

J. E. SUGDEN

# A21 SERIES TWO CLASS A AMPLIFIER INSTRUCTION LEAFLET

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**SPECIFICATION** (all levels quoted  $\pm 1$ dB)

|  |  |
|--|--|
| Power output :                               | 12 watts RMS per channel (24 watts RMS both channels simultaneous operation) at clipping level into 8 ohm load   |
| Total harmonic distortion                    | less than 0.2% at 10 watts, mainly 2nd & 3rd harmonic, negligible proportion of high order harmonics and reducing in proportion with reducing power to give less than .01% at $\frac{1}{2}$ watt - i.e. the average power listening level. |
| Frequency and power response                 | $\pm 1$ dB 30Hz to 20KHz   |
| Output to tape recorder                      | direct connection from radio and aux. inputs, 150mV from disc amplifier when correctly loaded.   |
| Input sensitivity :                          | 150mV into 200Kohm flat response   |
| Radio  | "    "    "    "    "  |
| Tape   | "    "    "    "    "  |
| Auxiliary                                    | "    "    "    "    "  |
| Magnetic Cartridge                           | 2.5mV into 68K, equalized to R.I.A.A.  |
| Ceramic Cartridge                            | 50mV into special input circuit.   |
| Overload capabilities                        | 25dB on disc inputs; infinite on radio, aux. and tape inputs.  |
| Signal to noise ratio<br>(30 phon weighting) | 80dB on radio, aux and tape inputs<br>70dB on disc inputs  |
| Interchannel crosstalk                       | typically 40dB 20Hz - 10KHz, dependent upon input load impedance   |
| Rumble filter                                | Built in on disc input, 18dB per octave below 30Hz.  |
| Control knobs :                              |  |
| Bass   | $\pm 14$ dB at 40Hz  |
| Treble                                       | $\pm 14$ dB at 10KHz   |
| Volume                                       | Logarithmic (Channel Balance $\pm 1$ dB maintained to 40dB attenuation)  |
| Balance                                      | $\pm 6$ dB for 180° rotation, either channel eliminated at limits of rotation.   |
| Push buttons to select :                     | DISC, RADIO, AUXILIARY, TAPE.  |
| Inputs                                       |  |
| High frequency filter                        | 12dB per octave above 7KHz.  |
| Function                                     | MONO, STEREO, INPUT RIGHT, INPUT LEFT  |
| General :                                    |  |
| Power consumption                            | 70 watts   |
| Size   | 15 $\frac{1}{2}$ " x 5" x 9" (400 x 130 x 230 mm)  |
| Weight                                       | 24 lbs (11 Kg)   |



**COMPONENT LIST PRE-AMPLIFIER SECTION**

|     |      |     |      |      |              |     |          |     |       |
|-----|------|-----|------|------|--------------|-----|----------|-----|-------|
| R1  | 100K | R17 | 4.7K | R33  | 1.5K         | C4  | 80       | C20 | .022  |
| R2  | 1M   | R18 | 2.2M | R34  | 4.7K         | C5  | .1       | C21 | .1    |
| R3  | 1.2K | R19 | 5.6K | R35  | 1.2K         | C6  | 47p      | C22 | 25    |
| R4  | 100K | R20 | 680  | R36  | 8.2K         | C7  | .1       | C23 | 80    |
| R5  | 47K  | R21 | 470K | R37  | 330          | C8  | 2.5      | C24 | 2.5   |
| R6  | 2.2K | R22 | 1.2K | VR1  | 250K LOG.    | C9  | 25       | C25 | 400   |
| R7  | 3.3K | R23 | 1M   | VR2  | 50K          | C10 | 3600p    | C26 | 400   |
| R8  | 2.7K | R24 | 4.7K | VR2T | 250K Trimmer | C11 | 1000p    |     |       |
| R9  | 39K  | R25 | 2.2K | VR3  | 250K         | C12 | not used | VT1 | BC109 |
| R10 | 1M   | R26 | 2.2M | VR3T | 1M Trimmer   | C13 | 80       | VT2 | BC109 |
| R11 | 68K  | R27 | 8.2M | VR4  | 50K          | C14 | .1       | VT3 | BC109 |
| R12 | 4.7K | R28 | 39K  |      |              | C15 | .01      | VT4 | BC109 |
| R13 | 2.2K | R29 | 18K  | C1   | 470p         | C16 | .01      |     |       |
| R14 | 2.2M | R30 | 18K  | C2   | not used     | C17 | .01      |     |       |
| R15 | 470K | R31 | 220K | C3   | .1           | C18 | 2200p    |     |       |
| R16 | 8.2K | R32 | 47K  |      |              | C19 | .022     |     |       |

