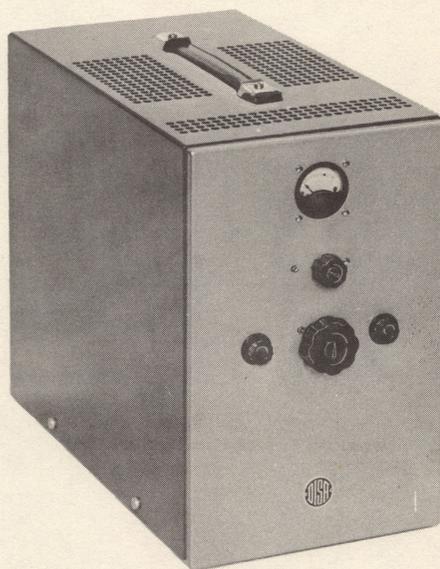


INSTRUCTION MANUAL
FOR
TV - CAMERA TYPE 93B10
AND
CONTROL UNIT TYPE 93C20



DISA ELEKTRONIK A/S HERLEV DENMARK

INSTRUCTION MANUAL
FOR
TV - CAMERA TYPE 93B10
AND
CONTROL UNIT TYPE 93C20



Instruction Manual
for
Television Camera Type 93 B 10
and Control Unit Type 93 C 20

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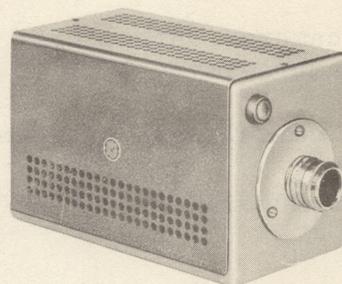
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Television.
Data Sheet 93 C 20.

TV CAMERA TYPE 93 B 10.

CAMERA CONTROL UNIT TYPE 93 C 20.

System: 625 lines,
50 fields per sec.,
interlaced.
Sync signal as
recommended by
CCIR except that
equalizing and
serration pulses
have been excluded.



Dimensions: See dimensional outline overleaf.

Weight: Camera: 4 kg. (9 lbs.).
C.C.U.: 16 kg. (35 lbs.).

Power source: 90 - 130 volts and 180 - 240 volts 50 - 60 c/s,
adjustable in steps of 10%.
Stabilized power supply. Sudden power line variations
of $\pm 10\%$ do not affect the picture visibly.

Power consumption: 250 VA.

**Max. ambient
temperature:** 40°C. (105° F).

Output signal: 1 volt peak to peak into 75 ohms,
white positive-going,
sync negative-going.

Nominal load: 75 ohms

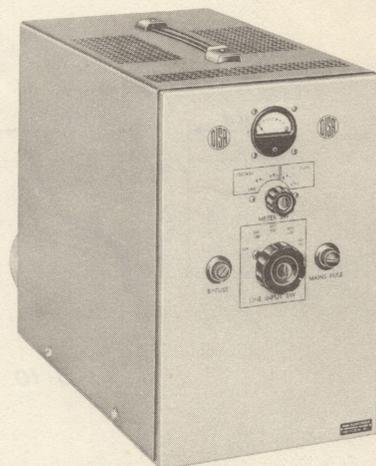
Resolving power: Not less than 500 lines in the
horizontal direction.

Camera tube: Vidicon type.

**Lighting
requirements:** 100 lux (static subject, reflec-
tion coefficient 75%, lens stop
f:2).
Automatic sensitivity control.

Lens: Standard 16 mm lenses, type 'C'
mount. (Fitting 1" diameter,
32 t.p.i., register .690").

**Geometry and
linearity:** Displacement of a picture element is less than 3%
of picture height or width.





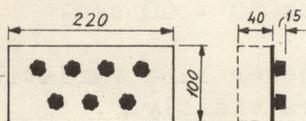
Remote control facilities:

- (Remote control panel type 93 C 66).
- Sensitivity
- Beam
- Black level
- Electrical focus
- Horizontal deflection amplitude
- Vertical deflection amplitude
- Power On-Off.

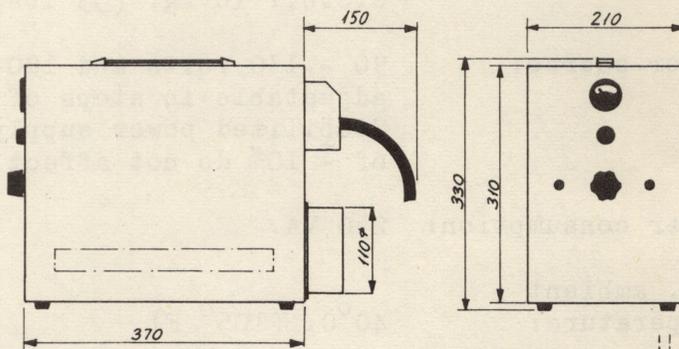
The camera control unit type 93 C 20 may be used with one, two or three TV cameras type 93 B 10 or 93 B 60.

Max. cablelength between camera and C.C.U. 300 m (1000 ft.).

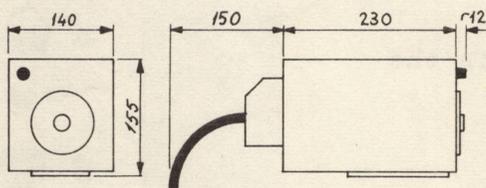
Telephone jacks in camera and Remote Control Panel for intercom.



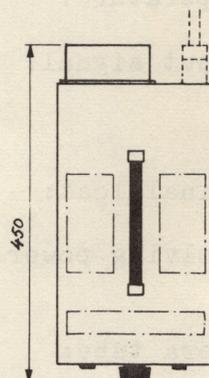
93 C 66 (70)



93 C 20



93 B 10



Accessories:

- Weather proof camera-housing
- Underwater " " (max. depth: 100 m (300 ft.))
- Air- or watercooled jackets.





CLOSED-CIRCUIT TELEVISION

Simplified lay-out.

93E01 Camera Cable

May be used with all DISA-cameras.
Maximum length, 300m.

93B60 Camera

Has remote control of pan, tilt, lense changing, and focusing.



93E02 Camera Cable

For use with 93B10 Camera only.
Maximum length, 300m.

93B10 Camera

For fixed positioning.



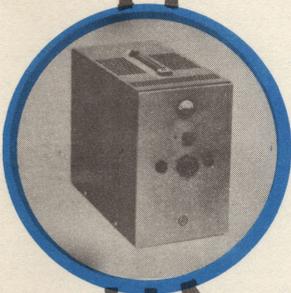
93C20 Camera Control Unit

Available with provision for connection of one, two or three cameras. Cameras may be Type 93B10 or Type 93B60 as desired.

Or:

Type 93C20/1a which incorporates 93C66 and only has provision for one camera type 93B10

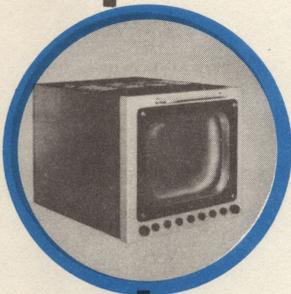
93E41 Remote Control Cable
Maximum length, 500m.



93E20 Coax Cable

Maximum length, 500m.

93E40 Remote Control Cable
Maximum length, 500m.

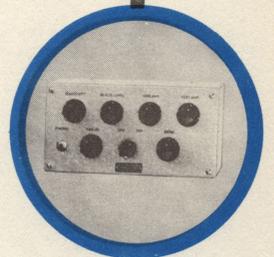


Monitor

Up to 30 DISA monitors (any type) may be used.

93C66 Remote Control Panel

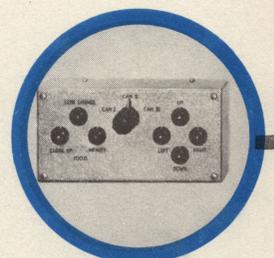
For electrical camera control only. One panel is used for each 93B10 or 93B60 camera.



93D25 TV Micro-Transmitter or 93D20 TV Mini-Transmitter

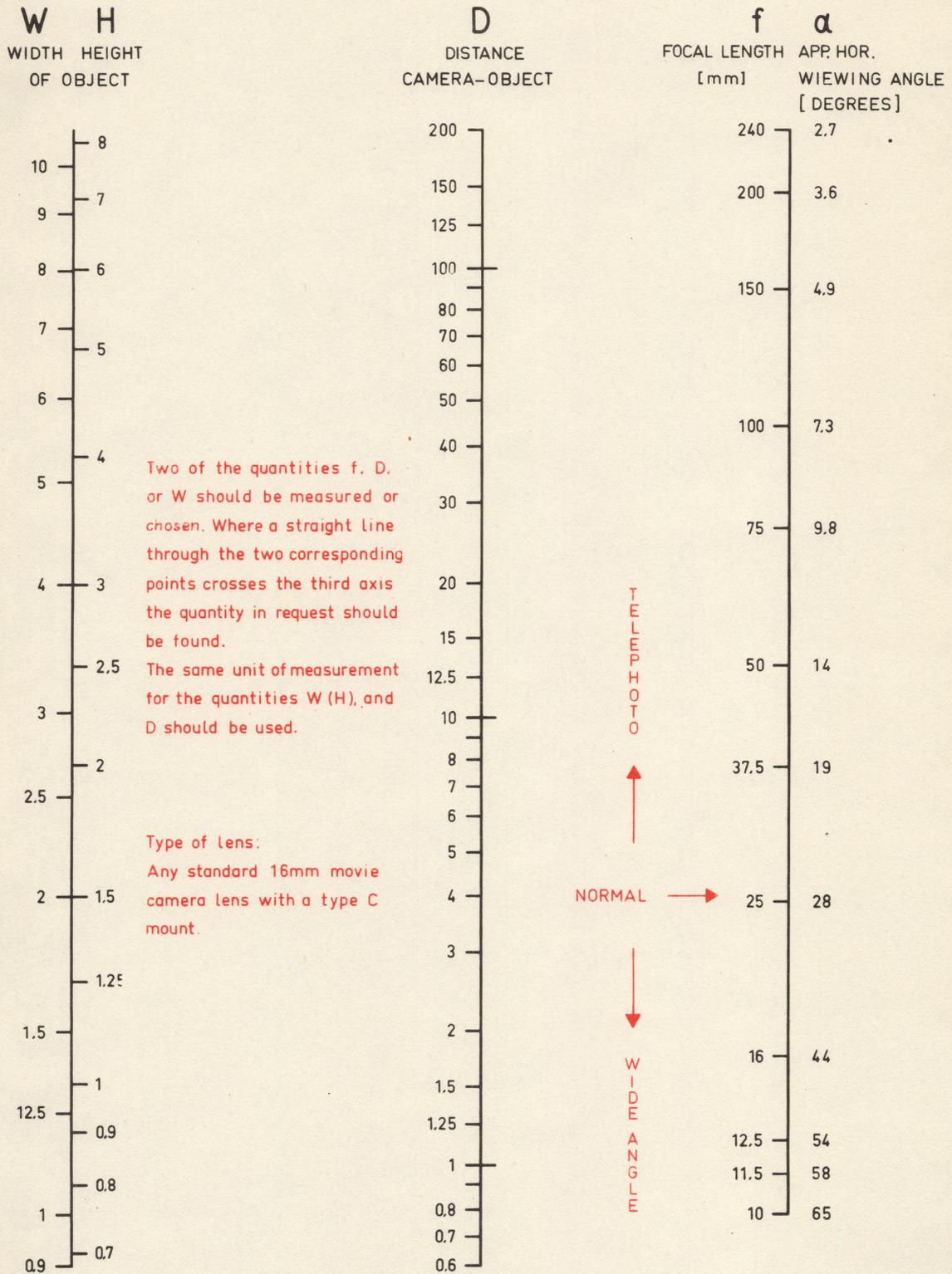
Supplied for any desired frequency in European bands 1 or 3.

93C70 Remote Control Panel
For remote control of 93B60 camera(s). One panel is required if the camera control unit is connected to one or more 93B60 cameras.



HF output

NOMOGRAM FOR DETERMINATION OF FOCAL LENGTH (f) OF LENSES, DISTANCE (D) BETWEEN TV-CAMERA AND OBJECT OR WIDTH (W) OF OBJECT.



Scanned area of camera tube 12.8 x 9.6 mm.

Installation

- 2.1. The Camera is normally supplied with an adaptor plate provided with a mounting hole tapped with 3/8" ANC thread (16 t.p.i.). This thread is standard on photographic equipment. The Camera can thus be mounted on a standard tripod (Cine type).

During normal operation the Camera should not be tilted forward more than 45°. If the Camera is mounted face down the utmost care should be taken to avoid vibration and shocks which may cause small dust particles inside the camera tube falling on the sensitive layer. These particles will show in the picture as white specs.

- 2.2. Lenses. The lens mounting plate is intended for use with international type "C" lenses (mounting thread: 1", 32 t.p.i.). The "C" mount is standard for 16 mm film cameras. Thus a very considerable range of different lenses (including "Zoom" lenses) is immediately available for use with the DISA camera. Data sheet 93 B 170, showing horizontal viewing angle as a function of focal lengths, may serve as a guide when deciding which focal length to use.

