

# MCLAREN 402

Control Preamplifier





# MCLAREN 402 Control Preamplifier

*The McLaren 02 component series represents a unique synthesis of art, science and technology — the realisation of a design philosophy dedicated simply to the accurate reproduction of music. Form, function and performance specifications all express and testify to this basic ideal. But most important is the innate ability of the range to recreate a true musical experience.*

**T**he McLaren 402 is a high gain, full function preamplifier capable of selecting, accepting, processing and controlling a wide range of signal sources from low output moving coil cartridges to high output CD players.

In its simplest operating mode the 402 performs the classic "straight wire with gain" function, but it also offers flexible and comprehensive facilities for source and inter-source switching and copying via two tape or external signal processing circuits.

Phono gain can be switched for either moving or fixed coil cartridges. Provision is made for optimum cartridge loading. An input buffer precedes the two-stage passive/active RIAA equalisation where particular care and attention has been given to achieving both amplitude and phase accuracy, not only in absolute terms, but to ensure precise matching between channels.

Power supply design also makes a major contribution to performance. Individual stages of each channel have their own locally regulated supplies fed from a central regulated supply incorporating a heavy duty shielded toroidal transformer.

As a result the 402 possesses superlative dynamic and imaging qualities — clearly focused detail revealing the most subtle instrumental and vocal timbres, with a true perception of image depth and height.

The 402 incorporates an active tone control stage with turnover points and contours carefully chosen to give natural frequency balance changes when required. Tone control bypass switching also provides a useful phase reversal function.

The high undistorted output voltage capability of the line stage with an unusually low output impedance, ensures that the 402 will fully drive any power amplifier even via extreme lengths of shielded cable.

Construction is to the highest

engineering standards. The case is entirely non-ferrous — faceplate and side blocks are cut and machined from proprietary extruded sections, top and bottom covers coated with an attractive and durable textured finish. Front fixing screws, nameplate and all input and output sockets on the rear panel are 24-karat gold plated. Control knobs are turned from solid aluminium, satin anodised to harmonise with the front panel.

Internal construction features gain selected semiconductors and highest quality passive components mounted on a double-sided military grade glass epoxy board. The precision film potentiometers and sealed switches with self-wiping contacts have been chosen not only for their sonic excellence, but also for their smooth precise action and tactile qualities.

## Features

- Phono gain adjustable for MC or MM.
- User-selectable phono loading.
- Two-stage RIAA equalisation—passive high frequency followed by active low frequency equalisation.
- Two complete taping circuits with full monitoring and copying facilities.
- Switchable tone controls — signal normally bypasses tone control stage. Tone control switch also reverses absolute phase.
- Output muting relay to avoid on/off switching transients.
- Heavy duty toroidal power transformer.
- Individual regulated power supply for each stage.
- Highest quality components, including
  - gain selected semiconductors
  - polypropylene/polystyrene capacitors
  - metal film resistors
  - conductive film potentiometers
  - gold plated signal connectors
- Star grounding system.

## Specifications

### Input Sensitivities

(for rated output, 1kHz)

Phono MC: 100  $\mu$ V

MM: 1.0 mV

High Level/Tape Play: 100 mV

### Gain Structure (at 1kHz)

Phono Section MC: 60dB

MM: 40dB

Line Section: 20dB

### Input Impedances

Phono: 47k ohm (user selectable to any lower value)

High Level/Tape Play: 50k ohm

### Signal/Noise Ratios

#### (A-WTD/UNWTD)

Phono MC (ref. 0.5mV): 76dB/68dB

MM (ref. 5mV): 82dB/74dB

High Level/Tape Play (ref. 500mV):  
100 dB/94dB

### Input Overload Levels (at 1kHz)

Phono MC: 15mV

MM: 150mV

High Level/Tape Play: Infinite

### Output Levels

Rated: 1.0V

Maximum: 16V

### Output Impedances

Phono Section (Tape Rec.): 100 ohm

Main Out: 100 ohm

### Frequency Response

Phono (RIAA Equ.):

$\pm 0.2$ dB 20Hz-20kHz

High Level/Tape Play:

$\pm 0.1$ dB 5Hz-100kHz

### Tone Controls

Bass:  $\pm 8$ dB at 100Hz

Treble:  $\pm 8$ dB at 10kHz

### Balance Control

$\pm 3$ dB each channel

### Distortion

Less than 0.015% THD 20Hz-20kHz at rated output, any input/output

### Phase (tone controls bypassed)

Phono through main out:

Noninverting—Reversed by activation of Tone Control Switch

High Level/Tape Play through main out: Inverting—Reversed by activation of Tone Control Switch

Phono through Tape Rec: Inverting

### Power Requirements

110-120/220-240VAC, 50-60Hz, 10VA

### Dimensions (inches/mm)

16.5/420(W), 4.1/105(H), 11.2/285(D)

### Shipping Weight (lb/kg)

14.3/6.5

Specifications subject to change without notice  
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## MCLAREN AUDIO

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## Introduction

The McLaren 402 is a full function preamplifier, with input facilities for accepting moving coil or moving magnet phono cartridges, as well as five high level inputs including two tape inputs and a dedicated CD input. The 402 has a tone control section which also provides a phase inversion when activated.

The phono input provides 60(MM) or 80dB (MC) of gain (from input to output of the preamplifier) at 1kHz. The stage is split into two active gain blocks, the first one is a has a flat frequency response and switchable gain. The second stage incorporates the RIAA equalisation as well as some further gain. An extra set of phono sockets is provided at the input to allow the phono cartridge being used to be loaded appropriately.

The high level inputs provide 20dB of gain (max) with a flat frequency response. Volume and balance controls are also provided in this stage,

Two tape record outputs are also provided. Record signal is selected by means of a second selector switch completely independant of the input selector. This switching is done at high level and no amplification is provided between the tuner, CD, Aux or tape inputs and the record output.

Operating Instructions

1. Phono Operation
2. Line Level Operation
3. Tape Record Output

1. Phono Operation

Moving coil or Moving magnet operation

Note The McLaren 402 is normally shipped set for moving magnet operation.

If the unit is not set to the gain required, the gain will need to be reset by following the procedure below.

WARNING Removing the top cover may expose DANGEROUS VOLTAGES.

ENSURE THE UNIT IS DISCONNECTED FROM THE MAINS.

a. Using the allen key provided remove the four cap screws holding the top cover, and slide the cover back.

b. Locate the two DIL switches on the right hand side of the board viewed from the front of the unit. In front of the DIL switches, printed on the board, is a chart showing the positions of the poles for Moving Coil (MC) or Moving Magnet (MM) operation. Poles 1-3 select the gain of the input stage, while pole 4 selects the phono loading of either 100ohms or 47kohms.

POLE	MM	MC	LOADING
1	OFF	ON	ON=100ohms OFF=47kohms
2	ON	OFF	
3	OFF	ON	
4	ON	OFF	

c. Use a small screwdriver or other suitable instrument to move each lever to the required position making sure it is positively locked in position.

d. Replace the top cover and screws.

Cartridge Loading

The correct phono input impedance for most Moving Magnet cartridges (and some moving coils) is 47kohms (Pole 1 OFF). If required, lower values can easily be set by inserting phono plugs loaded with appropriate resistors, into the phono loading socket.



next to the phono input sockets on the rear panel. A pair of phono plugs is provided for this purpose.

For many Moving Coil cartridges a suitable load is 100ohms (Pole 1 ON). Again lower values can be obtained by the using phono plugs provided loaded as required.

**NOTE** The loading plug resistance is placed in parallel with either 47kohms or 100ohms depending on the position of pole 1.

Once the phono gain and loading are correct and the unit is reassembled, proceed as follows...

a. Connect the output sockets (Located at the left hand end of the unit viewed from the front) to a suitable power amplifier with a high quality interconnect cable taking care to not reverse the channels.

b. Connect the turntable output to the phono input sockets (Located at the right hand end of the preamplifier viewed from the front). Connect the earth (ground) lead of the turntable to the terminal provided.

c. Connect the unit to the mains and switch on. After approximately 10 seconds delay a slight click may be heard from the muting relay, indicating that it has opened allowing the signal to pass.

d. Set the volume control to a low listening level (about 10 o'clock).

e. Select PHONO on the input selector.

f. Switch on the turntable and power amplifier.

g. Reset the volume to a preferred listening level.

## 2. High Level Operation

a. Connect the output sockets to a suitable power amplifier with a high quality interconnect cable taking care to not reverse the channels.

b. Connect the output from the CD Player tuner or Tape deck etc, to the appropriate input sockets on with a high quality interconnect cable taking care to not reverse the channels.

c. Connect the unit to the mains and switch on. After approximately 10 seconds delay a slight click may be heard from the muting relay, indicating that it has opened allowing signal to pass.

d. Set the volume control to a low listening level, (about 10 o'clock).

e. Select the appropriate input on the input selector.

f. Switch on the input source and power amplifier.

g. Reset the volume to a preferred listening level.

## 3. Tape Record Outputs

These outputs provide a line level recording signal of the source selected on the RECORD selector.

a. Connect the tape record outputs on the McLaren 402 to the record inputs of the tape deck and the tape play sockets to the

play output of the tape deck.

b. Connect the source you wish to record following the instructions in the appropriate section above.

c. Select the required source on RECORD selector, turn the tape deck on and begin recording.

NOTE Any source may be selected on the INPUT SELECTOR while recording the same or any other source.

## Control Description

### ON/OFF Switch

The ON/OFF switch on the McLaren 402 applies mains voltage to the primary side of the mains transformer, and so power to the unit. IT also controls the muting relay, so clamping the output to earth immediately after switch off.

