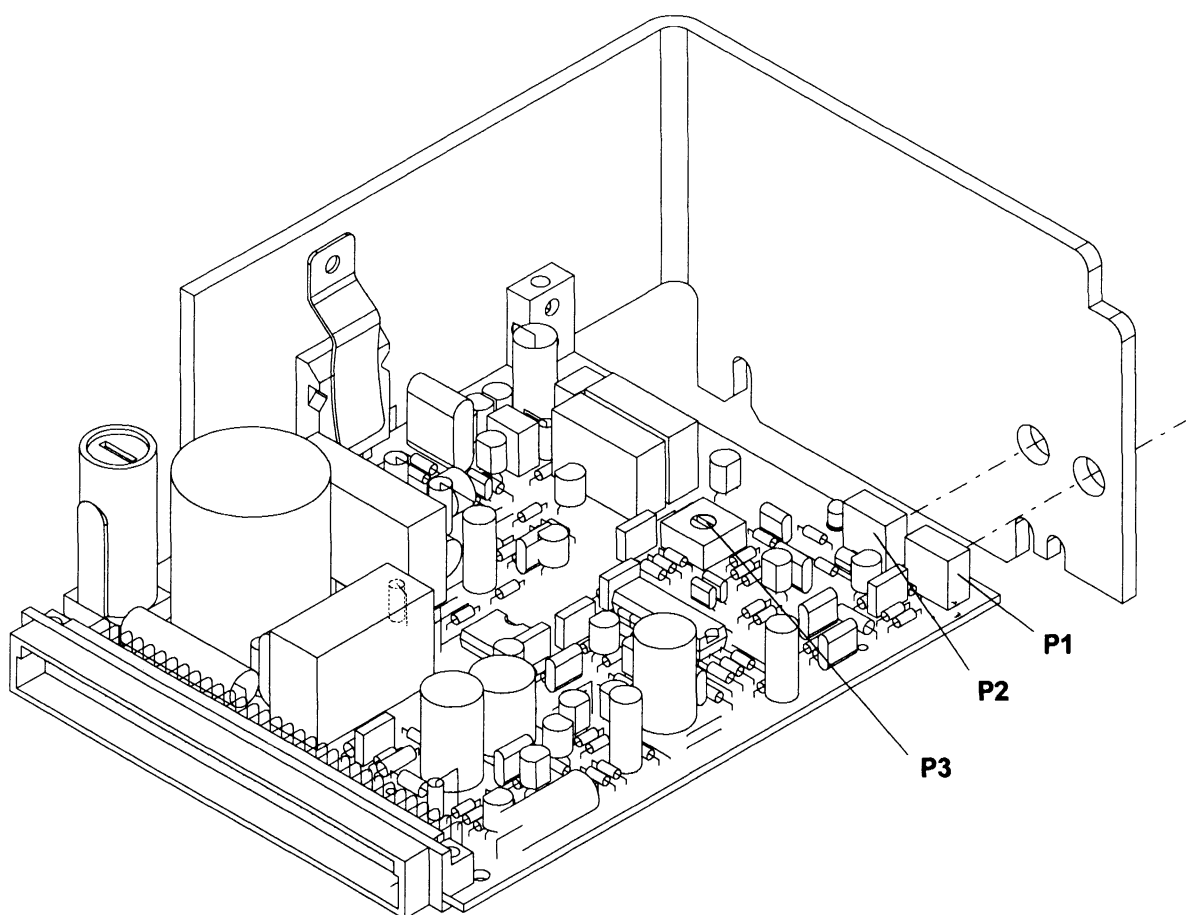
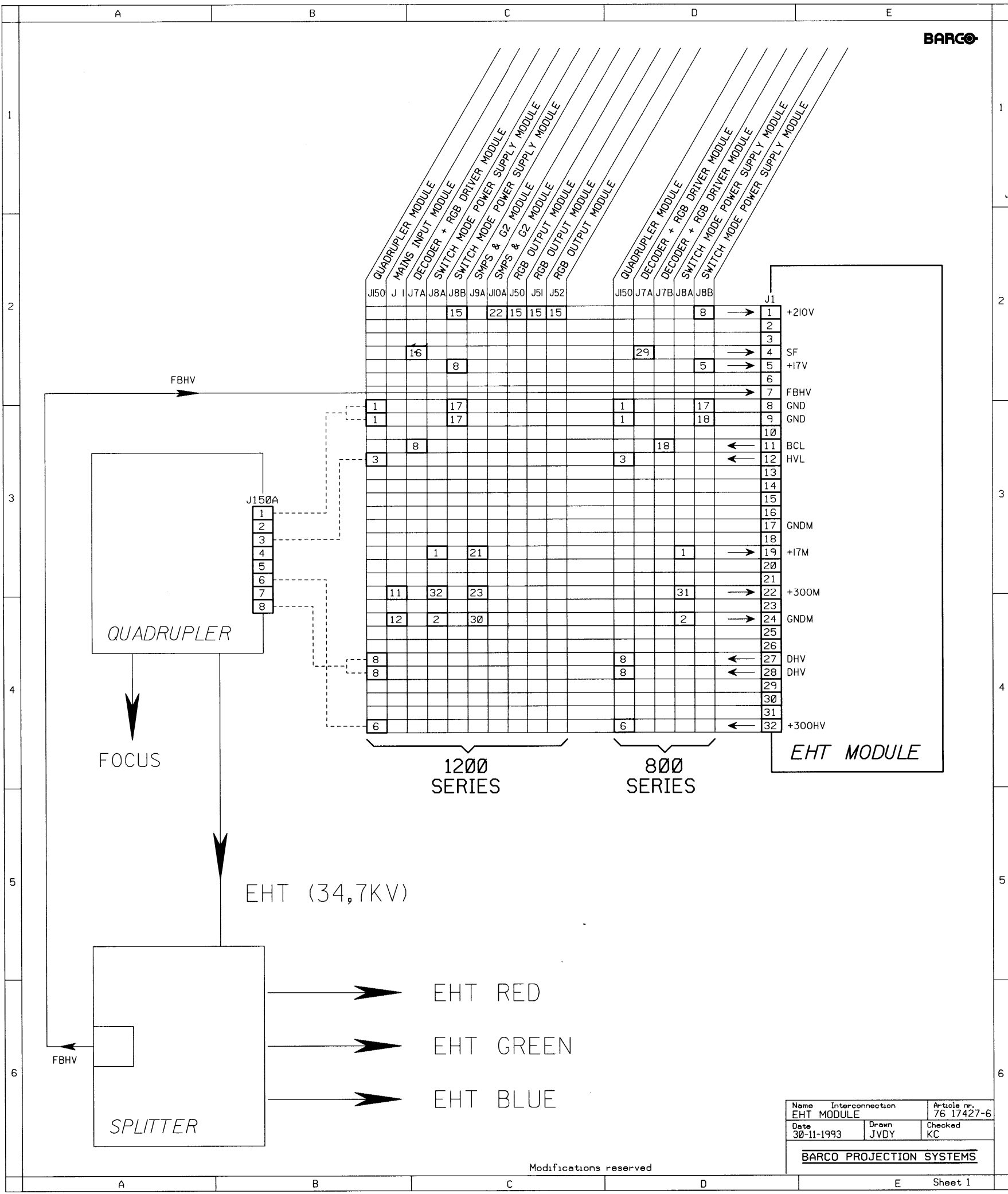
