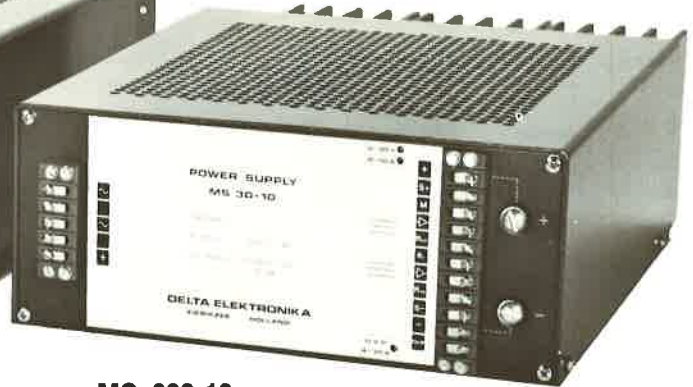




MST 030-10



MS 030-10

HIGH EFFICIENCY DC POWER SUPPLIES

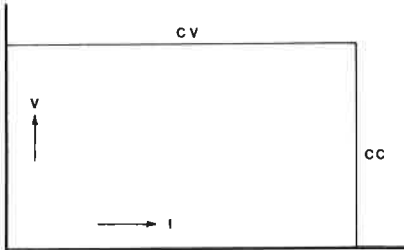
Bench model	Module	CV	CC
MST 015-20	MS 015-20	0-15 V	0-20 A
MST 030-10	MS 030-10	0-30 V	0-10 A
MST 060- 5	MS 060- 5	0-60 V	0- 5 A

- Input 185-250 V AC, 45-500 Hz.
- Efficiency as high as 80% at 300 Watts output.
- Small size and weight.
- Constant voltage/constant current.
- Protected against all overload and short circuit conditions.
- Built-in over voltage protector to protect against internally and externally generated over voltage conditions.
- Unit will operate for a period of 40 mS at full load after removal of AC input.
- Very low conducted and radiated interference by optimized filtering.

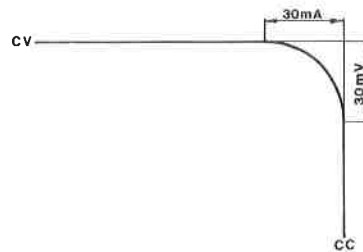
COMPARISON WITH CONVENTIONAL POWER SUPPLIES

The new MS power supplies use high frequency energy conversion and regulation, which means a considerable size and weight reduction of transformer and capacitors. They also offer a large improvement of efficiency. Another advantage is a larger allowed AC input voltage variation. A disadvantage of the switching regulator, compared with the series pass regulator, is a worse specification of regulation, ripple and recovery time. However for many applications these specifications are still sufficient.

CONSTANT VOLTAGE/CONSTANT CURRENT REGULATION



CV/CC load characteristic

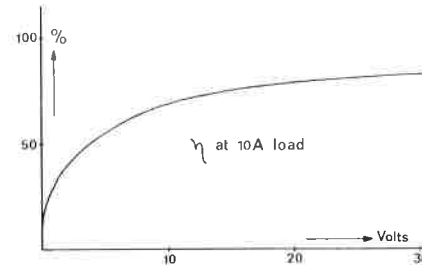


Crossover

The MS and MST power supplies can be used either as a constant voltage source with a limited current or as a constant current source with a limited open voltage. The change of mode occurs sharply at the crossing of the voltage and current setting.

EFFICIENCY

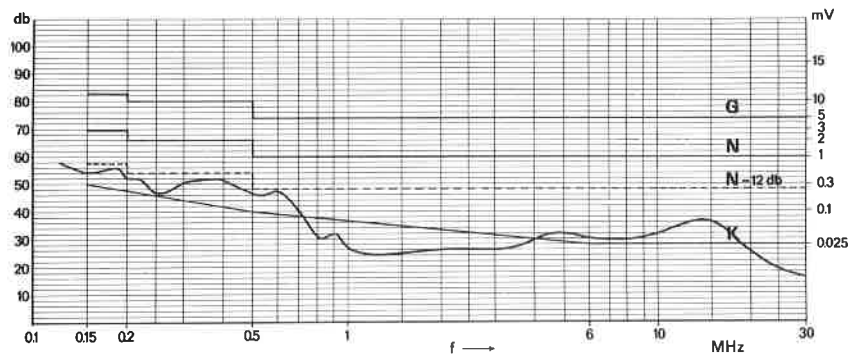
Efficiency versus output voltage measured on MS 030-10 with 10 A load.



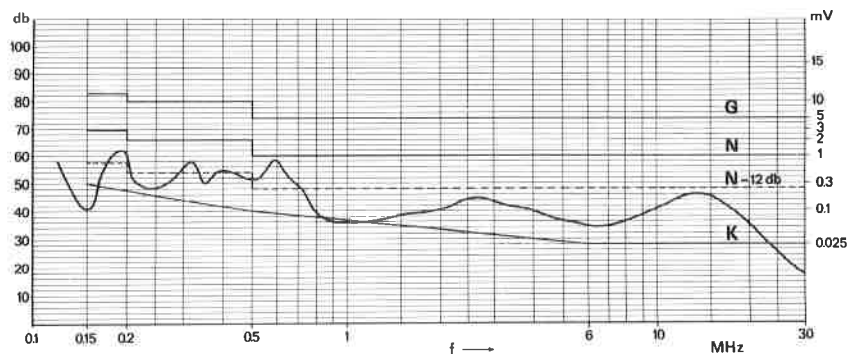
R.F. INTERFERENCE

Conducted and radiated interference are kept very low by optimized filtering.

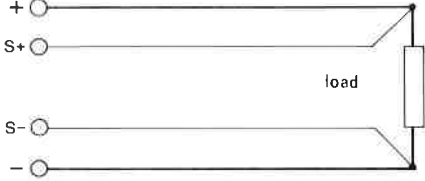
R.F. voltage on input terminals. Measured across 150 ohm between input and case according to VDE 0875/7.71



R.F. voltage on output terminals. Measured across 150 ohm between output and case according to VDE 0875/7.71



CONSTANT VOLTAGE OPERATION

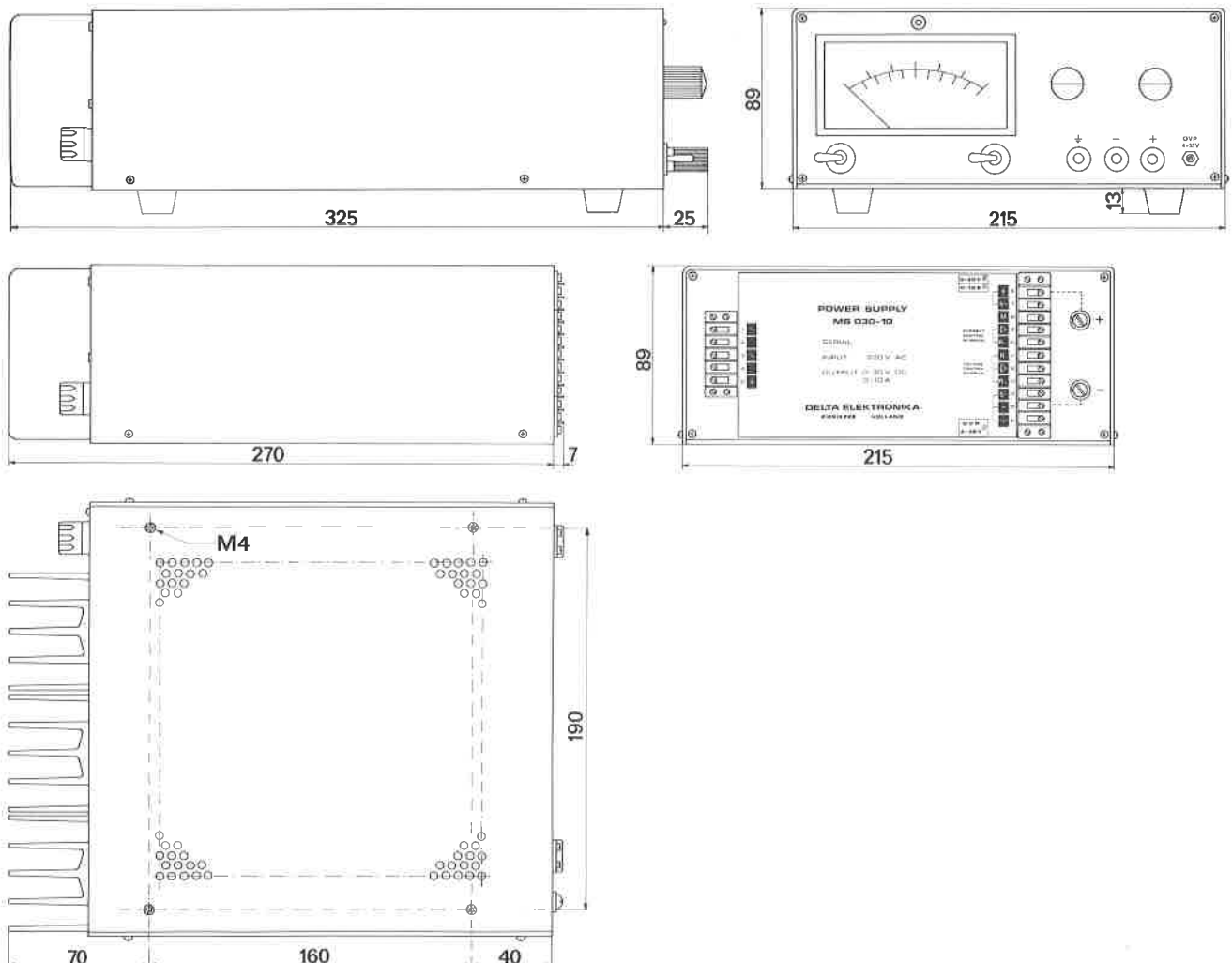
Voltage control	MST models 10-turn potentiometer, resolution 0.02%. MS models 20-turn screw driver adj., resolution 0.3%.
Remote programming (Only MS models)	The output voltage can be programmed externally by a variable resistor of 0–5 KOhm (0–10 KOhm for MS 060-5). Programming with an external voltage (1 V per V) is also possible. At full load the programming speed is 300 V/sec. (measured with a triangular waveform).
Remote sensing (Only MS models)	Separate amplifier terminals enable the output voltage to be regulated at a remote load point, using two sensing leads. <div style="text-align: right; margin-top: 10px;">  </div>
Voltage regulation	0.05% from max. voltage for a + 10 to – 15% AC line voltage variation. 0.05% from max. voltage for a 100% load variation.
Temp. coefficient	Less than 0.01% per °C.
Long term stability	Drift is less than 0.1% during 1000 hours under constant ambient and load conditions after a warmup time of 20 minutes.
Ripple and noise	10 mV r.m.s., 50 mV p-p.
Recovery time	500 micro-seconds for recovery to within 30 mV of steady state voltage after a step load change from 10% to 100%.

