

## SECTION 15

### TRAP VALVE AMPLIFIERS TV/17 TO TV/21

#### Introduction

The function of a trap valve amplifier is to enable a given programme to be distributed to a number of selected points in such a way that a fault occurring on one distribution circuit will not affect the programme on the remaining circuits. In many cases a trap valve amplifier comprises two or more trap valves having a common input and independent outputs.

The input impedance of a trap valve amplifier is conditioned by the source impedance to which it is connected and the number of such amplifiers

Its normal function is that of a low-gain amplifier for feeding a number of Post Office lines, but it can also be used as a medium-gain level-raising or D amplifier. The condition under which it works is determined by the setting of a two-way input switch controlling an attenuator network. With the input switch in the *Amplifier* position, the unit functions as a distribution or C amplifier having an input impedance of 3,300 ohms and a gain of 6 dB. With the switch in the *Line* position, it functions as a level raiser having an input impedance of 530 ohms and a gain of 28.5 dB.

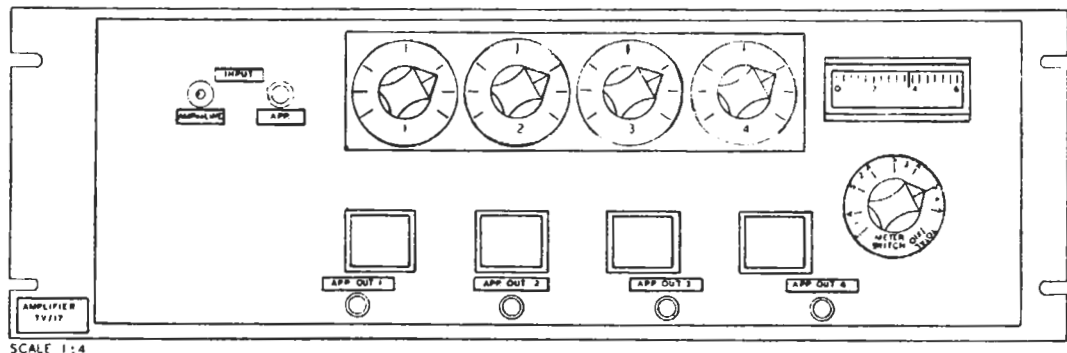


Fig. 15.1 Face Panel TV/17

likely to be connected to that source. Similarly, the output impedance is conditioned by the maximum variation in load likely to be placed across it. Thus for feeding a number of Post Office lines with a given programme, a separate output is required for each line, hence a large number of trap valves may be used, each having a high input impedance and a 600-ohm output impedance. For distribution of programme to house-phone circuits, which involves the feeding of a given programme to a large and varying number of high impedance circuits, the input impedance is usually matched to the source impedance, while the output impedance is made very low to accommodate the maximum required load without affecting level conditions.

#### Trap Valve Amplifier TV/17

The Trap Valve Amplifier TV/17 was designed as a dual-purpose amplifier for use in emergency control rooms.

The unit comprises four trap valves having a common input, each valve feeding a separate output transformer, designed for an output impedance of 600 ohms. The TV/17 is therefore capable of performing the same function as four C amplifiers.

The programme input and output circuits are connected through a 12-pin plug and socket, the details of which are shown on the circuit diagram.

#### Circuit Description (Fig. 35)

The circuit comprises an input transformer feeding into the paralleled grids of four pentodes, Type AC/SP3B, the output of each pentode being fed to a separate output transformer. The input transformer is preceded by a resistance network which can be connected in two ways according to the position of the input switch. With the switch in the *Amplifier* position, a 1,500-ohm resistor is inserted in each leg of the transformer primary, the latter being shunted by a 600-ohm resistor,

**INSTRUCTION S3**  
**Section 15**

R2. The input impedance under these conditions is 3,300 ohms.

In the *Line* position of the input switch, the primary is shunted by the whole of the resistance network in series. The secondary winding is shunted by a 300,000-ohm resistor, R4, and four gain controls each of 300,000 ohms. The transformer impedance ratio is 1 : 100. The input impedance is therefore equal to  $\frac{60,000}{100}$  ohms in parallel with 3,300 ohms, that is 530 ohms approximately. A gain-control switch is connected in the grid circuit of each valve which, when the amplifier is used as a trap valve for programme distribution, is normally adjusted so that the output level is +4 dB. The primary of each output transformer is connected in the anode circuit of the valve, the secondary winding being built out to an impedance of 600 ohms by the insertion of a 200-ohm resistor, R18, R19, in each leg.

The cathode return circuit is taken through an additional winding on the output transformer by

**Valve Data**

| Valve      | Anode Current<br>mA | Screen Current<br>mA | Fil. Volts | Fil. Amps. |
|------------|---------------------|----------------------|------------|------------|
| AC/SP3B RH | 4.5                 | 1.7                  | 4          | 1          |

Total feed for four stages, 24.8 mA.  
H.T. Supply, 250 or 300 V.  
L.T. Supply, 4 V a.c.

**General Data**

*Volume Control* (4)

*Type*, Morganite Stackpole MNAP 30450.

*Resistance*, 300,000 Ω.

*Meter*. Elliott Edgewise. Specification No. ED 1456.

*Meter Switch*. Yaxley Type A, 2-bank, 9-position.

*Impedances*

|                     |             |
|---------------------|-------------|
| Input Amp. Position | Z = 3,300 Ω |
| „ Line „            | Z = 530 Ω   |
| Output              | Z = 600 Ω   |
| Normal Load Line    | 100-2,000 Ω |

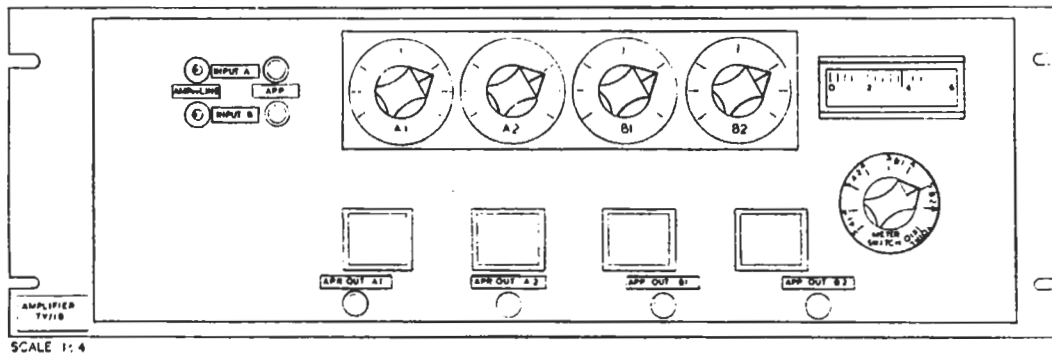


Fig. 15.2 Face Panel TV/18

means of which 20.2 dB negative voltage feedback is applied in series with the grid-cathode circuit.