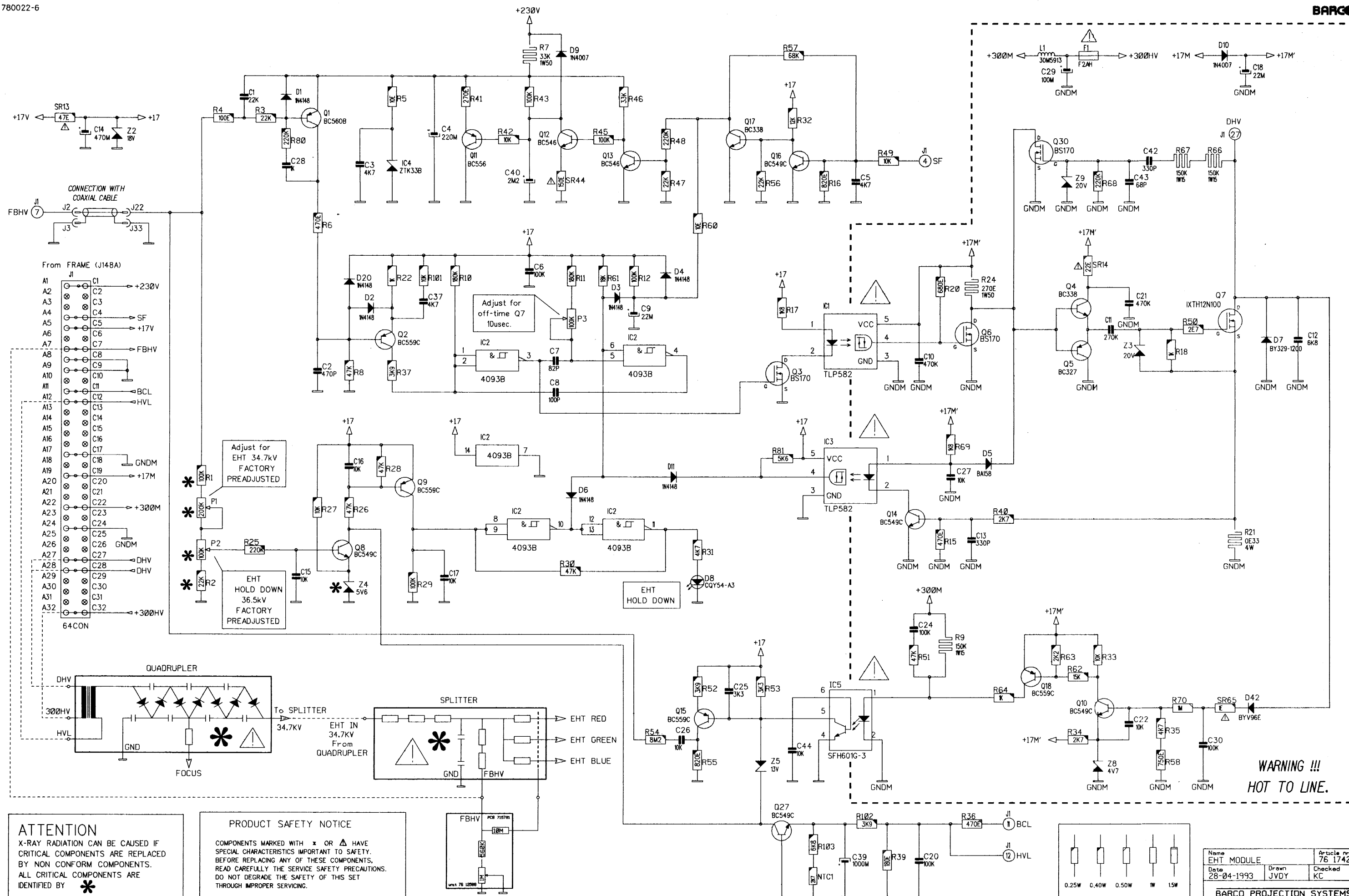


