

PPA 600

SERVICE MANUAL

Date: 88.11.09

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1. INTRODUCTION

The present service manual describes the Ortofon PPA600 professional power amplifier. Removal of amplifier cover and servicing should be carried out by authorized personnel only. Dangerous voltages exist inside the amplifier, even for some time after this has been turned off.

There are no user-serviceable parts inside the amplifier.

The amplifier is accessible by removing 18 screws on the sides and the top of the cover. The power supply module is situated in the right-hand side of the amplifier. A soft start board is attached to the console plate of the power supply module. Two identical amplifier modules are located in the left-hand side of the amplifier. Between the power supply and the amplifiers you find the input module with input sockets and mono-switch which extrudes from the rear of the amplifier. The display board is located just behind the front plate.

In the circuit descriptions and in the diagrams, all voltages are referred to with respect to ground (0 V) unless otherwise stated. All voltages are measured in idling state at 35°C and at nominal mains supply voltage with no signal applied. When referring to power amplifier boards, +/-Vcc means +/-75 V, and +/-12 V when referring to auxiliary circuits. Component numbers are referred to their respective boards.

2. CIRCUIT DESCRIPTION

2.1. Input Module

The input module is available in several versions. The standard version is described under 2.1.1. The optional version is described under the following sections of this chapter.

2.1.1. Input Module Standard

The input module is an integrated unit consisting of a metal housing and a PCB mounted with jack-input sockets and attenuator potentiometers.

Channel A input is fed to potentiometer R1 and leads from its wiper to the channel A output of input board.

Channel B input is fed to potentiometer R5 and leads from its wiper through SW1 to channel B output.

Op. amp. IC3 inverts signals coming from channel A and when SW1 is in the bridge position, the inverted channel A input is fed to the channel B output. In the bridge mode, SW1 also lets current to LED indicators D8 and D9 located on the display board. The input module also contains a traditional +/- 12 V supply, regulated by IC1 and IC2.

2.1.2. Input Module Balanced

The input module is an integrated unit consisting of a metal housing and a PCB mounted with both XLR and jack-input sockets and attenuator potentiometers. Connection of XLR socket follows European standard:

Pin 1: Ground
Pin 2: Phase
Pin 3: Non phase

Connection of XLR socket on amplifiers sold in the USA follows US-standard:

Pin 1: Ground
Pin 2: Non phase
Pin 3: Phase.

Channel A

Channel A input is fed to op-amp IC3 through R1 and R2. Diodes D2-D4 limits amplitude of input signal to +/- 12 V peak. Output of IC3 is fed to channel A output of input board through attenuating potentiometer R5.

2.1.-1.

Channel B

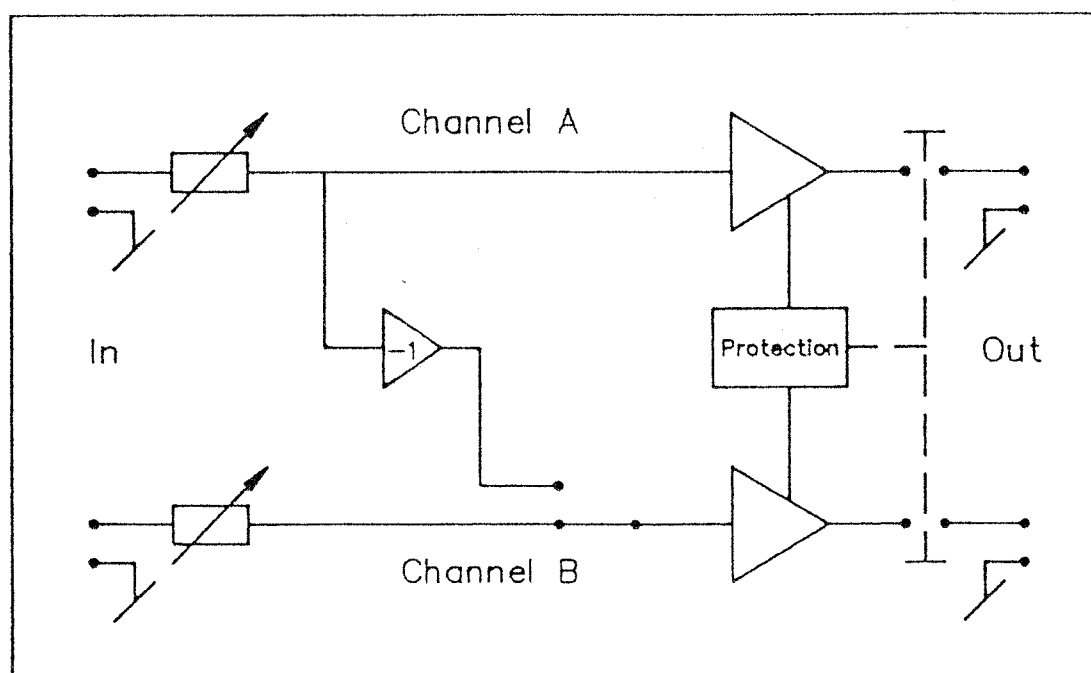
Channel B input is fed to op-amp IC4 through R9 and R10. Diodes D6-D9 limit its amplitude of input signal to +/- 12 V peak. Output of IC4 is fed to channel B output of input board through attenuating potentiometer R13 and switch SW1.

Op-amp IC5 inverts signal coming from channel A output, and when SW1 is in "bridge position" the inverted channel A output is fed to channel B output.

In the bridged mode, SW1 also lets current through R15 to LED indicators D8 and D9 located on the display board.

The input module also contains a traditional +/- 12V supply regulated by IC1 and IC2.

Op-amps IC3 and IC4 are set to a gain of 2 which gives PPA600 an overall sensitivity of 750 mV.



2.2. Amplifier Board

A high-pass (C_1, R_1) and a low-pass-filter ($R_{2A}+R_2, C_2$) are located at the input of the amplifier to prevent unwanted signals from reaching the amplifier.

The double differential input stage consists of transistors T1-T4. Transistors T5 and T6 form two current sources for the input stage. The currents are set by R_{11}, D_1 and R_{12}, D_2 to 0.6 mA.

Transistors T7 and T8 are the second voltage gain stage. Current amplification is provided by emitter followers T10 and T11 which can deliver the necessary current drive for the output stage. The input impedance of the emitter followers is made linear by R_{19} .

The output stage consists of 4 paralleled N-channel (T23-T26) and 4 paralleled P-channel MOS-FET power transistors (T27-T30). Due to different gate capacities of N-channel and P-channel devices, different gate resistors are chosen to give equal time delays in both sides.

The biasing current is set by circuitry network that enhances work into non-linear loads at high frequencies.

Overall negative feedback is provided by returning the output signal to the inverting input of the differential input stage through the feedback network $R_{31}, C_{27}, R_{32}, C_3+C_{3A}$.

The AC gain is set by R_{31} and R_{32} to 30 dB. C_3 and C_{3A} ensure that the DC gain is unity.

A lead-lag compensation consisting of $R_{35}, C_{25}, R_{36}, C_{26}$ combined with a high-frequency roll-off network (R_{31}, C_{27}) provides a minimum phase margin of 45° in any load.

2.3. Protection and Display Circuit Description

The amplifier board contains a complex protection and display circuit. This circuit comprises a delayed and soft loudspeaker turn-on, a loudspeaker DC-protection, a one-shot current limiter, an over-temperature amplifier protection with hysteresis, a trueclipping indicator, and a signal indicator.

2.3.1. Delayed Start

When the amplifier is turned on, C42 will be charged through R46 and at 0,6 V T40 and T41 will conduct and activate relay RL01. T42 is then cut off, and that will in turn cut off T43.

At this point the "overload out" signal will no longer drive the overload indicator D3 (channel A) or D4 (channel B) located in the display board.

Simultaneously, T48 will turn off and C47 will discharge through R81. Following the voltage across C47, fet-transistors T12 and T13 gradually open and thereby defeat the input signal.

2.3.2. DC Protection

To avoid unwanted DC signals at the loudspeaker output, a DC protection circuit surveys the output through a second order lowpass filter R41, R42, C40 and C41 with cut-off-frequency at 0.4 and 2.6 Hz. This allows maximum output down to 10 Hz.

The signal is fed to a positive and a negative sensing open collector comparator. When a signal exceeds either +1.5 V or -1.5 V, the comparators trig and discharge C42 which activates the output relay as described under point 2.3.1. delayed start.

2.3.3. Signal Indicator

A signal indicator is provided to help troubleshooting in sound system connections.

Output signals from the amplifier are led to comparator IC40 through D54 and R43. R43,Z3 limits input voltage on IC40. When the signal exceeds 1.5 V, the comparator will turn on the signal indicator LED D5 (channel A) or D10 (channel B) located on the display board. The indication will be illuminated for a fraction of a second set by R84 and C44.

2.3.-1.

2.3.4. Current Limiter

To avoid damaging the output transistors, a current limiting circuit has been incorporated in the design. This circuit does not gradually decrease the sound quality, but will at a certain point (40 A) shut the amplifier input down for a couple of seconds.

In the negative amplifier supply rail, a 5 mohm sensing resistor R62 is inserted. A separate circuit located around IC41, T46, T47, T49 operates at 6.8 V DC above the negative supply rail. This voltage is supplied through R59 to Z5.

The voltage across R62 is fed to the negative input of an open collector comparator through R61. The positive input of the comparator is set to 200 mV by R60, R63.

When the current for the output transistors exceeds 40 A, the voltage at negative input of the comparator will exceed 200 mV ($40 \text{ A} \times 0.005 \text{ ohm}$). This will cause the comparator output to close and thereby, through C45, turn off T49. This will furthermore increase voltage on negative input by pulling up R61 through R85+R87, insuring proper turning on the overload indicator LED as described under point 2.3.1. delayed start.

2.3.5. True Clipping Indicator

The second half of IC41, which operates at 6.8 V above negative supply rail, compares an attenuated (R68, R66) difference between output and supply rail to reference voltage set by (R65, R67).

When the output signal is less than 12 V from the supply voltage, the comparator will turn on transistor T1 (channel A) or T2 (channel B) located on the display board through R69, the voltage converter T47 and R57. This will turn on the overload indicator LED D3 (channel A) or D4 (channel B).

The indicator will be illuminated for at least a fraction of a second set by R69 and C46.

2.3.6. Fan Regulator

The airflow through the heat sink depends on the fan speed which is controlled by the temperature of the heat sink.

A constant voltage set by R76, R79, is applied to a NTC-resistor R80 through T44. R80 is mounted onto the heat sink and will increase the current through R75 with rising temperature. Voltage across R75 is buffered by an emitter follower Darlington transistor T45. Channel A and B fan outputs are connected in parallel to the fan, and the hottest channel will determine rotation speed.

2.3.-2.

