

## 7 Power supply

Stand-

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The FL1.0 sets are equipped with 2 supply circuits, namely a main supply and an auxiliary supply (stand-by supply).

### 7.1 The main supply

This supply is of the SOPS type (Fig. 7.1). A characteristic feature of the FL1.0 main supply is that the entire driver circuit (with the exception of the stand-by and protection parts) is located on a separate SOPS control PC board. This power supply delivers the +141, +16 and -16 (for the sound output stage) and the +13 supply voltages.

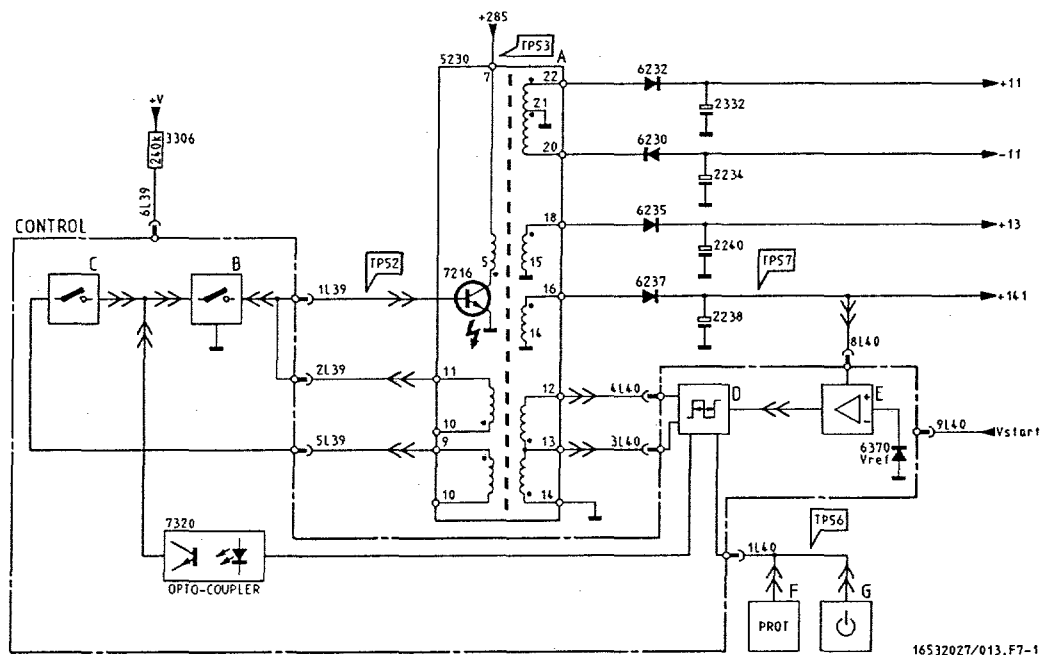


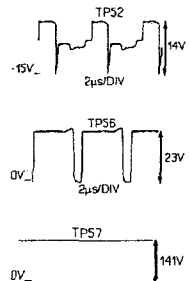
Fig. 7.1

The mains voltage is rectified on the primary side (TP53). The power supply is started up via resistor R3306. The rectified voltage is fed to switching transistor 7216, which is driven by the circuit on the control PCB (TP52).

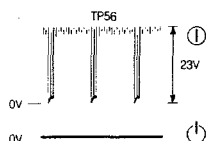
The control PCB accommodates both the primary and the secondary part of the control circuit. The stand-by circuit (G) and the protective circuit (F) are not located on the control PCB.

The primary control circuit, consisting of the switch-off circuit (B) and the blocking circuit (C), is driven by the secondary part (via an optocoupler) and by turns 9-10-11. The secondary part contains a pulse width modulator (D), which is driven by turns 12-13-14 and by a voltage comparator (E). The latter adjusts the pulse width modulator with 141-volt voltage that is presented via pin 8L40.

### Working

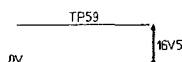


## Stand-by



## Starting-up

## + 13 Volt



The power supply can be turned off via pin 1L40 (TP56). This takes place if the voltage at this pin drops below  $\pm 1$  Volt (fig. 7.2).

In stand-by mode the control microcomputer generates a low level at the base of TS7385. Via TS7384 pin 1 of connector L40 is now connected to 0 V.

The main supply is now completely turned off and all output voltages are 0 Volts.

