

Serial no.

**AD 160
ENG MIXER
HANDBOOK**

WARNING

IMPORTANT SAFETY INSTRUCTIONS

The user of electrical products must be familiar with their potential dangers, and fundamental precautions must always be taken. Please read the following text carefully.

A power supply unit manufactured by Audio Developments Ltd. is not user serviceable - it has no user-serviceable parts.

THE OUTER COVERS MUST NOT BE REMOVED

Such a power supply unit is solely for use with audio mixers and sound processors - hereafter called the equipment - manufactured by Audio Developments Ltd. Always use a cord set accepted by a National Approved Body.

EARTHING/GROUNDING: When using an external power supply unit that is connected to the mains supply to drive the mixer it must be **CONNECTED TO EARTH**.

In certain types of malfunction or breakdown, earthing provides a path of least resistance for electric current and considerably reduces the risk of electric shock.

DANGER: Improper connection of the equipment grounding/earthing conductor can result in the risk of electric shock. Where possible obtain a pre-wired mains lead from a reputable supplier with the correctly fitted mains connector for the type of mains outlet in use; otherwise, one correctly wired and checked by a qualified electrical engineer. If your mains lead is not suitable for the mains outlet, have the correct plug fitted by qualified personnel.

OTHER PRECAUTIONS

- Read the instructions before using the equipment and its power supply unit.
- The power-supply cords should be unplugged from the outlet when left unused for a long period.
- The equipment, but especially the mains power supply unit, should be serviced by qualified personnel.
- The mains power supply unit should be checked by qualified personnel on a periodic basis to ensure it meets its specifications, especially those associated with SAFETY.
- Electrical and electronic products should definitely be serviced if the power supply cord or plug have been damaged.
OR
Objects have fallen on them or they has been dropped, causing physical damage:
OR
Liquid has been spilled upon them or they have been exposed to rain.
OR
They do not seem to perform at all, or are operating, or appearing to operate, below normal specification
- Do not use the equipment or a mains power supply unit near water or in rain or in any other areas where the power supply could get wet or exposed to moisture.
- Never locate your equipment and its power supply unit near a source of heat, eg radiator or stove.
- The equipment should only be connected to the type of power supply unit marked on its casework or as described in the operating instructions.

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NOTE: The several Drawing lists which
appear throughout this Manual
relate to current model variations.

AD 160 ENG MIXER

OPERATION

INPUTS

The mixer has 3 microphone inputs and one line input.

The gain selector for each microphone input is mounted on the top panel and has 3 settings. The setting is determined by the type of microphone being used. The optimum recommended setting is with both the channel and master fader set to 10dB down. The gain switch position is selected to give the best signal to noise ratio and headroom and will also leave 10dB in hand on each fader.

If condenser microphones are being used then the correct powering should be selected i.e. either phantom or tonader. It must be noted that the tonader powering connection used by some is reverse of AUDIO DEVELOPMENTS selected standard i.e. PIN 2 - POSITIVE. If the reverse polarity is required this can be achieved.

On each microphone input there is a high pass filter with 2 turn over frequencies. These are brought into circuit if undesirable low frequencies are present.

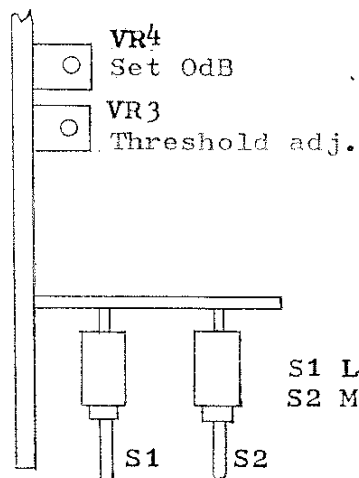
The Line input has a sensitivity of 10dB and the level to the output is controlled by a screwdriver operated potentiometer. However, even when the level control is at infinity the line output still appears at the monitor output. This allows for off tape monitoring.

OUTPUT

There is one output which is electronically balanced. Care should be taken when driving un-balanced loads. (Refer to connection details). Also when driving unbalanced loads it should be noted that 6 dB less level appears across the output than the meter indicates. This is due to one side of the electronic balance being left floating. This can be overcome by inserting a 600/600 transformer between mixer and load. Also on the output is a switch to change the reference level from line (H1) to mic (LO). The attenuation is 60dB.

LIMITER

A limiter with a 20:1 ratio is incorporated in the output amplifier. It can be switched in or out of circuit. It is used in cases where over modulation must be prevented. The factory setting is at +8dBm but can be readjusted by the operator as shown below.



Access can be gained to this module by removal of the one side panel. This is secured by two screws into the base

MONITOR

The monitor output is via a P.O. Type B jack as standard but a Type A can be fitted. The monitor level is controlled as with the line input by a screwdriver adjusted potentiometer. The listener can choose whether he listens to either the main output or the line input. As explained previously, the line pot can be set to infinity and the line input can still be monitored. This allows such as off tape monitoring to be achieved.

The meter follows the audible monitor.

LINE UP TONE

The button marked 1kHz injects a tone onto the output for line up purposes. When selected the program line is interrupted.

POWERING

The mixer can be either powered from an external source or batteries.

If connecting from an external source refer to the connection details.

Powering from batteries can be achieved using

either dry or NI-CAD cells. When using NI-CAD batteries they can be re-charged via the constant current charger built into the mixer. A voltage of 15 to 28v d.c. needs to be fed to PIN 2 of the connector. The charging current is between 50 and 60 mA.

The batteries are incorporated in the bottom of the mixer and are AA size, requiring nine cells.

AD 160 ENG MIXER

CONNECTIONS

AUDIO INPUTS

XLR (3 Pin Female)	1 - EARTH)	TRANSFORMER BALANCED AND FLOATING	
	2 - LIVE)		
	3 - RETURN)		
PHANTOM POWER	1 - EARTH	TA or AB	1 - EARTH
	2 - +48V		2 - +12V
	3 - +48V		3 - 0V
XLR (3 Pin Female)	1 - EARTH)	ELECTRONIC BALANCED	
LINE INPUT	2 - LIVE)		
	3 - RETURN)		

AUDIO OUTPUT

XLR (3 Pin Male)	1 - EARTH
	2 - LIVE
	3 - RETURN
DIN (6 Pin Female)	1 - LINE I/P +ve
	2 - LINE I/P -ve
	3 - +12V
	4 - O/P +ve
	5 - O/P -ve
	6 - 0V

The main output is an electronically balanced output and if used to drive an unbalanced load PIN 3 must be left open circuit not connected to ground.

i.e. when driving unbalanced load:

1 - EARTH
2 - SIGNAL
3 - NO CONNECTION

MONITOR JACK

TYPE - "RENDAR"	TYPE 'A' or 'B'
TIP - SIGNAL)	3 POLE
RING - SIGNAL)	
SLEEVE - EARTH)	
TIP - SIGNAL)	2 POLE
SLEEVE - EARTH)	

POWER UNIT

1 - 0V
2 - CHARGE
3 - 15 - 28V
4 - 10 - 15V

The voltage source must be of a d.c. regulated type and capable of supplying 200 mA.

The CHARGE input requires a regulated voltage of at least 15V with a maximum of 28V i.e. connect Pin '2' to Pin '3'. The constant current charger circuit is built in the mixer.

AD160 ENG MIXER

SERVICE AND CALIBRATION NOTES

1. MECHANICAL:

Access is gained to all the electronics by removal of the upper and lower side panels. These are secured by two screws in each into the battery box extrusion. Other mechanical parts only need be removed to ease the changing of certain components if this becomes necessary.

Input and output modules are held via a bracket to the mother board and the front panel. One of these can be removed from the chassis by taking the screw out holding the bracket to the mother board, removing the potentiometer knob and nut and then unplugging the module from its connector. If difficulty is experienced in this area total removal of the front panel should help the situation. This is done by removing all pot. knobs and nuts and then the side panel fixing screws (4 off.) All procedures are reversed for assembly.

The Monitor Amp board and Meter Drives are just retained by their connectors and secured by the upper side cover.

2. ELECTRICAL:

Introduction

A description is given of each module in turn with a drawing reference number given at the beginning of the paragraph. This refers to the schematic drawing contained in the manual. A brief summary of all useful test points and calibrations is given at the end in tabular form.

The block Diagram (AD160-C-12) should be studied to gain an understanding of the way the various modules are linked in relation to each other.

MOTHER BOARD AD160-C-105 & C-305

This board carries all the interconnections between all the modules, the only wiring in the unit being from the input and output connectors and the DC to DC Converter Module.

The Microphone Input XLR is wired to the Mother Board and the signal tracks are then routed to the MIC INPUT MODULE. Mounted on the mother board, breaking into the input signal tracks is the microphone powering. S.1 through to S.3 are the PH-OFF-TA switches.

TEST - with the switch in the OFF position no DC volts should appear at either pins 2 or 3 of the XLR. When the PH position (PHANTOM) and the input unterminated 48v DC should appear at PINS 2 & 3 of the XLR. If not it should be checked that 48v is present at the Converter output. PIN 105 connector PL1. When switches S1-S3 are in the TA position 12v DC should be present on PIN 2 and 0v on PIN 3 of the input XLR. This again, when the input is unterminated. This can be checked at the positive terminal of C1, C2 or C3. If the volts are not present, then the connections via R26 can be tested back to PIN 203 of PL1. **NOTE:** With some microphones needing a reverse polarity to what is described, it may be found that PIN 2 of the XLR is at -12v and not +12v. If this needs to be changed in the field the following procedure should be adopted:-

- a) Move R26 into its alternate position. i.e. -12v line.
- b) Remove C1, C2 and C3 and reverse their polarity in the P.C.B.
- c) Also reverse the polarity position of C4, C5 and C6.

This will have then set up the mixer with PIN3 of the XLR the more positive with regard to audio signals.

The signal path from the microphone power switches is direct to the Microphone Amplifier boards. C4 to C6 just act as d.c. blocking capacitors. The output of each MIC AMP module is a good test point

for checking if the audio signal is present on each input module.
(Edge connector No.3.)

From the Microphone Input Modules the signal path moves to the mixer amplifier (IC 1.) Thus at PIN 6 of IC 1 the summed signal can be checked. Also mixed into the bus is the Line Input signal via VR1 and on a MK III version the Talkback signal (MIC 1.) S9 is the Talkback Inject switch.

From the Mixer Amp. output the signal path moves onto S7. This is the 1KHz Tone switch. When this switch is operated the main signal path is broken and the 1KHz Tone is injected into the output amplifier.

From S7 the signal path moves into the Output and Limiter Module, then onto the main output connector via S.4. This is the HI/LO switch. In the HI position the Line level signal is present at the output, in the LO an attenuated signal appears. (60dB attenuation.)

The output signal is also fed to the Monitor Amplifier. VR2 is the monitor level control.

MICROPHONE AMPLIFIER MODULE. Drg. No. AD160 D 129 & D.30

There are no calibration controls associated with the MIC AMP MODULE.

The circuit itself is made up of a common emitter stage (TR4) which provides the gain and a class B output pair (TR1 & TR3) which provides a low output impedance stage to enable the feedback and subsequent stages to be driven efficiently. R18,R19 & TR2 provide bias for the class B output stage.

The feedback is provided by R7 with S1 (the GAIN SELECT SWITCH) switching R5 in parallel with R7 to increase the feedback and lower the gain by 20dB. In the -40dB position of S1 an attenuator (-20dB) is switched into the input signal path.

Therefore the signal tests to be carried out on this stage are to check if the gain is correct. A good test point to choose is at the junction of C3 & VR1 (the channel gain control.)

The gains are with S1 in -80 position, gain = 50dB

S1 in -60 " " = 30dB

S1 in -40 " " = 10dB

The d.c. bias of the stage can be checked at the junction of R12 & R13. This should be 0v (± 0.5 v) with respect to signal ground.

OUTPUT & LIMITER MODULE Drg. No. AD 160 C 103 & D303

The signal enters this module at CONNECTOR 8 which feeds the main output gain control VR1. From here it moves into the two stages formed by IC2 which form the main output amplifier. Each stage is made up of 1/2 of IC2 which drives a class B stage made up of TR1, 2, 3 and 4 or TR5, 6, 7 and 8. This enables a low impedance output, consequently a high drive capability, to be provided. The electronic balance is formed by driving the output of Stage 1 into the input of Stage 2. As each stage is of the inverting type a balance is formed looking across both outputs. This signal appears across connectors 1 & 2 of the module.

The limiter is formed in a feedback stage comprising of sections made up of IC1 and TR9. The output signal is full wave rectified by D3 & D4. It then gets amplified by IC1a. The signal at the output of the amplifier charges C7. R14 determines the rate of charge and thus the ATTACK TIME. D1 prevents C7 discharging into the outputs of IC1a.

The voltage change across C7 causes TR9 to switch on and divert current from the signal input path. This notionally decreases the gain of the input stage around IC2a. Therefore as the output signal tries to increase the charge across C7 also increases and switches TR9 on more, which lowers the gain of the input amplifier even further.

R13 determines the rate of discharge of C7 after the excess signal has ended thus creating the RELEASE TIME of the limiter.

IC1b is used as a bias network and VR4 is varied to set the FET TR9 to its pinch off voltage. This can be set, with S1 open (the limiter ON/OFF switch) by adjusting the output signal level to 0dBm. With S1 closed VR4 should then be adjusted until the signal level falls by 0.25dB. Throughout this setting the THRESHOLD control VR3 should be at the centre of its travel.

The THRESHOLD is adjusted by setting the output signal to 2dB over the desired signal threshold (with S1 open.) Then with S1 closed adjust VR3 until the signal falls to the desired level. (Factory setting is +8dB.)

A d.c. check that can be carried out at this stage is to see if approximately -2.2v and -2.4v d.c. appear at PIN 7 of IC1 and the wiper of VR3 respectively.

LINE INPUT, MONITOR & 1KHz TONE BOARD. Drg.No.AD 160 D 102 & D302.

LINE INPUT :- This amplifier is made up of a conventional differential amplifier around IC1a. This stage normally has a loss of 6dB, but care should be taken here, because certain customers have requested gain of up to 20dBm to match into their equipment. If this is the case the values of R3 and R4 have changed. Edge connector 9 (the output of the LINE AMP) feeds the LINE FADER and the MONITOR SELECT switch S2 mounted on the Output and Limiter Module. The Line Fader controls the level of signal fed to the main output. The Monitor Select switch allows the monitor to either receive the Line or Main Output signals. Therefore with the Line Fader off the Line Input can be used for such as tape return. (DC check PIN1 = 0v.)