- 2.3. Block diagramme TV 8/E shows how the various units should be connected. The Control Unit is connected to the Camera by means of a special camera cable. Since all the controls required during normal operation are located on the Remote Control Unit 93 C 66, the CCU can be placed away from the control position, if so desired. AC-mains connection is required, and it is strongly recommended to make provision for earth connection. Do not connect the equipment to DC! Control Unit Type 93 C 20/1a has the 93 C 66 controls built into its rear panel.

The LINE INPUT SWITCH is normally used as ON-OFF Switch. The knob labelled ON-OFF on the Remote Control Panel is intended for switching the individual camera in installations with more than one camera.

(It is however, possible to use this ON-OFF control as the main control if a relay is connected via the CAM.SW.ETC socket on the CCU rear panel. If a relay is not used, the equipment is delivered with a shorting plug inserted in this socket). The CCU is normally connected for use with 180 - 240 volts 50 c/s mains. If the range 90 - 120 volts (or 60 c/s) is required, alterations must be made inside the unit (for instructions see Circuit Description).

- 2.4. Monitors should be connected to the CCU via a 75 ohm coaxial cable. This cable must be terminated at the far end with a 75 ohm resistor. Some monitors have this termination built-in (switchable), on other types it is necessary to use a termination plug. If more than one monitor is used, the cable should be routed through each monitor in turn. Cables branching off will give rise to reflections, if isolation amplifiers are not used. Beware never to terminate in more than one place.
- 2.5. The Remote Control Panel is normally located near the monitor.
- 2.6. The equipment should not be used with ambient temperatures exceeding 35°C (95° F) without special precautions.

Operating Instructions

- 3.1.1. Check that all cable connections are correctly carried out. LINE INPUT SW. on 93 C 20 in position OFF.
- 3.1.2. Adjust all controls on the Remote Control Unit 93 C 66 to the position indicated by the factory (white dot opposite white dot); the switch in position ON. These controls are factory adjusted pre-set controls in the case of Control Unit 93 C 20/1a.
- 3.1.3. Switch on the monitor and adjust CONTRAST to mid-position.
- 3.1.4. Turn LINE INPUT SW. clockwise till the meter (with METER SW. in position LINE) reaches the black mark. Let the equipment warm up approximately one minute.
- 3.1.5. Re-adjust iris and focus (on lens) to best possible picture.

- 3.1.6. Turn SENSITIVITY (93 C 66) anticlockwise until the picture disappears, then adjust BRIGHTNESS so that the raster is just visible on the monitor. (If the equipment has automatic sensitivity control, "BLACK LEVEL" should be turned down instead of SENSITIVITY).
- 3.1.7. Turn SENSITIVITY back to approx. normal position. (The indication of this and the normal position of BEAM is made at the factory with a typical picture. When using the equipment, it will normally prove necessary to deviate a little from this position, depending on the content of the picture). Then turn BEAM anticlockwise until white parts in the picture start being "clipped" (the detail in white disappears).

Always use the equipment with BEAM current as low as possible.
(The control turned as far as possible counterclockwise).
Always readjust BEAM when SENSITIVITY has been adjusted.

- 3.1.8. Adjust FOCUS on 93 C 66 to obtain the sharpest possible picture. NB! Also adjust optical focus (on the lens).
- 3.1.9. Adjust BLACK LEVEL so that the dark details on the picture just avoid "Clipping". (It may here be a help to set BRIGHTNESS on the monitor so that the picture becomes a little too bright. Thus, it is possible to avoid clipping on the monitor: Black "clipping" from the camera will happen in grey).
- 3.1.10. Re-adjust CONTRAST and BRIGHTNESS on the monitor to give the best possible picture.

Note: When setting up the equipment for the first time, it will be of assistance if an oscilloscope is available. The oscilloscope is connected across on the input of the monitor. The signal should be 1 volt peak to peak of which 0.3 volt is a synchronizing pulse. (The amplitude of these pulses is adjusted at the factory; if an oscilloscope without calibration is used, the level of the signal can be estimated by comparison with the pulse amplitude). The signal level is adjusted by means of SENSITIVITY. BLACK LEVEL is adjusted so that the signal comes as close to the sync pulses as possible without being clipped.

Remember that the equipment has a built-in white limiter so that

the signal from 93 C 20 cannot be more than approx. 30% too large; the influence of this limiter can be mistaken for too little BEAM.

3.2. Switching off the Equipment

3.2.1. Cover the lens.

3.2.2. Switch off the LINE INPUT SW. (compare Installation Directions 2.3.).

3.3. Rules for the Use of the Camera Tube

3.3.1. Always utilize the greatest possible area of the light sensitive layer

If the tube has been used in such a way that only a part of the layer has been scanned, this will always be visible if the deflection amplitudes are later turned up to normal. Therefore, take care never to turn the amplitude controls without at the same time checking the size and location of the raster. Further it can be said the resolving power will be diminished and the sensitivity reduced if the layer is not fully utilized.

3.3.2. Never use the Beam Current set higher than necessary to discharge the white details in the picture. If the beam current is forced too high, the picture will be blurred and the tube unnecessarily worn.

3.3.3. Never expose the light sensitive layer to direct sunlight or pictures of the sun (strong sun reflection) or photographic flash. During transport of the camera - or during arrangements where there is a risk of sun reflections or direct sunlight falling into the lens when the equipment is not used - the lens should always be covered against light.

3.3.4. Beware that ALIGNMENT is always correctly adjusted (compare 4.4.4.)

MAINTENANCE

4.1. Spare parts. The majority of components used are standard parts which can be obtained from local dealers. The parts lists will

give sufficient information about tolerances etc.
Special components are obtainable from DISA ELEKTRONIK.

- 4.2. Colour code for cables. It is attempted to observe a colour code covering all cables in the equipments, the colours meaning as follows:

Black	0	Earth
Brown	1	Heaters
Red	2	+ Voltage
Orange	3	Screen Grid (lower + voltage)
Yellow	4	Cathode
Green	5	Grid
Blue	6	Anode
Violet	7	Replacement colour
Grey	8	Mains cables and the like
White	9	Decoupled DC voltages

- 4.3. Routine checking. Lenses should be checked and possibly cleaned (carefully !) at short intervals.
The dust filter on the control unit ventilator should be checked at intervals of approx. one month. If the equipment is located in a specially dusty room, cleaning should be carried out more frequently. It is under all circumstances better to remove the filter altogether than to leave a dirty filter on, since this will cause overheating of the unit.
Spare filter inserts can be obtained from DISA ELEKTRONIK.

- 4.4. Exchange of camera tubes.

Remove the camera cover. Also remove the chromium-plated lens holder (respectively the slide projector).

Loosen the tube retaining clip (behind the deflection system) and push forward the camera tube until it is possible to hold it with one hand. With the other hand remove the socket from the tube which, thus, will be free. Put in the new tube minding not to make finger-prints on the front glass. Fix the tube socket before the tube is pushed in completely. The tube should not be pushed so much that the three earth connected guiding springs contact the

signal electrode. Screw on the lens holder. Make sure that the camera tube is clean.

Before switching on the equipment make sure of the following:

- 1) That the BEAM control is turned fully anticlockwise.
- 2) That the HOR.AMP. and VERT.AMP. controls are turned fully clockwise.
- 3) That the SENSITIVITY control is turned on approx. 50%.
- 4) All other controls in approx. normal position.

When the equipment is switched on, turn BEAM until a picture appears. Turn FOCUS to sharpest possible picture. Adjust the lens to infinity and point the camera at a suitable remote object. Push the camera tube forward (back) until the picture is sharp, then tighten the clip so that the tube is held firmly. Now adjust ALIGNMENT I and II as follows:

Turn the FOCUS control (electrical) evenly backwards and forwards through the point giving sharpness. Next adjust the ALIGNMENT controls so that the centre of the picture does not move as the focus voltage is varied. Point the camera at a test picture with the correct 3 by 4 aspect ratio and adjust amplitude and centering controls to give the best utilization of the sensitive layer.

A suitable test picture is incorporated in this manual.

5. Circuit Description

5.1. Camera (diagram 93 B 331)

- 5.1.1. Video amplifier. Bias for the signal electrode on the camera tube is adjusted on the SENSITIVITY potentiometer (93 C 66) (or by the automatic control) and taken to the tube via R_4 , R_3 . The video signal appearing across R_3 is amplified by V_1 and V_2 . V_1 is a cascode-coupled stage and parallel feed-back to the input is used in order to reduce the input impedance. V_{3A} is the video output stage. The signal being routed from its anode to the main amplifier in the control unit via the camera cable. $C13$ is adjusted for maximum sharpness without overshoot from vertical edges.

- 5.1.2. Deflection. V_5 is the vertical deflection generator. The triode section is fed with 50 c/s positive pulses from the CCU via a balanced 600 ohm pair. Anode tension for the sawtooth generator is controlled by the VERT.AMP. control (93 C 65). R42 adjusts the DC current through the deflection coils thus giving picture centering. V_6 is Horizontal Deflection Generator. Amplitude is remotely controlled as for vertical amplitude. R64 is the centering control and linearity is adjusted on C32.
- 5.1.3. Camera tube protection. Waveforms from V_5 and V_6 are rectified in two circuits. The resulting DC voltages are added and control the grid of V_{4B} which operates a relay. The relay interrupts the G_2 supply for the camera tube if the scanning waveforms are below a certain value. This prevents damage to the tube caused by scan failures. The signal lamp on the camera front plate indicates correct operation of this circuit.
- 5.1.4. The magnetic field which is necessary for the operation of the camera tube is provided by the focus coil. The focus current is stabilized by a pentode in the CCU. The alignment field is varied by adjustment of R45 and R48. The focus electrode ($G_3 + 4$) and the control grid (G_1) are controlled from the Remote Control Unit (93 C 65) with FOCUS and BEAM potentiometers.
- 5.1.5. Camera tube blanking V_{4A} is fed with 50 c/s and 15 Kc/s negative pulses. The amplified and inverted pulses are impressed on the tube cathode. The 50 c/s pulse consists of a narrow pulse on top of a wider one. The pulses are as already mentioned taken from a balanced circuit. The negative side to V_4 where the wide pulse is used (the narrow one being below cut-off). The positive side is utilized on V_5 . The grid of which restores to the positive peak and thus suppresses the wide pulse, so that the narrow part forms vertical fly-back.
- 5.1.6. The heater supply is built into the camera as the voltage drop on long camera cables would be too great if a 6.3 volt supply voltage were used. The voltage drop on 220 Volts is negligible. A supply point is provided on the rear panel intended for connection of a lamp or a soldering iron (max. 75 Watts).

A telephone jack is also provided. The telephone circuit terminates in the Remote Control Panel.

5.2. Control Unit. (Diagram 93 C 351).

5.2.1. The Master Oscillator (V_{8B}) is a cathode coupled blocking oscillator running at twice the horizontal frequency.

5.2.2. This oscillator triggers the main divider which consists of 4 phantastrons ($V_2 - V_7$) each dividing by 5, down to 50 c/s. 50 c/s from the divider is compared with the mains frequency by means of V_{1B} and the diodes $D_{21} - D_{24}$. The voltage from the diode-bridge is taken to V_{8A} which is a cathode-follower buffer. The cathode voltage (DC) controls the frequency of V_{8B} so that it is locked to the mains frequency. If this lock is not desired TP8 may be connected to chassis which makes the system free-running. This can be an advantage if the mains frequency is not stable, or if large motors are switched on and off on the same branch of the mains supply line. This alteration is also required if the equipment is used on 60 c/s mains.

5.2.3. Line pulses are formed as described: V_{8B} triggers the binary V_{16} . The pulse (15 Kc/s) is differentiated and amplified in V_{15A} . The anode circuit of V_{15A} consists of a 1.25 usec delay-line (1.25 usec is the length of the front porch of line sync). V_{14B} is triggered from the "0"-end of the delay line and forms line blanking. V_{14A} forms line sync pulses, triggered from +1.25 usec. V_{14A} and B function as pulse generators:

A positive pulse on the grid activates the resonance circuit in the anode. After $\frac{1}{2}$ cycles the signal is clipped by the diode. The length of the pulse is thus decided by the L/C ratio and the R/C ratio which gives the diode bias. The pulses are taken to mixers V_{12} and V_{13} . Sync pulses are also taken to V_{15B} which acts as clipper and buffer for line drive pulses.

5.2.4. Frame pulses are formed in three monostable multivibrators $V_9 - V_{10} - V_{11}$. V_9 is triggered from V_{1A} and forms frame blanking (20 lines duration). V_{10} is triggered by V_9 and supplies a $2\frac{1}{2}$ line pulse giving the necessary delay for frame sync which is

formed in V_{11} ($2\frac{1}{2}$ line duration). Blanking and sync are taken to V_{12} and V_{13} . The combined frame drive for the camera is formed across R 72.

