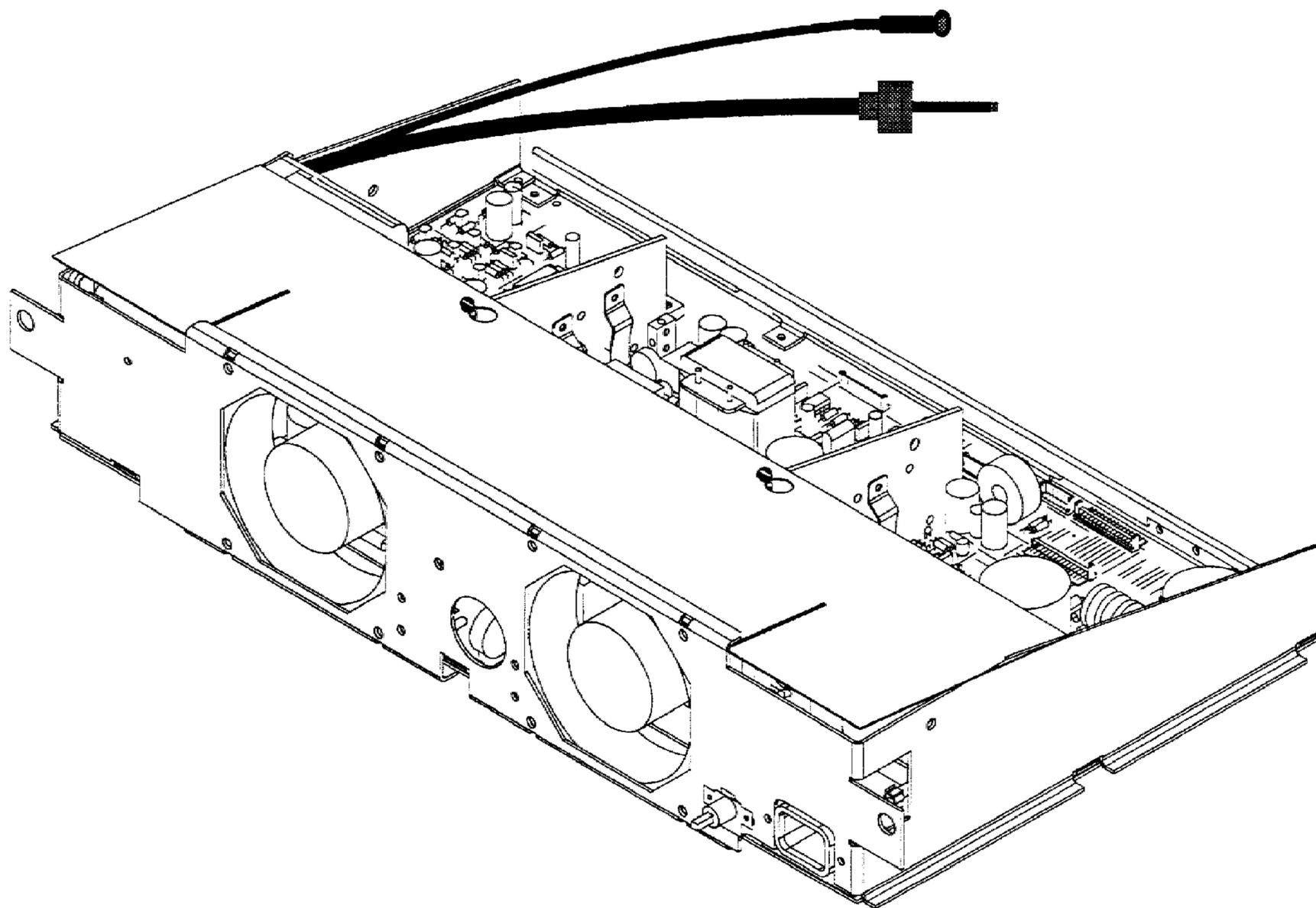


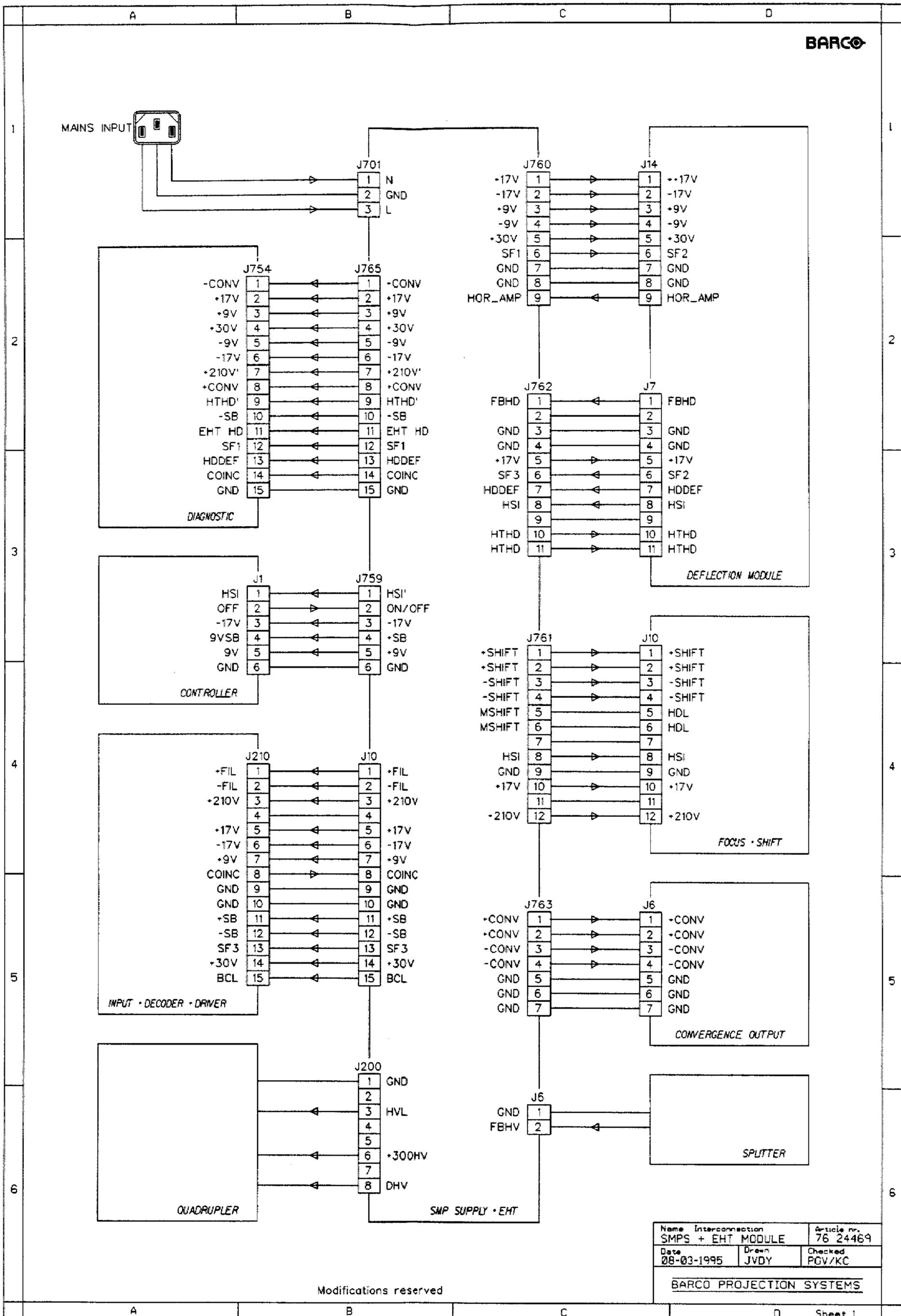
WARNING

THIS CIRCUIT BOARD IS HOT TO AC. THIS POWER SUPPLY, LIKE THE HIGH VOLTAGE POWER SUPPLY, DOES NOT USE A LINE ISOLATION TRANSFORMER, MEANING A PORTION OF THE CIRCUITRY IS HOT-TO-LINE AND SHOULD BE TREATED WITH CAUTION.

WARNING

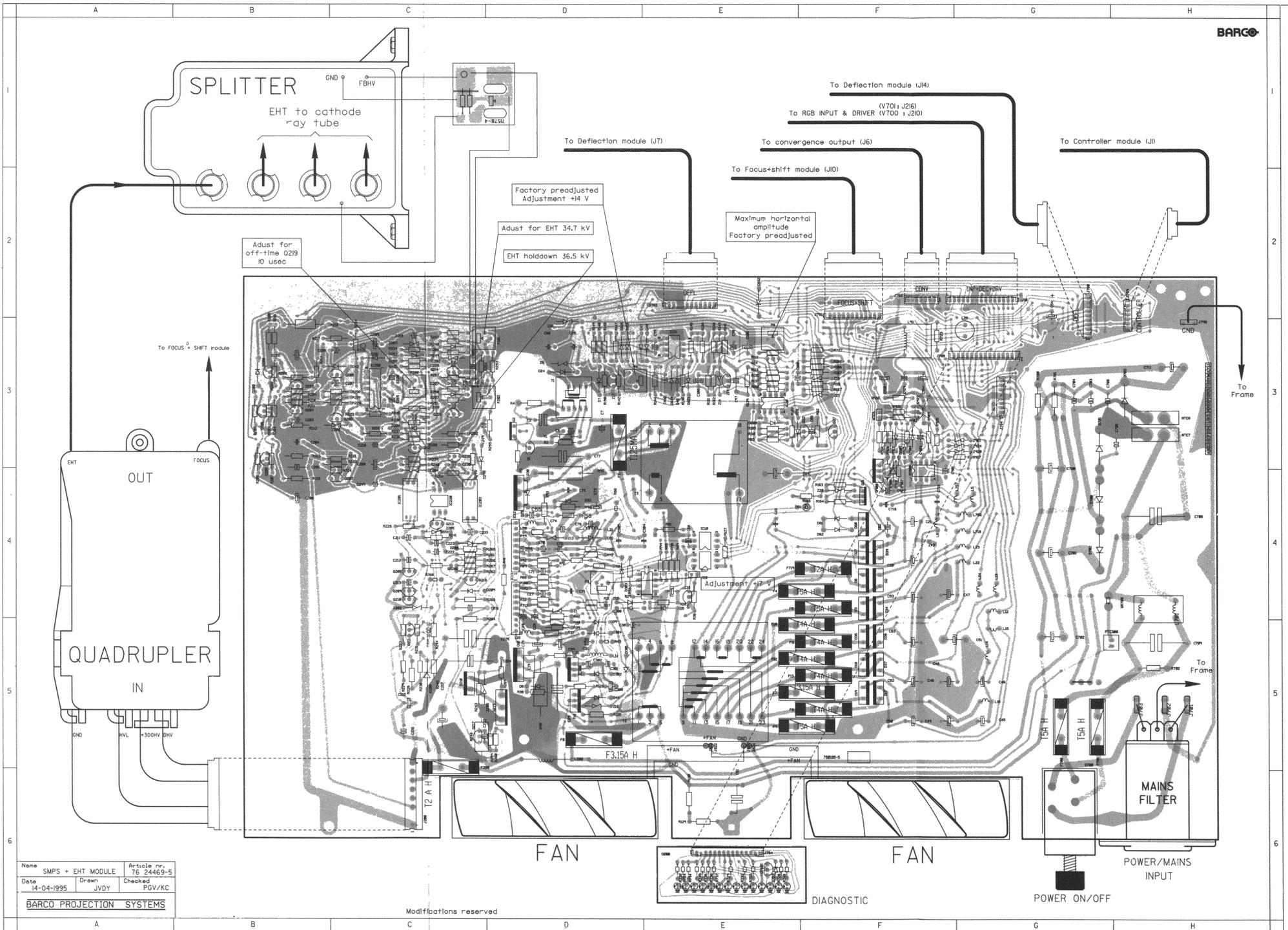
To Avoid DANGER TO LIFE, do not attempt to service the chassis until all precautions necessary for working on HIGH VOLTAGE equipment have been observed. In order to prevent damage to solid state device, do not arc picture tube anode lead to chassis or earth ground.





Modifications reserved

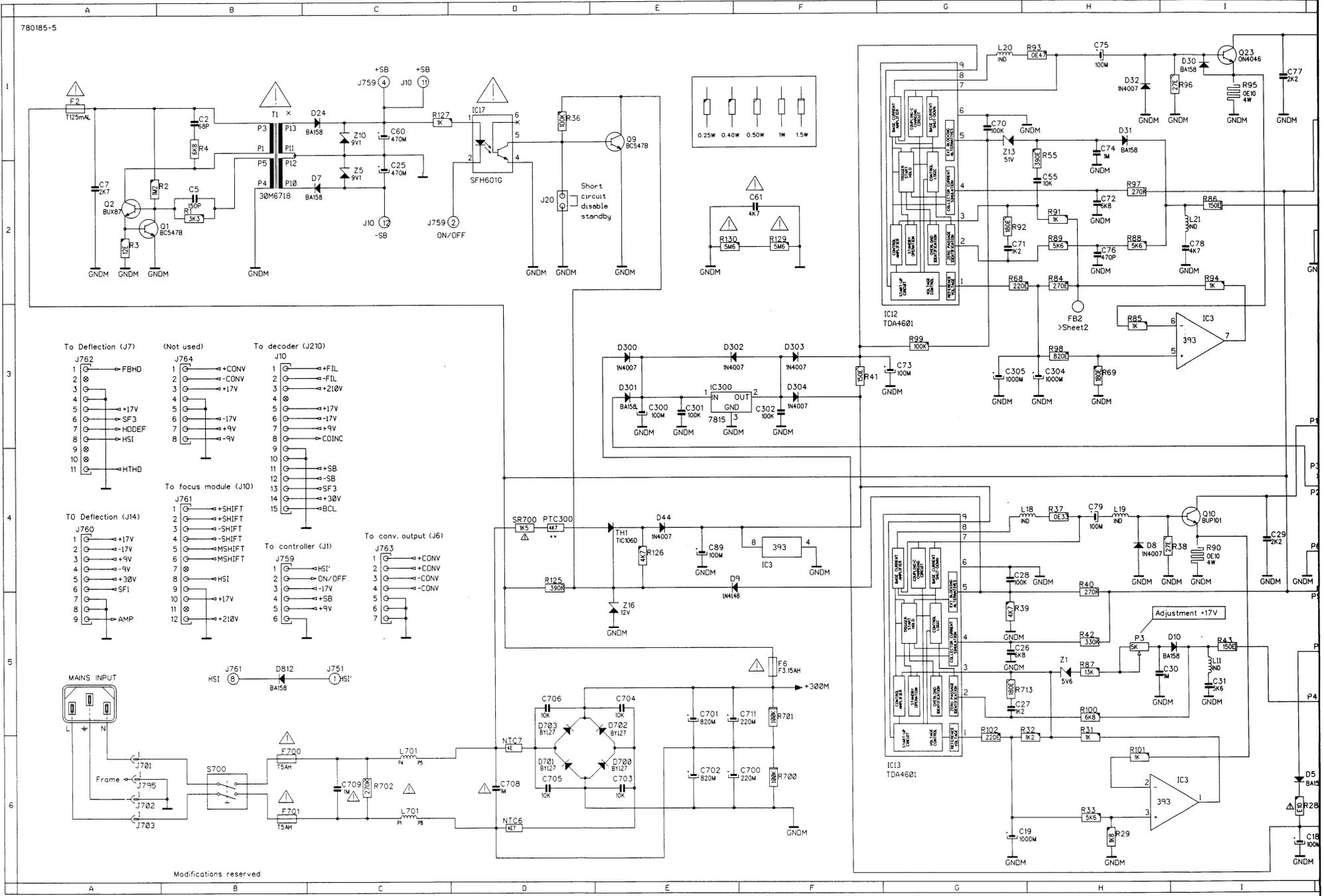
Name Interconnection		Article nr.
SMPS + EHT MODULE		76 24469
Date	Drawn	Checked
08-03-1995	JVDY	PGV/KC
BARCO PROJECTION SYSTEMS		



