

## for 100 Hz TV sets with chassis 601-M2

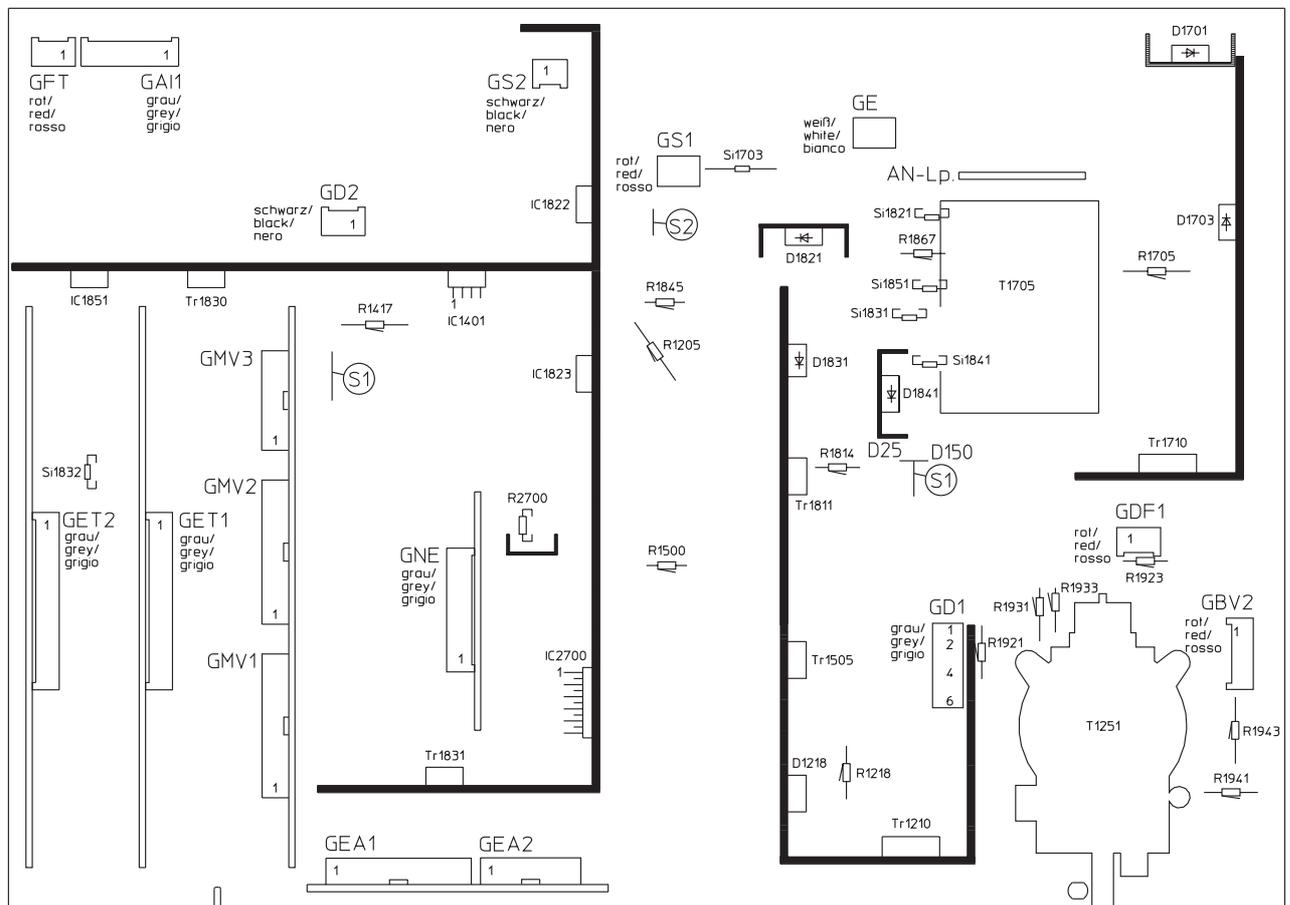
**⚠** When carrying out repairs, remember that various components carry mains voltage. After any work on the set, ensure that it is electrically safe in accordance with the applicable regulations. Only original spare parts may be used when replacing components or assemblies with the safety code ⚠.

