

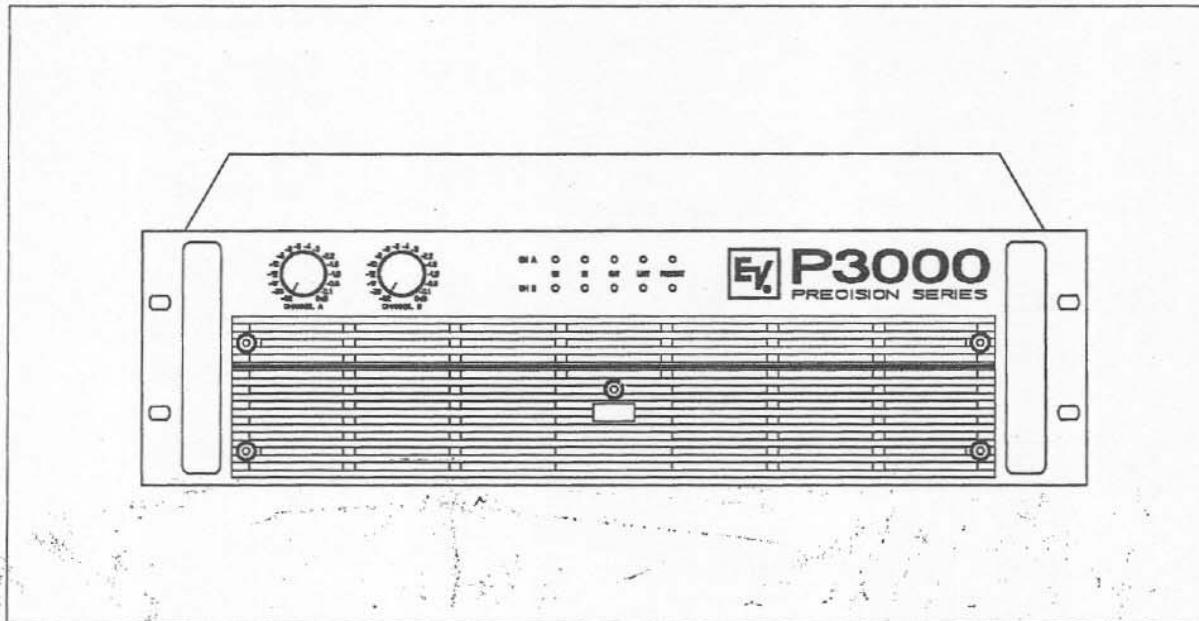


# Electro-Voice®

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## OWNER'S MANUAL

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**P 3000**

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**PRECISION SERIES**

**DESCRIPTION**

Thank you very much for choosing an EV PRECISION SERIES amplifier. We are sure it will give you many years of satisfying performance.

EV power amplifiers of the PRECISION SERIES meet the stringent requirements of tough touring applications. They are protected against over-temperature, overload, shorted outputs, radio frequency interference and DC faults. The power transistors are protected from damage from reverse feeding of electrical energy by means of an additional special protective circuit. For the so-called soft-start, the power outputs are switched on delayed via relays. An inrush current limiter circuit prevents the mains fuses from being blown.

Maximum precision is also guaranteed as regards mechanical construction and finish. The robust steel chassis features remarkable torsion resistance and is specially designed to cope with the tough wear and tear associated with going on tour. Thermal stability is guaranteed by several low noise 3-stage fans which also means that they can be used inside the studio.

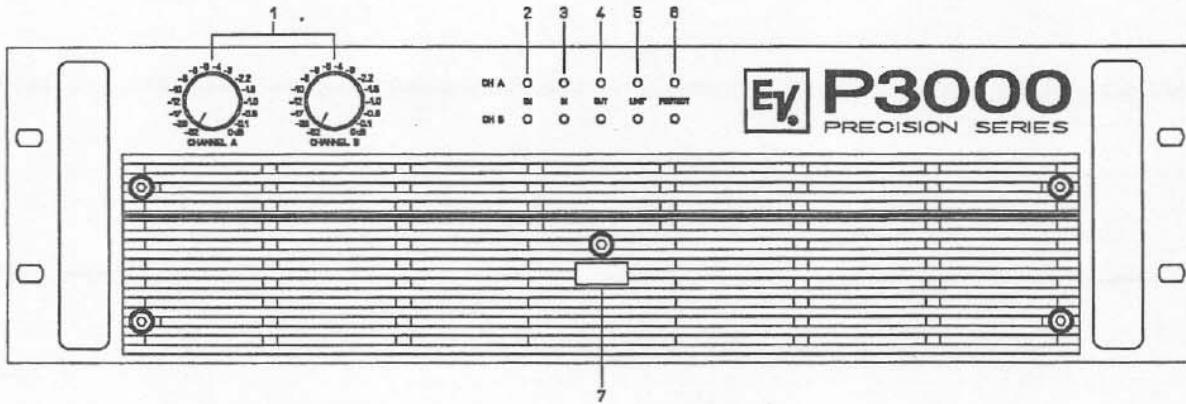
Comparator circuits constantly compare the power amplifiers' input and output signal and control the limiters under non-linear operating conditions. They protect the loudspeakers from overload due to power stage clipping. The PRECISION SERIES power amplifiers feature excellent transmission properties. The power amplifier topology also makes for extremely low distortion rates. Distortion factor (THD), intermodulation distortion (SMPTE-IM) and transient intermodulation distortion (DIM 30 and DIM 100) are so low that they are only detectable with the most sophisticated measuring equipment. Generously dimensioned power supplies with low-leakage toroidal-core transformers provide considerable headroom well above the nominal ratings. V/I foldback limiter circuits were deliberately not included in the PRECISION SERIES power amplifiers to facilitate operation at complex loads up to a phase angle of +/- 90°.

The inputs are electronically balanced on XLR connectors. (Isolation transformers can be retrofitted). Direct Outs in the form of XLR connectors (male), to loop the signal through, are also standard features. The modes DUAL/Stereo or PARALLEL/Mono can be selected via the Input Routing Switch. Furthermore, the PRECISION SERIES power amplifiers can also be operated in "Mono Bridged" mode.

The front panel accommodates the dB-calibrated input Gain controls which are designed as especially precise and safe-to-operate detented potentiometers. The LED display provides information about the power amplifiers' operating status. For the two channels, they demonstrate readiness to operate, whether there is a signal at the input or output, when the Limiters have been activated and whether one of the protective features has been triggered. The power outputs Channel A, Channel B and Bridged Out are available on Speakon connectors. The rear side of the unit accommodates the ON/OFF switches for the integrated Hi and Lo cut filters, a groundlift switch which separates the housing from the circuit ground thus helping to prevent hum loops and the operating modes selector to mono bridged operation. They also feature extremely quiet fans with front-to-rear airflow, facilitating operation in large and narrow amplifier racks.

This Owner's Manual is meant to help you familiarize yourself with all the PRECISION SERIES' other features. Please read it through carefully and we guarantee that your new power amplifier of the PRECISION SERIES from EV will give you great pleasure.

## FRONT PANEL



### 1. Level Control

Calibrated detented potentiometers to alter the total gain of the power amplifier. In order to avoid distortion in mixing consoles upstream, these controls should normally be positioned between 0 dB and -6 dB. The calibrated markings show the additional attenuation directly.

### 2. Power ON indication

This LED lights up when the mains switch is pressed. If it does not light up, the unit is not connected to the mains or the mains fuse has blown.

### 3. Input indication

This LED lights up if a signal is present at the power amplifier input. The indicator does not light up when the input controls are turned down completely.

### 4. Output indication

This LED lights up if a signal is present at the power amplifier output. The indicator goes off when the speaker line has shorted or a protective circuit has been activated thus indicating that there is no signal at the speaker output terminals.

### 5. LIMIT

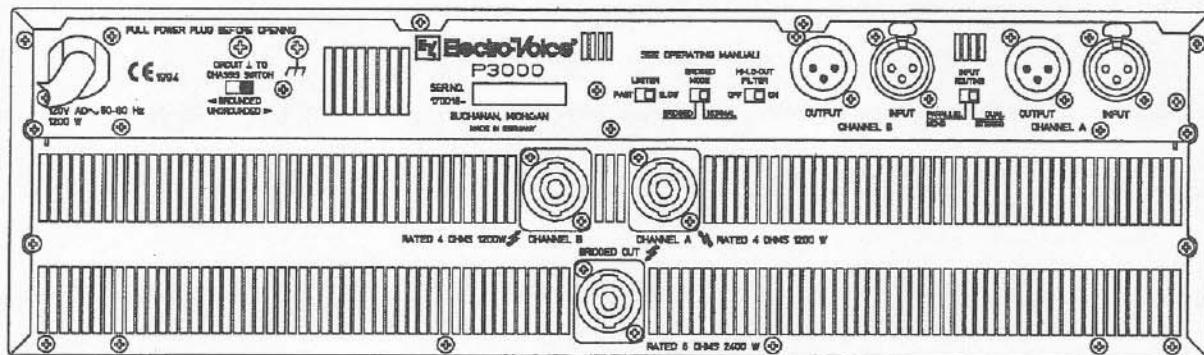
This LED lights up if the limiter has been activated and the power amplifier is being operated at the clip level. If the LED flashes briefly, this is not a cause for concern. If this LED is lit permanently, the volume should be reduced to avoid overload damages to the connected loudspeaker systems.

### 6. PROTECT

When this LED lights up during operation, one of the protection circuits against over-temperature, overload, shorted outputs, radio frequency interference or DC faults has been triggered. The cause of the error e.g. a shorted loudspeaker line must be remedied. In case of overheating, wait a little until the amplifier switches back to operating mode itself.

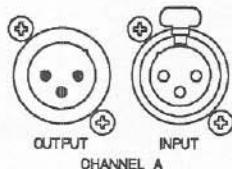
### 7. POWER Switch

The unit is switched on via the power switch. The loudspeaker outputs are switched on via delayed relays so that no startup transients are audible. A current limiter prevents startup peaks on the mains line and prevents the mains fuse from blowing.



## REAR SIDE

## Power amplifier input connectors



XLR connectors (male) are provided for "Looping" the signal to other power amplifiers. These are wired parallel to the XLR input connectors in each channel.

The inputs of the power amplifier are electronically balanced and wired according to IEC 268. Isolation transformers can be retrofitted in order to avoid hum interference in larger sound reinforcement systems. Please contact your dealer if you have any problems.

## Input wiring XLR

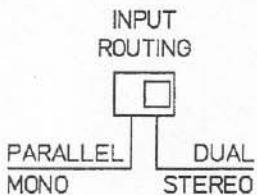
- PIN 1: SHIELD
- PIN 2: a, +, hot
- PIN 3: b, -, cold

The inputs are electronically balanced.

