LAB.GRUPPEN

LAB 4000

SERVICE MANUAL

1999 EMC

LAB.GRUPPEN

1999-03-01

SERVICEINFORMATION FOR LAB 4000

Serial number from: **990-226**

Low pass filter on input board.

LAB 4000 has a 24dB low pass filter on the input board.
The filter has been modified for a higher corner frequency.

Input board 2kinp

Component	Old value	New value
C6, C106	470pF	220pF
C7, C107	470pF	220pF
C8, C108	680pF	330pF
C9, C109	220pF	100pF

LAB.GRUPPEN

1999-02-01

SERVICEINFORMATION FOR LAB 1200,1300,1600,2000,4000

New power supply board. PSUG, PSUH

Serial number from:

LAB 1200:	**980-901**
LAB 1300:	**980-801**
LAB 1600:	**980-901**
LAB 2000:	**980-801**
LAB 4000:	**990-101**

To bee able to produce all the power supply on the same print board there have been some small changes done.
The out put power, and the electrical specification is not effected.
The new boards are called PSUG, and PSUH.

LAB.GRUPPEN

1997-09-01

SERVICEINFORMATION FOR LAB 4000

Serial number before 970-8xx

When the fans are changed, the fan control circuit should bee modified.

Power supply board PSU C

Q4	Change from	BDX 53F too	**IRF 730**
D7	New	**15v 0,4w zener between Q4 g-s**	
D8	New	**39v 0,4w zener between centre point of fans, and Q4 g**	

(D7 and D8 have too bee installed on the solder side off PSU C).

1996-12-06

SERVICEINFORMATION FOR LAB 4000

LF BOARD serial number before 961-201

R24, R47 change from *10kohm* to **56kohm 1%**

HF BOARD serial number before 970-101

D1, D5 change from *1 diode* to **2 diodes BYW81pi200 in series**

R63, R64 change from *3,9ohm* to **2,2ohm 2w**

C53, C54 change from *1nF* to **470pF 200V np0**

LAB 4000
Theory of function

Powersupply

AC-power is coming in to terminal K1. The voltage is rectified by D1 and filtered by C10, C11. This gives 310V DC to the transformer TR1. The PWM-controller U1 controls the switch Q1-Q3 to give the correct output voltage at terminal J17, J19. When the switch Q1-Q3 i closed, current flows trough transformer, TR1, storing energy. Because of the voltagepolarity, diode D3, D4 are reverse-biased, thus no voltage present at the load. When the switch is open, transformer TR1 reverses polarity because of the collapsing magnetic field, forward-biasing diod D3, D4, and inducing a current flow into the capacitors C12, C14. The reversed voltage is sensed by a winding in TR1 and rectified by diod D8. The PWM-controller adjust the on-time of the switch, by comparing the voltage across C14 with an internal referens, to give a railvoltage of +-155V across the capacitors C12,C14. The voltage can be adjusted by potentiometer TP2. The maximum current in the transformer is sensed over the resistor R6-R8. The voltage across R6-R8 is compared with a referense-voltage, set by TP3, which make it possible to adjust the maximum output power from the powersupply. Normally TP3 is in maximum position, but if something has too be repaird in the amplifier, TP3 is used for "slowstarting" the amplifier.

Amplifier

The inputsignal is connected to the balanced amplifier U1. The gain in this amplifier can be reduced by optoresistor LDR1 to prevent clipping in the output amplifier. From amplifier U1 signal is going to limiter U2, Q1, Q2 passing gaincontrol P1. This limiter together with the phaselineare lowpassfilter U3, U4 limits the slewrate of the signal going to the output amplifier 4KLF, preventing intermodulation in this amplifier if signals of too high frequencies are presented on the input terminal.

The output amplifier 4KLF works as an ordinary power amplifier with the difference that the collectorvoltage to the output transistors is supplied from the switchmode amplifier 4KHF. The base voltage on the output transistors Q26-Q28, Q31-Q33 is sensed by voltage divider R36-R38 and is then sent to the adjustable limiter U3, U4 on the input board, bofore it reaches the input on the switchmode amplifier. Limitlevel is set by the minimum load select-switches (MLS-sv.) to give correct output power in different loads.

The amplifier U1 (U2) on the HF-board makes sure that the output signal on terminal J4 (J8) is a copy of the input signal on terminal J12, by giving correct controvoltage to pulsewidth modulator U3. U3 compares this voltage with an 614Khz triangularwave giving a pulsewide modulated output signal from Q1 (Q7) which is filtered by L1, C1 (L4, C10). The gain from the base of the output transistors in the LF-amplifier to the output of the HF-amplifier is equal to one. TP1 (TP2) is used to add a DC-ofsett on the input of U1 (U2) giving +7,5V (J4) - 7,5V (J8) relative output of the LF-amplifier (J6), which is the same as collector-emitter voltage for the output transistors Q26-Q28, Q31-Q33.

REPAIRING INSTRUCTIONS

REQUIRED MEASUREMENT EQUIPMENT:
-Audiogenerator
-AC-voltmeter/THD-meter
-2 digital voltmeters
-Two channel oscilloscope for audio
-Variac 0-280V, 6A
-50Mhz oscilloscope, ex. Tek 2225
with 100x probe ex. Tek P6009

AMPLIFIER

1. Without changing any fuses check the powersupply +155V, -155V, +16V, -16V,+30V. If these aren't OK go to section for reparing power supply.

2. If all fuses are OK, follow the signal from input to output, and repair in normal way. The best way is to place the amplifier on the front handles, losen the rear panel, and mount it back on distances (delivered with this manual) to make it possible to measure.

3. If there is a fault in the power amplifier stage do as follows:

   3:1 Turn TP1, TP2 on the HF-board, TP3 on the power supply board counter clockwise.

   3:2 Short-circuit R38 on LF-board.

   3:3 Disconnect cables from Q28, and Q32 collectors on the LF-board.

   3:4 Replace broken fuses. (only for the channel you repair)

   3:5 Connect DC-voltmeter (200V) to the positive (nagative) rail voltage.

   3:6 Connect another DC-voltmeter (20V) to the cable disconnected from Q28 (Q32).

   3:7 Turn TP3 (PSU) slowly clockwise, TP1 and watch the voltmeters. Rail voltage should increase rapidly, "collector voltage" should read 0. After turning TP3 maximum 30°, railvoltage should be 155V.

   a. If the railvoltage is zero or very low, check Q1, D1 (Q7, D5) (shorted) on the HF-board..
   If Q1 (Q7) is broken, also replace R3 (R16) and D2 (D6).

   b. If OK (155V) turn TP1 (TP2) slowly maximun clockwise. Voltage measured on the disconnected colectorcable should stop at about 7,5V.
   c. If OK turn TP1 (TP2) and TP3 counter clockwise.

3:8 Repeat from 3:5 for the negative side.

3:9 Reconnect cable to Q28 colector.

3:10 Connect dummy load 16Ω to output, and connect an oscilloscope (10V/div) across the load.

3:11 Slowly turn TP3 (PSU) for 155V (-155V) railvoltage.

3:12 Slowly turn TP1 (TP2) clockwise and look at the oscilloscope. There should be no DC on the oscilloscope. If there is DC (<1V) repair the positive (negative) output section on the LF-board.

3:13 Turn back TP1 (TP2) and TP3, and disconnet Q28 collector.

3:14 Reconnect Q32 collector and repeat from 3:11 for the negative side.

3:15 Reconnect cables to Q28 and Q32 collector. Turn TP3 for 155V rail voltage. Turn TP1 clockwise, no DC on the oscilloscope. Then slowly turn TP2 clockwise. There can be some oscillation with TP2 in middle position, byt it will stop at further turning.

3:16 Connect 1KHz sine wave to the input of the amplifier. Adjust gain until there is signal on the output. It should be a 7V PK sinewave with no distortion.

3:17 Disconnect short circuit from R38, and the amplifier will work.

POWER SUPPLY

Required measurement equipmen
-Audiogenerator
-DVM
-50 MHz oscilloscope, ex. Tek 2225 with 100x probe ex. Tek P6009

-Isolationtransformator for the mains, 1:1
-Variac 0-280V, 6A
(-Two chanel oscilloscope for audio)
(-AC Voltmeter/ THD-meter)

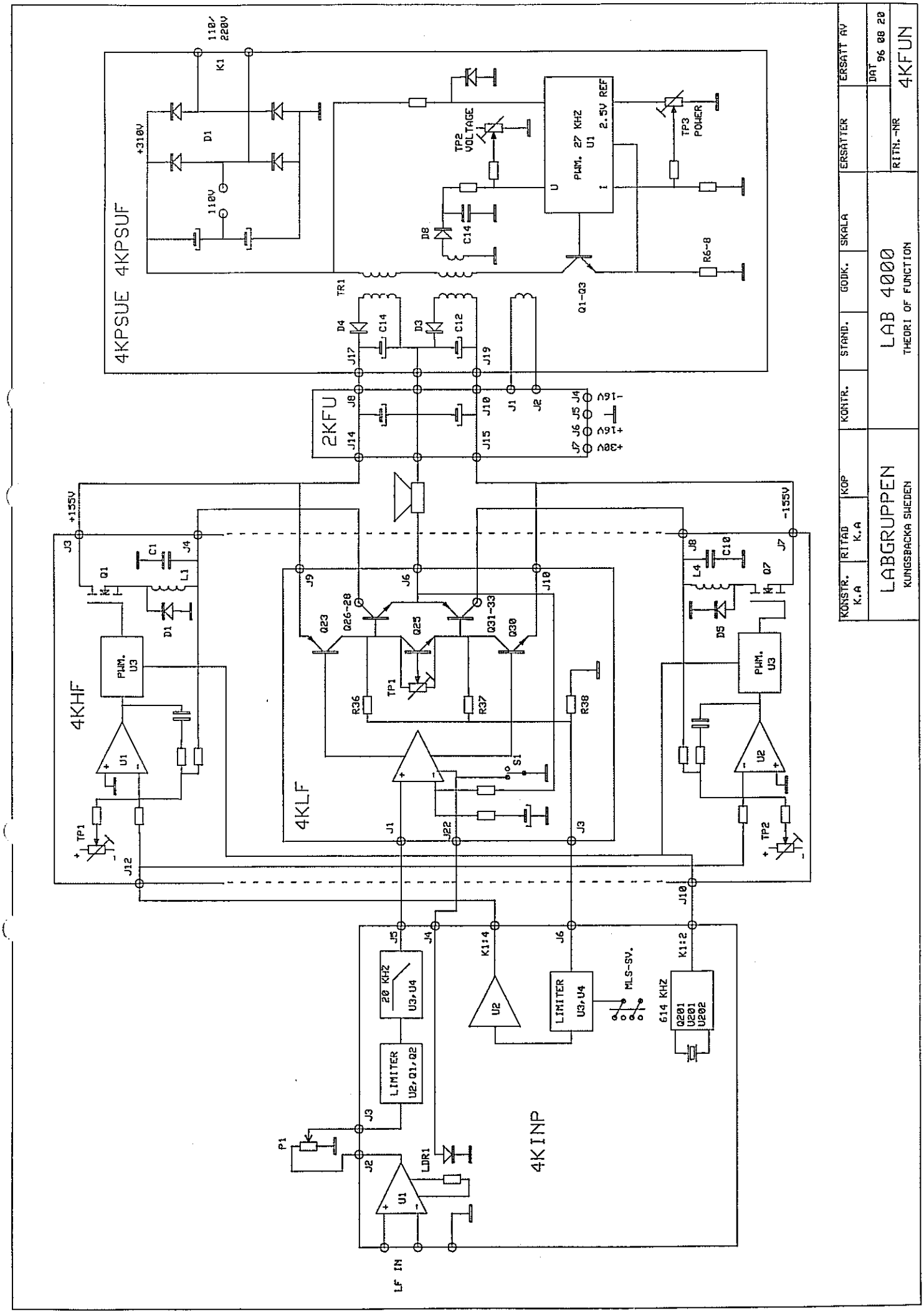
1) Turn TP2 and TP3 fully counter clockwise.
2) Change F1 on the PSUE.
3) Increase the main voltage slowly by the variac.
4) Measure the voltage across C1 on PSUF.
   a) No voltage: -change R5.
   b) The current inceases quickly: -check D1-PSUE.
      -check Q1, Q2, Q3.
5) It is now possible to increase the voltage across C1 on PSUF to approx. 300 V without current inrush.
6) Connect an oscillscope to mains voltage via an isolation transformer. Then measure across Q1 collector and emitter.

