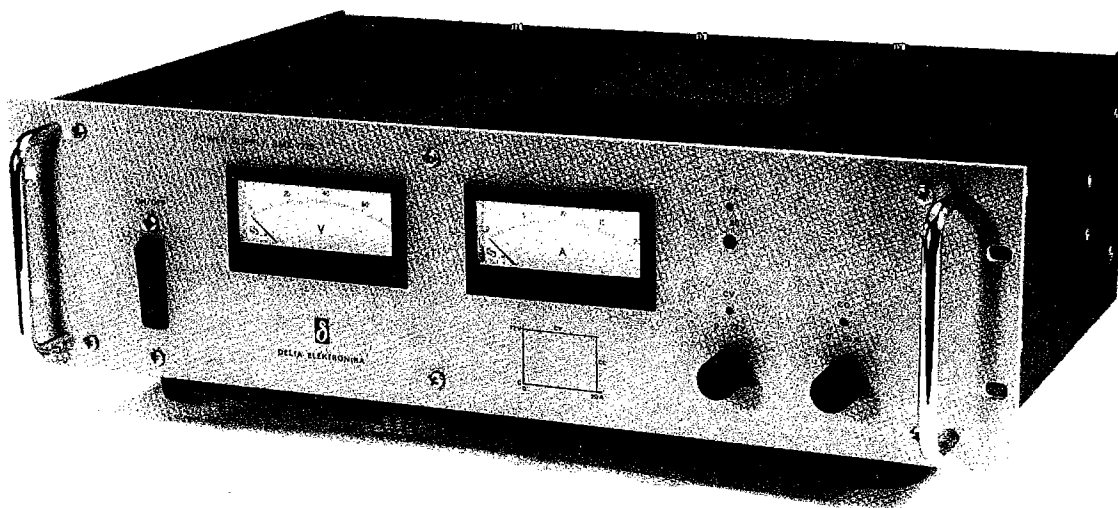


**SMX 7220**

**DELTA ELEKTRONIKA BV**



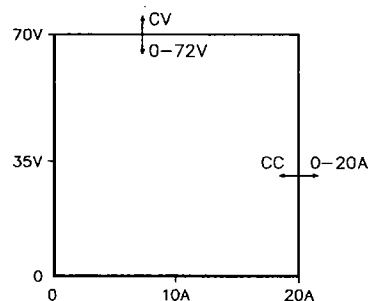
P.O. BOX 27  
4300 AA ZIERIKZEE  
NETHERLANDS  
TEL. (01110) 13656 TLX 55349  
FAX 31 1110 16919



## **SMX 7220**

**1440 W SWITCHED MODE DC POWER SUPPLY**

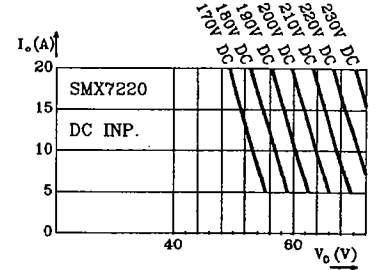
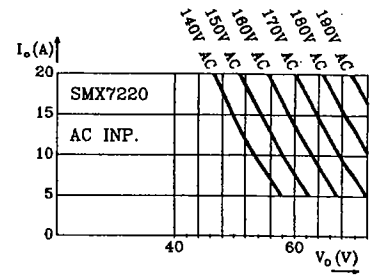
**0 - 72 V 0 - 20 A**



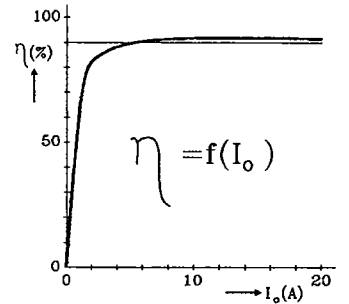
- Available with analog or digital meters. For digital meters add -D to model no.
- 100 kHz power conversion technique.
- Efficiency 91 %.
- Weight only 14.5 kgs.
- Natural convection cooling, no blower, no noise.
- Remote programming of voltage and current by analog voltages 0 - 5 V.
- Very low output ripple.
- IEEE 488 programming with external interface PSC 44M (pin compatible).
- Master / Slave parallel and series operation with equal current and voltage sharing.
- Wide input voltage range, AC and DC.
- No inrush current during switch on.
- 50 Hz choke on input to avoid low frequency distortion on the line voltage.
- Input / output insulation 3750 V rms.
- RFI suppression according to VDE 0871 B both on input and output.
- Designed for long life at full power.
- Protection against all overload and short circuit conditions.
- Modular built-up, service friendly.
- Built-in overvoltage protection
- Voltage and current control with 10 turn potentiometers, resolution 0.03 %.
- Can also be used as a DC - DC converter.

## Specifications:

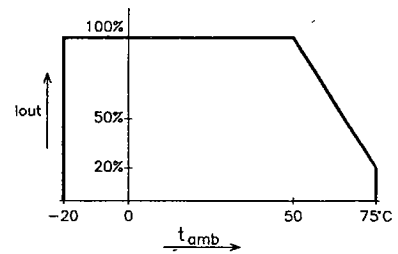
	CV	CC
Output	: 0 - 72 V	0 - 20 A
Regulation		
Load 0 - 100%	: 5 mV	15 mA
Line 198 - 265 V AC	: 5 mV	15 mA
Ripple + noise, rms/p-p	: 4 / 20 mV	4 / 12 mA
Temp. coeff., per °C	: $5 \cdot 10^{-5}$	$1.10^{-4}$
Stability during 8 hrs after 1 hr warm up	: $3 \cdot 10^{-4}$	$1.10^{-3}$
Output imp. up to 100 kHz	: 0.05 Ohm	—
Recovery time		
50 - 100% load step recovery within 50mV	: 150 $\mu$ s	—
Programming input	: 0 - 5 V	0 - 5 V
impedance	: 1 MOhm	1MOhm
Monitoring output	: 0 - 5 V	0 - 5 V
impedance	: 20 Ohm	20 Ohm
Max. programming speed	: 0 - 72 V in 60 ms	
OVP trip range	: 7 - 80 V	
Status output CV/CC	: 5 V / 10 mA logic 1 is CC	
Status output OVP	: 5 V / 10 mA logic 1 is trip	
Input	: 198 - 265 V 50 - 60 Hz	237 - 350 V DC
Input current	: 9.3 A at 220 V AC	
Insulation		
Input/Output	: 3750 Vrms (1 min.)	8mm creepage/clearance
Input/case	: 2500 Vrms (1 min.)	
Output/case	: 600 V DC	
Safety	: IEC 348 / IEC 380	
RFI suppression	: VDE 0871 B, input and output	
Operating temp.	: -20 to +50 °C	
Remote sensing	: Max. 2 V per lead	
Series operation	: Max. 600 V total voltage	
Standby input power	: Only 10W	
Thermal protection	: Output shuts down in case of insufficient cooling.	



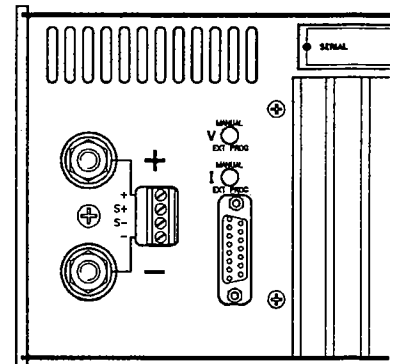
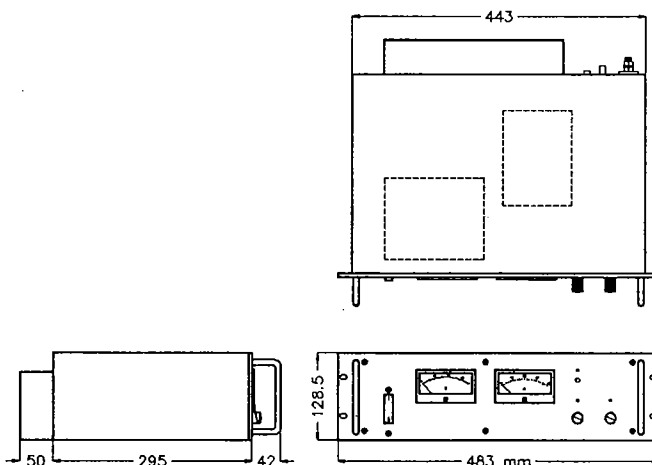
Maximum output current vs output voltage AC or DC input voltage as a parameter



Efficiency versus load current at 72 V output, DC input

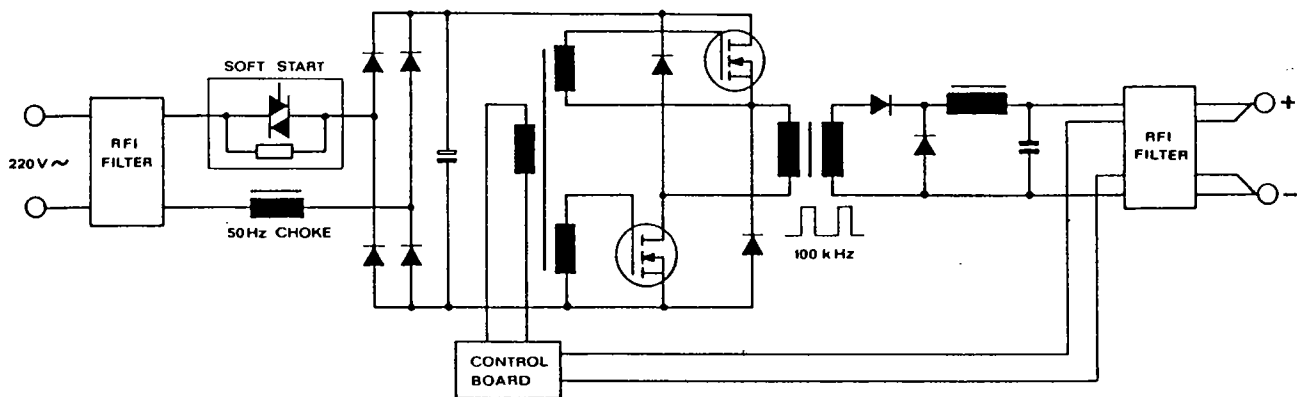


Operating temperature range



Rear panel. 15-p D connector for remote programming and master / slave operation

## Circuit description



Simplified functional diagram of **SMX 7220**

The 220V AC line voltage is rectified by a bridge rectifier and smoothed by a large electrolytic capacitor. The 50Hz choke in the input circuit improves the waveform of the input current so that no low frequency distortion is produced on the line voltage.

The high frequency interference produced inside the power supply is prevented to go to the line or the load by carefully designed RFI filters.

When the unit is switched on the large electrolytic capacitor is charged via the resistor of the SOFT START circuit so that no large inrush current will flow. As soon as the voltage is sufficiently high the power supply starts working and the series resistor is bypassed by a triac.

The use of powerfet's makes it possible to operate at 100kHz switching frequency with many advantages like small size, light weight, low ripple and fast regulation. The rectified 220V (300VDC) is chopped by the power mosfet and transformed to a lower voltage. This 100kHz power converter is of the feed forward type. The regulation is achieved by pulse width modulation.

Carefull design, overdimensioning of vital components, several built-in protections and cool operation (because of the very high efficiency) make the **SMX7220** a very reliable power supply which can continuously be used at maximum rating.

## Cooling and thermal protection

The SM3540 has natural convection cooling (no fans no noise). This means that it has to be used in horizontal position so that the air can pass freely vertically along and through the unit.

To protect the unit for overheating in case of wrong use (like covering it with something or building it in with insufficient cooling) two thermo-switches are built in which can shut down the output.

One is thermally coupled to the power fets. If it is activated all led lamps go out.

The second is thermally coupled to the high frequency power diodes of the output circuit. If it is activated the led lamp of the OVP starts burning.

## Load ripple and peak currents

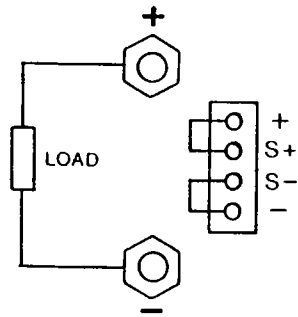
Ripple currents caused by the load at frequencies below 1 kHz are compensated by the voltage regulation.

However high load ripple currents which exceed the current limit or which have strong

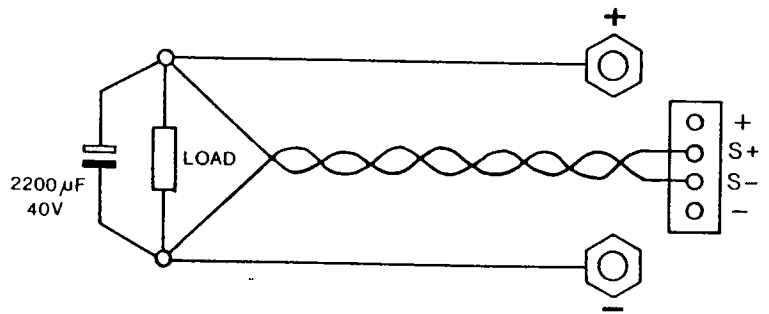
components above 1 kHz can overheat the output electrolytic capacitors. Also repetitive high peak currents, like taken by 50Hz DC-AC inverters can have this effect. If the current limit is exceeded periodically by such high ripple current the CC led lamp will start blinking. The rms value of the current should be kept below 15A

In above cases an electrolytic capacitor of 10.000 uF as buffer parallel to the load is recommended.

### Local or remote sensing



Local sensing



Remote sensing

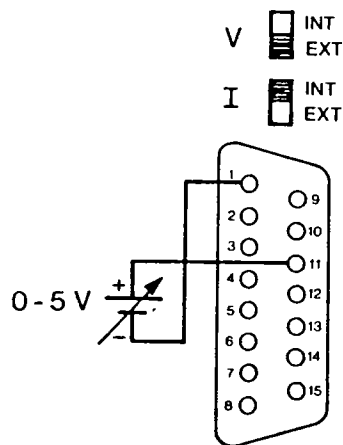
For most applications the **SMX 7220** can be used with local sensing, which means that the output voltage is kept constant at the output terminals. Local sensing is recommended because it cannot cause problems like interference or oscillating.

However if it is desirable to compensate the voltage drop over the leads to the load the point of stabilisation can be displaced from the output terminals to the load terminals by using sense leads (thin measuring wires) from S+ and S- to the + and - of the load.

