

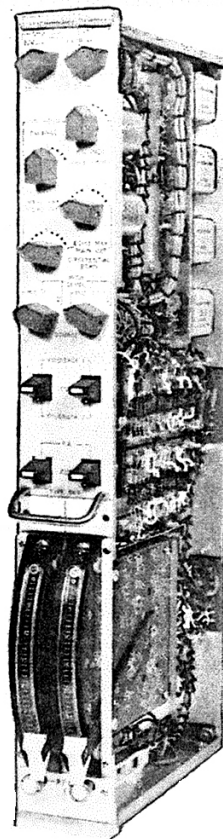


**INSTRUCTION MANUAL**

**2-CHANNEL**

**STUDIO MIXER MODULE**

**TYPE 849**



**E.M.I. ELECTRONICS LTD.**  
**HAYES · MIDDLESEX · ENGLAND.**

## CONTENTS

	<u>Page</u>
SUPPLEMENT	(i)
1. INTRODUCTION	1
2. SPECIFICATION	2
3. INSTALLATION	3
4. OPERATING INSTRUCTIONS	4
5. TECHNICAL INFORMATION	6
(a) Circuit Description	6
(b) Maintenance	8
(c) Component List	9
	 <u>Fig.</u>
FRONT PANEL	1
COMPONENT LAYOUT	2
CIRCUIT DIAGRAM	3
CIRCUIT DIAGRAM - LATER MODELS	4

## SUPPLEMENT TO TL.1220

As a result of design improvements since this equipment was first introduced, the following changes have been incorporated on current modules. A further circuit diagram of these improved models (Fig.4) is also added to this manual.

1. (a) The Low Level Amplifiers Type 839, which are now obsolete, are replaced by Low Level Amplifiers Type 839/1; the capacitors C1 and C4 (Fig.3) are now incorporated within the amplifier and no longer appear as an external component.  
(b) The 5 $\mu$ F capacitors C7, C8, C9 and C10 (Fig.3) have been removed and the 6dB pad resistor "b" has been rewired directly across the leads to connections 2 and 3 on the MAIN faders X2 and X5.  
(c) In order to provide correct matching into the Low Level Amplifiers Type 839/1, the input impedance of which is 5K $\Omega$  the value of the resistors R1, R11, R12, R15, R25 and R26 have been changed from 750 $\Omega$  to 680 $\Omega$ .  
(d) The resistors R30, R31, R33 and R34 (Fig.4) have been added across the output connections of the low level amplifiers numbers 3, 4, 7 and 8 respectively.
2. The electrostatic shields inside the transformers T1 and T2 are connected to pin 10 on the secondary winding of the transformers (Fig.4).
3. The input high level pads have been redesigned to provide 45dB of attenuation giving a maximum high level input of +19dBm.
4. The resistors R29 and R32 (Fig.4) have been added in series with the leads from pin 1 of faders X2 and X5 to K1 and K4 respectively.

### Component List

The following alterations and additions are necessary to the component list on page 9 in order that it may be read in conjunction with Fig. 4.

<u>Reference</u>		<u>Description</u>			<u>Manufacturers Ref.</u>	<u>E.M.I. No.</u>
<u>Resistors (fixed)</u>						
R1	(H)	680	$\frac{1}{4}$ W	5%	Welwyn C21	C20016M
R11	(H)	680	$\frac{1}{4}$ W	5%	Welwyn C21	C20016M
R12	(H)	680	$\frac{1}{4}$ W	5%	Welwyn C21	C20016M
R15	(H)	680	$\frac{1}{4}$ W	5%	Welwyn C21	C20016M
R25	(H)	680	$\frac{1}{4}$ W	5%	Welwyn C21	C20016M
R26	(H)	680	$\frac{1}{4}$ W	5%	Welwyn C21	C20016M
R29	(H)	15K	$\frac{1}{4}$ W	5%	Electrosil TR6(NJ65)	25191-133-515
R30	(H)	100K	$\frac{1}{4}$ W	5%	Electrosil TR6(NJ65)	25191-133-610
R31	(H)	100K	$\frac{1}{4}$ W	5%	Electrosil TR6(NJ65)	25191-133-610
R32	(H)	15K	$\frac{1}{4}$ W	5%	Electrosil TR6(NJ65)	25191-133-515
R33	(H)	100K	$\frac{1}{4}$ W	5%	Electrosil TR6(NJ65)	25191-133-610
R34	(H)	100K	$\frac{1}{4}$ W	5%	Electrosil TR6(NJ65)	25191-133-610

#### 45dB Attenuator Pads

a	(H)	910	$\frac{1}{4}$ W	2%	Welwyn C21	C20016VW
b	(H)	240	$\frac{1}{4}$ W	2%	Welwyn C21	C20016VT
c	(H)	750	$\frac{1}{4}$ W	1%	Welwyn C21	C20016FE

#### Capacitors (fixed)

C1	Not used
C4	Not used
C7-C10	Not used

#### Miscellaneous

Low Level Transistor Amplifier Type 839/1

9A/B839100

## 1. INTRODUCTION

The 2 Channel Studio Mixer Module, Type 849, is designed to provide initial mixing of two channels of a multi-channel mixing desk.