WARNING

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.



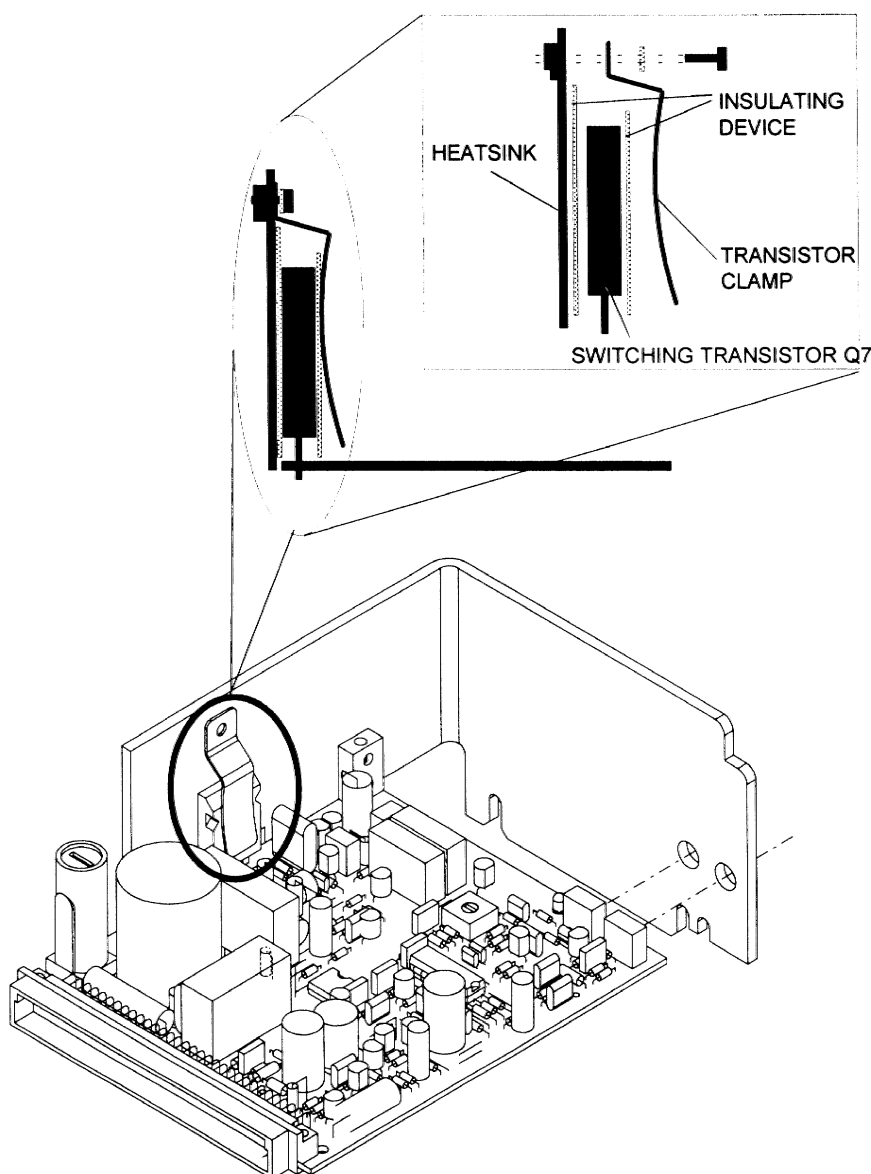




SAFETY PRECAUTION**SWITCHING TRANSISTOR Q7 REMOVAL/REPLACEMENT**

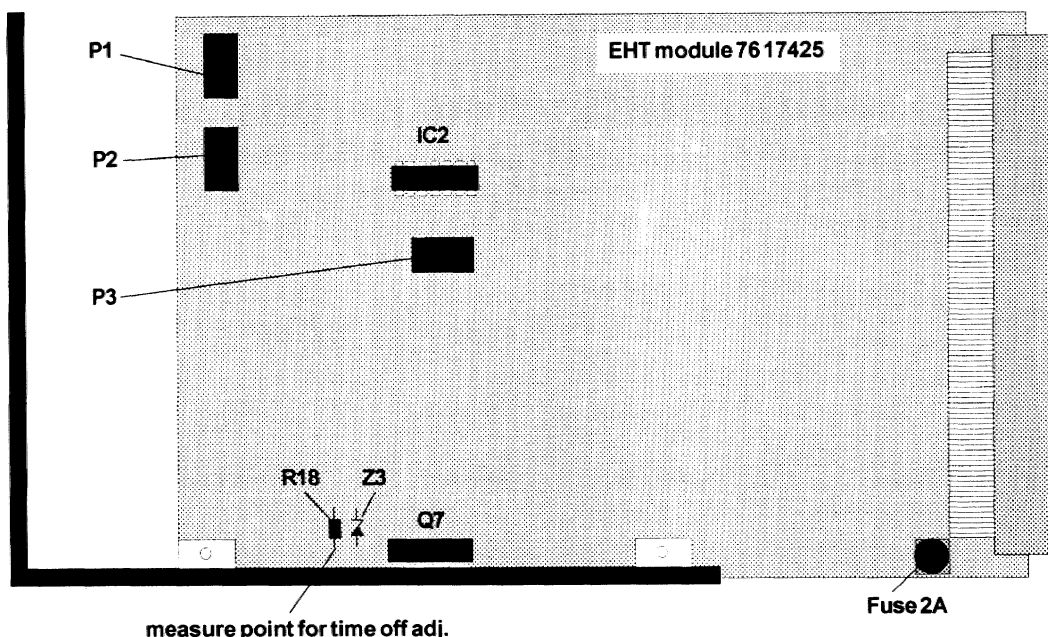
RE-INSTALL ALWAYS THE INSULATING DEVICE BETWEEN THE SWITCHING TRANSISTOR Q7 AND THE HEATSINK AND THE TRANSISTOR CLAMP.

PROCEED TO A LEAKAGE CURRENT HOT CHECK AS DESCRIBED IN THE SAFETY NOTICES



HIGH VOLTAGE 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 devices, do not arc pix tube anode lead to chassis or earth ground.



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.

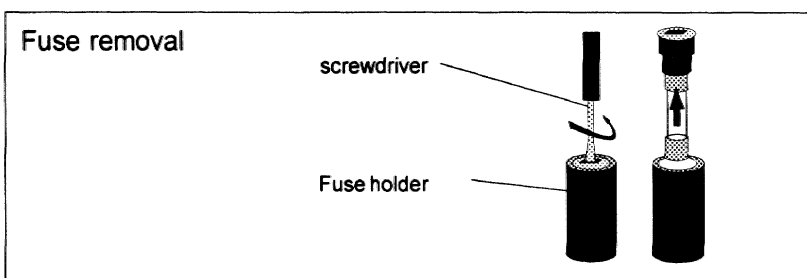
- Turn the projector off.
- Put the potentiometers P1 and P2 in their minimum position (turning clockwise!!) .
- Pull out one CRT-EHT cable of the EHT splitter.
- Insert in the free EHT connector the **precision** EHTprobe (ratio 1000/1).

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

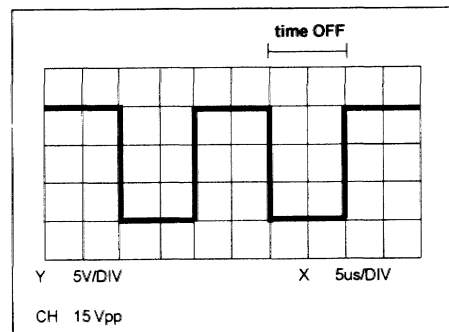
Adjustment

P3 Switching transistor time OFF

- Remove fuse "F 2A" out of fuseholder (see illustration "Fuse removal")



- Connect the oscilloscope to the resistor R18 (=gate switching transistor Q7)
- Switch on the projector.
- Adjust potentiometer P3 for a drive pulse 'time OFF' width of 10 μ s.