### Tone Controls

The tone controls provide a cut or boost of BASS or TREBLE of up to +or- 8dB. The controls from left to right are

TONE/BYPASS switch which allows the user to select the tone controls (TONE POSITION) or totally bypass them (BYPASS POSITON).

BASS. This control gives a progressive boost to the bass frequencies as it is rotated clockwise and a progressive cut for anticlockwise rotation.

TREBLE. This control gives a progressive boost to the treble frequencies as it is rotated clockwise and a progressive cut for anticlockwise rotation.

### Balance

The BALANCE control allows either channel to be boosted or cut with respect to the other by 6dB. Clockwise rotation of this control progressively boosts the right hand channel by 3dB while simultaneously, progressively cutting the left hand channel by 3dB. Anticlockwise rotation of this control progressively boosts the left hand channel by 3dB while simultaneously, progressively cutting the right hand channel by 3dB.

### Volume Control

This is a passive attenuator control which with clockwise rotation progressively increases the gain of the preamplifier from minus infinity dB to 80dB (MC operation), 60dB (MM operation) or 20dB (Line level operation).

### Record Selector

The RECORD SELECTOR selects any of the inputs to the preamplifier for recording purposes. Output from the Record Selector can be found on the record outputs.

NOTE The record selector operates independantly of the input selector, so that any input may be selected while recording the same or any other input.



### Input Selector

The INPUT SELECTOR selects any of the inputs to the preamplifier for output to a power amplifier.

**NOTE** The input selector operates independantly of the record selector, so that any input may be recorded while listening to the same or any other input.

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### Mechanical Description

The McLaren 402 has seven major mechanical components in its construction. these are...

1. The main PC Board. Which carries almost all the electronic components, including control potentiometers, switches and input socets.

2. Front Panel. Made from extruded and drilled aluminium. Finish is light bronze anodising. The front panel carries the mains switch, tone switch, bass and teble controls, volume and balance, input and tape selectors.

3. Back panel. The back panel carries the mains fuse, earthing(grounding), input and output sockets. This panel is made from punched sheet aluminium and finished with black powdercoat.

4. Top Cover. Made from sheet aluminium and finished with black powdercoat,

NOTE Removal of the top cover gives access to the component side of the PC Board.

5. Bottom Cover. Made from sheet aluminium and finished with black powdercoat,

NOTE Removal of the bottom cover gives access to the solder side of the PC Board.

6. and 7. Left and Right hand side rails. Made from extruded aluminium and finishsed with black powdercoat.

Access for scervicing is by removing the top and bottom panels which are secured by 3/16" cap screws. (The screws can be removed using the 5/32" allen key provided with the unit)

NOTE Care should be taken to not mix top and bottom screws as top cover screws are longer and may damage the pretapped threads provided for the bottom cover screws

Electrical Description

The McLaren 402 consists of 10 stages (5 per channel) and a power supply. FIG 1.

From input to output these are (Description for one channel only)...

Phono Input Stage FIG 3

This stage consists of two input differential pairs made up of 2SC2546 transistors and 2SA1084 transistors, these are run at a current of 5mA per transistor to ensure a low noise figure when the circuit is driven from very low impedance sources (3-100ohms).

The two input pairs then drive a push-pull, class A output stage using BC550 and BC560 transistors running at 9mA allowing the stage to drive the low impedance feedback loop of the moving coil gain setting. (the low impedance feedback loop is required to keep thermal noise to a minimum.) Switching complete feedback loops has been used to allow moving magnet gain to be incorporated in the preamplifier as well as moving coil.

The stage has a flat frequency response with gains of 146 times (43dB) or 11.9 (21.5dB). Output impedance is less than 50ohms at 1kHz

The input to the stage is DC coupled with loading switchable between 47kohms and 100ohms, DC coupling of the input ensures that distortion is minimised at this critical interface. The output from the stage is AC coupled via 1uF polypropylene capacitor to avoid DC offsets being amplified by consequent stages.

There is also a regulated power supply with an output of + and - 11Volts supplying power to the stage, this supply is a capacitor multiplier type which provides the good noise performance required and good regulation.

RIAA Equalisation Stage FIG 4

This stage is made up of 2 input differential pairs made up of BC550B and BC560B transistors. These are run at 1mA per pair (500uA per device). This drives a Class A, push-pull output stage made up of BC550 and BC560 transistors running at 12mA.

At the input to the stage there is a passive RC filter using a 5K1 resistor and a 30nF capacitor. This provides the high frequency RIAA equalisation. The low frequency section of the characteristic is formed by the 3n3 capacitor, 91K and 1M0 resistors in the feedback loop.

As for the moving coil stage the input is DC coupled and the output is AC coupled through a 1uF polypropylene capacitor. Gain of the section is 100 times (40dB) at 1kHz. The input impedance of the stage is 9kohms and the output impedance is 150ohms.

The RIAA stage has its own regulated power supply consisting of two three terminal regulators.



### Switching Stage FIG 5

This is a totally passive stage consisting of two "flex" switches. The flex switches provide for the selection of program material on the inputs of the preamplifier for either auditioning or recording.

The two "flex" selector switches are connected in such a way that they function independently of one another, allowing any input to be selected while recording the same or any other input.

### Line Stage FIG 6

The first part of the line stage is the volume control, which is a 50kohm potentiometer operating as a passive attenuator.

The active part of the line stage follows the volume control, and is made up of two differential pairs with BC550 and BC560 transistors running at 1mA (500uA per device). This is followed by a Class A, push-pull output stage using BC550 and BC560 transistors running at 12mA.

This stage has a flat frequency response with a gain of 10 times (20dB) with the balance at the mid point. Using the balance control located in the feedback loop the gain can be varied by + and - 3dB.

Once more this stage is run from a regulated power supply using three terminal regulators.

As for the other stages the input is DC coupled and the output AC coupled through a 1uF Polypropylene capacitor.

Input impedance to the stage is 50kohms and the output impedance is 100ohms at 1kHz.

### Tone Stage FIG 7

As for all the other active stages the tone stage consists of two differential pairs made up of BC550 and BC560 transistors running at 1mA (500uA per device). This is followed by a Class A, push-pull output stage using BC550 and BC560 transistors running at 12mA.

The tone control circuitry is of the Baxandal type with turnover frequencies of 340Hz and 5kHz. The control range for these controls are + or - 8dB at 100Hz and 10kHz.

Three terminal regulators provide the power for the stage which is DC coupled at the input, and AC coupled at the output by a 1uF polypropylene capacitor. The input impedance is 5kohms and the output impedance is 100ohms.

The tone/bypass switch is also included in this stage, and simply selects either the output from the line stage or the tone stage.

## Functional Check Procedure

The following is a full functional check procedure for the McLaren 402, some of which may not be required for checking specific problems.

### Check Procedures

1. Power Transformer Taps
2. Noise.....(i) phono  
(ii) High level
3. Input Sensitivity...(i) Phono  
(ii) High Level
4. Input Overload.....Phono
5. Distortion
6. RIAA Responce.....Phono
7. Bandwidth.....High Level
8. Crosstalk.....All Inputs
9. Relay Operation
10. Balance Control
11. Tone stage

### Power Transformer Taps

**CAUTION** Check that the unit is set for the mains voltage being used.

To change the mains voltage setting proceed as follows...

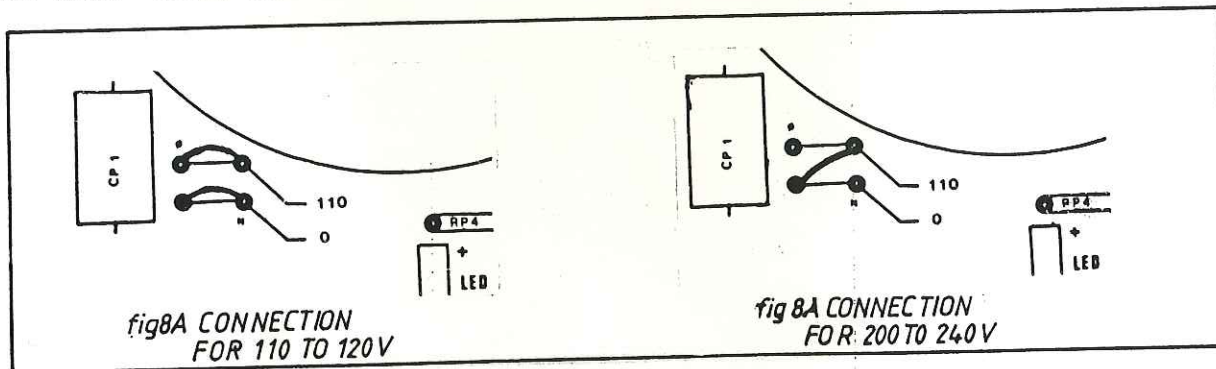
**WARNING** Removing the top cover may expose DANGEROUS VOLTAGES.

Ensure that the unit is DISCONNECTED FROM THE MAINS.

a. Using the 5/32" allen key provided, unscrew the four cap screws which secure the top cover and slide it back.

b. Remove the bottom cover by removing the four cap screws securing it with the 5/32" allen key provided.

c. Locate on the top side of the board, in the front left hand corner (viewed from the front of the unit), next to the mains transformer, an area marked with 0 and 110V. See FIG 8. USE ONLY WIRE WITH MAINS RATED INSULATION.



- d. For 100-120Vac mains connect as shown in FIG 8A .  
For 200-240Vac mains connect as shown in FIG 8B .



WARNING Joints must be soldered carefully and must be secure.

e. Replace top and bottom covers and secure with the appropriate cap screws.