An edgewise-type feed-meter is provided with each unit, together with a multi-point rotary switch by means of which anode and screen grid currents for each stage can be obtained.

**Power Supplies**

Power supplies are taken from a mains unit, type MU/8A or type MU/16. Where the type MU/8A is used, two TV/17 amplifiers are fed from each mains unit.

**Normal Working Levels**

|        | Amplifier | Line           |
|--------|-----------|----------------|
| Input  | + 4 dB    | - 24 to +4 dB. |
| Output | + 4 dB    | + 4 dB.        |

**Test Data**

600-Ω Test Gain

Test Conditions :

Volume control set at maximum gain.

Tone Source Sending Level.

Amplifier - 1.5 dB.

Line - 24.5 dB.

Gain at 1,000 c/s.

Amplifier G = 10.5 dB.  
Line G = 26.5 dB.  
Gain at 50-10,000 c/s G = + 1 dB relative to gain at 1,000 c/s.

**Maximum Working Voltage Gain**

Test Conditions :  
Output loaded with 600 Ω and output level at + 4 dB.

Gain at 1,000 c/s G = 

|           |         |
|-----------|---------|
| Amplifier | Line    |
| 6 dB      | 26.5 dB |

**Total Percentage Harmonic Content**

8 dB above normal level

|           |       |
|-----------|-------|
| 100 c/s   | < 1.0 |
| 1,000 c/s | < 1.0 |

**Trap Valve Amplifier TV/18 (Fig. 36)**

This unit is similar to the TV/17, except that it is provided with two inputs each of which is coupled to two output stages. The TV/18, therefore, comprises two separate amplifiers, mounted on a single chassis.

The two inputs are referred to as Input A and Input B, and the outputs as A1, A2; B1, B2. The secondary of the input transformer in this case is loaded with two volume controls only, hence to obtain an input impedance similar to that of the TV/17, the shunt resistance (R4) is 100,000 ohms.

In all other respects the electrical design is similar to and the unit functions in the same way as a TV/17 amplifier, but, because of its two inputs, it can be used for two programmes simultaneously, each programme being distributed to two lines or other destinations.

house-phone circuits and is used for this purpose at Broadcasting House, London.

It comprises a single push-pull stage using pentodes Type AC/SP3B. The gain of the amplifier is pre-set at zero, + 2 or + 4 dB, according to the conditions under which it is required to work.

**Circuit Description (Fig. 37)**

The input transformer secondary winding is fed in push-pull to the grids of the two pentodes. The winding is centre-tapped, each half being shunted by three resistors in series, from which tapings are taken to provide the pre-set gain adjustment.

The anodes of V1, V2 are connected to the h.t. supply through the split primary of the output transformer, T2. An additional centre-tapped winding on T2 provides 14-dB voltage feedback in series with the cathode circuits of the two valves. A variable resistor (R5) is included in the screen-grid circuit of V2, the purpose of which is to balance the anode feeds.

**Meter Circuits**

An edgewise meter mounted on the face panel can be switched across shunts to obtain individual anode and screen currents, total feed, or filament volts (d.c.).

**Valve Data**

| Valve              | Anode<br>Current<br>mA | Screen<br>Current<br>mA | Fil.<br>Volts | Fil.<br>Amps. |
|--------------------|------------------------|-------------------------|---------------|---------------|
| AC/SP3B RH         | 10.0                   | 4.5                     | 4             | 1             |
| Total feed, 29 mA. |                        |                         |               |               |

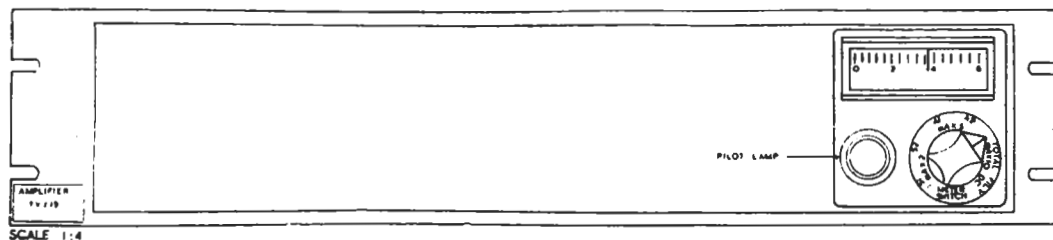


Fig. 15.3 Face Panel TV/19

The amplifier is used extensively at Broadcasting House, London. The Valve, General and Test Data are identical to the Data given for TV/17.

**Trap Valve Amplifier TV/19**

The Trap Valve Amplifier TV/19 was designed for the distribution of programme to multipled

H.T. Supply, 300 or 250 V.  
L.T. Supply, 4 V a.c. or 6 V d.c.

**General Data**

*Adjust Feed Control*  
Type, Morganite Stackpole MNAP 10350.  
Resistance, 10,000 Ω.

# INSTRUCTION S3

## Section 15

*Meter.* Elliott Edgewise. Specification No. E.D. 1456.

*Meter Switch.* Yaxley Type A, 2-bank, 9-position.

*Impedances*

Input  $Z = 50,000 \Omega$

Output  $Z = 5 \Omega$

Normal Load  $Z = 12 \Omega$

*Normal Working Levels*

Input 0 dB.

Output 0 to + 4 dB.

**Test Data**

*600- $\Omega$  Test Gain*

Test Conditions :

Volume control set at maximum gain.

Tone Source Sending Level, - 9 dB.

Gain at 1,000 c/s,  $G = 13$  dB.

Gain at 50-10,000 c/s,  $G = \pm 0.3$  dB relative to gain at 1,000 c/s.

each having two separate outputs, so that each half of the unit is capable of feeding one programme to two Post Office lines. Each output is normally adjusted to deliver a level to line of + 4 dB by means of a variable gain control.

**Circuit Description (Fig. 38)**

The two sections of the TV/20 unit are referred to as A and B, the outputs being designated A1, A2 ; B1, B2. Since the two sections are identical, only one will be described.

The secondary of the input transformer is coupled to the grids of two single amplifying valves, AC/SP3, a volume control being included in the grid circuit of each valve. 18-dB negative current feedback is obtained from the voltage developed across R6, R7, and is applied through C2. The amount of feedback is designed to give the amplifier an overall gain of 10 dB with the volume control in the maximum position.