**COMPONENT LIST POWER AMPLIFIER SECTION**

|     |      |     |      |     |          |     |      |     |           |
|-----|------|-----|------|-----|----------|-----|------|-----|-----------|
| R1  | 2.4K | R13 | 2.7K | R25 | 390      | C6  | 400  | VT1 | BC109     |
| R2  | 470K | R14 | 3.3K | R26 | 390      | C7  | 400  | VT2 | BFY53     |
| R3  | 220K | R15 | 2.7K | R27 | 1.0      | C8  | 400  | VT3 | BC109     |
| R4  | 4.7K | R16 | 3.9K | R28 | 100      | C9  | 470p | VT4 | BFY52     |
| R5  | 4.7K | R17 | 100  | Rx* | 27K-150K | C10 | 80   | VT5 | BFY52     |
| R6  | 47   | R18 | 100  | VR1 | 1K       | C11 | 4000 | VT6 | BDY38     |
| R7  | 1K   | R19 | 0.7  |     |          | C12 | .1   | VT7 | BDY38     |
| R8  | 330  | R20 | 1.0  | C1  | 470p     | C13 | 2500 |     |           |
| R9  | 680  | R21 | 10   | C2  | .1       | C14 | 2500 | X1  | BAX13     |
| R10 | 5.6K | R22 | 10   | C3  | 80       | C15 | .1   | X2  | BYX36-150 |
| R11 | 1.2K | R23 | 10   | C4  | 2200p    | C16 | .022 | X3  | BYX36-150 |
| R12 | 10   | R24 | 10   | C5  | 80       |     |      |     |           |

\*For channel balance (one channel only) Adjust on test



## INSTALLATION

The amplifier is fully integrated and supplied complete in a Teak veneered case. This case may be removed if required (after disconnection from the mains) by carefully standing the amplifier on the heat sinks at the rear and unscrewing the four mounting feet on the base. The case may then be lifted clear of the amplifier chassis.

It is not advisable to mount the amplifier in a vertical position, and care must be taken to ensure adequate ventilation. The heat sinks at the rear of the amplifier must be unobstructed.

## CONNECTIONS

### i. Mains

Approximately 10 feet (3 metres) of 3 core cable is supplied for connection to the mains supply. The colour coding of the mains lead is BROWN - LIVE; BLUE - NEUTRAL; GREEN/YELLOW - EARTH. A safety earth terminal is provided on the back panel adjacent to the mains input lead. This terminal may be used for the connection of an earth lead where it is inconvenient to use the green/yellow core of the mains lead. This terminal is NOT for the earthing of ancilliary equipment.

A voltage selector plug is provided on the rear panel to cope with all normal supply voltages. This will normally be set for 240 volts, but should any alteration be necessary the plug should be pulled outwards and rotated until the required voltage is in alignment with the arrow marked on the panel. The plug may then be re-inserted into the socket.

An auxiliary mains output socket is provided for connecting to ancillary equipment such as a turntable or self-powered radio tuner. The total load on this outlet should not exceed 150 watts.

Viewing from the underside of the amplifier, the mains fuse (1 amp) is located on the right hand side member of the chassis, and the two L.T. fuses (1 amp) are mounted on the power amplifier printed circuit panels.

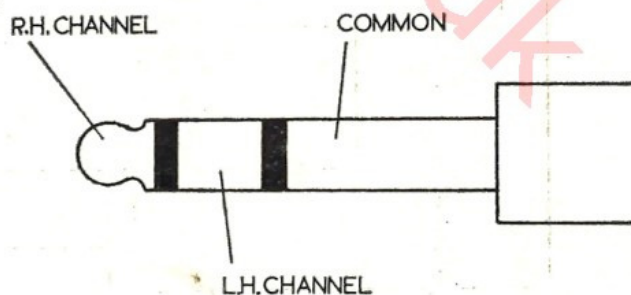
### ii. Loudspeakers

Loudspeaker connections are made via the red and black 4 mm sockets provided on the rear panel. Mains twin flex (14/0076 preferably colour coded for ease of phasing) is recommended for the connecting wire.

