GR2.3

Service
Service
Service

Training Manual

Contents

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PCS 68 673 GB

1. Chassis for the following picture tubes:
   - 21" "blackline", "black HIBRI", "HIBRI"
   - 25", 28" "blackline S" and "black matrix"; 4:3
   - 28" "black matrix"; 16:9

2. Chassis suitable for systems PAL BG, PAL I, SECAM BG, SECAM LL' and SECAM DK combined with 2SC or NICAM stereo

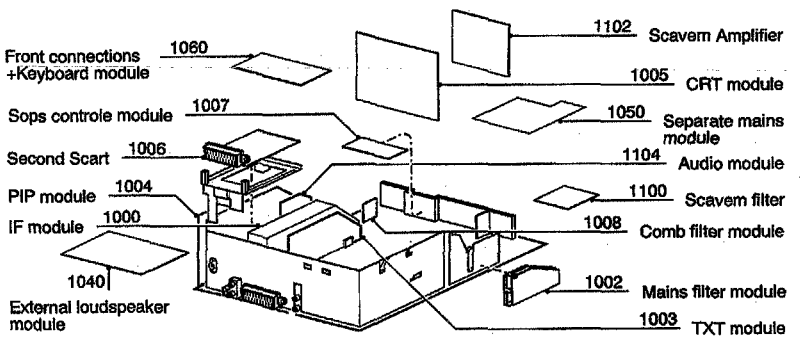
3. Teletext (WST, TOP and/or FLOF) are possible

4. Depending on execution, the chassis is featured with 2 "EURO"/"SCART" connectors, Y/C and audio-out (SVHS) connector.

5. Customer controls are menu-controlled.

6. On the carrier panel the following functions are applied:
   - channel selector
   - video processing
   - audio output amplifier
   - synchronisation
   - frame and line deflection circuitry
   - controls
   - power supply

7. On separate modules the following functions are applied:
   - teletext; inclusive as part of the 16:9 control-circuitry (TXT module - 1003)
   - picture and sound IF-circuitry (IF module - 1001)
   - power supply control (SOPS control module - 1007)
   - comb-filter (COMB filter module - 1008)
   - audio-filters (Audio module - 1104)
   - picture in picture circuitry (PIP module - 1004)
   - scan velocity modulation circuitry (SCAVEM filter module - 1100; SCAVEM amplifier module - 1102)
   - picture-width widen circuitry (PANORAMA module - 1105)
   - circuitries for sourcing and 2ND EURO connector (EURO module - 1006)
   - EXT. LS module (1040)
   - front connector module



Repair provisions

1. Carrier panel with (TP1. TP2 etc.).

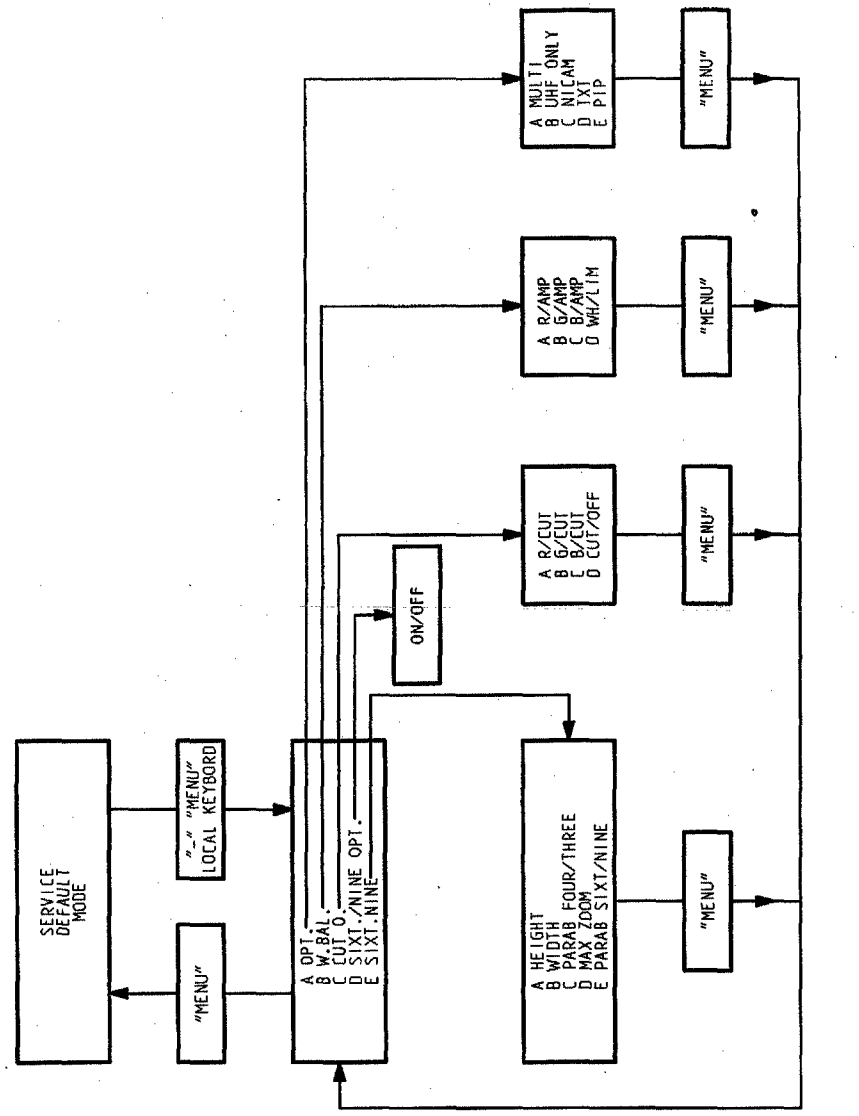
2. All panels with service printing.

3. Software is provided with:

   - "Service Default Mode"
     This mode is activated by short circuiting the "service" pins and simultaneously switching on the set with the mains switch.
     After switching on "SERV" appears on the screen.
     The set will be set in the following state:
     * set is tuned at 475.25 MHz and a defined system.
     * all linear controls are in mid-position except for volume which is set at its minimum level.

   - "Service Menu"
     This mode is activated by simultaneously pressing the "menu" and the "-" button when you are in the Service Default Mode.
     In this mode:
     * different options can be set
     * some software controlled picture settings can be set/adjusted
   - Error-detection system
     Via OSD messages, defective circuits are given.

Repair provisions



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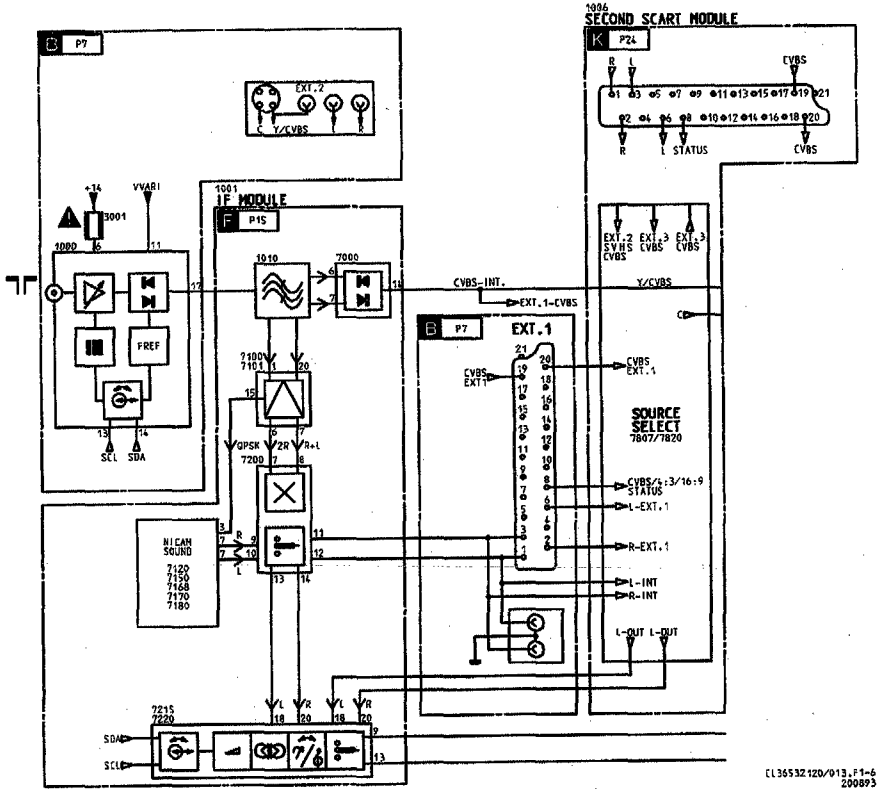
1. Video input signals
   - Video signals can be offered via the following paths:
     * HF signal via the tuner
     * CVBS signal via "euroconnectors" EXT1, EXT3
     * SVHS (separate chrominance and luminance) signals via EXT2
     * RGB signals via "euroconnector" EXT1
   - HF signal is demodulated to CVBS signal via the tuner and the IF-circuitry in the IF-module
     This CVBS signal will also be fed to EXT1 and EXT3.