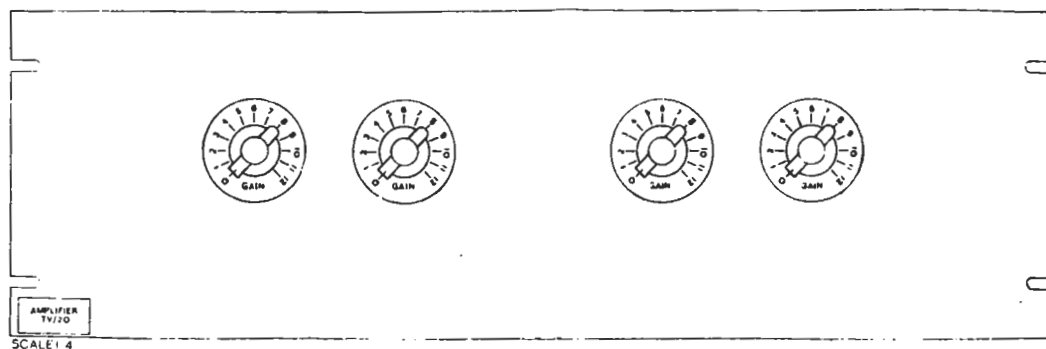


Fig. 15.4 Face Panel TV/20

*Maximum Working Voltage Gain*

Test Conditions :

Output loaded with 12  $\Omega$  and output level at + 4 dB.

Gain at 1,000 c/s  $G = 4$  dB.

*Total Percentage Harmonic Content*

|           | 8 dB above   |              |
|-----------|--------------|--------------|
|           | Normal level | normal level |
| 100 c/s   | < 0.7        | < 1.3        |
| 1,000 c/s | < 0.4        | < 1.0        |

**Trap Valve Amplifier TV/20**

The Trap Valve Amplifier TV/20 was designed as a programme distribution amplifier and comprises two separate amplifiers on one mounting,

The TV/20 is not equipped with a feed meter and switch, but a jack is provided in each section of the amplifier for measuring total cathode current.

Where a special portable feed-meter is not available, an Avometer should be used. It should be remembered that the reading obtained will represent anode and screen currents for two valves in each case. This test is carried out by means of a single-ended cord, the blue lead (ring) of which should be connected to common negative and the white lead (tip) to the + connection on the meter. In the case of an Avominor, the white lead should be connected to the 25-mA socket, the reading being taken from the centre scale and divided by 2.

**Valve Data**

| Valve             | Anode Current<br>mA | Screen Current<br>mA | Fil. Volts | Fil. Amps. |
|-------------------|---------------------|----------------------|------------|------------|
| AC/SP3B RH        | 9                   | 3.5                  | 4          | 1          |
| Total per Section | 18                  | 7.0                  |            |            |

H.T. Supply 300 V.  
L.T. Supply 4 V a.c. or 6 V d.c.

**General Data**

*Volume Control*

Type, Morganite Stackpole MNAP 20450.

Resistance, 200,000 Ω.

*Impedances*

Input Z = 8,500 Ω

Output Z = 580 Ω

Normal Load Z = 600 Ω

*Normal Working Levels*

Input 0 or + 4 dB.

Output + 4 dB or + 10 dB.

for feeding ring-main systems, comprising house-  
phone, loudspeaker and recording-room circuits.  
It normally works from zero level and delivers  
nominal output level of zero or + 4 dB, the gain  
being pre-set according to which output level is  
required. The input impedance is 1,200 ohms,  
hence, in order to maintain a terminating im-  
pedance of 600 ohms, two TV/21 amplifiers are  
normally tied to a 600-ohm source. In the event of  
an amplifier being connected independently to a  
600-ohm source, the input should be loaded with  
a resistance of 1,200 ohms.

**Circuit Description (Fig. 39)**

The circuit comprises a single push-pull stage  
using pentode valves, Type AC/SP3B. The input  
transformer has an impedance ratio of 1:100,  
each half of the split secondary winding being  
loaded with 50,000-ohms resistance (R2, R3)  
which gives a theoretical input impedance of 1,000  
ohms. This is increased to 1,200 ohms by the total

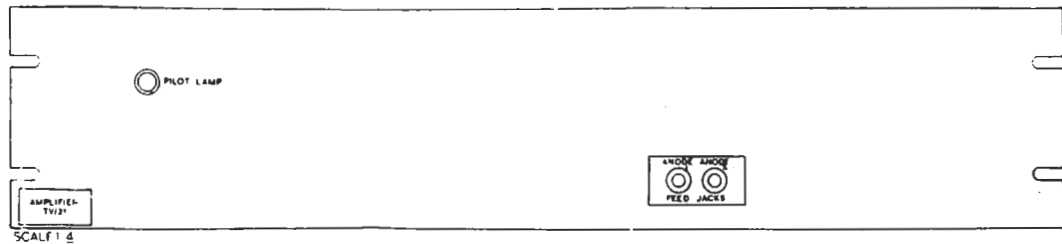


Fig. 15.5 Face Panel TV/21

**Test Data**

*600-Ω Test Gain*

Test Conditions :

Volume control set at maximum gain,

Tone Source Sending Level - 8 dB.

Gain at 1,000 c/s, G = 17.5 dB.

Gain at 50-10,000 c/s, G = ± 0.5 dB relative to  
gain at 1,000 c/s.

*Maximum Working Voltage Gain*

Test Conditions :

Output loaded with 600 Ω and output level  
at + 4 dB.

Gain at 1,000 c/s, G = 12 dB.

*Total Percentage Harmonic Content*

Normal level 8 dB above  
(+ 10dB) normal level

100 c/s

< 1.26 < 2.4

1,000 c/s

< 0.5 < 1.3

**Trap Valve Amplifier TV/21**

The Trap Valve Amplifier TV/21 was designed

a.c. resistance of the two secondary windings.  
Grid stoppers, R17, R18, are fitted in each grid  
lead, the resistor being mounted inside the grid  
cap. The two valves are independently biased by  
resistors R5 and R8, the bias being applied  
through R7 and R10.

Negative feedback is applied as follows :—

Voltage feedback is tapped off from the  
potentiometers comprising R11, R12 and R13,  
R14, and fed to the respective grids through C2,  
C3. Current feedback, derived from the unde-  
coupled cathode resistors R5, R6 and R8, R9,  
is fed to the grids through the same path as the  
voltage feedback via C1. The total feedback  
obtained is either 22 dB or 26 dB according to  
the values of R12 and R14. These values are  
determined on installation according to whether a  
nominal gain of zero or + 4 dB is required. For  
zero level the value is 13,000 ohms and for + 4 dB  
6,000 ohms.

