McLAREN 702

Dual Channel Power Amplifier

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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.

Over 200 Watts (320 into 4 ohms) of Pure Power in an Elegant, Conveniently Sized Package

The McLaren 702 Dual Channel Power Amplifier represents a significant advance in the application of Power MOSFETs. Designed and engineered for the most critical applications, it raises solid state amplifier technology to a new performance level.

Increasing recognition is now being given to the superiority of Power MOSFETs over bipolar power transistors. Briefly they offer the following advantages:

- Extreme reliability and stability under all operating conditions.
- Vastly superior high frequency performance — faster and more accurate transient response and wider bandwidth at all power levels.
- Inherent self-protection avoiding the need for thermal sensors, relays or limiting circuitry.
- Lower distortion, particularly the unpleasant odd-order harmonics, as the onset of clipping is approached.
- Simplification of amplifier circuit topologies with fewer active devices in the signal path and lower negative feedback.

The successful application of Power MOSFETs in the McLaren 702 however, has been achieved not merely through careful attention to circuit design and layout, but from a critical analysis of the dynamic and interactive operating conditions within the output, driver and pre-driver stages.

The result is a power amplifier possessing quite special qualities — natural, effortless reproduction of dynamics with an unusually accurate resolution of fine detail, harmonic structure and ambient information.

Construction and interwiring employ the highest quality materials, components and craftsmanship. The case is entirely non-ferrous. Faceplate and side blocks are cut and machined from proprietory extruded sections, then hand finished and anodised. A single alloy casting forms the mounting bracket for the output devices and the external finned heatsink — heat flow is not impeded by poor metal to metal surface contact or mechanical fastenings. Top and bottom covers are coated with an attractive and durable textured finish. Front fixing screws, nameplate and input connectors are all 24-karat gold plated.

Features

- Power MOSFET output stages optimised and critically damped for fast and accurate transient response.
- Unconditionally stable even into highly reactive loads.
- Output devices inherently self-protecting, requiring no special protection circuitry which can cause premature power limiting and distortion.
- Single alloy casting heatsink/output stage module for superior thermal efficiency and structural integrity.
- Massive power supply incorporates heavy duty transformer and bridge rectifier, heavy gauge wiring and computer grade capacitors.
- Input and driver stages have individual, locally regulated power supplies fed from a separate rectified and smoothed supply.
- Highest quality components and materials including
  - — gain selected semiconductors
  - — polypropylene/polystyrene capacitors
  - — metal film resistors
  - — gold plated input sockets
  - — LC-OFC cable for input and output wiring.

Specifications

Continuous Power Output (both channels driven):
100 watts RMS per channel into 8 ohms
160 watts RMS per channel into 4 ohms

Dynamic Power (IHF) (both channels driven):
120 watts per channel into 8 ohms
200 watts per channel into 4 ohms

Power Bandwidth: 10Hz-50kHz

Harmonic Distortion: Less than 0.05% up to rated output, 20Hz-20kHz

Frequency Response:
+0, -1dB 5Hz-60kHz, -3dB at 120kHz

Rise Time at Rated Power: 2.5 μS

Channel Separation:
Greater than 70dB 20Hz-20kHz

Input Sensitivity:
1.0V RMS for rated output

Input Impedance: 50k ohms

Output Impedance: 0.05 ohms

Noise: 110dB (A) below rated output

Phase: Noninverting

Power Requirements:
110-120/220-240 VAC, 50-60Hz, 500 VA max.

Dimensions (inches/mm):
16.5/420(W), 4.1/105(H), 11.6/295(D)

Shipping Weight (lb/kg): 28.6/13.0

Specifications subject to change without notice

McLAREN AUDIO
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Contents

Introduction

The McLaren 702 is a 100 watt dual channel power amplifier. The only control is the mains power switch. The amplifier also has only one input option and a set of output terminals for each channel.
The amplifier will give an output of 100 watts into 8ohms for an input of 0.9Vac from 10Hz to 100khz +or -3dB. The 702 has been designed to drive complex loads without an appreciable loss in performance.

Operating Instructions

1. Connect the power amplifier input socket to the preamplifier output using a high quality interconnecting cable, left channel to the top socket and the right channel to the bottom socket.
2. Connect the speaker wiring to the colour coded binding posts, being careful to get the phasing correct.

RED should be connected to the positive speaker lead.

BLACK should be connected to the negative speaker lead.

As for the inputs, left is at the top and right at the bottom.