### Noise Check

#### (i) Phono

NOTE Check the gain setting of the phono stage, following the operating instructions Pg 2

#### High Gain

a. Load the phono input by using pole 1 of the gain selector switch set to 100ohms (Pole 1 ON), and a further 100ohm loading plug.

b. Plug a measuring instrument (preferably an audio volt meter) into the pre out sockets taking care to avoid hum loops. Set the volume control to maximum.

c. Set the input selector to PHONO.

d. Plug the unit into the mains and switch on.

e. Read the measuring instrument used.

NOTE At this sensitivity the preamplifier is sensitive to stray magnetic and electric fields, so care should be taken to keep transformers etc well away from the unit under test.

Noise for the McLaren 402 Phono high gain should be  
Unwiegthed -54dB ref 1V at the output = -68dB ref 500uV at the input.

Wiegthed -62dB ref 1V at the output = -76dB ref 500uV at the input.

#### Low Gain

a. Load the input by using pole 1 of the gain selector switch set to 47kohms (Pole 1 OFF), and a further 1kohms loading plug.

b. Plug a measuring instrument (preferably an audio volt meter) into the pre out sockets taking care to avoid hum loops set the volume control to maximum.

c. Set the input selector to PHONO.

d. Plug the unit into the mains and switch on.

e. Read the measuring instrument used.

NOTE At this sensitivity the preamplifier is sensitive to stray magnetic and electric fields, so care should be taken to keep trnsformers etc well away from the unit under test.

Noise for the McLaren 402 Phono low gain should be  
Unwiegthed -60dB ref 1V at the output = -74dB ref 5mV at the input.

Wiegthed -68dB ref 1V at the output = -82dB ref 5mV at

the input.

#### (ii) High Level

- a. Load the appropriate input sockets with loading plugs with 10Kohm resistors in them.
- b. Plug a measuring instrument (preferably an audio volt meter) into the pre out sockets, and set the volume control to maximum.
- c. Set the input selector to the input being measured.
- d. Plug the unit into the mains and switch on.
- e. Read the measuring instrument used.

High Level input noise for the preamplifier should not exceed  
 Unwieghted -80dB ref 1V at the output = -94dB ref 500mv  
 at the input  
 Wieghted -91dB ref 1V at the output = -100dB ref 500mv  
 at the input

#### Input Sensitivity

##### (i) Phono

NOTE Check the gain setting of the phono stage, using the instructions in the operating instructions Pg 2

NOTE Take care to avoid hum loops when measuring phono sensitivity as the hum will lead to an incorrect measurement.

#### High Gain

- a. Connect a signal generator to the left hand PHONO input socket.
- b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.
- c. Set the volume control to maximum, and the input selector to the PHONO input.
- d. Ensure that the input impedance is set at 47Kohms (Pole 1 OFF).
- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level to give 10Vrms at the preamplifier output.
- g. Measure the signal level at the PHONO input.  
 The input signal for 10Vrms output should be 1mv rms.
- h. Repeat the procedure for the other channel.

#### Low Gain

- a. Connect a signal generator to the left hand PHONO input socket.
- b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.
- c. Set the volume control to maximum, and the input selector to the PHONO input.
- d. Ensure that the input impedance is set at 47Kohms (Pole 1



OFF).

- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level to give 10Vrms at the preamplifier output.
- g. Measure the signal level at the PHONO input.  
The input signal for 10Vrms output should be 10mv rms.
- h. Repeat the procedure for the other channel.

#### High Level

- a. Connect a signal generator to the left hand input socket on the appropriate input.
- b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.
- c. Set the volume control to maximum, and the input selector to the appropriate input.
- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level to give 10Vrms at the preamplifier output.
- g. Measure the signal level at the appropriate input.  
The input signal for 10Vrms output should be 1V rms.
- h. Repeat the procedure for the other channel.

#### Record Outputs

##### (i) Phono

NOTE Check the gain setting of the phono stage, using the instructions in the operating instructions Pg 2

NOTE Take care to avoid hum loops when measuring phono sensitivity as the hum will lead to an incorrect measurement.

#### High Gain

- a. Connect a signal generator to the left hand PHONO input socket.
- b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand REC socket.
- c. Set the Record selector to the PHONO input.
- d. Ensure that the input impedance is set at 47Kohms (Pole 1 OFF).
- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level to give 1Vrms at the record output.
- g. Measure the signal level at the PHONO input.  
The input signal for 1Vrms output should be 1mv rms.
- h. Repeat the procedure for the other channel.

#### Low Gain

- a. Connect a signal generator to the left hand PHONO input socket.
- b. Connect a measuring instrument (Preferably an audio

voltmeter) to the left hand REC socket.

- c. Set the Record selector to the PHONO input.
- d. Ensure that the input impedance is set at 47Kohms (Pole 1 OFF).
- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level to give 1Vrms at the record output.
- g. Measure the signal level at the PHONO input.  
The input signal for 1Vrms output should be 10mv rms.
- h. Repeat the procedure for the other channel.

#### High Level

- a. Connect a signal generator to the left hand input socket on the appropriate input.
- b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand REC socket.
- c. Set the record selector to the appropriate input.
- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level to give 1Vrms at the record output.
- g. Measure the signal level at the appropriate input.  
The input signal for 1Vrms output should be 1V rms.
- h. Repeat the procedure for the other channel.

#### Input Overload Phono

**NOTE** Check the gain setting of the phono stage, using the instructions in the operating instructions Pg 2

#### High Gain

- a. Connect a signal generator to the left hand PHONO input socket.
- b. Connect an oscilloscope to the left hand pre-out socket.
- c. Set the input selector to the PHONO input.
- d. Ensure that the input impedance is set at 47kohms (Pole 1 OFF).
- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level to give gradually while reducing the volume control setting so that the output does not exceed 15Vrms. Continue increasing the input level until clipping becomes visible.
- g. Measure the signal level at the PHONO input.  
Input Overload should be 15mV at 1kHz.

#### Low Gain

- a. Connect a signal generator to the left hand PHONO input socket.
- b. Connect an oscilloscope to the left hand pre out socket.
- c. Set the input selector to the PHONO input.
- d. Ensure that the input impedance is set at 47Kohms (Pole 1



OFF).

- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level to give gradually while reducing the volume control setting so that the output does not exceed 15Vrms. Continue increasing the input level until clipping becomes visible.
- g. Measure the signal level at the PHONO input.  
Input Overload should be 150mV at 1kHz.

### Distortion (THD)

#### All Inputs

- a. Connect a low distortion signal generator to the left hand input socket of the appropriate input.
- b. Connect a distortion analyser to the left hand pre out socket.
- c. Set the input selector to the appropriate input.
- d. Ensure that the input impedance is set at 47kohms (Pole 1 OFF) if measuring the phono input.
- e. Plug the unit into the mains and switch on.
- f. Adjust the analyser using the manufacturer's instructions to give the required measurements.
- g. Repeat the above procedure for the right hand channel.

**NOTE** Avoid running the preamplifier at levels at which the input may become overloaded or noise may make a significant contribution to measured distortion.

**NOTE** Take care to avoid hum loops when measuring Distortion as the hum will lead to an incorrect measurement.

Distortion of less than 0.015% should be achieved from 20Hz to 20kHz.

#### RIAA Response

- a. Connect a signal generator to the left hand PHONO input socket.
- b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.
- c. Set the volume control to 12 oclock, and the input selector to the PHONO input.
- d. Ensure that the input impedance is set at 47Kohms (Pole 1 OFF).
- e. Plug the unit into the mains and switch on.
- f. Set the signal generator to a 1kHz sine wave and adjust its level until a convenient reference output level is reached.
- g. Sweep the signal generator frequency up and or down to the spot frequencies below and measure the output with respect to the 1kHz reference.
- h. Repeat the above procedure for the right hand channel.

NOTE Take care to avoid hum loops, and overloading the input when measuring RIAA response, as the hum or an overload will lead to an incorrect measurement.

### RIAA Response

FREQUENCY	OUTPUT ref 1kHz	The peamplifier should conform to this response to within + or - 0.2dB
50Hz	+17.0dB	
100Hz	+13.1dB	
500Hz	+ 2.6dB	
1kHz	+ 0.0dB	
2kHz	- 2.6dB	
5kHz	- 8.2dB	
10kHz	-13.7dB	
15kHz	-17.2dB	
20kHz	-19.6dB	

### Bandwidth

- Connect a signal generator to the left hand input socket of one of the high level inputs.
- Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.
- Ensure that the tone switch is in the BYPASS position and set the volume control to maximum.
- Plug the unit into the mains and switch on.
- Set the signal generator to 1kHz and a level so that the preamplifier output level is at a convenient reference.
- Now sweep the frequency up or down to find the -1dB and -3db points.  
 These should be at    -1dB at 50kHz and 20Hz  
                              -3dB at 100kHz
- Repeat the procedure for the other channel.

### Crosstalk

#### Phono

- Connect a signal generator to the left hand input socket of the PHONO input.
- Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.
- Ensure that the tone switch is in the BYPASS position and set the volume control to about 12 oclock.
- Plug the unit into the mains and switch on.
- Set the signal generator to 1kHz and a level so that the output level is at a convenient reference.
- Measure the output from the right hand channel by connecting a measuring instrument to the right hand output socket.
- Repeat steps b,e and f for spot frequencies across the audio band. Substitute the measuring frequency for 1kHz in step e.



Crosstalk should be better than

20Hz to 2kHz better than -80dB ref the driven channel.  
2kHz to 20kHz better than -60dB ref the driven channel.

h. Repeat the above procedure for the other channel

#### High Level

a. Connect a signal generator to the left hand input socket of a high level input.

b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.

c. Ensure that the tone switch is in the BYPASS position and set the volume control to about 12 oclock.

d. Plug the unit into the mains and switch on.

e. Set the signal generator to 1kHz and a level so that the preamplifier output level is at a convenient reference.

f. Measure the output from the right hand channel by connecting a measuring instrument to the right hand output socket.

g. Repeat step f for spot frequencies across the audio band. There is no need to re adjust the input level.