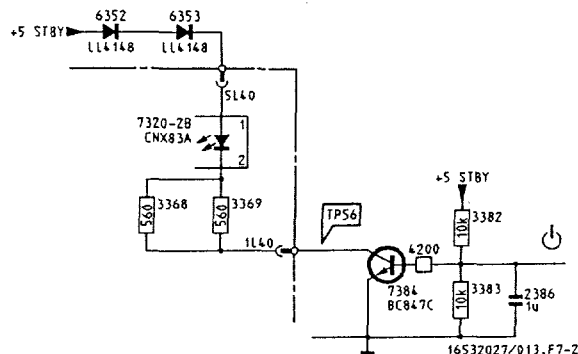


Fig. 7.2

The power supply can be adjusted back via pin 9L40; if the voltage at this pin is lower than 7 volts, the output voltages of the SOPS will be low, but the SOPS stays operational. For a good start-up of the line output stage when the set is switched on, first the auxiliary supply and then the main supply should be started. Therefore the +V start supply voltage of the auxiliary supply is fed to pin 9L40 of the control PCB. As long as this voltage is not available, the output voltages of the main supply stay low.

Most current for the +13 volts is supplied by resistor R3241 (Fig. 7.3).

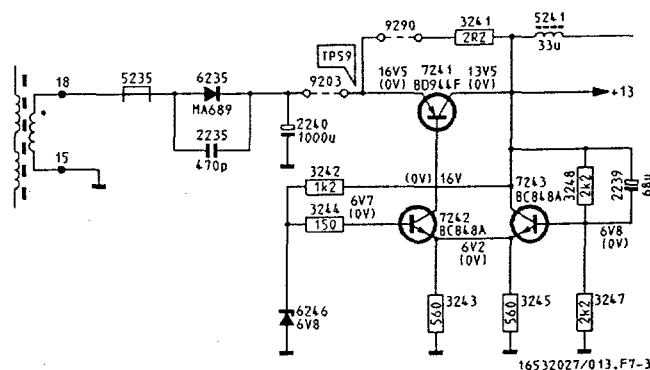
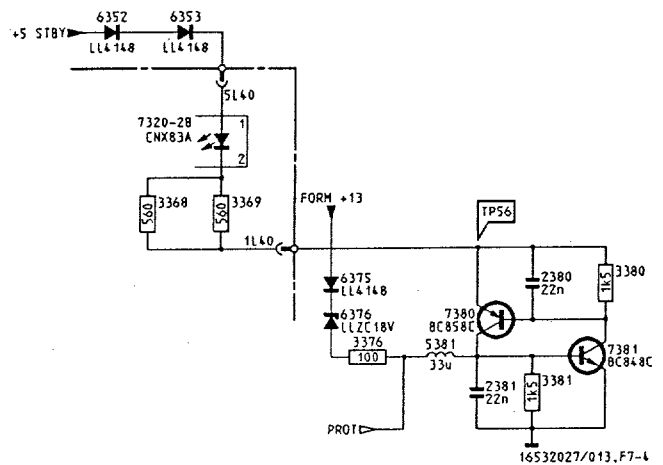
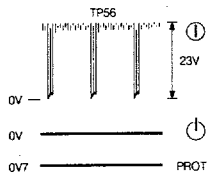


Fig. 7.3

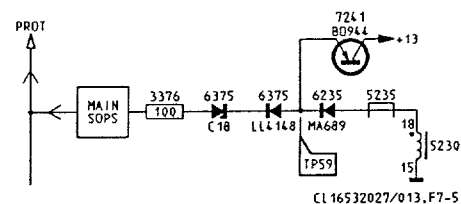
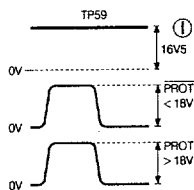
However, its dimensions are such that during normal operation the output voltage is slightly less than 13 volts. Therefore an extra current is carried via TS7241, which brings the voltage at the required value of 13V. TS7241 is driven by the differential amplifier that is built around TS7242 and TS7243. D6246 delivers the necessary reference voltage.

The FL1.0 chassis is equipped with a number of protective circuits. If one of these circuits detects a fault, the main power supply will be switched off. The protection is driven via the thyristor function that is built up around TS7380 and TS7381 (Fig. 7.4), and is activated by a pulse generated by one of the protective circuits.



