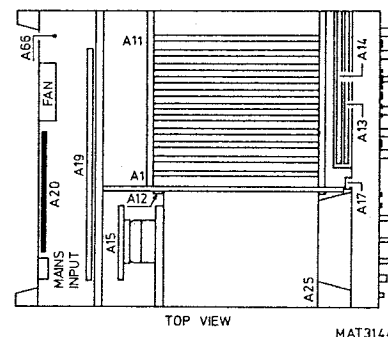


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8.20.1 General information

This unit consists of several circuits:

- a reference voltage source
- a line trigger circuit
- a power down/up detection circuit
- an EHT converter
- a fan-control circuit

WARNING: To avoid any electrical shock, it is strongly recommended to read section 10.1 first.

8.20.2 The reference voltage source

The voltage source consists of an operational amplifier N4601 with the associated components.

The zenerdiode V4601 (6,5 V) serves as the reference voltage source for the op-amp.

Via diode V4602 the node R4601, R4602, V4602 is kept at a stable voltage of 9,4 V to achieve a stable current through zenerdiode V4601. The output voltage RV10 can be adjusted with R4607.

8.20.3 The line trigger circuit

The line trigger circuit is not used in this instrument.

8.20.4 The power down/up detection circuit

The circuit consists of two comparators (N4602) with their associated components.

After power on, the signal C-ON goes high (> 20 V). After a time delay of 0.1 sec, determined by R4644 and C4622, the IL07--LT goes high.

This signal, which is routed to the microprocessor unit A6, tells the microprocessor that the power is on and it can start.

In case of a converter failure, the C-ON-signal goes immediately low, which causes the signal IL07--LT to go low with a very short time delay, because C4622 is discharged fast via R4643 and N4602. The microprocessor will stop.

NOTE: C4622 can't be charged via R4643, because N4602 has open collector outputs.

8.20.5 The EHT converter

Transformer T4601 forms with the various capacitive loads an LC resonance circuit, with an own frequency of approx. 60 kHz.

The circuit is every period charged by a thyristor circuit, consisting of transistors V4608 and V4612 (switched parallel resonance converter).

The thyristor circuit is fired on the negative peak of T4601-9 (see figure 8.20.1). On the negative peak of T4601 - 9, the capacitor C4609 is charged via V4603, R4616, R4618, the b-e junction of V4608 and diode V4607. This fires the thyristor circuit.

Now V4611 charges the LC resonance circuit as soon as T4601 - 9 becomes positive, and V4608 discharges V4608.

When V4608 is discharged the thyristor circuit turns off, because the current from V4603 is below the threshold current of the thyristor circuit. Now C4608 is charged again via V4603.

A higher voltage at the base of V4603 results in a higher charge of C4608 and causes the thyristor circuit to be turned off later, so there will be supplied more energy to the resonance circuit, in this case the output transformer.

During the off-time of the thyristor circuit C4608 is discharged via R4616.

One output voltage (-2,1 kV) is fed back into op-amp N4601 to perform voltage stabilisation.

If the output voltage rises (i.e. -2,1 kV goes more negative) then N4601-3, N4601-1 and the emitter of V4603 go more negative. The on-time of the thyristor circuit will be shorter; the energy supplied to the transformer will decrease and therefore the output voltages will also decrease.

The output voltage F1/F2 (6,3 V) supplies the filament.

The output voltage of T4601-6 is rectified by V4613 and gives the -2,1 kV cathode voltage for the CRT and the feedback to N4601.

The output voltage of T4601-11 is converted to 14 kV in the HT-multiplier D4001 to supply the post acceleration anode of the CRT. For security reasons the EHT ground is separated from the analogue ground on connector X4604 (1A, 1C, 2A, 2C) when the unit is removed. The EHT is not available now (see also section 10.4).

The following figure gives some voltages in the circuit.