2.3.7. Temperature Protection

Each amplifier module is protected against over-temperature by a comparator circuit working with the fan regulation circuit (see description on this circuit under point 2.3.6.).

When the temperature of the module reaches 70°C , the voltage across R78 will exceed the reference (+0.8 V with respect to -Vcc) set by R74 and R77, causing the comparator IC40 to activate the input defeat circuitry (see description under point 2.3.1. on delayed start) through R72.

When once triggered, the comparator will lower the reference voltage (to 0.6 V with respect to -Vcc) by additionally pulling down R74 through R73 and D46, preventing the amplifier from turning on until the temperature has fallen to 60°C . At this point normal operation will be resumed.

2.4. Soft Start Board

In order to limit the inrush current to the mains transformer, TR1, a soft-start circuit is provided. This circuit, furthermore, contains the main fuse, S1, as well as fuses S2 and S3 for the supply voltage for the auxiliary circuits.

In the primary voltage circuit a resistor, R5, is connected in series with the transformer, for a short period of time set by R2 and C2 after a power on.

C2 will be charged through R2 and at 12.6 V DC T1 and T2 will conduct, so that the relay RL1 is activated and the series resistor, R5, is shorted.

2.5. Power Supply Module

The power supply is an integrated unit consisting of a 1 KVA toroidal transformer, 2 bridge rectifiers, 4 large capacitors, the soft start module (see previous section), and a mains switch. All components are mounted on a 2 mm heavy duty steel console.

The toroidal transformer has separate outputs (2 x 2 x 54 V) for each amplifier channel and a dual 13 V output for the auxiliary circuits. Bridge rectifiers D1 and D2 supply energy to C1, C2 and C3, C4 respectively. Idling voltage should be approximately +/- 75 V DC.

The power supply is available in more versions to adapt the different mains voltages:

2.5.1. Power Supply 110-220 Volt

In this configuration the primary windings are made of two coils which can be used either in parallel or in serial.

In parallel it is for a mains voltage of 110 Volt,
In serial it is for a mains voltage of 220 Volt.

The primary windings are to be connected as follows:

110 Volt: Mains terminated to orange and brown
Mains terminated to black and violet

220 Volt: Mains terminated to orange
Black terminated to brown
Mains terminated to violet.

2.5.2. Power Supply 100-120-220-240 Volt

In this configuration the primary windings are made of four coils. For the correct secondary voltage the primary winding voltages have to be 100, 100, 20 and 20 Volt.

The colors of the wires are as listed:

Orange-black: 100 V
Brown-violet: 100 V
White-blue: 20 V
Pink-green: 20 V

The primary coils are to be connected as follows:

- 100 V: Mains terminated to orange and brown
 Mains terminated to black and violet
- 120 V: Mains terminated to orange and brown
 Black terminated to white
 Violet terminated to pink
 Mains terminated to green and blue
- 220 V: Mains terminated to orange
 Black terminated to brown
 Violet terminated to white
 Mains terminated to blue
- 240 V: Mains terminated to orange
 Black terminated to brown
 Violet terminated to white
 Blue terminated to pink
 Mains terminated to green

2.5.-2.

3. Troubleshooting Hints

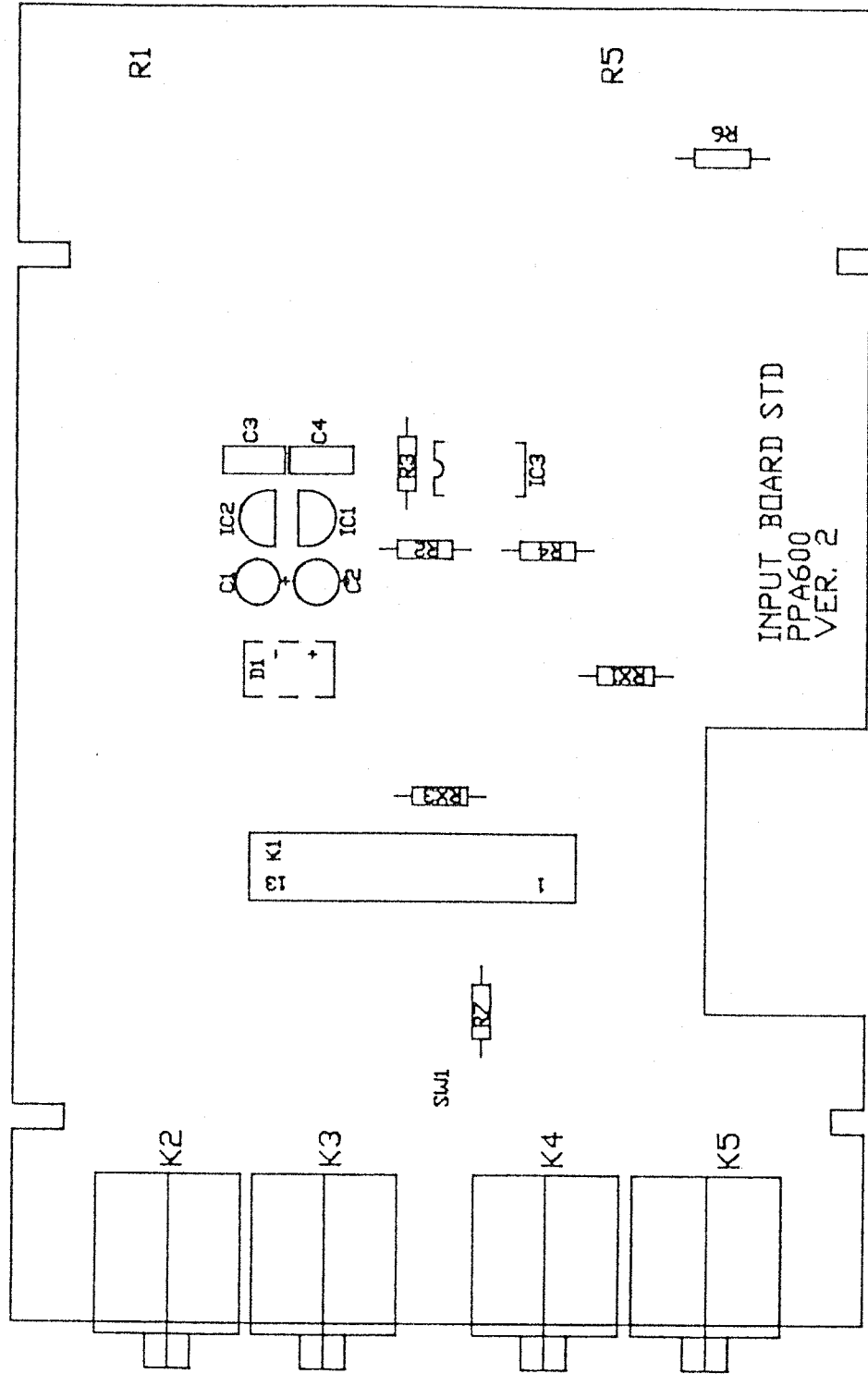
Servicing on amplifier modules is eased by the use of a ± 30 V (± 15 V) laboratory power supply with a 100 mA current limiter. When the amplifier modules are removed for laboratory bench service, the input ground pin (pin number 2, connector K1) must be connected to the power supply ground to ensure DC balance.

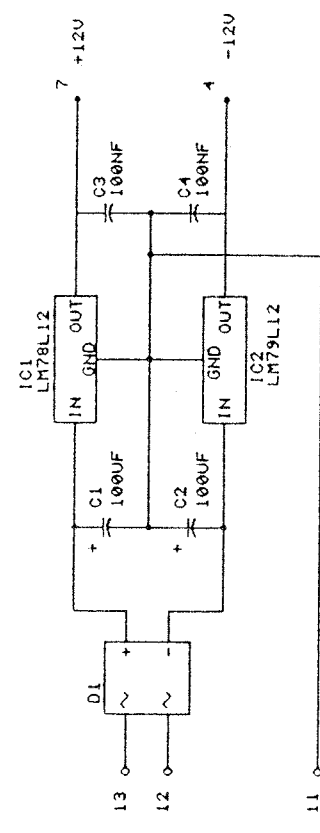
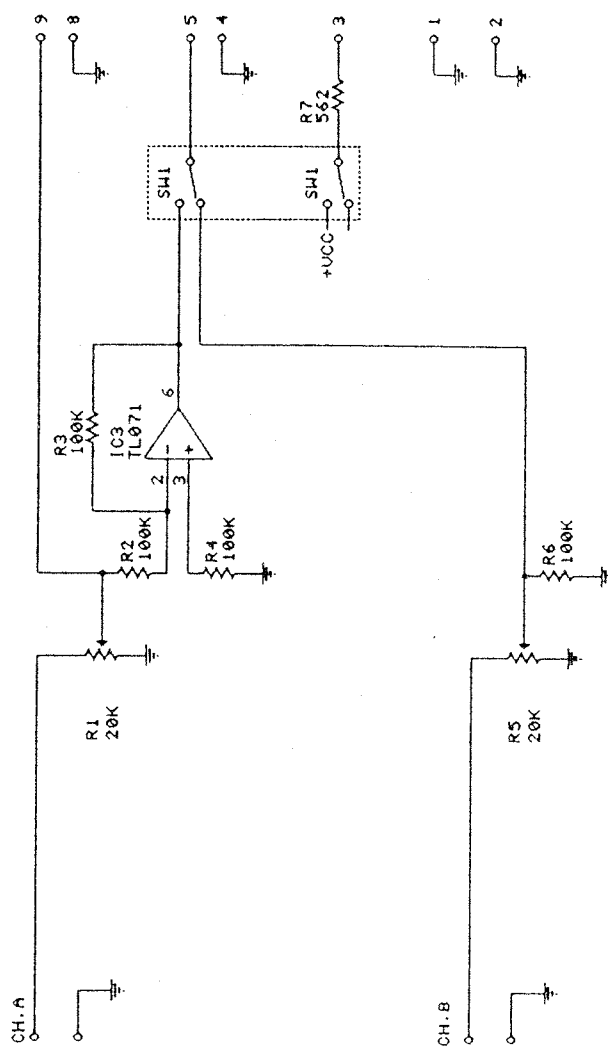
Since the output transistors are paralleled at source and drain, it can be difficult to recognize defective devices from intact ones without removing these.

However, the resistance from gate to source/drain in defective transistors will nearly always drop to around 0 ohms.

By means of an ohm meter only, it is normally possible to locate defective devices.

Series resistor R5 in the soft start board will sometimes burn out if amplifier modules are short-circuited. Repair the amplifier module before replacing R5.