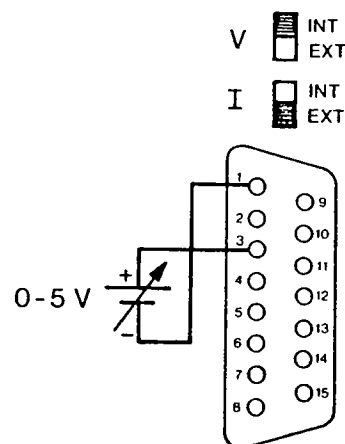
To prevent for interference and oscillations it is advisable to twist the sense leads and to connect an extra electrolytic capacitor of 2200 uF to the load terminals.

Maximum 2V can be compensated in each load lead. Of course in that case the 4V subtracts from the maximum voltage rating.

### Voltage and current programming



Voltage programming  
by 0 - 5 V



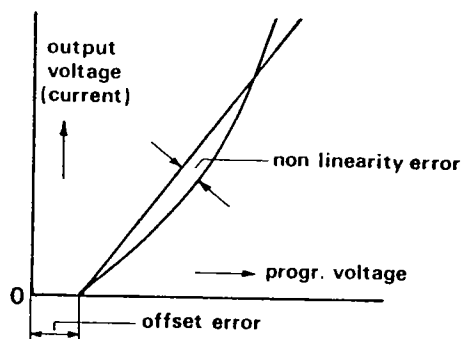
Current programming  
by 0 - 5 V

Both output voltage and current can be programmed by 0-5V. To program connect as drawn above and put the switches V and I (through the holes above the connector) in the right position (at external for programming).

The programming inputs have a very high input impedance (opamp inputs). The zero of the programming inputs (pin 1 at the 15-pole D-connector at the rear of the power supply) is internally connected (through a picofuse of 250mA) to the negative power output terminal. So when connecting one has to take care that the load current will not flow through the programming zero connection and blow the picofuse.

Our IEC625/IEEE488 controllers PSC 625 and PSC 44M have isolated (1000V) analog outputs, so in that case there is no problem.

### Programming accuracy



For the full output voltage range (or current range) the required programming input voltage is 0-5V +/- 2%.

The linearity error (not including the offset error) is maximum 0.15%.

The zero offset error is always positive and maximum 30mV for voltage- and max. 40mV for current programming.

Our IEC625/IEEE488 power supply controllers PSC625 and PSC44M have trim pots at the rear to compensate for the range tolerance and zero shift of the power supply programming inputs.

### Programming speed

The maximum programming speed at full load (0,875 Ohm) is about 600V/sec.

With other loads higher speed is possible but to avoid overheating of the output capacitors do not exceed 1000V/sec.

**Reference 0**

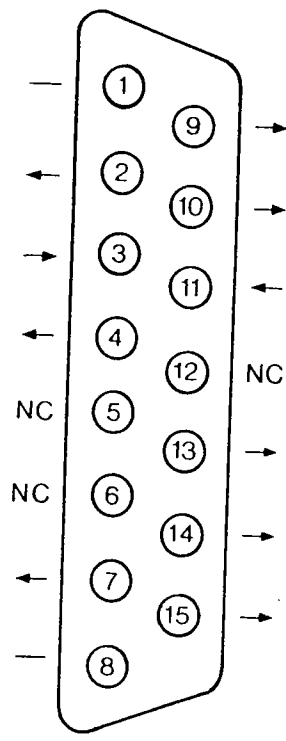
**I-monitor**, 0-5V out corresponds with zero to full output current.

**I-program**, 0-5V in corresponds with zero to full output current.

**CC-signal**, 5V out when in constant current mode, 0V when in constant voltage mode.

+ 12 V

0, return of connections 4, 7, 13



**Reference voltage** 5.1V

**V-monitor**, 0-5V out corresponds with zero to full output voltage.

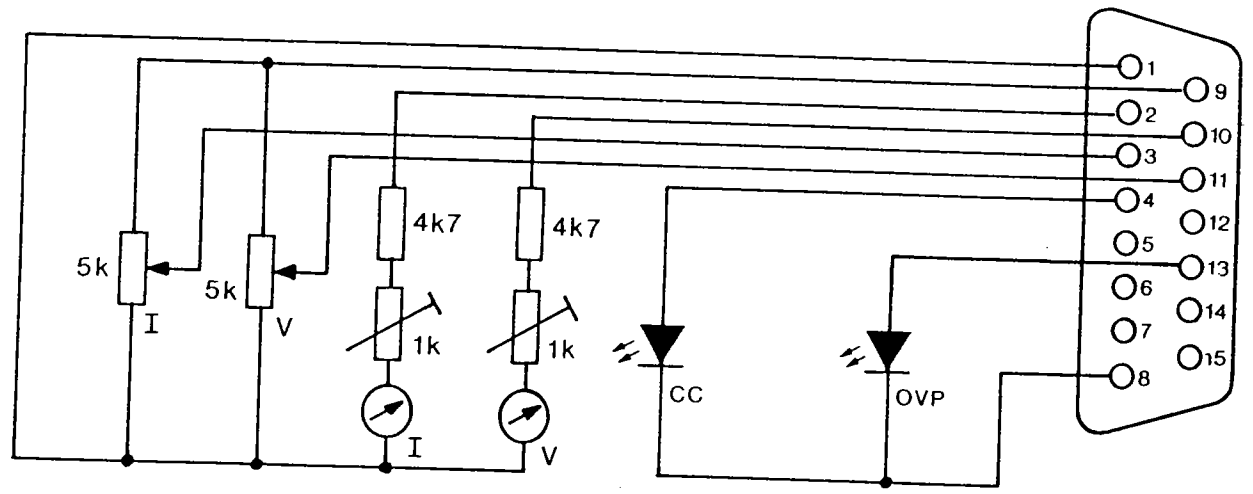
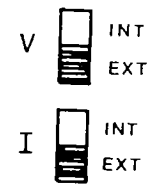
**V-program**, 0-5V in corresponds with zero to full output voltage.

**OVP-signal**, 5V out when in overvoltage protection, 0V when not.

**Series m/s 0**, to be connected to pin 1 of slave when used as master/slave in series.

**Series m/s Vp**, to be connected to pin 11 of slave when used as master/slave in series.

Connections to 15-pole D-connector



Remote control

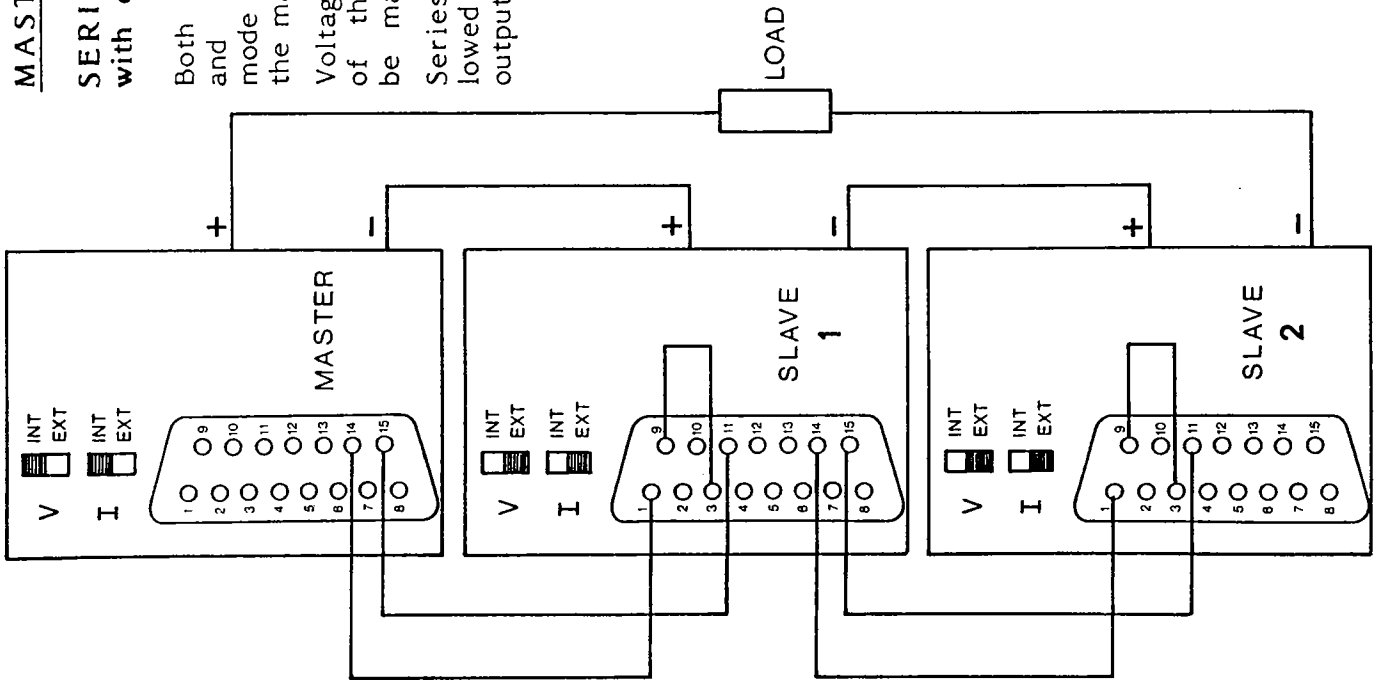
## MASTER AND SLAVE

### SERIES CONNECTION with equal voltage sharing

Both in constant voltage and in constant current mode the slaves will follow the master.

Voltage and current control of the master can either be manual or programmed.

Series connection is allowed up to 500V total output.