In order to ensure safe operation of the TV set, only original spare parts may be used when replacing components with special specifications, which are marked with **S**.

If you move any wires or remove any covers during the course of the work, always replace them in their original positions after completing the work.

**👉** After each repair, the TV set must be tested in accordance with VDE 0701/Part 200. For further details, see our Technical Information No. 02/88.

### Chassis, view on component side



03/03/16

601 46 9014-1/1

**⚠** When carrying out repairs, remember that various components carry mains voltage. After any work on the set, ensure that the mains isolation is fully established..

## 1. Supply voltages and high voltage

**⚡** The supply voltages must be measured and adjusted with the aid of a DC voltmeter with an accuracy of at least 0.3% !

With the beam current set to "0", use **R 1896** on the G chassis to adjust the voltages D138 and D140 to the values shown in Table 1. If there are no faults, the high voltage should then be as shown in the table:

CRT type		Chassis	D 138 D 140	High voltage	U <sub>m</sub> *)
A68 ELR 50X71	PA72	601 G1 0073	138 V	32 KV	800 mV
A80 EJX 11X429	PF84	601 G1 0081	140 V	32 KV	800 mV
W76 ERF 342X044	RF82	601 G9 0083	138 V	32 KV	800 mV

Table 1: Voltages

\*) see also Section 3.1.3

If the voltages D138, D140 are set correctly, the secondary voltage of the power supply unit and the voltages generated by the line transformer will automatically have the correct values (see Table 2).

**⚡** Never attempt to correct the picture width by adjusting the voltages D138 or D140 (R 1896) !

## 2. Configuration

**⚡** The settings in the menu "Configuration" need to be changed only if you have replaced the EEPROM, a tuner or the CRT.

In the "Service menu" (see Section 3), use the blue key to select "Configuration". The red cursor points to "Language". Use the cursor control key to select "Hardware" and then press "OK". Depending on which component you have changed, it may be necessary to set all parameters to new values or only those for the changed component.

In the lines "CRT" and "Tuner", you can select the appropriate type from a list.

**⚡** Take care to select the correct type in each case (see Table 1). If you select an incorrect CRT type, the maximum beam current may be exceeded, resulting in a reduced CRT lifetime.

### 2.1 Initialising the EEPROM

**⚡** When you initialise the EEPROM, all stored data will be lost! The EEPROM is filled with suitable initial values.

In the "Service menu", use the red key to select "Init. memory". The red cursor now points to "Data memory". Use the cursor control key or press the "OK" key to move to the file card labelled "Initialisation".

Press the "OK" key to confirm your selection and then use the cursor control key to move to "Initialise". Press the "OK" key again to confirm this selection and then use the - + key to select "Yes". Press the "OK" key again to start the initialisation procedure

## 3. Service menu

The "Service menu" is called as follows:

- Switch off the TV set with the main power switch.
- Press and hold any two keys on the control panel of the TV set until the green LED lights and switch the set on with the main power switch.
- The service menu is now displayed. The software version number is displayed below the Metz logo.



The service menu is divided into three submenus:

- Configuration
- Adjustment
- Memory initialisation

### Basic operating procedures

In the service menu, you select the desired submenu with the key of the same colour on the remote control unit. You select the various functions with the oval cursor control key

- The **INFO** (Help) key has no function in the service menu.
- Pressing the **TV** key terminates the service mode and switches the TV set back to its normal operating mode.
- The **MENU** key moves you from any menu item to the next higher level of the menu tree. From the main menu, it switches the set back to the TV picture.
- Pressing the OK key saves any changes you have made to the settings.

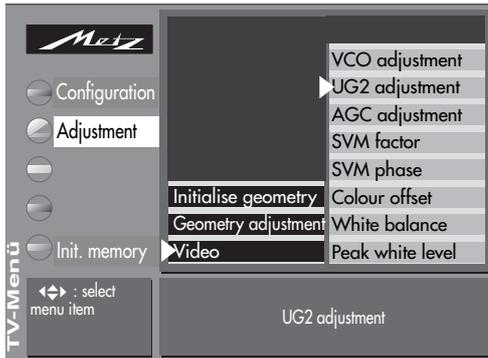
You can now switch programmes. Pressing the **MENU** key again returns you to the service menu.