Crosstalk should be better than

20Hz to 2kHz better than -80dB ref to the driven channel.  
2kHz to 20kHz better than -60dB ref to the driven channel.

h. Repeat the above procedure for the other channel

#### Relay Operation

a. Connect a signal generator to the left hand input socket of a high level input.

b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.

c. Set the volume control to about 12 oclock.

d. Set the signal generator to give a preamplifier output of 1V approx.

e. Plug the unit into the mains and switch on.

f. Output should not immediately appear, there should be a 10 second delay, then a slight click will be heard and the signal will be present at the output.

h. Repeat the above procedure for the other channel

NOTE Output should be muted immediately on switch off.

#### Balance Control

a. Connect a signal generator to the left hand input socket of a high level input.

b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.

c. Set the volume control to about 12 oclock.

d. Plug the unit into the mains and switch on.

- e. Set the signal generator to 1kHz and a level so that the preamplifier output level is at a convenient reference.
  - f. Rotate the balance control Clockwise. The output from the left channel should fall by 3dB. Anticlockwise rotation will increase the output by 3dB.
  - g. Repeat the above procedure for the right hand channel.
- For the right hand channel Anticlockwise rotation will decrease the output from the right channel by 3dB. Clockwise rotation will increase the output by 3dB.

### Tone Controls

- a. Connect a signal generator to the left hand input socket of a high level input.
- b. Connect a measuring instrument (Preferably an audio voltmeter) to the left hand pre out socket.
- c. Set the volume control to about 12 oclock.
- d. Plug the unit into the mains and switch on.
- e. Set the signal generator to 100Hz and a level so that the preamplifier output level is at a convenient reference.
- f. Set the tone switch to TONE.
- g. Rotate the bass control Clockwise. The output from the channel should rise by 8dB. Anticlockwise rotation will reduce the output by 8dB.
- h. Reset the signal generator to 10kHz.
- i. Rotate the treble control Clockwise. The output from the channel should rise by 8dB. Anticlockwise rotation will reduce the output by 8dB.
- j. Repeat the above procedure for the right hand channel.



Parts\_List

<u>PC_Board_</u> <u>Number</u>	<u>Supplier_Part_No.</u>	<u>Description</u>
<u>Capacitors</u>		
CIR1,CIL1	Philips 2222-427-41501	150pF Polystyrene cap
CIR2,CIL2	Philips 2222-427-41002	1nF Polystyrene cap
CIR3,CIL3	Wima MKP10 1uF 160V	1uF 160V Polypropylene
CIR4,CIL4	Philips 2222-035-55222	2200uF 16V Electrolytic
CIR5,CIL5	Philips 2222-035-55222	2200uF 16V Electrolytic
CIR6,CIL6	Philips 2222-368-41104	0.1uF 250V Polyester cap
CIR7,CIL7	Philips 2222-368-41104	0.1uF 250V Polyester cap
CER1,CEL1	Philips 2222-424-41503	15nF Polystyrene cap
CER2,CEL2	Philips 2222-424-43302	3.3nF Polystyrene cap
CER3,CEL3	Wima MKP10 1uF 160V	1uF 160V Polypropylene
CIR4,CIL4	Philips 2222-035-58101	100uF 63V Electrolytic
CIR5,CIL5	Philips 2222-035-58101	100uF 63V Electrolytic
CLL1,	Philips 2222-680-09828	8.2pF Ceramic cap
CLR1,	Philips 2222-680-10109	10pF Ceramic cap
CLR2,CLL2	Wima MKP10 1uF 160V	1uF 160V Polypropylene
CLR3,CLL3	Philips 2222-035-59228	2.2uF 63V Electrolytic
CLR4,CLL4	Philips 2222-035-59228	2.2uF 63V Electrolytic
CTR1,CTL1	Philips 2222-424-46802	6.8nF Polystyrene cap
CTR2,CTL2	Philips 2222-368-41473	47nF 250V Polyester cap
CTR3,CTL3	Philips 2222-368-41473	47nF 250V Polyester cap
CTR4,CTL4	Wima MKP10 1uF 160V	1uF 160V Polypropylene
CTR5,CTL5	Philips 2222-035-58101	100uF 63V Electrolytic
CTR6,CTL6	Philips 2222-035-58101	100uF 63V Electrolytic
CTL7,CTL7	Philips 2222-680-09478	4.7pF Ceramic cap
CP1,CP9	Philips 2222-330-00473	47nF 250Vac polyester
CP2,	Philips 2222-330-18102	1000uF 50V Electrolytic
CP3,CP4	Philips 2222-330-18102	1000uF 50V Electrolytic
CP5,CP6	Philips 2222-368-41104	0.1uF 250V Polyester cap
CP7,CP8	Philips 2222-035-58101	100uF 63V Electrolytic
<u>Resistors</u>		
0ohm	Philips 2322-181-90018	0ohm resistor
RIR1,RIL1	Philips 2322-151-54703	47Kohm 1% Resistor
RIR2,RIL2	Philips 2322-151-51501	150ohm 1% Resistor
RIR3,RIL3	Philips 2322-151-51002	1Kohm 1% Resistor
RIR4,RIL4	Philips 2322-151-51002	1Kohm 1% Resistor
RIR5,RIL5	Philips 2322-151-51501	150ohm 1% Resistor
RIR6,RIL6	Philips 2322-151-53304	330Kohm 1% Resistor
RIR7,RIL7	Philips 2322-151-54702	4.7Kohm 1% Resistor
RIR8,RIL8	Philips 2322-151-54708	4.7ohm 1% Resistor



RIR9, RIL9	Philips	2322-151-56801	680ohm 1% Resistor
RIR10, RIL10	Philips	2322-151-54301	430ohm 1% Resistor
RIR11, RIL11	Philips	2322-151-52209	22ohm 1% Resistor
RIR12, RIL12	Philips	2322-151-52209	22ohm 1% Resistor
RIR13, RIL13	Philips	2322-151-58202	8.2Kohm 1% Resistor
RIR14, RIL14	Philips	2322-151-58202	8.2Kohm 1% Resistor
RIR15, RIL15	Philips	2322-151-51001	100ohm 1% Resistor
RER1, REL1	Philips	2322-151-55102	5.1Kohm 1% Resistor
RER2, REL2	Philips	2322-151-54702	4.7Kohm 1% Resistor
RER3, REL3	Philips	2322-151-53602	3.6Kohm 1% Resistor
RER4, REL4	Philips	2322-151-52403	24Kohm 1% Resistor
RER5, REL5	Philips	2322-151-52403	24Kohm 1% Resistor
RER6, REL6	Philips	2322-151-53602	3.6Kohm 1% Resistor
RER7, REL7	Philips	2322-151-52704	270Kohm 1% Resistor
RER8, REL8	Philips	2322-151-52704	270Kohm 1% Resistor
RER9, REL9	Philips	2322-151-51501	150ohm 1% Resistor
RER10, REL10	Philips	2322-151-51501	150ohm 1% Resistor
RER11, REL11	Philips	2322-151-51005	1Mohm 1% Resistor
RER12, REL12	Philips	2322-151-59103	91Kohm 1% Resistor
RR9, RL9	Philips	2322-151-51002	1Kohm 1% Resistor
RLR1, RLL1	Philips	2322-151-51203	12Kohm 1% Resistor
RLR2, RLL2	Philips	2322-151-53602	3.6Kohm 1% Resistor
RLR3, RLL3	Philips	2322-151-52403	24Kohm 1% Resistor
RLR4, RLL4	Philips	2322-151-52403	24Kohm 1% Resistor
RLR5, RLL5	Philips	2322-151-53602	3.6Kohm 1% Resistor
RLR6, RLL6	Philips	2322-151-51501	150ohm 1% Resistor
RLR7, RLL7	Philips	2322-151-51501	150ohm 1% Resistor
RLR8, RLL8	Philips	2322-151-59103	91Kohm 1% Resistor
RTR1, RTL1	Philips	2322-151-56802	6.8Kohm 1% Resistor
RTR2, RTL2	Philips	2322-151-56802	6.8Kohm 1% Resistor
RTR3, RTL3	Philips	2322-151-52202	2.2Kohm 1% Resistor
RTR4, RTL4	Philips	2322-151-52203	22Kohm 1% Resistor
RTR5, RTL5	Philips	2322-151-52203	22Kohm 1% Resistor
RTR6, RTL6	Philips	2322-151-51003	10Kohm 1% Resistor
RTR7, RTL7	Philips	2322-151-51003	10Kohm 1% Resistor
RTR8, RTL8	Philips	2322-151-53602	3.6Kohm 1% Resistor
RTR9, RTL9	Philips	2322-151-52403	24Kohm 1% Resistor
RTR10, RTL10	Philips	2322-151-52403	24Kohm 1% Resistor
RTR11, RTL11	Philips	2322-151-53602	3.6Kohm 1% Resistor
RTR12, RTL12	Philips	2322-151-51501	150ohm 1% Resistor
RTR13, RTL13	Philips	2322-151-51502	150ohm 1% Resistor
RP1,	Philips	2322-151-59103	91Kohm 1% Resistor
RP2,	Philips	2322-191-33901	390ohm 5% 1.6WATT Resistor
RP3,	Philips	2322-151-52204	220Kohm 1% Resistor
RP4,	Philips	2322-151-52002	2Kohm 1% Resistor