Further facilities provided include controls for the ancillary functions of echo, foldback, public address and pre-fade listening. In addition to the passive circuits associated with these functions, the module provides all the necessary signal amplification by means of a number of plug-in Low Level Transistor Amplifiers, Type 839. The module is therefore self-contained except for the 20V d.c. supplies required by the type 839 amplifiers and the supplies for the quadrant fader scale illumination, at a nominal 24V.

The module is designed to slide into a "nest slot" in the sound mixing desk and multi-contact plugs on the lower face mate with sockets in the desk to effect all the necessary connections.

The module is constructed on an I - section aluminium extrusion, each channel occupying one side of the centre web except for the components which require too large a space to be so accommodated. The upper bar of the extrusion provides the panel surface for the controls, while the multi-contact plugs are mounted on the lower bar. The plug-in amplifiers type 839, which are mounted on brackets on both sides of the centre web and held in place by spring retainers, are readily withdrawn for replacement in the event of a fault developing.

The mixed outputs from up to twelve 2 - Channel Studio Mixer Modules 2 to 24 channels; can be controlled either by 2-Group Studio Mixer Modules, Type 901, or passed direct to a Studio Output Mixer Module, Type 903. Echo facilities are controlled by an Echo Module, Type 905.

## 2. SPECIFICATION

### (a) Physical

Height	17 in	43.2 cm
Width	2.1/8 in.	5.4 cm
Depth	7 in.	17.8 cm
Weight	8 lb	3.6 Kg

### (b) Electrical

#### Power Supplies

Amplifiers 20V d.c.  $\pm 1\%$  at 160mA  $\pm 10\%$

Lamps 24V d.c at approximately 160mA

#### Input Impedance

To suit microphones of 30, 200 and 600 $\Omega$  nominal impedance with substantially open-circuit loading  
High Level:- 600 $\Omega \pm 5\%$  resistive

#### Maximum Microphone Input

Low sensitivity:- -36dBm

#### \*Maximum High Level Input

+ 8dBm

#### Noise Factor

+ 6dB or better at input for maximum gain

#### Frequency Response

Within 1dB between 30c/s and 15Kc/s

#### Gain

86dB maximum before mixing

#### Distortion

Less than 0.1% between 60c/s and 10Kc/s providing the output from any type 839 amplifier does not exceed 0dBm.  
The maximum output before severe distortion occurs is +4dBm.

#### \* NOTE

The maximum high level input assumes an output of +4dBm from the type 839 input amplifiers.

## 4. OPERATION

### 4.1 Controls

All controls are mounted on the front panel and are in pairs, one for each channel. The controls are illustrated in Fig.1 and in sequence from the top they are:-

- (a) MICΩ a six position switch providing for HIGH and LOW SENSITIVITY at 30, 200 or 600 ohms microphone impedance.
- (b) BALANCE an attenuator having a range from MIN -15dB to MAX +15dB in 3dB steps.
- (c) DIFFERENTIAL ECHO an attenuator having a range from MAIN MAX ECHO OFF to ECHO MAX MAIN OFF in ten equal steps.
- (d) SOURCE a three position input selector switch providing for a microphone and two high level inputs. Positions are marked MIC. HIGH LEVEL 1 and HIGH LEVEL 2.
- (e) FOLDBACK a three position switch providing two foldback conditions; FOLDBACK 1 and FOLDBACK 2 either side of the normal position marked CUT.
- (f) P.A. a switch enabling the channel to be switched into the studio public address system.
- (g) Main quadrant fader.
- (h) P.F.L. pre-fade listen push-button switch.

4.2 The module accepts a wide variety of input signals which can be divided into two main categories, low or intermediate level signals from a microphone, and high level signals from disc or tape reproducers or from external lines. Choice of the category to be mixed is made by the SOURCE switch.

If MIC is selected, the MICΩ control is set to the microphone impedance and the signal level appropriate. The higher sensitivity is more generally useful but the lower sensitivity prevents overload when a sensitive microphone is used.

