

### Introduction

On the main board of this module we find the generation of all fixed voltages and the variable +HTHD voltage.

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

The SMPS main board is composed of:

- fixed voltage generation section (operational voltage)
- HTHD voltage generation section
- start circuit

The subunit :

- ++9V standby supply
- fan supply
- filament voltage regulator
- fan fail circuit

In order to be sure that the fixed voltage section starts prior to the variable voltage (HTHD) a delay is installed between the start up of I1 and I101.

The powering of the 2 IC's is done by TH1, its gate receives 13V or 0V depending on the value of *TH\_ON/OFF*. The switching on of the IC's is done on pin 5 by *TH\_ON/OFF*.

### Generation of the line frequency independent voltages.

The +300 volt supply coming from the PFC is now the supply voltage for the SMP. The SMP uses the flyback converter architecture, the TDA 4601 (I1) plays the role of PWM based regulator.

The feedback for the IC is routed from the transfo winding (P21,P22) towards pin 3 where it is compared to an internal reference and results in a PWM signal controlling the power transistor Q1.

An undervoltages protection is done through R4,R5,R6.

P1 is inserted in the feedback circuit and allows the adjustment of the +17V supply (see adjustment section). A supplementary protection circuit compares the emitter voltage of Q1 to a reference and influences the feedback signal.

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 of the power switch 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.

The negative amplitude is rectified by D2 and compared with the reference 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 windings P18-P22 also serve as a help at starting up. These windings provide energy the moment the P22-P24 winding does not. The rectified (D130,D132) and stabilized (7815) voltage is used to power the control IC's at pin 9 until 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 (IC101) output drops the error voltage in order to adapt the duty cycle of the switcher. I150 (pin 2,3) compares the emitter voltage of Q1 to a reference and influences the feedback signal.

Note that a special winding is provided, delivering +17VM or a voltage related to the **Mains** ground and not to 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 module) !

### Generation of +HTHD

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 subunit.

This feedback voltage (FBHD') of the subunit, is sent to the base of the error amplifier Q730. The potentiometer P2 allows an adjustment of this feedback, or in other words, the horizontal amplitude can be aligned with P700.

Note that the current flowing through Q730 is delivered by the current generator Q740 (I = 5mA).

The emitter of Q730 is set at a reference zener voltage, adjustable with the voltage at the regulating pin of Z720. This voltage is the result of the output of the DC-amplifier- buffer I700, combined with the +HTHD voltage, the AMP signal coming from the RCU.

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 into the opto-coupler I750 and the phototransistor of this insulating device is now regulating via connector J3 the DC voltage at pin 3 of IC101, in order to stabilize the +HTHD voltage for one typical line frequency and amplitude setting.

D710 is a **green** LED to visualise the +HTHD voltage.

### Overvoltage protection.

Pin 2 of the 393 (I701) is set at 5.6 volts with Z750 and, the other input, pin 3 is an image of the scan voltage (voltage divider).

As soon this input exceeds the zener voltage, the output switches high and saturates transistor Q750. The saturated transistor Q9 pulls pin 2 of IC750 at ground level. The incorporated Led has its max emission whereas pin 5 is pulled at ground level via *GND\_FB\_SMPS*. This ground level, applied to IC101, drops the +HTHD voltage to a low level.

## 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.

The pin 6 of I700 is fixed at 14 volts. If pin 5 drops down then its output pin 7 saturates Q762.

The same happens if I701 detects an **absence of a feedback signal**.

## DC Fan control of the fans.

The speed of the fans is regulated by means of a sensor (NTC resistor) mounted on the SMPS subunit.

I500 is an integrated circuit regulating the speed of the fans by adapting the duty cycle of the output drive for the power transistor Q500. L500 and C504 filters the output voltage.

The feedback is applied to pin 5 which is protected against arcing with D501/D502.

Z500 and Q501 insure that the fan is always working by fixing a minimum voltage (+/- 7V).

The maximum speed corresponds to 14 volts set by Q501, Z501, Z502.

An RC (integral factor of the loop) feedback straight from the output to pin 5 provides a more regular speed at any time.

An additional circuit built around I702 senses the current through the fan (+4.7 Ohms series resistor) and generates a *FAN\_FAIL* signal when the fan is blocked or not connected.

## Power supply for the EHT generator.

The EHT generator is supplied directly from the rectified mains voltage. The +300M volts is leaving the board at the contacts 30/31/32 of the J10 connector for the EHT board (see description of that board)

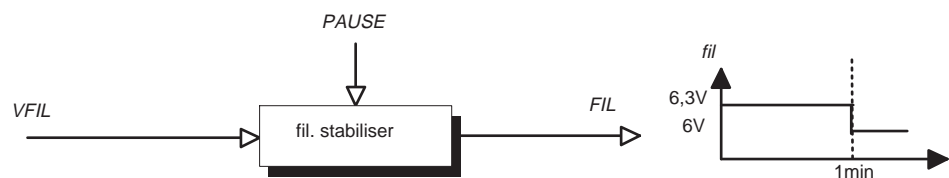
By above measure, we eliminate the influence of the EHT load on the performance of the power supply, and the maximum peak current of the EHT generator is increased.