NO.	AN-NO.	REMARKS	DATE	BY
		CONSTR.	27.06.88	M0
		DWG.	27.06.88	M0
		ISSUED	27.06.88	M0
		APPROVED	27.06.88	M0
		TOOL		
		REPLACE		

SCALE		TITLE	
1	1	PPA600 INPUT BOARD STD. V.A.	
NO.		1711614270	
SHEET 1 CONT. 1		ORTOFON INSTRUMENTS	
MATR.		FINISH	

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PPA 600 C O N N E C T I O N S

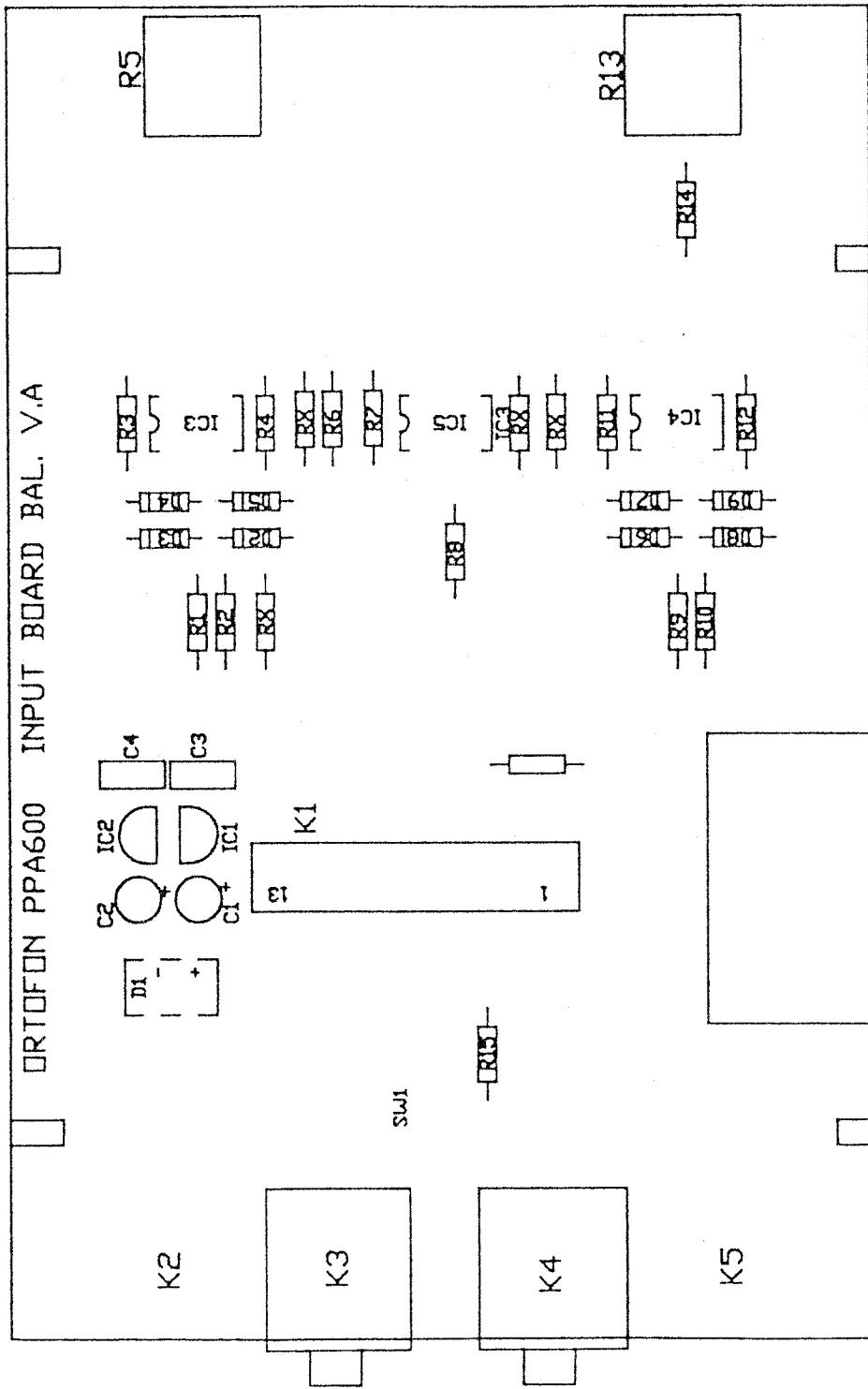
Title: Input Board Standard PPA 600 No.: I711614770
 Connector K1
 Date: 21.11.1988
 1.Edition: 21.11.1988
 Compiled by: FN/id
 Rev.:

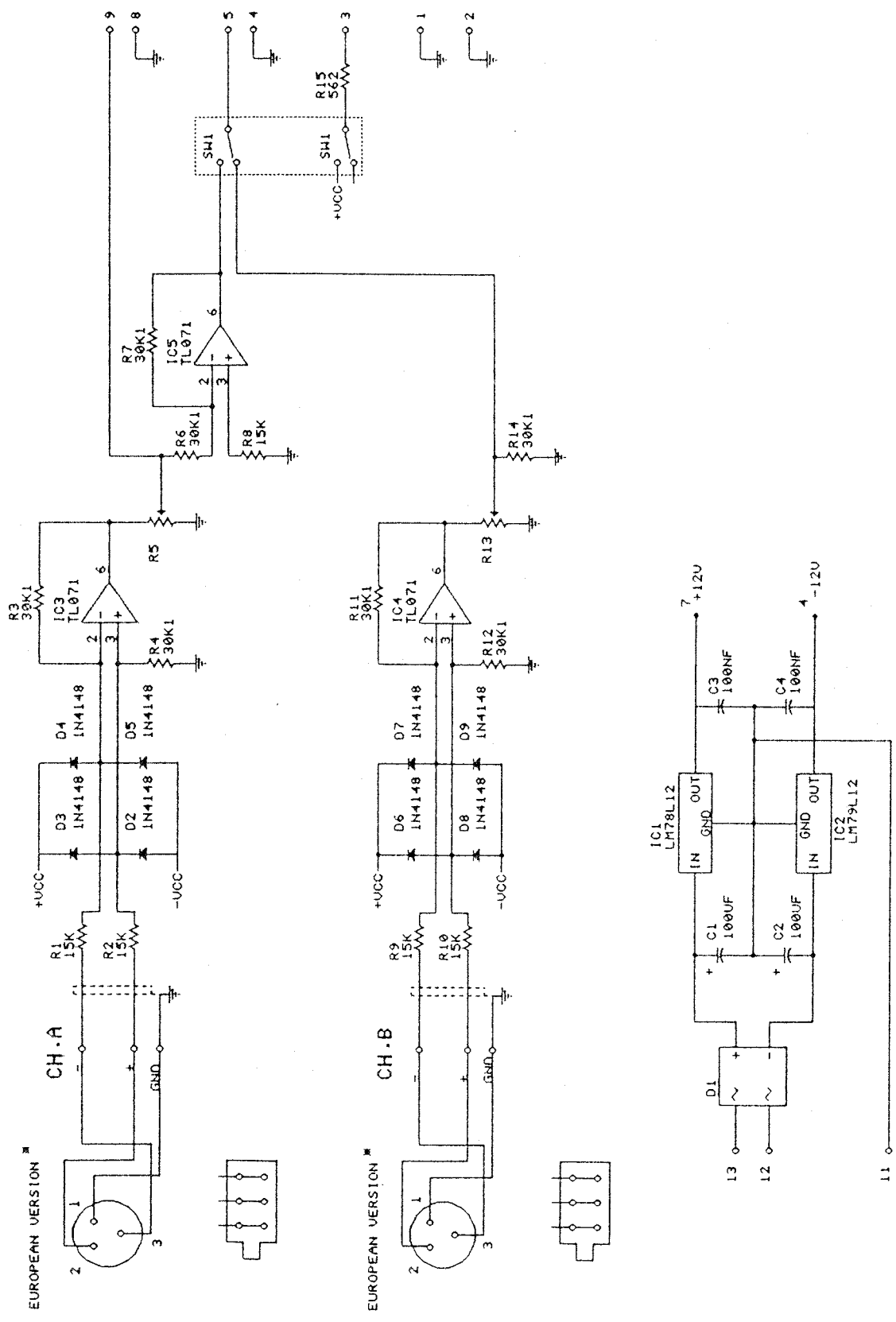
PIN	Signal Type	Connected to	
		PIN	Board
1	0 Volt	Ground	Elyt. ground plate P.S.
2	0 Volt	Ground	Elyt. ground plate P.S.
3	Mono indicator	K1-11	Display
4	Ground CH. B out	K1- 2	Amplifier CH. B
5	Signal CH. B out	K1- 1	Amplifier CH. B
6	n.c.		
7	n.c.		
8	Ground CH. A out	K1- 2	Amplifier CH. A
9	Signal CH. A out	K1- 1	Amplifier CH. A
10	n.c.		
11	0 Volt	Ground	Elyt. ground plate P.S.
12	26 V AC in	K1- 3	Soft start
13	26 V AC in	K1- 5	Soft start

P A R T S L I S T

Title : Input Board Standard PPA 600 No.: I711614170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

Serial No.	Pcs.	Item No.	Title
P01	1	I711614200	PCB
P02	1	I711614570	Diagram
P03	1	I711614572	Component Overlay
C01	1	I247100500	Cap 100u 35 V Elyt.
C02	1	I247100500	Cap 100u 35 V Elyt.
C03	1	I215103410	Cap 100n 100 V MKT.
C04	1	I215103410	Cap 100n 100 V MKT.
D01	1	I431450100	Bridge Rectifier CSBI 8506
IC01	1	I370781200	Voltage Regulator 78L12
IC02	1	I371791200	Voltage Regulator 79L12
IC03	1	I360007100	Op-Amp TL 071CP
K01	1	I630013400	Connector 13 pol Siemens C42334-A51-A17
R01	1	I160422011	Pot.M. 22k LIN
R02	1	I103510000	Res 100k 1% 0.25w metal
R03	1	I103510000	Res 100k 1% 0.25w metal
R04	1	I103510000	Res 100k 1% 0.25w metal
R05	1	I160422011	Pot.M. 22k LIN 20% LCR 20
R06	1	I103510000	Res 100k 1% 0.25w metal
R07	1	I103256200	Res 562E 1% 0.25w metal
RX01	1	I101000000	Res 0R
RX02	1	I101000000	Res 0R
SW01	1	I626022001	Switch, Shadow F2UEE
MEK01	1	I626022000	Button for switch
K01	1	I639000011	Jack Socket 6mm, stereo
K02	1	I639000011	Jack Socket 6mm, stereo
K03	1	I639000011	Jack Socket 6mm, stereo
K04	1	I639000011	Jack Socket 6mm, stereo





NO.	AM-NO.	REMARKS	SCALE	1	1
		CONSTR. 01.03.88 M0	TITLE		
		DWG.	PPA600		
		ISSUED 01.03.88 M0	INPUT BOARD BAL.		
		APPROVED 01.03.88 M0	V.A.		
		TOOL	MATR.		
		REPLACE	FINISH		