MONITOR OUTPUT: The Monitor Amplifier is a stage identical to one section of the Output Stage previously described. The monitor level control is mounted on the mother board VR1. The overall gain of the stage is 10dB. The stage is built around the other half of IC1 and a D.C. check is that 0v d.c. should be at the junction

of R9 & R10.

1 KHz OSCILLATOR:- This is of the Wein Bridge type constructed around IC2. R15, R16, C6 & C7 provides the positive feedback and determines the frequency of oscillation.

The negative feedback is provided by TH1, VR1, R13 & R14. The thermistor TH1 gives amplitude stability. VR1 is the level control adjuster. The factory set level at the output with the master gain at maximum is +10dBm. The 1KHz selector switch S7 is mounted on the mother board. When in the off state the switch shorts out the negative feedback path so that the oscillator is not continuously running.

D.C. check at PIN 6 of IC2 = 0v.

METER DRIVER Drg. No. PPM-AD160 C21 & D22 VU-AD160 D23 & D24

The PPM circuit is made up of a full wave rectifier around IC1a, which drives a unity gain buffer made up of the comparator half of IC2a. This provides a very high input and exceptionally low output impedance. This is then sufficient to drive the following stages. C1, as well as being the smoothing capacitor for the full wave rectified signal, also charges in proportion to the level of signal applied. The charge across C1 gets amplified by the stage around IC2b, which then passes into the CURVE GENERATOR constructed around IC1b with the feedback being controlled by TR2, TR3, TR4 & TR5. The attack time of the meter is determined by the time constant R7, C1 and the release time by R8, C1. C1 is prevented from discharging through the output of IC2a because it is a comparator output.

The circuit around TR1 provides the reference voltages that determine when and at which point in the curve the various transistors in the feedback circuit turn on.

SET UP PROCEDURE

1. Set all presets to their mechanical centre.
2. With 0dBm appearing at the output adjust VR1 to give a reading of MARK 4 on BBC scale and 0/TEST on an N10.

3. BBC - with +8dBm at the output adjust VR2 to give a reading of MARK 6.
N.10 - with +6dBm at the output adjust VR2 to give a reading of +6.
4. With 0dBm at output check the '0' readings.
5. BBC - with -12dB at the output adjust VR3 to give a reading of MARK 1.
N.10 - to give a reading of -12.
6. Return to 0dBm at the output and check the '0' readings.

Steps 3 - 6 should be repeated until all readings are accurate and a final check of all marks on the meter should then be made.

The VU METER driver provides a buffer circuit to match the signal path with the impedance of the meter. VR1 is the sole calibration control and sets the level. OVU = +4dBm.

DC-DC CONVERTER Drg. No. AD 100 C67/D68.

The basis of the converter circuit is that an oscillator drives the power transistor stage with the primary of the transformer in its collector. The secondary has three sections to its winding to create +12v; -12v & 48v. These are rectified and smoothed. The +12v output is used as the control voltage which drives the feedback circuit that controls the oscillator output.

The oscillator is formed by IC1; D1/2; R1/2 and C2. The output of this is a squarewave at a frequency between 22 and 25KHz. This oscillator drives TR3 which provides the current drive to the power transistor TR1. The outputs of the secondary of the transformer are rectified by D3; D4 & D5, with the smoothing circuits created around L1, L2 & L3. The voltages are kept constant by the feedback which drives TR2, subsequently controlling the mark/space ratio of the wave.

VR1 calibrates the +12v output and the -12v and 48v are forced to be correct by the turns ratio of the transformer. This setting

should be carried out with the circuit under a load of at least 50mA. In the off load condition the output voltages will aim toward $\pm 15\text{v}$ on the $\pm 12\text{v}$ rail and +55v on the +48v rail. This is restricted by ZD2.

Test points that are useful are (i) PIN 12 of IC1 allows the oscillator output to be checked. (ii) The collector of TR1. When the converter is under load the wave at this point should be SQUARE. No 'rounding off' of the wave should be evident as this indicates inefficiency, which will cause excess temperature rise in TR1. The cause of this is usually insufficient drive from IC1, the oscillator output, or a poor TR1 in that its high frequency switching capability is out of specification.

SUMMARY OF SERVICE & TEST PROCEDURE

Except if specified:-

MIXER SET UP WITH ALL GAIN CONTROL AT MAX & -30DBM APPLIED TO THE INPUT SET AT -40 POSITION. PH/OFF/TA SWITCH IN OFF POSITION, LIMITER IN THE OFF POSITION, 1KHZ TONE NOT SELECTED. EXTERNAL POWER BETWEEN 15 & 24V D.C.

<u>DESCRIPTION</u>	<u>DRG.NO.</u>	<u>ADJUST</u>	<u>MEASUREMENT</u>	<u>TEST POINT</u>
Motherboard	C105	NONE	-14dBm	IC1 PIN 6
"	"	"	12v dc	PL1/101
"	"	"	-12.5v dc	PL1/102
"	"	"	+12.5v dc	PL1/103
"	"	"	0v dc	PL1/104
"	"	"	+50c dc	PL1/105
Microphone Amp	D29	NONE	0v±0.5v	R12/R13 JUNCTION
"	"	"	-20dBm	VR1/C3 "
Output Board	C103	NONE	0v dc	R7/R8 JUNCTION
"	"	"	0v dc	R23/R24 "
"	"	"	+4dBm	R7/R8 "
"	"	"	+4dBm	R23/R24 "
" (Limiter)	"	VR2/3/4	---	Refer text
Monitor/Line/Tone	D102	NONE	0v dc	IC1 PIN 1
" " "	"	"	0v dc	R9/R10 JUNCTION
" " "	"	"	+14dBm	R9/R10 "
" " "	"	VR1	+4dBm	R7/R8 "
				of output board with tone selected
PPM	C21	VR1/2/3	---	Refer text
"	"	NONE	5v6 dc	JUNCTION R4/ZD1
"	"	"	0v dc	PIN 1 IC1
"	"	"	0v dc	PIN 1 & 7 IC2
				No signal condition
VU	D23	NONE	0v dc	PIN 6 IC 1
"	"	VR1	'0' VU	+4dBm at OUTPUT
DC-DC Converter	C67	VR1	+12.5v	PIN 203
" "	"	NONE	-12.5v	PIN 202
" "	"	NONE	+55v	PIN 201
				These are with mixer as load.

SOME POINTS TO CONSIDER BEFORE USING AD160 MIXER

- * Ensure correct microphone power is selected before inserting microphones
- * Ensure that microphone power is switched off when inputs are unterminated. If microphone power is on when the input is unterminated it will result in greatly increased inter-channel crosstalk when switched to TA.
- * When using AD100-05 Power Supply and Charger Unit with batteries only allow charge switch to operate when using Nickel Cadmium batteries.
- * When using AD100-05 Power Supply ensure the mixer power switch is to "ext". The mixer will still operate when switched to "Int" but its performance will be impaired.
- * On the AD100-05 Power Supply there is a mains voltage selector. Ensure this is in the correct position for the intended mains voltage.
- * The AD160 in its standard form has a microphone powering facility when switched to TA +12v hot 0v cold. The procedure for reversing the microphone power is explained on page
- * Do not store the mixer with batteries for long periods. This will result in battery leakage.
- * Remove batteries when transporting. Often mixers can accidentally be switched on whilst packing is taking place.
- * To clean mixer, do not use solvent cleaners. This may result in the silk screen lifting and/or plastic components suffering. It is best to use a damp cloth and mild detergent. For the paintwork use household furniture polish.



DECLARATION OF CONFORMITY

We Audio Developments Limited, of:

Hall Lane,
Walsall Wood,
Walsall,
West Midlands.
WS9 9AU
ENGLAND.

Declare under our sole responsibility that the product:

AD 160 ENG Mixer, all variations.

To which this declaration relates is in conformity with the following; transposing harmonised standards

Directive	Name	Ref	Year
EMC Directive 89/336/EEC	Generic Emission Standard	BS EN 50081-1	1992
	Radiated Emissions	EN 55022 Class B	
	AC Mains Conducted Emissions*	EN 55022 Class B	
	Generic Immunity Standard	BS EN 50082-1	
	Radio Frequency EM Field, Unmodulated	IEC 801-3	1992
	ESD 8kV Air Discharge	IEC 801-2	
	Fast Transients	IEC 801-4	

and therefore is in conformity with the production requirements of Council Directives 89/336/EEC on the approximation of the laws of the member states relating to Electromagnetic Compatibility.

Signed.....
Name Roger F. Tromans

Date.....14-12-95
Managing Director

*When used with AD100-09 PSU



DECLARATION OF CONFORMITY

We Audio Developments Limited, of:

**Hall Lane, Walsall Wood, Walsall, West Midlands. WS9 9AU
ENGLAND.**

Declare under our sole responsibility that the product:

AD 100-09 Mains PSU.

To which this declaration relates is in conformity with the following; transposing harmonised standards

Directive	Name	Ref	Year
EMC Directive 89/336/EEC	Generic Emission Standard	BS EN 50081-1	1992
	Radiated Emissions	EN 55022 Class B	
	AC Mains Conducted Emissions	EN 55022 Class B	
	Generic Immunity Standard	BS EN 50082-1	1992
	Radio Frequency EM Field, Unmodulated	IEC 801-3	
	ESD 8kV Air Discharge	IEC 801-2	
	Fast Transients	IEC 801-4	
LV Directive 93/68/EC	Safety requirements for mains operated apparatus	BS EN 60065	1994

and therefore is in conformity with the production requirements of Council Directives 89/336/EEC and 93/68/EC on the approximation of the laws of the member states relating to Electromagnetic Compatibility and Low Voltage powered equipment.

Signed.....

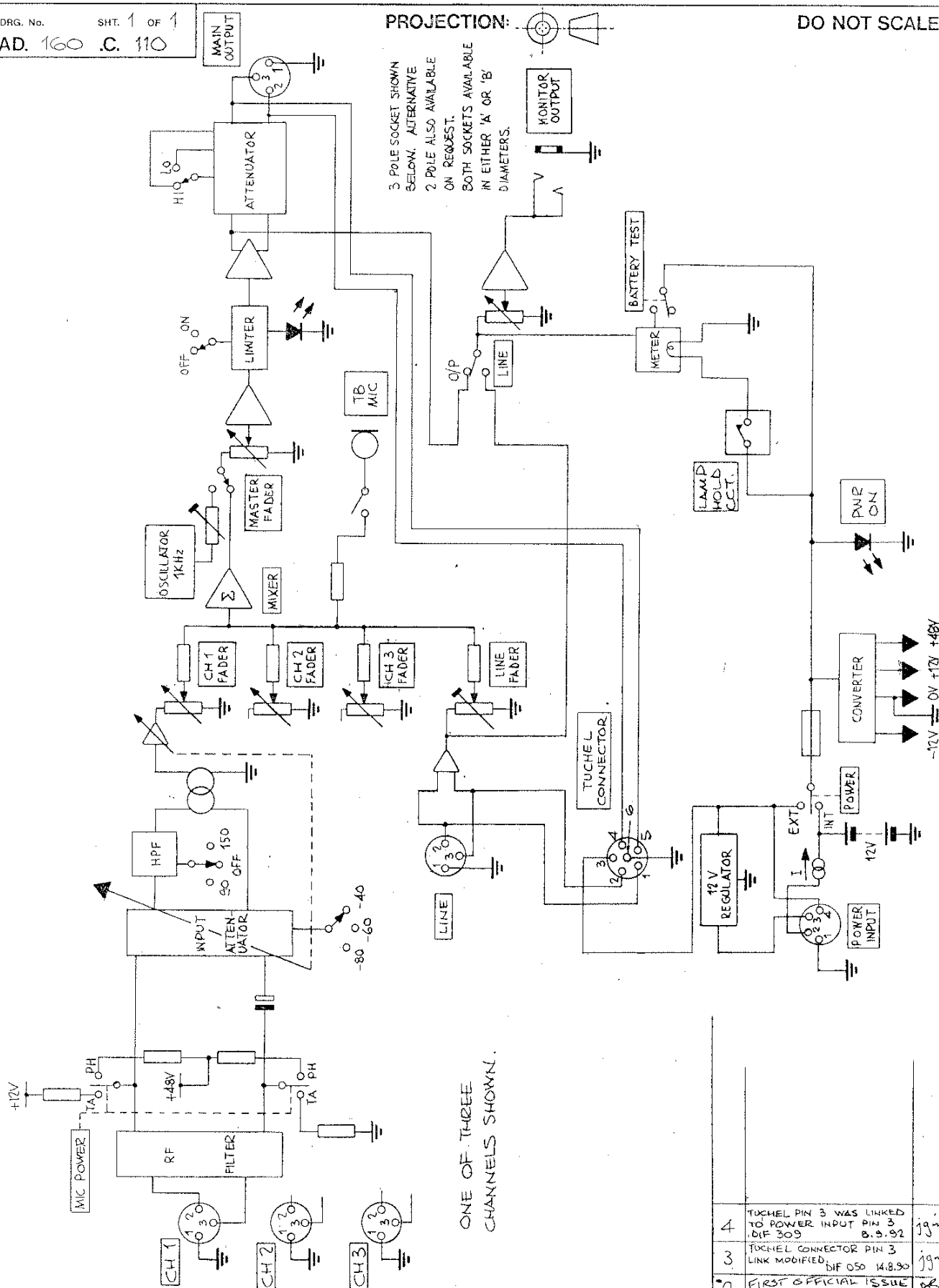
Date.....24.1.97

Name: Roger F. Tromans
Managing Director

AD 160

DRAWING LIST

BLOCK DIAGRAM	AD.160.C.110
MOTHER BOARD	
Circuit Diagram	AD.160.C.112 Sheet 1
Component Location Drawing	AD.160.C.312 Sheets 1 & 3
Component Cross Reference List	AD.160.D.312 Sheets 5 & 6
INPUT MODULE (Mic/Line)	
Circuit Diagram	AD.160.D. 29 Sheet 1
Component Location Drawing	AD.160.D. 30 Sheet 1
Component Cross Reference List	AD.160.D. 30 Sheet 3
OUTPUT MODULE	
Circuit Diagram	AD.160.C.114 Sheet 1
Component Location Drawing	AD.160.D.314 Sheet 1
Component Cross Reference List	AD.160.D.314 Sheet 3
LINE I/P, MONITOR O/P & 1KHz OSCILLATOR	
Circuit Diagram	AD.160.D.122 Sheet 1
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Component Cross Reference List	AD.160.D.322 Sheet 3
P.P.M. (Type 14)	
Circuit Diagram	AD.043.C.103 Sheet 1
Component Location Drawing	AD.043.D.303 Sheet 1
Component Cross Reference List - BBC	AD.043.D.303 Sheet 3
Component Cross Reference List - N.10	AD.043.D.303 Sheet 5
V.U. (Type 14)	
Circuit Diagram	AD.043.D.104 Sheet 1
Component Location Drawing	AD 043.D.304 Sheet 1
Component Cross Reference List	AD.043.D.304 Sheet 3
CONVERTER	
Circuit Diagram	AD.100.C. 67 Sheet 1
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Component Cross Reference List	AD.100.D. 68 Sheet 3
BATTERY TEST & METER ILLUMINATION	
Circuit Diagram (see Mother Board)	AD.160.C. 112 Sheet 1
Component Location Drawing	AD.100.C.3001 Sheet 1
TUCHEL CONNECTOR (6-PIN)	
Wiring Details	AD.160.D.309
POWER SUPPLY	
Circuit Diagram	AD.100-09.C.102 Sheet 2
Component Location Drawing	AD.100-09.C.302 Sheet 1