- 5.2.5. Video amplifier (diagram 93 C 352). The signal from the camera is taken to the VIDEO AMPLITUDE control R 149. V_{23} amplifies the signal which is then taken to V_{20} grid. V_{22} function as clamp, the DC-value of the signal being fixed by line drive-pulses (from V_{18A}) which make the two diodes conduct during line blanking thus locking the signal to the potential at R 130/131.
- 5.2.6. Blanking is added to the signal on V_{20} anode. Pulses from V_{12} are amplified in V_{21} , the left half of which has a common anode with V_{20} . Black clipping is carried out by D 11/R 122 using +200 Volt stab. as a reference. The DC value of the signal is fixed on V_{20} , but the clipping level is adjusted on the BLACK LEVEL control (93 C 65) which regulates the grid bias on V_{21A} . D_{12} short circuits the signal on V_{20} anode when D11 is not conducting.
- 5.2.7. White limiter. D10 (reference R 125/R 126) shorts the signal on R 122 if it surpasses the reference voltage. This gives a limiting of picture highlights which is desirable in order to avoid overloading of monitors etc.
- 5.2.8. V 19 is the video output stage. V_{18B} is sync output stage, the two anodes being connected. Sync amplitude is adjusted by R 113.
- 5.2.9. V_{17} is the focus current stabilizer. V_{24} acts as output stage for line and frame drivepulses to the camera.
- 5.2.10. Power Unit (diagram 93 C 353). All H.T. voltages are stabilized. The main (+200 Volt) supply employs series stabilization, the rest is neon stabilized.
- 5.2.11. Switching of voltage ranges. LINE INPUT SW. normally works in the range 180 - 240 volts. If the 90 - 120 range is required the input connections to the transformer should be resoldered as shown on the diagram. The two 90 volt windings should be connected

in parallel and 10 volt tapings on the overwind used.
(The Camera heater transformer) and the CCU blower motor must also be altered to 110 volt connection.

AC supply for camera etc. is taken from the standard voltage (110/220 Volts) tapping on the main transformer, which thus acts as an autotransformer if the input voltage is different from 110/220 Volts.

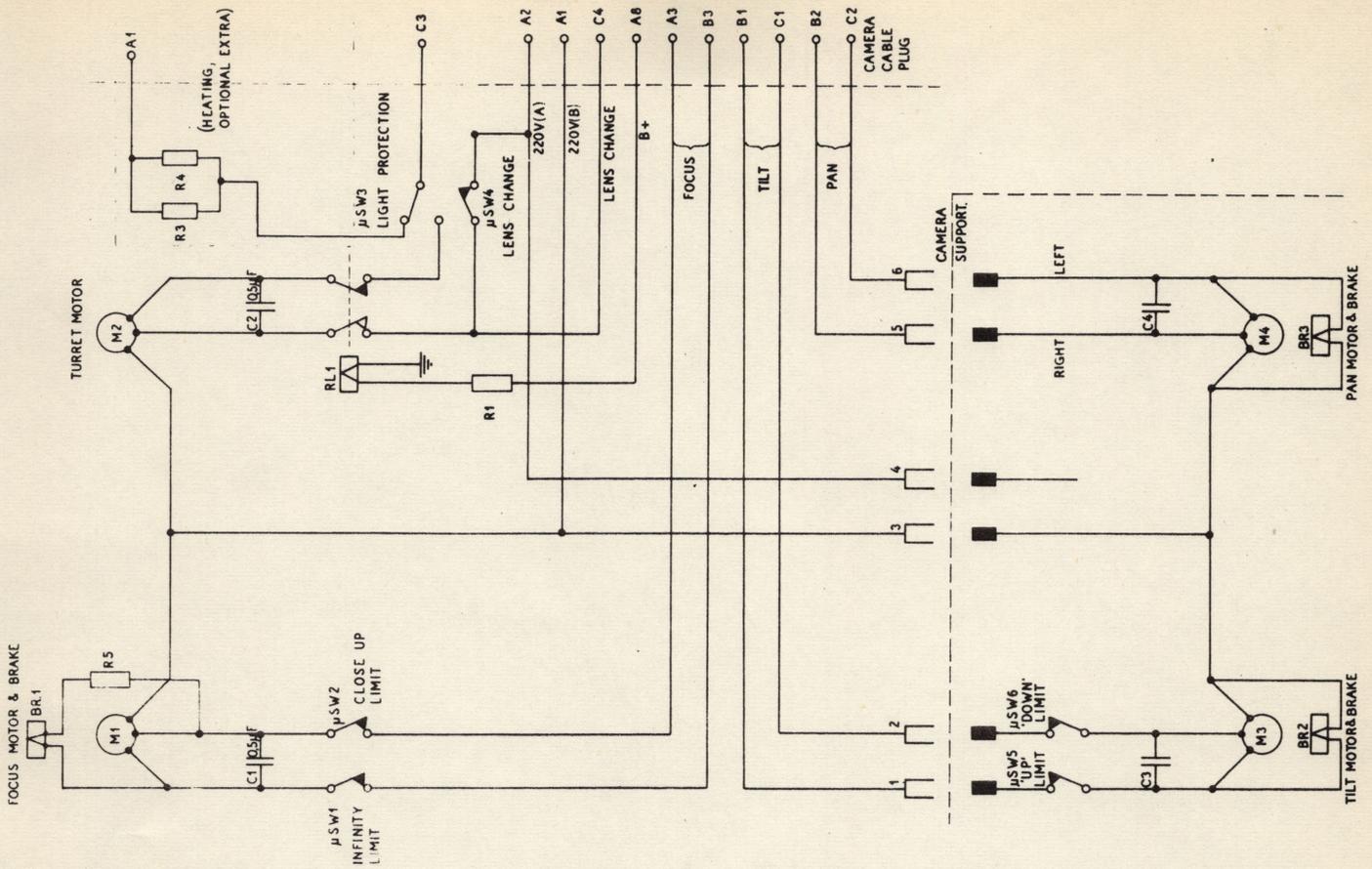
5.2.12. CCU Rear Panel (Diagram 93 C 340 or diagram 93 C 391). If an automatic sensitivity circuit is employed, this is located on the rear panel.

Rear panels with provision for a single camera do not contain RL A and B. If operation of more than one camera is required, only the rear panel need be modified, the remaining parts of the CCU being unaltered.

Note: PL 7 pin 13 and 14 must be connected in order to make the equipment operative. This is normally done with a shorting plug in which case the equipment is switched on and off on the LINE INPUT SW. This is desirable with portable units since the operator automatically controls the mains voltage each time he switches on. With permanent installations the most practical procedure is to insert a relay so that the ON-OFF knob on the Remote Control Panel switches the entire equipment. The normal set up with multi-camera installations is to use the extra contacts on the R.C.P. ON-OFF switch in parallel, so that the CCU is switched on if any camera is turned on.

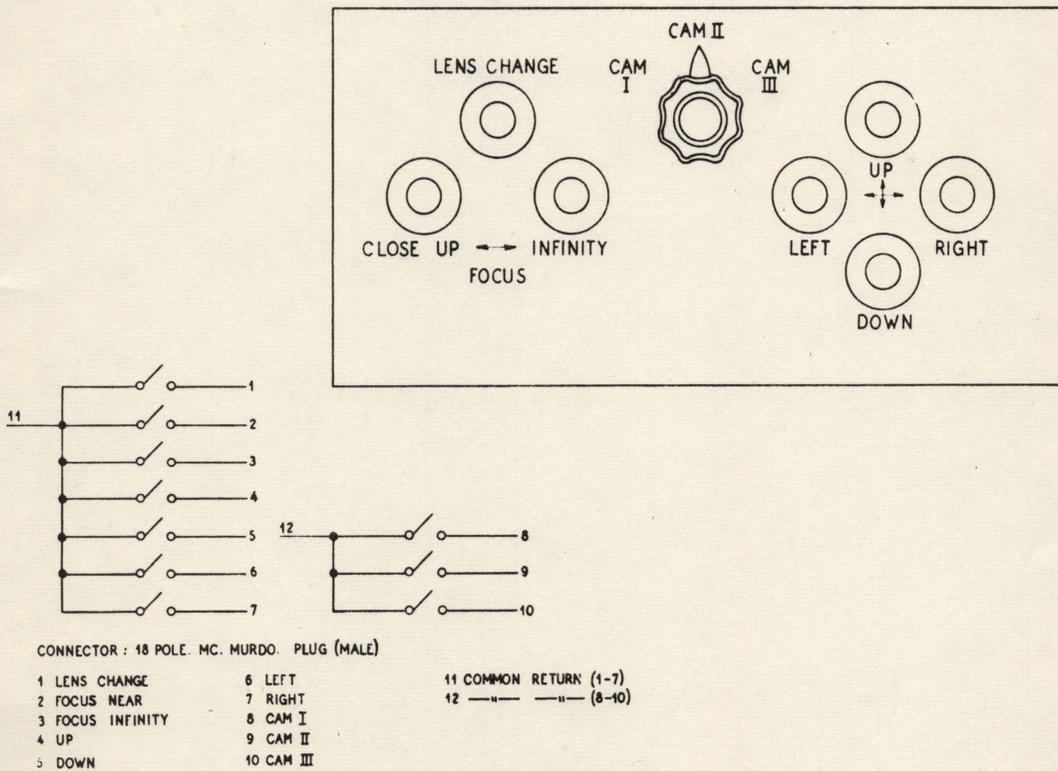
Important: Pin C3 on the camera cable carries mains voltage even when the equipment is switched off. This is done to provide heating for cameras installed in damp surroundings.

Therefore, always make sure that the mains lead is pulled out (or mains supply externally broken) before removing camera or CCU cover.



CAMERA TYPE 93B10(60)

REMOTE CONTROL UNIT Drawing no. 93B326 15.10.60



CAMERA TYPE 93B10(60)

REMOTE CONTROL CIRCUIT Drawing no. 93B325 15.10.60

AMP/31.250 1/4
OSC.

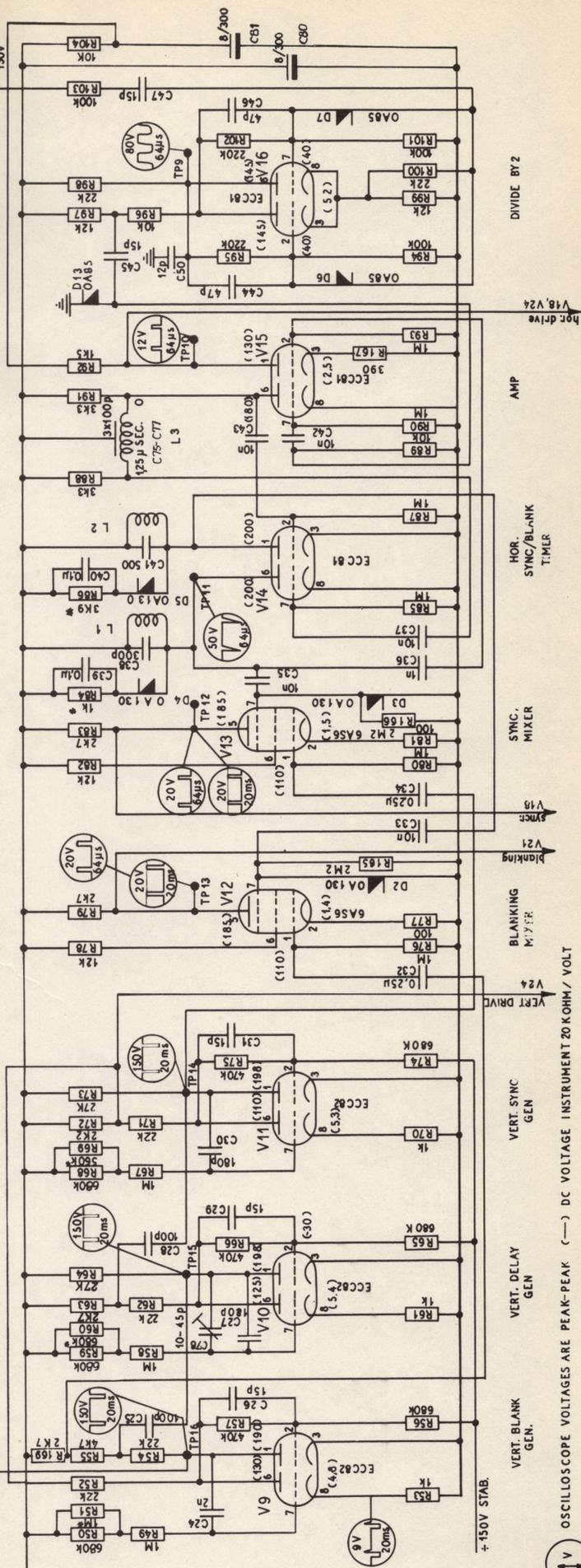
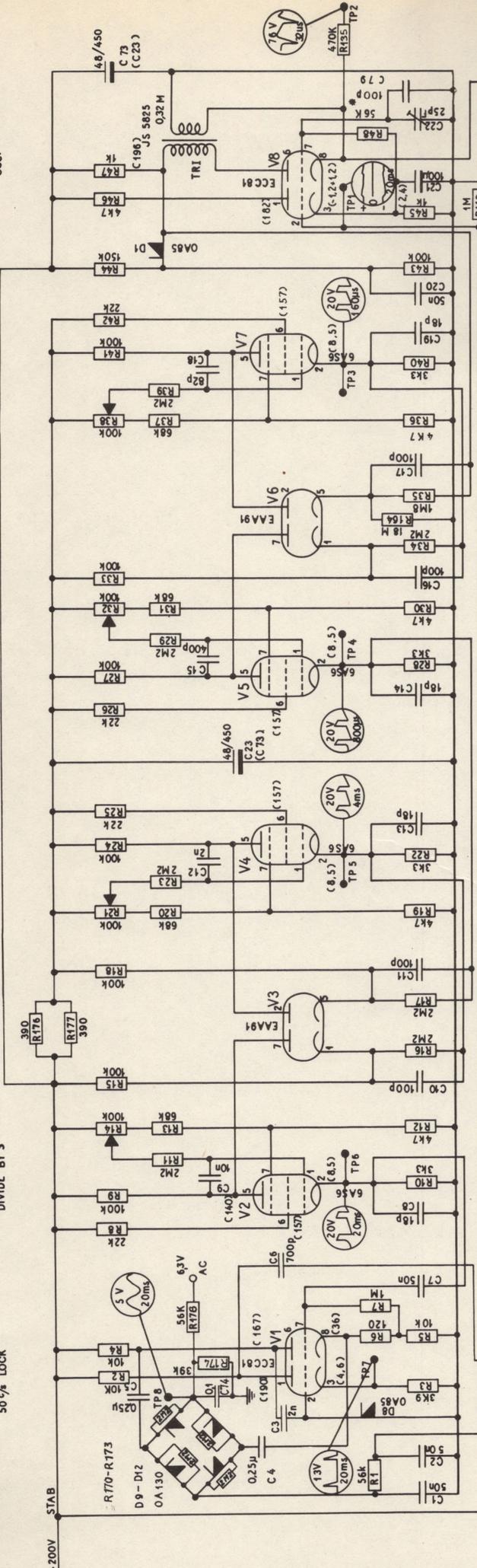
DIVIDE BY 5