The two HIGH LEVEL positions enable signals of from -20dBm to +8dBm to be accepted without overload, by means of internal attenuators.

Coarse control of level is provided by the BALANCE control. Fine control is provided by a thirty step quadrant fader, which is graded so that more than half its movement is suitable for this purpose. The attenuation per step increases rapidly over the last ten steps towards "off".

Echo signals are extracted by operation of the DIFFERENTIAL ECHO control which when fully anti-clockwise, passes no signals to the echo "bus bars". A progressive clockwise movement of the control increases the signal to the echo out circuit, and simultaneously decreases the signals to the main channel to zero at the same rate. The combined signal remains approximately constant.

Operation of the FOLDBACK and PA switches is self-explanatory; signals being extracted after the main fader. As the three circuits are identical FOLDBACK 2 can be used as an extra P.A. circuit and P.A. as a third foldback channel should the need arise.



## 5. TECHNICAL INFORMATION

### (a) Circuit Description

The 2- Channel Studio Mixer Module, Type 849, consists of two identical circuits corresponding to the two channels and therefore for the purpose of this description only one channel will be considered. All circuit references are to be found in the top half of the circuit diagram, Fig.3.

#### Input Circuits

There are three balanced input circuits available, one of which is a low level circuit designed for a microphone input and the other two are high level circuits.

The microphone input is connected to pins 1 and 2 of plug PL1 and thence to the wipers of banks a, b, c and d of the SOURCE switch S2; these banks are paralleled, in pairs as protection against contact failure. The signal is then passed to the wipers of banks a and b of the MIC $\Omega$  switch S1, the contacts of which are in linked pairs; each pair is connected to the appropriate impedance tap on the primary of the microphone transformer, T1.

High Level signals which enter the module on either pins 1, 2 and 3 or 9, 10 and 11 of plug, PL2, are attenuated by 34dB attenuator pads and passed to contacts 2 or 3 of banks e and f of the SOURCE switch S2. The wipers of these banks are connected to the 600 $\Omega$  tap on the primary of T1.

#### Main Circuit

From the secondary of T1 the circuit is unbalanced. It is important that there should be no connection between the B+ or programme "earth" rail and the metallic structure of the module itself.

The signal is taken directly from the secondary of T1 to the input of the Low Level Plug-in Amplifier, Type 839, which presents a substantially resistive load of approximately 3K $\Omega$  to the transformer. The microphone connected to the primary works therefore into a virtual open circuit. The effective gain from the microphone input to the output of the first type 839 amplifier is 35dB. The amplifier has a constant load of 600 $\Omega$  impedance presented by the BALANCE control X which has a maximum loss of 30dB.

With the source switch S2 set to one of the two HIGH LEVEL positions the signal is routed via S2g and S2h contacts 2 or 3 directly to the main quadrant fader X2. With S2 set to MIC and the MICΩ switch S1 set to one of the three LOW positions, the signal is routed via S2g, S1c and S1d, contacts 2, 4 or 6, and S2h again directly to the main quadrant fader. If however, S2 is set to MIC and S1 to one of the three HIGH positions, the signal is routed to the input of amplifier 839(2) which is shunted by R1 to provide correct matching for X1.

R2 is permanently shunted across 839(2) output terminals to provide a d.c. path for the amplifiers blocking capacitor when the signal circuit is open. The gain of 839-2 under these conditions is 30dB. As in the other positions of S1 and S2 the amplified signal is passed to the main quadrant fader X2. The output from S2 is taken to the main quadrant fader via PL1/5 and PL1/6 to provide a filter insertion point.

The output from the main quadrant fader is reduced by a 6dB pad and passed to the DIFFERENTIAL ECHO attenuator X3. This attenuator takes the form of differential potentiometers which due to the i.r. differential action present a substantially constant impedance to the previous stages.

From this point the channel divides into the main channel and the echo channel. Both channels contain a 839 amplifier shunted at the input by a resistor, R11 or R12, for matching. A series resistor R13 or R14 is introduced into the live side of both outputs as a series mixing resistor. The main output is brought out on PL1 contacts 7 and 8 and the echo output on PL1 contacts 15 and 16.

#### Pre-fade Listen Circuit

Pre-fade listen signals are extracted from the main channel immediately prior to the main quadrant fader X2 by the P.F.L. push-button switch K1. The contacts of this and other P.F.L. push-buttons are connected in an interlocked chain to render it impossible to parallel two channels by inadvertently pressing two push-buttons simultaneously.