The anodes of the valves are connected direct

# INSTRUCTION S3

## Section 15

to a split-primary output transformer, T2, which has a very low output impedance. The amplifier has no permanent metering facilities. A feed jack has, however, been inserted in the positive h.t. supply lead to each anode. In the absence of a special feed-meter, feeds should be taken by means of an Avometer, as indicated in the instruction on TV/20.

### Valve Data

| Valve                 | Anode Current<br><i>mA</i> | Screen Current<br><i>mA</i> | Fil. Volts | Fil. Amps. |
|-----------------------|----------------------------|-----------------------------|------------|------------|
| AB SP3B RH (2) 13     |                            | 4.5                         | 4          | 1          |
| H.T. Supply, 300 V.   |                            |                             |            |            |
| L.T. Supply, 4 V a.c. |                            |                             |            |            |

### General Data

#### Impedances

|                 |                    |
|-----------------|--------------------|
| Input           | Z = 1,200 $\Omega$ |
| Output          | Z = 5.3 $\Omega$   |
| Normal Load Z = | 10 $\Omega$        |

### Normal Working Levels

|        |                      |
|--------|----------------------|
| Input  | 0 dB.                |
| Output | + 4 dB into 10 ohms. |

### Test Data

#### 600- $\Omega$ Test Gain

##### Test Conditions :

Tone Source Sending Level, - 2.5 dB.

Gain at 1,000 c/s, G = 10 dB.

Gain at 50-10,000 c/s, G =  $\pm$  0.2 relative to gain at 1,000 c/s.

#### Maximum Working Voltage Gain

##### Test Conditions :

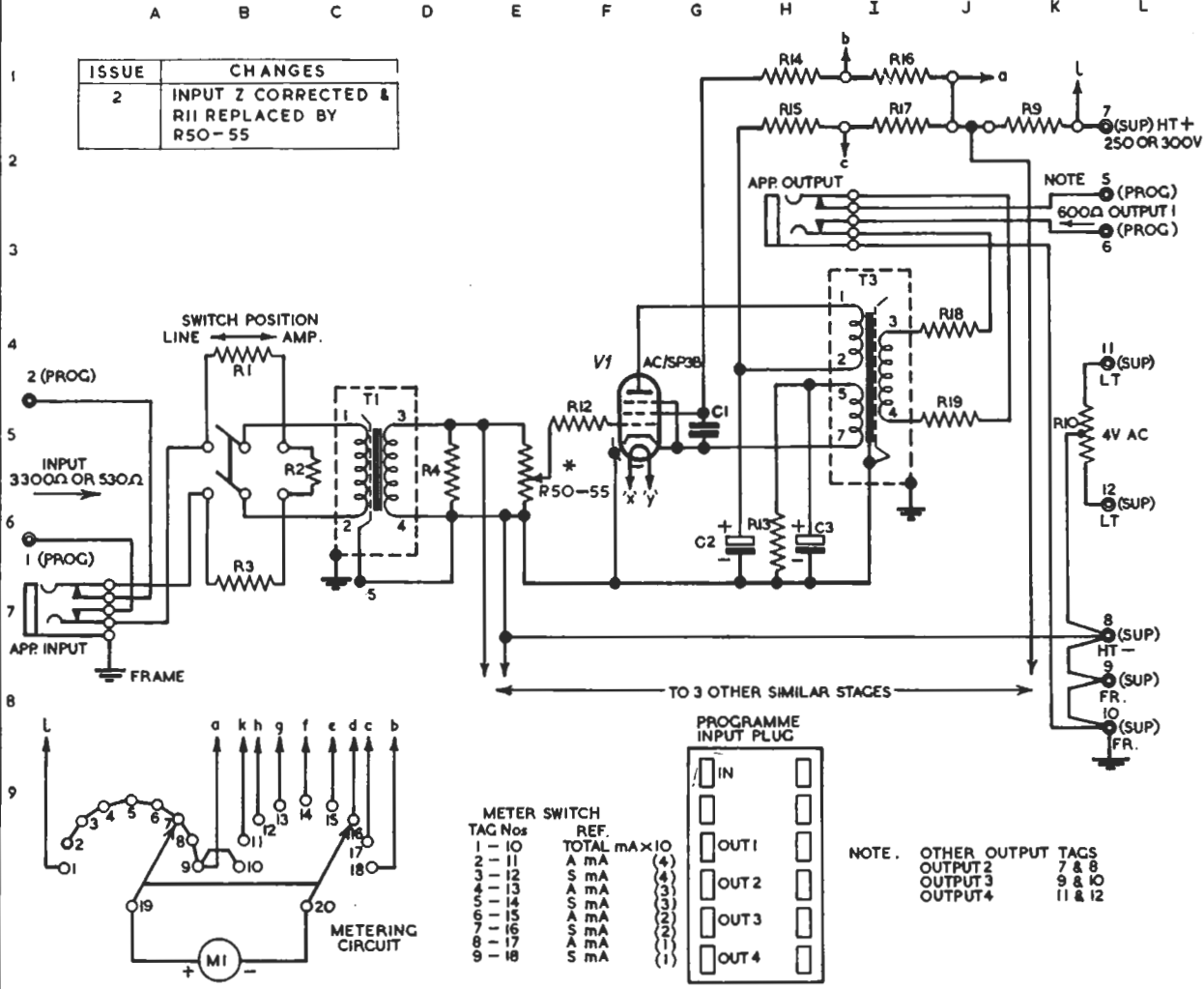
Output loaded with 10  $\Omega$  and output level at + 4 dB.

Gain at 1,000 c/s, G = 4 dB.

#### Total Percentage Harmonic Content

|                                       | Normal level<br>(+ 4 dB) | 8 dB above<br>normal level |
|---------------------------------------|--------------------------|----------------------------|
| 100 c/s                               | < 0.2                    | < 1.0                      |
| 1,000 c/s                             | < 0.2                    | < 0.5                      |
| 1,000 c/s at 12 dB above normal level |                          | 10                         |

| ISSUE | CHANGES                                    |
|-------|--|
| 2     | INPUT Z CORRECTED & R11 REPLACED BY R50-55 |



