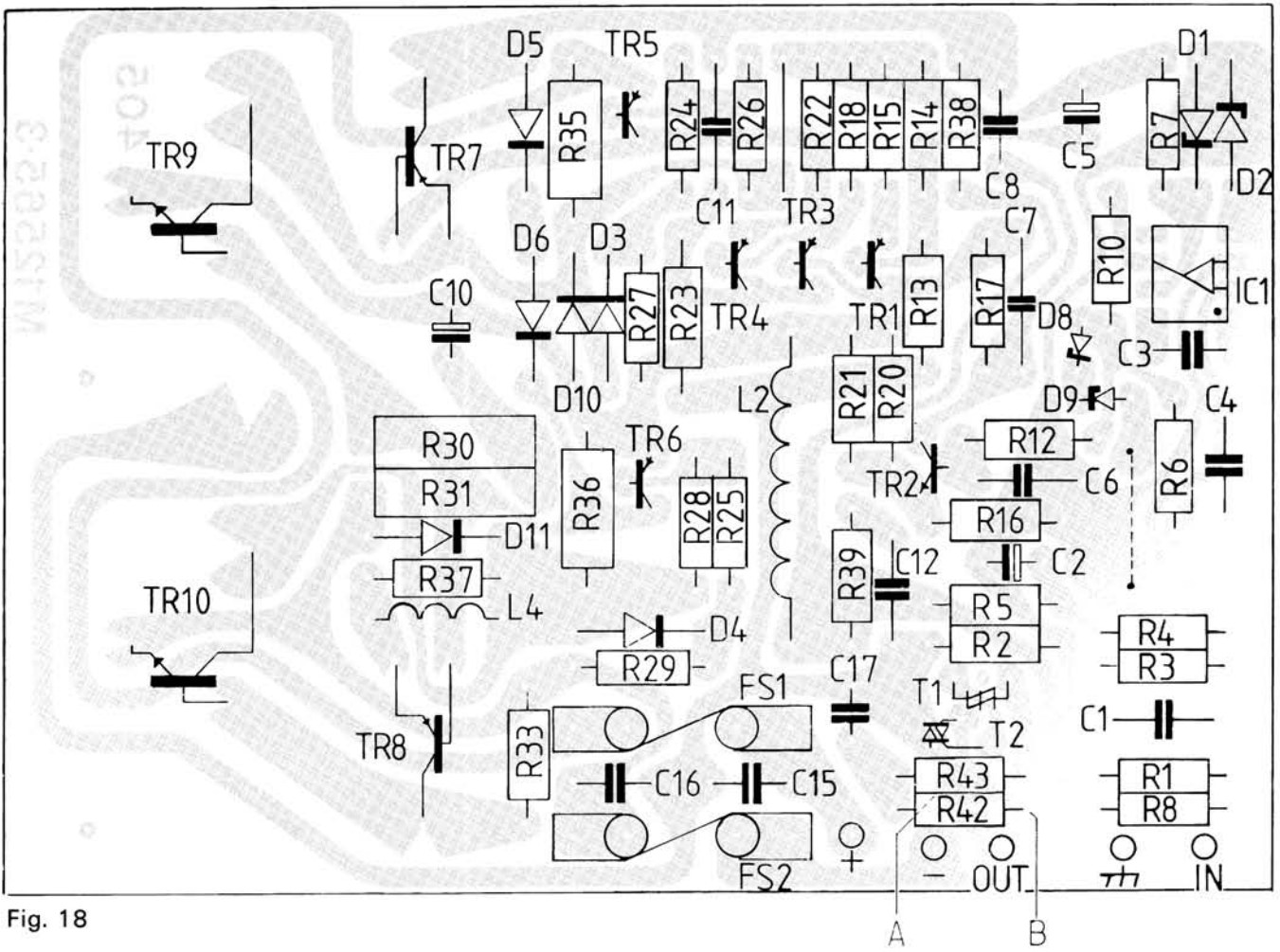
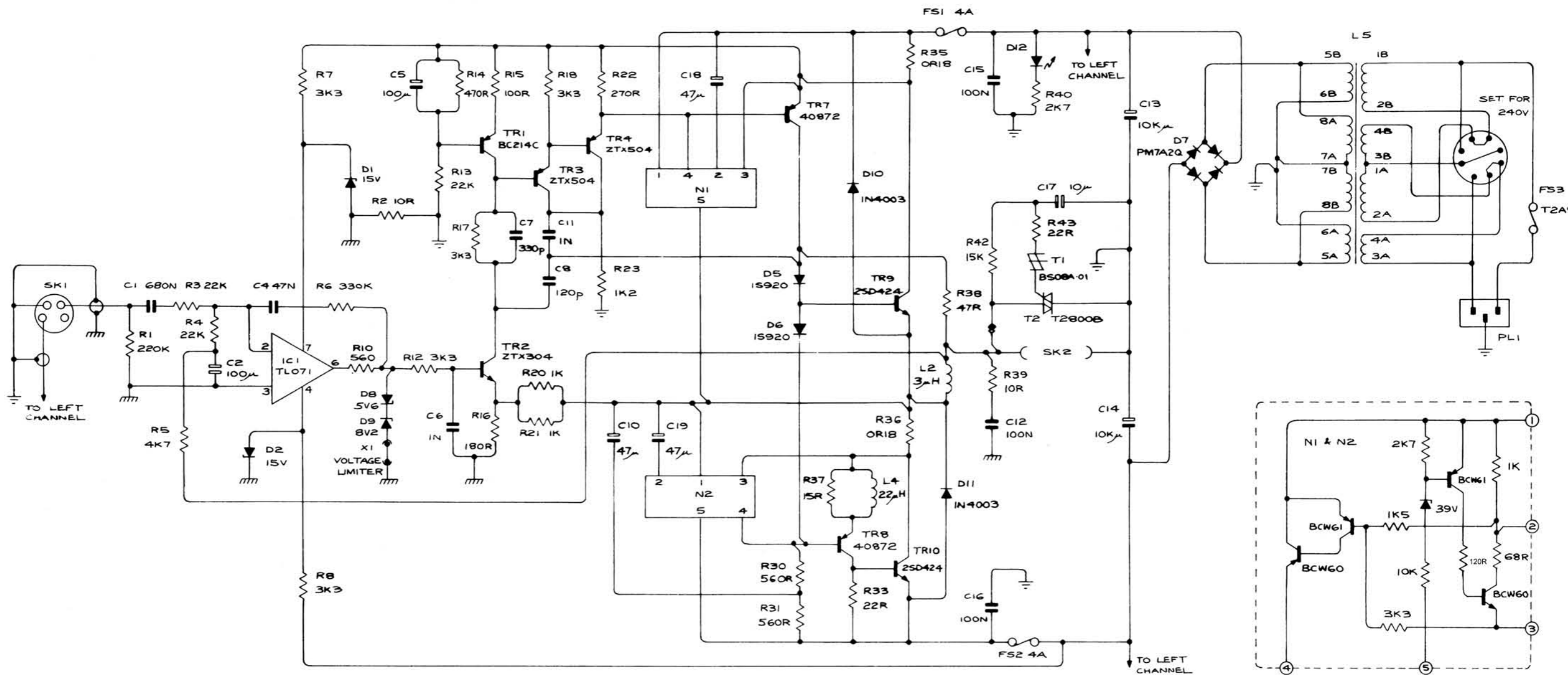