Name	SMPS + EHT MODULE	Article nr.	76 24469-5
Date	14-04-1995	Drawn	JVDY
		Checked	PGV/KC
BARCO PROJECTION SYSTEMS			

Modifications reserved

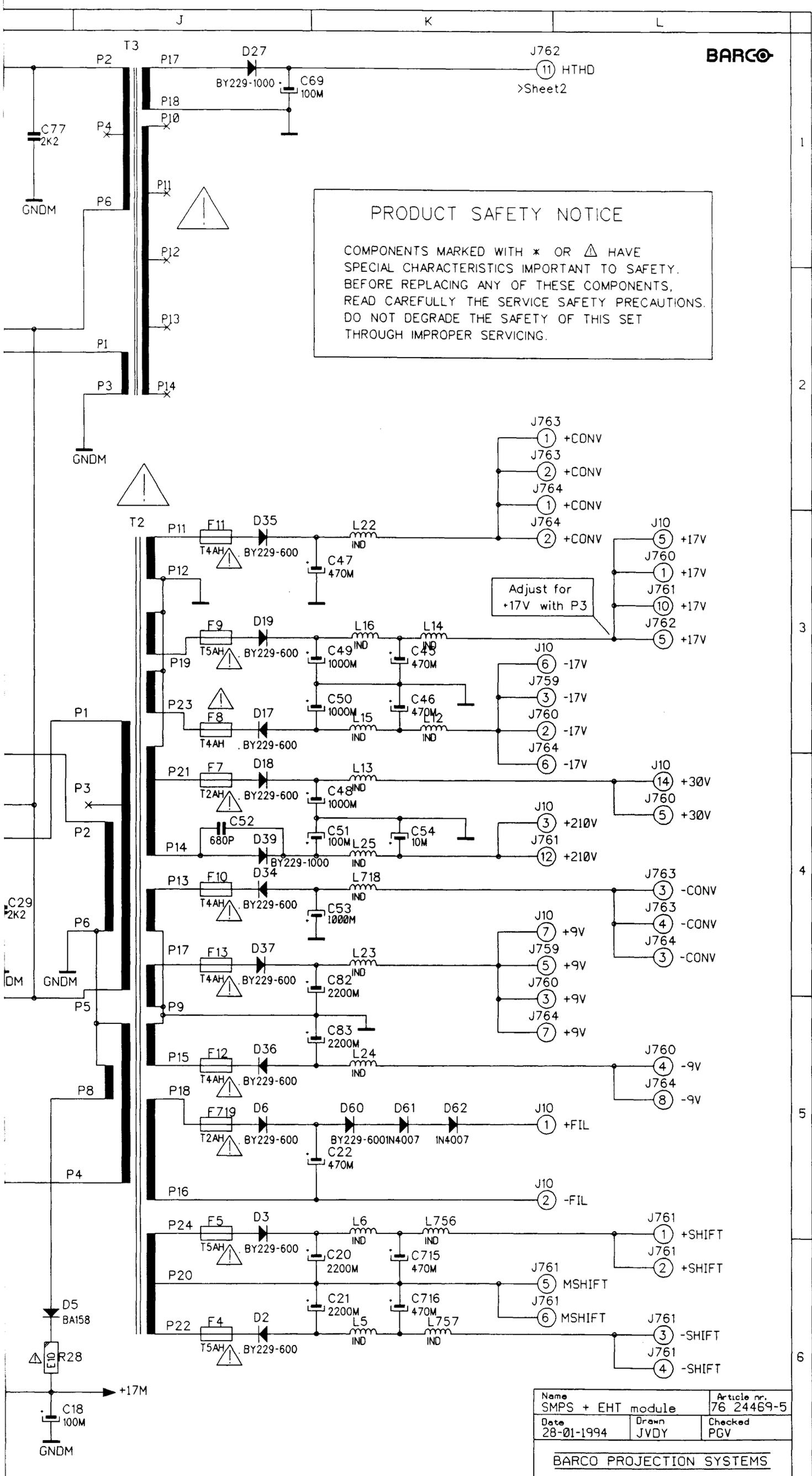
780185-5



Modifications reserved

PRODUCT SAFETY NOTICE

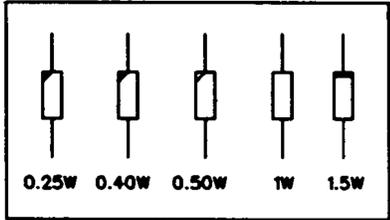
COMPONENTS MARKED WITH * OR Δ HAVE SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. BEFORE REPLACING ANY OF THESE COMPONENTS, READ CAREFULLY THE SERVICE SAFETY PRECAUTIONS. DO NOT DEGRADE THE SAFETY OF THIS SET THROUGH IMPROPER SERVICING.



Name SMPS + EHT module		Article nr. 76 24469-5
Date 28-01-1994	Drawn JVVDY	Checked PGV

BARCO PROJECTION SYSTEMS

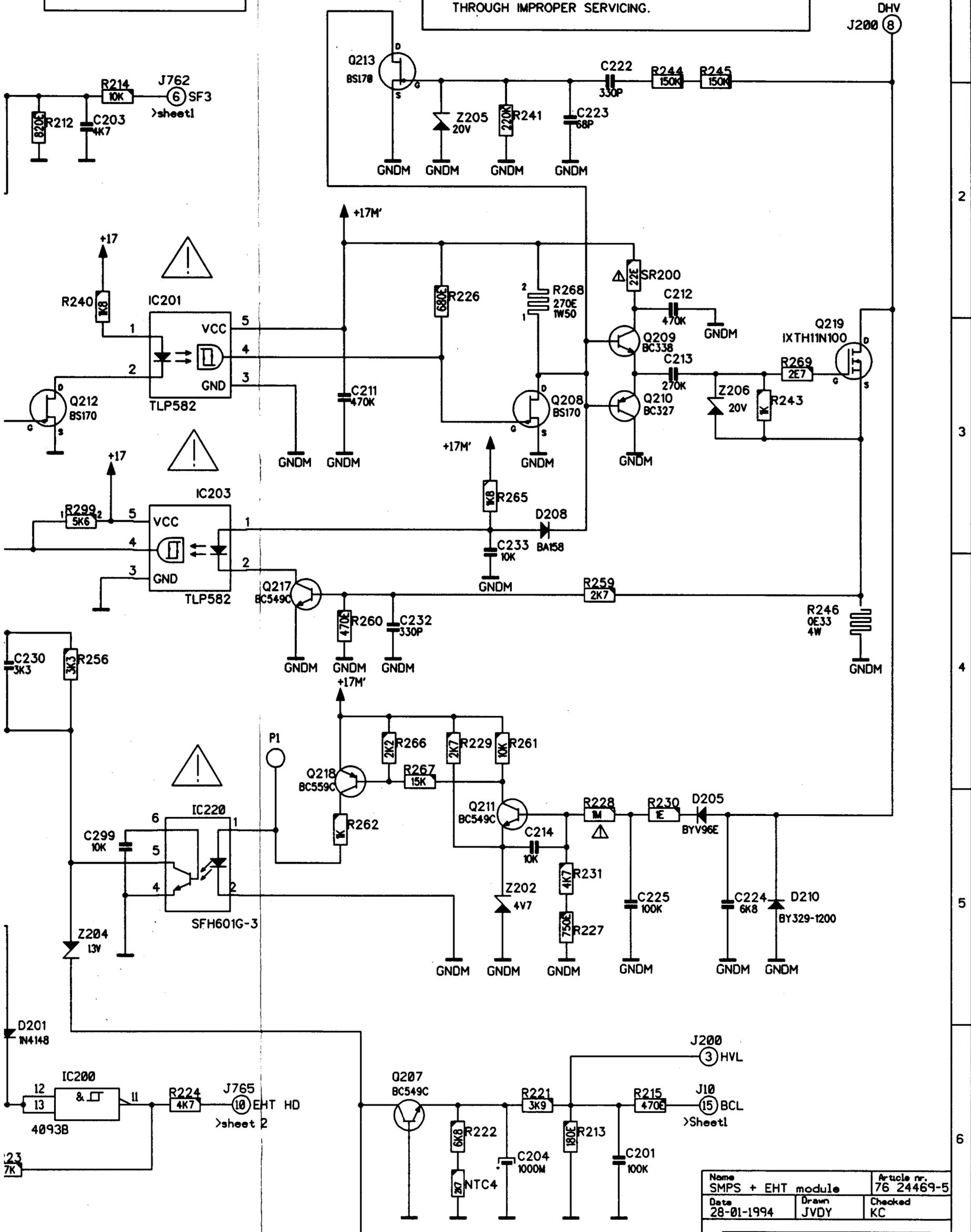
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C5	B	2	sheet	1	C919	D	5	sheet	2	IC20	H	3	sheet	2
C7	A	2	sheet	1	C927	C	5	sheet	2	IC21	E	1	sheet	2
C18	A	6	sheet	1	C928	C	4	sheet	3	IC21	H	1	sheet	2
C19	G	6	sheet	1	C929	C	5	sheet	3	IC21	G	1	sheet	2
C20	K	6	sheet	1						IC21	G	1	sheet	2
C21	K	6	sheet	1	D2	J	6	sheet	1	IC200	A	2	sheet	3
C22	K	5	sheet	1	D3	J	5	sheet	1	IC200	A	2	sheet	3
C25	C	2	sheet	1	D5	I	6	sheet	1	IC200	G	6	sheet	3
C26	G	5	sheet	1	D6	J	5	sheet	1	IC200	F	6	sheet	3
C27	G	5	sheet	1	D7	C	2	sheet	1	IC200	E	3	sheet	3
C28	G	4	sheet	1	D8	H	4	sheet	1	IC200	D	3	sheet	3
C29	I	4	sheet	1	D9	E	4	sheet	1	IC201	G	2	sheet	3
C30	H	5	sheet	1	D10	I	5	sheet	1	IC202	C	2	sheet	3
C31	I	5	sheet	1	D17	J	3	sheet	1	IC203	G	3	sheet	3
C45	K	3	sheet	1	D18	J	4	sheet	1	IC220	G	5	sheet	3
C46	K	3	sheet	1	D19	J	3	sheet	1	IC300	E	3	sheet	1
C47	K	3	sheet	1	D24	C	1	sheet	1	IC777	A	5	sheet	3
C48	K	4	sheet	1	D27	J	1	sheet	1	IC778	A	6	sheet	3
C49	K	3	sheet	1	D28	G	6	sheet	2	IC900	A	5	sheet	2
C50	K	3	sheet	1	D30	I	1	sheet	1					
C51	K	4	sheet	1	D31	H	1	sheet	1	J6	D	5	sheet	3
C52	J	4	sheet	1	D32	H	1	sheet	1	J6	D	5	sheet	3
C53	K	4	sheet	1	D34	J	4	sheet	1	J10	B	3	sheet	1
C54	K	4	sheet	1	D35	J	3	sheet	1	J20	D	2	sheet	1
C55	H	2	sheet	1	D36	J	5	sheet	1	J200	A	3	sheet	3
C60	C	1	sheet	1	D37	J	4	sheet	1	J700	E	5	sheet	1
C61	F	2	sheet	1	D39	J	4	sheet	1	J701	A	6	sheet	1
C68	E	6	sheet	2	D42	E	2	sheet	3	J702	A	6	sheet	1
C69	J	1	sheet	1	D44	E	4	sheet	1	J703	A	6	sheet	1
C70	G	1	sheet	1	D46	F	2	sheet	2	J754	A	1	sheet	2
C71	G	2	sheet	1	D47	H	1	sheet	2	J759	B	4	sheet	1
C72	H	2	sheet	1	D48	H	1	sheet	2	J760	A	4	sheet	1
C73	G	3	sheet	1	D51	F	5	sheet	2	J761	B	4	sheet	1
C74	H	1	sheet	1	D60	K	5	sheet	1	J762	A	3	sheet	1
C75	H	1	sheet	1	D61	K	5	sheet	1	J763	C	4	sheet	1
C76	H	2	sheet	1	D62	K	5	sheet	1	J764	B	3	sheet	1
C77	I	1	sheet	1	D200	E	1	sheet	3	J765	B	1	sheet	2
C78	I	2	sheet	1	D201	G	5	sheet	3	J779	C	5	sheet	3
C79	H	4	sheet	1	D202	D	3	sheet	2	J780	C	6	sheet	3
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C83	K	5	sheet	1	D204	C	2	sheet	3	J822	D	6	sheet	2
C85	H	5	sheet	2	D205	I	5	sheet	3	J823	D	6	sheet	2
C89	E	4	sheet	1	D206	B	1	sheet	3	J824	D	6	sheet	2
C97	G	3	sheet	2	D207	C	2	sheet	3	J825	D	6	sheet	2
C98	D	2	sheet	2	D208	I	3	sheet	3					
C99	G	1	sheet	2	D209	A	1	sheet	3	L5	K	6	sheet	1
C100	G	5	sheet	2	D210	J	5	sheet	3	L6	K	5	sheet	1
C105	F	3	sheet	2	D298	F	3	sheet	3	L11	I	5	sheet	1
C106	F	3	sheet	2	D300	E	3	sheet	1	L12	K	3	sheet	1
C200	D	2	sheet	3	D301	E	3	sheet	1	L13	K	4	sheet	1
C201	I	6	sheet	3	D302	E	3	sheet	1	L14	K	3	sheet	1
C202	C	1	sheet	3	D303	F	3	sheet	1	L15	K	3	sheet	1
C203	G	2	sheet	3	D304	F	3	sheet	1	L16	K	3	sheet	1
C204	I	6	sheet	3	D600	G	5	sheet	2	L18	H	4	sheet	1
C205	B	1	sheet	3	D700	E	6	sheet	1	L19	H	4	sheet	1
C206	E	6	sheet	3	D701	D	6	sheet	1	L20	G	1	sheet	1
C207	E	5	sheet	3	D702	E	5	sheet	1	L21	I	2	sheet	1
C208	A	2	sheet	3	D703	D	5	sheet	1	L22	K	3	sheet	1
C209	E	3	sheet	3	D726	B	3	sheet	2	L23	K	4	sheet	1
C210	E	6	sheet	3	D738	B	3	sheet	2	L24	K	5	sheet	1
C211	H	3	sheet	3	D739	B	3	sheet	2	L25	K	4	sheet	1
C212	I	2	sheet	3	D740	A	3	sheet	2	L200	A	3	sheet	3
C213	I	3	sheet	3	D741	B	3	sheet	2	L701	C	6	sheet	1
C214	I	5	sheet	3	D742	C	3	sheet	2	L701	C	6	sheet	1
C215	A	1	sheet	3	D743	A	3	sheet	2	L701	C	6	sheet	1
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C217	A	3	sheet	3	D747	C	3	sheet	2	L756	K	5	sheet	1
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C228	C	3	sheet	3	D819	E	2	sheet	2	P3	H	5	sheet	1
C229	F	4	sheet	3	D821	E	1	sheet	2	P7	G	2	sheet	2
C230	F	4	sheet	3	D904	C	6	sheet	2	P8	G	4	sheet	2
C231	A	2	sheet	3	D905	C	5	sheet	2	P200	D	3	sheet	3
C232	H	4	sheet	3	D910	C	5	sheet	2	P201	D	6	sheet	3
C233	I	3	sheet	3	D930	B	6	sheet	3	P202	D	6	sheet	3
C299	G	5	sheet	3	D931	B	4	sheet	3					
C300	E	3	sheet	1	D932	B	6	sheet	3	PTC30D	4	sheet	1	
C301	E	3	sheet	1	D933	B	5	sheet	3					
C302	F	3	sheet	1						Q1	B	2	sheet	1
C304	H	3	sheet	1	F2	A	1	sheet	1	Q2	A	2	sheet	1
C305	G	3	sheet	1	F4	J	6	sheet	1	Q9	E	1	sheet	1
C700	F	6	sheet	1	F5	J	5	sheet	1	Q10	I	4	sheet	1
C701	E	5	sheet	1	F6	F	5	sheet	1	Q22	G	6	sheet	2
C702	E	6	sheet	1	F7	J	4	sheet	1	Q23	I	1	sheet	1
C703	E	6	sheet	1	F8	J	3	sheet	1	Q24	F	3	sheet	2
C704	E	5	sheet	1	F9	J	3	sheet	1	Q27	H	5	sheet	2
C705	D	6	sheet	1	F10	J	4	sheet	1	Q31	F	5	sheet	2
C706	D	5	sheet	1	F11	J	3	sheet	1	Q200	E	1	sheet	3
C708	D	6	sheet	1	F12	J	5	sheet	1	Q201	D	1	sheet	3
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C781	A	5	sheet	3	F719	J	5	sheet	1	Q206	E	6	sheet	3
C782	B	5	sheet	3						Q207	H	6	sheet	3
C783	B	6	sheet	3	IC3	I	6	sheet	1	Q208	I	3	sheet	3
C784	A	6	sheet	3	IC3	F	4	sheet	1	Q209	I	3	sheet	3
C787	A	6	sheet	3	IC3	F	4	sheet	1	Q211	H	5	sheet	3
C788	A	5	sheet	3	IC3	I	3	sheet	1	Q212	G	3	sheet	3
C789	C	5	sheet	3	IC10	F	5	sheet	2	Q213	H	1	sheet	3
C790	C	4	sheet	3	IC12	G	3	sheet	1	Q214	C	1	sheet	3
C816	D	2	sheet	2	IC13	G	6	sheet	1	Q215	C	3	sheet	3
C901	A	6	sheet	2	IC17	D	1	sheet	1	Q216	F	4	sheet	3
C903	B	6	sheet	2	IC20	G	2	sheet	2	Q217	H	4	sheet	3
C910	B	6	sheet	2	IC20	H	2	sheet	2	Q218	H	4	sheet	3
Q219	J	2	sheet	3						Q219	J	2	sheet	3
Q746	D	3	sheet	2						Q746	D	3	sheet	2
Q908	B	5	sheet	2						Q908	B	5	sheet	2
Q922	C	6	sheet	2						Q922	C	6	sheet	2
R1	B	2	sheet	1						R1	B	2	sheet	1
R2	B	2	sheet	1						R2	B	2	sheet	1
R3	A	2	sheet	1						R3	A	2	sheet	1
R4	B	1	sheet	1						R4	B	1	sheet	1
R28	I	6	sheet	1						R28	I	6	sheet	1
R29	H	6	sheet	1						R29	H	6	sheet	1
R31	H	5	sheet	1						R31	H	5	sheet	1
R32	G	5	sheet	1						R32	G	5	sheet	1
R33	H	6	sheet	1						R33	H	6	sheet	1
R36	D	1	sheet	1						R36	D	1	sheet	1
R37	H	4	sheet	1						R37	H	4	sheet	1