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DRAWN 22.12.88 jgm
CHECKED/APP'D. MK
SCALE N/A
P.C.B. No. N/A

TITLE
MK IV
ENG MIXER - AD 160
BLOCK DIAGRAM

Audio
Developments Ltd.
Hall Lane, Walsall Wood, Walsall,
West Midlands, WS9 9AU, England
Tel. Brownhills (0543) 375351

4	TUCHEL PIN 3 WAS LINKED TO POWER INPUT PIN 3. DIF 309	8.9.92	jgm
3	TUCHEL CONNECTOR PIN 3 LINK MODIFIED. DIF 050	14.8.90	jgm
2	FIRST OFFICIAL ISSUE DIF 001 - 23.1.90		
1	FIRST	22.12.88	jgm
ISS.	REVISION/DATE		SIG.

PT. No.

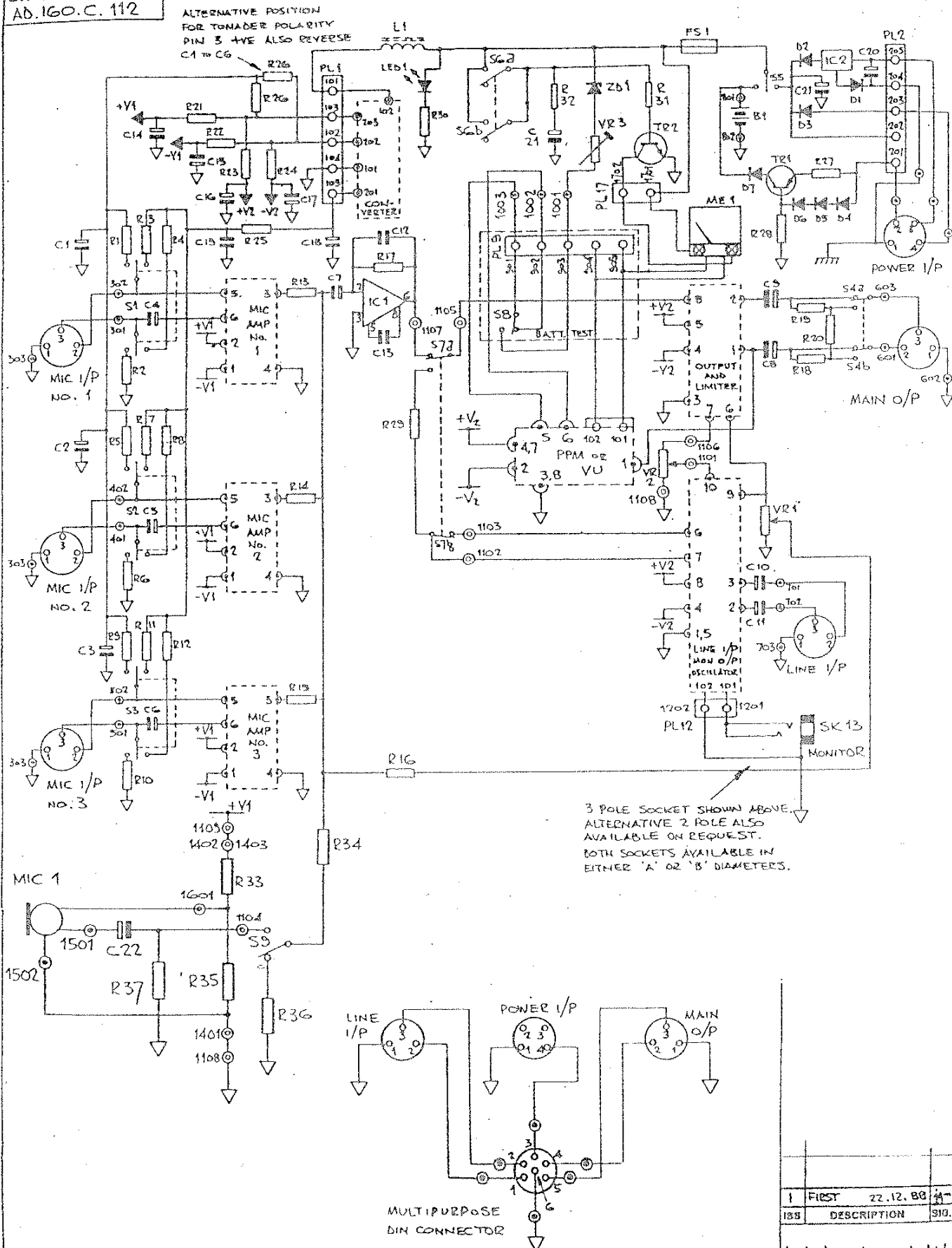
DRG. No. SHT. 1 OF 1
AD. 160 .C. 110

DRG. No. SHT 1 of 2
AD.160.C.112

THIRD ANGLE PRO.

SECTION

DO NOT SCALE



Drawn 22.12.88 jg	Scale —	Unstated Tolerances 3 Dec. Pl. 2-010
Checked	Material	3 Dec. Pl. 2-006
Approved	Finish	Fractions 2/100 Metric 3-Decim

MOTHER BOARD
(MK IV)
CIRCUIT DIAGRAM
(MANUAL)

1	FIRST	22.12.88	4
103	DESCRIPTION		510.

Audio Developments Ltd.
Hall Lane,
Walsall Wood, Staffs.

DRG. No. SHT 1 of 2
AD.160.C.112

DRG. No. SHT 1 OF 6
AD.160.C. 312

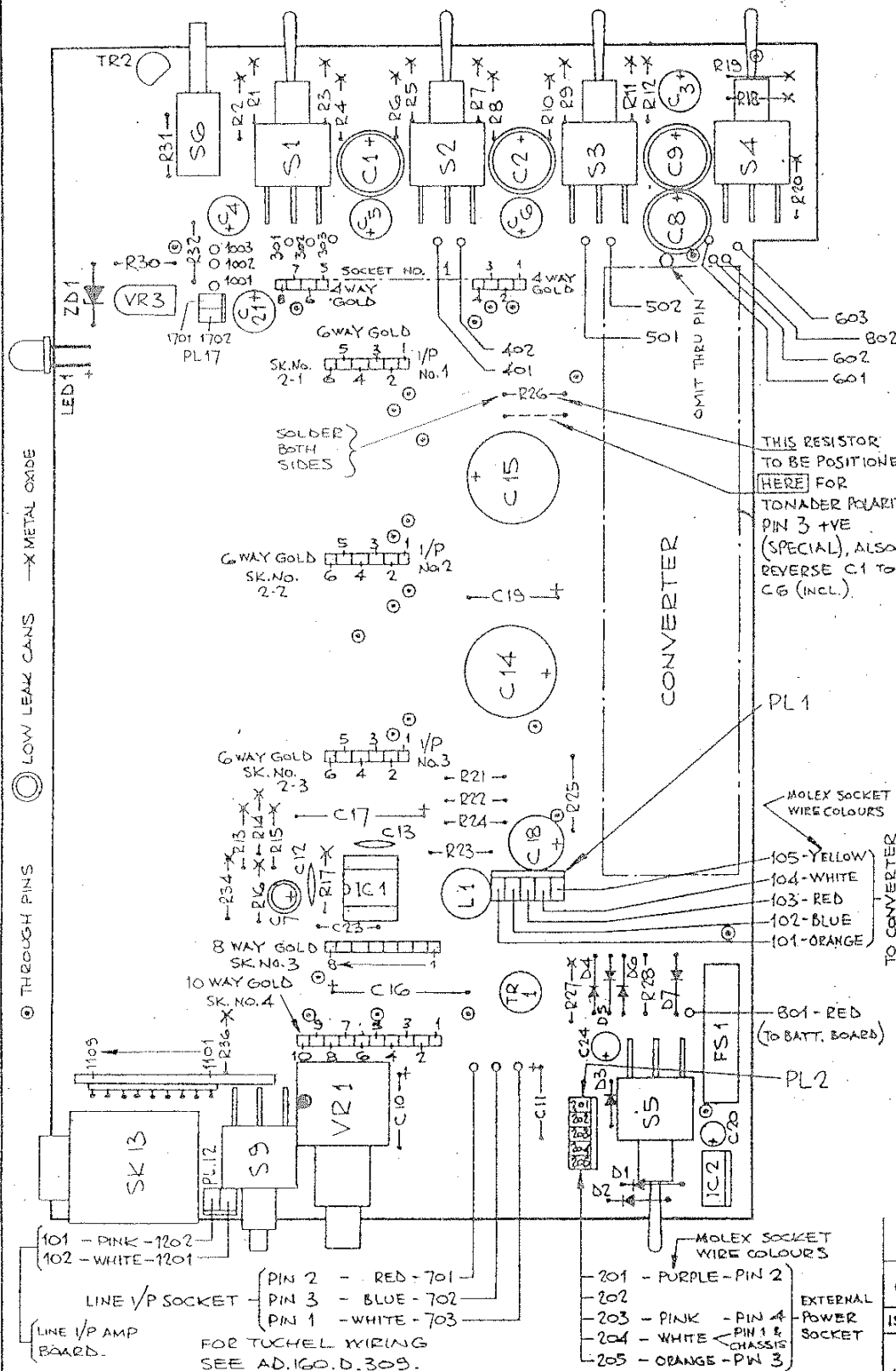
1701-RED } TO
1702-BLACK } METER

301 - BLUE - PIN 3 }
302 - RED - 2 } 1/P NO. 1
303 - WHITE - 1 }
401 - BLUE - PIN 3 }
402 - RED - 2 } 1/P NO. 2

501 - BLUE - PIN 3 }
502 - RED - 2 } 1/P NO. 3
601 - RED - PIN 2 }
602 - WHITE - 1 } o/p
603 - BLUE - 3 }
802 - WHITE - TO BATT. BOARD

DO NOT SCALE

1001-RED }
1002-ORANGE } TO 5-WAY
1003-YELLOW } MOLEX ON
BATT-TEST
BOARD



GOLD EDGE CONNECTORS

NO. MODULE BOARD
PIN NOS. & BOARD DESCR.

SKT. No. 1 - PPM/VU DRIVER		
1	1	- 1/P
2	2	- -12v
3	3	- Ov
4	4	- +12v
5	5	} BATT. TEST
6	6	
7	7	- +12v
8	8	- Ov

SKT. No. 2 - 1/P NO. 1		
1	1	- -12v
2	2	- +12v
3	3	- o/p
4	4	- Ov
5	5	} 1/P AMP.
6	6	

SKT. No. 2 - 1/P NO. 2		
1	1	- -12v
2	2	- +12v
3	3	- o/p
4	4	- Ov
5	5	} 1/P AMP.
6	6	

SKT. No. 2 - 1/P NO. 3		
1	1	- -12v
2	2	- +12v
3	3	- o/p
4	4	- Ov
5	5	} 1/P AMP.
6	6	

SKT. No. 3 - o/p A LIMITER		
1	1	} o/p
2	2	
3	3	- Ov
4	4	- -12v
5	5	- +12v
6	6	} MON.
7	7	
8	8	- 1/P

SKT. No. 4 - LINE 1/P AMP.		
1	1	- Ov
2	2	} LINE 1/P
3	3	
4	4	- -12v
5	5	- Ov
6	6	} OSC. o/p
7	7	
8	8	- +12v
9	9	- LINE o/p
10	10	- MON. 1/P

ISS	DESCRIPTION	SIG.
6	204/WHITE WAS TO PIN 1 ONLY, "CHASSIS" WIRING DIF 403 28.4.94	ig

PCB NO.