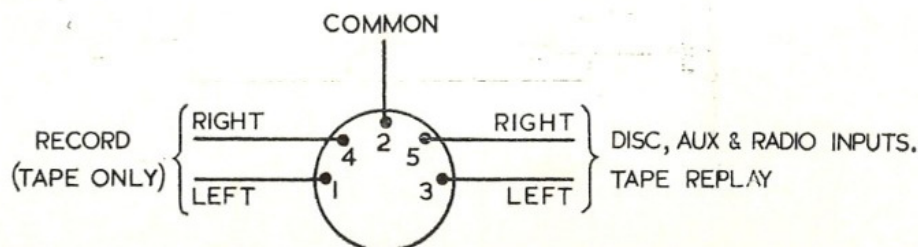
The amplifier produces its full rated output into loudspeakers of 8 ohms impedance. It will, however, operate satisfactorily into loudspeakers of higher impedance, but at reduced maximum output (approximately 9 watts into 15 ohms).

### iii. Headphones

A headphone socket is provided on the front panel of the amplifier. When the plug is inserted the loudspeakers are automatically disconnected.



### iv. Inputs



Four input sockets are provided with 5 pin DIN plugs for DISC, AUX., RADIO and TAPE, which should be wired according to DIN standards as shown, viewing from the inside of the plug, i.e. at the solder tag end.

Please note that on DISC inputs, pin 1 is connected internally in the amplifier to pin 5, and may be used as an alternative for R.H. input.

### **Earthing of DISC input**

It is important that the L.H. and R.H. screened leads from the pick-up cartridge, and the chassis lead (sometimes combined in the pick-up lead) should be connected **ONLY** to pin 2 of the DIN plug. Do **NOT** connect to the plug body, and care must be taken to insulate the screens from the plug body securing clip.

## **OPERATION**

Control facilities are provided by means of four knobs - BASS, TREBLE, BALANCE, combined VOLUME - ON/OFF switch, and six push buttons on the front panel.

The push-buttons, which are of independent push on and push off operation offer facilities as follows :-

**INPUT SELECTION** — this is controlled by the two extreme left hand buttons allowing four selections to be made :-

|                       |     |     |                        |
|-----------------------|-----|-----|------------------------|
| DISC button in        | ... | ... | magnetic cartridge     |
| Both buttons out      | ... | ... | ceramic cartridge      |
| RADIO (DISC & AUX in) | ... | ... | radio (stereo or mono) |
| AUX in                | ... | ... | auxiliary              |

The AUX facility has the same sensitivity as the RADIO input allowing the use of an additional tuner or other high level programme source.

## **TAPE**

To play pre-recorded tape the TAPE button should be depressed.

To record from programme sources, e.g. disc or radio, it is necessary to depress those input buttons normally required to select that source (as described above). The selected input is automatically connected to the tape output socket. If the output from the monitoring circuit on the tape recorder is connected to the tape input of the amplifier, A-B monitoring is possible by depressing the TAPE button.

## **FILTER**

This is a high frequency filter and comes into operation when the FILTER button is depressed. It is useful for removing undesirable surface noise or distortion from old or inferior discs. A built-in rumble filter is incorporated on the disc inputs.

## **FUNCTION**

The two end right hand buttons select as follows :-

|                           |     |     |   |
|---------------------------|-----|-----|---|
| STEREO (both buttons out) | ... | ... | Stereo  |
| LEFT in                   | ... | ... | left hand input to both amplifiers                  |
| RIGHT in                  | ... | ... | right hand input to both amplifiers                 |
| MONO (both buttons in)    | ... | ... | left and right hand inputs mixed to both amplifiers |

*The right is reserved to change the specification or design without notice*

**J. E. Sugden & Co. Ltd., Bradford Road, Cleckheaton, Yorkshire**

# AMENDMENTS TO LATER PRODUCTION MODELS

## In Specification :

Rumble filter altered to 18 dB per octave below 30 Hz.

## On Power Amplifier Circuit :

The following omission was made in the circuit diagram and is present on all amplifiers. C17 .1 $\mu$ F in series with R25—R29 inc. in parallel, each of 10 ohms. i.e. to make 2.5 ohms, connected from VT6 collector to ground.