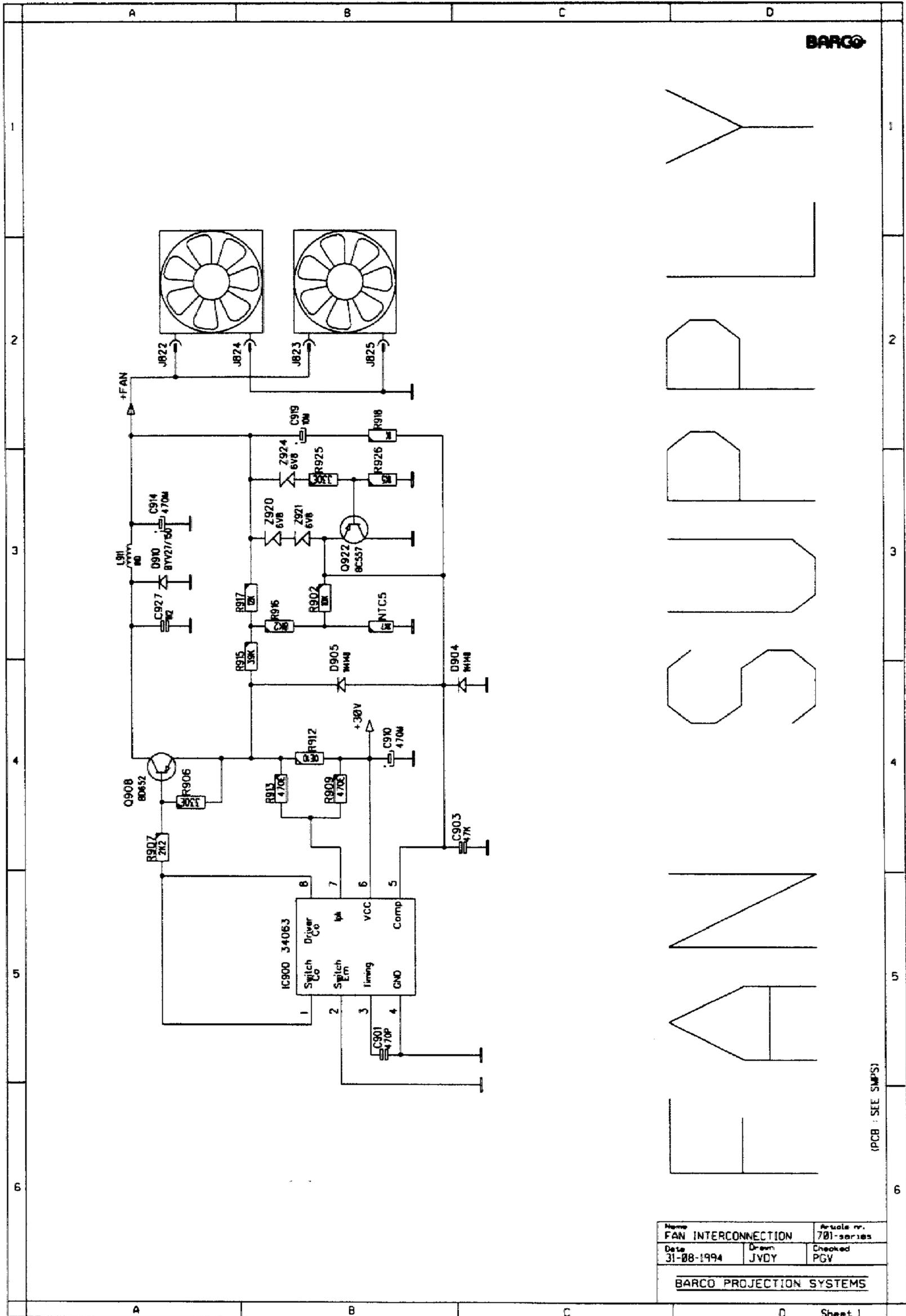
PRODUCT SAFETY NOTICE

COMPONENTS MARKED WITH * OR Δ HAVE SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. BEFORE REPLACING ANY OF THESE COMPONENTS, READ CAREFULLY THE SERVICE SAFETY PRECAUTIONS. DO NOT DEGRADE THE SAFETY OF THIS SET THROUGH IMPROPER SERVICING.

BARCO



Name SMPS + EHT module		Article nr. 76 24469-5
Date 28-01-1994	Drawn JVDY	Checked KC
BARCO PROJECTION SYSTEMS		



BARCO

FAN SUPPLY

SCHEMATIC NAME: fan.sch SHEET NUMBER: 1 DATE: May 15, 1996

(PCB : SEE SMPS)

Name	FAN INTERCONNECTION	Article no.	781-series
Date	31-08-1994	Drawn	JVDY
		Checked	PGV

BARCO PROJECTION SYSTEMS

Sheet 1

Adjustment procedure SM Power Supply+EHT module

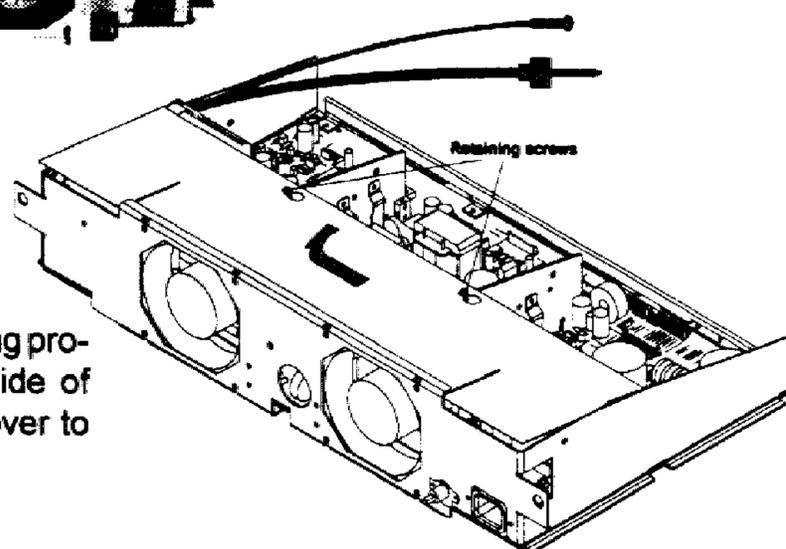
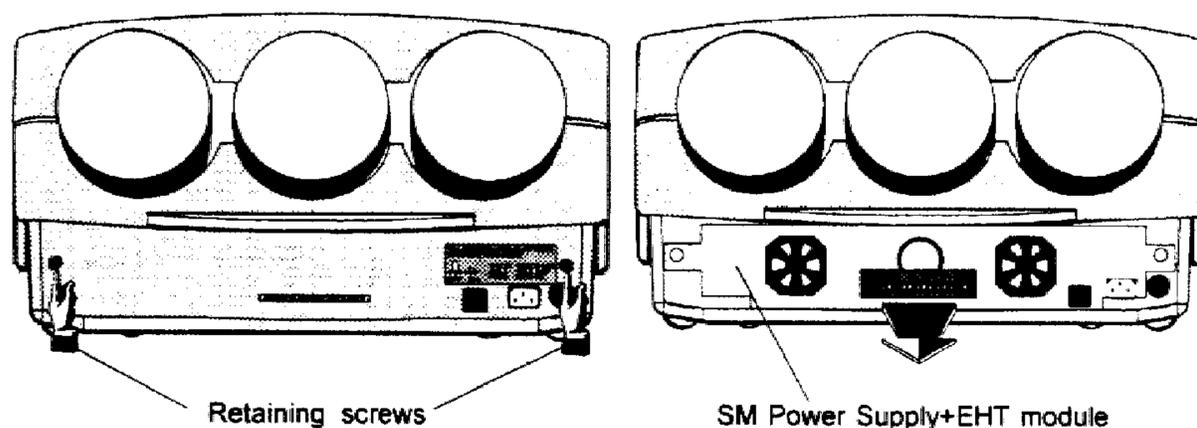
Important

The SM Power Supply has to be adjusted when the projector displays a picture of the internal generated testpattern or of an input signal at **standard line- and frame frequency**.

Preparation

Access to adjustments

- Unplug the power cord from the power input on the front panel.
- Remove the two screws holding front panel to main frame of the projector.
- Remove the front panel.
- Slide the SM Power Supply+EHT module out of the main frame so far until all adjustment controls are accessible.



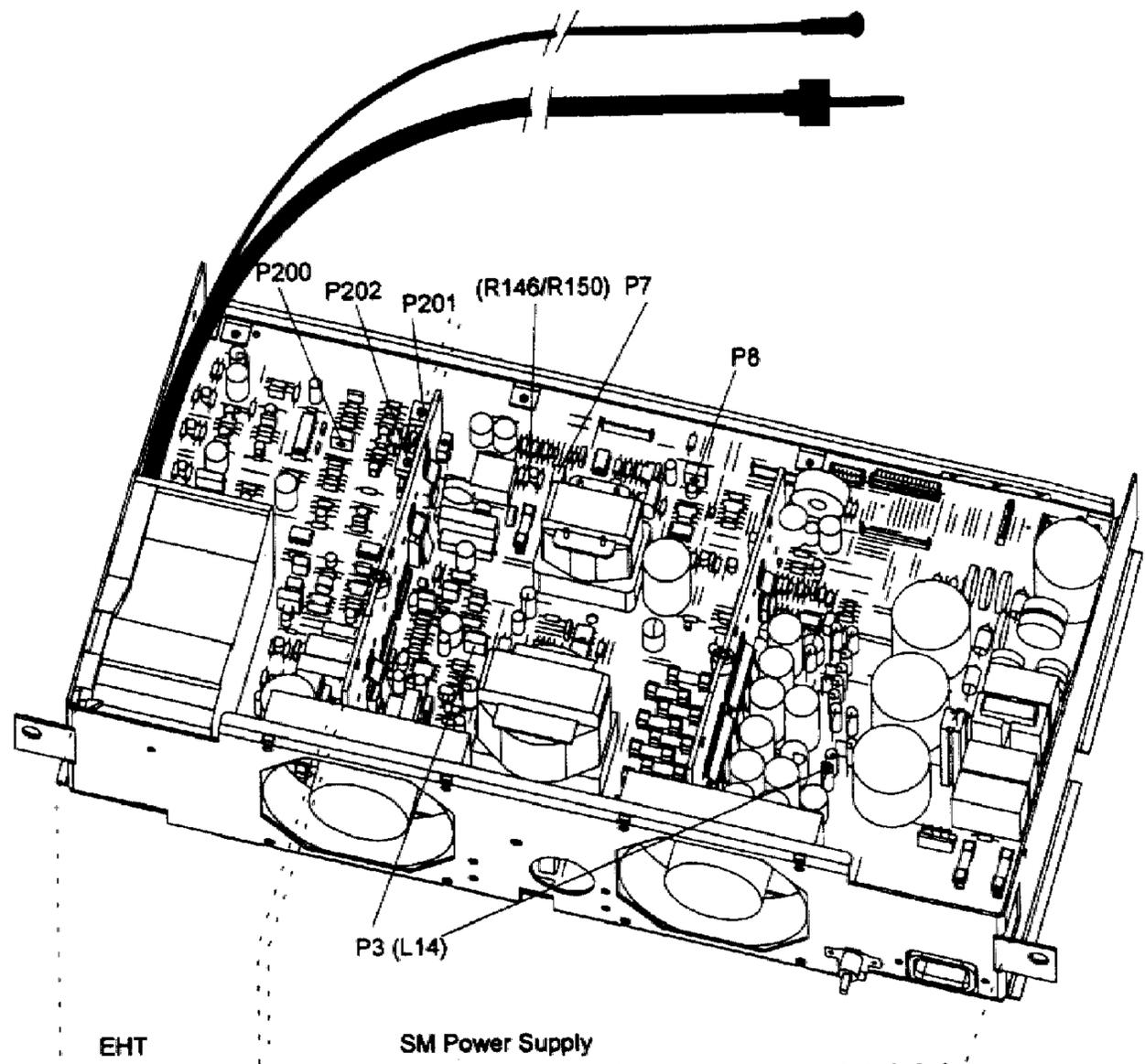
- Loosen two screws holding protective cover to upper side of the module. Slide the cover to the left to remove.