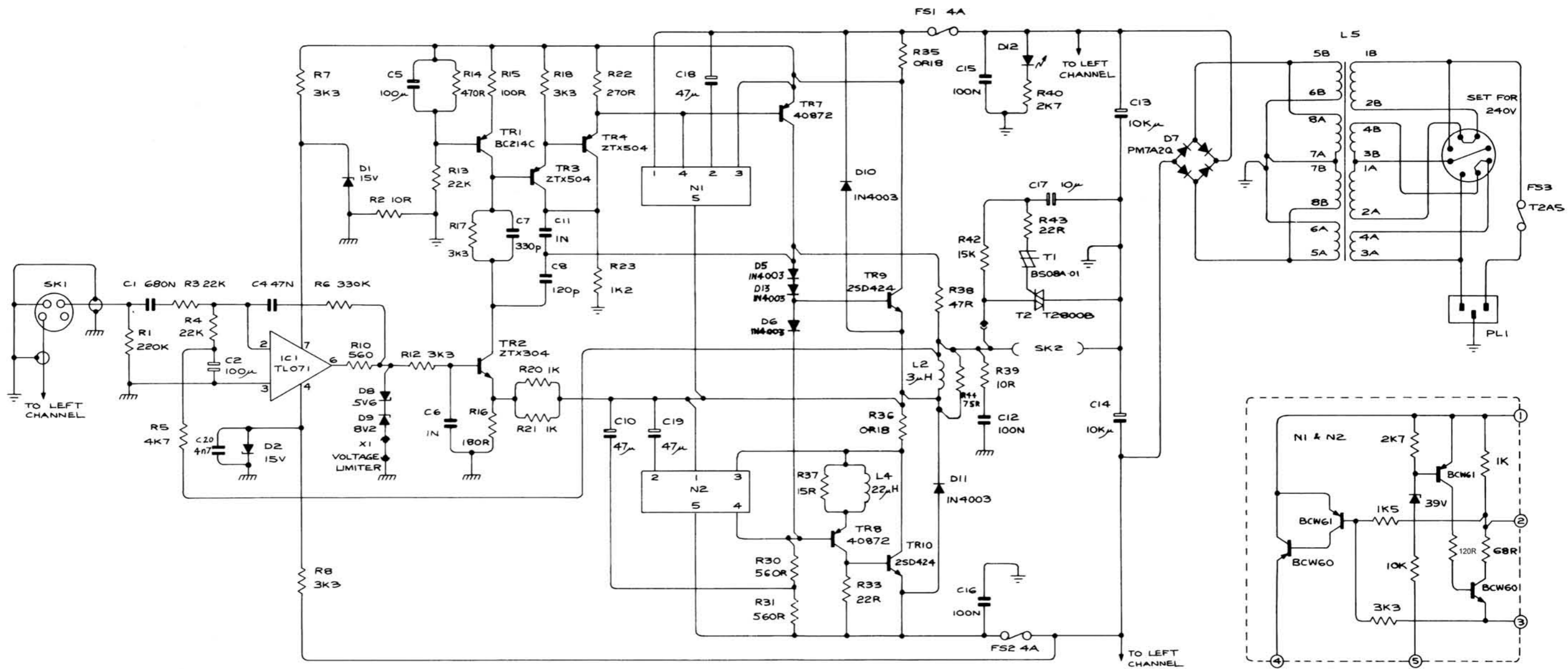