WAD.2261

Drawn

22.12.88

Checked

MK

Approved

MK

Scale

N/A

Material

N/A

Finish

N/A

Unstated Tolerances

2 Dec. Pl. 2-010

3 Dec. Pl. 2-005

Fractions 2-1/34

Metric 2-2mm

MOTHER BOARD

(Mk IV)

COMPONENT LOCATION

DRAWING

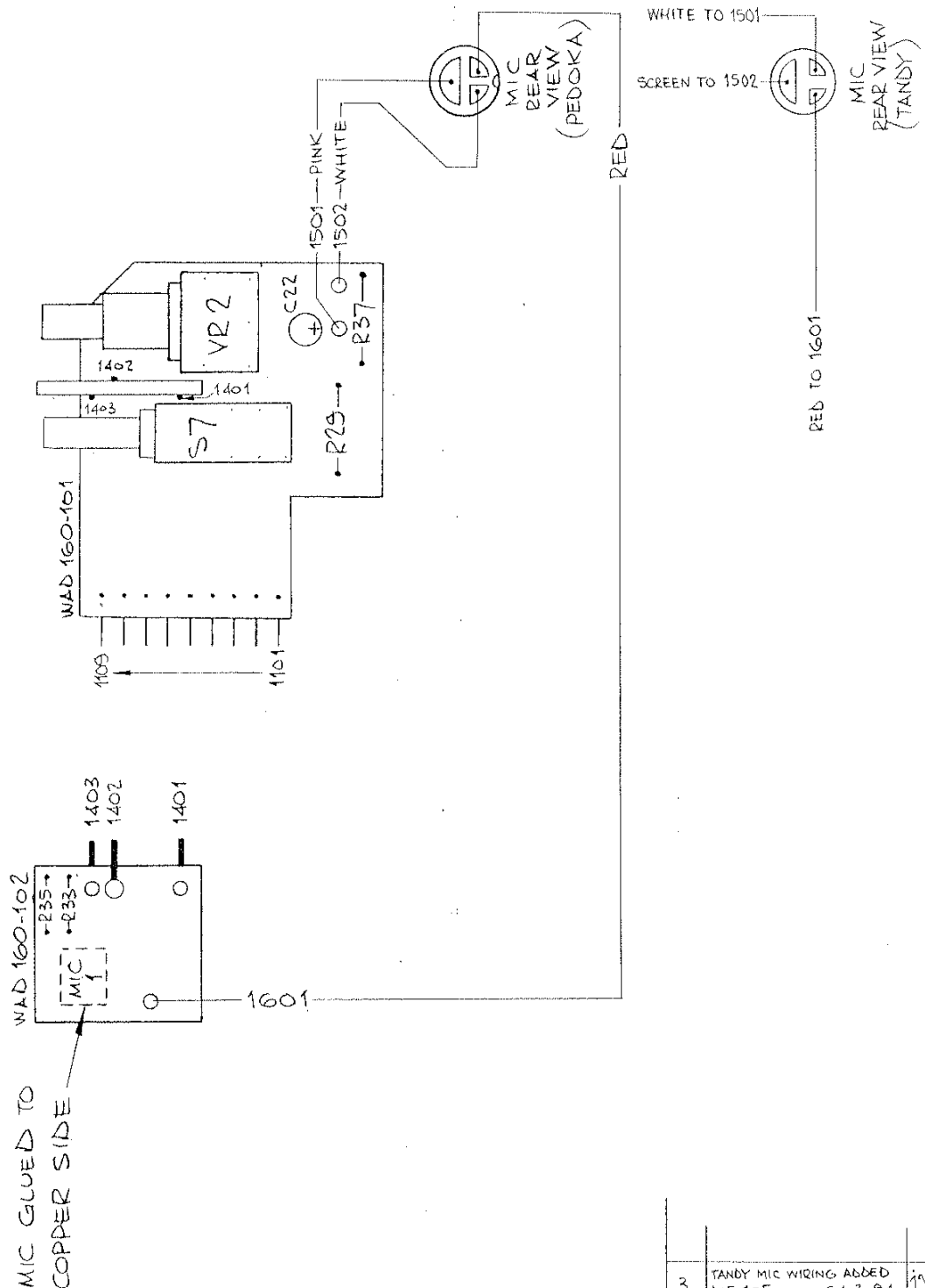
(MANUAL)

Audio Developments Ltd.,
Hall Lane,
Walsall Wood, Staffs.

DRG. No. SHT 1 OF 6

AD.160.C. 312

(TAKEN FROM AD.160.C.305) MT 2706 R



PCB NO.

SEE ABOVE

Drawn 22.12.88 jgm

Checked MK

Approved MK

Scale 2 x 1

Material N/A

Finish N/A

Unstated Tolerances

2 Dec. Pl. ± 0.10

3 Dec. Pl. ± 0.05

Fractions $\pm 1/64$

Metric $\pm 2mm$

MOTHER BOARD (MK IV)

SUPPLEMENTARIES COMPT LOC. DRAWING

Audio Developments Ltd,
Hall Lane,
Walsall Wood, Staffs.

DRG. No. SHEET 3 OF 6
AD.160.C.312

ISS	DESCRIPTION	SIG.
3	TANDY MIC WIRING ADDED DIF 405 24.3.94	jgm
2	FIRST OFFICIAL ISSUE DIF 001 - 23.1.90	mk
1	FIRST	jgm

AD 160MOTHER BOARDCOMPONENT CROSS REFERENCE LIST1. Capacitors

C1 330 uF 16V
C2 330 uF 16V
C3 100 uF 25V
C4 100 uF 25V
C5 100 uF 25V
C6 100 uF 25V
C7 10 uF 25V
C8 330 uF 16V
C9 330 uF 16V
C10 1 uF 63V
C11 1 uF 63V
C12 22 pF
C13 22 pF
C14 2200 uF 16V
C15 2200 uF 16V
C16 470 uF 16V
C17 470 uF 16V
C18 47 uF 63V
C19 4.7 uF 63V
C20 10 uF 25V
C21 100 uF 25V
C22 10 uF 25V
C23 100 pF
C24 33 uF 16V

2. Diodes

D1 1N 4001
D2 1N 4001
D3 1N 4001
D4 1N 4148
D5 1N 4148
D6 1N 4148
D7 1N 4148

3. Fuse

FS1 500mA

4. Inductance

L1 220 uH

5. Microphone

MIC1 Electret Condenser

6. Op. Amps

IC1 NE 5534
IC2 7812 12V Reg.

7. Resistors

R1 180R
R2 180R
R3 6K8
R4 6K8
R5 180R
R6 180R
R7 6K8
R8 6K8
R9 180R
R10 180R
R11 6K8
R12 6K8
R13 47K
R14 47K
R15 47K
R16 240K
R17 100K
R18 11K
R19 11K
R20 22R
R21 220R
R22 220R
R23 100R
R24 100R
R25 100R
R26 82R
R27 30R
R28 2K2
R29 130K
R30 4K7
R31 47K
R32 1K
R33 10K - 1/8 Watt
R34 10K
R35 10K - 1/8 Watt
R36 100K
R37 100K

AD 160

MOTHER BOARD (contd.)

COMPONENT CROSS REFERENCE LIST

8. Switches

S1	2PCO, ON-OFF-ON
S2	2PCO, ON-OFF-ON
S3	2PCO, ON-OFF-ON
S4	2PCO, ON-NONE-ON
S5	2PCO, ON-OFF-ON
S6	2PCO, MOMENT
S7	2PCO, BBM
S8	2PCO, MOMENT
S9	1PCO, MOMENT

9. Transistors

TR1	BC 461
TR2	BC 549

10. Variable Resistors

VR1	10K Log
VR2	10K Log
VR3	220K Pre Set

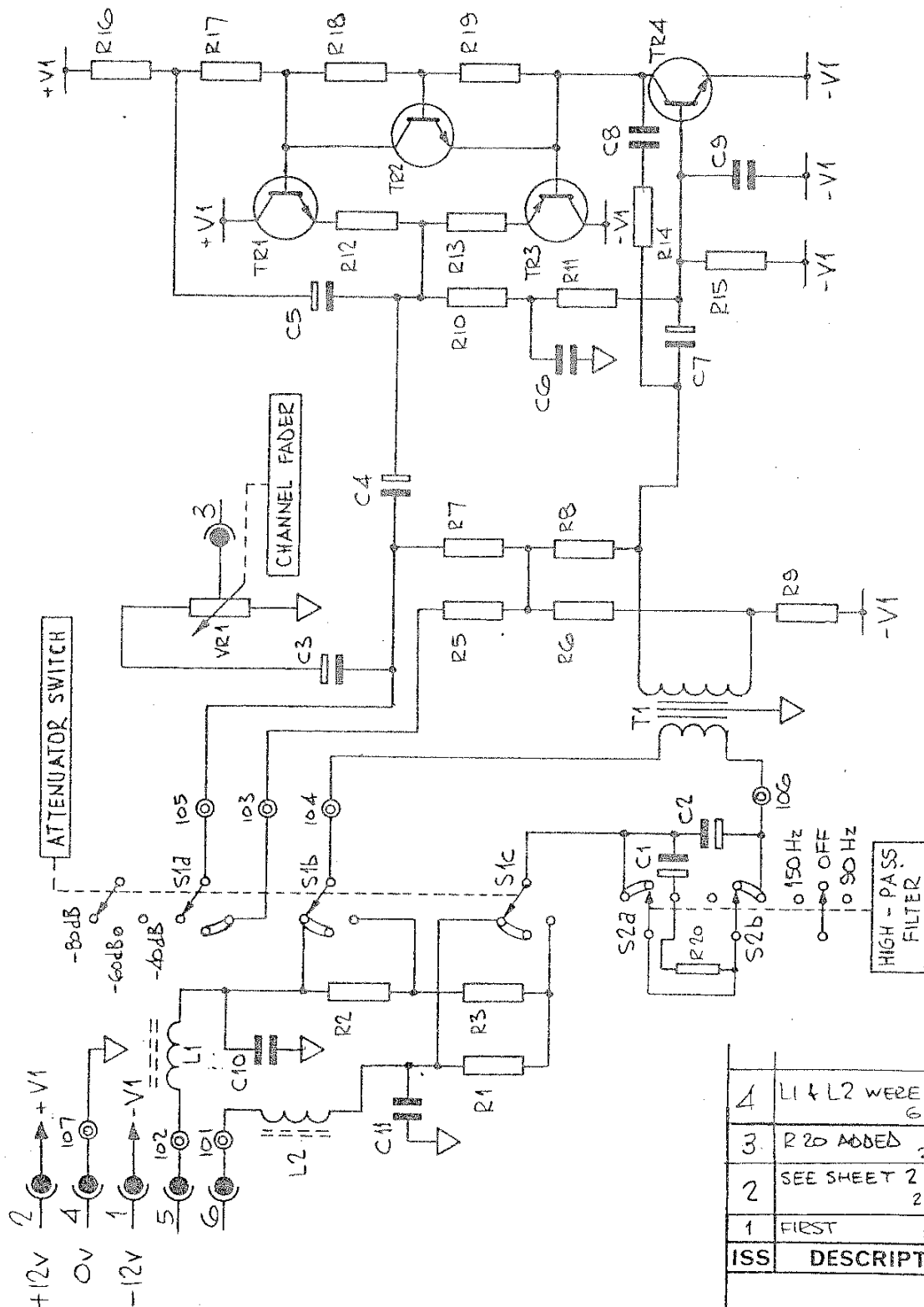
11. Zener Diode

ZD1	BZY 88 C5V6
-----	-------------

DRG. No. SHT 1 OF 2
AD.160.D.29

THIRD ANGLE PROJECTION

DO NOT SCALE



4	L1 & L2 WERE 5μH 6.8.85	jgm
3	R20 ADDED 21.6.85	jgm
2	SEE SHEET 2 23.10.84	SEA
1	FIRST 9.12.83	SEA
ISS	DESCRIPTION	SIG.

Drawn 9.12.83	Scale jgm	Unstated Tolerances
Checked	Material	2 Dec.Pl. ±.010
Approved	Finish	3 Dec.Pl. ±.005
		Fractions ± 1/64
		Metric ±.2mm

MICROPHONE
AMPLIFIER
CIRCUIT DIAGRAM
(MANUAL) (MK II)

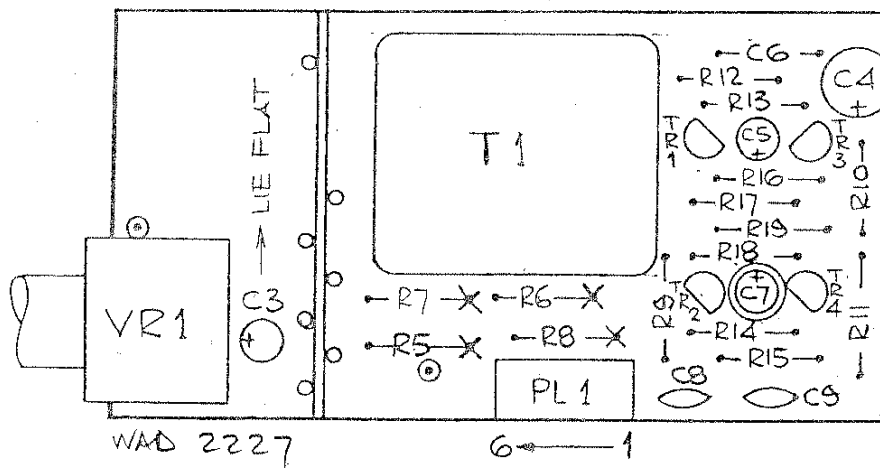
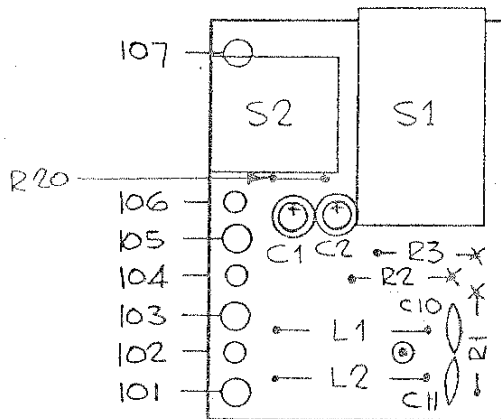
Audio Developments Ltd.,
Hall Lane,
Walsall Wood, Staffs

DRG. No. SHT 1 OF 2
AD.160.D.29

DRG. No. SHT 1 OF 3
AD. 160. D. 30

THIRD ANGLE PROJECTION

DO NOT SCALE



7	"LIE FLAT" NOTE ADDED. DIF 234	9.7.91	jgm
6	FIRST OFFICIAL ISSUE : DIF001 - 23190		jgm
5	+ ADDED TO C3	5.11.85	jgm
4	L1 & L2 WERE 5uH	6.8.85	jgm
3	R20 ADDED	21.6.85	jgm
2	SEE SHEET 2	23.10.84	
1	FIRST	13.12.83	jgm
ISS	DESCRIPTION	SIG.	