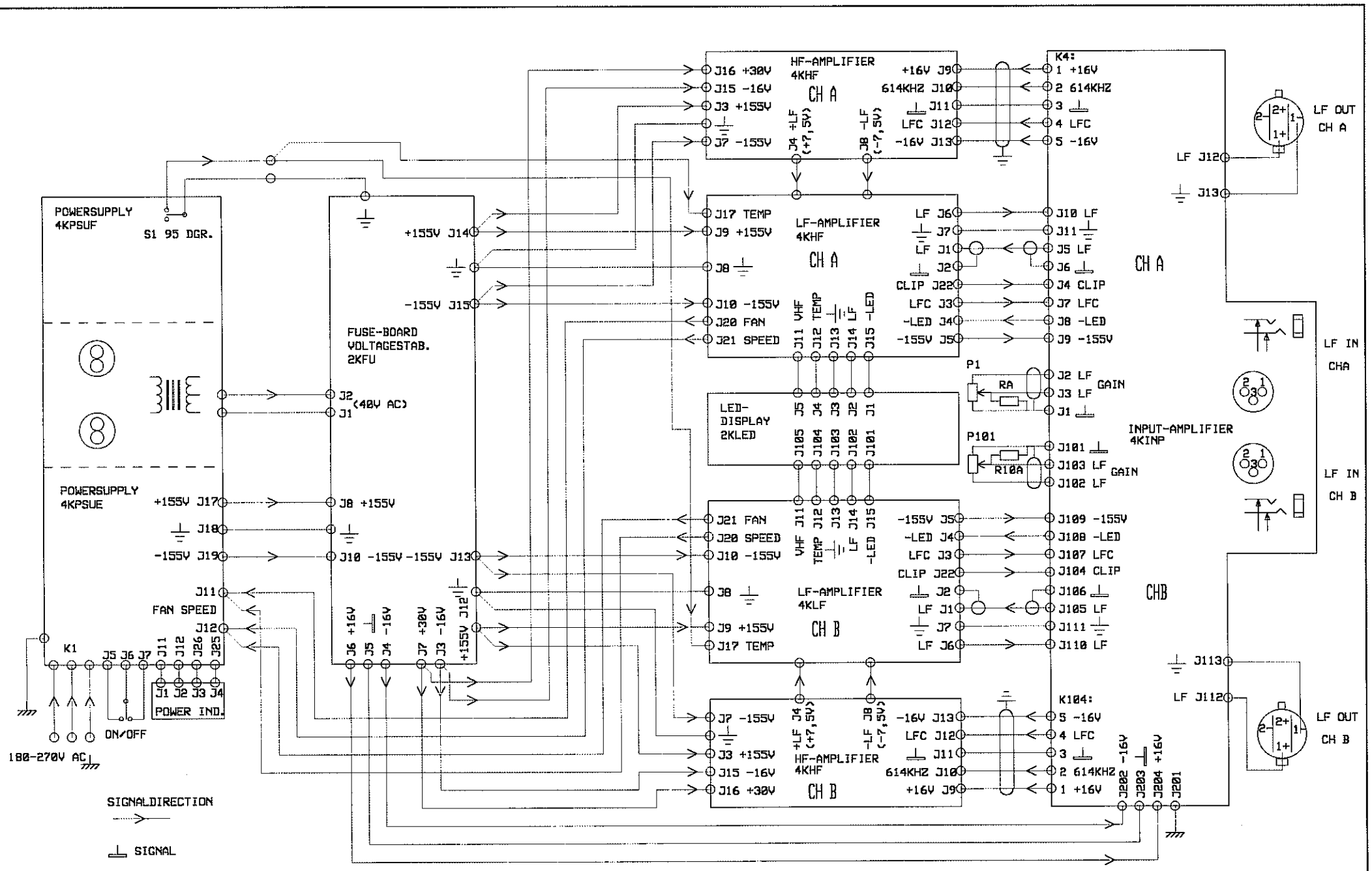
is approx.27 kHz (see figure1). If the graph is seen, go to item 9).

8) If only narrow spikes is seen, check the following components.
   a) D3, D4 -PSUE or the output circuits.
   b) D1 (C5, R1) -makes U1 go into over voltage protection.
   c) U1 -the output will remain low all the time.

9) Turn TP3 fully clockwise:
   a) Check the output voltage on C12, C14 -PSUE for +- 155V.
   Adjust with TP2.
   b) Check the softstart circuit by turn on and off the mainswitch and look at the oscilloscope.
   c) Increase the power by applying an audiosignal to the amplifier and turn up the gaincontrols. -The pulsewidth will increase.
   d) Check the over/ under voltage protection circuits by turning the variac up to 280 VAC and down to 130 VAC. (No load).

Fig. 1


4KPSUE 4KPSUF
2KFU
4KHF
4KLF
4KINP
LAB 4000
THEORI OF FUNCTION
LABGRUPPEN
KUNGSBACKA SWEDEN
4KFUN
PWM. 27 KHZ
2.5V REF
20 KHZ
LIMITER
614 KHZ
MLS-SV.
LF IN



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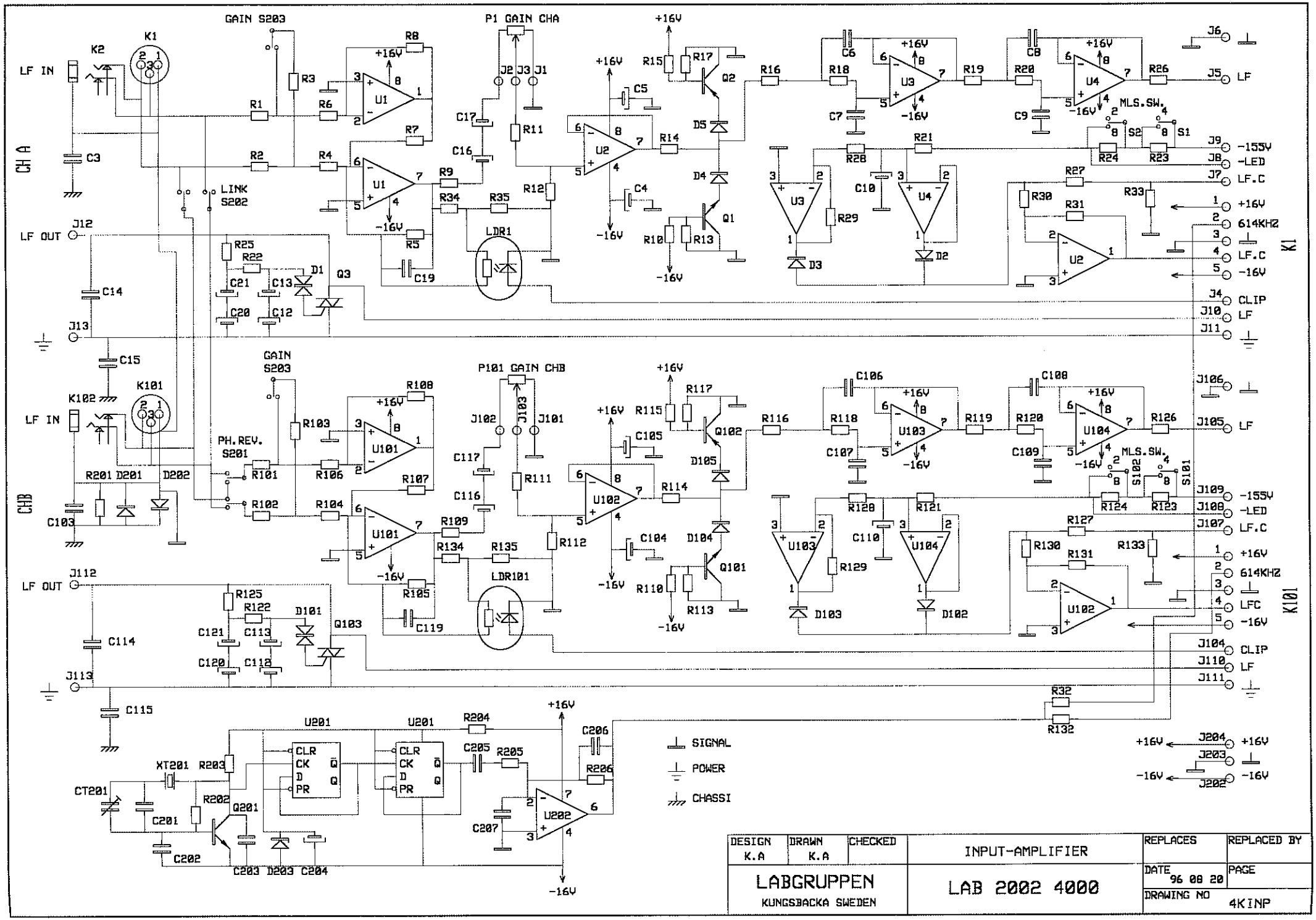
CH A
CH B
GAIN S203
P1 GAIN CHA
P101 GAIN CHB
LINK S202
PH.REV. S201
LF IN
LF OUT
LDR1
LDR101
MLS.SW.
+16V
-16V
-155V
-LED
LF.C
614KHZ
CLIP
LF
SIGNAL
POWER
CHASSI
K1
K101
LABGRUPPEN
KUNGSBACKA SWEDEN
INPUT-AMPLIFIER
LAB 2002 4000
DESIGN K.A
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DATE 96 08 20
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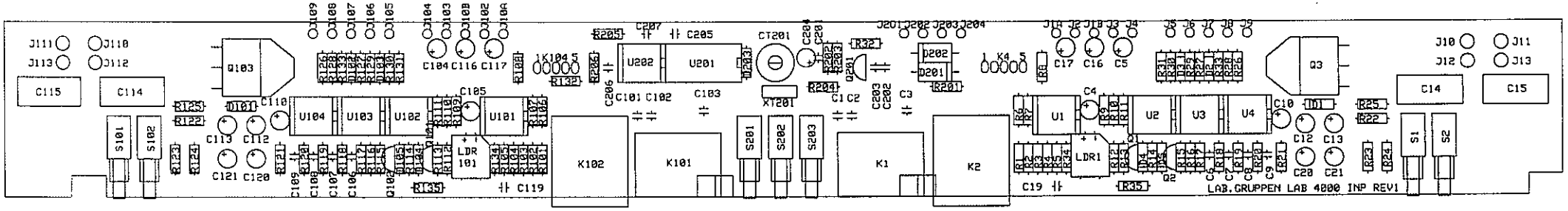
DRAWING NO 4KINP



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K.A	K.A		INPUT AMPLIFIER		
LABGRUPPEN KUNGSBACKA SWEDEN			LAB2002 LAB 4000	DATE 99 09 18	PAGE
				DRAWING NO 4KINPR1-P	

LAB 4000
INPUT AMPLIFIER AND INTERNAL CONNECTIONS
Component-list

LAB 4000 INPUT AMPLIFIER
Component-list Channel A (Ch. B; add 100, Ch. A+B add 200)

Resistors

R1	10 kΩ 1%	
R2	10 kΩ 1%	gain
R3	9,2 kΩ 1%	33 dB
	6,34 kΩ 1%	32 dB
	3,74 kΩ 1%	29 dB
	2,33 kΩ 1%	26 dB
	1,5 kΩ 1%	23 dB
R4	10 kΩ 1%	
R5	66 kΩ 1%	
R6	10 kΩ 1%	
R7	22 kΩ 1%	
R8	22 kΩ 1%	
R9	100 Ω	
R10	47 kΩ 1%	
R11	1 kΩ 1%	
R12	47 kΩ 1%	
R13	18 kΩ 1%	
R14	1 kΩ 1%	
R15	47 kΩ 1%	
R16	10 kΩ 1%	
R17	18 kΩ 1%	
R18	10 kΩ 1%	
R19	10 kΩ 1%	
R20	10 kΩ 1%	
R21	715 kΩ 1%	
R22	27 kΩ 1% *	
R23	2,4 kΩ 1% long legs	
R24	4.7 kΩ 1W long legs	
R25	27 kΩ 1%	
R26	100 Ω	
R27	10 kΩ 1% *	
R28	47 kΩ 1%	
R29	47 kΩ 1%	
R30	10 kΩ 1%	
R31	10 kΩ 1%	
R32	100 Ω	
R33	12,4 kΩ 1%	
R34	10 kΩ 1%	
R35	1 kΩ 1%	
R36	47 kΩ 1%	

Optoresistor

LDR1 VTL5C4

Transistors

Q1	BC 547
Q2	BC 557
Q3	Q 4015R6

Capacitors

C1	-
C2	-
C3	330 nF 50V
C4	10 µF 50V
C5	10 µF 50V
C6	220 pF 5% *
C7	220 pF 5% *
C8	330 pF 5% *
C9	100 pF 5% *
C10	0.47 µF 50V
C11	-
C12	22 µF 50V
C13	22 µF 50V
C14	0.47 µF 250V
C15	2.2 µF 63V
C16	22 µF 50V
C17	22 µF 50V
C18	-
C19	22 pF
C20	22 uF 50V
C21	22 uF 50V

Diodes

D1	DB 3 *
D2	1N 4148
D3	1N 4148
D4	1N 4148
D5	1N 4148

Switches

S1	Alps SPPJ3
S2	Alps "

Integrated circuits

U1	NE 5532
U2	NE 5532
U3	LF 353
U4	LF 353

Connectors

K1	3-pole XLR chassie
K2	3-pole Telejack
K4	5-pole pinheader

Resistors

R201	10 Ω
R202	220 kΩ
R203	1 kΩ 1%
R204	2.2 kΩ
R205	2,2 kΩ 1%
R206	22 kΩ 1%

Capacitors

C201	22 pF
C202	220 pF
C203	68 pF
C204	10 µF 25V
C205	1 nF
C206	68 pF 5%
C207	220 pF