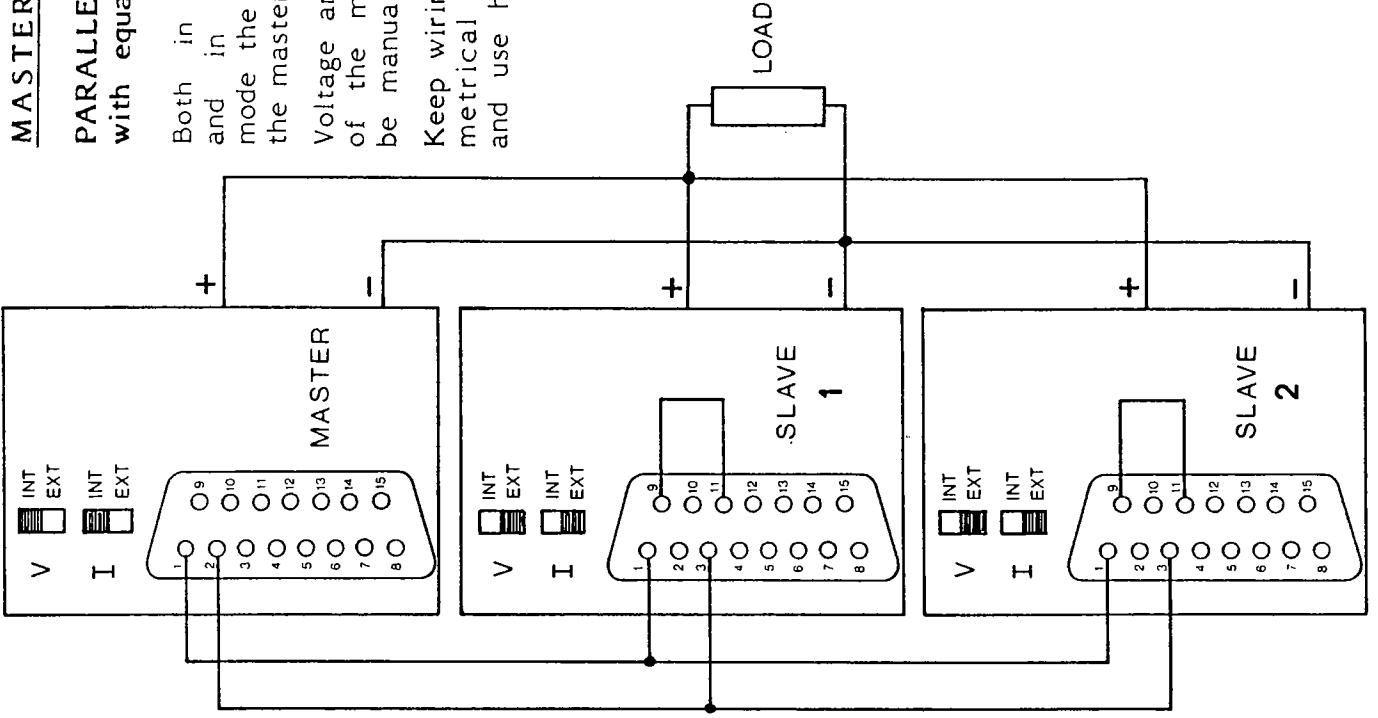
## MASTER AND SLAVE

### PARALLEL CONNECTION with equal current sharing

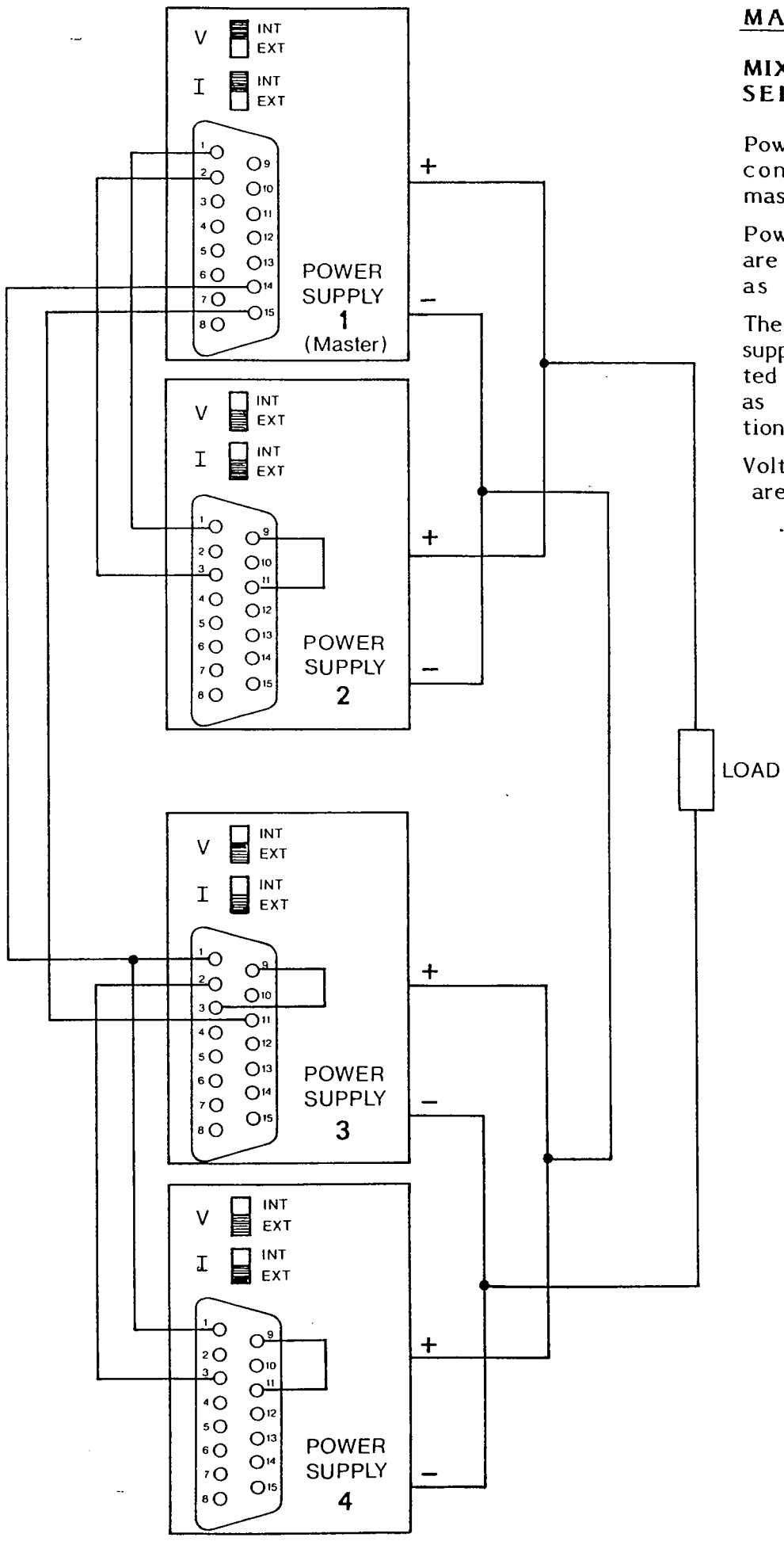
Both in constant voltage and in constant current mode the slaves will follow the master.

Voltage and current control of the master can either be manual or programmed.

Keep wiring short and symmetrical (equal lengths) and use heavy gauge wire.







MASTER AND SLAVE

**MIXED PARALLEL AND SERIES CONNECTION**

Power supply 1 and 2 are connected parallel as master and slave.

Power supply 3 and 4 are also connected parallel as master and slave.

The combination of power supply 3 and 4 is connected in series with and as slave of the combination 1 and 2.

Voltage and current control are now by power supply 1.

**MAIN SECTION**

C001	=	0.22UF 250V RMS X2	
C002	=	0.22UF 250V RMS X2	
C003	=	1UF 250V RMS X2	
C004	=	4700PF 400V RMS SAFETY	
C005	=	4700PF 400V RMS SAFETY	
C006	=	0.22UF 250V RMS X2	
C007	=	1.5UF 250V MET POLYES	
C008	=	0.22UF 250V RMS X2	
C009	=	2200UF 400V SPRAGUE	
C010	=	0.1UF 250V MET POLYES	
C011	=	0.22UF 63V MET POLYES	
C012	=	0.1UF 250V MET POLYES	
C013	=	0.22UF 63V MET POLYES	
C014	=	5100PF 1000V POLYPROP	
C015	=	1UF 400V MET POLYES	
C016	=	1UF 400V MET POLYES	
C017	=	1UF 400V MET POLYES	
C018	=	1UF 400V MET POLYES	
C019	=	22NF 630V POLYPROP	
C020	=	150PF 2000V CERAMIC	
C021	=	10PF 400V RMS SAFETY	
C022	=	10PF 400V RMS SAFETY	
C023	=	150PF 2000V CERAMIC	
C024	=	5100PF 1000V POLYPROP	
C025	=	22NF 630V POLYPROP	
C026	=	1UF 400V MET POLYES	
C027	=	1UF 400V MET POLYES	
C028	=	1UF 400V MET POLYES	
C029	=	1UF 400V MET POLYES	
C030	=	0.1UF 250V MET POLYES	
C031	=	0.1UF 250V MET POLYES	
C032	=	0.22UF 63V MET POLYES	
C033	=	0.22UF 63V MET POLYES	
C056	=	0.22UF 63V MET POLYES	
C057	=	15UF 16V SOLID ALU	
C058	=	0.22UF 63V MET POLYES	
C059	=	0.22UF 63V MET POLYES	
C060	=	47NF 250V MET POLYES	
C061	=	0.22UF 63V MET POLYES	
C062	=	10NF 1000V MET POLYES	
C063	=	1000PF 100V POLYPROP	
C064	=	10NF 250V MET POLYES	
C065	=	10NF 250V MET POLYES	
C066	=	100PF 400V CERAMIC	
C067	=	100PF 400V CERAMIC	
C068	=	15UF 16V SOLID ALU	
C069	=	15UF 16V SOLID ALU	
C070	=	100PF 400V CERAMIC	
C071	=	100PF 400V CERAMIC	
C072	=	100PF 400V CERAMIC	
C073	=	2200PF 100V CERAMIC	
C075	=	470PF 500V CERAMIC	
C076	=	22NF 250V MET POLYES	
C077	=	2.2UF 25V SOLID ALU	
C078	=	15UF 16V SOLID ALU	
C079	=	15UF 16V SOLID ALU	
C080	=	47PF 500V CERAMIC	
C081	=	1500PF 3000V CERAMIC	
C082	=	1500PF 3000V CERAMIC	
C083	=	470PF 500V CERAMIC	
C084	=	1000PF 100V POLYPROP	
C085	=	15UF 16V SOLID ALU	
C086	=	15UF 16V SOLID ALU	
C087	=	10NF 1000V MET POLYES	
C088	=	47PF 500V CERAMIC	
C089	=	15PF 500V CERAMIC	
C090	=	100PF 400V CERAMIC	
C091	=	2200PF 100V CERAMIC	
C092	=	2200PF 100V CERAMIC	
C093	=	470PF 500V CERAMIC	
C097	=	0.22UF 250V RMS X2	
C099	=	2.2UF 25V SOLID ALU	
C100	=	47UF 40V ALU	
C101	=	47UF 40V ALU	
C102	=	15PF 500V CERAMIC	
C108	=	15UF 16V SOLID ALU	
C109	=	10NF 250V MET POLYES	
C110	=	10NF 250V MET POLYES	
C111	=	10NF 250V MET POLYES	
C112	=	10NF 250V MET POLYES	
C113	=	10NF 250V MET POLYES	
C114	=	0.1UF 630V MET POLYES	
C115	=	0.1UF 630V MET POLYES	
C117	=		
C118	=		
C119	=	47NF 250V MET POLYES	
C120	=	47NF 250V MET POLYES	
C121	=	47NF 250V MET POLYES	
C122	=	47NF 250V MET POLYES	
C123	=	47NF 250V MET POLYES	
C124	=	47NF 250V MET POLYES	
C125	=	10NF 1000V MET POLYES	
C126	=	0.22UF 250V RMS X2	
C127	=	10NF 1000V MET POLYES	
C128	=	10NF 1000V MET POLYES	
C129	=	15UF 16V SOLID ALU	
C130	=	47NF 250V MET POLYES	
C131	=	10NF 1000V MET POLYES	
C132	=	10NF 1000V MET POLYES	
C133	=	2500PF 250V CERAMIC	
C134	=	10NF 1000V MET POLYES	
C200	=	22UF 200V ALU	
C201	=	22UF 200V ALU	
C202	=	22UF 200V ALU	
C203	=	22UF 200V ALU	
C204	=	0.1UF 400V MET POLYES	
C205	=	2200PF 100V POLYPROP	
C206	=	100PF 400V CERAMIC	
C207	=	10NF 500V CERAMIC	
C208	=	2200PF 100V POLYPROP	
C209	=	22UF 40V ALU	
C210	=	2200PF 100V POLYPROP	
C211	=	150PF 2000V CERAMIC	
C212	=	1000PF 100V POLYPROP	
C213	=	220UF 25V ALU	
C214	=	220UF 25V ALU	
C215	=	220UF 25V ALU	
C900	=	47NF 250V MET POLYES	
C901	=	1000PF 100V POLYPROP	
C902	=	15UF 16V SOLID ALU	
C903	=	1000PF 100V POLYPROP	
C904	=	10NF 250V MET POLYES	
C905	=	0.22UF 63V MET POLYES	
C906	=	150PF 100V POLYPROP	
C907	=	220PF 100V POLYPROP	
C908	=	2200PF 100V POLYPROP	
C909	=	15UF 16V SOLID ALU	
C910	=	47UF 25V ALU	
C911	=	1000PF 100V POLYPROP	
C912	=	22NF 250V MET POLYES	
C913	=	2.2UF 25V SOLID ALU	
C914	=	2.2UF 25V SOLID ALU	
C915	=	47NF 250V MET POLYES	
C916	=	15UF 16V SOLID ALU	
C917	=	2200PF 100V POLYPROP	
D001	=	T2513NK TAG	
D002	=	SKB25-06 SEMICRON	
D003	=	BYV26B PHILIPS	
D004	=	BYV26B PHILIPS	
D005	=	BYV26B PHILIPS	
D006	=	TZB15CB SEMICON	
D007	=	1N5818 MOTOROLA	
D008	=	TZB15CB SEMICON	
D009	=	BYV26B PHILIPS	
D010	=	BYV26B PHILIPS	
D011	=	BYV26B PHILIPS	
D012	=	BYV26B PHILIPS	
D013	=	BYT08PI400 ST	
D014	=	BYT08PI400 ST	
D015	=	BYT08PI400 ST	
D016	=	BYT08PI400 ST	
D017	=	BYT08PI400 ST	
D018	=	BYT08PI400 ST	
D019	=	BYT08PI400 ST	

D020	=	BYT08PI400	ST
D021	=	BYV26B	PHILIPS
D022	=	BYV26B	PHILIPS
D023	=	BYV26B	PHILIPS
D024	=	BYV26B	PHILIPS
D025	=	TZB15CB	SEMICON
D026	=	1N5818	MOTOROLA
D027	=	TZB15CB	SEMICON
D028	=	BYV26B	PHILIPS
D029	=	BYV26B	PHILIPS
D030	=	BYV26B	PHILIPS
D057	=	ZPD15	ITT
D058	=	1N5818	MOTOROLA
D059	=	ZPY20	ITT
D060	=	1N4148	ST
D061	=	ZPD15	ITT
D062	=	ZPY51	ITT
D063	=	1N4148	ST
D064	=	ZPY12	ITT
D065	=	1N4148	ST
D066	=	Z0104BA	TAG
D067	=	ZPY12	ITT
D068	=	1N4148	ST
D069	=	LED 3MM RED	PHILIPS
D070	=	LED 3MM RED	PHILIPS
D071	=	LED 3MM RED	PHILIPS
D072	=	ZPD8.2	ITT
D073	=	1N4148	ST
D074	=	1N4148	ST
D075	=	1N4148	ST
D076	=	1N4148	ST
D077	=	1N4148	ST
D078	=	1N4148	ST
D079	=	ZPY15	ITT
D080	=	ZPY15	ITT
D081	=	ZPD12	ITT
D082	=	ZPD8.2	ITT
D083	=	BYW93-200U	PHILIPS
D084	=	BYW93-200U	PHILIPS
D085	=	BYW93-200U	PHILIPS
D086	=	BYW93-200U	PHILIPS
D087	=	1N4148	ST
D088	=	1N4148	ST
D089	=	1N4148	ST
D090	=	1N4148	ST
D091	=	ZPD12	ITT
D092	=	ZPD8.2	ITT
D093	=	ZPY12	ITT
D094	=	ZPY12	ITT
D095	=	ZPY12	ITT
D096	=	40HF10	IR
D097	=	40HF10	IR
D200	=	SKB2-08L5A	SEMIKRON
D201	=	1N4148	ST
D202	=	1N4148	ST
D203	=	BYV26B	PHILIPS
D204	=	BYV26B	PHILIPS
D205	=	BYV26B	PHILIPS
D206	=	BYV28-200	PHILIPS
D900	=	1N4148	ST
D901	=	ZPD6.2	ITT
D902	=	ZPD10	ITT
D903	=	ZPD8.2	ITT
D904	=	1N4148	ST
D906	=	1N4148	ST
D907	=	1N4148	ST
D908	=	1N4148	ST
D909	=	1N4148	ST
D910	=	1N4148	ST
D911	=	1N4148	ST
D912	=	BYV26B	PHILIPS
D913	=	1N825A	IR
F001	=	FUSE 5X20 16T	
F002	=	FUSE 5X20 16T	
F003	=	FUSE 6X32 10FF	
F006	=	FUSE 5X20 .315F	
F200	=	FUSE PICO 0.25F	
F201	=	FUSE 5X20 1T	
IC05	=	TL431ILP	TEXAS
IC06	=	TL431ILP	TEXAS
IC07	=	TL084IN	TEXAS
IC08	=	TL084IN	TEXAS
IC09	=	OP177GP	PMI
IC10	=	REF02HP	BOURNS
IC200	=	UC3842	UNITRODE
IC900	=	HEF4046 BP	PHILIPS
IC901	=	HEF4011BD	PHILIPS
IC902	=	HEF4069UBD	PHILIPS
L001	=	L191	DELTA
L002	=	L191	DELTA
L003	=	L192	DELTA
L004	=	L193	DELTA
L005	=	L198	DELTA
L006	=	L197	DELTA
L007	=	L196	DELTA
L008	=	L195	DELTA
L009	=	L199	DELTA
L010	=	L195	DELTA
L011	=	L196	DELTA
L012	=	L198	DELTA
L013	=	L197	DELTA
L014	=	L194	DELTA
L015	=	L194	DELTA
L016	=	L208	DELTA
L017	=	15UH	SIEMENS
L018	=	L202	DELTA
L019	=	L201	DELTA
L020	=	2X TORO 14	BLUE
Q001	=	BST100	PHILIPS
Q002	=	BST70	PHILIPS
Q003	=	IRF9523	IR
Q004	=	IRF513	IR
Q005	=	BUZ67	SIEMENS
Q006	=	BUZ67	SIEMENS
Q007	=	BUZ67	SIEMENS
Q008	=	BUZ67	SIEMENS
Q009	=	BUZ67	SIEMENS
Q010	=	BUZ67	SIEMENS
Q011	=	BUZ67	SIEMENS
Q012	=	BUZ67	SIEMENS
Q013	=	IRF9523	IR
Q014	=	IRF513	IR
Q015	=	BST100	PHILIPS
Q016	=	BST70	PHILIPS
Q028	=	BS250	ITT
Q029	=	BS170	ITT
Q030	=	BST100	PHILIPS
Q031	=	BST70	PHILIPS
Q032	=	IRF513	IR
Q033	=	2N2907A	ST
Q034	=	2N2222A	ST
Q035	=	2N2222A	ST
Q036	=	2N2222A	ST
Q037	=	ESM693	ST
Q038	=	BS170	ITT
Q039	=	BS170	ITT
Q200	=	BUK444-800B	PHILIPS
Q900	=	2N2222A	ST
Q901	=	BS170	ITT
Q902	=	BS170	ITT
Q903	=	2N2907A	ST
Q904	=	2N2222A	ST
Q905	=	2N2222A	ST
Q906	=	2N2907A	ST
Q907	=	BS250	ITT
Q908	=	2N2222A	ST
Q909	=	2N2222A	ST
Q910	=	2N2907A	ST
R001	=	2.21M MF/0.25W/1600V	
R002	=	Z21L471K	IR
R003	=	100 WW/7.0W	
R004	=	120 MF/2.0W/500V	
R005	=	8.2 WW/9.0W	
R006	=	8.2 WW/9.0W	
R007	=	8.2 WW/9.0W	
R008	=	8.2 WW/9.0W	