The input sensitivity is set to 0dBu (775 mV) by the factory. Please contact your local dealer if you want to change to 6dBu or 26 dB gain.

## INPUT ROUTING

## PARALLEL MONO



If the mode selector is in position PARALLEL MONO, the input connectors channel A und B are directly wired in parallel, but the volume for channel A or B can be adjusted independently using the input controls A or B.

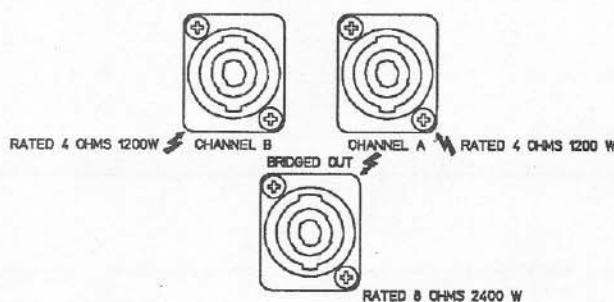
## DUAL STEREO

If the mode selector is in position DUAL STEREO, channel A and B are amplified separately.

**Many mixing consoles have XLR connectors in the outputs, but are wired in such a way that they are unbalanced. If a mixer is used with unbalanced outputs, PIN 1 and PIN 3 of the power amplifier's input connectors must be connected by a jumper or PIN 3 must not be connected to the connection cable.**

**If signals are taken from unbalanced units via PIN 3 (b, -, cold) and PIN 2 (a, +, hot), strange hum interference or high frequency oscillations can occur. These effects can cause power amplifiers or loudspeakers to malfunction.**

## REAR SIDE



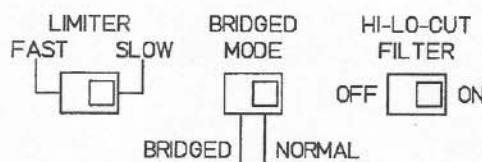
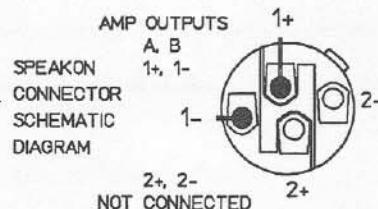
### POWER AMPLIFIER OUTPUT CONNECTORS

SPEAKON output connectors are provided for the power amplifier channels A (left) and B (right).

The Bridged Out connector for bridged operation is sealed with a plastic cover to prevent connection errors.

#### WARNING:

Please make sure not to hook Speakers up to the BRIDGED OUTput in NORMAL mode or damage will result.



### LIMITER

The time constant of the built-in limiter to avoid overdriving is adjustable. Position "SLOW" is the factory preset and this should also be the normal position.

If the power amplifier is used as a MID/HI-frequency amplifier in active multi-way systems, the limiter switch should be set to "FAST".

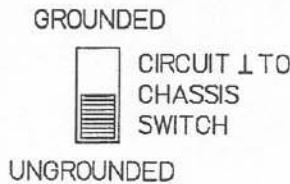
If the power amplifier is used as LOW-frequency amplifier in active multi-way systems, the limiter switch should be set to "SLOW".

### BRIDGED MODE

Slide switch to change from Normal Stereo mode to Bridged mode. In Bridged mode the built-in power amplifiers operate in "push-pull" and the double output voltage from channel A and B appears at the Bridged output connector. The phases of Channel A and B are in opposite and therefore the individual channels must not be used as loudspeaker outputs.

### HI-LO-CUT FILTER

This filter attenuates subsonic and high frequency signals so that the power amplifiers are not modulated with these signals. This switch should normally always be in position ON. The OFF position is only for applications where an upstream unit, e.g. a crossover or an equalizer, has integrated HI-Cut and LO-Cut filters.



### GROUNDLIFT SWITCH

Hum loops can be avoided with the groundlift switch. If the power amplifier is operated together with other units in one 19" rack, the switch should be in GROUNDED position. If the power amplifier is used with units which have different earthing potentials, the switch should be adjusted to the UNGROUNDED position.

**TECHNICAL SPECIFICATIONS** at rated output power 8ohms, one channel driven, unless otherwise specified

**Output Power** (20Hz - 20kHz / THD ≤ 0,1%) **P 3000**

into 8 Ohms	2 x 750 W
into 4 Ohms	2 x 1200 W
into 8 Ohms bridged	1 x 2400 W

**Output Power** (1kHz / THD = 1,0%)

into 8 Ohms	2 x 850 W
into 4 Ohms	2 x 1300 W
into 8 Ohms bridged	1 x 2600 W

**Technical Specification**

**Frequency Response** 0dB .....-1dB / 20Hz.....20kHz

**Max. Output Level**  
before clipping, no load  
reference 1 KHz / THD = 1%

91V / RMS

**Voltage Gain**  
reference 1kHz 26 dB (constant gain option)

**Input Sensitivity**  
at rated output power 0 dBu/0.775 V  
reference 1 kHz 6 dBu/1.55 V

**Maximum Input Level** 21 dBu / 8.7 V

**Input Impedance**  
active balanced 20 kOhm

**THD**  
at rated output power MBW = 80 kHz, f = 1kHz < 0.05%

**IMD - SMPTE**  
60 Hz, 7 kHz, typical < 0.01%

**IMD - SMPTE**  
60 Hz, 7 kHz, at rated output power < 0.01%

**Signal / Noise Ratio** > 105 dB  
A-weighted, RMS to rated output level,  
Input sensitivity + 6dBu

**Crosstalk**  
at rated output power reference 1 kHz < -70 dB

**Damping Factor** > 300  
internal, 1kHz

**DIM 30** < 0.01%

**DIM 100** < 0.01%

**Slew Rate Internal** > 40 V /  $\mu$ s

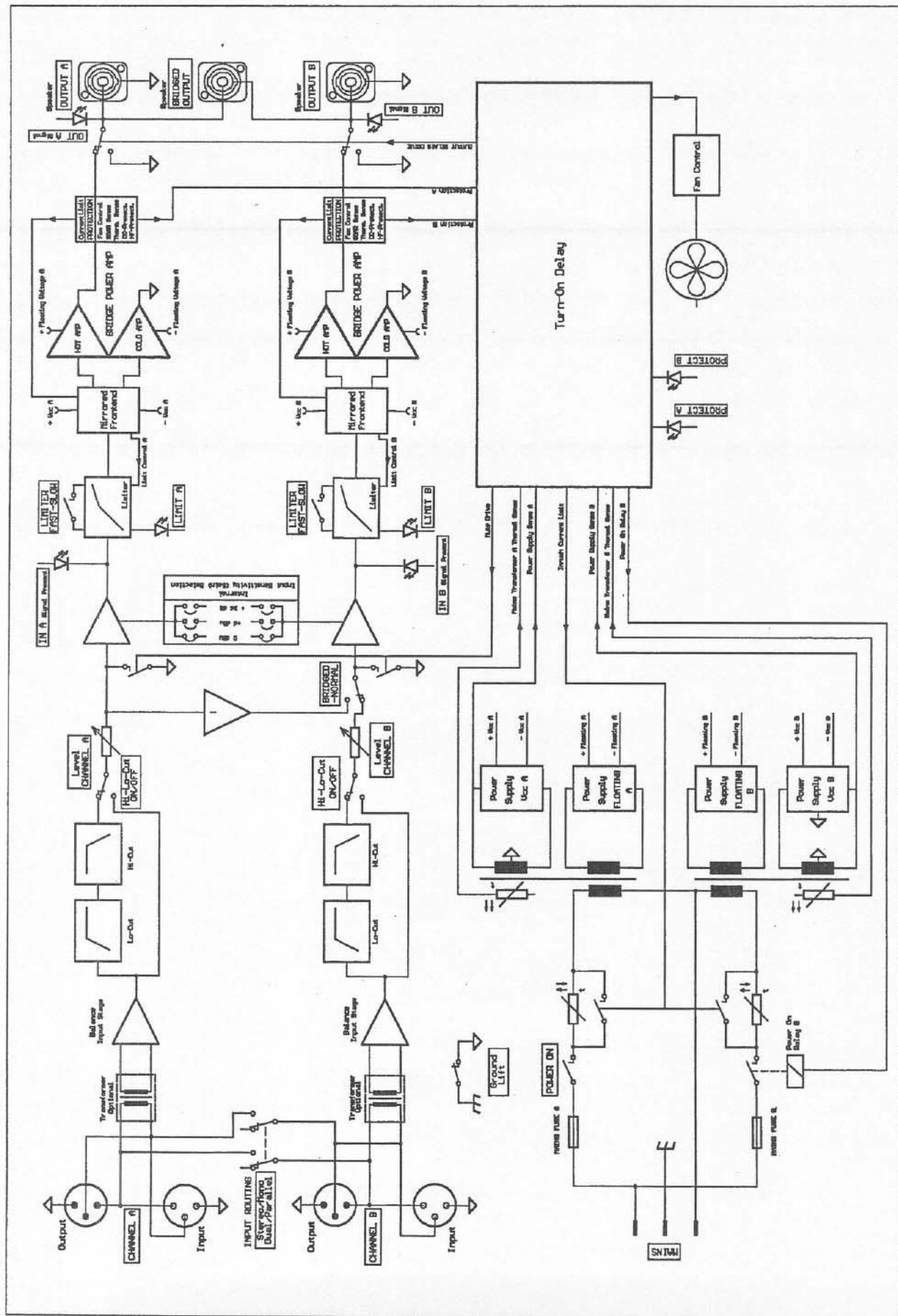
**Power Consumption** 1650 W  
1/8 rated output power 4 Ohm

