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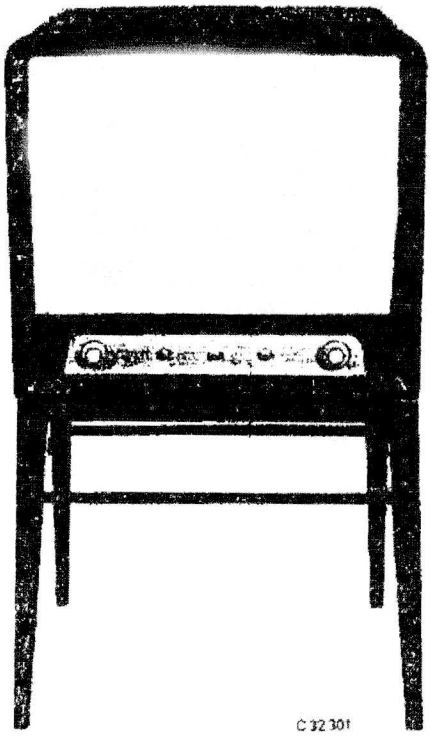
PHILIPS

SERVICE NOTES

for

Television Projector

VE2600–VE2601



C 32 301

Printed in Holland 1958

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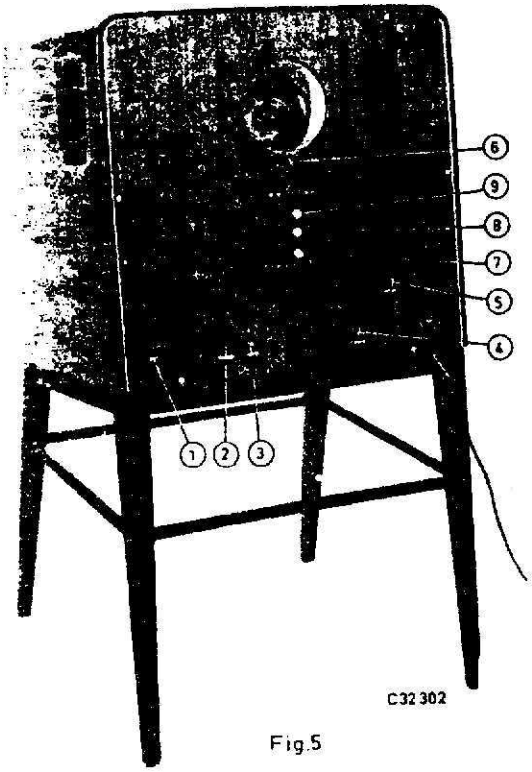


Fig.5

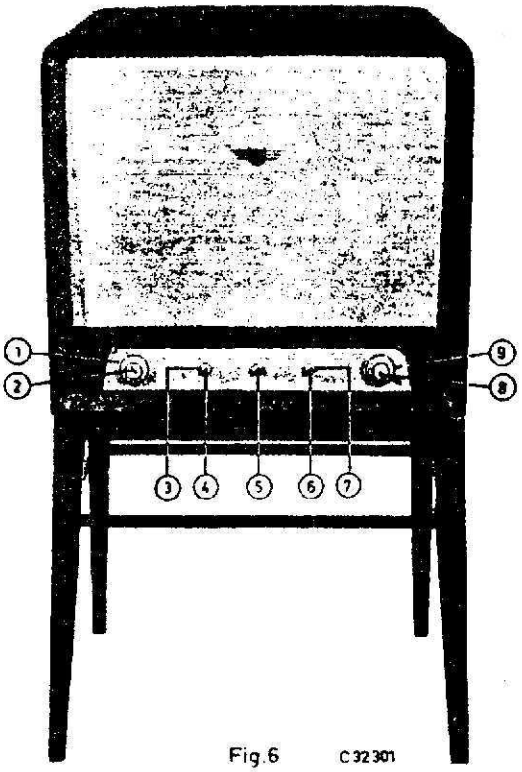
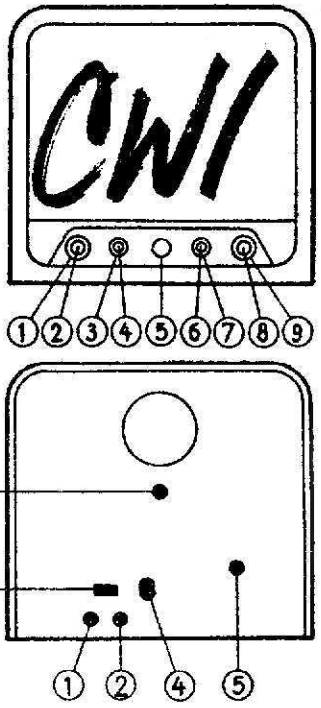


Fig.6 C32301

30 Röhren Fernseh-Projektor



Technische Daten

Cascode - Trommelwähler mit 12 Raststellungen

Kanal	2	47 — 54 MHz	
Kanal	3	54 — 61 MHz	
Kanal	4	61 — 68 MHz	
Kanal	5	174 — 181 MHz	
Kanal	6	181 — 188 MHz	
Kanal	7	188 — 195 MHz	
Kanal	8	195 — 202 MHz	
Kanal	9	202 — 209 MHz	
Kanal	10	209 — 216 MHz	
Kanal	11	216 — 223 MHz	
Kanal	(Reserve)		
Kanal	(Reserve)		

⊓⊓ — 240 Ω sym.

Bildträger - ZF: 38,9 MHz
Tonträger - ZF: 33,4 MHz
Ton - ZF: 5,5 MHz (Intercarrier)

Bildgröße: 1,6 x 1,2 m

Netzspannung:	220 V ~
Leistungsaufnahme:	230 Watt
Si 1:	2000 mA
Si 2:	2000 mA
Si 3:	200 mA
Si 4:	400 mA
Lautsprecher:	49 24216 - 5 Ω
Lautsprecher:	49 239 58 - 5 Ω
Bildröhre:	MW 6 - 2
Bildträger:	AM, negativ
Tonträger:	FM
Horizontalfrequenz:	15.625 Hz
Vertikalfrequenz:	50 Hz
Hochspannung:	25 kV
Abmessungen:	630 x 635 x 1200 mm
Gewicht:	ca. 35 kg

Bedienungsseite

(1) Lautstärkeregler
(2) Kontrastregler
(3) Netzschalter u. Tonblende
(4) Helligkeitsregler
(5) Schärfe - Regler
(6) Vertikal - Regler
(7) Horizontal - Regler
(8) Stationswähler
(9) Feinabstimmung

Projektionsseite

(1) Vertikallinearitätsregler
(2) Vertikalamplituden - Regler
(3) Antenneneingang
(4) NF - Ausgang
(5) Horizontalamplituden-Rgl.
(6) Bildschärfeneinstellung der Projektionsoptik für den oberen u. unteren Bildteil.

Wirkungsweise der Schaltung:

(Die nachfolgende Beschreibung bezieht sich nur auf die gegenüber der Service-Dokumentation Typ 21 TD 140 A geänderten, bzw. zusätzlich verwendeten Stufen. Die Wirkungsweise der übrigen Stufen bitten wir in der Service - Dokumentation Typ 21 TD 140 A nachzulesen.)

Video - Stufe.

Zur Erzielung der für die volle Aussteuerung der Projektionsbildröhre MW 6-2 benötigten Video - Spannung von ca. 100 V, hat die Video - Endstufe Rö 10 einen Außenwiderstand R 49 von 3,3 kOhm, und eine feste Schirmgitterspannung von 185 V. Entsprechend der anderen Dimensionierung des Video - Ausgangskreises gegenüber dem 21 TD 140 A wurden auch die beiden Video - Korrekturdrosseln S 24 R 61 — S 29 geändert.

Kontrastregelung.

Die Kontrastregelung erfolgt mit dem Potentiometer R 51 durch Veränderung des Arbeitspunktes am Steuergitter des Pentodensystems der Röhre 12, das zur Erzeugung der getasteten Schwundregelspannung benutzt wird, da von der Größe des Innenwiderstandes der getasteten Schwundregelröhre die erzeugte Regelspannung für den ZF- und HF-Verstärker abhängig ist.

Schwarzpegel - Konstanthaltung.

Zur Konstanthaltung des Schwarzpegels des Video - Signals an der Bildröhre, d.h. zur unveränderten Grundhelligkeit bei beliebig eingestelltem Kontrastregler, wird zusätzlich das Triodensystem der Röhre 11 benutzt. Am Gitter dieses Triodensystems liegt über einen Spannungsteiler, der zur negativen Sannung (— 120 V) des Hochspannungs - Chassis führt, die Katodenspannung der Video - Endröhre, während von der Anode die Anodenspannung für die Röhre der Schutzschaltung Rö 16 DAF 96 abgenommen wird.

Der Helligkeitsregelzweig der Bildröhre liegt in der Katode dieser Schutzröhre, so daß bei einer Kontrastregelung die Gleichsspannungsverlagerung an der Katode der Bildröhre durch eine in gleicher Polarität sich verändernde Spannung am Wehnelt - Zylinder kompensiert wird.

Schutzschaltung.

Um bei evtl. Ausfällen der Horizontal- bzw. Vertikal - Ablenkung ein Einbrennen des Leuchtschirmes der Projektionsröhre zu vermeiden, besitzt der Empfänger eine gesonderte Schutzschaltung. Diese Funktion übernimmt die direkt geheizte Röhre 16, von deren Innenwiderstand das Potential am Wehnelt-Zylinder und damit der Anodenstrom der Bildröhre, abhängig ist. Rö 16 wird von der Zusatzwicklung S 45 des Vertikal - Ausgangstrafos über eine Kurzschlußbrücke im Stecker der Ablenkeinheit geheizt und am Schirmgitter durch die über R 140 - C 133 zugeführten positiven Rückschlag-Impulse des Zeilenausgangstransformators offen gehalten.

Bei Ausfall eines der beiden Kippgeräte wird Rö 16 durch den fehlenden Heizstrom, bzw. durch den Fortfall der positiven Schirmgitterspannung gesperrt. Hierdurch wird die positive Spannung die von der Anode der Schutzröhre über ihren Innenwiderstand am Helligkeitsregler R 118 liegt, unwirksam. Im selben Augenblick verschiebt sich die Spannung an R 118 und damit am Wehnelt-Zylinder der Bildröhre auf einen hohen negativen Wert, (ca. — 120 V) und führt zur sofortigen Sperrung der Bildröhre.

Hochspannungs - Chassis.

Die zum Betrieb der Projektionsröhre Rö 21 erforderliche Hochspannung von 25 kV wird in einem getrennten Aggregat gewonnen, das gleichzeitig die für die Schutzschaltung benötigte Sperrspannung, sowie den Gleichstrom für die Fokussierspule S 47 liefert. Röhre 124, Typ UBC 41 arbeitet als Sperrschwinger und erzeugt an C 275 eine Sägezahnspannung mit einer Frequenz von ca. 1000 Hz, die über C 277 den Gittern der parallel geschalteten Endröhren Rö 125 und Rö 126 Typ UL 44 zugeführt wird.

Im Anodenkreis dieser Röhren befindet sich die völlig gekapselte, ölgefüllte Hochspannungseinheit A3 421 13, die neben einem Spezialtransformator (ähnl. dem Zeilenausgangstransformator) drei Hochspannungsdioden der Type EY 51 mit den entsprechenden Ladekondensatoren enthält.

Der Transformator wird durch die Sägezahnrückläufe zu Resonanzschwingungen angeregt (ca. 30 kHz), wobei während der jeweiligen Strom-Nulldurchgänge infolge der niedrigen Wicklungskapazitäten sehr hohe Spannungsspitzen auftreten (ca. 8,5 kV).

Diese Spannung wird in einer anschließenden Kaskadenschaltung gleichgerichtet und verdreifacht.

Die beiden Dioden der Röhre 124 werden von einer Zusatzwicklung des Transformators gespeist und liefern eine Regelspannung, die über R 278 eine von der Belastung der Hochspannung abhängige Arbeitspunktverlagerung der Endröhren bewirkt. Durch diese automatische Regelung wird der Innenwiderstand der Hochspannungsquelle stark herabgesetzt, sodaß Belastungsänderungen im Arbeitsbereich keine nennenswerte Schwankung der abgegebenen Hochspannung mehr verursachen können. Die Röhren 127 und 128 bilden in einer Spannungs-Verdoppler-Schaltung die Stromversorgung des Hochspannungs-Chassis. Durch eine dritte Netzgleichrichter-Röhre Rö 129, erhält man die negative Sperrspannung von — 120 V für die Schutzschaltung. Die Heizfäden sind unter Zwischenschaltung des NTC - Widerstandes R 285 zu einem gesonderten Heizkreis zusammengefaßt, während eine 400 mA Sicherung das gesamte Aggregat absichert.

Die Hochspannungseinheit A3 421 13 soll prinzipiell nicht repariert werden.

(Im Bedarfsfall als komplettes Service - Teil zu beziehen.)

Besondere Hinweise:

1.) Die im umseitigen Schaltbild aufgeführten Strom- und Spannungsangaben sind Mittelwerte. Sie beziehen sich — ebenso die Oszillogramme — auf den normalen Betriebszustand des Gerätes. Der Empfänger kann dabei wahlweise mit einem Sendertestbild oder der Bildmodulation eines Fernseh - Prüfsenders (PHILIPS GM 2891, GM 2888 bzw. GM 2850) ausgesteuert werden. Das HF-Signal soll ca. 1 bis 3 mV betragen. Als Meßgeräte finden zweckmäßig das Röhrenvoltmeter GM 7635 und der Oszillograf GM 5659 (bzw. GM 5654) Verwendung. Zum Abgleichen und Sichtbarmachen der Durchlaßkurven ist, zusammen mit einem geeigneten Oszillografen, der AM / FM-Meßgenerator GM 2889 geeignet.

2.) Bei Reparaturen und Messungen soll das Gerät aus Sicherheitsgründen stets über einen Trenntransformator betrieben werden! (PHILIPS RTT 54)

3.) Vorsicht bei jeglichen Messungen an der Zeilenendstufe, dem 25 kV-Chassis und der Bildröhre! Hochspannung!

4.) Vor dem Auswechseln der Projektionsröhre vollständige Entladung des Hochspannungsteiles abwarten!

5.) Auf keinen Fall darf versucht werden, das Hochspannungskabel von der Hochspannungseinheit zu lösen!
Lockern bzw. Entfernen der Überwurfmutter macht die Einheit unbrauchbar!

Projektoreinstellung.

I. Strahlenverlauf.

Beim Fernseh-Projektor wird das Schirmbild einer kleinen Katodenstrahlröhre (Typ MW 6 - 2) mit Hilfe eines äußerst lichtstarken optischen Systems — der Schmidt - Optik — vergrößert und auf eine Projektionswand projiziert.

Die Projektionsröhre, die zur Erzielung ausreichender Helligkeit mit einer Anodenspannung von 25 kV betrieben wird, ragt mit ihrem Bildschirm durch die Öffnung im Planspiegel.

Die Lichtstrahlen, die von dem ca. 4,8 x 3,6 cm großen Schirmbild ausgehen, werden vom gegenüber liegenden Hohlspiegel zurückgeworfen und mittels des Planspiegels, der unter einem Winkel von 45° angeordnet ist, in Richtung der Korrektionslinse abgelenkt.

Der Hohlspiegel bewirkt eine optische Vergrößerung des Bildes und ist in seiner Funktion mit einer Sammellinse vergleichbar.

Um zu verhindern, daß Strahlen vom Hohlspiegel auf die Bildröhre zurückfallen, was zu Kontrastminderungen führen würde, ist die Mittelzone des Hohlspiegels mit einer schwarzen, nicht reflektierenden Schicht versehen.

Die Korrektionslinse hat die Aufgabe, sphärische Aberrationen zu kompensieren. Sie besteht aus einer zwischen zwei Glasplatten angeordneten, profilierten Gelatineschicht und ist auf die Brennweite des Systems abgestimmt.

Mit dem Passieren der Korrektionslinse verlassen die Lichtstrahlen den völlig staubdicht ausgeführten Projektor und gelangen auf den Projektionsschirm der Kristallperlwand.

Auf diese Weise laufen alle Strahlen, die von einem beliebigen Punkt der Bildröhre ausgehen, auf dem Projektionsschirm wieder in einem Punkt zusammen.

Der Lichtweg ist gleichsam zusammengefaltet, so daß ein sehr kompakter Aufbau des Gerätes erzielt werden konnte.

Bei einem Projektionsabstand von 3 m beträgt die Bildgröße 1,60 x 1,20 m.

II. Einstellung der Ablenkeinheit.

Das Auswechseln der Projektionsröhre bzw. einzelner Teile der Ablenkeinheit erfordert folgende Arbeitsgänge:

1.) Nach lösen der 6 Zierschrauben an der Frontplatte (Projektionsseite), läßt sich die Frontplatte abnehmen, wodurch die Ablenkeinheit des Projektors zu erreichen ist.

2.) Jetzt löse man die Schrauben (Pos. 14, 29, 32) einige Umdrehungen und verdrehe die Ablenkeinheit bis an den Anschlagbolzen (Pos. 15), so daß die Aussparungen (Pos. 18, 27) gegenüber den Schrauben (Pos. 14, 29, 32) zu liegen kommen.

Die gesamte Ablenkeinheit mit der Bildröhre kann nun herausgenommen werden. Anschließend ist die Röhrenfassung der Projektionsröhre sowie die Hochspannungszuführung abzunehmen.

3.) Nun lockere man die beiden Schrauben (Pos. 21, 23) und löse mit der Schraube (Pos. 22) die Schelle (Pos. 24).

Die Bildröhre läßt sich jetzt leicht herausziehen.

Auch Einzelteile, wie Ablenk- und Fokussierspule (Pos. 28 bzw. 19) können nach geringfügiger weiterer Demontage bequem ausgewechselt werden. Man achte beim Wiedereinsetzen der Röhre darauf, daß sie mit ihrem konischen Teil fest gegen den Erdkontakt anliegt und daß ihr Hochspannungsanschluß die ursprüngliche Lage einnimmt.

4.) Nach diesen Arbeiten wird die Schelle (Pos. 24) wieder angespannt und anschließend durch Anziehen der beiden Schrauben (Pos. 21, 23) für einen festen Sitz der Röhre in der Ablenkeinheit gesorgt.

Achtung! Die Schrauben (Pos. 21, 22, 23) dürfen auf keinen Fall zu fest angezogen werden, da starke mechanische Spannungen die Projektionsröhre gefährden können!

5.) Röhrenfassung und Hochspannungszuführung sind anzubringen. Die nunmehr wieder kompl. Ablenkeinheit wird zunächst, wie folgend beschrieben, außerhalb des Projektors zur Zentrierung des Bildes in Betrieb genommen.

6.) Man schalte das Gerät ein und stimme den Empfänger auf einen Fernsehsender oder einen Bildsignalgenerator ab. (z.B. PHILIPS GM 2657 oder GM 2887).

Hierbei müssen Schärfe- u. Linearitätsregler optimal eingestellt sein

Achtung! Die Bildröhre darf außerhalb des Projektors nicht mit voller Helligkeit betrieben werden.