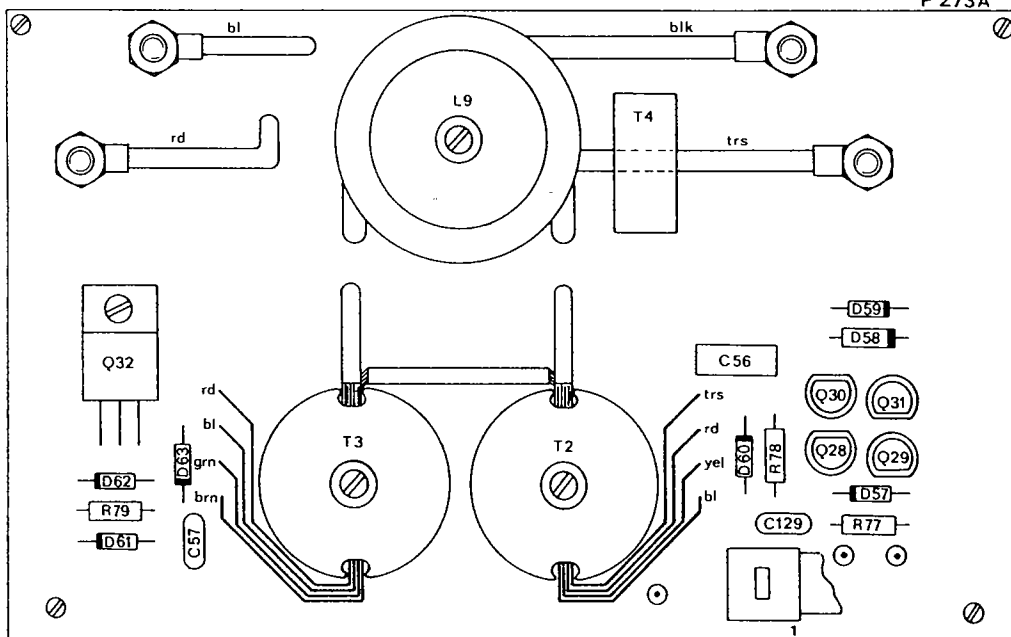
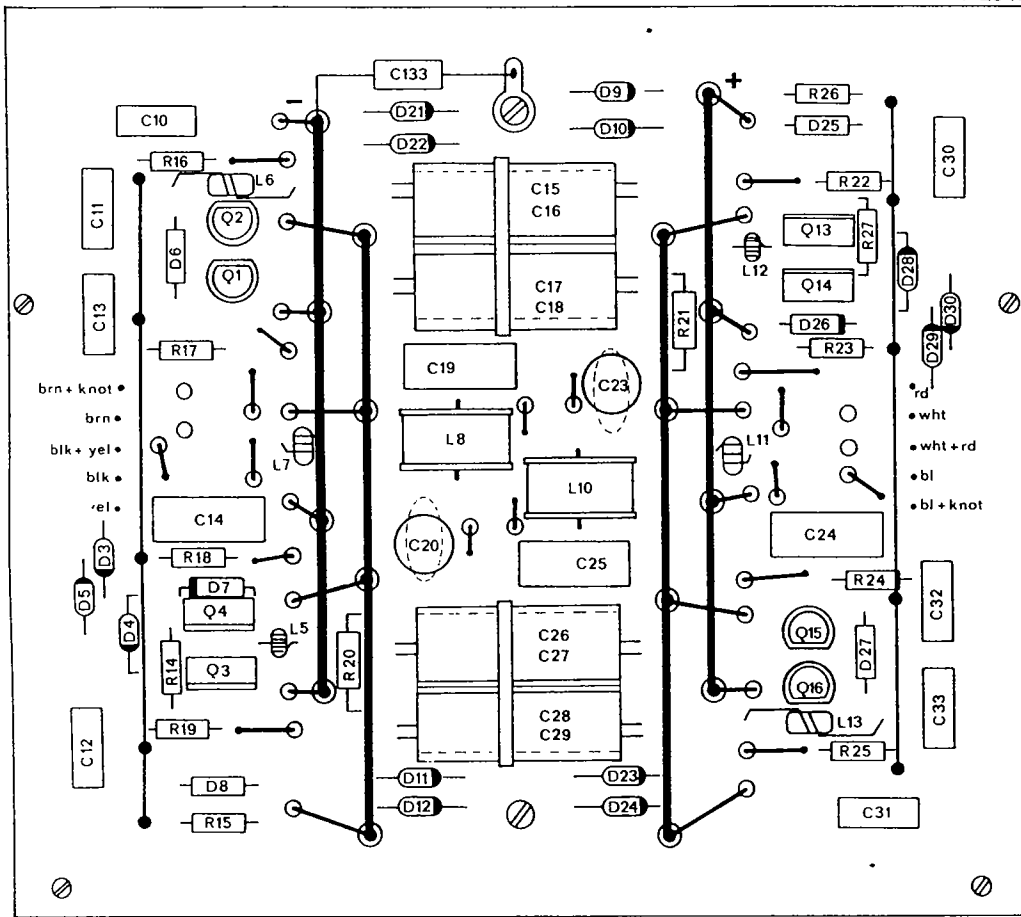
R009	=	8.2	WW/9.0W	R152	=	Z7L821	IR
R010	=	10K	MF/2.0W/500V	R153	=	5K	POTM 10 TURNS
R011	=	10K	MF/2.0W/500V	R154	=	5K	POTM 10 TURNS
R012	=	10K	MF/2.0W/500V	R155	=	26.7K	MF/0.6W/250V
R013	=	10K	MF/2.0W/500V	R157	=	1K	MF/0.6W/250V
R014	=	1K	MF/0.6W/250V	R164	=	22.1	MF/0.6W/250V
R015	=	1K	MF/0.6W/250V	R165	=	22.1	MF/0.6W/250V
R016	=	6.81	MF/0.6W/250V	R166	=	22.1	MF/0.6W/250V
R017	=	6.81	MF/0.6W/250V	R167	=	22.1	MF/0.6W/250V
R018	=	6.81	MF/0.6W/250V	R168	=	4.75K	MF/0.6W/250V
R019	=	6.81	MF/0.6W/250V	R169	=	1K	TRIMPOTM 20 TURNS
R020	=	100	MF/2.0W/500V	R170	=	4.75K	MF/0.6W/250V
R021	=	100	MF/2.0W/500V	R171	=	1K	MF/0.6W/250V
R022	=	6.81	MF/0.6W/250V	R200	=	562K	MF/0.6W/250V
R023	=	6.81	MF/0.6W/250V	R201	=	562K	MF/0.6W/250V
R024	=	6.81	MF/0.6W/250V	R202	=	1K	MF/0.6W/250V
R025	=	6.81	MF/0.6W/250V	R203	=	68.1K	MF/0.6W/250V
R026	=	1K	MF/0.6W/250V	R204	=	15K	MF/0.6W/250V
R027	=	1K	MF/0.6W/250V	R205	=	392K	MF/0.6W/250V
R077	=	10K	MF/0.6W/250V	R206	=	681K	MF/0.6W/250V
R078	=	4.75K	MF/0.6W/250V	R207	=	CR	MF/0.6W/250V
R079	=	10	MF/0.6W/250V	R208	=	8.25K	MF/0.6W/250V
R080	=	22.1	MF/0.6W/250V	R209	=	33.2K	MF/0.6W/250V
R081	=	1K	MF/0.6W/250V	R210	=	33.2K	MF/0.6W/250V
R082	=	1K	MF/0.6W/250V	R211	=	33.2K	MF/0.6W/250V
R083	=	47.5	MF/0.6W/250V	R212	=	33.2K	MF/0.6W/250V
R084	=	22.1	MF/0.6W/250V	R213	=	6.81	MF/0.6W/250V
R085	=	2.21K	MF/0.6W/250V	R214	=	475	MF/0.6W/250V
R086	=	22.1	MF/0.6W/250V	R215	=	3.92	MF/0.6W/250V
R087	=	475	MF/0.6W/250V	R216	=	10K	MF/0.6W/250V
R088	=	1K	MF/0.6W/250V	R217	=	221	MF/0.6W/250V
R089	=	1K	MF/0.6W/250V	R218	=	2.2K	MF/2.0W/500V
R090	=	10K	MF/0.6W/250V	R219	=	2.2K	MF/2.0W/500V
R091	=	2.21K	MF/0.6W/250V	R220	=	2.2K	MF/2.0W/500V
R092	=	150	MF/0.6W/250V	R900	=	100	MF/0.6W/250V
R093	=	681	MF/0.6W/250V	R901	=	332	MF/0.6W/250V
R094	=	475	MF/0.6W/250V	R902	=	332	MF/0.6W/250V
R096	=	267	MF/0.6W/250V	R903	=	56.2K	MF/0.6W/250V
R097	=	332	MF/0.6W/250V	R904	=	CR	MF/0.6W/250V
R098	=	2.21K	MF/0.6W/250V	R905	=	10K	MF/0.6W/250V
R099	=	2.21K	MF/0.6W/250V	R906	=	12.1K	MF/0.6W/250V
R100	=	2.21K	MF/0.6W/250V	R907	=	12.1K	MF/0.6W/250V
R101	=	18.2K	MF/0.6W/250V	R908	=	10K	MF/0.6W/250V
R102	=	18.2K	MF/0.6W/250V	R909	=	10K	MF/0.6W/250V
R103	=	82.5K	MF/0.6W/250V	R910	=	10K	MF/0.6W/250V
R104	=	6.81K	MF/0.6W/250V	R911	=	10K	MF/0.6W/250V
R105	=	6.81K	MF/0.6W/250V	R912	=	10K	MF/0.6W/250V
R106	=	2.21M	MF/0.25W/1600V	R913	=	825	MF/0.6W/250V
R107	=	4.75K	MF/0.6W/250V	R914	=	1K	MF/0.6W/250V
R108	=	4.75K	MF/0.6W/250V	R915	=	1.82K	MF/0.6W/250V
R109	=	4.75K	MF/0.6W/250V	R916	=	3.32K	MF/0.6W/250V
R110	=	4.75K	MF/0.6W/250V	R917	=	18.2	MF/0.6W/250V
R111	=	4.75K	MF/0.6W/250V	R918	=	6.81K	MF/0.6W/250V
R112	=	4.75K	MF/0.6W/250V	R919	=	1K	MF/0.6W/250V
R117	=	681	MF/0.6W/250V	R920	=	1K	MF/0.6W/250V
R118	=	10K	TRIMPOTM 20 TURNS	R921	=	3.32K	MF/0.6W/250V
R119	=	3.32K	MF/0.6W/250V	R922	=	3.32K	MF/0.6W/250V
R120	=	10K	MF/0.6W/250V	R923	=	100	MF/0.6W/250V
R121	=	100K	MF/0.6W/250V	R924	=	10K	MF/0.6W/250V
R122	=	1K	MF/0.6W/250V	R925	=	3.32K	MF/0.6W/250V
R123	=	68	MF/2.5W/500V	R926	=	100	MF/0.6W/250V
R124	=	68	MF/2.5W/500V	R927	=	10K	MF/0.6W/250V
R125	=	68	MF/2.5W/500V	R928	=	18.2	MF/0.6W/250V
R126	=	68	MF/2.5W/500V	R929	=	12.1K	MF/0.6W/250V
R127	=	10K	TRIMPOTM 20 TURNS	R930	=	2.21K	MF/0.6W/250V
R128	=	100K	MF/0.6W/250V	R931	=	1K	MF/0.6W/250V
R129	=	100K	MF/0.6W/250V	R932	=	1K	MF/0.6W/250V
R132	=	825	MF/0.6W/250V	R933	=	12.1	MF/0.6W/250V
R133	=	68.1	MF/0.6W/250V	R934	=	10K	MF/0.6W/250V
R134	=	825	MF/0.6W/250V	R935	=	56.2K	MF/0.6W/250V
R135	=	68.1	MF/0.6W/250V	R936	=	100	MF/0.6W/250V
R136	=	100K	MF/0.6W/250V	T001	=	T204	DELTA
R137	=	4.75K	MF/0.6W/250V	T002	=	T206	DELTA
R138	=	4.75K	MF/0.6W/250V	T003	=	T205	DELTA
R142	=	2.21M	MF/0.25W/1600V	T004	=	PE 51687	P.ENG.
R143	=	10K	MF/0.6W/250V	T200	=	XT239	DELTA
R144	=	1.0	MF/0.6W/250V				
R150	=	475	MF/0.6W/250V				
R151	=	1K	MF/0.6W/250V				