DIVIDE BY 5

DIVIDE BY 5

DIVIDE BY 5

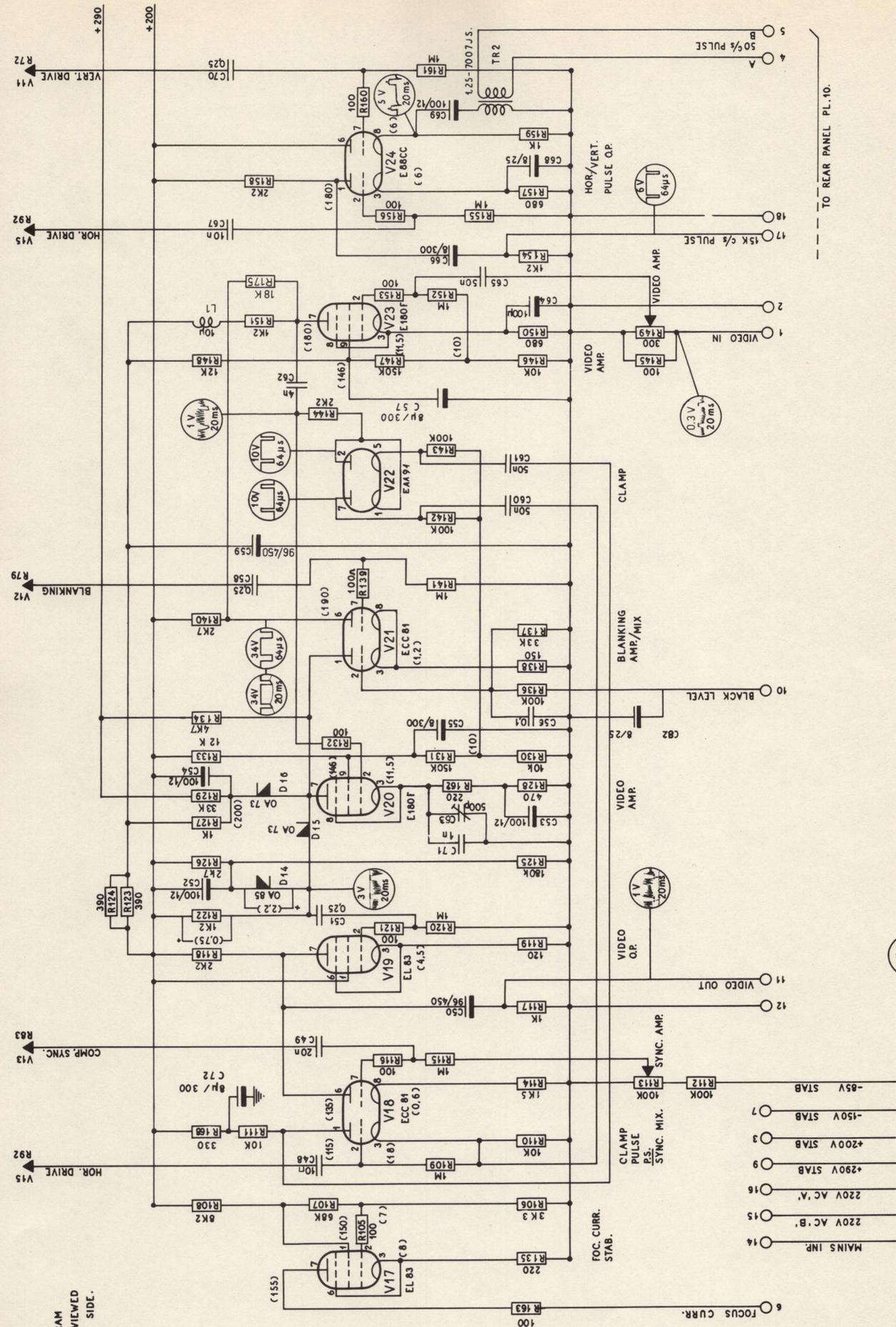
50 % LOCK



CAMERA CONTROL UNIT TYPE 93C20
 MAIN CHASSIS: PULSE GENERATOR
 Drawing no 93C351 15.3.61

OSCILLOSCOPE VOLTAGES ARE PEAK-PEAK (—) DC VOLTAGE INSTRUMENT 20 KOHM/ VOLT





NOTE: TUBES ARE PLACED ON DIAGRAM AS ON CHASSIS VIEWED FROM COMPONENT SIDE.

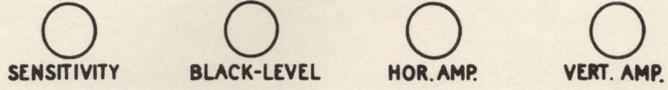
CAMERA CONTROL UNIT TYPE 93C20
 MAIN CHASSIS B: VIDEO AMP. ETC.
 Drawing no. 93C352 15.3.61

TO REAR PANEL PL. 10.

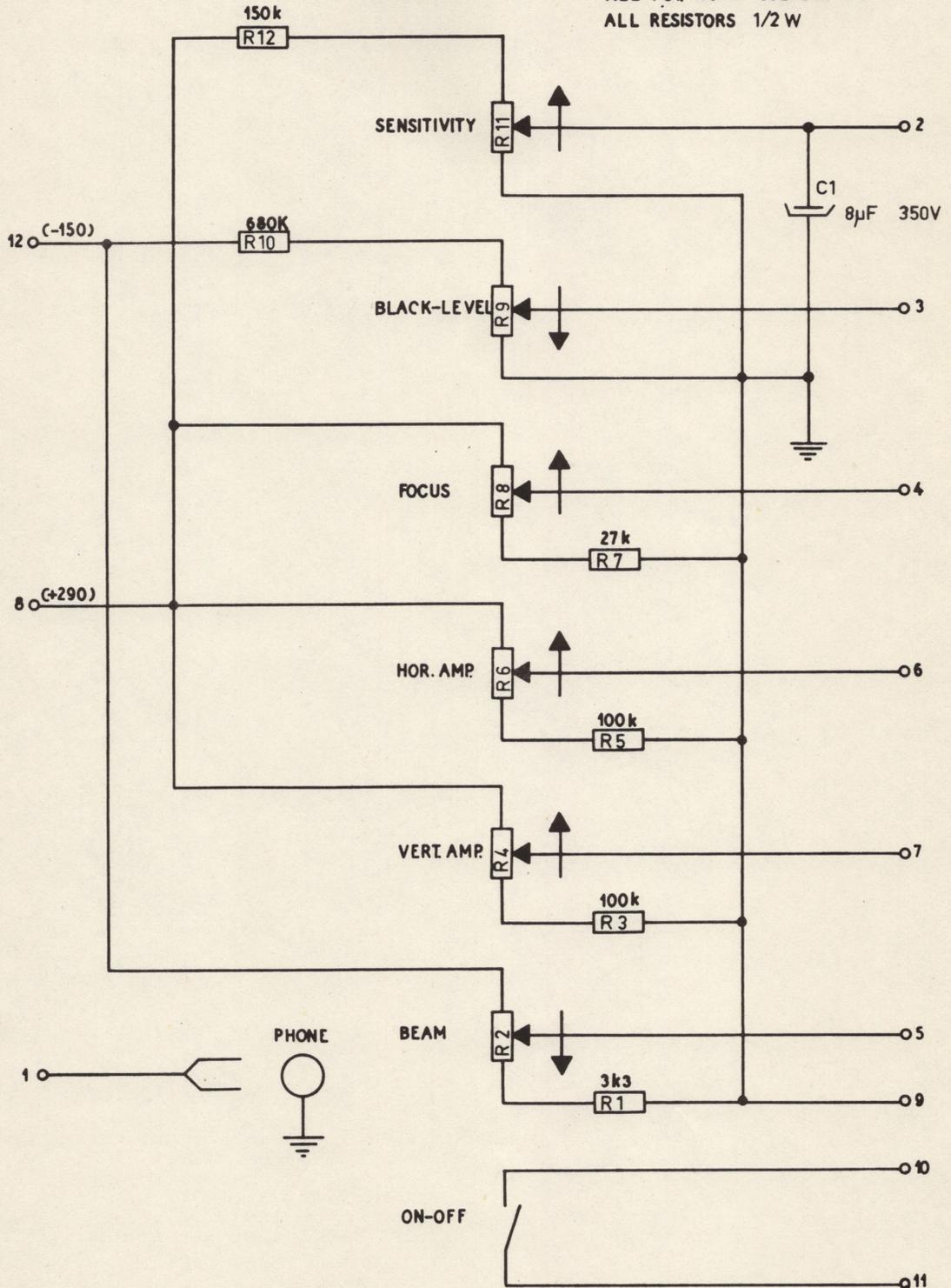
OSCILLOSCOPE VOLTAGES ARE PEAK-PEAK (—) DC VOLTAGES INSTRUMENT ZOKOHM/VOLT

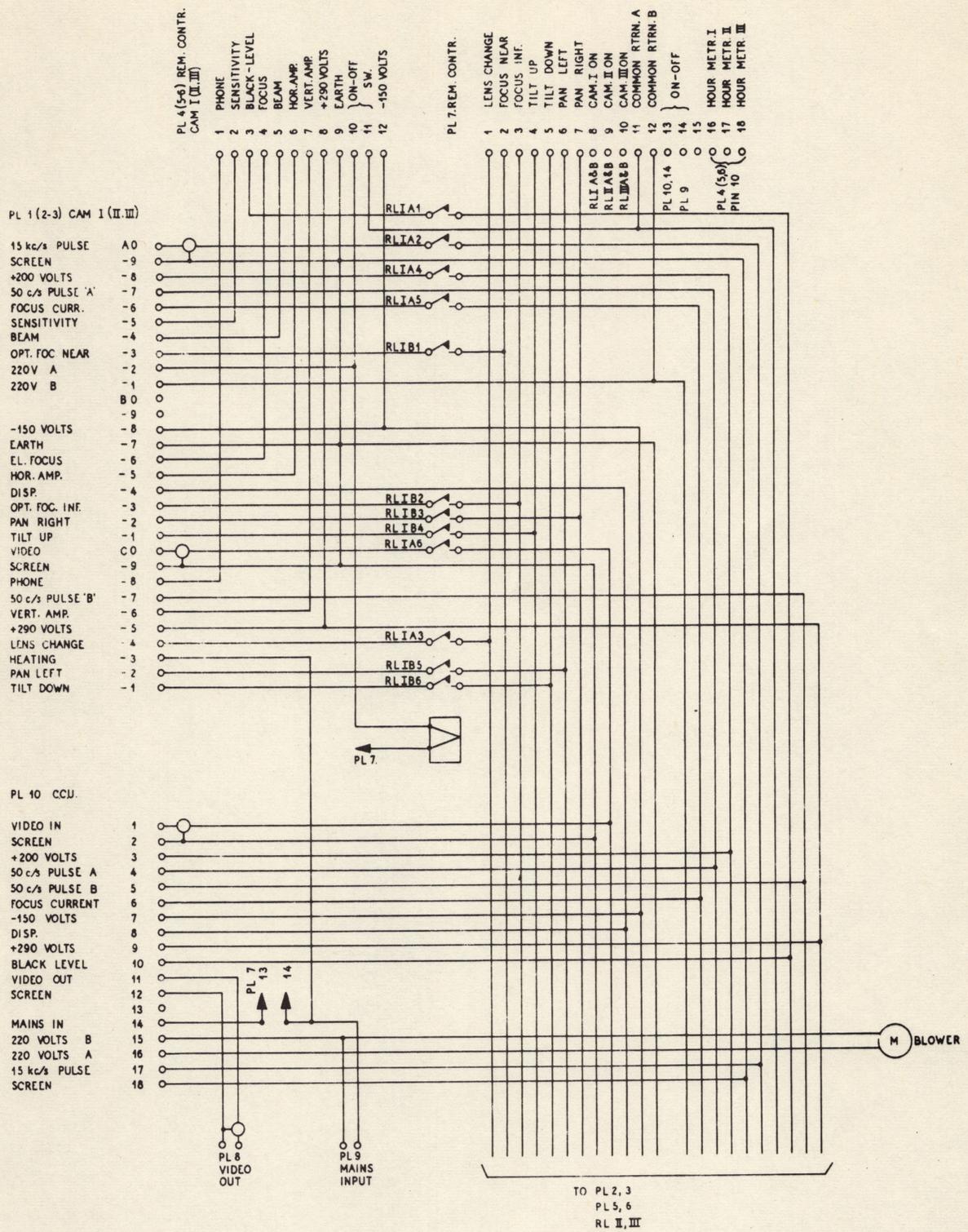
FROM POWER CHASSIS.

