RC900

RC940 Monitor

Hardware reference manual

PN: 99111117

PN: 99200389

RC Computer

Keywords:
RC940, Colour Monitor, RC900

Abstract:
This paper contains Service instructions for the RC940 Colour monitor.

Date:
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Author:
Jens Peter Jakobsen

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INTRODUCTION

The RC940 Color monitor is used as a self-contained terminal or as a monitor for the RC950 CPU depending on the board installed in the base of the monitor.

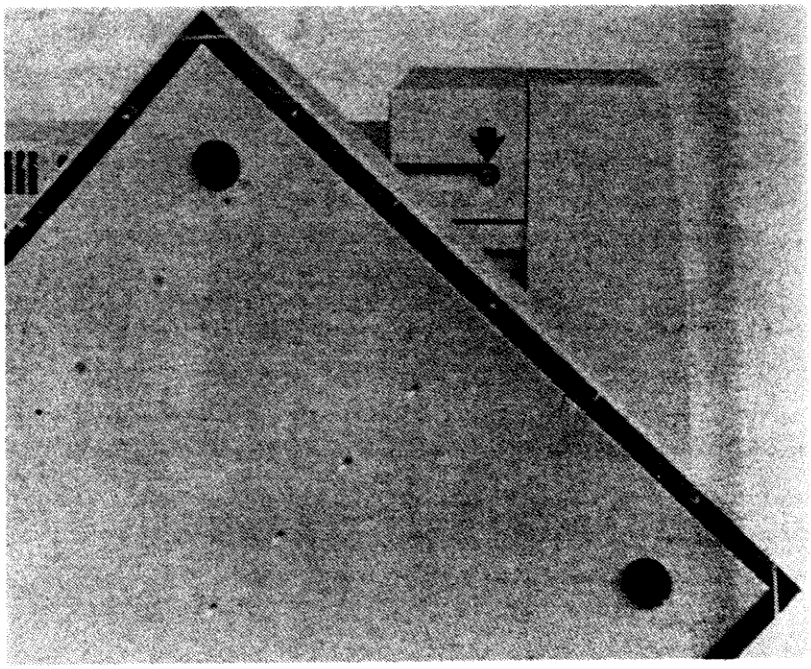
This manual contains the following information:

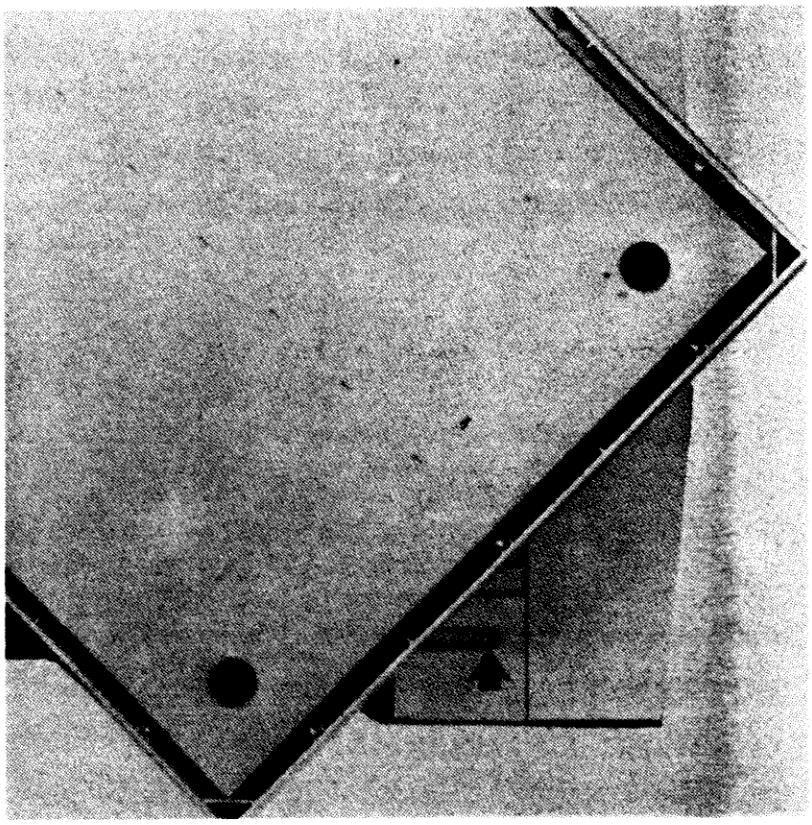
- A series of pictures showing how to disassemble the monitor and gain access to the PCB's.
- Circuit diagrams for each of the PCB's both in overview form and as overlapping "snapshots" where details can be read.
- Oscillograms with numbers referring both to the diagrams and to the assembly drawings.
- Assembly drawings showing component and testpoint placement.
- Test and Service instructions describing how to test and adjust the monitor electronics.
- Spare parts list.

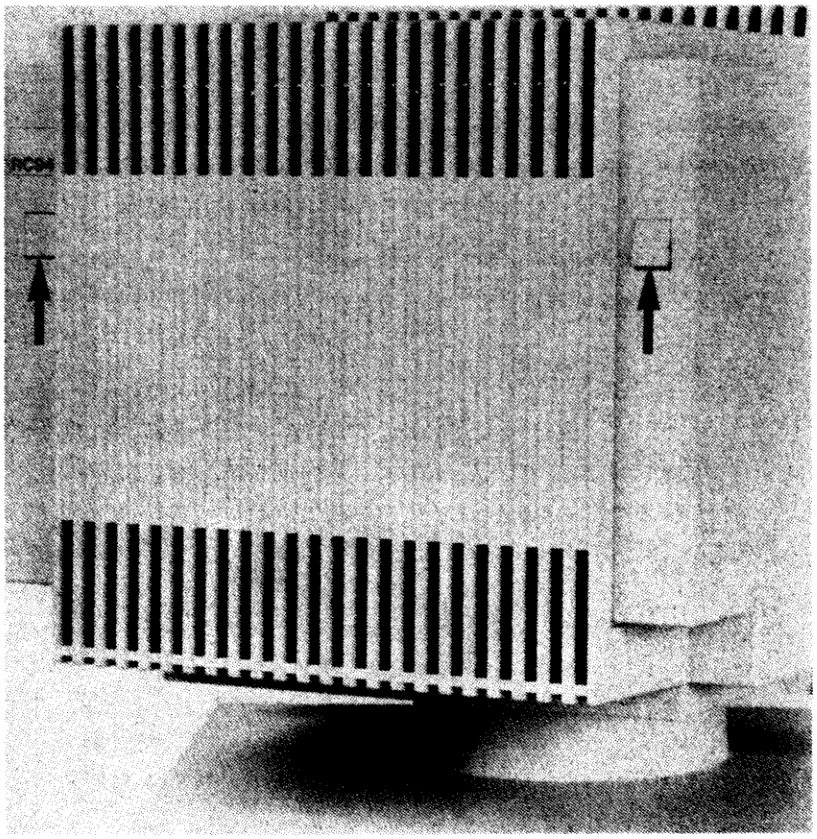
Specifications

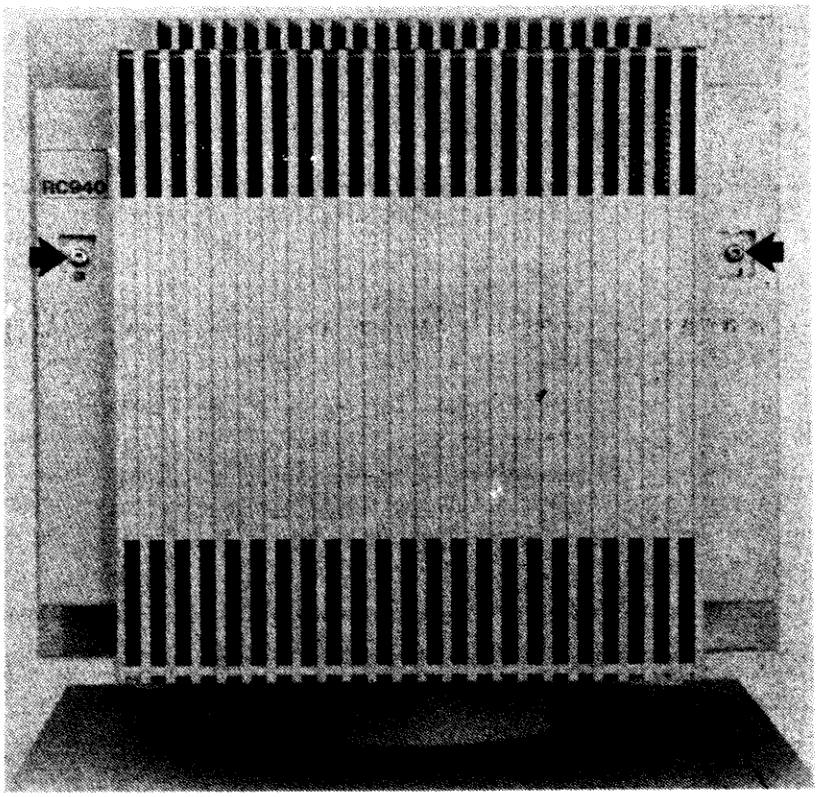
Picture Tube:	15 inch Flat square. 0,31 mm pitch, P22 phosphor. Dot type black matrice.
Antiglare:	Silica coating.
Input signals:	6 TTL Video Signals. Seperate Horizontal and Vertical sync. signals, TTL level. 2 Analog voltages for Contrast and Brightness.
Scan frequencies:	Horizontal: 27,3 kHz Vertical : 74 Hz, 65Hz or 54Hz.
Resolution:	Horizontal: 720 or 640 dots. Vertical : 350, 400 or 480 lines.
Display area:	250 mm (H) x 180 mm (V).
Power supply:	AC 220-240V, 50/60Hz
Power consumption:	Up to 125W depending on plug in card.
Dimensions:	380mm (H) x 365mm (W) x 365mm (D).
Weight:	20 kg.
Operating conditions:	Temperature 10^{o}C-32^{o}C Humidity 20% to 80%.