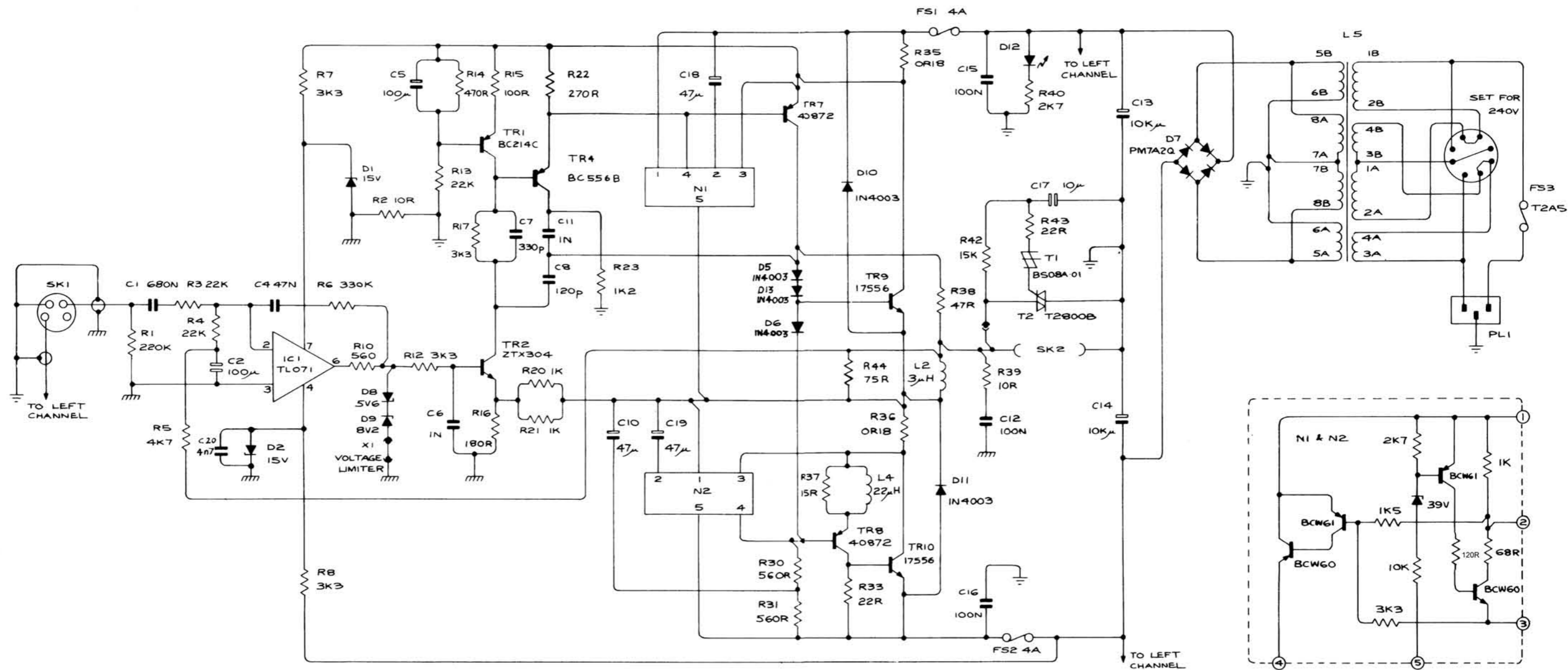
Fig. 18



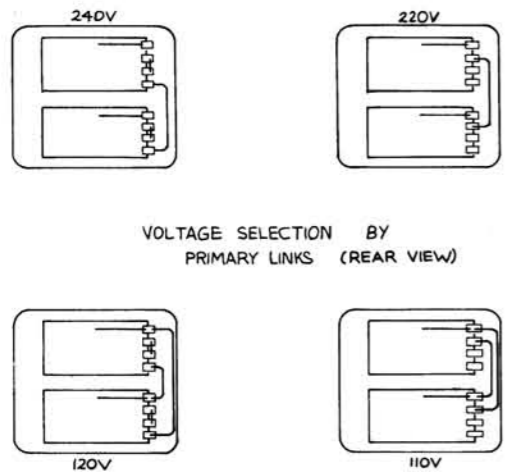
R1	RESISTOR	220K	± 5%	R220KJ1	R38	RESISTOR	47R	± 5%	R47ROJ1	TR1	TRANSISTOR	BC214C	DBC214C	FS1	FUSE	4A	UM04AQU
R2	RESISTOR	10R	± 5%	R10ROJ1	R39	RESISTOR	10R	± 5%	R10ROJ1	TR2	TRANSISTOR	ZTX304	DZTX304	FS2	FUSE	4A	UM04AQU
R3	RESISTOR	22K	± 2%	R22KOG1	R40	RESISTOR	2K7	± 5%	R2K7OJR	TR3	TRANSISTOR	ZTX504	DZTX504	FS3	FUSE	T2A5 220-240V T5A 110-130V	UM2A5DA UM05ADA
R4	RESISTOR	22K	± 2%	R22KOG1	R42	RESISTOR	15K	± 5%	R15KOJ1	TR4	TRANSISTOR	ZTX504	DZTX504	L5	MAINS	TRANSFORMER	L12362A
R5	RESISTOR	4K7	± 5%	R4K7OJ1	R43	RESISTOR	22R	± 5%	R22ROJ1	TR7	TRANSISTOR	40872	D40872X	L2	CHOKE	3µH	L12405A
R6	RESISTOR	330K	± 2%	R330KG1	C1	CAPACITOR	680N		C680NKS	TR8	TRANSISTOR	40872	D40872X	L4	CHOKE	22µH	L4.T220K
R7	RESISTOR	3K3	± 5%	R3K3OJ1	C2	CAPACITOR	100µ		C100WJ	TR9	TRANSISTOR	2SD424	D2SD424	N1	NETWORK		Q05N1AW
R8	RESISTOR	3K3	± 5%	R3K3OJ1	C4	CAPACITOR	47N		C47NOJS	TR10	TRANSISTOR	2SD424	D2SD424	N2	NETWORK		Q05N1AW
R10	RESISTOR	560R	± 5%	R56ORJ1	C5	CAPACITOR	100µ		C100UZB	TR10	TRANSISTOR	2SD424	D2SD424				
R12	RESISTOR	3K3	± 5%	R3K3OJ1	C6	CAPACITOR	1N		C1N00JP	T1	DIAC	BS08A-01	DBS08AA				
R13	RESISTOR	22K	± 2%	R22KOG1	C7	CAPACITOR	330P		C330PKJ	T2	TRIAC	T2800B	DT2800B				
R14	RESISTOR	470R	± 5%	R47ORJ1	C8	CAPACITOR	120P		C120PJ1	D1	ZENER DIODE	BZY88C 15V	D8815VA				
R15	RESISTOR	100R	± 5%	R100RJ1	C10	CAPACITOR	47µ		C47UCZB	D2	ZENER DIODE	BZY88C 15V	D8815VA				
R16	RESISTOR	180R	± 2%	R180RG1	C11	CAPACITOR	1N		C1N00SA	D5	DIODE	1S920	D1S920B				
R17	RESISTOR	3K3	± 5%	R3K3OJ1	C12	CAPACITOR	100N		C100NJS	D6	DIODE	1S920	D1S920B				
R18	RESISTOR	3K3	± 5%	R3K3OJ1	C13	CAPACITOR	10Kµ		C10KUTA	D7	BRIDGE RECTIFIER	PM7A2Q	DPM7A2Q				
R20	RESISTOR	1K	± 2%	R1K0OG1	C15	CAPACITOR	100N		C100NJS	D8	ZENER DIODE	BZY41C 5V6	DZ5V6AA				
R21	RESISTOR	1K	± 2%	R1K0OG1	C16	CAPACITOR	100N		C100NKS	D9	ZENER DIODE	BZY41C 8V2	DZ8V2AA				
R22	RESISTOR	270R	± 5%	R27ORJ1	C17	CAPACITOR	10µ		C10UOZR	D10	DIODE	IN4003	DIN4003				
R23	RESISTOR	1K2	± 5%	R1K2OJR	C18	CAPACITOR	47µ		C47UOZE	D11	DIODE	IN4003	DIN4003				
R30	RESISTOR	560R	± 5%	R56ORJC	C19	CAPACITOR	47µ		C47UOZE	D12	LED	XC5053R	BL5053R				
R31	RESISTOR	560R	± 5%	R56ORJC						X1	SHORTING LINK		PP37712				
R33	RESISTOR	22R	± 5%	R22ROJ1						IC1	INT CIRCUIT	TL071	DO71CPX				