- Reinstall power connection and switch ON the projector.
- Select the internal generated test pattern or an input source at standard frequency (refer to owner's and installation manual of the projector)
- Put the BRIGHTNESS and the CONTRAST level in mid-position (refer to owner's manual of the projector)

proceed to the adjustments,

Adjustments

Location of adjustment controls



Summary of adjustment controls

SM Power Supply	P3	Adjustment of the +17V
	P7	Adjustment of the +14V (R146/R150)
	P8	Adjustment of the Max Hor. Ampl.
EHT Power Supply	P200	Adjustment of the Switching transistor 'Time OFF'
	P201	Adjustment of the +High Voltage
	P202	Adjustment of the +Hold Down

SM Power Supply

a) Adjusting Vout P3 (adjusted voltage +17V)

- Connect a voltmeter to the top of the coil L14 (+17V).
- Adjust potentiometer P3 for +17V read out.

b) Adjusting the Reference voltage of the drop circuit P7

Important: Potentiometer P7 is factory pre-adjusted. A readjustment is only necessary after a replacement of a defective component in the +17V drop circuit.

- Connect a voltmeter to the node R146/R150 (cathode Z17).
- Adjust potentiometer P7 for +14V read out.

c) Adjusting the MAXIMUM Horizontal Amplitude P8

Starting-point: projector operates on a standard video signal (15.6kHz)

Adjustment:

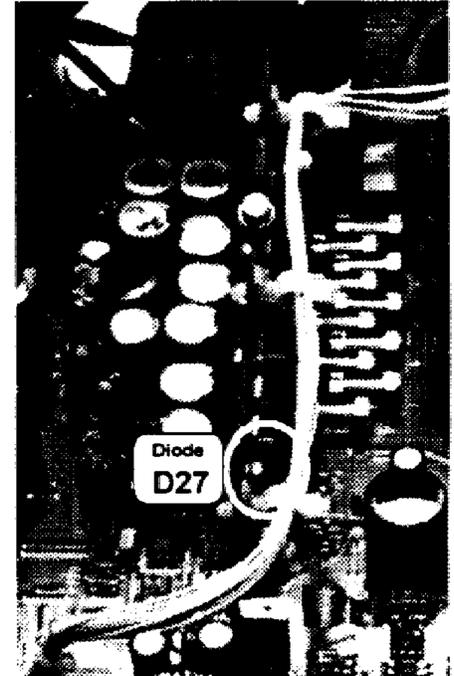
- Adjust the Horizontal Amplitude of the displayed picture by means of the RCU until the bar scale on screen indicates 50. (Refer to the owner's manual of the projector to select the corresponding menu for adjustment).

- Connect a voltmeter to the cathode of the diode D27 (+HTHD) and adjust the potentiometer P8 for:

+38V read out for CRT R7622072-5-6

and

+35V read out for CRT R7623292-5-6



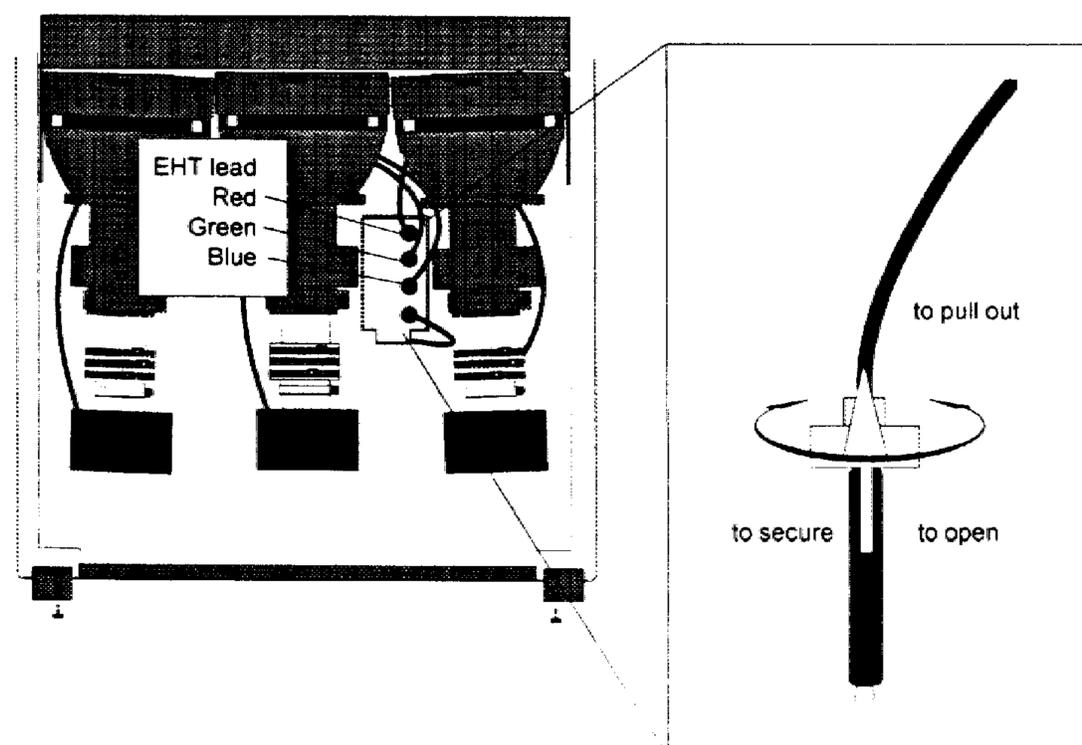
EHT Power Supply

Preparation

WARNING: The power must be OFF before removing any connector from circuit board or unit. Failure to do so may result in severe damage to the projection unit.

- Turn the projector OFF.
- Put the potentiometers P201 and P202 in their minimum position (turning clockwise!).
- Pull out one CRT-EHT cable from the EHT splitter.
- Insert in the free EHT connector the precision EHT probe (ratio 1000/1)

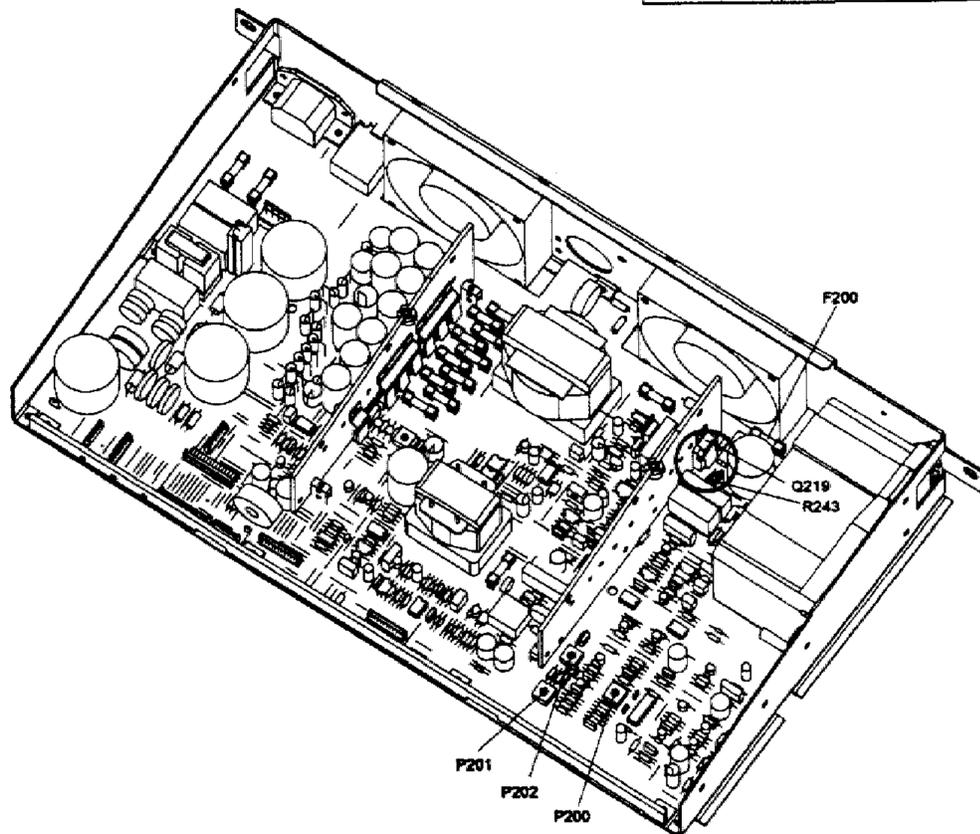
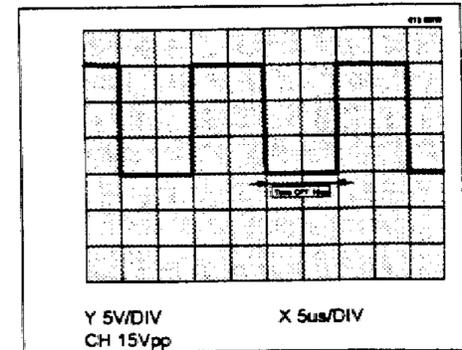
Caution: read carefully all safety instructions, mentioned in the user's manual of the precision high voltage probe.



Adjustments

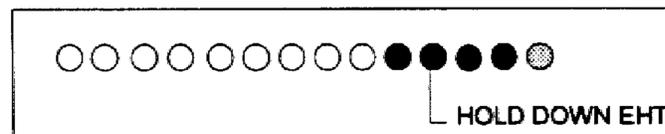
a) Adjusting Switching transistor 'time OFF' P200

- Remove Fuse 'F200' out of fuseholder
- Connect the oscilloscope to the resistor R243 (= gate of the switching transistor Q219)
- Switch ON the projector.
- Adjust potentiometer P200 for a pulse 'time OFF' width of 10us.



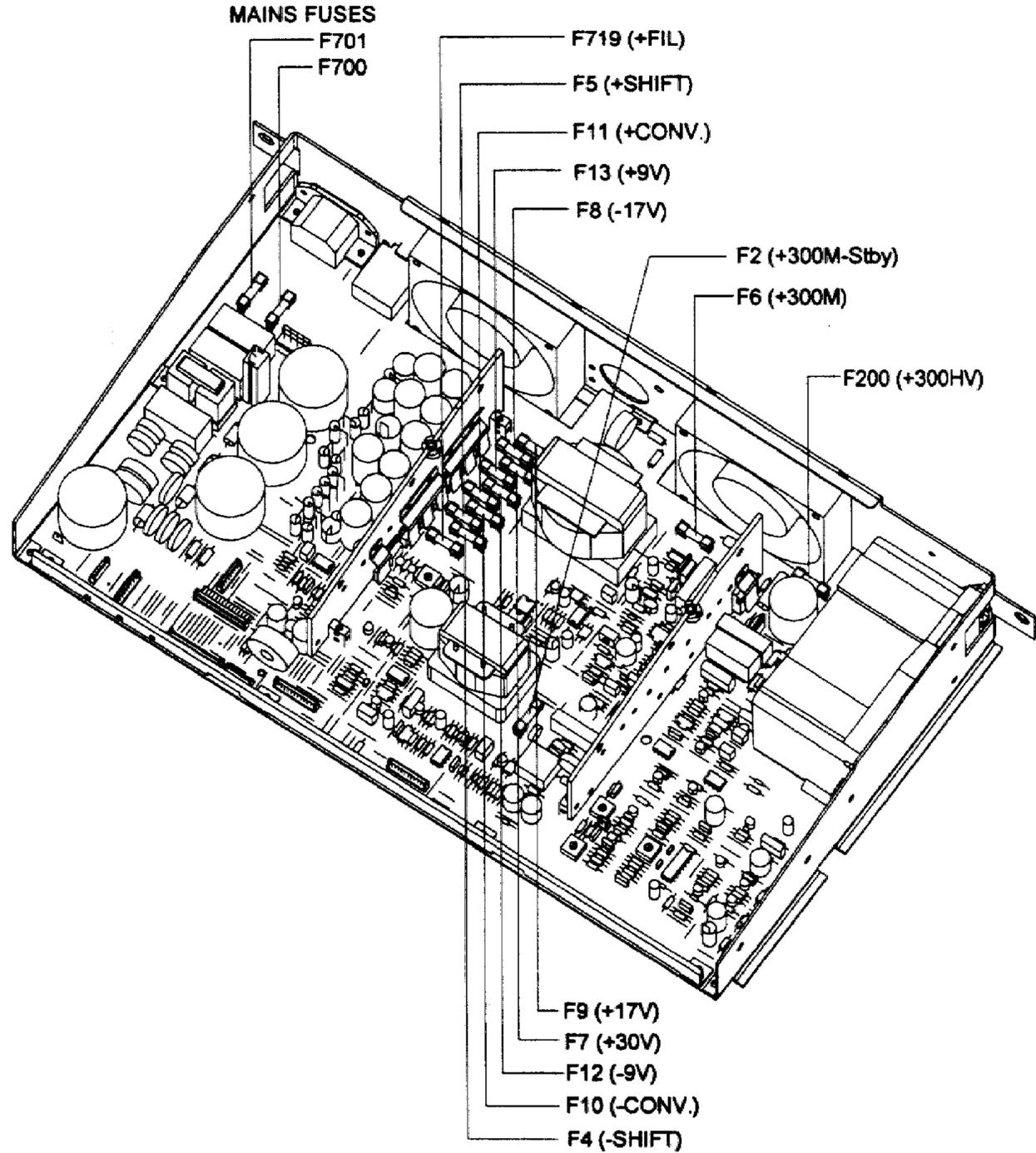
b) Adjusting P201 'High Voltage' and P202 'Hold Down'

- Switch OFF the projector.
- Put the fuse F200 on its place.
- Switch on the projector.
- Adjust potentiometer P201 'High Voltage adj.' until the EHT voltage reaches 36.5kV.
- Turn the potentiometer P202 'Hold Down' until the Hold Down EHT LED lights up. (Hold Down EHT LED located on the diagnostic panel, visible on the front panel) The projector switches at that moment into Hold Down mode, picture disappears.



- Put the potentiometer P201 again in its minimum position (turning clockwise!).
- Switch OFF and ON the projector.
- Adjust the potentiometer P201 for an EHT voltage of 34.7kV.