### 3.1 Adjustment

#### 3.1.1 Adjusting the screen-grid voltage Ug2

- ☞ **The screen-grid voltage of the CRT is set to a value which depends on the model and should not be changed.**  
**The only exception to this is if you have replaced the diode split transformer, the CRT, the BV module or the KS module.**

In the "Service menu", use the yellow key to select the menu item "Adjustment". The set then displays a card file with the red cursor pointing to "Video". Use the cursor control key to select the item "Ug2 adjustment"



Press the **OK** key to display the Ug2 test pattern. Turn the screen-grid adjustment control Ug2 (the bottom control on the line transformer) fully counterclockwise and then turn it slowly clockwise until the red bar on the screen changes to green. Turn the control further until the bar changes back to red. Then turn the control back slightly until the bar changes back to green.

Press the **OK**, **MENU** or **TV** key to return to the TV picture.

#### 3.1.2 Focus adjustment

- ☞ **Prerequisite: the screen grid voltage Ug2 must be set correctly before the focus is adjusted.**

On the TV sets, there are two focus controls on the DF module (focus block). The control "Focus 1" acts primarily in the vertical direction, the control "Focus 2" primarily in the horizontal direction. The two controls affect each other slightly, which means that it may be necessary to adjust them alternately. Judge the focus at the centre of the screen and adjust the controls for the best results.

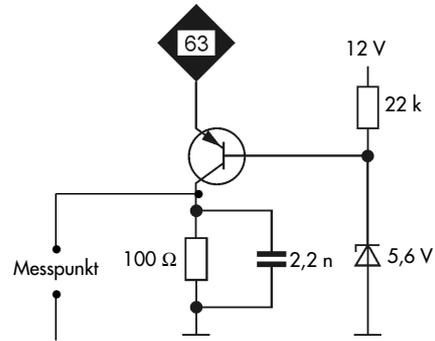
#### 3.1.3 Adjusting the peak white level

- ☞ **This setting must always be made after replacing the KS module, the video processor IC 3101, the BV module, or the CRT, after adjusting the screen-grid voltage and after initialising the EEPROM.**

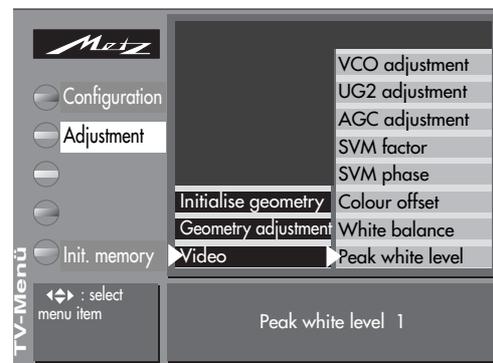
Connect the following measuring circuit between test point  $\diamond$  63 (anode of D 5580) and ground:

- ☞ **Prerequisite: The Ug2 voltage must be correct (see Section 3.1.1). The voltage drop across the 100  $\Omega$  resistor is proportional to the peak beam current: 100 mV = 1 mA**

Connect an oscilloscope to the 100  $\Omega$  resistor of the measuring circuit.



In the "Service menu", use the yellow key to select the menu item "Adjustment". The red cursor points to "Video". Use the cursor control key to select the item "Peak white level". Press the **OK** key to display the test pattern for the peak white level. Use the - + key to adjust the pulse voltage on the 100  $\Omega$  resistor to the value Um shown in Table 1.



Then save the setting by pressing the **OK** key. If necessary, you can cancel the adjustment by pressing the **MENU** key or **TV** key.

#### 3.1.4 White balance

In the "Service menu", use the yellow key to select the menu item "Adjustment". The red cursor points to "Video". Use the cursor control key to select the item "White balance". Press the **OK** key to display the test pattern for the white balance.

The desired white balance can now be adjusted with the - + key. You can step through the colours in the settings box with the cursor control key. Note that the colour with the highest value must be set to 31.

Then save the setting by pressing the **OK** key. If necessary, you can cancel the adjustment by pressing the **MENU** key or **TV** key.