P1 High Voltage Adj. - Switch off the projector

P2 Hold Down - Put the fuse 2A on its place.

- Switch on the projector
- Adjust potentiometer P1 "High Voltage Adj." until the EHT voltage reaches 36.5kV.
- Turn potentiometer P2 "Hold Down" until the Hold Down LED lights up. The projector switches at that moment into the Hold Down mode, picture disappears.
- Put the potentiometer P1 again in its minimum position (turning clockwise!!).
- Turn the power switch in its OFF position (not-pressed) and switch on the projector again (press the power switch).
- Adjust the potentiometer P1 for an EHT voltage of 34.7kV.

Important: The EHTsplitter, on which a potentiometer is mounted, leaves the factory as a factory pre-adjusted unit. A readjustment of the mentioned potentiometer is in no case allowed.



Introduction.

On this board, 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 built around two Schmitt Trigger NAND gates in IC2. Two time constants are involved in this circuit : C7 / P3 / R11 and in the feedback loop C8 / R10 + transistor Q2.

The first time constant is fixed and determines the OFF time of the power switch Q7 and is tuned with P3 to 10 μ S. The second time constant is variable and depends on the current flow through Q2. By varying the bias on transistor Q2, the time constant can be varied. Q2 is driven by the comparator Q1. This Q1 receives its base bias voltage from FBHV(feedback high voltage from the divider by 1000 circuit on the splitter. The emitter of Q1 is set at +33 volts by zener IC4. The duty cycle or the on/off time of the power switcher Q7 is regulated by the voltage difference detected by Q1, between the fixed emitter and the BFHV from the splitter.

The frequency of this oscillator is typically 80 kHz.

The squared waveform at pin 3 of the NAND gate is, via a fast switching and inverting FET Q3, sent to the opto-coupler IC1. 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 board 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.

As this board is supplied with the +300M as soon the Mains switch is pushed, it is not recommended to remove this board even when the projector is in a standby position. This action will damage the contacts of the board.

The output drives a FET Q6 which on its turn drives the push-pull stage Q4/ Q5. The pulses are capacitively coupled with C11 to the gate of Q7. The 20 volts zener Z3 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 Q7.

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 L1/C19/C29 and a fuse 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 P2 ("hold down adjust" potentiometer) is sent to the base of Q8 and Q8's emitter is set to a threshold of 5.6 volt by Z4. As soon as the EHT rises beyond 36.5kV, transistor Q8 starts conducting, turning on Q9. The Schmitt-trigger pins 8 and 9 of IC2 go high and its output pin 6 goes low. D6 pulls pin 6 of IC2 low in order to stop the EHT multivibrator, halting the EHT.

The output of IC2, pin 11 goes high at the same time (inverting) to forward biases LED D8 to indicate the EHT HOLD DOWN condition. The feedback resistor R30 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 Q7.

These pulses are rectified by D42 and the resulting pulsating DC is filtered by C30 / C12 divided down with R70/R35+R58 and sent to the base of Q10. A threshold level of 4.7 volt is set at the emitter with Z8. From 5.6 volt base voltage onwards Q10 starts conducting, turning fully on Q18. The base voltage of Q15 is set at 14 volt in normal conditions, but, is now decreased, as pin 5 is pulled to a saturating level with the photo-transistor in the opto-coupler IC5.

Via Z5 (13 volt) the collector of Q8 is dropped to approx. 13 volts, sufficient to introduce the conduction of Q9. The further actions are now similar to what is explained above.

Note that the same optocoupler and transistor Q15 are used for mains hum suppression. The +300M is via a filter C24/R51/R9 sent to pin 1 of IC5. The isolated feedback voltage is taken from the collector of Q15 and capacitively coupled to the FBHV input of the board.

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

Finally, in the vent of an excessive amount of CRT beam current, with a long duration, the duration is determined by the time constant R102/C39, the collector of Q8 is pulled low via Q27, resulting in EHT Hold Down.

The base of Q27 is connected to ground, and HVL is in the ground return of the Quadrupler, so as the emitter of Q27 goes more negative as the total beam current increases, Q27 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, Q27 turns on causing HV holddown.

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 Q10/Q18 and the opto-coupler IC5.
- 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 Q16 is blocked turning on Q17. D3 becomes forward biased and pulls pin 6 of the multivibrator at ground level, stopping the EHT.

c) Overcurrent protection of the Q7 switcher.

The drain-source current of Q7 is measured by the resistor R21 in series with the source. This voltage is applied to the base of Q14 via a divider R40/ R15.

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

The pin 4 output of the opto-coupler IC3 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 Q4/5 are coupled with D5 to pin 1 of the opto-coupler. When the drain of Q6 is at low level, D5 is forward biased and inhibits the supply voltage +17M' 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 Q11. The voltage for the reference zener IC4 is taken from the +230V line via R7.