Location of fuses

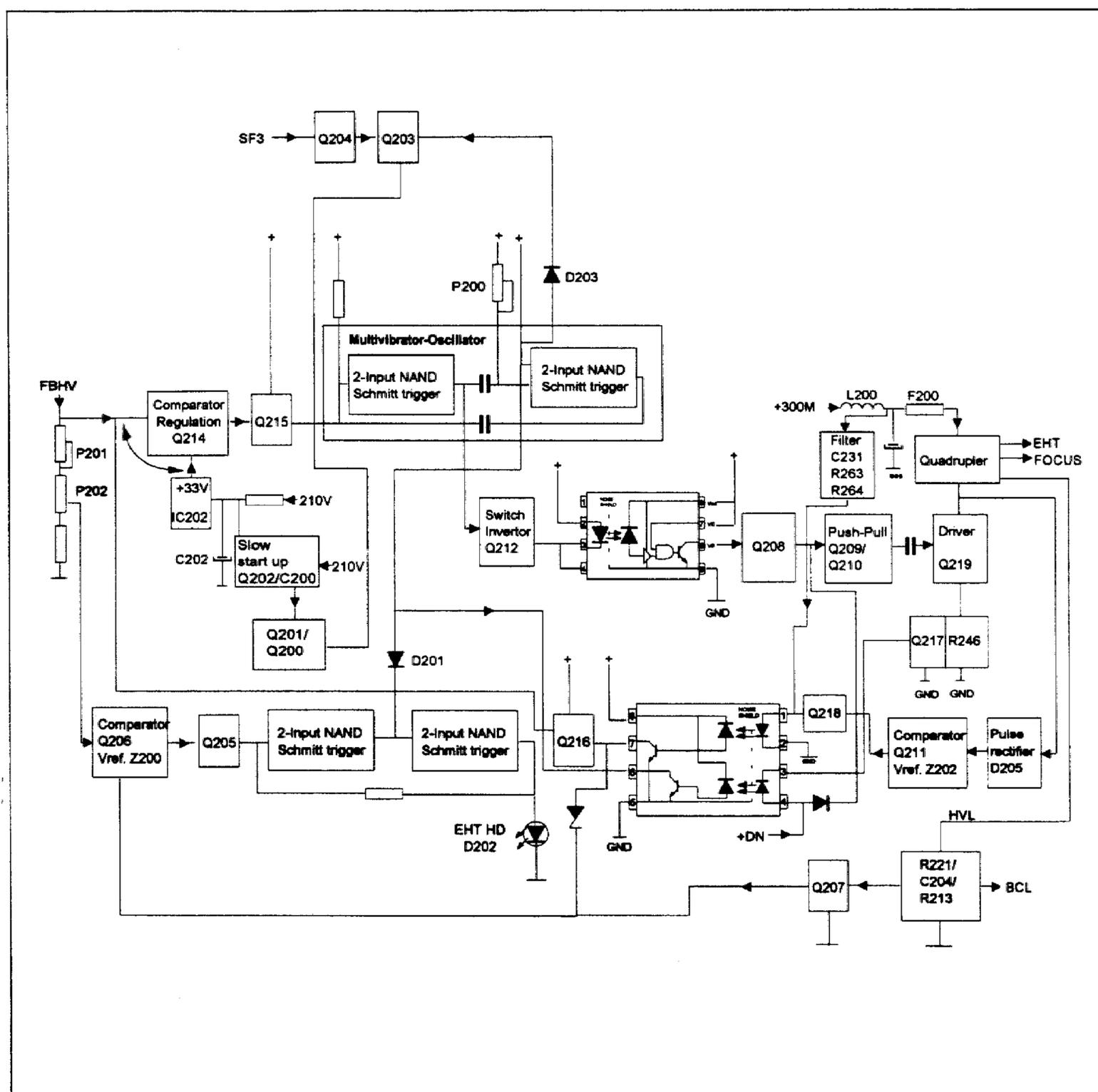


PRODUCT SAFETY NOTICE

Components identified by  have SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. Before replacing any of these components, read carefully the service safety precautions.

R314142	F..2	F 5X20 T	0A125L	RU/VDE	R3141041	F.11	F 5X20 T	4A	H	RU/VDE	
R314104	F..4	F 5X20 T	5A	H	RU/VDE	R3141041	F.12	F 5X20 T	4A	H	RU/VDE
R314104	F..5	F 5X20 T	5A	H	RU/VDE	R3141041	F.13	F 5X20 T	4A	H	RU/VDE
R314147	F..6	F 5X20 F	3A15	H	RU/VDE	R314116	F200	F 5X20 T	2A	H	RU/VDE
R314103	F..7	F 5X20 T	3A15	H	RU/VDE	R314104	F700	F 5X20 T	5A	H	RU/VDE
R3141041	F..8	F 5X20 T	4A	H	RU/VDE	R314104	F701	F 5X20 T	5A	H	RU/VDE
R314104	F..9	F 5X20 T	5A	H	RU/VDE	R314116	F719	F 5X20 T	2A	L	RU/VDE
R3141041	F.10	F 5X20 T	4A	H	RU/VDE						

Blockdiagram EHT Power supply



TECHNICAL DESCRIPTION OF THE SM POWER SUPPLY

Introduction.

On this module we find the generation of all stable voltages , we mean voltages independent on the line frequency, the variable +HTHD voltage (referred to as the second SMPS) and the generation of the EHT voltage.

This second SMPS is linked with the horizontal deflection module as the +HTHD voltage (horizontal scan voltage) is linearly proportional with the line frequency.

Because the 'second' SMPS utilizes the rectified voltage from the winding P2-P6, this SMPS totally depends on the 'first' one', or in other words, if the first SMPS is down , the second one 'follows' .

The ON/OFF voltage delivered by the controller module can stop or start up these Switched Mode Power Supplies.

The module comprises also the DC-fan control, the regulation circuit for the +HTHD, its Under- and Overvoltage protection circuits, the +17volts drop protection and the stand-by power supply.

Generation of the line frequency independent voltages.

The mains voltage is rectified with D700-D703 and the +300 volts (+300M) is now the supply voltage for the power switches Q10 and Q23 on the module.

We assume that the thyristor TH1 TIC106C is conducting (its gate is not clamped at ground level, see later).

The positive halfwave of the mains voltage (START) charges C89 via D44 . The gate of the thyristor is set at 12 volts with the zener Z16 through R125 from the +300volts.

As soon as the capacitor voltage of C89 reaches approximately 12 volts, the IC13 can start up by driving the base of the power switch Q10.

The diode D44 stops conducting as its anode is at about $(11 + 0.6)$ volts.

The thyristor gets blocked as well, because its cathode equals the gate voltage.

In the meantime the IC13 has started up and the voltage at pin 9 receives its supply voltage now from the winding 2-6 of the transformer T2 via D33.

The push-pull outputs, pins 7 and 8, drive the Q10 power switch and during the off time of the latter the accumulated energy in the primary winding is transferred to the secondary capacitors via the rectifying diodes (flyback principle).

The feedback winding P4-P6 provides two informations for the control IC13 :

Firstly, the waveform is sent to pin 2 where the **zero passages** are detected, useful to drive the power switch on at the exact moment.

The base drive is delayed until the energy in the transformer has been completely transferred to the secondary side. By this measure, the current through the power switch is reduced to a minimum.

Secondly, the negative amplitude is rectified by D10 and compared with the reference 4 volts that is available at pin 1.

The error voltage is now sent to pin 3 and serves as a control voltage to adjust the duty cycle and frequency of the switcher.

The same winding also serves as a help at starting up. This winding provides energy the moment the P2-P6 winding does not. The rectified voltage passes to pin 9 up to the moment that pin has reached 12 volts.

The current through the power switch is at all times checked and if too high (in the event of a short on the secondary side) the comparator 393 (IC3) output drops the error voltage in order to adapt the duty cycle of the switcher.

Note that a "special" winding P5-P8 is provided, delivering +17M, or, a voltage related to the **Mains** ground and not the chassis ground. This voltage is utilized on the EHT board, because the drive circuit for the power switcher is Mains ground and not Chassis ground. (see description EHT board).

Generation of the +HTHD voltage (scan voltage).

This voltage is linked with the horizontal deflection board as it has to be adapted to the scanning frequency. A feedback voltage (FBHD) is for that reason arriving on the module.

This feedback voltage, at contact 1 of connector J762, is sent to the base of the error amplifier Q24. The potentiometer P8 allows an adjustment of this feedback, or in other words, the horizontal width can be aligned with P8.

The emitter of Q24 is set at a reference zener voltage, adjustable with the voltage at the regulating pin of Z19. This voltage is the result of the output of the DC-amplifier-buffer 353 (IC21), combined with the +HTHD voltage.

By this measure, we reduce the range of the horizontal width at high scanning frequencies. Indeed, at standard video frequency we need much more range to overscan.

The collector current of the regulating transistor Q24 flows into the opto-coupler IC10 and the phototransistor of this insulating device is now regulating the DC voltage at pin 3 of IC12, in order to stabilize the +HTHD voltage for one typical line frequency and amplitude setting.

Q31 is a 5mA current generator and D51 a **green** LED to visualise the +HTHD voltage.

Overvoltage protection.

Pin 2 of the 393 (IC4) is set at 5.6 volts with Z15 and, the other input, pin 3 is the scan voltage +HTHD divided by R106/R107.

As soon this input exceeds the zener voltage, the output switches high and saturates transistor Q27. Via IC10 (pin 5) the +HTHD voltage is dropped to a low level.

The original overvoltage protection is now causing an undervoltage protection.

Undervoltage protection.

The stabilized zener voltage with Z19 is used as reference voltage for the comparator 393, pin 6. Now, the other pin 5 is the +HTHD voltage.

If the pin 5 drops below the reference voltage, the output switches low, and the transistor Q22 saturates, pulling again pin 2 of IC10 low.

Protection against too low +17 volts.

If, for some reasons, the +17 volts (and all the other voltages as well) are, even temporarily, too low, it is then advised to shut down the +HTHD voltage (coming from the other SMPS).

Pin 6 is preadjusted, ex factory, at 14 volts with P7

This happens with the comparator in IC21 and its output pin 7 saturates again Q22.

**Stand-by / ON-OFF
switching.**

An oscillator is built up around Q1/Q2 and the transformer T1.

Q2 gets its base current via R2. The collector current of the latter flows in the winding P1-P3 and induces a voltage in the winding P5-P4 'encouraging' the base current.

As soon the emitter voltage of Q2 can drive the Q1 and saturate it, this transistor clamps the base of Q2 at ground level and cuts off Q2. The cycle starts all-over again.

Two opposite polarity SB voltages (+/- 9 volts) are available at the secondary side.

a) Stand-by mode (OFF).

The voltage at contact 2 of the J759 connector ('OFF') is in this case 'high' and this means for the optocoupler IC17 that the phototransistor in IC17 is not conducting.

The transistor Q9 is thus saturated as R36 can provide the required base-emitter current.

The collector of Q9 is 'low'. Furthermore, pin 5 of IC13 is below its "active level" via the diode D9 disabling the drive output.

As a conclusion, only the standby voltages +/- 9 SB voltages are available.

b) Operational mode (ON).

The I/O block of the controller module (collector of a transistor) pulls now contact 2 of J759 at a low level to light the LED in the opto-coupler IC17.

Now, the phototransistor of the latter is saturated and brings the base of Q9 at nearly ground level. This means now for this transistor an OFF state.

The zener Z16 can now install +11 volts at the gate of the thyristor allowing the charge of the capacitor C89.

DC Fan control of the fans. The speed of the fans is regulated by means of a sensor (NTC resistor, mounted close to the heatsink of the SMPS board).

IC900 is an integrated circuit regulating the speed of the fans by adapting the duty cycle of the output drive for the power transistor Q908. L911 and C914 filters the output voltage.

The feedback is applied to pin 5 which is protected against arcing with D904/D905.

MC34063 is a switching regulator. An oscillator trimmed with C901 is applied together with a dc voltage to an RS-flipflop via an AND gate. That DC voltage now is the result

of a comparator output receiving an internal reference voltage of 1.25 volts and the feedback voltage at pin 5 (comp). Consequently, the duty cycle depends on the DC voltage that is built up as follows :

- it is determined by the output voltage via R917 / R916 / R902 in order to stabilize the latter for a well-determined value of the NTC resistor.
- it is equally influenced by any change of the NTC resistor itself, sensing the heatsink of the SMPS board.

The minimum voltage is set by Z924 at approximately 7.5 volts and the maximum speed by Z920 + Z921. at 15 volts.

The maximum current output is limited by R909, and an RC feedback straight from the output to pin 5 provides a more regular speed at any time.

Power supply for the EHT generator.

The EHT generator is supplied directly from the rectified mains voltage +300M volts.

By above measure, we eliminate the influence of the EHT load on the performance of the power supply, and the maximum peak current of the EHT generator is increased.

TECHNICAL DESCRIPTION OF THE EHT POWER SUPPLY

Introduction.

On this part of the module, the EHT drive pulses for the EHT power supply are generated. The primary circuit for the EHT power supply receives its 300VDC supply from the Mains. In the event of a failure, either because the EHT is too high, too much current in the EHT circuit or a horizontal or vertical scan failure condition exists, the EHT voltage is discontinued. We will discuss the generation of the EHT pulses, the regulation of the high voltage and the different protection circuits.

DC controlled multivibrator.

The EHT multivibrator is configured around two Schmidt Trigger NAND gates in IC200. Two time constants are involved in this circuit : C220 / P200 / R232 and in the feedback loop C219 / R155 + transistor Q215.

The first time constant is fixed and determines the OFF time of the power switch Q219 and is tuned with P200 to 10 μ S. The second time constant is variable and depends on the current flow through Q215. By varying the bias on transistor Q215, the time constant can be varied. Q215 is driven by the comparator Q214. This Q214 receives its base bias voltage from FBHV(feedback high voltage from the divider by 1000 circuit on the splitter. The emitter of Q214 is set at +33 volts by zener IC202. The duty cycle or the on/off time of the power switcher Q219 is regulated by the voltage difference detected by Q214, between the fixed emitter and the FBHV from the splitter. The frequency of this oscillator is typically 80 khz.

The squared waveform at pin 3 (IC200) of the NAND gate is, via a fast switching and inverting FET Q212, sent to the opto-coupler IC201. This opto-coupler is necessary because the remainder of the circuit is supplied with the +DN (+17M) and the +300M which are not isolated from the Mains. The +17M voltage is obtained from a special winding on the SMPS and the +300M is the main bridge rectified mains voltage (GNDM is mains or hot ground).

Caution : Any servicing on a module that uses both a Mains Ground and a Chassis ground should involve the use of an Isolation Transformer, especially when using an oscilloscope, or other equipment connected to the main AC source. Do not connect the Main and Chassis Ground together at any time.

The supply voltage of this opto-coupler IC201 is stabilized at 5 Volts with Z20. The output drives a FET Q208 which on its turn drives the push-pull stage Q209/Q210. The pulses are capacitively coupled with C213 to the gate of Q219. The 20 volts zener Z206 has two purposes:

The negative level of the pulses is clamped at -0.6 volt, and on the other hand the gate-source voltage is limited (protected) to 20 volt DC, in order to protect the switcher Q219.

The drain DHV of the switcher is connected with the primary winding of the EHT transformer. Transformer and quadrupler are one in the same unit. The +300M enters the board and is passing a filter L200/C217 and a fuse F200 before it supplies the Transformer / Quadrupler.

Protections.

a) EHT Hold down :

The EHT of the projector must be switched off in the event of a failure in the regulating circuit or a loss of the feedback. Moreover, when the required current of one or more tubes is excessively high, the EHT voltage is inhibited. We'll discuss these protections in more detail.

1. EHT Hold Down due to fault in the regulating circuit:

The slider voltage of P202 ("hold down adjust" potentiometer) is sent to the base of Q206 and Q206's emitter is set to a threshold of 5.6 volt by Z200. As soon as the EHT rises beyond 36.5kV, transistor Q206 starts conducting, turning on Q205. The Schmidt-trigger pins 8 and 9 of IC200 go high and its output pin 10 goes low. The diode D201 pulls pin 6 of IC200 low in order to stop the EHT multivibrator, halting the EHT.

The output of IC200, pin 11 goes high at the same time (inverting) to forward biases LED D202 to indicate the EHT HOLD DOWN condition. The feedback resistor R223 keeps the hold down condition on (lock-down), until the projector is powered off to reset the circuit.

2. EHT Hold Down due to a feedback loop fault condition.

The EHT hold down must equally operate when there is an "open loop" situation, or no EHT feedback voltage from the splitter. If that were the condition, there would be no way for the circuit to monitor the EHT, and it could go higher than the 36.5kV. The detection for "open loop" is built around the EHT "flyback" pulses on the drain of Q219.

These pulses are rectified by D205 and the resulting pulsating DC is filtered by C225 / C224 divided down with R228/R231+R227 and sent to the base of Q211. A threshold level of 4.7 volt is set at the emitter with Z202. From 5.6 volt base voltage onwards Q211 starts conducting, turning fully on Q218. The base voltage of Q216 is set at 14 volt in normal conditions, but, is now decreased, as pin 7 is pulled to a saturating level with the photo-transistor in the opto-coupler IC203.