X3 added in parallel with R13, anode connected to junction of R13 and C7.

## On Power Amplifier parts list :

R1 now 2.2K

R5 now 4.7K

R11 now 47

R12 now 5.6K

R20 now 1

R21 now 1.5

X3 added BAX13 or 1S44

R23 now 390

R22 now 390

## On Pre-Amplifier parts list :

R9 now 39K

R16 now 8.2K

Note : There is no necessity to alter any amplifier which does not contain the above amendments. Some alterations are for convenience, others affect only marginal improvements to performance.

The L.T. fuses on some later models are located on the power amplifier printed circuits instead of on the chassis

## SPECIFICATION

(all levels quoted  $\pm$  1dB)

|  |   |
|--|---|
| Power output:  | 20 watts RMS per channel both channels driven at clipping level into 8 ohm loads or 25 watts in 4 ohm loads.  |
| Total harmonic distortion  | less than 0.1%, mainly 2nd & 3rd harmonic, negligible proportion of high order harmonics and reducing in proportion with reducing power.  |
| Frequency and power response   | $\pm$ 1dB 30Hz to 20KHz.  |
| Output to tape recorder  | direct connection from radio and aux. inputs, 200mV from disc amplifier when correctly loaded at average modulation.  |
| Input sensitivity:   | Radio 100mV into 200 Kohm flat response<br>Tape " " " " "<br>Auxiliary " " " " "<br>Magnetic Cartridge 2.5mV into 47K, equalized to R.I.A.A.<br>Ceramic Cartridge 50mV into special input circuit.                              |
| Overload capabilities  | 130mV on magnetic disc input; infinite on radio, aux. and tape inputs.<br>80dB on radio, aux. and tape inputs.<br>70dB on disc inputs<br>typically 40dB 20Hz - 10KHz, dependent upon input load impedance                       |
| Signal to noise ratio<br>(30 phon weighting)<br>Interchannel crosstalk | Built in on disc input, 18dB per octave below 30Hz.   |
| Rumble filter  |   |
| Control knobs:   | Bass $\pm$ 14dB at 40Hz<br>Treble $\pm$ 14dB at 10KHz<br>Volume Logarithmic (Channel Balance $\pm$ 1dB maintained to 40dB attenuation)<br>Balance $\pm$ 6dB for 180° rotation, either channel eliminated at limits of rotation. |
| Push buttons to select: Inputs   | DISC, RADIO, AUXILIARY, TAPE.   |
| High frequency filter  | 12dB per octave above 7KHz.   |
| Function   | Mono, Stereo, Input Right, Input Left.  |
| General: Power consumption   | 70 watts maximum.   |
| Size   | 15½" x 5" x 9" (400 x 130 x 230mm)  |
| Weight   | 20lbs (9Kg)   |

*The right is reserved to change the specification or design without notice.*

**J. E. SUGDEN & CO. LTD**

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**Instruction  
Leaflet**

**J.E.SUGDEN**

**A21  
Amplifier**





## INSTALLATION

The amplifier is fully integrated and supplied complete in a Teak veneered case. This case may be removed if required (after disconnection from the mains) by carefully standing the amplifier on the heat sinks at the rear and unscrewing the four mounting feet on the base. The case may then be lifted clear of the amplifier chassis.

## CONNECTIONS

### i Mains

Approximately 10 feet (3 metres) of 3 core cable is supplied for connection to the mains supply. The colour coding of the mains lead is BROWN—LIVE; BLUE—NEUTRAL; GREEN/YELLOW—EARTH.

A safety earth terminal is provided on the back panel adjacent to the mains input lead. This terminal may be used for the connection of an earth lead where it is inconvenient to use the green/yellow core of the mains lead. This terminal is NOT for the earthing of ancillary equipment.

A voltage selector plug is provided on the rear panel to cope with all normal supply voltages. This will normally be set for 240 volts, but should any alteration be necessary the plug should be pulled outwards and rotated until the required voltage is in alignment with the arrow marked on the panel. The plug may then be re-inserted into the socket.

An auxiliary mains output socket is provided for connecting to ancillary equipment such as a turntable or self-powered radio tuner. The total load on this outlet should not exceed 150 watts.