2. Source select
   - Via a matrix IC on the EURO connector module a choice is made between CVBS/AUDIO signals of the IF module, EXT1, EXT3 or the Y/C-AUDIO signals of EXT2.
   - In case of PIP, the PIP-CVBS signal is sent to the PIP-module. The desired PIP picture can be selected from the signal of the IF module or CVBS EXT1, EXT2 or EXT3.

3. IF-sound
   - IF sound-signal gets demodulated in the IF-module. Here the selection is made between internal and external sound.
   - Before the R and L signals are fed to the sound-output stage, sound regulation takes place in IC7215 and 7220 on the IF-module.
   - IF-module has 2; stereo and NICAM.

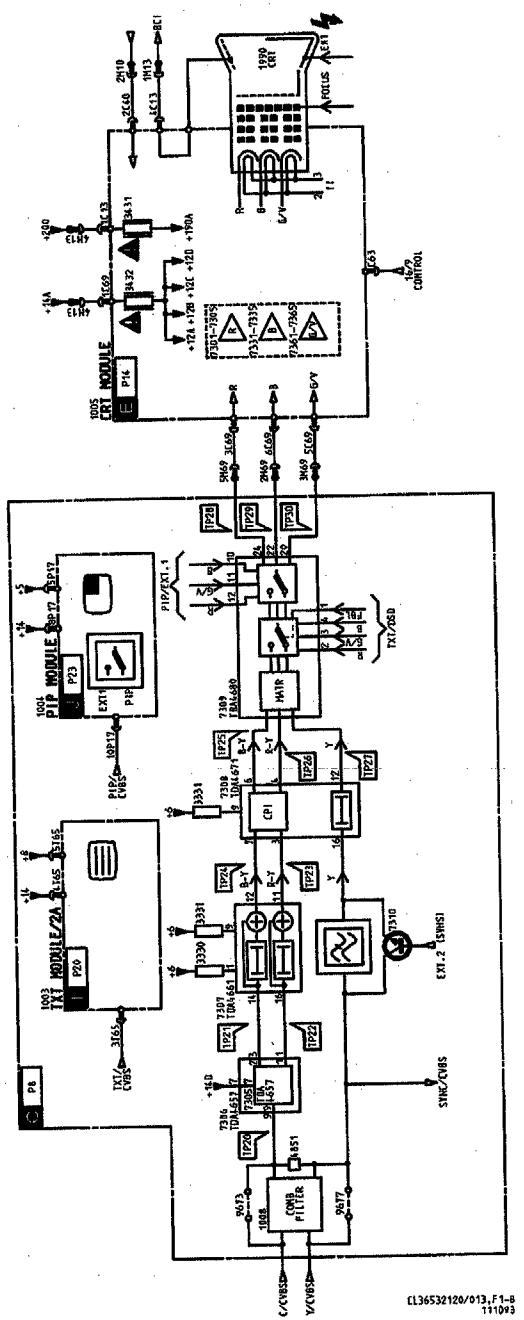


Block diagram

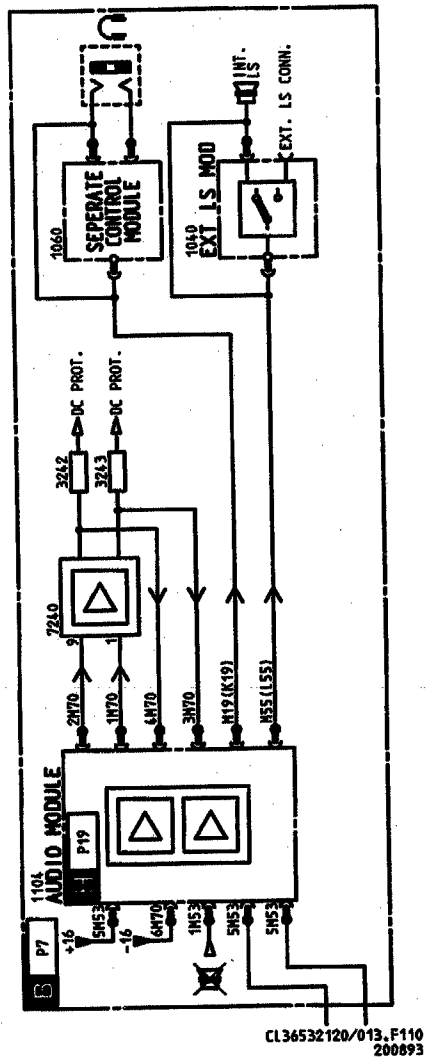
4. Luminance path
   - Via COMB filter 1016, chroma-blocking-filter 7310, delay-line in 7308 to video-control IC7309.
   - In the case of sets without the COMB filter, the jumper 9677 is fitted instead of the COMB filter.
   - Chroma-blocking-filter 7310 is shorted if the Y signal enters from EXT2.

5. Chrominance path
   - Via COMB filter 1016, chroma-decoder IC7306. Chroma-decoder gives colour-difference-signals (B-Y) and (R-Y). Via baseband-delay-line IC7307 to CTI IC7308 and video-control IC7309.
   - In the case of sets without COMB filter, the jumper 9673 is fitted instead of the COMB filter.

6. Video-control and RGB output stage
   - In IC7309, (B-Y), (R-Y) and Y are converted into RGB signals.
   - Via source select switches in IC7309, RGB signals from EXT1/PIP, TXT-module or OSD generator can be selected.
   - After adjustments of brightness, contrast, cut-off points, white balance, and peak-white limiting RGB signals are fed to the RGB output stage on the CRT-panel.
   - In case of 4:3 sets, circuits for east/west and picture width are situated on the CRT-panel.
   - In case of 16:9 sets, picture tube corrections take place in the 16:9 processor on the TXT module.



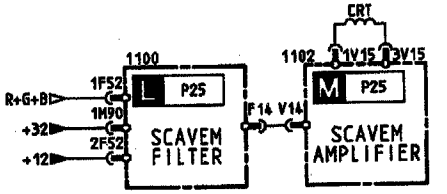
7. Audio-path
   - After source selection, L and R signals are supplied to the "Audio" module.
   - On the "Audio" module 1104, circuitries for filtering and "soft clipping" are situated.
   - From the "audio" module, the audio signals are fed to sound-output stage in IC7240.
   - Amplified L and R signals are fed via the "audio" module to the:
     * "separate control" module with the headphone connection.
     * internal and/or external loudspeaker via the "EXT. LS" module.



Block diagram

8. Synchronisation-, line- and frame-circuitry
   - CVBS signal to synchronisation chip, IC7470. IC7470 generates frame- and line-drive pulses.
   - Frame circuitry with TS7500, TS7502, TS7503 for vertical deflection.
   - Line circuitry with driver TS7540, line output stage TS7545, LOT 5545 gives horizontal deflection. Line circuitries also give the following supply voltages: +200, +14D, +8, -26, Vg2, V-focus and the EHT.

9. Scan velocity modulation
   - The SCAVEM filter, to detect the black/white crossings, is situated at the SCAVEM filter module 1100.
   - The SCAVEM amplifier which influences the scanning-speed of the horizontal deflection current, is situated at the SCAVEM amplifier module 1102.



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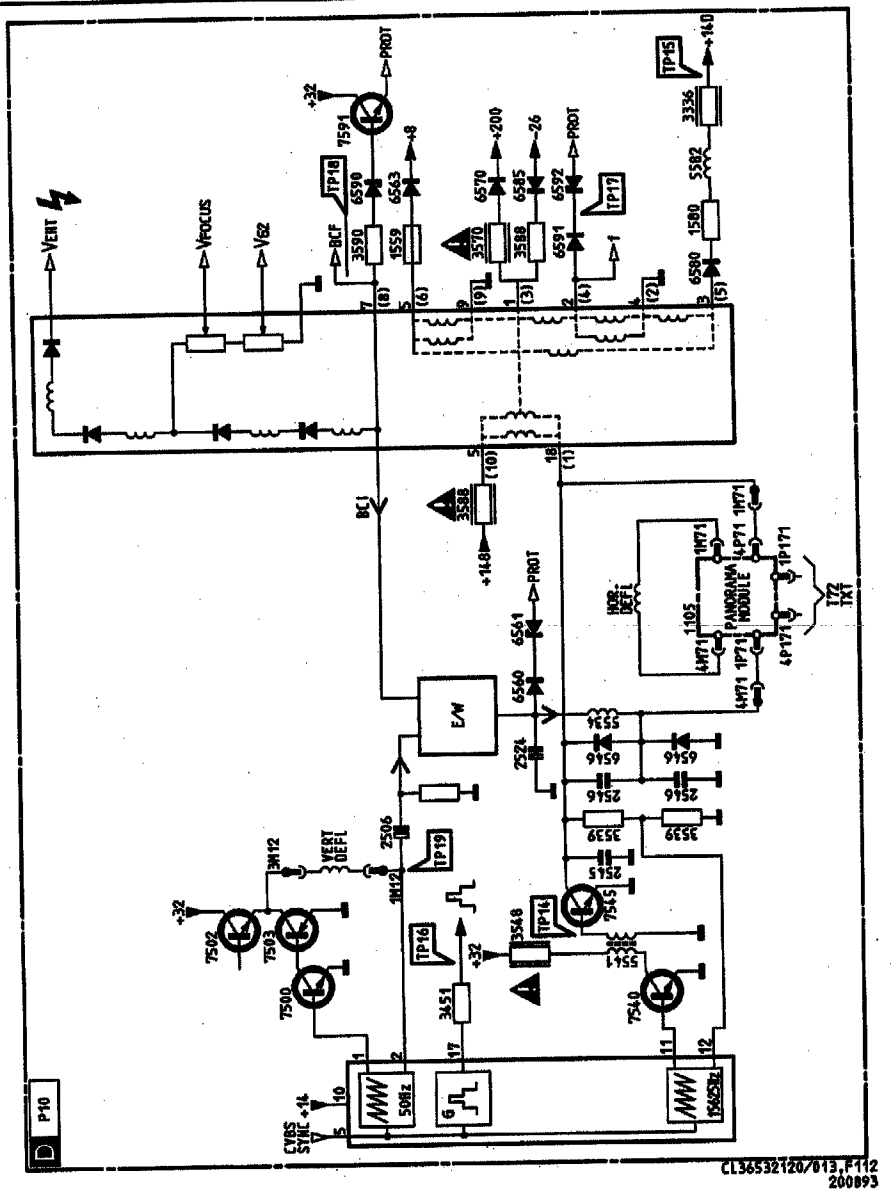
Block diagram