Da der Schirm der Röhre weiche Röntgenstrahlen aussendet, ist es bei voller Helligkeit erforderlich, als Strahlenschutz eine Bleiglasplatte mit einer äquivalenten Bleidicke von mindestens 0,5 mm zwischen Betrachter und Röhre anzubringen. Diese Maßnahme ist nicht erforderlich, wenn die Röhre nur mit einer Helligkeit betrieben wird, bei der das Bild gerade noch gut zu erkennen ist.

7.) Nach Lösen von Kontermutter und Schraube (Pos. 25) um ca. 6 Umdrehungen kann nunmehr die Fokussierspule (Pos. 19) mit Hilfe der Schrauben (Pos. 20, 26) in Bezug auf die Achse der Bildröhre gekantet werden.

Diese beiden Schrauben sind so einzustellen, daß das Bild gut zentriert auf dem Schirm der Projektionsröhre erscheint. Es muß dabei darauf geachtet werden, daß die Fokussierspule keinerlei Druck auf den Hals der Bildröhre ausübt!

8.) Schraube und Kontermutter (Pos. 25) sind wieder anzuziehen. Dabei soll das Schraubenende den Boden des Korbes nur leicht berühren.
Anschließend ist der Bildschirm von evtl. Schmutzresten zu befreien.

9.) Nachdem der Empfänger ausgeschaltet wurde, setze man die Ablenkeinheit mit der Bildröhre wieder in den Projektor ein (siehe Ziffer 2), ziehe aber die Schrauben (Pos. 14, 29, 32) zunächst nur leicht an.

10.) Das Gerät wird wieder eingeschaltet und die gesamte Ablenkeinheit so verdreht, daß das Bild auf der Projektionswand genau waagerecht steht.
Nunmehr können die Schrauben (Pos. 14, 29, 32) festgezogen werden.

11). Es ist jetzt erforderlich, den Projektor mit Hilfe der Knöpfe (Pos. 12, 17, 35), die eine Verschiebung des Haltejochs und damit der gesamten Ablenkeinheit in vertikaler und horizontaler Richtung ermöglichen, so einzuregeln, daß gleichmäßige optimale Schärfe des Bildes über die gesamte Fläche des Projektionsschirmes erzielt wird.

12.) Die Kändelmuttern (Pos. 16, 36) werden gelockert.

13.) Während der nachfolgend beschriebenen Arbeiten soll das Gerät mit einer mittleren Bildhelligkeit betrieben und der Schärferegler laufend auf optimale Einstellung kontrolliert werden.

14.) Einstellen maximaler Schärfe am **linken** Rand des Projektionsschirmes mit Hilfe des **rechten** Knopfes (Pos. 35).

15.) Einstellen maximaler Schärfe am **rechten** Rand des Projektionsschirmes mit Hilfe des **linken** Knopfes (Pos. 17).

16.) Durch wechselseitiges Wiederholen des unter Ziffer 14 und 15 angeführten Abgleichs muß sowohl für den linken als auch für den rechten Blickrand befriedigende Schärfe erreicht werden können.

Es ist sehr wichtig, daß mit dem rechten Knopf (Pos. 35) der linke Bildrand und mit dem linken Knopf (Pos. 17) der rechte Bildrand fokussiert wird.
Fokussiert man z.B. den linken Bildrand statt mit dem rechten Knopf (Pos. 35) mit dem linken Knopf (Pos. 17), so gelingt es nicht, den rechten Bildrand einwandfrei einzustellen und man entfernt sich durch wechselseitiges Verdrehen der beiden Knöpfe (Pos. 17 und 35) immer weiter von der richtigen Einstellung.

17.) Einstellen maximaler Stärke am **oberen** und gleichzeitig am **unteren** Bildrand des Projektionsschirmes mit Hilfe des vorderen Knopfes (Pos. 12).
Dieser Knopf ist so einzuregeln, daß das Bild oben und unten gleichmäßig scharf erscheint.

18.) Wenn die Schärfe des Bildes insgesamt oder zonenweise noch unbefriedigend ist, dann muß der gesamte Abgleichvorgang (Ziffer 14 bis 17) wiederholt werden.

19.) Die Stellung der Knöpfe (Pos. 17, 35) ist durch Festdrehen der Rändelmuttern (Pos. 16, 36) zu fixieren.

III. Allgemeines.

Das gesamte optische System muß möglichst frei von Staub gehalten werden.

Auf folgende Punkte wird besonders hingewiesen:

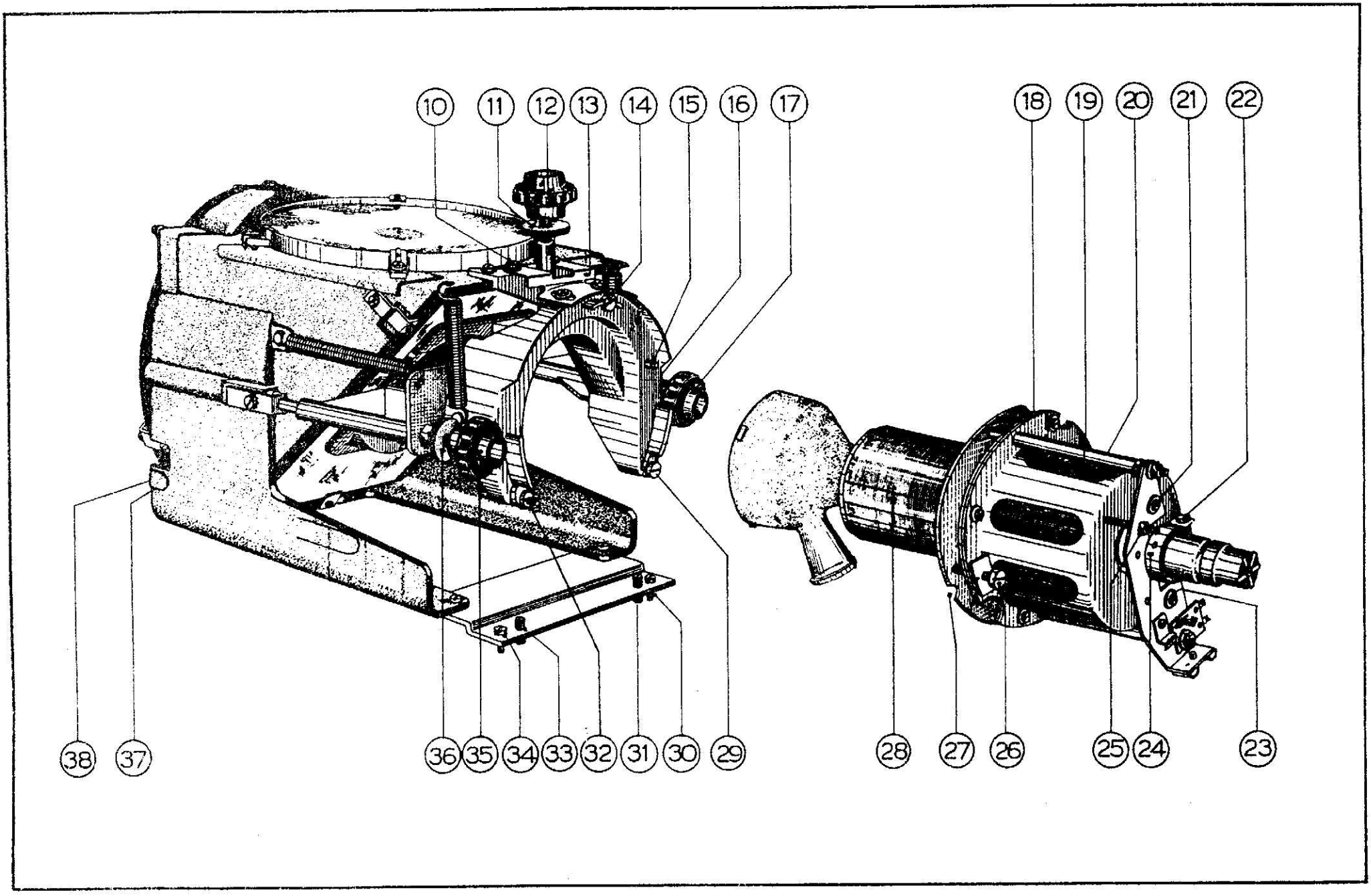
1.) Bevor die Ablenkeinheit mit der Bildröhre in den Projektor eingesetzt wird, soll der Röhrenschirm staubfrei sein.

2.) Wenn sich keine Röhre im Projektor befindet, ist die Öffnung in der Gummitülle mit einer entsprechend zugeschnittenen Pappscheibe zu verschließen.

4.) Der Gehäusespiegel ist auf seiner Oberfläche mit einem Aluminiumbelag überzogen und darf nur an den Rändern angefaßt werden! Die normal üblichen Reinigungsmethoden können auf keinen Fall Anwendung finden!

5.) Wenn durch unvorsichtige Behandlung Fingerabdrücke auf den Spiegel gekommen sind, müssen diese **unmittelbar** auf folgende Weise entfernt werden:

Ein Stück Watte sehr guter Qualität wird mit Reinigungsalkohol getränkt und die betreffende Stelle durch leichte, reibende Bewegung in einer Richtung gereinigt. Jedes Stück Watte darf nur einmal benutzt werden. Mit derselben reibenden Bewegung in gleicher Richtung wird dann der Spiegel mit einem Stück trockener Watte abgetrocknet. Auch dieses Stück Watte nur einmal verwenden! Auf keinen Fall darf durch zu starkes Aufdrücken der Spiegelbelag stellenweise durchgerieben werden; dies ist gefährlicher als eine leichte, bleibende Trübung!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Service - Ersatzteile

(Die nachfolgenden Positionen stellen die gegenüber der in der Ersatzteil-Liste der Service-Dokumentation Typ 21 TD 140 A aufgeführten, abweichenden elektrischen Werte dar.)

Empfänger - Chassis:

S 12	Lautsprecher	Typ 9770 M
S 12a	Lautsprecher	Typ 9742 X
S 12b	Lautsprecher	Typ 9742 X
S 24, R 61	Korrektur - Drossel	KR 110 00
S 29	Korrektur - Drossel	A3 118 52
S 33, S 46	Ablenkspule	A3 115 73
S 34, S 37	Zeilentrafo	A3 694 13
S 38 – S 40	Zeilenregelspule	KR 692 00
S 43 – S 45	Bildausgangstrafo	A3 169 51
S 47	Fokussierspule	A3 111 19

C 84	10 µF	500 V	49 020 73
C 85	10 µF	500 V	49 020 73
R 21	500 kΩ	Pot. log.	KR 375 32
R 118	1 MΩ	Pot. lin.	
R 49	3,3 kΩ	5,5 W	48 765 10/3K3
R 121	—	NTC	49 379 58
R 122	5 kΩ	Pot. lin. (5 W)	KR 375 40
R 142	700 kΩ	Pot. lin.	KR 375 24

Hochspannungs - Chassis:

S 180, S 181	Sperrschwingertrafo	A3 169 29
S 182	Netzdrossel	A3 166 15
S 183 – S 188	Hochspannungseinheit	A3 421 13
Si 4	Sicherung 400 mA	08 141 13

R 284	150 Ω	25 W	48 492 05/150E
R 285	220 Ω	NTC	49 379 62
R 286	2,8 kΩ	25 W	48 492 10/2K8
R 287	10 kΩ	25 W	48 492 10/10K
C 278	25 µF	25 V	A9 999 10/D25
C 280	50 µF	350 V	49 021 26
C 281	50 µF	500 V	A9 999 12/R25+25
C 282	50 µF	500 V	A9 999 12/R25+25
C 283	50 µF	350 V	A9 999 12/R25

Versions

VE 2600 = Television projection receiver
VE 2601 = VE 2600, however, with a video input stage for closed circuit operation.

Warning!

The television projector (VE 2601) must be operated always via a separating-transformer (683.6030).

Contents of the Service Notes.

Figures.

A. OPERATION

Projection side, see fig. 5

1. Aerial input
2. Picture height
3. Vertical linearity
4. A.F. Output
5. Picture width
6. Picture focus control of the optics for the upper and lower part of the picture.
7. Switch for R.F. or V.F. *
8. Video input
9. Contrast control of the V.F. signal.

Points 7-8-9 at VE 2601 only!

Control side, see fig. 6

1. Volume control
2. Mains switch and treble control.
3. Vertical hold control
4. Brightness control
5. Focus control
6. Horizontal hold control
7. Contrast control.
8. Channel selector.
9. Tine tuning.

The apparatus can be installed without difficulty by any body familiar with the adjustment of a television set.

* V.F. = Video frequency

Tubes.

Main-chassis	1 x DAF96,	1 x ECH81,	1 x ECL80,	4 x EF80
	1 x PCC84,	5 x PCF80,	1 x PL81,	2 x PL82
	1 x PL83,	1 x PY81,	2 x PY82,	3 x OA81.
	1 x OA70,	1 x MW6-2 (projection tube)		
Video input stage	1 x ECC85,	1 x OA81		
High tension unit	1 x UBC41,	2 x UL44,	3 x UY41,	

Fuses

Si1	2000 mA	Code number 974/V2000
Si2	2000 mA	974/2000
Si3	200 mA	974/V200
Si4	200 mA	974/200

B. Technical Data.

Channel selector with cascode R.F. stage.

Channel 2	47 - 54 Mc/s
Channel 3	54 - 61 Mc/s
Channel 4	61 - 68 Mc/s
Channel 5	174-181 Mc/s
Channel 6	181-188 Mc/s
Channel 7	188-195 Mc/s
Channel 8	195-202 Mc/s
Channel 9	202-209 Mc/s
Channel 10	209-216 Mc/s
Channel 11	216-223 Mc/s

Channels 12 and 13 are provided as reserve.

For more details of the Channel Selector see the relevant Service Notes : 93 981 24.1.05.

Aerial : 240 Ω symm. A.F. output : 5Ω

Picture carrier I.F. : 38.9 Mc/s
Sound carrier I.F. : 33.4 Mc/s
Sound I.F. : 5.5 Mc/s

Television standard : C.C.I.R.

Horizontal frequency : 15,625 c/s
Vertical frequency : 50 c/s

Mains : 220 V~
High tension : 25 kV

Power consumption : 230 Watt.
Dimensions : 24 7/8" x 25" x 48".

Weight : 72 lbs.

Picture size : 48" x 63".

C. Description of the circuit diagrams.

Channel selector.

For a description of this unit see the relevant Service Notes.
The channel selector used in this apparatus has been modified a little: C6 = 2,7 pF. R3 = 1 MΩ R4 is used no longer.
R5 = 820 kΩ R9 = 47 Ω.

I.F. amplifier stage.

To this I.F. amplifier stage (picture + sound) belong the tubes Rö6, Rö7, Rö8 and Rö9 as well as the I.F. band-pass filters S8t-S13, S15-S16, S19-S20, S22-S23 and S25-S26.
The I.F. signal, from the mixer tube Rö2, is coupled via the coil S8t of the primary circuit to the coil S9t; the latter being part of the secondary winding S13. This low impedance link coupling is used to limit the effect of the capacitance of the relatively long connecting cable between the channel selector and the I.F. amplifier stage. The secondary circuit of the first I.F. band-pass filter S13 is tuned to 36,5 Mc/s. The circuit is damped by resistor R31 in order to obtain the necessary bandwidth. The other band-pass filters are also damped by resistor R27, R35, R38a, R39, R42a and R43.
The cathode resistor R32, R37, R41 are not decoupled, in order to prevent alterations of the I.F. band-pass curve due to tube capacitance variations which will appear by variations of the automatic gain control.

To avoid cross-modulation, the own sound-carrier is suppressed. The parallel circuit S14-C35a represents an inductance for this frequency and with C35 the series circuit C35-S14//C35a forms a tuned absorption circuit for the sound-carrier.
From the anode of Rö6 the I.F. signal is applied, via the second I.F. band-pass filter, to the control grid of Rö7. The coupling impedance (foot coupling) is formed by two tuned parallel connected series circuits S17-C39 and S18-C43. Circuit S17-C39 is tuned to the adjacent I.F. sound-carrier and circuit S18-C43 is tuned to the adjacent I.F. picture-carrier. At this two frequencies the coupling between S15-S16 is minimum, so that these frequencies are suppressed. The elements R29-C34 are incorporated to effect, by phase compensation, the total suppression of the adjacent I.F. sound-carrier.
From the anode of Rö7 the I.F. signal is transferred to the control grid of Rö8 via the third I.F. band-pass filter S19-S20, tuned to 38.5 Mc/s. Via the I.F. band-pass filter S22-S23 the signal from the anode of Rö8 is transferred to the control grid of Rö9. The transfer of the signal from the anode of this last I.F. amplifier tube is effected by the I.F. band-pass filter S25-S26, which is tuned to 37 Mc/s.
The signal for nois suppression is taken from a point, between the anode and screen grid of Rö9.

Video-detector.

The I.F. signal is detected by X4 via the I.F. band-pass filter S25-S26. The detector capacitance consists of the capacitor C50 and the wiring capacitance, while the detector resistor is formed by R47.

In order to maintain the D.C. component of the video signal the detector resistor is connected directly to the input of the video amplifier tube Rö10.
The parallel circuits S27a-R46 and S28-R47a prevent an attenuation of the high video frequencies due to the wiring capacitance.
The series circuit S27-S51 prevents the harmonics of the detected video signal from penetrating into the video amplifier tube Rö10.

Except the detected video signal at C50 there will also be the sound I.F. signal, which appears at C50 as a difference of the I.F. picture and I.F. sound carrier. The frequency of the sound I.F. signal amounts to 5.5 Mc/s and is removed by the series circuit C4-S3, which is tuned to 5.5 Mc/s. To prevent this signal from penetrating into tube Rö10 a parallel circuit C49-S28a is fitted to form a blocking for this frequency. C49-S28a is therefore tuned to 5.5 Mc/s.

Video amplifier

This amplifier is formed by tube Rö10. To obtain the required 100 V video signal for full modulation of the projection tube Rö21 the anode resistor R49 amounts to 3k3 Ω in order to get the necessary amplification.
Filter R61-S24 and coil S29 prevent attenuation of the high video frequencies and via this coil the video signal is applied to the cathode of the projection tube Rö21.

Automatic gain control

The penthode section of tube Rö12 operates with a grounded grid circuit and, owing to the low screengrid voltage, has a small grid base. The cathode of this penthode is directly connected to the cathode of tube Rö10 and the video signal on this cathode is pos. directed, so with negative-going synchronizing pulses.
If there is no video signal or only a very small one the penthode of Rö12 is blocked by the pos. D.C. voltage on the cathode. If the video signal becomes larger, the penthode will conduct and within a certain range we will see that the larger the video signal the better the penthode will conduct and the larger the anode current will be.
From the screen grid of the line time-base output tube Rö14 a voltage is derived and via C63 applied to the anode of the penthode Rö12. Owing to the cap. C63 the signal does not have a D.C. component any more. If the video signal comes into the grid base of the Ia-Vg characteristic an anode current will occur only during the pos. pulses on the anode. During the time the anode is neg. there will not be anode current, as a result of which the average D.C. voltage across R65, R66 and C64 is negative. The magnitude of this negative voltage depends on the magnitude of the anode current and thus upon how far the video signal reaches in into the grid-base.
The neg. voltage across C64 acts as a grid bias for the first three I.F. amplifier tubes and so determines their amplification.
If the video signal becomes larger this signal will reach somewhat further in the grid base of the penthode Rö12, as a result of which the neg. voltage across C64 increases and the gain of the I.F. stage decreases.