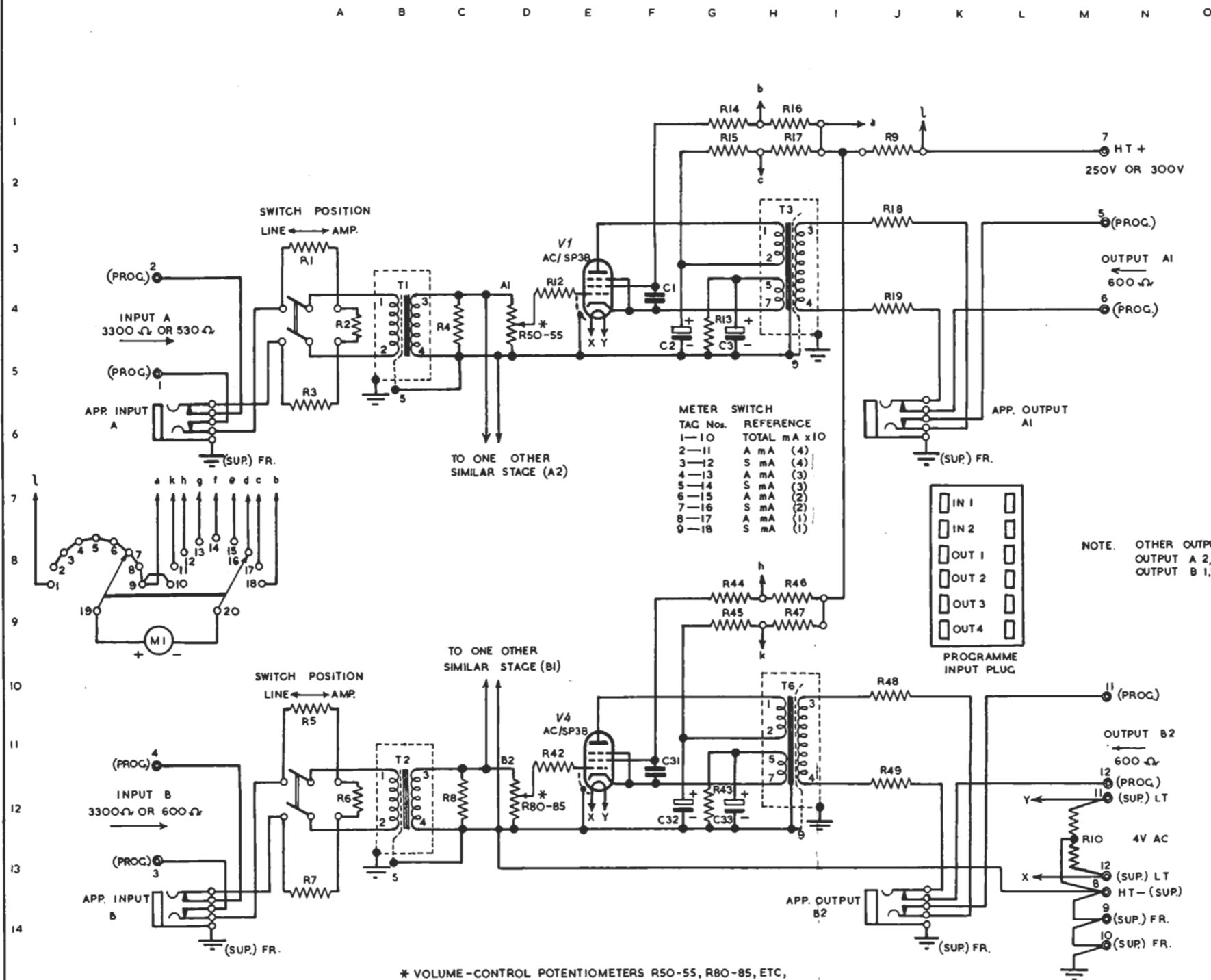
\* VOLUME-CONTROL POTENTIOMETERS R50-55 ETC CAN BE SWITCHED FOR OUTPUT LEVELS OF +6,+4,+2,0,-2 & -4db OR TO 'OFF'

| COMP | LOC | VALUES   | TYPE      | COMP | LOC | VALUES      | TYPE       |
|------|-----|----------|-----------|------|-----|-------------|------------|
| C1   | G5  | 2μF      | 78        | R15  | H2  | 10 000Ω     | 0.25 WATT  |
| C2   | G6  | 16 "     | MAI4556   | R16  | I1  | 33.3 "      |            |
| C3   | H6  | 250 "    | MAIO154   | R17  | I2  | 33.3 "      |            |
|      |     |          |           | R18  | J4  | 200 "       | 0.25 WATT  |
|      |     |          |           | R19  | J5  | 200 "       | " "        |
| R1   | B4  | 1500Ω    | 0.25 WATT | R50  | E5  | 62 000Ω ±5% | 0.125 WATT |
| R2   | C5  | 600 "    | " "       | R51  | E5  | 47 000 "    | " "        |
| R3   | B7  | 1500 "   | " "       | R52  | E5  | 39 000 "    | " "        |
| R4   | D5  | 300 000Ω | " "       | R53  | E5  | 30 000 "    | " "        |
| R9   | K2  | 2.56Ω    | " "       | R54  | E6  | 24 000 "    | " "        |
| R10  | K5  | 10+10 "  | " "       | R55  | E6  | 100 000 "   | " "        |
| R12  | F5  | 5000 "   | 0.25 WATT |      |     |             |            |
| R13  | H6  | 250 "    | " "       | T1   | C5  | 1:10        | LG/8 SA    |
| R14  | H1  | 100 000Ω | " "       | T3   | I4  | 8.05:1      | AL/6 RA    |

TRAP VALVE AMPLIFIER TV/17

This drawing is the property of the British Broadcasting Corporation and may not be reproduced or disclosed to a third party in any form without the written permission of the Corporation.

This drawing is the property of the British Broadcasting Corporation and may not be reproduced or disclosed to a third party in any form without the written permission of the Corporation.



METER SWITCH REFERENCE

| TAC Nos. | TOTAL mA x10 |
|----------|--------------|
| 1-10     |              |
| 2-11     | A mA (4)     |
| 3-12     | S mA (4)     |
| 4-13     | A mA (3)     |
| 5-14     | S mA (3)     |
| 6-15     | A mA (2)     |
| 7-16     | S mA (2)     |
| 8-17     | A mA (1)     |
| 9-18     | S mA (1)     |