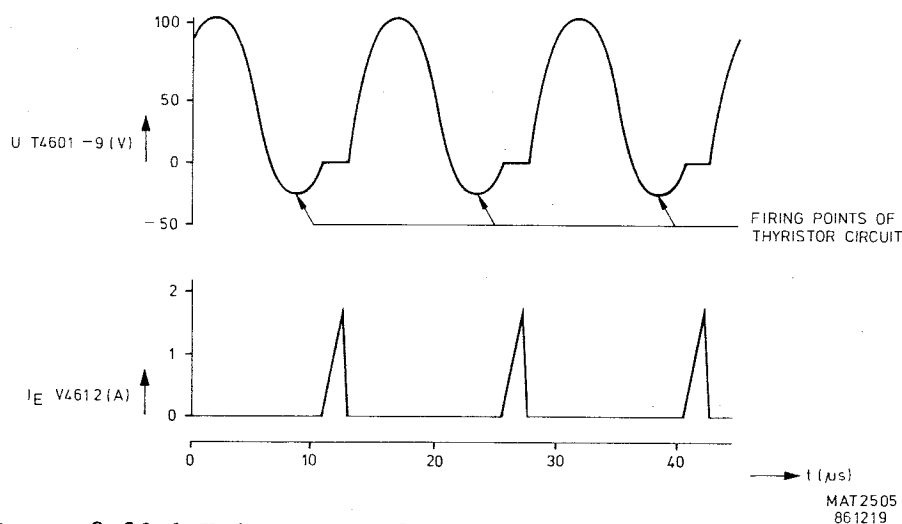


Figure 8.20.1 Voltage waveforms in the EHT converter.

8.20.6 The fan control circuit

In this circuit, a triangle wave voltage of 70 kHz is generated by comparator N4602. Resistor R4652 loads the open collector output. This triangle voltage is on N4602-5 compared with a voltage on N4602-4, which is influenced by a NTC resistor R4656 on this board. The output voltage on N4602-2 is a square-wave signal, whose duty cycle depends on the temperature of the NTC. This square-wave switches via V4621 and V4622 a converter, consisting of L4601, V4619 and C4624, which gives a maximum voltage of 28 V. The output voltage is supplied to the fan and fed back to N4602-4 via V4618 to achieve an overvoltage protection for the fan. If V4622 doesn't switch for some reason, the fan runs on 14 V via L4601, V4619 and L4602, which is mostly sufficient to keep the oscilloscope running.

8.20.7 Signal name list

UNIT A20

Signal name	Description	Signal source	Signal destination(s)
BAVO	Battery voltage	A66	-
C-ON	Converter on	A19	-
EG	EHT ground	A20	A25
FS	Fan supply	A20	A66
f1	Filament 1	A20	A15-C.R.T.
f2	Filament 2	A20	A15-C.R.T.
ILØ7—LT	Interrupt level Ø7	A20	A19-A12-A6
LNØ1	Line Ø1	A19	-
LN	Line trigger	A20	Not used
RVG	Reference voltage ground	A20	A20,A19
RV1Ø	Reference voltage 1Ø V	A20	A20,A19
-2,1 kV	-2,1 kV C.R.T.	A20	A20,A15-C.R.T.
14 kV	14 kV EHT C.R.T.	A20	C.R.T.