#### 3.1.5 Colour offset

In the "Service menu", use the yellow key to select the menu item "Adjustment". The red cursor points to "Video". Select the item "Colour offset" with the cursor control key. Press the **OK** key to switch to adjustment mode. Then use the - + key to achieve the best possible coincidence of the colour and monochrome pictures, using a suitable test pattern (via the tuner; not an RGB test pattern).

Then save the setting by pressing the **OK** key. If necessary, you can cancel the adjustment by pressing the **MENU** key or **TV** key.

### 3.1.6 SVM factor and SVM phase

The menu items "SVM factor" and "SVM phase" are automatically adjusted after initialisation of the EEPROM.

### 3.1.7 VCO adjustment

The VCO adjustment must always be carried out after replacing the quartz crystal Q5901 or the digital colour decoder IC 5901 and after initialising the EEPROM..

A suitable test pattern (not RGB) should be used for adjustment of the VCO (the voltage-controlled oscillator which is important for the capture range of the colour carrier frequency). The colour carrier of the test pattern should be as accurate as possible.

In the "Service menu", use the yellow key to select the menu item "Adjustment". With the cursor control key, choose the option "VCO adjustment". Press the **OK** key to switch to adjustment mode. Then use the - + key to select "No", "Yes" or "Default". Selecting "Yes" starts adjustment of the VCO with the colour carrier of the displayed test pattern. If no suitable test pattern is available, you can set the VCO to a default value by selecting "Default".

### 3.2 Colour purity

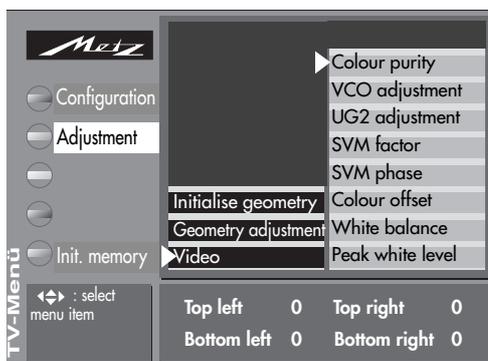
(on model Spectral-84 MF 84 TH 89 only)

On the model Spectral-84 MF 84 TH 89, the service menu **VCO adjustment** contains the additional item "Colour purity".

With this menu item, it is possible to adjust the colour purity in all four corners of the screen with the aid of a setting menu. A red screen is displayed to facilitate this adjustment. Depending on the installation location and any existing colour impurities, it may be necessary to change the factory setting.

Adjust the colour purity, while viewing the red screen to detect any impurities. The four adjustments top left, top right, bottom left and bottom right (these are also displayed as text on the screen) may affect each other slightly.

In the menu, you can select the four corners with the **P+** and **P-** keys and adjust the values with the + and - keys.



### 3.3 Picture geometry (no internal test pattern possible)

#### Selecting factory or table values:

Explanation:

Basic geometry values: The current picture geometry settings. If the picture geometry is changed, the new values are stored here.

Factory geometry values: The picture geometry settings which were made in the factory.

Table values: The picture geometry data stored in the computer programme memory (flash memory, IC3665), sorted by CRT diagonal dimension. These are identical for all TV sets with a CRT of the same diagonal dimension.

In the "Service menu", use the yellow key to select the menu item "Adjustment". With the cursor control key, first call the item "Initialise geometry" and then "Factory geometry values" or "Table values". Press the **OK** key to switch to the lower settings box. The - + key now permits you to select either "yes" or "no". Then save the setting by pressing the **OK** key.

#### Adjusting the picture tube:

If you have replaced the EEPROM (IC 2250), then:

Open the "Service menu" and use the blue key to select "Configuration". The red cursor points to "Language". Use the cursor control key to select "Hardware" and press the **OK** key to confirm this selection. Then use the cursor control key to select the menu item "CRT" and press the **OK** key for confirmation. You can now choose the CRT type with the - + key. Finally, confirm this selection by pressing the **OK** key.

#### Adjustment the picture geometry:

**⚠ The picture geometry may be adjusted only with a test pattern with a vertical frequency of 50 Hz!**

In the "Service menu", use the yellow key to select the menu item "Adjustment". Use the cursor control key to select the item "Geometry adjustment" and press the **OK** key to confirm this selection. Then use the cursor control key to select the desired geometry correction and confirm this by pressing the **OK** key.