**Dimensions (WxHxD)** 483 x 132.5 x 426 mm  
19 x 5.2 x 16.77 (in)

**Weight** 29 kg (63.9 lbs)

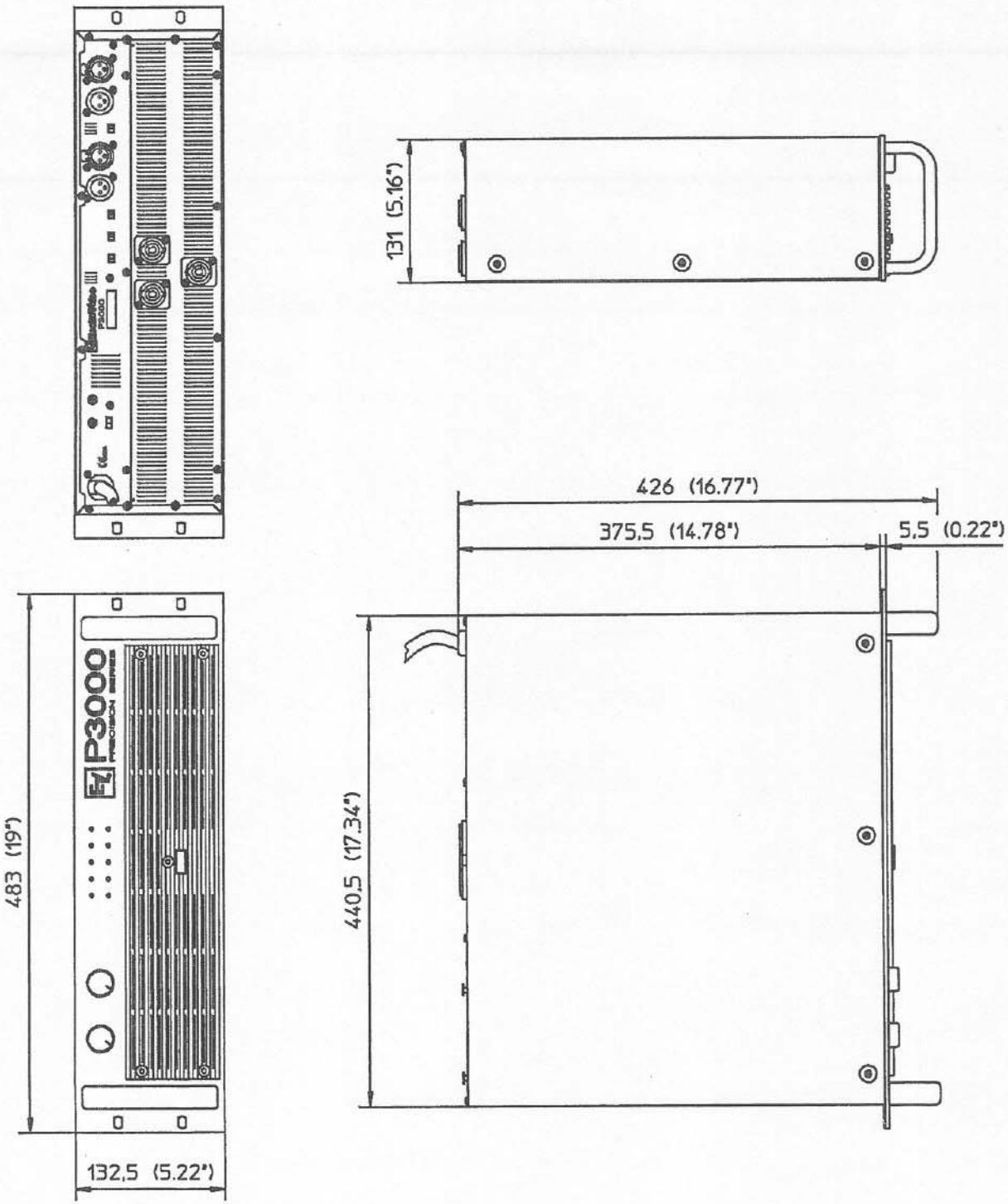
**Optional Input Transformer** 90176

# BLOCK DIAGRAM



## DIMENSIONS

Dimensions in mm (inch)



## SPECIFICATIONS: P 3000 complete unit

Standard specifications: IEC 268 part 3, IHF-A

0 dBu = 775 mV (RMS)

### A. POWER SUPPLY

1. Type of power supply:	AC
2. Rated power supply voltage:	120 V
3. Rated power supply frequency:	60 Hz
4. Power drawn under rated conditions (1200W/4 ohms)	4100 watts
5. Power drawn under standard test conditions (120W/4 ohms)	1500 watts
6. Power consumption at 1/8 rated output power (150W/4 ohms)	1650 watts
7. Tolerance of power supply voltage variations:	-10%...+10%

### B. INPUT CHARACTERISTICS

\* Level controls fully clockwise

Input	Rated Input Level (rated source e.m.f)			Rated Output Power	Rated Load Impedance
	select Jumper internal				
	0dBu	+6dBu	26 dB		
CHANNEL A/B	+1dBu (870mV)	+7dBu (1.74V)	14dBu (3.87V)	750 W	8 ohms
CHANNEL A/B	0dBu (775mV)	+6dBu (1.55V)	13dBu (3.46V)	1200W	4 ohms
CHANNEL (Bridged)	0dBu (755mV)	+6dBu (1.55V)	13dBu (3.46V)	2400W	8 ohms

Maximum Input Level +21dBu (9V)

### C. OUTPUT CHARACTERISTICS

\* Rated output power at THD = < 0.1%, 20 Hz...20 kHz, MBW = 80 kHz

\* Maximum Output Power at 1kHz / THD = 1%

### OUTPUT POWER

Output socket	Rated Load Impedance	Rated Output Power Dual Mode	Maximum Output Power, Dual Mode	Single Channel Output Power )1	Rated Output Voltage
SPEAKER (A/B)	8 ohms	750 W	850 W	950 W	77.5 V
SPEAKER (A/B)	4 ohms	1200 W	1300 W	1700 W	69.3 V
SPEAKER BRIDGED	8 ohms	2400 W	2600 W	3400 W	138.6 V

)1 measured with "Dynamic Headroom" test signal according IHF-A: 1 kHz tone burst, 20ms ON, 480 ms OFF

### D. MAXIMUM OUTPUT VOLTAGE (NO-LOAD)

Output socket	SPEAKER A/B	SPEAKER BRIDGED
Max. output voltage (no-load)	91 V (RMS)	182 V (RMS)

## E. STABILIZATION

with rated load impedance, Dual Mode, standard test conditions

	8 ohms	4 ohms
Stabilization	0.325%	0.686%
Stabilization level	0.028 dB	0.059 dB

## F. FREQUENCY RESPONSES

### Gain frequency response:

\* -3 dB drop against level at norm frequency 1 kHz

Input	Output	f(l)	f(u)	Comment
INPUT A/B	SPEAKER A/B	<10Hz	75 kHz	HI-LO-CUT Off
INPUT A/B	SPEAKER A/B	20Hz	35 kHz	HI-LO-CUT On

### Distortion-limited effective frequency range (power bandwidth):

\* THD = 0.1%, 1/2 rated power into 4 ohms, MBW = 500 kHz

Input	Output	f(l)	f(u)	Comment
INPUT A/B	SPEAKER A/B	<10Hz	48 kHz	HI-LO-CUT Off

## G. PHASE-FREQUENCY RESPONSE

+/- 30 degrees (20 Hz-20 kHz, HI/LO-CUT Off)

## H. INPUT IMPEDANCE

20 kohms (20 Hz ... 20 kHz)

## I. AMPLITUDE NON-LINEARITIES

	Amplitude Non-Linearities	Comment
Rated total harmonic distortion	< 0.05%	MBW = 80 kHz, f = 1 kHz
Total harmonic distortion under standard test conditions	< 0.02%	MBW = 80 kHz, f = 1 kHz
IMD - SMPTE	< 0.01%	60 Hz, 7 kHz
DIM 30	< 0.01%	3.15 kHz, 15 kHz
DIM 100	< 0.01%	3.15 kHz, 15 kHz

## J. CROSSTALK

< -70 dB

- at f = 1 kHz

**K. DAMPING FACTOR**

&gt; 300

- internal at  $f = 1 \text{ kHz}$

**L. SLEW RATE**> 40 V/ $\mu\text{s}$ 

- internal

**M. NOISE**

- $R(S) = 50 \text{ ohms}$
- Power amplifier input sensitivity 0dBu
- $E(F) = \text{Noise voltage, unweighted with } B = 22 \text{ Hz} \dots 22 \text{ kHz, RMS (IEC 268-1)}$
- $E(G) = \text{Noise voltage, frequency weighting filter according CCIR-4683, quasi peak-weighted (IEC 268-1)}$
- $E(A) = \text{Noise voltage, dB(A) frequency-weighted, RMS (IEC 268-1)}$
- S/N ratios ref. to rated output voltage 69.3 V (1200W/4ohms)
- HI/LOW-CUT ON, GND LIFT = GROUNDED
- i.s. = Input Sensitivity

	Noise Out-put Voltage	S/N-Ratio	Equiv. input noise voltage	Equiv. input noise level	Residual noise output voltage
$E(F)$	< 615 $\mu\text{V}$	> 101 dB	< 6.9 $\mu\text{V}$	< -101dBu	< 435 $\mu\text{V}$
$E(G)$	< 3.65mV	> 85.5 dB	< 41 $\mu\text{V}$	< -85.5dBu	< 1.55mV
$E(A) \text{ i.s.=0dBu}$	< 490 $\mu\text{V}$	> 103 dB	< 5.5 $\mu\text{V}$	< -103dBu	< 345 $\mu\text{V}$
$E(A) \text{ i.s.=6dBu}$	< 245 $\mu\text{V}$	> 109 dB	< 5.5 $\mu\text{V}$	< -103dBu	< 170 $\mu\text{V}$
$E(A) \text{ Gain=26dB}$	< 110 $\mu\text{V}$	> 116 dB	< 5.5 $\mu\text{V}$	< -103dBu	< 90 $\mu\text{V}$

**N. Dimensions**

Height : 132.5mm (3 HU)

Width : 483 mm

Depth : 426 mm

**O. Weight**

29 kg

## TEST DATA: P 3000 complete unit

General measuring conditions unless specified otherwise elsewhere:

- \* Measuring Tolerance:  $\Delta X = 1.5 \text{ dB}$
- \* Test Frequency:  $f = 1 \text{ kHz}$
- \* All Levels referred to:  $E = 775 \text{ mV (0dBu)}$
- \* Level controls fully clockwise
- \* Pin assignment of the XLR-socket:
  - PIN 1 = SHIELD, GROUND
  - PIN 2 = + INPUT
  - PIN 3 = - INPUT
- \* Source impedance for feed-in via XLR socket:  $R(S) = 50 \text{ ohms}$

The pcbs 86211 (MAIN PCB) and 84157 (POWER AMP) are equipped with service connectors.