3. Plug the unit into the mains and switch on, the LED should light.

4. Select the required source and volume setting on the preamplifier.

FUSE REPLACEMENT

In addition to the MAINS FUSE located on the rear panel next to the powe cable, the McLaren 702 has RAIL FUSES to protect the output stage. Under conditions of severe over-driving (particularly into low impedance loads) or accidental short circuiting of the output while the amplifier is being driven, the fuses may blow.

WARNING

Replacement of rail fuses requires removal of the top cover which may expose DANGEROUS VOLTAGES

Accordingly, this procedure should be undertaken only by an authorized dealer or service person.

ENSURE THE AMPLIFIER IS FIRST DISCONNECTED FROM THE MAINS

Using the Allen key supplied to remove the four cap screws holding the cover, and slide the cover back. The rail fuses are located alongside the heatsink bracket (see fig 4) on which the output devices are mounted.

CAUTION

Fuses must be replaced only with the types specified.

MAINS FUSE		RAIL FUSES
110-120V	220-240V	
5A		3A(x4)

All types standard quick blow.
A complete set of spare fuses is packed with each amplifier.

NOTE

Persistent fuse blowing may indicate an electrical or installation fault Such cases should be referred immediately to an authorised dealer or service person.

Control Description

There is only one control on the McLaren 702, the ON/OFF switch, which applies mains voltage to the primary side of the mains transformer,and so power to the unit.

Mechanical Description

The McLaren 702 has 6 major mechanical components in its construction. These are....

1. Heatsink and main P.C.B. assembly. This module carries all the circuitry with the exception of the power supply smoothing capacitors, bridge rectifier, transformer and mains wiring.
The MOSFET output devices secure the P.C.B. to the cast aluminium (single piece) heatsink which provides very efficient heat transfer from the output devices. The heatsink also carries input and output connectors. Finish is black powdercoat.
2. Front panel. Made from extruded aluminium with a bronze anodised finish. This carries the main power switch and model identification badge.
3. Top cover. Made from sheet aluminium and finished with black powdercoat. Removal of this cover provides access to the component side of the P.C.B. and major power supply components.
4. Bottom cover. This carries all major power supply components and mains circuitry. Finish is black powdercoat.
5and6. Left and Right side rails. Made from proprietary extruded aluminium finished with black powdercoat.

Access for servicing board components is by first removing the top cover screws (3/16" cap screws) then removing the top cover. Now the 3/16" cap screws located on the back of the amplifier may be removed, releasing the heatsink which can now be turned over providing access to the solder side of the P.C.B.

Electrical Description

The McLaren 702 is a dual channel power amplifier consisting of three stages for each channel, fed by two power supplies with further regulation provided for each of the driver and input stages on each channel.

Main Amplifier (see circuit diagram)

This part of the amplifier consists of three stages per channel. The input stage is a differential pair using two BC556 transistors with a current of 1.5ma per device. The input is AC coupled through a 1uF capacitor and is fed to the non inverting input of the differential pair. Feedback is applied to inverting side of the same pair of transistors.
The input pair's output is then fed into a second differential pair with a current mirror to increase its voltage gain. A single sided output is then taken from the non inverting side to drive the output stage.
The output stage is made up of two pairs of power MOSFETS, making up a fully complimentary class AB output stage capable of delivering large currents, the stage is also fast and free from second breakdown problems, so only requires fuse protection.

The output stage is then followed by an inductor and RC network which ensure that the amplifier is stable into highly reactive loads and preventing capacitive loads effectively becoming a short circuit at high frequencies.

Power Supply

The power supply consists of two rectified and smoothed supplies, one is high current supply with 15000uF of smoothing per rail, this supplies bot output stages. The second supply is a low current supply, which provides power for input and driver stages. The low current supply has 470uF of smoothing per rail, but this is then followed by separate regulators for each stage,. This provides a very high degree of isolation between stages and channels.

Functional Check Procedure

Note: The following is a full functional check procedure for the McLaren 702 some of which may be omitted for checking specific problems.

Check Procedures

1 Power transformer taps
2 Quiescent current
3 DC offset
4 Noise
5 Distortion and Maximum output
6 Bandwidth
7 Crosstalk
8 Rise time
9 Input sensitivity

1. Power Transformer

WARNING: Check 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 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. Locate the plastic shield on the mains transformer primary end, remove the cover by prising it off with a screwdriver.

c. The transformer primary has two separate windings each marked with 0 at one end and 115 at the other. For supply voltages from 110-120Vac the primaries should be connected in parallel (see fig 5a), and for supply voltages from 200-240Vac they should be connected in series (see fig 5b).