To obtain a satisfactory signal-noise ratio for small inputs and to prevent overloading by very strong inputs of the cascode circuit in the channel selector, this stage only gets a neg. control voltage when the input exceeds a certain level. To generate this delayed control voltage, the diode, formed by the third grid and cathode of tube Rö6, is used for this purpose. This diode receives a pos. bias voltage via R67 and R30, so that it will conduct. As already said above, a neg. voltage will arise across C64 and via R62 this voltage is applied to C65. If this neg. voltage does not exceed the pos. bias of the diode, the diode will conduct and the voltage across C65 will be practically at zero. In this case the cascode stage in the channel selector does not receive a neg. control voltage. However, when at strong inputs, the neg. voltage applied to C65 will exceed the pos. bias of the diode, the diode does not conduct any more. Now the cascode circuit in the channel selector gets a neg. control voltage.
Once the delayed control is operating, the delayed control voltage will rise sharply with an increase of the input signal and so prevent overloading of the R.F. stage.
Via R68 and pot. meter R51 a pos. voltage has been applied to the control grid of the penthode Rö12. By means of pot. meter R51 the grid voltage and with it the anode current can be controlled. Variations of the anode current thus cause variations of the neg. voltage for the automatic gain control. With R51 we can therefore regulate the amplification and thus the contrast.

Synchronizing pulse separator and noise suppressor.

The penthode of tube Rö11 is used as pulse separator. To this end the video signal across R49 is fed to the third grid of tube Rö11 via R53, C56, C56a and R54a. Resistor R53 prevents the input circuit of penthode Rö11 from influencing the video amplifier Rö10 and thus the video response curve. Cap. 56 acts as a blocking capacitor. The input circuit is so designed that the opposite requirements: a min. deformation of the syn. pulses and min. of interference on the sync. pulses are effectively satisfied.

Owing to the low anode and screengrid voltage the penthode has a small grid-base. The neg. bias for g3 is produced automatically, since a grid current flows during the pulse-peaks as a result of which the cap. C56 is charged. Since the grid-leak resistor R54 is very large C56 can discharge itself very slowly and in this way the pulse-peaks of the sync. pulses are fixed practically at the zero line of the Ia-Vg3 characteristic. Because of the small grid base only the sync. pulses enter into the grid base and are separated from the composite video signal in this way. Only during the sync. pulses the penthode Rö11 will conduct so that neg. going pulses arise at the anode of it. During the pulse peaks the resistor R53 and the electronic input resistance of the tube from together a voltage divider, so that any irregularities on the pulse-peaks are practically eliminated. If, however, the video signal gets positive going interference pulses, tube penthode Rö11 will conduct and at the anode of it then arise neg. going interference pulses which may have an indesirable influence on the sync. pulses. In order to avoid this, a noise suppressing circuit is incorporated. From the anode of tube Rö9 a part of the I.F. signal is applied to the control grid of the triode of Rö3.

Resistor R45a prevents the input circuit of the triode from influencing the I.F. band-pass curve.
Thie filters S51-C129 and S52-Cgk are tuned to 35 Mc/s and are so dimensioned that only the frequencies between the picture and sound I.F. carrier can pass. In this way it is obtained that only the I.F. picture signal and not the sync. pulses reaches the grid of triode of Rö3. The anode direct current produces such a neg. bias for this tube, across the large cathode resistor R131 that the operating point is in the lower bend of the Ia-Vg characteristic. The quadratic Ia-Vg characteristic brings about a rectified signal with neg. going interference pulses which are produced across the anode resistor R129.
Capacitor C57 couples the I.F. picture carrier and higher harmonics. C128 and R128 are incorporated to prevent the anode-band detector from having a reactive effect on the other parts of the receiver. Since the filter S51-S52 cannot be steep enough to suppress the picture I.F. carrier completely, very small sync. pulses will arise across R129 too.

From R129 the neg. video signal with its neg. interference pulses are fed to the first grid of the penthode Rö11 via the coupling network R56 and C58. Via resistor R55 the first grid receives a positive bias, so that the small sync. pulses still present becomes ineffective.
At this first grid the interference pulses are 180° out of phase with resepct to the positive going interference pulses of the video signal on the third grid.
If now a positive interference pulse on the third grid treis to make the tube conductive, this tube will be blocked at the same time by the neg. interferenc pulse on the first grid. The neg. interference pulses at g1 also prevents undesirable charging up of C56 caused by the positive interference pulses at g3.

As already mentioned, the penthode of Rö11 acts with low anode and screengrid voltages. The anode voltage is limited by the diode, formed by the grid and cathode of the triode Rö12. This diode is biassed due to the cathode voltage across R59, produced by the anode direct current of the triode.
During the time between the sync. pulses the penthode Rö11 is cut off, so that the anode voltage of it is max. and practically equal to the cathode voltage at R59. The result of it is making the triode Rö12 conductive, and at the anode of this tube the voltage will be therefore at its min. during the time between the sync. pulses.
During the sync. pulses the penthode of Rö11 will conduct as a result of which the anode voltage will fall and the triode of Rö12 is cut off. The anode voltage of this triode will be max. during the sync. pulses. So on the anode of this tube positive going sync. pulses are formed and at the same time neg. pulses will arise at the cathode of it. The positive going sync. pulses at the junction R60-R58 are fed to the phase discriminator via C68, R75 and pot. meter R73. The neg. going sync. pulses at R59 are also fed to the phase discriminator via the coupling network C67, R74 and pot. R73.

From the anode of the penthode Rö11 positive going pulses are taken and fed to the first grid of the penthode of Rö17 via the coupling capacitor C61 and integrators R52-C100 and R98-C98. The penthode of Rö17 is circuited as a triode and owing to the low anode voltage the grid base of it is very small.

The positive going pulses at the anode are therefore not only amplified but limited too. These positive pulses are necessary to synchronize the blocking oscillator of the frame-time-base.

Phase discriminator.

The purpose of this phase discriminator is to compare the sync. pulses of the video signal with pulses from the line output transformer, which are applied to the discriminator via the differentiation network C69, C90, R76, R77 and C70.
Due to the anti-phase connection of the diodes X6 and X7 the potential on the grid of the reactance tube triode Rö13 is the same as the potential on the slider of R73. If the potential on the slider goes higher or lower one of the diodes will conduct until the potential on the grid is again equal to that on the slider. The reactance tube triode Rö13 is biassed positively on the cathode caused by the anode current of the reactance tube and by the current of the oscillator tube. This pos. bias on the cathode results in a neg. bias on the grid.

The positive and negative going sync. pulses join the differentiated line pulses on the junction R76, R77. If there is no phase difference between sync. and differentiated line pulses the grid bias of the reactance tube does not alter as a result of which the frequency of the line oscillator does not change.
If, however, a phase difference occurs, e.g. by an increase of the line oscillator frequency, the potential on the junction R76, R77 becomes a little positive which effects that more current flows through X7 than through X6, which results in an increase of the neg. bias of the first grid of the reactance tube. The increase of the neg. grid bias causes a lower frequency of the line oscillator until a condition of equilibrium is reached.
The elements C71 and R78 are fitted to avoid too rapid an equilibrium on the grid of the reactance tube with the arrival of interference pulses, since this may cause one of the diodes to cut off. The phase discriminator is thus made more insensitive to interference by means of this R.C.-circuit. Resistor R71 and cap. C99 are incorporated to suppress interferences, while R79 prevents the grid from being earthed.for A.C.
By means of the phase discriminator the line oscillator frequency will therefore be corrected automatically in a certain range.
It can be necessary of course that with R73 the line oscillator-frequency must be adjusted in the "catch-range" of the phase discriminator.

Line time-base generator.

This generator is formed by a Collpit connected sinusoidal oscillator, the frequency of which is controlled by the reactance tube triode Rö13. The oscillator is formed by the cathode, grid 1 and 2 of the penthode of Rö13, S30-S31 and the capacitors C77 and C78. Capacitor C76 is the coupling cap., whilst R81 is the grid-leak resistor which is connected to a low positive voltage to achieve a faster start of the oscillator.
The oscillator produces a sinusoidal voltage of which only a part of the positive period comes into the grid base of the penthode Rö13. During the time this tube is cut off, C80 will be charged via R85, R83 and R86,and during the time the penthode conducts,

C80 is discharged by the anode current of the penthode Rö13. Across C80 will therefore arise a saw-tooth and across R86 a square-wave voltage. The sum of these two voltages is the required control voltage for the line output tube Rö14. C81 acts as a blocking capacitor for the D.C. voltage.

The anode voltage of the triode and screengrid voltage of the penthode is taken from the smoothing filter R85-C79 via resistor R84 and the tap of the coil S30-S31.
The screengrid current is limited by R82 while this resistor is short-circuited by C74 for A.C. Via R83 the anode of penthode Rö13 gets it voltage, which is also taken from the smoothing filter. Capacitor C73 is fitted in order to reduce positive feed back across C72 and thus prevents oscillation.

Line output stage.

This stage consist of the tube Rö14, output transformer S34-S37, the booster diode Rö15 with booster capacitor C82.
In order to obtain a saw-tooth shaped deflection current through the deflection coil S33 of the projection tube, it is necessary to keep the voltage across S36 and S37 constant during the line trace time. The booster diode Rö15 is adjusted so that it is conducting during the whole trace time. During this time therefore C82 is connected in parallel to the windings S36 and S37 via the booster diode. Due to the large capacitance of C82 the voltage across it only slightly alters during each period of the saw-tooth current. During the time tube Rö14 is cut off, by the control voltage on its first grid, the saw-tooth current through the deflection coil S33 starts a cosine-wave shaped oscillation. For S33 forms with its stray capacitance an oscillatory circuit with slight damping, since Rö14 and Rö15 are not conducting. However, at the moment the saw-tooth current has reached its max. opposite value, the booster diode starts conducting again and holds the voltage across S36 and S37 constant. S40//R91 have been fitted to correct the horizontal linearity, while with S38 and S39 the picture width can be adjusted.

From the screengrid of tube Rö14 a voltage is taken for the automatic gain control circuit whereas from point 3 of the output transformer voltages are derived for the phase discriminator and for the first grid of the projection tube. The latter voltage is necessary to suppress the beam current during the line fly-back. The voltage across S35 is applied to the screengrid of tube Rö16. This tube is a part of the protecting circuit of the projection tube.

Frame oscillator.

The oscillator used here is a blocking oscillator which is formed by tube triode Rö17, transformer S41-S42, grid capacitor C93 and grid-leak resistor R94+R95.
If the apparatus is switched on, a current will flow through R102, R101, S41 and the triode Rö17. The windings S41 and S42 are so tightly coupled and in such a way that the positive voltage induced in S42 produces on increase in anode current. This effect is cumulative. The positive voltage across S42 causes gridcurrent, which will charge up capacitor C93 negatively.

At the moment the neg. voltage across C93 exceeds the positive voltage across S42, the tube is cut off and remains blocked until C93 has been discharged by R94 and R95 up to the cut-off voltage of the triode. At this instant a new oscillation will start. The frequency of the oscillator can be regulated by the vertical hold control R95. The blocking oscillator is synchronized by the pulses derived from the anode of penthode Rö17.

During the time the triode is cut off, C97 will be discharged by the anode current of the triode. The result of this is that across C97 a saw-tooth voltage and across R106 a pulse shaped voltage will arise.
The sum of these two voltages is applied to the frame output s tage. Capacitor C92 is fitted to prevent excessive voltage-peaks across S42 caused by the rapid alteration of the current. C88 service to short-circuit the line pulses, which may be induced in the frame oscillator. The amount of charge of C97 can be regulated by R102. By means of R102 we can adjust therefore the picture height. Resistor R94 is adjusted so that with the slider of R95 in the middle the oscillator is synchronized. The voltage across R106 and C97 is applied to the control grid of the projection tube via R100 and C89. This is necessary to suppress the beam current during the frame fly-back.

Frame output stage.

To produce a saw-tooth current through the deflection coil S46 of the projection tube, a saw-tooth voltage must be formed across S46, since the impedance of the coil is ohmic at the frame frequency. In view of the fact that this saw-tooth voltage will be across S43 (via S44) the anode current of the tube Rö18 must therefore be composed of a saw-tooth and a parabolic shaped current.
For a parabolic shaped current through a coil causes a saw-tooth voltage across it. So the control voltage at the first grid of Rö18 should consist of a saw-tooth and parabolic component.
The saw-tooth voltage across C97 causes, via the blocking capacitor C109, a pulse shaped current through C127 and a saw-tooth current through R104 and R107. The pulse shaped current produces across C132 a saw-tooth voltage. The saw-tooth current through R104 and R107 forms a parabolic voltage across C132. The sum of the two voltages across C132 will be between control grid and chassis via R116 and S44//C96. In this way the anode current of Rö18 gets its correct shape to produce a saw-tooth current through S46.
The frame output tube is fed-back, by means of S46, to eliminate the microphonic effects of this tube. Resistor R116 is fitted to block the tube during the frame fly-back. During this fly-back a neg. voltage peak will arise across R116, caused by the rapid alteration of the deflection current. Capacitor C96 serves to short-circuited the line pulses induced in S44 by the line deflection coil S33. Resistor R109 prevents too high voltage peaks at S43. The resistance of R109 decreases by an increase of the voltage peaks. With R104 the vertical linearity can be adjusted. The filament supply of the tube Rö16 is taken from winding S45 via the socket of the deflection unit.

Protecting circuit of the projection tube.

If one of the deflection fields gets out of order, the beam current will only write a vertical or a horizontal line and the screen of the projection tube will burn in after a while.
To prevent this burning-in, a protecting circuit has been incorporated. For this purpose a batterie tube D.A.F.96 Rö16 is used, which has a very low filament consumption. The filament supply voltage is derived from the winding S45 of the frame output transformer. From the winding S35 positive fly-back pulses are taken and applied to the screen grid via R140, C115 and C133. Via R141, R118 and R117 the screengrid is neg. biassed and without the positive pulses the projection tube is blocked by this neg. bias. To operate with max. anode current the control grid and the cathode are interconnected.
During operation the cathode current will charge up C137 positively via the slider of R118 and resistor R119. In this way the control grid of the projection tube gets it necessary pos. voltage.
With the aid of pot. meter R118 the amount of charge of C137 can be regulated and thereby the brightness.

If for instance the line deflection stage breaks down there will be no longer positive pulses at the screengrid due to which Rö16 is blocked. Capacitor C137 will be rapidly discharged across R119, R118 and R141 and via these resistor the control grid of the projection tube becomes instantaneously negative, and thus prevents the projection tube from burning-in.
When the frame deflection section gets out of order the cathode stops emitting immediately as a result of which Rö16 is blocked. In the same way as described above the beam current will be suppressed and thus prevents the projection tube from burning-in.

To keep constant of the black level.

To keep constant the black level at the projection tube means, unchanged background brightness in any position of the contrast control. With a decrease of the contrast, the brightness must be decreased in such a way that the black level is kept constant. This is done automatically in the following way.
Let us assume the video signal decreases (and thus the contrast) due to which the amplification of the I.F. stage is reduced.
After detection of the videosignal, the average negative voltage across R47 has decreased, as a result of which the cathode current increases and consequently the positive voltage across R48.
The control voltage on the grid of triode Rö11 will become more positive and therefore the anode voltage of the triode will decrease. Since this anode is connected to the anode of tube Rö16, the anode voltage of the latter tube will be decreased too. The anode current of this tube will be decreased due to which a lower positive voltage across C137 will arise causing a decrease of the brightness.

Sound I.F. stage

The sound I.F. signal derived from the video detector is applied to the I.F. band-pass filter C4-S3, C4a-S4. Resistor R3 is a damping resistor to achieve a sufficient band-width.
Via the band-pass filter the signal is fed to the control grid of the penthode of Rö3.

The diode voltage of X2, however, will make X2 conductive and so the neg. voltage across C17 has been compensated.
Suppose that the frequency is equal to 5.5 Mc/s (resonance freq.) the diode voltages of X2 and X3 are equal, due to which the voltage across C17 is at zero. By the resonance frequency the phase-difference of the signal across C14 and the sum of the signal across C15 and C15a amounts to 90°. If for instance the signal frequency is higher than the res. frequency the above mentioned phase difference is more than 90° as a result of which the diode voltage of X3 is greater than that of X2. A neg. voltage therefore arises across C17. When the freq. is lower than the resonance freq., a positive voltage will appear across C17. So the amplitude of this voltage changes with the freq. alteration of the signal. Via the resistor R12a, R14 and capacitor C18 the signal of C17 is applied to the volume control R15.

A.F. amplifier stage.

The A.F. signal taken from the volume control R15 is applied to the control grid of triode Rö4, via C7 and R11. In order to bias this tube a voltage is derived from cap. C81a of the control grid circuit of the line output tube Rö14. Via the voltage divider R127, R87a and resistor R6 this voltage is applied to the grid of triode Rö4.
After amplification in the triode, the signal is fed to the output tube Rö5. From the anode of this tube the A.F. signal is finally applied to the loudspeakers via the output transformer. Loudspeaker S12 produces the low notes while the loudspeakers S12a, S12b produce the high ones.
To achieve a better frequency response, the A.F. amplifier stage is fed back frequency-dependently. To this end the circuits C21//R136 and C131//R137 are incorporated. By means of R21 the high notes can be regulated. In the upper position of the slider the high notes will be attenuated most.

Video input stage, see fig. 7

This stage has been incorporated in order to operate in closed-circuit connection.
The video signal coming from the camera is applied via the input plug to the contrast control R2. The total resistance of R1//R2 is the required terminal resistance of the camera cable. Owing to the stray capacitance the elements in the cathode leads of both tubes, R4//C2 and R8//C5, and coil S1 are so demensioned, that the prevent attenuation of the high video frequencies.
After the signal has been amplified in both tubes, it reaches the video output tube Rö10 via the level diode X1 and switch pos. 7 fig. 5.
The level diode X1 is required to regain the D.C. component in the video signal. Tube Rö10 receives a neg. bias via R12 and R13.

Supply section.

The used supply section is intended for a mains supply of 220 V A.C. The mains voltage is passed via the fuses Si1, Si2 and the stopper resistors R111, R112 to the parallel connected rectifier tubes Rö19 and Rö20.

To prevent hum-modulation caused by these tubes, capacitor C102 has been provided. At the buffer capacitor C103 there will be the rectified voltage and via the smoothing S54-C104, R139-C135 the A.F. output tube Rö5 gets it supply voltage (+3). The supply voltage for the main part of the apparatus is taken from the cap. C104 via the smoothing circuit S55-C107 (+2). For the line and frame-time base output the supply voltages are derived from cap. C103 via the smoothing circuit S53-C134//C106 (+1).
The core of the smoothing chokes have a positive voltage in order to prevent electrolytics.
The filaments of the tubes are connected in series and the whole series connection is circuited to the mains voltage. To prevent mutual coupling in the filament circuit the filaments are earthed for R.F. and I.F. by capacitors of 1k5pF.
In order to use projection tubes with different heater currents the filament of this tube is connected to a separate winding of the transformer S48-S49-S50. To achieve more rapid operation of the booster diode Rö15 its filament is also connected to a separate winding of the transformer.

High tension unit.