Trim capacitors

CT201 2-22pF

Diodes

D201	1N 5404
D202	1N 5404
D203	5.6V Zener 2%

Transistors

Q201	BC 547

Integrated circuits

U201	74HC74
U202	LM 318

Crystals

X201	2,4576 mHz

Switches

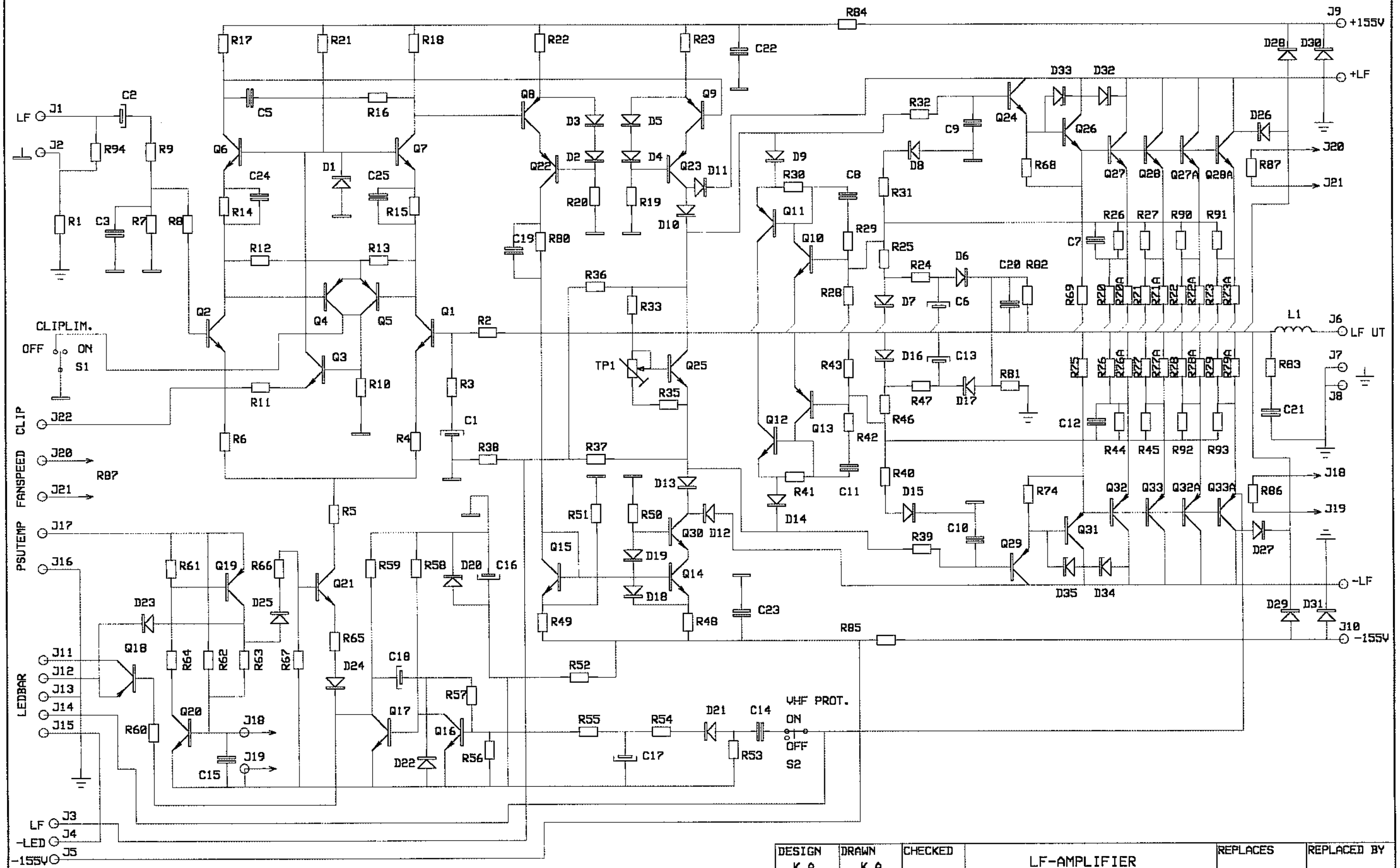
S201	Alps SPPJ3
S202	Alps "
S203	Alps "

INTERNAL CONNECTIONS

RA	10 kΩ 1%
P1	10 kΩ lin Tokos
K3	Speak-on NL-4MP

Inductors

L1	9.5 µH (2 core)
L2	9.5 µH (2 core)



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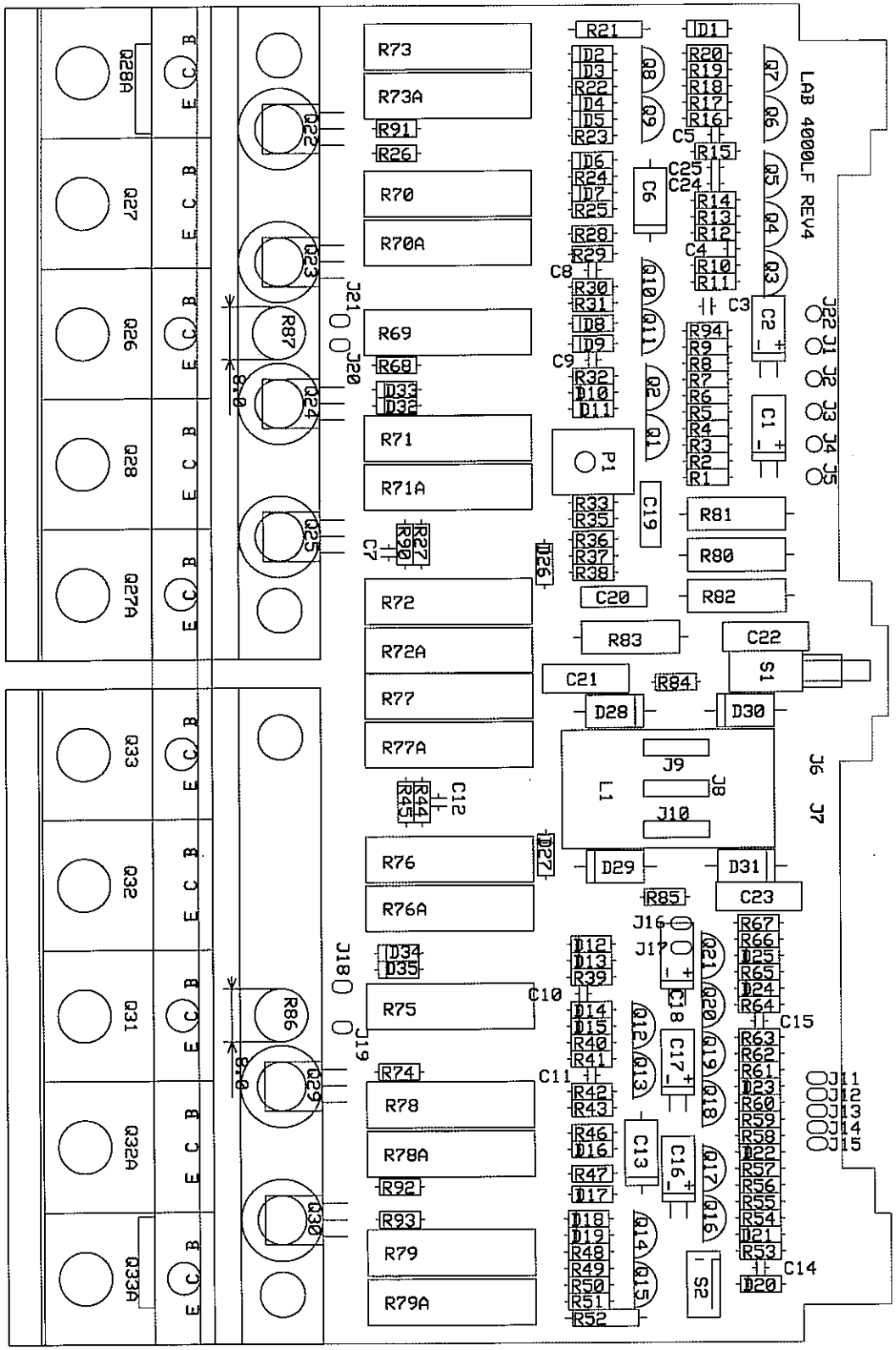


DESIGN K.A	DRAWN K.A	CHECKED	
LABGRUPPEN KUNGSBACKA SWEDEN		LF AMPLIFIER	REPLACES
LAB2002 LAB4000			REPLACED BY
		DATE 99 09 18	PAGE
		DRAWING NO	4KLFR4-P

LAB 4000
LF-AMPLIFIER
Component-list

Resistors

R1	10 Ω
R2	27 kΩ 1%
R3	806 Ω 1%
R4	180 Ω 1%
R5	1.8 kΩ 1%
R6	180 Ω 1%
R7	27 kΩ 1%
R8	10 Ω
R9	1 kΩ 1%
R10	100 kΩ 1%
R11	1.8 kΩ 1%
R12	27 kΩ 1%
R13	27 kΩ 1%
R14	3.3 kΩ 1%
R15	3.3 kΩ 1%
R16	4.7 kΩ 1%
R17	3.3 kΩ 1%
R18	3.3 kΩ 1%
R19	100 kΩ 1%
R20	100 kΩ 1%
R21	18 kΩ 2W
R22	100 Ω 1%
R23	100 Ω 1%
R24	56 kΩ 1%
R25	68 kΩ 1%
R26	12,4 kΩ 1%
R27	12,4 kΩ 1%
R28	3.9 kΩ 1%
R29	10 kΩ 1%
R30	4.7 kΩ 1%
R31	560 kΩ 1%
R32	220 Ω
R33	3.3 kΩ 1%
R34	-
R35	604 Ω 1%
R36	100 kΩ 1% 0.7W
R37	100 kΩ 1% 0.7W
R38	820 kΩ
R39	220 Ω
R40	560 kΩ 1%
R41	4.7 kΩ 1%
R42	10 kΩ 1%
R43	3.9 kΩ 1%
R44	12.7 kΩ 1%
R45	12.7 kΩ 1%
R46	68 kΩ 1%
R47	56 kΩ 1%
R48	100 Ω 1%
R49	100 Ω 1%
R50	100 kΩ 1%
R51	100 kΩ 1%
R52	18 kΩ 2W
R53	10 kΩ 1%
R54	10 kΩ 1%
R55	220 kΩ 1%
R56	100 kΩ 1%
R57	220 kΩ 1%
R58	56 kΩ 1%
R59	56 kΩ 1%
R60	27 kΩ 1%
R61	3.3 kΩ 1%
R62	432 kΩ 1%
R63	2.2 MΩ
R64	27 kΩ 1%
R65	2.7 kΩ 1%
R66	100 kΩ 1%
R67	56 kΩ 1%
R68	47 Ω
R69	4.7 Ω 5W
R70	0.33 Ω 5W
R70a	0.33 Ω 5W
R71	0.33 Ω 5W
R71a	0.33 Ω 5W
R72	0.33 Ω 5W
R72a	0.33 Ω 5W
R73	0.33 Ω 5W
R73a	0.33 Ω 5W
R74	47 Ω
R75	4.7 Ω 5W
R76	0.33 Ω 5W
R76a	0.33 Ω 5W
R77	0.33 Ω 5W
R77a	0.33 Ω 5W
R78	0.33 Ω 5W
R78a	0.33 Ω 5W
R79	0.33 Ω 5W
R79a	0.33 Ω 5W
R80	6.8 kΩ 3W
R81	820 Ω 6W
R82	1.5 kΩ 3W
R83	10 Ω 3W
R84	10 Ω
R85	10 Ω
R86	150 kΩ NTC
R87	150 kΩ NTC
R88	-
R89	-
R90	12.4 kΩ 1%
R91	12.4 kΩ 1%
R92	12.4 kΩ 1%
R93	12.4 kΩ 1%
R94	27 kΩ 1%

Trim potentiometers

TP1	250 Ω

Capacitors

C1	220 µF 16V
C2	10 µF 50V
C3	150 pF ker
C4	-
C5	680 pF
C6	1 µF 100V
C7	1 nF 63V
C8	1 nF 63V
C9	680 pF
C10	680 pF
C11	1 nF 63V
C12	1 nF 63V
C13	1 µF 100V
C14	39 pF 500V
C15	0.1 µF 40V
C16	220 µF 16V
C17	4.7 µF 50V
C18	10 µF 50V
C19	22 nF 250V
C20	47 nF 250V
C21	0.1 µF 250V
C22	0.1 µF 250V
C23	0.1 µF 250V
C24	4.7 nF
C25	4.7 nF
C26	-
C27	-

Diods

D1	15 V Zener
D2	1N 4148
D3	1N 4148
D4	1N 4148
D5	1N 4148
D6	1N 4004
D7	27 V Zener
D8	BAV 21
D9	1N 4148
D10	1N 4148
D11	BAV 21
D12	BAV 21
D13	1N 4148
D14	1N 4148
D15	BAV 21
D16	27 V Zener
D17	1N 4004
D18	1N 4148
D19	1N 4148
D20	15 V Zener
D21	1N 4004
D22	1N 4148
D23	1N 4148
D24	1N 4148
D25	1N 4148
D26	1N 4004
D27	1N 4004
D28	BYW 96E
D29	BYW 96E
D30	1N 5404
D31	1N 5404
D32	BZX85C100
D33	BZX85C100
D34	BZX85C100
D35	BZX85C100