#### Foldback and P.A. Circuits

Signals for these circuits are extracted immediately after the main quadrant fader X2. Operation of the FOLDBACK switch K2 or the P.A. switch K3 connects this common feed to the appropriate "bus bars" via the series resistors R3, R7 or R10. Dummy resistors R4, R5, R6 R9 and

R10 are connected to preserve constant impedance conditions when the contacts of these switches are in their normal or CUT positions.

### Auxiliary Circuits

The main quadrant fader scale illuminating lamps are wired permanently to an external source of d.c. nominally at 24V. The type 839 amplifiers are supplied with  $20V \pm 0.5V$  on PLA4/5 and PL4/13 from an external supply unit.

The main quadrant fader has auxiliary micro-switches at either end of its travel; each switch has a set of single pole changeover contacts and these are connected via PL2 and PL4 to external cue circuits.

### (b) Maintenance

To remove the module from its position in the mixer desk, grasp the handle provided and exert a pull at right angles to the panel. Steady the unit by a light downward pressure below the P.F.L. push-buttons and the module will come free safely.

Low Level Transistor Amplifiers, Type 839, are hermetically sealed and any attempt to unsolder the base seal will irreparably damage internal components. Faulty amplifiers should therefore be returned to the manufacturers; a spare being replaced in the module. The withdrawal of a faulty amplifier is made easier if a thin metal blade is available to assist in disengaging the retaining clip.

The quadrant faders and their internal scale lamps, can be withdrawn for maintenance without removing the module as a whole. This can be accomplished by releasing the Oddie fasteners by giving the head of each a quarter turn. The fader may then be disengaged from its base connector plug by a slight pull. Access to the contacts and lamps is made by prising off the side opposite to the operating lever; this side being normally held in place by spring clip retainers. When replacing lamps make sure that the replacements are of the type specified.

(c) Component List

<u>Reference</u>		<u>Description</u>			<u>Manufacturers Ref.</u>	<u>E.M.I. No.</u>
<u>Resistors (fixed)</u>						
R1	(H)	750	$\frac{1}{4}W$	5%	Welwyn C21	C20016FG
R2		100K	$\frac{1}{4}W$	20%	Dubilier BTS	C20035EA
R3	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R4	(H)	300	$\frac{1}{4}W$	5%	Welwyn C21	C20016AY
R5	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R6	(H)	300	$\frac{1}{4}W$	5%	Welwyn C21	C20016AY
R7	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R8	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R9	(H)	300	$\frac{1}{4}W$	5%	Welwyn C21	C20016AY
R10	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R11	(H)	750	$\frac{1}{4}W$	5%	Welwyn C21	C20016FG
R12	(H)	750	$\frac{1}{4}W$	5%	Welwyn C21	C20016FG
R13	(H)	560	$\frac{1}{4}W$	5%	Welwyn C21	C20016VR
R14	(H)	560	$\frac{1}{4}W$	5%	Welwyn C21	C20016VR
R15	(H)	750	$\frac{1}{4}W$	5%	Welwyn C21	C20016FG
R16		100K	$\frac{1}{4}W$	20%	Dubilier BTS	C20035EA
R17	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R18	(H)	300	$\frac{1}{4}W$	5%	Welwyn C21	C20016AY
R19	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R20	(H)	300	$\frac{1}{4}W$	5%	Welwyn C21	C20016AY
R21	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R22	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R23	(H)	300	$\frac{1}{4}W$	5%	Welwyn C21	C20016AY
R24	(H)	10K	$\frac{1}{4}W$	5%	Welwyn C21	C20016U
R25	(H)	750	$\frac{1}{4}W$	5%	Welwyn C21	C20016FG
R26	(H)	750	$\frac{1}{4}W$	5%	Welwyn C21	C20016FG
R27	(H)	560	$\frac{1}{4}W$	2%	Welwyn C21	C20016VR
R28	(H)	560	$\frac{1}{4}W$	2%	Welwyn C21	C20016VR
<u>34dB Attenuator Pads</u>						
a	(H)	820	$\frac{1}{4}W$	2%	Welwyn C21	C20016VV
b	(H)	680	$\frac{1}{4}W$	2%	Welwyn C21	C20016VT
c	(H)	750	$\frac{1}{4}W$	1%	Welwyn C21	C20016FE

<u>Reference</u>	<u>Description</u>	<u>Manufacturers Ref.</u>	<u>E.M.I. No.</u>
<u>6dB Attenuator Pads</u>			
a	(H) 430 $\frac{1}{4}$ W 5%	Welwyn C21	C20016RV
b	(H) 1.8K $\frac{1}{4}$ W 5%	Welwyn C21	C20016RZ
	(H) = High Stability		
	A.O.T. = Adjusted on Test		