* US-VERSION HAS REVERSED PHASING
PIN 1: GROUND, PIN 2: NON-PHASE, PIN 3: PHASE

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D C B A

D C B A

PPA 600 C O N N E C T I O N S

Title: Input Board Balanced PPA 600 No.: I711613770
 Connector K1
 Date: 21.11.1988
 1.Edition: 21.11.1988
 Compiled by: FN/id
 Rev.:

PIN	Signal Type	Connected to	
		PIN	Board
1	0 Volt	Ground	Elyt. ground plate P.S.
2	0 Volt	Ground	Elyt. ground plate P.S.
3	Mono indicator	K1-11	Display
4	Ground CH. B out	K1- 2	Amplifier CH. B
5	Signal CH. B out	K1- 1	Amplifier CH. B
6	n.c.		
7	n.c.		
8	Ground CH. A out	K1- 2	Amplifier CH. A
9	Signal CH. A out	K1- 1	Amplifier CH. A
10	n.c.		
11	0 Volt	Ground	Elyt. ground plate P.S.
12	26 V AC in	K1- 3	Soft start
13	26 V AC in	K1- 5	Soft start

P A R T S L I S T

Title : Input Board Balanced PPA 600 Nr.: I711613170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

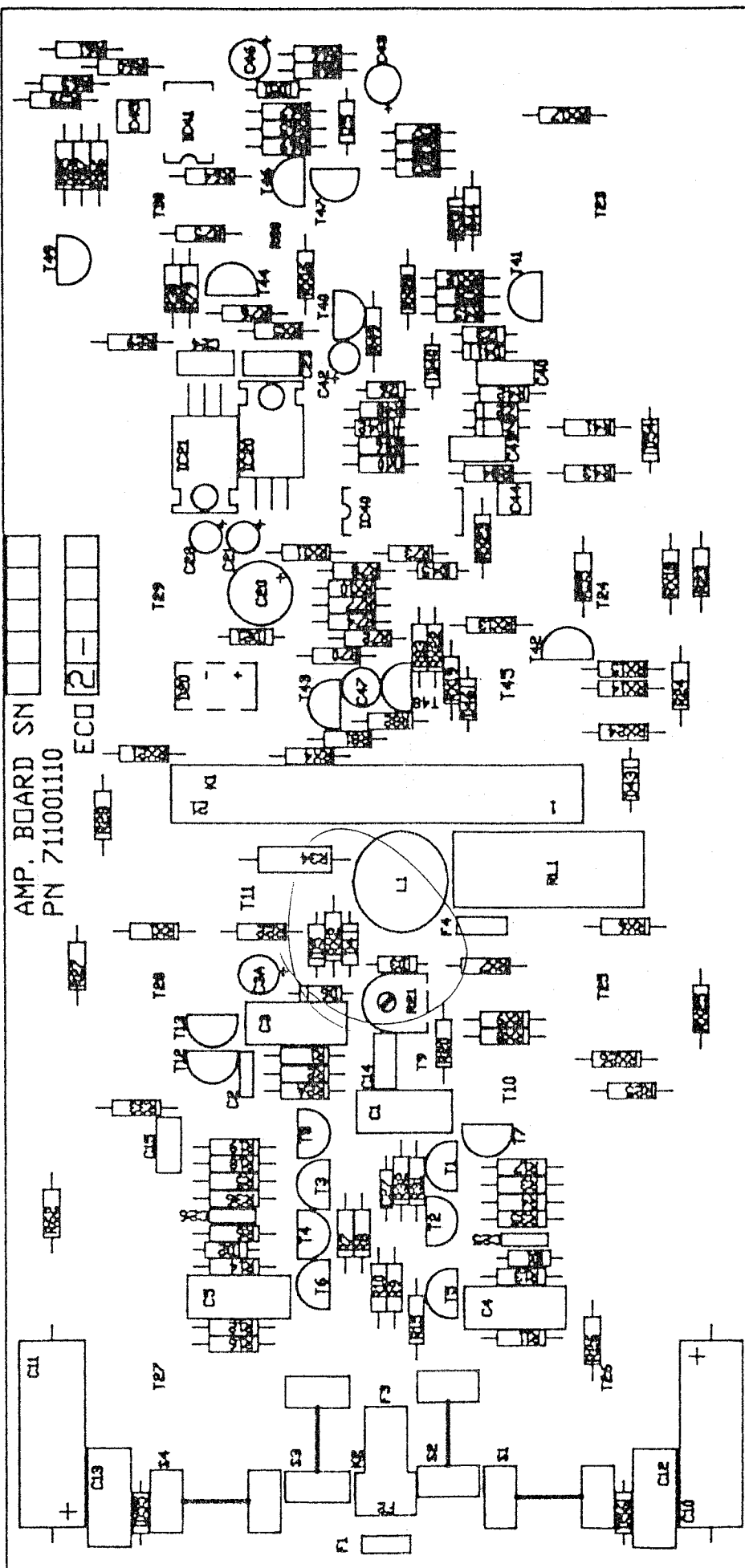
Serial No.	Pcs.	Item No.	Title
P01	1	I711613200	PCB
P02	1	I711613270	Diagram
P03	1	I711613572	Component Overlay
A01	1	I633300001	PPCB-H Adapter
A02	1	I633300001	PPCB-H Adapter
C01	1	I247100500	Cap 100 u 35V Elyt.
C02	1	I247100500	Cap 100 u 35V Elyt.
C03	1	I215103410	Cap 100 n 100V mkt
C04	1	I215103410	Cap 100 n 100V mkt
D01	1	I431450100	Bridge Rectifier CSBI 8506
D02	1	I470414800	Diode 1 N 4148
D03	1	I470414800	Diode 1 N 4148
D04	1	I470414800	Diode 1 N 4148
D05	1	I470414800	Diode 1 N 4148
D06	1	I470414800	Diode 1 N 4148
D07	1	I470414800	Diode 1 N 4148
D08	1	I470414800	Diode 1 N 4148
D09	1	I470414800	Diode 1 N 4148
IC01	1	I370781200	Voltage Regulator 78L12
IC02	1	I371791200	Voltage Regulator 79L12
IC03	1	I360007100	Op-amp TL 071CP
IC04	1	I360007100	Op-amp TL 071CP
IC05	1	I360007100	Op-amp TL 071CP
K01	1	I630013400	Connector 13 Pins Siemens C42334-A51-A17
K02	1	I639000011	Jack-Socket
K03	1	I639000011	Jack-Socket
K04	1	I633300000	NC3-FPP XLR Socket
K05	1	I633300000	NC3-FPP XLR Socket
R01	1	I103415000	Res 15k 1% 0.25w metal
R02	1	I103415000	Res 15k 1% 0.25w metal
R03	1	I103430100	Res 30k1 1% 0.25w metal
R04	1	I103430100	Res 30k1 1% 0.25w metal
R05	1	I160422011	Pot.M. 22k LIN
R06	1	I103430100	Res 30k1 1% 0.25w metal

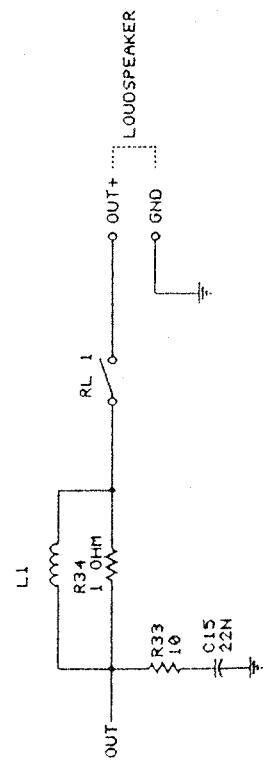
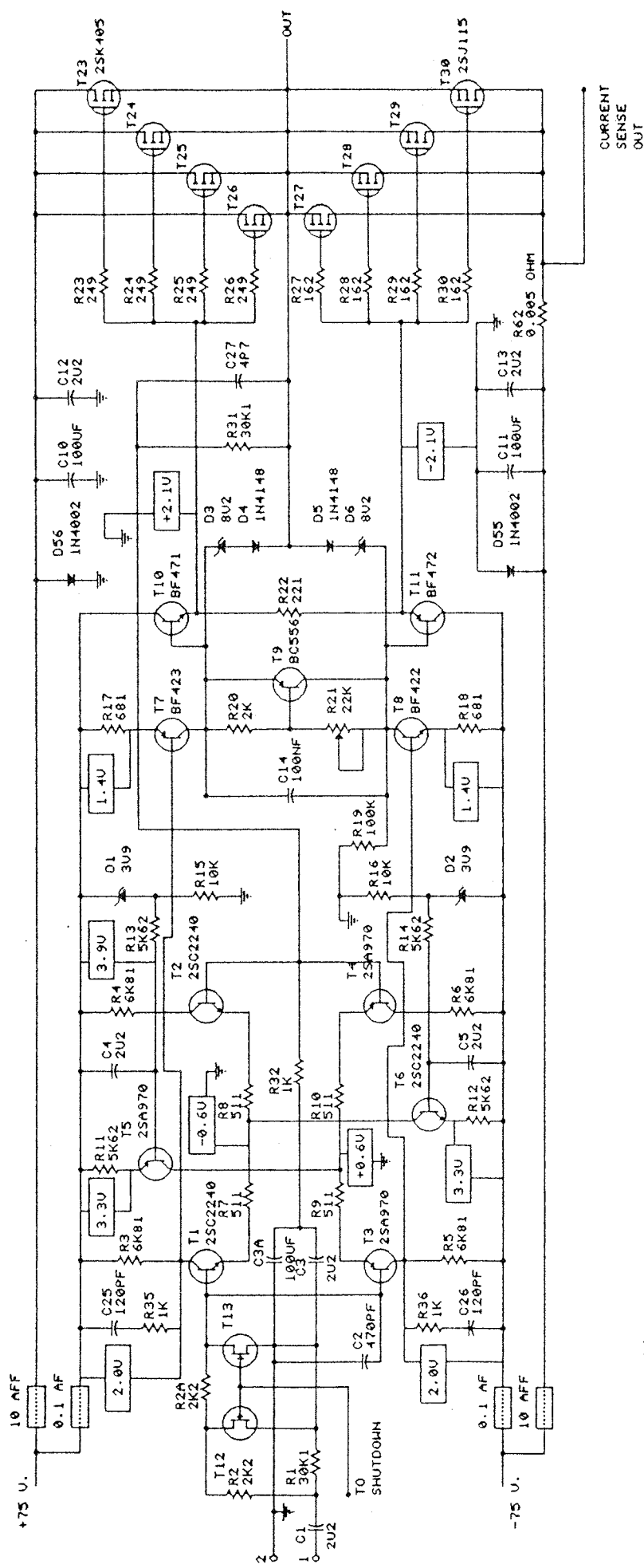
P A R T S L I S T