Transistors

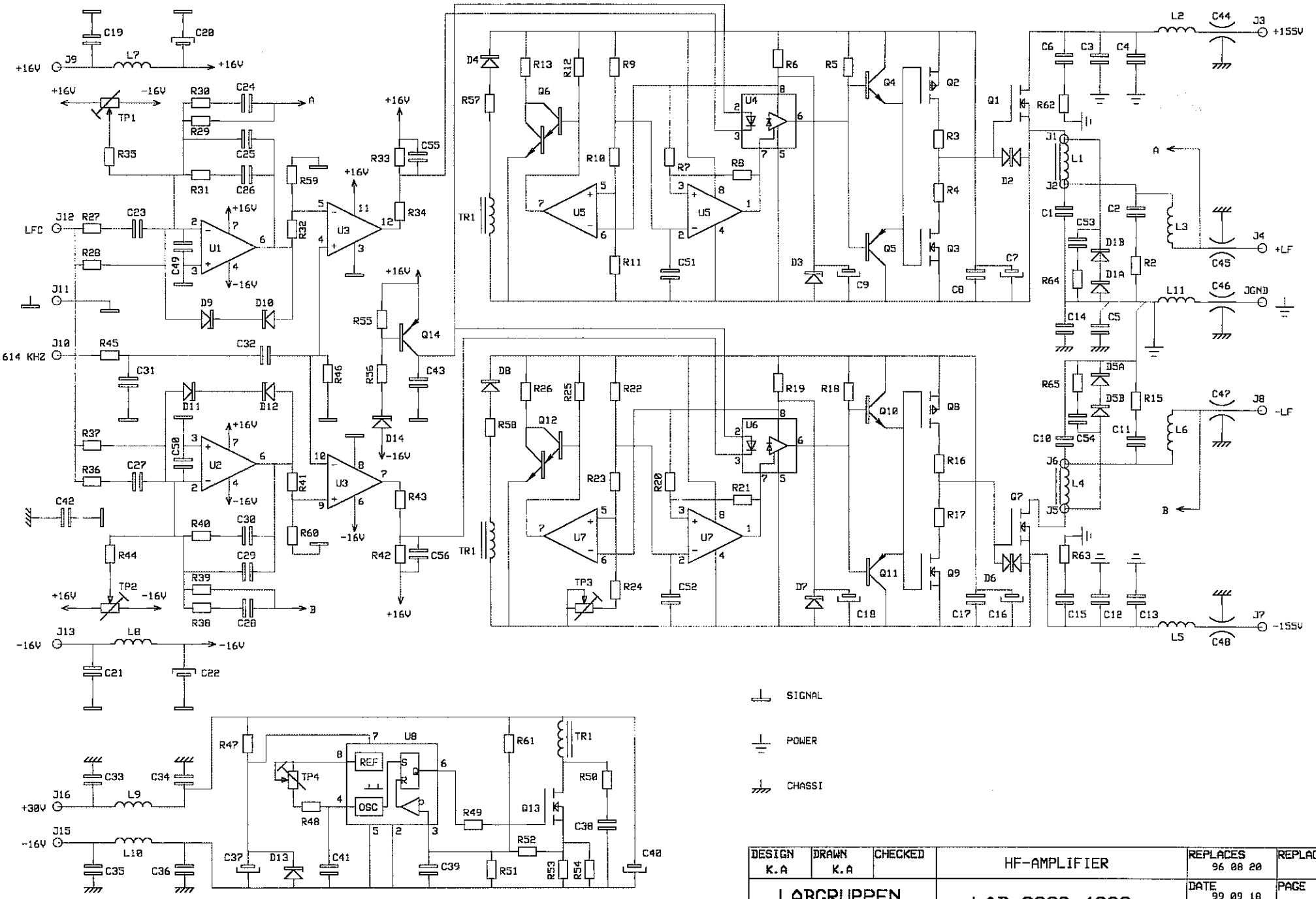
Q1	BC 549C matched
Q2	BC 549C matched
Q3	BC 547
Q4	BC 557
Q5	BC 557
Q6	MPSA 42
Q7	MPSA 42
Q8	BC 557
Q9	BC 557
Q10	BC 547
Q11	BC 557
Q12	BC 547
Q13	BC 557
Q14	BC 547
Q15	BC 547
Q16	BC 547
Q17	BC 547
Q18	BC 557
Q19	BC 557
Q20	BC 547
Q21	BC 547
Q22	MJE 350
Q23	MJE 350
Q24	MJE 340
Q25*	BD329
Q26	MJL 21194
Q27	MJL 21194
Q27a	MJL 21194
Q28	MJL 21194
Q28a	MJL 21194
Q29	MJE 350
Q30	MJE 340
Q31	MJL 21193
Q32	MJL 21193
Q32a	MJL 21193
Q33	MJL 21193
Q33a	MJL 21193

Switches

S1	SPPJ3 Alps
S2	Dipfix Siemens

* **Until 9801**

R35	750 Ω 1%
Q25	MJE 340



DESIGN	DRAWN	CHECKED	HF-AMPLIFIER	REPLACES 96 08 20	REPLACED BY
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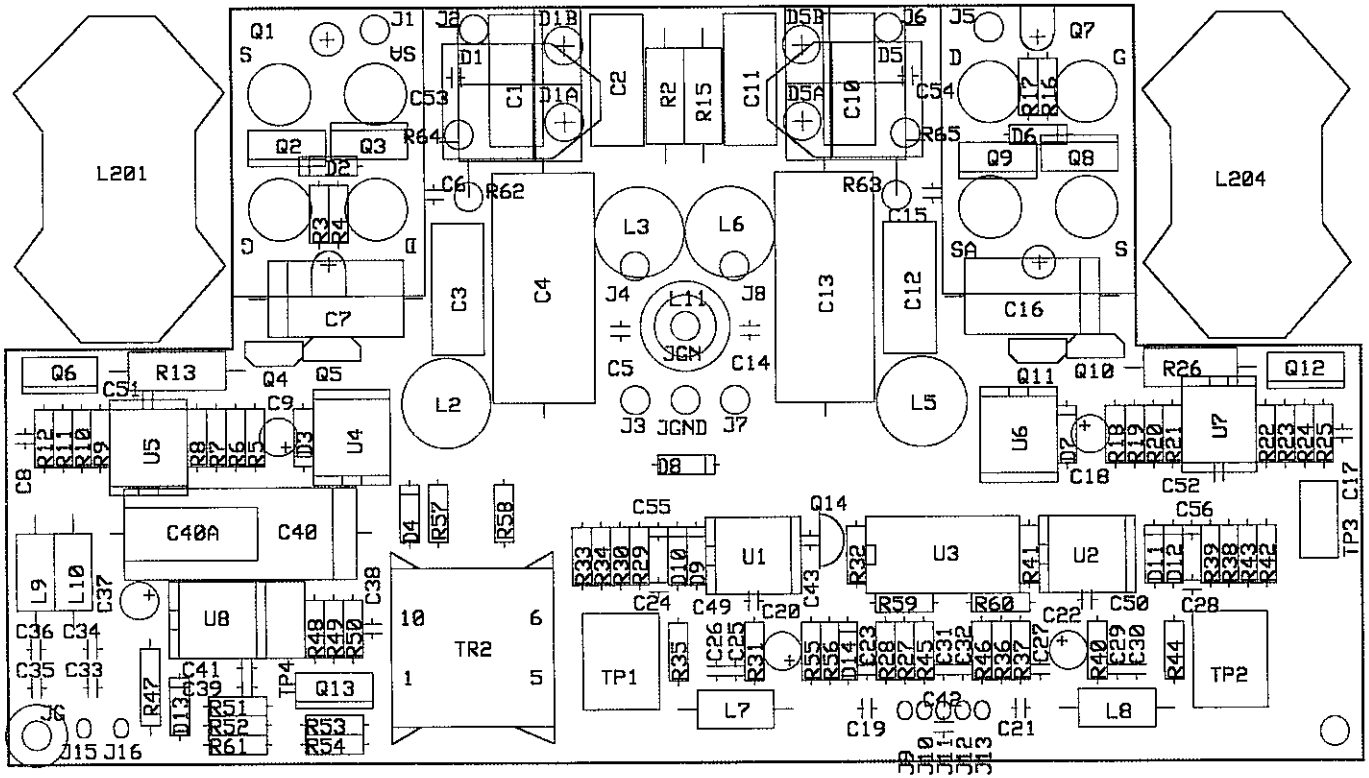
LABGRUPPEN KUNGSBACKA SWEDEN			LAB 2002 4000	DRAWING NO 4KHF	



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LABGRUPPEN KUNGSBACKA SWEDEN			LAB2002 LAB4000	DATE 99 09 18	PAGE
				DRAWING NO 4KHFR1-P	

LAB 4000
HF-AMPLIFIER
Component-list

Resistors

R1	-
R2	2,2 Ω 2W on legs
R3	4.7 Ω
R4	1 Ω 1W on legs
R5	680 Ω
R6	47 Ω
R7	2.2 kΩ 1%
R8	22 kΩ
R9	820 Ω
R10	47 Ω
R11	2.2 kΩ 1%
R12	4.7 kΩ 1%
R13	15 Ω 6W on legs
R14	-
R15	2,2 Ω 2W on legs
R16	4.7 Ω
R17	1 Ω 1W on legs
R18	680 Ω
R19	47 Ω
R20	2.2 kΩ 1%
R21	22 kΩ
R22	820 Ω
R23	47 Ω
R24	1.8 kΩ 1%
R25	4.7 kΩ 1%
R26	15 Ω 6W on legs
R27	1,5 kΩ 1%
R28	1.8 kΩ 1%
R29	27 kΩ 1%
R30	2,2 kΩ 1%
R31	6,8 kΩ 1%
R32	4.7 kΩ
R33	330 Ω
R34	1.2 kΩ
R35	56 kΩ 1%
R36	1,5 kΩ 1%
R37	1.8 kΩ 1%
R38	2,2 kΩ 1%
R39	27 kΩ 1%
R40	6,8 kΩ 1%
R41	4.7 kΩ 1%
R42	330 Ω
R43	1.2 kΩ
R44	56 kΩ 1%
R45	2.2 kΩ 1%
R46	2.2 kΩ 1%
R47	1,2 kΩ 3W
R48	12 kΩ
R49	47 Ω
R50	27 Ω 1% on legs
R51	1 kΩ 1%
R52	1 kΩ 1%
R53	2.2 Ω
R54	2.2 Ω
R55	2.2 kΩ1%
R56	2.2 kΩ 1%
R57	1 Ω 1W on legs
R58	1 Ω 1W on legs
R59	2.2 kΩ 1%
R60	2.2 kΩ 1%
R61	120 kΩ 1%
R62	2.2 Ω 2W on legs
R63	2.2 Ω 2W on legs
R64	2.2 Ω 2W on legs
R65	2.2 Ω 2W on legs

Trim potentimeters

TP1	25 kΩ
TP2	25 kΩ
TP3	1 kΩ
TP4	10 kΩ

Capacitors

C1	0.33 µF 250V
C2	0.33 µF 250V
C3	0.33 µF 250V
C4	4.7 µF 160V
C5	1 µF 63V
C6	4,7 nF 200V NP0
C7	470 µF 10V
C8	0.1 µF 63V
C9	10 µF 50V
C10	0.33 µF 250V
C11	0.33 µF 250V
C12	0.33 µF 250V
C13	4.7 µF 160V
C14	1 µF 63V
C15	4,7 nF 200V NP0
C16	470 µF 10V
C17	0.1 µF 63V
C18	10 µF 50V
C19	0.1 µF 63V
C20	10 µF 50V
C21	0.1 µF 63V
C22	10 µF 50V
C23	2,2 nF 5%
C24	100 pF 5%
C25	39 pF 5%
C26	270 pF 5%
C27	2,2 nF 5%
C28	100 pF 5%
C29	39 pF 5%
C30	270 pF 5%
C31	68 pF
C32	1 nF
C33	0.1 µF 63V
C34	0.1 µF 63V
C35	0.1 µF 63V
C36	0.1 µF 63V
C37	10 µF 50V
C38	1 nF/100V/5/NP0
C39	220 pF
C40	2,2 uF 100V
C41	1 nF NP0
C42	0.1 µF 63V ker
C43	-
C44	1.5 nF feed through
C45	1.5 nF feed through
C46	1.5 nF feed through
C47	1.5 nF feed through
C48	1.5 nF feed through
C49	220 pF
C50	220 pF
C51	1 nF
C52	1 nF
C53	470 pF 200V NP0
C54	470 pF 200V NP0

Diods

D1a	BYW 81PI200
D1b	BYW 81PI200
D2	BZW 06P15B
D3	5.6V Zener 2%
D4	BYV 100-100
D5a	BYW 81PI200
D5b	BYW 81PI200
D6	BZW 06P15B
D7	5.6V Zener 2%
D8	BYV 100-100
D9	12V Zener
D10	12V Zener
D11	12V Zener
D12	12V Zener
D13	18V Zener 1.3W
D14	27V Zener

Transistors

Q1	IXFN 73N30
Q2	MTP2955V
Q3	BUZ 71
Q4	ZTX 650
Q5	ZTX 750
Q6	Tip 120
Q7	IXFN 73N30
Q8	MTP2955V
Q9	BUZ 71
Q10	ZTX 650
Q11	ZTX 750
Q12	Tip 120
Q13	IRF 730
Q14	BC 557

Integrated circuits

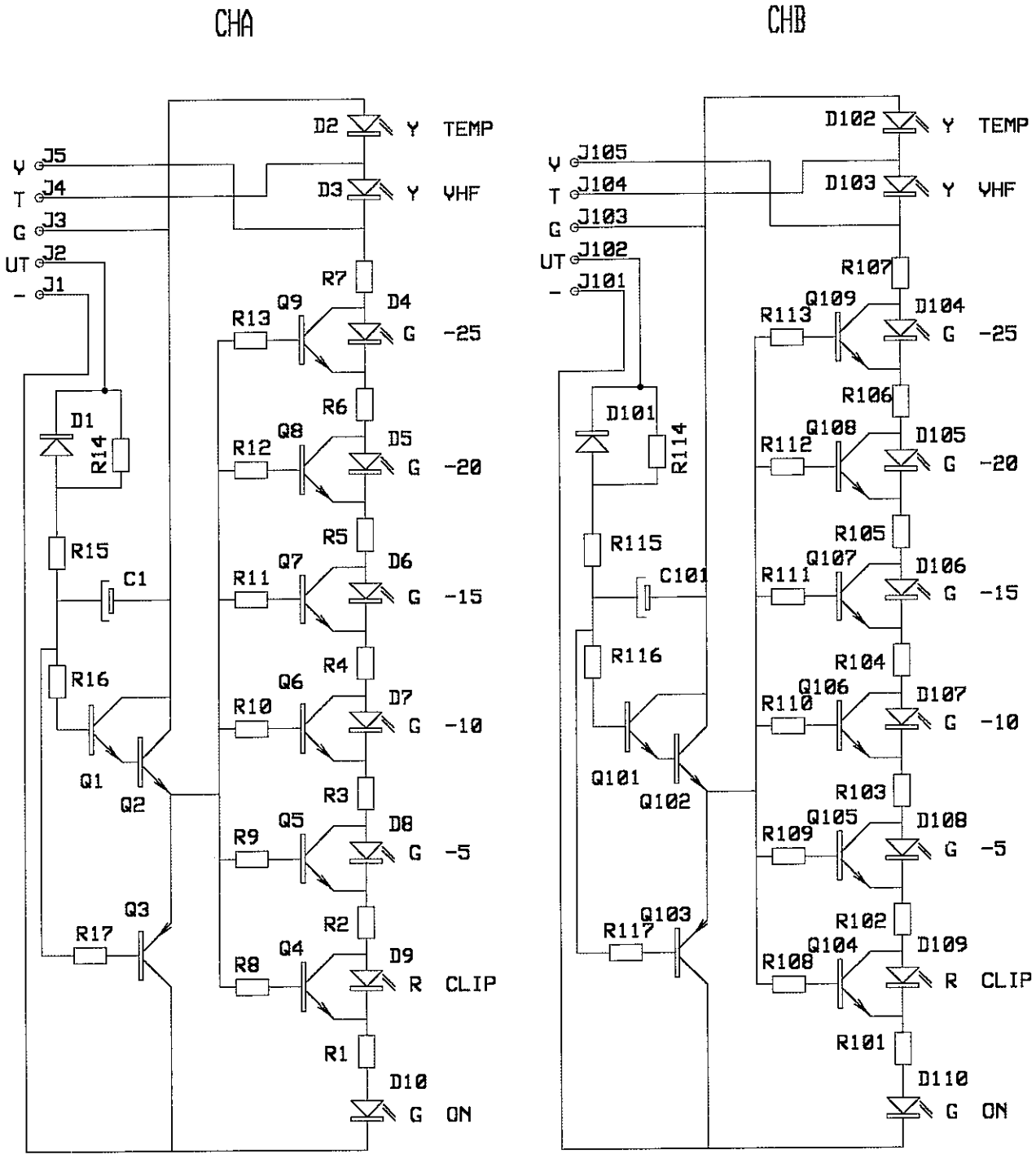
U1	LM 318
U2	LM 318
U3	LM 319
U4	HCPL 2400
U5	LM 393
U6	HCPL 2400
U7	LM 393
U8	UC 3843