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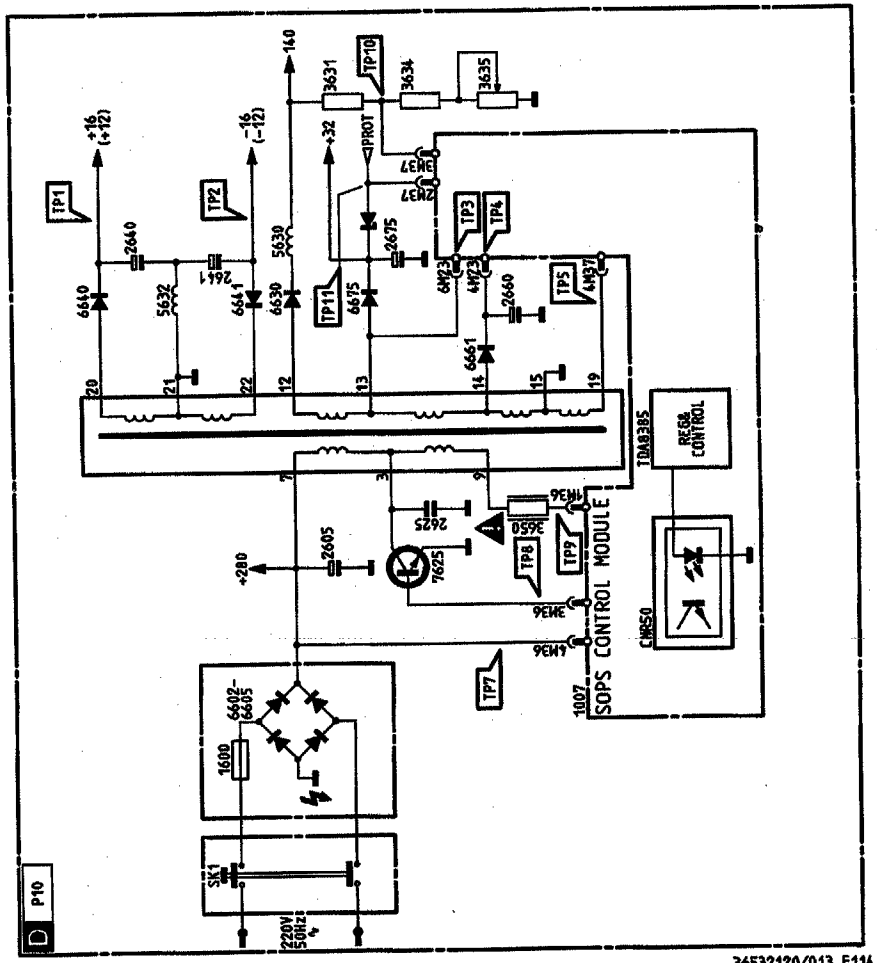
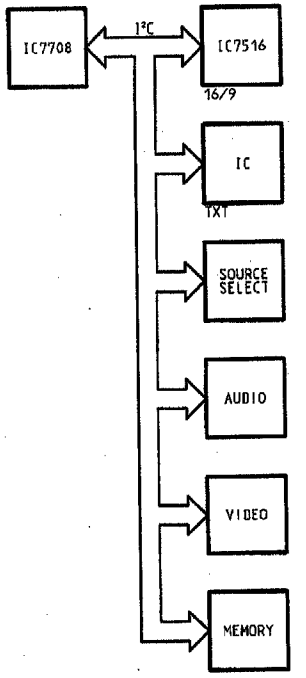
10. Power supply circuitry
    - Power supply is mains-isolated and of the SOPS type.
    - Driving-circuits of the switching transistor 7625 and control-part are situated on the "SOPS control" module 1007.
    - The power supply delivers the following supply voltages: +148, +32, +16 , -16 and +5



Block diagram

11. Controls
    - The controls are driven by a 16K microcomputer IC7708 on the carrier panel and a 32K microcomputer IC7880 on the TXT module.
      * IC7708 controls the general TV operation, such as tuning, sound and picture-adjustments.
      * IC7880 controls teletext and generates the menu's in all languages except France. The software for the French menu is situated in IC7708.
    - In the case of 16:9 sets an extra 12K microcomputer IC7516 on the TXT module, controls the 16:9 functions.
    - The microcomputers communicate with each other via the IC bus.



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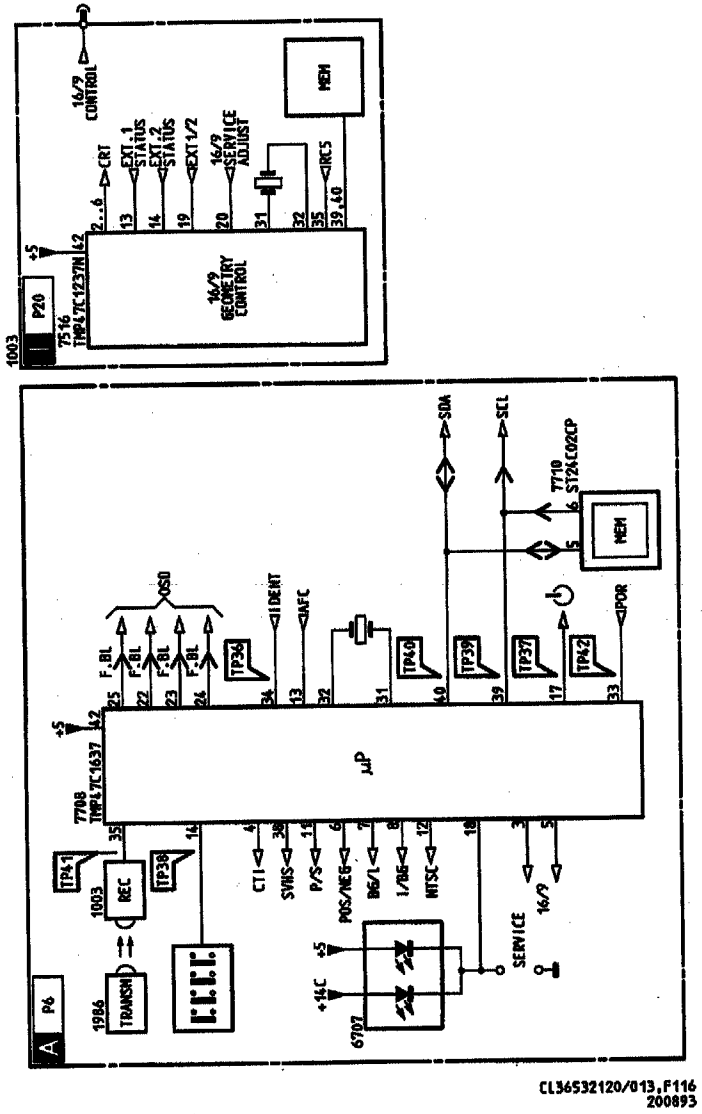
Block diagram