NOTE All Resistors are .6watt unless specified



### Transistors

TIR1, TIL1	Hitachi	2SC2546	Low Noise Transistor
TIR2, TIL2	Hitachi	2SC2546	Low Noise Transistor
TIR3, TIL3	Hitachi	2SA1084	Low Noise Transistor
TIR4, TIL4	Hitachi	2SC1084	Low Noise Transistor
TIR5, TIL5	Philips	BC550B	Low Noise Transistor
TIR6, TIL6	Philips	BC560B	Low Noise Transistor
TIR7, TIR8	RCA or equiv	TIP29A	1Amp Transistor
TIR9, TIR9	RCA or equiv	TIP30A	1Amp Transistor
TER1, TEL1	Philips	BC550B	Low Noise Transistor
TER2, TEL2	Philips	BC550B	Low Noise Transistor
TER3, TEL3	Philips	BC560B	Low Noise Transistor
TER4, TEL4	Philips	BC560B	Low Noise Transistor
TER5, TEL5	Philips	BC560B	Low Noise Transistor
TER6, TEL6	Philips	BC550B	Low Noise Transistor
TLR1, TLL1	Philips	BC550B	Low Noise Transistor
TLR2, TLL2	Philips	BC550B	Low Noise Transistor
TLR3, TLL3	Philips	BC560B	Low Noise Transistor
TLR4, TLL4	Philips	BC560B	Low Noise Transistor
TLR5, TLL5	Philips	BC560B	Low Noise Transistor
TLR6, TLL6	Philips	BC550B	Low Noise Transistor
TTR1, TTL1	Philips	BC550B	Low Noise Transistor
TTR2, TTL2	Philips	BC550B	Low Noise Transistor
TTR3, TTL3	Philips	BC560B	Low Noise Transistor
TTR4, TTL4	Philips	BC560B	Low Noise Transistor
TTR5, TTL5	Philips	BC560B	Low Noise Transistor
TTR6, TTL6	Philips	BC550B	Low Noise Transistor
TP1	Philips	BC550B	Low Noise Transistor

### Diodes

DIR1, DIL1	Philips	BZX-79C12	12Volt zener diode
DIR2, DIL2	Philips	BZX-79C12	12Volt zener diode
DP1, DP2	Philips	1N4007	1Amp 1000V Diode
DP3, DP4	Philips	1N4007	1Amp 1000V Diode
DP5, DP6	Philips	BZX-79C12	12Volt zener diode
DP7,	Philips	BZX-79C12	12Volt zener diode

### Regulators

GER1, GEL1	SGS	7824	+24V 1.5Amp Regulator
GER2, GEL2	SGS	7924	-24V 1.5Amp Regulator
GLR1, GLL1	SGS	7824	+24V 1.5Amp Regulator
GLR1, GLL1	SGS	7924	-24V 1.5Amp Regulator
GTR1, GTL1	SGS	7824	+24V 1.5Amp Regulator
GTR1, GTL1	SGS	7924	-24V 1.5Amp Regulator

GP1	SGS 7815	+15V 1.5Amp Regulator
GP2	SGS 7915	-15V 1.5Amp Regulator

Potenciometers

PL1	ALPS K272A002K-50DX2	50Kohm log dual log pot
PL2	ALPS K272A002K-100DX2	100Kohm lin dual log pot
PT1	ALPS K272A002K-100DX2	100Kohm lin dual log pot
PL2	ALPS K272A002K-100DX2	100Kohm lin dual log pot

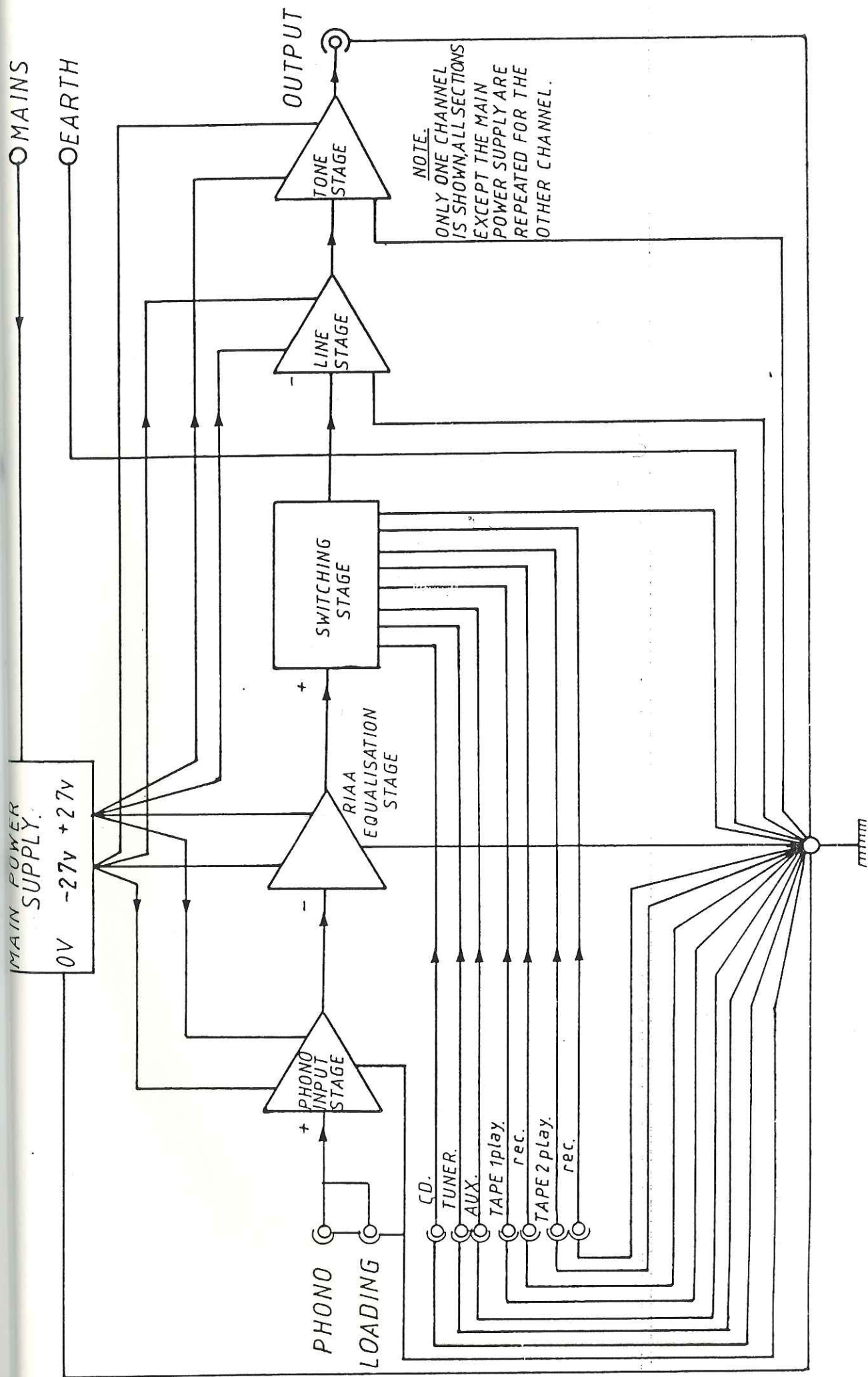
Switches

Input Selector	ALPS SBU06 ALPS SSR24	Switch Control Unit Switch
Tape Selector	ALPS SBU06 ALPS SSR24	Switch Control Unit Switch
Gain Selector	4pole DIL switch	

Other

RLA1	Philips 4823-280-23312	Takimiswa 12V relay
LED	H.P. HLMP-1401 YELLOW	Yellow LED