**Pin assignment of service connectors:**

84157 CNSERV	Assignment	86211 CNASERV	Assignment	86211 CNBSERV	Assignment
1	Coding	1	limiter A/B OFF	1	n.c.
2	BIAS Hot-Side+	2	Service Limiter A	2	Service Limiter B
3	BIAS Hot-Side-	3	-15V	3	-15V
4	Hot - Out	4	GND	4	Fan voltage
5	BIAS Cold-Side +	5	+15V	5	Service Fan Switch 1
6	BIAS Cold-Side -	6	Heat sink temp. A/B	6	Service Fan Switch 2
7	GND	7	+U1 Frontend A	7	+U1 Frontend B
8	Floating +	8	-U1 Frontend A	8	-U1 Frontend B
9	Floating -	9	Coding	9	Coding

**1. Power supply voltage:**  $E(O) = 120V / 60 \text{ Hz}$

**2. Tolerance of power supply voltage variations** -10% .... +10%

**3. Power consumption:**

- 3.1. without load  $P(O) = 180 - 260 \text{ watts}$
- 3.2. Power drawn under rated conditions (1200W/4 ohms)  $P(O) = 4100 \text{ watts}$
- 3.3. Power drawn under standard test conditions (120W/4 ohms)  $P(O) = 1500 \text{ watts}$
- 3.4. Power consumption at 1/8 rated output power (150W/4 ohms)  $P(O) = 1650 \text{ watts}$

**4. Adjustments:**

**4.1. ADJUSTMENT OF IDLE CURRENT:**

Connect a DC voltmeter to the two test points (see table) and adjust the idle current with the trimmer (on PCB 84157). Perform adjustment for both power amplifier sides A&B.

Adjustment	Test point 1	Test point 2	E(DC)	BIAS Trimmer
BIAS HOT A	CNSERV2	CNSERV3	15mV	VR1
BIAS HOT A	CNSERV5	CNSERV6	15mV	VR2
BIAS HOT B	CNSERV2	CNSERV3	15mV	VR1
BIAS HOT B	CNSERV5	CNSERV6	15mV	VR2

The adjustment of the idle current must be done at room temperature, i.e the unit must be left to cool down for several hours, after it has been in operation.

## 4.2. FLOATING SYMMETRY

The symmetry of the floating voltage must be checked immediately after the idle current adjustment. The power amplifier is operated without load. Connect DC voltmeters between test point 1, test point 2 or test point 2 and test point 3. The floating voltage must be adjusted symmetrically against ground via the FLOATING trimmers on PCB 86211. The symmetry of the + floating voltage and the - floating voltage against ground is decisive, the absolute value of the voltage is not so important.

Adjustment	Test point 1	Test point 2	Test point 3	E(DC)	Trimmer
FLOATING SYMMETRY A	CNSERV8	CNSERV7	CNSERV9	approx. +/-67 V	VR102
FLOATING SYMMETRY B	CNSERV8	CNSERV7	CNSERV9	approx. +/-67 V	VR202

#### 4.3. VCA - OFFSET:

Open and close service switches S101 or S201 on PCB 86211 rhythmically and adjust with VR101 or VR201 to a minimum offset (with oscilloscope to minimum peak or by ear to minimum noise volume) at the amplifier output.

The function of the service switches can also be executed via the service connectors with a short between CNASERV 2 and CNASERV 3 for the power amplifier A or a short between CNBSERV 2 and CNBSERV 3 for the power amplifier B.

#### 4.4. ADJUSTMENT OF INDICATIONS

\* Level control fully clockwise,  $f = 1$  kHz, input sensitivity = 0 dBu

Feed in a signal ( $E/I$ ) approx. -34 dBu) via Input A or B, until the IN LED lights up. Adjust the corresponding OUT LED to the same brightness via trimmer VR600 or VR601 on PCB 86211.

#### **4.5. FAN ADJUSTMENT**

Close service switch S001 on PCB 86211 or insert jumper between CNBSERV 5 and CNBSERV 6. Adjust the voltage at CNBSERV 4 with VR700 to 27.5 V (DC). Open switch or jumper again.

#### 4.6. GAIN SELECTION

The input sensitivity of the power stage can be adjusted via the jumpers J11 ... J13 or J21 ... J23. The ratings for the Input Sensitivity or Gain refer always to fully opened level controls.

CHANNEL A	CHANNEL B	SELECTION
J11	J21	Input Sensitivity 0 dBu
J12	J22	Input Sensitivity +6 dBu
J13	J23	Gain +26 dB

The Input Sensitivity is set to 0 dBu from the factory.

### 5. Function Test:

## 5.1. OUTPUT Offset Voltage

DC measurement at the loudspeaker outputs CHANNEL A/B

$U_{(DC)} \approx \pm 10 \text{ mV}$

## 5.2 LIMITER

### 5.2.1. Attenuation Test

Drive both channels with 1 kHz until  $E(O) = 89$  V (without load); increase input voltage by 10 dB. The LIMITER LED will light up, the output voltage will only rise by approx. 0.5 dB to 91 V and is slightly clipped. The THD of the limited signal is approx. 1% ... 2%. If the input voltage is increased further up to +21 dBu, the output signal must not clip more.

### 5.2.2. LIMITER FAST/SLOW Test

\* Test both power amplifier channels separately, perform test without load resistors

1) Drive the power amplifier with a burst signal ( $f = 1 \text{ kHz}$ , 1 - 10 cycles, rate = 0.5 sec.) and  $E(I) = 10 \text{ dB}$  higher than nominal input voltage.

2) Monitor the output signal with an oscilloscope and operate the FAST/SLOW switch

\* SLOW: after 2 - 3 signal periods the limiter responds to the

strong distortion and regulates it to a small residual distortion (THD = 1% ... 2%)

\* FAST: after 1-2 signal periods the limiter has already regulated the strong distortion to a small residual distortion (THD = 1% ... 2%)

The factory preset position is SLOW!

### 5.3. POWER-ON DELAY

After approx 2 sec. from operating the Power On switch the relays E1 and E3 on pcb 86211 and the relays E1 on the pcbs 84157 (channel A/B) will pick up together.

### 5.4. FAN CONTROL:

The fans run for approx. 2 seconds after switching the power amplifier on and then stop if the power amplifier is cold. The fans toggle between stage 1 and stage 0 in stand-by mode of the power amplifier (Power On, no signal), depending on the temperature of the heat sinks. If the switch S001 at PCB 86211 is closed, the fans run in stage 3.

The function of the fan control can be tested by connecting a variable resistor (approx. 100 kohms) to CNBSERV 5 and CNBSERV 6. Via CNASERV 6 the heatsink temperature can be monitored during operation.

Fan stage	E(DC) CNASERV 6	E(DC) CNBSERV 4	Comment
Stage 0	<6.5 V	0 V	Fans do not run
Stage 1	6.5 V .... 7.5 V	12.5 V	
Stage 2	7.5 V .... 9 V	19.5 V	
Stage 3	9 V .... 12.5 V	27.5 V	
Protect	> 12.5 V	27.5 V	Power amp switches off

Note: S001 is opened from the factory!

### 5.5. SOAR PROTECTION CIRCUIT TEST

Drive both channels separately to 69.3 V into 4 ohms . Connect a 0.1ohms resistor parallel; protection circuit responds and always tries to switch on again! The Protect LED flashes at the same rhythm.

### 5.6. SHORT CIRCUIT - CURRENT LIMITER TEST

Test the two amplifier channels individually

- drive the power amplifier to ( $E(O) = 89 \text{ V}$ ) with a burst signal ( $f = 1 \text{ kHz}$ , 1 - 10 cycles, rate: = 1 sec.), without load

- terminate with load resistor 1 ohm

- the short circuit current limiter limits the output voltage over the load resistor symmetrically (monitor with oscilloscope!) to a peak value of approx. 45 V (approx. 45 amps).

## 5.7. DC VOLTAGE PROTECTION CIRCUIT TEST

- \* HI/LO CUT OFF
- \* Limiter in position SLOW

Test the two channels individually:

- drive the power amplifier with a test signal ( $f = 7$  Hz, without load resistor)
- the protection circuit responds at a input voltage of approx. 3 V peak and always tries to switch on again! The Protect LED flashes at the same rhythm.

Repeat test with  $f = 14$  Hz, the power amplifier may not switch off.

## 5.8. RF PROTECTION CIRCUIT TEST

- \* Switch HI/LO CUT OFF
- \* Fan service switch on
- \* Note: Operate power amplifiers absolute without load resistors.

Switch off limiter via S102 or jumper between CNASERV 1 and CNASERV 3. Feed in burst signal ( $f = 60$  kHz, 100 msec On, 900 msec. Off) with  $E(I) = 7$  V rms into always one channel. The protection circuit must respond. The power amplifier always tries to switch on again! The Protect LED flashes at the same rhythm.

Repeat test with  $f = 30$  kHz and Limiter On, the power amplifier may not switch off.

## 6. Levels CHANNEL A and B

- \* Level control fully clockwise
- \* INPUT ROUTING switch into position DUAL/STEREO
- \* HI-LOW-CUT switch: ON (factory preset)
- \* BRIDGED MODE: NORMAL
- \* LIMITER: SLOW (factory preset)
- \* THD 0.1%

### 6.1. Rated Levels

Input	$E(I)$	Test point	$E(O)$	$R(L)$	Comment
CH. A/B	0 dBu	SPEAKER A/B	69.3 V	4 ohms	select J11,J21
CH. A/B	+6 dBu	SPEAKER A/B	69.3 V	4 ohms	select J12,J22
CH. A/B	+13 dBu	SPEAKER A/B	69.3 V	4 ohms	select J13,J23
CH. A/B	+1 dBu	SPEAKER A/B	77.5 V	8 ohms	select J11,J21
CH. A/B	-2 dBu	SPEAKER A/B	54.8 V	2 ohms	select J11,J21

6.2. Max. Input Level:

$E(I) = +21$  dBu ( 8.7 V rms)

## 7. INPUT ROUTING Switch

DUAL/STEREO (factory preset!)

- Channels A and B must be driven separately

PARALLEL/MONO

- Channels A and B are switched in parallel at the input; both channels can be driven by one signal source.

## 8. Level BRIDGED MODE

- \* Level control fully clockwise
- \* HI-LOW-CUT switch: ON (factory preset)
- \* BRIDGED MODE: BRIDGED
- \* LIMITER: SLOW (factory preset)
- \* THD 0.1%

Factory preset: NORMAL

BRIDGED: The double output voltage is available at the BRIDGED OUT socket.

The CHANNEL A input socket must be used; the CHANNEL B input socket has no function.