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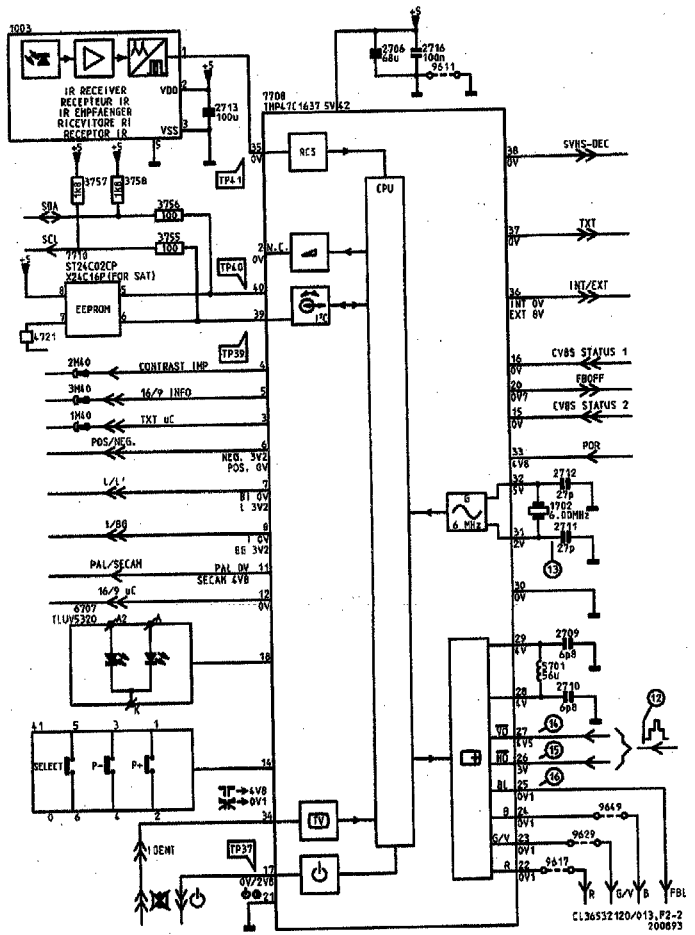
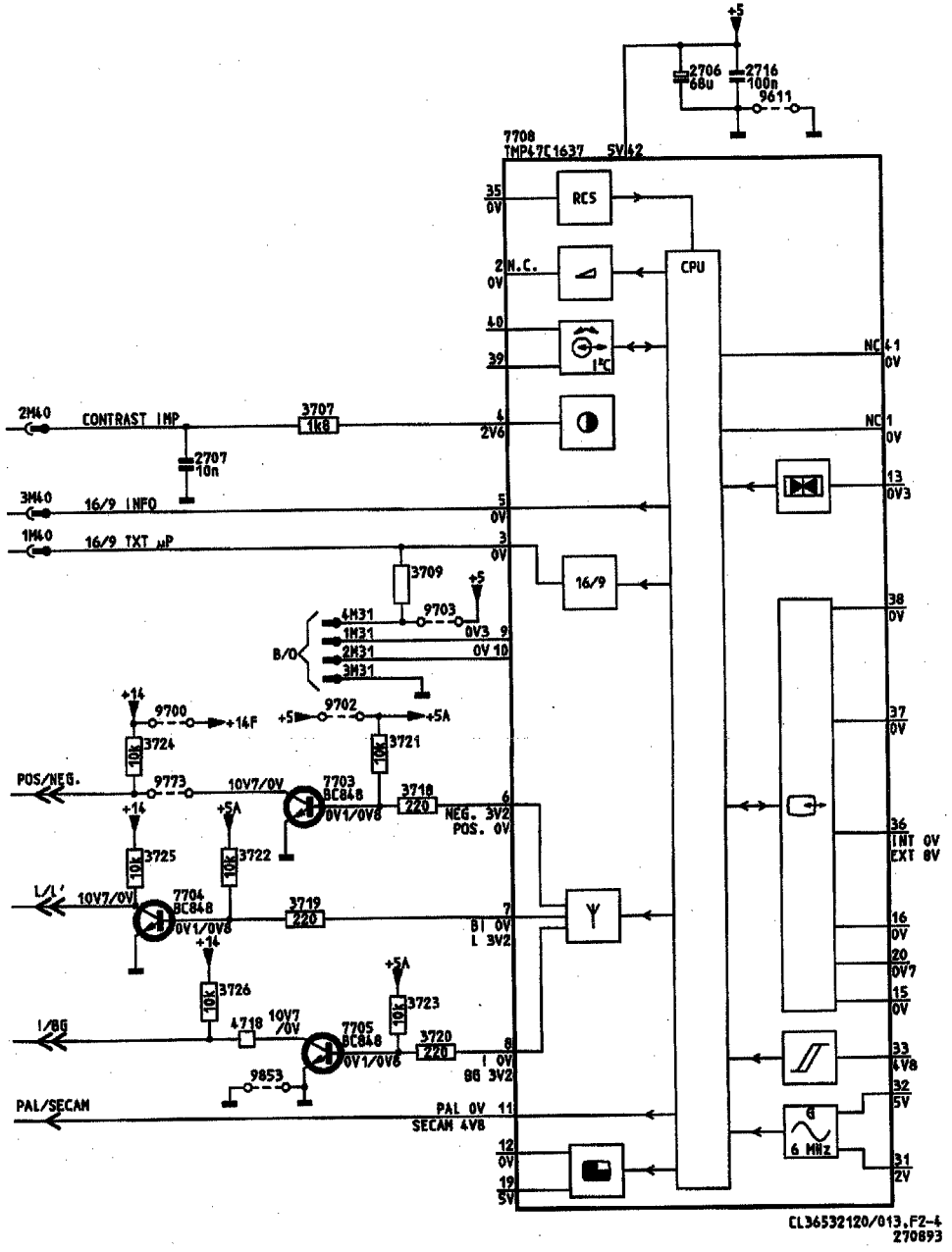
1. Introduction
   - The GR2.3 family has an option for three microcomputers
     * IC7708 (16k; TMP47C1637) on the mainpanel: the main μC for general controlling and operation of the set
     * IC7880 (32k; P83C528) on the TXT module 1003: controlling of the teletext and the language sensitive information of the menu's, with exception of the French language
       For further description see chapter 7: Teletext
     * IC7516 (12k; TMP47C1237) on the TXT panel: controlling of the 16:9 circuit and a part of the operation for a 16:9 set
   - For a description of the operation functions, see the chapter - directions for use, in the GR2.3 service manual

2. Pin-connections of the main microcomputer IC7708
   - Pin 1: Not connected (nc)
   - Pin 2: Not connected (nc)
   - Pin 3: Direct communication with TXT μC
     → The TXT μC is in "slave" function controlled by the main μC
   - Pin 4: Contrast improvement via the picture tube panel: A pulse width modulated signal from the μC is converted to a control voltage.
     → Minimum pulse width on μC produces 6,2V on picture tube panel: the set is at minimum contrast
     → Maximum pulse width on μC produces 8,2V on picture tube panel: the set is at maximum contrast



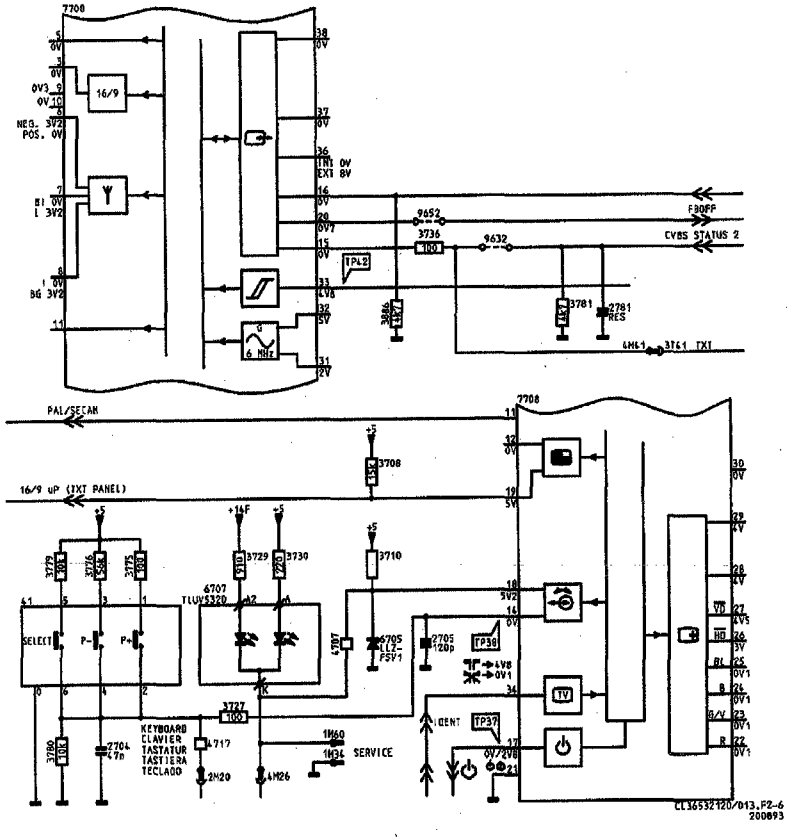
Microcomputers
Pin-connections of the main µC IC7708 (cont.)