Audio Developments Ltd,
Hall Lane,
Walsall Wood, Staffs

DRG. No. SHT 1 OF 3
AD. 160. D. 30

Drawn 13.12.83 jgm	Scale 1.42 : 1	Unstated Tolerances
Checked MK	Material N/A	2 Dec.PI. ± 0.10
Approved MK	Finish N/A	3 Dec.PI. ± 0.05
		Fractions $\pm 1/64$
		Metric $\pm 2mm$

I/P MODULE
(MIC - AMP)
COMPONENT LOCATION
DRAWING (MANUAL) (MK II)

AD 160

I/P MODULE(MIC/AMP)

COMPONENT CROSS REFERENCE LIST

1. Capacitors

C1	0.47 μ F	50v
C2	0.47 μ F	50v
C3	10 μ F	25v
C4	100 μ F	25v
C5	10 μ F	25v
C6	0.1 μ F	
C7	22 μ F	16v
C8	22pF	
C9	220pF	
C10	2n2F	
C11	2n2F	

2. Inductance

L1	220 μ H
L2	220 μ H

3. Resistors

R1	470R
R2	470R
R3	120R
R4	-
R5	1K
R6	1K
R7	22K
R8	51K
R9	100R
R10	470K
R11	470K
R12	220R
R13	220R
R14	47K
R15	47K
R16	47K
R17	47K
R18	100K
R19	68K
R20	1M

4. Transformer

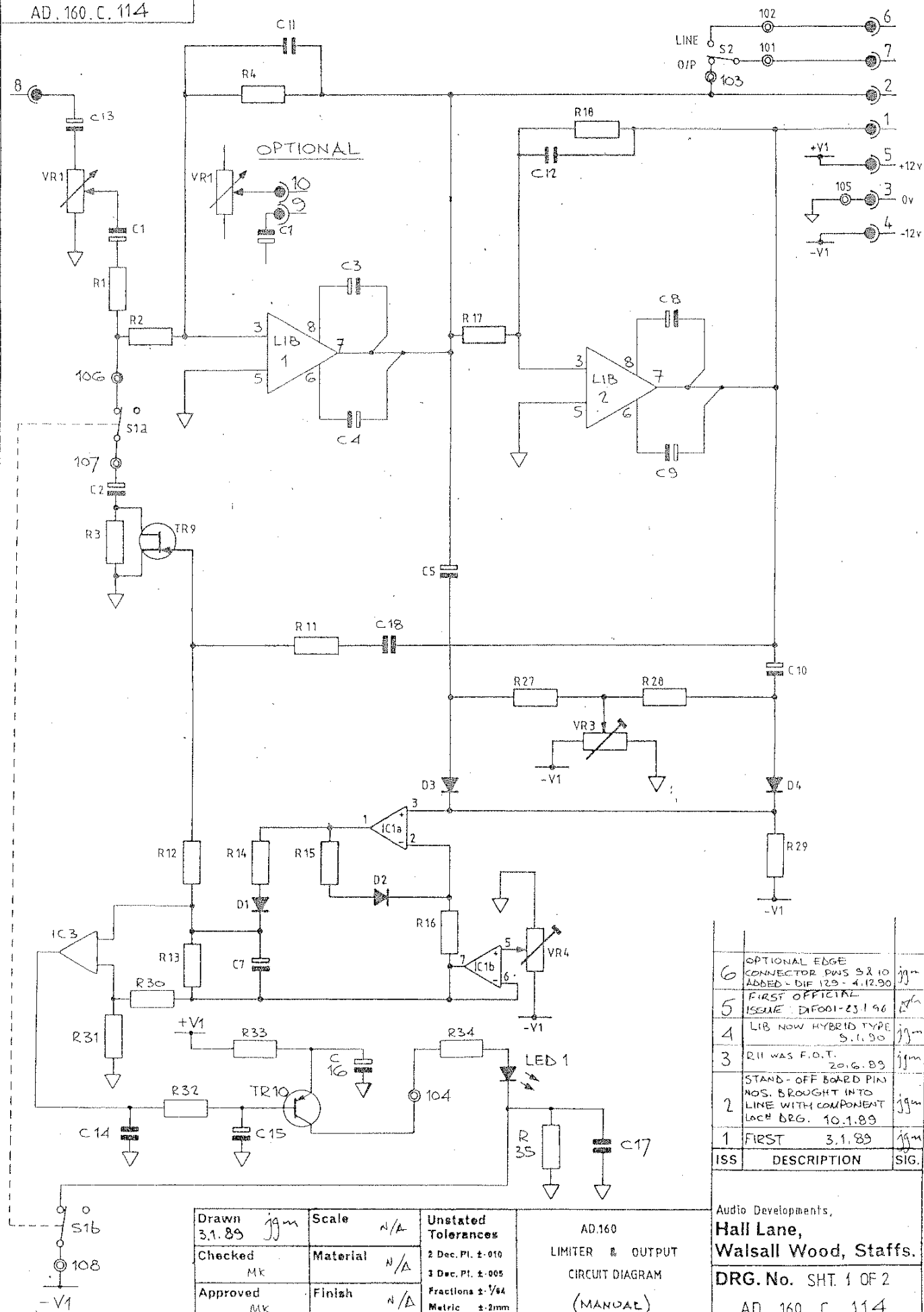
T1	EN 8303
----	---------

5. Transistors

TR1	BC 549
TR2	BC 549
TR3	BC 214
TR4	BC 549

6. Variable Resistors

VR1	10K LOG
-----	---------

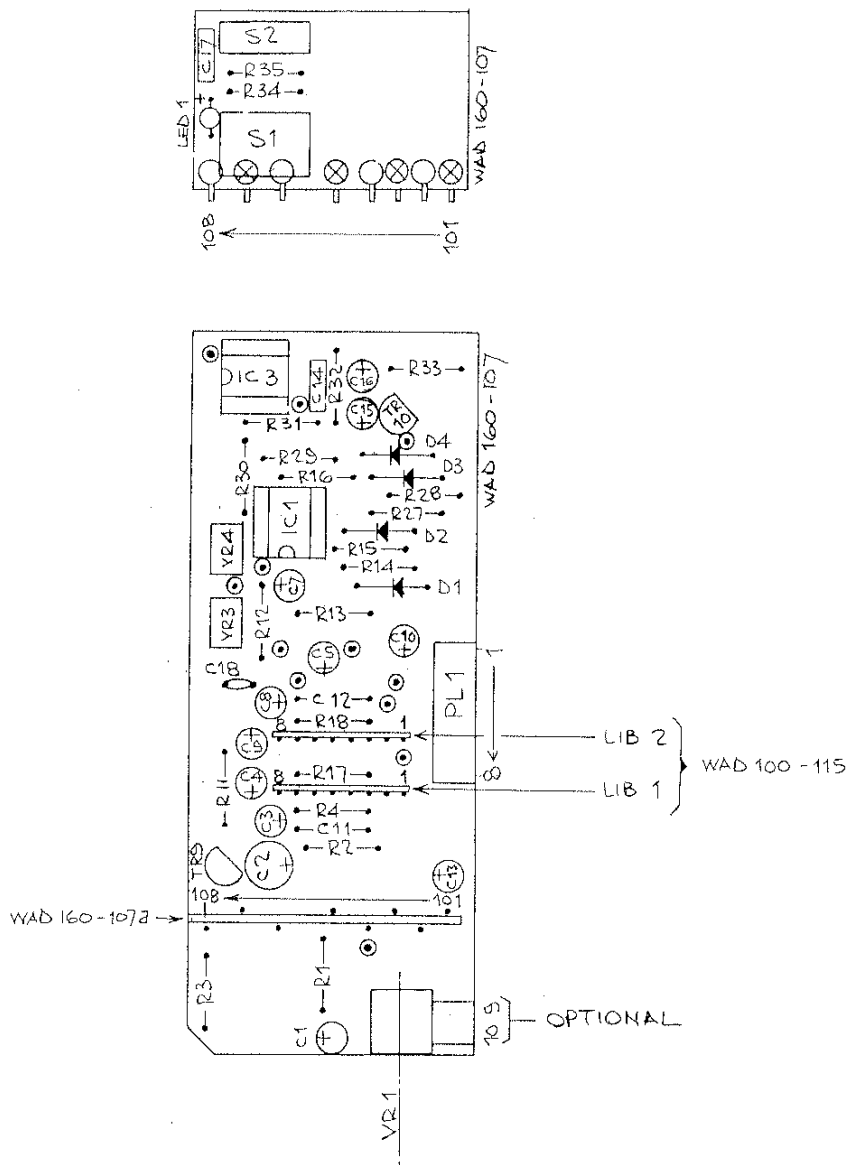


Drawn 3.1.89 ggm	Scale N/A	Unstated Tolerances 2 Dec. Pl. ± 0.10 3 Dec. Pl. ± 0.05 Fractions $\pm \frac{1}{64}$ Metric $\pm 0.2mm$
Checked MK	Material N/A	
Approved MK	Finish N/A	

AD.160
LIMITER & OUTPUT
CIRCUIT DIAGRAM
(MANUAL)

Audio Developments,
Hall Lane,
Walsall Wood, Staffs.
DRG. No. SHT. 1 OF 2
AD.160.C.114

ALL RESISTORS ARE METAL FILM



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DRAWN 11.11.90 jgm
CHECKED/APP'D. UK
SCALE N/A
P.C.D. No.
SEE ABOVE

TITLE
OUTPUT & LIMITER
COMPONENT LOCATION DRAWING

Audio
Developments Ltd.
Hall Lane, Walsall W.C. d, Walsall,
West Midlands, WS9 9.U. England
Tel. Brownings (0543) 375351

6	OPTIONAL EDGE CONNECTOR PLUS 9 & 10 ADDED. DIF. 12.9 - 2.12.90	jgm
5	FIRST OFFICIAL ISSUE DIF 001 - 23.1.90	jgm
4	REBORN LIB NOW HYBRID TYPE 11.1.90	jgm
ISS.	REVISION/DATE	SIG.
PT. No.		
DRG. No. SHT. 1 OF 3 AD. 160 .C. 314		

O/P AND LIMITERCOMPONENTS CROSS REFERENCE LIST1. Capacitors

C1	0.47/50 uF
C2	47 uF 16v
C3	10 uF 25v
C4	10 uF 25v
C5	10 uF 25v
C6	
C7	1.0 uF 50v
C8	10 uF 25v
C9	10 uF 25v
C10	10 uF 25v
C11	2 p 2 F
C12	22 pF
C13	10 uF 16v
C14	0.047 uF
C15	1 uF 63v
C16	10 uF 16v
C17	0.047 uF
C18	2 n 2

2. Diodes

D1	1N 4148
D2	1N 4148
D3	1N 4148
D4	1N 4148

3. Op Amps

IC1	TL 062
IC2	
IC3	TL 061

4. Resistors

R1	47K
R2	2K2
R3	1M
R4	390K
R5	
R6	
R7	
R8	
R9	
R10	
R11	4M7
R12	16K
R13	75K
R14	10K

4. Resistors (cont'd)

R15	100K
R16	10K
R17	100K
R18	100K
R19	
R20	
R21	
R22	
R23	
R24	
R25	
R26	
R27	47K
R28	47K
R29	1M
R30	47K
R31	1M0
R32	220K
R33	100R
R34	6K8
R35	47K

5. Transistors

TR1	
TR2	
TR3	
TR4	
TR5	
TR6	
TR7	
TR8	
TR9	BF 256A
TR10	BC 214

6. Variable Resistors

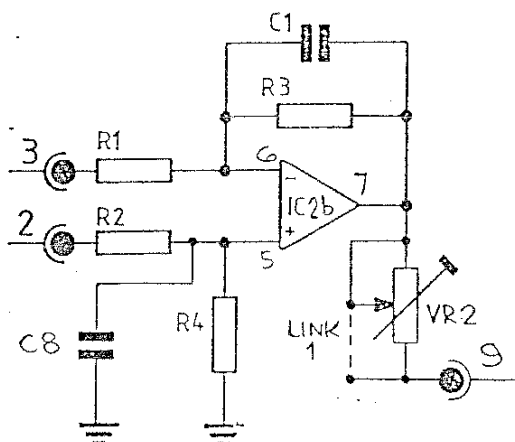
VR1	10K LOG
VR2	
VR3	100K
VR4	100K

7. Light Emitting Diode

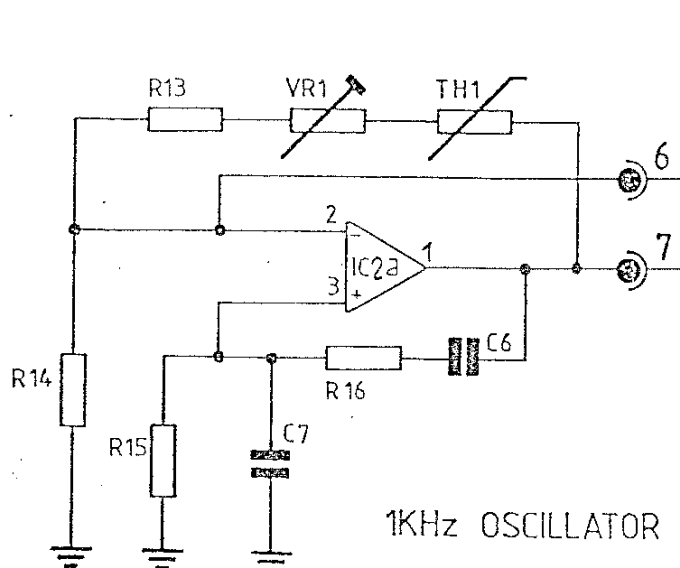
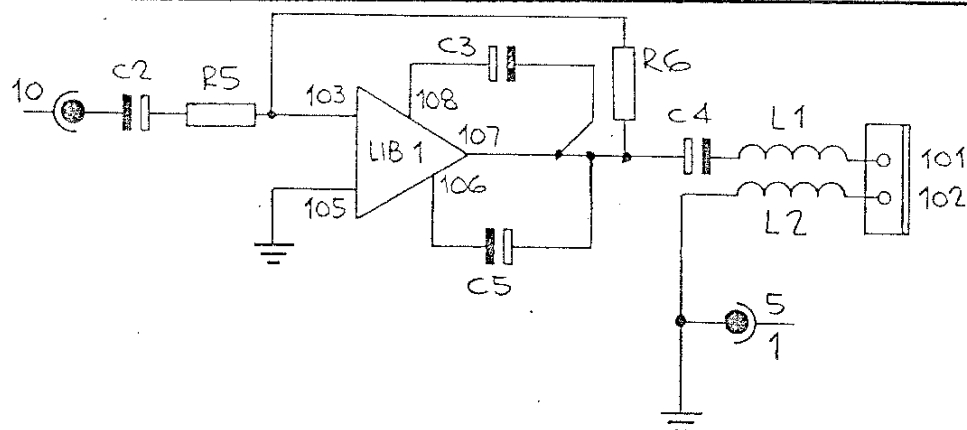
LED 1	RED (Miniature)
-------	-----------------