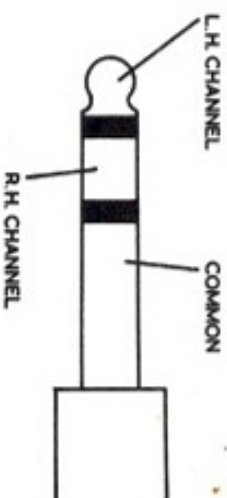
Viewing from the underside of the amplifier, the mains fuse (1 amp) is located on the right hand side member of the chassis, and the two L.T. fuses (1 amp) are mounted on the power amplifier printed circuit panels.

### ii Loudspeakers

Loudspeaker connections are made via the red and black 4mm sockets provided on the rear panel. Mains twin flex (14/0076 preferably colour coded for ease of phasing) is recommended for the connecting wire. The amplifier produces its full rated output into loudspeakers of 8 or 4 ohms impedance. It will, however, operate satisfactorily into loudspeakers of higher impedance, but at reduced maximum output (approximately 30 watts into 15 ohms)

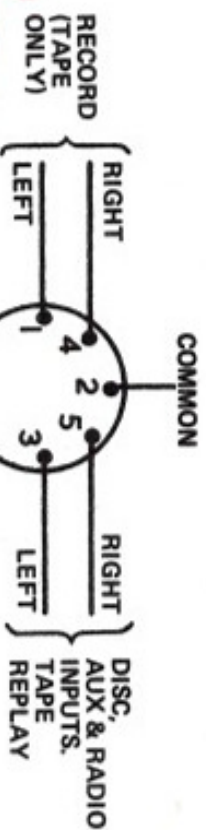
### iii Headphones

A headphone socket is provided on the front panel of the amplifier. When the plug is inserted the loudspeakers are automatically disconnected.



JACK PLUG CONNECTIONS—A2/V3 & A48

### iv Inputs



Four input sockets are provided with 5 pin DIN plugs for DISC, AUX., RADIO and TAPE, which should be wired according to DIN standards as shown, viewing from the inside of the plug, i.e. at the solder tag end.

Please note that on DISC inputs, pin 1 is connected internally in the amplifier to pin 5, and may be used as an alternative for R.H. input.

### Earthing of DISC input

It is important that the L.H. and R.H. screened leads from the pick-up cartridge, and the chassis lead (sometimes combined in the pick-up lead) should be connected ONLY to pin 2 of the DIN plug. Do NOT connect to the plug body, and care must be taken to insulate the screens from the plug body securing clip.

## OPERATION

Control facilities are provided by means of four knobs BASS, TREBLE, BALANCE, combined VOLUME — ON/OFF switch, and six push buttons on the front panel.

The push buttons, which are of independent push on and off operation offer facilities as follows:

**INPUT SELECTION**—this is controlled by the two extreme left hand buttons allowing four selections to be made—

|                       |                        |
|-----------------------|------------------------|
| DISC button in        | magnetic cartridge     |
| Both buttons out      | ceramic cartridge      |
| RADIO (DISC & AUX in) | radio (stereo or mono) |
| AUX in                | auxiliary              |

The AUX facility has the same sensitivity as the RADIO input allowing the use of an additional tuner or other high level programme source.

## TAPE

To play pre-recorded tape the TAPE button should be depressed. To record from programme sources, e.g. disc or radio, it is necessary to depress those input buttons normally required to select that source (as described above). The selected input is automatically connected to the tape output socket. If the output from the monitoring circuit on the tape recorder is connected to the tape input of the amplifier, A-B monitoring is possible by depressing the TAPE button.

## FILTER

This is a high frequency filter and comes into operation when the FILTER button is depressed. It is useful for removing undesirable surface noise or distortion from old or inferior discs. A built in rumble filter is incorporated on the disc inputs.