FRONT VIEW



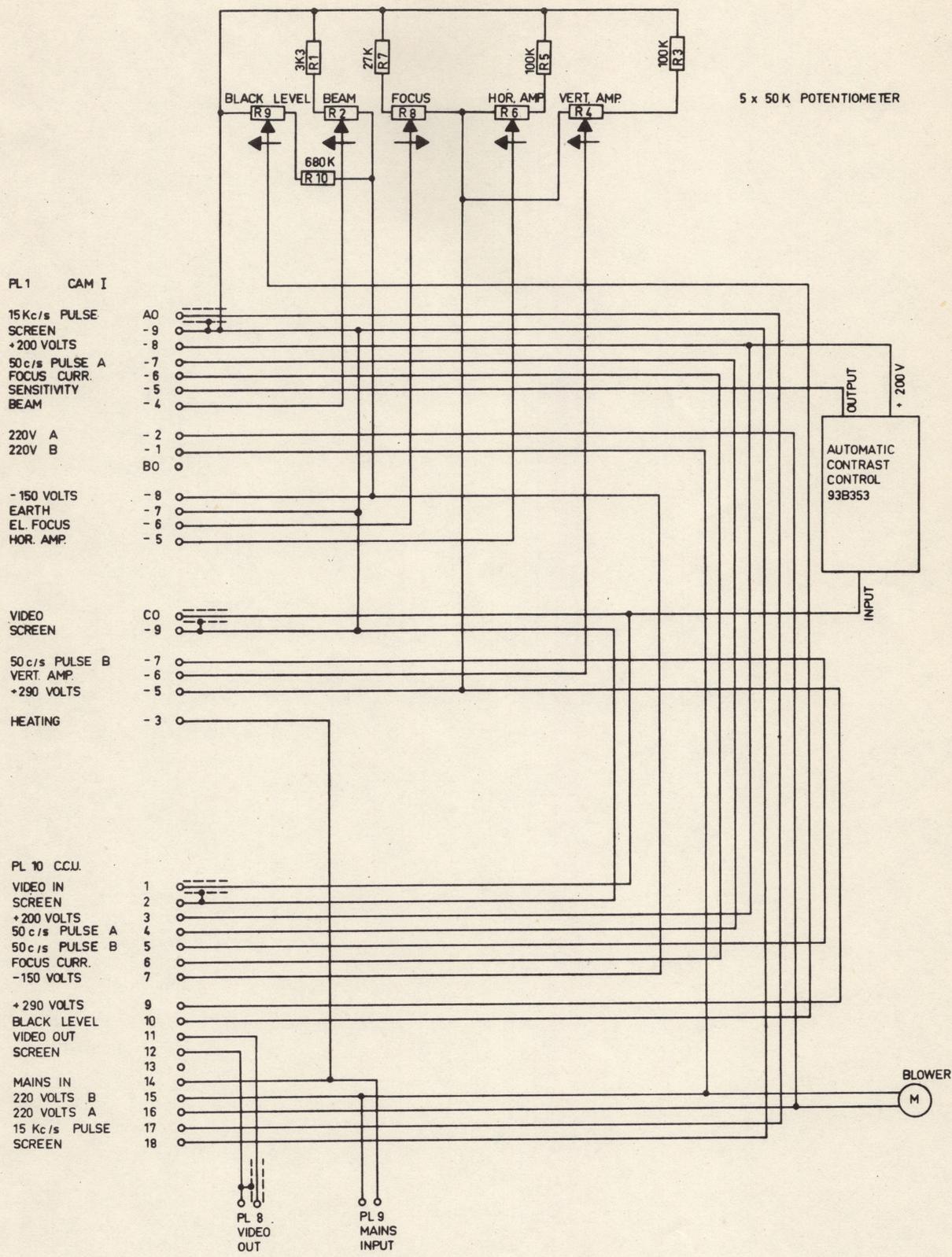
ALL POT. 50kΩ COLVERN 2W
ALL RESISTORS 1/2 W





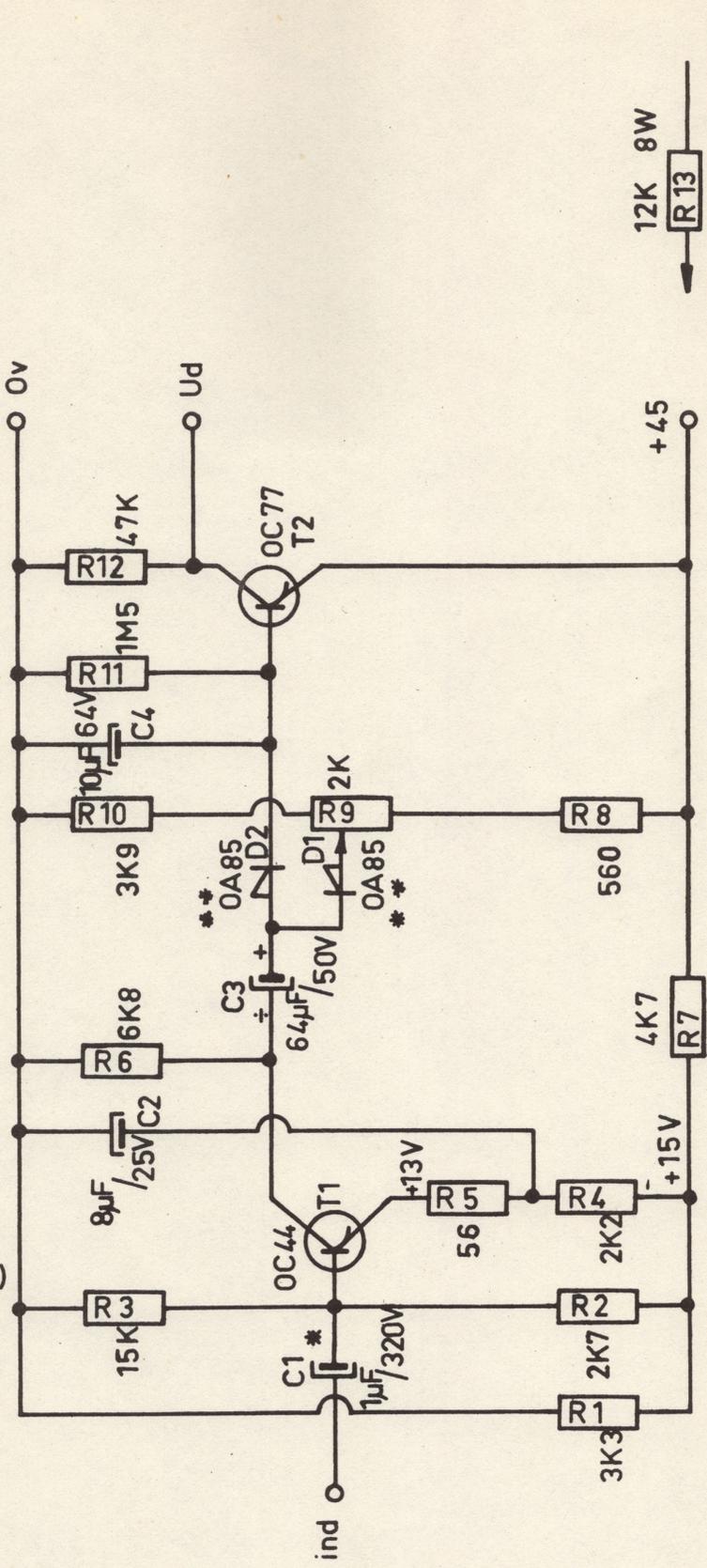
CAMERA CONTROL UNIT TYPE 93C20

REAR PANEL CONNECTION Drawing no. 93C340 15.10 60



CAMERA CONTROL UNIT TYPE 93C20/1a
 REAR PANEL CONNECTION
 Drawing. no. 93C391 9-3-61 JZ

(Vc. Jc) ≈ 6v, ± 0.9mA



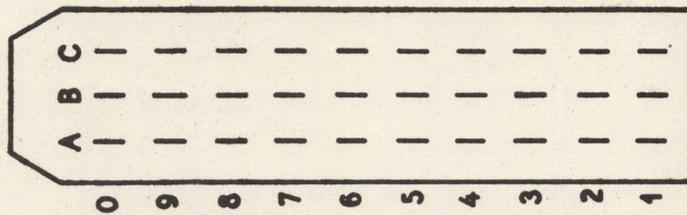
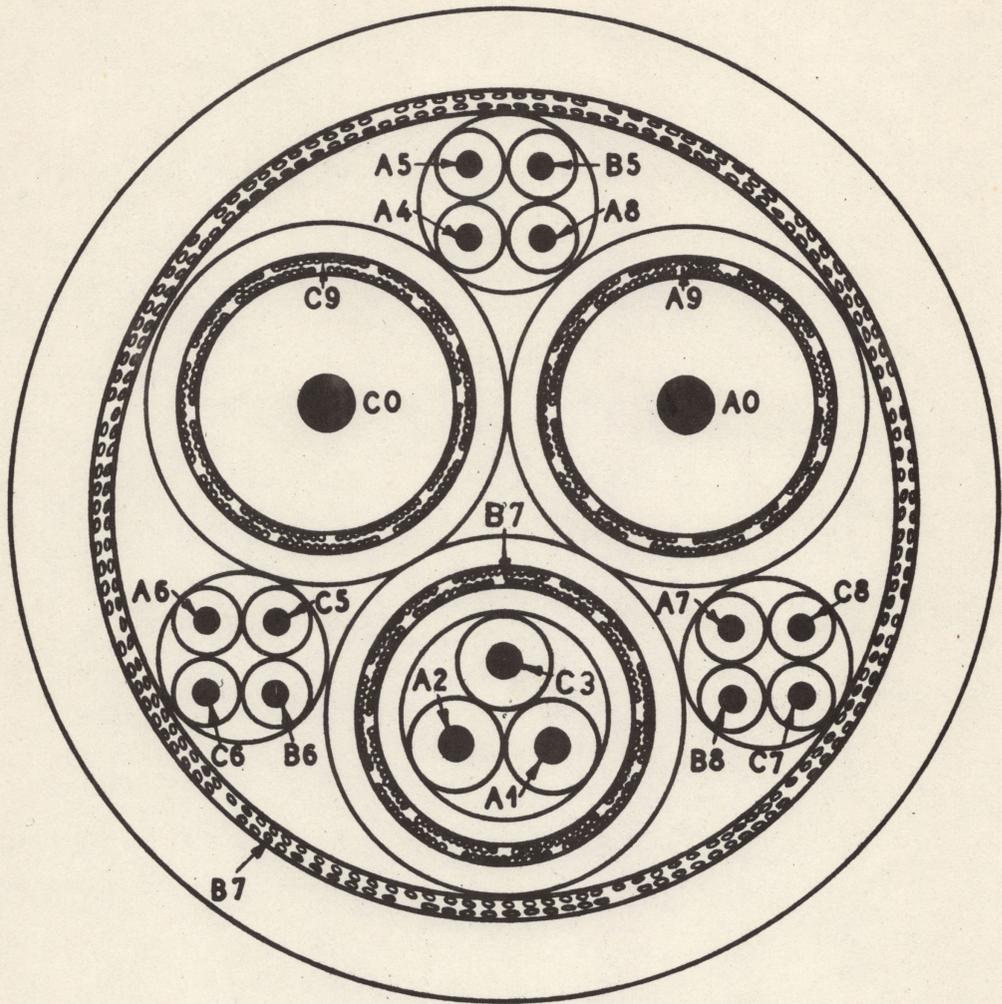
* IF THE INPUT TERMINAL IS CONNECTED TO CHASSIS POTENTIAL THE POLARITY OF THIS CAPACITOR MUST BE REVERSED.

* * EXCHANGEABLE WITH TYPE OA95.