Disassembly

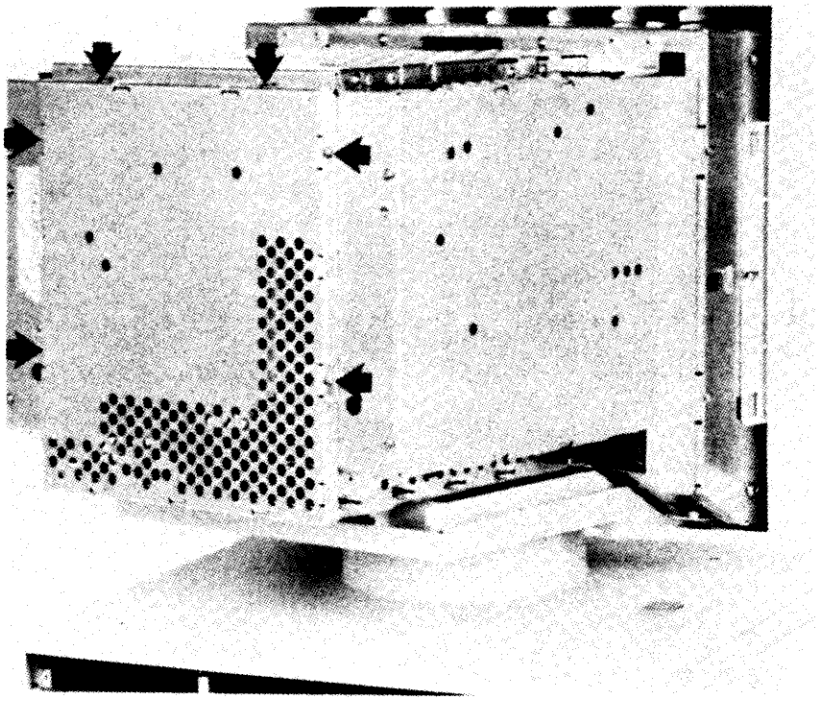


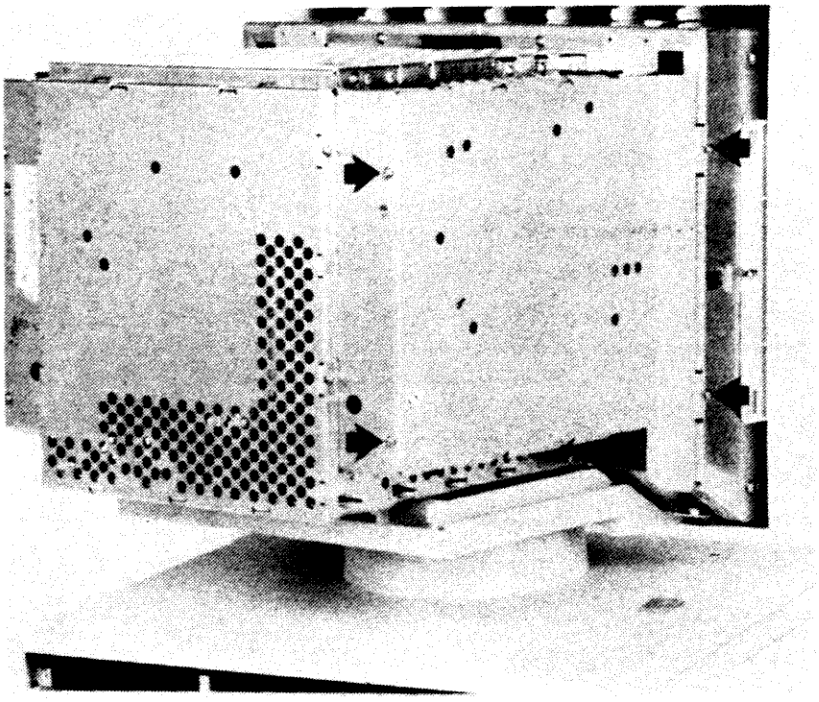


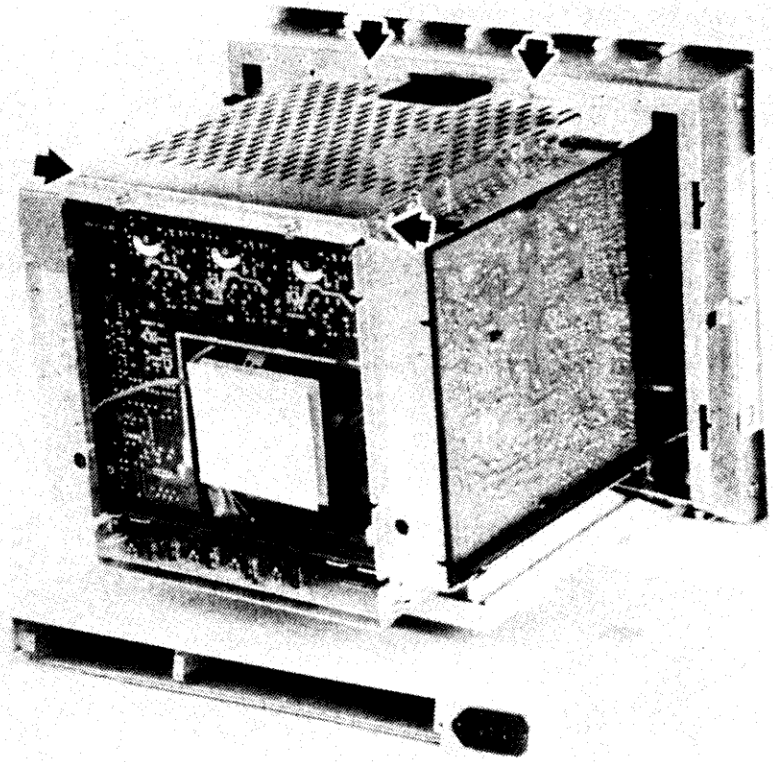


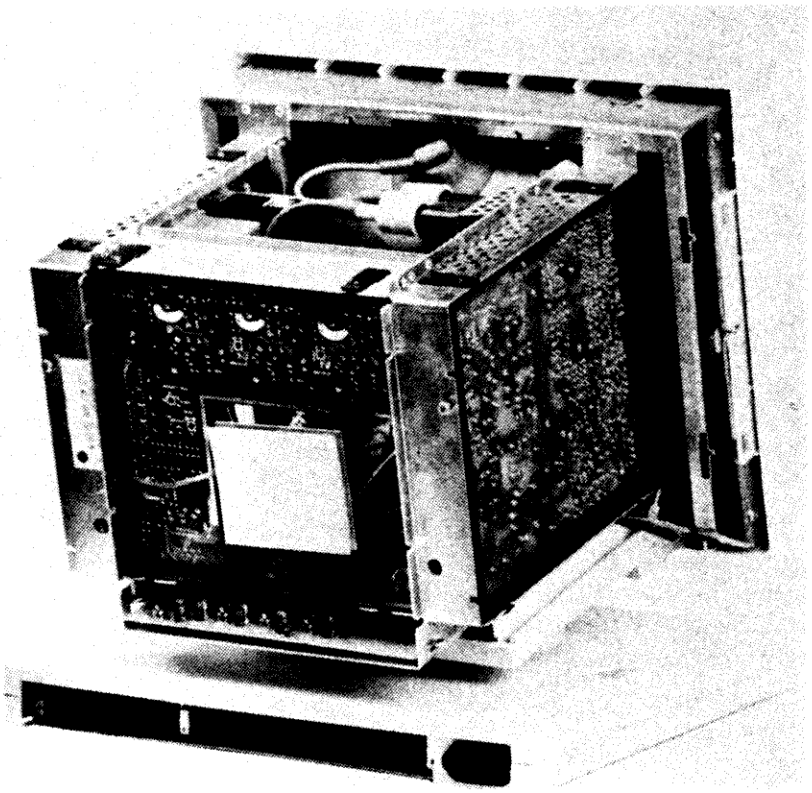

RC940

Disassembly

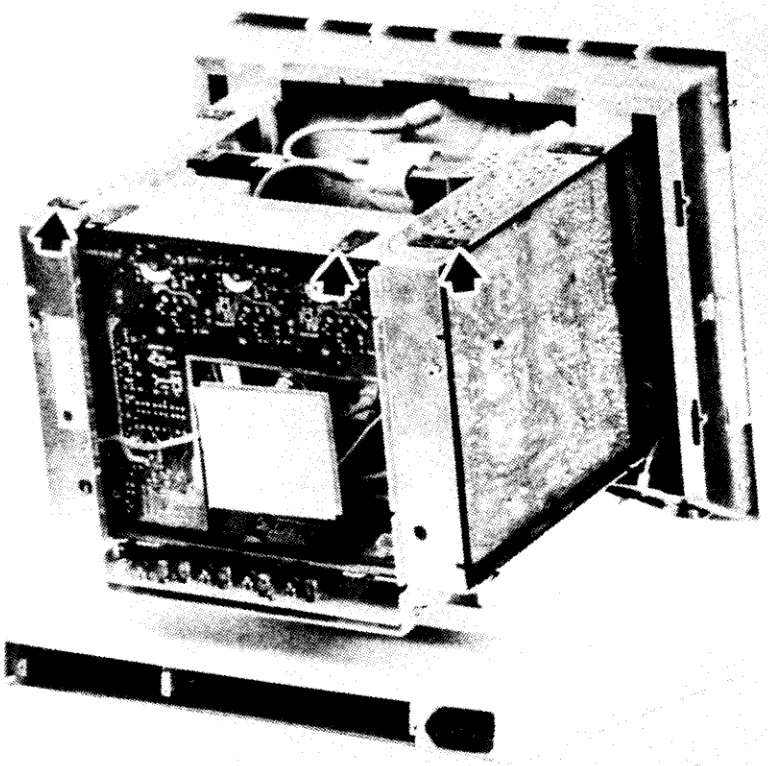


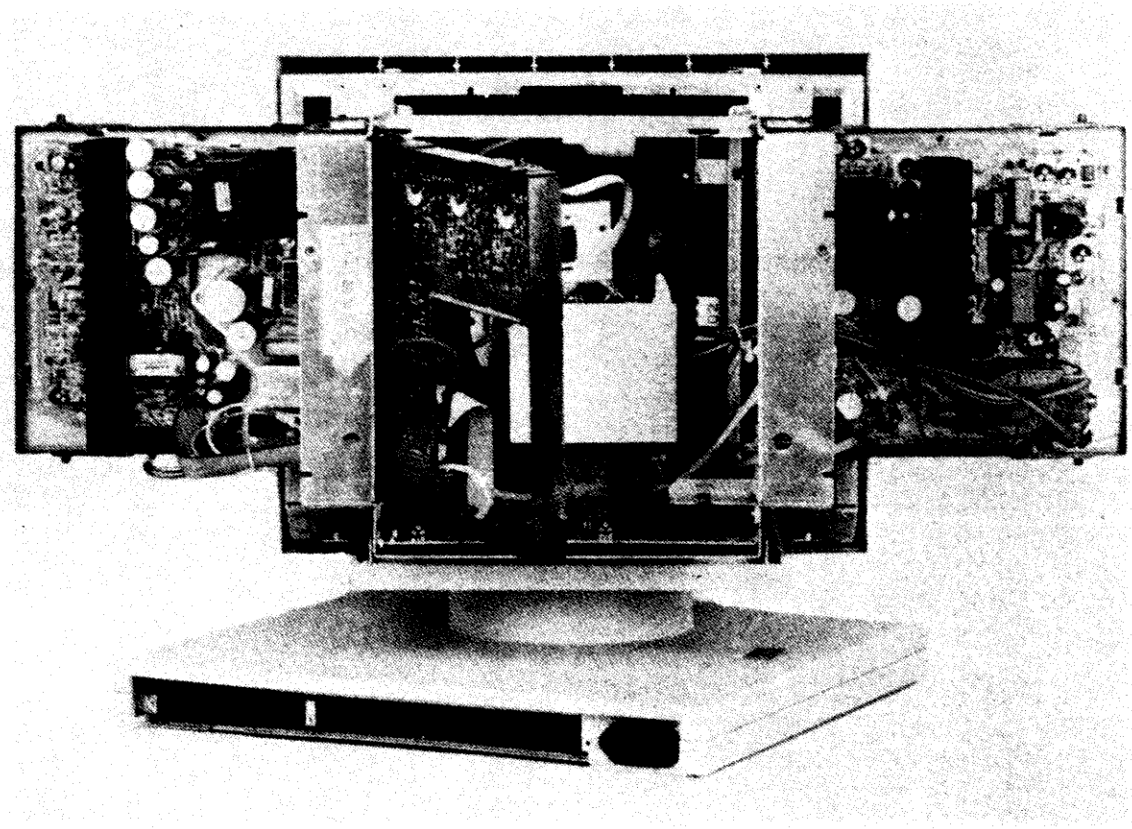




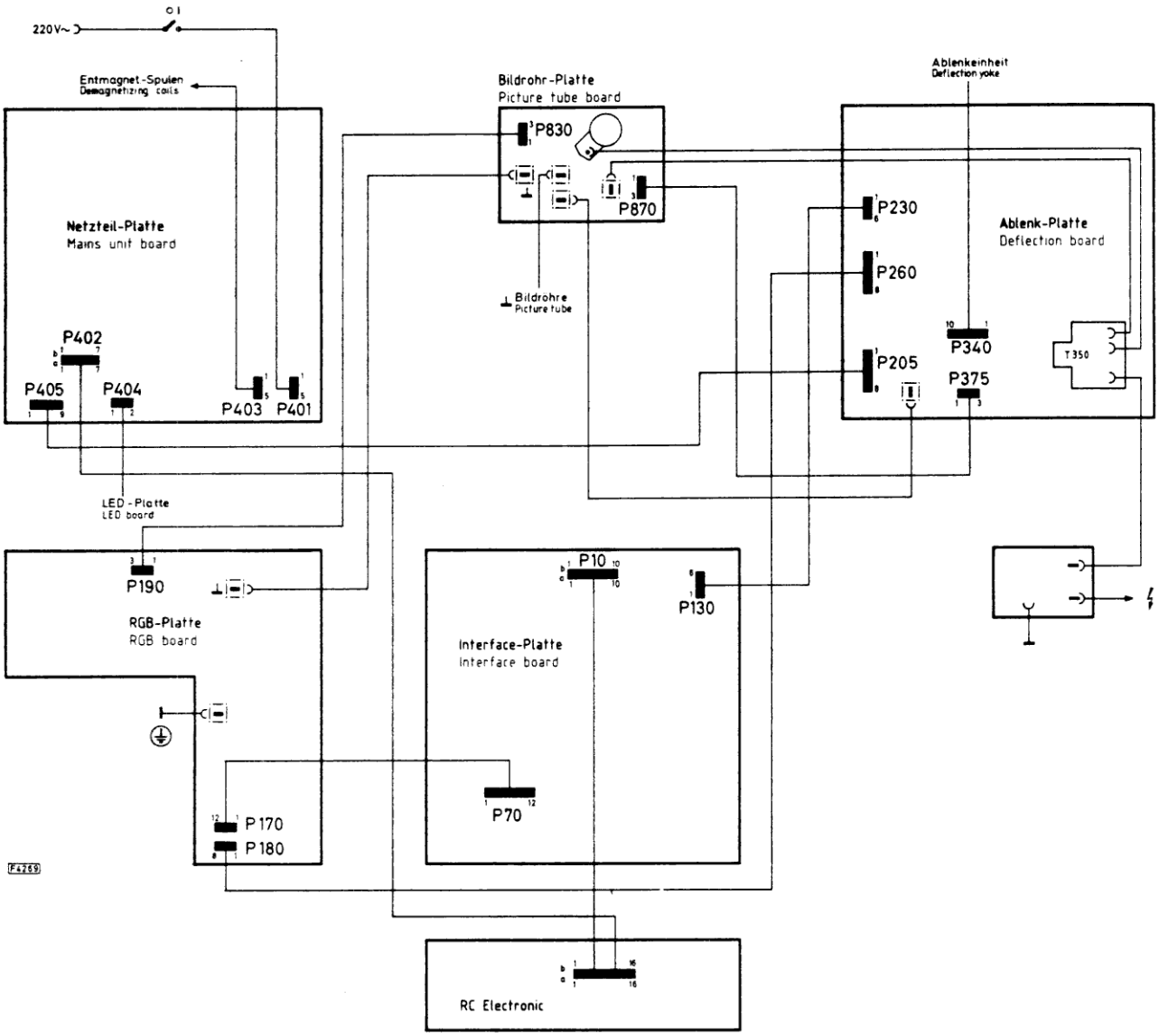


Disassembly

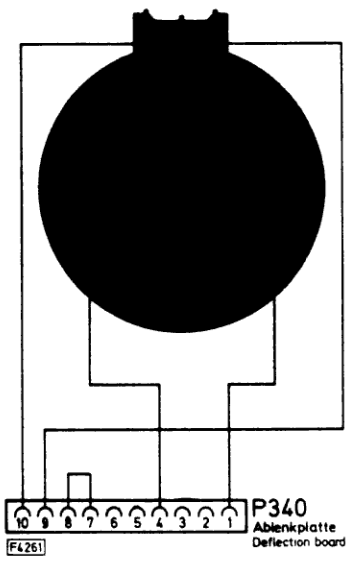




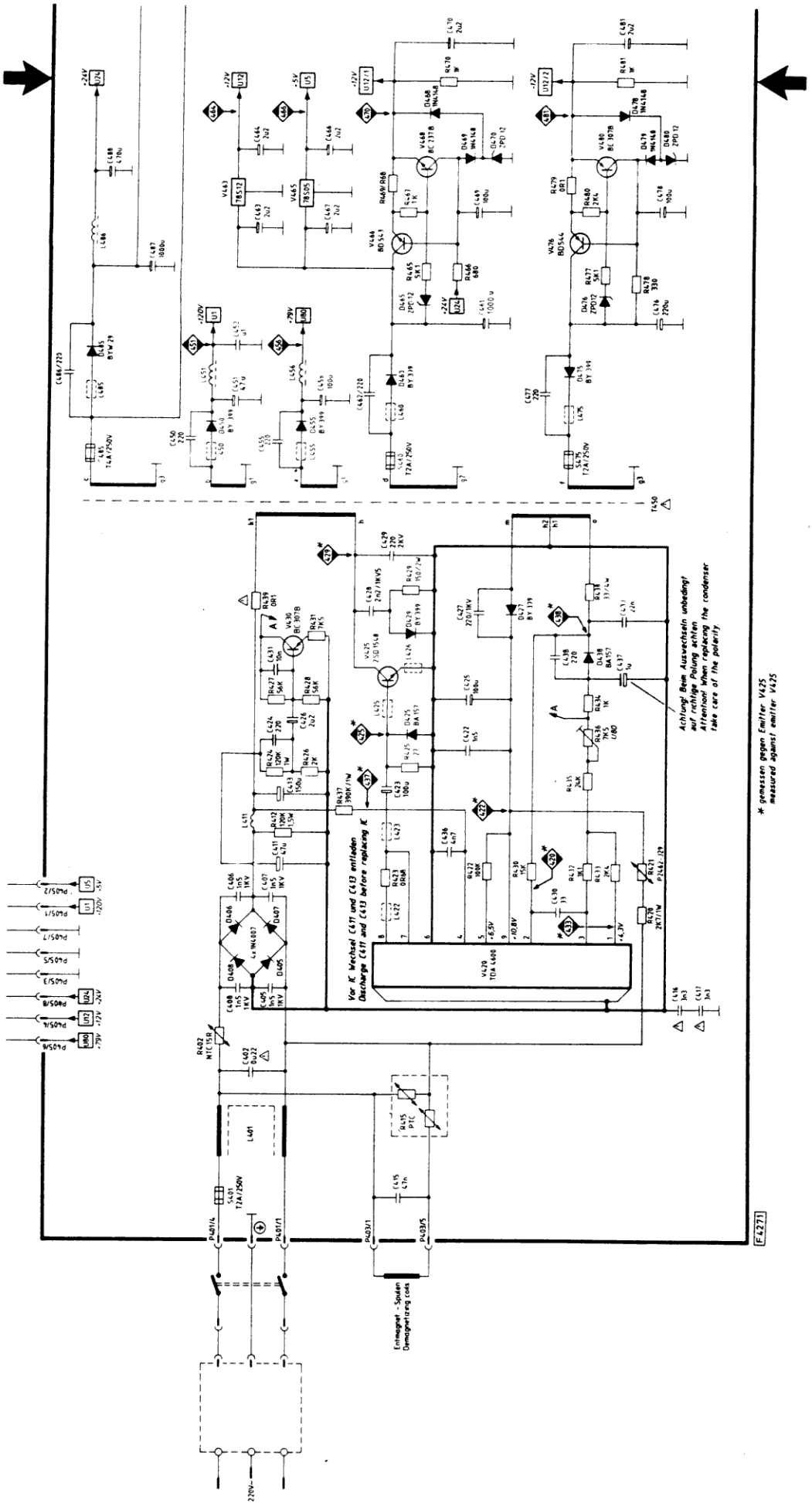
Plug Connections

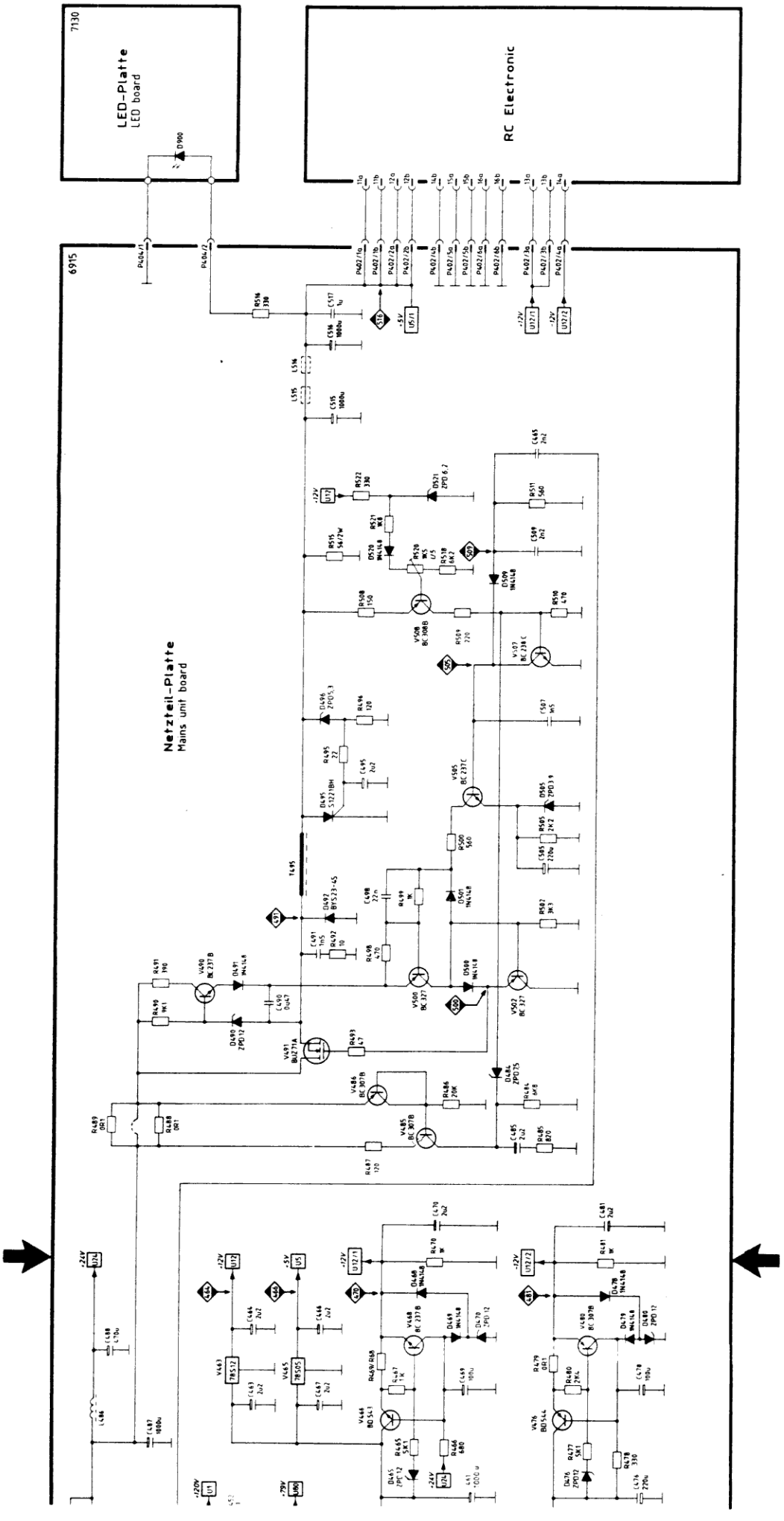


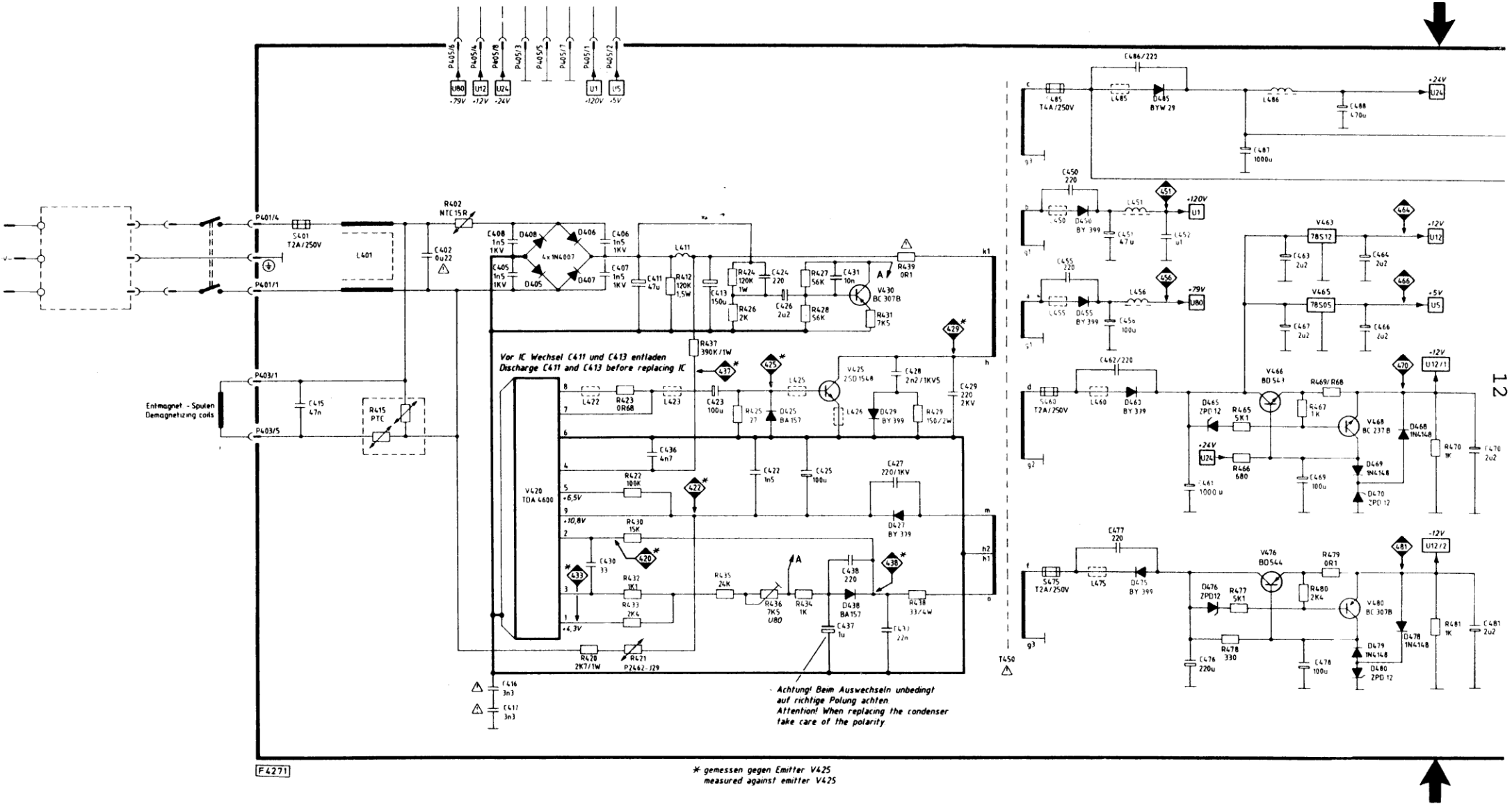
Verdrahtung der Ablenkspulen
Wiring of Deflection Yoke