## FUNCTION

The two end right hand buttons select as follows:—

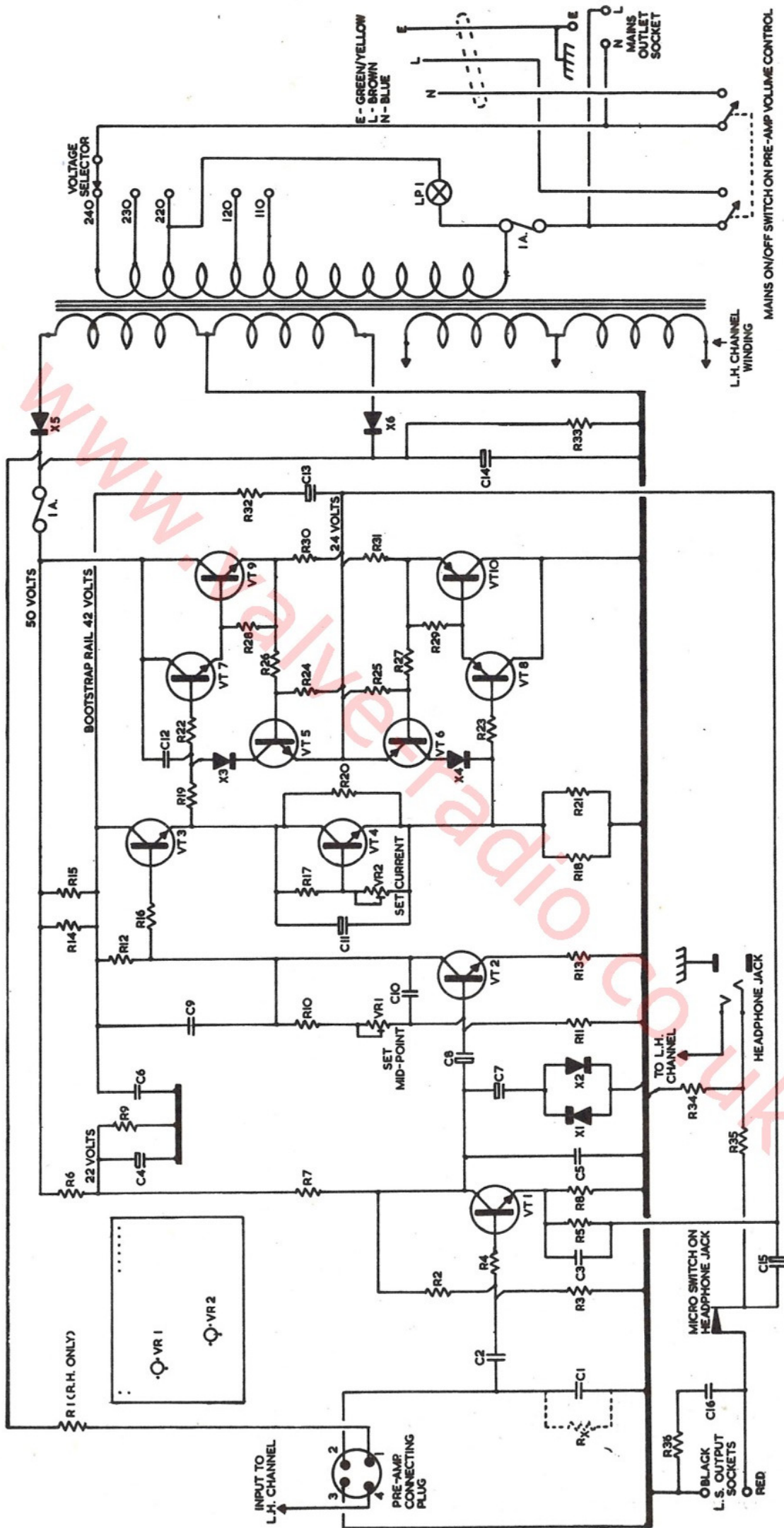
|                           |  |
|---------------------------|--|
| STEREO (both buttons out) | Stereo   |
| LEFT in                   | left hand input to both amplifiers                   |
| RIGHT in                  | right hand input to both amplifiers                  |
| MONO (both buttons in)    | left and right hand inputs mixed to both amplifiers. |