MCLAREN 402 BLOCK DIAGRAM SHOWING STAR EARTH AND STAR POWER SUPPLY

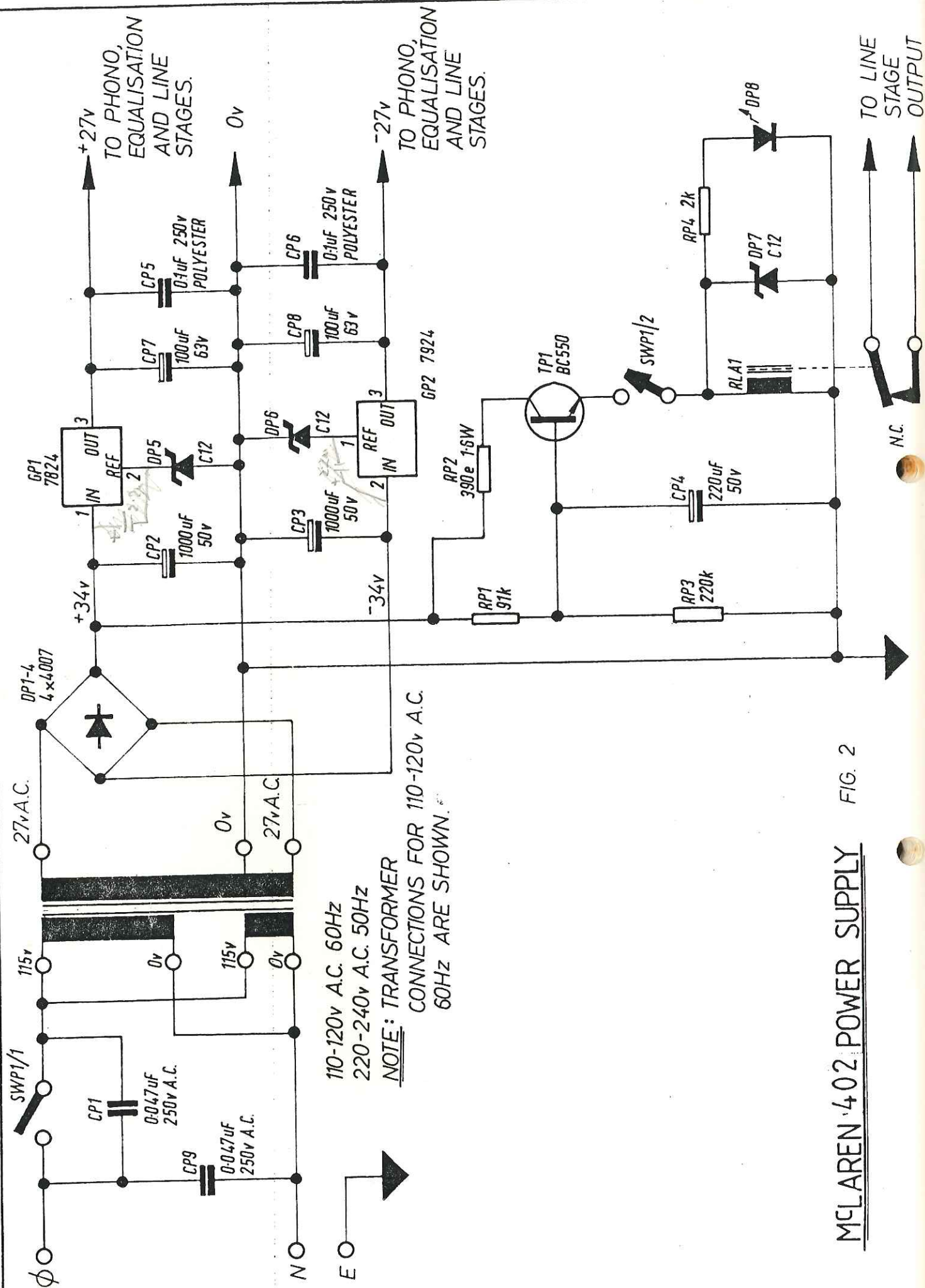
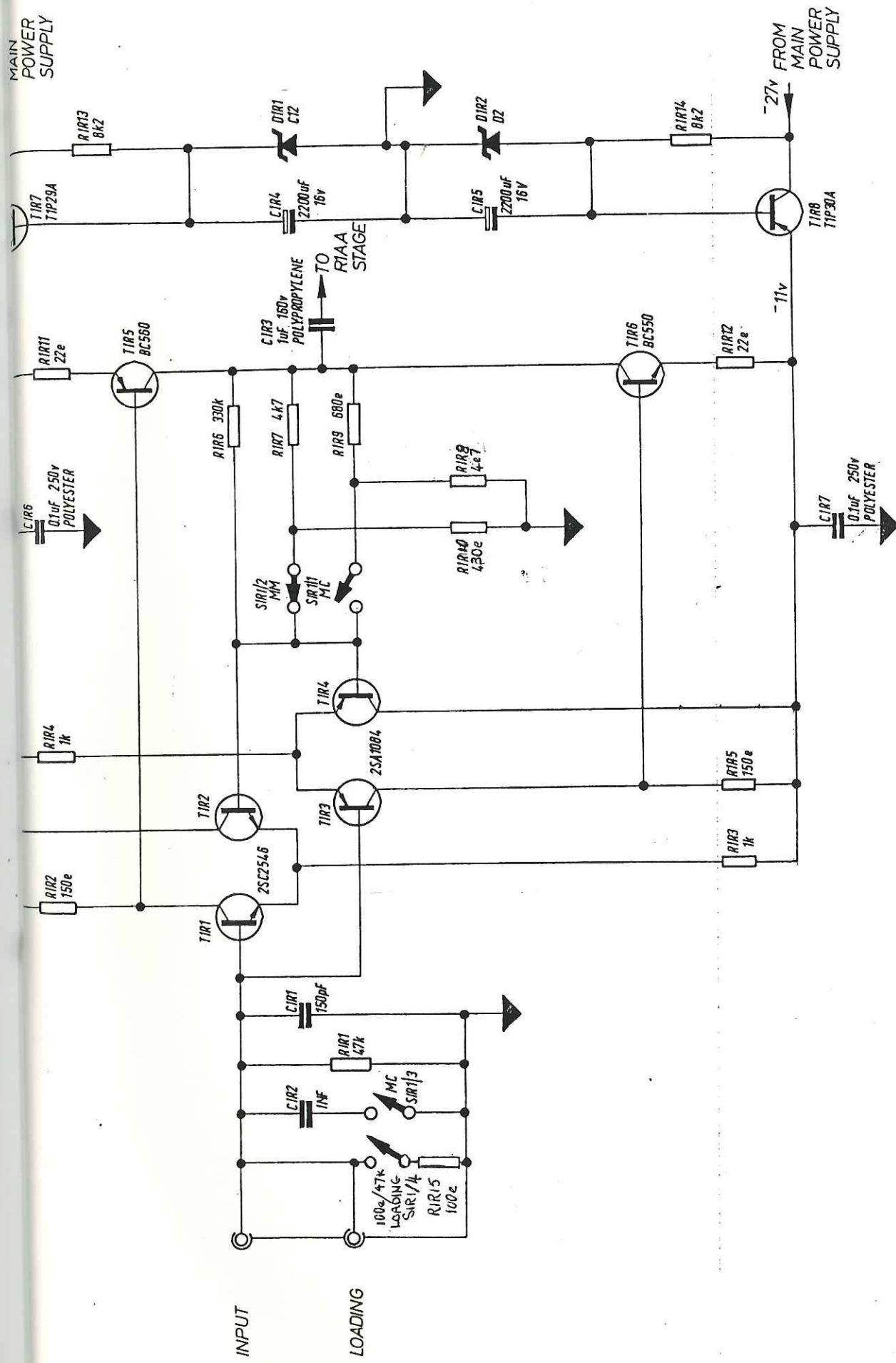
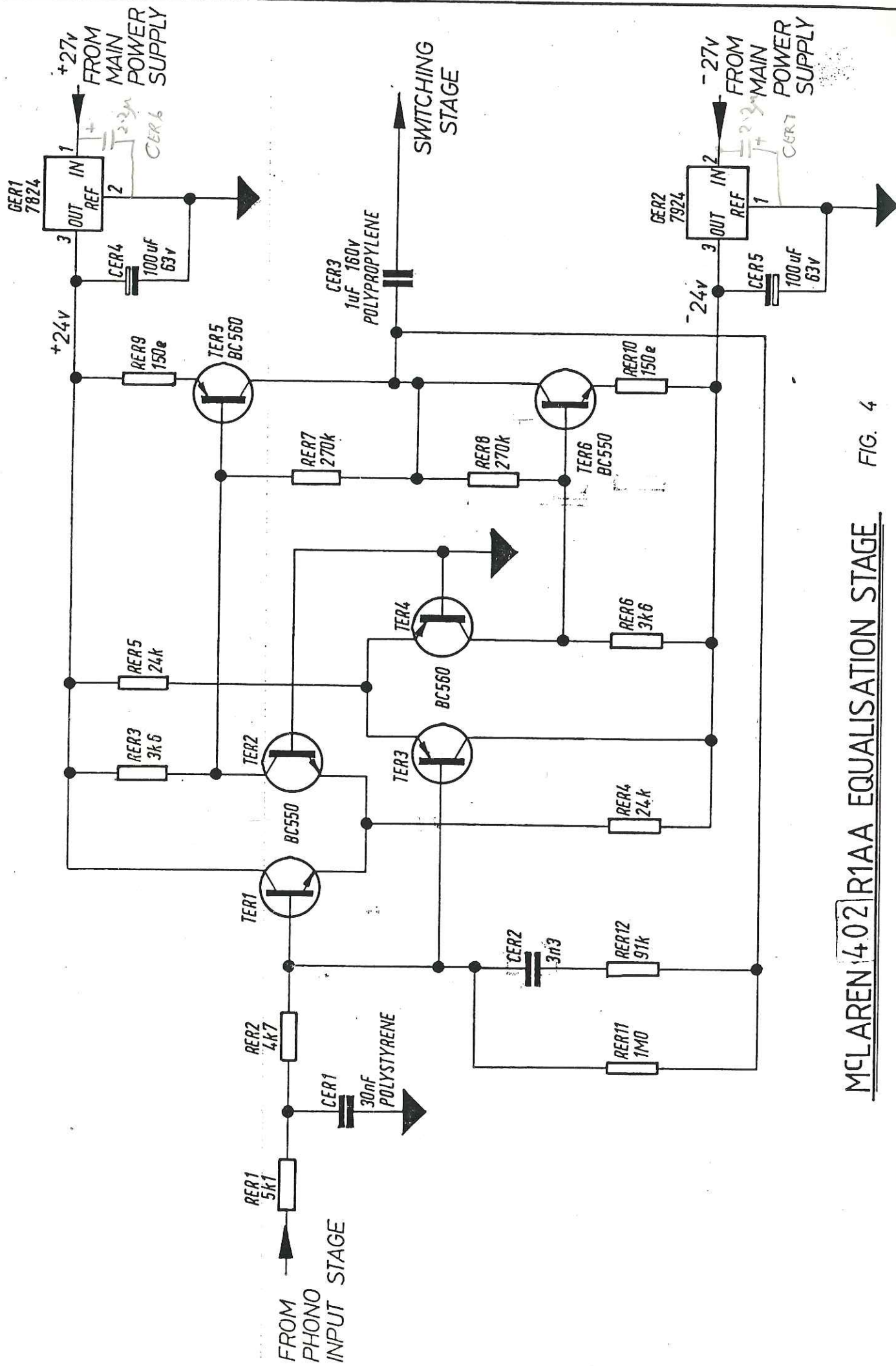