Via Z204 (13 volt) the collector of Q206 is dropped to approx. 13 volts, sufficient to introduce the conduction of Q205. The further actions are now similar to what is explained above.

Note that the same optocoupler and transistor Q216 are used for mains hum suppression. The +300M is via a filter C231/R263/R264 sent to pin 1 of IC203. The isolated feedback voltage (mains hum) is (via optocoupler) taken from the collector of Q216 and capacitively coupled to the FBHV voltage.

3. EHT Hold Down in the event of an excessive amount of CRT beam currents.

Finally, in the event of an excessive amount of CRT beam current, with a long duration, this duration is determined by the time constant R221/C204, the collector of Q206 is pulled low via Q207, resulting in EHT Hold Down.

The base of Q207 is connected to ground, and HVL is in the ground return of the Quadrupler, so as the emitter of Q207 goes more negative as the total beam current increases, Q207 is more forward biased and starts to conduct, pulling the collector low and activating the EHT hold down. If any one CRT begins to draw too much current i.e. shorted CRT, Q207 turns on causing HV hold down.

Note that the beam current proportional voltage is sent to the RGB-Decoder drive board to reduce the contrast and brightness from some level onwards.

In conclusion, the EHT Hold Down is active for :

- too high EHT, information coming from the feedback line FBHV
- too high EHT in "open loop" via Q211/Q218 and the opto-coupler IC203.
- too high beam current lasting for some time (short in a crt).

b) Switching off the EHT when a Horizontal or Vertical scan failure occurs.

In the event of a horizontal and vertical scan failure Q204 is blocked turning on Q203. D203 becomes forward biased and pulls pin 6 of the multivibrator at ground level, stopping the EHT.

c) Overcurrent protection of the Q219 switcher.

The drain-source current of Q219 is measured by the resistor R246 in series with the source. This voltage is applied to the base of Q217 via a divider R259/R260.

The purpose of the circuit is to stop temporarily the drive when the beam current tends to go beyond a maximum.

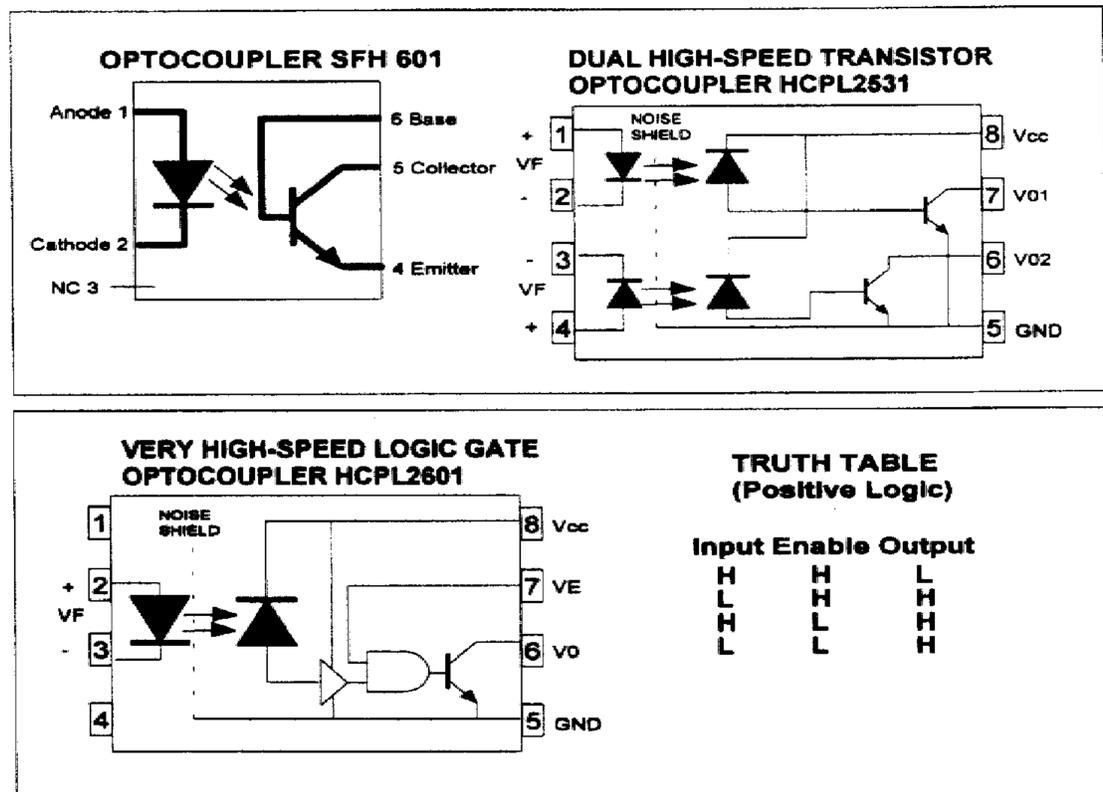
The pin 6 output of the opto-coupler IC203 may only halt the EHT multivibrator when there is a drive pulse on the common bases of the push-pull stage. For that reason, the drive pulses at the bases of Q209/Q210 are coupled with D208 to pin 4 of the opto-coupler. When the drain of Q208 is at low level, D208 is forward biased and inhibits the supply voltage +DN for the LED in the opto-coupler.

A stop of the multivibrator via the opto-coupler is thus only possible when a drive pulse is present at the push-pull stage.

Slow start up of the EHT. When the projector is switched on, a slow start up of the EHT voltage is provided. This is accomplished by the circuit around Q202 (Power voltage +DJ). The voltage for the reference zener IC202 is taken from the +210V line via R216. When the unit is switched on, until C200 is fully charged, Q202 will be forward biased and inhibits C200 from charging. This gives a slow rise to the voltage for IC202, and this is the voltage the FBHV is referenced to, so therefore the EHT will also have a slow rise.

When the unit is switched off, C200 is quickly discharged via D200, because the 210VDC line drops quickly, taking the EHT reference voltage on IC202 quickly down, and therefore the EHT itself goes down. C200 discharging, turns on Q202 because its base is pulled in a negative direction. If a scan fail condition is met, Q200 sees a low at its base and turns off. The base of Q201 then goes "high" and C200 is discharged, pulling down the reference voltage.

Delay of the power switch drive . The Fet Q213 is used to keep a drive pulse from driving Q219, until the EHT pulse on the Drain of Q219 has not fully dropped to its minimum. The EHT pulse is coupled to the gate of Q213 and removes the high on the enable pin (pin 7) of IC201 until the drive pulse is zero, turning off Q213. Then the next pulse can pass.



SM Power Supply+EHT Module

R7624469

Parts listing

SIT.	ITEM NO.	DESCRIPTION	QUANTITY	SIT.	ITEM NO.	DESCRIPTION	QUANTITY
10	R133036	SPR L 6 D 6 D 2.4 C	6	500	R803703	FRM PJ53 SMP SCR N	1
20	R133039	SPR L 8 D 4 D 1.2 C	20	400	R803707	FRM PJ53 DN SMP	1
120	R133039	SPR L 8 D 4 D 1.2 C	2	202	R803746	HTSNK PJ53 FIX U TDA4601	1
30	R1330391	SPR L 8 D 4 D 1.5 C	8	70	R804832	Q ACC SPG 1XM3 LONG	2
206	R133063	Q ACC ISO MICA SOT93	4	207	R804832	Q ACC SPG 1XM3 LONG	4
305	R133074	Q ACC ISO SIL600 W 30	0,11	210	R804832	Q ACC SPG 1XM3 LONG	1
306	R133074	Q ACC ISO SIL600 W 30	0,12	290	R804832	Q ACC SPG 1XM3 LONG	3
405	R312869	SPR PCB L 9.5 D4 SP1-6-01	4	307	R804832	Q ACC SPG 1XM3 LONG	2
110	R313328	BSHG SNAP D38 /33.3 BLK	1	308	R804833	Q ACC SPG 2X 3.1 LONG	2
40	R314501	F ACC HLDR 5X20 PC/SPG	30	309	R804834	Q ACC SPG 2XM3 LONG	2
60	R315315	J RVT MBT D 2 L14	2	611	R806328	FRM PJ53 *701 SPG EARTH	1
2020	R3153151	J RVT MBT D 2.3L13	4	C 2	R1128111	C N750DI 68P M102E3 HV	1
401	R324386	FAN AX 12V V700 	2	C 5	R112815	C CE DI 150P M400E3	1
402	R347965	FSTNR FAN	8	C 7	R112830	C CE DI 2N7S400E3	1
1000	R3480051	CBLA TIE C D13,5/16	2	C 18	R111477	C EL RA 100M Z 25E2 85	1
2000	R3480051	CBLA TIE C D13,5/16	1	C 19	R111453	C EL RA1000M Z 6E2 85	1
710	R348019	CBLA TIE B L100 W2,5	1	C 20	R1114708	C EL RA2200M M 16E3 SM	1
1001	R348019	CBLA TIE B L100 W2,5	3	C 21	R1114708	C EL RA2200M M 16E3 SM	1
2010	R348019	CBLA TIE B L100 W2,5	3	C 22	R111468	C EL RA 470M Z 16E2 85	1
310	R348086	CBLA SLCSE D 8,9	3	C 25	R111468	C EL RA 470M Z 16E2 85	1
404	R348086	CBLA SLCSE D 8,9	1	C 26	R115936	C PP RA 6N8J 63E2 85	1
406	R348087	CBLA SLCSE D12	2	C 27	R112740	C CE MI 1N2K100E2	1
	R3484156	CD CT MSMT P15 370	1	C 28	R113724	C POMERA 100N K 63E2 85	
303	R3626696	SCR D921 M 3 X 8 SI	1	C 29	R1150051	C PPMERA 2N2J162E9 HV	1
302	R3631049	SCR D933 M 3 X 6 XIC	2	C 30	R114090	C POMERA 1M M 63E2 85	1
311	R3631049	SCR D933 M 3 X 6 XIC	2	C 31	R115934	C PP RA 5N6J 63E2 85	1
80	R3631059	SCR D933 M 3 X 8 XIC	3	C 45	R111489	C EL RA 470M T 35E2 85	1
203	R3631059	SCR D933 M 3 X 8 XIC	8	C 46	R111489	C EL RA 470M T 35E2 85	1
220	R3631059	SCR D933 M 3 X 8 XIC	1	C 47	R111556	C EL RA 470M M100E3 85	1
312	R3631059	SCR D933 M 3 X 8 XIC	5	C 48	R1114909	C EL RA1000M M 50E3 SM	1
313	R3631079	SCR D933 M 3 X 12 XIC	4	C 49	R1114909	C EL RA1000M M 50E3 SM	1
613	R3631239	SCR D933 M 4 X 10 XIC	1	C 50	R1114909	C EL RA1000M M 50E3 SM	1
615	R3631269	SCR D933 M 4 X 20 XIC	1	C 51	R111575	C EL RA 100M M315E4 105	1
208	R366102	NUT D934 M 3 SZ	2	C 52	R111716	C CE DI 680P M202E3 HV	1
614	R366103	NUT D934 M 4 SZ	5	C 53	R1114909	C EL RA1000M M 50E3 SM	1
205	R366988	NUT I SOUTH M 3 X0.5	1	C 54	R1114169	C EL RA 10M M350E2 105	1
304	R366988	NUT I SOUTH M 3 X0.5	1	C 55	R1137121	C POMERA 10N K250E2 85	1
700	R367434	RVT POP D2.4 L 6 P AA	2	C 60	R111468	C EL RA 470M Z 16E2 85	1
612	R3674391	RVT POP D3.2 L 7.4 P ASW	9	C 61	R1147009	C CE DI 4N7M400E5 Y 	1
616	R3674391	RVT POP D3.2 L 7.4 P ASW	1	C 68	R1137151	C POMERA 18N K100E2 85	1
602	R3674411	RVT POP D3.2 L 9.8 P ASW	4	C 69	R111564	C EL RA 220M M200E4 105	1
610	R367504	WSHR D6798 A 5.3 SZ	5	C 70	R113724	C POMERA 100N K 63E2 85	1
201	R367600	NUT BLOC M 3	2	C 71	R112362	C N750MI 100P G100E2	1
301	R367600	NUT BLOC M 3	2	C 72	R115936	C PP RA 6N8J 63E2 85	1
204	R369996	SCR D84 M 3 X 12 SP	1	C 73	R111477	C EL RA 100M Z 25E2 85	1
7000	R590266	PRM LBL PJ SMP CAUTIONCVR	1	C 74	R114090	C POMERA 1M M 63E2 85	1
100	R7123024	WSHR D 3.25X 7 T1 L	1	C 75	R111477	C EL RA 100M Z 25E2 85	1
750	R7123046	WSHR D 4.25X10 T. L	1	C 76	R112238	C NP0 MI 47P G100E2	1
205	R721607	SPR L 5 D10 D 7 P	1	C 77	R1150051	C PPMERA 2N2J162E9 HV	1
50	R721850	R ACC CLIPS TCE V PROTECT	2	C 78	R1127475	C CE MI 4N7K100E2	1
90	R722545	FRM PJ53 LED ACC HLDR	1	C 79	R111477	C EL RA 100M Z 25E2 85	1
800	R7622091	UN EHT PJ53 V700 QDR SD 	1	C 82	R1114708	C EL RA2200M M 16E3 SM	1
403	R803085	BTN PUSH PJ49R *800 MNS	1	C 83	R1114708	C EL RA2200M M 16E3 SM	1
200	R803700	HTSNK PJ53 SMP	1	C 85	R112772	C CE MI 47N S 63E2 85	1
300	R803700	HTSNK PJ53 SMP	1	C 89	R111477	C EL RA 100M Z 25E2 85	1
600	R803701	FRM PJ53 SMP SOL	1	C 97	R114132	C POMERA 100N K250E4 85	1
				C 98	R113720	C POMERA 47N K 63E2 85	
				C 99	R1137121	C POMERA 10N K250E2 85	
				C100	R112737	C CE MI 680P K100E2	1
				C105	R111550	C EL RA 4M7M 50E2 85	
				C106	R111550	C EL RA 4M7M 50E2 85	
				C200	R111531	C EL RA 10M M 35E2 85	
				C201	R114100	C POMERA 100N K100E4 85	1
				C202	R111488	C EL RA 220M Z 40E2 85	1