The high tension of 25 kV required for operating the projection tube Rö21, is generated in a separate aggregate, producing at the same time the blocking voltage (-1) required for the protecting circuit, as well as the direct current for the focussing coil S47. Tube Rö124 acts as a blocking oscillator and generates a saw-tooth voltage with a frequency of obt. 1000 c/s at C275, which is applied to the grids of the output tubes Rö125 and Rö126 via C277. In the anode circuit of these tubes is the entirely invested oil-filled high voltage unit A3 421 13, containing besides a special transformer three high voltage diodes of the type EY51 with the corresponding charging capacitors.

The transformer is excited to resonance oscillations (obt. 30 kc/s) by the saw-tooth fly-backs, whereby very high voltage peaks occur (8,5 kV) during each current-zero-passing, as a consequence of the low winding capacities. This voltage is rectified and triplicated in a corresponding cascade connection. The voltage taken from an additional winding of the transformer is rectified by the parallel connected diodes of tube Rö124. A neg. voltage will therefore arise across R282, R283. The neg. voltage across R282 forms the neg. bias of the output tubes Rö125, Rö126.
Owing to this automatic control, charge variations can no more cause a considerable deviation of the high tension. Thus the high tension unit is stabilized by this automatic biassing. The tubes Rö127 and Rö128 circuited in a voltage doubling connection are in charge of the voltage supply for the high tension unit.
By a third mains rectifying tube Rö129, the neg. blocking voltage of -120 V(-1) is obtained for the protecting circuit. The filaments are connected together to a separate heating circuit, with intermediate connection of the NTC resistor R285, whereas a 400 mA fuse protects the whole unit.

D. Measurements and adjustments.

Special instructions when measuring.

1. The details of current and voltage represented in the diagrams are average values. They refer to the normal operation state of the apparatus, just like the oscillograms. The receiver can therefore be modulated either by a transmitter test chart or with the image modulation of a television test transmitter (PHILIPS GM 2891, GM 2888 resp. GM 2850). The RF signal should be abt. 1 to 3 mV. As measuring apparates the tube voltmeter GM 7635 and the oscillographe GM 5659 (resp. GM 5654) can efficiently be applied.
   For alignment and making visible of the transmission curves, the AM/FM measuring generator GM 2889 is applicable.

2. In case of repairs and measurements the equipment should always be operated via an isolating transformer, for security's sake (PHILIPS RTT 54).

3. Care should be taken when measuring at the line output stage, as well as at the 25 kV unit and the picture tube! High tension!!

4. Before replacing the projection tube, entire discharge of the high-tension part should be awaited.

5. In no case it should be tried to separate the high-voltage cable from the high-voltage unit.
   Loosening resp. elimination of the cap nut makes the unit unusable

Projector Adjustment:

a. Radiation course.

With the television projector the screen image of a cathode ray tube (type MW6-2) is enlarged with the aid of an extremely light-intensive optical system- the Schmidt optics- and projected on a projection wall.
The projection tube which is operated with an anode voltage of 25 kV to obtain sufficient brightness, protrudes with its picture screen through the opening in the plan mirror.
The light rays, radiating from the abt. 1 7/8" x 1½" picture screen are reflected from the spherical mirror opposite to it and deflected by means of the plan mirror, placed at an angle of 45°, towards the correcting lens.
The spherical mirror caused an optical enlargement of the picture and its function can be compared with a collector lens.
To prevent rays of the spherical mirror from reflecting on the picture screen, which lead to contrast reductions, the central zone of the spherical mirror is provided with a black, non-reflecting layer.
The correcting lens has to compensate the spheric aberrations. It consists of a profiled gelating layer fitted between two glass plates and is adjusted to the focal length of the system.

When passing the correcting lens, the light rays leave the entirely dustfree executed projector and reach the projection scree of the crystal pearl wall.

In this way all rays radiating from a given point of the picture tube, are concentrated again on one point of the projection screen. The track of light is like folded together, so that a very compact construction of the apparatus could be achieved.
With a projection distance of 120" the image dimension is 64" x 48".

b. Adjustment of the deflection unit; see fig. 4.

The replacent of the projection tube resp. of separate parts of the deflection unit requires the following working process:

1. After unscrewing the 6 ornamental screws of the front plate (projection side), the front plate can be removed, enabling access to the deflection unit of the projector.
2. Now the screws are loosened (pos. 14, 29, 32) some turns and the deflection unit is turned up to the stop bolt (Pos. 15), so that the recesses (pos. 18,27) will ly opposite the screws (pos. 14, 29, 32).
   The entire deflection unit with the picture tube can now be removed. Then the tube fitting of the projection tube, as well as the high-voltage supply should be removed.
3. Further the two screws (pos. 21, 23) are loosened and the bell (pos. 24) is loosened with the screw (pos. 22).
   Now the picture tube can be easily removed.
   The replacement of separate parts, as deflection and focussing coils (pos. 28 resp. 19) can be easily done after further minor dismantling.
   When re-assembling the tube care should be taken that is lies with its conical part fixed against the earth connection and that its high voltage connection takes its original position.
4. After these proceedings the bell (pos. 24) is again installed and care should be taken that the tube in the deflection unit is thoroughly fixed by tightening the two screws (pos. 21,23).

Attention! The screws (pos. 21, 22, 23) may never be tightened too much, because strong mechanic tensions may be dangerous for the projection tube!

5. Valve holder and high tension supply should be mounted. The deflection unit, now complete again, is first put into operation, outside the projector for centring of the picture.
6. The apparatus is switched on and the receiver is tuned to a television transmitter or to a pattern generator (e.g.PHILIPS GM 2657 or GM 2887).
   Focus and linearity control should be adjusted at optimum.

Attention! Outside the projector the picture tube may not be operated at full brightness.

As the screen of the tube radiates weak X-rays, it is required at full brightness, to apply a lead glass plate with an equivalent lead thickness of at least 1/4" between the observer and the tube, as a protection against these rays. This mesure is not required, when the tube is operated with a brightness at which the picture is fairly well visible.

7. After loosening the counternut and screw (pos. 25) abt.6 turns, the focussing coil (pos. 19) can be adjusted with regard to the axis of the picture tube, by means of the screws (pos. 20, 26).
These two screws are to be adjusted so that the picture appears well centred on the screen of the projection tube.
Care should be taken that the focussing coil does not exert any pressure on the neck of the picture tube.

8. Screw and counternut (pos. 25) are again tightened. The screw end should then lightly touch the bottom of the basket.
Further the picture screen has to be cleaned.

9. After the receiver has been switched off, the deflection unit with the picture tube is again introduced into the projector (see cipher 2).
However, first lightly tighten the screws (pos. 14, 29, 32).

10. The apparatus is again switched on and the entire deflection unit is turned so that the picture on the projection wall stands exactly horizontally.
The screws (pos. 14, 29, 32) can now be fully tightened.

11. It is now required to adjust the projector with the aid of the knobs (pos. 12, 17, 35), enabling a displacement of the hold yoke and thus of the entire deflection unit in vertical and horizontal direction, in such a way that equal optimum focus of the picture over the whole surface of the projection screen is obtained.

12. The knurled nuts (pos. 16, 36) are loosened.

13. In the course of the operations mentioned hereafter the apparatus should be operated with an average picture brightness and the focus control continuously checked on optimum adjustment.

14. Adjustment of maximum focus on the left margin of the projection screen with the aid of the right hand knob (pos. 35).

15. Adjustment of maximum focus on the right margin of the projection screen with the aid of the left hand knob (pos. 17).

16. By alternating repetition of the alignment as mentioned under 14 and 15, it is possible to reach a satisfactory focus for the left picture edge as well as for the right hand one.
It is very important that the picture edge on the left is focussed with the right hand knob (pos. 35), and the picture edge on the right with the left hand knob (pos. 17).
If, for example, the left picture edge is focussed with the left hand knob, (pos 35) instead of with the right hand knob (pos. 17), it will not be possible to adjust the right hand picture edge in a faultless way and by mutual turning of the two knobs (pos. 17 and 35) the adjustment will become still more troubled.

17. Adjustment of maximum focus at the upper and at the same time at the lower picture edge of the projection screen, with the aid of the abovementioned knob (pos. 12.)
This knob should be adjusted so as to ensure that the picture appears with equal focus on the upper and lower side.

18. If the focus of the picture is still unsatisfactory, entirely or partly, the total alginment process (item 14 to 17) should be repeated.

19. The position of the knobs (pos. 17, 35) can be fixed by tightening the knurled nuts (pos. 16, 36).

c. Some useful hints.

The whole optical system should be kept as dustfree as possible. The following points are to be kept in mind for this purpose:

1. Before placing the deflection unit with the picture tube into the projector, the tube screen should be entirely dustfree.

2. If there is nc tube in the projector, the opening in the rubber grommet should be closed with a cardboard disc cut in the same way.

3. The cabinet glass is covered with an aluminium layer on the surface and should only be seized at the edges! The normal ordinary cleaning methods are in no case applicable!

4. If by careless handling there are finger prints on the glass, these should be removed immediately in the following way:

A piece of wadding of very good quality is soaked with a cleaning alcohol and the spot in question is cleaned in one direction by a light, rubbing movement. With the same rubbing movement in the same direction the glass is then dried with a piece of dry wadding. This piece of wadding also to be used only once!
In no case the glass cover should be rubbed through by too heavy pressure; this would do more harm than a light, permanent unclearness!

Service spare parts.

We refer to the Booklet of Standard Service Parts for the parts not mentioned in the lists stated below.
The values and powers of the resistors are stated in the circuit diagrams.
Unless otherwise stated the tolerance is 10 %.
Resistors of a $\frac{1}{4}$ W and $\frac{1}{2}$ W are delivered under code number 901/...
Resistors of 1 W under code number 900/...

Behind the sloping line the desired value should be filled in.

R4	6K8Ω	3 W	48 767 05/6K8
R15	800 kΩ log		KR 375 35
R16	200 kΩ log		
R21	500 kΩ log		
Mains switch			
R46	See S27a		
R47a	See S28		
R49	3K3Ω	5,5 W	48 767 05/3K3
R51	50 kΩ lin		KR 375 34
R73	20 kΩ lin		
R61	See S24		
R73	See R51		
R89	2K2Ω	5,5 W	48 767 05/2K2
R91	1K8Ω	1,5 W	900/3K9+900/3K3 par.
R93	2K2Ω	1,5 W	900/4K7+900/3K9 par.
R94	700 kΩ		KR 375 24
R95	500 kΩ lin		KR 375 41
R118	1 MΩ lin		
R102	1 MΩ		916/GE1M
R104	1 MΩ		916/GE1M
R109	2K7Ω	V.D.R.	VD 9011
R111	40 Ω	10 W	49 417 01
R112	40 Ω	10 W	
R113	500 Ω	6 W	
R114	44 Ω	N.T.C.	49 379 53
R115	12 kΩ	1,5 W	900/27K+900/22K par.
R118	See R95		
R122	5 kΩ lin.		KR 375 40
R139	270 Ω	1,5 W	900/560E+900/560E par.
R142	700 kΩ lin.		KR 375 24
R153	220 Ω	1,5 W	900/390E+900/470E par.

H.T. UNIT

R284	150 Ω	25 W	48 492 05/150E
R285	220 Ω	N.T.C.	49 379 62
R286	2K8Ω	25 W	B8 300 34B/2K8
R287	10 kΩ	25 W	B8 300 34B/10K

VIDEO INPUT STAGE

R2	300 Ω lin.		915/E300E

C1	904/390E
C2	904/390E
C3	904/1K5
C4	(in S3-S4)
C4-a	(in S3-S4)
C5	904/4K7
C6	904/1K5
C7	904/10K
C8	(in S5-S6)
C9	904/1K5
C10	(in S5-S6)
C11	904/4K7
C12	904/10K
C13	909/E3,2
C13-a	904/1K5
C14	904/27E
C14-a	904/5E6
C15	904/39E
C15-a	904/56E
C16	904/12E
C17	904/47E
C18	906/10K
C19	906/6K8
C20	910/C100
C21	904/270E
C22	906/4K7
C24	904/390E
C26	904/1K5
C27	904/10K
C30	904/1K
C33	904/100E
C34	904/100E
C35	904/5E6
C35a	(in S13-S14)
C36	904/1K5
C37	904/100E
C38	904/1K5
C39	(in S17-S18)
C40	904/1K5
C41	904/1K5
C42	904/1K5
C43	(in S17-S18)
C44	904/1K5
C45	(in S25-S26)
C46	904/1K5
C47	904/1K5
C48	904/1K5
C49	904/39E
C50	904/5E6
C51	904/5E6
C52	904/1K5
C53	904/1K5
C54	911/L8
C55	904/1K5
C56	904/820E
C56a	904/220E
C57	904/100E
C58	906/39K
C61	904/820E
C62	904/10K
C63	904/1K5
C64	906/100K
C65	906/470K
C66	906/100K
C67	904/1K5
C68	904/1K5
C69	904/68E
C70	906/27K
C71	906/470K
C72	904/68E
C73	904/82E
C74	904/4K7
C75	906/100K
C76	906/1K
C77	905/10K
C78	05/3K3
R77) C106) C107)	913/L100+50+50
C80	906/2K2
C81	904/4K7
C81a	906/39K
C82	906/100K
C83	904/2K2
C84	AC 6083/10
C85	AC 6083/10
C86	904/15E
C87	904/150E
C88	906/100K
C89	904/1K2
C90	904/390E
C91	906/47K
C92	904/270E
C93	906/22K

C94	910/C100
C95	911/L8
C96	906/15K
C97	906/39K
C98	904/220E
C99	904/820E
C100	904/47E
C102	906/V100K
C103) C104)	913/L100+100
C106	(in C79)
C107	(in C79)
C108	904/1K5
C109	906/56K
C110	904/1K5
C111	904/1K5
C112	904/1K5
C113	904/1K5
C114	904/1K5
C115	904/27E
C116	904/1K5
C117	904/1K5
C118	904/1K5
C119	904/1K5
C120	904/1K5
C122	904/1K5
C123	904/1K5
C124	904/1K5
C125	904/1K5
C126	904/1K5
C127	904/12K
C128	904/1K5
C129	(in S51-S52)
C130	904/1K5
C130-a	909/E3,2
C131	906/4K7
C132	906/27K
C133	904/390E
C134) C135) C136)	913/L100+100+50
C137	904/220E
C143	904/390E
C144	906/15K
C145	909/E3,2

VIDEO INPUT STAGE

C1	906/100K
C2	904/330E+904/10E par.
C3) C7)	912/R25+25
C4	906/100K
C5	904/220E+904/180E par.
C6	906/220K
C7	See C3
C8	906/100K

H.T. UNIT, fig. 2

C278	910/D25
C280	AC 6087/50
C281	912/R25+25
C282	912/R25+25
C283	912/R12½+12½

S3, C4 S4, C4a	A3 127 46
S5, C8 S6, C10	A3 127 53
S6a	A3 802 15
S7, S7a S8	A3 127 22
S9, S9a, S10 S10a, S11	918/05
S12	Type 9770 M
S12a	Type 9742 X
S12b	Type 9742 X
S13, S14 C35a	A3 127 50
S15, S16	A3 127 49
S17, C39 S18, C43	A3 127 48
S19, S20	A3 127 51
S22, S23	A3 127 51
S24, R61	KR 110 00
S25, S26 C45	A3 127 52
S27	A3 119 99
S27a-R46	A3 119 06
S28-R47a	KR 135 15
S28a	924/20
S29	A3 118 52
S30-S31	A3 119 05
S33, S46	A3 110 70.3
S34, S47	A3 694 13
S38-S40	KR 692 00
S43-S45	A3 169 51
S47	A3 111 19
S48, S49 S49a, S50	A3 161 75
S51, S52 C129	A3 127 47
S53	A3 166 25
S54	A3 166 25
S55	A3 166 25
S59	A3 112 26

H.T. UNIT

S180, S181	A3 169 29
S182	A3 166 15

VIDEO INPUT STAGE

S1	KR 110 00

vdV/GH

List of mechanical spare parts.

Fig.	Pos.	Description	Code number
5	2,3,5	Knob	P4 485 35
5	4	Socket	976/4x12
		Ornamental screws	A3 713 21
6	1	Knob of volume control	KR 712 13
6	2	Knob of treble control	KR 712 42
6	3	Knob of vertical hold control	KR 712 40
6	4	Knob of brightness control	KR 712 41
6	5	Knob of focus control	KR 712 40 + KR 712 41
6	6	Knob of horizontal hold control	KR 712 40
6	7	Knob of contrast control	KR 712 41
6	8	Knob of channel selector	KR 712 12
6	9	Knob of fine tuning	KR 712 13
		Channel selector	A3 768 31
		Plan mirrow	A3 326 91
		Spherical mirrow	A3 325 17
		Correcting lens	A3 382 38
		H.T. unit	A3 421 13

vdV/GH

TRIMMING

SOUND I.F.

Contrast control at min.
Tubevoltmeter (range - 3 Volt) across C5.
R.F. signal (unmod.) 5.5 Mc/s to S27/S28.

Apply damping (1500 Ω + 1500 pF) across S3
Trim S4 at max.
Damping across S4
Trim S3 at max.
Damping across S5
Trim S6 at max.
Damping across S6
Trim S5 at max.
Trim S7/S7a at max.

Repeat the trimming procedure once more !

Connect a tube B8 10 via 1500 pF with g1-P B83.
Trim S28a at min.
Remove the connection of 1500 pF.
Apply tube voltmeter (range - 3 Volt) to R12/R12a.
Trim S8 at min. reading of the meter (0 V).

Control of the I.F. band-pass curve :

Apply oscilloscope via 200 kΩ to R14/C18 and chassis.
Apply a wobbulator-signal of 5.5 Mc/s (sweep 400 kc/s; 50 c/s) to S27/S28.
Correct by means of S8, the symmetry of the I.F. band-pass curve.
Adjust S7/S7a at max. A.M. suppression.

PICTURE I.F.

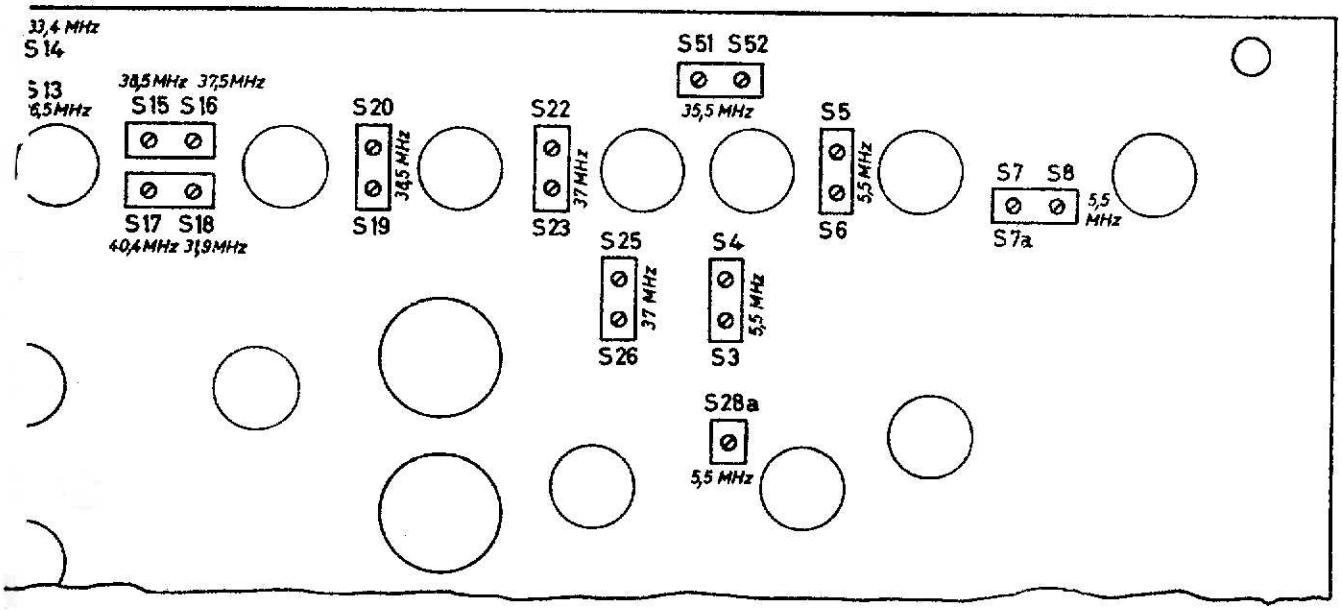
Contrast control at max.
Apply a neg. voltage of approx. 4.5 V across C64 (+pole to earth) !
Connect a tubevoltmeter (range - 3 Volt) between g1-B810 and k-B810.
R.F. signal (unmod.) via 1500 pF at measuring point "M".