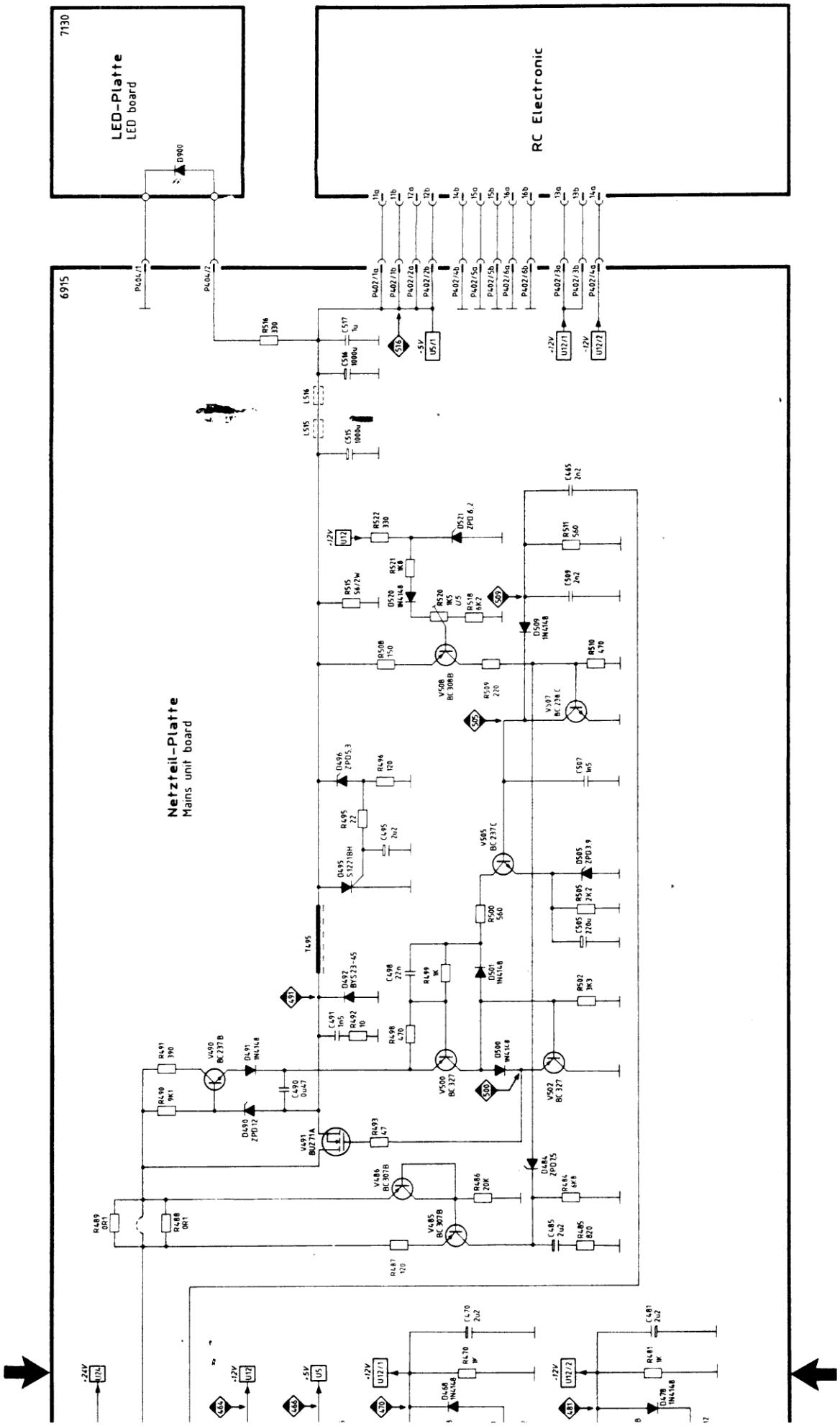


Power supply board

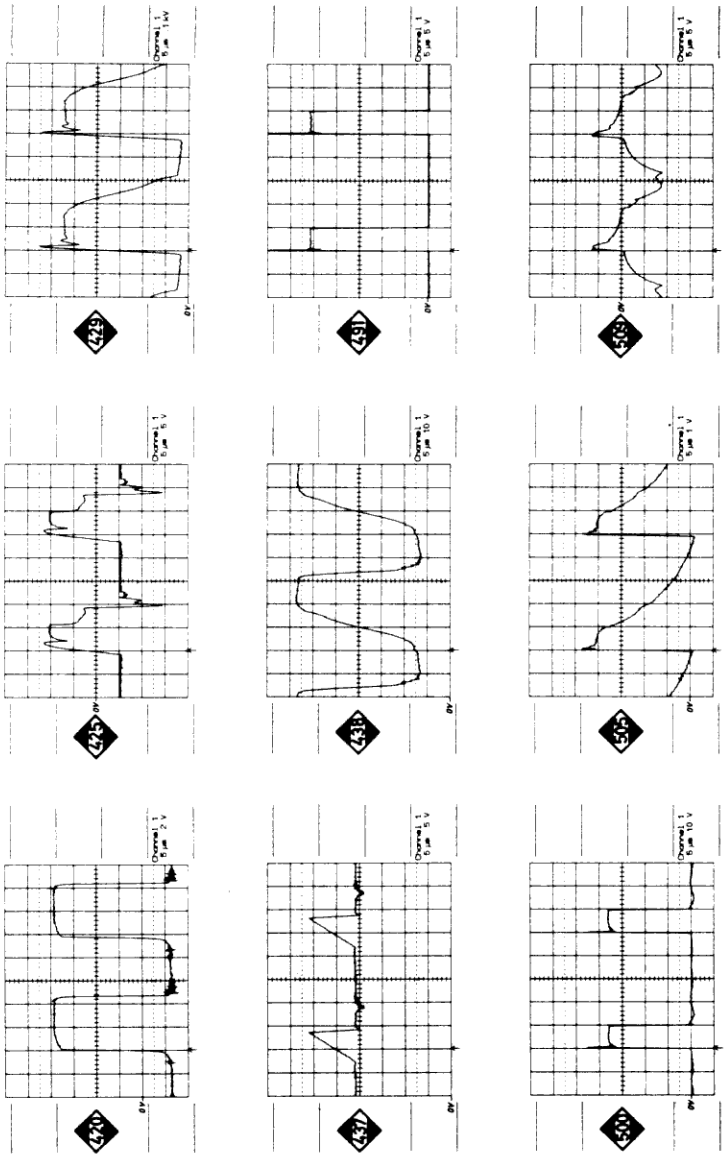



7130
LED-Platte
LED board
D900
RC Electronic
6915
Netzteil-Platte
Mains unit board

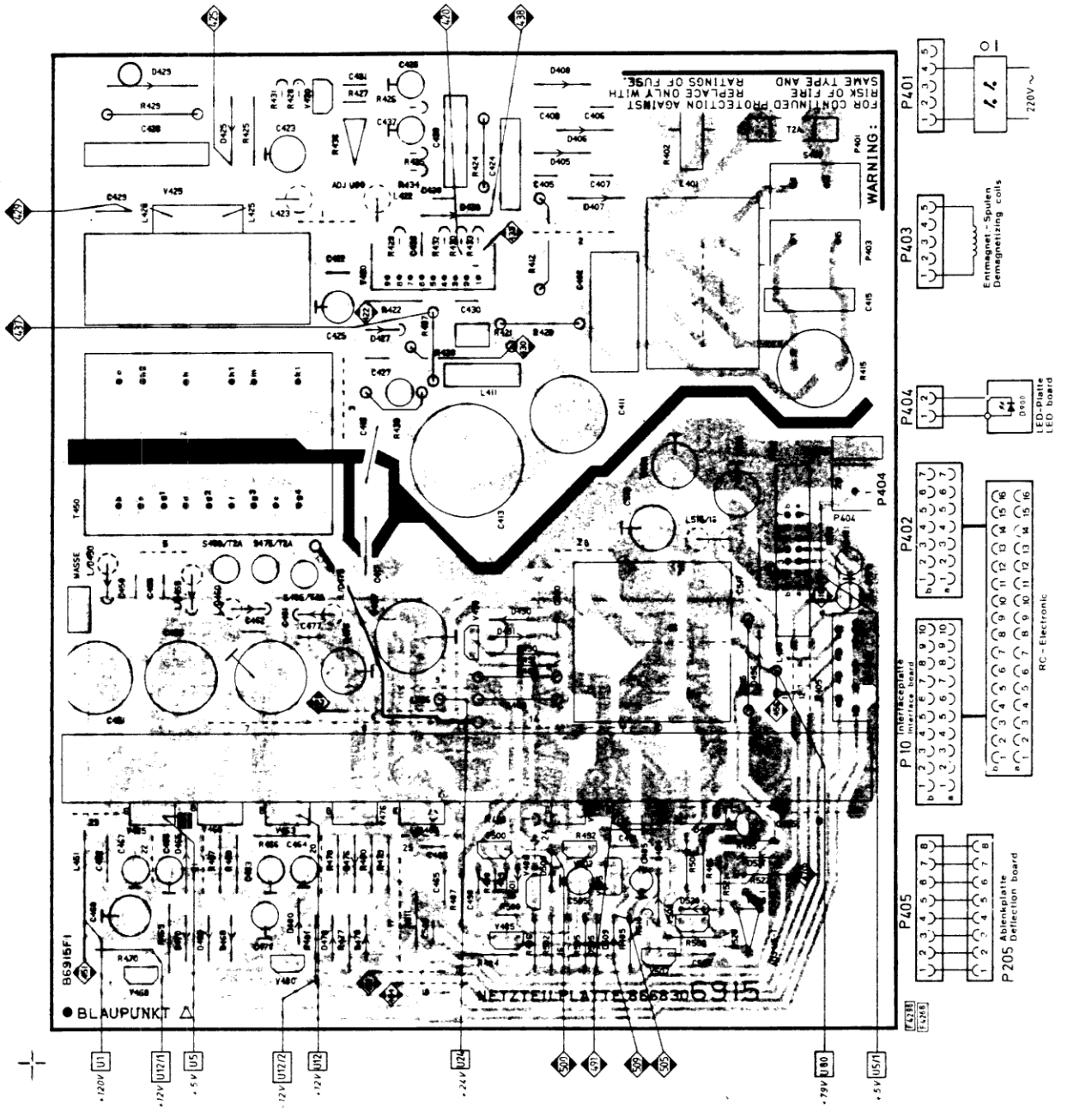

P405/6
P405/4
P405/8
P405/3
P405/5
P405/7
P405/1
P405/2
U80 -79V
U12 +12V
U24 -24V
U1 -120V
U5 -5V
P401/4
P401/1
S401 T2A/250V
L401
R402 NTC 15R
C402 0u22
C408 1n5 1KV
C405 1n5 1KV
D408
D405
D406
D407
4x 1N4007
C406 1n5 1KV
C407 1n5 1KV
L411
C411 47u
R412 120K 1,5W
C413 150u
R424 120K 1W
C424 220
R426 2K
C426 2u2
R427 56K
C431 10n
R428 56K
V430 BC 307B
R431 7K5
R439 0R1
k1
h
Vor IC Wechsel C411 und C413 entladen
Discharge C411 and C413 before replacing IC
R437 390K/1W
C428 2n2/1KV5
C429 220 2KV
V425 2SD1548
L425
L426
D429 BY 399
R429 150/2W
D425 BA157
R425 27
L422
R423 0R68
L423
C423 100u
C436 4n7
C422 1n5
C425 100u
C427 220/1KV
D427 BY 339
R422 100K
+6,5V
+10,8V
+4,3V
V420 TDA 4600
R430 15K
C430 33
R432 1K1
R433 2K4
R435 24K
R436 7K5 U80
R434 1K
C438 220
D438 BA157
R438 33/4W
C437 1u
C431 22n
R428 2K7/1W
R421 P2462-129
m
h2
h1
o
C416 3n3
C417 3n3
P403/1
P403/5
Entmagnet - Spulen
Demagnetizing coils
C415 47n
R415 PTC
T450
Achtung! Beim Auswechseln unbedingt auf richtige Polung achten.
Attention! When replacing the condenser take care of the polarity
C486/220
C485 T4A/250V
L485
D485 BYW 29
L486
C488 470u
C487 1000u
+24V
U24
C450 220
D450 BY 399
L451
C451 47u
C452 u1
+120V
U1
C455 220
D455 BY 399
L456
C456 100u
+79V
U80
V463 78S12
C463 2u2
C464 2u2
+12V
U12
V465 78S05
C467 2u2
C466 2u2
+5V
U5
C462/220
S460 T2A/250V
L460
D463 BY 339
V466 BD 544
R469/R68
D465 ZPD 12
R465 5K1
R467 1K
V468 BC 237 B
D468 1N4148
R470 1K
C470 2u2
C461 1000 u
R466 680
C469 100u
D469 1N4148
D470 ZPD 12
C477 220
S475 T2A/250V
L475
D475 BY 399
V476 BD 544
R479 0R1
D476 ZPD12
R477 5K1
R480 2K4
V480 BC 307B
D478 1N4148
R481 1K
C481 2u2
R478 330
C476 220u
C478 100u
D479 1N4148
D480 ZPD 12
-12V
U12/1
U12/2
F4271
* gemessen gegen Emitter V425
measured against emitter V425

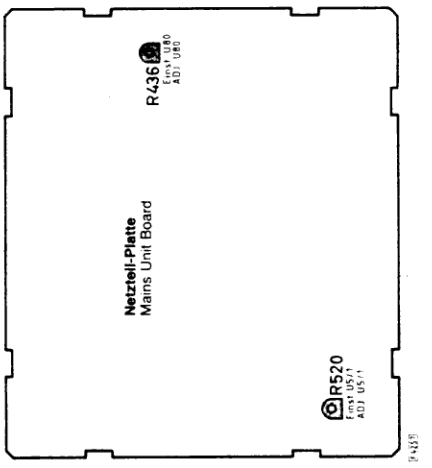

7130
LED-Platte
LED board
D900
RC Electronic
6915
Netzteil-Platte
Mains unit board
P402/1a
P402/1b
P402/2a
P402/2b
P402/4a
P402/5a
P402/5b
P402/6a
P402/6b
P402/3a
P402/3b
P402/4a
P404/1
P404/2
R516 330
C517 1u
C516 1000u
C515 1000u
L514
L515
+5V U5/1
-12V U12/1
-12V U12/2
-12V U12
D521 ZPD 6.2
R522 330
R521 1K8
R520 1K5 U5
R518 6K2
R515 56/2W
D520 1N4148
D519 1N4148
R511 560
C465 2n2
C519 2n2
R508 150
V508 BC 308B
R509 270
R510 470
V507 BC 238 C
C507 1n5
D496 ZPD5.3
R496 120
R495 22
C495 2n2
D495 S1221BH
V505 BC 237C
D505 ZPD3.9
R505 2K2
C505 220u
R500 560
T495
D492 BYS23-45
C498 22n
R499 1K
D501 1N4148
R502 3K3
C491 1n5
R492 10
R498 470
V500 BC 327
D500 1N4148
V502 BC 327
R491 390
V490 BC 237B
D491 1N4148
R490 9K1
C490 0u47
D490 ZPD12
V491 BUZ71A
R493 47
D484 ZPD15
R484 6K8
V486 BC 307B
R486 20K
V485 BC 307B
R485 820
C485 2u2
R489 0R1
R488 0R1
R487 120
C470 2u2
R470 1K
D468 1N4148
C481 2u2
R481 1K
D478 1N4148
-24V U24
-12V U12
-5V U5
-12V U12/1
-12V U12/2