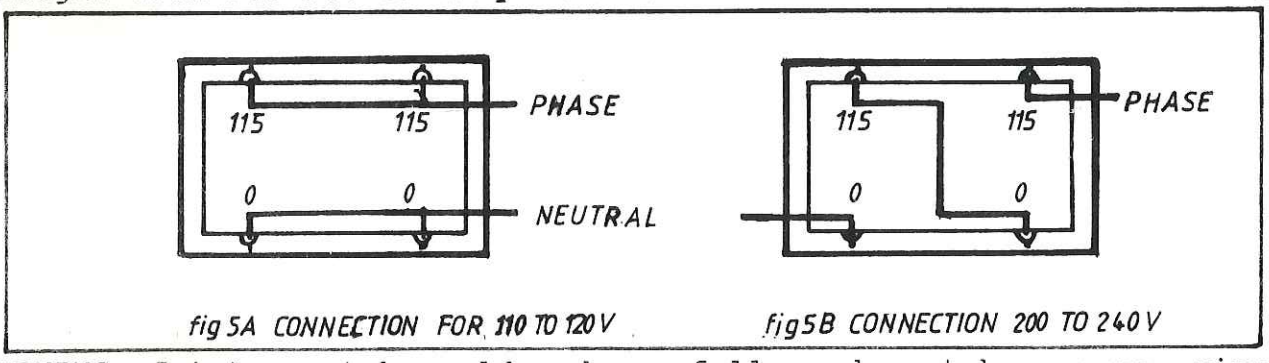


fig 5A CONNECTION FOR 110 TO 120 V fig 5B CONNECTION 200 TO 240 V

WARNING: Joints must be soldered carefully and must be secure, wires should go through the holes in the lugs.

d. Replace the transformer's plastic shield and slide the top cover back into place and replace cover screws.

WARNING: The external rating label must be changed to guard against the unit being connected to incorrect mains voltages.

2. Quiescent Current (IQ)

WARNING: This procedure should only be attempted by a qualified person a it involves adjustments being made while the amplifier is running.

WARNING: Some internal parts are live.

a. Ensure unit is disconnected from the mains supply and no input or loa is connected.
b. Using the 5/32" Allen key provided unscrew the four cap screws which secure the top cover and slide it back.
c. Locate the rail fuses (near the heatsink web with the output devices it)
d. Carefully remove the fuse closer to the IQ trimpot, see fig 4, on one channel only and place a current meter(preferably a fused type) in place the fuse(observe polarity shown in fig 4 when using an analog meter), set the meter range 400mA or greater.
e. Ensure that there are no short circuits to chassis or other component
f. Plug the unit into the mains and switch on. The IQ should increase rapidly then gradually to a maximum of 200mA after 5 minutes. If the IQ not set at 200mA it will be necessary to adjust the trimpot until a readi of 200mA is obtained.
Left channel, clockwise rotation will increase IQ Anticlockwise will decrease IQ.
Right channel, clockwise rotation will decrease IQ. Anticlockwise rotat will increase IQ.
g. Once the IQ has been set turn the power off and disconnect the amplifier from the mains, wait for the current to drop, then remove the meter and replace the fuse. Repeat procedures a-f for the other channel.

3. DC Offset

WARNING: This procedure should only be attempted by a qualified person it involves adjustments being made while the amplifier is running.

WARNING: Some internal parts are live.

a.Ensure unit is disconnected from the mains supply and no input or lo is connected.
b. Using the 5/32" Allen key provided unscrew the four cap screws which secure the top cover and slide it back.
c. Connect a DC meter across the output terminals, then connect the uni to the mains and switch on.
d. Right channel, clockwise rotation will shift the offset in the negat direction, and anticlockwise in the positive direction.
e. Left channel, clockwise rotation will shift the offset in the positi direction, and anticlockwise in the negative direction.
f. Adjust the offset until a reading of less than + or - 5mV is obtaine Repeat the procedure for the other channel.

4. Noise.

a. Connect shorting plugs to the input sockets of the amplifier.
b. Connect a measuring instrument to the output terminals, taking care to observe the correct polarity.
RED should be connected to the positive meter lead.
BLACK should be connected to the negative meter lead.
c. Connect the unit to the mains and switch on.
d. Measure the residual noise. The noise floor should be below
-70dB ref 1V unweighted
-81dB ref 1V A weighted

5. Distortion and Maximum Output

Distortion

a. Connect a low distortion signal generator to the left hand input socket of the amplifier.
b. Connect a distortion analyser to the left hand output binding posts being careful to observe the correct polarity.
RED should be connected to the positive meter lead.
BLACK should be connected to the negative meter lead.
Also connect an 8ohm load across the output terminals.
c. Connect the unit to the mains and switch on.
d. Follow the instructions for the distortion analyser being used to make the required measurements.
Distortion should be less than 0.015% 20Hz to 20KHz at rated output.
e. Repeat the above procedure for the right hand channel.