CONTRAST - REGULATOR FOR TV - CAMERA

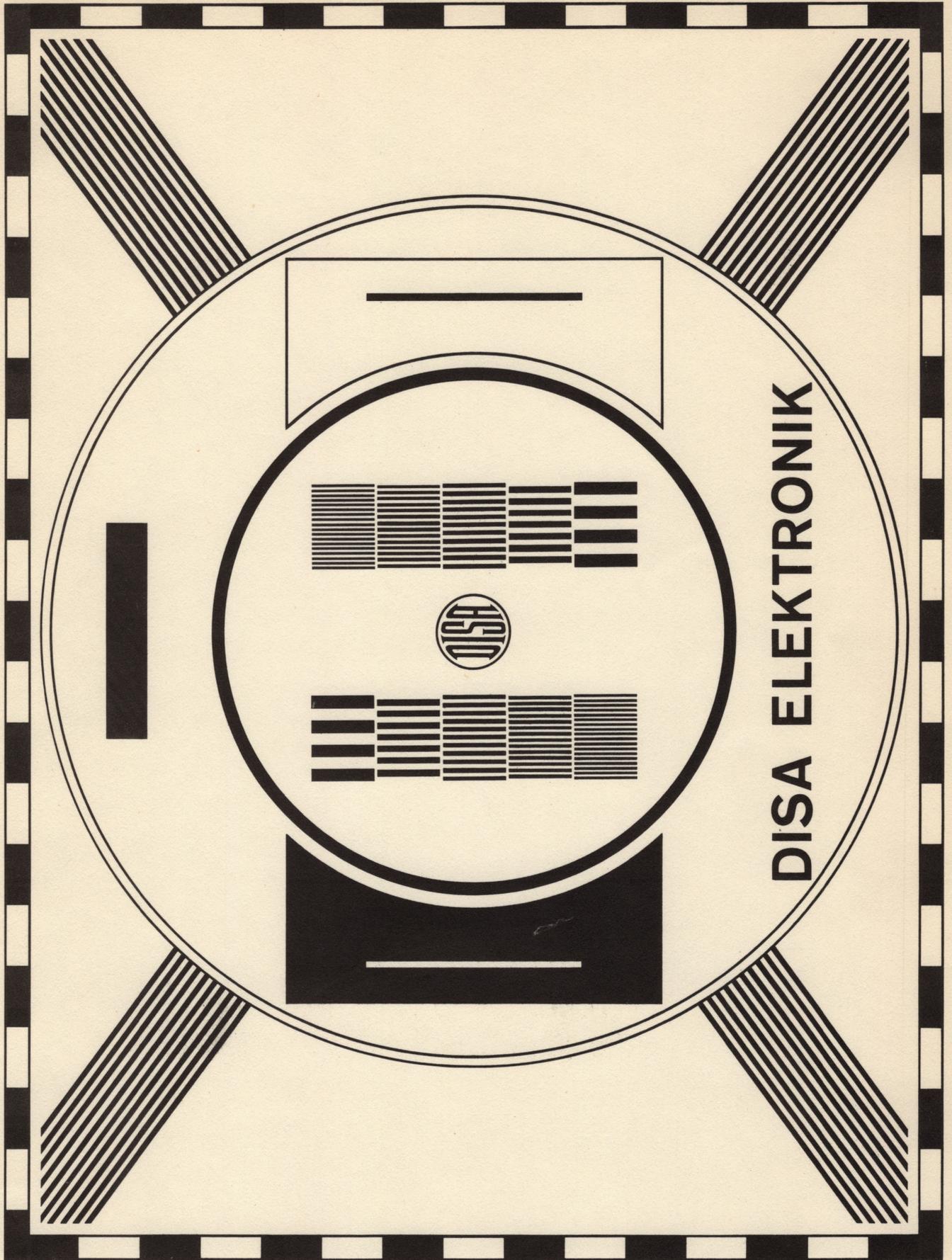
Drawing. no. 93B353

13-6-60 JZ.



CAMERA CABLE TYPE 93E02

DRAW. 93E101
19-11-57



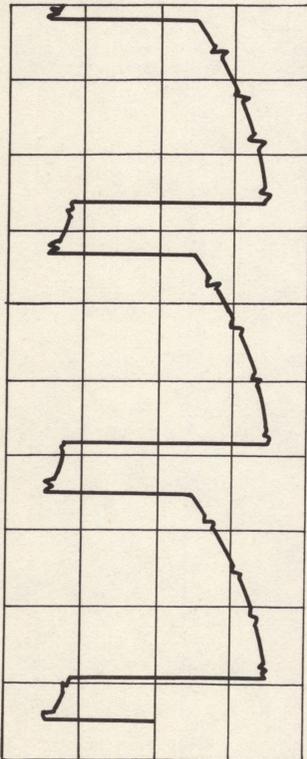
DISA ELEKTRONIK

TV Test Chart

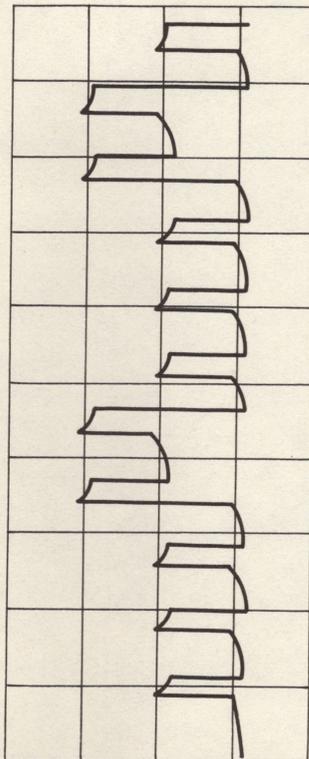
Drawing no. 93 D 378

ADJUSTMENT OF MAIN DIVIDER IN CCU 93C20.

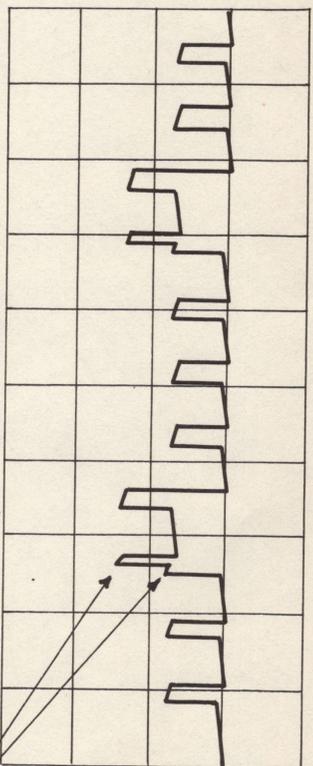
Testpoint 3
 H = 50 μ S / div
 V = 5 V / div



Testpoint 3+4
 H = 200 μ S / div
 V = 10 V / div

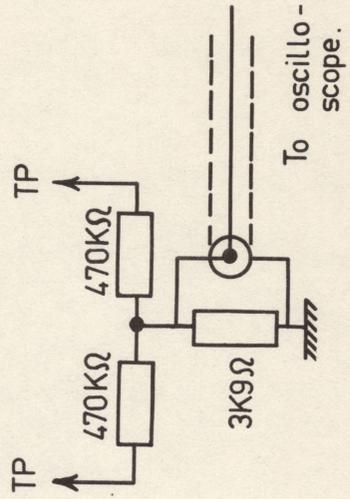


Testpoint 4+5
 H = 1 ms / div
 V = 10 V / div



Testpoint 5+6
 H = 5 ms / div
 V = 10 V / div

These waveforms measured with the probe shown.



Parts list
for
TV Camera type 93B10

Symbol	Component	Description	Type	Make
R1	Resistor	470K Ω 5% $\frac{1}{4}$ W		
R2	"	1M Ω 5% $\frac{1}{4}$ W		
R3	"	3,9M Ω 5% $\frac{1}{4}$ W		
R4	"	270K Ω 5% $\frac{1}{4}$ W		
R5	"	680 Ω 5% $\frac{1}{2}$ W		
R6	"	1,2K Ω 5% $\frac{1}{2}$ W		
R7	"	100K Ω 5% $\frac{1}{4}$ W		
R8	"	120K Ω 5% $\frac{1}{4}$ W		
R9	"	1M Ω 5% $\frac{1}{4}$ W		
R10	"	560 Ω 5% $\frac{1}{2}$ W		
R11	"	100 Ω 5% $\frac{1}{4}$ W		
R12	"	680 Ω 5% $\frac{1}{2}$ W		
R13	"	1,2K Ω 5% $\frac{1}{2}$ W		
R14	"	4,7K Ω 5% 4,5W	83540 B	Philips
R15	"	1M Ω 5% $\frac{1}{4}$ W		
R16	"	1K Ω 5% $\frac{1}{4}$ W		
R17	"	220 Ω 5% $\frac{1}{4}$ W		
R18	"	680 Ω 5% $\frac{1}{2}$ W		
R19	"	1M Ω 5% $\frac{1}{4}$ W		
R20	"	10K Ω 5% $\frac{1}{4}$ W		
R21	"	560 Ω 5% $\frac{1}{2}$ W		
R22	"	120 Ω 5% $\frac{1}{4}$ W		
R23	"	10K Ω 5% 4,5W	83540 B	Philips
R24	"	330 Ω 5% $\frac{1}{2}$ W		
R25	"	10K Ω 5% $\frac{1}{2}$ W		
R26	"	82 Ω 5% $\frac{1}{4}$ W		
R27	"	100K Ω 5% $\frac{1}{4}$ W		
R28	"	100K Ω 5% $\frac{1}{4}$ W		
R29	"	10K Ω 5% 4,5W	83540 B	Philips
R30	"	3,9K Ω 5% $\frac{1}{4}$ W		
R31	"	330 Ω 5% $\frac{1}{4}$ W		
R32	"	330 Ω 5% $\frac{1}{4}$ W		
R33	"	8,2K Ω 5% $\frac{1}{4}$ W		
R34	"	8,2K Ω 5% $\frac{1}{4}$ W		
R35	"	1,8M Ω 5% $\frac{1}{2}$ W		
R36	"	120K Ω 5% $\frac{1}{2}$ W		
R37	"	1,2M Ω 5% $\frac{1}{4}$ W		

Symbol	Component	Description	Type	Make
R38	Resistor	1,5K Ω 5% 4,5W	83540 B	Philips
R39	"	390 Ω 5% $\frac{1}{2}$ W		
R40	"	2,2M Ω 5% $\frac{1}{4}$ W		
R41	"	2,2K Ω 5% $\frac{1}{2}$ W		
R42	Potentiometer	5k Ω	CLR 1106	Colvern
R43	Resistor	3,9K Ω 5% $\frac{1}{2}$ W		
R44	"	470 Ω 5% $\frac{1}{4}$ W		
R45	Potentiome.	1K Ω	CLR 1106	Colvern
R46	Resistor	470 Ω 5% $\frac{1}{4}$ W		
R47	"	470 Ω 5% $\frac{1}{4}$ W		
R48	Potentiome.	1K Ω	CLR 1106	Colvern
R49	Resistor	470 Ω 5% $\frac{1}{4}$ W		
R50	"	5,6K Ω 5% $\frac{1}{4}$ W		
R51	"	10K Ω 5% $\frac{1}{4}$ W		
R52	"	100K Ω 5% $\frac{1}{4}$ W		
R53	"	100K Ω 5% $\frac{1}{4}$ W		
R54	"	270K Ω 5% $\frac{1}{4}$ W		
R55	"	270K Ω 5% $\frac{1}{4}$ W		
R56	"	1M Ω 5% $\frac{1}{4}$ W		
R57	"	270K Ω 5% $\frac{1}{2}$ W		
R58	"	39K Ω 5% $\frac{1}{2}$ W		
R59	"	1M Ω 5% $\frac{1}{4}$ W		
R60	"	180K Ω 5% $\frac{1}{4}$ W		
R61	"	8,2K Ω 5% $\frac{1}{4}$ W		
R62	"	100 Ω 5% $\frac{1}{4}$ W		
R63	"	470 Ω 5% $\frac{1}{2}$ W		
R64	Potentiome.	200 Ω	CLR 1106	Colvern
R65	Resistor	470 Ω 5% $\frac{1}{2}$ W		
R66	"	33 Ω 5% $\frac{1}{4}$ W		
R67	"	33 Ω 5% $\frac{1}{4}$ W		
R68	"	2,2M Ω 5% $\frac{1}{4}$ W		
R70	"	8,2K Ω 5% $\frac{1}{4}$ W		
R71	"	82 Ω 5% $\frac{1}{4}$ W		