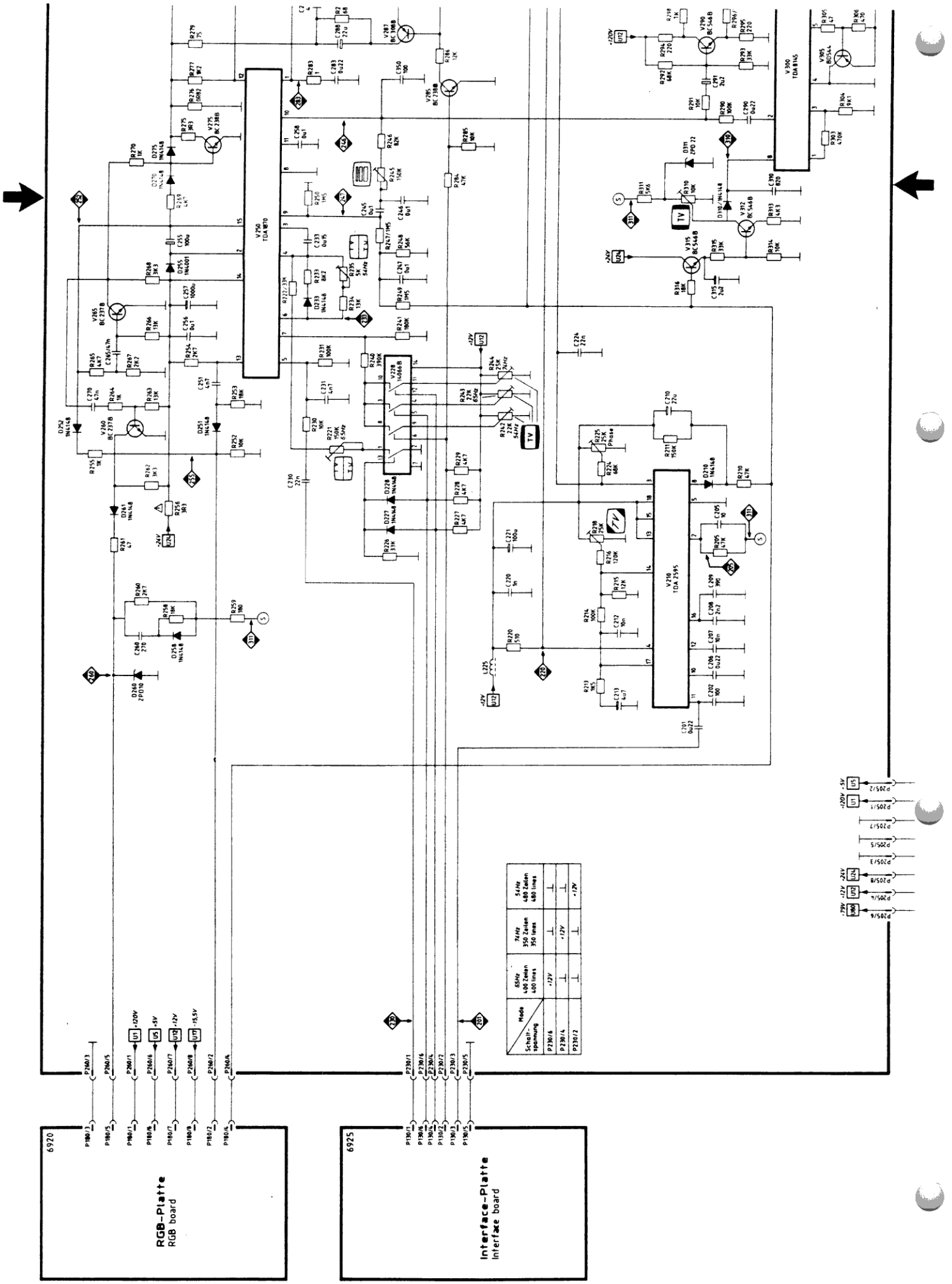
Netzteilplatte

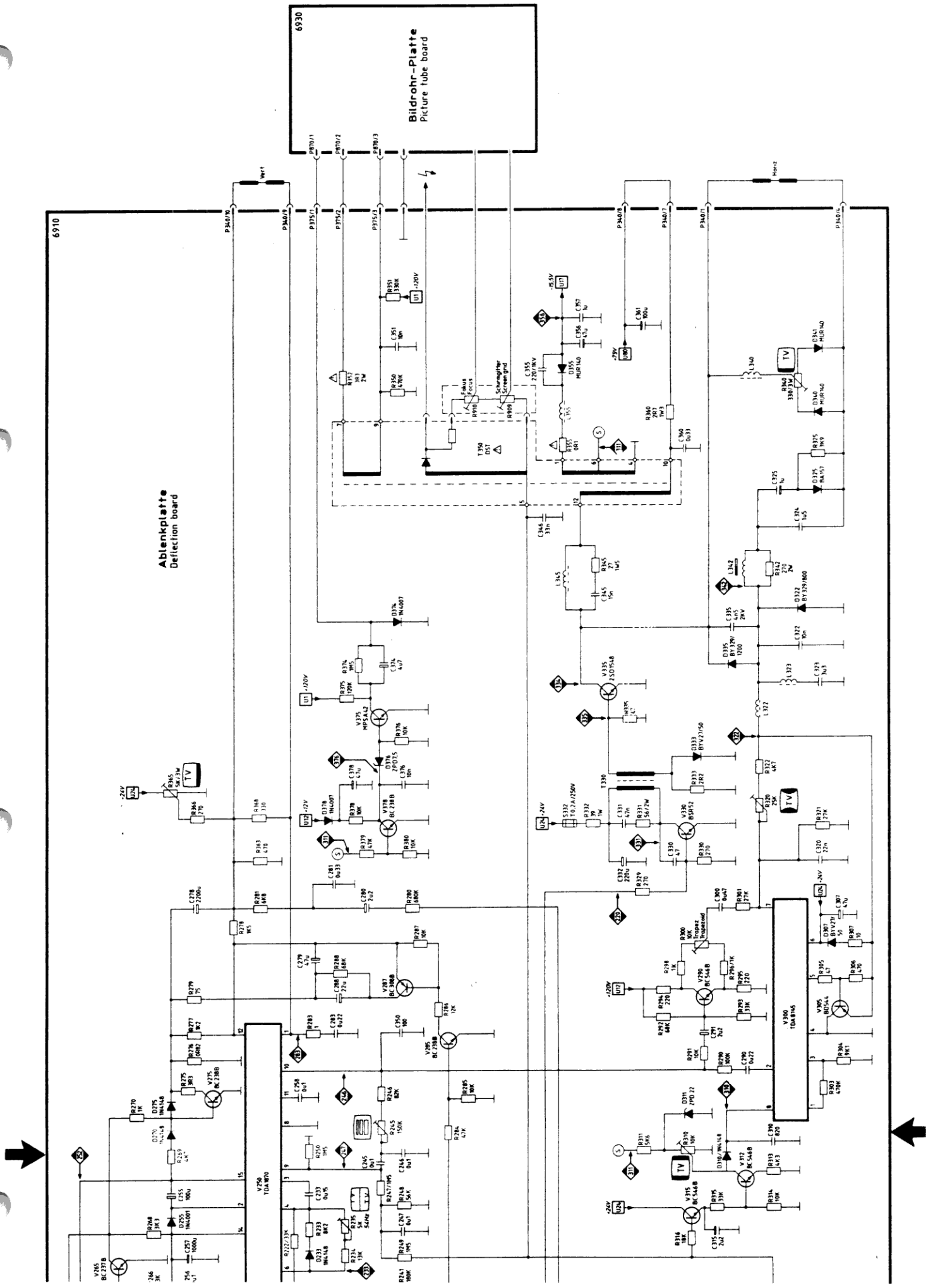


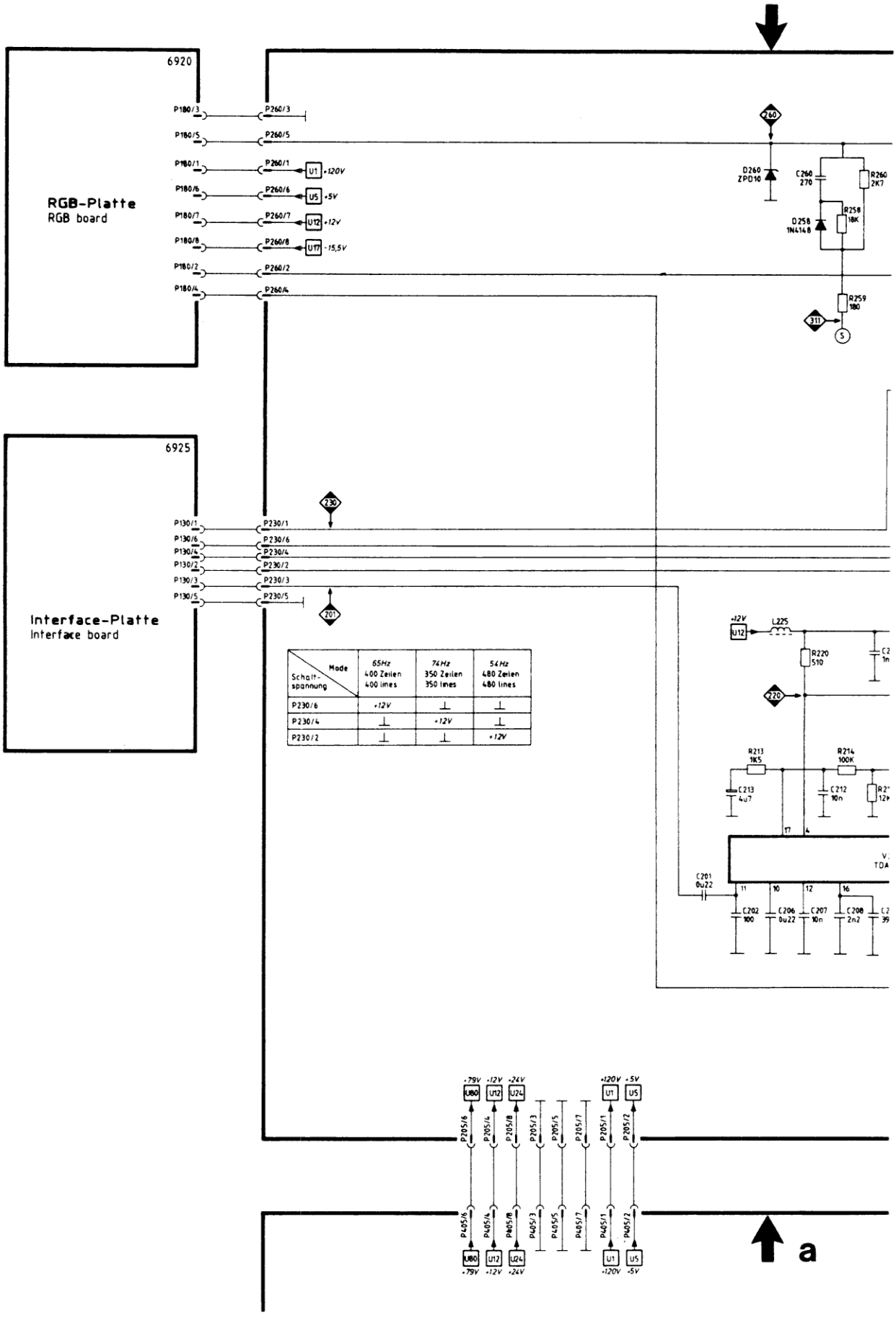
Netzteil-Platte
Mains Unit Board

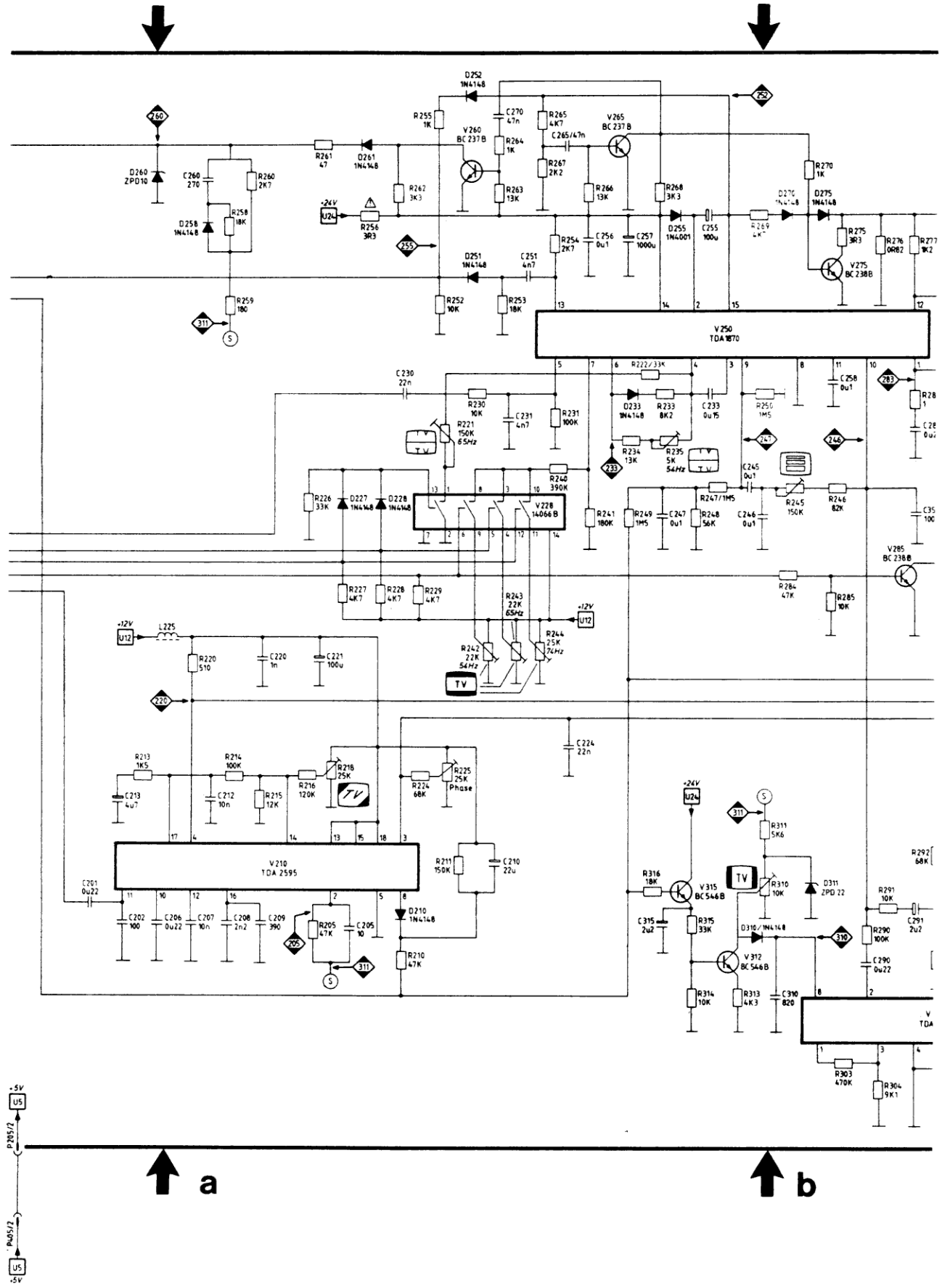


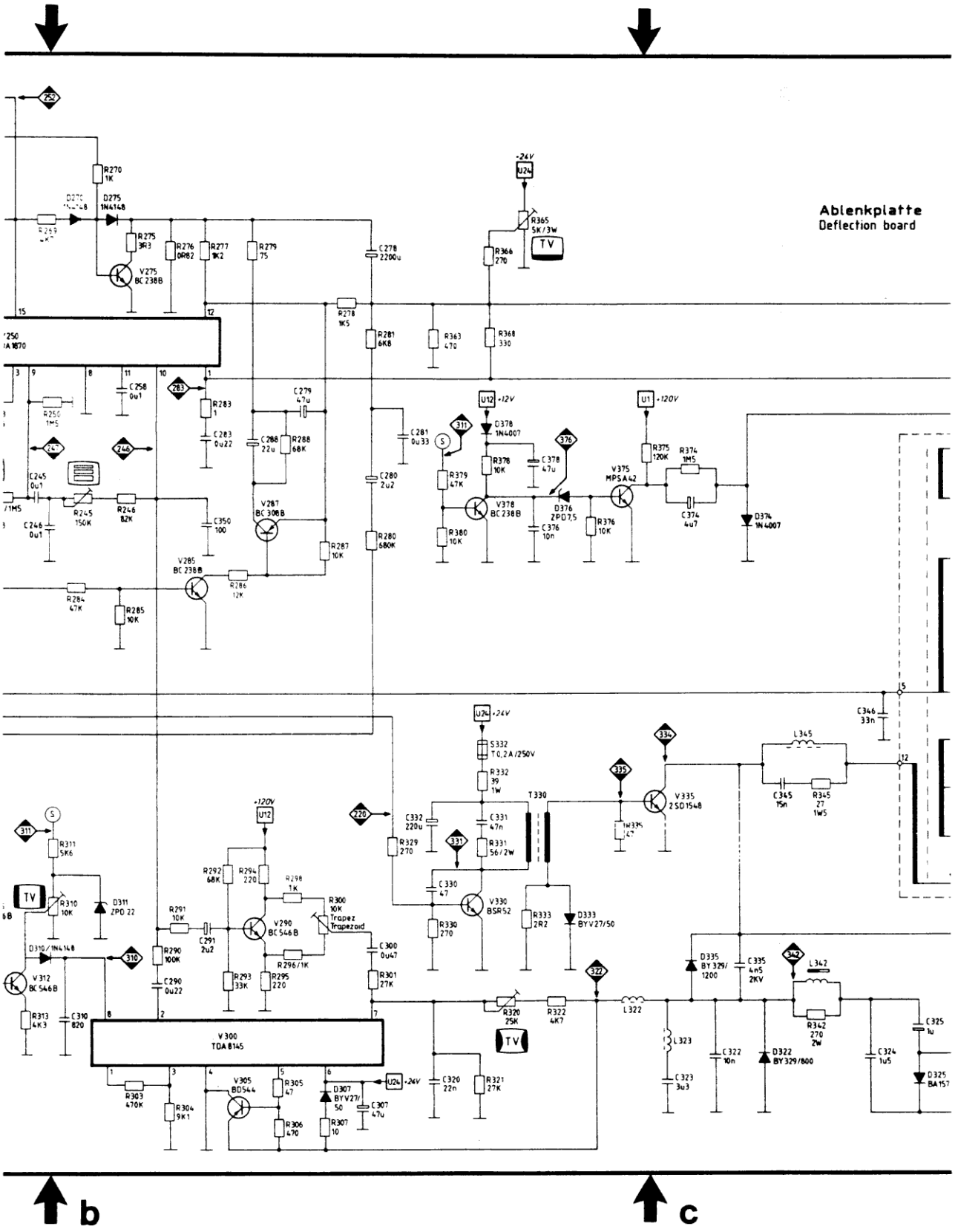


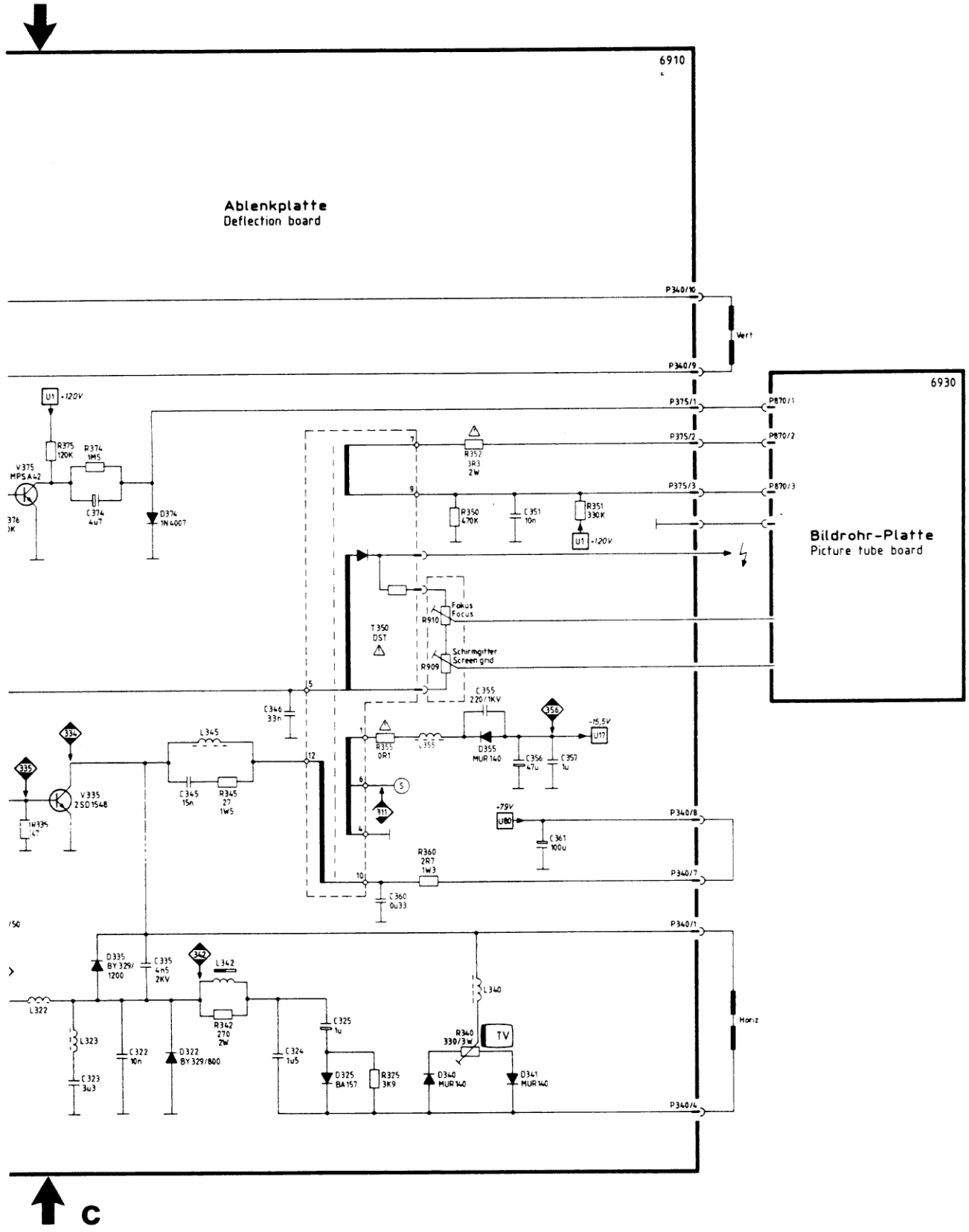

RGB-Platte
RGB board
6920
Interface-Platte
Interface board
6925
V750 TDA4870
V228 14066B
V210 TDA2595
V360 TDA8145
V290 BC548B
V285 BC238B
V275 BC238B
V265 BC237B
V260 BC237B
V315 BC548B
V312 BC548B
V305 BD544
TV
Mode
Schalt-spannung
65Hz 400 Zeilen 400 lines
74Hz 350 Zeilen 350 lines
54Hz 480 Zeilen 480 lines
P230/6
P230/4
P230/2
-12V
+12V


6930
Bildrohr-Platte
Picture tube board
6910
Ablenkplatte
Deflection board
Fokus
Focus
Schirmgitter
Screengrid
TV
Horiz
Vert
V750 TDA4870
V390 TDA8145