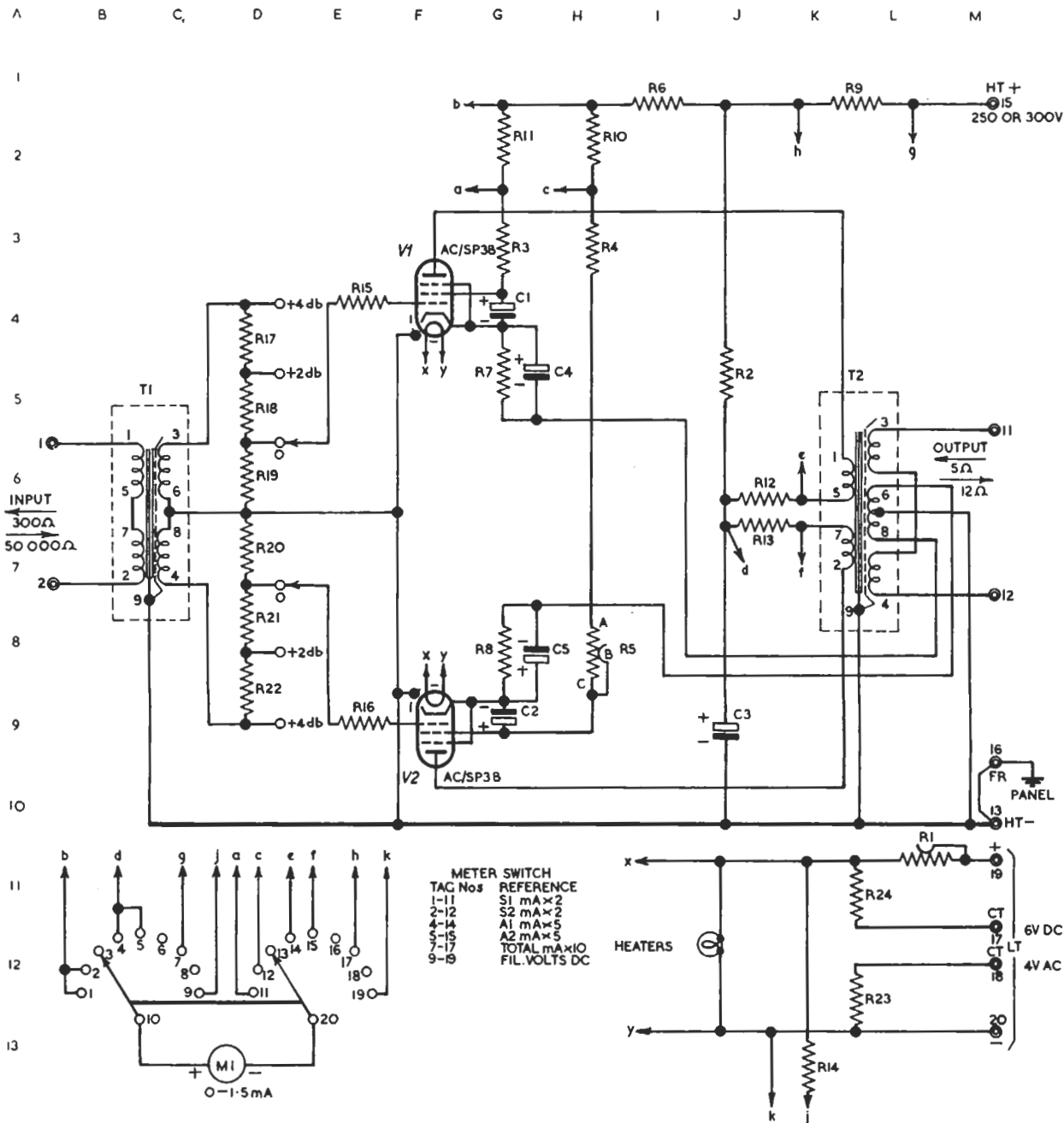
| ISSUE | CHANGES   |
|-------|---|
| 2     | INPUT Z CORRECTED & R11, R41 REPLACED BY R50-55, R80-85 |

| COMP.   | LOC.    | VALUE         | TYPE         |
|---------|---------|---------------|--------------|
| C1      | F4      | 2 μF          | TCC TYPE 87  |
| C2      | F5      | 16 "          | BEC MA 14556 |
| C3      | G5      | 250 "         | BEC MA 10154 |
| C31     | F11     | 2 "           | TCC TYPE 87  |
| C32     | F12     | 16 "          | BEC MA 14556 |
| C33     | G12     | 250 "         | BEC MA 10154 |
|         |         |               |              |
| R1      | A3      | 1500 Ω        | 0.25 WATT    |
| R2      | A4      | 600 "         | " "          |
| R3      | A6      | 1500 "        | " "          |
| R4      | C4      | 100 000 "     | " "          |
| R5      | A10     | 2 000 "       | " "          |
| R6      | A12     | 600 "         | " "          |
| R7      | A13     | 2 000 "       | " "          |
| R8      | C12     | 100 000 "     | " "          |
| R9      | J2      | 2.56 "        |              |
| R10     | M13     | 10 + 10 "     |              |
|         |         |               |              |
| R12     | E4      | 5 000 "       | 0.25 WATT    |
| R13     | G4      | 250 "         | " "          |
| R14     | G1      | 100 000 "     | 0.5 "        |
| R15     | G2      | 10 000 "      | " "          |
| R16,17  | H1,2    | 33.3 "        |              |
| R18,19  | J3,4    | 200 "         | 0.25 "       |
|         |         |               |              |
| R42     | D11     | 5 000 "       | 0.25 "       |
| R43     | G12     | 250 "         | " "          |
| R44     | G9      | 100 000 "     | 0.5 "        |
| R45     | G9      | 10 000 "      | " "          |
| R46,47  | H8 H9   | 33.3 "        |              |
| R48,49  | J10,J12 | 200 "         | 0.25 "       |
|         |         |               |              |
| T1      | B4      | 1 : 10        | LG/8SA       |
| T2      | B12     | 1 : 10        | LG/8SA       |
| T3      | H3      | B-05 : 1      | AL/6RA       |
| T6      | H11     | B-05 : 1      | AL/6RA       |
|         |         |               |              |
| R50,80  | D4, D11 | 62 000 Ω ± 5% | 0.125 WATT   |
| R51, 81 | D4, D11 | 47 000 "      | " "          |
| R52,82  | D4, D12 | 39 000 "      | " "          |
| R53,83  | D5, D12 | 30 000 "      | " "          |
| R54,84  | D5, D13 | 24 000 "      | " "          |
| R55,85  | D5, D13 | 100 000 "     | " "          |

TRAP VALVE AMPLIFIER TV/18



This drawing is the property of the British Broadcasting Corporation and may not be reproduced or disclosed to a third party in any form without the written permission of the Corporation.