**ONLY FOR SM3540**

C074	=	4700PF 63V	POLYPROP
C094	=	820UF 50V	SPRAGUE
C095	=	820UF 50V	SPRAGUE
C096	=	820UF 50V	SPRAGUE
C098	=	4700PF 63V	POLYPROP
C103	=	820UF 50V	SPRAGUE
C104	=	820UF 50V	SPRAGUE
C105	=	820UF 50V	SPRAGUE
C106	=	820UF 50V	SPRAGUE
C107	=	820UF 50V	SPRAGUE
C116	=	4.7UF 63V	MET POLYES
R095	=	5K	POTM 10 TURNS
R113	=	475	MF/0.6W/250V
R114	=	22.1K	MF/0.6W/250V
R115	=	3.92K	MF/0.6W/250V
R116	=	82.5K	MF/0.6W/250V
R130	=	680	WW/9.0W
R131	=	680	WW/9.0W
R139	=	100K	MF/0.6W/250V
R140	=	2.74K	MF/0.6W/250V
R141	=	SHUNT	40A/50MV
R145	=	3.32K	MF/0.6W/250V
R146	=	3.32K	MF/0.6W/250V
R147	=	3.32K	MF/0.6W/250V
R148	=	3.32K	MF/0.6W/250V
R149	=	2.74K	MF/0.6W/250V
R158	=	5.62K	MF/0.6W/250V
R159	=	6.81K	MF/0.6W/250V
R160	=	1K	MF/0.6W/250V
R161	=	47.5K	MF/0.6W/250V
R162	=	8.25K	MF/0.6W/250V
R163	=	82.5K	MF/0.6W/250V

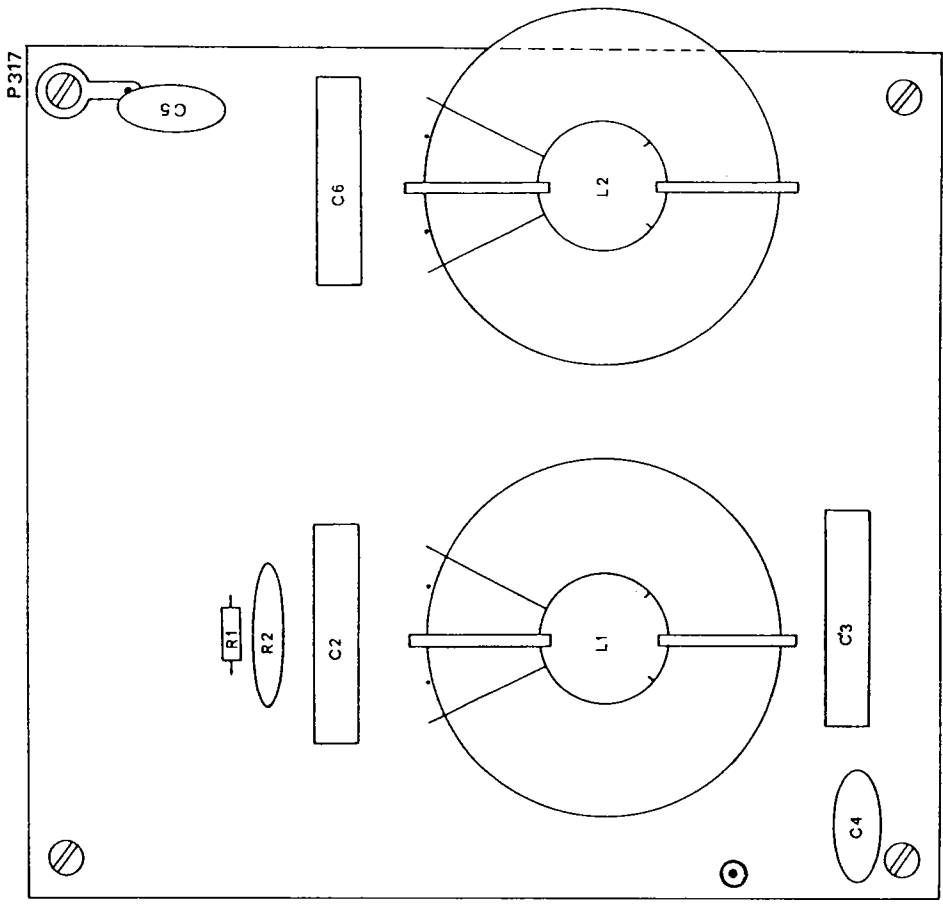
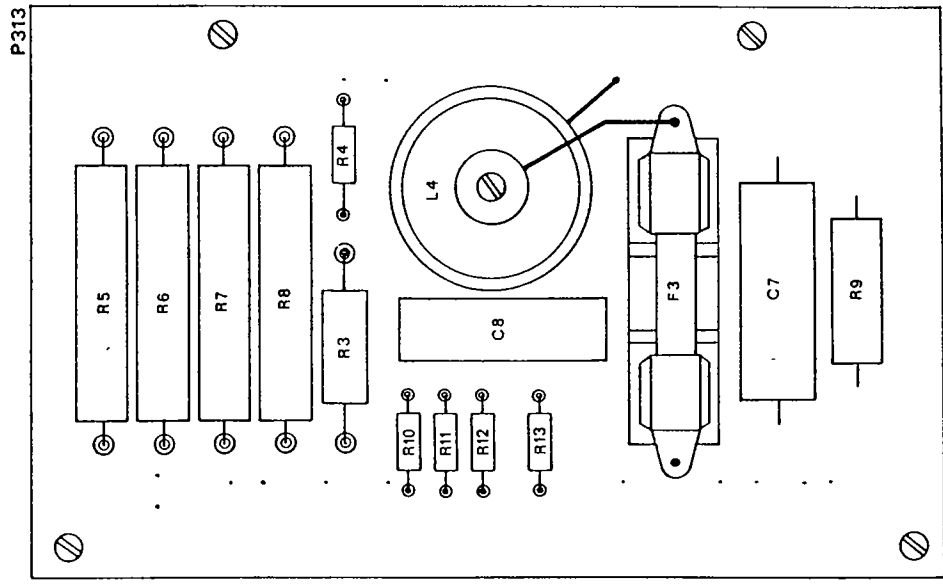
**ONLY FOR SMX7220**

C074	=	2500PF 250V	CERAMIC
C094	=	220UF 100V	SPRAGUE
C095	=	220UF 100V	SPRAGUE
C096	=	220UF 100V	SPRAGUE
C098	=	2500PF 250V	CERAMIC
C103	=	220UF 100V	SPRAGUE
C104	=	220UF 100V	SPRAGUE
C105	=	220UF 100V	SPRAGUE
C106	=	220UF 100V	SPRAGUE
C107	=	220UF 100V	SPRAGUE
C116	=	3.3UF 100V	MET POLYES
R095	=	10K	POTM 10 TURNS
R113	=	475	MF/0.6W/250V
R114	=	68.1K	MF/0.6W/250V
R115	=	5.62K	MF/0.6W/250V
R116	=	56.2K	MF/0.6W/250V
R130	=	2.7K	WW/7.0W
R131	=	2.7K	WW/7.0W
R139	=	100K	MF/0.6W/250V
R140	=	2.74K	MF/0.6W/250V
R141	=	SHUNT	20A/50MV
R145	=	8.25K	MF/0.6W/250V
R146	=	8.25K	MF/0.6W/250V
R147	=	6.81K	MF/0.6W/250V
R148	=	6.81K	MF/0.6W/250V
R149	=	5.62K	MF/0.6W/250V
R158	=	12.1K	MF/0.6W/250V
R159	=	12.1K	MF/0.6W/250V
R160	=	2.21K	MF/0.6W/250V
R161	=	68.1K	MF/0.6W/250V
R162	=	6.81K	MF/0.6W/250V
R163	=	22.1K	MF/0.6W/250V



P284B (C20, C23)	8-88	Vr.	Title: <b>SMX 7220</b>
Q1, 2, 15, 16, 30, 31.	5-87	Vr.	Date: 1-'85
Modifications	Date	App.	<b>delta elektronika bv</b>

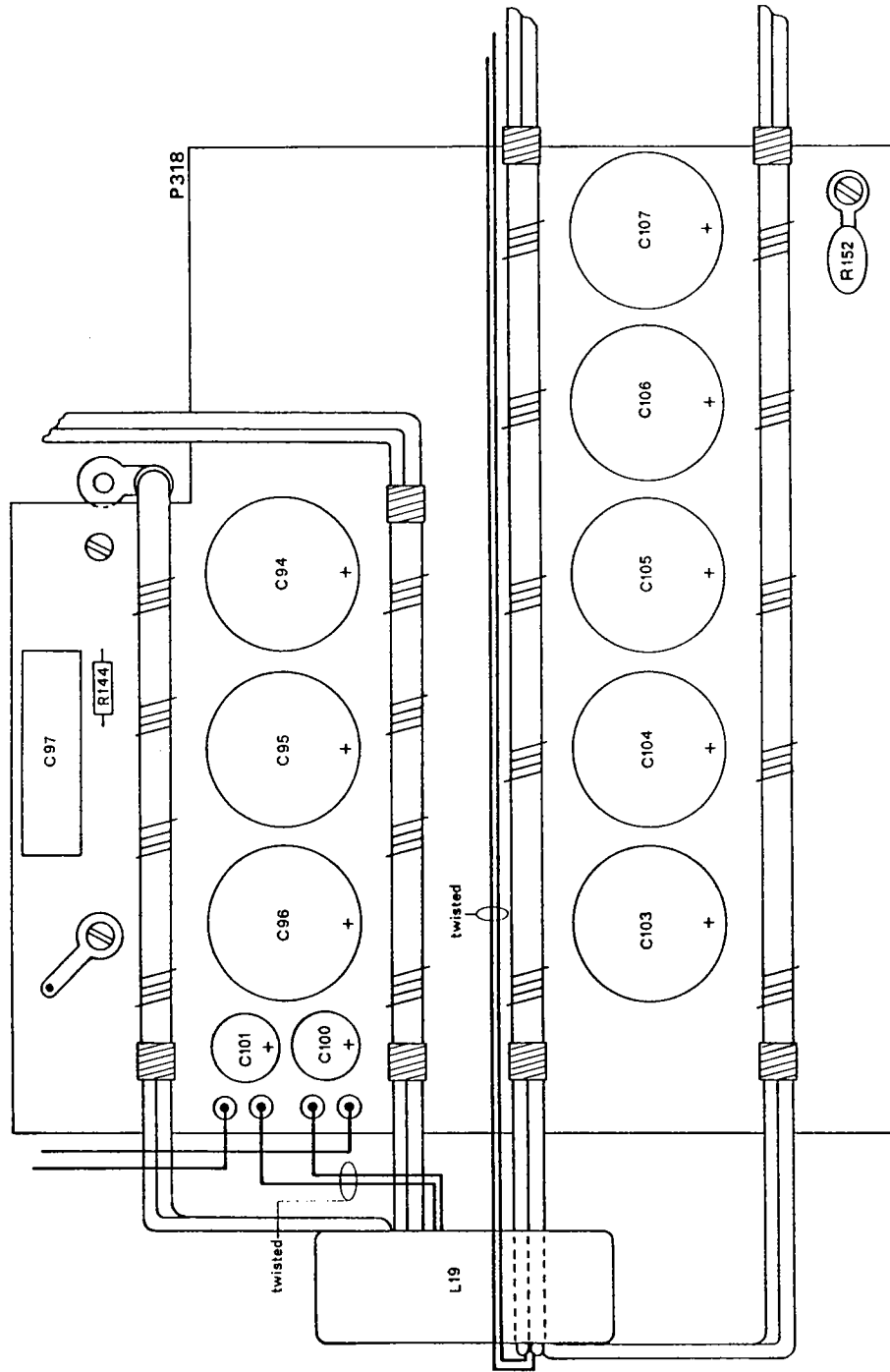




Title: <b>SMX7220</b>	
Date: 1 - '85	
Modifications	Date App



delta elektronika bv

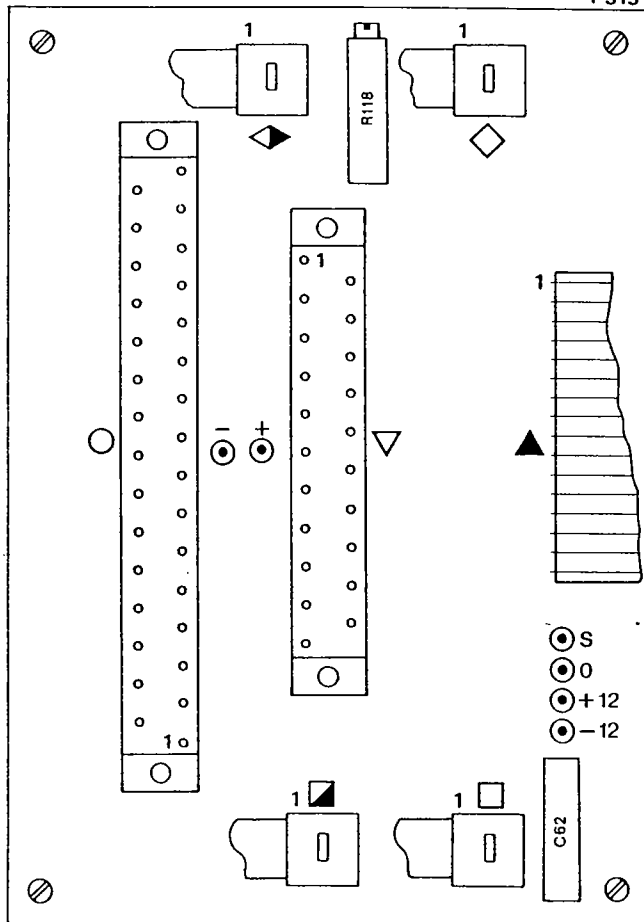


Title: <b>SMX7220</b>		Date: 1 - '85	
Modifications	Date	App	Delta elektronika bv