SM Power Supply+EHT Module

R7624469

C203	R112747	C CE MI 4N7K100E2		D 2	R131927	D R BY229 60007A TO220C	1
C204	R111453	C EL RA1000M Z 6E2 85	1	D 3	R131927	D R BY229 60007A TO220C	1
C205	R1137161	C POMERA 22N K100E2 85		D 5	R131637	D R BA158 600400 DO7	1
C206	R1137121	C POMERA 10N K250E2 85		D 6	R131927	D R BY229 60007A TO220C	1
C207	R1137121	C POMERA 10N K250E2 85		D 7	R131637	D R BA158 600400 DO7	1
C208	R111479	C EL RA 470M Z 25E2 85	1	D 8	R131646	D R 1N4007 10201A DO41	1
C209	R111532	C EL RA 22M M 35E2 85		D 9	R131621	D S 1N4148 075150 DO35	
C210	R112763	C CE MI 10N U 63E2		D 10	R131637	D R BA158 600400 DO7	1
C211	R113732	C POMERA 470N K 63E2 85		D 17	R131927	D R BY229 60007A TO220C	1
C212	R113732	C POMERA 470N K 63E2 85		D 18	R131927	D R BY229 60007A TO220C	1
C213	R113729	C POMERA 270N K 63E2 85		D 19	R131927	D R BY229 60007A TO220C	1
C214	R112763	C CE MI 10N U 63E2		D 24	R131637	D R BA158 600400 DO7	
C215	R111532	C EL RA 22M M 35E2 85		D 27	R131913	D R BY329 10208A TO220C	1
C216	R113732	C POMERA 470N K 63E2 85		D 28	R131621	D S 1N4148 075150 DO35	
C217	R111578	C EL RA 100M M400E4 85	1	D 30	R131637	D R BA158 600400 DO7	
C218	R113724	C POMERA 100N K 63E2 85		D 31	R131637	D R BA158 600400 DO7	1
C219	R1122415	C NP0 MI 82P G100E2		D 32	R131646	D R 1N4007 10201A DO41	1
C220	R1122415	C NP0 MI 82P G100E2		D 34	R131927	D R BY229 60007A TO220C	1
C221	R112747	C CE MI 4N7K100E2		D 35	R131927	D R BY229 60007A TO220C	1
C222	R112819	C CE DI 330P M400E3	1	D 36	R131927	D R BY229 60007A TO220C	1
C223	R112240	C NP0 MI 68P G100E2		D 37	R131927	D R BY229 60007A TO220C	1
C224	R111720	C PPMERA 6N8J162E9 HV	1	D 39	R131913	D R BY329 10208A TO220C	1
C225	R114603	C POMERA 100N M102E9 HV	1	D 42	R131621	D S 1N4148 075150 DO35	
C226	R112747	C CE MI 4N7K100E2	1	D 44	R131646	D R 1N4007 10201A DO41	
C227	R112739	C CE MI 1N K100E2		D 46	R1316361	D Y BAT85 030200 DO34	1
C228	R112763	C CE MI 10N U 63E2	1	D 47	R1316361	D Y BAT85 030200 DO34	
C228	R112763	C CE MI 10N U 63E2		D 48	R1316361	D Y BAT85 030200 DO34	
C229	R112763	C CE MI 10N U 63E2		D 51	R131667	D LED D3 T GN	1
C230	R112760	C CE MI 3N3K100E2		D 60	R131927	D R BY229 60007A TO220C	1
C231	R114162	C POMERA 100N K400E6 85	1	D 61	R131646	D R 1N4007 10201A DO41	
C232	R112733	C CE MI 330P K100E2	1	D 62	R131646	D R 1N4007 10201A DO41	
C233	R1137121	C POMERA 10N K250E2 85		D200	R131646	D R 1N4007 10201A DO41	1
C299	R112763	C CE MI 10N U 63E2		D201	R131621	D S 1N4148 075150 DO35	
C300	R111477	C EL RA 100M Z 25E2 85	1	D202	R131662	D LED D3 T RD	1
C301	R113730	C POMERA 330N K 63E2 85	1	D203	R131621	D S 1N4148 075150 DO35	
C302	R113724	C POMERA 100N K 63E2 85		D204	R131621	D S 1N4148 075150 DO35	
C304	R111453	C EL RA1000M Z 6E2 85	1	D205	R131906	D R BYV96E 1021A5 SOD57	1
C305	R111453	C EL RA1000M Z 6E2 85	1	D206	R131621	D S 1N4148 075150 DO35	
C700	R111564	C EL RA 220M M200E4 105	1	D207	R131621	D S 1N4148 075150 DO35	
C701	R111566	C EL RA 820M M200E4 85	1	D208	R131637	D R BA158 600400 DO7	
C702	R111566	C EL RA 820M M200E4 85	1	D209	R131646	D R 1N4007 10201A DO41	1
C703	R112837	C CE DI 10N S400E3	1	D210	R131958	D R BY329 12208A TO220C	1
C704	R112837	C CE DI 10N S400E3	1	D211	R131628	D S BAW62 075200 DO35	1
C705	R112837	C CE DI 10N S400E3	1	D298	R131621	D S 1N4148 075150 DO35	
C706	R112837	C CE DI 10N S400E3	1	D300	R131646	D R 1N4007 10201A DO41	
C708	R114716	C PO RA 1M M250E11 X2	△ 1	D301	R131637	D R BA158 600400 DO7	
C709	R114716	C PO RA 1M M250E11 X2	△ 1	D302	R131646	D R 1N4007 10201A DO41	
C711	R111564	C EL RA 220M M200E4 105	1	D303	R131646	D R 1N4007 10201A DO41	
C715	R111468	C EL RA 470M Z 16E2 85	1	D304	R131646	D R 1N4007 10201A DO41	
C716	R111468	C EL RA 470M Z 16E2 85	1	D600	R131621	D S 1N4148 075150 DO35	
C781	R1159181	C PP RA 1N2J100E2 85		D700	R1319025	D R BYM56E 13203A SOD18	1
C782	R115940	C PP RA 10N J 63E2 85		D701	R1319025	D R BYM56E 13203A SOD18	1
C783	R115940	C PP RA 10N J 63E2 85		D702	R1319025	D R BYM56E 13203A SOD18	1
C784	R1159181	C PP RA 1N2J100E2 85		D703	R1319025	D R BYM56E 13203A SOD18	1
C787	R1115915	C EL5 RA 4M7M 35E2 85		D726	R131667	D LED D3 T GN	1
C788	R1115915	C EL5 RA 4M7M 35E2 85		D738	R131667	D LED D3 T GN	1
C789	R111500	C EL RA 47M M 10E2 85		D739	R131667	D LED D3 T GN	1
C790	R111500	C EL RA 47M M 10E2 85		D740	R131667	D LED D3 T GN	1
C816	R1127475	C CE MI 4N7K100E2	1	D741	R131667	D LED D3 T GN	1
C901	R1159081	C PP RA 470P J100E2 85		D742	R131667	D LED D3 T GN	1
C903	R113720	C POMERA 47N K 63E2 85		D743	R131667	D LED D3 T GN	1
C910	R111489	C EL RA 470M T 35E2 85	1	D744	R131667	D LED D3 T GN	1
C914	R111479	C EL RA 470M Z 25E2 85	1	D747	R131662	D LED D3 T RD	1
C919	R111678	C EL BRA 10M M 25E2 85	1	D749	R1316581	D LED D3 T YL	1
C927	R112740	C CE MI 1N2K100E2	1	D750	R131662	D LED D3 T RD	1
C928	R1127741	C Z5U MU 100N Z 50E2 85	1	D751	R131662	D LED D3 T RD	1
C929	R1127741	C Z5U MU 100N Z 50E2 85	1	D752	R131621	D S 1N4148 075150 DO35	1
				D755	R131667	D LED D3 T GN	1

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D793	R131681	D O BPW41N	PIN		1	L 6	R305913	CH MNS AX 12 UH 3A	1
D794	R131681	D O BPW41N	PIN		1	L 11	R3061322	CH AX NS 10 UH	1
D812	R131637	D R BA158	600400 DO7			L 12	R305913	CH MNS AX 12 UH 3A	1
D815	R131621	D S 1N4148	075150 DO35			L 13	R305913	CH MNS AX 12 UH 3A	1
D818	R131621	D S 1N4148	075150 DO35			L 14	R305913	CH MNS AX 12 UH 3A	1
D819	R131621	D S 1N4148	075150 DO35			L 15	R305913	CH MNS AX 12 UH 3A	1
D821	R131621	D S 1N4148	075150 DO35			L 16	R305913	CH MNS AX 12 UH 3A	1
D904	R131621	D S 1N4148	075150 DO35			L 18	R302108	CORE TUBE 3.5 /1.3 X 3	1
D905	R131621	D S 1N4148	075150 DO35			L 19	R302102	CORE TUBE 4.95/1.3 X40.5	1
D910	R131950	D R BYV27	15002A SOD57		1	L 20	R302108	CORE TUBE 3.5 /1.3 X 3	1
D932	R131744	D ZEN 5V6 0W5	C DO35		1	L 21	R3061322	CH AX NS 10 UH	1
D933	R131744	D ZEN 5V6 0W5	C DO35			L 22	R305913	CH MNS AX 12 UH 3A	1
F 2	R314142	F 5X20 T	0A125L RU/VE	△	1	L 23	R305913	CH MNS AX 12 UH 3A	1
F 4	R314104	F 5X20 T	5A H RU/VE	△	1	L 24	R305913	CH MNS AX 12 UH 3A	1
F 5	R314104	F 5X20 T	5A H RU/VE	△	1	L 25	R3060522	CH RA NS 150 UH	1
F 6	R314147	F 5X20 F	3A15 H RU/VE	△	1	L200	R305913	CH MNS AX 12 UH 3A	1
F 7	R314103	F 5X20 T	3A15 H RU/VE	△	1	L701	R305917	CH MNS 2X 2.2 MH 5APMF	△ 1
F 8	R3141041	F 5X20 T	4A H RU/VE	△	1	L718	R305913	CH MNS AX 12 UH 3A	1
F 9	R314104	F 5X20 T	5A H RU/VE	△	1	L756	R305913	CH MNS AX 12 UH 3A	1
F 10	R3141041	F 5X20 T	4A H RU/VE	△	1	L757	R305913	CH MNS AX 12 UH 3A	1
F 11	R3141041	F 5X20 T	4A H RU/VE	△	1	L791	R3061582	CH AX NS 1.5 MH	1
F 12	R3141041	F 5X20 T	4A H RU/VE	△	1	L792	R3061582	CH AX NS 1.5 MH	1
F 13	R3141041	F 5X20 T	4A H RU/VE	△	1	L911	R305909	CH TOR V 1500 UH 2A	1
F200	R314116	F 5X20 T	2A H RU/VE	△	1	NTC4	R105016	R NTC 2K7 0W25	1
F700	R314104	F 5X20 T	5A H RU/VE	△	1	NTC5	R105016	R NTC 2K7 0W25	1
F701	R314104	F 5X20 T	5A H RU/VE	△	1	NTC6	R105018	R NTC 4E7 2W6	1
F719	R314116	F 5X20 T	2A H RU/VE	△	1	NTC7	R105020	R NTC 4E M	1
I 3	R134114	U 393 LM	DIP8 P		1	P 3	R106728	R TCE H 5K K 0W5 S10TS	1
I 10	R131691	U 601G-3 SFH	DIP6 P	△	1	P 7	R106727	R TCE H 2K K 0W5 S10TS	1
I 12	R132787	U 4601 TDA	SIP9 P		1	P 8	R106732	R TCE H 50K K 0W5 S10TS	1
I 13	R132787	U 4601 TDA	SIP9 P		1	P200	R106733	R TCE H100K K 0W5 S10TS	1
I 17	R131691	U 601G-3 SFH	DIP6 P	△	1	P201	R106734	R TCE H200K K 0W5 S10TS	1
I 20	R134114	U 393 LM	DIP8 P		1	P202	R106733	R TCE H100K K 0W5 S10TS	1
I 21	R134116	U 353 LF	DIP8 P		1	P300	R105211	R PTC 4K7	1
I200	R1373945	U 4093B	DIP14 P		1	PC	R780185	PCD PJ53 V 700 SMP+EHT	1
I201	R134224	U 582 TLP	1119A1 P	△	1	Q 1	R1314071	Q BC547B N SS TO92	
I202	R132102	U 33B ZTK	DO35			Q 2	R132935	Q BUX87 N P TO126	1
I203	R134224	U 582 TLP	1119A1 P	△	1	Q 9	R1314071	Q BC547B N SS TO92	
I220	R131691	U 601G-3 SFH	DIP6 P		1	Q 10	R132913	Q BUP1C1 N P TO218	1
I300	R134010	U 7815	TO220 P		1	Q 22	R1314131	Q BC557B P SS TO92	
I777	R132824	U 2800 TBA	DIP14 P		1	Q 23	R1325096	Q ON4046 N P SOT93	1
I778	R132824	U 2800 TBA	DIP14 P		1	Q 24	R131428	Q BC548C N SS TO92	1
I900	R137625	U 34063	DIP8 P		1	Q 27	R1314071	Q BC547B N SS TO92	
J	R313095	CH MNS J	MCT A 6 H6,3	△	1	Q 31	R131471	Q BF458 N P TO126	1
J 6	R313922	J CT H	MBT P 2 M2SN		1	Q200	R132924	Q BC546 N SS TO92	1
J A	R34554911	CD REC	1672AWG22WT 110		1	Q201	R132924	Q BC546 N SS TO92	1
J B	R34594918	CD RNG	1015AWG18YG 180		1	Q202	R132923	Q BC556 P SS TO92	1
J C	R34554011	CD REC	1672AWG22BK 110		1	Q203	R131424	Q BC338 N SS TO92	1
J D	R34704702	SLVU SHR	D6,4/3,2 BK 20		3	Q204	R131411	Q BC549C N SS TO92	
J 10	R313935	J CT H	MBT P15 M2SN		1	Q205	R1314182	Q BC559C P SS TO92	
J 20	R3132862	J MD1	MBT P 2 E1SN		1	Q206	R131411	Q BC549C N SS TO92	
J200	R3138078	J SL FL	MBT P 8 M3,96 RP		1	Q207	R131411	Q BC549C N SS TO92	
J700	R348103	WU JUMP	0,6 10		1	Q208	R132910	Q BS170 FN SS TO92	1
J701	R313454	J TAB1	MBT H 4.8S0.5		1	Q209	R131424	Q BC338 N SS TO92	1
J703	R313454	J TAB1	MBT H 4.8S0.5		1	Q210	R1314311	Q BC327 P SS TO92	
J759	R313926	J CT H	MBT P 6 M2SN		1	Q211	R131411	Q BC549C N SS TO92	
J760	R313929	J CT H	MBT P 9 M2SN		1	Q212	R132910	Q BS170 FN SS TO92	1
J761	R313932	J CT H	MBT P12 M2SN		1	Q213	R1329105	Q BS170 FN SS TO92	1
J762	R313931	J CT H	MBT P11 M2SN		1	Q214	R132590	Q BC560B P SS TO92	1
J763	R313927	J CT H	MBT P 7 M2SN		1	Q215	R1314182	Q BC559C P SS TO92	
J779	R3485044	CD CT	FTMS P 4 220		1	Q216	R1314182	Q BC559C P SS TO92	
J780	R313944	J CT H	MBS P 4 M2SN		1	Q217	R131411	Q BC549C N SS TO92	
J795	R313454	J TAB1	MBT H 4.8S0.5		1	Q218	R1314182	Q BC559C P SS TO92	
L 5	R305913	CH MNS AX	12 UH 3A		1	Q219	R132951	Q IXTH11N100 FN P TO247	1