Input	E(I)	Test point	E(O)	R(L)	Comment
CH. A	-2 dBu	BRIDGED OUT	109.5 V	4 ohms	select J11,J21
CH. A	0 dBu	BRIDGED OUT	138.5 V	8 ohms	select J11,J21

## 9. GROUND LIFT Switch

Factory preset: GROUNDED

Check the correct function of the switch with an ohm-meter:

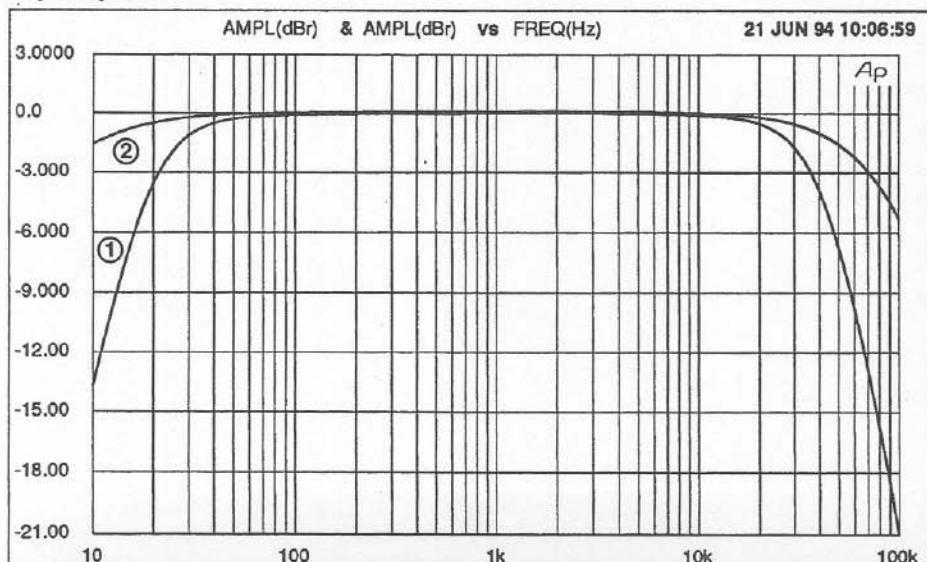
- Circuit ground (at the input or output socket) is connected or disconnected with chassis ground (contact at the earth-terminal screw at the rear or protective-conductor of the mains cable)

## 10. Amplitude non-linearities

- \* Input Sensitivity 0 dBu
- \* Measurements with load resistor 8 ohms
- \* MBW = 80 kHz
- \* Power amplifier in factory preset condition (HI/LO Cut On, Limiter Slow)

Measurement	at rated output level E(O) = 77.5 V	at output level under standard test conditions E(O) = 24.5V	Comment
THD+N (f=1kHz)	< 0.005%	< 0.005%	MBW=80kHz
THD+N (f=10kHz)	< 0.02%	< 0.01%	MBW=80kHz
DIM 30	< 0.007%	< 0.005%	3.15kHz, 15kHz
DIM 100	< 0.009%	< 0.005%	3.15kHz, 15kHz
SMPTE	< 0.01%	< 0.01%	60Hz, 7kHz

## 11. Frequency response



\* plot 1: HI/LO CUT On  
\* plot 2: HI/LO-CUT Off

## 12. Noise levels

- Input Sensitivity = 0 dBu
- E(F) = Noise voltage, unweighted with B = 22 Hz ... 22 kHz, RMS (IEC 268-1)
- E(G) = Noise voltage, frequency weighting filter according CCIR-4683, quasi peak-weighted (IEC 268-1)
- E(A) = Noise voltage, dB(A) frequency-weighted, RMS (IEC 268-1)
- S/N ratios ref. to rated output voltage 69.3 V (1200W/4ohms)
- HI/LOW-CUT ON, GND LIFT = GROUNDED

	Noise Out-put Voltage	S/N-Ratio	Equiv. input noise voltage	Equiv. input noise level	Residual noise output voltage
E(F)	< -615µV	> 101dB	< 6.9µV	< -101 dBu	< 435µV
E(G)	< 3.65mV	> 85.5dB	< 41µV	< -85.5 dBu	< 1.55mV
E(A)	< 490µV	> 103dB	< 5.5µV	< -103 dBu	< 345µV