R35	RESISTOR	0R18	± 5%	R0R18JC													
R36	RESISTOR	0R18	± 5%	R0R18JC													
R37	RESISTOR	15R	± 5%	R15ROJ1													



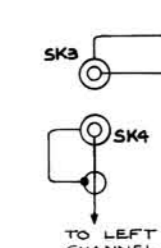
R1	RESISTOR	220K	± 5%	R20KJ1		R38	RESISTOR	47R	± 5%	R47ROJ1		TR1	TRANSISTOR	BC214C	DBC214C	FS1	FUSE	4A	UM04AQU
R2	RESISTOR	10R	± 5%	R10ROJ1		R39	RESISTOR	10R	± 5%	R10ROJ1		TR2	TRANSISTOR	ZTX304	DZTX304	FS2	FUSE	4A	UM04AQU
R3	RESISTOR	22K	± 2%	R22K0G1		R40	RESISTOR	2K7	± 5%	R2K70JR		TR3	TRANSISTOR	ZTX504	DZTX504	FS3	FUSE	T2A5 220-240V T5A 110-130V	UM2A5DA UM05ADA
R4	RESISTOR	22K	± 2%	R22K0G1		R42	RESISTOR	15K	± 5%	R15K0J1		TR4	TRANSISTOR	ZTX504	DZTX504	L5	MAINS TRANSFORMER		L123G2A
R5	RESISTOR	4K7	± 5%	R4K70J1		R43	RESISTOR	22R	± 5%	R22R0J1		TR7	TRANSISTOR	40872	D40872X	L2	CHOKE	3μH	L12405A
R6	RESISTOR	330K	± 2%	R330KG1		R44	RESISTOR	75R	± 5%	R75R0J1		TR8	TRANSISTOR	40872	D40872X	L4	CHOKE	22μH	L4T220K
R7	RESISTOR	3K3	± 5%	R3K30J1		C1	CAPACITOR	680N		C680NKS		TR9	TRANSISTOR	2SD424	D2SD424	N1	NETWORK		Q05N1AW
R8	RESISTOR	3K3	± 5%	R3K30J1		C2	CAPACITOR	100μ		C100WJ		TR10	TRANSISTOR	2SD424	D2SD424	N2	NETWORK		Q05N1AW
R10	RESISTOR	560R	± 5%	R560RJ1		C4	CAPACITOR	47N		C47NOJS		TR10	TRANSISTOR	2SD424	D2SD424				
R12	RESISTOR	3K3	± 5%	R3K30J1		C5	CAPACITOR	100μ		C100UZB									
R13	RESISTOR	22K	± 2%	R22K0G1		C6	CAPACITOR	1N		C1N00JP									
R14	RESISTOR	470R	± 5%	R470RJ1		C7	CAPACITOR	330P		C330PKJ									
R15	RESISTOR	100R	± 5%	R100RJ1		C8	CAPACITOR	120P		C120PJ1									
R16	RESISTOR	180R	± 2%	R180RG1		C10	CAPACITOR	47μ		C47UOZB									
R17	RESISTOR	3K3	± 5%	R3K30J1		C11	CAPACITOR	1N		C1N00SA									
R18	RESISTOR	3K3	± 5%	R3K30J1		C12	CAPACITOR	100N		C100NJS									
R20	RESISTOR	1K	± 2%	R1K00G1		C13	CAPACITOR	10Kμ		C10KUTA									
R21	RESISTOR	1K	± 2%	R1K00G1		C15	CAPACITOR	100N		C100NKS									
R22	RESISTOR	270R	± 5%	R270RJ1		C16	CAPACITOR	100N		C100NKS									
R23	RESISTOR	1K2	± 5%	R1K20JR		C17	CAPACITOR	10μ		C10UOZR									
R30	RESISTOR	560R	± 5%	R560RJ1		C18	CAPACITOR	47μ		C47UOZE									
R31	RESISTOR	560R	± 5%	R560RJ1		C19	CAPACITOR	47μ		C47UOZE									
R33	RESISTOR	22R	± 5%	R22R0J1		C20	CAPACITOR	4N7		C4N715J									
R35	RESISTOR	0R18	± 5%	R0R18JC															
R36	RESISTOR	0R18	± 5%	R0R18JC															
R37	RESISTOR	15R	± 5%	R15ROJ1															