- Pin 5: 16:9 information to the picture tube panel:
  - → 0V on µC: 4:3 picture system
  - → 4,7V on µC: 16:9 picture system
- Pin 6: Controlling of the demodulation of positive/negative modulated IF signal in the IF IC IC7000 (TDA2549) and controlling of the demodulation of the AM/FM audio signal:
  - → 0V on µC; 10,7V on IF IC7000: negative IF modulation and FM sound
  - → 3V on µC; 0V on IF IC7000: positive IF modulation and AM sound
- Pin 7: Controlling of switching between BG and L' sound signal:
  - → 0V on µC; 10,7V to the switch transistors T7150/T7151 for the tunable filter 1150: BG system
  - → 3V on µC; 0V to the switch transistors T7150/T7151 for the tunable filter 1150: L' system
- Pin 8: Controlling for switching between BG and I sound signal:
  - → 3V on µC; 0V to switch the crystal filters 1103/1102 (5,5 MHz/6,0 MHz): BG system
  - → 0V on µC; 10,7V to switch the crystal filters 1103/1102 (5,5 MHz/6,0 MHz): I system
- Pin 9: Spare connection
- Pin 10: Spare connection



Pin-connections of the main µC IC7708 (cont.)

- Pin 11: PAL/SECAM identification of the chroma decoding IC7306 (TDA4657):
  - → 0V on µC: PAL
  - → 5V on µC: SECAM
- Pin 12: Spare connection
- Pin 13 Feedback information of the Automatic Frequency Control (AFC)
- Pin 14: Connection of the local control:
  - → Pressing the "+" knob or "-" knob, the program will increase 1 number or decrease 1 number
  - → After pressing the "select" knob, the "+" and "-" knob will change 1 step at the selected function
    * Normal voltage at this pin is 0V
    * With "+" pressed: 4,7V
    * With "-" pressed: 3,1V
    * With "Select" pressed: 2,4V
- Pin 15: Feedback CVBS status EXT.3 coming from the Euro module 1006:
  - → 5V on the µC: EXT.3 signal present
- Pin 16: Feedback CVBS status EXT.1 coming from Euro module 1006:
  - → 5V on the µC: EXT.1 signal present
- Pin 17: "Standby" command:
  - → TV on (Power On): 2,7V
  - → TV in "standby": 0V
- Pin 18: LED indication:
  - → TV on (Power On): 4,9V
  - - The green LED in D6707 will light with the current flowing through R3729 (+14F)

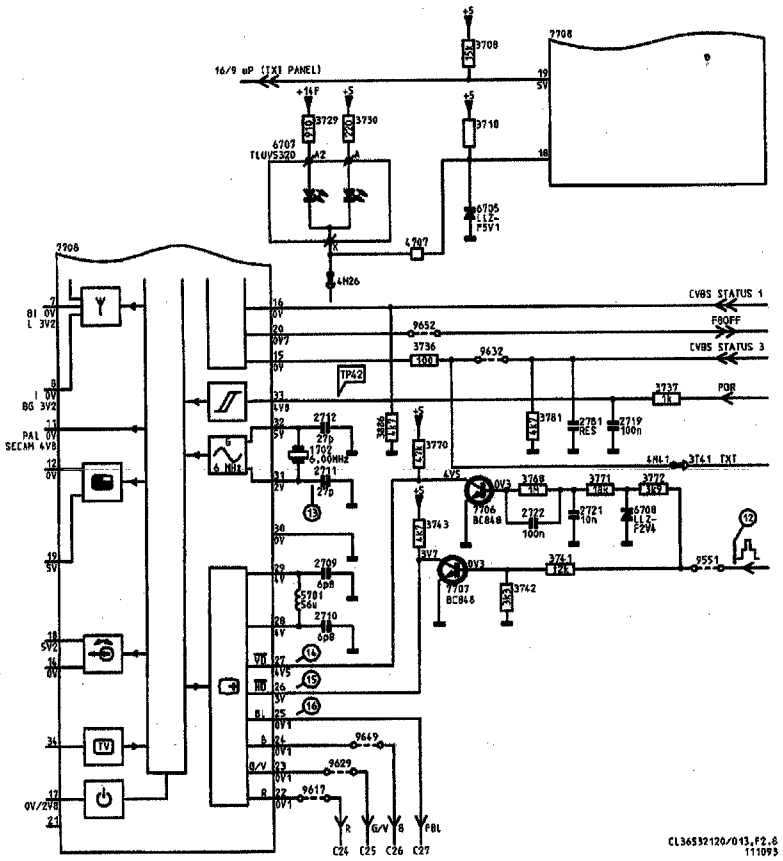


Microcomputers

Pin-connections of the main μC IC7708 (cont.)

- Pin 18: TV in "standby": 0V
  → - The red LED in D6707 will light with the current flowing through R3730 (+5V)
  - If the +14F is not present; the green LED will not light.
  → When RC commands are received: the voltage pulses between 0V and 5V
  - The green LED in D6707 will light continuously by the current through R3729
  - During the pulses the LED in D6707 will light by the current through R3730
  - By the lighting of both the red and green LED's the orange colour will be visible
- Pin 19: Direct communication with the 16:9 μC on the TXT module 1003 :
  → The 16:9 μC is in "slave" function controlled by the main μC
- Pin 20: Switching off the Fast Blanking (FB OFF)
- Pin 21: Ground connection of μC IC7708
- Pin 22: OSD controller (menu display): colour red :
  → 0V: no OSD
  → 4V: OSD text or background colour
- Pin 23: OSD controller (menu display): colour green :
  → 0V: no OSD
  → 4V: OSD text or background colour
- Pin 24: OSD controller (menu display): colour blue :
  → 0V: no OSD
  → 4V: OSD text or background colour

Microcomputers

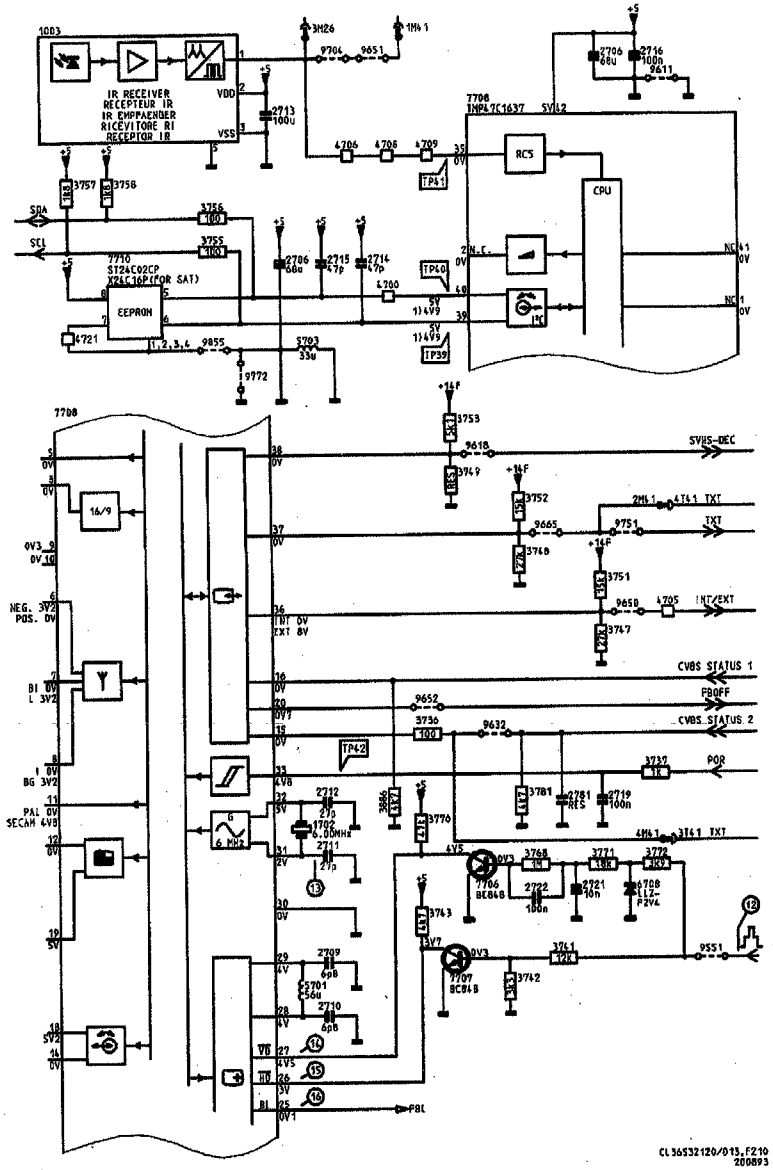


Microcomputers

Pin-connections of the main μC IC7708 (cont.)