Title : Input Board Balanced PPA 600 Nr.: I711613170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

Serial No.	Pcs.	Item No.	Title
R07	1	I103430100	REs 30k1 1% 0.25w metal
R08	1	I103415000	Res 15k 1% 0.25w metal
R09	1	I103415000	Res 15k 1% 0.25w metal
R10	1	I103415000	Res 15k 1% 0.25w metal
R11	1	I103430100	Res 30k1 1% 0.25w metal
R12	1	I103430100	Res 30k1 1% 0.25w metal
R13	1	I160422011	Pot.M. 22k
R14	1	I103430100	Res 30k1 1% 0.25w metal
R15	1	I103256200	Res 562R 1% 0.25w metal
RX01	1	I101000000	Res OR
RX02	1	I101000000	Res OR
RX03	1	I101000000	Res OR
RX04	1	I101000000	Res OR
RX05	1	I101000000	Res OR
SW01	1	I639000011	Switch, Shadow F2UEE
MEK01	1	I626022000	Button for Switch

* source manual





NO.	AN-NO.	REMARKS	SCALE	1	1
		CONSTR. 01.03.88	M0.	TITLE	
		DHG.		AMP. BOARD	
		ISSUED 01.03.88	M0.	NO. I711615270	
		APPROVED 01.03.88	M0.	SHEET 1 CONT. 2	
		TOOL		MTR.	
		REPLACE		FINISH	
				ORTOFON INSTRUMENTS	

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PPA 600 C O N N E C T I O N S

Title: Amplifier
Connector K1
Date: 21.11.1988
1.Edition: 21.11.1988
Compiled by: FN/id
Rev.:

No.: I711615770

PIN	Signal Type	Connected to	
		PIN	Board
1	Signal input CH. A	K1- 5	Input board
	Signal input CH. B	K1- 9	Input board
2	Signal ground CH. A	K1- 4	Input board
	Signal ground CH. B	K1- 8	Input board
3	n.c.		
4	n.c.		
5	n.c.		
6	n.c.		
7	n.c.		
8	Fan		To the fan
9	Clip CH. A	K1-12	Display
	Clip CH. B	K1- 4	Display
10	n.c.		
11	n.c.		
12	n.c.		
13	Overload CH. A	K1-10	Display
	Overload CH. B	K1- 1	Display
14	Signal CH. A	K1- 7	Display
	Signal CH. B	K1- 2	Display
15	+12 Volt		To the fan
16	+17 Volt CH. A	K1-13	Display
	+17 Volt CH. B	K1- 6	Display
17	0 Volt	Ground	Elyt. ground plate P.S.
18	n.c.		
19	26 V AC	K1- 3	Soft start
20	26 V AC	K1- 5	Soft start.

P A R T S L I S T

Title : Amplifier Board PPA 600 No.: I711615170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

Serial No.	Pcs.	Item No.	Title
P01	1	I711615200	PBC
P02	1	I711615270	Diagram
P03	1	I711615572	Component Overlay
C01	1	I216223300	Cap 2u2 100V mkt
C02	1	I202472300	Cap 470pF cer
C03	1	I216223300	Cap 2u2 100V mkt
C03A	1	I247100700	Cap 100u 25V electrlytic
C04	1	I216223300	Cap 2u2 100V mkt
C05	1	I216223300	Cap 2u2 100V mkt
C10	1	I247100900	Cap 100u 100V electrolytic
C11	1	I247100900	Cap 100u 100V electrolytic
C12	1	I216223300	Cap 2u2 100V mkt
C13	1	I216223300	Cap 2u2 100V mkt
C14	1	I215473302	Cap 0u47 63V mkt
C15	1	I214223400	Cap 22n 100V mkt
C20	1	I247100800	Cap 100u 40V electrolytic
C21	1	I247220500	Cap 220u 25V electrolytic
C22	1	I247100700	Cap 100u 25V electrolytic
C23	1	I215473302	Cap 0u47 63V mkt
C24	1	I215473302	Cap 0u47 63V mkt
C25	1	I202125300	Cap 120p cer
C26	1	I202125300	Cap 120p cer
C27	1	I200475300	Cap 4p7 cer
C40	1	I215473302	Cap 0u47 63V mkt
C41	1	I215473302	Cap 0u47 63V mkt
C42	1	I246057500	Cap 4u7 100V electrolytic
C43	1	I247100700	Cap 100u 25V electrolytic
C44	1	I215473302	Cap 0u47 63V mkt
C45	1	I215473302	Cap 0u47 63V mkt
C46	1	I215470300	Cap 4u7 100V electrolytic
C47	1	I215470300	Cap 4u7 100V
D01	1	I440003900	Zener Diode ZDP 3V9 0.4w
D02	1	I440003900	Zener Diode ZDP 3V9 0.4w
D03	1	I440008200	Zener Diode BZX 79C8V2
D04	1	I470414800	Diode 1N 4148
D05	1	I470414800	Diode 1N 4148
D06	1	I440008200	Zener Diode BZX 79C8V2
D20	1	I431450100	Bridge Rectifier CSBI 8506
D21	1	I470400200	Diode 1N 4002

P A R T S L I S T

Title : Amplifier Board PPA 600
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

No.: I711615170

Serial No.	Pcs.	Item No.	Title
D40	1	I440001500	Zener Diode BZV46C1V5
D41	1	I440001500	Zener Diode BZV46C1V5
D42	1	I470414800	Diode 1N 4148
D43	1	I470414800	Diode 1N 4148
D45	1	I470414800	Diode 1N 4148
D46	1	I101000000	Res OR
D51	1	I470414800	Diode 1N 4148
D53	1	I470414800	Diode 1N 4148
D54	1	I470414800	Diode 1N 4148
D55	1	I470400200	Diode 1N 4002
D56	1	I470400200	Diode 1N 4002
F01	1	I635191000	Connectorpin for PCB mount.
F02	1	I635191000	Connectorpin for PCB mount.
F03	1	I635191000	Connectorpin for PCB mount.
F04	1	I635191000	Connectorpin for PCB mount.
IC20	1	I370781200	Voltage Regulator 7812C
IC21	1	I371791200	Voltage Regulator 7912C
IC40	1	I361033900	Comparator LM 339N
IC41	1	I370039300	Comparator LM 393
K01	1	I630121000	Connector C42334A53A18
L01	1	I590001000	Coil
R01	1	I103430100	Res 30k1 1% 0.25w metal
R02	1	I103322000	Res 2k2 1% 0.25w metal
R2A	1	I103322000	Res 2k2 1% 0.25W metal
R03	1	I103368100	Res 6k81 1% 0.25w metal
R04	1	I103368100	Res 6k81 1% 0.25w metal
R05	1	I103368100	Res 6k81 1% 0.25w metal
R06	1	I103368100	Res 6k81 1% 0.25w metal
R07	1	I103251100	Res 511R 1% 0.25w metal
R08	1	I103251100	Res 511R 1% 0.25w metal
R09	1	I103251100	Res 511R 1% 0.25w metal
R10	1	I103251100	Res 511R 1% 0.25w metal
R11	1	I103356200	Res 5k62 1% 0.25w metal
R12	1	I103356200	Res 5k62 1% 0.25w metal
R13	1	I103356200	Res 5k62 1% 0.25w metal
R14	1	I103356200	Res 5k62 1% 0.25w metal

Doc. No : I7116151/PPA600

Print Date : 21.03.89/11:16:19

P A R T S L I S T

Title : Amplifier Board PPA 600 No.: I711615170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

Serial No.	Pcs.	Item No.	Title
R15	1	I103410000	Res 10k 1% 0.25w metal
R16	1	I103410000	Res 10K 1% 0.25w metal
R17	1	I103268100	Res 681R 1% 0.25w metal
R18	1	I103268100	Res 681R 1% 0.25w metal
R19	1	I103510000	Res 100k 1% 0.25w metal
R20	1	I103320000	Res 2k 1% 0.25w metal
R21	1	I140422000	Potentiometer 22k Cer VA05
R22	1	I103222100	Res 221R 1% 0.25w metal
R23	1	I103224900	Res 249R 1% 0.25w metal
R24	1	I103224900	Res 249R 1% 0.25w metal
R25	1	I103224900	Res 249R 1% 0.25w metal
R26	1	I103224900	Res 249R 1% 0.25w metal
R27	1	I103216200	Res 162R 1% 0.25w metal
R28	1	I103216200	Res 162R 1% 0.25w metal
R29	1	I103216200	Res 162R 1% 0.25w metal
R30	1	I103216200	Res 162R 1% 0.25w metal
R31	1	I103430100	Res 30k1 1% 0.25w metal
R32	1	I103310000	Res 1k 1% 0.25w metal
R33	1	I120110000	Res 10R 5% 1.60w metal
R34	1	I120010000	Res 1R 10% 1.60w metal
R35	1	I103310000	Res 1k 1% 0.25w metal
R36	1	I103310000	Res 1k 1% 0.25w metal
R40	1	I103410000	Res 10k 1% 0.25w metal
R41	1	I103524100	Res 241k 1% 0.25w metal
R42	1	I103543200	Res 432k 1% 0.25w metal
R43	1	I103510000	Res 100k 1% 0.25w metal
R44	1	I103410000	Res 10k 1% 0.25w metal
R45	1	I103410000	Res 10k 1% 0.25w metal
R46	1	I103547500	Res 475k 1% 0.25w metal
R48	1	I103510000	Res 100k 1% 0.25w metal
R49	1	I103447500	Res 47k5 1% 0.25w metal
R50	1	I103420000	Res 20k 1% 0.25w metal
R53	1	I103510000	Res 100k 1% 0.25w metal
R55	1	I103422000	Res 22k 1% 0.25w metal
R57	1	I103510000	Res 100k 1% 0.25w metal
R58	1	I103510000	Res 100k 1% 0.25w metal
R59	1	I103410000	Res 10k 1% 0.25w metal
R60	1	I103510000	Res 100k 1% 0.25w metal
R61	1	I103420000	Res 20k 1% 0.25w metal
R62	1	I103000500	Res 5mR made by Scan Micro
R63	1	I103330100	Res 3k01 1% 0.25w metal

P A R T S L I S T

Title : Amplifier Board PPA 600
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