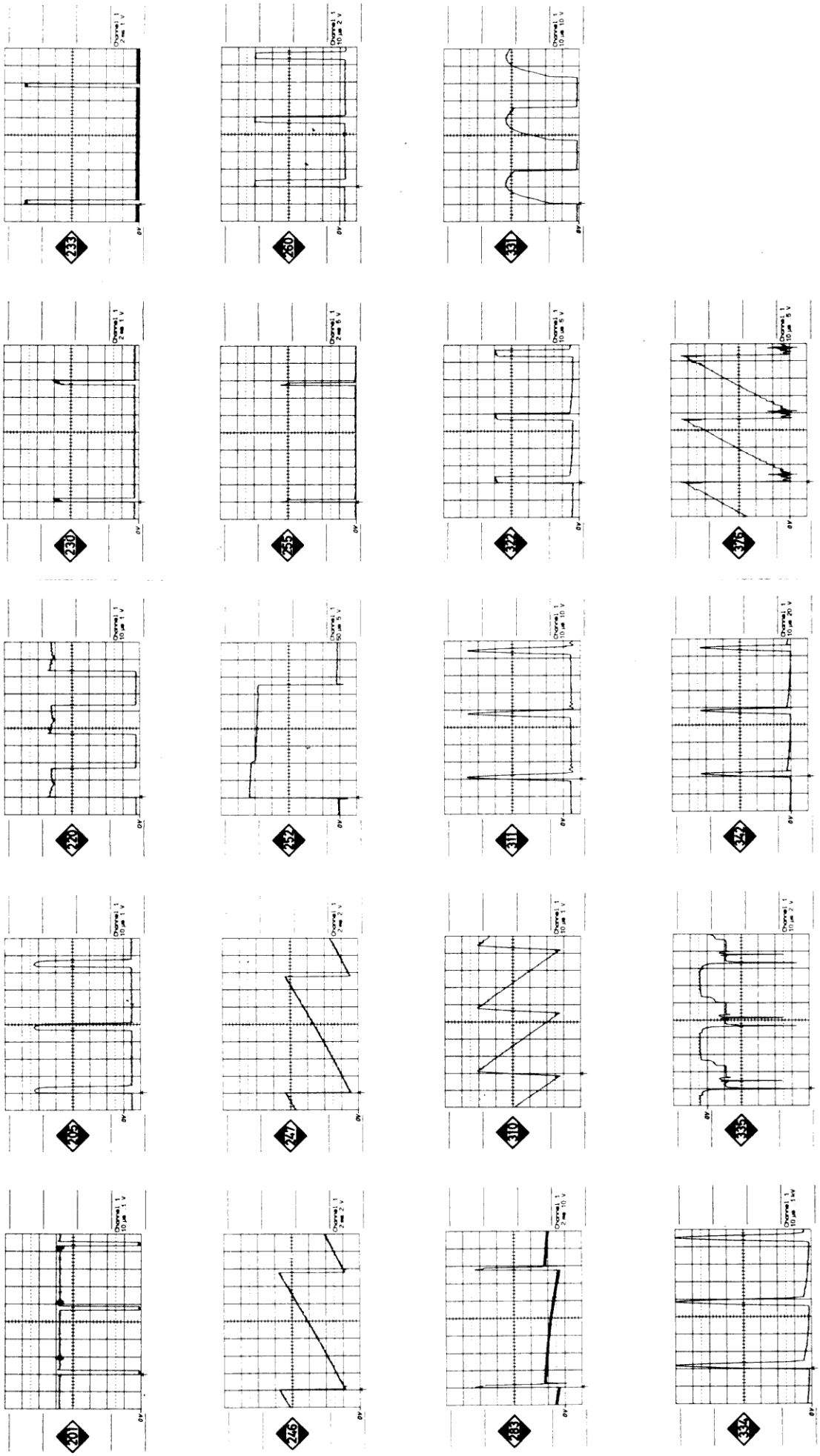

6920
RGB-Platte
RGB board
P180/3
P180/5
P180/1
P180/6
P180/7
P180/8
P180/2
P180/4
P260/3
P260/5
P260/1
P260/6
P260/7
P260/8
P260/2
P260/4
U1 +120V
U5 +5V
U12 +12V
U17 -15,5V
260
D260 ZPD10
C260 270
R260 2K7
D258 1N4148
R258 18K
R259 180
311
S
6925
Interface-Platte
Interface board
P130/1
P130/6
P130/4
P130/2
P130/3
P130/5
P230/1
P230/6
P230/4
P230/2
P230/3
P230/5
230
201
Mode
Schalt-spannung
65Hz 400 Zeilen 400 lines
74Hz 350 Zeilen 350 lines
54Hz 480 Zeilen 480 lines
P230/6 +12V ⊥ ⊥
P230/4 ⊥ +12V ⊥
P230/2 ⊥ ⊥ +12V
+12V
U12
L225
R220 510
220
R213 1K5
R214 100K
C213 4u7
C212 10n
C201 0u22
C202 100
C206 0u22
C207 10n
C208 2n2
TDA
P205/6
P205/4
P205/8
P205/3
P205/5
P205/7
P205/1
P205/2
P405/6
P405/4
P405/8
P405/3
P405/5
P405/7
P405/1
P405/2
+79V +12V +24V +120V +5V
U80 U12 U24 U1 U5
-79V -12V -24V -120V -5V
a


V250 TDA1870
V210 TDA 2595
V228 14066 B
V260 BC 237 B
V265 BC 237 B
V275 BC 238 B
V285 BC 238 B
V315 BC 546 B
V312 BC 546 B
TV
+24V
+12V
+5V
a
b

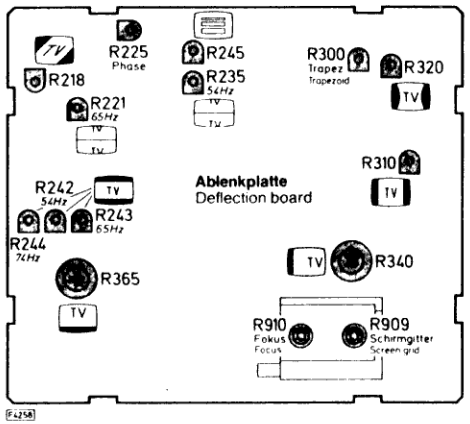

Ablenkplatte
Deflection board
b
c

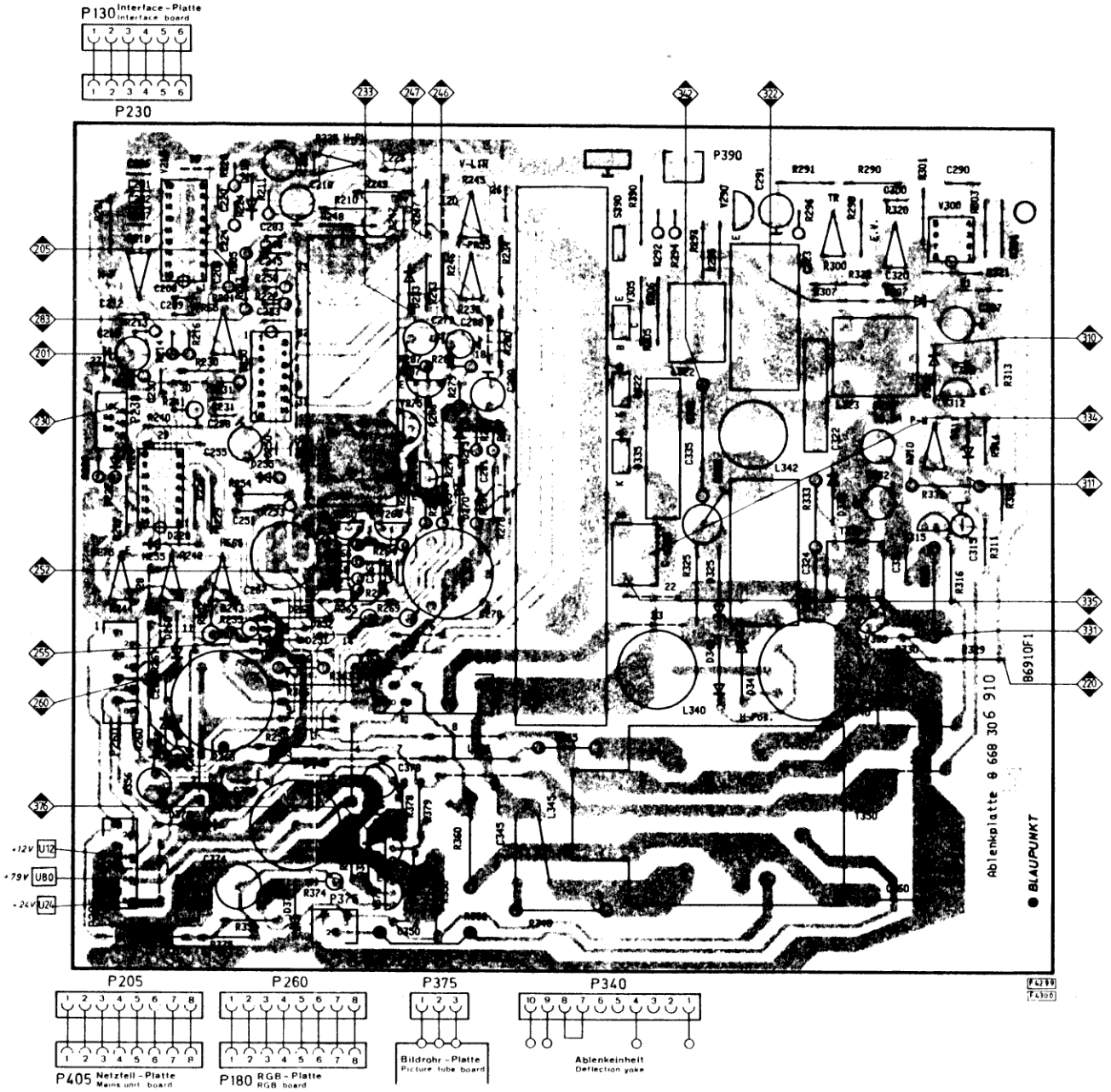

6910
Ablenkplatte
Deflection board
P340/10
Vert
P340/9
6930
P375/1
P870/1
P375/2
P870/2
P375/3
P870/3
Bildrohr-Platte
Picture tube board
U1 +120V
R375 120K
R374 1M5
V375 MPSA42
C374 4u7
D374 1N4007
R352 3R3 2W
R350 470K
C351 10n
R351 330K
U1 +120V
T350 DST
Fokus Focus
R910
Schirmgitter Screen grid
R909
C346 33n
L345
C345 15n
R345 27 1W5
V335 2SD1548
C355 220/1KV
D355 MUR140
C356 47u
C357 1u
U17 ~15.5V
R355 0R1
L355
~79V
U80
C361 100u
P340/8
P340/7
R360 2R7 1W3
C360 0u33
P340/1
D335 BY329/1200
C335 4n5 2KV
L342
R342 270 2W
L322
L323
C323 3u3
C322 10n
D322 BY329/800
C324 1u5
C325 1u
D325 BA157
R325 3K9
L340
R340 330/3W
TV
D340 MUR140
D341 MUR140
Horiz
P340/4
C