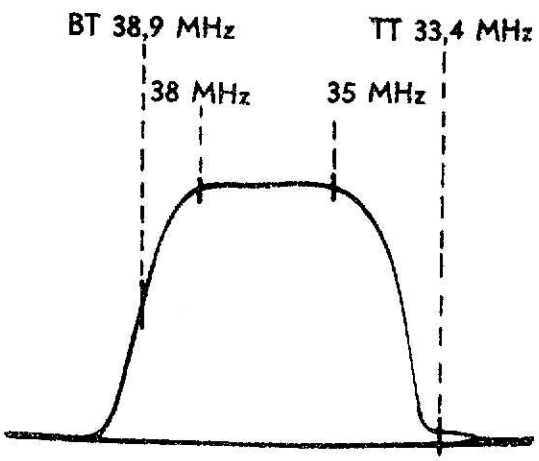
Damping 1 kΩ and 1500 pF across	Frequency	Trim
-	40.4 Mc/s	S17 at min.
-	31.9 Mc/s	S18 at min.
S25	37 Mc/s	S26 at max.
S26	37 Mc/s	S25 at max.
S22	37 Mc/s	S23 at max.
S23	37 Mc/s	S22 at max.
S19	38.5 Mc/s	S20 at max.
S20	38.5 Mc/s	S19 at max.
S15	37.5 Mc/s	S16 at max.
S16	38.5 Mc/s	S15 at max.
-	33.4 Mc/s	S14 at min.
Unscrew core of S8		
-	36.5 Mc/s	S13 at max.
S13	35.5 Mc/s	S8 at max.

Repeat the trimming procedure once more !

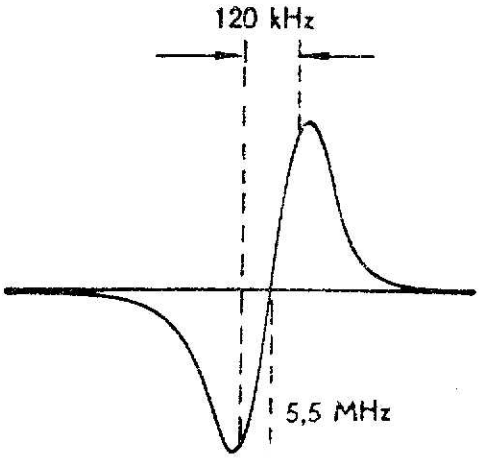
Apply R.F. signal of 35.5 Mc/s (A.M. 400 c/s) to measuring point "M" via 1500 pF.
Apply tube voltmeter (range 3 Volt -) to R56/C58.
Damp S51 with 1000 Ω and 1500 pF.
Trim S52 at max.
Damping across S52.
Trim S51 at max.

Control of the I.F. band-pass curve :
Damp S51 with 1000 Ω and 1500 pF
Connect oscilloscope between k-B8 21 and chassis via 200 kΩ.
Apply R.F. signal of 36 Mc/s (P.M.) to measuring point "M".





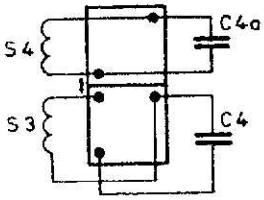
illoscope via 200 kOhm at kRö 23

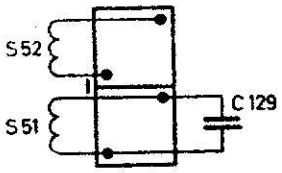


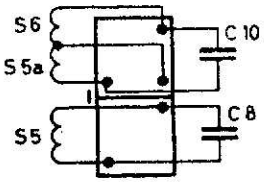
Oscilloscope via 200 kOhm at R 14/C 18

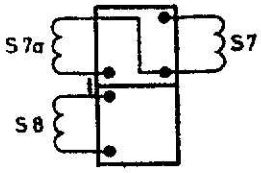
The picture and sound I.F. band-pass curves have been measured with the Philips AM/FM generator GM 2889 together with the Philips oscilloscope GM 5654.

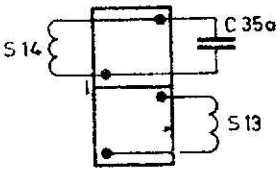
COILS AND TRANSFORMER CONNECTIONS

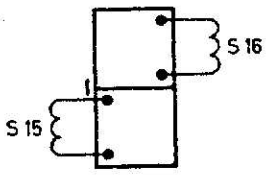


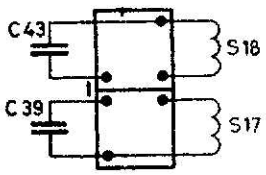


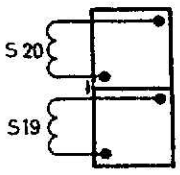


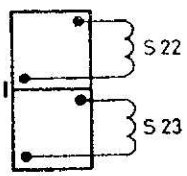


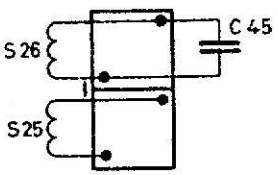


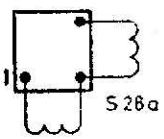


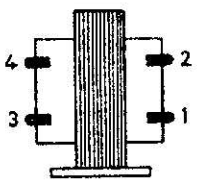




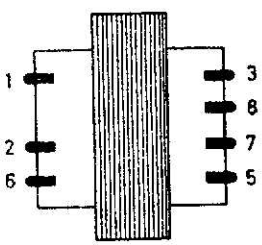




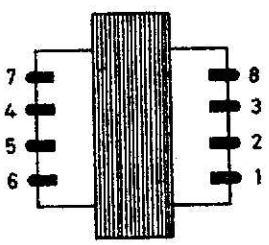




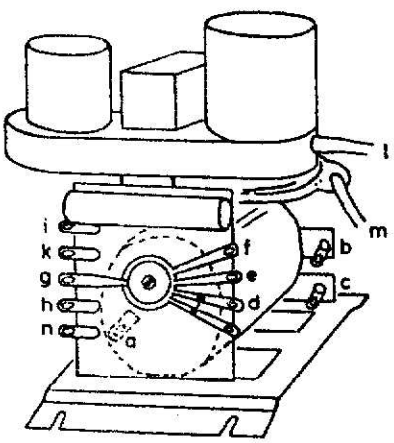
S41, S42



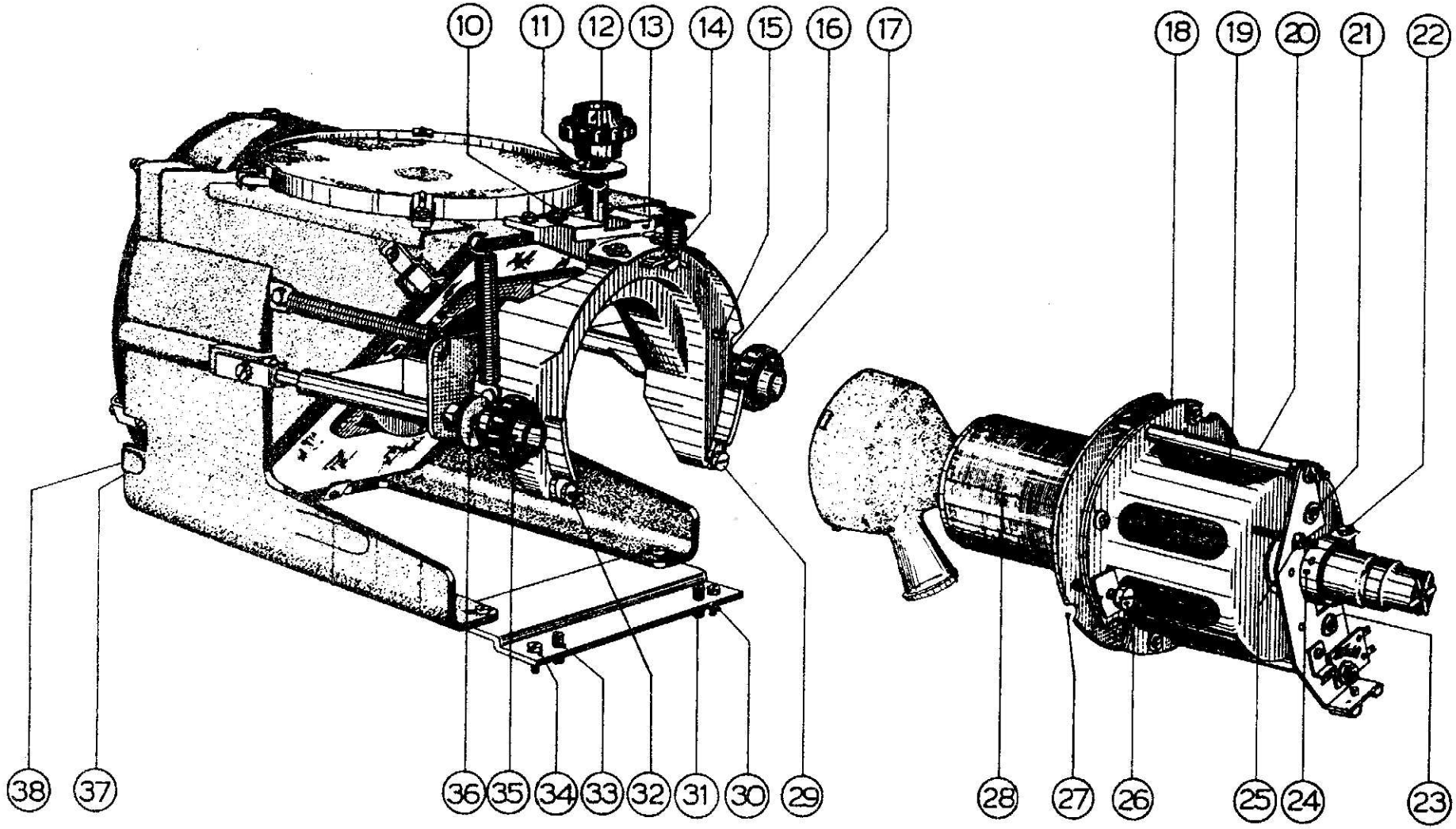
S43-S45



S9-S11



S34-S40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15
16
17
18
19
20
21
22
38
37
36
35
34
33
32
31
30
29
28
27
26
25
24
23

FIG. 4

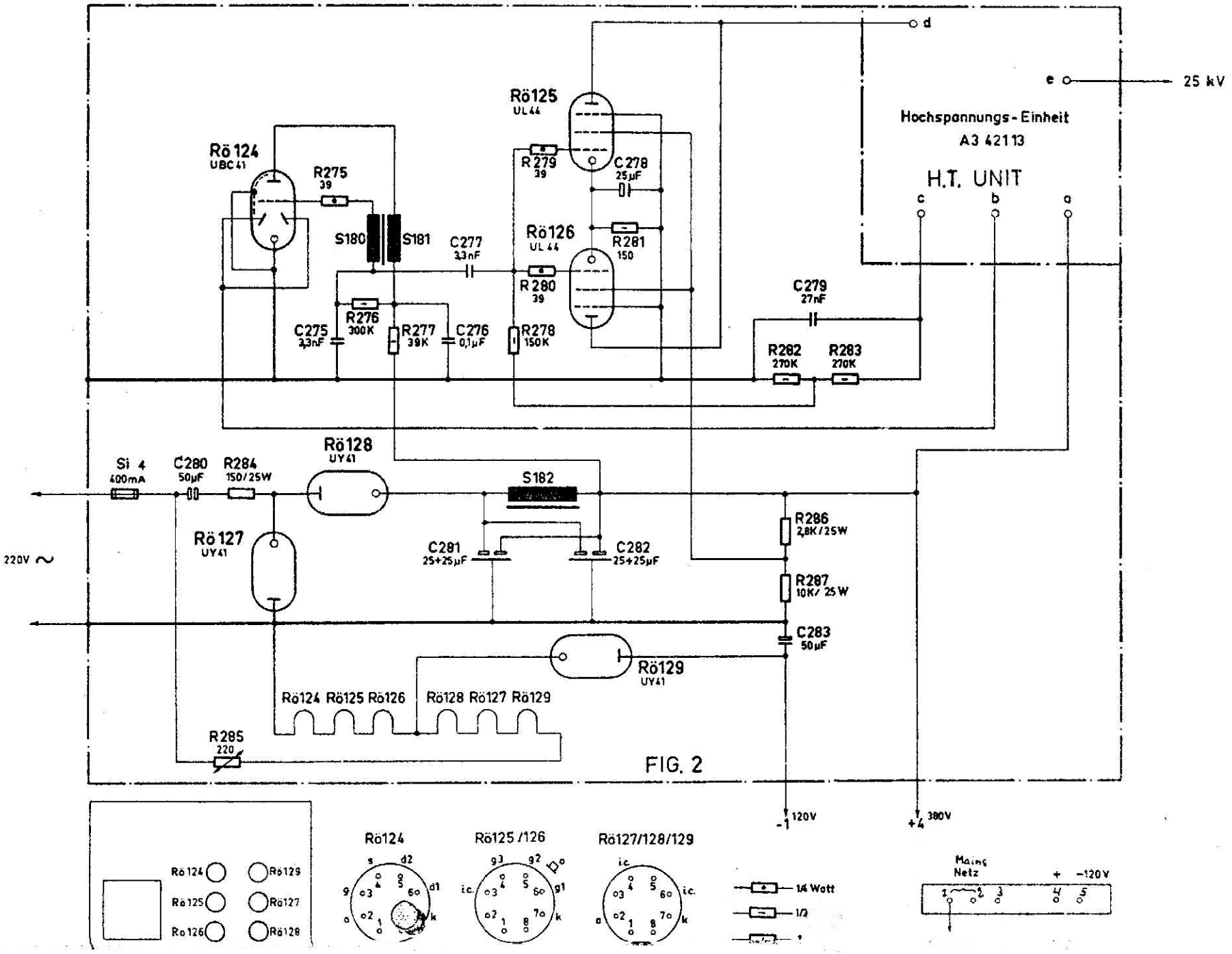
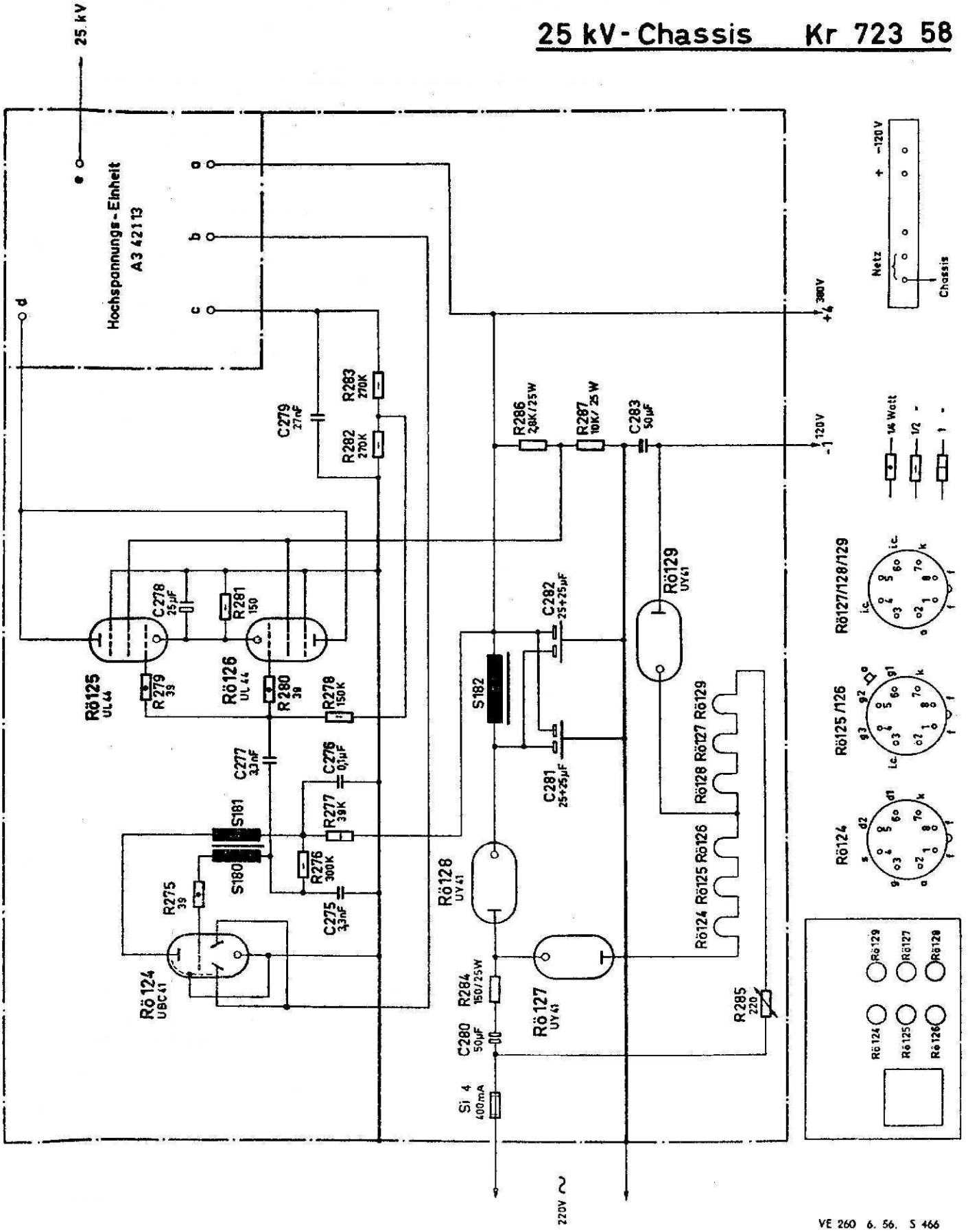