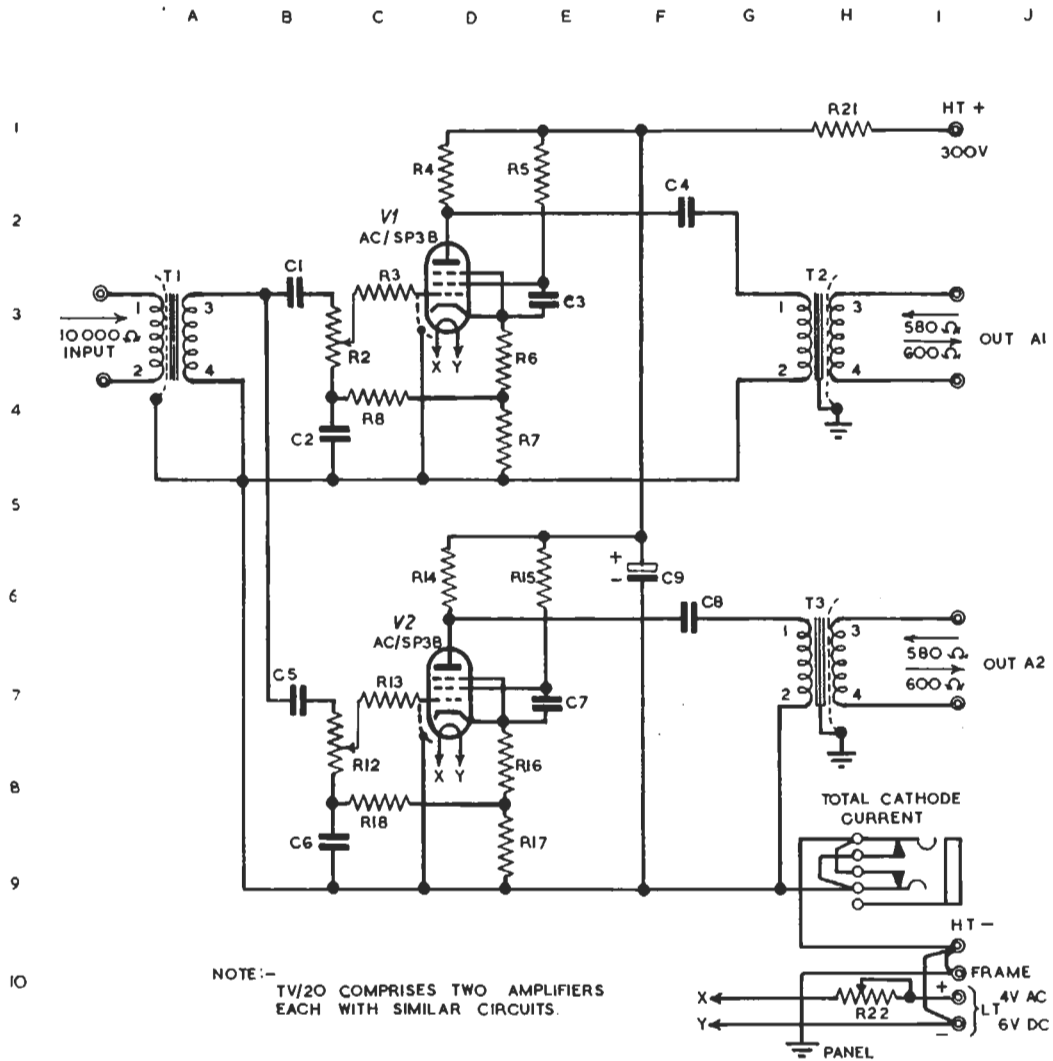


NOTE 1 R6 SHORTED WHEN USING 250V HT SUPPLY  
2 WHEN LT SUPPLY IS AC TERMINALS 13 & 17 AND 17 & 18 ARE TO BE STRAPPED R1 TO BE SHORTED BY ADJUSTING SLIDER

| COMP.  | LOC.    | VALUES   | TYPE     | COMP.  | LOC.  | VALUES  | TYPE     | COMP.  | LOC.   | VALUES    | TYPE      |
|--------|---------|----------|----------|--------|-------|---------|----------|--------|--------|-----------|-----------|
| C1,2,3 | G4,9,J9 | 16 μF    | MA14556  | R6     | I1    | 5000Ω   | 1.0 WATT | R18    | D5     | 50 000Ω   | 0.25 WATT |
| C4,5   | G5,8    | 250 "    | MA14580  | R7,8   | G5,8  | 150 "   | .5 "     | R19,20 | D6,7   | 210 000 " | " "       |
|        |         |          |          | R9     | K1    | 2.56 "  | " "      | R21    | D8     | 50 000 "  | " "       |
|        |         |          |          | R10,11 | H2,G2 | 14.3 "  | " "      | R22    | D9     | 70 000 "  | " "       |
| R1     | L11     | 2Ω       | " "      | R12    | J6    | 5.26 "  | " "      | R23,24 | K12,11 | 10 "      | " "       |
| R2     | J5      | 2000 "   | " "      | R13    | J6    | 5.26 "  | " "      |        |        |           |           |
| R3     | G3      | 20 000 " | 1.0 WATT | R14    | J13   | 3900 "  | " "      |        |        |           |           |
| R4     | H3      | 15000 "  | " "      | R15,16 | E4,9  | 5000 "  | 0.25 "   | T1     | C6     | 1:3-63    | LGC/7R B  |
| R5     | HR      | 10000 "  | " "      | R17    | D4    | 70000 " | " "      | T2     | L6     | 64.8:1    | ALL/9RA   |