Ablenkplatte

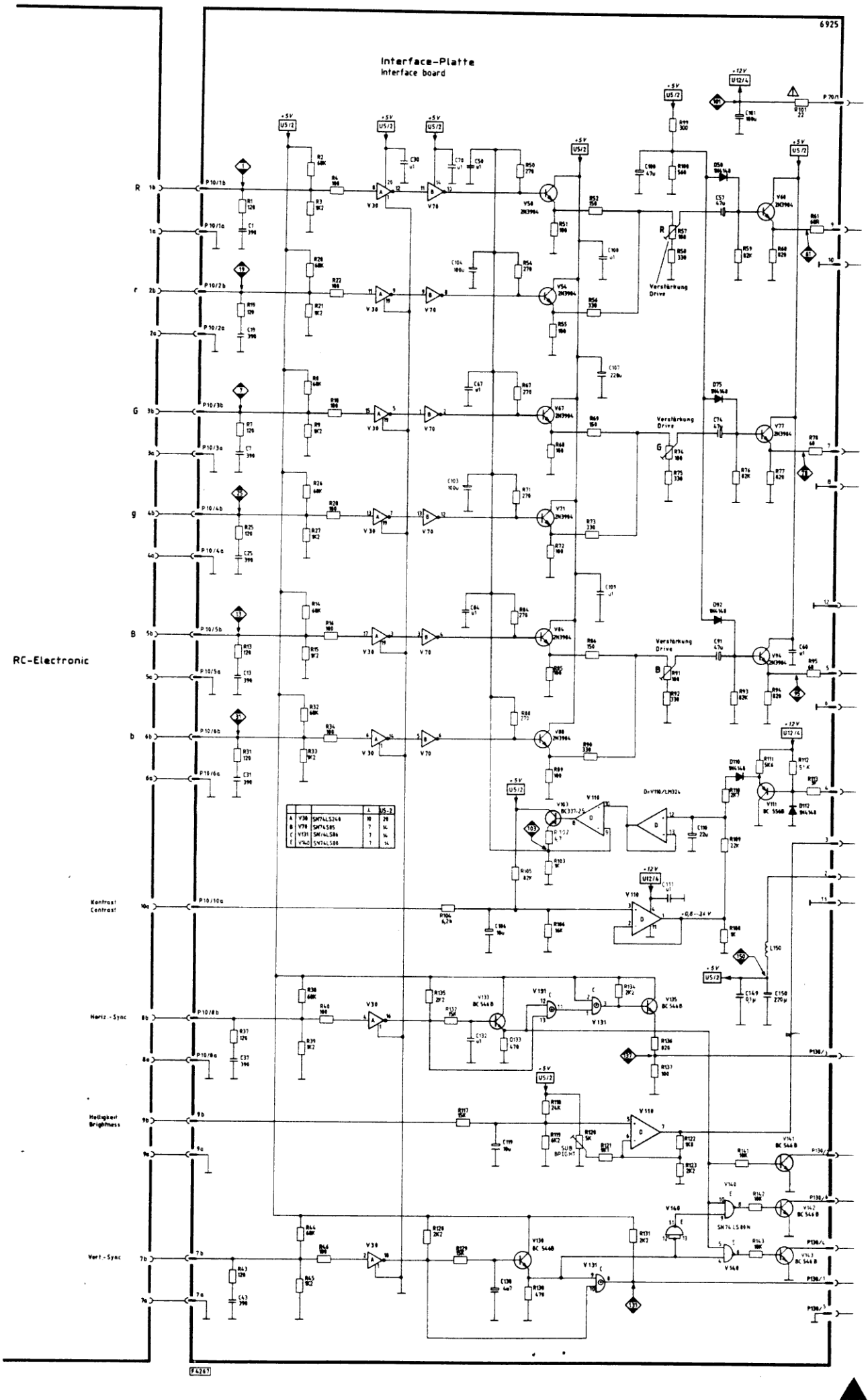


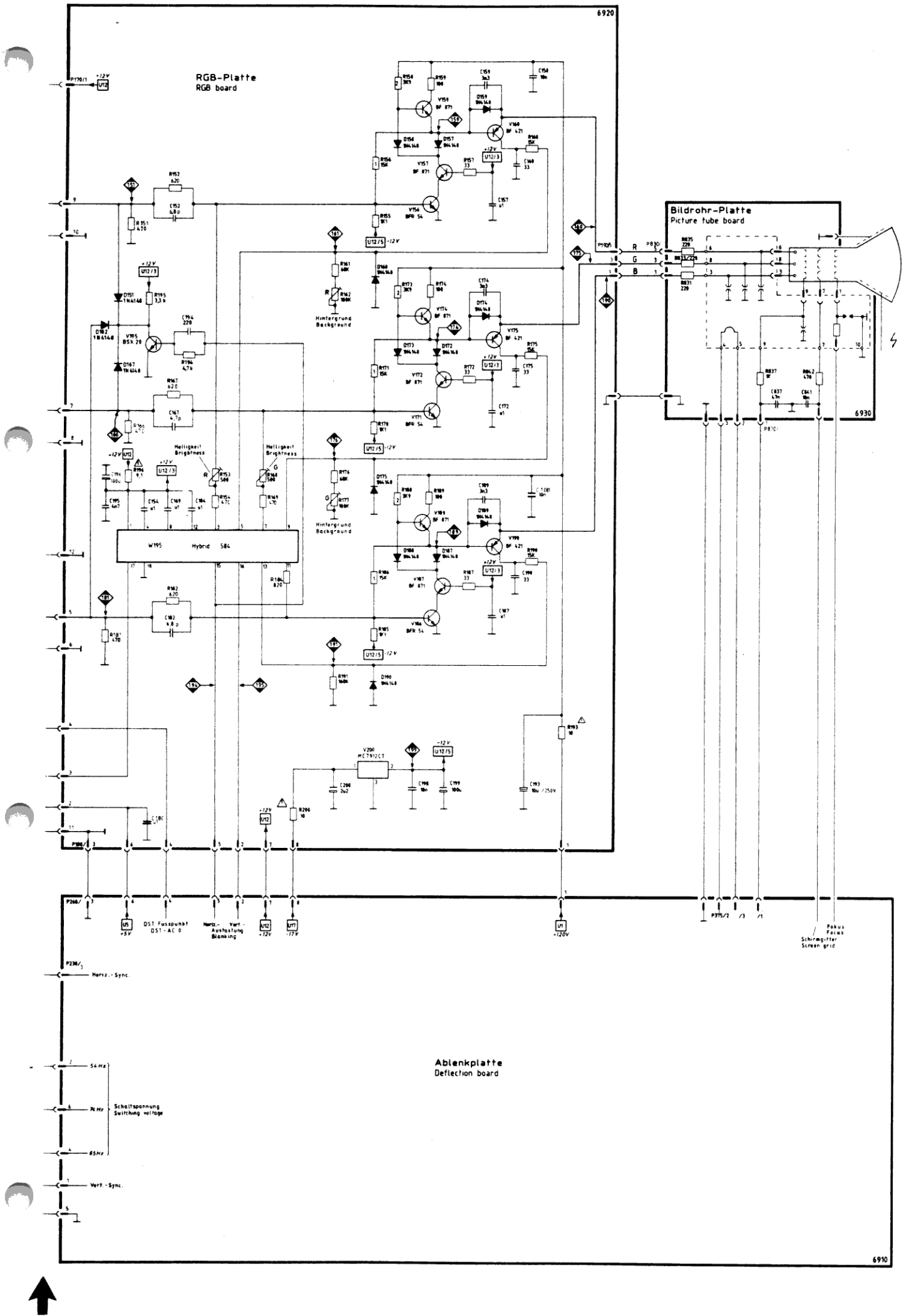
Ablenkplatte
Deflection Board

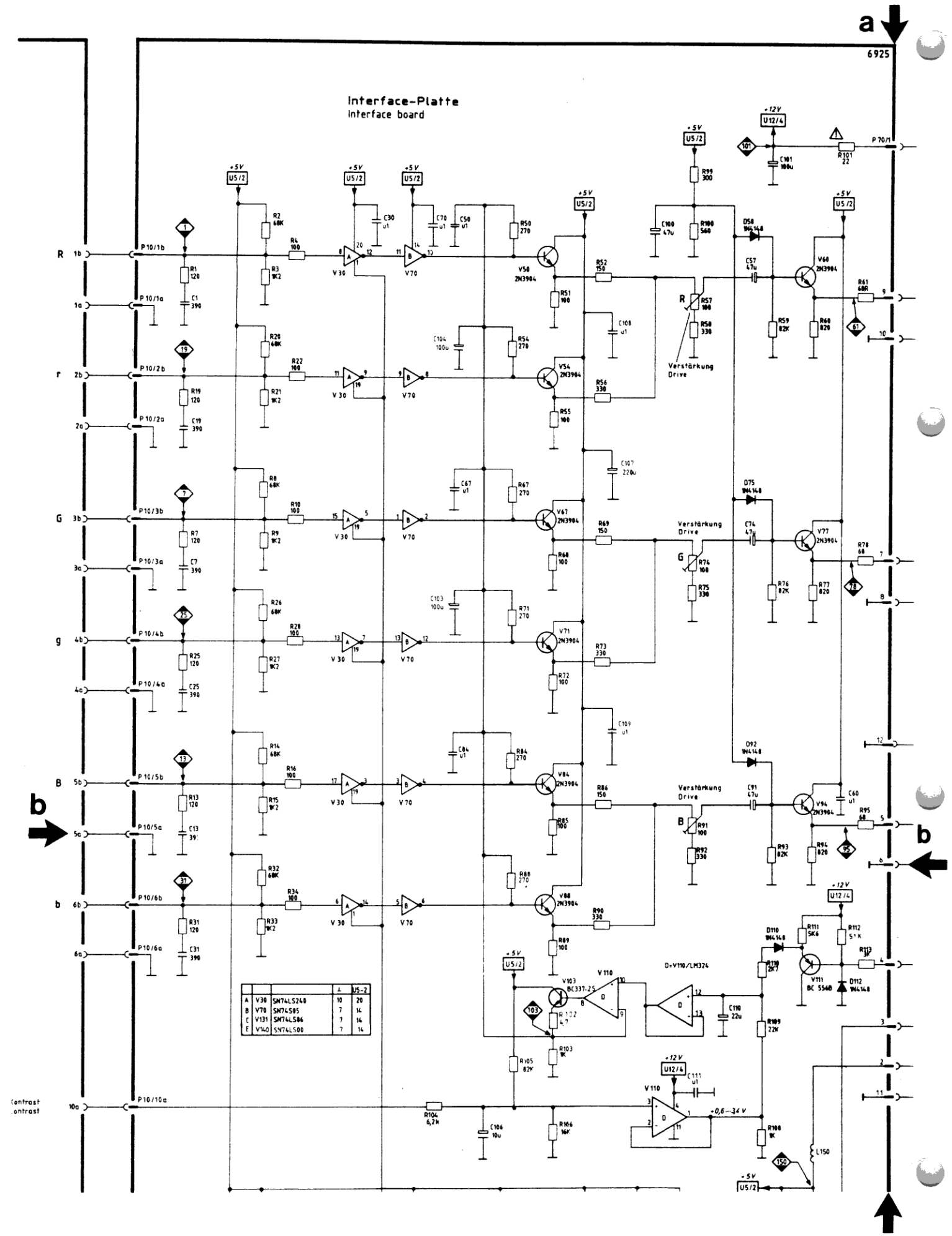


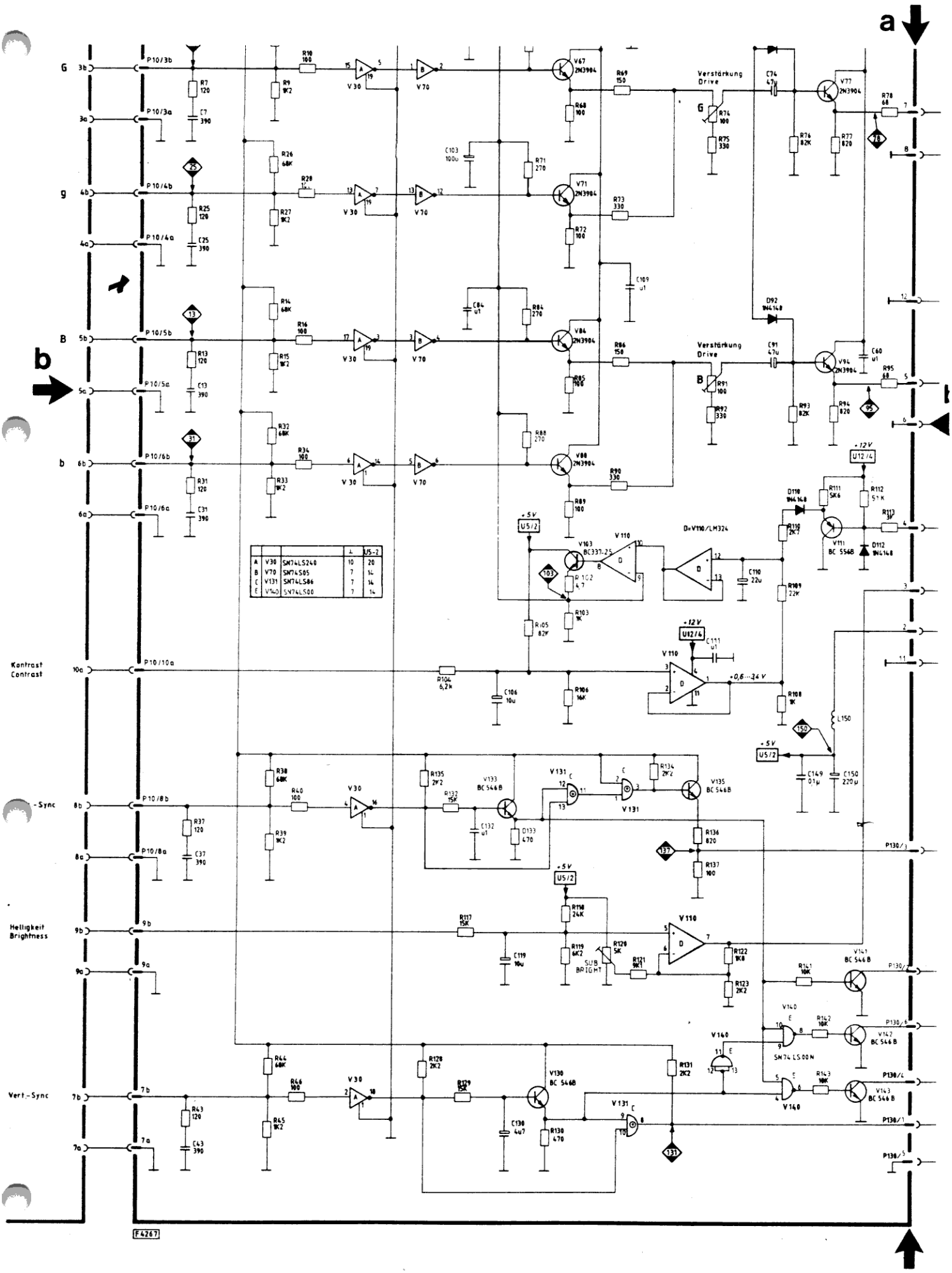


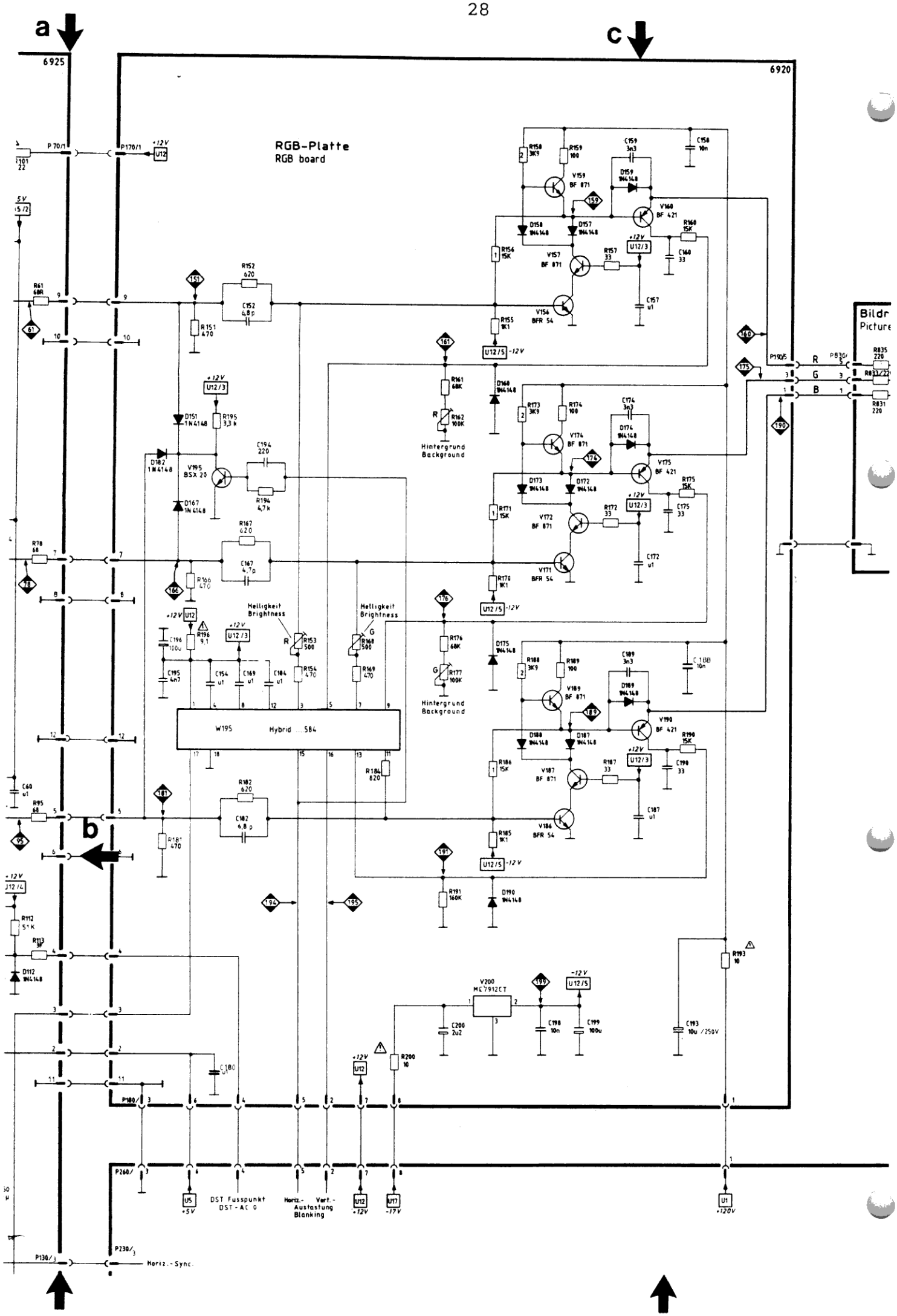
RC-Electronic

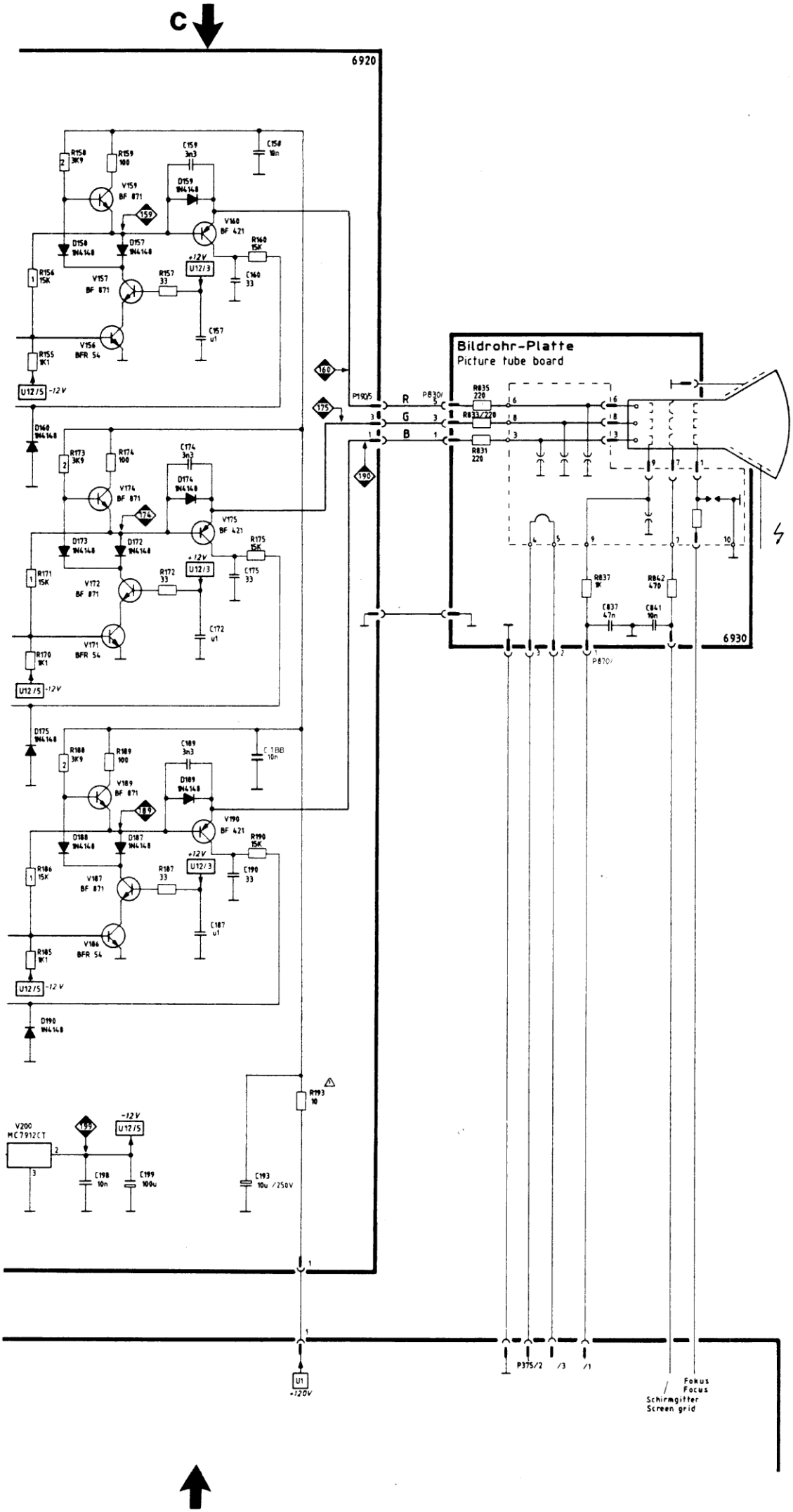



6920
RGB-Platte
RGB board
Bildrohr-Platte
Picture tube board
6930
Hintergrund
Background
Helligkeit
Brightness
W195 Hybrid 584
Ablenkplatte
Deflection board
6910
Horiz.-Sync.
Vert.-Sync.
Schaltspannung
Switching voltage
DST Fusspunkt
DST - AC 0
Horiz.- Vert.-
Austastung
Blanking
Fokus
Focus
Schirmgitter
Screen grid

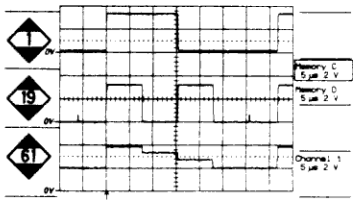

Interface-Platte
Interface board
6925
a
b
b
Verstärkung
Drive
Verstärkung
Drive
Verstärkung
Drive
D=V110/LM324
Contrast
Contrast
+0,6...34 V
+5V
+12V
U5/2
U12/4
V30
V70
V110
P10/1b
P10/1a
P10/2b
P10/2a
P10/3b
P10/3a
P10/4b
P10/4a
P10/5b
P10/5a
P10/6b
P10/6a
P10/10a
P70/1
L150

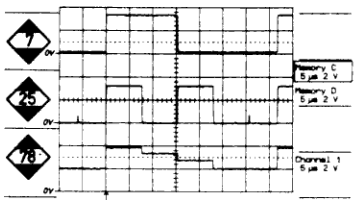

a
b
G
g
B
b
Kontrast
Contrast
- Sync
Helligkeit
Brightness
Vert.-Sync
Verstärkung
Drive
SUB BRIGHT
SN74 LS 00 N
F4267

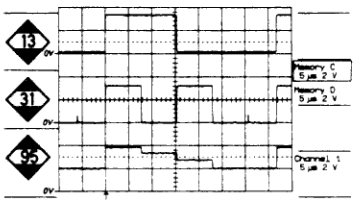

RGB-Platte
RGB board
6925
6920
a
b
c
Helligkeit
Brightness
Hintergrund
Background
W195 Hybrid 584
V200 MC7912CT
DST Fusspunkt
DST - AC 0
Horiz.- Austastung
Blanking
Vert.- Austastung
Horiz.- Sync.
Bildr
Picture

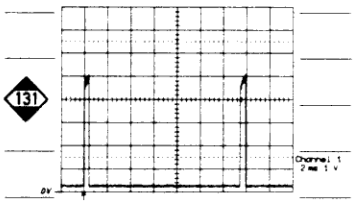

C
6920
Bildrohr-Platte
Picture tube board
6930
R
G
B
P830/
P870/
P1905
P375/2
/3
/1
U1
+120V
Fokus
Focus
Schirmgitter
Screen grid
V200
MC7912CT
-12V
+12V