Hochspannungs-Einheit
A3 42113
H.T. UNIT
d
e
25 kV
c
b
a
Rö 124
UBC41
R275
39
S180
S181
C277
3,3nF
Rö125
UL44
R279
39
C278
25µF
Rö126
UL44
R281
150
R280
39
C279
27nF
C275
3,3nF
R276
300K
R277
39K
C276
0,1µF
R278
150K
R282
270K
R283
270K
Si 4
400mA
C280
50µF
R284
150/25W
Rö128
UY41
S182
220V ~
Rö 127
UY41
C281
25+25µF
C282
25+25µF
R286
2,8K/25W
R287
10K/ 25W
C283
50µF
Rö129
UY41
Rö124 Rö125 Rö126
Rö128 Rö127 Rö129
R285
220
-1 120V
+4 380V
Rö124
Rö125 /126
Rö127/128/129
Rö124
Rö125
Ro126
Rö129
Rö127
Rö128
1/4 Watt
1/2
Mains
Netz
+
-120V

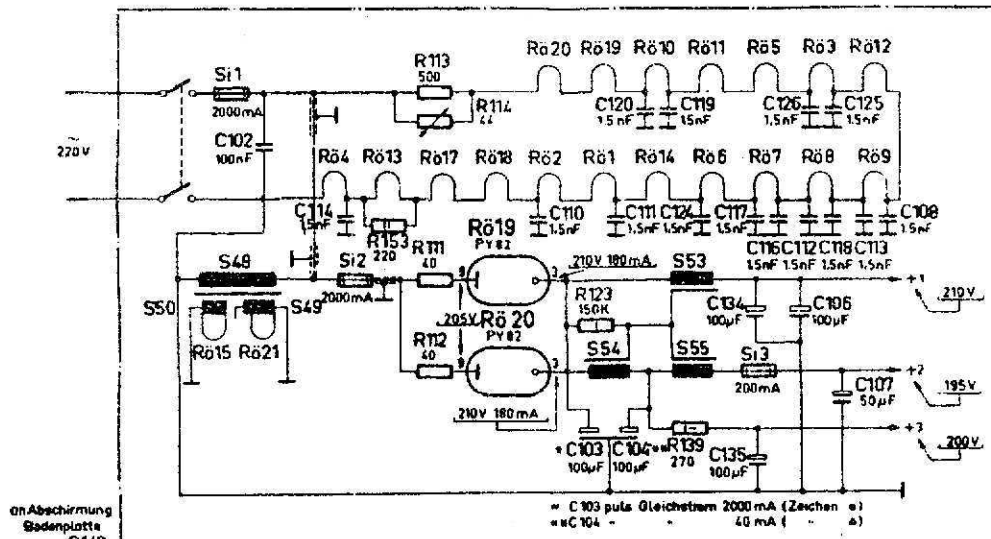
FIG. 2

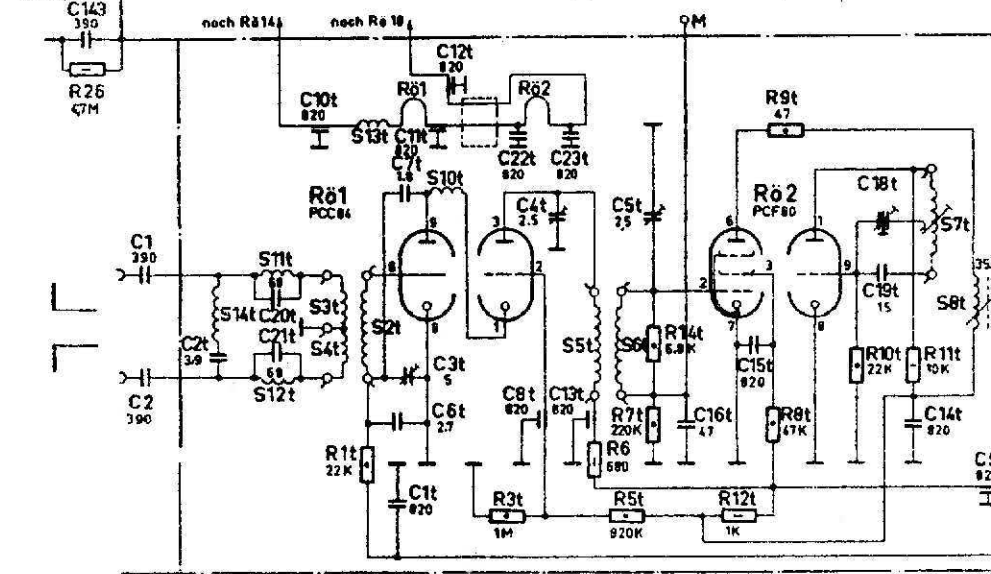
PHILIPS SERVICE VE 2600

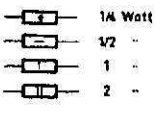
25 kV-Chassis Kr 723 58

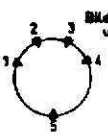


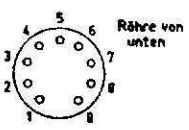
PHILIPS SERVICE

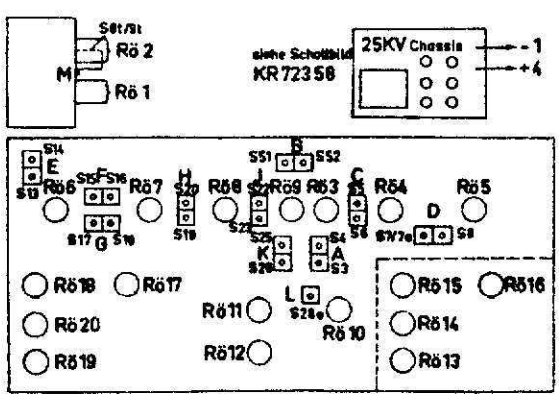


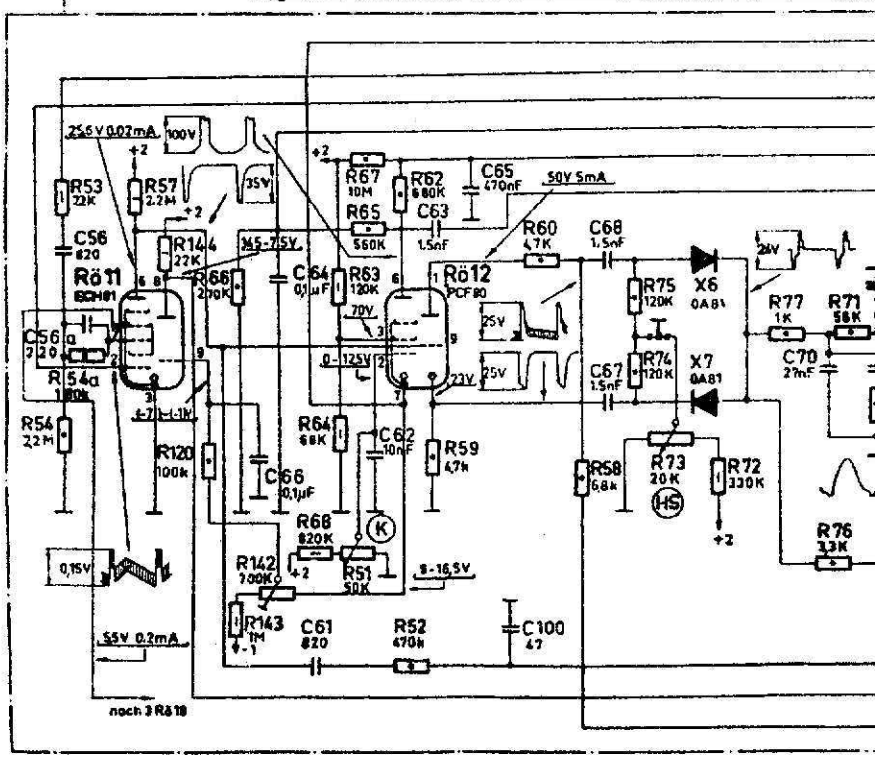












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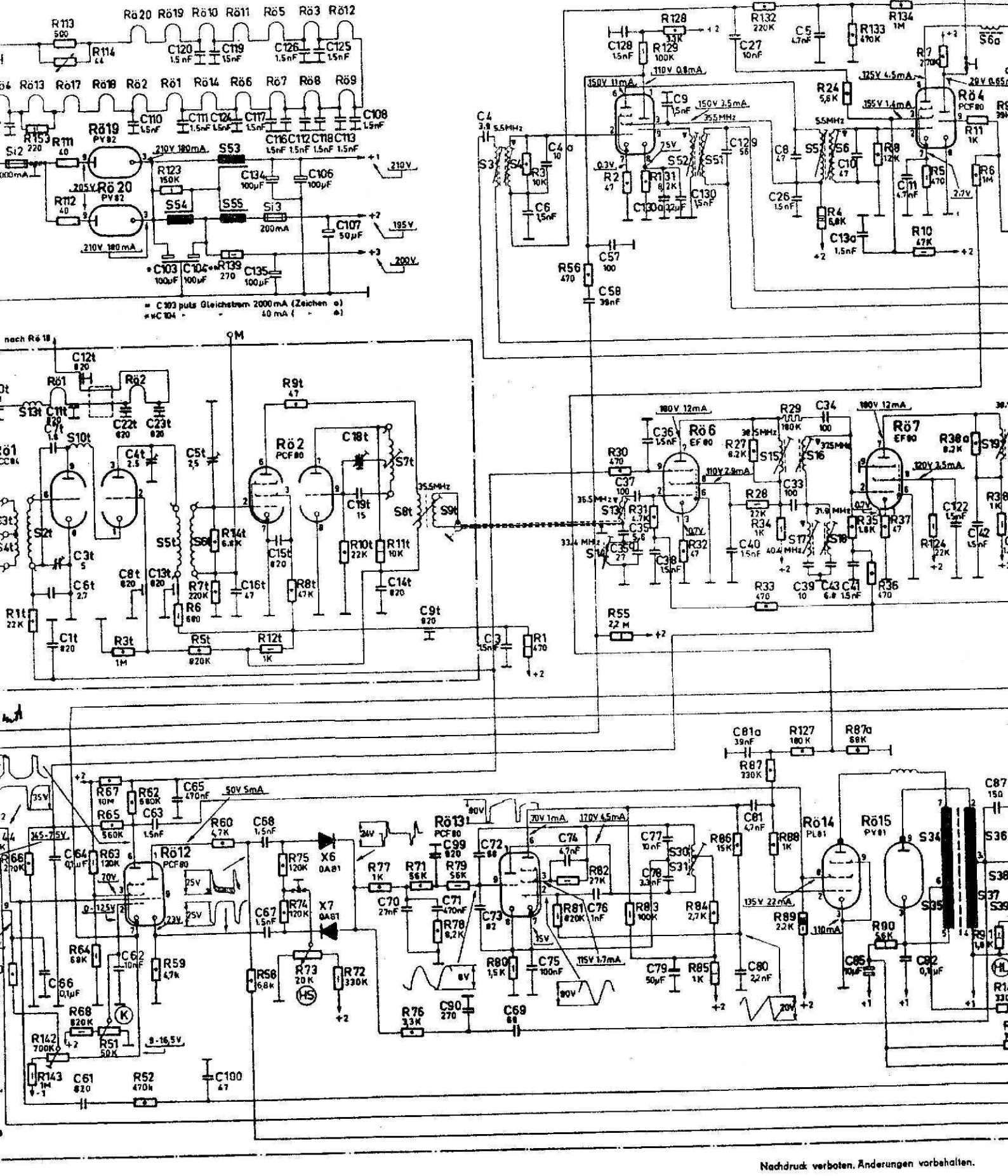
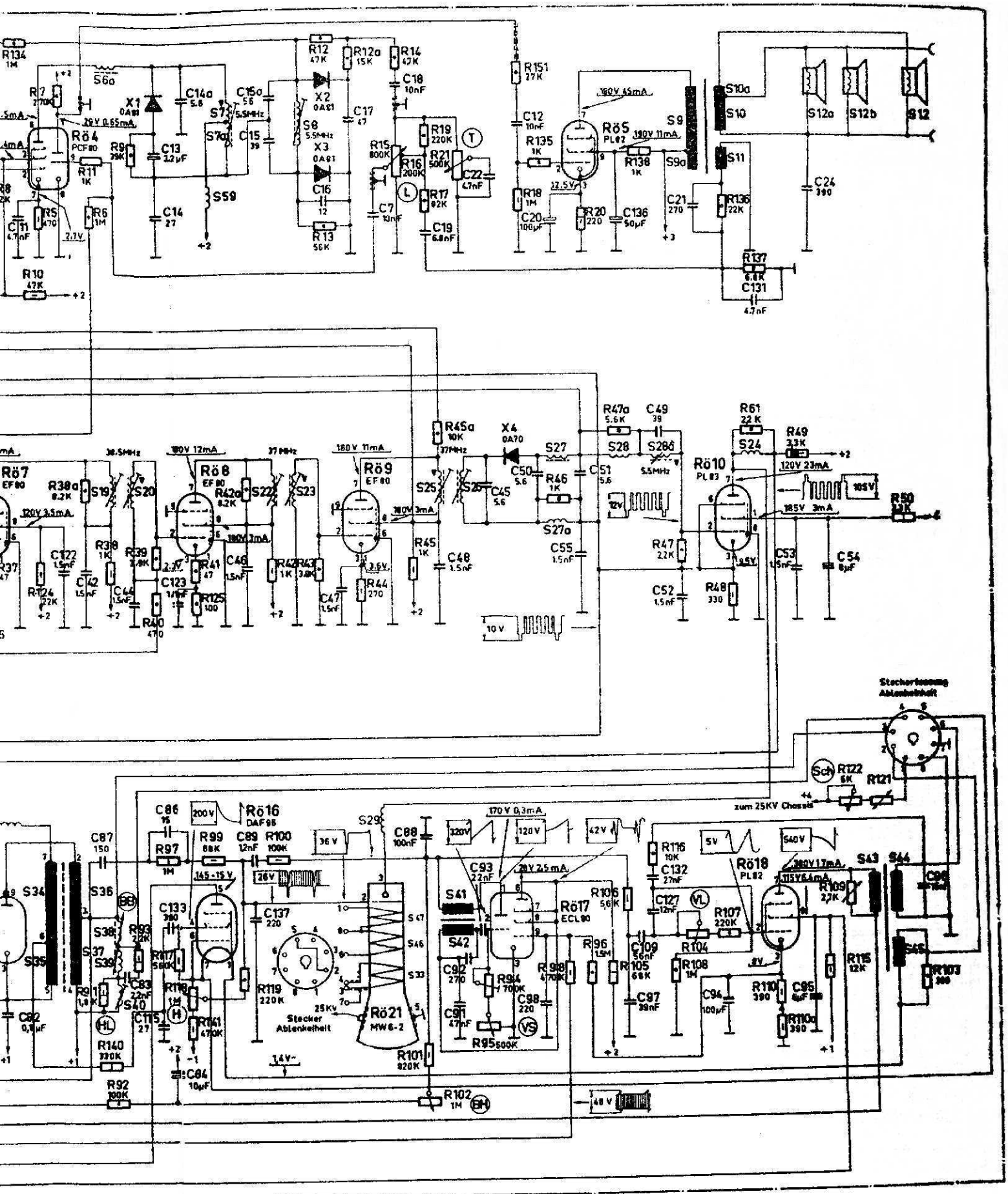
SERVICE - ABT.


Rö20 Rö19 Rö10 Rö11 Rö5 Rö3 Rö12
Rö4 Rö13 Rö17 Rö18 Rö2 Rö1 Rö14 Rö6 Rö7 Rö8 Rö9
Rö19 PY82
Rö 20 PY82
Rö 4 PCF80
Rö 6 EF80
Rö 7 EF80
Rö2 PCF80
Rö12 PCF80
Rö13 PCF80
Rö14 PL81
Rö15 PY81
S53
S54
S55
Si3
200mA
210V 180mA
205V
195V
200V
+1
+2
+3
C103 100µF
C104 100µF
C134 100µF
C106 100µF
C135 100µF
C107 50µF
R139 270
R123 150K
R113 500
R114 44
R153 220
R111 40
R112 40
C120 1,5nF
C119 1,5nF
C126 1,5nF
C125 1,5nF
C110 1,5nF
C111 1,5nF
C124 1,5nF
C117 1,5nF
C116 1,5nF
C112 1,5nF
C118 1,5nF
C113 1,5nF
C108 1,5nF
* C 103 puls Gleichstrom 2000 mA (Zeichen o)
* C 104 " " 40 mA (" o)
R128 3,3K
R129 100K
C128 1,5nF
R132 220K
C27 10nF
C5 4,7nF
R133 470K
R134 1M
S6a
R7 270K
110V 0,8mA
350V 11mA
125V 4,5mA
155V 1,4mA
R24 5,6K
C9 1,5nF
150V 3,5mA
35,5MHz
5,5MHz
C4 3,9 5,5MHz
C4a 10
S3
S4
R3 10K
C6 1,5nF
C129 56
S52
S51
R2 47
R131 6,2K
C130a 32µF
C130 1,5nF
C8 47
S5
S6
C10 47
R9 12K
C11 4,7nF
R5 470
R6 1M
C26 1,5nF
R4 6,8K
C13a 1,5nF
R10 47K
2,7V
C57 100
R56 470
C58 39nF
nach Rö 18
M
C12t 820
Rö1
Rö2
C22t 820
C23t 820
S13t
C11t 39
C7t 1,5
S10t
C4t 2,5
C5t 2,5
R9t 47
C18t
S7t
C19t 15
S8t
S9t
S12t
C3t 5
C6t 2,7
S5t
R14t 6,8K
C15t 820
R10t 22K
R11t 10K
C14t 820
C8t 820
C13t 820
R7t 220K
C16t 47
R8t 47K
R6 680
C9t 820
R1t 22K
C1t 820
R3t 1M
R5t 820K
R12t 1K
C3 1,5nF
R1 470
+2
180V 12mA
R29 180K
C34 100
C36 1,5nF
R27 6,2K
S15
S16
R30 470
C37 100
110V 2,9mA
R28 27K
R34 1K
C33 100
S17
S18
R31 4,7K
C35 5,6
C35a 27
C38 1,5nF
R32 47
C40 1,5nF
R35 1,8K
R37 47
R38a 8,2K
S19
R38 1K
C122 1,5nF
C42 1,5nF
R124 22K
120V 3,5mA
R33 470
C39 10
C43 6,8
C41 1,5nF
R36 470
R55 2,2 M
C81a 39nF
R127 180K
R87a 68K
R87 330K
C87 150
S34
S35
S36
S37
S38
S39
R67 10M
R62 680K
C65 470nF
50V 5mA
R65 560K
C63 1,5nF
R60 4,7K
C68 1,5nF
R63 120K
C64 0,1µF
R66 270K
R75 120K
X6 0A81
R74 120K
X7 0A81
C67 1,5nF
R64 68K
C62 10nF
R59 4,7K
C66 0,1µF
R68 820K
R142 700K
R51 50K
R143 1M
C61 820
R52 470K
C100 47
R58 6,8K
R73 20K
R72 330K
R77 1K
R71 56K
R79 56K
C99 820
C70 27nF
C71 470nF
R78 9,2K
C72 68
C73 82
C74 4,7nF
R82 27K
R81 820K
C76 1nF
R83 100K
R84 2,7K
R80 1,5K
C75 100nF
R76 3,3K
C90 270
C69 68
C77 10nF
C78 3,3nF
S30
S31
R86 15K
C79 50µF
R85 1K
C80 2,2nF
R88 1K
R89 2,2K
110mA
R90 5,6K
C85 10nF
C82 0,1µF
90V
70V 1mA
170V 4,5mA
135V 22mA
115V 1,7mA
24V
25V
23V
8V
20V
0-125V
345-375V
9-16,5V
Nachdruck verboten. Änderungen vorbehalten.