No.: I711615170

Serial No.	Pcs.	Item No.	Title
R64	1	I103322000	Res 2k2 1% 0.25w metal
R65	1	I103410000	Res 10k 1% 0.25w metal
R66	1	I103520000	Res 200k 1% 0.25w metal
R67	1	I103310000	Res 1k 1% 0.25 metal
R68	1	I103410000	Res 10k 1% 0.25w metal
R69	1	I103410000	Res 10k 1% 0.25w metal
R70	1	I103347500	Res 4k75 1% 0.25w metal
R72	1	I103422000	Res 22k 1% 0.25w metal
R73	1	I103413700	Res 13k7 1% 0.25w metal
R74	1	I103534800	Res 348k 1% 0.25w metal
R75	1	I103356200	Res 5k62 1% 0.25w metal
R76	1	I103439200	Res 39k2 1% 0.25w metal
R77	1	I103310000	Res 1k00 1% 0.25w metal
R78	1	I103124900	Res 24R9 1% 0.25w metal
R79	1	I103410000	Res 10k 1% 0.25w metal
R80	1	I191347000	Res 4k7 NTC Philips
R81	1	I103610000	Res 1M 1% 0.25w metal
R82	1	I103422000	Res 22k 1% 0.25w metal
R83	1	I103347500	Res 4k75 1% 0.25w metal
R84	1	I103610000	Res 1M 1% 0.25w metal
R85	1	I103539000	Res 390k 1% 0.25w metal
R86	1	I103522100	Res 221k 1% 0.25w metal
R87	1	I103410000	Res 10k 1% 0.25w metal
RX01	1	I101000000	Res OR
RX02	1	I101000000	Res OR
RX04	1	I101000000	Res OR
RX05	1	I101000000	Res OR
RX06	1	I101000000	Res OR
RX07	1	I101000000	Res OR
RX08	1	I101000000	Res OR
RX09	1	I101000000	Res OR
RX10	1	I101000000	Res OR
RX11	1	I101000000	Res OR
RX12	1	I101000000	Res OR
RX13	1	I101000000	Res OR
RX14	1	I101000000	Res OR
RX15	1	I101000000	Res OR
RX16	1	I101000000	Res OR
RX17	1	I101000000	Res OR
RX18	1	I101000000	Res OR

P A R T S L I S T

Title : Amplifier Board PPA 600 No.: I711615170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

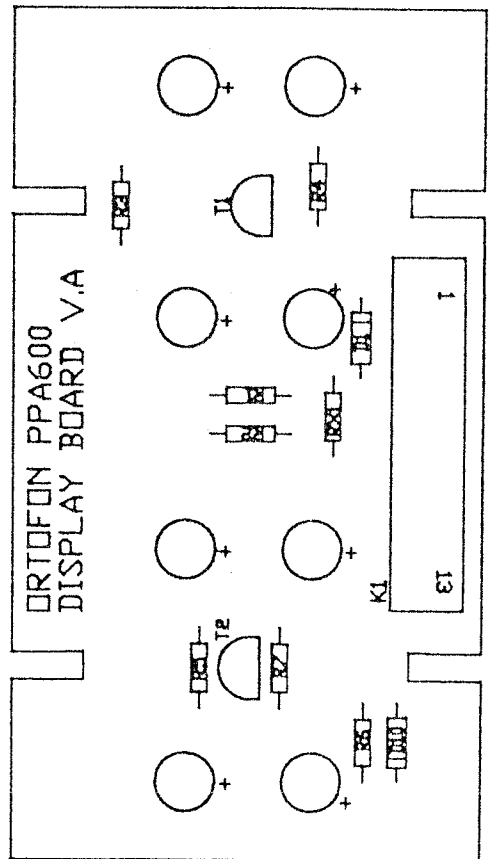
Serial No.	Pcs.	Item No.	Title
RX19	1	I101000000	Res OR
RX20	1	I101000000	Res OR
RX21	1	I101000000	Res OR
RX22	1	I101000000	Res OR
RX23	1	I101000000	Res OR
RX24	1	I101000000	Res OR
RX25	1	I101000000	Res OR
RX26	1	I101000000	Res OR
RL01	1	I601300000	Relay MZP A002 47 05
S01	1	I724100000	Fuse 10A super qck. 5x20mm
S02	1	I723001000	Fuse 100mA qck.blow 5x20mm
S03	1	I723001000	Fuse 100mA qck.blow 5x20mm
S04	1	I724100000	Fuse 10A super qck. 5x20mm
SH01	1	I640010300	Fuse Socket, module 5mm
SH02	1	I640010300	Fuse Socket, module 5mm
SH03	1	I640010300	Fuse Socket, module 5mm
SH04	1	I640010300	Fuse Socket, module 5mm
SH05	1	I640010300	Fuse Socket, module 5mm
SH06	1	I640010300	Fuse Socket, module 5mm
SH07	1	I640010300	Fuse Socket, module 5mm
SH08	1	I640010300	Fuse Socket, module 5mm
T01	1	I400512240	Transistor 2 SC 2240
T02	1	I400512240	Transistor 2 SC 2240
T03	1	I400500970	Transistor 2 SA 970
T04	1	I400500970	Transistor 2 SA 970
T05	1	I400500970	Transistor 2 SA 970
T06	1	I400512240	Transistor 2 SC 2240
T07	1	I401300423	Transistor BF 423
T08	1	I401300422	Transistor BF 422
T09	1	I401100556	Transistor BC 556B
T10	1	I401300471	Transistor BF 471
T11	1	I401300472	Transistor BF 472
T12	1	I400174000	Transistor Siliconix J174
T13	1	I400174000	Transistor Siliconix J174
T23	1	I400530405	Transistor 2 SK 405
T24	1	I400530405	Transistor 2 SK 405
T25	1	I400530405	Transistor 2 SK 405

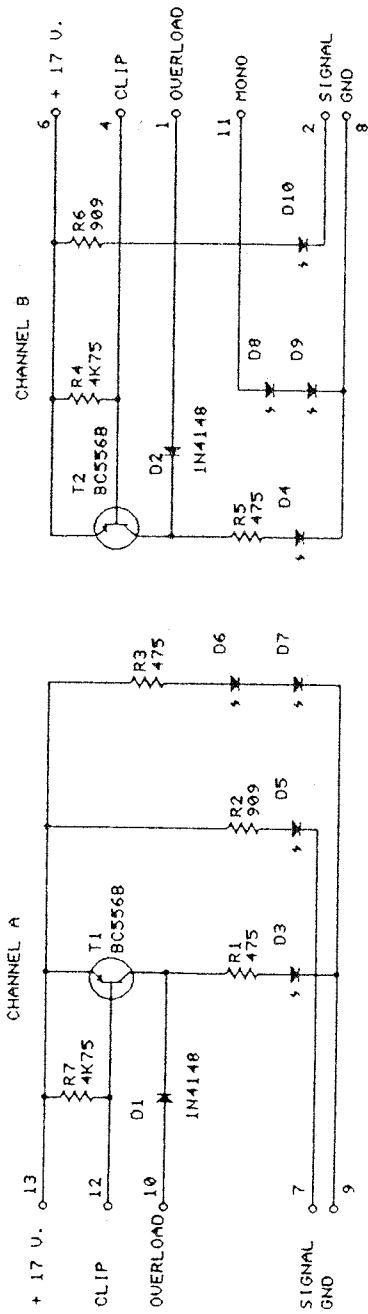
P A R T S L I S T

Title : Amplifier Board PPA 600
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

No.: I711615170

Serial No.	Pcs.	Item No.	Title
T26	1	I400540405	Transistor 2 SK 405
T27	1	I400520115	Transistor 2 SJ 115
T28	1	I400520115	Transistor 2 SJ 115
T29	1	I400520115	Transistor 2 SJ 115
T30	1	I400520115	Transistor 2 SJ 115
T40	1	I401100546	Transistor BC 546B
T41	1	I401100556	Transistor BC 556B
T42	1	I401100556	Transistor BC 556B
T40	1	I401100556	Transistor BC 556B
T44	1	I401100546	Transistor BC 546B
T45	1	I401200678	Transistor BD 678
T46	1	I401300422	Transistor BF 422
T47	1	I401300422	Transistor BF 422
T48	1	I401100546	Transistor BC 546B
T49	1	I401100546	Transistor BC 546B
Z01	1	I440005600	Zener Diode ZDP 5V6 0.4w
Z02	1	I440005600	Zener Diode ZDP 5V6 0.4w
Z03	1	I440005600	Zener Diode ZDP 5V6 0.4w
Z05	1	I440006800	Zener Diode ZDP 6V8 0.4w
Z06	1	I441001200	Zener Diode ZDP 12V 0.2w
SM01	1	I810003000	Nut M3
SM02	1	I810003000	Nut M3
SKS01	1	I803306000	Screw M3 x 6 nylon
SKS02	1	I803306000	Screw M3 x 6 nylon
SI01	1	I750001200	Washer Insolation
SI02	1	I750001200	Washer Insolation





NO.	AN-NO.	REMARKS	SCALE	SHEET	NO.
		CONSTR.	01.03.88		
		DWG.			
		ISSUED	01.03.88		
		APPROVED	01.04.88		
		TOOL			
		REPLACE			
TITLE			PPA 600		
TITLE			DISPLAY BOARD V.A		
MTR.			ORTOFON		
FINISH			INSTRUMENTS		

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PPA 600 C O N N E C T I O N S

Title: Display
Connector K1
Date: 21.11.1988
1.Edition: 21.11.1988
Compiled by: FN/id
Rev.:

No.: I711616770

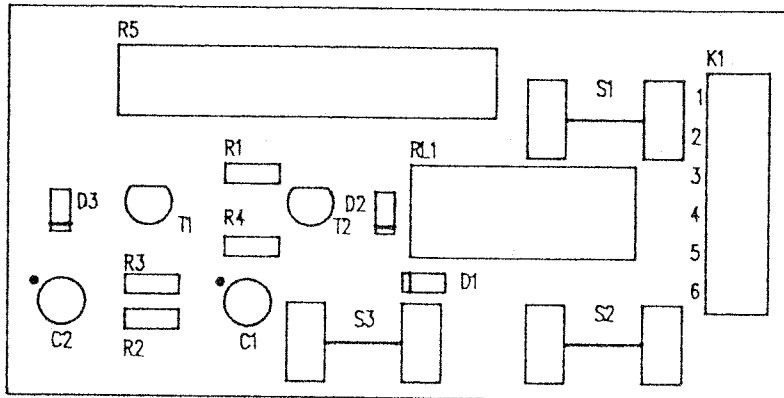
PIN	Description	Connected to	
		PIN	Board
1	Overload CH. B	K1-13	Amplifier CH. B
2	Signal CH. B	K1-14	Amplifier CH. B
3	n.c.		
4	Clip CH. B	K1- 9	Amplifier CH. B
5	n.c.		
6	+17 V CH. B	K1-16	Amplifier CH. B
7	Signal CH. A	K1-14	Amplifier CH. A
8	0 Volt CH. A	Ground	Elyt. ground plate P.S.
9	0 Volt CH. A	Ground	Elyt. ground plate P.S.
10	Overload CH. A	K1-13	Amplifier CH. A
11	Mono	K1- 3	Input
12	Clip CH. A	K1- 8	Amplifier CH. A
13	+17 V CH. A	K1-16	Amplifier CH. A