Inductors

L1	14 µH
L2	1 µH
L3	1 µH
L4	14 µH
L5	1 µH
L6	1 µH
L7	47 µH
L8	47 µH
L9	47 µH
L10	47 µH
L11	1 µH

Transformers

TR1	EF20 N27



DESIGN	DRAWN	CHECKED	LED.DISPLAY	REPLACES	REPLACED BY
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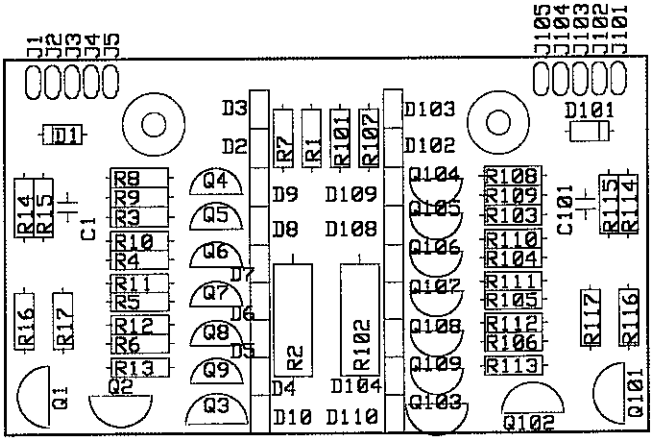
LABGRUPPEN KUNGSBACKA SWEDEN			LAB500 1000 1300 1600 2000 4000	DATE 90 12 01	PAGE
				DRAWING NO	2KLED



DESIGN	DRAWN	CHECKED	LED DISPLAY	REPLACES	REPLACED BY
K.A	K.A				
LABGRUPPEN KUNGSBACKA SWEDEN			LAB500 1000 1300 1600 2000 4000	DATE 99 09 18	PAGE
				DRAWING NO	LEDRA-P

LAB 4000
LED DISPLAY
Component-list

Channel A
(Ch. B add 100)

Resistors

R1	1,2 kΩ 1%
R2	4,7 kΩ 3W
R3	2,2kΩ 1%
R4	1,2 kΩ 1%
R5	560 Ω
R6	220 Ω
R7	390 Ω
R8	56 kΩ
R9	56 kΩ
R10	56 kΩ
R11	56 kΩ
R12	56 kΩ
R13	56 kΩ
R14	56 kΩ
R15	220 Ω
R16	2.7 kΩ
R17	2.7 kΩ

Capacitors

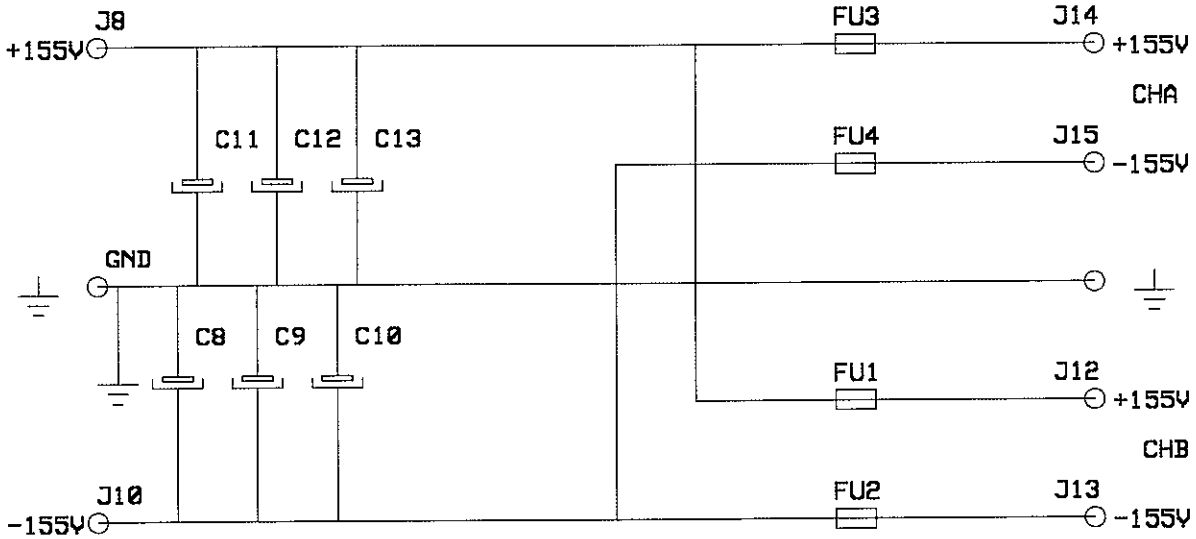
C1	2,2 µF 160V

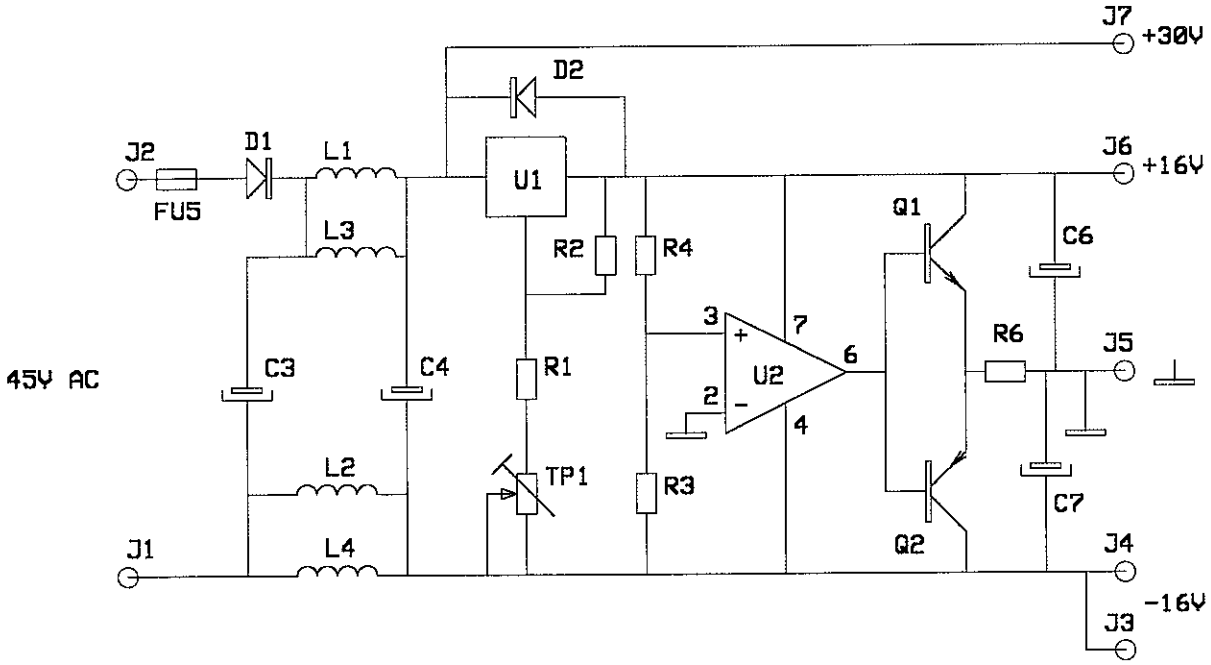
Diods

D1	1N 4004
D2	Led Y
D3	Led Y
D4	Led G
D5	Led G
D6	Led G
D7	Led G
D8	Led G
D9	Led R
D10	Led G

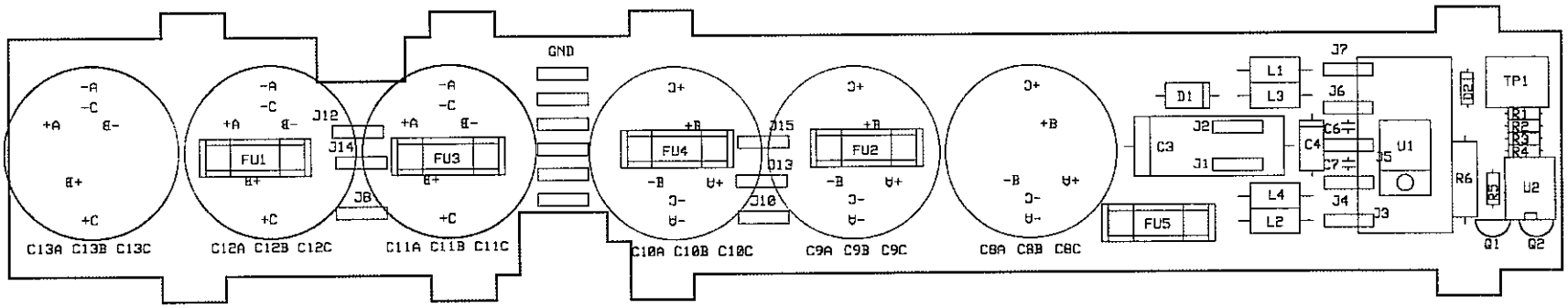
Transistors

Q1	MPSA 42
Q2	MPSA 42
Q3	MPSA 92
Q4	BC 547
Q5	BC 547
Q6	BC 547
Q7	BC 547
Q8	BC 547
Q9	BC 547





DESIGN	DRAWN	CHECKED		REPLACES	REPLACED BY
K.A	K.A		FUSE-BOARD VOLTAGESTABB.-BOARD		
LABGRUPPEN			LAB 4000	DATE 96 08 01	PAGE
KUNGSBACKA SWEDEN				DRAWING NO	4KFU



DESIGN	DRAWN	CHECKED		REPLACES	REPLACED BY
K.A	K.A		FUSE BOARD, VOLTAGE STABB. BOARD		
LABGRUPPEN KUNGSBACKA SWEDEN			LAB2000 2002 4000	DATE 99 09 18	PAGE
				DRAWING NO 2KFUC-P	

LAB 4000
FUSE, VOLTAGESTABB. BOARD
component-list

Resistors

R1	5.6 kΩ
R2	270 Ω
R3	10 kΩ 1%
R4	10 kΩ 1%
R5	1 kΩ
R6	150 Ω 3W

Trim potentiometers

TP1	2.5 kΩ

Capacitors

C1	-
C2	-
C3	470 µF 100V (ASM021)
C4	22 µF 100V (ASM021)
C5	-
C6	22 µF 50V
C7	22 µF 50V
C8	2200 µF 160V
C9	2200 µF 160V
C10	2200 µF 160V
C11	2200 µF 160V
C12	2200 µF 160V
C13	2200 µF 160V