CONSTANT CURRENT OPERATION

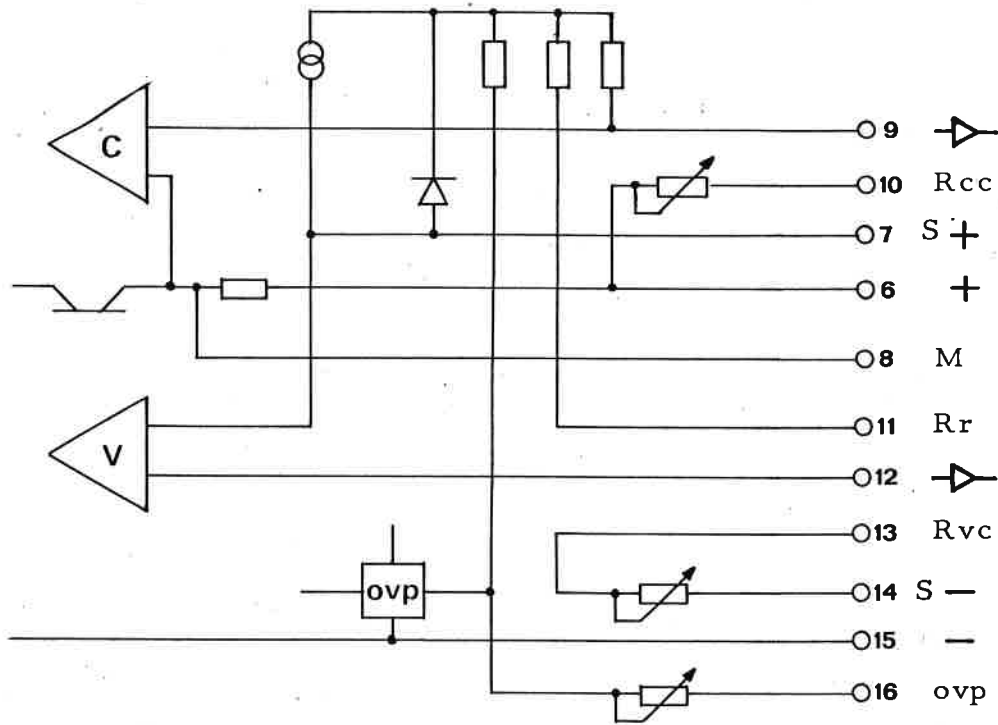
Current control	MST models: single turn potentiometer, resolution 0.02%. MS models: 20-turn screw driver adjustment, resolution 0.3%.
Remote programming (Only MS models)	The output current can be programmed by an external variable resistor of 0–5000 Ohm or by a voltage of about 0–0.5 V. Programming speed: MS 015-20 0.5 A/mS MS 030-10 0.5 A/mS MS 060- 5 0.25 A/mS
Current regulation	0.2% from max. current for a + to – 15% AC line voltage variation. 0.3% from max. current for a 100% output voltage swing.
Temp. coefficient	Less than 0.05% per °C.
Long term stability	Drift is less than 0.4% during 1000 hours under constant ambient and load conditions after a warm-up time of 20 minutes.
Ripple current	MS 015-20 40 mA r.m.s., 200 mA p-p. MS 030-10 10 mA r.m.s., 50 mA p-p. MS 060- 5 5 mA r.m.s., 25 mA p-p.

REMAINING SPECIFICATIONS

Input voltage	185-250 V AC 45–500 Hz. Starve out: 175 V AC.
Hold up time	The unit will operate for a minimum of 40 milli-seconds after AC power is removed.
Ambient temperature	– 20 to + 50 °C, 100% load.
Parallel and series connection	Special design enables parallel and series operation without any precaution. Series connection up to 300 V is allowed.
Over voltage protector	The built-in O.V.P. can be adjusted with a 20-turn screw driver adjustment, range 4–18 V MS 015-20 4–35 V MS 030-10 4–70 V MS 060- 5
Isolation	The output terminals may float 400 V above or below ground.
Cooling	Natural convection. The air must flow freely through the vertical heat sink and through the case for effective cooling.
Meters (Only MST models)	Meter with selector switch for voltage and current. Accuracy 1.5% of f.s.
Finish	Dark gray case with light gray front panel.
Weight and size	MST models 6.3 kgs 215 x 89 x 325 mm (w x h x d). MS models 5.5 kgs 215 x 89 x 270 mm (w x h x d).

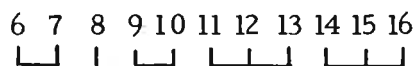


Power supply interconnections



Internal voltage and current adjustment

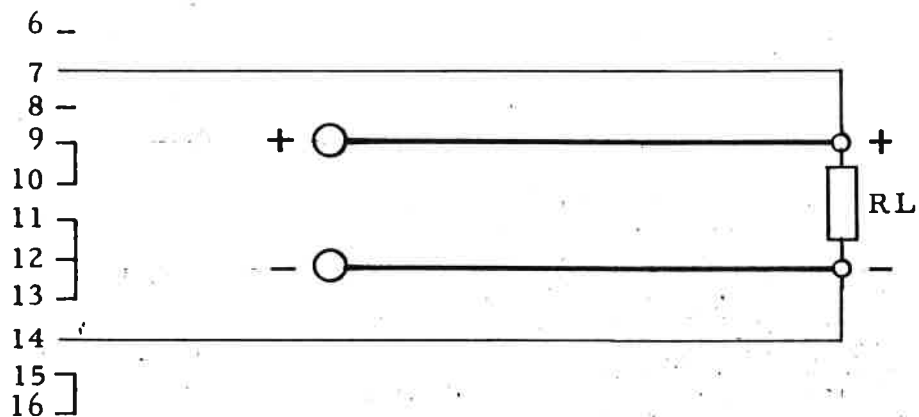
Connection of the terminal strip



Remote sensing

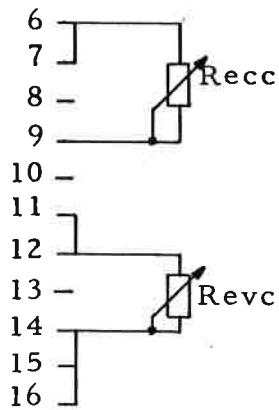
All units have connections for remote sensing to enable regulation at the load point. If remote sensing is not used, the terminals S+ and S- have to be connected to + and - respectively. A voltage-drop of 0,5 V per lead can be compensated.

Connection of the terminal strip



External voltage and current adjustment

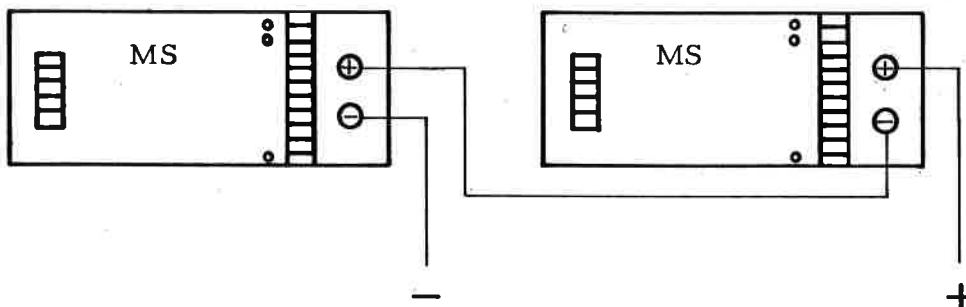
By means of a resistance



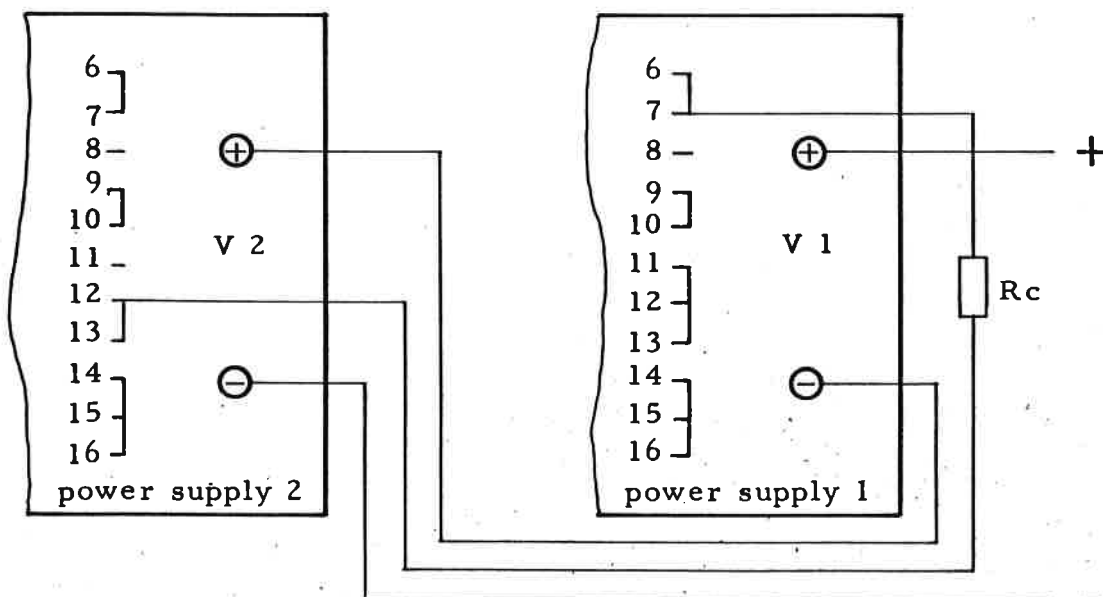
	MS 015-20	MS 030-10	MS 060-5
Revc	5 K	5 K	10 K
Recc	5 K	5 K	5 K