Maximum output

a. Connect a signal generator to the left hand input socket of the amplifier.
b. Connect either a distortion analyser or an oscilloscope to the left channel output terminals being careful to observe the correct polarity.
RED should be connected to the positive meter lead.
BLACK should be connected to the negative meter lead.
Also connect an 8ohm 100watt load across the output terminals.
c. Connect the unit to the mains and switch on.
d. Slowly increase the signal generator output until.
i. Distortion analyser, a steep rise in distortion is noted indicating clipping.
ii. Clipping is visible on the oscilloscope screen.
Maximum output should be greater than...
8ohm load..28.3Vrms...100Watts
4ohm load..25.3Vrms...160Watts
Note. To measure the 4ohm performance repeat procedures a to d but connect a suitable 4ohm load to the output terminals.
e. Repeat the above procedure for the right hand channel.

6. Bandwidth

a. Connect a signal generator to the left hand input socket of the amplifier.
b. Connect an audio volt meter to the left hand output binding posts bei careful to observe the correct polarity.
RED should be connected to the positive meter lead.
BLACK should be connected to the negative meter lead.
Also connect an 8ohm load across the output terminals.
c. Connect the unit to the mains and switch on.
d. Set the signal generator so that the output is at a convenient reference level.
NOTE Do not run the amplifier at greater than 15Vrms output as this m damage the output RC network when run at frequencies greater than 50KHz.
e. Sweep the signal frequency up until the -1dB and -3dB points are reached, then sweep the frequency down to determine the low frequency -1d point.
-1dB 10Hz to 60KHz
-3dB 120KHz
f. Repeat the above procedure for the right hand channel.

7. Crosstalk

a. Connect a signal generator to the left channel input socket of the amplifier.
b. Connect an audio volt meter to the left channel output binding posts being careful to observe the correct polarity.
RED should be connected to the positive meter lead.
BLACK should be connected to the negative meter lead.
Also connect an 8ohm load across the output terminals.
c. Connect the unit to the mains and switch on.
d. Set the signal generator so that the left channel output is 28Vrms at 1KHz.
e. Measure the output from the right channel by connecting the AC voltmeter to the right channel binding posts being careful to observe the correct polarity.
f. Now sweep the frequency of the signal generator between 20Hz and 20K The output from the right channel should not exceed -70dB ref 28V or -41 ref 1Vrms.
NOTE Do not exceed 20KHz while running the amplifier at outputs greater than 20Vrms.

8. Rise Time

a. Connect a signal generator to the left hand input socket of the amplifier.
b. Connect an oscilloscope and 8ohm load to the left hand output binding posts of the amplifier being careful to observe the correct polarity.
RED should be connected to the positive scope lead.
BLACK should be connected to the negative scope lead.
c. Connect the unit to the mains and switch on.
d. Set the signal generator to give a 1KHz square wave, and adjust the level to give a 100V peak to peak output.
e. Read off the oscilloscope the time taken to go from 10% to 90% output as shown below in fig 6.

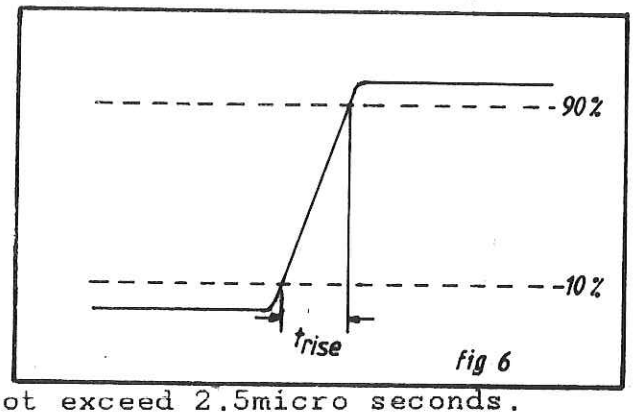


fig 6

The rise time should not exceed 2.5micro seconds.
f.Repeat the above procedure for the right hand channel.

9. Input Sensitivity

a. Connect a signal generator to the left hand input socket of the amplifier.
b. Connect an AC voltmeter and 8ohm load to the left hand output binding posts of the amplifier being careful to observe the correct polarity.
RED should be connected to the positive scope lead.
BLACK should be connected to the negative scope lead.
c. Connect the unit to the mains and switch on.
d. Set the signal generator to give a 1KHz sinewave output at a level that gives a convenient reference level output from the amplifier. e.g. 10Vrms.
e. Measure the input voltage input required for this output.
Gain should be 30.6dB or 33.7 times.
f. Repeat the above procedure for the right channel.