Diods

D1	BYW 98-200
D2	1N 4004

Transistors

Q1	BC 337
Q2	BC 327

Integrated circuits

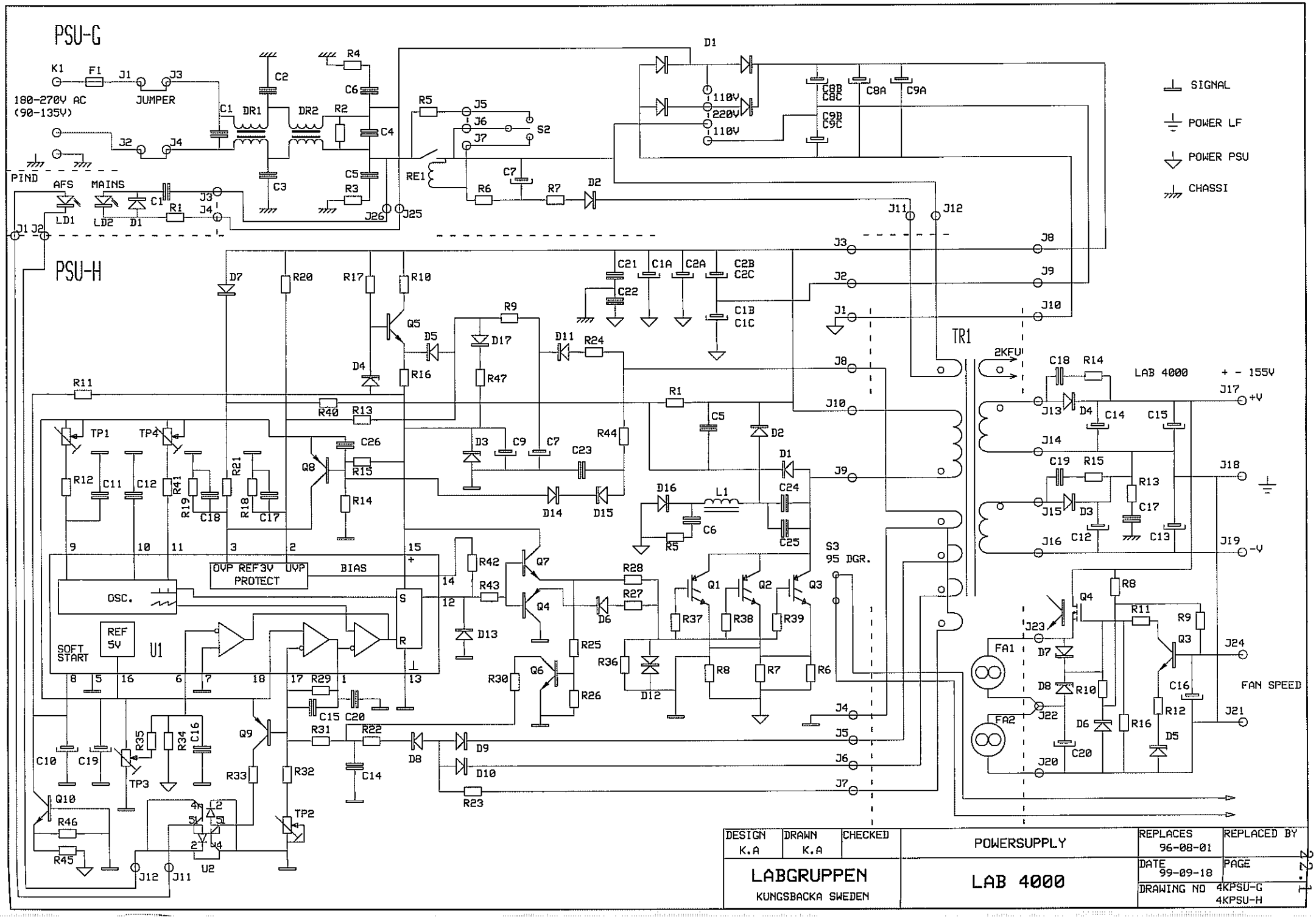
U1	LM 317
U2	uA 741

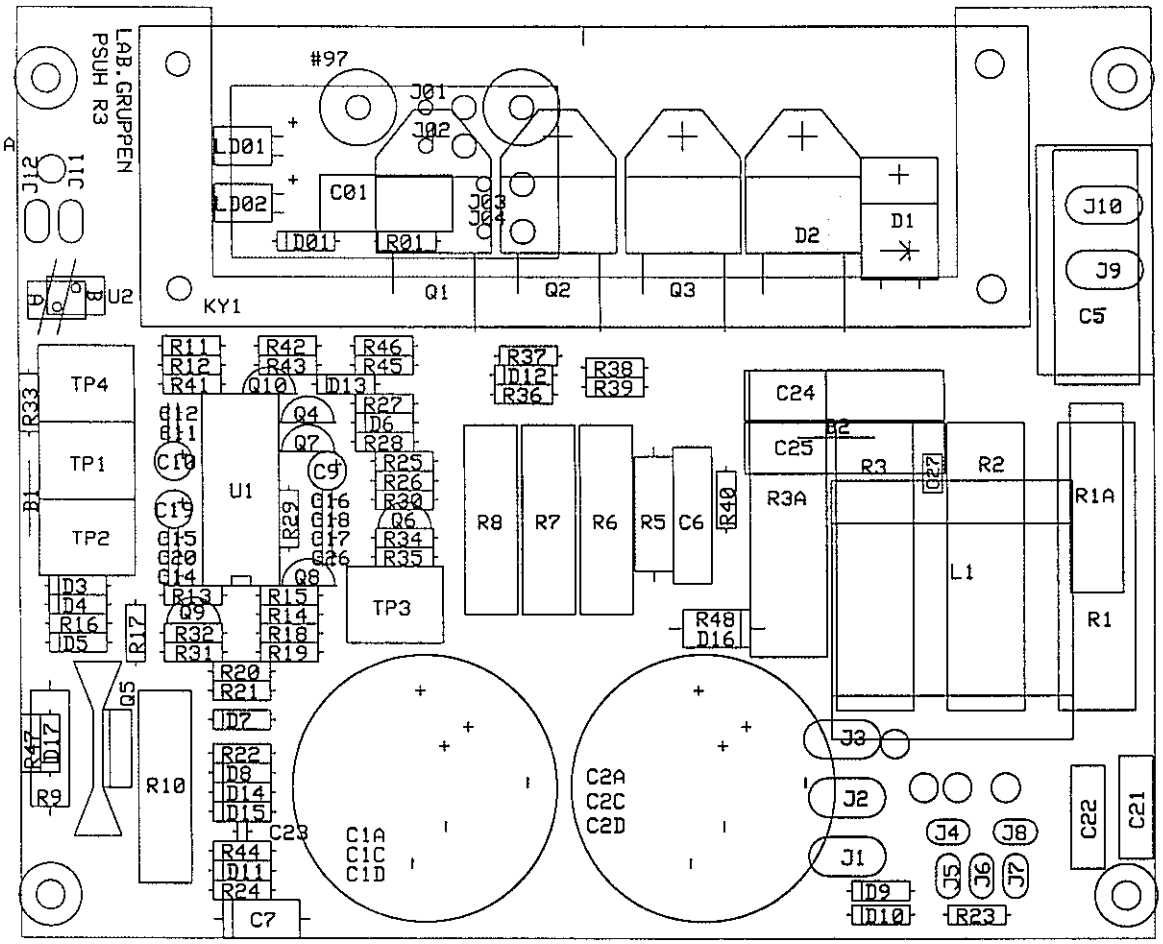
Fuses

FU1	F 15A
FU2	F 15A
FU3	F 15A
FU4	F 15A

Inductors

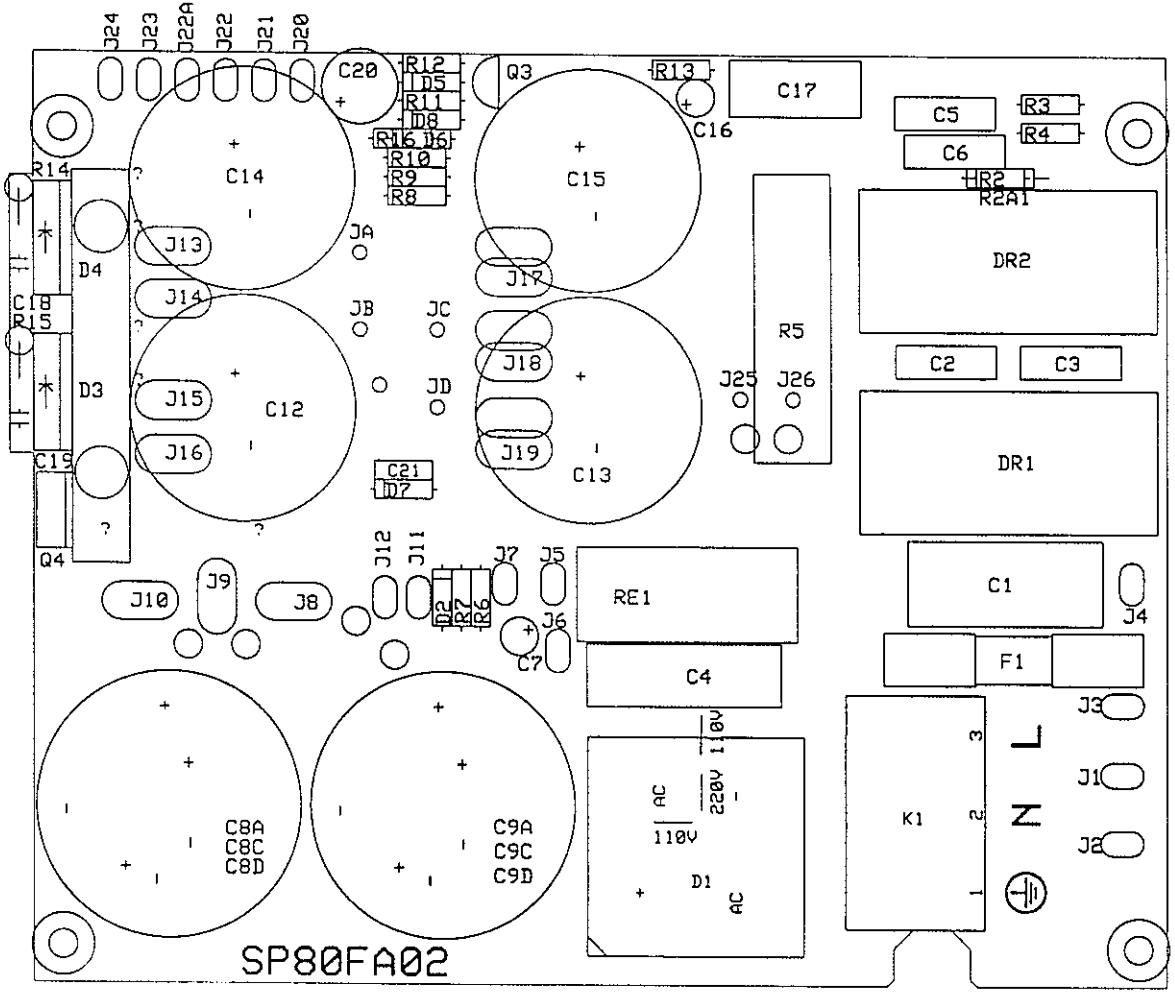
L1	47 µH
L2	47 µH
L3	47 µH
L4	47 µH


PSU-G
PSU-H
SIGNAL
POWER LF
POWER PSU
CHASSI
180-270V AC
(90-135V)
JUMPER
PIND
AFS
MAINS
LD1
LD2
110V
220V
TR1
2KFU
LAB 4000
+ - 155V
+V
-V
OVP REF3V UVP
PROTECT
BIAS
OSC.
SOFT
START
REF
5V
U1
S3
95 DGR.
FA1
FA2
FAN SPEED
TP1
TP2
TP3
TP4
DESIGN
K.A
DRAWN
K.A
CHECKED
LABGRUPPEN
KUNGSBACKA SWEDEN
POWERSUPPLY
LAB 4000
REPLACES
96-08-01
REPLACED BY
DATE
99-09-18
PAGE
DRAWING NO
4KPSU-G
4KPSU-H



DESIGN	DRAWN	CHECKED	POWER SUPPLY H	REPLACES	REPLACED BY
K.A	K.A			99 09 18	
LABGRUPPEN KUNGSBACKA SWEDEN			LAB 1200 1300 1600 2000C 2002 4000 PSU48	DATE 00 03 02	PAGE
				DRAWING NO PSUHR3-P	

23.1.1



4 rectangles in milling type 1 = hole plated

DESIGN	DRAWN	CHECKED	POWER SUPPLY SP80FA	REPLACES	REPLACED BY
K.A	K.A			01 04 13	
LABGRUPPEN KUNGSBACKA SWEDEN			LAB 1200 1300 1600 2000C 2002 4000 PSU48	DATE 01 05 04	PAGE
				DRAWING NO	SP80FA02-P

23.1.2

POWER SUPPLY, BOARD PSUG
component-list

Resistors

R1-	
R2	1 MΩ 1%
R3	33 Ω
R4	33 Ω
R5#	47 Ω 9W
R6	33 Ω
R7	2.2 Ω 1W
R8	See below
R9	See below
R10	See below
R11	See below
R12	See below
R13	4.7 Ω
R14	See below
R15	See below
R16	See below

Capacitors

C1	0.47uF
C2#	1.5 nF Y
C3#	1.5 nF Y
C4	0.22uF
C5#	1.5 nF Y
C6#	1.5 nF Y
C7	100uF 50V
C8a#	See below
C9a#	See below
C12	See below
C13	See below
C14	See below
C15	See below
C16	22uF 16V
C17	2.2uF 63V
C18	See below
C19	See below
C20	See below
C21	See below

Diods

D1	600V 35A
D2	BYW26C
D3	STTB3006PI
D4	STTB3006PI
D5	5.6V Zener
D6	See below
D7	See below
D8	See below