Series connection

Two or more power supplies of the same model can be connected in series by simply connecting the + of the one with the - of the other power supply. In this case both voltage adjustment resistors (internal or external) have to be varied to control the total voltage



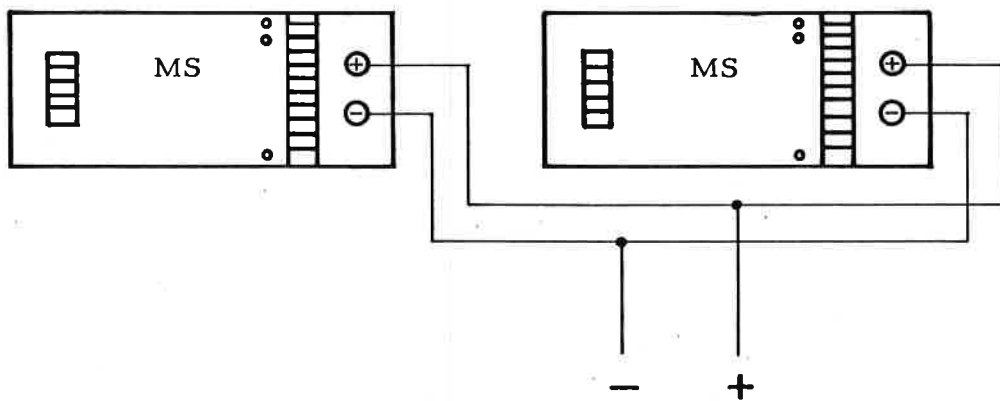
If it is desirable to control the total voltage with only one adjustment resistor (internal or external) a special connection can be made between the terminal strips.



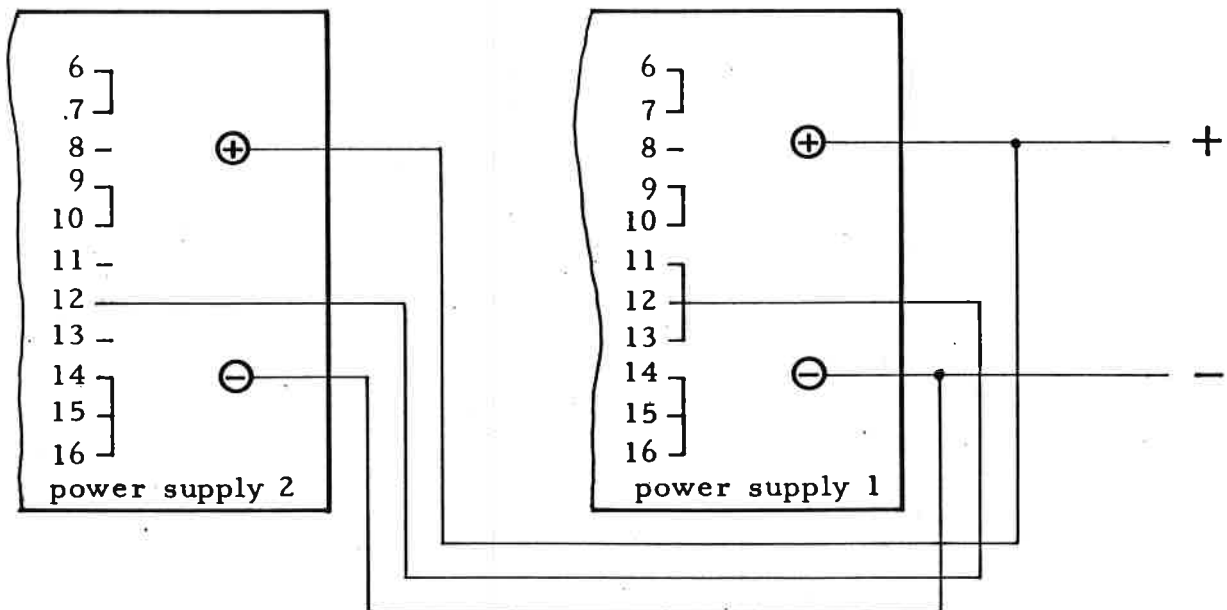
With the voltage adjustment resistor of power supply 1 the absolute value of the total output voltage can be varied. With the voltage adjustment resistor of power supply 2 the ratio of V_1 and V_2 can be varied. For MS 015-20 and MS 030-10 the couple resistor R_c is 5 K Ohm and for MS 060-5 R_c is 10 K Ohm, 1 W, metalfilm.

Parallel connection

Two or more power supplies of the same model can be connected parallel by simply connecting the + terminals and the - terminals. In that case both voltage adjustment resistors (internal or external) have to be varied to control the total voltage.



If it is desirable to control the voltage with only one adjustment resistor (internal or external) a special connection can be made between the terminal strips.



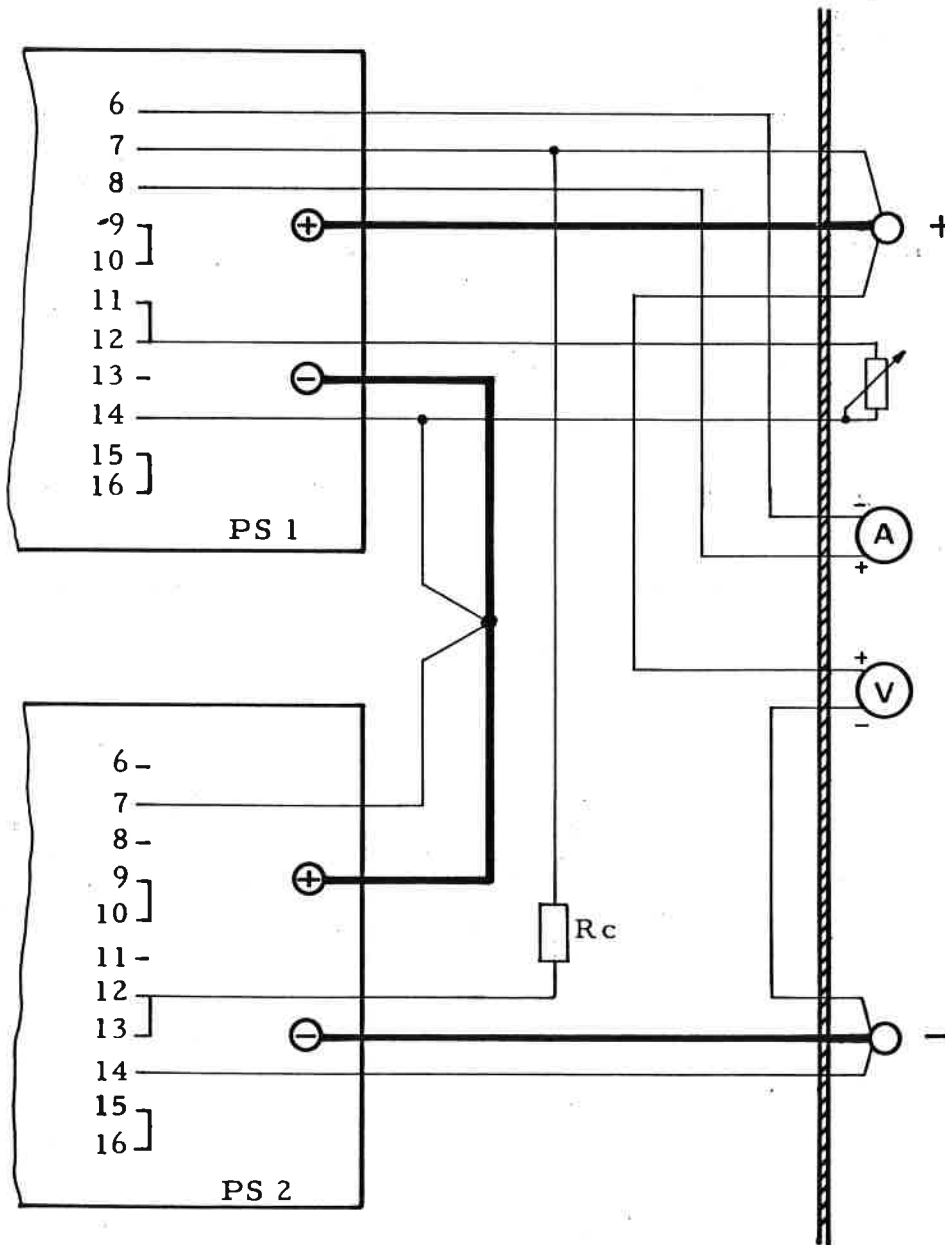
With the voltage adjustment resistor of power supply 1 the absolute value of the total output can be varied.

Current measurement

An amperemeter can be connected between the terminals 6 and 8. The voltage between the terminals 6(-) and 8(+) is for all units $0,5 \text{ V} \pm 5\%$ at max. nominal current.