## Filament voltage stabilisation.

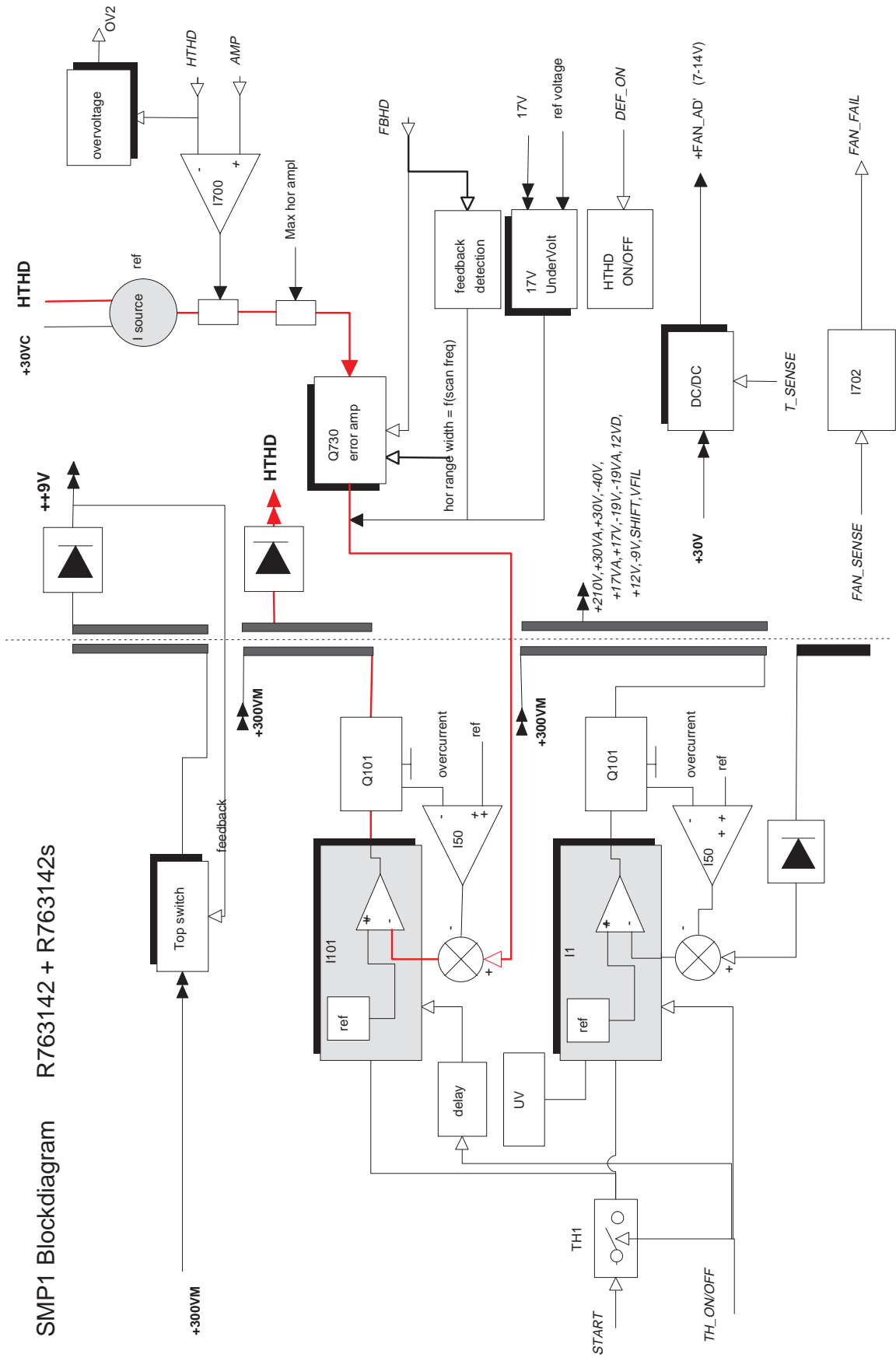
The filament voltage starts up at 6.3V, and is switched to 6V after one minute.

The *PAUSE* signal pulls down the filament voltage via Q616/Q601 which desaturates the series transistor Q600.

P600 can be used for filament voltage adjustment (factory adjusted !, see adjustment section).



Filament voltage stabilisation



SMP1 Blockdiagram R763142 + R763142s