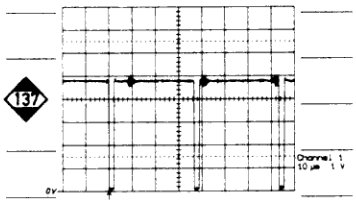
Interface-Platte



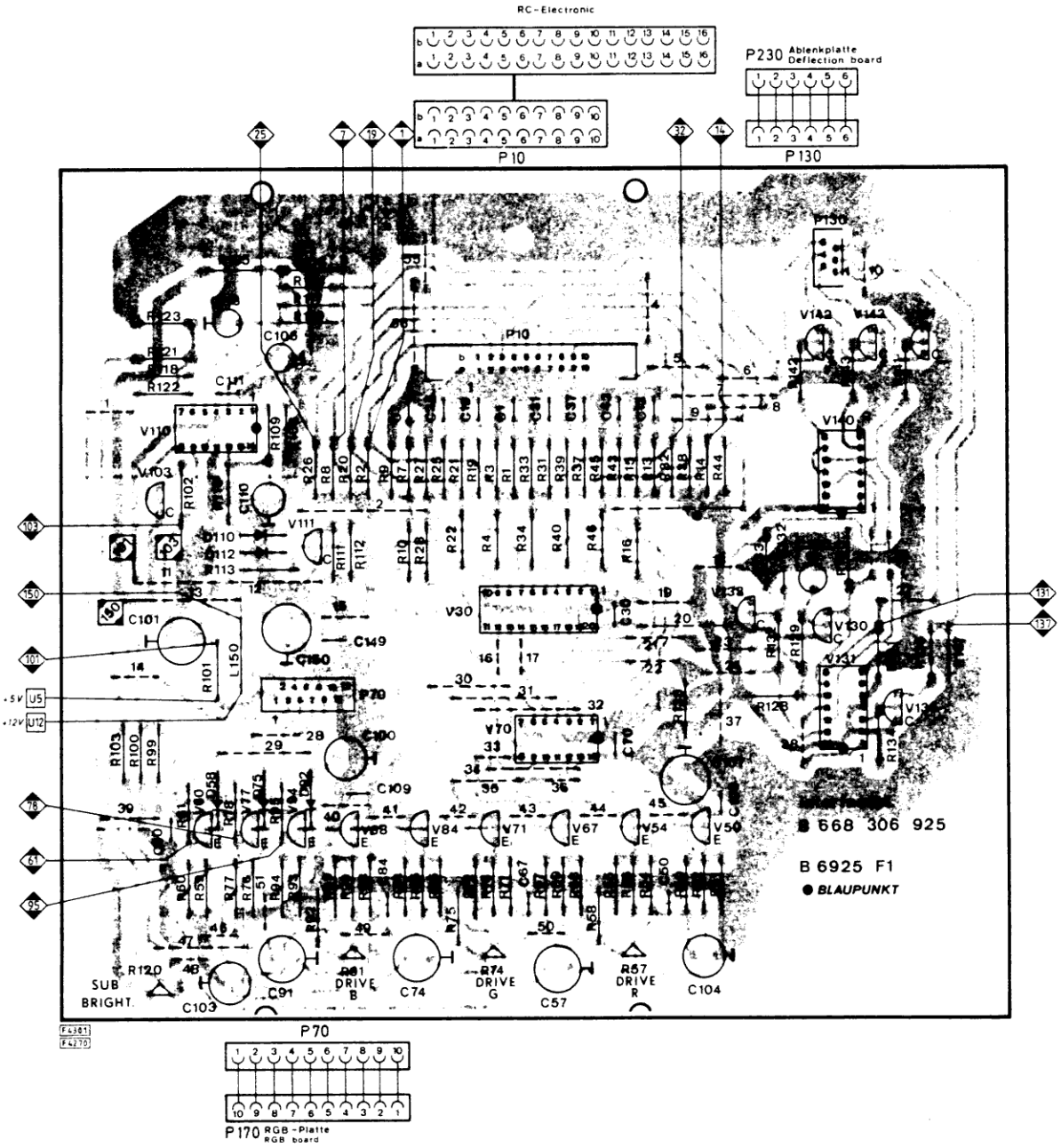


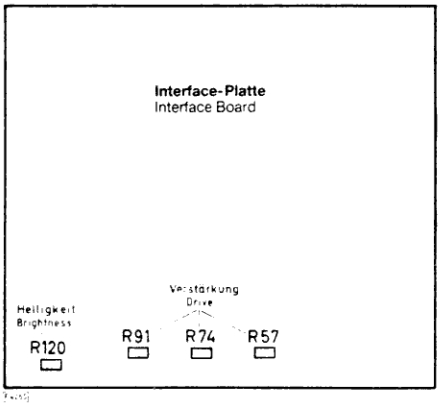




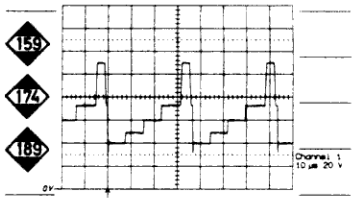


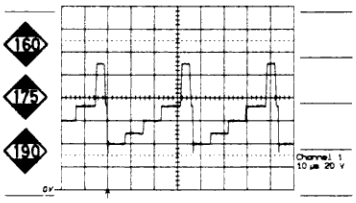
Interface-Platte
Interface Board



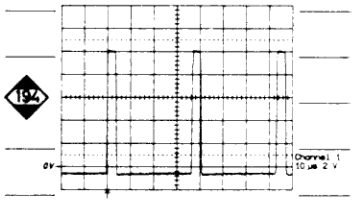


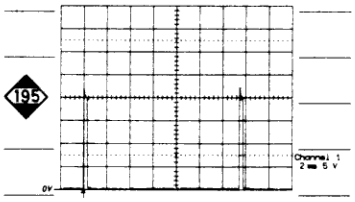
RGB-Platte


159
174
189
0V
Channel 1
10 µs 20 V

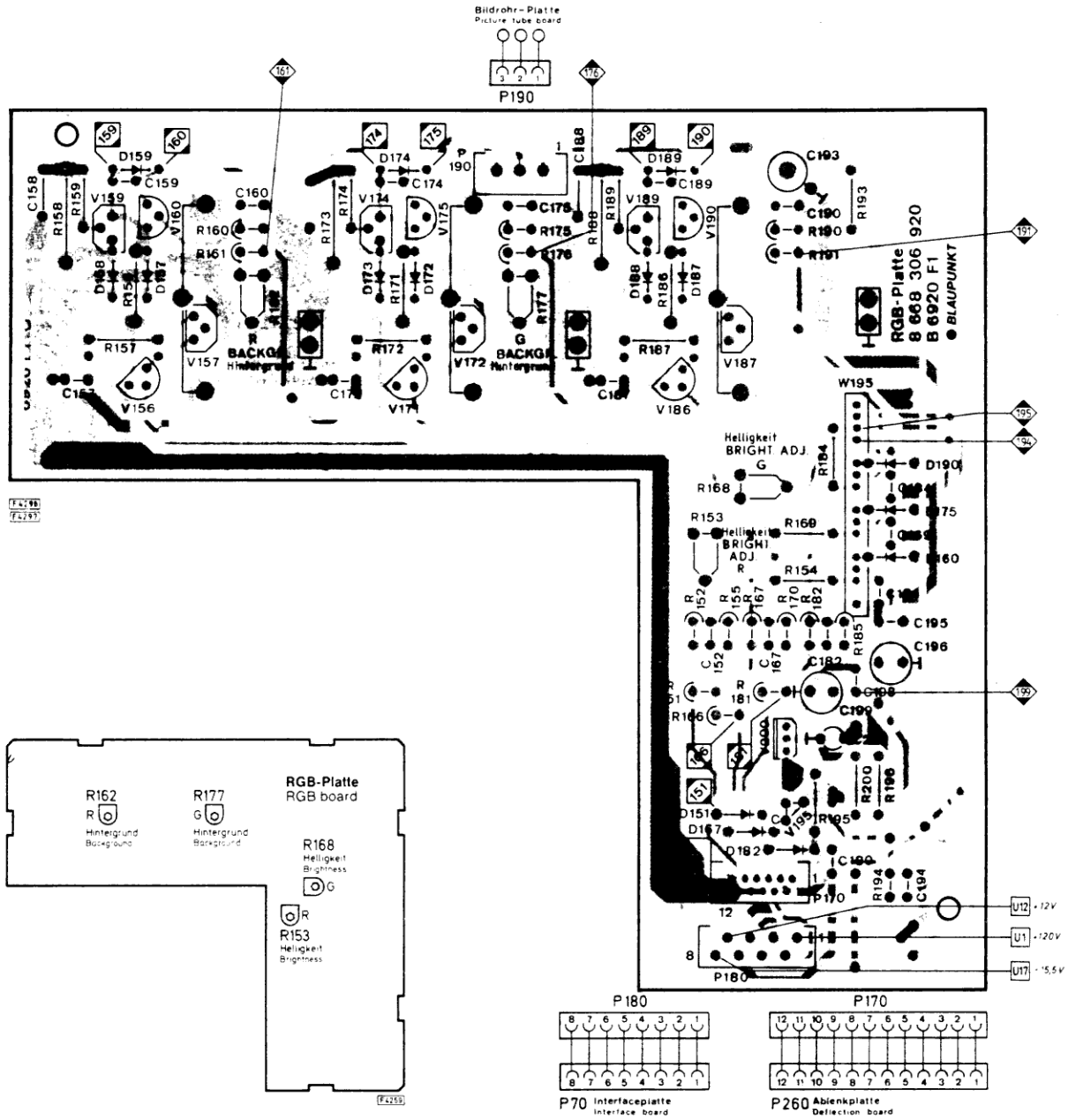

160
175
190
0V
Channel 1
10 µs 20 V

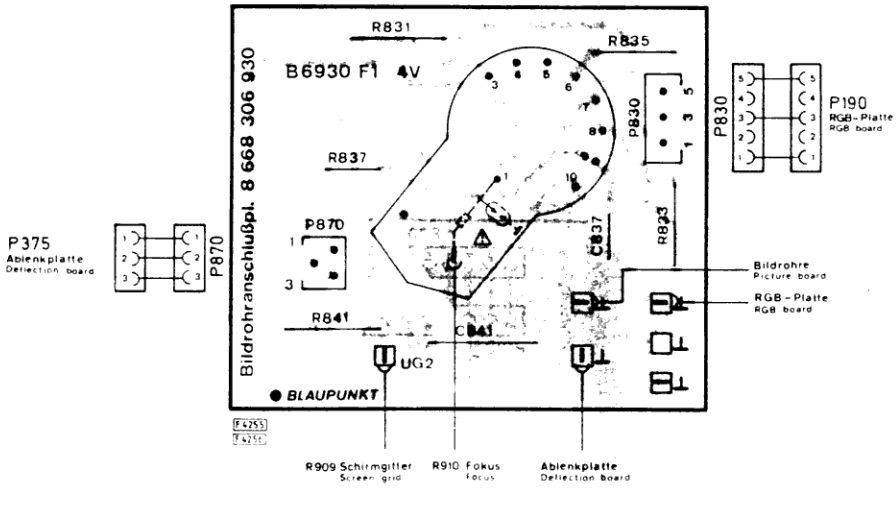

161
176
191
0V
Channel 1
10 µs 5 V


194
0V
Channel 1
10 µs 2 V


195
0V
Channel 1
2 ms 5 V

RGB-Platte
RGB Board





TEST AND SERVICE INSTRUCTIONS for RC940 Display

1. General

1.1 Necessary instruments and tools

Variable separating transformer
Multimeter
Digital voltmeter
Oscilloscope (dual trace) approx. 20 MHz, 5 mV/cm
Frequency counter (5 Hz - 200 MHz)
Degaussing coil
Service mirror
Soldering station (low voltage, 50 W, temperature regulated)
Test pattern software according to specifications
Standard servicing tools and testing leads
Color meter (for special requirements)
Luxmeter

1.2 Controller interface connector (32-pin DIN)

1.2.1 Display interface PCB: Plug P10 / input from controller

P 10 pin	signal
1a	Signal return (RTN)
1b	Primary RED (R)
2a	RTN
2b	Secondary RED (r)
3a	RTN
3b	Primary GREEN (G)
4a	RTN
4b	Secondary GREEN (g)
5a	RTN
5b	Primary BLUE (B)
6a	RTN
6b	Secondary BLUE (b)
7a	RTN
7b	Vertical sync.
8a	RTN
8b	Horizontal sync.
9a	RTN
9b	Brightness
10a	Contrast
10b	N.C. (not connected)

1.2.2 Display power supply PCB: Plug P402 / output to controller

P 402 pin	voltages	
1a	U 5/1	+ 5 V
1b	U 5/1	+ 5 V
2a	U 5/1	+ 5 V
2b	U 5/1	+ 5 V
3a	U 12/1	+12 V
3b	U 12/1	+12 V
4a	U 12/2	-12 V
4b	GND	0 V
5a	GND	0 V
5b	GND	0 V
6a	GND	0 V
6b	GND	0 V

2. Power Supply

Note:
All adjustments should be carried out after a minimum warm-up time of 10 minutes.

Measurements in the primary section of the power supply may only be carried out when the set is operated via a separating transformer.

The reference for ground potential is the ground connection of charging capacitor C 411.

All checks and adjustment of voltages should be carried out with a nominal mains supply of 220 VAC. The power supply must be under normal load: controller and display in nominal working condition.

2.1 Adjustment of voltages U 80 and U 5/1

U 80 voltage: with trimmer resistor R 436 (power PCB) adjust to +79V +/- 0.5 V on TP 456 (P 405 / pin 6)
U 5/1 voltage: with trimmer resistor R 520 (power PCB) adjust to +5.1V +/- 0.05 V on TP 516 (P 402 / pin 1-4)

2.1.2 Checklist for all voltages

Voltage		Tolerance	Nominal current	Test point	Plug/pin	
U 24	= +24 V	+/- 1.3 V	438 mA	MP 487	P 405 / 8	
U 1	= +120 V	+/- 6.0 V	42 mA	MP 451	P 405 / 1	
U 80	= +79 V*	+/- 0.5 V	487 mA	MP 456	P 405 / 6	To display circuit
U 12	= +12 V	+/- 0.7 V	113 mA	MP 464	P 405 / 4	
U 5	= +5 V	+/- 0.7 V	147 mA	MP 466	P 405 / 2	
U12/1	= +12 V	+/- 1.0 V	500 mA	MP 470	P 402/3a/3b	
U12/2	= -12 V	+/- 1.0 V	50 mA	MP 481	P 402/4a	To controller
U 5/1	= +5.1 V*	+/- 0.1 V	2000 mA	MP 516	P 402/1a-2b	

* adjustable voltage

The voltages U 5/1, U 12/1 and U 12/2 are short circuit protected. The power supply should work efficiently at a mains supply voltage between 185 and 260 VAC.

2.1.3 Check of supply voltages of IC 420 (TDA 4600)

AC mains = 220 V

Supply voltage on pin 9:	+10.8 V +/- 0.9 V
Reference voltage on pin 1:	+ 4.3 V +/- 0.2 V

3. Deflection Board

Test pattern: grid test pattern
H-sync. neg. 500 mVp-p on P 230 / 3

3.1 Line oscillator

3.1.2 Adjustment line frequeny (R 218)

Short circuit pin 12 of IC V 210 to ground. With R 218 adjust nominal frequency on pin 4 (MP 220).
fH = 27285 Hz +/- 50 Hz
Remove short circuit from pin 12.

3.1.3 Check of line oscillator catching range

Turn R 218 to one side until line oscillator is out of sync. Then turn R 218 back, so that the picture just synchronizes again. Short circuit pin 12 (V 210) to ground and measure the line frequency.

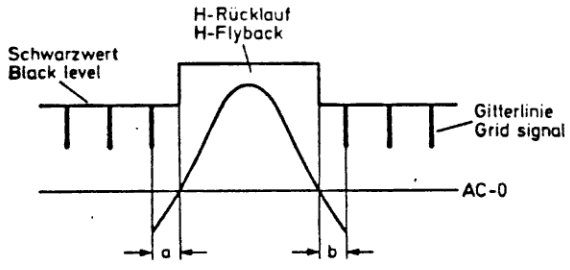
The difference between the measured and the nominal frequency should be f..= +/- 850 Hz. Repeat the same check by turning R 218 in the opposite direction.

Check out the nominal line frequency: fH = 27285 Hz +/- 50 Hz.
Remove the short circuit from pin 12 of V 210.

3.1.4 Adjustment of horizontal phase (R 225)

Display grid test pattern.
Compare horizontal flyback pulse on collector of transistor V 335 with the video signal on either of the picture tube cathodes. Adjust with R 225 the first and the last grid line symmetrically to the AC zero line of the flyback pulse on collector of V 335.

Tolerance: (a - b)/2 .. = +/- 1 us



3.2 Vertical deflection

3.2.1 Adjustment of vertical frequency

Signals: Grid test pattern and V-sync. TTL pos. on pin 1 of plug P230. Short circuit pin 5 of IC V 250 to ground. Frequency counter on pin 15 of IC V 250 (MP 255).

Adjustment tolerance: +/- 0.5 Hz

Adjustment sequence:

Mode	Frequency H / V	Plug P 230 Pin 2	Pin 4	Pin 6	Adjustment Trimmer	Frequency
480 line	27.3 kHz/54.3 Hz	open	GND	GND	R 235	50 Hz
400 line	27.3 kHz/64.9 Hz	GND	open	GND	R 221	60 Hz
350 line	27.3 kHz/73.9 Hz	GND	GND	open	R 221	60 Hz

4. CRT Voltage Adjustments

4.1 Adjustment of screen grid voltage (G2)

Apply RGB and sync. signal, contrast and brightness controls to minimum setting. Trigger input of oscilloscope to pin 16 of hybrid W 195 (RGB board).

Select channel of oscilloscope to DC input, 10 V / division.

Measure RGB signals on input to CRT connection board (P 830 / pins 1, 3, 5) using probe with 10 : 1 divider.
Connect probe to input with highest DC level.

Display the reference pulse for the black level gating after the vertical gating period.

With the screen grid adjuster (Ug 2) on the DST transformer (lowest near the base) adjust the peak value of the reference pulse to 80 VDC +/- 5 V.

4.2 Focus adjustment

Apply small letter test pattern.
Adjust the brightness so that the screen background is just dark. Then adjust with the contrast control the letters in the center of the screen to a moderate brightness (approx. 60 Lux).

With the focus adjuster (Ufoc) on the DST transformer (highest from the base) adjust the letters to best focus uniform over the entire screen.

5. Signal Timing

The RC940 display works in three different vertical modes. This requires a different vertical timing of the signal in each mode.

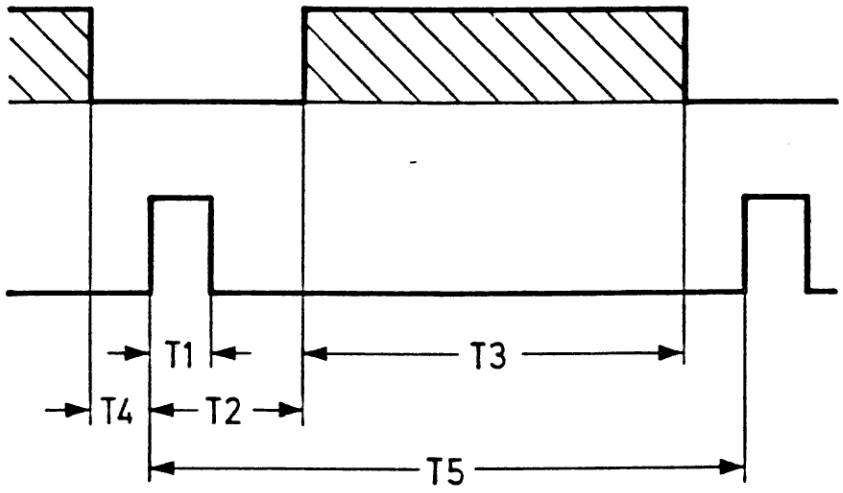
The horizontal timing stays the same.

The selection of the three different modes is done via polarity changes of the sync. pulses.

5.1 Mode selection

Polarity H-sync.	V-sync.	Vertical mode	V-frequency	H-frequency
neg.	pos./neg.	480 lines	54.35 Hz	27.3 kHz
pos.	neg.	350 lines	73.94 Hz	27.3 kHz
pos.	pos.	400 lines	64.965 Hz	27.3 kHz

5.2 Timing diagram (H and V).



5.2.1 Horizontal timing

Dot frequency		20.996 MHz	10.478 MHz	23.575 MHz	
Dot time TD		47.72 ns	95.44 ns	42.42 ns	
Frequency	27.3 kHz				
Th (H)	36.65 us	768 x TD	384 x TD	864 x TD	T5
Blanking	6.11 us	128 x TD	64 x TD	144 x TD	T4+T2
Display time	30.54 us	640 x TD	320 x TD	720 x TD	T3
Sync pulse	3.05 us	64 x TD	-	-	T1
A Front porch	0.0 us	0 x TD	-	-	T4
Sync pulse	2.71 us	-	-	64 x TD	T1
B Front porch	0.17 us	-	-	4 x TD	T4
Sync pulse	2.67 us	56 x TD	-	-	T1
C Front porch	0.19 us	4 x TD	-	-	T4
Sync pulse	2.29 us	-	24 x TD	-	T1
D Front porch	0.38 us	-	4 x TD	-	T4
Sync pulse	3.44 us	72 x TD	-	-	T1
E Front porch	-0.19 us	-4 x TD	-	-	T4

Note: All five sync timings have a common sync pulse center at: Front porch + 0.5 * sync pulse = 1.525 us from start of blanking interval.

5.2.2 Vertical timing

H = 36.65 us (27.3 kHz) in all modes

	Timing diagram	350 line mode	400 line mode	480 line mode
Frequency	fv	73.94 Hz	64.965 Hz	54.35 Hz
Tv	T5	13.52 ms = 369 xH	15.393 ms = 420 xH	18.388 ms = 502 xH
Blanking	T4+T2	0.697 ms = 19xH	0.733 ms = 20 xH	0.806 ms = 22 xH
Display time	T3	12.83 ms = 350 xH	14.66 ms = 400 xH	17.582 ms = 480 xH
Sync pulse	T1	0.476 ms = 13 xH	0.476 ms = 13 xH	0.476 ms = 13 xH
Front porch	T4	0.037 ms = 1 xH	0.037 ms = 1 xH	0.037 ms = 1 xH
V. sync polarity		neg.	pos.	pos./neg.
H. sync polarity		pos.	pos.	neg.

6. Geometrical adjustments

The adjustments should only be started after a warm-up time of .. 20 minutes.

Horizontal and vertical oscillator frequencies must be adjusted before (see 3.1.2 and 3.2.1).

The signal timing must be according to specification. Adjust brightness so that the screen background is just dark.

Adjust contrast to a rather low setting. Apply grid test pattern. The adjustments should be done in the following sequence.

6.1 Adjustments

6.1.1 East-West correction

With R 320 to straight lines of utmost left and right vertical lines.

6.1.2 Trapezium distortion

With R 300 to parallel lines of utmost left and right vertical lines.

6.1.3 Picture width

With R 310 to 250 mm data line +/- 2.5 mm .. 30.54 us (hor. display time).

6.1.4 Vertical linearity

With R 245 to equal height of boxes on the top and bottom of the screen.

6.1.5 Picture height

Adjust the data field to 180 mm +/- 2.5 mm with the respective trimmer in the different modes.

Picture height trimmer	Vertical frequency	Display time	Mode	V-sync	H-sync
R 242	54.35 Hz	17.582 ms	480 lines	pos./neg.	neg.
R 243	64.965 Hz	14.66 ms	400 lines	pos.	pos.
R 244	73.94 Hz	12.83 ms	350 lines	neg.	pos.

6.1.6 Horizontal phase

Check according to chapter 3.1.4 and, if necessary, adjust with R22.

6.1.7 Horizontal positioning

With R 340 adjust the picture symmetrically to the screen mask. Tolerance: +/- 1 mm.

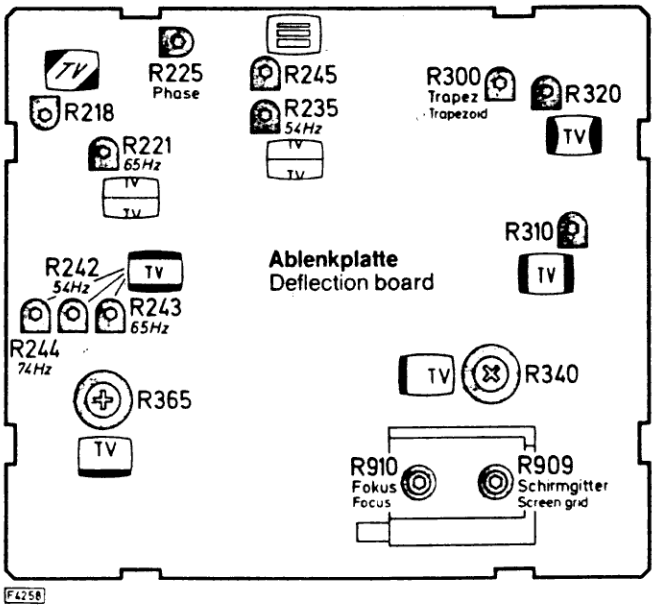
6.1.8 Vertical positioning

With R 365 adjust the picture symmetrically to the screen mask. Tolerance: +/- 1 mm.