Application

Two power supplies in series with remote sensing and external voltage adjustment.

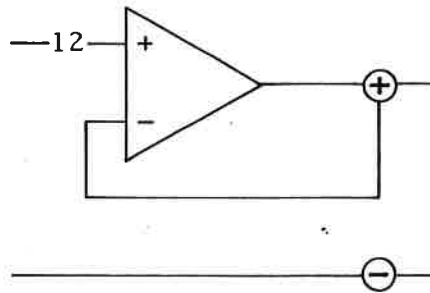
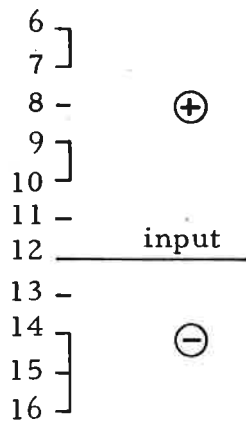


Extension of the regulating loop

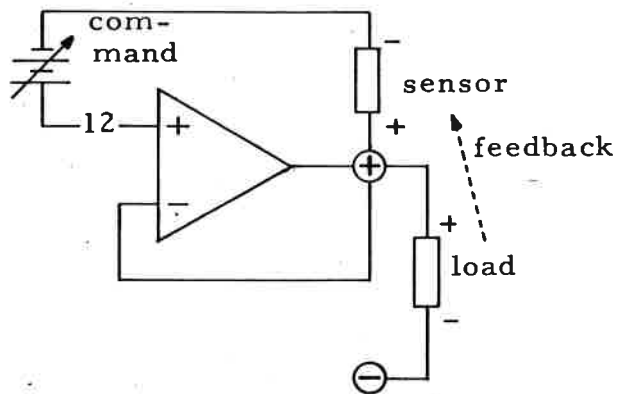
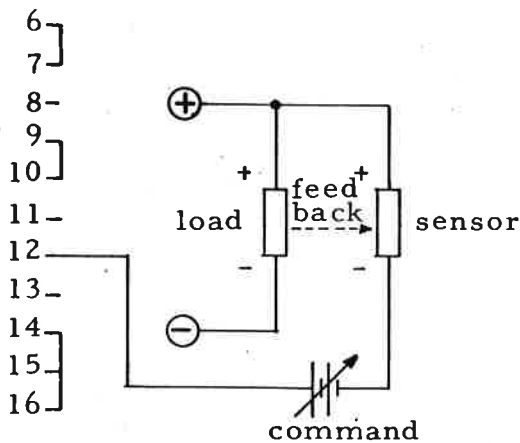
Regulated power supplies, as feedback controlled devices, are designed to control the electrical parameters of voltage or current. The regulating loop can also be extended to include a variety of physical elements such as position, speed, temperature, pressure, chemical activity and the like.

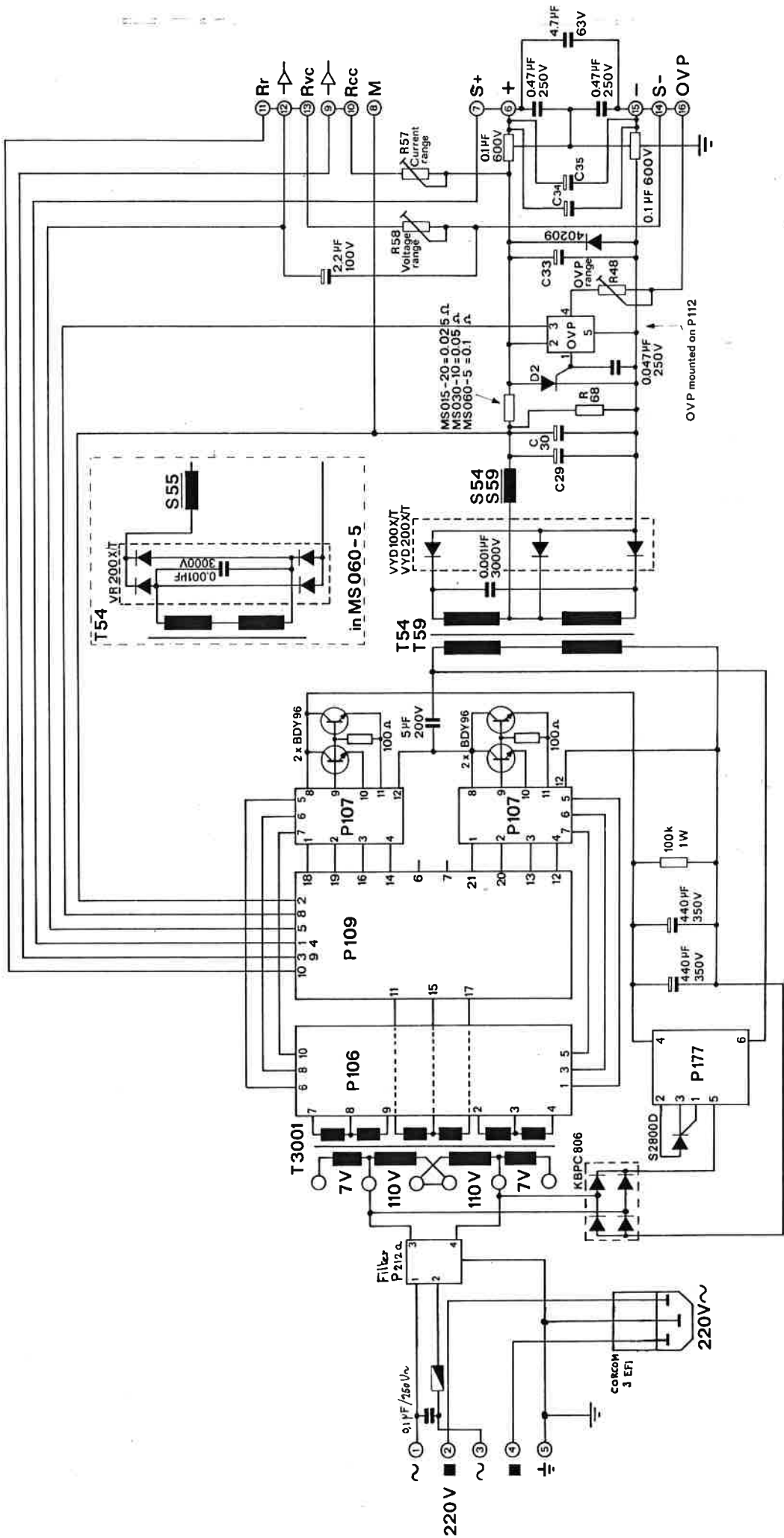
Assuming the necessary transducers and sensors, servo-like control mechanisms can easily be constructed using D-C regulators as translators, summers, amplifiers, followers.