- Pin 25: OSD controller (menu display): "fast blanking"
  - → 0V: no OSD
  - → 4,7V: OSD text or background colour
- Pin 26: OSD controller (menu display): inverted horizontal synchronisation
  - * The control signal is deducted from the sandcastle signal via TS7707
- Pin 27: OSD controller (menu display): inverted vertical synchronisation
  - * The control signal is deducted from the sandcastle signal via TS7706
- Pin 28: OSD oscillator (5,6 MHz), synchronised with the line frequency
- Pin 29: OSD oscillator (5,6 MHz), synchronised with the line frequency
- Pin 30: Earth
- Pin 31: Ground connection μC clock-oscillator (6 MHz)
- Pin 32: Ground connection μC clock-oscillator (6 MHz)
- Pin 33: Power On Reset (POR) :
  - → After switching on the TV: delayed 5V
- Pin 34: TV signal recognition of the sync IC7470 :
  - → 4,6V on the μC: (antenna) signal present
  - → 0,1V on the μC: no signal present
- Pin 35: Remote Control (RC) signals from the RC receiver 1003
- Pin 36: Status signal internal/external signal :
  - → 0V on the μC: internal signal selected
  - → 3,9V on the μC: EXT.1, EXT.2 or EXT.3 selected
- Pin 37: Status signal EXT.3
- Pin 38: Status signal SVHS :
  - → 5V if SVHS signal on EXT.2 is present

Microcomputers



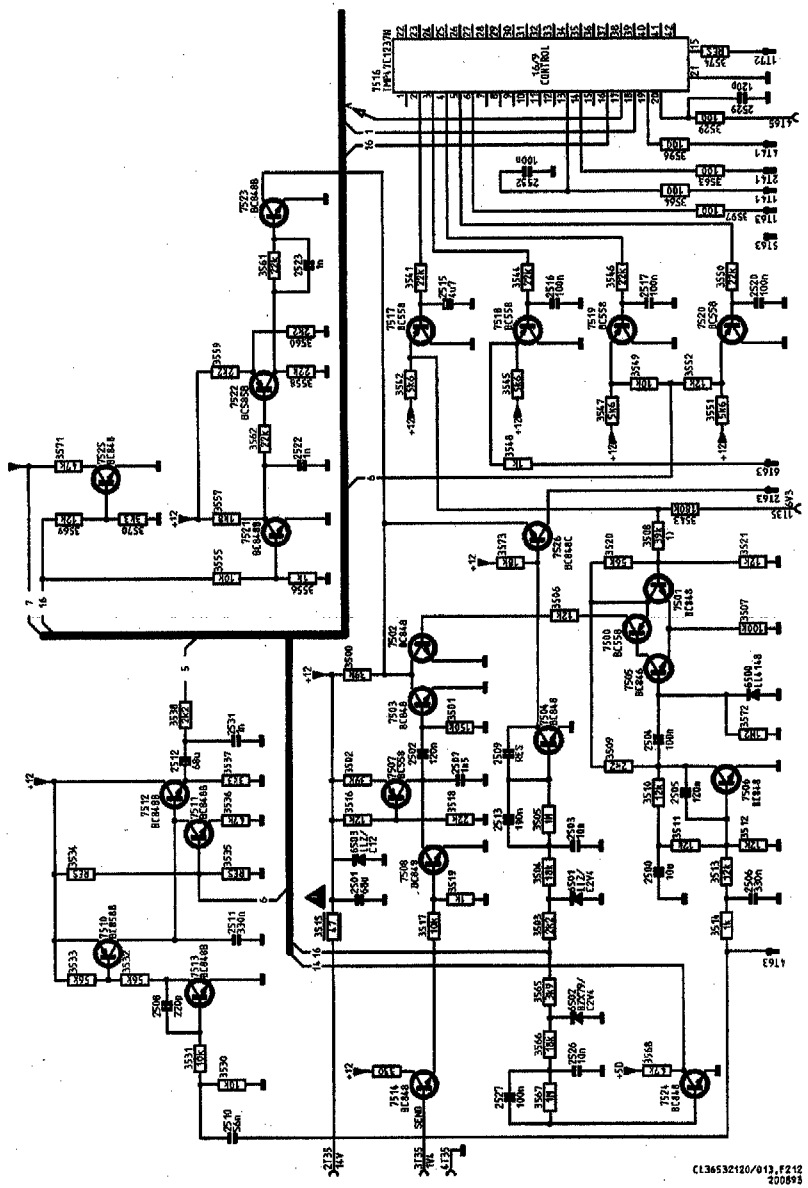
Microcomputers
Pin-connections of the main µC IC7708 (cont.)

- Pin 39: I^2C control signal: clock SCL
- Pin 40: I^2C control signal: data SDA
- Pin 41: Not connected (nc)
- Pin 42: +5V supply

3. Pin-connection of the 16:9 µC IC7516 on the TXT module 1003

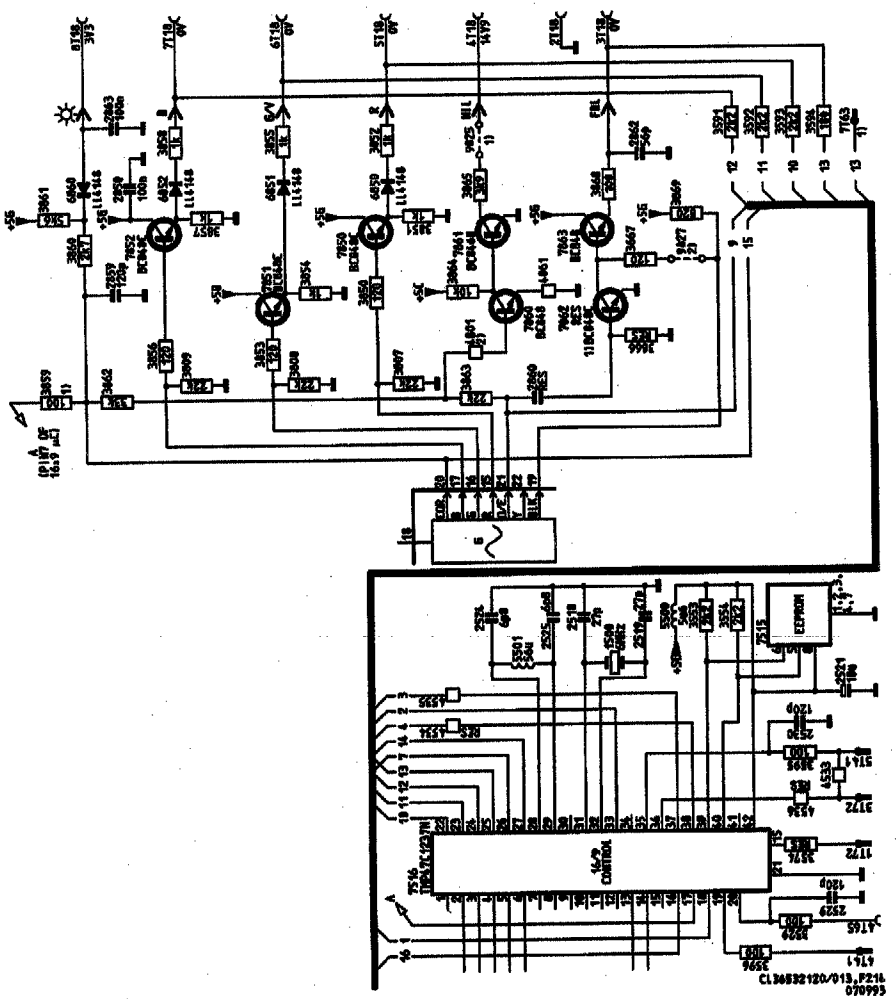
- Pins not mentioned are not connected
- Pins 2 to 5:
  Pulse width modulated output for 16:9 picture control; 0-5V
  → With the circuitry on the TXT module 1003, the correct control is realised
- Pin 2: Picture height
- Pin 3: Picture width
- Pin 4: 4:3 parabola
- Pin 5: 16:9 parabola
- Pin 6: 16:9 switch information :
  → 0V for: 4:3 picturesize
  → 5V for: 16:9 picturesize
- Pin 13: External connection EXT.1 :
  → less than 1,2V: no EXT.1; picturesize 4:3
  → 1,6V to 3,4V: EXT.1; picturesize 16:9
  → more than 3,8V: EXT.1; picturesize 4:3
- Pin 14: External connection EXT.3 :
  → less than 1,2V: no EXT.3; picturesize 4:3
  → 1,6V to 3,4V: EXT.3; picturesize 16:9
  → more than 3,8V: EXT.3; picturesize 4:3
- Pin 17: No interlace (NIL) :
  → 0V: normal picture
  → 5V: TXT mode; no interlace

Microcomputers



Pin-connections of the 16:9 µC IC7516 (cont.)