WARNING
HIGH VOLTAGE CIRCUIT

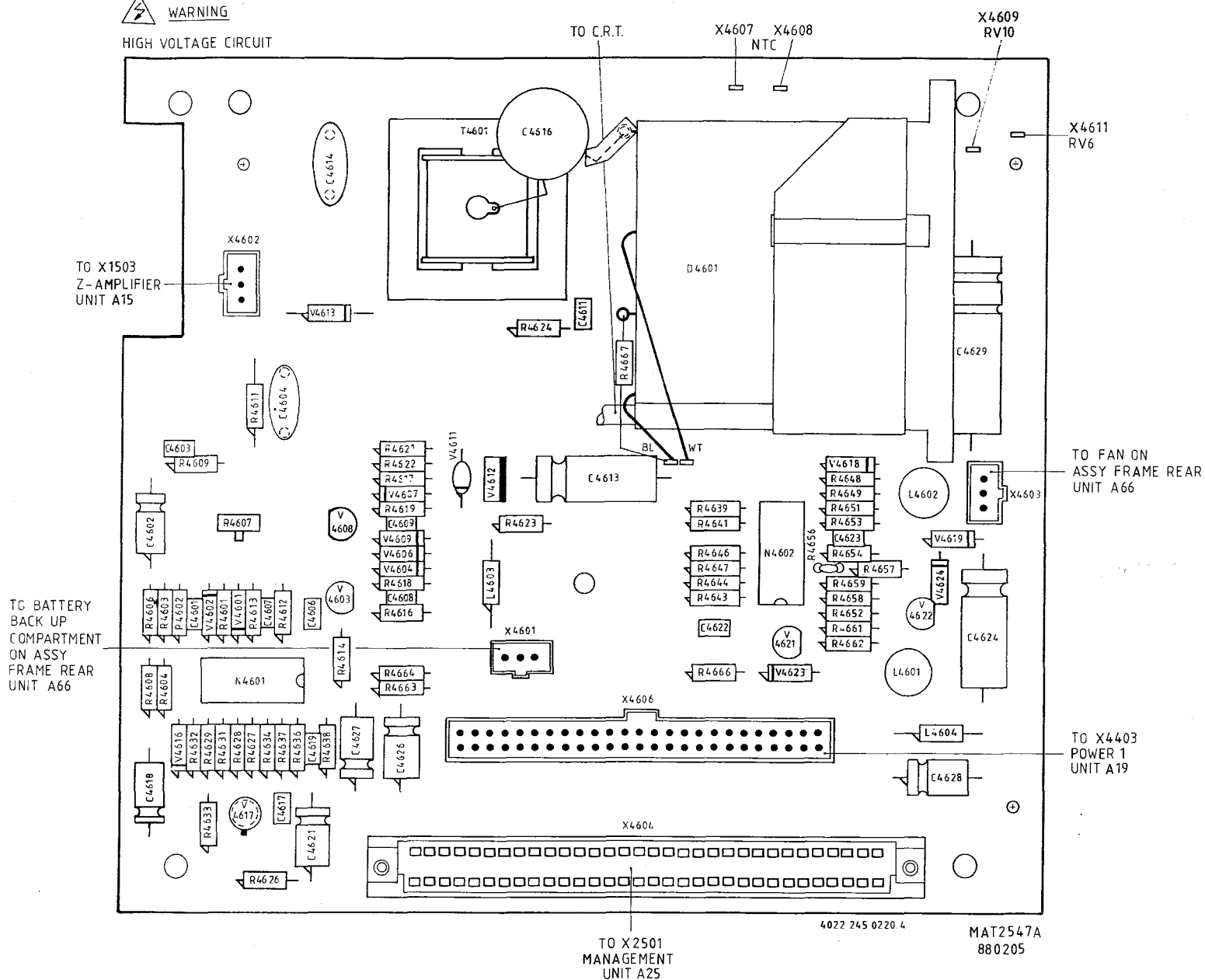


Figure 8.20.2 Unit A20 - POWER 2 - p.c.b. lay-out.