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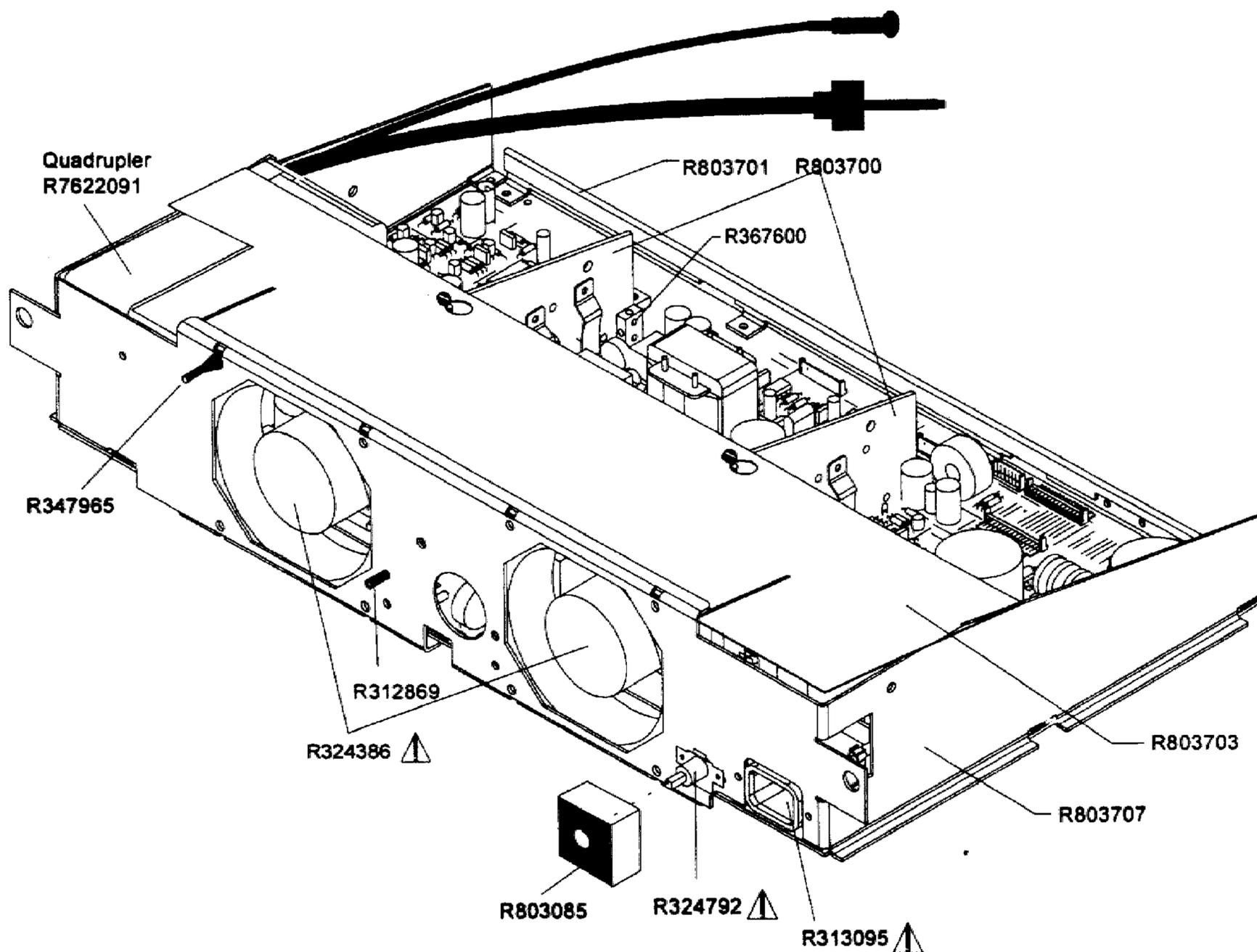
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Q746	R1314071	Q BC547B	N SS TO92			R144	R101154	R MF H 33K2 F 0W6 E4	
Q908	R132909	Q BD652	DP P TO220	1		R145	R101167	R MF H392K F 0W6 E4	
Q922	R131413	Q BC557	P SS TO92			R146	R101144	R MF H 4K75F 0W6 E4	
R 1	R101142	R MF H 3K32F 0W6 E4				R147	R101156	R MF H 47K5 F 0W6 E4	
R 2	R104656	R HV H 1M2 J 0W5 3500		1		R148	R101144	R MF H 4K75F 0W6 E4	
R 3	R1011134	R MF H 12E1 F 0W6 E4		1		R149	R101140	R MF H 2K21F 0W6 E4	
R 4	R101346	R MF H 6K8 J 1W E6		1		R150	R101154	R MF H 33K2 F 0W6 E4	
R 28	R1011907	R CFFH E1 J 0W4		△ 1		R155	R101164	R MF H221K F 0W6 E4	
R 29	R101139	R MF H 1K82F 0W6 E4		1		R160	R101172	R MF H 1M F 0W6 E4	
R 31	R101136	R MF H 1K F 0W6 E4				R161	R101145	R MF H 5K62F 0W6 E4	
R 32	R101137	R MF H 1K21F 0W6 E4		1		R162	R101154	R MF H 33K2 F 0W6 E4	
R 33	R101145	R MF H 5K62F 0W6 E4				R163	R101137	R MF H 1K21F 0W6 E4	
R 36	R101160	R MF H100K F 0W6 E4				R164	R101162	R MF H150K F 0W6 E4	
R 37	R102499	R MF H E33J 0W6		1		R165	R101130	R MF H332E F 0W6 E4	
R 38	R101217	R CF H 27E J 0W5		1		R166	R101236	R CF H 1K J 0W5	1
R 39	R101144	R MF H 4K75F 0W6 E4				R167	R1011246	R CFFH100E J 0W35	1
R 40	R101265	R CF H270K J 0W5				R200	R101152	R MF H 22K1 F 0W6 E4	1
R 41	R101126	R MF H150E F 0W6 E4				R201	R101164	R MF H221K F 0W6 E4	1
R 42	R101266	R CF H330K J 0W5				R202	R101154	R MF H 33K2 F 0W6 E4	1
R 43	R103226	R MO H150E J 2W		1		R203	R101160	R MF H100K F 0W6 E4	1
R 55	R101131	R MF H392E F 0W6 E4		1		R204	R1011269	R CFFH150E J 0W25	1
R 68	R101128	R MF H221E F 0W6 E4				R205	R101156	R MF H 47K5 F 0W6 E4	1
R 69	R101127	R MF H182E F 0W6 E4				R206	R101148	R MF H 10K F 0W6 E4	1
R 81	R101131	R MF H392E F 0W6 E4				R207	R101129	R MF H274E F 0W6 E4	1
R 82	R101165	R MF H274K F 0W6 E4				R208	R101112	R MF H 10E F 0W6 E4	
R 83	R101148	R MF H 10K F 0W6 E4				R209	R101158	R MF H 68K1 F 0W6 E4	
R 84	R101129	R MF H274E F 0W6 E4				R210	R101152	R MF H 22K1 F 0W6 E4	
R 85	R101136	R MF H 1K F 0W6 E4		1		R211	R101149	R MF H 12K1 F 0W6 E4	
R 86	R103226	R MO H150E J 2W		1		R212	R101135	R MF H825E F 0W6 E4	
R 87	R1011505	R MF H 13K F 0W6 E4		1		R213	R1011274	R MF H180E F 0W25	1
R 88	R101145	R MF H 5K62F 0W6 E4				R214	R101148	R MF H 10K F 0W6 E4	1
R 89	R101145	R MF H 5K62F 0W6 E4				R215	R1011324	R MF H470E F 0W25	1
R 90	R103600	R WW H E1 K 4W		1		R216	R103254	R MO H 33K J 2W	1
R 91	R101136	R MF H 1K F 0W6 E4		1		R217	R101160	R MF H100K F 0W6 E4	
R 92	R101127	R MF H182E F 0W6 E4				R218	R101156	R MF H 47K5 F 0W6 E4	
R 93	R102499	R MF H E33J 0W6		1		R219	R101156	R MF H 47K5 F 0W6 E4	
R 94	R101136	R MF H 1K F 0W6 E4				R220	R101148	R MF H 10K F 0W6 E4	
R 95	R103600	R WW H E1 K 4W		1		R221	R101143	R MF H 3K92F 0W6 E4	
R 96	R101217	R CF H 27E J 0W5		1		R222	R101146	R MF H 6K81F 0W6 E4	1
R 97	R101265	R CF H270K J 0W5		1		R223	R101156	R MF H 47K5 F 0W6 E4	
R 98	R101135	R MF H825E F 0W6 E4				R224	R101144	R MF H 4K75F 0W6 E4	1
R 99	R101160	R MF H100K F 0W6 E4				R226	R101134	R MF H681E F 0W6 E4	
R100	R101146	R MF H 6K81F 0W6 E4				R227	R1026845	R MF H750E F 0W6 E4	1
R101	R101136	R MF H 1K F 0W6 E4		1		R228	R104654	R HV H 1M J 0W5 3500	1
R102	R101128	R MF H221E F 0W6 E4				R229	R101141	R MF H 2K74F 0W6 E4	1
R105	R101148	R MF H 10K F 0W6 E4				R230	R1011008	R CFFH 1E J 0W25	1
R106	R104658	R HV H 1M5 J 0W5 3500		1		R231	R1011444	R MF H 4K7 F 0W25	1
R107	R1025561	R MF H 43K G 0W25				R232	R101163	R MF H182K F 0W6 E4	
R108	R101140	R MF H 2K21F 0W6 E4				R233	R101151	R CF H 18K J 0W25	
R110	R101156	R MF H 47K5 F 0W6 E4				R234	R101160	R MF H100K F 0W6 E4	
R111	R101144	R MF H 4K75F 0W6 E4				R235	R101148	R MF H 10K F 0W6 E4	
R112	R101157	R MF H 56K2 F 0W6 E4				R236	R101529	R MF H270E F 0W4 E3	
R113	R101163	R MF H182K F 0W6 E4				R237	R101143	R MF H 3K92F 0W6 E4	
R125	R101267	R CF H390K J 0W5		1		R238	R101164	R MF H221K F 0W6 E4	
R126	R101144	R MF H 4K75F 0W6 E4		1		R239	R101143	R MF H 3K92F 0W6 E4	
R127	R101136	R MF H 1K F 0W6 E4				R240	R101139	R MF H 1K82F 0W6 E4	
R129	R104672	R HV H 5M6 J 0W5 3500		△ 1		R241	R101164	R MF H221K F 0W6 E4	
R130	R104672	R HV H 5M6 J 0W5 3500		△ 1		R243	R101136	R MF H 1K F 0W6 E4	
R135	R101270	R CF H680K J 0W5		1		R244	R1014625	R MF H150K J 1W2 E7	1
R136	R101161	R MF H121K F 0W6 E4				R245	R1014625	R MF H150K J 1W2 E7	1
R137	R101172	R MF H 1M F 0W6 E4				R246	R103606	R WW H E33K 4W	1
R138	R101154	R MF H 33K2 F 0W6 E4				R247	R1011209	R CFFH 47E J 0W25	1
R139	R101144	R MF H 4K75F 0W6 E4				R248	R101152	R MF H 22K1 F 0W6 E4	
R140	R101160	R MF H100K F 0W6 E4				R249	R101112	R MF H 10E F 0W6 E4	
R141	R104688	R HV H 27M J 0W5 3500		1		R250	R101132	R MF H475E F 0W6 E4	
R142	R101145	R MF H 5K62F 0W6 E4				R251	R101156	R MF H 47K5 F 0W6 E4	
R143	R101168	R MF H475K F 0W6 E4				R252	R101152	R MF H 22K1 F 0W6 E4	
						R253	R101160	R MF H100K F 0W6 E4	

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R254	R101124	R MF H100E F 0W6 E4			
R255	R101183	R MF H 8M25F 0W6 E4			
R256	R101142	R MF H 3K32F 0W6 E4			
R257	R101164	R MF H221K F 0W6 E4	1		
R258	R101135	R MF H825E F 0W6 E4	1		
R259	R101141	R MF H 2K74F 0W6 E4			
R260	R101132	R MF H475E F 0W6 E4			
R261	R101148	R MF H 10K F 0W6 E4	1		
R262	R101136	R MF H 1K F 0W6 E4	1		
R263	R101156	R MF H 47K5 F 0W6 E4	1		
R264	R1014625	R MF H150K J 1W2 E7	1		
R265	R101243	R CF H 3K9 J 0W5			
R266	R101140	R MF H 2K21F 0W6 E4	1		
R267	R101150	R MF H 15K F 0W6 E4	1		
R268	R103229	R MO H270E J 2W	1		
R269	R101105	R MF H 2E74F 0W6 E4			
R299	R101145	R MF H 5K62F 0W6 E4			
R700	R101460	R MF H100K J 2W E7	1		
R701	R101460	R MF H100K J 2W E7	1		
R702	R101265	R CF H270K J 0W5	1		
R713	R101127	R MF H182E F 0W6 E4			
R723	R103058	R MF H 68K J 1W E6	1		
R724	R101544	R MF H 4K7 F 0W4 E3			
R727	R101168	R MF H475K F 0W6 E4			
R728	R101550	R MF H 15K F 0W4 E3			
R729	R101548	R MF H 10K F 0W4 E3			
R732	R101540	R MF H 2K2 F 0W4 E3			
R733	R101548	R MF H 10K F 0W4 E3			
R734	R101544	R MF H 4K7 F 0W4 E3			
R735	R101541	R MF H 2K7 F 0W4 E3			
R736	R101548	R MF H 10K F 0W4 E3			
R737	R101541	R MF H 2K7 F 0W4 E3			
R745	R101544	R MF H 4K7 F 0W4 E3			
R748	R101536	R MF H 1K F 0W4 E3			
R753	R101542	R MF H 3K3 F 0W4 E3			
R785	R101560	R MF H100K F 0W4 E3	1		
R786	R101560	R MF H100K F 0W4 E3	1		
R902	R101148	R MF H 10K F 0W6 E4			
R906	R101230	R CF H330E J 0W5			
R907	R101140	R MF H 2K21F 0W6 E4			
R909	R101132	R MF H475E F 0W6 E4			
R912	R1011907	R CFFH E1 J 0W4	1		
R913	R101132	R MF H475E F 0W6 E4			
R915	R101559	R MF H 82K F 0W4 E3	1		
R916	R101147	R MF H 8K25F 0W6 E4			
R917	R101145	R MF H 5K62F 0W6 E4	1		
R918	R101136	R MF H 1K F 0W6 E4			
R925	R101130	R MF H332E F 0W6 E4			
R926	R101138	R MF H 1K5 F 0W6 E4			
R930	R101520	R MF H 47E F 0W4 E3			
R931	R101520	R MF H 47E F 0W4 E3	1		
S700	R324792	SW MNS JPZ 2M TV5 BS	△	1	
SR2*	R1011169	R CFFH 22E J 0W25	△	1	
SR7*	R1041698	R WWFV 1K5 K 2W	△	1	
T 1	R306718	T PJ49 SMP STAND-BY	△	1	
T 2	R774345	T PJ53 SMP D 700 FIX	△	1	
T 3	R774346	T PJ53 SMP D 700 VAR	△	1	
TH 1	R1322101	Q TIC106D TH P TO66		1	
Z 1	R131734	D ZEN 5V6 0W5 B DO35		1	
Z 5	R131706	D ZEN 9V1 1W3 C DO41		1	
Z 10	R131706	D ZEN 9V1 1W3 C DO41		1	
Z 13	R131787	D ZEN 51V 0W5 C DO35			
Z 14	R131756	D ZEN 7V5 0W5 C DO35			
Z 15	R131744	D ZEN 5V6 0W5 C DO35			
Z 16	R131740	D ZEN 12V 0W5 C DO35			
Z 17	R134031	U 431C TL TO92 P		1	
Z 19	R134031	U 431C TL TO92 P		1	
Z 20	R131756	D ZEN 7V5 0W5 C DO35			
Z 21	R131790	D ZEN 33V 1W3 C DO41			
Z200	R131734	D ZEN 5V6 0W5 B DO35		1	
Z202	R131865	D ZEN 4V7 0W5 B DO35		1	
Z203	R131745	D ZEN 18V 1W3 C DO41		1	
Z204	R131721	D ZEN 13V 0W5 C DO35			
Z205	R131730	D ZEN 20V 0W5 C DO35		1	
Z206	R131730	D ZEN 20V 0W5 C DO35		1	
Z920	R131767	D ZEN 6V8 0W5 B DO35		1	
Z921	R131767	D ZEN 6V8 0W5 B DO35		1	
Z924	R131742	D ZEN 6V8 0W5 C DO35		1	



PRODUCT SAFETY NOTICE

Components identified by ⚠ have SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. Before replacing any of these components, read carefully the service safety precautions.