R1	RESISTOR	220K	± 5%	R220KJ4	R38	RESISTOR	47R	± 5%	R47ROJ4	TR1	TRANSISTOR	BC214C	DBC214C	FS1	FUSE	4A	UM04AQU
R2	RESISTOR	10R	± 5%	R10ROJ1	R39	RESISTOR	10R	± 5%	R10ROJ1	TR2	TRANSISTOR	ZTX304	DZTX304	FS2	FUSE	4A	UM04AQU
R3	RESISTOR	22K	± 2%	R22K0G1	R40	RESISTOR	2K7	± 5%	R2K7OJ4	TR4	TRANSISTOR	BC556B	DBC556B	FS3	FUSE	T2A5 220-240V T5A 110-130V	UM2A5DA UM05ADA
R4	RESISTOR	22K	± 2%	R22K0G1	R42	RESISTOR	15K	± 5%	R15K0J4	TR7	TRANSISTOR	40872	D40872X	L5	MAINS	TRANSFORMER	L12362A
R5	RESISTOR	4K7	± 5%	R4K7OJ4	R43	RESISTOR	22R	± 5%	R22ROJ4	TR8	TRANSISTOR	40872	D40872X	L2	CHOKE	3µH	L12405A
R6	RESISTOR	330K	± 2%	R330KG1	R44	RESISTOR	75R	± 5%	R75ROJ4	TR9	TRANSISTOR	17556	D17556X	L4	CHOKE	22µH	L4T220K
R7	RESISTOR	3K3	± 5%	R3K3OJ1						TR10	TRANSISTOR	17556	D17556X	N1	NETWORK		Q05NIAT
R8	RESISTOR	3K3	± 5%	R3K3OJ1										N2	NETWORK		Q05NIAT
R10	RESISTOR	560R	± 5%	R560RJ4	C1	CAPACITOR	680N		C680NKA	D1	ZENER DIODE	BZY88C 15V	D8815VA				
R12	RESISTOR	3K3	± 5%	R3K3OJ1	C2	CAPACITOR	100µ		C100WJ	D2	ZENER DIODE	BZY88C 15V	D8815VA				
R13	RESISTOR	22K	± 2%	R22K0G1	C4	CAPACITOR	47N		C47NOJS	D5	DIODE	IN4003	DIN4003				
R14	RESISTOR	470R	± 5%	R470RJ4	C5	CAPACITOR	100µ		C100UME	D6	DIODE	IN4003	DIN4003				
R15	RESISTOR	100R	± 5%	R100RJ4	C6	CAPACITOR	1N		C1N00JP	D7	BRIDGE RECTIFIER	PM7A2Q	DPM7A2Q				
R16	RESISTOR	180R	± 2%	R180RG1	C7	CAPACITOR	330P		C330PKJ	D8	ZENER DIODE	BZY41C 5V6	DZ5V6AA				
R17	RESISTOR	3K3	± 5%	R3K3OJ1	C8	CAPACITOR	120P		C120PJ1	D9	ZENER DIODE	BZY41C 8V2	DZ8V2AA				
R20	RESISTOR	1K	± 2%	R1K00G1	C10	CAPACITOR	47µ		C47UOZB	D10	DIODE	IN4003	DIN4003				
R21	RESISTOR	1K	± 2%	R1K00G1	C11	CAPACITOR	1N		C1N00SA	D11	DIODE	IN4003	DIN4003				
R22	RESISTOR	270R	± 5%	R270RJ4	C12	CAPACITOR	100N		C100NJS	D12	LED	XC5053R	BL5053R				
R23	RESISTOR	1K2	± 5%	R1K2OJR	C13	CAPACITOR	10Kµ		C10KUTB	D13	DIODE	IN4003	DIN4003				
R30	RESISTOR	560R	± 5%	R560RJ4	C14	CAPACITOR	10Kµ		C10KUTB	X1	SHORTING LINK		Q05LINK				
R31	RESISTOR	560R	± 5%	R560RJ4	C15	CAPACITOR	100N		C100NKS	IC1	INT. CIRCUIT	TL071	DO71CPX				
R33	RESISTOR	22R	± 5%	R22ROJ4	C16	CAPACITOR	100N		C100NKS								
R35	RESISTOR	OR18	± 5%	ROR18JC	C17	CAPACITOR	10µ		C10UOZR								
R36	RESISTOR	OR18	± 5%	ROR18JC	C18	CAPACITOR	47µ		C47UOZE								
R37	RESISTOR	15R	± 5%	R15ROJ4	C19	CAPACITOR	47µ		C47UOZE								
					C20	CAPACITOR	4N7		C4N706J								