When the unit is switched on, until C40 fully charges, Q11 will be forward biased and inhibits C4 from charging. This gives a slow rise to the voltage for IC4, 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, C40 is quickly discharged via D9, because the 230VDC line drops quickly, taking the EHT reference voltage on IC4 quickly down, and therefore the EHT itself goes down.

C40 discharging turns on Q11 because its base is pulled in a negative direction. If a scan fail condition is met, Q13 sees a low at its base and turns off. The base of Q12 then goes "high" and C40 is discharged, pulling down the reference voltage.

Delay of the power switch drive .

Fet Q30 is used to keep a drive pulse from driving Q7, until the EHT pulse on the Drain of Q7 has not fully dropped to its minimum. The EHT pulse is coupled to the gate of Q30 and the on state inhibits the push-pull stage Q4/ Q5 from being driven. When the EHT pulse has dropped, turning off Q30, then the next drive pulse can pass. The gate-source of Q30 is limited by the zener D9 to 20V DC.

Parts listing EHT Module 76 17427

ITEM NO.	SIT.	DESCRIPTION	ITEM NO.	SIT.	DESCRIPTION
11 37161	C..1	C POMERA 22N K100E2	10 6834	P..1	R TCE V200K K 0W5 S10SS3386H
11 2735	C..2	C CE MI 470P K100E2	10 6833	P..2	R TCE V100K K 0W5 S10SS3386H
11 2747	C..3	C CE MI 4N7K 63E2	10 6733	P..3	R TCE H100K K 0W5 S10TS3386P
11 1488	C..4	C EL RA 220M Z 40E2 85	78 0022	PC..	PCS PJ49 800 EHT 761742
11 2747	C..5	C CE MI 4N7K 63E2	13 2590	Q..1	Q BC560B P SS TO92 045A1
11 3724	C..6	C POMERA 100N K 63E2	13 14182	Q..2	Q BC559C P SS TO92 030A1
11 22415	C..7	C NPO MI 82P J 63E2	13 2910	Q..3	Q BS170 FN SS TO92 060A5
11 2242	C..8	C NPO MI 100P J 63E2	13 1424	Q..4	Q BC338 N SS TO92 025A8
11 1532	C..9	C EL RA 22M M 35E2 85	13 14311	Q..5	Q BC327 P SS TO92 045A5
11 3732	C..10	C POMERA 470N K 63E2	13 2910	Q..6	Q BS170 FN SS TO92 060A5
11 3729	C..11	C POMERA 270N K 63E2	13 2918	Q..7	Q IXTH12N100 FN P TO247 10212
11 1720	C..12	C PPMERA 6N8J162E9 HV FKP1	13 1411	Q..8	Q BC549C N SS TO92 030A1
11 2733	C..13	C CE MI 330P K100E2	13 14182	Q..9	Q BC559C P SS TO92 030A1
11 1479	C..14	C EL RA 470M Z 25E2 85	13 1411	Q..10	Q BC549C N SS TO92 030A1
11 2763	C..15	C CE MI 10N U 63E2	13 2923	Q..11	Q BC556 P SS TO92 065A1
11 37121	C..16	C POMERA 10N K100E2 365	13 2924	Q..12	Q BC546 N SS TO92 065A1
11 37121	C..17	C POMERA 10N K100E2 365	13 2924	Q..13	Q BC546 N SS TO92 065A1
11 1532	C..18	C EL RA 22M M 35E2 85	13 1411	Q..14	Q BC549C N SS TO92 030A1
11 3724	C..20	C POMERA 100N K 63E2	13 14182	Q..15	Q BC559C P SS TO92 030A1
11 3732	C..21	C POMERA 470N K 63E2	13 1411	Q..16	Q BC549C N SS TO92 030A1