You can now adjust the selected value with the - + key.

Save the changed setting by pressing the **OK** key. By repeating the above steps, you can adjust any or all of the following geometry settings sequentially:

- Vertical picture position
- Picture amplitude: adjust for an overscan of 3%.
- Horizontal picture position
- Picture width
- East-West parabola
- East-West trapezoid
- Corner correction, top
- Corner correction, bottom

- Extreme corner correction
- Vertical linearity: adjust with the - +key so that the amplitudes of the top, middle and bottom boxes are equal.
- Vertical parallelogr.: use the - + key to tilt the picture to the right or left to compensate for any asymmetrical trapezoid distortion
- Vertical bending: use the - + key to compensate for any bending of the vertical lines in the test pattern.
- Vertical S-correction: use the - + key to adjust the middle box in the test pattern to the same height as the top or bottom box

☞ **The following factory settings should be changed only if absolutely necessary.**

- Vertical EHT compensation: use - + key to cancel out any variations of the picture amplitude as the beam current varies.
- Horizontal EHT compensation: use - + key to cancel out any variations of the picture width as the beam current varies.
- AFC EHT compensation: use - + key to cancel out any asymmetrical trapezoid distortion in particularly bright areas of the picture by tilting the entire field.

After completing the adjustments, press the **MENU** key to return to the "Service menu".

## 4. Brief descriptions with servicing hints

### 4.1 Power supply unit

On the chassis 601 G1..., the supply voltages are divided into the following groups:

#### The D voltages

The D voltages are generated by the switching power supply and are about 20% higher during "operation without H deflection" than in normal TV mode.

#### The DS voltages

These are derived from the D voltages and are present in both normal TV mode and "operation without H deflection". They are switched off in standby mode.

#### The C voltages

These voltages are generated by the line transformer and are present only in normal TV mode.

### 4.2 Standby control

In standby mode, the power supply unit operates in pulsed mode. The power supply unit is switched on for about 20 ms and then switched off for about 400 ms. As a result of this, there is a sawtooth voltage superimposed on the D voltages.

The standby function is activated by the control line  $\overline{\text{STBY}}$  (L state).

The transistors Tr 1870, Tr 1880, the optocoupler LK1740, and the transistors Tr 1730 and Tr 1890 all conduct. Transistor Tr 1881 is cut off, the  $\overline{\text{ON}}$  line is "high" and the DS voltages are all switched off.

When the voltage D25 reaches the threshold of D1890 (12 V), transistor Tr 1891 conducts. This causes IC 1735 to cut off transistor Tr 1710 until the IC supply voltage (pin 14) drops to 8 V. A new cycle is then started via the start-up circuit.

For faultfinding, this pulsating mode (ecological standby mode) can be disabled by **removing** the service strap  $\textcircled{2}$  (the TV set then runs in service standby mode). The DS voltages remain switched off.

### 4.3 The switching stage

The supply voltages needed for operation of the TV set are generated in the switching stage and the line output stage.

The switching stage is a self-starting blocking oscillator whose transformer T 1705 acts as a protective isolating transformer on the mains side. The regulation circuits of the switching stage compensate for variations in the mains voltage and in the currents drawn by the circuits of the TV set.

The switching stage receives the rectified mains voltage A 300. R 1701 and R 1702 provide a start-up voltage for the central component of the power supply, IC 1735, when the TV set is switched on.

During normal operation (and also in standby mode), IC 1735 receives its voltage from the winding 16/14 of transformer T 1705 and the rectifier circuit D 1733/C 1736.

#### 4.3.1 Checking the switching stage

☞ **Unsolder service strap  $\textcircled{1}$  (in the horizontal output stage) or remove the plug GD1!**

In this mode, the supply voltage D150 is about 50% higher than shown in the circuit diagram. The supply voltages D24, D25, D16 and D8 are protected by normal fuses. If one of these fuses blows, examine the related parts of the circuit.