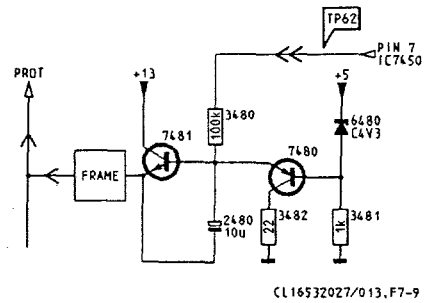
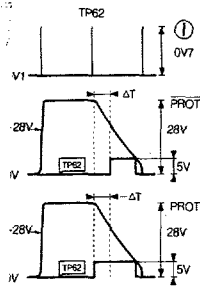
If the protection is activated, pin 1L40 (TP56) will be kept low (0,7 volt) so that the main supply is switched off. The thyristor function will keep the power supply switched off, even when the fault is eliminated.

## Main SOPS



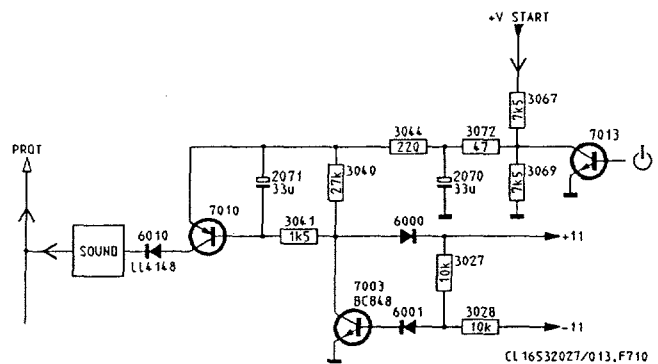
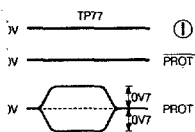
In order to detect a possible overvoltage of the main SOPS the +13 output voltage is checked.  
If the output voltage at the cathode of D6235 exceeds +19 volts, zener diode D6376 will start to conduct and activate the protection circuit.





**Fig. 7.9**

At switch-off, the +5 supply voltage drops out quickly, so that TS7480 starts to conduct and C2480 is discharged via this transistor.



**Fig. 7.10**

If, moreover, the average voltage supplied to one of the loudspeakers is not 0V, TS7003 or TS7004 will also be driven into conduction.

## Fault detection

By fixing a measuring pin to a test point in one of the protected circuits, and then switching on the set, it can be checked whether that circuit activated the protective circuit.

## 7.2 The auxiliary supply (micro SOPS)

This power supply remains active when the set is in stand-by mode.

### Block diagram

#### Primary

- blocking oscillator A
- switch-off circuit B
- switch-off accelerator F

#### Secondary

- variable load C
- voltage stabiliser D
- switch-on pulse generator E

The auxiliary supply is built up of 6 blocks:(Fig. 7.11)

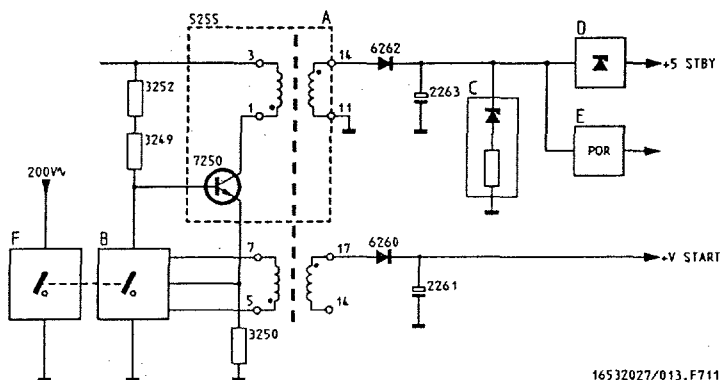


Fig. 7.11

### Primary

#### Blocking oscillator

Transistor TS7250 receives its base voltage via R3252 and R3249 and starts conducting.

A linearly increasing current then starts flowing through winding 3-1 of T5255, TS7250 and R3250.

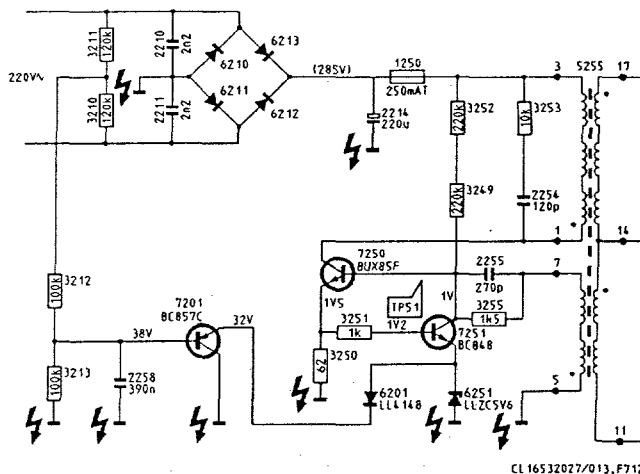
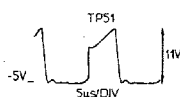