FOLLOWER



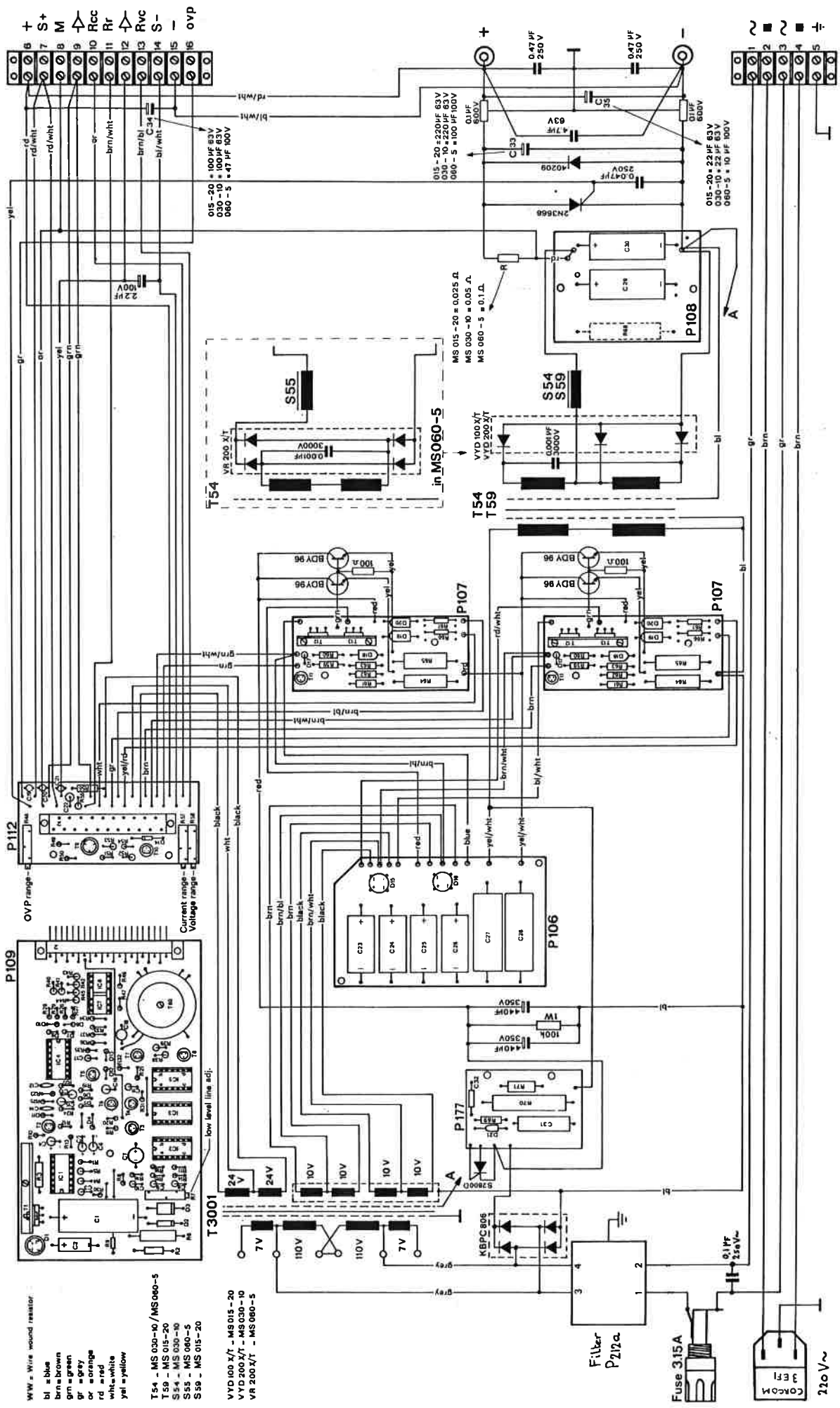
FEEDBACK LINKED CONTROL CIRCUIT





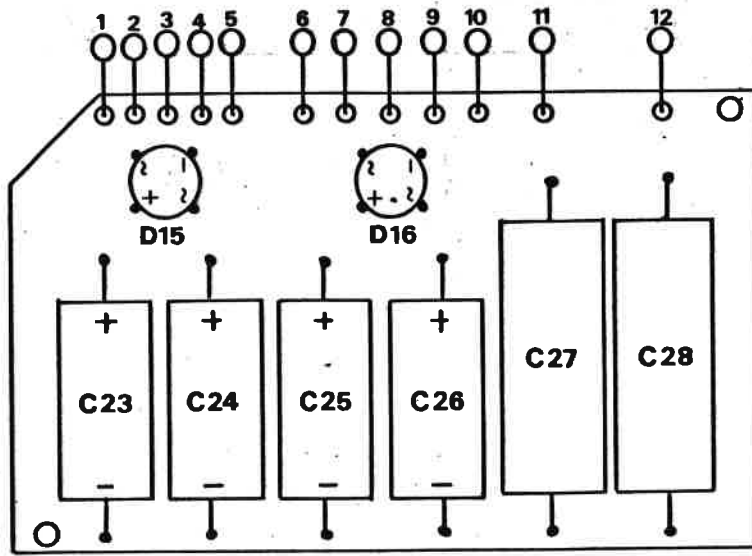
WIRING

Title: Circuit diagram		
MS 015-20 MS 030-10		
MS 060-5		
Filter P212a / Corcom 3EF1	Nov 77	Date: Aug 76
Modifications	Date App	delta elektronika bv

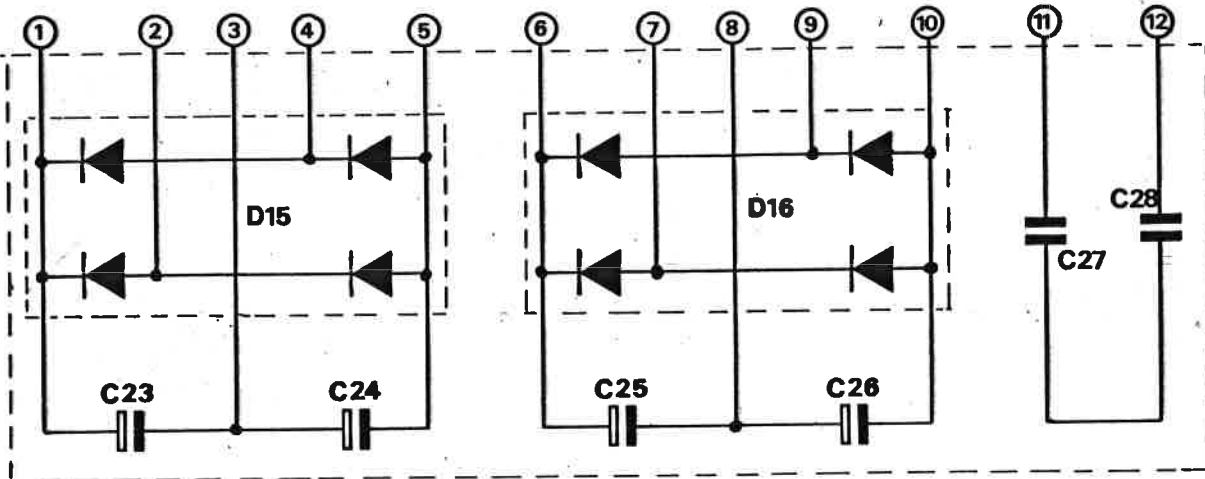


- WW = Wire wound resistor
- bl = blue
 - brn = brown
 - grn = green
 - gr = grey
 - or = orange
 - rd = red
 - wh = white
 - yel = yellow
- T3001 - low level line ac.
- T54 - MS 030-10 / MS 060-5
 T59 - MS 015-20
 S54 - MS 030-10
 S55 - MS 060-5
 S59 - MS 015-20
- VYD 100 X/T - MS 015 - 20
 VYD 200 X/T - MS 030 - 10
 VR 200 X/T - MS 060 - 5

Title: Wiring diagram	
MS 015-20	MS 030-10
MS 060-5	
Filter P212a / Corcom 3EF1	Nov/77
Modifications	Date App
	Ur
	Aug '76
	delta elektronika bv



P 106



P 106

C = microfarad

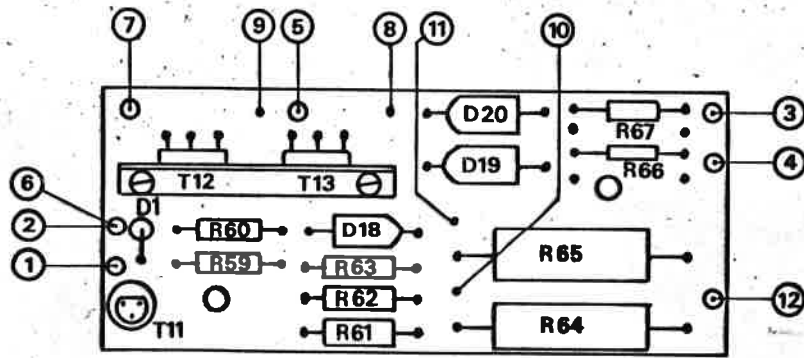
- 23 = 1000 16 V
- 24 = 1000 16 V
- 25 = 1000 16 V
- 26 = 1000 16 V
- 27 = 10 100 V
- 28 = 10 100 V

D

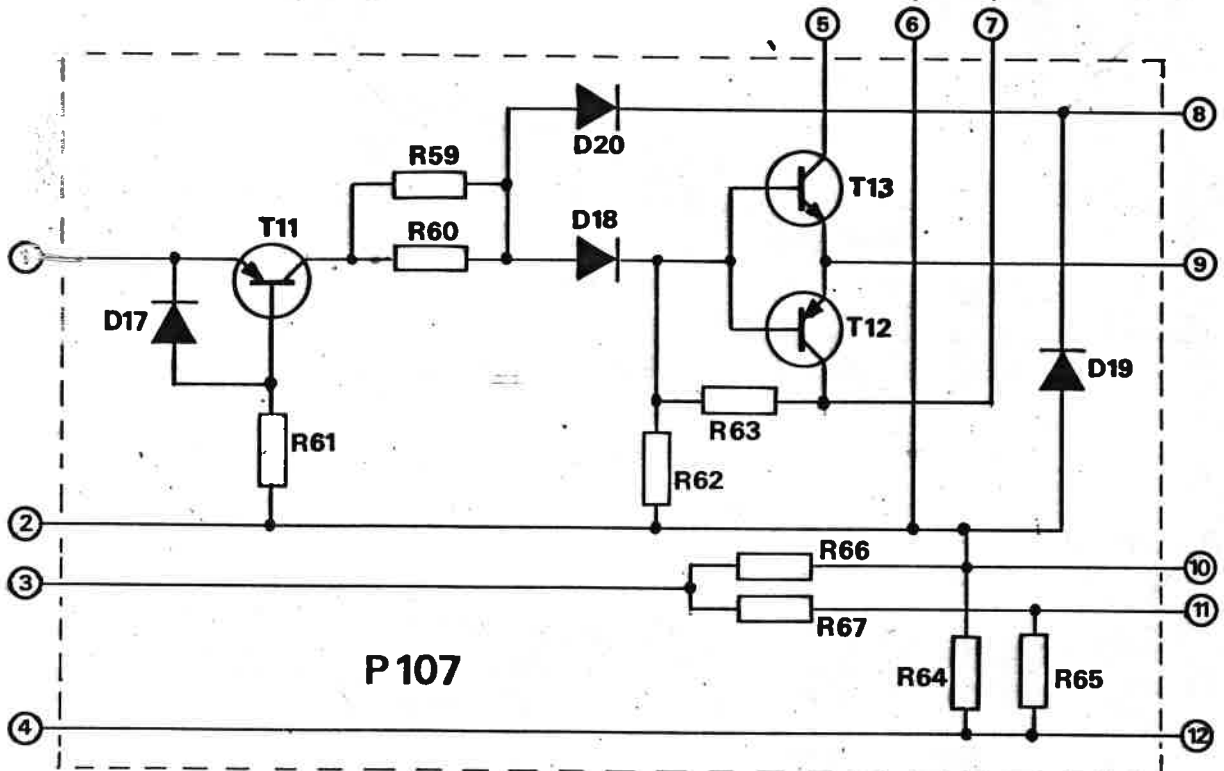
- 15 = KB10-B80C1000 Hermann
- 16 = KB10-B80C1000 Hermann

			Title: MS 015-10
			MS 030-10 MS 060-5
			Date: Apr. 75 Vr
Modifications	Date	App.	delta elektronika bv





P 107



P 107

R (Ohm)

59 =	10	$\frac{1}{2}$ W
60 =	47	$\frac{1}{2}$ W
61 =	1 k	$\frac{1}{2}$ W
62 =	100	$\frac{1}{2}$ W
63 =	220	$\frac{1}{2}$ W
64 =	1	7 W WW
65 =	1	7 W WW
66 =	22	
67 =	22	