Parts List

PC Board	Supplier Part No.	Description
Capacitors		
CA1,CB1	Wima MKP10 1uF 160V	1uF 160V Polypropylene
CA2,CB2	Philips 2222-427-13301	330pF Polystyrene cap
CA3,CB3	Philips 2222-035-56221	220uF 16V Electrolytic
CA4,CB4	Wima MKP10 1uF 160V	1uF 160V Polypropylene
CA5,CB5	Philips 2222-680-10229	22pF 100V Ceramic cap
CA6,CB6	Wima MKS4 0.1uF 100V	0.1uF 100V Polyester
CA7,CB7	Wima MKS4 0.1uF 100V	0.1uF 100V Polyester
CA8,CB8	Philips 2222-035-58109	10uF 63V Electrolytic
CA9,CB9	Philips 2222-035-58109	10uF 63V Electrolytic
CA10,CB10	Philips 2222-035-58109	10uF 63V Electrolytic
CA11,CB11	Philips 2222-035-58109	10uF 63V Electrolytic
CA12,CB12	Philips 2222-035-58109	10uF 63V Electrolytic
CA13,CB13	Philips 2222-035-58109	10uF 63V Electrolytic
CP14,	Wima MKS4 1uF 100V	1uF 100V Polyester
CP15,	Wima MKS4 1uF 100V	1uF 100V Polyester
CP16,	Elna PC4 15000uF 63V	15000uF 63V Electrolytic
CP17,	Elna PC4 15000uF 63V	15000uF 63V Electrolytic
CP18,	Wima MKS4 1uF 100V	1uF 100V Polyester
CP19,	Wima MKS4 1uF 100V	1uF 100V Polyester
CP20,	RIFA 470uF 100V	470uF 100V Electrolytic
CP21,	RIFA 470uF 100V	470uF 100V Electrolytic
CP22,	Philips 2222-368-41104	0.1uF 250 V Polyester
CA23,CB23	1uF 100V Polycarbonate or Polypropylene	
CA24,CB24	1uF 100V Polycarbonate or Polypropylene	

Resistors

RA2,RB2	Philips 2322-151-54703	47Kohm 1% Resistor
RA3,RB3	Philips 2322-151-52202	2.2Kohm 1% Resistor
RA4,RB4	Philips 2322-151-53903	39Kohm 1% Resistor
RA5,RB5	Philips 2322-151-51002	1Kohm 1% Resistor
RA6,RB6	Philips 2322-151-51001	1Kohm 1% Resistor
RA7,RB7	Philips 2322-151-52702	2.7Kohm 1% Resistor
RA8,RB8	Philips 2322-151-52702	2.7Kohm 1% Resistor
RA9,RB9	Philips 2322-191-38208	8.2ohm 5% 1.6Watt resistor
RA10,RB10	Philips 2322-151-58201	820ohm 1% Resistor
RA11,RB11	Philips 2322-151-52703	27Kohm 1% Resistor
RA12,RB12	Philips 2322-151-51001	100ohm 1% Resistor
RA13,RB13	Philips 2322-151-51001	100ohm 1% Resistor
RA14,RB14	Philips 2322-191-52202	18Kohm 5% 1.6Watt Resistor
RA15,RB15	Philips 2322-151-31001	100ohm 1% Resistor
RA16,RB16	Philips 2322-151-52201	220ohm 1% Resistor
RA17,RB17	Philips 2322-151-52201	220ohm 1% Resistor
RA18,RB18	Philips 2322-151-52201	220ohm 1% Resistor
RA19,RB19	Philips 2322-151-52201	220ohm 1% Resistor
RA20,RB20	Micron 0.56ohm 5Watt	0.56ohm 5% 5Watt Resistor
RA21,RB21	Philips 2322-191-38208	8.2ohm 5%1.6Watt Resistor
RA22,RB22	Philips 2322-191-38208	8.2ohm 5%1.6Watt Resistor
RP23	Philips 2322-191-32702	2.7Kohm 5%1.6Watt Resistor

RA24,RB24	Philips 2322-151-52703	27Kohm 1% Resistor
RA25,RB25	Philips 2322-151-58202	8.2Kohm 1% Resistor