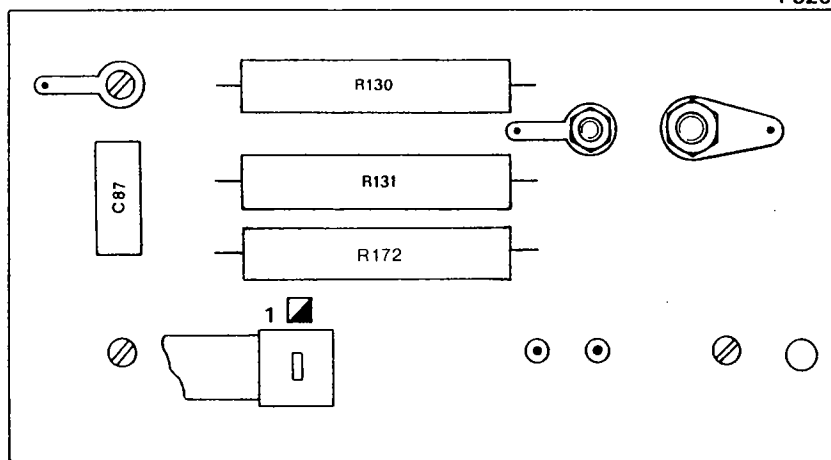




P319



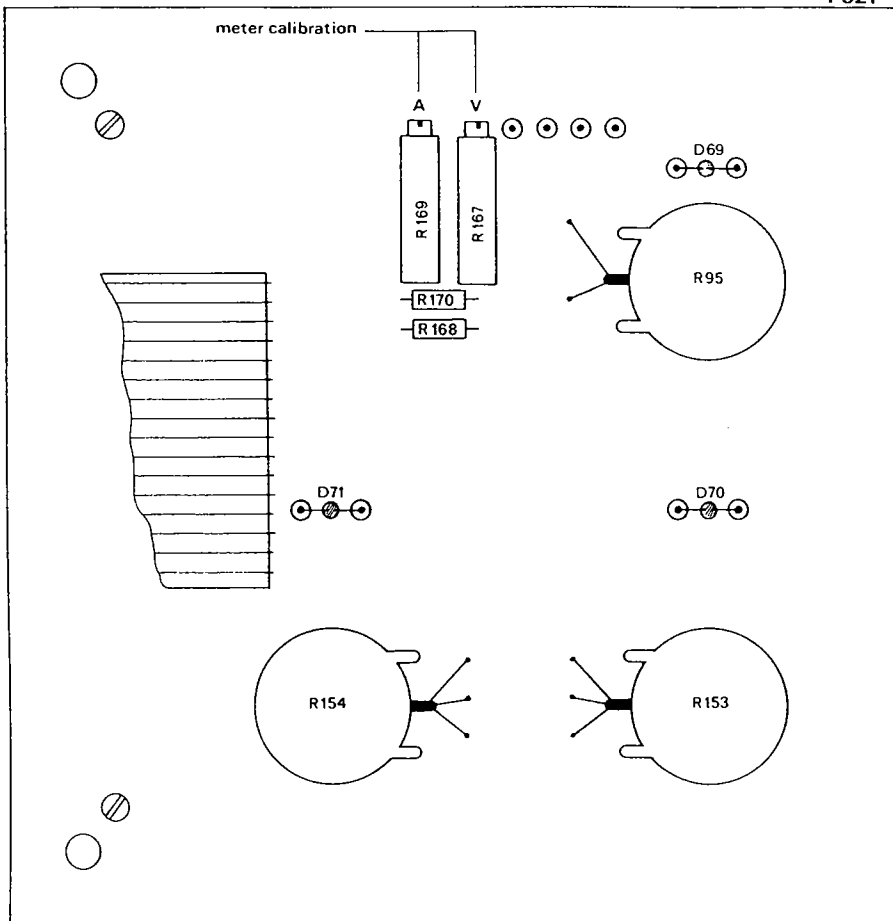
P320



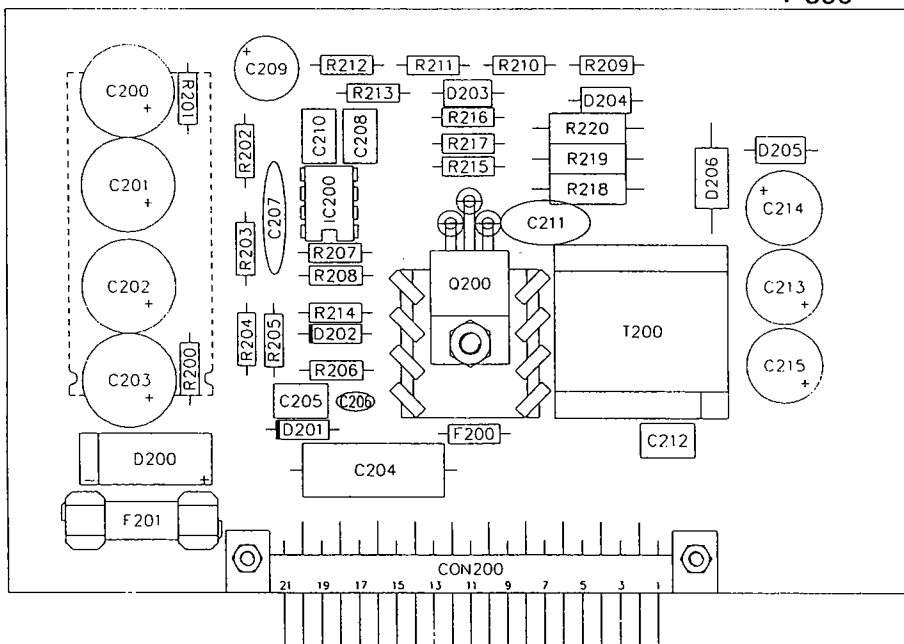
			Title: <b>SMX7220</b>
+ R172 (P320)	5/91	Vr.	Date: 1-'85
Modifications	Date	App.	delta elektronika bv



P321

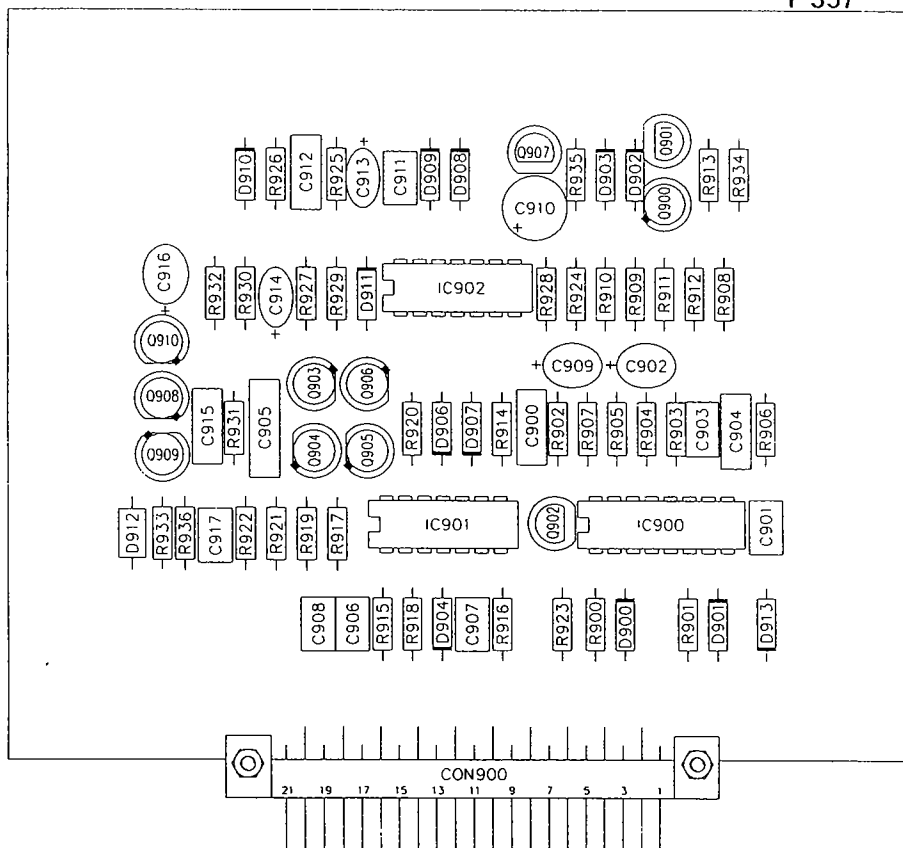
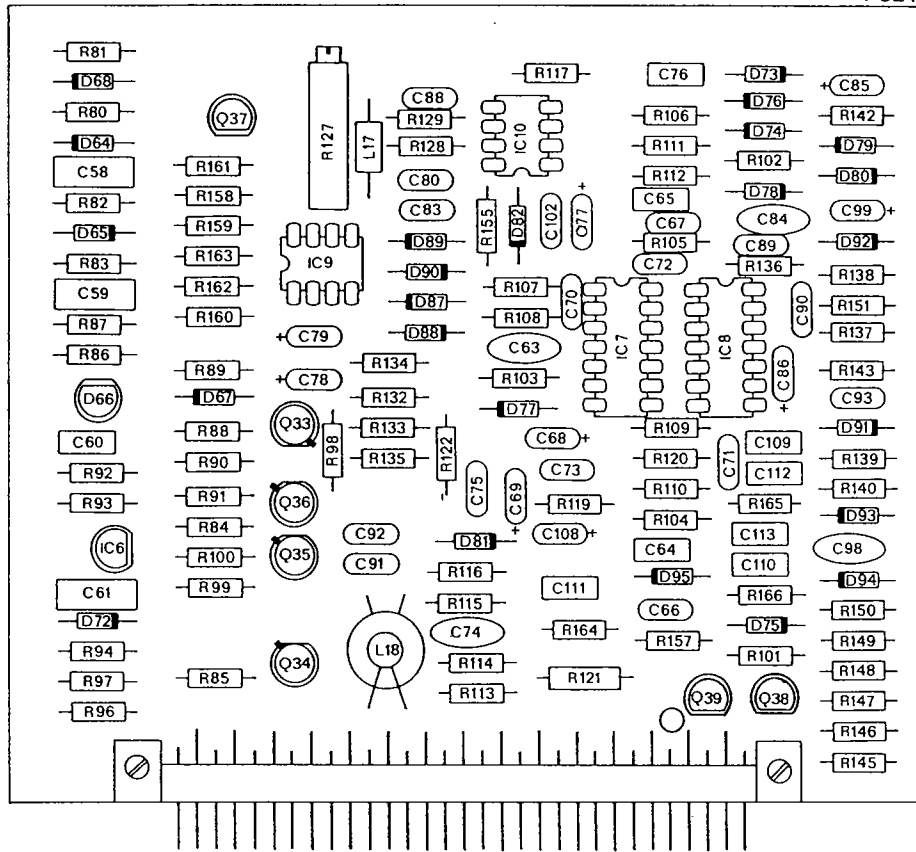


P358



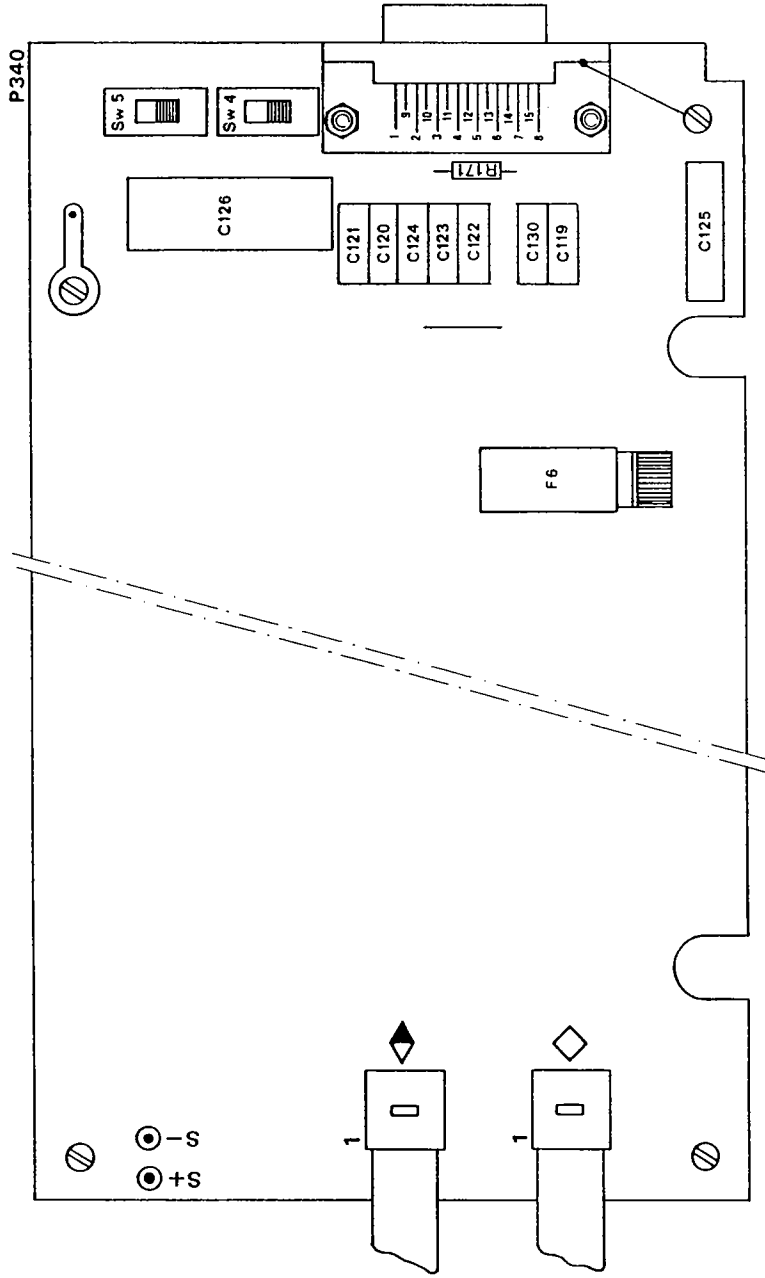
			Title: <b>SMX 7220</b>
P321 = P358	8-88	V.	Date: 1-'85
Modifications	Date	App.	<b>delta elektronika bv</b>





			Title: <b>SMX 7220</b>
P324 = b type	11-88	Vr.	Date: 1-'85
P323 = P357	8-88	Vr.	
Modifications	Date	App.	delta elektronika by