Transistors

Q3	BC 546
Q4	See below

Relays

RE1	FEME MZF 0014816

Fuses

FU1	See below

Coils

DR1#	See below
DR2#	See below

Switches

S1#	See below
S2#	See below
S3	Comepa 4JT95 ARIUI 95°C

Relays

RE1	FEME MZF 0014816

Socket

K1	MKDSP10/3-10,16

<u># 110V AC</u>

R5	22 Ω 9W
C2	2,2 nF Y
C3	2,2 nF Y
C5	2,2 nF Y
C6	2,2 nF Y

*	**Until 9708**
Q4	BDX53F
D7	-
D8	-

POWER SUPPLY, BOARD PSUG

	LAB 1200C	LAB 1300C	LAB 1600	LAB 2000C	LAB 4000	PSU48-8
R8	4.7 kΩ 1%	Jumper	8.2 kΩ 1%	Jumper	27 kΩ 1%long leg	4,7 kΩ 1%
R9	1 MΩ	470 kΩ	150 kΩ	390 kΩ	180 kΩ 1%	470 kΩ
R10	39 kΩ 1%	4.7 kΩ 1%long leg	39 kΩ 1%	47 kΩ 1%	39 kΩ 1%	10 kΩ 1%
R11	18 kΩ 1%	1.8 kΩ	18 kΩ 1%	6.8 kΩ	18 kΩ 1%	4,7 kΩ 1%
R12	4.7 kΩ 1%	Jumper	4.7 kΩ	1.8 kΩ	4.7 kΩ 1%	Jumper
R14	2.2 Ω 2W	-	2.2 Ω 2W	-	-	-
R15	2.2 Ω 2W	-	2.2 Ω 2W	-	-	-
R16	-	18 kΩ 1%	-	39 kΩ 1%	-	-
C8a	220uF 385V	220uF 385V	220uF 385V	220uF 385V		220uF 385V
C9a	220uF 385V	220uF 385V	220uF 385V	220uF 385V		220uF 385V
C8b	-	-	-	-	1500 uF 200V	-
C9b	-	-	-	-	1500 uF 200V	-
C12	3900 uF 100V	3900 uF 100V	3900 uF 100V	1800 uF 160V	1800 uF 160V	3900 uF 100V
C13	3900 uF 100V	3900 uF 100V	3900 uF 100V	1800 uF 160V	1800 uF 160V	3900 uF 100V
C14	3900 uF 100V	3900 uF 100V	3900 uF 100V	1800 uF 160V	1800 uF 160V	3900 uF 100V
C15	3900 uF 100V	3900 uF 100V	3900 uF 100V	1800 uF 160V	1800 uF 160V	3900 uF 100V
C18	4.7 nF 400V	-	4.7 nF 400V	-	-	-
C19	4.7 nF 400V	-	4.7 nF 400V	-	-	-
C20	100 uF 50V	100 uF 50V	100 uF 50V	100 uF 50V	100 uF 50V	-
C21	-	-	-	680 pF/400V	680 pF/400V	-
D6	62 V ±2% Zener	-	62 V ±2% Zener	-	62 V ±2% Zener	27V Zener
D7	-	-	-	15V Zener	15V Zener	-
D8	-	-	-	39V ±2% Zener	39V ±2% Zener	-
Q4	TIP132	TIP41	TIP132	*IRF730	*IRF730	BDX53F
F1	T10AH250V	T8AH250V	T10AH250V	T10AH250V	T15AH250V	T10AH250V
DR1	2.7mH 8A 220V	2.7mH 8A 220V	2.7mH 8A 220V	2.7mH 8A 220V	1.4mH 16A 110V	2.7mH 8A 220V
DR2	2.7mH 8A 220V	2.7mH 8A 220V	2.7mH 8A 220V	2.7mH 8A 220V	1.4mH 16A 110V	2.7mH 8A 220V
S1	8550VB	8550VB	8550VB	8550VB	Jumper	8550VB
S2	-	-	-	-	H8610VBBB	-
B1	JB-JC, D1,2	-	-	-	-	-
B2	-	-	-	-	-	JA-JB, D1,2
B3	-	-	-	-	-	JC-JD, D1,2
B4	J5-J6	J5-J6	J5-J6	J5-J6	-	J5-J6
B5#	Rectifier 220V	Rectifier 220V	Rectifier 220V	Rectifier 220V	Rectifier 220V	Rectifier 220V

 # 110V

C8b#	1500 uF 200V	1500 uF 200V	1500 uF 200V	1500 uF 200V	-	1500 uF 200V
C9b#	1500 uF 200V	1500 uF 200V	1500 uF 200V	1500 uF 200V	-	1500 uF 200V
C8d#	-	-	-	-	2200 uF 200V	-
C9d#	-	-	-	-	2200 uF 200V	-
F1#	T20A	T20A	T20A	T20A	T30A	T20A
DR1#	1.4mH16A110V	1.4mH16A110V	1.4mH16A110V	1.4mH16A110V	1.4mH25A110V	1.4mH16A110V
DR2#	1.4mH25A110V	1.4mH16A110V	1.4mH16A110V	1.4mH16A110V	1.4mH25A110V	1.4mH16A110V
S1	Jumper	Jumper	Jumper	Jumper	Jumper	Jumper
S2#	H8610VBBB	H8610VBBB	H8610VBBB	H8610VBBB	H8610VBBB	H8610VBBB
B5	Rectifier 110V	Rectifier 110V	Rectifier 110V	Rectifier 110V	Rectifier 110V	Rectifier 110V
B6	Rectifier 110V	Rectifier 110V	Rectifier 110V	Rectifier 110V	Rectifier 110V	Rectifier 110V

POWER SUPPLY, BOARD PSUH

component-list

Resistors

R1	See below
R2	See below
R3	See below
R4	-
R5	See below
R6	0.1 Ω 4W
R7	0.1 Ω 4W
R8	0.1 Ω 4W
R9	See below
R10	4.7 kΩ 5W
R11	680 kΩ 5%
R12	33 kΩ 1%
R13	100 kΩ 1%
R14	10 kΩ 1%
R15	18 kΩ 1%
R16	180 Ω 1%
R17	120 kΩ 2W
R18#	8.2 kΩ 1% (110V see below)
R19	See below
R20	432 kΩ 1% highvolt
R21	750 kΩ 1%
R22	4.7 Ω
R23	See below
R24	4.7 Ω
R25	15 kΩ 1%
R26	1 kΩ 1%
R27	See below
R28	82 Ω
R29	4.7 MΩ
R30	See below
R31	220 kΩ 1%
R32	See below
R33	See below
R34	See below
R35	See below
R36	15 kΩ 1%
R37	See below
R38	See below
R39	See below
R40	See below
R41	18 kΩ 1%
R42*	-
R43*	Jumper
R44	See below
R45	See below
R46	See below
R47	See below
R48	See Below

Capacitors

C1a#	See below
C2a#	See below
C5	0.68 uF 250V
C6	-
C7	10 uF 63V
C8	-
C9	10 uF 50V
C10	22 uF 50V
C11*	470 pF NPO
C12	1 nF
C13	-
C14	10 nF
C15	See below
C16	330 pF
C17	-
C18	1 nF
C19	10 uF 50V
C20	-
C21#	1.5 nF Y
C22#	1.5 nF Y
C23	1 nF
C24	See below
C25	See below
C26	1 nF
C27	See Below

Diods

D1	BYT 12PI 1000
D2	See below
D3	15V 1.3W Zener
D4	5.6V 0.4W Zener
D5	1N 4148
D6	BYW 26C
D7	1N 4004
D8	1N 4148
D9	1N 4148
D10	1N 4148
D11	BYW 26C
D12	BZW 06P15B
D13	BAT 85
D14	1N 4148
D15	See below
D16	See below
D17	See below

Trim potentiometers

TP1	10 kΩ
TP2	25 kΩ
TP3	10 kΩ
TP4*	15 kΩ Resistor

Integrated circuits

U1	UC 3851 alt. UC 3841
U2	See below

Transistors

Q1	See below
Q2	See below
Q3	See below
Q4	BC 327
Q5	TIP 50
Q6	BC 547
Q7*	Jumper b-e
Q8	BC 557
Q9	See below
Q10	See below

Switches

S2	Temp switch 95°

Inductors

L1	See below

Jumpers

B1	See below
B2	See below

 # 110V

C1b	See below
C2b	See below
C21	2,2nF Y
C22	2,2nF Y
R18	10kΩ 1%

*** UC3841**

R42	4.7 kΩ
R43	82 Ω
TP4	10 kΩ
C11	1 nF
Q7	BC 337

POWER SUPPLY, BOARD PSUH

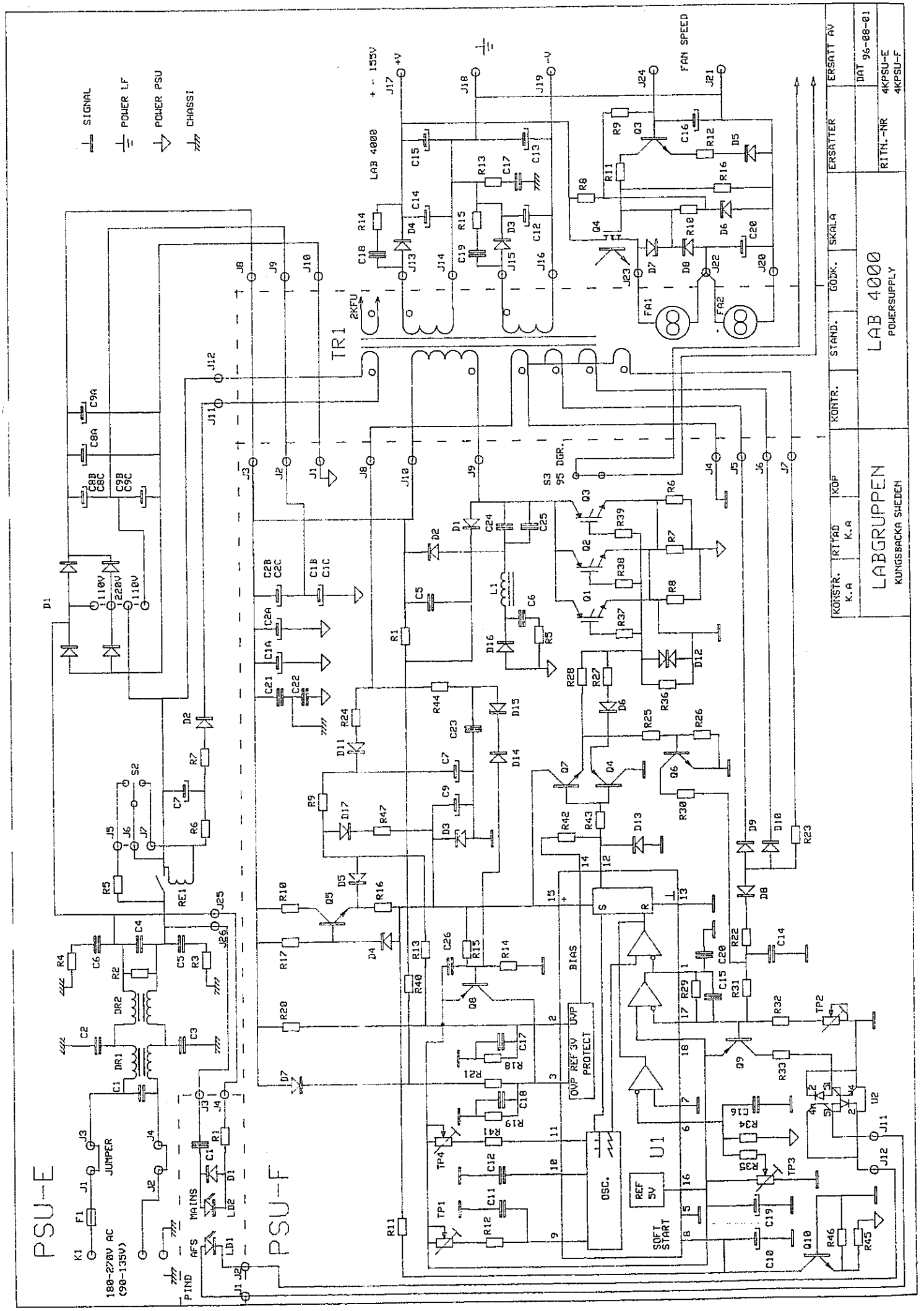
	LAB 1200C	LAB 1300C	LAB 1600	LAB 2000C	LAB 4000	PSU 48-8
R1	18 kΩ 9W	18 kΩ 9W	18 kΩ 9W	18 kΩ 9W	33 kΩ 9W	18 kΩ 9W
R2	18 kΩ 9W	18 kΩ 9W	18 kΩ 9W	18 kΩ 9W	-	18 kΩ 9W
R3	18 kΩ 9W	18 kΩ 9W	18 kΩ 9W	18 kΩ 9W	-	18 kΩ 9W
R5	-	-	-	-	330 Ω 2W	-
R9	1.5 kΩ 2W	1.5 kΩ 2W	1.5 kΩ 2W	1.5 kΩ 2W	1 kΩ 3W	1.5 kΩ 2W
R19	5.62 kΩ 1%	5.62 kΩ 1%	5.62 kΩ 1%	5.62 kΩ 1%	5.9 kΩ 1%	5.62 kΩ 1%
R23	8,2 kΩ 1%	6.8 kΩ 1%	6.8 kΩ 1%	6.8 kΩ 1%	6.8 kΩ 1%	10 kΩ 1%
R27	4.7 Ω	4.7 Ω	4.7 Ω	4.7 Ω	jumper	4.7 Ω
R30	56 kΩ 1%	56 kΩ 1%	56 kΩ 1%	56 kΩ 1%	180 kΩ 1%	56 kΩ 1%
R32	133 kΩ 1%	88.7 kΩ 1%	169 kΩ 1%	88.7 kΩ 1%	88.7 kΩ 1%	
R33	270 kΩ 1%	-	330 kΩ 1%	-	1 kΩ 1%	-
R34	2,2 kΩ 1%	2,0 kΩ 1%	2,2 kΩ 1%	2,2 kΩ 1%	2,4 kΩ 1%	
R35	4.7 kΩ 1%	4.7 kΩ 1%	4.7 kΩ 1%	4.7 kΩ 1%	3,3 kΩ 1%	4.7 kΩ 1%
R37	4.7 Ω	4.7 Ω	4.7 Ω	4.7 Ω	2.2 Ω	
R38	4.7 Ω	4.7 Ω	4.7 Ω	4.7 Ω	2.2 Ω	4.7 Ω
R39	4.7 Ω	4.7 Ω	4.7 Ω	4.7 Ω	2.2 Ω	4.7 Ω
R40	1 MΩ 1%	1 MΩ 1%	1 MΩ 1%	1 MΩ 1%	1,2 MΩ 1%	1 MΩ 1%
R44	470 Ω	470 Ω	470 Ω	470 Ω	560 Ω	470 Ω
R45	-	-	-	-	698 Ω 1%	-
R46	-	-	-	-	196 Ω 1%	-
R47	-	-	-	-	820 Ω	-
R48	2,2Ω 2W	2,2Ω 2W	2,2Ω 2W	2,2Ω 2W	-	2,2Ω 2W
C1a#	220 uF 385V	220 uF 385V	220 uF 385V	220 uF 385V		220 uF 385V
C2a#	220 uF 385V	220 uF 385V	220 uF 385V	220 uF 385V		220 uF 385V
C1b#	-	-	-	-	1500 uF 200V	-
C2b#	-	-	-	-	1500 uF 200V	-
C6	-	-	-	-	1 nF 1.5 kV	-
C15	330 pF	330 pF	330 pF	330 pF	330 pF	1 nF
C24	-	-	-	-	22 nF 1kV	-
C25	-	-	-	-	22 nF 1kV	-
C27	100pF/1600V	100pF/1600V	100pF/1600V	100pF/1600V	-	100pF/1600V
D2	-	-	-	-	STTA 1512PI	-
D15	43V 2% Zener	43V 2% Zener	39V 2% Zener	43V 2% Zener	43V 2% Zener	30V 2% Zener
D16	-	-	-	-	BYM 26E	-
D17	-	-	-	-	1N4148	-
Q1	BUP 307	BUP 307	BUP 307	BUP 307	BUP 314S	BUP 307
Q2	BUP 307	BUP 307	BUP 307	BUP 307	BUP 314S	
Q3	BUP 307	BUP 307	BUP 307	BUP 307	BUP 314S	
Q9	Jumper b-c	-	Jumper b-c	-	BC557	-
Q10	-	-	-	-	BC547	-
U2	PC 113	-	PC 113	-	Jumper 1-5	PC 113
U2	-	-	-	-	Jumper 2-4	-
L1	-	-	-	-	400 uH LAB	-
B1	-	-	-	-	-	jumper
B2	-	-	-	-	-	jumper
# 110V						
C1b#	1500 uF 200V	1500 uF 200V	1500 uF 200V	1500 uF 200V	-	1500 uF 200V
C2b#	1500 uF 200V	1500 uF 200V	1500 uF 200V	1500 uF 200V	-	1500 uF 200V
C1d#	-	-	-	-	2200 uF 200V	-
C2d#	-	-	-	-	2200 uF 200V	-
R18	10 kΩ 1%	10 kΩ 1%	10 kΩ 1%	10 kΩ 1%		
AFS IND.						
R01	-	-	-	-	4,7 kΩ 1%	
C01	-	-	-	-	0,1uF 400V	
D01	-	-	-	-	1N4148	-
LD01	-	-	-	-	green 2,5x5mm	red 2,5x5mm
LD02	-	-	-	-	red 2,5x5mm	green 2,5x5mm