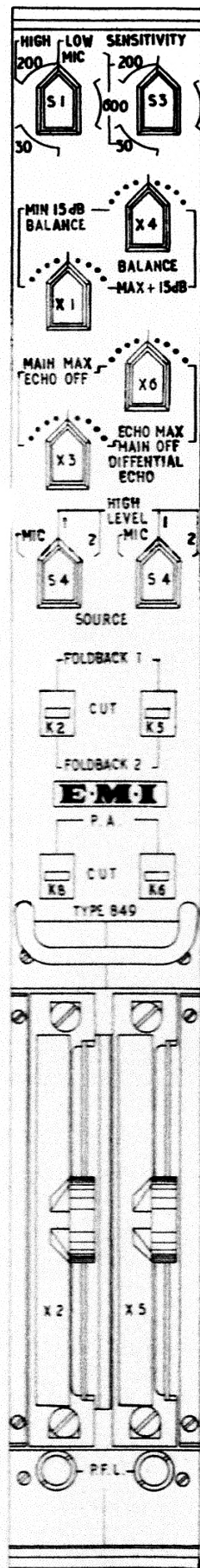
Capacitors (fixed)

C1		100p 500V	Erie N3300/831	9A/A14214
C2	A.O.T.	0.005 $\mu$ 150V	Hunts W99	9A/A14213
C3	A.O.T.	0.005 $\mu$ 150V	Hunts W99	9A/A14213
C4		100p 500V	Erie N3300/831	9A/A14214
C5	A.O.T.	0.005 $\mu$ 150V	Hunts W99	9A/A14213
C6	A.O.T.	0.005 $\mu$ 150V	Hunts W99	9A/A14213
C7	(E)	5 $\mu$ 2.5V	Mullard C426AD/A5	9A/A14204
C8	(E)	5 $\mu$ 2.5V	Mullard C426AD/A5	9A/A14204
C9	(E)	5 $\mu$ 2.5	Mullard C426AD/A5	9A/A14204
C10	(E)	5 $\mu$ 2.5V	Mullard C426AD/A5	9A/A14204
		(E) = Electrolytic		
		A.O.T. = Adjusted on Test		