Symbol	Component	Description	Type	Make
C1	Electrolytic	8 μ F 300V	AC 8107/8	Philips
C2	Capacitor	20nF 600V	Oil	Janko
C3	"	50nF 250V	AM 101	Hunts
C4	Electrolytic	100 μ F 16V	C426 AM/E100	Philips
C5	Capacitor	68pF	9/0112,3 P	Ferroperm
C6	Electrolytic	100 μ F 16V	C426 AM/E100	Philips
C7	Capacitor	10nF 400V	B 810	Hunts
C8	Electrolytic	8 μ F 300V	AC 8107/8	Philips
C9	Capacitor	50nF 250V	AM 101	Hunts
C10	Electrolytic	100 μ F 16V	C426 AM/E100	Philips
C11	Capacitor	50nF 250V	AM 101	Hunts
C12	Electrolytic	100 μ F 16V	C426 AM/E100	Philips
C13	Trimmer	500pF		Torotor
C14	Electrolytic	8 μ F 300V	AC 8107/8	Philips
C15	"	8 μ F 25V	AC 5715/8	"
C16	"	8 μ F 25V	AC 5715/8	"
C17	Capacitor	0,5 μ F 250V	AM 104	Hunts
C18	"	1 μ F 350V	KO/MP20/1G350A3	Bosch
C19	Electrolytic	150 μ F 150/170V	EAM	T.J.
C20	"	8 μ F 25V	AC 5715/8	Philips
C21	Capacitor	10nF 400V	B 810	Hunts
C22	"	0,1 μ F 350V	AM 108	"
C23	"	10nF 400V	B 810	"
C24	"	0,1 μ F 250V	AM 102	"
C25	"	10nF 400V	B 810	"
C26	"	33pF	9/0112,3 P	Ferroperm
C27	"	0,1 μ F 250V	AM 102	Hunts
C28	"	10nF 400V	B 810	"
C29	Electrolytic	8 μ F 300V	AC 8107/8	Philips
C30	Capacitor	150V 400V	TTH150JDC	T.J.
C31	"	500pF 600V	B 820	Hunts
C32	Trimmer	500pF		Torotor
C33	Capacitor	10nF 400V	B 810	Hunts
C34	"	33pF	9/0112,3 P	Ferroperm
C35	"	0,25 μ F 250V	AM 103	Hunts
C36	Electrolytic	100 μ F 16V	C426 AM/E100	Philips
C37	"	100 μ F 16V	C426 AM/E100	"
C38	Capacitor	50nF 250V	AM 101	Hunts
C39	Electrolytic	100 μ F 16V	C426 AM/E100	Philips

Symbol	Component	Description	Type	Make
C40	Capacitor	3nF 600V	B 859	Hunts
C41	"	10nF 150V	B 800	"
C42	1 Electrolytic	8μF 300V	AC 8107/8	Philips
C43	1 "	8μF 25V	AC 5715/8	"
L1	1 Mini choke	10μH	158/0,01	Prahn
L2	1 "	10μH	158/0,01	"
V1	Tube	E88CC		Telefunken
V2	"	E88CC		"
V3	"	E88CC		"
V4	"	ECC81		Philips
V5	"	ECL82		"
V6	"	ECL82		"
D1-4	4 Diodes	OA 130		Telefunken
	1 Heater Transf.	6,5V-4A	31,5CAX-7481	J.S.
	1 Choke		1,25-2817	"
	1 Relay	T.rls. 154d	65403/97d	Siemens
	6 Tube holder	Noval	XM9/UC1	Mc Murdo
	1 "	for PTW Resistron		
	1 Jack		J30	Bulgin
	1 Holder for	30-pol connector	T1136V	Tuchel
	1 Multiconnector	30-pol	T2070	"
	2 Connectors	220V AC	93B339	DISA

Parts list
for
Control Unit type 93C20
Main chassis

Symbol	Component	Description	Type	Make
R1	1 Resistor	56K Ω 5% $\frac{1}{4}$ W		
R2	1 "	10K Ω 5% $\frac{1}{2}$ W		
R3	1 "	3,9K Ω 5% $\frac{1}{2}$ W		
R4	1 "	10K Ω 5% $\frac{1}{2}$ W		
R5	1 "	10K Ω 5% $\frac{1}{4}$ W		
R6	1 "	120 Ω 5% $\frac{1}{4}$ W		
R7	1 "	1M Ω 5% $\frac{1}{4}$ W		
R8	1 "	22K Ω 5% $\frac{1}{2}$ W		
R9	1 "	100K Ω 5% $\frac{1}{2}$ W		
R10	1 "	3,3K Ω 5% $\frac{1}{4}$ W		
R11	1 "	2,2M Ω 5% $\frac{1}{4}$ W		
R12	1 "	4,7K Ω 5% $\frac{1}{4}$ W		
R13	1 "	68K Ω 5% $\frac{1}{4}$ W		
R14	1 Potentiometer	100K Ω	P 190	Preh
R15	1 Resistor	100K Ω 5% $\frac{1}{4}$ W		
R16	1 "	2,2M Ω 5% $\frac{1}{4}$ W		
R17	1 "	2,2M Ω 5% $\frac{1}{4}$ W		
R18	1 "	100K Ω 5% $\frac{1}{4}$ W		
R19	1 "	4,7K Ω 5% $\frac{1}{4}$ W		
R20	1 "	68K Ω 5% $\frac{1}{4}$ W		
R21	1 Potentiometer	100K Ω	P 190	Preh
R22	1 Resistor	3,3K Ω 5% $\frac{1}{4}$ W		
R23	1 "	2,2M Ω 5% $\frac{1}{4}$ W		
R24	1 "	100K Ω 5% $\frac{1}{2}$ W		
R25	1 "	22K Ω 5% $\frac{1}{2}$ W		
R26	1 "	22K Ω 5% $\frac{1}{2}$ W		
R27	1 "	100K Ω 5% $\frac{1}{2}$ W		
R28	1 "	3,3K Ω 5% $\frac{1}{4}$ W		
R29	1 "	2,2M Ω 5% $\frac{1}{4}$ W		
R30	1 "	4,7K Ω 5% $\frac{1}{4}$ W		
R31	1 "	68K Ω 5% $\frac{1}{4}$ W		
R32	1 Potentiometer	100K Ω	P 190	Preh
R33	1 Resistor	100K Ω 5% $\frac{1}{4}$ W		
R34	1 "	2,2M Ω 5% $\frac{1}{4}$ W		
R35	1 "	1,8M Ω 5% $\frac{1}{4}$ W		

Symbol	Component	Description	Type	Make
R36	1 Resistor	4,7KΩ 5% 1/4W		
R37	1 "	68KΩ 5% 1/4W		
R38	1 Potentiometer	100KΩ	P 190	Preh
R39	1 Resistor	2,2MΩ 5% 1/4W		
R40	1 "	3,3KΩ 5% 1/4W		
R41	1 "	100KΩ 5% 1/2W		
R42	1 "	22KΩ 5% 1/2W		
R43	1 "	100KΩ 5% 1/4W		
R44	1 "	150KΩ 5% 1/4W		
R45	1 "	1KΩ 5% 1/2W		
R46	1 "	4,7KΩ 5% 1/2W		
R47	1 "	1KΩ 5% 1/2W		
R48	1 "	56KΩ 5% 1/4W		
R49	1 "	1MΩ 5% 1/4W		
R50	1 "	680KΩ 5% 1/4W		
R51	1 "	Adjust 1/4W		
R52	1 "	22KΩ 5% 8W	83542 B	Philips
R53	1 "	1KΩ 5% 1/4W		
R54	1 "	22KΩ 5% 1/2W		
R55	1 "	4,7KΩ 5% 1/2W		
R56	1 "	680KΩ 5% 1/4W		
R57	1 "	470KΩ 5% 1/4W		
R58	1 "	1MΩ 5% 1/4W		
R59	1 "	680KΩ 5% 1/4W		
R60	1 "	Adjust 1/4W		
R61	1 "	1KΩ 5% 1/4W		
R62	1 "	22KΩ 5% 8W	83542 B	Philips
R63	1 "	2,7KΩ 5% 1/2W		
R64	1 "	27KΩ 5% 1/2W		
R65	1 "	680KΩ 5% 1/4W		
R66	1 "	470KΩ 5% 1/4W		
R67	1 "	1MΩ 5% 1/4W		
R68	1 "	680KΩ 5% 1/4W		
R69	1 "	Adjust 1/4W		
R70	1 "	1KΩ 5% 1/4W		
R71	1 "	22KΩ 5% 8W	83542 B	Philips
R72	1 "	2,2KΩ 5% 1/2W		
R73	1 "	27KΩ 5% 1/2W		
R74	1 "	680KΩ 5% 1/4W		

Symbol	Component	Description	Type	Make
R75	1 Resistor	470K Ω 5% $\frac{1}{4}$ W		
R76	1 "	1M Ω 5% $\frac{1}{4}$ W		
R77	1 "	100 Ω 5% $\frac{1}{4}$ W		
R78	1 "	12K Ω 5% $\frac{1}{2}$ W		
R79	1 "	2,7K Ω 5% $\frac{1}{2}$ W		
R80	1 "	1M Ω 5% $\frac{1}{4}$ W		
R81	1 "	100 Ω 5% $\frac{1}{4}$ W		
R82	1 "	12K Ω 5% $\frac{1}{2}$ W		
R83	1 "	2,7K Ω 5% $\frac{1}{2}$ W		
R84	1 "	1K Ω 5% $\frac{1}{4}$ W		
R85	1 "	1M Ω 5% $\frac{1}{4}$ W		
R86	1 "	3,9K Ω 5% $\frac{1}{4}$ W		
R87	1 "	1M Ω 5% $\frac{1}{4}$ W		
R88	1 "	3,3K Ω 5% $\frac{1}{4}$ W		
R89	1 "	10K Ω 5% $\frac{1}{4}$ W		
R90	1 "	1M Ω 5% $\frac{1}{4}$ W		
R91	1 "	3,3K Ω 5% $\frac{1}{4}$ W		
R92	1 "	1,5K Ω 5% $\frac{1}{2}$ W		
R93	1 "	1M Ω 5% $\frac{1}{4}$ W		
R94	1 "	100K Ω 5% $\frac{1}{4}$ W		
R95	1 "	220K Ω 5% $\frac{1}{4}$ W		
R96	1 "	10K Ω 5% $\frac{1}{4}$ W		
R97	1 "	12K Ω 5% $\frac{1}{4}$ W		
R98	1 "	22K Ω 5% $\frac{1}{2}$ W		
R99	1 "	12K Ω 5% $\frac{1}{2}$ W		
R100	1 "	22K Ω 5% $\frac{1}{4}$ W		
R101	1 "	100K Ω 5% $\frac{1}{4}$ W		
R102	1 "	220K Ω 5% $\frac{1}{4}$ W		
R103	1 "	100K Ω 5% $\frac{1}{4}$ W		
R104	1 "	10K Ω 5% $\frac{1}{2}$ W		
R105	1 "	100 Ω 5% $\frac{1}{4}$ W		
R106	1 "	3,3K Ω 5% $\frac{1}{4}$ W		
R107	1 "	68K Ω 5% $\frac{1}{4}$ W		
R108	1 "	8,2K Ω 5% $\frac{1}{2}$ W		
R109	1 "	1M Ω 5% $\frac{1}{4}$ W		
R110	1 "	10K Ω 5% $\frac{1}{2}$ W		
R111	1 "	10K Ω 5% $\frac{1}{2}$ W		
R112	1 "	100K Ω 5% $\frac{1}{4}$ W		
R113	1 Potentiometer	100K Ω	P 190	Preh

Symbol	Component	Description	Type	Make
R114	1 Resistor	1,5K Ω 5% $\frac{1}{4}$ W		
R115	1 "	1M Ω 5% $\frac{1}{4}$ W		
R116	1 "	100 Ω 5% $\frac{1}{4}$ W		
R117	1 "	1K Ω 5% $\frac{1}{4}$ W		
R118	1 "	2,2K Ω 5% 4,5W	83540 B	Philips
R119	1 "	120 Ω 5% $\frac{1}{2}$ W		
R120	1 "	1M Ω 5% $\frac{1}{4}$ W		
R121	1 "	100 Ω 5% $\frac{1}{4}$ W		
R122	1 "	1,2K Ω 5% $\frac{1}{4}$ W		
R123	1 "	390 Ω 5% 1W		
R124	1 "	390 Ω 5% 1W		
R125	1 "	180K Ω 5% $\frac{1}{4}$ W		
R126	1 "	2,7K Ω 5% $\frac{1}{4}$ W		
R127	1 "	1K Ω 5% $\frac{1}{4}$ W		
R128	1 "	470 Ω 5% $\frac{1}{4}$ W		
R129	1 "	33K Ω 5% $\frac{1}{4}$ W		
R130	1 "	10K Ω 5% $\frac{1}{4}$ W		
R131	1 "	150K Ω 5% $\frac{1}{4}$ W		
R132	1 "	100 Ω 5% $\frac{1}{4}$ W		
R133	1 "	12K Ω 5% $\frac{1}{2}$ W		
R134	1 "	4,7K Ω 5% 4,5W	83540 B	Philips
R135	1 "	470K Ω 5% $\frac{1}{4}$ W		
R136	1 "	100K Ω 5% $\frac{1}{4}$ W		
R137	1 "	33K Ω 5% $\frac{1}{4}$ W		
R138	1 "	150 Ω 5% $\frac{1}{2}$ W		
R139	1 "	100 Ω 5% $\frac{1}{4}$ W		
R140	1 "	2,7K Ω 5% $\frac{1}{2}$ W		
R141	1 "	1M Ω 5% $\frac{1}{4}$ W		
R142	1 "	100K Ω 5% $\frac{1}{4}$ W		
R143	1 "	100K Ω 5% $\frac{1}{4}$ W		
R144	1 "	2,2K Ω 5% $\frac{1}{4}$ W		
R145	1 "	100 Ω 5% $\frac{1}{4}$ W		
R146	1 "	10K Ω 5% $\frac{1}{4}$ W		
R147	1 "	150K Ω 5% $\frac{1}{4}$ W		
R148	1 "	12K Ω 5% $\frac{1}{2}$ W		
R149	1 Potentiometer	300 Ω	P 190	Preh
R150	1 Resistor	680 Ω 5% $\frac{1}{4}$ W		
R151	1 "	1,2K Ω 5% $\frac{1}{4}$ W		
R152	1 "	1M Ω 5% $\frac{1}{4}$ W		