☞ **Never operate the switching stage without a basic load connected. In other words, never remove all of the diodes D 1811, D 1821, D1831, D 1841, D 1851 and D 1861 simultaneously. In addition, never remove the fuses Si 1821, Si 1831, Si 1841 and Si 1851 and simultaneously operate the TV set with a reduced mains voltage.**

#### 4.4 Service notes for the horizontal output stage

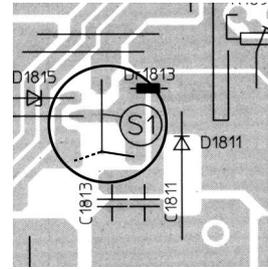
All supply voltages derived from the horizontal output stage are protected by means of fuse-resistors which disconnect the defective circuit section from the diode split transformer in the case of a fault.

For faultfinding in the deflection circuit, the horizontal output stage can be operated with a reduced supply voltage by unsoldering the service strap (S1) and moving it to the other position (dotted line in picture on the right). The horizontal output stage now runs from the D 25 voltage, which is about 15% of its normal supply voltage.

This means that all pulse and supply voltages of the horizontal output stage are about 15% of the values shown in the circuit diagram. The waveforms do not change. Since the vertical deflection is not running, the vertical parabola is not superimposed on some of the waveforms when they are measured with an oscilloscope. Incorrect waveforms and/or deviations from the reduced (15%) values of the voltage indicate the possible cause of the fault.

#### 4.5 Monitoring circuit

Faults in the high-voltage generator and CRT control circuits are detected by a monitoring circuit. This circuit consists primarily of the transistors Tr 1301 and Tr 1302. If this circuit is triggered, Tr 1302 cuts off and initiates a power-off function via the control line HPROT (this occurs if the HPROT pulses become greater than 4.5 V). The TV set then switches to standby mode.



The following individual parameters are monitored:

a) An increase in the high voltage

The positive amplitude of the g-pulse from the line transformer is evaluated (this acts directly on input HPROT of IC 3301, SDA 9380; Tr 1302 is not affected).

b) An increase in the beam current

In this case, the voltage at the terminal "B-ground" of the diode split transformer becomes 0 Volt.

c) Arcing or a short-circuit in a spark gap

In this case, the voltage at the terminal "B-ground" of the diode split transformer becomes very positive. In cases a), b) and c), the TV set switches itself off. After three unsuccessful attempts to restart, the TV set switches permanently to standby mode and the standby LED blinks five times.