Miscellaneous

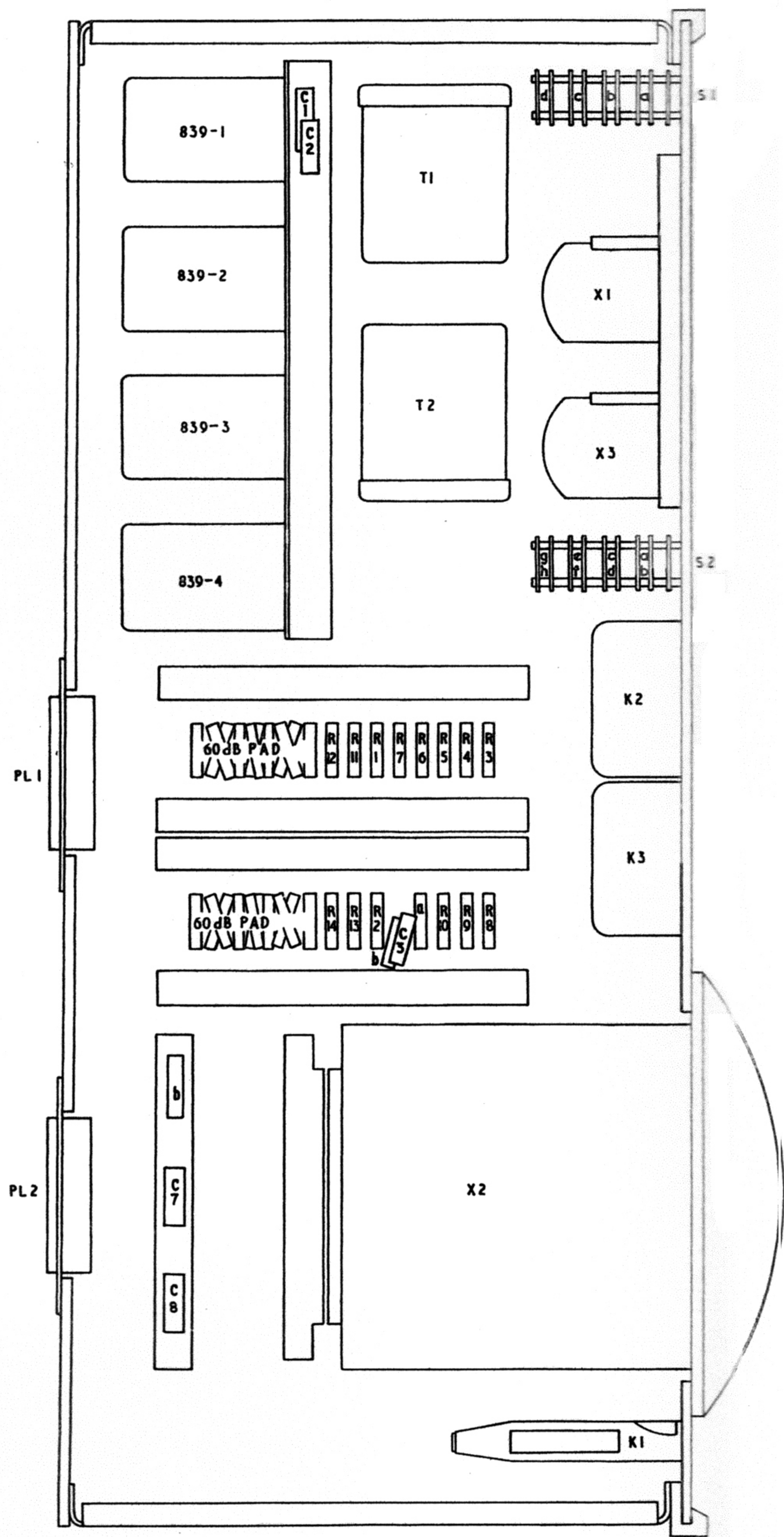
T1	Transformer	TDS5382	9A/B5382
T2	Transformer	TDS5382	9A/B5382
X1	600 $\Omega$ Bridged "T" 10 3dB steps	Painton M	9A/B13251
X2	600 $\Omega$ Bridged "T" Quadrant Fader	Painton EM2	9A/B11731
X3	600 $\Omega$ Differential	Painton M	9A/B13252
X4	600 $\Omega$ Bridged "T" 10 3dB steps	Painton M	9A/B13251
X5	600 $\Omega$ Bridged "T" Quadrant Fader	Painton EM2	9A/B11731
X6	600 $\Omega$ Differential	Painton M	9A/B13252
S1	Switch 4 pole 6 way	Ardente S1450	9A/B13261
S2	Switch 8 pole 3 way	Ardent S1450	9A/B13262
S3	Switch 4 pole 6 way	Ardent S1450	9A/B13261
S4	Switch 8 pole 3 way	Ardent S1450	9A/B13262

<u>Reference</u>	<u>Description</u>	<u>Manufacturers Ref.</u>	<u>E.M.I. No.</u>
K1	Key switch 2c/o N/L	Siemens Q2806	9A/A8843
K2	Key switch D.T.	Ericsson N9316A3AT	C21609BA
K3	Key switch S.T. 2C 2KL	Ericsson N932A2AT	C21602KA
K4	Key switch 2c/o N/L	Siemens Q2806	9A/A8843
K5	Key switch D.T.	Ericsson N9316A3AT	C21609BA
K6	Key switch S.T. 2C 2KL	Ericsson N932A2AT	C21602KA
	Knob pointer large bore		9A/B13768
	Knob pointer small bore		9A/B13767
PL1	Plug 16 way	McMurdo RP16	9A/A1800
PL2	Plug 16 way	McMurdo RP16	9A/A1800
PL3	Plug 16 way	McMurdo RP16	9A/A1800
PL4	Plug 16 way	McMurdo RP16	9A/A1800
	Low Level Transistor Amplifier Type 839		9A/B839000