Transistors

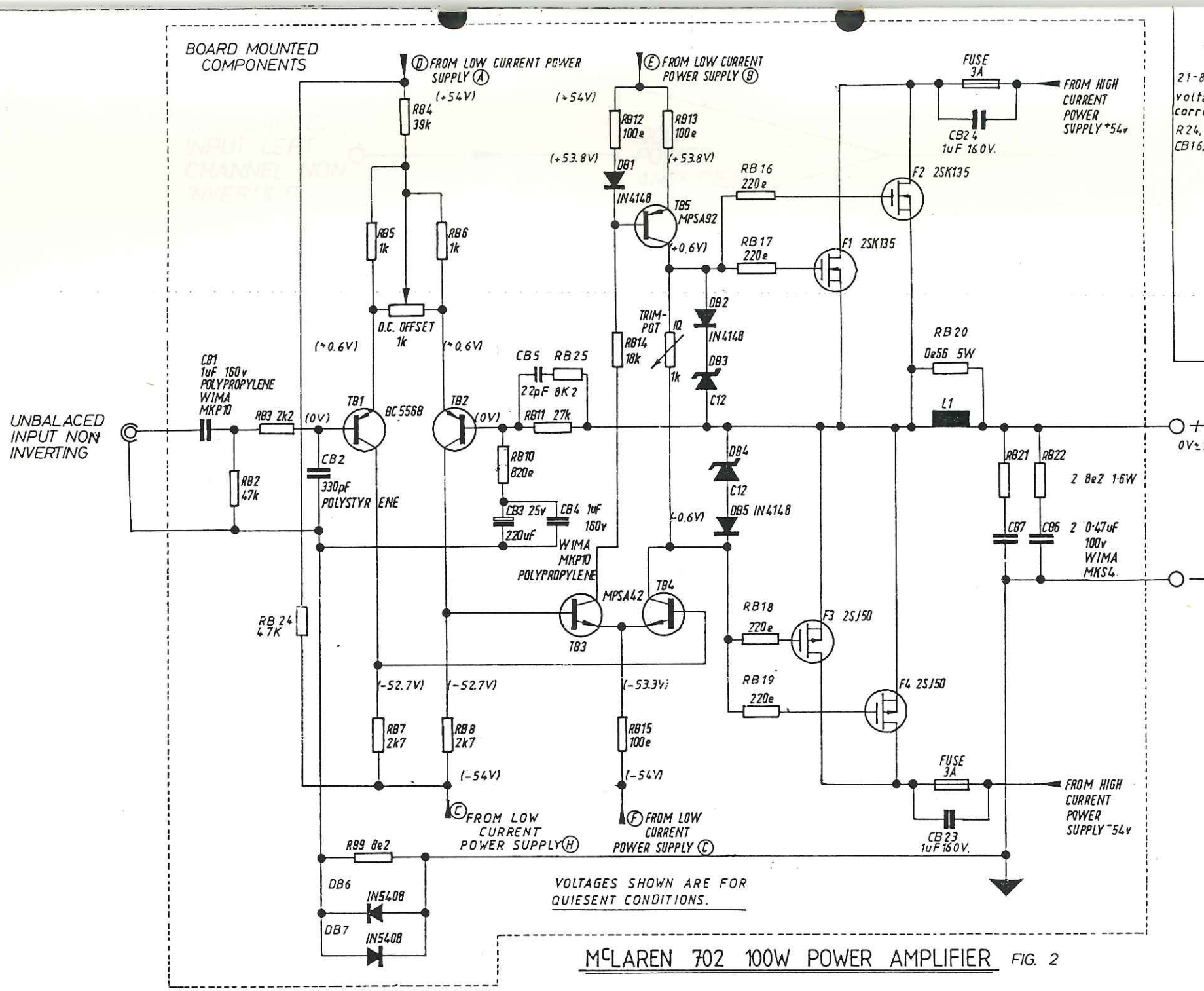
TA1,TB1	Philips BC556B	80V 200mA Transistor
TA2,TB2	Philips BC556B	80V 200mA Transistor
TA3,TB3	Motorola MPSA42	300V 500mA Transistor
TA4,TB4	Motorola MPSA42	300V 500mA Transistor
TA5,TB5	Motorola MPSA42	300V 500mA Transistor
F1,F2	Hitachi 2SK135	+160V 7Amp MOSFET
F3,F4	Hitachi 2SJ50	-160V 7Amp MOSFET