Fig. 7.12

### Switch-off circuit

If the current increases, the voltage across R3250 increases as well. If this voltage exceeds the emitter voltage of TS7251, TS7251 will start conducting and TS7250 will be switched off. As the emitter voltage of TS7251 has been set at 5.6 V by D6251, the voltage across R3250 at that moment will be 6.2 Volts and the current approx. 90 mA. The polarity of the magnetic field in the transformer then is reversed and the voltage across winding 5-7 becomes negative. Transistor TS7250 is kept out of conduction via R3255/C2254 until all energy on the secondary side has been dissipated. Capacitor C2254 now constitutes an oscillator circuit with winding 3-1, so that an oscillation is formed. The polarity of the voltage across winding 7-5 is reversed via the magnetic coupling, thus causing a current to be delivered to the base of TS7250. This transistor starts conducting and the cycle above is repeated.

## Switching off

The mains AC voltage is fed via R3210, R3211 and R3212 to the base of TS7201. If the mains voltage drops out (at switch-off), TS7201 will start conducting immediately and the voltage across zener diode D6251 will decrease. Consequently, the output voltages of the micro SOPS will decrease at once.

## Secondary

On the secondary side 2 voltages are supplied:

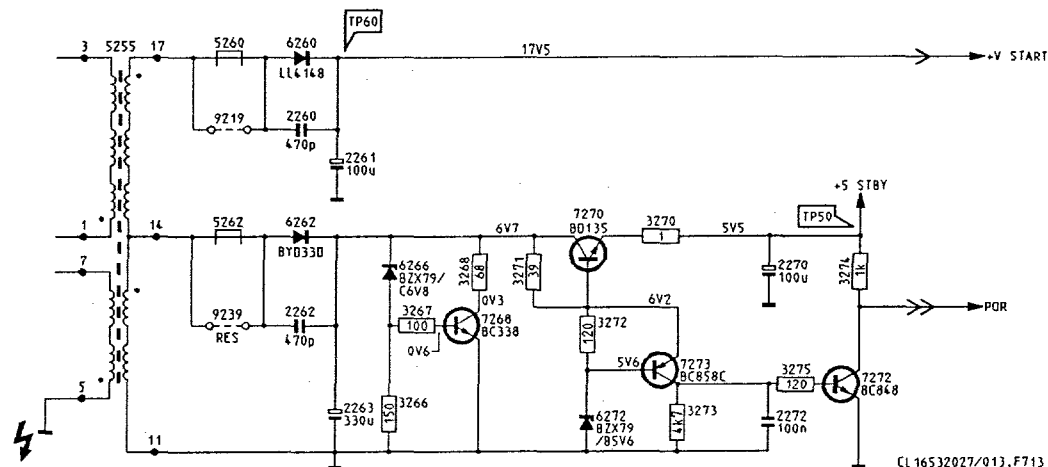


Fig. 7.13

At pin 17 the Vstart voltage is supplied via D6260 across C2261. This voltage is used to activate the synchronisation IC and to let the main power supply know that the micro SOPS has been started up and that now the main SOPS may be started up as well.

At pin 14 a voltage is supplied via D6262 across C2263 from which the +5-volt stand-by voltage is formed. The +5-volt standby voltage is stabilised in 2 different ways.

### Variable load

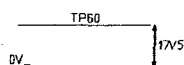
If the voltage across C2263 exceeds 6.9 volts, zener diode D6266 and TS7268 start conducting. The power supply, then, is loaded extra by R3268, so that the voltage decreases more quickly.

### Stabilisation

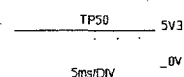
Series stabiliser TS7270 stabilises the output voltage at 5v6.

At switch-on, the voltage across R3272 is lower than 0.7 volts. Transistor TS7273 is not conducting. If the +5-volt stand-by voltage is turned on, the POR signal is kept high via R3274. If the voltage across R3272 increases, TS7273 and thus also TS7272 start conducting and the POR signal is switched to a lower level by TS7272. Meanwhile the power supply has been started and a reset pulse has been supplied to the microcomputer.

### + Vstart



### + 5 Stand-by



## Switch-on pulse