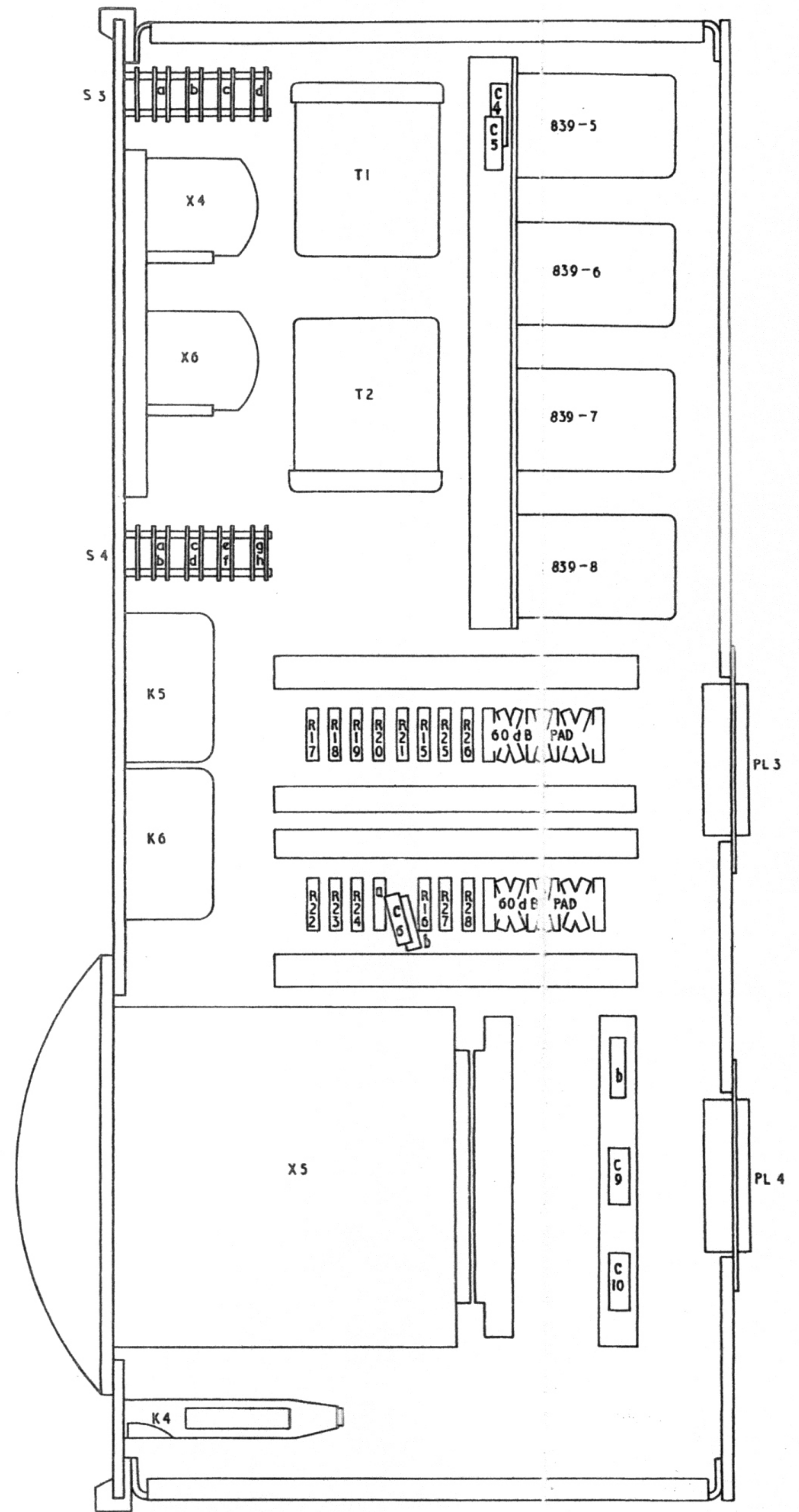


2-CHANNEL STUDIO MIXER MODULE  
FRONT PANEL

FIG.1

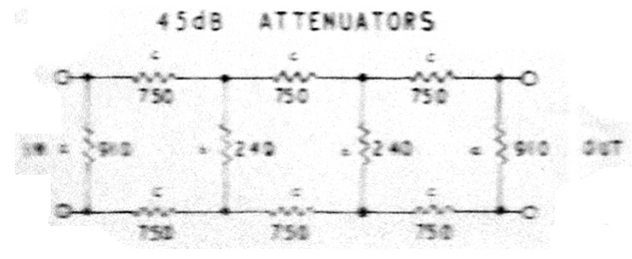
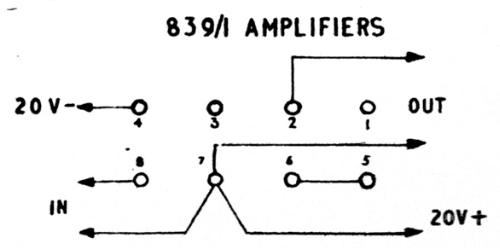
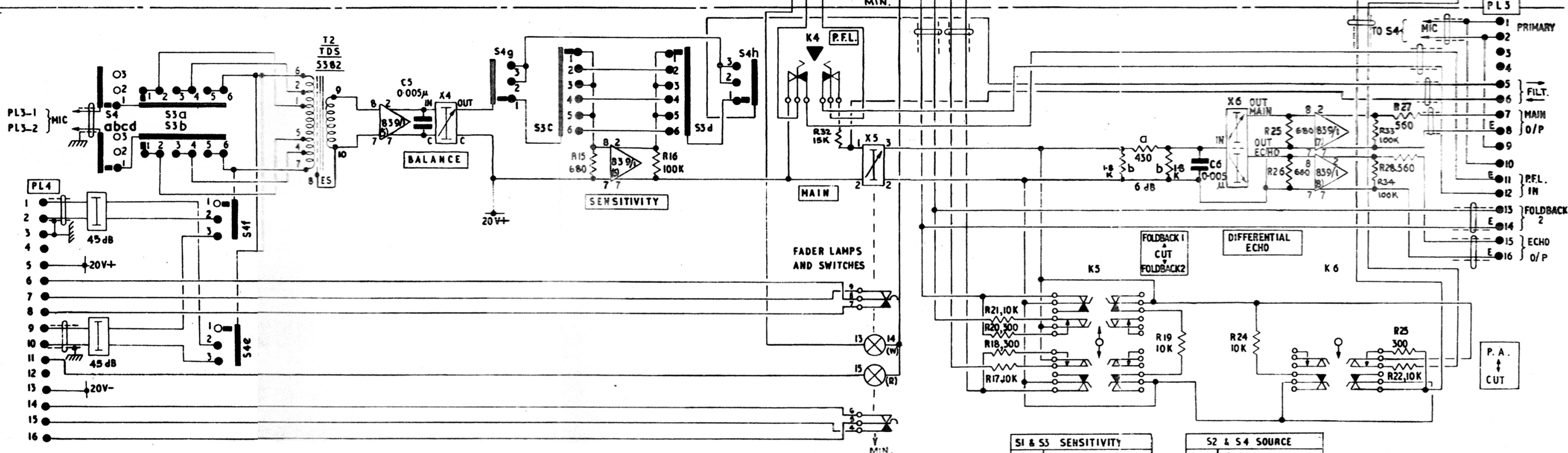