11 2763	C..22	C CE MI 10N U 63E2	13 1424	Q..17	Q BC338 N SS TO92 025A8
11 4162	C..24	C POMERA 100N K400E6	13 14182	Q..18	Q BC559C P SS TO92 030A1
11 2760	C..25	C CE MI 3N3K 63E2	13 1411	Q..27	Q BC549C N SS TO92 030A1
11 2763	C..26	C CE MI 10N U 63E2	13 2910	Q..30	Q BS170 FN SS TO92 060A5
11 37121	C..27	C POMERA 10N K100E2 365	10 1560	R..1	R MF H100K F 0W4 E2
11 2739	C..28	C CE MI 1N K100E2	10 1552	R..2	R MF H 22K F 0W4 E2
11 1578	C..29	C EL RA 100M M400E4 85	10 1552	R..3	R MF H 22K F 0W4 E2
11 4603	C..30	C POMERA 100N M102E9 HV MKS	10 1524	R..4	R MF H100E F 0W4 E2
11 2747	C..37	C CE MI 4N7K 63E2	10 1512	R..5	R MF H 10E F 0W4 E2
11 1453	C..39	C EL RA1000M Z 6E2 85	10 1532	R..6	R MF H470E F 0W4 E2
11 1548	C..40	C EL RA 2M2M 50E2 85	10 3254	R..7	R MO H 33K J 1W5
11 2819	C..42	C CE DI 330P M400E3	10 1556	R..8	R MF H 47K F 0W4 E2
11 2240	C..43	C NPO MI 68P J 63E2	10 1462	R..9	R CF H150K J 1W15 214
11 37121	C..44	C POMERA 10N K100E2 365	10 1563	R..10	R MF H180K F 0W4 E2
13 1621	D..1	D S 1N4148 075150 DO35	10 1563	R..11	R MF H180K F 0W4 E2
13 1621	D..2	D S 1N4148 075150 DO35	10 1560	R..12	R MF H100K F 0W4 E2
13 1621	D..3	D S 1N4148 075150 DO35	10 1532	R..15	R MF H470E F 0W4 E2
13 1621	D..4	D S 1N4148 075150 DO35	10 1535	R..16	R MF H820E F 0W4 E2
13 1637	D..5	D R BA158 600400 DO7	10 1539	R..17	R MF H 1K8 F 0W4 E2
13 1621	D..6	D S 1N4148 075150 DO35	10 1536	R..18	R MF H 1K F 0W4 E2
13 1958	D..7	D R BY329 12208A TO220	10 1534	R..20	R MF H680E F 0W4 E2
13 1662	D..8	D LED D3 T RED	10 3606	R..21	R WW H E33K 4W KKA4
13 1646	D..9	D R 1N4007 10201A DO41	10 1536	R..22	R MF H 1K F 0W4 E2
13 1646	D..10	D R 1N4007 10201A DO41	10 3229	R..24	R MO H270E J 1W5
13 1621	D..11	D S 1N4148 075150 DO35	10 1564	R..25	R MF H220K F 0W4 E2
13 1621	D..20	D S 1N4148 075150 DO35	10 1556	R..26	R MF H 47K F 0W4 E2
13 1906	D..42	D R BYV96E 1021A5 SOD57	10 1548	R..27	R MF H 10K F 0W4 E2
31 4143	F..1	F 5X20 F 2A H RU/VDE	10 1556	R..28	R MF H 47K F 0W4 E2
31 4516	H..1	F ACC HLDR T 5X20 PC/HSG	10 1560	R..29	R MF H100K F 0W4 E2
13 4224	I..1	U 582 TLP 1119A1P	10 1556	R..30	R MF H 47K F 0W4 E2
13 73945	I..2	U 4093B DIP14 PNANDG	10 1544	R..31	R MF H 4K7 F 0W4 E2
13 4224	I..3	U 582 TLP 1119A1P	10 1549	R..32	R MF H 12K F 0W4 E2
13 2102	I..4	U 33B ZTK DO35 PSTAB	10 1548	R..33	R MF H 10K F 0W4 E2
13 1691	I..5	U 601G-3 SFH DIP6 POPTOC	10 1541	R..34	R MF H 2K7 F 0W4 E2
31 3525	J..1	J EUR2C MBS P64 E1 C2S1.6	10 1544	R..35	R MF H 4K7 F 0W4 E2
30 5913	L..1	CH MNS AX 12 UH 3A	10 11324	R..36	R MF H470E F 0W25
10 5016	NTC1	R NTC 2K7 0W25 640	10 1543	R..37	R MF H 3K9 F 0W4 E2
			10 11274	R..39	R MF H180E F 0W25 156
			10 1541	R..40	R MF H 2K7 F 0W4 E2
			10 1529	R..41	R MF H270E F 0W4 E2