## 13. Crosstalk

< -70 dB

- at f = 1 kHz

## 14. Damping factor

> 300

- internal at f = 1kHz

## 15. Slew rate

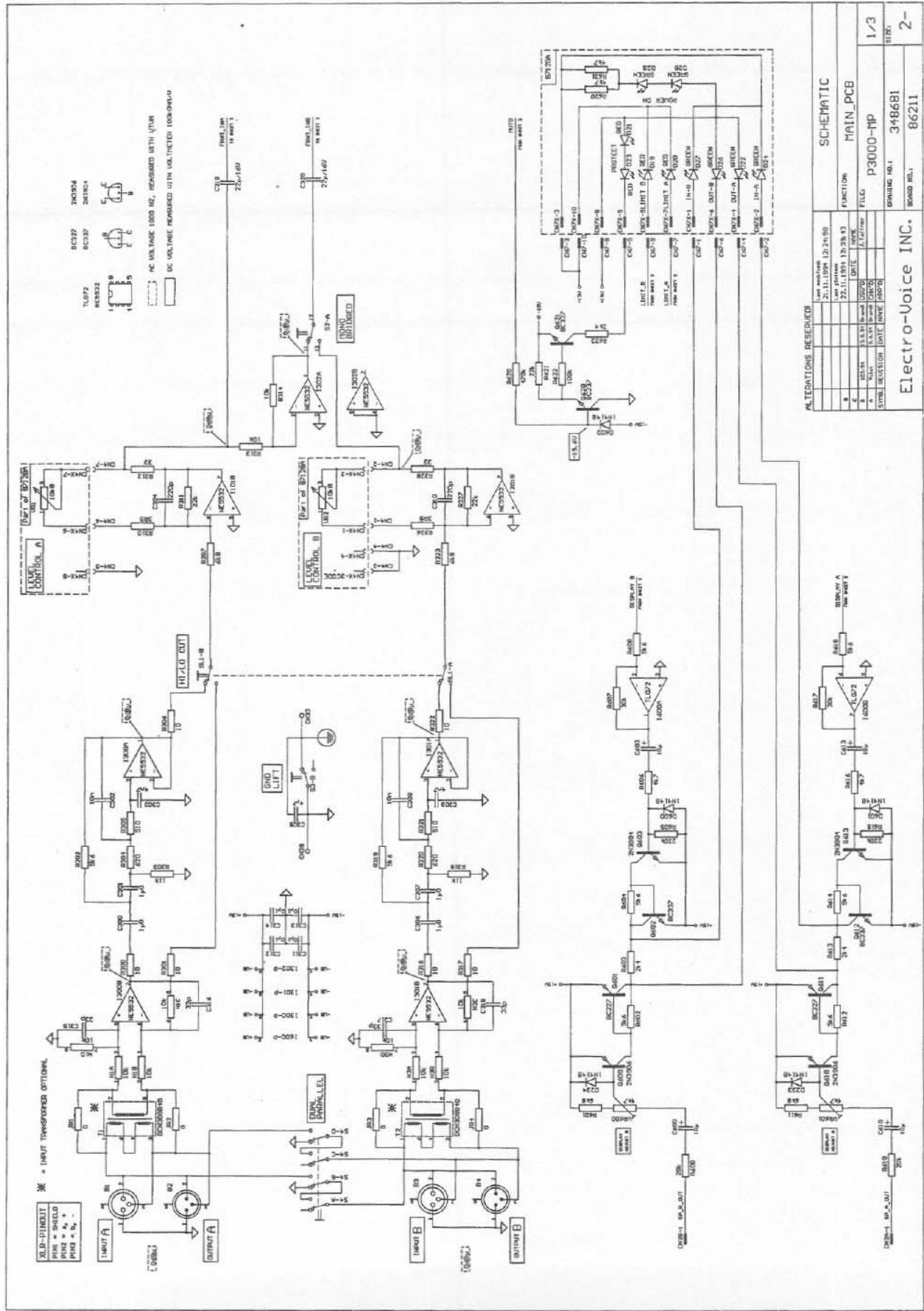
> 40 V/µs

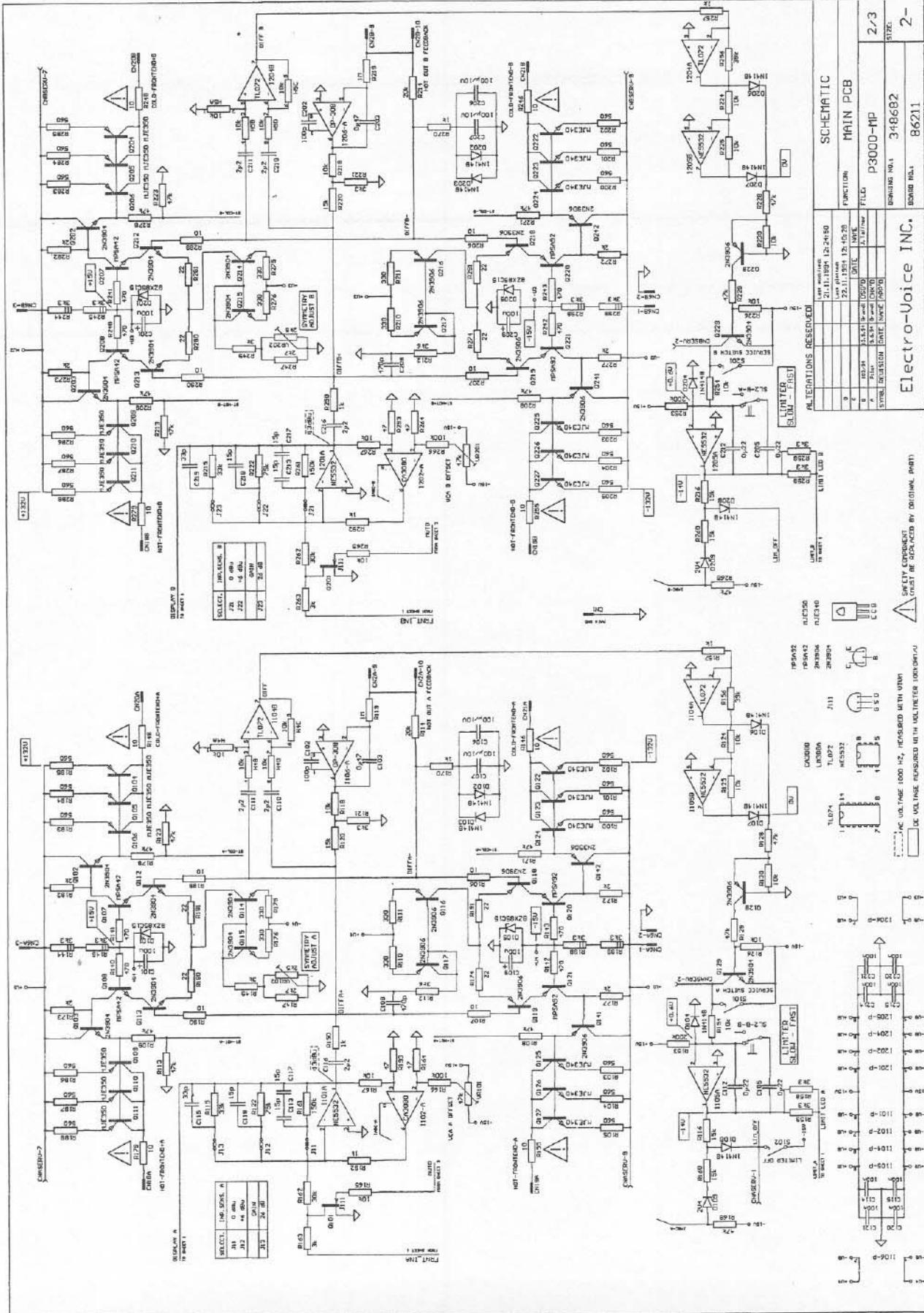
- internal

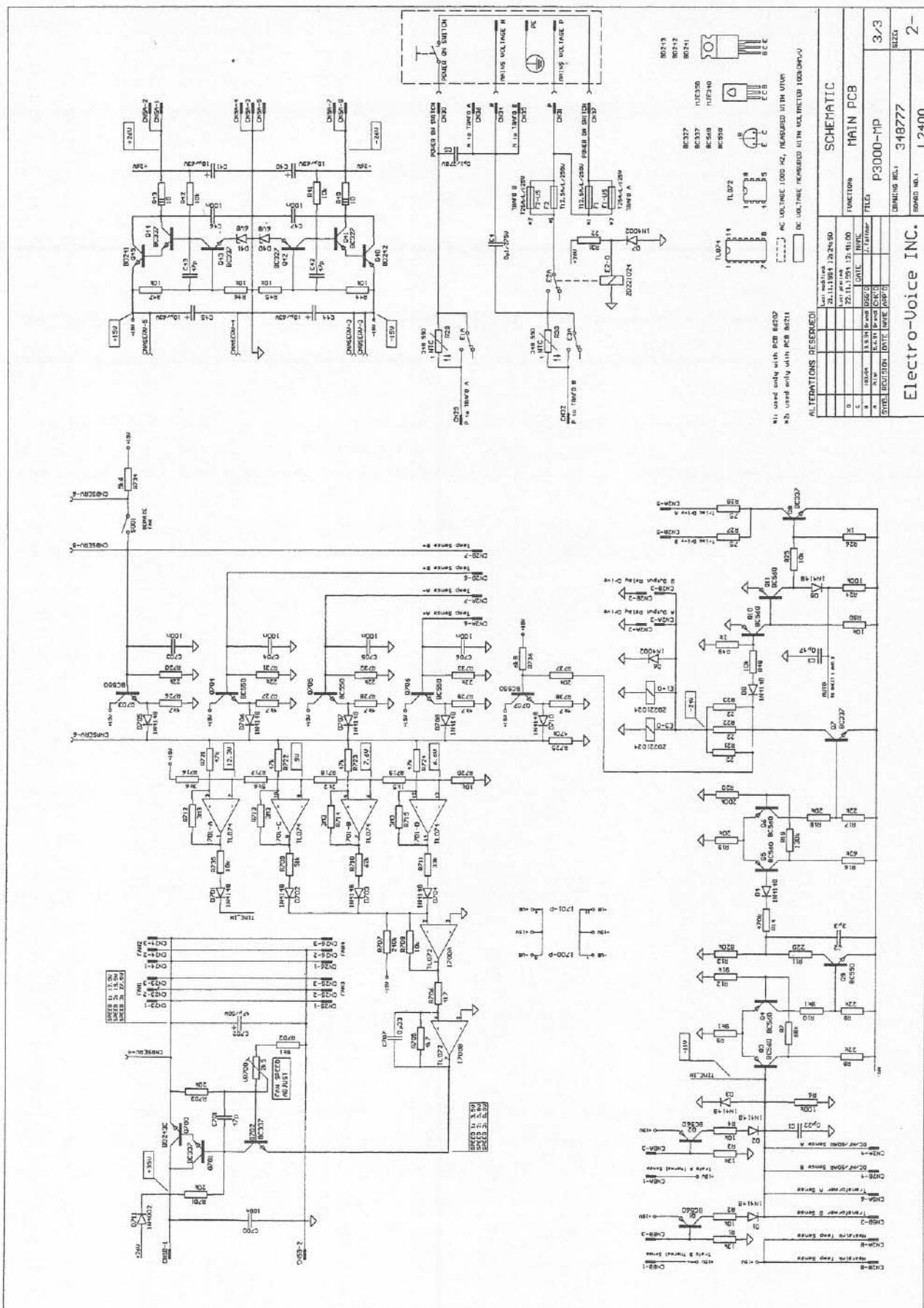
## 16. Factory Preset Condition

\* Check settings

Function	Position	Control element	Condition	Setting
Input sensitivity	PCB 86211	Jumper J11/12	plugged	0 dBu
Limiter Off switch	PCB 86211	bow-type switch S102	open	Limiter On
Limiter Service switch	PCB 86211	bow-type switch S101/S2012	open	
Service fan switch	PCB 86211	bow-type switch S001	open	
Input Routing	Rear side	slide switch	Dual/Stereo	Dual Mode
HI/LO CUT filter	Rear side	slide switch	On	Filter On
Bridged Mode	Rear side	slide switch	Normal	Not bridged
Limiter	Rear side	slide switch	Slow	Limiter slow
CIR.GND to CHASSIS	Rear side	slide switch	Grounded	







Electro-Voice Inc.