## A21 Series III Power Amplifier Component List

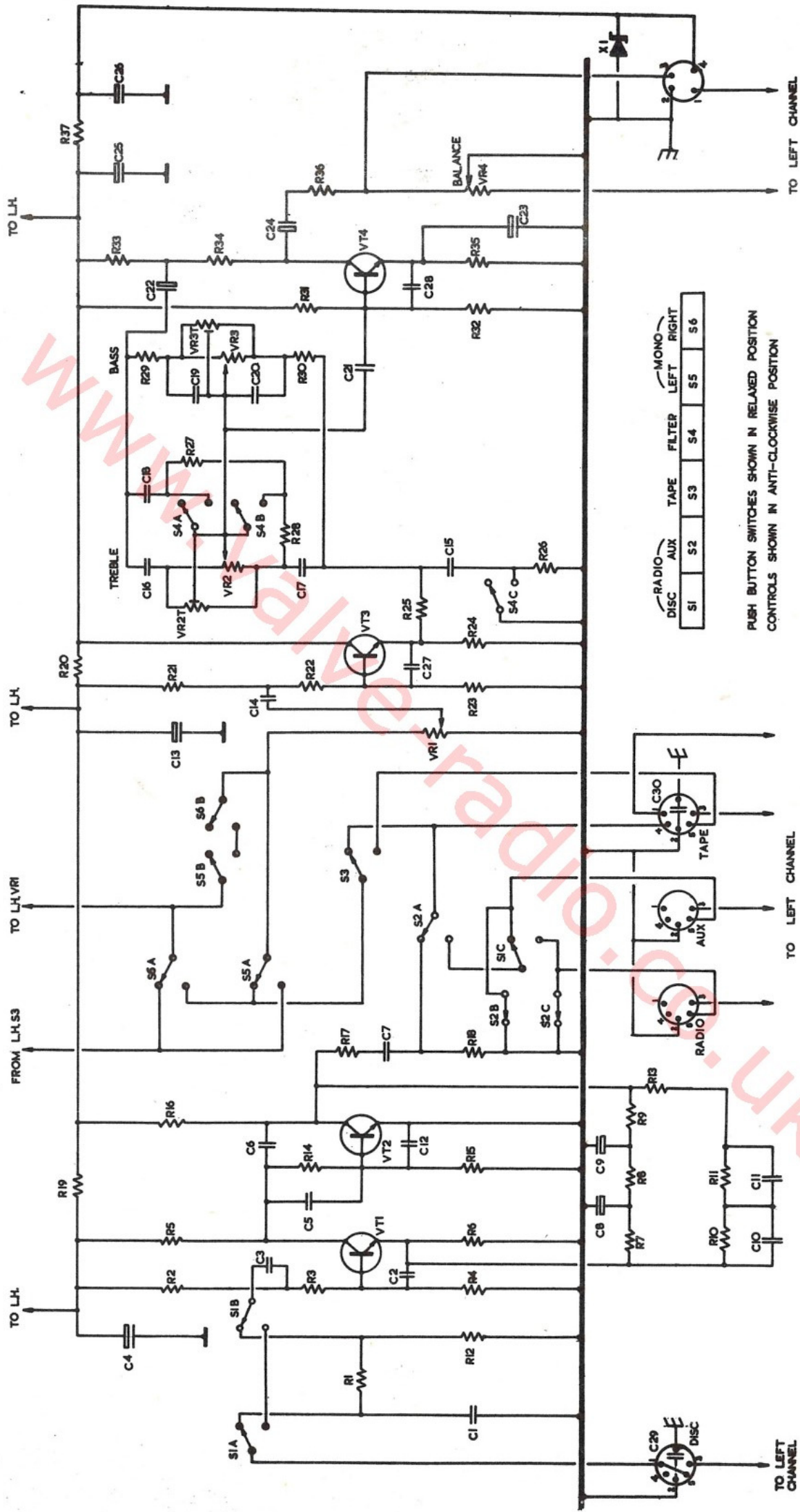
|     |      |     |       |         |        |
|-----|------|-----|-------|---------|--------|
| R 1 | 1.5K | R27 | 4.7K  | C13     | 470    |
| R 2 | 2.2M | R28 | 100   | C14     | 1600   |
| R 3 | 470K | R29 | 100   | C15     | 2500   |
| R 4 | 4.7K | R30 | 0.7   | C16     | 0.1    |
| R 5 | 1.5K | R31 | 0.7   |         |        |
| R 6 | 2.7K | R32 | 10    | X1      | BAX13  |
| R 7 | 4.7K | R33 | 10K   | X2      | BAX13  |
| R 8 | 47   | R34 | 390   | X3      | BAX13  |
| R 9 | 2.2K | R35 | 390   | X4      | BAX13  |
| R10 | 100K | R36 | 1.0   | SKE1/02 |        |
| R11 | 10K  |     |       | SKE1/02 |        |
| R12 | 10K  | VR1 | 220K  |         |        |
| R13 | 100  | VR2 | 4.7K  | VT 1    | BC109C |
| R14 | 1.2K |     |       | VT 2    | ZTX341 |
| R15 | 1.2K | C 1 | 270P  | VT 3    | BFY52  |
| R16 | 1.2K | C 2 | 0.1   | VT 4    | BC548  |
| R17 | 6.8K | C 3 | 2200P | VT 5    | BC548  |
| R18 | 3.9K | C 4 | 470   | VT 6    | BC558  |
| R19 | 1.8K | C 5 | 470P  | VT 7    | BD519  |
| R20 | 330  | C 6 | 0.1   | VT 8    | BD520  |
| R21 | 3.9K | C 7 | 100   | VT 9    | 2N3055 |
| R22 | 10   | C 8 | 100   | VT10    | MJ2955 |
| R23 | 10   | C 9 | 470P  |         |        |
| R24 | 1.2K | C10 | 270P  |         |        |
| R25 | 1.2K | C11 | 470   |         |        |
| R26 | 4.7K | C12 | 47P   |         |        |