FIG. 2



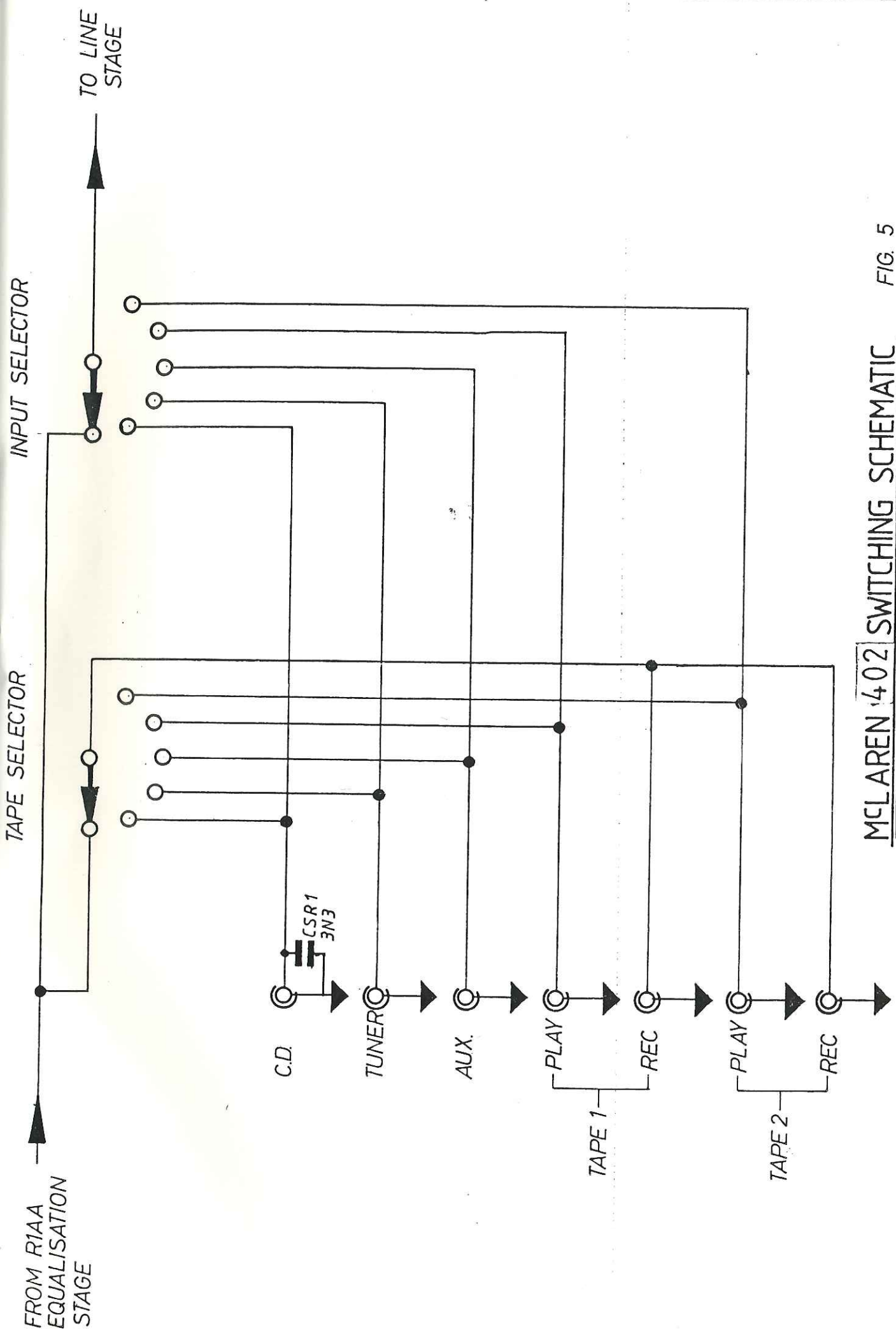


MCLAREN 402 PHONO INPUT STAGE FIG. 3

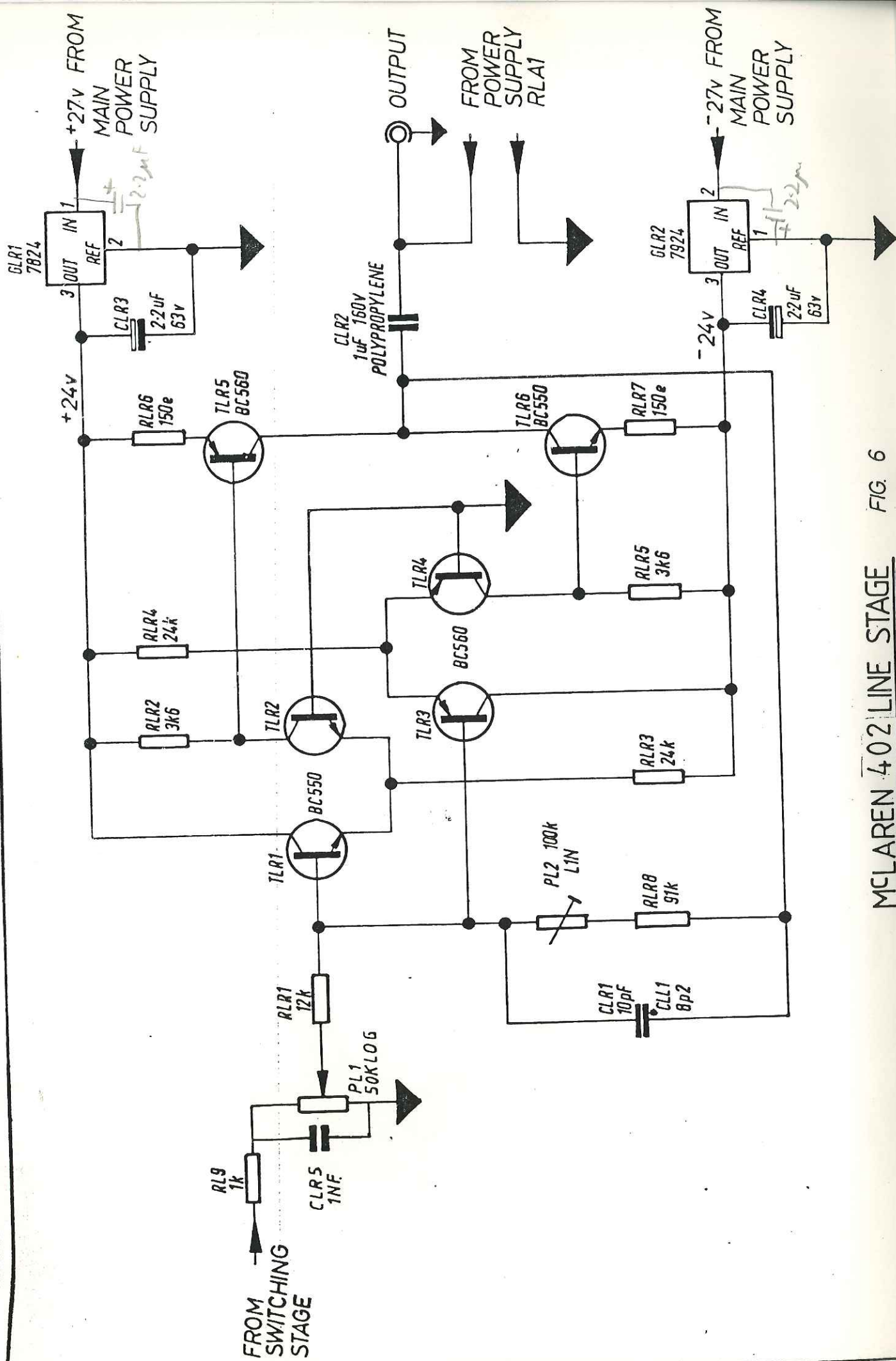


MCLAREN 402 R1AA EQUALISATION STAGE FIG. 4





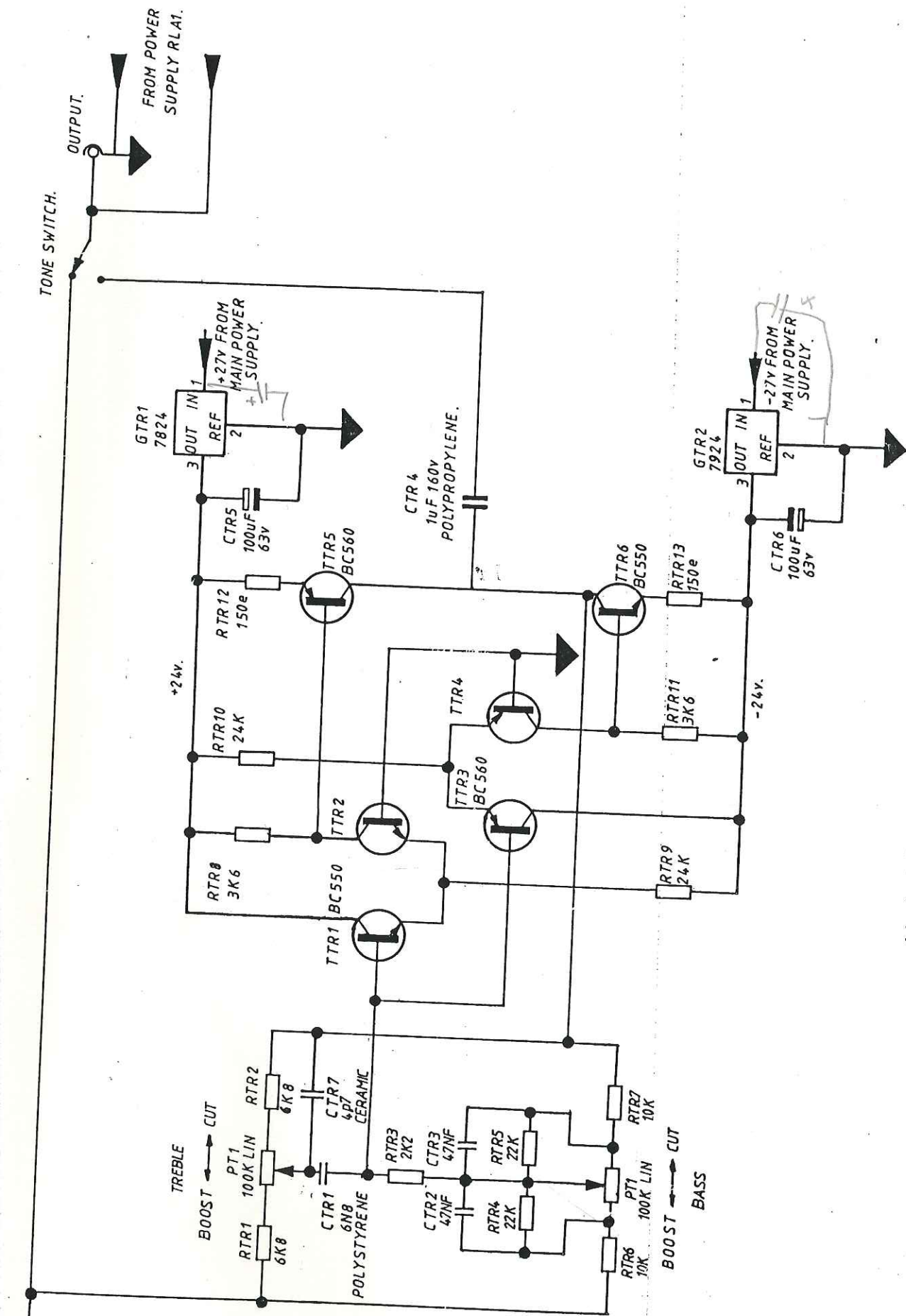