VE 2600



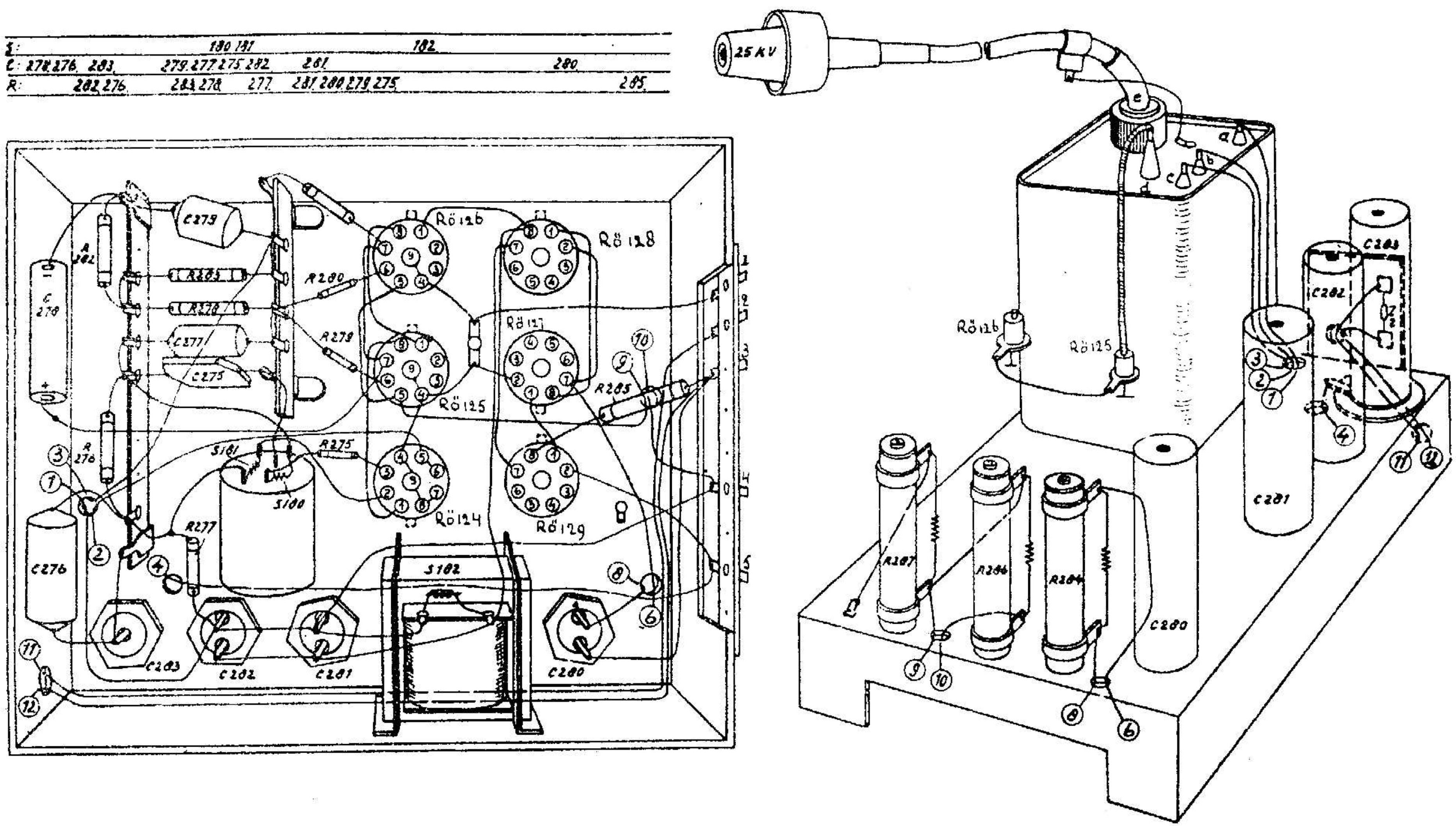

S: 180 181 182
C: 278 276 283 279 277 275 282 281 280
R: 282 276 283 278 277 281 280 279 275 285
25 KV
Rö126
Rö128
Rö127
Rö125
Rö124
Rö129
R280
R279
R275
R277
R285
R283
R278
C279
C277
C275
C276
C283
C282
C281
C280
S181
S100
S182
R287
R286
R284

FIG. 3

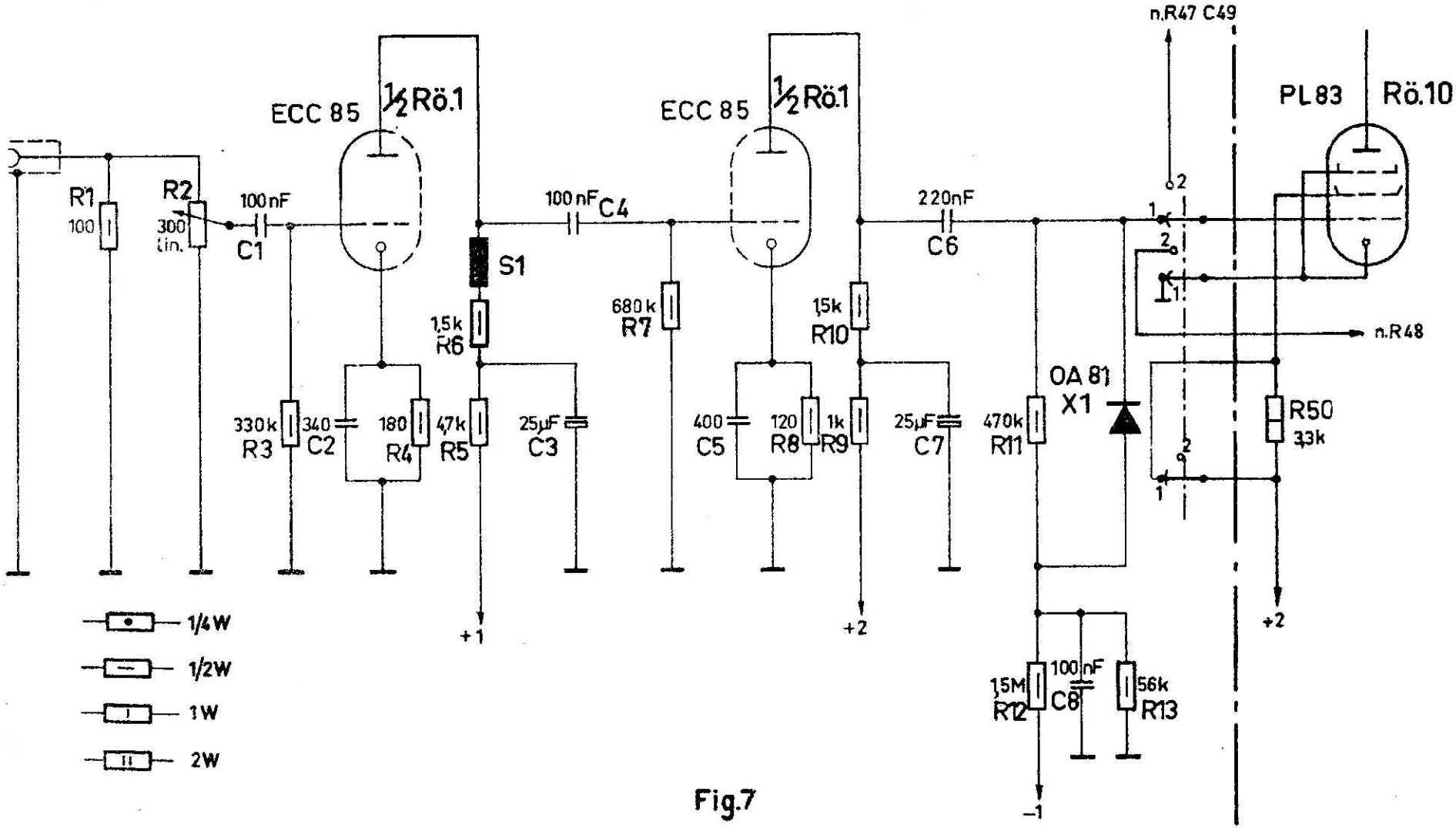

ECC 85
½ Rö.1
ECC 85
½ Rö.1
PL 83
Rö.10
n.R47 C49
n.R48
R1
100
R2
300
lin.
C1
100nF
100nF C4
220nF
C6
S1
1,5k
R6
680k
R7
1,5k
R10
330k
R3
340
C2
180
R4
47k
R5
25µF
C3
400
C5
120
R8
1k
R9
25µF
C7
470k
R11
OA 81
X1
R50
3,3k
+1
+2
+2
1,5M
R12
100nF
C8
56k
R13
–1
1/4W
1/2W
1W
2W

Fig.7

PHILIPS SERVICE

A3 696 52

12 Kanal - Cascode - Trommelwähler

H.F - Einheit

Technische Daten:

Cascode-Trommelwähler mit 12 Raststellungen

— 240 Ω sym.
— 60 Ω asym.

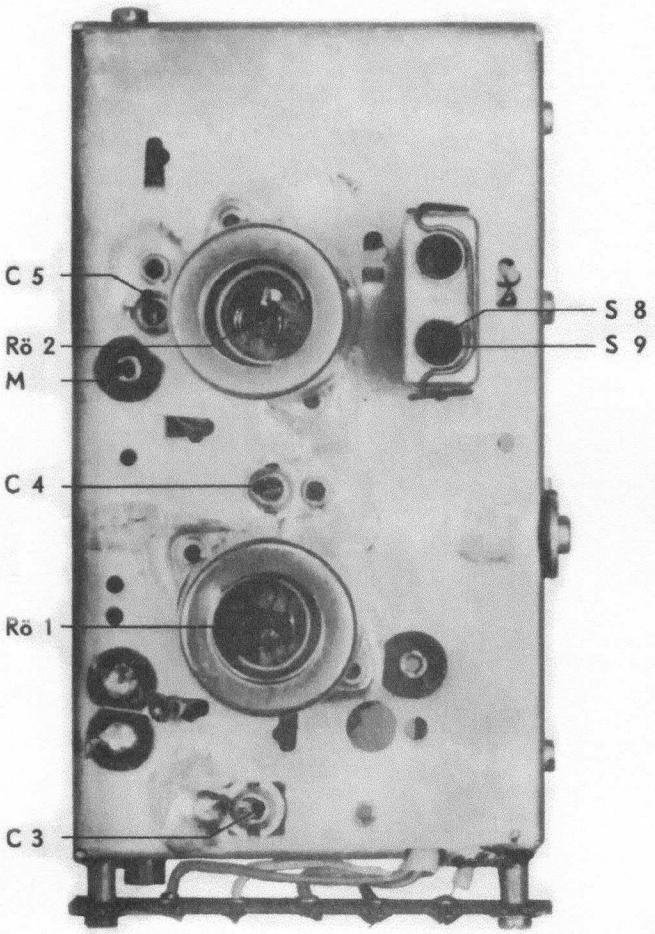
Grenzempfindlichkeit Band I: 5 kTo
Grenzempfindlichkeit Band III: 7 kTo

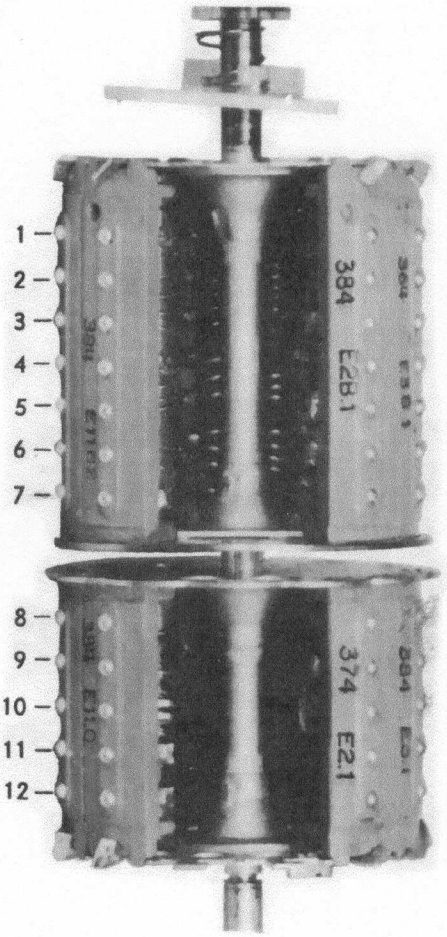
Bildträger-ZF = 38,9 MHz
Tonträger-ZF = 33,4 MHz

Regelbereich der Feinabstimmung:
Band I: ca. 0,8 MHz
Band III: ca. 1,5 MHz

Kanal 2:	47—54 MHz
Kanal 3:	54—61 MHz
Kanal 4:	61—68 MHz
Kanal 5:	174—181 MHz
Kanal 6:	181—188 MHz
Kanal 7:	188—195 MHz
Kanal 8:	195—202 MHz
Kanal 9:	202—209 MHz
Kanal 10:	209—216 MHz
Kanal 11:	216—223 MHz

zwei Kanäle Reserve





Widerstände

Pos.	Wert	Belastung	Code-Nr.
R 1	3,3 kΩ	0,25 W	A 9 999 00/3K3 „D"
R 3	1 MΩ	0,5 W	A 9 999 00/ 1M „D"
R 5	820 kΩ	0,5 W	A 9 999 00/820K „D"
R 6	680 Ω	0,5 W	A 9 999 00/680E „D"
R 7	220 kΩ	0,25 W	A 9 999 00/220K „D"
R 8	47 kΩ	0,25 W	A 9 999 00/47K „D"
R 9	47 Ω	0,25 W	A 9 999 00/47E „D"
R 10	22 kΩ	0,25 W	A 9 999 00/22K „D"
R 11	10 kΩ	1 W	A 9 999 00/10K
R 12	1 kΩ	0,5 W	A 9 999 00/1K „D"
R 14	6,8 kΩ	0,25 W	A 9 999 00/6K8 „D"

Kondensatoren

Pos.	Wert	Spannung	Code-Nr.
C 1	820 pF	500 V	A 9 999 04/820E
C 2	3,9 pF	—	in S 11—S 14
C 3	0—5 pF	—	49 627 50
C 4	0—2,5 pF	—	49 005 62
C 5	0—2,5 pF	—	49 005 62
C 6	2,7 pF	500 V	A 9 999 04/2E7
C 7	1,8 pF	500 V	A 9 999 04/1E8
C 8	820 pF	500 V	B1 664 13
C 9	820 pF	500 V	B1 664 13
C 10	820 pF	500 V	B1 664 13
C 11	820 pF	500 V	B1 664 13
C 12	820 pF	500 V	B1 664 13
C 13	820 pF	500 V	B1 664 13
C 14	820 pF	500 V	A 9 999 04/820E
C 15	820 pF	500 V	A 9 999 04/820E
C 16	47 pF	500 V	A 9 999 04/47E
C 19	15 pF	500 V	B1 664 18
C 20	68 pF	—	in S 11—S 14
C 21	68 pF	—	in S 11—S 14
C 22	820 pF	500 V	A 9 999 04/820E
C 23	820 pF	500 V	A 9 999 04/820E

Spulen

Pos.	Bezeichnung	Code-Nr.
S 8, S 9	1. Bild-ZF-Filter	A 3 126 70
S 10	Koppelspule	A 3 117 72
S 11, S 12, S 14, C 2, C 20, C 21	ZF-Saug- u. Sperrkreis	A 3 118 78
S 13	Drossel	A 3 117 71
Fe 1	Ferroxcubedrossel	56 390 28/228