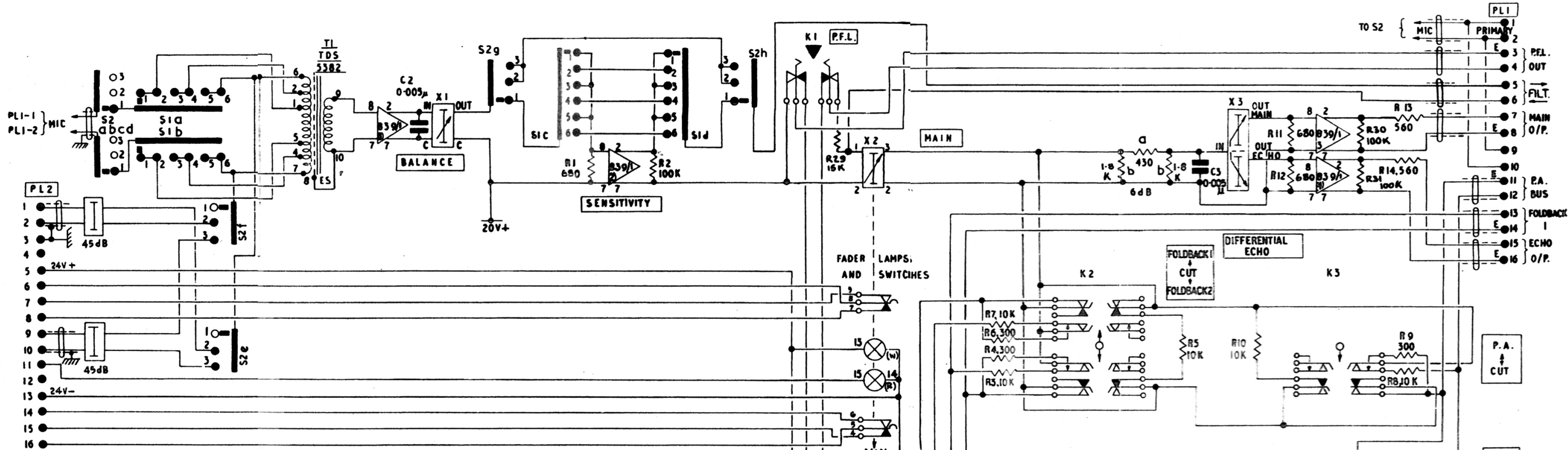


LEFT VIEW



RIGHT VIEW





S1 & S3 SENSITIVITY	
POS	ENGRAVING
1	30 HIGH
2	30 LOW
3	200 HIGH
4	200 LOW
5	600 HIGH
6	600 LOW

S2 & S4 SOURCE	
POS	ENGRAVING
1	MIC.
2	HIGH LEVEL 1
3	HIGH LEVEL 2