L-2400

## SCHEMATIC

MAIN PCB

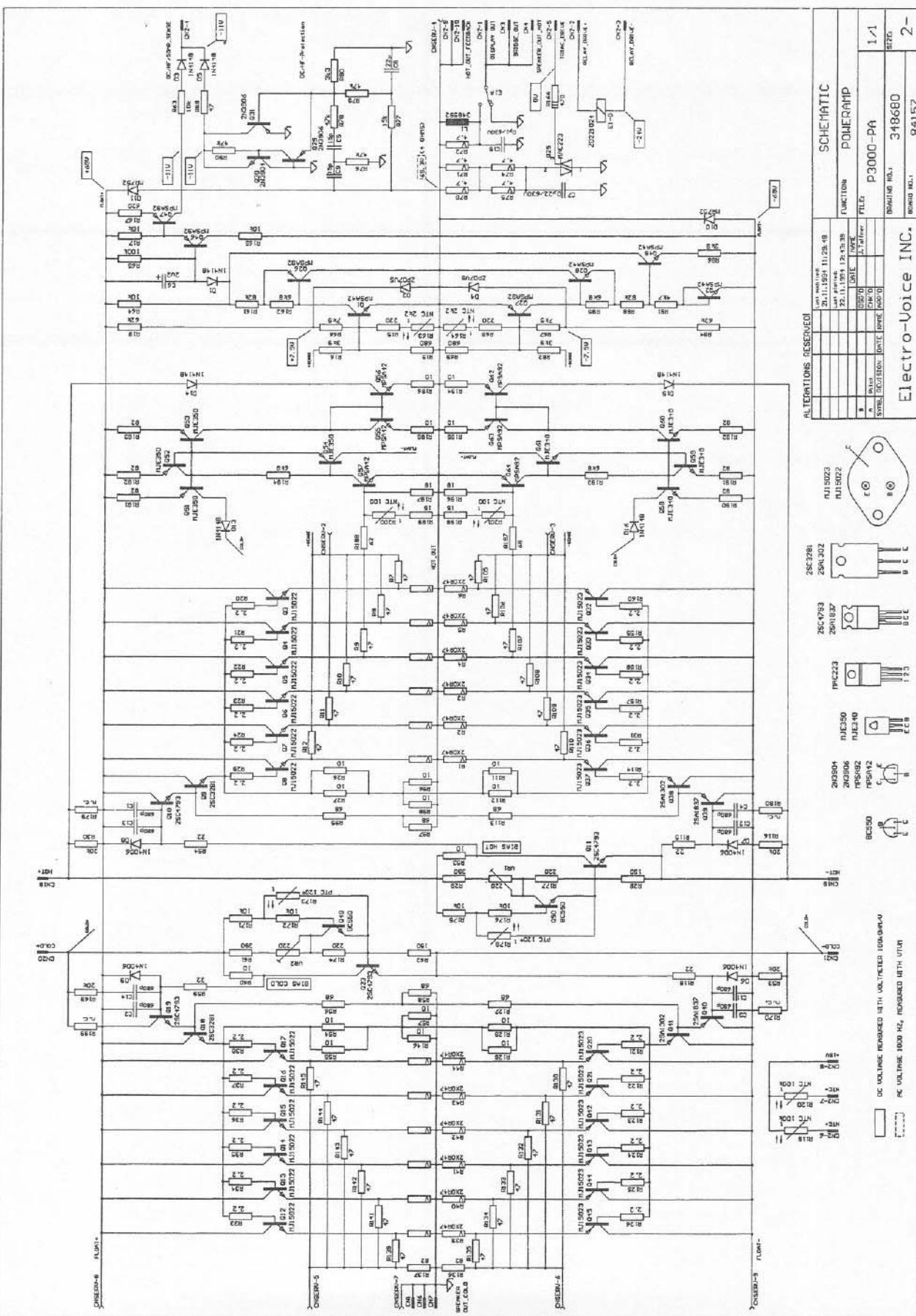
FILE: P3000-MP

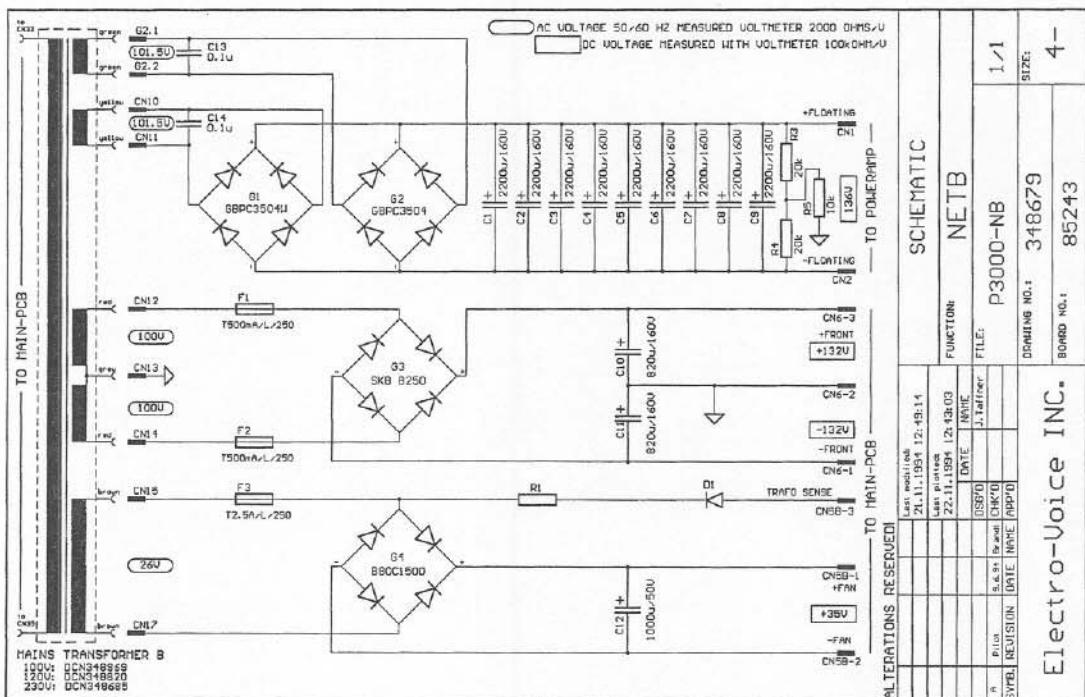
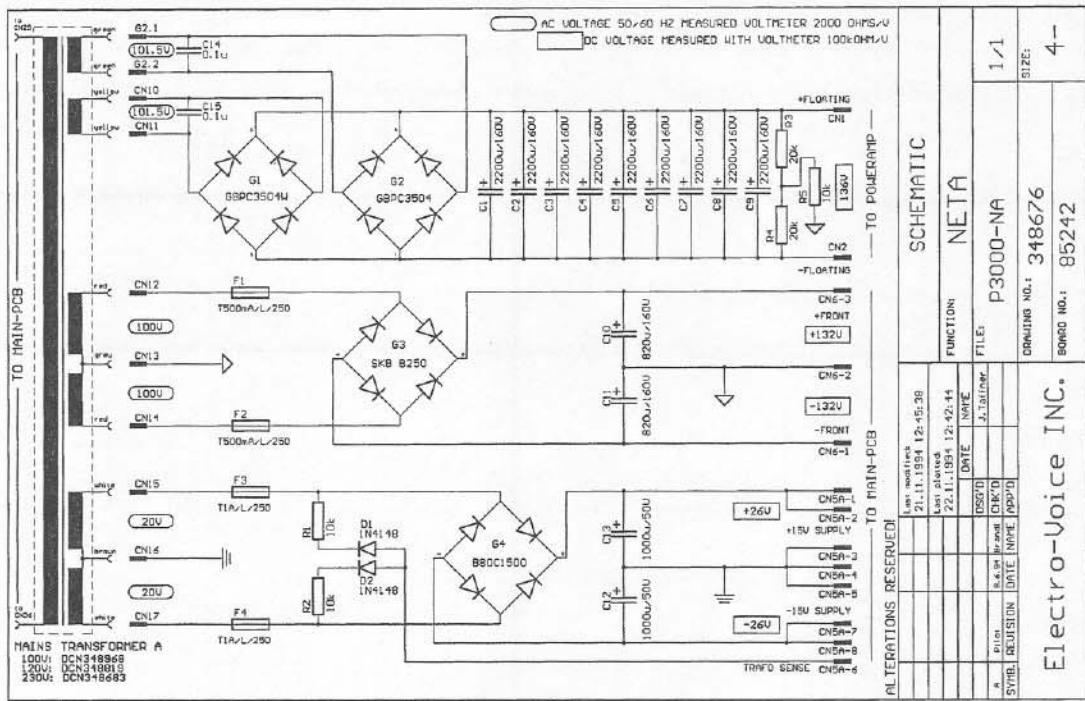
SIZE: 3/3

DRAWING NO.: 348777

BOARD NO.: L-2400

2-





Pos. in diagram description	Part-No.	Pos. in diagram description	Part-No.
B0010 speaker socket 4pol.	341343	Q0025 triac MAC 223-6	338876
C0013 capacitor S0 0.10 MF/250V	333014	Q0026 trans. MPSA 92	348423
C0014 capacitor S0 0.10 MF/250V	333014	Q0027 trans. MPSA 92	348423
S0010 power switch	346720	Q0028 trans. MPSA 42	348422
Z0080 rubber foot	335589	Q0029 trans. 2N 3906	348421
00030 power button black	341382	Q0030 trans 2N 3904	335763
00210 handle 109mm	349520	Q0031 trans. 2N 3906	348421
00510 fan	348415	Q0032 trans. MJ 15023	331658
		Q0033 trans. MJ 15023	331658
00005 PCB	841578	Q0034 trans. MJ 15023	331658
CNSER connector 9pol	306446	Q0035 trans. MJ 15023	331658
C0007 safety component 0,22MF	344934	Q0036 trans. MJ 15023	331658
C0015 safety component	341714	Q0037 trans. MJ 15023	331658
D0001 diode 1N 4148	301254	Q0038 trans. 2SA 1302	348424
D0002 break down diode ZPD 7V5	307916	Q0039 trans. 2SA 1837	348408
D0003 diode 1N 4148	301254	Q0040 trans. 2SA 1837	348408
D0004 break down diode ZPD 7V5	307916	Q0041 trans. 2SA 1302	348424
D0005 diode 1N 4148	301254	Q0042 trans. MJ 15023	331658
D0006 diode 1N 4006	305739	Q0043 trans. MJ 15023	331658
D0007 diode IN 4006	305739	Q0044 trans. MJ 15023	331658
D0008 diode 1N 4006	305739	Q0045 trans. MJ 15023	331658
D0009 diode 1N 4006	305739	Q0046 trans. MPSA 92	348423
D0010 diode MR 752	328769	Q0047 trans. MPSA 92	348423
D0011 diode MR 752	328769	Q0048 trans. MPSA 42	348422
D0012 diode 1N 4002	304360	Q0049 trans. BC 550 B	301184
D0013 diode 1N 4148	301254	Q0050 trans. BC 550 B	301184
D0014 diode 1N 4148	301254	Q0051 trans. MJE 350	338869
D0015 diode 1N 4148	301254	Q0052 trans. MJE 350	338869
D0016 diode 1N 4148	301254	Q0053 trans. MJE 350	338869
E0001 relay ZD 22	348634	Q0054 trans. MJE 350	338869
L0001 coil	348592	Q0055 trans. MPSA 42	348422
Q0001 trans. MPSA 42	348422	Q0056 trans. MPSA 42	348422
Q0002 trans. MPSA 42	348422	Q0057 trans. MPSA 42	348422
Q0003 trans. MJ 15022	331657	Q0058 trans. MJE 340	338868
Q0004 trans. MJ 15022	331657	Q0059 trans. MJE 340	338868
Q0005 trans. MJ 15022	331657	Q0060 trans. MJE 340	338868
Q0006 trans. MJ 15022	331657	Q0061 trans. MJE 340	338868
Q0007 trans. MJ 15022	331657	Q0062 trans. MPSA 92	348423
Q0008 trans. MJ 15022	331657	Q0063 trans. MPSA 92	348423
Q0009 trans. 2SC 3281	348305	Q0064 trans. MPSA 92	348423
Q0010 trans. 2SC 4793	348409	R0070 wire-wound resistor 4,7ohm	341713
Q0011 trans. 2SC 4793	348409	R0071 wire-wound resistor 4,7ohm	341713
Q0012 trans. MJ 15022	331657	R0072 wire-wound resistor 4,7ohm	341713
Q0013 trans. MJ 15022	331657	R0074 wire-wound resistor 4,7ohm	341713
Q0014 trans. MJ 15022	331657	R0075 wire-wound resistor 4,7ohm	341713
Q0015 trans. MJ 15022	331657	00035 shorting plug	306397
Q0016 trans. MJ 15022	331657		
Q0017 trans. MJ 15022	331657	00010 PCB	871288
Q0018 trans. 2SC 3281	348305	D0019 LED red 3mm	336399
Q0019 trans. 2SC 4793	348409	D0020 LED red 3mm	336399
Q0020 trans. MJ 15023	331658	D0021 LED red 3mm	336399
Q0021 trans. MJ 15023	331658	D0022 LED green 3mm	336398
Q0023 trans. 2SC 4793	348409	D0023 LED red 3mm	336399

Pos. in diagram description	Part-No.	Pos. in diagram description	Part-No.
D0024 LED green 3mm	336398	D0701 diode 1N 4148	301254
D0026 LED green 3mm	336398	D0702 diode 1N 4148	301254
D0027 LED green 3mm	336398	D0703 diode 1N 4148	301254
D0028 LED green 3mm	336398	D0704 diode 1N 4148	301254
D0029 LED green 3mm	336398	D0705 diode 1N 4148	301254
VR001 potentiometer 10kohm lin	348430	D0706 diode 1N 4148	301254
VR002 potentiometer 10kohm lin	348430	D0707 diode 1N 4148	301254
00005 shorting plug	306397	D0708 diode 1N 4148	301254
		D0710 diode 1N 4148	301254
00015 PCB	862118	D0711 diode 1N 4002	304360
B0001 socket XLR 3pol.	346791	E0001 relay ZD 22	348634
B0002 connector XLR 3pol.	346792	E0002 relay ZD 22	348634
B0003 socket XLR 3pol.	346791	E0003 relay ZD 22	348634
B0004 connector XLR 3pol.	346792	H0001 res.network RKL 8A 103J	343457
CNASE connector 9pol	306446	H0003 res.network RKL 8A 103J	343457
CNBSE connector 9pol	306446	H0004 res.network RKL 8A 103J	343457
C0004 safety component 0,22MF	344934	H0005 res.network RKL 8A 103J	343457
C0005 safety component	341714	I0101 IC NE 5532 N	327197
C0702 KO-EL 47MF 50V	343530	I0102 IC CA 3080 E	307421
C0707 KO-FOL 0.33MF 63V	340244	I0104 IC TL 072 CP	331340
D0001 diode 1N 4148	301254	I0105 IC NE 5532 N	327197
D0002 diode 1N 4148	301254	I0106 IC LM 308 A	338359
D0003 diode 1N 4148	301254	I0201 IC NE 5532 N	327197
D0004 diode 1N 4148	301254	I0202 IC CA 3080 E	307421
D0005 diode 1N 4148	301254	I0204 IC TL 072 CP	331340
D0006 diode 1N 4002	304360	I0205 IC NE 5532 N	327197
D0007 diode 1N 4002	304360	I0206 IC LM 308 A	338359
D0008 diode 1N 4148	301254	I0300 IC NE 5532 N	327197
D0040 break down diode ZPD 6V8	304992	I0301 IC NE 5532 N	327197
D0041 break down diode ZPD 6V8	304992	I0302 IC NE 5532 N	327197
D0101 diode zener BZX 85C 15V	334321	I0600 IC TL 072 CP	331340
D0102 diode 1N 4148	301254	I0700 IC TL 072 CP	331340
D0103 diode 1N 4148	301254	I0701 IC TL 074 CN	332985
D0104 diode 1N 4148	301254	Q0001 trans. BC 560 B	306928
D0105 diode zener BZX 85C 15V	334321	Q0002 trans. BC 560 B	306928
D0106 diode 1N 4148	301254	Q0003 trans. BC 560 B	306928
D0107 diode 1N 4148	301254	Q0004 trans. BC 560 B	306928
D0108 diode 1N 4148	301254	Q0005 trans. BC 560 B	306928
D0109 diode zener BZX 55C 2V4	329511	Q0006 trans. BC 560 B	306928
D0201 diode zener BZX 85C 15V	334321	Q0007 trans. BC 337-25	307150
D0202 diode 1N 4148	301254	Q0008 trans. BC 337-25	307150
D0203 diode 1N 4148	301254	Q0009 trans. BC 550 B	301184
D0204 diode 1N 4148	301254	Q0010 trans. BC 560 B	306928
D0205 diode zener BZX 85C 15V	334321	Q0011 trans. BC 560 B	306928
D0206 diode 1N 4148	301254	Q0040 trans. BD 242B	301235
D0207 diode 1N 4148	301254	Q0041 trans. BC 327-25	307430
D0208 diode 1N 4148	301254	Q0042 trans. BC 327-25	307430
D0209 diode zener BZX 55C 2V4	329511	Q0043 trans. BC 337-25	307150
D0233 diode 1N 4148	301254	Q0044 trans. BC 337-25	307150
D0234 diode 1N 4148	301254	Q0045 trans. BD 241B	301236
D0600 diode 1N 4148	301254	Q0101 trans. J 111 A	330264
D0601 diode 1N 4148	301254	Q0102 trans. 2N 3904	335763
D0602 diode 1N 4148	301254	Q0103 trans. 2N 3904	335763