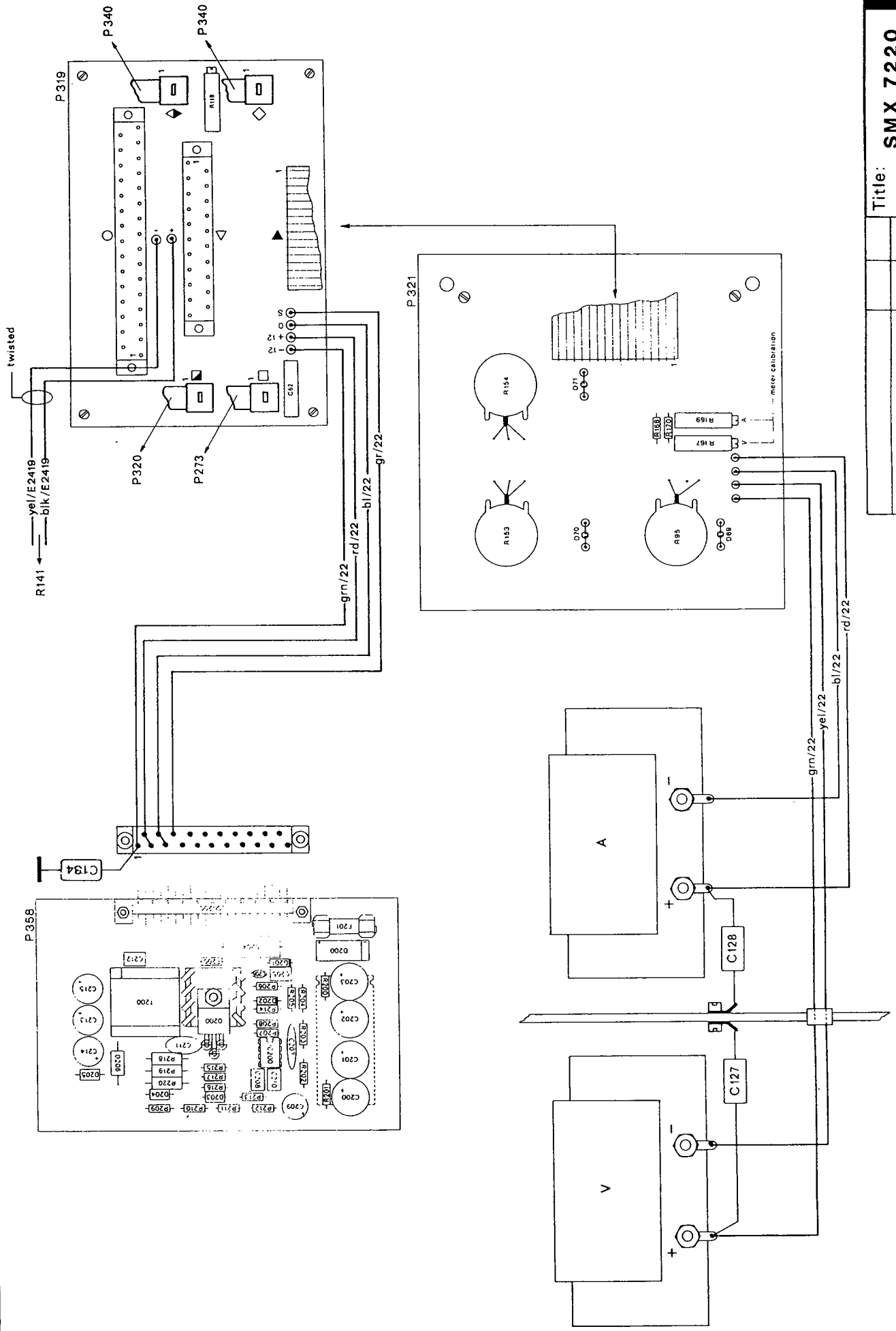




Title: <b>SMX7220</b>	
Date: 1 - '85	
Modifications	Date / App

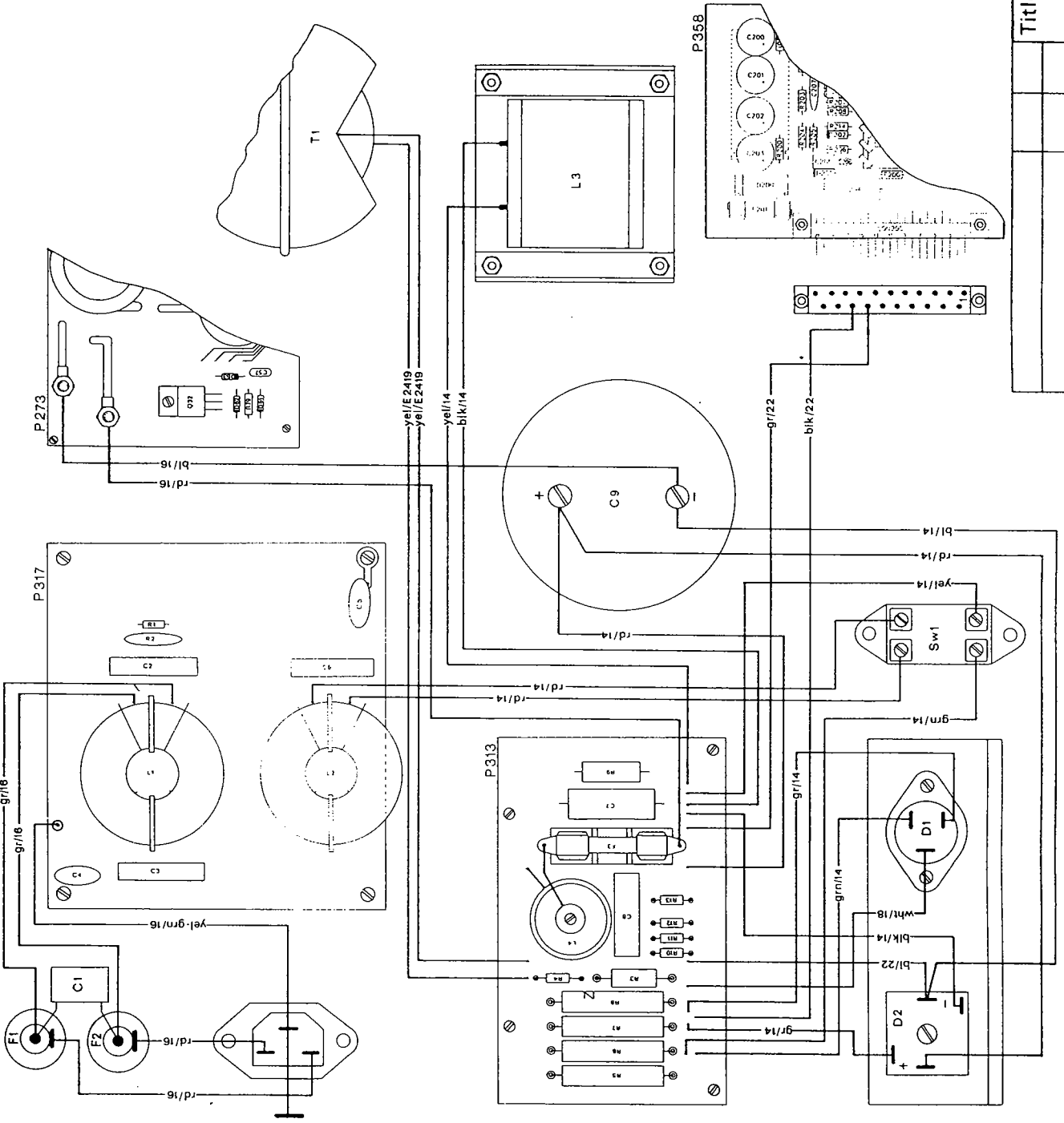


delta elektronika bv



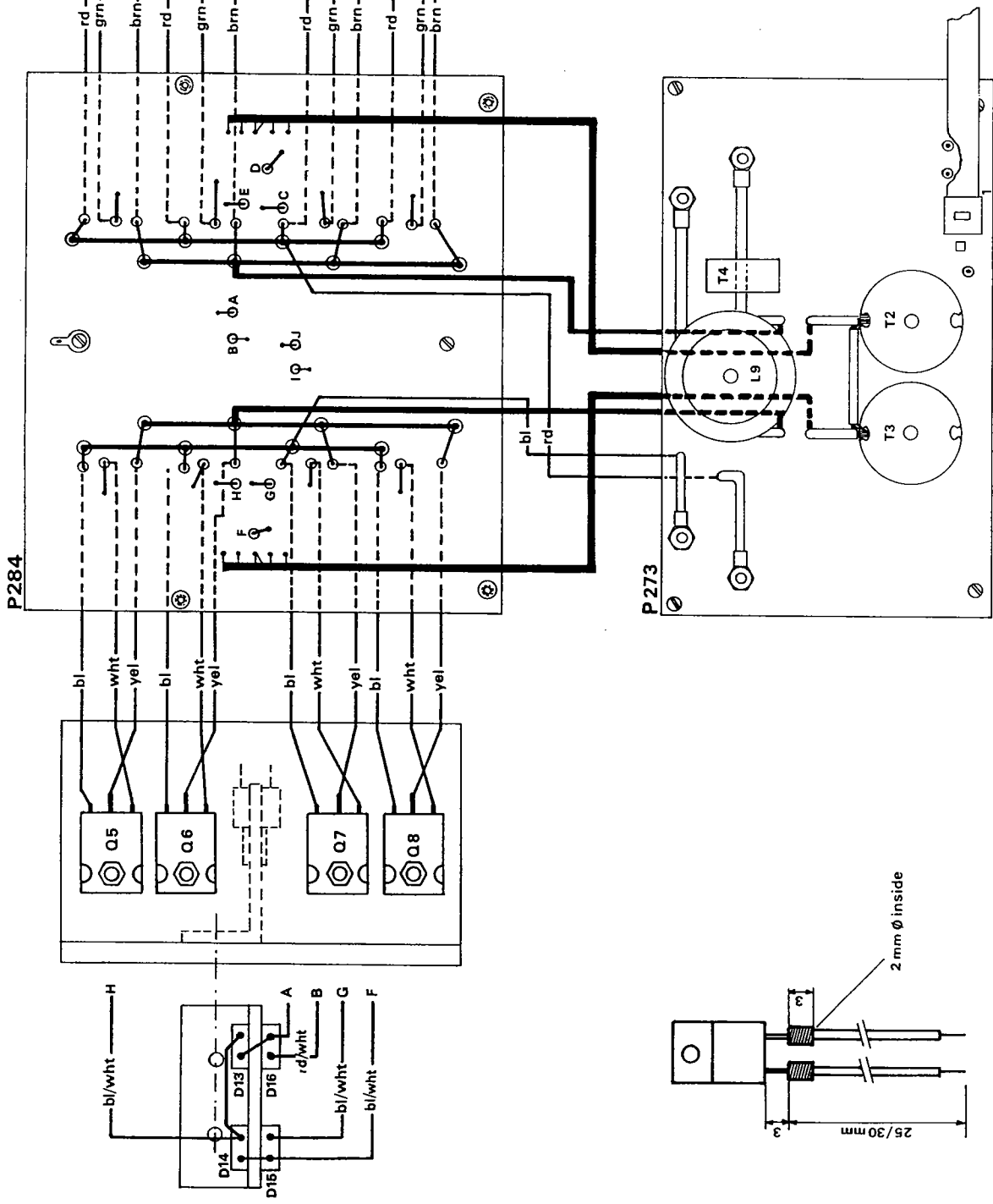
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Date: <b>1-'85</b>	
Revisions:	Date: <b>Ann</b>
Delta elektronika bv	



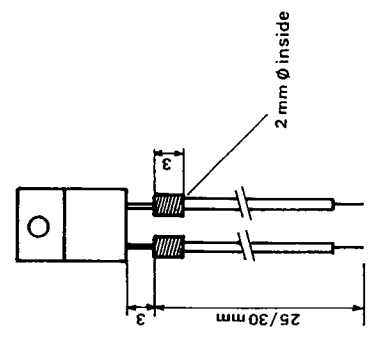


Title: <b>SMX 7220</b>		Date: <b>1 - '85</b>	
Modifications	Date	App	Delta elektronika bv



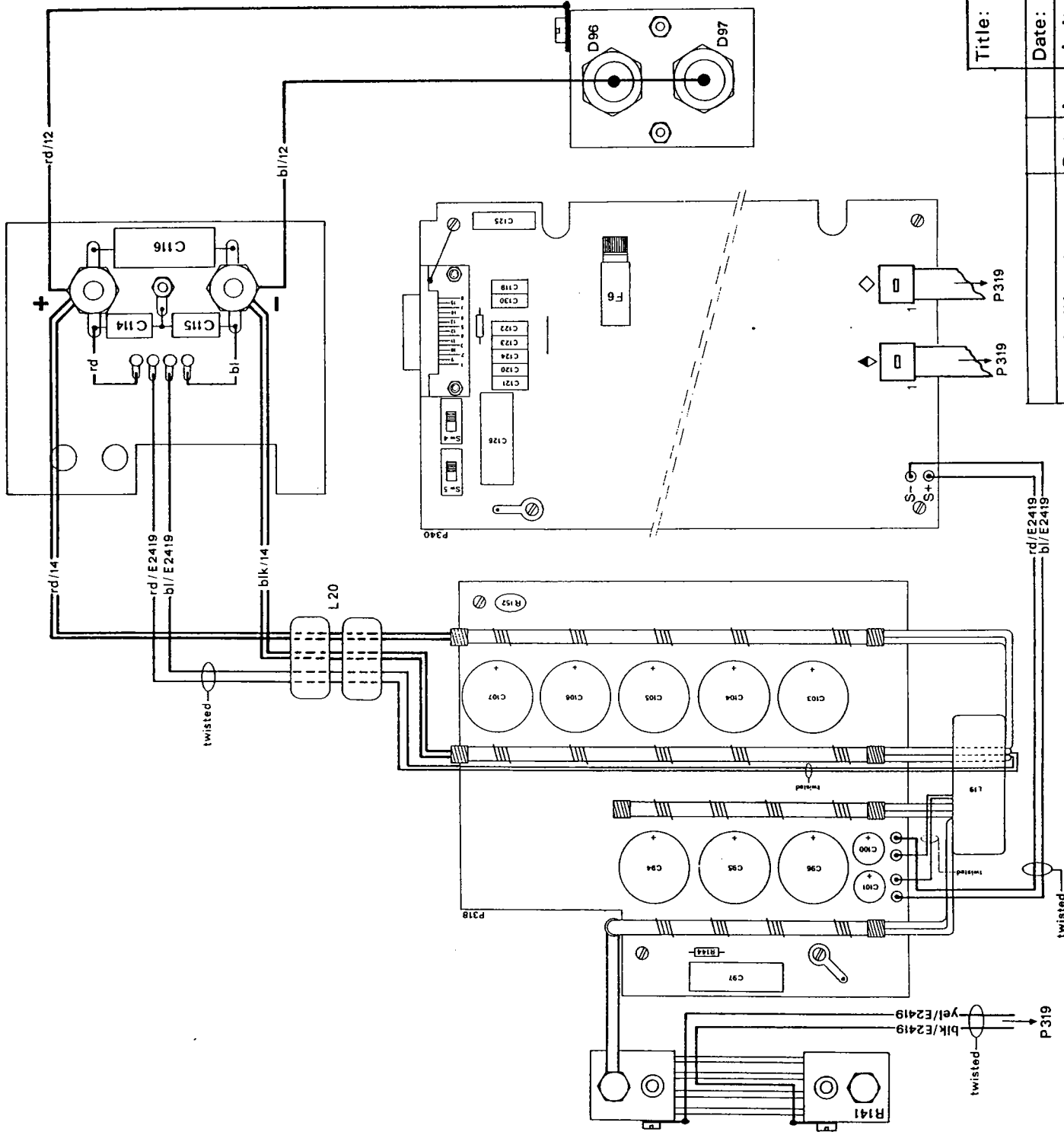


- brown AWG 16 65 mm
- green AWG 20 75 mm
- red AWG 16 65 mm
- blue AWG 16 60 mm
- yellow AWG 16 70 mm
- white AWG 20 75 mm
- blue/white AWG 22 25 mm
- red/white AWG 22 30 mm