Symbol	Component	Description	Type	Make
R153	1 Resistor	100Ω 5% ¼W		
R154	1 "	1,2KΩ 5% ¼W		
R155	1 "	1MΩ 5% ¼W		
R156	1 "	100Ω 5% ¼W		
R157	1 "	680Ω 5% ¼W		
R158	1 "	2,2KΩ 5% ½W		
R159	1 "	1KΩ 5% ½W		
R160	1 "	100Ω 5% ¼W		
R161	1 "	1MΩ 5% ¼W		
R162	1 "	220Ω 5% ¼W		
R163	1 "	100Ω 5% ½W		
R164	1 "	18MΩ 5% ¼W		
R165	1 "	2,2MΩ 5% ¼W		
R166	1 "	2,2MΩ 5% ¼W		
R167	1 "	390Ω 5% ¼W		
R168	1 "	330Ω 5% ½W		
R169	1 "	2,7KΩ 5% ¼W		
R170	1 "	2,2MΩ 5% ¼W		
R171	1 "	2,2MΩ 5% ¼W		
R172	1 "	2,2MΩ 5% ¼W		
R173	1 "	2,2MΩ 5% ¼W		
R174	1 "	39KΩ 5% ¼W		
R175	1 "	18KΩ 5% ¼W		
R176	1 "	390Ω 5% 1W		
R177	1 "	390Ω 5% 1W		
R178	1 "	56KΩ 5% ¼W		
C1	1 Capacitor	50nF 250V	AM 101	Hunts
C2	1 "	50nF 250V	AM 101	"
C3	1 "	2nF 400V	B 818	"
C4	1 "	0,25µF 250V	AM 103	"
C5	1 "	0,25µF 250V	AM 103	"
C6	1 "	700pF	Glimmer	"
C7	1 "	50nF 250V	AM 101	"
C8	1 "	18pF	9/0112,3 P	Ferroperm
C9	1 "	10nF 400V	B 810	Hunts
C10	1 "	100pF	9/0112,3 P	Ferroperm
C11	1 "	100pF	9/0112,3 P	"
C12	1 "	2nF 400V	B 818	Hunts

Symbol	Component	Description	Type	Make
C13	1 "	18pF	9/0112,3 P	Ferroperm
C14	1 "	18pF	9/0112,3 P	"
C15	1 "	400pF	Glimmer	Hunts
C16	1 Capacitor	100pF	9/0112,3 P	Ferroperm
C17	1 "	100pF	9/0112,3 P	"
C18	1 "	82pF	9/0112,3 P	"
C19	1 "	18pF	9/0112,3 P	"
C20	1 "	50nF 250V	AM 101	Hunts
C21	1 "	100μF 16V	C426 AM/E100	Philips
C22	1 "	3-25pF trimmer	CO05 BA/25E	"
C23	1 "	48+48μF 450/500V	EAS	T.J.
C24	1 "	2nF 400V	B 818	Hunts
C25	1 "	100pF	9/0112,3 P	Ferroperm
C26	1 "	15pF	9/0112,3 P	"
C27	1 "	180pF	9/0112,3 P	"
C28	1 "	100pF	9/0112,3 P	"
C29	1 "	15pF	9/0112,3 P	"
C30	1 "	180pF	9/0112,3 P	"
C31	1 "	15pF	9/0112,3 P	"
C32	1 "	0,25μF 250V	AM 103	Hunts
C33	1 "	10nF 400V	B 810	"
C34	1 "	0,25μF 250V	AM 103	"
C35	1 "	10nF 400V	B 810	"
C36	1 "	1nF 600V	B 847	"
C37	1 "	10nF 400V	B 810	"
C38	1 "	300pF 600V	B 828	"
C39	1 "	0,1μF 250V	AM 102	"
C40	1 "	0,1μF 250V	AM 102	"
C41	1 "	500pF 600V	B 820	"
C42	1 "	10nF 400V	B 810	"
C43	1 "	10nF 400V	B 810	"
C44	1 "	47pF	9/0112,3 P	Ferroperm
C45	1 "	15pF	9/0112,3 P	"
C46	1 "	47pF	9/0112,3 P	"
C47	1 "	15pF	9/0112,3 P	"
C48	1 "	10nF 400V	B 810	Hunts
C49	1 "	20nF 400V	Oil	Janko
C50	1 "	48+48μF 450/500V	EAS	T.J.
C51	1 "	0,25μF 250V	AM 103	Hunts

Symbol	Component	Description	Type	Make
C52	1 Capacitor	100 μ F 16V	C426 AM/E100	Philips
C53	1 "	100 μ F 16V	C426 AM/E100	"
C54	1 "	100 μ F 16V	C426 AM/E100	"
C55	1 "	8 μ F 300V	AC 8107/8	"
C56	1 "	0,1 μ F 250V	AM 102	Hunts
C57	1 "	8 μ F 300V	AC 8107/8	Philips
C58	1 "	0,25 μ F 250V	AM 103	Hunts
C59	1 "	48+48 μ F 450/500V	EAS	T.J.
C60	1 "	50nF 250V	AM 101	Hunts
C61	1 "	50nF 250V	AM 101	"
C62	1 "	4nF 600V	B 860	"
C63	1 "	100-500pF trimmer		Torotor
C64	1 "	100 μ F 16V	C426 AM/E100	Philips
C65	1 "	50nF 250V	AM 101	Hunts
C66	1 "	8 μ F 300V	AC 8107/8	Philips
C67	1 "	10nF 400V	B 810	Hunts
C68	1 "	8 μ F 25V	AC 5715/8	Philips
C69	1 "	100 μ F 16V	C426 AM/E100	"
C70	1 "	0,25 μ F 250V	AM 103	Hunts
C71	1 "	1nF 600V	B 847	"
C72	1 "	8 μ F 300V	AC 8107/8	Philips
C73	1 "	48+48 μ F 450/500V	EAS	T.J.
C74	1 "	0,1 μ F 250V	AM 102	Hunts
C75	1 "	100pF	9/0112,3 P	Ferroperm
C76	1 "	100pF	9/0112,3 P	"
C77	1 "	100pF	9/0112,3 P	"
C78	1 "	10-45pF trimmer	D 90	Stettner
C79	1 "	100pF	9/0112,3 P	Ferroperm
C80	1 "	8 μ F 300V	AC 8107/8	Philips
C81	1 "	8 μ F 300V	AC 8107/8	"
C82	1 "	8 μ F 25V	AC 5715/8	"
L1	1 Mini choke	10 μ F	158/0,01	Prahn
D1	1 Diode	OA 85		Philips
D2	1 "	OA 130		TFK
D3	1 "	OA 130		TFK
D4	1 "	OA 130		TFK
D5	1 "	OA 130		TFK
D6	1 "	OA 85		Philips

Symbol	Component	Description	Type	Make
D7	1 Diode	OA 85		Philips
D8	1 "	OA 85		"
D9	1 "	OA 130		TFK
D10	1 "	OA 130		TFK
D11	1 "	OA 130		TFK
D12	1 "	OA 130		TFK
D13	1 "	OA 85		Philips
D14	1 "	OA 85		"
D15	1 "	OA 73		"
D16	1 "	OA 73		"
V1	1 Tube	ECC 81		
V2	1 "	5725	RCA	
V3	1 "	EAA 91		
V4	1 "	5725	RCA	
V5	1 "	5725	RCA	
V6	1 "	EAA 91		
V7	1 "	5725	RCA	
V8	1 "	ECC 81		
V9	1 "	ECC 82		
V10	1 "	ECC 82		
V11	1 "	ECC 82		
V12	1 "	5725	RCA	
V13	1 "	5725	RCA	
V14	1 "	ECC 81		
V15	1 "	ECC 81		
V16	1 "	ECC 81		
V17	1 "	EL 83		
V18	1 "	ECC 81		
V19	1 "	EL 83		
V20	1 "	E 180 F		
V21	1 "	ECC 81		
V22	1 "	EAA 91		
V23	1 "	E 180 F		
V24	1 "	E 88 CC		
	1 Transformer	0,32M	5825	J.S.
	1 "	1,25	7007	"

Parts list
for
Control Unit type 93C20
Power Chassis

Symbol	Component	Description	Type	Make
R1	Resistor	Adjust		
R2	"	"		
R3	"	470Ω 5% 1/4W		
R4	"	470Ω 5% 1/4W		
R5	"	8,2KΩ 5% 1/4W		
R6	"	680KΩ 5% 1/4W		
R7	"	680KΩ 5% 1/4W		
R8	"			
R9	"			
R10	"	1KΩ 5% 1/2W		
R11	"	47Ω 5% 4,5W	83540 B	Philips
R12	"	47Ω 5% 4,5W	83540 B	"
R13	"	1KΩ 5% 1/2W		
R14	"	500Ω 15W	ERS	Vitrohm
R15	"	1KΩ 5W	H	"
R16	"	220Ω 5% 1/2W		
R17	"	5,6KΩ 5% 1/2W		
R18	"	220Ω 5% 1/2W		
R19	"	15KΩ 5% 1/2W		
R20	Potentiometer	10KΩ	P 190	Preh
R21	Resistor	15KΩ 5% 1/2W		
R22	"	33KΩ 5% 1/2W		
R23	"	1KΩ 5W	H	Vitrohm
R24	"	2,2MΩ 5% 1/2W		
R25	"	220KΩ 5% 1/2W		
R26	"	220Ω 5% 1/2W		
R27	"	5,6MΩ 5% 1/2W		

Symbol	Component	Description	Type	Make
C1	Capacitor	10nF 400V	B 810	Hunts
C2/C8	Electrolytic	48+48μF 450/500V	EAS	T.J.
C3/C4	"	48+48μF 450/500V	EAS	"
C5/C7	"	48+48μF 450/500V	EAS	"
C6	Capacitor	0,5μF 250V	AM 104	Hunts
C9	"	0,5μF 250V	AM 104	Hunts
V25	1 Tube	0A 2		
V26	1 "	85A 2		
V27	1 "	ECC 83		
V28	1 "	6080		
V29	1 "	90C1		
4	Selenium rect.	B 390 C 170		Siemens
2	"	B 250 C 100		"

Parts list
for
Remote Control Panel Type 93C66

Symbol	Component	Description	Type	Make
R1	1 Resistor	3,3K Ω 5% $\frac{1}{2}$ W		
R2	1 Potentiometer	50K Ω 2W	905c	Colvern
R3	1 Resistor	100K Ω 5% $\frac{1}{2}$ W		
R4	1 Potentiometer	50K Ω 2W	905c	Colvern
R5	1 Resistor	100K Ω 5% $\frac{1}{2}$ W		
R6	1 Potentiometer	50K Ω 2W	905c	Colvern
R7	1 Resistor	27K Ω 5% $\frac{1}{2}$ W		
R8	1 Potentiometer	50K Ω 2W	905c	Colvern
R9	1 "	50K Ω 2W	905c	"
R10	1 Resistor	680K Ω 5% $\frac{1}{2}$ W		
R11	1 Potentiometer	50K Ω 2W	905c	Colvern
R12	1 Resistor	150K Ω 5% $\frac{1}{2}$ W		
C1	1 Capacitor	8 μ F 300V	AC 8107/8	Philips

Parts list
for
Contrast-Regulator for TV-Camera

Symbol	Component	Description	Type	Make
R1	1 Resistor	3,3K Ω 5% $\frac{1}{4}$ W		
R2	1 "	2,7K Ω 5% $\frac{1}{4}$ W		
R3	1 "	15K Ω 5% $\frac{1}{4}$ W		
R4	1 "	2,2K Ω 5% $\frac{1}{4}$ W		
R5	1 "	56 Ω 5% $\frac{1}{4}$ W		
R6	1 "	6,8K Ω 5% $\frac{1}{4}$ W		
R7	1 "	4,7K Ω 5% $\frac{1}{4}$ W		
R8	1 "	560 Ω 5% $\frac{1}{4}$ W		
R9	1 Potentiometer	2K Ω	EO 97AD/2K	Philips
R10	1 Resistor	3,9K Ω 5% $\frac{1}{4}$ W		
R11	1 "	1,5M Ω 5% $\frac{1}{4}$ W		
R12	1 "	47K Ω 5% $\frac{1}{4}$ W		
*R13	1 "	12K Ω 5% 8W	83542B	Philips
C1	1 Capacitor	1 μ F 320V	EAH 7397e	T.J.
C2	1 "	8 μ F 25V	AC 5715/8	Philips
C3	1 "	64 μ F 50V	AC 8122/64	"
C4	1 "	10 μ F 64V	C425 AL/H10	"
T1	1 Transistor	OC 44		Philips
T2	1 "	OC 77		"
D1	1 Diode	OA 85 (OA 95)		Philips
D2	1 "	OA 85 (OA 95)		"
*R13	1 Resistor	18K Ω 8W	93B01 93C01	