8. Switches

S1	2PCO TOGGLE (on-n-on)
S2	1PCO TOGGLE (on-n-on)

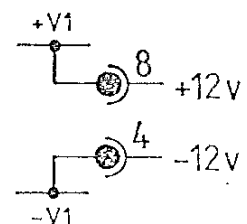


LINE INPUT
AMPLIFIER



1KHz OSCILLATOR

MONITOR OUTPUT AMPLIFIER



Drawn
26.10.89 jgm
Checked
Approved

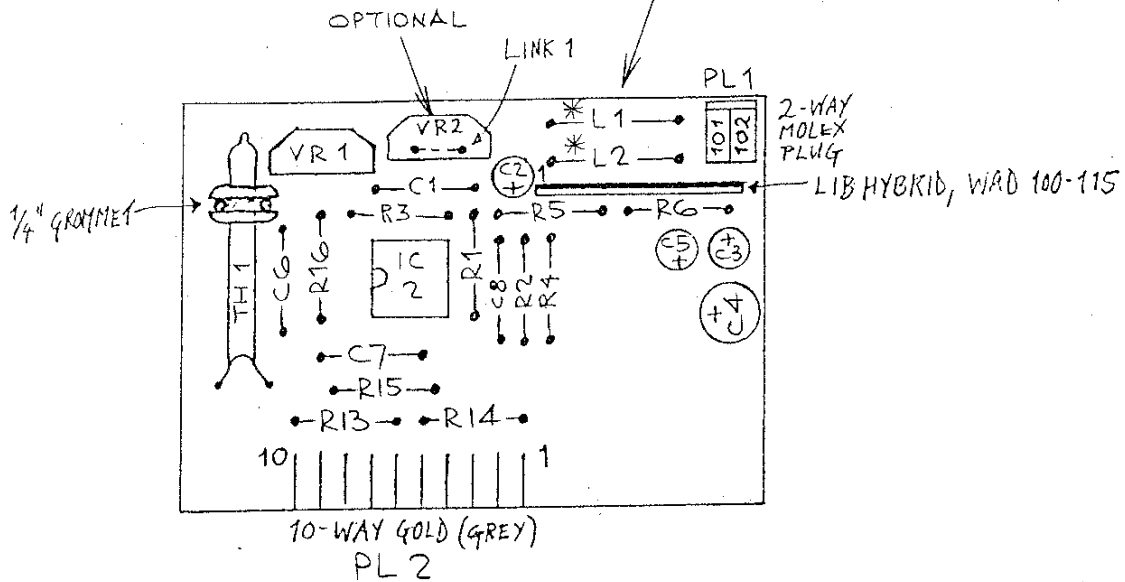
Scale
Material
Finish

Unstated
Tolerances
2 Dec.Pl. ± 0.010
3 Dec.Pl. ± 0.005
Fractions $\pm 1/64$
Metric $\pm 2mm$

AD.160 Mk IV+2+b
CIRCUIT DIAGRAMS FOR:-
LINE I/P AMP.
MONITOR O/P AMP.
1 KHz OSCILLATOR
(for manual)

AUDIO DEVELOPMENTS,
Hall Lane,
Walsall Wood, Staffs
DRG. No. SHT 1 OF 2
AD.160. D. 122

* WIRE LINKS NORMALLY
FITTED HERE. L1 & L2
FITTED ONLY WHEN
SPECIFIED.



4	HYBRID PIN 1 POSN ADDED DIF 195 3.7.91	jgm
3	NOTE ADDED RE INDUCTANCES. "OPTIONAL" ADDED TO VR2 DIF 045 12.7.90	jgm
2	FIRST OFFICIAL ISSUE: DIF001-23.1.90	mk
1	FIRST 26.10.89	jgm

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DRAWN 26.10.89 jgm	TITLE AD.160 MK IV + a + b + c
CHECKED/APP'D. MK	LINE I/P AMP MONITOR O/P AMP. 1 KHz OSCILLATOR
SCALE 2:1	
P.C.B. No. WAD 2259	

Audio
Developments Ltd.
Hall Lane, Walsall Wood, Walsall.
West Midlands, WS9 9AU. England
Tel. Brownhills (0543) 375351

ISS.	REVISION/DATE	SIG.
PART No.		
DRG. No.	SHT. 1 OF 3	
AD. 160 .D. 322		

AD 160

LINE I/P AMP
MONITOR O/P AMP
1KHz OSCILLATOR

COMPONENT CROSS REFERENCE LIST

1. Capacitors

C1 2p2
C2 10uF 25v
C3 10uF 25v
C4 100uF 25v
C5 10uF 25v
C6 1500pF
C7 1500pF
C8 2p2

6. Variable Resistors

VR1 470R
VR2 50K

2. Inductances

L1 220 uH) Wire links normally fitted -
L2 220 uH) Inductances fitted only when specified.

3. Op. Amps

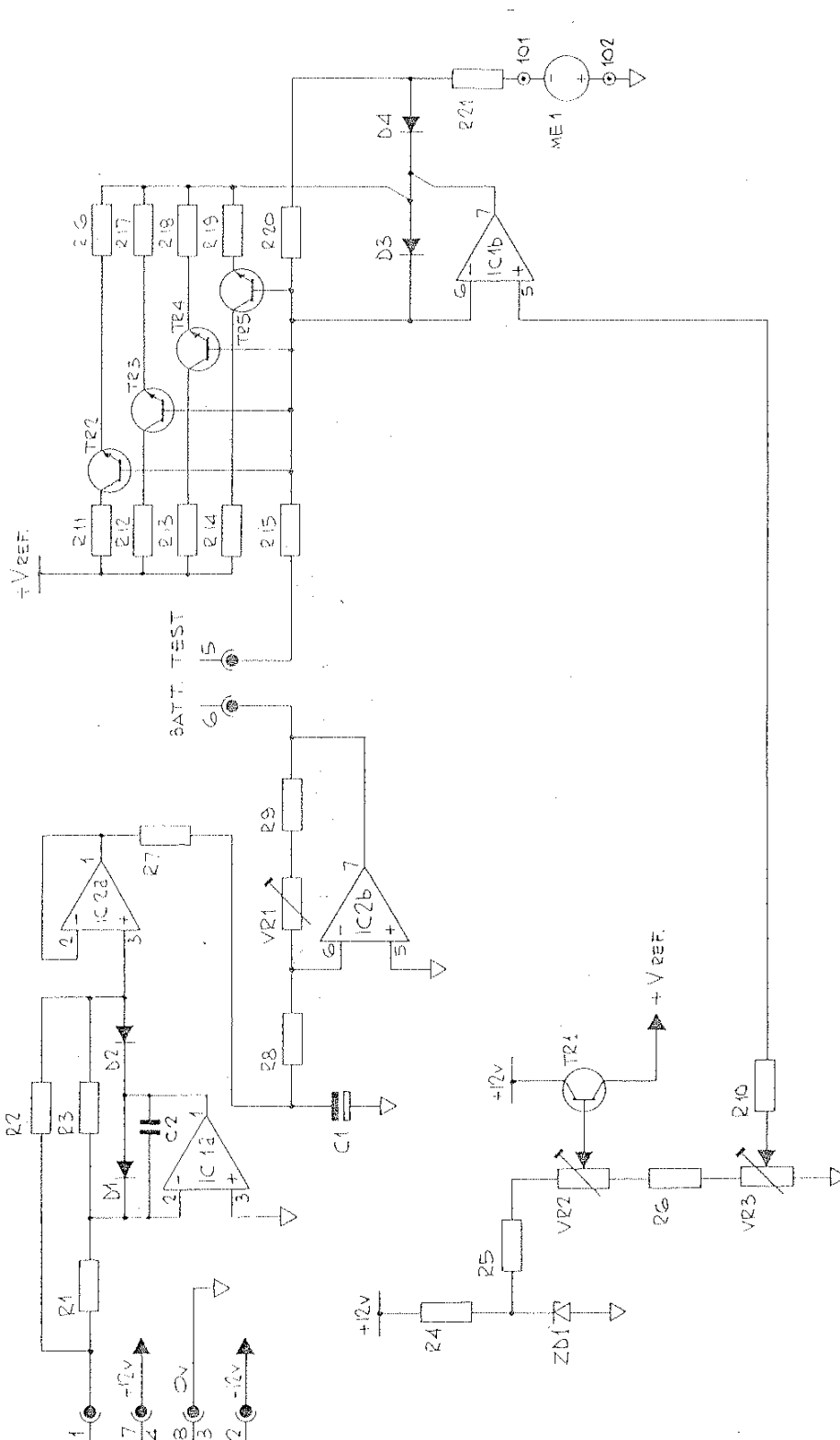
IC2 TL062

4. Resistors

R 1 100K
R 2 100K
R 3 240K
R 4 240K
R 5 150K
R 6 470K
R 7
R 8
R 9
R10
R11
R12
R13 220R
R14 470R
R15 100K
R16 100K

5. Thermistor

TH1 RA53



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DRAWN
27.11.90 jgm
CHECKED/APP'D.
RT
SCALE
N/A
P.C.B. No.
N/A

TITLE
PPM DRIVER
- CIRCUIT DIAGRAM -

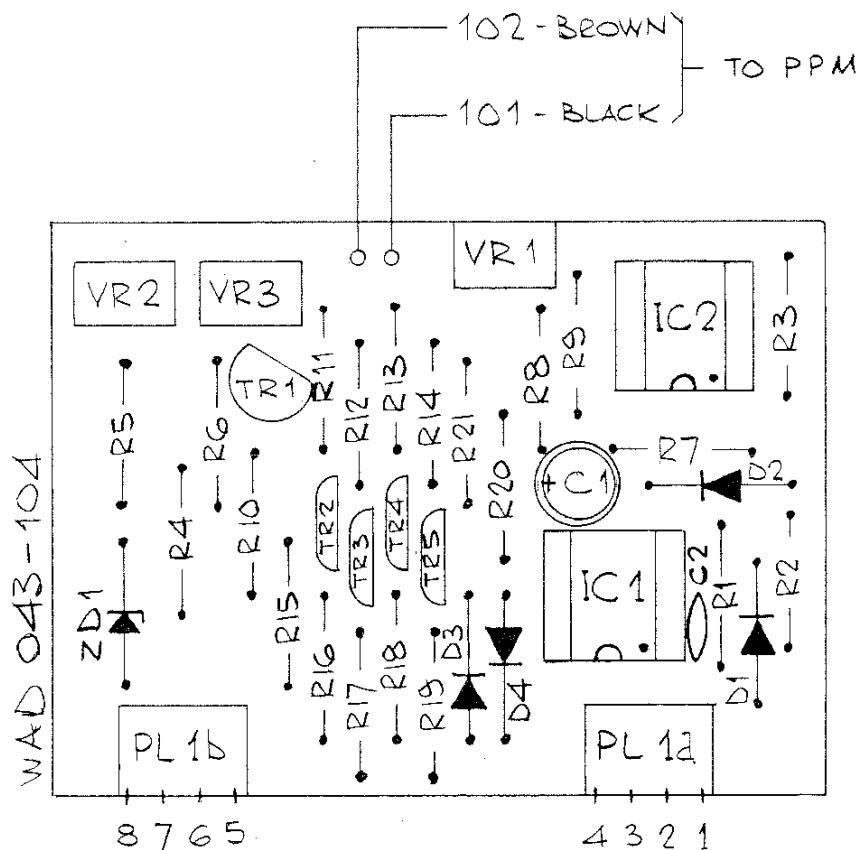
Audio
Developments Ltd.
Hall Lane, Walsall Wood, Walsall,
West Midlands, WS9 9AU, England
Tel. Brownhills (0543) 375351

1	REBORN FORMERLY AD160.C.21 DIF. 109	jgm
ISS.	REVISION/DATE	SIG.
PT. No.		
DRG. No.	SHT. 1 OF 2	
AD. 043 .C. 103		

DRG. No. SHT 1 OF 7
AD. 043. D. 303

THIRD ANGLE PROJECTION

DO NOT SCALE



LOW LEAK CAN.

1	FORMERLY AD. 160. D. 22 DIF. 109 27.11.90	jgm
6	FIRST OFFICIAL ISSUE DIF. 101 - 23.1.90	sh
5	101 & 102 REVERSED 101 WAS WHITE 102 WAS PINK 12.7.88	jgm
4	C1 NOW LOW LEAK CAN. C2 ADDED. 18.4.84	sh
3	SEE SHEETS 2 & 3 10.4.84	sh
2	EDGE CONNECTOR PIN NOS. REVERSED. DRG. NO. WAS: AD. 160. D. 306 21.11.83	sh
1	FIRST 9.11.83	sh
ISS	DESCRIPTION	SIG.