D

17 =	1N 4148	Philips
18 =	BYX 55/600	Philips
19 =	BYX 55/600	Philips
20 =	BYX 55/600	Philips

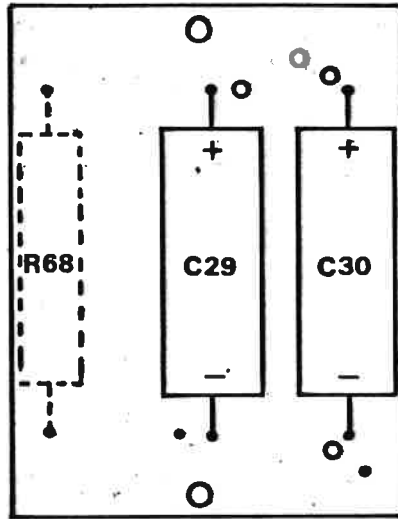
T

11 =	BC 212	TI
12 =	TIP 30 A	TI
13 =	TIP 29 A	TI

WW = wire wound resistor
All other resistors 1/8 W

			Title: MS015-20
			MS030-10 MS060-5
			Date: Apr. '75 Vr
Modifications	Date	App.	delta elektronika bv





P 108

P 108

MS 015-20

R (Ohm)

R 68 = 220

C(microfarad)

29 = 2200 . 25 V

30 = 2200 25 V

MS 030-10

680

1000 40 V

1000 40 V

MS 060-5

1,2 k 9 W WW

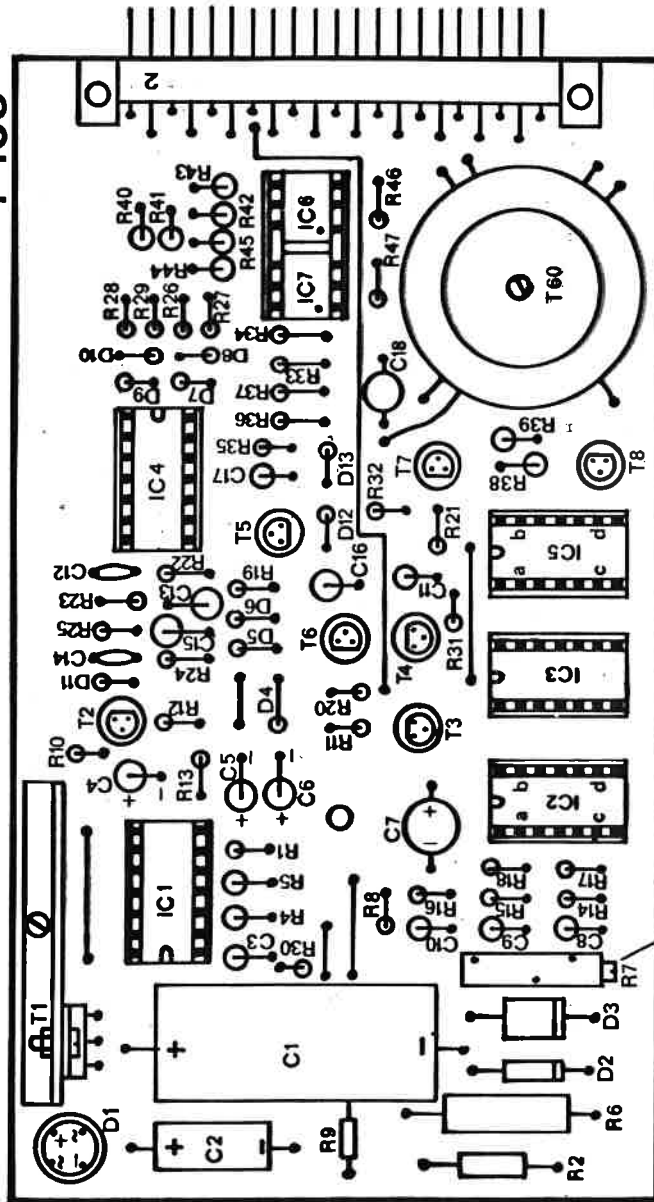
470 63 V

470 63 V

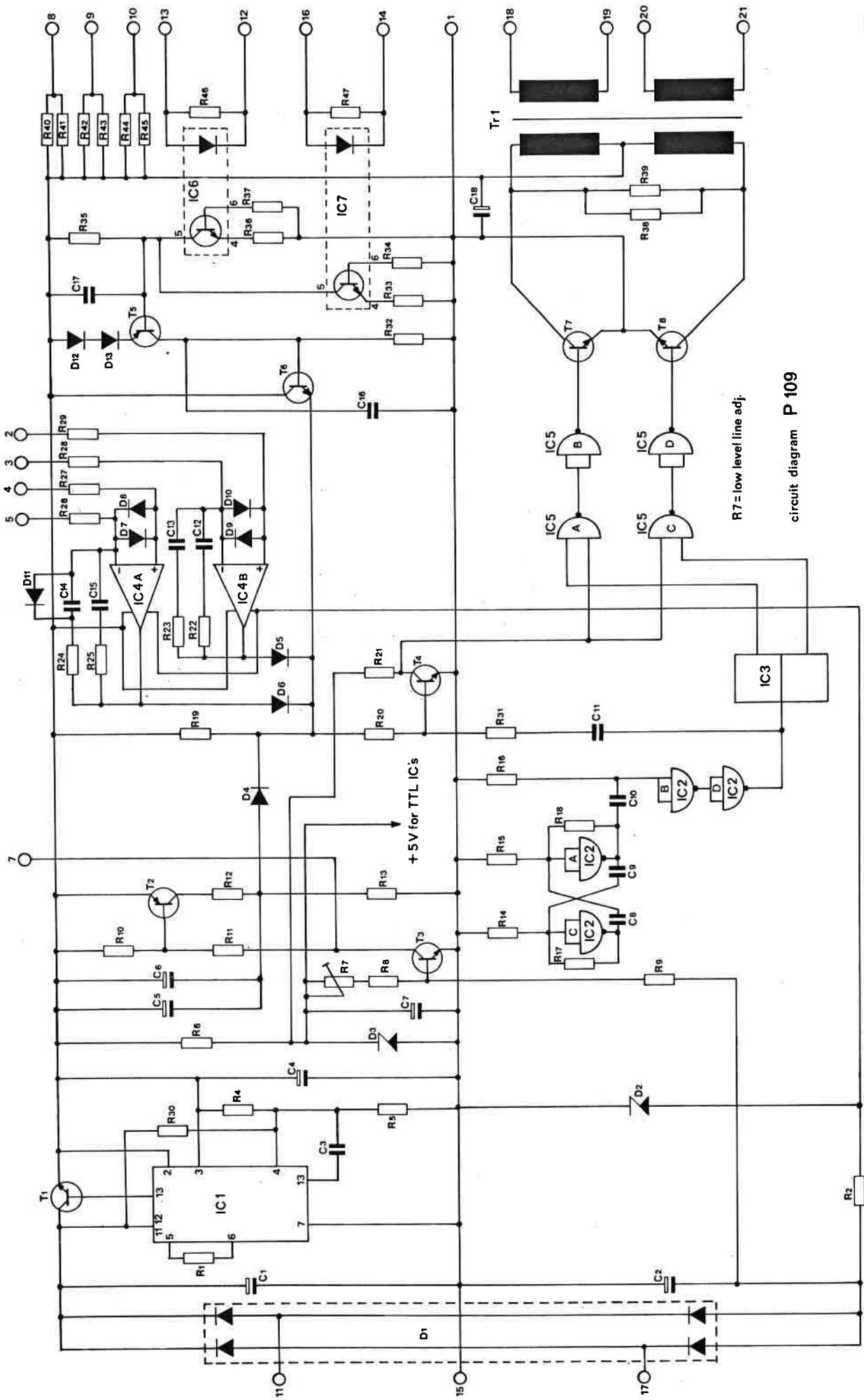
WW = wire wound resistor

			Title: MS015-20	δ
			MS030-10 MS060-5	
			Date: Apr.'75 Ur.	
Modifications	Date	App.	delta elektronika bv	

P109



	
Title: MS 015-20	
MS030-10 MS060-5	
Date: Dec'73	Vr
Modifications	Date App



R7= low level line adj.

circuit diagram P 109

Title: Circuit diagram		P 109	
Date: Aug '73			
Modifications	Date	App	delta elektronika bv

R (Ohm)

- 1 = 3,3 k
- 2 = 1,2 k 1 W
- 3 = _____
- 4 = 5,6 k MF $\frac{1}{2}$ W
- 5 = 8,2 k MF $\frac{1}{2}$ W
- 6 = 120 1 W
- 7 = 10 k trim
- 8 = 15 k
- 9 = 100 k
- 10 = 2,7 k
- 11 = 2,7 k
- 12 = 10
- 13 = 18 k
- 14 = 1,8 k
- 15 = 1,8 k
- 16 = 1 k
- 17 = 3,3 k
- 18 = 3,3 k
- 19 = CR
- 20 = 12 k
- 21 = 1 k
- 22 = 560
- 23 = 8,2 k
- 24 = 560
- 25 = 8,2 k
- 26 = 1 k
- 27 = 1 k
- 28 = 1 k
- 29 = 1 k
- 30 = CR
- 31 = 1 k
- 32 = 220 k
- 33 = 1 k
- 34 = 56 k
- 35 = 470 k
- 36 = 1 k
- 37 = 56 k
- 38 = 1,5 k MF $\frac{1}{2}$ W
- 39 = 1,5 k MF $\frac{1}{2}$ W
- 40 = 820
- 41 = CR

- | | | | |
|---|---|--|--|
| <ul style="list-style-type: none"> 42 = <u>MS 015-20</u>
270 k 43 = CR current range 44 = 3,9 k 45 = CR voltage range 46 = 10 47 = 10 | <ul style="list-style-type: none"> 42 = <u>MS 030-10</u>
120 k 43 = CR current range 44 = 2,2 k 45 = CR voltage range | <ul style="list-style-type: none"> 42 = <u>MS 060-5</u>
120 k 43 = CR current range 44 = 2,2 k 45 = CR voltage range | <ul style="list-style-type: none"> 42 = <u>MS 5-30</u>
330 k 43 = CR current range 44 = 10 k 45 = CR voltage range |
|---|---|--|--|

MF = metalfilm resistors
 CR = calibration resistors
 All other resistors $\frac{1}{8}$ W.