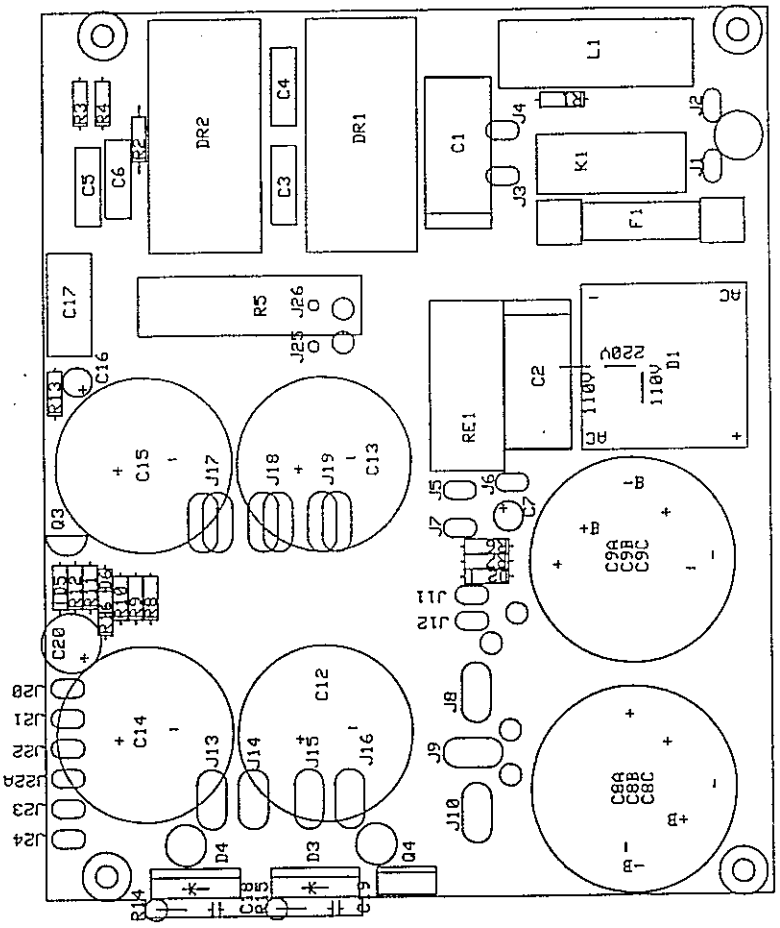
LAB.GRUPPEN

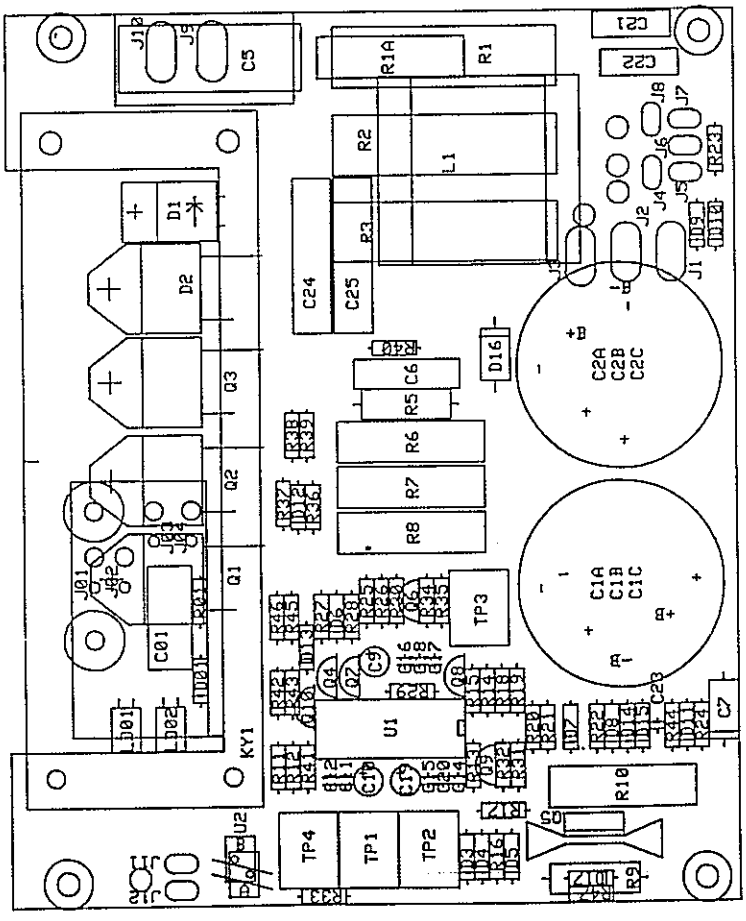
Old versions
Lab 4000

OLD VERSIONS

PAGE	CONTENTS	DRAWING SCHEMATIC	DRAWING LAYOUT
22-25	POWER SUPPLY FROM SERIAL NO. 960-901 TO 981-225	2KPSU-E	2KPSUE-P
		2KPSU-F	2KPSUF-P


SIGNAL
POWER LF
POWER PSU
CHASSI
LAB 4000
+ - 15SV
+V
-V
FAN SPEED
TR1
2KFU
FA1
FA2
S3 95 DGR.
LAB 4000
POWERSUPPLY
LABGRUPPEN
KUNGSBACKA SWEDEN
KONSTR. K.A
RITAD K.A
KOP
KONTR.
STAND.
GODK.
SKALA
ERSATTER
ERSATT AV
DAT 96-08-01
RITN.-NR 4KPSU-E 4KPSU-F
PSU-E
PSU-F
180-270V AC (90-135V)
JUMPER
MAINS
AFS
PIND
U1
OSC.
REF 5V
SOFT START
BIAS
OVP REF 3V UVP PROTECT





KONSTR.	RITAD	KOP	KONTR.	STAND.	GODK.	SKALA	ERSÄTTER	ERSATT AV
K.A	K.A							DAT 96 08 28

LABGRUPPEN
KUNGSBACKA SWEDEN

LAB 4000
POWERSUPPLY

RITN.-NR 4KPSUE-P 4KPSUF-P

LAB 4000
POWER SUPPLY, BOARD PSUE AND AFS IND. BOARD
component-list

PSU E

Resistors

R1-	
R2	1 MΩ 1%
R3	33 Ω
R4	33 Ω
R5#	47 Ω 9W
R6	33 Ω
R7	2.2 Ω 1W
R8	27 kΩ 1% on legs
R9	180 kΩ 1%
R10	39 kΩ 1%
R11	18 kΩ 1%
R12	4,7 kΩ 1%
R13	4.7 Ω
R14	-
R15	-
R16	-

Capacitors

C1	0.47 µF
C2#	1.5 nF Y
C3#	1.5 nF Y
C4	0.22 µF
C5#	1.5 nF Y
C6#	1.5 nF Y
C7	100 µF 50V
C8b#	1500 µF 200V
C9b#	1500 µF 200V
C12	1800 µF 160V
C13	1800 µF 160V
C14	1800 µF 160V
C15	1800 µF 160V
C16	22 µF 16V
C17	2.2 µF 63V
C18	-
C19	-
C20	100 µF 50V

Diods

D1	600V 35A
D2	BYW26C
D3	BYT30PI600
D4	BYT30PI600
D5	5.6V Zener
D6	62 V ±2% Zener
D7*	15v Zener
D8*	39V ±2% Zener

Fuses

F1#	T15AH250V

Transistors

Q3	BC 546
Q4*	IRF730

Coils

DR1#	2.7mH 16
DR2#	2.7mH 16

Switches

S1	Jumpers
S2	Marquart 1803.0102
S3	Comepa 4JT95 ARIUI 95°C

Relays

RE1	FEME MZF 0014816

110V AC

R5	22 Ω 9W?
C2	2,2 nF Y
C3	2,2 nF Y
C5	2,2 nF Y
C6	2,2 nF Y
C8b	2200 µF 200V
C9b	2200 µF 200V
F1	T30A
DR1	2,6mH 30A
DR2	2,6mH 30A

AFS IND.

RA	4,7 kΩ 1%
CA#	0,1uF 400V
DA	Led G
DB	Led Y

110V AC

CA	0,22uF 250V

* **UNTIL 9708**

Q4	BDX53f
D7	-
D8	-

LAB 4000
POWER SUPPLY, BOARD PSUF
component-list

UC 3851

Resistors

R1	33 kΩ 9W
R2	-
R3	-
R4	-
R5	330 Ω 2W
R6	0.1 Ω 4W
R7	0.1 Ω 4W
R8	0.1 Ω 4W
R9	1 kΩ 3W
R10	4.7 kΩ 7W
R11	680 kΩ 5%
R12	33 kΩ 1%
R13	100 kΩ 1%
R14	10 kΩ 1%
R15	18 kΩ 1%
R16	180 Ω 1%
R17	120 kΩ 2W
R18	8.2 kΩ 1%
R19	5.9 kΩ 1%
R20	432 kΩ 1% highvolt
R21	750 kΩ 1%
R22	4.7 Ω
R23	6.8 kΩ 1%
R24	4.7 Ω
R25	15 kΩ
R26	1 kΩ
R27	Jumper
R28	82 Ω 5%
R29	4 7 MΩ
R30	270 kΩ 1%
R31	220 kΩ 1%
R32	88,7 kΩ 1%
R33	1 kΩ
R34	2.2 kΩ 1%
R35	~~12kΩ~~ 1% 3,3kΩ/%
R36	15 kΩ 1%
R37	2,2 Ω
R38	2,2 Ω
R39	2,2 Ω
R40	1,2 MΩ 1%
R41	18 kΩ 1%
R42*	-
R43*	Jumper
R44	560 Ω
R45	1,4 kΩ 1%
R46	390 Ω 1%
R47	820 Ω

Capacitors

C1b#	1500 µF 200V
C2b#	1500 µF 200V
C5	0.6 µF 500V
C6	1 nF 1.5 kV
C7	10 µF 63V
C8	-
C9	10 µF 50V
C10	22 µF 50V
C11*	470 pF NPO
C12	1 nF
C13	-
C14	10 nF
C15	330 pF
C16	330 pF
C17	-
C18	1 nF
C19	10 µF 50V
C20	-
C21#	1.5 nF Y
C22#	1.5 nF Y
C23	1 nF
C24	22 nF 1kV
C25	22 nF 1kV
C26	1 nF (on solderside) (from 97-08)

Diods

D1	BYT 12PI 1000
D2	STTB 1512PI
D3	15V 1.3W Zener
D4	5.6V 0.4W Zener
D5	1N 4148
D6	BYW 26C
D7	1N 4004
D8	1N 4148
D9	1N 4148
D10	1N 4148
D11	BYW 26C
D12	BZW 06P15B
D13	BAT 85
D14	1N 4148
D15	43V 2% Zener
D16	BYM 26D
D17	1N4148

Trim potentiometers

TP1	10 kΩ
TP2	25 kΩ
TP3	10 kΩ
TP4*	15 kΩ Resistor 1%

Integrated circuits

U1	UC 3851 alt. UC 3841
U2	PC 113

Transistors

Q1	BUP 314S
Q2	BUP 314S
Q3	BUP 314S
Q4	BC 327
Q5	TIP 50
Q6	BC 547
Q7*	Jumper b-e
Q8	BC 557
Q9	BC557
Q10	BC547

Inductors

L1	400uH LAB

Switches

S2	Temp switch 95°

 # 110V

C1b	2200 µF 200V
C2b	2200 µF 200V
C21	2,2nF Y
C22	2,2nF Y

*** UC3841**

R42	4.7 kΩ
R43	82 Ω
TP4	10 kΩ
C11	1 nF
Q7	BC 337