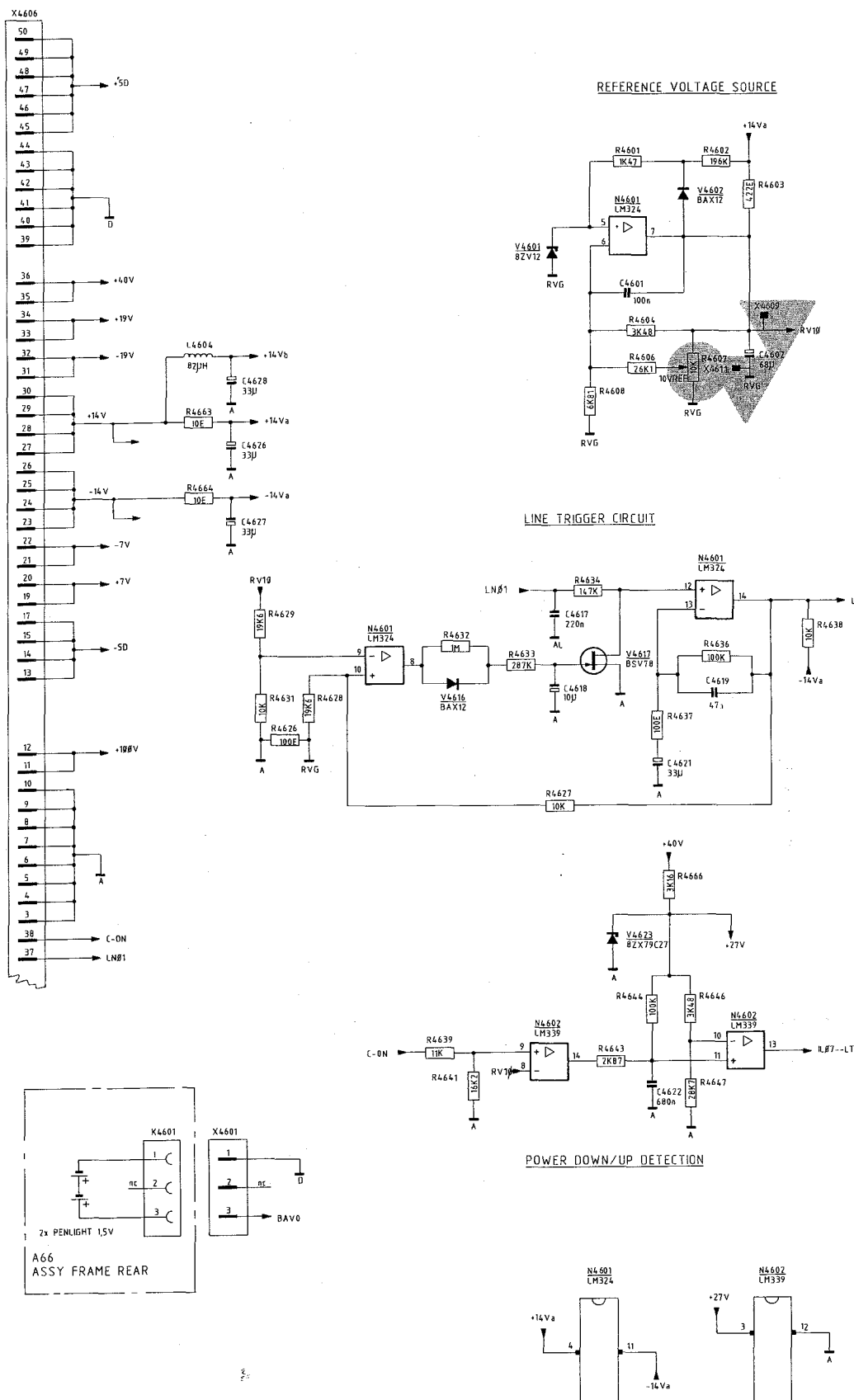
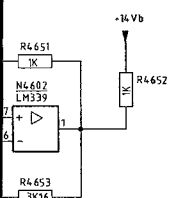
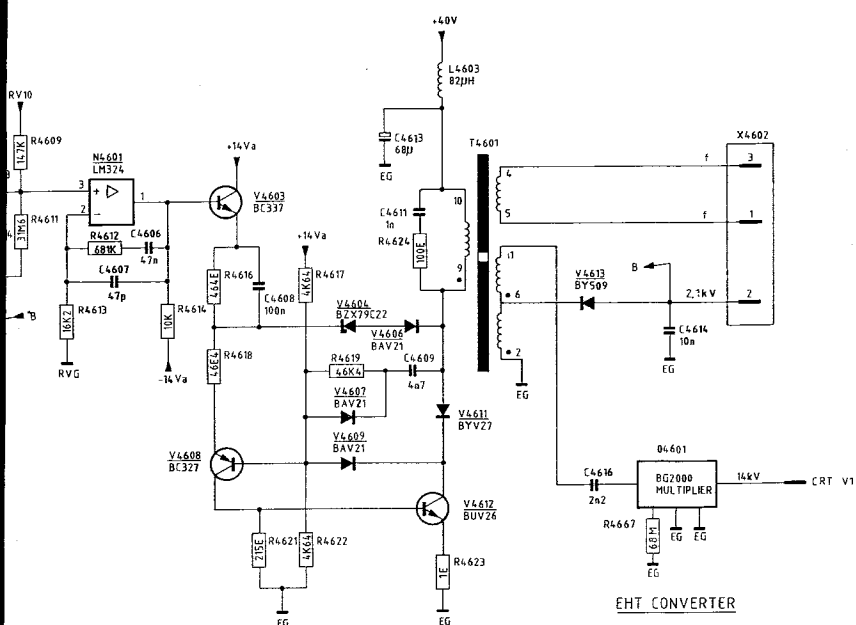


Figure 8.20.3 Unit A20 - POWER 2 - circuit diagram.



WARNING

HIGH VOLTAGE CIRCUIT



FAN CONTROL