Diodes

DA1,DB1	Philips 1N4148	100mA Signal Diode
DA2,DB2	Philips 1N4148	100mA Signal Diode
DA3,DB3	Philips BZX79 C12	12Volt zener Diode
DA4,DB4	Philips BZX79 C12	12Volt zener Diode
DA5,DB5	Philips 1N4148	100mA Signal Diode
DA6,DB6	Philips 1N5408	8Amp 400Volt Diode
DA7,DB7	Philips 1N5408	8Amp 400Volt Diode
DA7z,DB7z	Philips BZX85 C39	39Volt zener Diode
DA8,DB8	Philips BZX85 C39	39 Volt zener Diode
DP10,DP11	Philips 1N4007	1A 100V Rectifier
DP12	Philips BZX85 C33	33Volt zener Diode
BR11	BR354	35Amp 400V Bridge Rectifier

Regulators

GA1,GB1	SGS 7815	1.5Amp +15V Regulator
GA2,GB2	SGS 7815	1.5Amp +15V Regulator
GA3,GB3	SGS 7915	1.5Amp -15V Regulator
GA4,GB4	SGS 7915	1.5Amp -15V Regulator

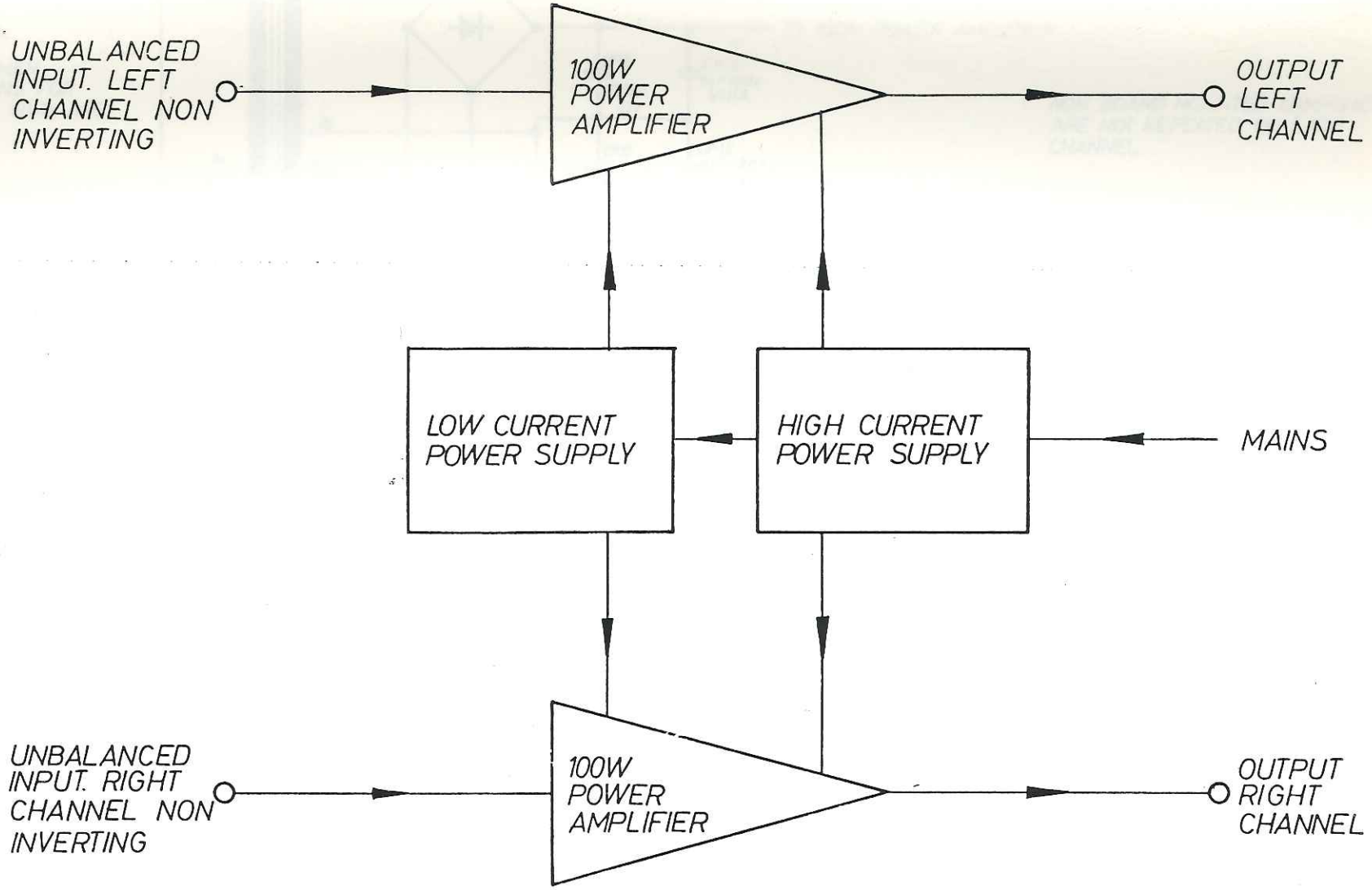


REVISIONS.