Pos. in diagram description	Part-No.	Pos. in diagram description	Part-No.
Q0104 trans. MJE 350	338869	Q0226 trans. MJE 340	338868
Q0105 trans. MJE 350	338869	Q0227 trans. MJE 340	338868
Q0106 trans. MJE 350	338869	Q0228 trans. 2N 3906	348421
Q0107 trans. MPSA 42	348422	Q0229 trans 2N 3904	335763
Q0108 trans. MPSA 42	348422	Q0241 trans. 2N 3906	348421
Q0109 trans. MJE 350	338869	Q0242 trans. 2N 3906	348421
Q0110 trans. MJE 350	338869	Q0600 trans. 2N 3906	348421
Q0111 trans. MJE 350	338869	Q0601 trans. BC 327-25	307430
Q0112 trans 2N 3904	335763	Q0602 trans. BC 337-25	307150
Q0113 trans 2N 3904	335763	Q0603 trans 2N 3904	335763
Q0114 trans 2N 3904	335763	Q0610 trans. 2N 3906	348421
Q0115 trans 2N 3904	335763	Q0611 trans. BC 327-25	307430
Q0116 trans. 2N 3906	348421	Q0612 trans. BC 337-25	307150
Q0117 trans. 2N 3906	348421	Q0613 trans 2N 3904	335763
Q0118 trans. 2N 3906	348421	Q0620 trans. BC 337-25	307150
Q0119 trans. 2N 3906	348421	Q0621 trans. BC 337-25	307150
Q0120 trans. MPSA 92	348423	Q0700 trans. BD 243C	339860
Q0121 trans. MPSA 92	348423	Q0701 trans. BC 337-25	307150
Q0122 trans. MJE 340	338868	Q0702 trans. BC 337-25	307150
Q0123 trans. MJE 340	338868	Q0703 trans. BC 550 B	301184
Q0124 trans. MJE 340	338868	Q0704 trans. BC 550 B	301184
Q0125 trans. MJE 340	338868	Q0705 trans. BC 550 B	301184
Q0126 trans. MJE 340	338868	Q0706 trans. BC 550 B	301184
Q0127 trans. MJE 340	338868	Q0707 trans. BC 550 B	301184
Q0128 trans. 2N 3906	348421	SL001 rotary switch	348583
Q0129 trans 2N 3904	335763	SL002 rotary switch	348583
Q0141 trans. 2N 3906	348421	S0001 control element on/off	327947
Q0142 trans. 2N 3906	348421	S0002 rotary switch	348583
Q0201 trans. J 111 A	330264	S0003 sliding switch	338886
Q0202 trans 2N 3904	335763	S0004 rotary switch	348572
Q0203 trans 2N 3904	335763	S0101 control element on/off	327947
Q0204 trans. MJE 350	338869	S0102 control element on/off	327947
Q0205 trans. MJE 350	338869	S0201 control element on/off	327947
Q0206 trans. MJE 350	338869	VR101 wire wound resistor 47 kohm	348486
Q0207 trans. MPSA 42	348422	VR102 wire wound resistor 2.5 k	348675
Q0208 trans. MPSA 42	348422	VR201 wire wound resistor 47 kohm	348486
Q0209 trans. MJE 350	338869	VR202 wire wound resistor 2.5 k	348675
Q0210 trans. MJE 350	338869	VR600 wire-wound resistor 4.70k	348487
Q0211 trans. MJE 350	338869	VR601 wire-wound resistor 4.70k	348487
Q0212 trans 2N 3904	335763	VR700 wire wound resistor 2.5 k	348675
Q0213 trans 2N 3904	335763	00025 shorting plug	306397
Q0214 trans 2N 3904	335763		
Q0215 trans 2N 3904	335763	00020 PCB	852428
Q0216 trans. 2N 3906	348421	C0012 KO-EL 1000MF 25V	337597
Q0217 trans. 2N 3906	348421	C0013 KO-EL 1000MF 25V	337597
Q0218 trans. 2N 3906	348421	C0015 safety component	341714
Q0219 trans. 2N 3906	348421	D0001 diode 1N 4148	301254
Q0220 trans. MPSA 92	348423	D0002 diode 1N 4148	301254
Q0221 trans. MPSA 92	348423	G0001 rectifier GBPC-W	348714
Q0222 trans. MJE 340	338868	G0002 rectifier GBPC 35-04	343270
Q0223 trans. MJE 340	338868	G0003 rectifier B250 C1000	333719
Q0224 trans. MJE 340	338868	G0004 rectifier B 80 C1500 M	340791
Q0225 trans. MJE 340	338868	00010 fuse holder	306838

Pos. in diagram description	Part-No.	Pos. in diagram description	Part-No.
00015 fuse holder	306838		
00020 fuse holder	306838		
00025 fuse holder	306838		
00025 PCB	852438		
C0012 KO-EL 1000MF 25V	337597		
C0014 safety component	341714		
G0001 rectifier GBPC-W	348714		
G0002 rectifier GBPC 35-04	343270		
G0003 rectifier B250 C1000	333719		
G0004 rectifier B 80 C1500 M	340791		
00010 fuse holder	306838		
00015 fuse holder	306838		
00020 fuse holder	306838		
00030 transformer power US	348819		
00035 transformer power US	348820		

## # SERVICE INFORMATION

**WARNING:** No user serviceable parts inside. Extremely hazardous voltages and currents may be encountered within the chassis. The servicing information contained within this document is only for use by Electro-Voice Authorized warranty repair stations and qualified service personnel. To avoid electric shock DO NOT perform any servicing other than that contained in the Operating instructions unless you are qualified to do so. Otherwise, refer all servicing to qualified service personnel.

**NOTICE:** Modification to Electro-Voice products is not recommended. Such modifications shall be at the sole expense of the person(s) or company responsible, and any damage resulting therefrom shall not be covered under warranty or otherwise.

### #.1 ORDERING REPLACEMENT PARTS

TO ORDER REPLACEMENT PARTS, LOOK UP THE ORDERING NUMBER FROM THE COMPONENT PARTS LISTING AND CALL E. S. T. (616) 695-6831, FAX (800) 685-6386, OR WRITE:

ELECTRO-VOICE SERVICE  
600 CECIL STREET  
BUCHANAN, MICHIGAN 49107  
U. S. A.

### #.2 ELECTRO-VOICE UNIFORM LIMITED WARRANTY STATEMENT

Electro-Voice products are guaranteed against malfunction due to defects in materials or workmanship for a specified period, as noted in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual, beginning with the date of original purchase. If such malfunction occurs during the specified period, the product will be repaired or replaced (at our option) without charge. The product will be returned to the customer prepaid. **Exclusions and Limitations:** The Limited Warranty does not apply to: (a) exterior finish or appearance; (b) certain specific items described in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual; (c) malfunction resulting from use or operation of the product other than as specified in the product data sheet or owner's manual; (d) malfunction resulting from misuse or abuse of the product; or (e) malfunction occurring at any time after repairs have been made to the product by anyone other than Electro-Voice or any of its authorized service representatives. **Obtaining Warranty Service:** To obtain warranty service, a customer must deliver the product, prepaid, to Electro-Voice or any of its authorized service representatives together with proof of purchase of the product in the form of a bill of sale or receipted invoice. A list of authorized service representatives is available from Electro-Voice at 600 Cecil Street, Buchanan, MI 49107 (616/695-6831 or 800/685-2606). **Incidental and Consequential Damages Excluded:** product repair or replacement and return to the customer are only remedies provided to the customer. Electro-Voice shall not be liable for any incidental or consequential damages including, without limitation, injury to persons or property or loss of use. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. **Other Rights:** This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Electro-Voice Electronics are guaranteed against malfunction due to defects in materials or workmanship for a period of three (3) years from the date of original purchase. Additional details are included in the Uniform Limited Warranty statement.

### #.3 Technical Assistance

For applications assistance or other technical information, contact the Applications Engineer. You can call (616) 695-6831, FAX (616) 695-1304, or write:

Electro-Voice Applications Engineer 600 Cecil Street Buchanan, MI 49107 U. S. A.

Electro-Voice a MARK IV company



600 Cecil Street, Buchanan, Michigan 49107, Phone (616) 695-6831, Fax: 616-695-1304  
8234 Doe Avenue, Visalia, California 93291, Phone (209) 651-7777, Fax: (209) 651-0164  
Mark IV Audio Canada, Inc. 345 Herbert St., Gananoque, Ontario, Canada K7G 2V1, Phone (613)382-2141,  
Fax (613)382-7466