## Pre-Amplifier

|     |      |      |         |     |       |     |               |
|-----|------|------|---------|-----|-------|-----|---------------|
| R 1 | 100K | R27  | 8.2M    | C 8 | 2.2   | X1  | BZY88<br>-C27 |
| R 2 | 470K | R28  | 39K     | C 9 | 100   |     |               |
| R 3 | 1.2K | R29  | 18K     | C10 | 3600P | VT1 | BC109S        |
| R 4 | 47K  | R30  | 18K     | C11 | 1000P | VT2 | BC109S        |
| R 5 | 100K | R31  | 470K    | C12 | 1000P | VT3 | BC109S        |
| R 6 | 4.7K | R32  | 68K     | C13 | 100   | VT4 | BC109S        |
| R 7 | 3.3K | R33  | 1.5K    | C14 | 0.1   |     |               |
| R 8 | 2.7K | R34  | 4.7K    | C15 | .01   |     |               |
| R 9 | 39K  | R35  | 1.2K    | C16 | .01   |     |               |
| R10 | 1.5M | R36  | 4.7K    | C17 | .01   |     |               |
| R11 | 68K  | R37  | 330     | C18 | 2200P |     |               |
| R12 | 4.7K |      |         | C19 | .022  |     |               |
| R13 | 2.2K | VR1  | 250Klog | C20 | .022  |     |               |
| R14 | 2.2M | VR2  | 50K     | C21 | 0.1   |     |               |
| R15 | 470K | VR3  | 250K    | C22 | 100   |     |               |
| R16 | 8.2K | VR4  | 50K     | C23 | 470   |     |               |
| R17 | 4.7K | VR2T | 220K    | C24 | 2.5   |     |               |
| R18 | 2.2M | VR3T | 1M      | C25 | 470   |     |               |
| R19 | 5.6K |      |         | C26 | 470   |     |               |
| R20 | 680  | C 1  | 470P    | C27 | 1000P |     |               |
| R21 | 1M   | C 2  | 470P    | C28 | 1000P |     |               |
| R22 | 1.2K | C 3  | 0.22    | C29 | .01   |     |               |
| R23 | 470K | C 4  | 100     | C30 | .01   |     |               |
| R24 | 4.7K | C 5  | 0.1     |     |       |     |               |
| R25 | 2.2K | C 6  | 47P     |     |       |     |               |
| R26 | 2.2M | C 7  | 0.1     |     |       |     |               |



— POWER AMPLIFIER - A 21 SERIES THREE —  
(R.H. CHANNEL, SHOWN IN DETAIL)



DISC S1  
 RADIO S2  
 AUX S3  
 TAPE S4  
 FILTER S5  
 MONO S6  
 LEFT  
 RIGHT

PUSH BUTTON SWITCHES SHOWN IN RELAXED POSITION  
 CONTROLS SHOWN IN ANTI-CLOCKWISE POSITION

**A 21 SERIES THREE**  
**- PRE-AMPLIFIER -**  
 (R.H. CHANNEL SHOWN IN DETAIL)