			Title: P109 part list
			MS015-20 MS030-10
			MS 060-5
			Date: Jan '74
Modifications	Date	App.	delta elektronika bv



C (microfarad)

1 = 1000	35 V
2 = 47	35 V
3 = 0,00015	750 V
4 = 22	25 V
5 = 22	25 V
6 = 22	25 V
7 = 100	6 V
8 = 0,01	250 V
9 = 0,01	250 V
10 = 0,001	750 V
11 = 0,001	750 V
12 = 0,0022	63 V
13 = 0,047	250 V
14 = 0,0022	63 V
15 = 0,047	250 V
16 = 0,047	250 V
17 = 0,001	250 V
18 = 10	35 V Tantaal


D

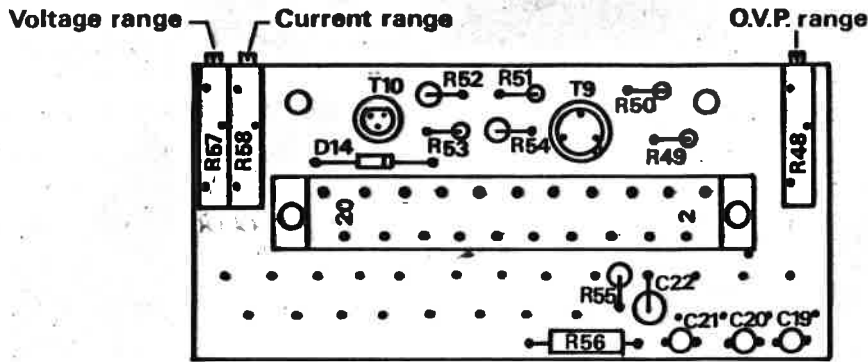
1 = KB10-B80C1000	Hermann
2 = ZY 12	ITT
3 = ZY 5, 1	ITT
4 = 1N 4148	ITT
5 = 1N 4148	ITT
6 = 1N 4148	ITT
7 = 1N 4148	ITT
8 = 1N 4148	ITT
9 = 1N 4148	ITT
10 = 1N 4148	ITT
11 = 1N 4148	ITT
12 = 1N 4148	ITT
13 = 1N 4148	ITT

T

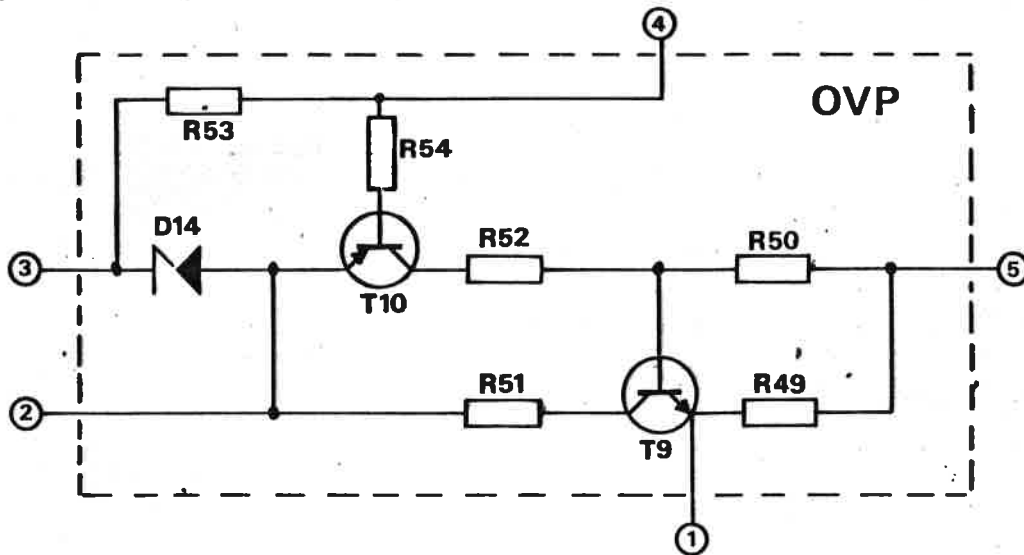
1 = TIP 29 A	TI
2 = BC 212	TI
3 = BC 182	TI
4 = BC 182	TI
5 = BC 212	TI
6 = BC 182	TI
7 = BC 182	TI
8 = BC 182	TI

IC 1	= SFC 2723 EC.	Sesco
IC 2 ABCD	= SN7400	TI
IC 3	= SN74L72	TI
IC 4 AB	= SN74747	TI
IC 5 ABCD	= SN7400	TI
IC 6	= T1L112	TI
IC 7	= T1L112	TI

			Title: P109 part list MS05-20 MS030-10 MS060-5	
			Date: Jan '74	
Modifications	Date	App.	delta elektronika bv	



P 112



OVP mounted on P 112

P 112

R (Ohm)

48 = 10 k Potm.

49 = 12 k

50 = 100

51 = 100

52 = 1,2 k

53 = 1,8 k $\frac{1}{2}$ W

54 = 3,9 k

55 = 5,6 k

56 = 1 k

57 = 5 k Potm.

58 = 5 k Potm. MS 060-5 10 k

R 54 in MS 030-10 1,8 k

MS 060-5 1 k

C (microfarad)

19 = 2 35 V

20 = 2 35 V

21 = 2 35 V

22 = 0,047 250 V

D

14 = ZP 6,2 ITT

T

9 = 2N 3053

RCA

10 = BC 212

TI

WW = wire wound resistor

All other resistors 1/8 W

			Title: MS015-20
			MS030-10 MS060-5
			Date: Apr. '75 Vr.
Modifications	Date	App.	delta elektronika bv



MST 015-20

MST 030-10

MST 060-5

R = Ohm

72 = 5 k 10 trn potm.

5 k 10 trn potm.

10 k 10 trn potm.

73 = 5 k potm.

5 k potm.

5 k potm.

74 = 10 k trim.

10 k trim.

10 k trim.

75 = 390

390

390

76 = 120

120

120

77 = 330 k

330 k

470 k

78 = 15 k

33 k

68 k

79 = 1 k trim.

1 k trim.

1 k trim.

80 = 1 k trim.

1 k trim.

1 k trim.