Drawn 9.11.83 jgm	Scale 2:1	Unstated Tolerances
Checked MK	Material N/A	2 Dec. Pl. ± 0.10 3 Dec. Pl. ± 0.05 Fractions $\pm 1/64$ Metric $\pm 2mm$
Approved RT	Finish N/A	

PPM DRIVER
(TYPE 14)
COMPONENT LOCATION
DRAWING
(MANUAL)

Audio Developments Ltd.,
Hall Lane,
Walsall Wood, Staffs

DRG. No. SHT 1 OF 7
AD. 043. D. 303

AD 043

PPM DRIVER

(BBC)

COMPONENTS CROSS REFERENCE LIST

1. Capacitors

C1 10 μ F 16v
 low leak
C2 22 pF

2. Diodes

D1 1N 4148
D2 1N 4148
D3 1N 4148
D4 1N 4148

3. Op. Amps

IC1 TL 062
IC2 LM 392

4. Resistors

R1 20K
R2 10K
R3 10K
R4 10K
R5 1K
R6 10K
R7 47R
R8 100K
R9 300K
R10 22K
R11 22K
R12 39K
R13 120K
R14 390K
R15 24K
R16 20K
R17 30K
R18 68K
R19 120K
R20 82K
R21 3K6

5. Transistors

TR1 BC 549
TR2 ZTX 109
TR3 ZTX 109
TR4 ZTX 109
TR5 ZTX 109

6. Variable Resistors

VR1 200K
VR2 10K
VR3 1K

7. Zener Diode

ZD1 BZY 88
 C5V6

AD 043

PPM DRIVER

(N.10)

COMPONENT CROSS REFERENCE LIST

1. Capacitors

C1 10 μ F 16v
low leak
C2 22pF

2. Diodes

D1 1N 4148
D2 1N 4148
D3 1N 4148
D4 1N 4148

3. Op. Amps

IC 1 TL 062
IC 2 LM 392

4. Resistors

R1 20K
R2 10K
R3 10K
R4 10K
R5 1K
R6 10K
R7 47R
R8 100K
R9 300K
R10 22K
R11 30K
R12 120K
R13 300K
R14 1M
R15 36K
R16 33K
R17 100K
R18 180K
R19 330K
R20 470K
R21 3K6

5. Transistors

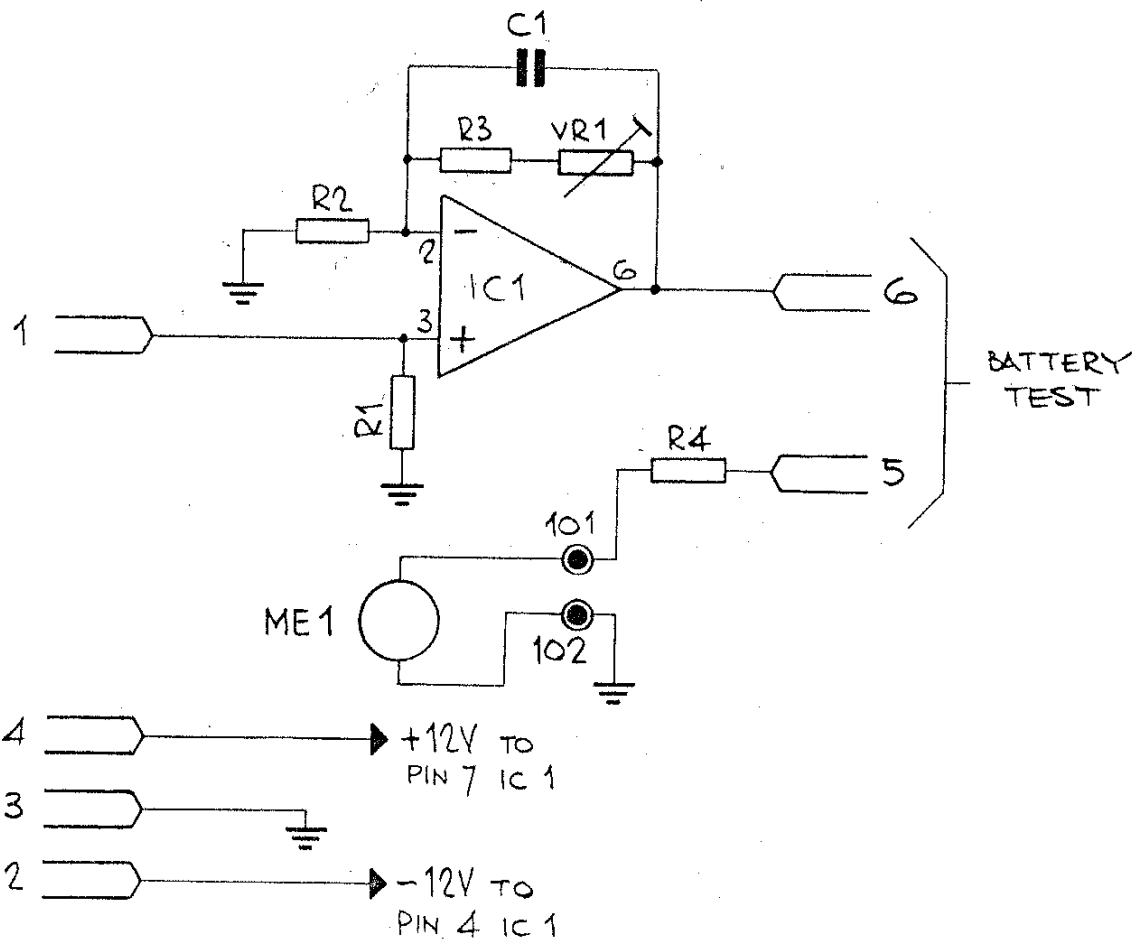
TR1 BC 549
TR2 ZTX 109
TR3 ZTX 109
TR4 ZTX 109
TR5 ZTX 109

6. Variable Resistors

VR1 200K
VR2 10K
VR3 1K

7. Zener Diode

ZD1 BZY 88
C5V6



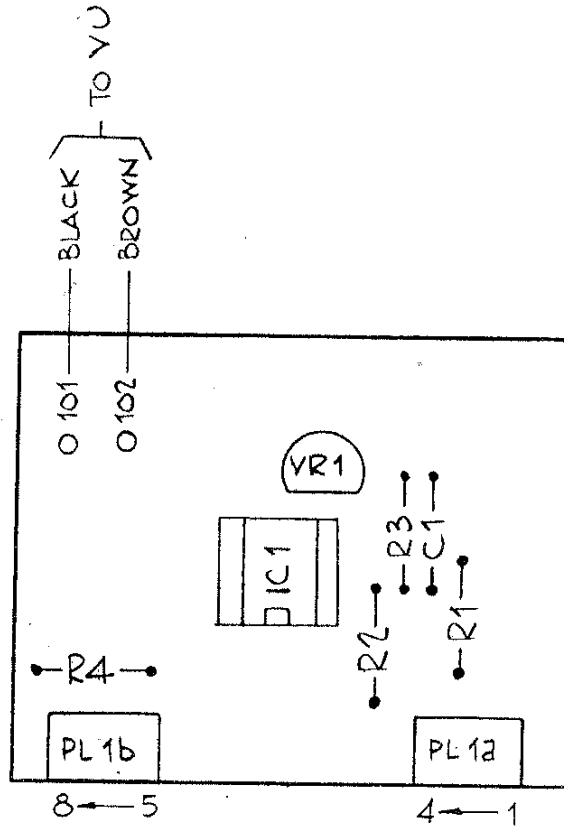
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DRAWN *jgm*
CHECKED/APP'D. *RFT.*
SCALE *N/A*
P.C.B. No. *N/A*

TITLE
V.U.
DRIVER

Audio
Developments Ltd.
Hall Lane, Walsall Wood, Walsall.
West Midlands, WS9 9AU. England
Tel. Brownhills (0543) 375351

2	RE-DESIGNED & REDRAWN DIF 273 10.9.92	<i>jgm</i>
ISS.	REVISION/DATE	SIG.
PART No.		
DRG. No. SHT. 1 OF 2 AD. 043 .D. 104		



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DRAWN <i>jgm</i>	TITLE VU DRIVER	 Audio Developments Ltd. Hall Lane, Walsall Wood, Walsall. West Midlands, WS9 9AU. England Tel. Brownhills (0543) 375351	2	RE-DESIGNED & REDRAWN DIF 273 10.9.92	<i>jgm</i>
CHECKED/APP'D. RFT.	ISS.		REVISION/DATE	SIG.	
SCALE 155%	PART No. 88-016-011				
P.C.B. No. 62-016-011	DRG. No. SHT. 1 OF 3 AD. 043 .D. 304				

AD 043

VU DRIVER

COMPONENT CROSS REFERENCE LIST

1. Capacitors

C1 100pF

2. Op. Amp

IC1 TL 061

3. Resistors

R1 1M
R2 27K
R3 22K
R4 3K6

4. Variable Resistors

VR1 10K

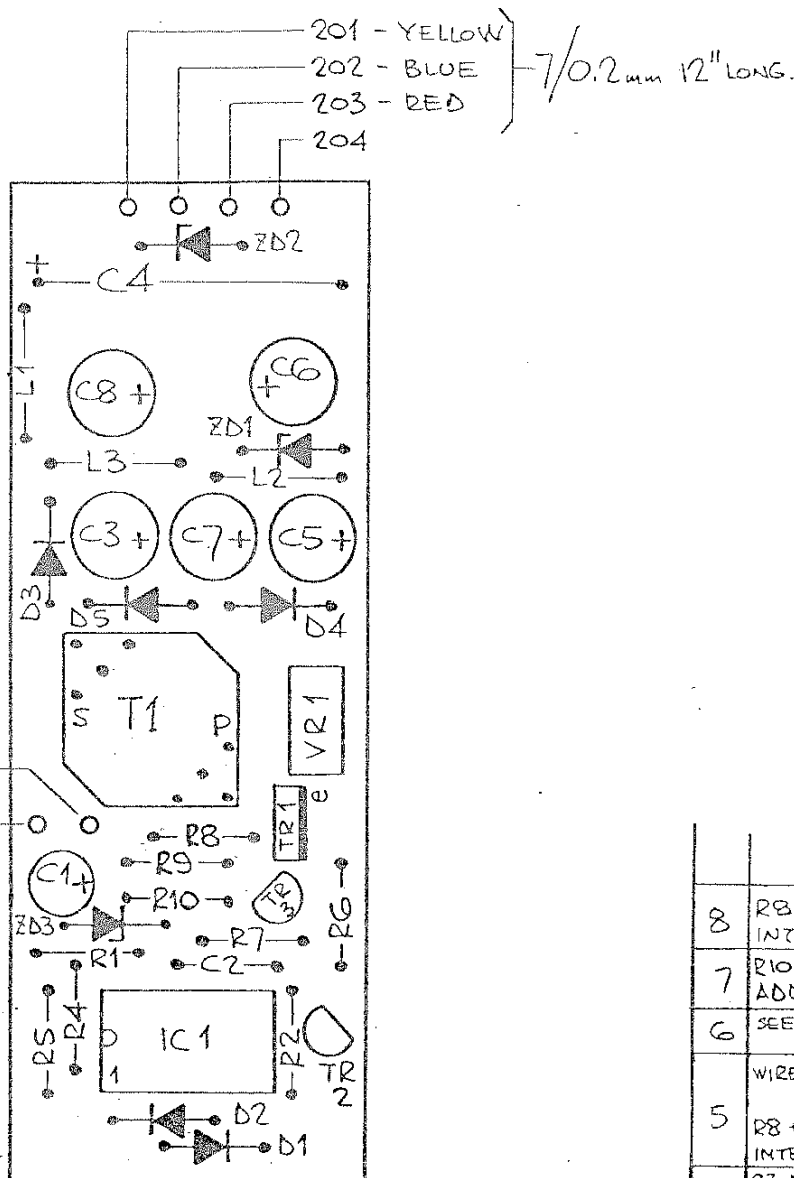
DRG. No. ^{SHT 1 OF 3}
AD.100.D.68

THIRD ANGLE PROJECTION

DO NOT SCALE

USED ON:-

AD.145
AD.160



8	R8 & R9 INTERCHANGED	8.9.83	jgm
7	R10 & ZD3 ADDED	30.6.86	jgm
6	SEE SHEET 2	7.2.85	jgm
5	WIRE LENGTH 12" WAS 9" R8 + R9 INTERCHANGED	4.2.85	jgm
4	R3 DELETED R7, R8, R9, TR3 ADDED	18.12.84	jgm
3	WIRE LENGTHS INCREASED BY 2"	19.4.84	jgm
2	WIRE HOLE NOS. MODIFIED TO CONFORM TO CIRCUIT DIAGRAM	15.12.83	jgm
1	DRG. NO. WAS AD.100.D.65	6.12.83	jgm
1	1ST ISSUE	19.8.83	jgm
ISS	DESCRIPTION	SIG.	

Audio Developments Ltd.,
Hall Lane,
Walsall Wood, Staffs

DRG. No. ^{SHT. 1 OF 3}
AD.100.D.68

Drawn 19.8.83 jgm	Scale	Unstated Tolerances
Checked	Material	2 Dec.Pl. $\pm .010$ 3 Dec.Pl. $\pm .005$ Fractions $\pm \frac{1}{64}$ Metric $\pm .2mm$
Approved	Finish	

CONVERTER
COMP'T. LOCATION
DRG. (MANUAL)

AD 100

CONVERTER

COMPONENT CROSS REFERENCE LIST

1. Capacitors

C1	220 μ F	16v
C2	330 pF	
C3	47 μ F	63v
C4	100 μ F	63v
C5	220 μ F	16v
C6	220 μ F	16v
C7	220 μ F	16v
C8	220 μ F	16v

2. Diodes

D1	IN	4148
D2	IN	4148
D3	BY	206
D4	BY	206
D5	BY	206

3. Inductances

L1	220 μ H
L2	220 μ H
L3	220 μ H

4. Resistors

R1	4K7
R2	100K
R3	-
R4	12K
R5	39K
R6	1K
R7	1K5
R8	150R
R9	470R
R10	82R

5. Op. Amps

IC1	4007 UB
-----	---------

6. Transistors

TR1	BD 131
TR2	BC 549
TR3	2N 3904

7. Transformer

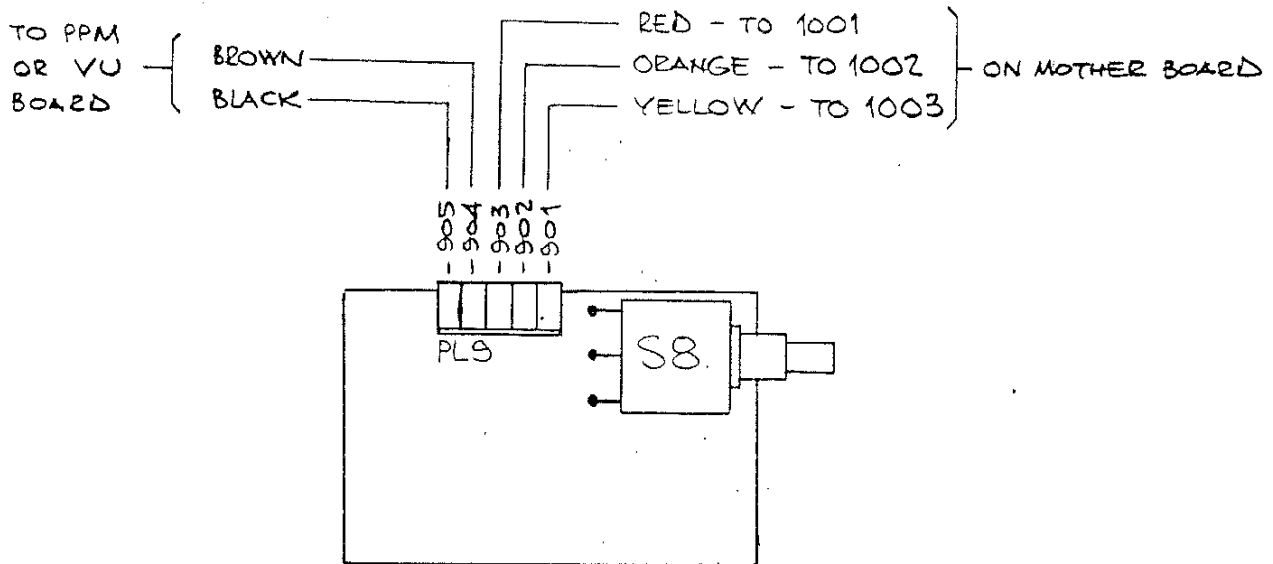
T1	RM7 250
----	---------

8. Variable Resistor

VR1	10K
-----	-----

9. Zener Diode

ZD1	BZY 88 C11
ZD2	BZX 61 C56
ZD3	BZY 88 C18



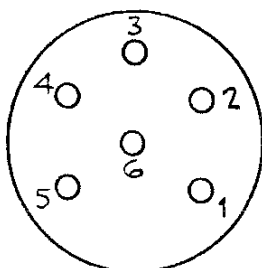
2	1001 WAS 1003 1003 WAS 1001 5.12.86	igm
1	FIRST 10.7.86	igm
ISS	DESCRIPTION	SIG.