TRAP VALVE AMPLIFIER TV/19

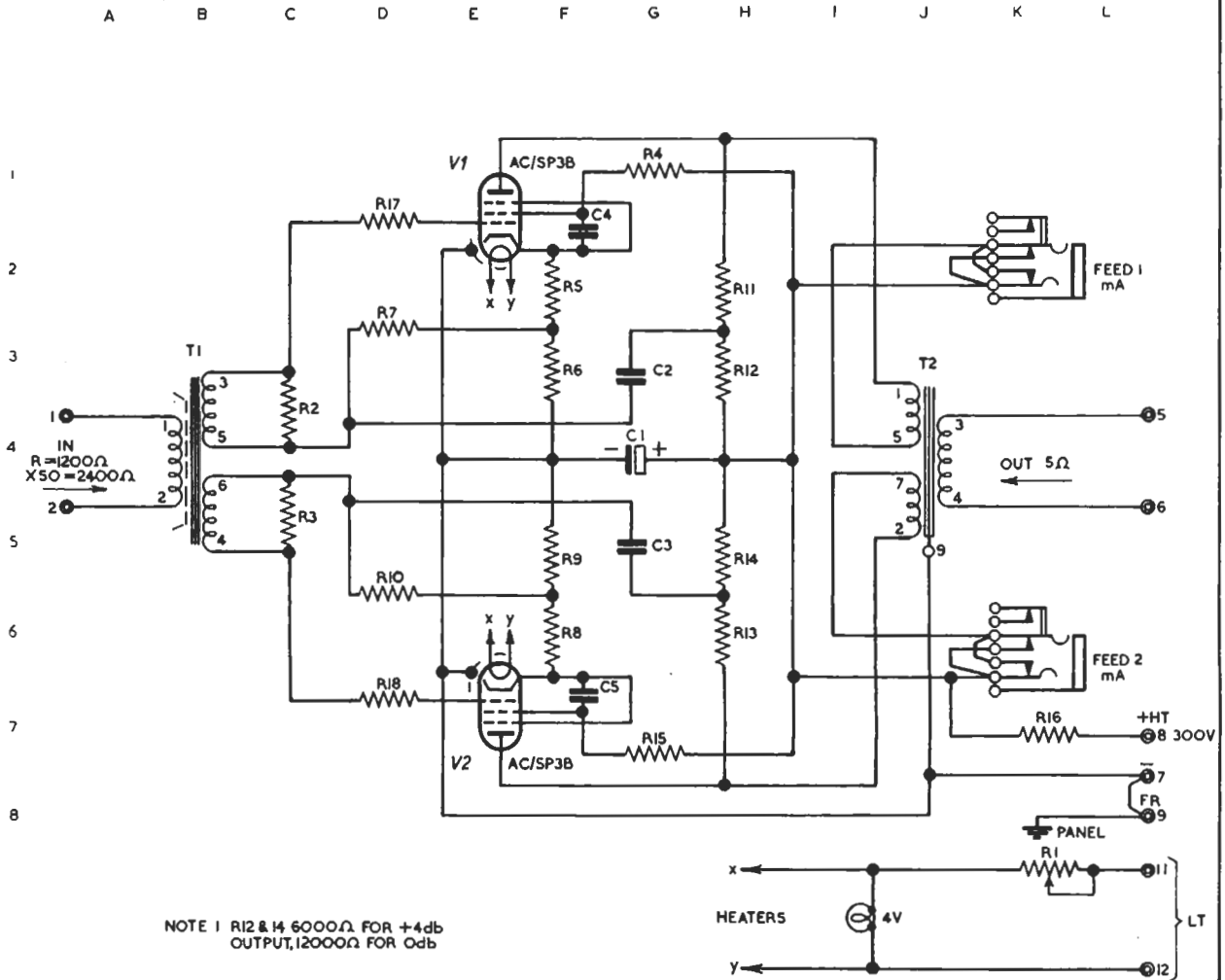
This drawing is the property of the British Broadcasting Corporation and may not be reproduced or disclosed to a third party in any form without the written permission of the Corporation.



NOTE:-  
TV/20 COMPRISES TWO AMPLIFIERS  
EACH WITH SIMILAR CIRCUITS.

| COMP | LOC. | VALUE       | TYPE                 | COMP | LOC. | VALUE            | TYPE   | COMP | LOC. | VALUE        | TYPE                  |
|------|------|-------------|----------------------|------|------|------------------|--------|------|------|--------------|-----------------------|
| C1   | B3   | 0.2 $\mu$ F | TCC TYPE 431         | R2   | C3   | 200 000 $\Omega$ |        | R16  | E8   | 250 $\Omega$ | 0.5 W                 |
| C2   | C4   | 0.5 "       | " " 87               | R3   | C3   | 5 000 "          | 0.25 W | R17  | E9   | 1300 "       | 0.5 "                 |
| C3   | E3   | 2 "         | " " "                | R4   | D2   | 20 000 "         | 3 "    | R18  | C8   | 100 000 "    | 0.25 "                |
| C4   | F2   | 0.5 "       | " " "                | R5   | E2   | 30 000 "         | 1 "    | R21  | H1   | 1 000 "      | 1 "                   |
| C5   | B7   | 0.2 "       | " " 431              | R6   | D3   | 250 "            | 0.5 "  | R22  | H10  | 2 "          |                       |
| C6   | C9   | 0.5 "       | " " 87               | R7   | D4   | 1300 "           | 0.5 "  | T1   | A3   | 1:3.16       | LG/7SG OR<br>LG/16RD  |
| C7   | E7   | 2 "         | " " "                | R8   | C4   | 100 000 "        | 0.25 " | T2   | H3   | 5.9:1        | No 271C OR<br>AL/20RD |
| C8   | F6   | 0.5 "       | " " "                | R12  | C8   | 200 000 "        |        | T3   | H7   | 5.9:1        | No 271C OR<br>AL/20RD |
| C9   | F6   | 16 "        | TYPE BEC MA<br>14556 | R13  | C7   | 5 000 "          | 0.25 " |      |      |              |                       |
|      |      |             |                      | R14  | D6   | 20 000 "         | 3 "    |      |      |              |                       |
|      |      |             |                      | R15  | E6   | 30 000 "         | 1 "    |      |      |              |                       |

TRAP VALVE AMPLIFIER TV/20



| COMP | LOC. | VALUES    | TYPE          | COMP   | LOC. | VALUES       | TYPE         |
|------|------|-----------|---------------|--------|------|--------------|--------------|
| C1   | G4   | 16 μF     | BEC MA1S129   | R9     | F5   | 240 Ω        | 0.25W OR .5W |
| C2,3 | G3,5 | 0.1 "     | TCC 431       | R10    | D6   | 200 000 "    | 0.25W        |
| C4,5 | F1,7 | 2 "       | " 87          | R11    | H2   | 110 000 "    | 0.25W OR .5W |
|      |      |           |               | R12    | H3   | SEE NOTE     | " " "        |
|      |      |           |               | R13    | H6   | 110 000 Ω    | " " "        |
| R1   | L8   | 2 Ω       | PAINTON 3B1   | R14    | H5   | SEE NOTE     | " " "        |
| R2,3 | C4,5 | 50 000 "  | 0.25 W        | R15    | G7   | 20 000 Ω     | .5W          |
| R4   | G1   | 20 000 "  | .5 W          | R16    | K7   | 1000 "       | 1 W          |
| R5   | F2   | 170 "     | 0.25W OR .5 W | R17,18 | D1,7 | 5000 "       | 0.25W        |
| R6   | F3   | 240 "     | " " "         |        |      |              |              |
| R7   | D3   | 200 000 " | 0.25W         | T1     | B4   | 1:10 OVERALL | LGG/135A     |
| R8   | F6   | 170 "     | 0.25W OR .5W  | T2     | J4   | 70.7:1       | AAL/11RD     |

TRAP VALVE AMPLIFIER TV/21

This drawing is the property of the British Broadcasting Corporation and may not be reproduced or disclosed to a third party in any form without the written permission of the Corporation.