P A R T S L I S T

Title : Display Board PPA 600 No.: I711616170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

Serial No.	Pcs.	Item No.	Title
P01	1	I711616200	PBC
P02	1	I711616270	Diagram
P03	1	I711616572	Component Overlay
D01	1	I470414800	Diode 1N 4148
D02	1	I470414800	Diode 1N 4148
D03	1	I452016100	LED red LD505H
D04	1	I452016100	LED red LD505H
D05	1	I452015100	LED green LD505G
D06	1	I452015100	LED green LD505G
D07	1	I452015100	LED green LD505G
D08	1	I452015100	LED green LD505G
D09	1	I452015100	LED green LD505G
D10	1	I452015100	LED green LD505G
K01	1	I630013400	Connector 13 pin Siemens C42334-A51-A17
R01	1	I103247500	Res 475R 1% 0.25w metal
R02	1	I103290900	Res 909R 1% 0.25w metal
R03	1	I103247500	Res 475R 1% 0.25w metal
R04	1	I103347500	Res 4k75 1% 0.25w metal
R05	1	I103247500	Res 475R 1% 0.25w metal
R06	1	I103290900	Res 909R 1% 0.25w metal
R07	1	I103347500	Res 4k75 1% 0.25w metal
T01	1	I401100556	Transistor BC 556B
T02	1	I401100556	Transistor BC 556B

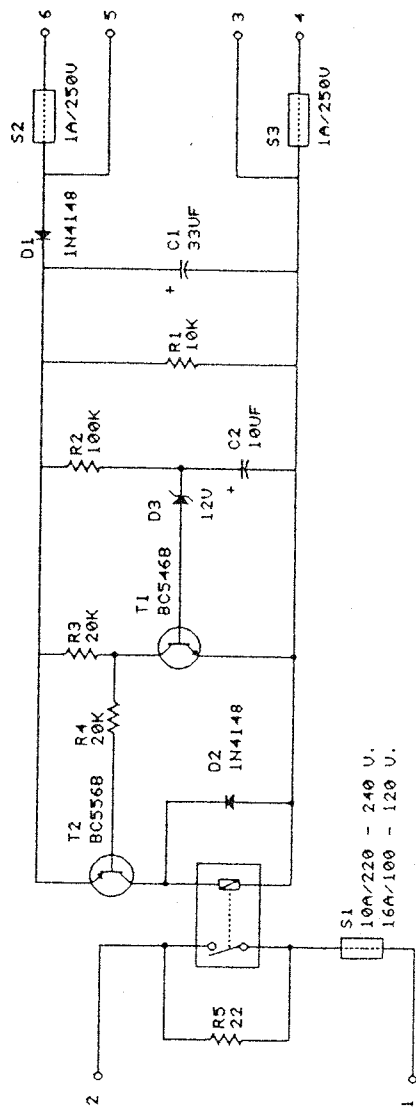
CAD nr.
AC612572



Udg.	ÆO-nr.	Frimålstolerance	±.			Skala	: 1
		Konstr.	—	—	Titel Overlay PPA 600 Soft-start board	Nr.	1711612572
		Tegn.	26.09.88	BDJ		Side 1	fort. s
		1.udg.		—			
		Godk.					
		Værktøj	.		Matr.	.	ortofon danmark
		Erstatter	.		Finish	.	

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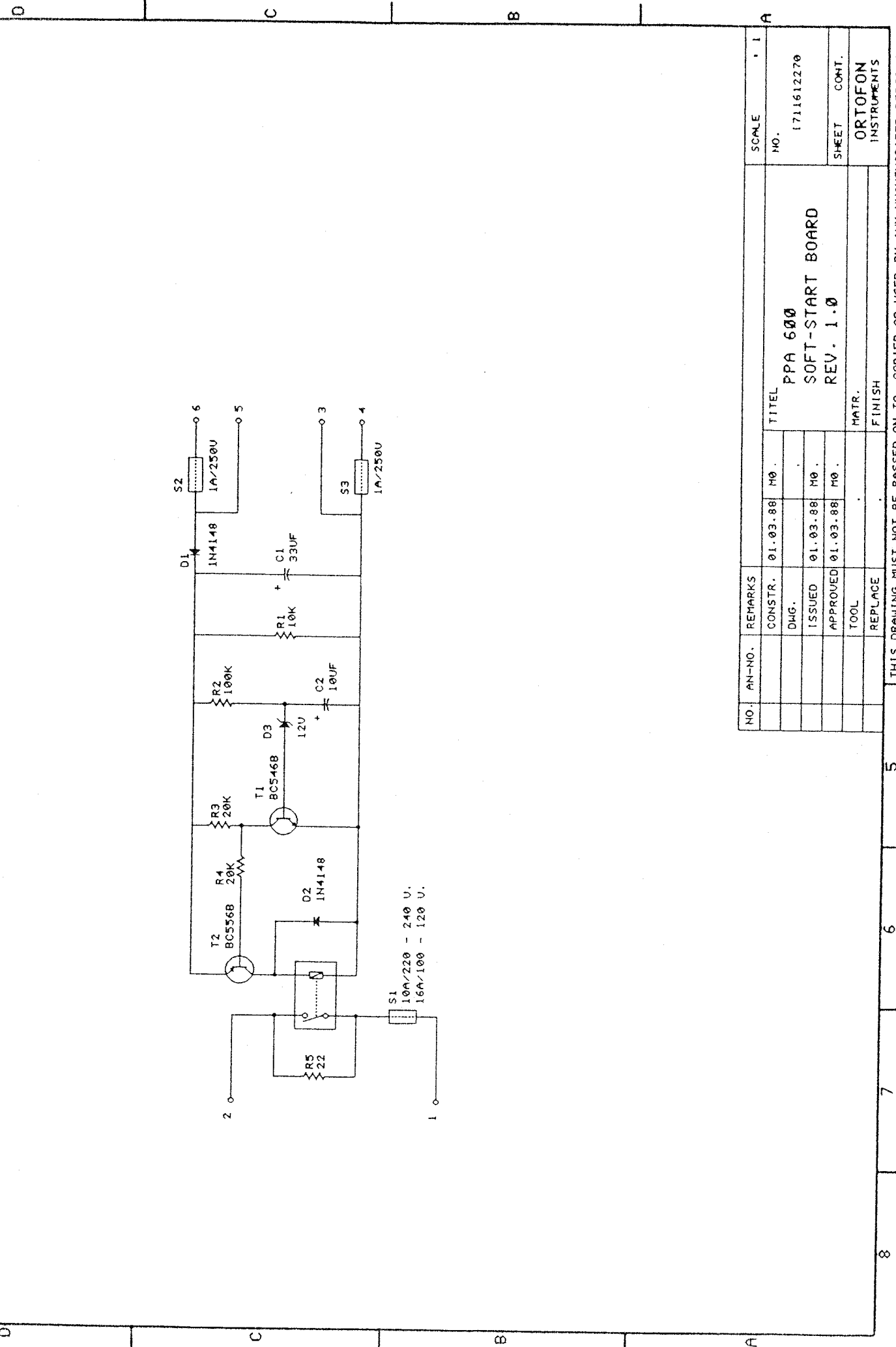
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S1
10A/220 - 240 V.
16A/100 - 120 V.

NO.	AN-NO.	REMARKS	CONSTR. NO.	NO.	TITLE	SCALE
		CONSTR.	01.03.88		PPA 600 SOFT-START BOARD REV. 1.0	1711612270
		DWG.				
		ISSUED	01.03.88			
		APPROVED	01.03.88		SHEET	CONT.
		TOOL			ORTOFON INSTRUMENTS	
		REPLACE			MATR.	FINISH

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PPA 600 C O N N E C T I O N S

Title: Soft Start
Connector K1
Date: 21.11.1988
1.Edition: 21.11.1988
Compiled by: FN/id
Rev.:

No.: I711612770

PIN	Description	Connected to PIN	Board

1	Mains in		
2	Mains out		Transformer
3	26 V AC out	K1-12	Input
		K1-19	Amplifier CH. A
		K1-19	Amplifier CH. B
4	26 V AC in		Transformer
5	26 V AC out	K1-13	Input
		K1-20	Amplifier CH. A
		K1-20	Amplifier CH. B
6	26 V AC in		Transformer

P A R T S L I S T

Title : Soft Start Board PPA 600 No.: I711612170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

Serial No.	Pcs.	Item No.	Title
P01	1	I711612200	PCB
P02	1	I711612270	Diagram
P03	1	I711612572	Component Overlay
C01	1	I246330500	Cap 33u 40V electrolytic
C02	1	I246100500	Cap 10u 63V electrolytic
D01	1	I470400200	Diode 1N 4002
D02	1	I470414800	Diode 1N 4148
D03	1	I441001200	Zener Diode ZDP 12V 0.4w
K01	1	I639006000	Terminal Block 4406-5
R01	1	I103410000	Res 10k 1% 0.25w metal
R02	1	I103510000	Res 100k 1% 0.25w metal
R03	1	I103420000	Res 20k 1% 0.25w metal
R04	1	I103420000	Res 20k 1% 0.25w metal
R05	1	I126220000	Res 22R 5% 11w wirew.
RL01	1	I601300000	Relay MZP A002 47 05
S01A	1	I722210000	Fuse 10A 250V slow blow (220V-240V)
S01B	1	I722216000	Fuse 16A 250V slow blow (100V-120V)
S02	1	I724001000	Fuse 1A 250V quick blow
S03	1	I724001000	Fuse 1A 250V quick blow
SH01	1	I691000100	Fuse Socket, module 5mm
SH02	1	I691000100	Fuse Socket, module 5mm
SH03	1	I691000100	Fuse Socket, module 5mm
SH04	1	I691000100	Fuse Socket, module 5mm
SH05	1	I691000100	Fuse Socket, module 5mm
SH06	1	I691000100	Fuse Socket, module 5mm
T01	1	I401100546	Transistor BC 546B
T02	1	I401100556	Transistor BC 556B

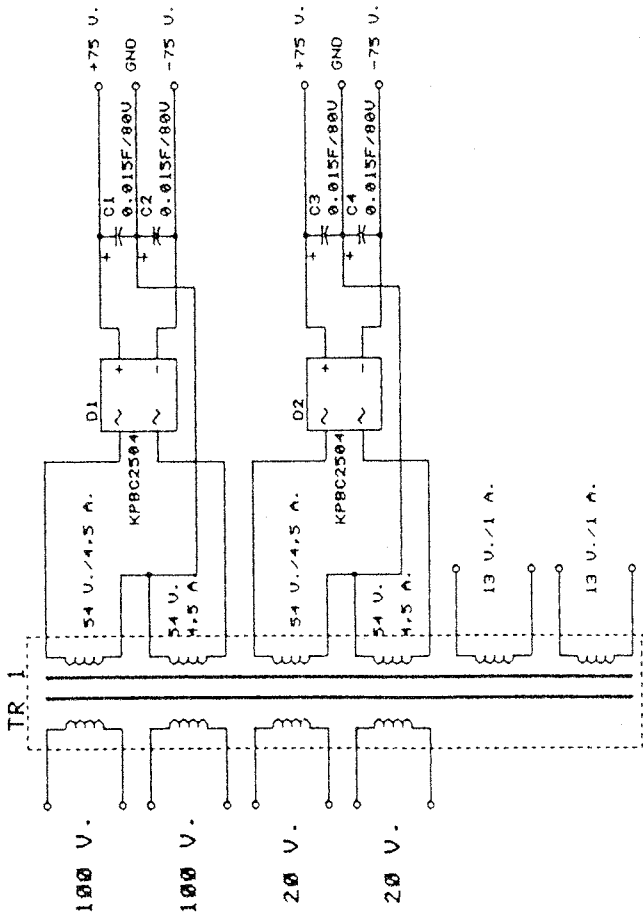
Doc. No. : I7116121/PPA600

Print Date : 21.12.88/12:08:12

NO. 1711601270

SHEET

CONT.