6.1.9 Horizontal linearity

Check for linearity errors: .. 5 %.

6.1.10 Position of the adjusters on the deflection PCB



Corrections for RC940 Monitor HW Reference Manual (99111117)

page 43: Horizontal timing

Dot frequency 20.996 MHz should be
Dot frequency 20.956 MHz

page 48: 7.5 Sub Bright adjustment, line 1

approx. +2.3V should be
approx. +2.75V.

page 54: Spare Parts List

D470 ZPD12 should be
D470 ZPY12 8 925 421 291

page 55: Supplemental Spare Parts List

add the following:
EHT - capacitor 8 664 290 444

7. Adjustment RGB Amplifier

7.1 Grey level (background)

Feed in no signal, darken room.

Connect the oscilloscope to either R, G or B output (plug P 830 pins 1, 3, 5 on CRT connection PCB) and display the reference gating pulse (see chapter 4.1).

Adjust with brightness control the brightness level of the signal to be on the same amplitude as the reference pulse.

Disconnect the oscilloscope.

Adjust with R 162 (R) and R 177 (G) a neutral grey screen.
Specification: 8000 K + 15 MPCD.

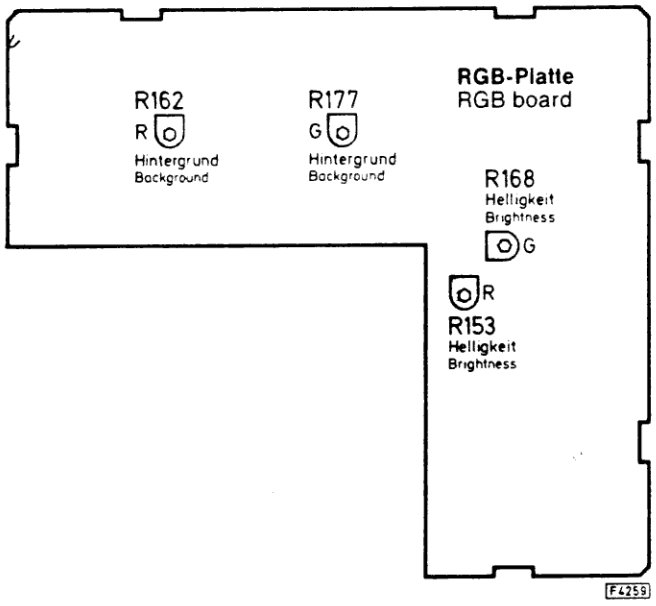
7.2 Drive (amplification)

Feed in no signal, darken room.

Turn the brightness control to nearly minimum. Adjust R 153 (R) and R 168 (G) in turn until the screen is neutral white.
Specification: 8000 K + 15 MPCD.

Note: Repeat a few times the background and drive adjustments until no more improvement is noticeable.

7.3 Position of the adjusters on the RGB PCB:



7.4 White level (Interface PCB)

Feed in white signal (window).
Turn brightness control to nominal (the black level of the signal lies on optical black). Turn contrast control to maximum.

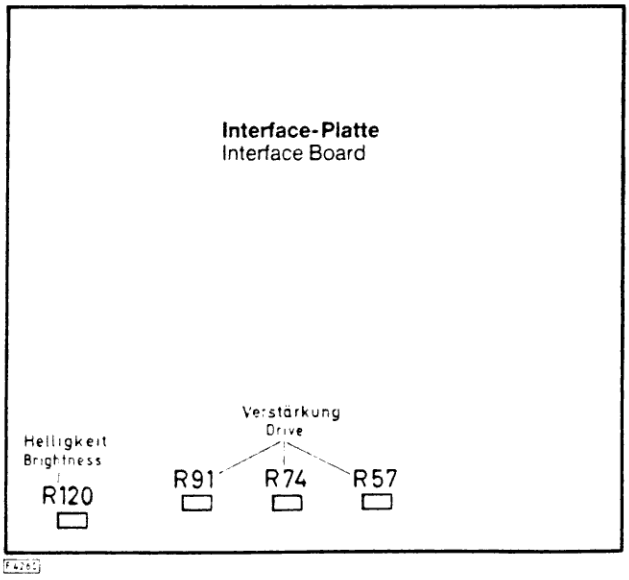
Adjust with R 57 (R), R 74 (G) and R 91 (B) the color temperature to neutral white. Specification: 8000 K + 15 MPCD.

Note: Adjust only 2 trimmers / potentiometers. 1 trimmer always stays at clockwise end position.

7.5 Sub Bright adjustment (interface PCB)

Set up the brightness adjustment voltage to approx. +2.3 V (P 10 / pin 9b). Adjust with R 120 the luminance of the screen to 6 cd/m2.

7.6 Position of the adjusters on the Interface PCB:



8. Adjustment: Purity and Convergence

Note: Under normal circumstances purity and convergence adjustments should not be attempted!

For this, the ring magnets on the deflection unit are fixed with a sealing.

As the computer-controlled manufacturer's adjustment is done under Northern Hemisphere conditions, slight tolerances might show up where sets are operated in Southern Hemisphere countries, due to differences in the earth magnetic field.

Before an adjustment is attempted, an external degaussing of the picture tube screen should be carried out.

8.1 Adjustment: purity

Preparations:	External degaussing of the picture tube screen. Darken room, feen in red signal, contrast and brightness setting about 50 % of the controls; screen should be evenly red without being luminous.
Adjustments:	First unlock the clamping ring in front of the adjustment magnets (nearest to the deflection coils) by turning it clockwise about 1/4 turn. Now the ring magnets are free to be moved. The purity magnets are the first two next to the clamping ring. By turning them either together to the left or to the right - against each other - or away from each other - the purity can be adjusted. By slowly moving the ring magnets in either of the three directions, you will find a position where the screen is most evenly red - without any shading. For a check switch over to a full screen white picture. - After the adjustment fix the clamping ring to lock position again.

8.2 Adjustment: Convergence

Preparations:	The same as under 8.1 for the purity adjustment. Feed in grid test pattern.

Adjustments:

In front of the purity ring magnets there are two more sets of ring magnets affecting the convergence. The next two in line - in the middle - alter the position of blue and green guns landing points.

The last two ring magnets mainly have an effect on the red gun.

After completion of the adjustments turn on the clamping ring and finally seal the positions of the ring magnets.

Then check the picture positioning and - if necessary - carry out correction adjustments.

Regnecentralen

Color Display

RC 940

7615412

Ersatzteilliste

Spare Parts List

Position Position	Bezeichnung Designation	Bestell-Nr. Part no.
	Gehäuseteile **Cabinet Parts**	
1	Gehäuse-Oberteil Cabinet upper part	8 665 226 730
2	Gehäuse-Unterteil Cabinet lower part	8 666 562 970
3	Geräte-Fuß, kompl. Cabinet foot, compl.	8 665 250 235
4	Sockel Base	8 665 250 231
5	Bildrohr-Blende Picture tube panel	8 666 562 965
6	Abdeckkappe Cover	8 660 510 257
7	Gleitring Slide ring	8 660 260 020
8	LED-Platte LED board	8 668 307 130
9	Netzschalter Mains switch	8 668 840 079
10	Netzfilter Mains filter	8 664 290 451
11	Netzkabel Mains cable	8 664 430 021
12	Netzkabel (dänische Form) Mains cable (Danish standard)	8 664 430 022
	Bildröhre **Picture Tube**	
21	Bildröhre Picture tube *(E 2994 B22 TC 12E)*	8 946 000 076
22	Entmagnetisierungsspule Demagnetizing coil	8 664 210 410
	Interface-Platte **Interface Board**	
101	Interface-Platte Interface board	8 668 306 925

Position Position	Bezeichnung Designation	Bestell-Nr. Part no.
	Elektrische Teil **Electrical Parts**	
L 150		8 634 220 811
V 30	SN 74 LS 240 N	8 945 900 800
V 70	SN 74 S 05 N	8 945 901 693
V 110	LM 324	8 905 955 523
V 131	SN 74 LS 86 N	8 905 900 120
V 140	SN 74 LS 00 N	8 905 900 108
V 50, 54, 60, 67, 71, 77, 84, 88, 94	2 N 3904	8 925 705 470
V 103	BC 337-25	8 925 707 347
V 111	BC 556 B	8 925 707 234
V 130, 133, 135, 141, 142, 143	BC 546 B	8 925 706 435
D 58, 75, 92, 110, 112	1 N 4148	8 925 405 822

Ersatzteilliste

Spare Parts List

Position Position	Bezeichnung Designation	Bestell-Nr. Part no.
R 57, 74, 91	100 Ω	8 941 506 020
R 120	5 kΩ	8 901 506 030
C 101, 103, 104	100 µF / 25 V	8 903 481 407
C 107, 150	220 µF / 16 V	8 903 481 308
	RGB-Platte **RGB Board**	
201	RGB-Platte RGB board	8 668 306 920
	Elektrische Teile **Electrical Parts**	
W 195	584	8 638 309 584
V 200	MC 7912 CT	8 945 901 548
V 156	BFR 54	8 945 705 241
V 157, 159	BF 871	8 945 705 383
V 160	BF 421	8 905 706 148
V 171	BFR 54	8 945 705 241
V 172, 174	BF 871	8 945 705 383
V 175	BF 421	8 905 706 148
V 186	BFR 54	8 945 705 241
V 187, 189	BF 871	8 945 705 383
V 190	BF 421	8 905 706 148
V 195	BSX 20	8 905 706 453
D 151, 157, 158, 159, 160, 167, 172, 173, 174, 175, 182, 187, 188, 189, 190	1 N 4148	8 925 405 822
R 153	500 Ω	8 901 506 414
R 156	15 kΩ / 1 W	8 940 517 154
R 158	3,9 kΩ / 2 W	8 940 517 393

Position Position	Bezeichnung Designation	Bestell-Nr. Part no.
R 162	100 kΩ	8 901 506 406
R 168	500 Ω	8 901 506 414
R 171	15 kΩ / 1 W	8 940 517 154
R 173	3,9 kΩ / 2 W	8 940 517 393
R 177	100 kΩ	8 901 506 406
R 186	15 kΩ / 1 W	8 940 517 154
R 188	3,9 kΩ / 2 W	8 940 517 393
C 193	10 µF / 250 V	8 903 511 106
C 196, 199	100 µF / 25 V	8 903 481 407
	Ablenkplatte **Deflection Board**	
301	Ablenkplatte Deflection board	8 668 306 910
	Elektrische Teile **Electrical Parts**	
L 225		8 928 411 500
L 322		8 664 240 455
L 323		8 664 240 450
L 340		8 667 210 441
L 342		8 664 220 254
L 345		8 664 220 231
L 355		8 634 220 811
T 330		8 667 210 468
T 350		8 667 210 435
V 210	TDA 2595	8 905 901 948
V 228	HCF 4066 * MC 14066	8 905 955 539
V 250	TDA 1870 A	8 905 901 947
V 300	TDA 8145	8 945 900 862
V 260, 265	BC 237 B	8 925 707 209
V 275, 285	BC 238 B	8 925 707 113
V 287	BC 308 B	8 925 707 475
V 290	BC 546 B	8 925 706 435
V 305	BD 544	8 905 705 327
V 312, 315	BC 546 B	8 925 706 435
V 330	BSR 52	8 945 705 564
V 335	2 SD 1548	8 945 705 530
V 375	MPS-A 42	8 905 706 141
V 378	BC 238 B	8 925 707 113

Ersatzteilliste

Spare Parts List

Position Position	Bezeichnung Designation	Bestell-Nr. Part no.
	Netzteil-Platte **Mains Unit Board**	
401	Netzteil-Platte Mains unit board	8 668 306 915
402	Sicherungshalter Fuse holder	8 670 610 033
	Elektrische Teile **Electrical parts**	
L 401		8 667 210 613
L 422		8 908 313 183
L 423		8 908 313 170
L 425, 426		8 908 313 121
L 450		8 908 313 183
L 451		8 634 220 811
L 455		8 908 313 183
L 456		8 634 220 811
L 460, 475		8 908 313 183
L 485		8 908 313 121
L 486		8 634 220 811
L 491		8 908 313 121
L 515, 516		8 908 313 170
T 450		8 667 210 674
T 495		8 667 210 848
V 420	TDA 4600-2	8 905 901 924
V 463	L 78 S 12 CV	8 905 956 185
V 465	L 78 S 05 CV	8 905 956 181
V 425	2 SD 1548	8 945 705 530
V 430	BC 307 B	8 925 707 231
V 466	BD 543	8 905 705 274
V 468	BC 237 B	8 925 707 209
V 476	BD 544	8 905 705 327
V 480, 485, 486	BC 307 B	8 925 707 231
V 490	BC 237 B	8 925 707 209
V 491	BUZ 71 A	8 945 705 159
V 500, 502	BC 327-25	8 925 707 476
V 505	BC 237 C	8 925 707 210
V 507	BC 238 C	8 925 707 471
V 508	BC 308 B	8 925 707 475
D 405, 406, 407, 408	1 N 4007	8 905 405 654
D 425	BA 157	8 905 405 094

Position Position	Bezeichnung Designation	Bestell-Nr. Part no.
D 210, 227, 228, 233, 251, 252	1 N 4148	8 925 405 822
D 255	1 N 4001	8 925 405 819
D 258	1 N 4148	8 925 405 822
D 260	ZPD 10	8 925 421 285
D 261, 270, 275	1 N 4148	8 925 405 822
D 307	BYV 27/50	8 945 405 395
D 310	1 N 4148	8 925 405 822
D 311	ZPD 22	8 905 421 318
D 322	BY 329/800	8 945 405 397
D 325	BA 157	8 905 405 094
D 333	BYV 27/50	8 945 405 395
D 335	BY 329/1200	8 945 405 648
D 340, 341, 355	MUR 140	8 945 405 469
D 374	1 N 4007	8 905 405 654
D 376	ZPD 7,5	8 925 421 211
D 378	1 N 4148	8 925 405 822
R 218	25 kΩ	8 901 506 417
R 221	150 kΩ	8 901 506 409
R 225	25 kΩ	8 901 506 417
R 235	5 kΩ	8 901 506 402
R 242, 243, 244	25 kΩ	8 901 506 417
R 245	150 kΩ	8 901 506 409
R 300, 310	10 kΩ	8 901 506 403
R 320	25 kΩ	8 901 506 417
R 331	56 Ω / 2 W	8 940 517 568
R 332	39 Ω / 1 W	8 940 644 391
R 333	2,2 Ω / 1 W	8 940 644 220
R 340	330 Ω / 3 W	8 941 701 011
R 342	270 Ω / 1,3 W	8 940 669 041
R 345	27 Ω / 1,5 W	8 900 517 271
R 352	3,3 Ω / 2 W	8 940 517 330
R 355	0,1 Ω	8 900 669 016
R 360	2,7 Ω / 1,3 W	8 941 016 010
R 365	5 kΩ / 3 W	8 901 701 066
R 909, 910	Schirmgitter / Screen grid Fokus / Focus	8 901 430 102
C 221	100 µF / 25 V	8 903 481 407
C 255	100 µF / 40 V	8 903 481 507
C 257	1000 µF / 40 V	8 903 481 550
C 278	2200 µF / 25 V	8 903 411 426
C 325	1 µF / 350 V	8 943 511 000
C 332	220 µF / 40 V	8 903 481 513
C 335	4500 pF / 2000 V	8 942 763 023
C 355	220 pF / 1000 V	8 902 222 246
C 361	100 µF / 160 V	8 903 511 037
C 374	4,7 µF / 350 V	8 903 511 203
S 332	T 0,2 A / 250 V	1 904 520 205

Ersatzteilliste

Spare Parts List

Position Position	Bezeichnung Designation	Bestell-Nr. Part no.
D 427, 429	BY 399	8 905 405 154
D 438	BA 157	8 905 405 094
D 450, 455, 460	BY 399	8 905 405 154
D 465	ZPD 12	8 905 421 340
D 468, 469	1 N 4148	8 925 405 822
D 470	ZPD 12	8 905 421 340
D 475	BY 399	8 905 405 154
D 476	ZPD 12	8 905 421 340
D 478, 479	1 N 4148	8 925 405 822
D 480	ZPD 12	8 905 421 340
D 484	ZPD 7,5	8 905 421 275
D 485	BYW 29/100	8 945 405 245
D 490	ZPD 12	8 905 421 340
D 491	1 N 4148	8 925 405 822
D 492	BYS 23-45	8 945 405 366
D 495	S 1221 BH	8 945 200 009
D 496	ZPD 5,1	8 945 421 153
D 500, 501	1 N 4148	8 925 405 822
D 505	ZPD 3,9	8 905 421 278
D 507, 509, 512, 520	1 N 4148	8 925 405 822
D 521	ZPD 6,2	8 925 421 207
R 402	15 Ω / 380 V (NTC)	8 941 351 001
R 412	120 kΩ / 1,5 W	8 940 517 125
R 415	PTC	8 941 351 002
R 420	2,7 kΩ / 1 W	8 940 644 273
R 421	5 kΩ / 265 V (PTC)	8 941 351 003
R 423	0,68 Ω	8 900 301 068
R 424	120 kΩ / 1 W	8 940 644 125
R 429	150 Ω / 2 W	8 900 517 152
R 432	1,1 kΩ	8 900 301 113
R 436	7,5 kΩ	8 901 506 411
R 437	390 kΩ / 1 W	8 940 644 395
R 438	33 Ω / 4 W	8 941 091 000
R 439	0,1 Ω	8 900 669 016
R 488, 489	0,1 Ω	8 940 669 027
R 515	56 Ω / 2 W	8 940 517 561
C 402	0,1 µF / 275 V	8 902 975 007
C 405, 406, 407, 408	1500 pF / 1000 V	8 902 215 339
C 423, 425	100 µF / 25 V	8 903 481 407
C 427	220 pF / 1000 V	8 905 222 246
C 428	2200 pF / 1500 V	8 902 763 271
C 429	220 pF / 2000 V	8 902 222 218
C 456	100 µF / 160 V	8 903 511 037
C 461	1000 µF / 50 V	8 943 490 357
C 469	100 µF / 25 V	8 903 481 407
C 476	220 µF / 40 V	8 903 481 508
C 478	100 µF / 25 V	8 903 481 407
C 487	1000 µF / 50 V	8 943 490 357
C 488	470 µF / 40 V	8 943 481 075
C 505	220 µF / 10 V	8 903 481 208
C 515, 516	1000 µF / 16 V	8 903 481 350

Position Position	Bezeichnung Designation	Bestell-Nr. Part no.
S 401	T 2 A / 250 V	1 904 522 841
S 460, 475	T 2 A / 250 V	1 904 520 204
S 485	T 4 A / 250 V	1 904 520 208
801	**Bildrohr-Platte** **Picture Tube Board** Bildrohr-Platte Picture tube board	8 668 306 930
802	Bildrohr-Sockel Picture tube socket	8 908 513 626
	Elektrische Teile **Electrical Parts**	
C 841	0,01 µF / 1500 V	8 902 973 301
811	**Verbindungskabel** **Connecting Cables** Verbindungskabel (P 170 - P 120) Connecting cable	8 664 491 589
812	Verbindungskabel (P 230 - P 130) Connecting cable	8 664 491 588
813	Verbindungskabel (P 260 - P 180) Connecting cable	8 664 491 613
814	Verbindungskabel (P 405 - P 205) Connecting cable	8 664 491 614

Änderungen vorbehalten!
Modifications reserved!

Supplemental Spare Parts List

Position	Designation	Part no.
Interface Board		
R101	22ohm/400mW	8 900 669 026
RGB-Board		
R193	10ohm/330mW	8 940 293 101
R196	10ohm	8 940 293 101
R200	10ohm/400mW	8 900 669 036
Deflection Board		
R256	2,2ohm	8 900 425 220
Power Supply		
C416	3,3nF/400V	8 942 899 088
C417	3,3nF/400V	8 942 899 088