ITEM NO.	SIT.	DESCRIPTION
10 1548	R.42	R MF H 10K F 0W4 E2
10 1560	R.43	R MF H100K F 0W4 E2
10 1560	R.45	R MF H100K F 0W4 E2
10 1554	R.46	R MF H 33K F 0W4 E2
10 1552	R.47	R MF H 22K F 0W4 E2
10 1564	R.48	R MF H220K F 0W4 E2
10 1548	R.49	R MF H 10K F 0W4 E2
10 1505	R.50	R MF H 2E7 F 0W4 E2
10 1556	R.51	R MF H 47K F 0W4 E2
10 1543	R.52	R MF H 3K9 F 0W4 E2
10 1542	R.53	R MF H 3K3 F 0W4 E2
10 1183	R.54	R CF H 8M2 J 0W25
10 1535	R.55	R MF H820E F 0W4 E2
10 1552	R.56	R MF H 22K F 0W4 E2
10 1558	R.57	R MF H 68K F 0W4 E2
10 15351	R.58	R MF H750E F 0W4 E2
10 1512	R.60	R MF H 10E F 0W4 E2
10 1551	R.61	R MF H 18K F 0W4 E2
10 1550	R.62	R MF H 15K F 0W4 E2
10 1540	R.63	R MF H 2K2 F 0W4 E2
10 1536	R.64	R MF H 1K F 0W4 E2
10 1462	R.66	R CF H150K J 1W15 214