VOLTAGE SELECTION BY
PRIMARY LINKS (REAR VIEW)



R1	RESISTOR	220K	± 5%	R220KJ4	R38	RESISTOR	47R	± 5%	R47RJ4	TR1	TRANSISTOR	BC214C	DBC214C	FS1	FUSE	4A	UM04AQU
R2	RESISTOR	10R	± 5%	R10RJ1	R39	RESISTOR	10R	± 5%	R10RJ1	TR2	TRANSISTOR	ZTX304	DZTX304	FS2	FUSE	4A	UM04AQU
R3	RESISTOR	22K	± 2%	R22K0G1	R40	RESISTOR	2K7	± 5%	R2K7OJ4	TR3	TRANSISTOR	BC556B	DBC556B	FS3	FUSE	T2A5 220-240V TSA 110-130V	UM2A5DA UM05ADA
R4	RESISTOR	22K	± 2%	R22K0G1	R42	RESISTOR	15K	± 5%	R15K0J4	TR7	TRANSISTOR	40872	D40872X	L5	MAINS TRANSFORMER		L12362A
R5	RESISTOR	4K7	± 5%	R4K7OJ4	R43	RESISTOR	22R	± 5%	R22RJ4	TR8	TRANSISTOR	40872	D40872X	L2	CHOKE	3μH	L12405A
R6	RESISTOR	330K	± 2%	R330KJ1	R44	RESISTOR	75R	± 5%	R75RJ4	TR9	TRANSISTOR	17556	D17556X	L4	CHOKE	22μH	L4-T220K
R7	RESISTOR	3K3	± 5%	R3K3OJ1					TR10	TRANSISTOR	17556	D17556X	N1	NETWORK		Q05NIAT	
R8	RESISTOR	3K3	± 5%	R3K3OJ1									N2	NETWORK		Q05NIAT	
R10	RESISTOR	560R	± 5%	R560RJ4	C1	CAPACITOR	680N		C680NKA	D1	ZENER DIODE	BZY88C 15V	D8815VA	PL1	AC. POWER IN/FUSEHOLDER PLUG		PPF12AA
R12	RESISTOR	3K3	± 5%	R3K3OJ1	C2	CAPACITOR	100μ		C100UJ	D2	ZENER DIODE	BZY88C 15V	D8815VA	SI	SWITCH		S4050FF
R13	RESISTOR	22K	± 2%	R22K0G1	C4	CAPACITOR	47N		C47NOJ5	D5	DIODE	IN4003	DIN4003	SK2	OUTPUT SOCKETS	RED	PSRS14C
R14	RESISTOR	470R	± 5%	R470RJ4	C5	CAPACITOR	100μ		C100UJ	D6	DIODE	IN4003	DIN4003	SK4	INPUT LEFT	BLACK	PSB514C
R15	RESISTOR	100R	± 5%	R100RJ4	C6	CAPACITOR	1N		C1N00JP	D7	BRIDGE RECTIFIER	PM7A2Q	DPM7A2Q	SK5	INPUT RIGHT		PSPH0N2
R16	RESISTOR	180R	± 2%	R180RJ1	C7	CAPACITOR	330P		C330PKJ	D8	ZENER DIODE	BZY41C 5V6	DZ5V6AA				PSPH0N9
R17	RESISTOR	3K3	± 5%	R3K3OJ1	C8	CAPACITOR	120P		C120PJ1	D9	ZENER DIODE	BZY41C 6V2	DZ6V2AA				PSP695S
R20	RESISTOR	1K	± 2%	RIK00G1	C10	CAPACITOR	47μ		C47UOZB	D10	DIODE	IN4003	DIN4003				
R21	RESISTOR	1K	± 2%	RIK00G1	C11	CAPACITOR	1N		C1N00SA	D11	DIODE	IN4003	DIN4003				
R22	RESISTOR	270R	± 5%	R270RJ4	C12	CAPACITOR	100N		C100NJS	D12	LED	XC5053R	BL5053R				
R23	RESISTOR	1K2	± 5%	RIK20JR	C13	CAPACITOR	10Kμ		C10KUTB	D13	DIODE	IN4003	DIN4003				
R30	RESISTOR	560R	± 5%	R560RJ4	C14	CAPACITOR	10Kμ		C10KUTB	XI	SHORTING LINK		Q05LINK				
R31	RESISTOR	560R	± 5%	R560RJ4	C15	CAPACITOR	100N		C100NKS	IC1	INT. CIRCUIT	TL071	DO71CPX				
R33	RESISTOR	22R	± 5%	R22RJ4	C16	CAPACITOR	100N		C100NKS								
R35	RESISTOR	0R18	± 5%	R0R18JC	C17	CAPACITOR	10μ		C10UOZR								
R36	RESISTOR	0R18	± 5%	R0R18JC	C18	CAPACITOR	47μ		C47UOZE								
R37	RESISTOR	15R	± 5%	R15RJ4	C19	CAPACITOR	47μ		C47UOZE								
				R15RJ4	C20	CAPACITOR	47N		C47UOZF								