- Pin 18: Internal/external signal present :
  - → 0V: no external signal present
  - → 5V: external signal present
- Pin 19: EXT.1 or EXT.3 signal present :
  - → 0V: EXT.1 present
  - → 5V: EXT.3 present
- Pin 20: Direct communication with main µC IC7708
- Pin 21: Ground connection of IC7516 (TMP47C1237)
- Pins 22 to 27: OSD via TXT RGB :
  - → R, G, B, Fast Blanking, horizontal synchronisation, vertical synchronisation and oscillator connections
- Pins 31 and 32:
  - → Connection µC clock-oscillator
- Pin 33: Reset connection
- Pin 35: Remote Control (RC) signals
- Pins 37 and 38:
  - → Reserved for I^2C connection with the main µC
- Pins 39 and 40:
  - → I^2C connections SCL and SDA :-
  - → These are only connected with the local memory IC7515 (ST24C02)
  - → Stored information: 16:9 settings
    - Picture height
    - Picture width
    - 4:3 parabola
    - maximum zoom 4:3
    - 16:9 parabola
- Pin 42: +5V supply



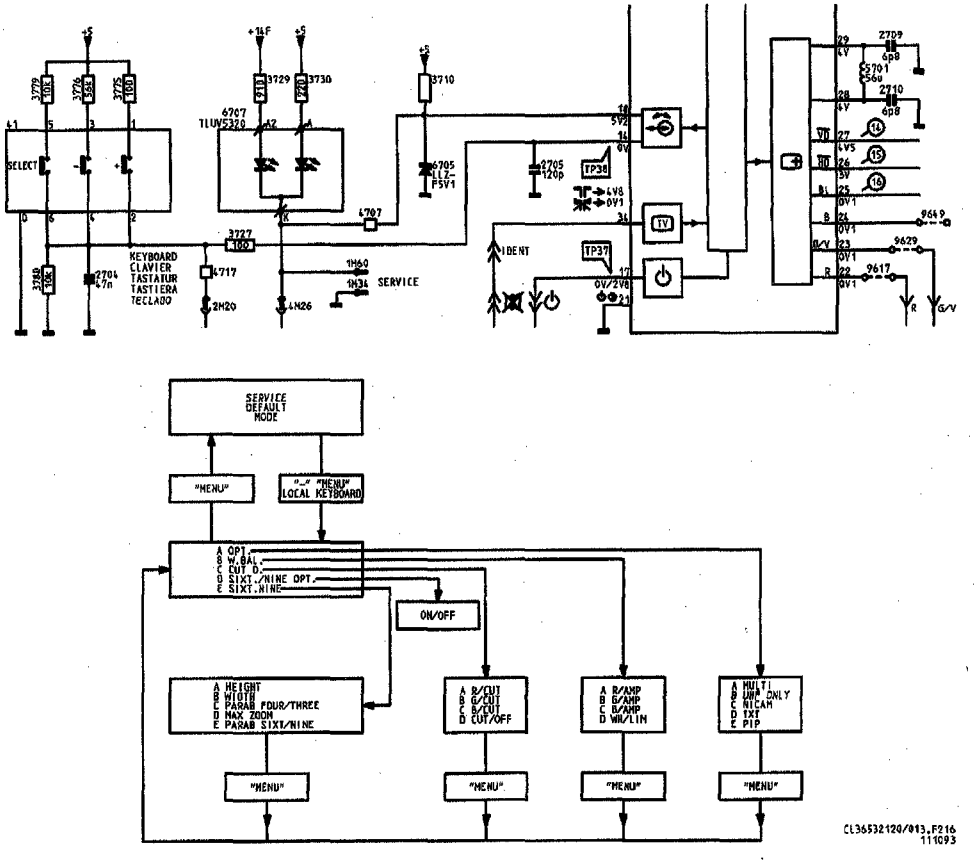
1. Service Mode

- **Function:**

  Setting the options and picture tube alignments

- **Operation:**

  - A shortcircuit of the Service pins whilst switching on the set will put the set into the Service Mode
  - Choices on the menu:
  *** Option**
  - PIP present
  - Teletext present
  - Nicam present
  - Multi system set
  - "UHF only" tuner present
  *** White balance; settings between 0 and 63**
  - White colour settings: red
  - White colour settings: green
  - White colour settings: blue
  - Peak white limiting
  *** Cut off voltages; settings between 0 and 63**
  - Cut off for red
  - Cut off for green
  - Cut off for blue
  - Cut off on/off
  *** 16:9 picturetube;**



2. Error messages

- Function:

  Fast diagnosis of defective IC's or problems with some functions

- Operation:

  - If an error has occurred: after switching on the Service Mode, an error message at the bottom left on the screen will appear
  - After a few seconds this error message will disappear
  - If there is an internal μC error:
    → The TV on/standby LED will start blinking

Survey of errormessages on the screen

Message on screen	Description
ER PIP	I^2C error PIP module
ER NICAM	I^2C error IC7160 (NICAM sets)
ER 8415	I^2C error IC7200 (STEREO sets)
ER 8425	I^2C error IC7213 (NICAM sets) I^2C error IC7220 (STEREO sets)
ER TXT	I^2C error teletext module
ER EEPROM	I^2C error IC7710
ER TUNER	I^2C error tuner
ER CHROMA	I^2C error IC7309
ER BUS	I^2C bus blocked

Tuner

1. Tuner U1000
   - Only PLL
   - Band I, band III and hyperband (Low, Mid and High)
   - 2 types:
     * UV916 for PAL BG / SECAM BGLL'DK
     * U944 for PAL I

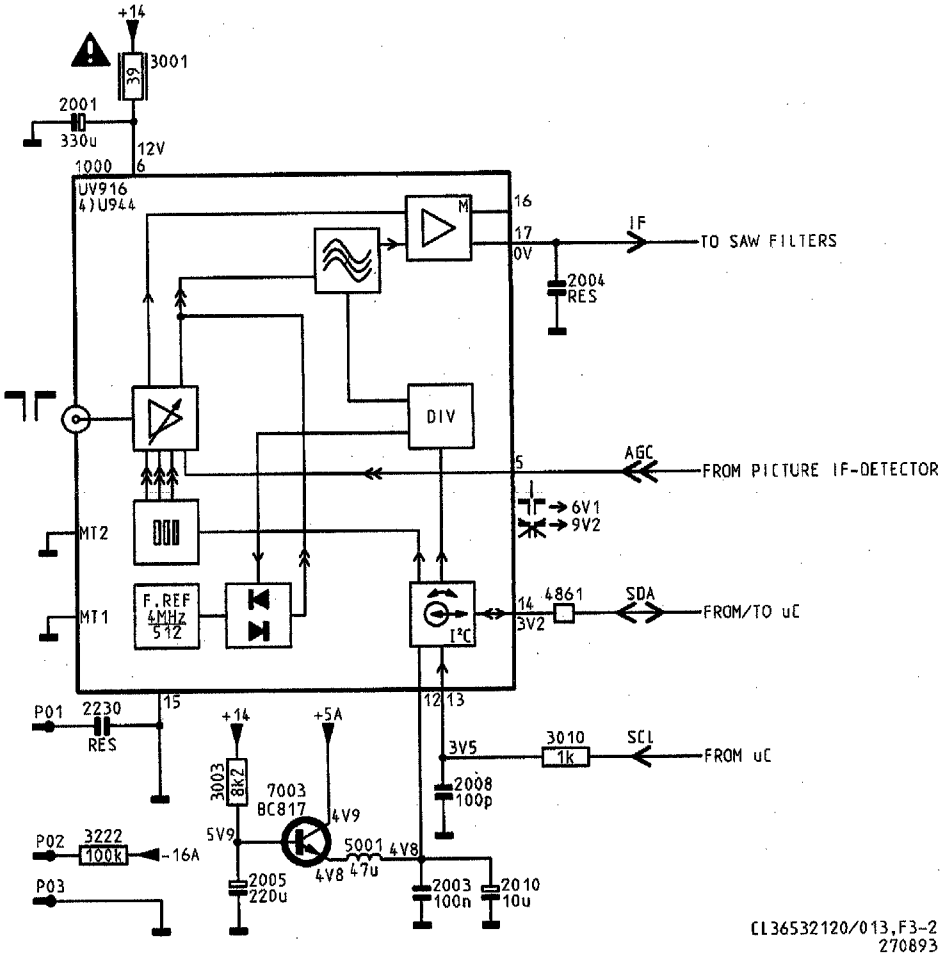
2. PLL
   - Band-switching and tuning from IF amplifiers and local oscillators via I^2C bus at pin 13 and 14
   - DC varicap-voltages measurable at pin 11 of the tuner (varies between 0 and 30V during tuning)

3. AGC (Automatic Gain Control)
   - AGC voltage from IF-detector to pin 5 of the tuner, controls the IF amplifiers in the tuner
   - If the aerial-signal gets under a certain threshold, the voltage at pin 5 will increase and so the amplifiers in the tuner will be adjusted at a lower level

4. IF (Intermediate-frequency signal)
   - Pin 17 is the IF output of the tuner
   - This IF signal is fed to the IF/sound-module:
     * Stereo IF sound-module (STEREO module, diagram F in service manual)
     * NICAM IF/sound-module (NICAM module, diagram G in service manual)

GR2.3 TUNER AND IF 3.1

Tuner

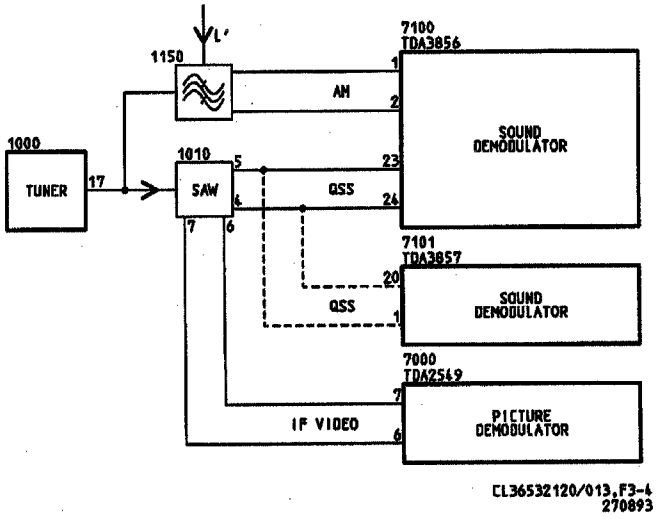


IF signal path

1. Possible IF modules:
   - PAL BG
   - PAL BG/SECAM BGDK (Multi-East Europe)
   - PAL BGI/SECAM BGLL' (Multi-France)
   - PAL BG/NICAM BG
   - PAL I/NICAM I