ITEM NO.	SIT.	DESCRIPTION
10 1462	R.67	R CF H150K J 1W15 214
10 1564	R.68	R MF H220K F 0W4 E2
10 1539	R.69	R MF H 1K8 F 0W4 E2
10 4654	R.70	R HV H 1M J 0W5 3500 242
10 1564	R.80	R MF H220K F 0W4 E2
10 1545	R.81	R MF H 5K6 F 0W4 E2
10 1548	R101	R MF H 10K F 0W4 E2
10 1543	R102	R MF H 3K9 F 0W4 E2
10 1546	R103	R MF H 6K8 F 0W4 E2
10 03209	SR13	R CFFV 47E J 0W25 E1
10 03169	SR14	R CFFV 22E J 0W25 E1
10 11269	SR44	R CFFH150E J 0W25
10 03009	SR65	R CFFV 1E J 0W25 E1
13 1745	Z..2	D ZEN 18V 1W1 C DO41
13 1730	Z..3	D ZEN 20V 0W5 C DO35
13 1734	Z..4	D ZEN 5V6 0W5 B DO35
13 1721	Z..5	D ZEN 13V 0W5 C DO35
13 1729	Z..8	D ZEN 4V7 0W5 C DO35
13 1730	Z..9	D ZEN 20V 0W5 C DO35

Spare parts EHT Module 76 17427

ART NO.	DESCRIPTION	QUANTITY	ART NO.	DESCRIPTION	QUANTITY
10 03009	R CFFV 1E J 0W25 E1	1	13 1745	D ZEN 18V 1W1 C DO41	1
10 03169	R CFFV 22E J 0W25 E1	1	13 1906	D R BYV96E 1021A5 SOD57	1
10 03209	R CFFV 47E J 0W25 E1	1	13 1958	D R BY329 12208A TO220	1
10 11269	R CFFH150E J 0W25	1	13 2102	U 33B ZTK DO35 PSTAB	1
10 1462	R CF H150K J 1W15 214	3	13 2590	Q BC560B P SS TO92 045A1	1
10 3229	R MO H270E J 1W5	1	13 2910	Q BS170 FN SS TO92 060A5	3
10 3254	R MO H 33K J 1W5	1	13 2918	Q IXTH12N100 FN P TO247 10212	1
10 3606	R WW H E33K 4W KKA4	1	13 2923	Q BC556 P SS TO92 065A1	1
10 4654	R HV H 1M J 0W5 3500 242	1	13 2924	Q BC546 N SS TO92 065A1	2
10 5016	R NTC 2K7 0W25 640	1	13 3039	SPR L 8 D 4 D 1.2 C CER	4
10 6733	R TCE H100K K 0W5 S10TS3386P	1	13 3063	Q ACC ISO MICA SOT93	1
10 6833	R TCE V100K K 0W5 S10SS3386H	1	13 4224	U 582 TLP 1119A1P	2
10 6834	R TCE V200K K 0W5 S10SS3386H	1	13 73945	U 4093B DIP14 PNANDG	1
11 1578	C EL RA 100M M400E4 85	1	30 5913	CH MNS AX 12 UH 3A	1
11 1720	C PPMERA 6N8J162E9 HV FKP1	1	31 3525	J EUR2C MBS P64 E1 C2S1.6	1
11 2819	C CE DI 330P M400E3	1	31 4143	F 5X20 F 2A H RU/VDE	1
11 4162	C POMERA 100N K400E6	1	31 4516	F ACC HLDR T 5X20 PC/HSG	1
11 4603	C POMERA 100N M102E9 HV MKS	1	31 5315	J RVT MBT D 2 L14	2
13 1411	Q BC549C N SS TO92 030A1	5	36 21229	SCR D7985 M 3 X 8 PIC	5
13 14182	Q BC559C P SS TO92 030A1	4	36 7600	NUT BLOC M 3	2
13 1424	Q BC338 N SS TO92 025A8	2	72 1850	R ACC CLIPS TCE V PROTECT	2
13 14311	Q BC327 P SS TO92 045A5	1	80 2634	HTSNK PJ49 EHT 07	1
13 1621	D S 1N4148 075150 DO35	7	80 2780	Q ACC ISO SHT 33X 33	3
13 1637	D R BA158 600400 DO7	1	80 4831	Q ACC SPG 1X 3.1 LONG	1
13 1646	D R 1N4007 10201A DO41	2			
13 1662	D LED D3 T RED	1			
13 1691	U 601G-3 SFH DIP6 POPTOC	1			
13 1721	D ZEN 13V 0W5 C DO35	1			
13 1729	D ZEN 4V7 0W5 C DO35	1			
13 1730	D ZEN 20V 0W5 C DO35	2			
13 1734	D ZEN 5V6 0W5 B 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.