81 = 560 k

560 k

560 k

C = Microfarad

33 = 2200 16 V

1000 40 V

470 63 V

34 = 1 250 V

1 250 V

1 250 V

35 = 10 40 V

10 40 V

—

36 = 0,47 250 V

0,47 250 V

0,47 250 V

37 = 0,047 250 V

0,047 250 V

0,047 250 V

38 = 0,001 1000 V

0,001 1000 V

0,001 1000 V

39 = 0,001 1000 V

0,001 1000 V

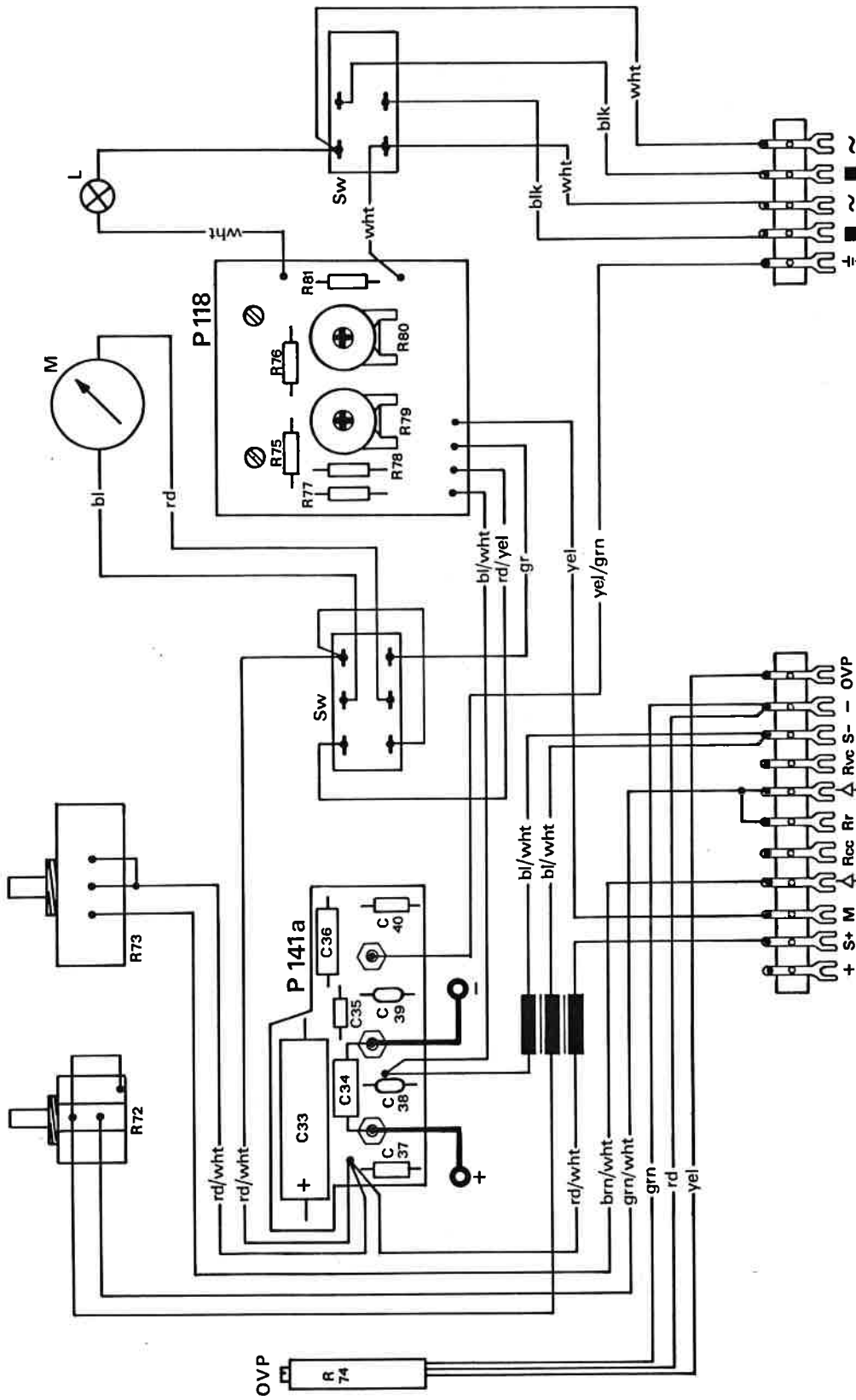
0,001 1000 V

40 = 0,047 250 V

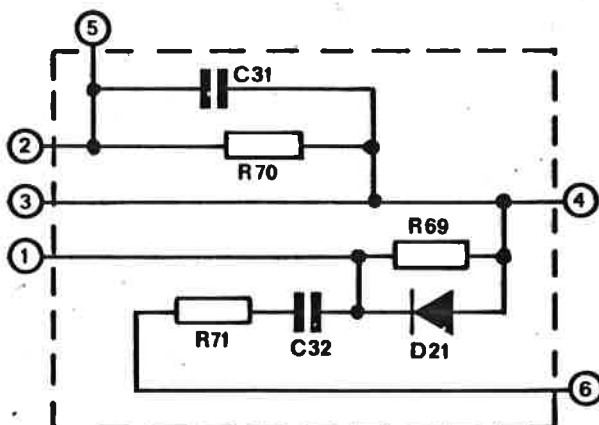
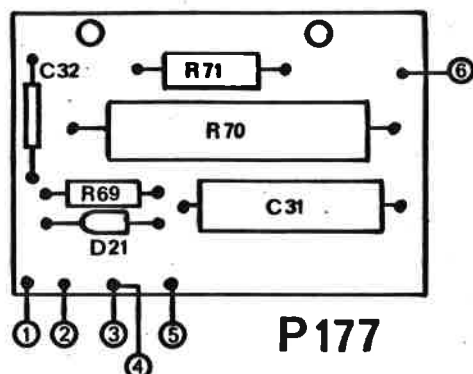
0,047 250 V

0,047 250 V

			Title: Part list P118-P141a	δ
			MST types.	
			Date: July '77	
Modifications	Date	App.	delta elektronika bv	



Title: MST Types.	
Wiring diagram	
Date: July '77	
Modifications	Date App



R = ohm

C = microfarad

R 69 = 220 $\frac{1}{2}$ W

C 31 = 1 250 V

R 70 = 8,2 9 W

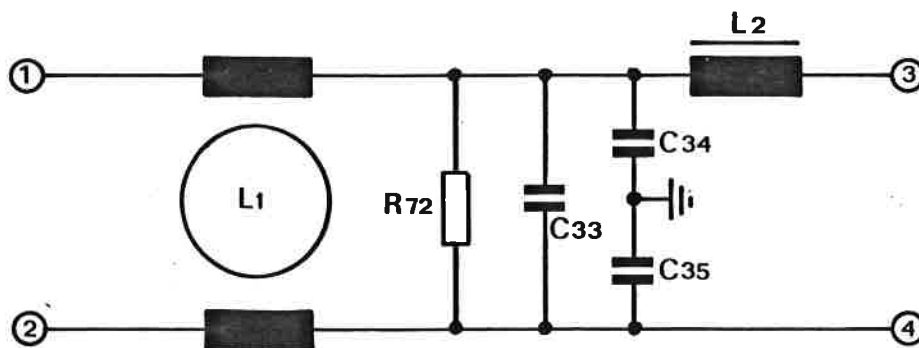
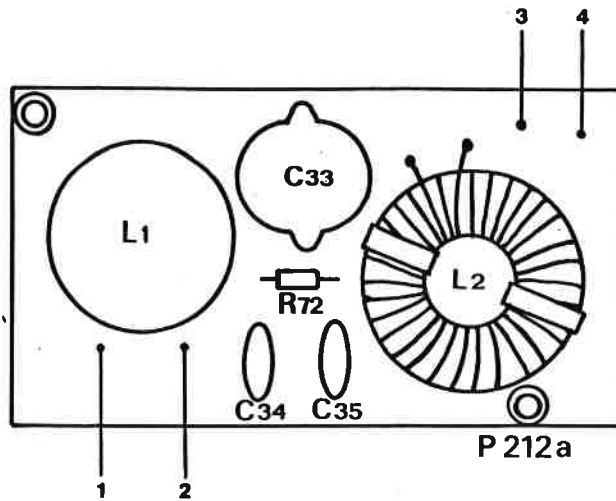
C 32 = 0,00047 3000 V

R 71 = 330 1 W

D

21 = BY 206 Philips

			Title: MS015-20	
			MS030-10 MS060-5	
			Date: Apr. '76 Vr.	
Modifications	Date	App.	delta elektronika bv	



R 72 = 1M Ω 0,4 W 2% metal film

C = microfarad

33 = 1 250 V

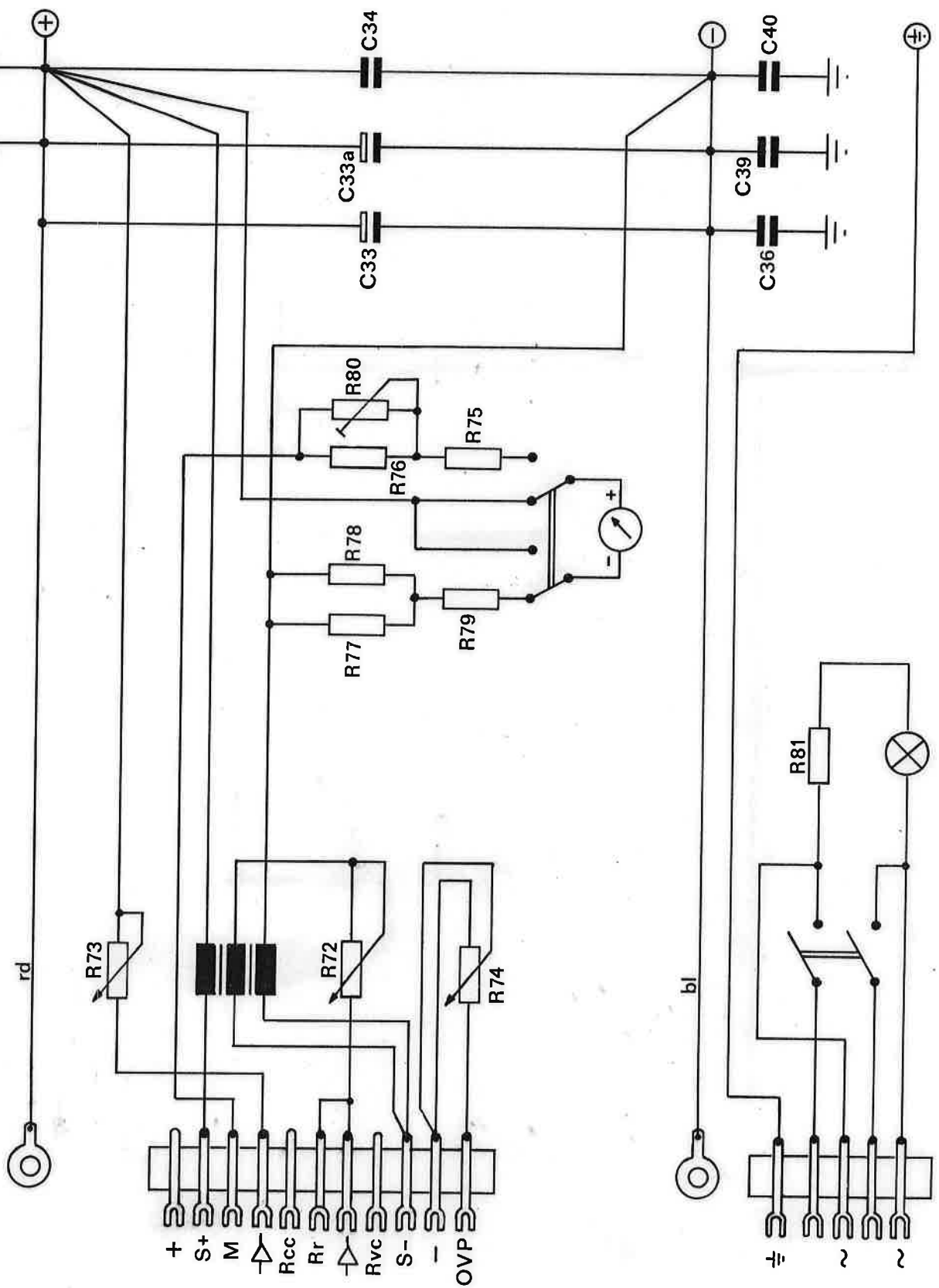
34 = 0,0025 250 V

35 = 0,0025 250 V

L1 = 1753 - 225 - 224 ERO

L2 = T69 - 55894 - A2 BFI

			Title: Filter P 212 a
			MS 030-10 MS 015-20 MS 060-5
			Date: Nov '77
Modifications	Date	App.	delta elektronika bv



			Title: MST types Circuit diagram.
			Date: Apr. 79
Modifications	Date	App.	delta elektronika bv