ORIGINAL

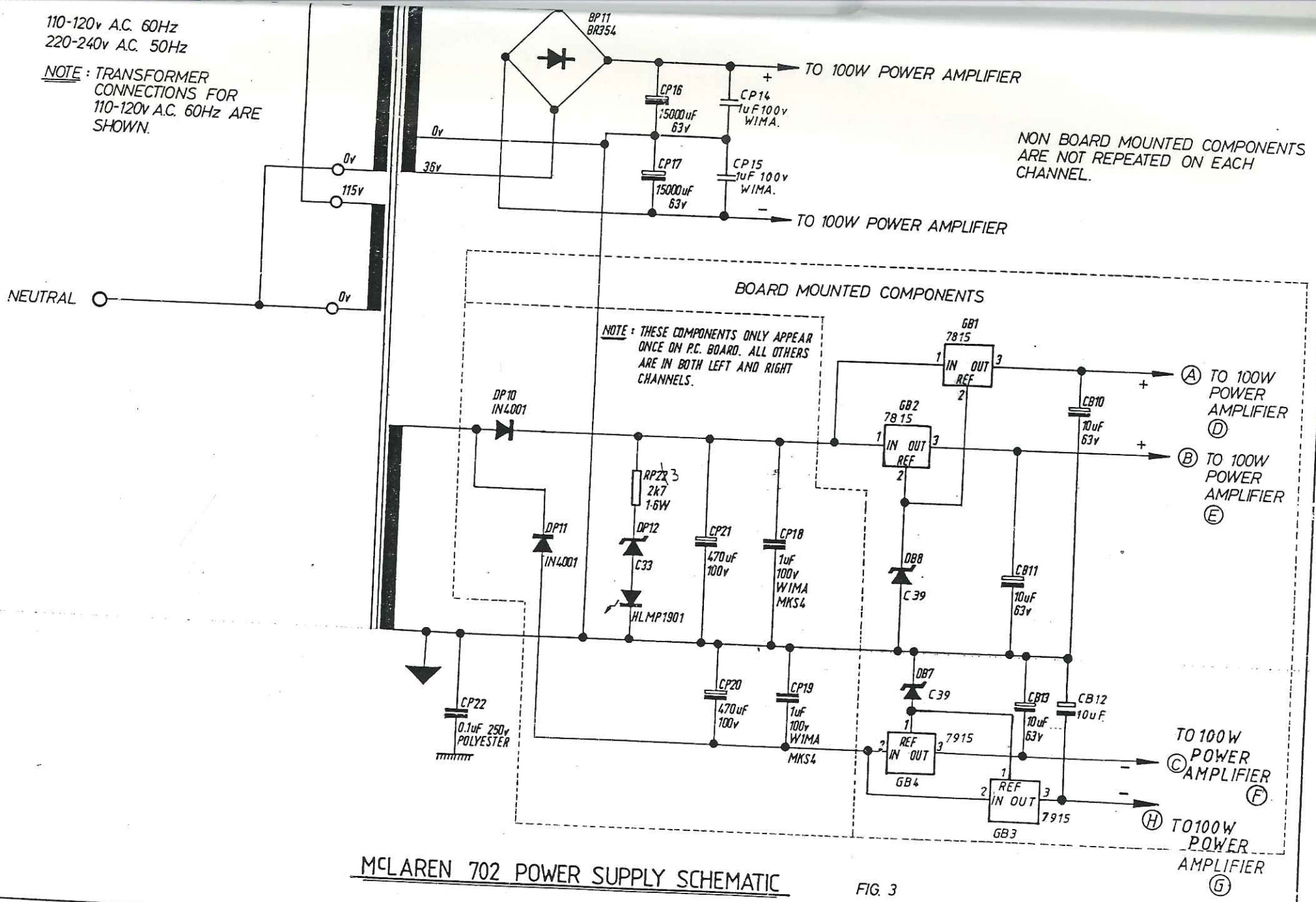
21-86 (1)
voltages added, k.fets corrected,
R24, R25 added.
CB16, CB17 fitted to fuses.

McLAREN 702 100W POWER AMPLIFIER FIG. 2



McLAREN 702 BLOCK DIAGRAM

FIG. 1



McLAREN 702 POWER SUPPLY SCHEMATIC

FIG. 3