NO.	AN-NO.	REMARKS	SCALE	1
		CONSTR.	NO.	
		DWG.	1711601270	
		ISSUED	PPA 600	
		APPROVED	POWER SUPPLY	
		TOOL	MATR.	
		REPLACE	FINISH	
			SHEET	CONT.
			ORTOFON INSTRUMENTS	

THIS DRAWING MUST NOT BE PASSED ON TO, COPIED OR USED BY ANY UNAUTHORIZED PERSONS.

PPA 600 C O N N E C T I O N S

Title: Power Supply Connections No.: I711601770
 Date: 21.11.1988
 1.Edition: 21.11.1988
 Compiled by: FN/id
 Rev.:

PIN	Signal Type	PIN	Connected to Board
Elyt. positive	+75 V	K2-F3	Amplifier CH. A
Elyt. ground plate	Ground	K2-F1	Amplifier CH. A
Elyt. negative	-75 V	K2-F2	Amplifier CH. A
Elyt. positive	+75 V	K2-F3	Amplifier CH. B
Elyt. ground plate	Ground	K2-F1	Amplifier CH. B
Elyt. negative	-75 V	K2-F2	Amplifier CH. B
Soft start K1-3	26 V AC (T1A fuse)	K1-12	Input
		K1-19	Amplifier CH. A
		K1-19	Amplifier CH. A
Elyt. ground plate	0 Volt	K1- 1	Input
		K1- 2	Input
		K1-11	Input
Soft start K1-5	26 V AC (T1A fuse)	K1-13	Input
		K1-20	Amplifier CH. B
		K1-20	Amplifier CH. B

P A R T S L I S T

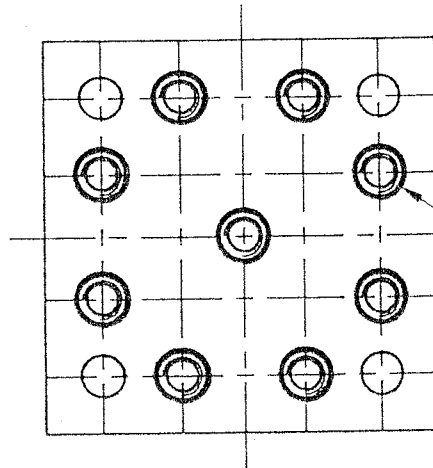
Title : Power Supply, 110V-220V No.: I711601170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

Serial No.	Pcs.	Item No.	Title
P1	1	I711601200	PCB
P2	1	I711601270	Diagram
P3	1	I711601572	Component Overlay
01	1	I940012270	Console
02	1	I510168220	Transformer 220V
03	2		Washer, ϕ 135
04	1		Bolt M8
05	1		Washer, Cover ϕ 135
06	1		Washer HFC 9163 M8
07	4	I810112000	Nut HFC 9833 M12
08	4	I249150300	Capacitor 15000uF 80V
09	1		Capacitor, incl.
10	4		Washer, Rubber ϕ 50
11	4		Washer Insulation ϕ 30
12	4		Washer, Lock M12
13	2	I960005213	Rail Connector
14	2	I431450200	Rectifier G.I. KBPC 2504
15	2	I804301600	Screw HFC 9041 M4x18
16	2	I812004000	Washer HFC 9163 M4
17	2	I810004000	Nut HFC 9805 M4
18	1x3 pos	I639012000	Terminal Block
19	1x2 pos	I639012000	Terminal Block
20	8	I820303200	Fixing Pins
21	4	I821100000	Distance Pipe RP 307760 22
22	1	I767075085	Cable, double isolated
23	2	I703100100	Cable w. Eye, red
24	2	I703100100	Cable w. Eye, blue
25	2x50mm	I703100200	Cable 0.75
26	1	I618000300	Mains Switch
27	1	I890000000	Fixture for Mains Switch

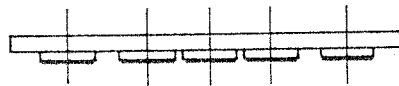
P A R T S L I S T

Title : Power Supply, 100V-120V-220V-240V No.: I711617170
 Date : 01.12.1988
 1.Edition : 01.12.1988
 Compiled by: FN/BDJ
 Rev. :

Serial No.	Pcs.	Item No.	Title
P1	1	I711601200	PCB
P2	1	I711601270	Diagram
P3	1	I711601572	Component Overlay
01	1	I940012270	Console
02	1	I510168000	Transf. 100-120-220-240V
03	2		Washer, ϕ 135
04	1		Bolt M8
05	1		Washer, Cover ϕ 135
06	1		Washer HFC 9163 M8
07	4	I810112000	Nut HFC 9833 M12
08	4	I249150300	Capacitor 15000uF 80V
09	1		Capacitor, incl.
10	4		Washer, Rubber ϕ 50
11	4		Washer Insulation ϕ 30
12	4		Washer, Lock M12
13	2	I960005213	Rail Connector
14	2	I431450200	Rectifier G.I. KBPC 2504
15	2	I804301600	Screw HFC 9041 M4x18
16	2	I812004000	Washer HFC 9163 M4
17	2	I810004000	Nut HFC 9805 M4
18	1x4 pos	I639012000	Terminal Block
19	1x3 pos	I639012000	Terminal Block
20	8	I820303200	Fixing Pins
21	4	I821100000	Distance Pipe RP 307760 22
22	1	I767075085	Cable, double isolated
23	2	I703100100	Cable w. Eye, red
24	2	I703100100	Cable w. Eye, blue
25	2x50mm	I703100200	Cable 0.75
26	1	I618000300	Mains Switch
27	1	I890000000	Fixture for Mains Switch



9 stk møtrik
type PS-M5-2
ipresses



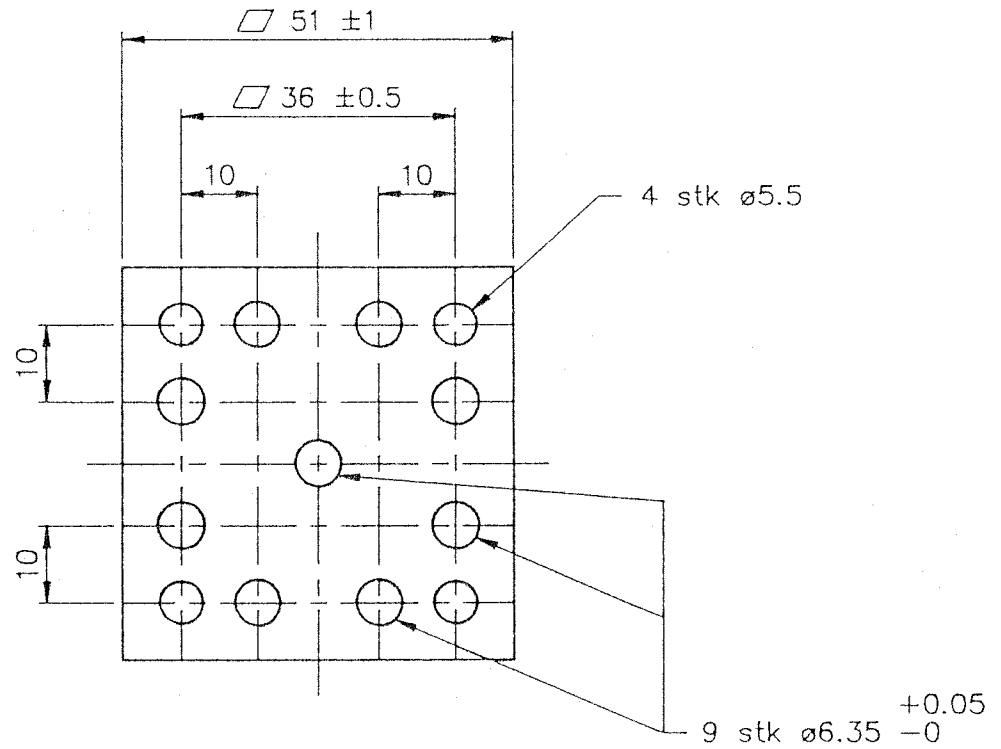
FORELØBIG UDGAVE
VORLAUFIGE AUSGABE
TENTATIVE DATA

Udg.	ÆO-nr.	Frimålstolerance ±.			Titel KORTSLUTNINGSPLADE mont. m. møtrikker	Skala 1 : 1
		Konstr.	19.04.89	PW		Nr. 196005223
		Tegn.	19.04.89	BDJ		
		1.udg.		PW		Side 1 fort. s
		Godk.				
		Værktøj	.		Matr. 1960005213	ortofon danmark
		Erstatter	.		Finish .	

Denne tegning må ikke overlades til, kopieres eller udnyttes af uvedkommende.

KD-HEH-OMIS / DW

CAD nr.
BF005213



FORELØBIG UDGAVE
VORLAUFIGE AUSGABE
TENTATIVE DATA

Udg.	ÆO-nr.	Frimålstolerance	±.		Skala	1	:	1
2	1783	Konstr.	11.04.88	BMH	Titel	KORTSLUTNINGSPLADE		
		Tegn.	02.01.89	BDJ				
		1.udg.	12.01.89	OMS/FN				
		Godk.				Side 1	fort.	s
		Værktøj	.		Matr.	Aluminiumplade 2 mm		
		Erstatter	.		Finish	.		
						ortofon danmark		

Denne tegning må ikke overlades til, kopieres eller udnyttes af uvedkommende.