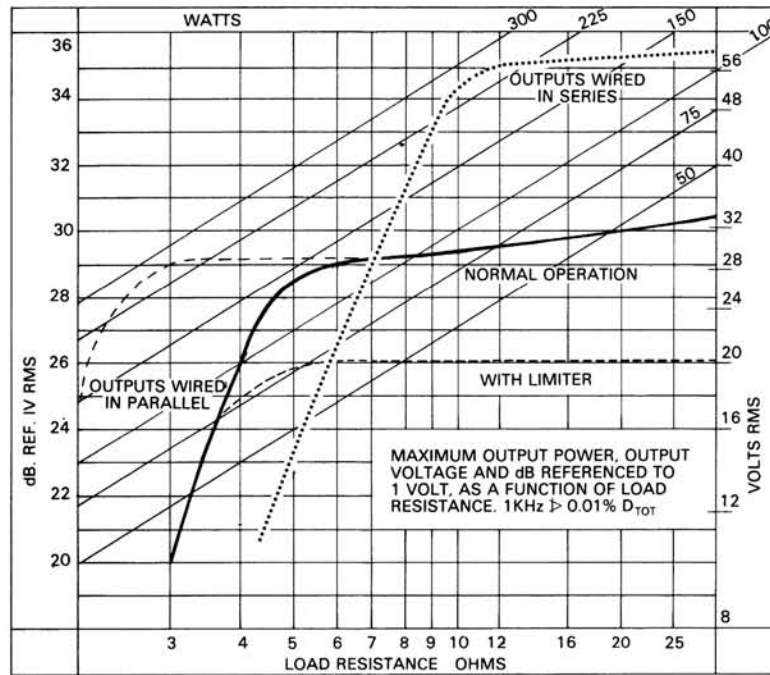
QUAD 405

APPLICATION SHEET NO. 1

Quad 405 power amplifier in single channel operation

The outputs of the Quad 405 can be connected in series or parallel to produce a single channel power amplifier capable of delivering up to 180 watts into high (12-16 Ω) or low (4 Ω) impedance loads.

The accompanying graph shows the output characteristics of the Quad 405 in either configuration.



A. Outputs wired in parallel

Power output 180 watts into 4 Ω

The input level to each channel must be adjusted by a pre-set potentiometer so that the output from each channel is identical to ensure accurate load sharing. Diagram 1 shows the input wiring arrangement.

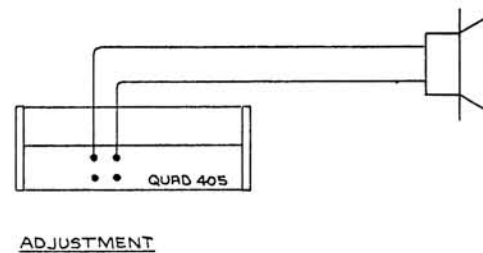
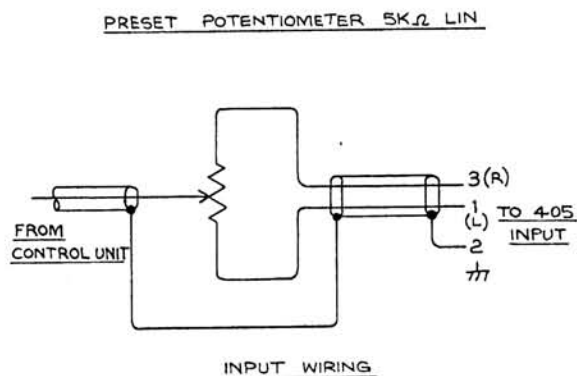


DIAGRAM 1

DIAGRAM 2

For initial adjustment the loudspeaker is connected as shown in Diagram 2. A signal is fed to the input of the amplifier. The potentiometer is adjusted until there is zero output from the loudspeaker and then sealed.

The loudspeaker is then connected as shown in Diagram 3 and the amplifier is ready for use.

OPERATION

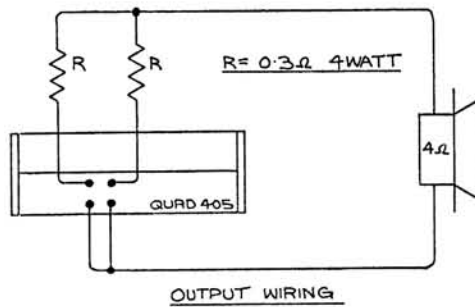


DIAGRAM 3

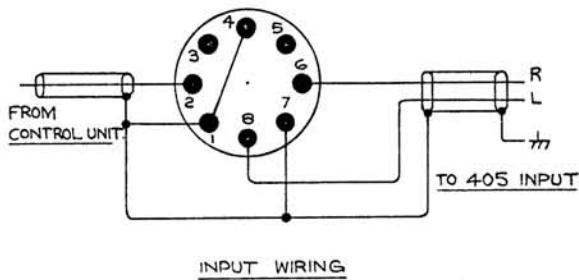
B. Outputs wired in series

Power output 180 watts into 10-16Ω.

A suitable 1:1 transformer with a centre tapped secondary such as the Quad 278Q/SP is required.

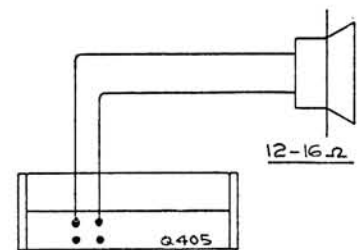
Diagram 4 illustrates the input wiring and Diagram 5 the output connections.

BASE OF 278Q/SP TRANSFORMER



INPUT WIRING

DIAGRAM 4



OUTPUT WIRING

DIAGRAM 5

NOTE:

A kit is now available to modify a Quad 405 into a single channel amplifier with outputs wired in parallel. Part No. Q410MOD.