Q5-Q12	6-8g	Vr.	Title: SM3540
SW2	5-g	Vr.	SMX 7220
Modifications	Date	App	Date: 2-'85
			delta elektronika bv





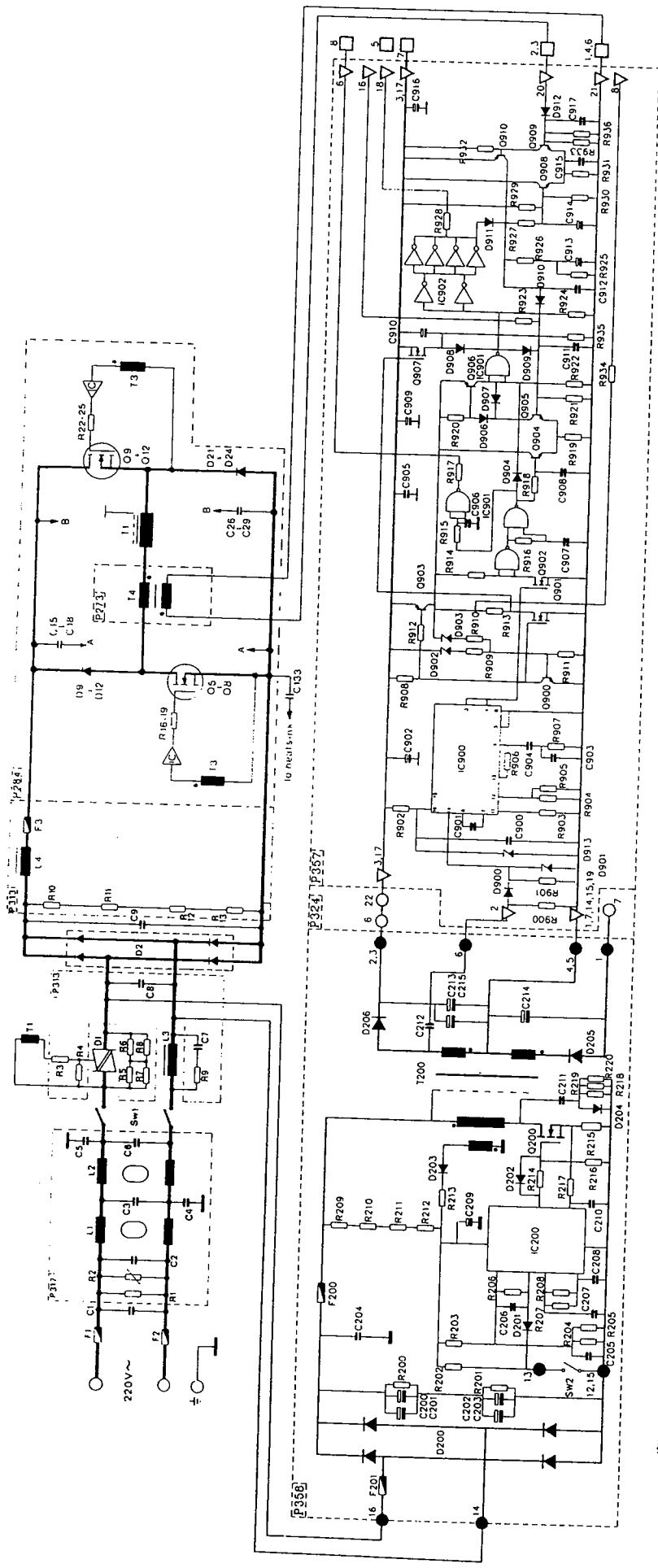
Title: **SMX7220**  
 Date: 1 - '85

Modifications	Date	App

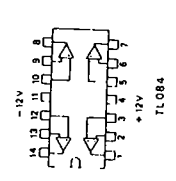
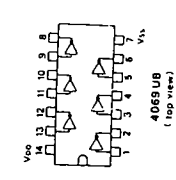
delta elektronika by

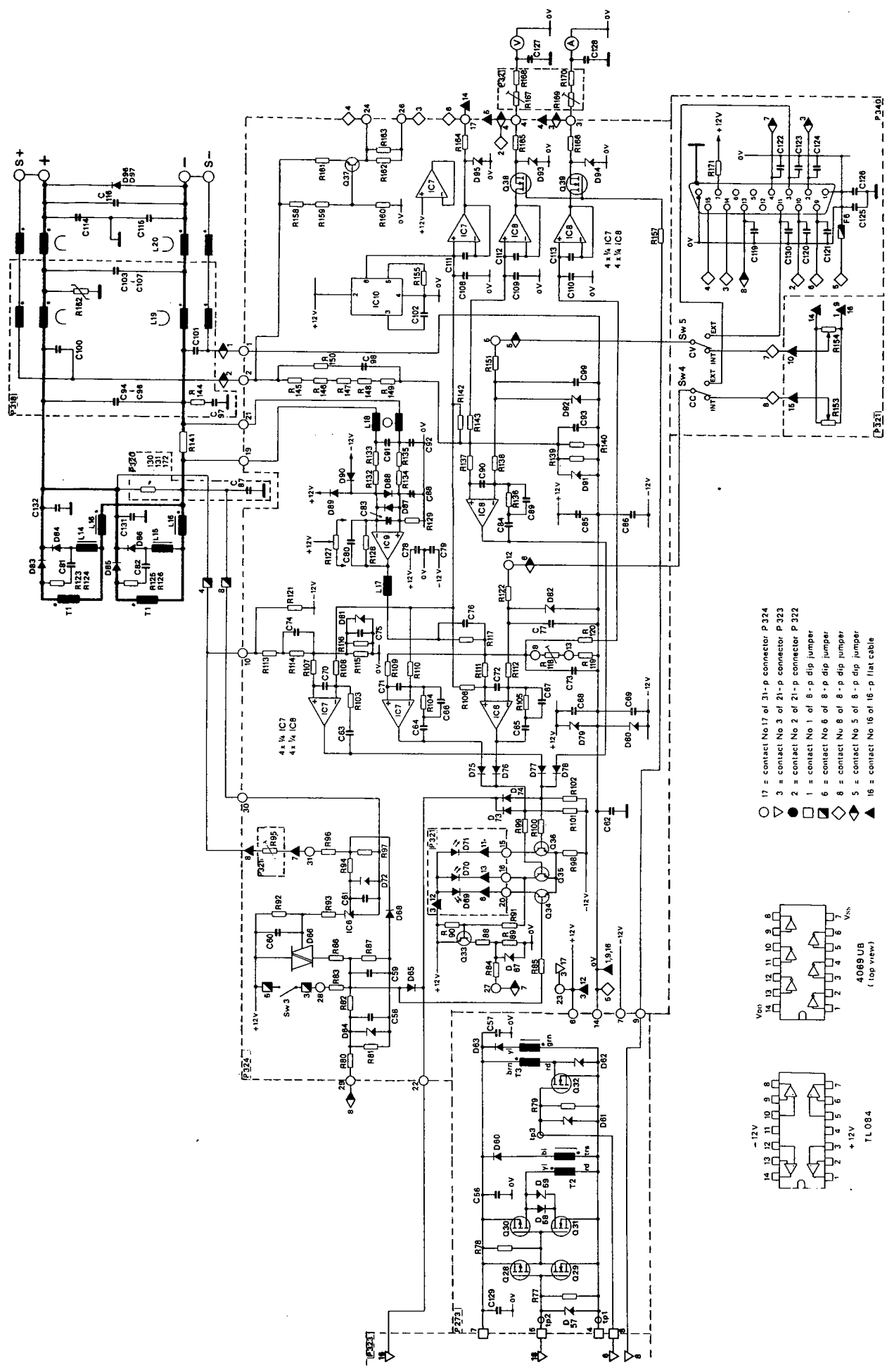
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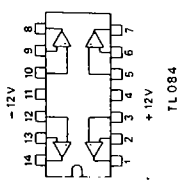
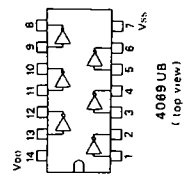


- 17 = contact No.17 of 31-p connector P 324
- 3 = contact No.3 of 21-p connector P 323
- ◐ 2 = contact No.2 of 21-p connector P 322
- ◑ 1 = contact No.1 of 8-p dip jumper
- ◒ 6 = contact No.6 of 8-p dip jumper
- ◓ 8 = contact No.8 of 8-p dip jumper
- ◔ 5 = contact No.5 of 8-p dip jumper
- ◕ 16 = contact No.16 of 16-p flat cable



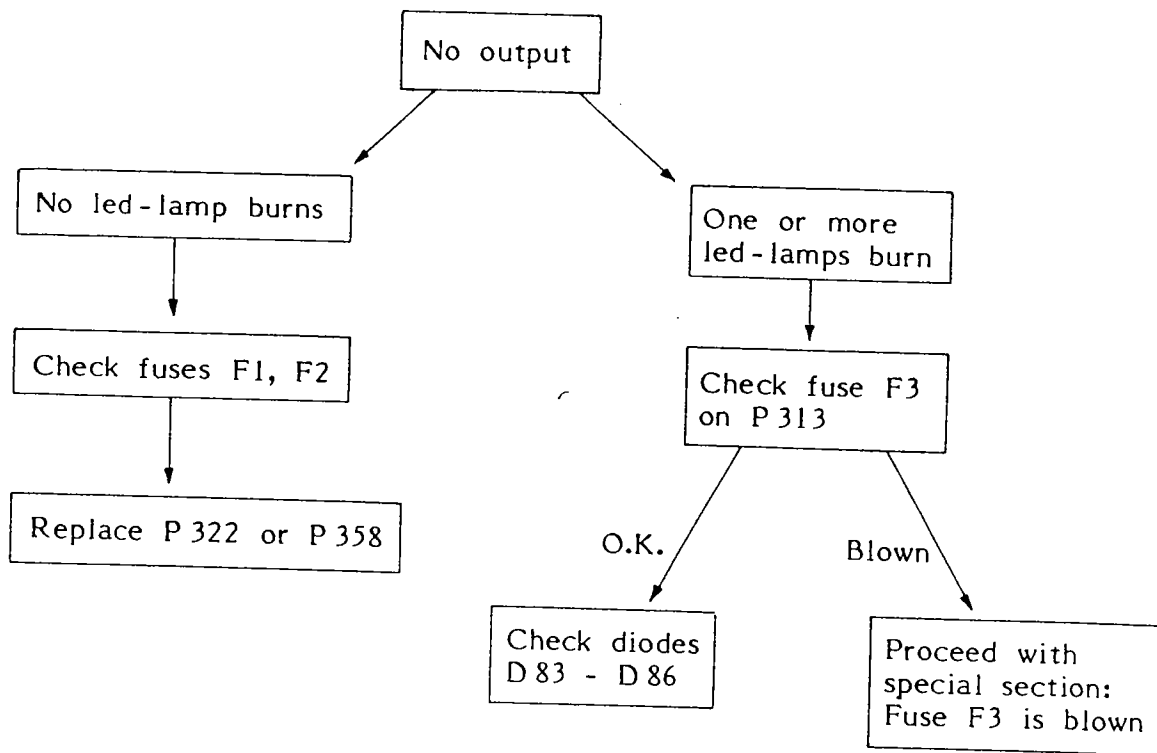


- 17 = contact No.17 of 31-p connector P 324
- ▽ 3 = contact No.3 of 21-p connector P 323
- 2 = contact No.2 of 21-p connector P 322
- 1 = contact No.1 of 8-p dip jumper
- ◇ 6 = contact No.6 of 8-p dip jumper
- ◇ 8 = contact No.8 of 8-p dip jumper
- ◇ 5 = contact No.5 of 8-p dip jumper
- ▲ 16 = contact No.16 of 16-p flat cable



Title: <b>SMX 7220</b>	
Date: <b>1-85</b>	Ur. <b>5/91</b>
App <b>delta elektronika bv</b>	Date <b>1-85</b>
Modifications	
<b>+ R172 (P320)</b>	

## TROUBLESHOOTING SMX 7220



### Fuse F3 is blown

1. Check diodes D 83, 84, 85, 86. (BYW 93-200, on heatsink).
2. Check all diodes on P 284, defective diodes will give a short. You don't have to desolder to measure them.
3. When one of the transistors Q 5 - Q 12 (BUZ 67) is blown, also one or more resistors R 16 - R 19, R 22 - R 25 (6,8 Ohm) will be blown (open circuit).
4. Replace defective components.
5. Switch on power supply.

If fuse F3 on P 313 is blown again, replace the whole switching unit containing P 273, P 284 and Q 5 - Q 12, also replace P **357**  
Send defective units for repair.

The SMX 7220 is a very reliable design and we expect a very low failure rate. To check this we want to keep record of every repair and therefore ask your cooperation.

In case you repair an SMX 7220 please report to us:

- Serial no
- Description of defect
- Presumable cause of defect
- Replaced parts

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