MCLAREN 402 SWITCHING SCHEMATIC



MCLAREN 402 LINE STAGE

FIG. 6





**McLAREN 402 TONE STAGE**

FIG. 7

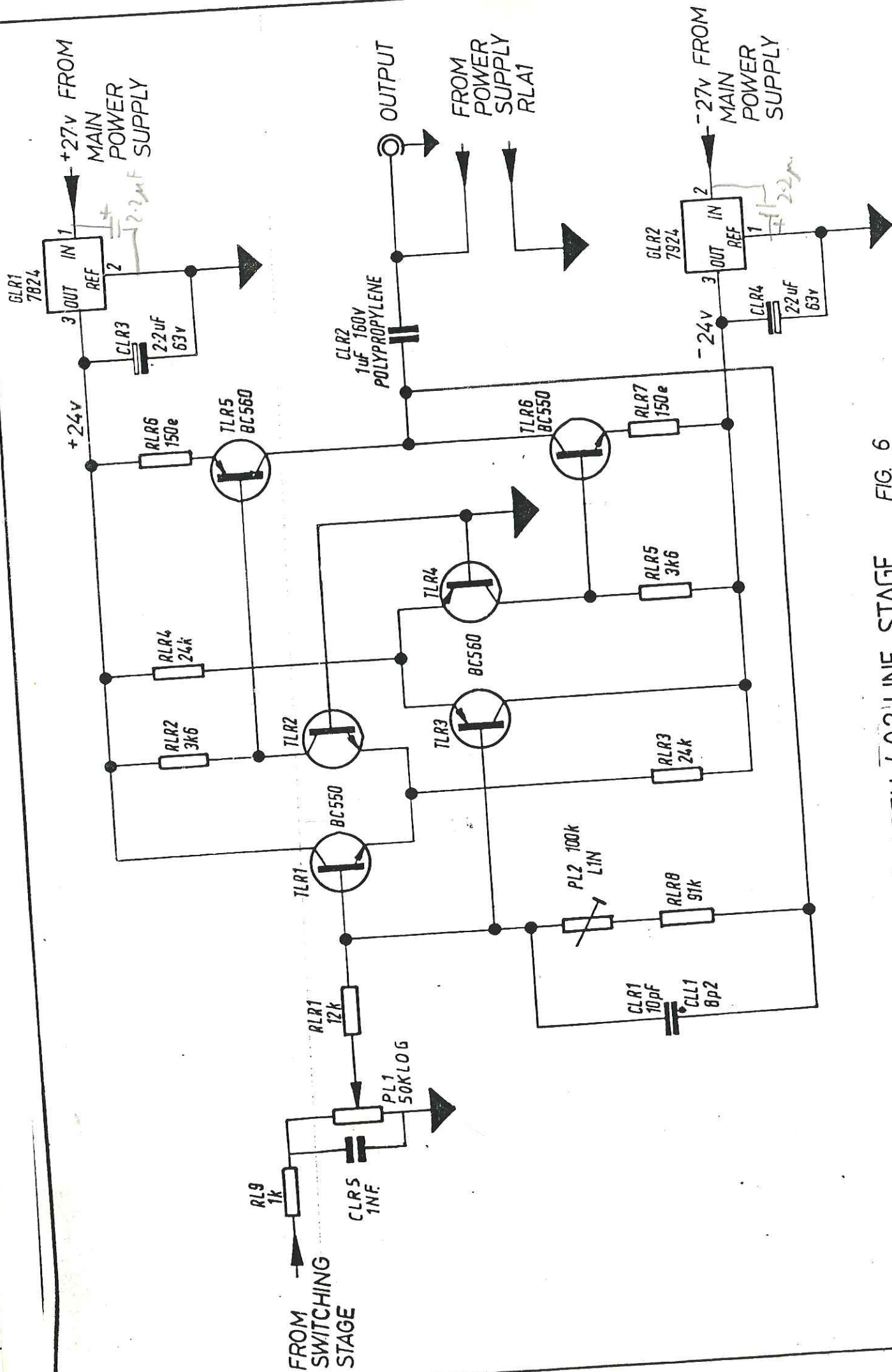
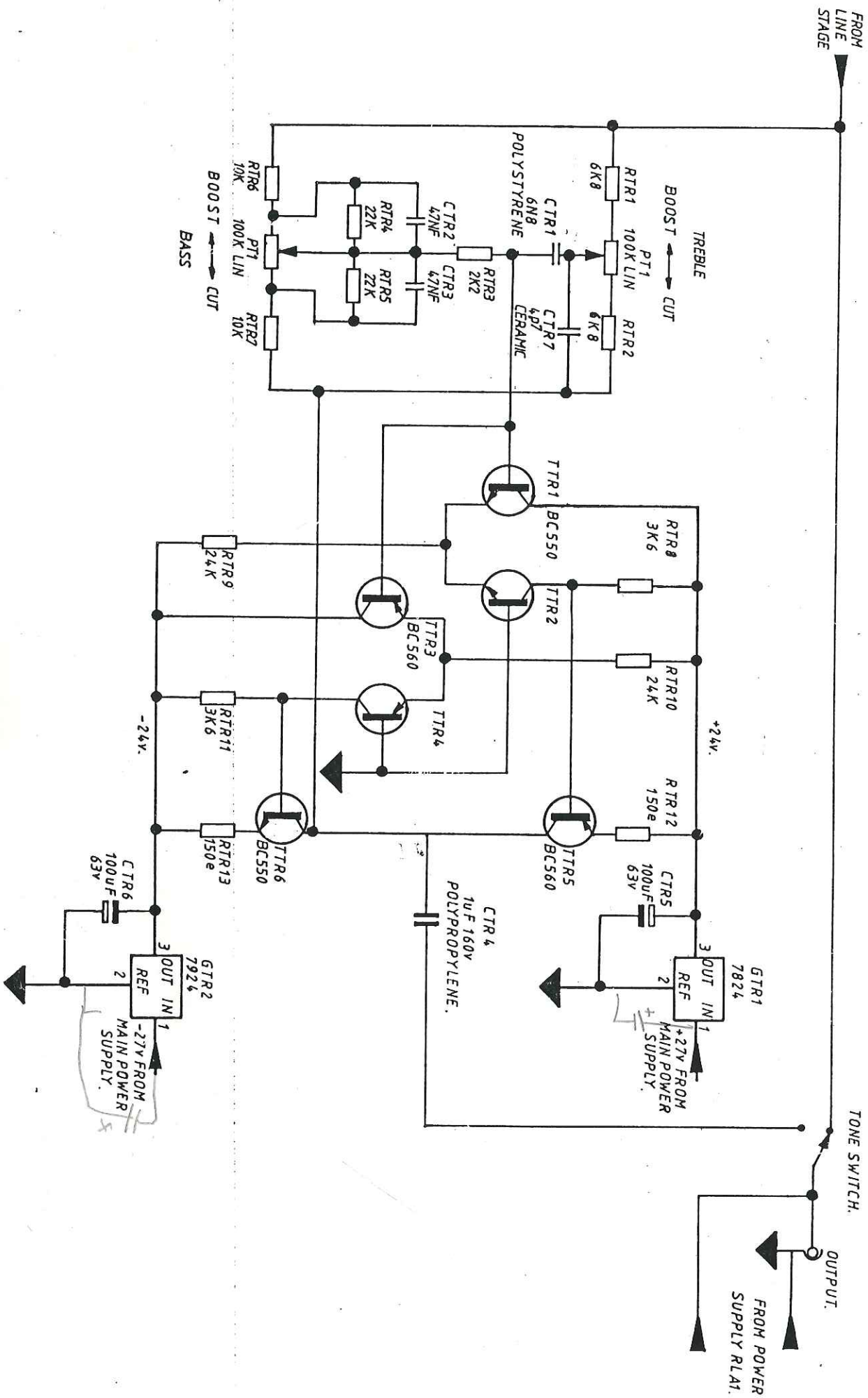


FIG. 6

MCLAREN 402 LINE STAGE





MCLAREN 402 TONE STAGE