QUAD

for the closest approach to the original sound



QUAD is a Registered Trade Mark

Accoustical Manufacturing Co. Ltd.
Huntingdon, Cambs. PE18 7DB
Telephone (0480) 52561

QUAD 405-2

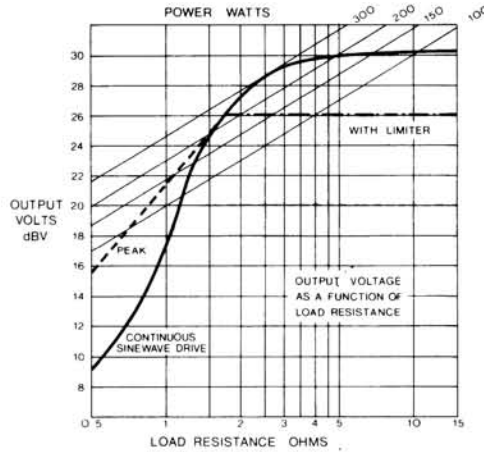
APPLICATION SHEET NO. 1

Quad 405-2 power amplifier in single channel operation

The outputs of the Quad 405-2 can be connected in series or parallel to produce a single channel power amplifier capable of delivering in excess of 200 watts into high (12-16 Ω) or low (4Ω) impedance loads.

The accompanying graph shows the output characteristics of the Quad 405-2 in either configuration.

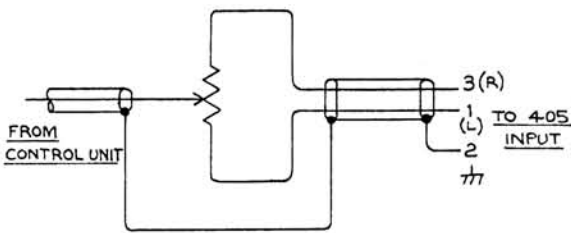
A. Outputs wired in parallel



Power output 200 watts into 4Ω .

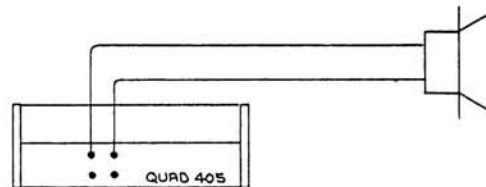
The input level to each channel must be adjusted by a pre-set potentiometer so that the output from each channel is identical to ensure accurate load sharing. Diagram 1 shows the input wiring arrangement.

PRESET POTENTIOMETER $5K\Omega$ LIN



INPUT WIRING

DIAGRAM 1



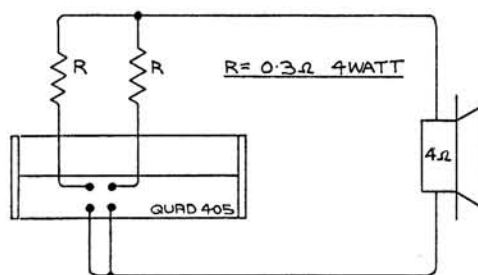
ADJUSTMENT

DIAGRAM 2

For initial adjustment the loudspeaker is connected as shown in Diagram 2. A signal is fed to the input of the amplifier. The potentiometer is adjusted until there is zero output from the loudspeaker and then sealed.

The loudspeaker is then connected as shown in Diagram 3 and the amplifier is ready for use.

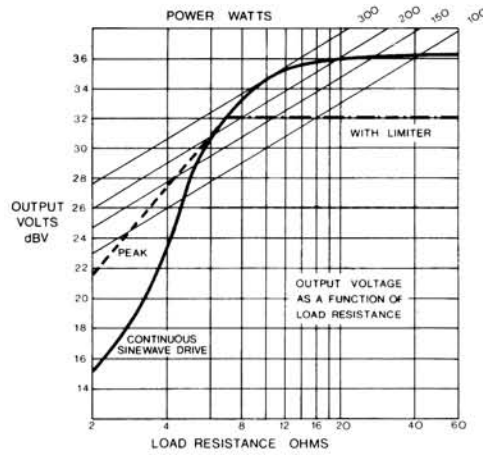
OPERATION



OUTPUT WIRING

DIAGRAM 3

B. Outputs wired in series

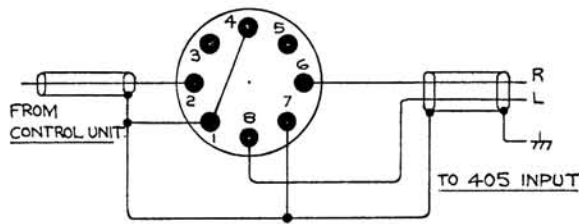


Power output 200 watts into 10-16 Ω .

A suitable 1:1 transformer with a centre tapped secondary such as the Quad L5EINAA is required.

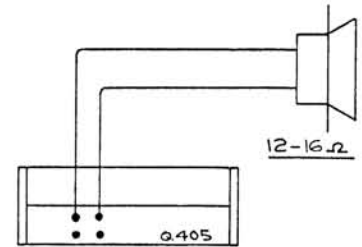
Diagram 4 illustrates the input wiring and Diagram 5 the output connections.

BASE OF 270Q/SP TRANSFORMER



INPUT WIRING

DIAGRAM 4



OUTPUT WIRING

DIAGRAM 5

NOTE: A kit is available to modify a Quad 405 into a single channel amplifier with outputs wired in parallel. Part No. Q410MOD.

QUAD

for the closest approach to the original sound



QUAD is a Registered Trade Mark

Accoustical Manufacturing Co. Ltd.
Huntingdon, Cambs. PE18 7DB
Telephone (0480) 52561

Mains voltage selection by primary links

Heat Sink