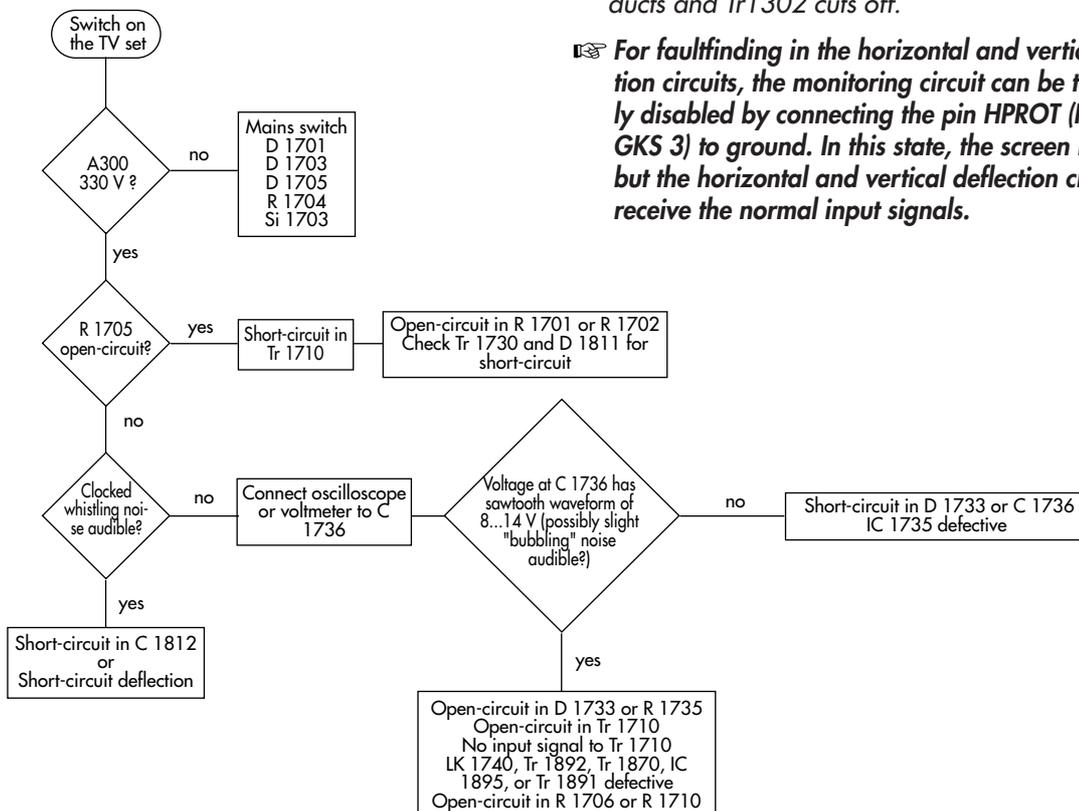
d) Voltage DS12

If the DS12 voltage drops below 9 V as the result of a fault, Tr1303 cuts off, Tr1301 conducts and TR1302 cuts off.

e) H driver stage, H deflection

If the H deflection becomes unstable or operates with an incorrect pulse-pause ratio, Tr1390 conducts and Tr1302 cuts off.

For faultfinding in the horizontal and vertical deflection circuits, the monitoring circuit can be temporarily disabled by connecting the pin HPROT (Pin 11 on GKS 3) to ground. In this state, the screen is dark, but the horizontal and vertical deflection circuits receive the normal input signals.



Designation	Normal operation	Operation without H deflection	Standby mode	Circuits supplied
	<ul style="list-style-type: none"> <li>• TV mode</li> <li>• SAT mode</li> <li>• AV playback</li> </ul>	<ul style="list-style-type: none"> <li>• AV copying</li> <li>• SAT recording</li> <li>• SAT radio</li> </ul>	<ul style="list-style-type: none"> <li>• (eco) standby</li> <li>• service standby</li> </ul>	
<b>SM voltages</b>				
D140	140V ± 1V	• 1)	• 3)	H output stage (601 G1 0081)
D138	138 ± 1V	• 1)	• 3)	H output stage (601 G1 0073, 601 G9 0083)
D60	60V ± 3V	• 1)	• 3)	V output stage (601 G1 0081), DS60 generation, tuner voltage DS45
D28	25V ± 2V	• 2)	• 4)	NF output stages on G chassis 601, (NE module)
D25	25V ± 2V	•	• 4)	SR module, MV module
D16	16V ± 2V	•	• 4)	H drivers, generation of DS12, standby circuit
D8	7V ± 1V	6,3V	• 4)	Generation of DS5, DS5a, DS5b, DS3.3 standby circuit
D5	5V ± 0,3V	•	•	AI module, MV module
<b>Switched SM voltages</b>				
DS60	61V ± 3V	•	–	SVM circuit (MV module)
DS45	46V ± 3V	•	–	Tuner, SR module
DS12	12V ± 0,6	•	1,3V	MV, BV, SR, TP and EA modules, OW-output stage
DS8	8V ± 0,4V	•	–	AI, MV and EA modules
DS5	5,2V ± 0,2V	•	–	MV and EA modules
DS5b	5,2V ± 0,2V	•	–	SR and TP modules
DS3,3	3,3 ± 0,2V	•	–	MV module
<b>H output-stage voltages 5)</b>				
C215	215V	–	–	RGB output stage (BV module)
C14	14,5V	–	–	V output stage
-C14	-14,5V	–	–	V output stage, (601 G1 0073, 601 G9 0083)
	-16V	–	–	V output stage, (601 G1 0083)

1) Approx 20% higher than in normal mode

2) AV copying and SAT recording: approx. 15% higher; SAT radio: same as in normal mode

3) Approx. 25% lower than in normal mode

4) Lower than in normal mode, with superimposed sawtooth waveform

5) Setting the voltage D140/142/150 with R1896 (with beam current 0) to the values shown in the table automatically sets the H output stage voltages to their correct values.

**Table 2: Supply voltages from the switching stage (SM) and the diode split transformer (H output stage).**