Audio Developments Ltd.,
Hall Lane,
Walsall Wood, Staffs

DRG. No. ^{SHEET 1 OF 2}
AD.100.C.3001

WAD 100-101

Drawn	Scale	Unstated Tolerances	BATT. TEST/LO VOLT
Checked	Material	2 Dec. Pl. ± 0.010	AND
Approved	Finish	3 Dec. Pl. ± 0.005	METER ILLUMINATION
		Fractions $\pm 1/64$	(FOR AD 160 ETC)
		Metric $\pm 0.2mm$	COMP. LOC. DRG.



1. RED - 701
 2. BLUE - 702
 3. PINK - FROM PIN 4 POWER XLR
 4. RED - 601
 5. BLUE - 603
 6. SCREENS FROM 602 & 703
- } TWIN SCREEN
- } TWIN SCREEN

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DRAWN 14.10.88 jgm
CHECKED/APP'D.
SCALE
P.C.B. No.

TITLE MK III & IV
6-PIN
TUCHEL
- WIRING -

Audio
Developments Ltd.
Hall Lane, Walsall Wood, Walsall.
West Midlands, WS9 9AU. England
Tel. Brownhills (0543) 375351

1	FIRST	14.10.88	jgm
ISS.	REVISION/DATE	SIG.	
PART No.			
DRG. No. SHT. 1 OF 1 AD. 160.D. 309			

MAINS POWER SUPPLY TYPES AD100-09

SERVICE SECTION FOR SUITABLY QUALIFIED PERSONNEL ONLY

WARNING

For SAFETY service must be carried out by suitably Qualified Personnel only.

DANGER

Isolate the power supply unit from the mains supply before removing any covers.

FUSES: Three 20mm ANTI-SURGE (T) fuses protect the AD100-09 against fault conditions. Should one fail, it is strongly recommended that the cause be traced.

The fuse holder on the front panel contains the mains fuse.

250mA HRC TYPE T 240v AC

For continued safety the specified fuse link must be fitted in the mains fuse holder when a replacement is required. Ensure it is of a type approved by a National Approved Body.

The DC fuses are fitted internally to the printed circuit board.

1.0 A HRC TYPE T ■ REGULATED DC OUTPUT

500mA HRC TYPE T ■ BATTERY CHARGE OUTPUT

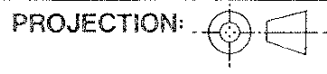
These are accessed by removing the top cover. Before carrying out this operation, ensure the required SAFETY precautions are taken. ISOLATE the power supply unit from the MAINS SUPPLY.

The regulated section of the power supply unit is of the series type, built around transistor TR1. D1 and D2 create the full wave rectification from the centre tap transformer. C1 acts as the smoothing capacitor. R1 and R2 create the path supplying the current to the base of TR1 and the reference transistor TR2. The output voltage is set by VR1 and the junction of this pre-set with R5 is fed to the base of TR2. This control on TR2 determines the drive to TR1 and thus keeps the output voltage constant.

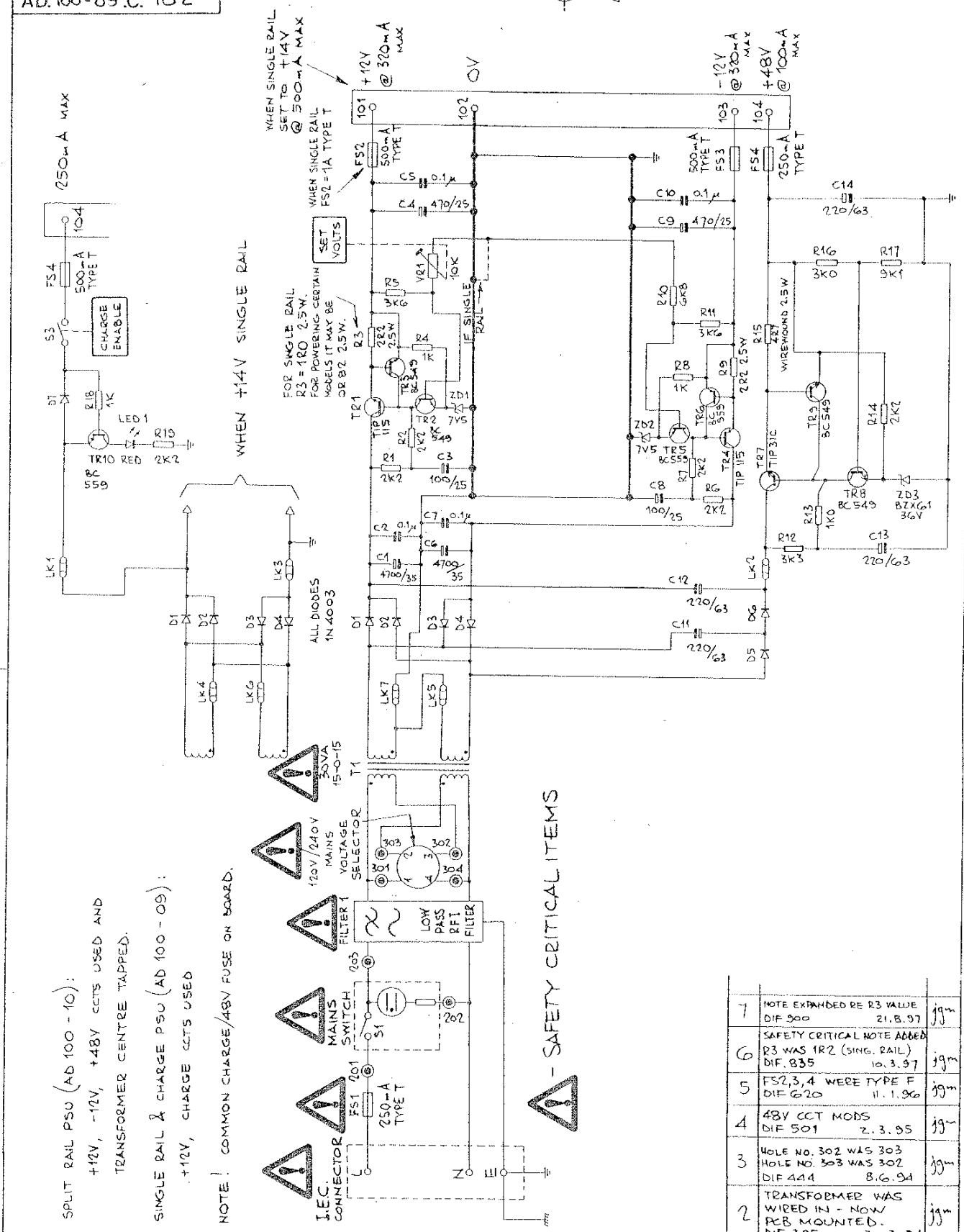
TR3, R3 and R4 form an overload or short circuit protection. When the current through R3 increases the voltage drop across R3 reaches a sufficient value to turn TR3 on, which then 'bleeds' current from the base of TR1 and turns this device off.

HINTS ON FAULT FINDING (All readings DC VOLTS using a DVM)

1. ZD1 should have a potential of $7.5\text{v} \pm 0.3\text{v}$ if the correct reference voltage is to be set up.
2. The base of TR2 should be 0.7v higher than that at the cathode of ZD1. Reference 0v .
3. TR1 base should be 0.7v higher than its emitter.
4. With no load on the power supply the collector of TR1 should be approximately 22v . Reference 0v .
5. If the output voltage is low it could mean TR3 is short circuit. This would cause the base drive current to TR1 to be diverted.



DO NOT SCALE



SPLIT RAIL PSU (AD 100-10):
+12V, -12V, +48V CTS USED AND
TRANSFORMER CENTRE TAPPED.

SINGLE RAIL & CHARGE PSU (AD 100-09):
+12V, CHARGE CTS USED

NOTE! COMMON CHARGE/48V FUSE ON BOARD.

! - SAFETY CRITICAL ITEMS

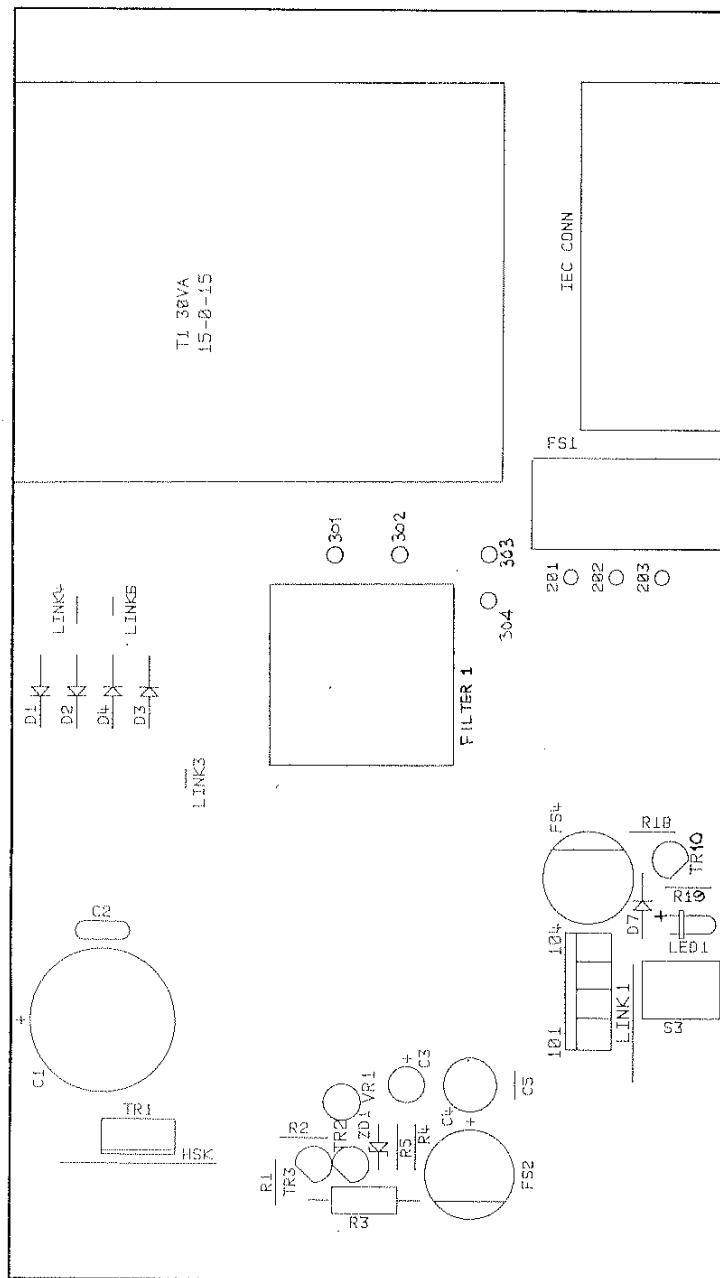
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DRAWN	27.9.93 jgm
CHECKED/APP'D.	R101
SCALE	1/1
P.C.B. No.	1/1

TITLE
P.S.U.
SINGLE RAIL + CHARGE
AND
SPLIT RAIL

Audio
Developments Ltd.
Hall Lane, Walsall Wood, Walsall,
West Midlands, WS9 9AU, England
Tel. Brownhills (0543) 375351

7	NOTE EXTENDED RE R3 VALUE DIF 900 21.8.97	jgm
6	SAFETY CRITICAL NOTE ADDED R3 WAS 1R2 (SING. RAIL) DIF. 835 10.3.97	jgm
5	FS2,3,4 WERE TYPE F DIF 620 11.1.96	jgm
4	48V CCT MODS DIF 501 2.3.95	jgm
3	HOLE NO. 302 WAS 303 HOLE NO. 303 WAS 302 DIF 444 8.6.94	jgm
2	TRANSFORMER WAS WIRED IN - NOW PCB MOUNTED. DIF 395 30.3.94	jgm
1	FIRST DIF 375 27.9.93	jgm
ISS.	REVISION/DATE	SIG.
PT. No.	N/A	
DRG. No.	SHT. 2 OF 2 AD.100-09.C. 102	



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DRAWN
17 SEP. 93 jgm

CHECKED/APP'D.
RET

SCALE
(ORIGINAL) 141%

P.C.B. No.
62-010-028

TITLE

P.S.U.

- SINGLE RAIL + CHARGE -



Audio
Developments Ltd.
Hall Lane, Walsall Wood, Walsall.
West Midlands, WS9 9AU. England
Tel. Brownhills (0543) 375351

5	TR10 WAS TR9 R19 WAS R17 DIF 501 2.3.95	jgm
4	COMPONENTS DELETED FOR SPLIT RAIL VERSION. DIF 513 9.2.95	jgm
3	TRANSFORMER WAS TOROIDAL DIF 355 29.3.94	jgm
2	FILTER REPOSITIONED DIF 378 7.10.93	jgm
1	FIRST 17.9.93 DIF 375	jgm

ISS. REVISION/DATE SIG.

PART No. 88-010-028

DRG. No. SHT. 1 OF 4
AD.100-09.C.302