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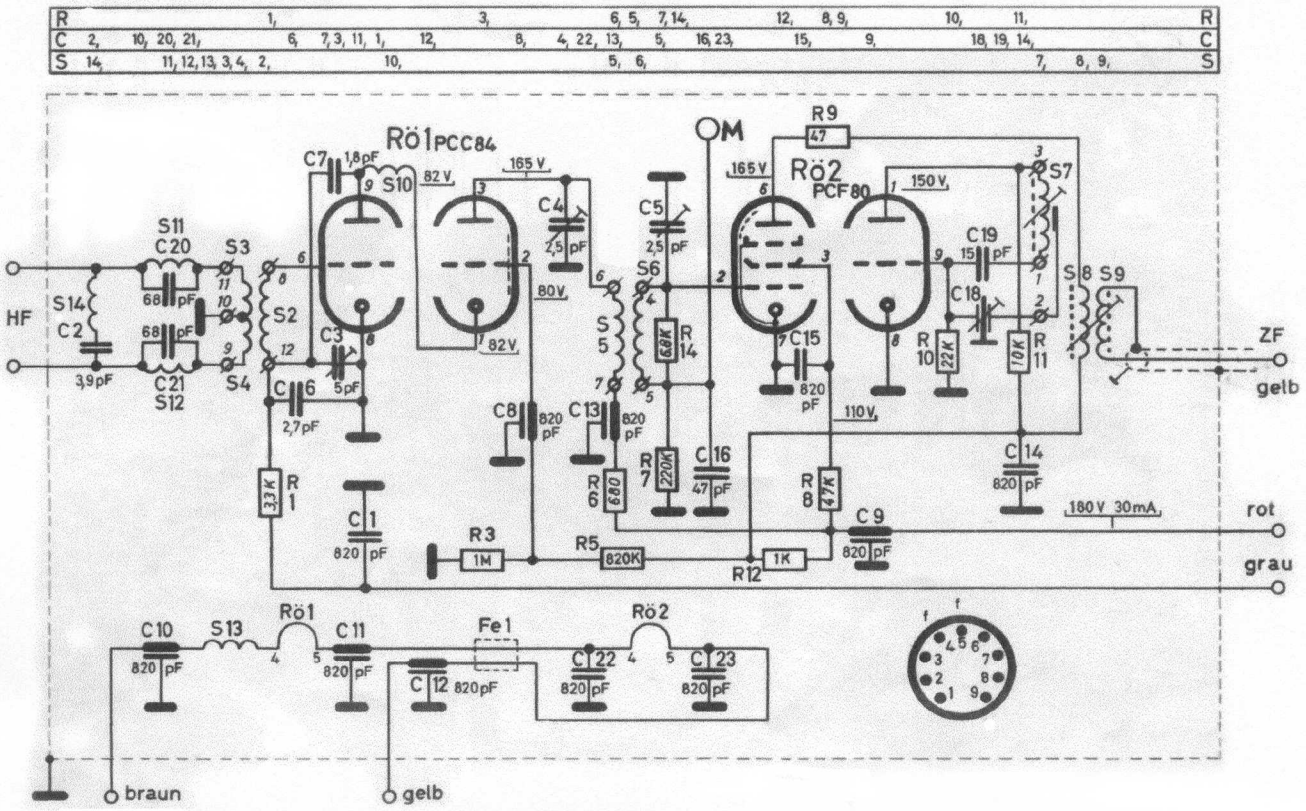
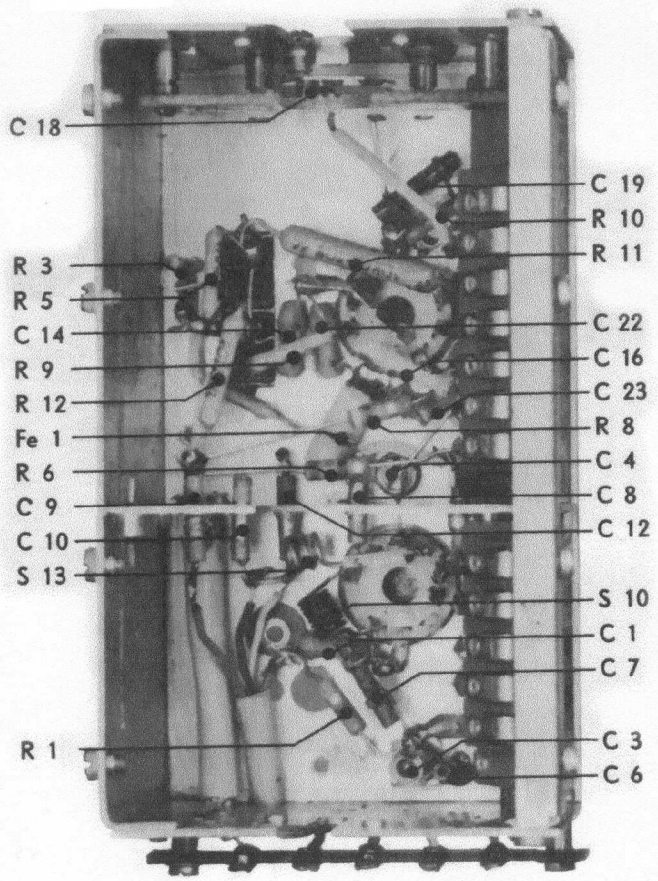
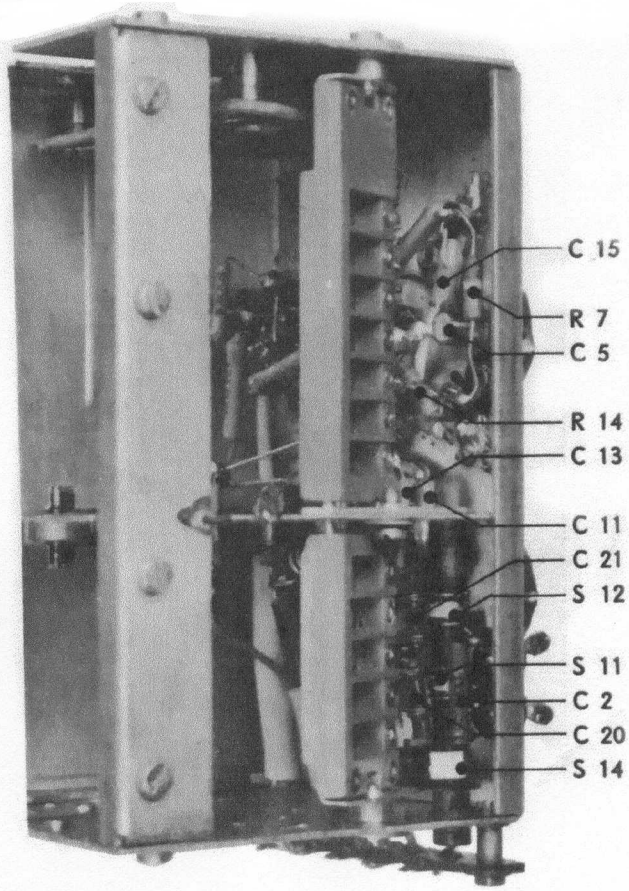
Änderungen vorbehalten.


R 1, 3, 6, 5, 7, 14, 12, 8, 9, 10, 11,
C 2, 10, 20, 21, 6, 7, 3, 11, 1, 12, 8, 4, 22, 13, 5, 16, 23, 15, 9, 18, 19, 14,
S 14, 11, 12, 13, 3, 4, 2, 10, 5, 6, 7, 8, 9,
Rö1 PCC84
Rö2 PCF80
M
HF
ZF
gelb
rot
grau
braun
gelb
S11 C20 S3
S14 C2
S2
S4 C21 S12
C7 1,8pF
S10
C4 2,5 pF
C5 2,5 pF
S6
S5
C3 5pF
C6 2,7pF
C8 820 pF
C13 820 pF
R 14 68K
R 7 220K
C16 47 pF
C15 820 pF
R 9 47
R 10 22K
C19 15 pF
C18
S7
S8 S9
R 11 10K
C14 820 pF
R 1 33K
C1 820 pF
R3 1M
R5 820K
R12 1K
R 8 47K
C9 820 pF
C10 820 pF
S13
Rö1
C11 820 pF
Fe1
C12 820pF
Rö2
C22 820 pF
C23 820 pF
82 V
165 V
80 V
150 V
110 V
180 V 30mA


C 18
C 19
R 10
R 11
R 3
R 5
C 14
R 9
R 12
Fe 1
R 6
C 9
C 10
S 13
C 22
C 16
C 23
R 8
C 4
C 8
C 12
S 10
C 1
C 7
R 1
C 3
C 6


C 15
R 7
C 5
R 14
C 13
C 11
C 21
S 12
S 11
C 2
C 20
S 14

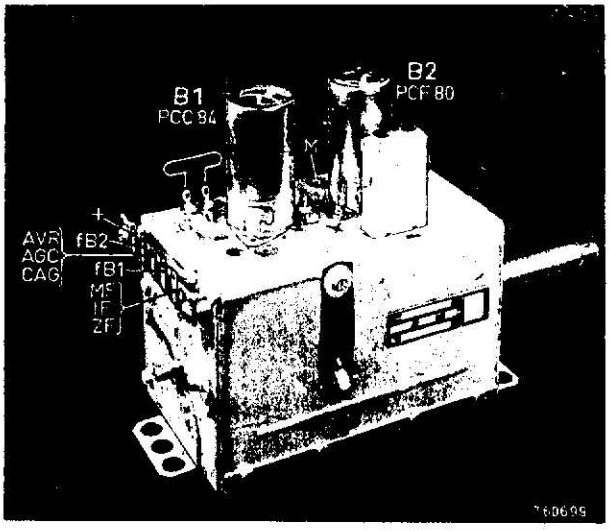
Uitgave van de
CENTRALE SERVICE AFDELING
N.V. Philips' Gloeilampenfabrieken
Eindhoven

PHILIPS SERVICE

DOCUMENTATIE

voor de kanalenkiezer

A3 696 52



Kanalen		Beeld draaggolf	Geluid draaggolf	Nominale * Oscillator frequentie
E2	47- 54 MHz	48.25 MHz	53.75 MHz	87.15 MHz
E3	54- 61 MHz	55.25 MHz	60.75 MHz	94.15 MHz
E4	61- 68 MHz	62.25 MHz	67.75 MHz	101.15 MHz
E5	174-181 MHz	175.25 MHz	180.75 MHz	214.15 MHz
E6	181-188 MHz	182.25 MHz	187.75 MHz	221.15 MHz
E7	188-195 MHz	189.25 MHz	194.75 MHz	228.15 MHz
E8	195-202 MHz	196.25 MHz	201.75 MHz	235.15 MHz
E9	202-209 MHz	203.25 MHz	208.75 MHz	242.15 MHz
E10	209-216 MHz	210.25 MHz	215,75 MHz	249.15 MHz
E11	216-223 MHz	217,25 MHz	222,75 MHz	256,15 MHz

* Dit is de oscillatorfrequentie voor een beeld M.F. van 38.9 MHz.

Fijnregelbereik van de oscillator (ten opzichte van de nominale oscillatorfrequentie)

Kanaal E2 t/m E4 : 250 en 400 kc/s) zowel hoger
Kanaal E5 t/m E11 : 400 en 800 kc/s) als lager

Versterking

M.F. uitgangsspanning = 20x
EMK antennespanning.

Hierbij is de M.F. uitgang afgesloten met 1 kΩ.

Buizen

B1 = PCC84
B2 = PCF80

Gloeispanning en gloeistroom

16 V en 300 mA.

Anodespanning en anodestroom

180 V en 33 mA (AVR spanning = 0 V)

Schemabeschrijving

Zie Hoofdstuk B-a-I van de televisiemap

Trimmen

Zie Hoofdstuk E-c van de televisiemap.

Vervanging

Indien de kanalenkiezer door een nieuwe moet worden vervangen, dan wordt hiervoor de A3 790 28 geleverd.

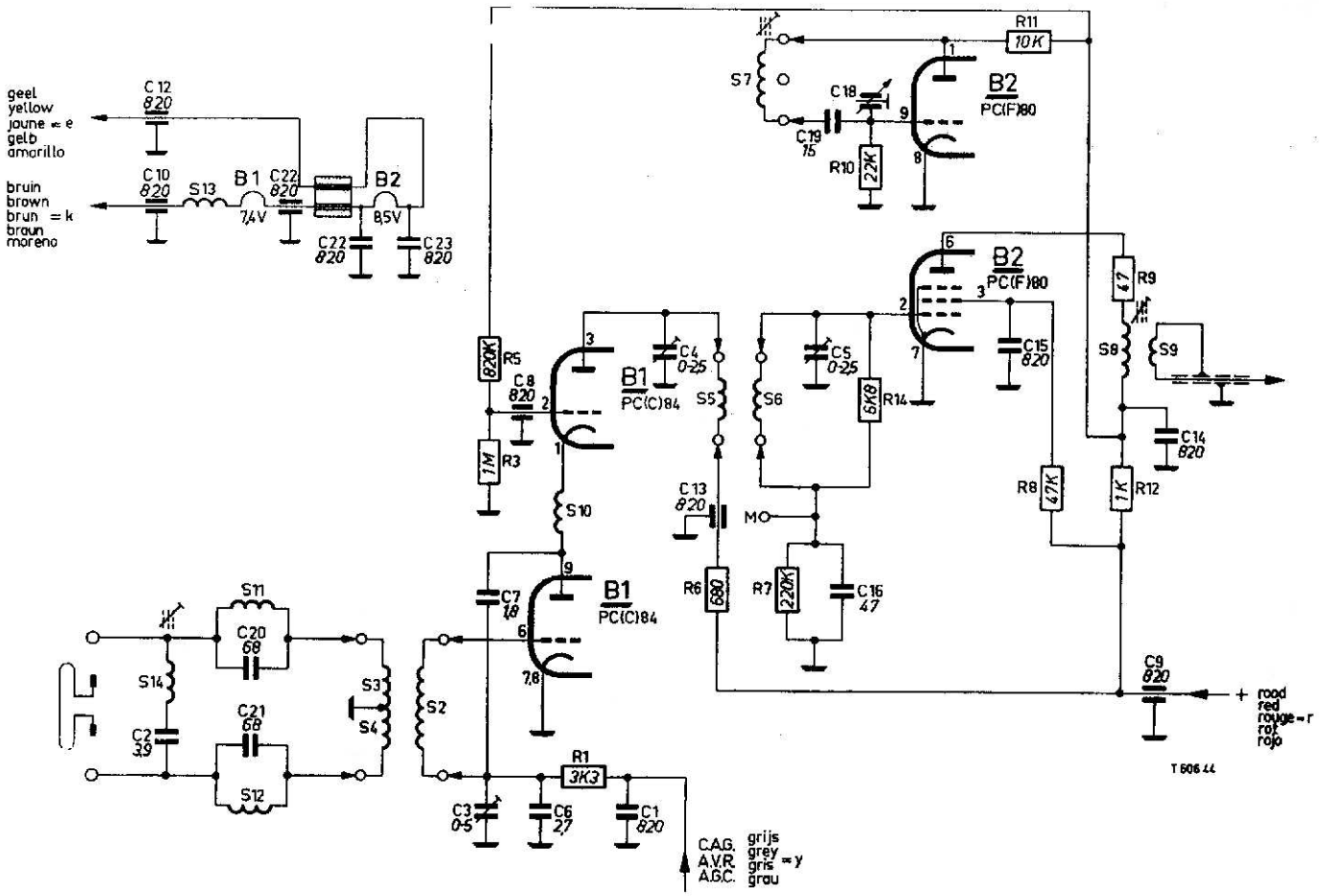
Fijnregelschijf met plastic bus, kleur BG		P4 505 56/26
Drukveer voor fijnregeling		A3 644 81.0
Plastic ring voor fijnregeling, kleur AB		P5 350 05/04
Veerhouder voor 7 contacten		A3 406 39.0
Veerhouder voor 5 contacten		A3 406 38.0
Drukveer (tegen uiteinde van de as aan achterzijde)		A3 810 48.0
Drukveer (arrêt)		A3 817 00.0
Nylonrol (arrêt)		A3 685 87.0

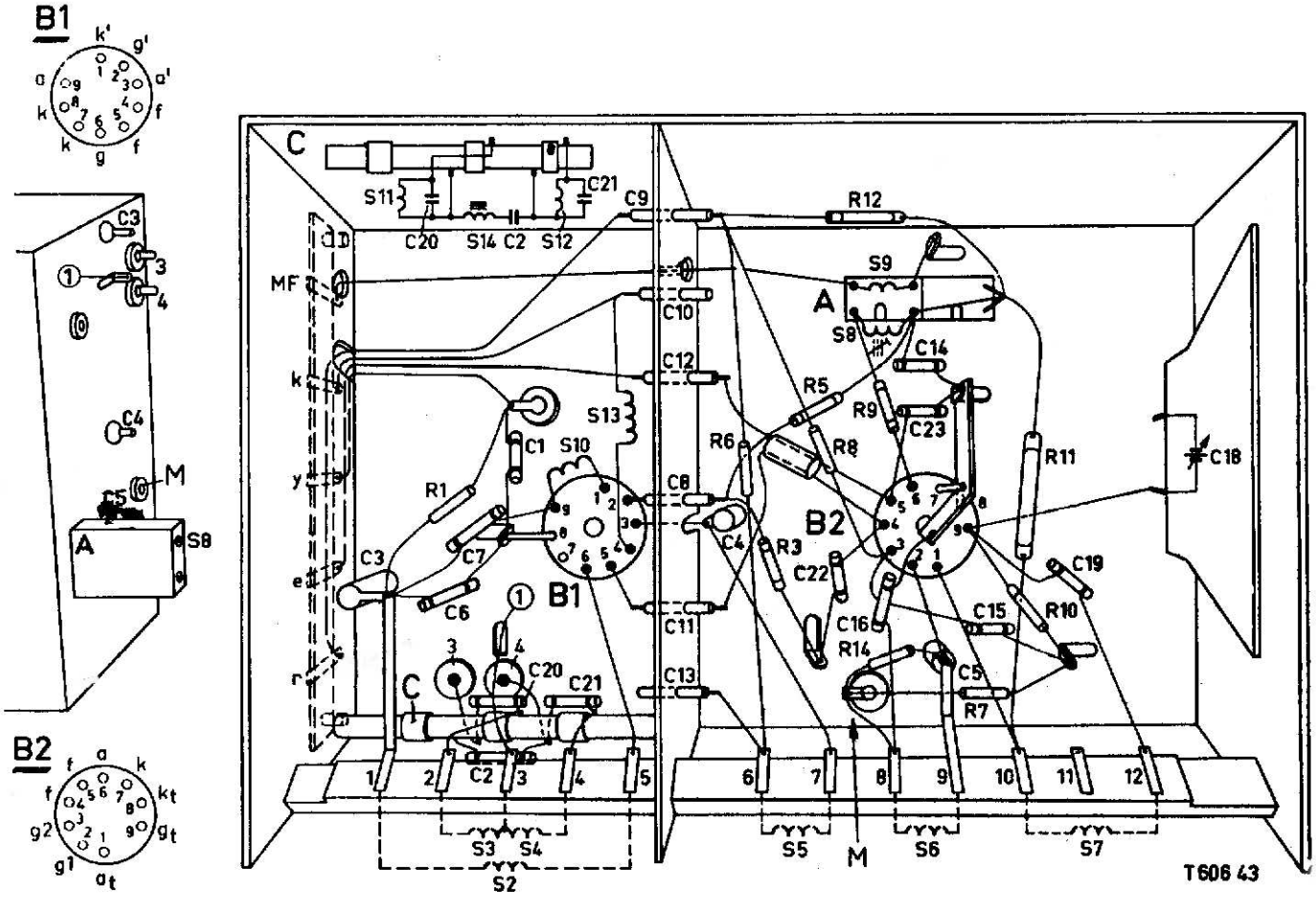
R1	3.3 kΩ	901/3K3
R3	1 MΩ	901/1M
R5	820 kΩ	901/820K
R6	680 Ω	901/680E
R7	220 kΩ	901/220K
R8	47 kΩ	901/47K
R9	47 Ω	901/47E
R10	22 kΩ	901/22K
R11	10 kΩ	900/10K
R12	1 kΩ	901/1K
R14	6.8 kΩ	901/6K8
C8	820 pF	B1 664 13.0
C9	820 pF	B1 664 13.0
C10	820 pF	B1 664 13.0
C11	820 pF	B1 664 13.0
C12	820 pF	B1 664 13.0
C19	15 pF	B1 664 18.0

De niet genoemde onderdelen zijn standaardonderdelen. Voor de codenummers zie de catalogus van service standaard onderdelen.

S2	kanaal E2	A3 746 00
S3	canal E3	A3 746 01
S4	Kanal E4	A3 746 02
	channel E5	A3 746 03
	E6	A3 746 04
	E7	A3 746 05
	E8	A3 746 06
	E9	A3 746 07
	E10	A3 746 08
	E11	A3 746 09
S5)	kanaal E2	A3 746 11
S6)	canal E3	A3 746 12
S7)	Kanal E4	A3 746 13
	channel E5	A3 746 14
	E6	A3 746 15
	E7	A3 746 16
	E8	A3 746 17
	E9	A3 746 18
	E10	A3 746 19
	E11	A3 746 20
S8 S9		A3 126 70.0

In Nederland gedrukt


geel
yellow
jaune = e
gelb
amarillo
bruin
brown
brun = k
braun
moreno
C12 820
C10 820
S13
B1
C22 820
B2
7,4V
8,5V
C22 820
C23 820
R11 10K
S7
C18
C19 15
R10 22K
B2 PC(F)80
R5 820K
C8 820
R3 1M
B1 PC(C)84
C4 0-25
S5
S10
C5 0-25
S6
6K8
R14
C15 820
R9 47
S8
S9
C14 820
R8 47K
R12 1K
C13 820
M
R6 680
R7 220K
C16 47
C7 18
B1 PC(C)84
S11
C20 68
S14
S3
C21 68
C2 3,9
S4
S2
S12
R1 3K3
C3 0-5
C6 27
C1 820
C9 820
+ rood
red
rouge = r
rot
rojo
T606 44
C.A.G. grijs
A.V.R. grey
A.G.C. gris = y
grau


B1
B2
C
MF
A
S11
C20
S14
C2
S12
C21
C9
R12
S9
S8
C14
C10
C12
R5
R9
C23
R6
R8
R11
C18
S13
C1
S10
R1
C8
C4
R3
C22
C19
C7
C3
C6
C11
C16
R14
C15
R10
C5
R7
C13
C20
C21
S3
S4
S2
S5
M
S6
S7
T606 43