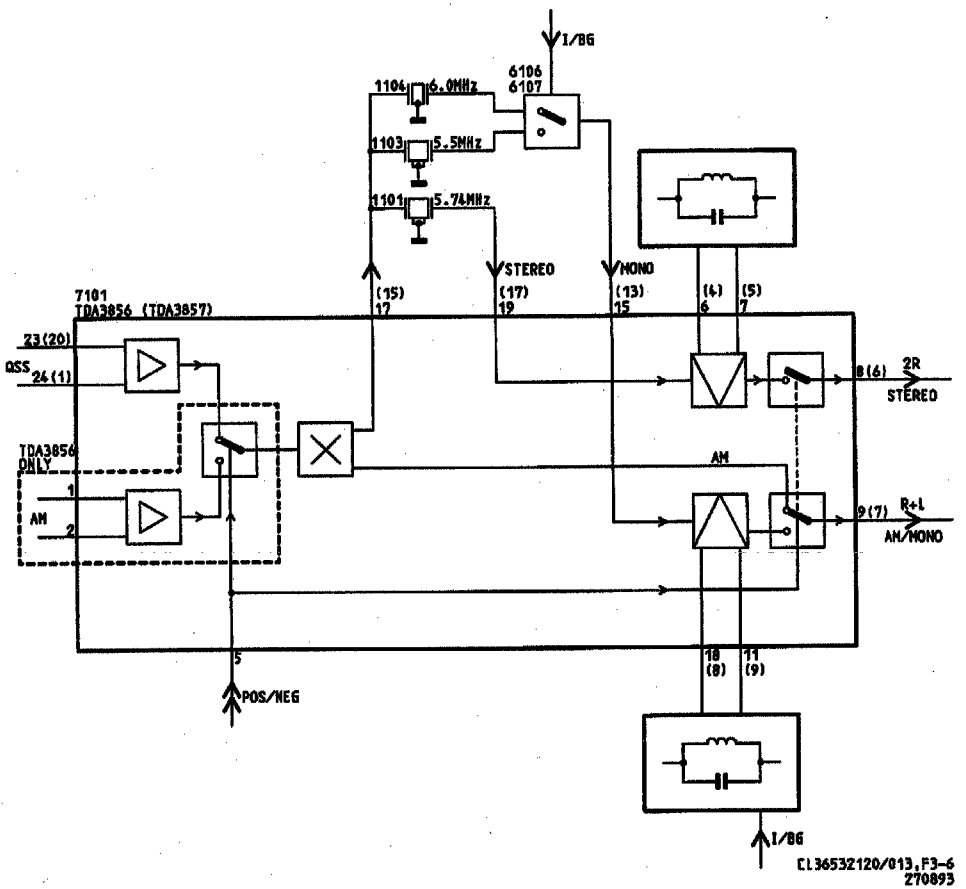
2. IF signal path
   - IF signal from pin 17 of the tuner to SAW filter 1010. This filter splits:
     * IF-video at 38.9 MHz at pin 6-7 of 1010 to pin 6-7 of picture-demodulator (TDA2549)
     * IF-sound at 33.4 to 38.9 MHz at pin 5-4 of 1010 to:
   - FM sound-demodulator at pin 23-24 IC7100 (TDA3856) for Multi-France sets
   - FM sound-demodulator at pin 20-1 IC7101 (TDA3857) for all other sets
   - For Multi-France sets, the AM modulated SECAM LL' sound-signal is fed via an adjustable bandpass-filter 1150, to the AM sound-demodulator at pin 1-2 of IC7100 (TDA3856)
     * If BGL, then BG/L' = 10V and so 1150 is set at 38.9 MHz
     * If L', then BG/L' = 0V and so 1150 is set at 33.4 MHz

IF signal path



Block diagram intermediate frequencies

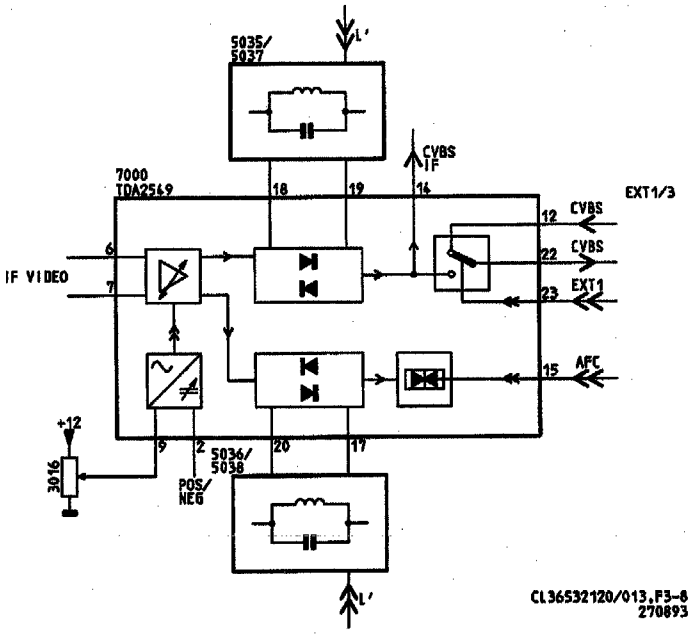
3. Sound IF circuitry IC 7100 TDA3856 (IC7101 TDA3857)
   - TDA3856 for both AM and FM sound-demodulation
   - TDA3857 for FM-only sound-demodulation
   - QSS demodulation via reference trap at pin 13-12 (11-10) at 38.9 MHz
   - Demodulated "intercarrier" sound at output pin 17 (15)
   - Via crystal 1103/1102, the 5.5/6.0 MHz mono carrier is filtered out. Via pin 15 (13) and the adjustable trap at pin 10-11 (8-9), this mono carrier gets demodulated
     * I/BG = 0V, then 5.5 MHz (BG) selected:
       - D6107 conducts; filter 1103 selected
       - Trap at pin 10-11 (8-9) at 5.5 MHz
     * I/BG = 10V, then 6.0 MHz (I) / 6.5 MHz (DK) selected:
       - D6106 conducts; filter 1102 selected
       - Trap at pin 10-11 (8-9) at 6.0 MHz for Multi-France and 6.5 MHz for Multi-East Europe
   - Via crystal 1101, the 5.74 MHz stereo carrier is filtered out. Via pin 19 (17) and trap at pin 6-7 (4-5), this stereo carrier gets demodulated
   - For TDA3856, AM/FM selection is via pin 5 IC7100 (module-pin 9):
     * POS/NEG = 0.9V then AM selected
       AM mono signal at output pin 9
     * POS/NEG = 4.7V then FM selected
       FM stereo signal at output pin 8 (2R) and pin 9 (R+L)
   - For TDA3857, FM stereo signal at output pin 6 (2R) and pin 7 (R+L)



Sound IF circuitry

4. Picture IF circuitry (IC7000, TDA2549)
   - IF-video is fed to the input-amplifier in TDA2459 which is controlled by an IF-AGC circuit. The take over point of delayed high frequency AFC is adjustable via R3016
   - After amplification, the signal is fed to the video, synchronisation, demodulator and AFC-demodulator stages
   - POS/NEG at pin 2 switches between pos. (SECAM L') and neg. signals (PAL BGI/SECAM BGLDK) demodulation:
     * POS/NEG = 12V, then negative modulation
     * POS/NEG = 0V, then positive modulation
   - Video, synchronisation, demodulator:
     * Demodulates CVBS out of IF-signal
     * Reference trap at pin 18 and 19 IC7000:
       - All sets except Multi-France:
         L5035 at 38.9 MHz
       - Multi-France sets:
         If BGL, then BG/L' = 10V, and so L5035 is set at 38.9 MHz
         If L', then BG/L' = 0V, and so L5037 is set at 33.4 MHz
   - AFC-demodulation:
     * IF-signal to AFC demodulator
     * Reference trap at pin 17 and 20 IC7000
       - All sets except Multi-France:
         L5036 at 38.9 MHz
       - Multi-France sets:
         If BGL, then BG/L' = 10V, and so L5036 is set at 38.9 MHz
         If L', then BG/L' = 0V, and so L5038 is set at 33.4 MHz
   - If the tuner is well tuned to a signal, then pin 15 = 6V DC
   - After detection, the CVBS signal is output at pin 14
   - CVBS internal and external selection at pin 23
     * INT/EXT = 0.9V, then internal CVBS
     * INT/EXT = 4.7V, then external CVBS (EXT 1/3)

     Selected CVBS signal at pin 22.

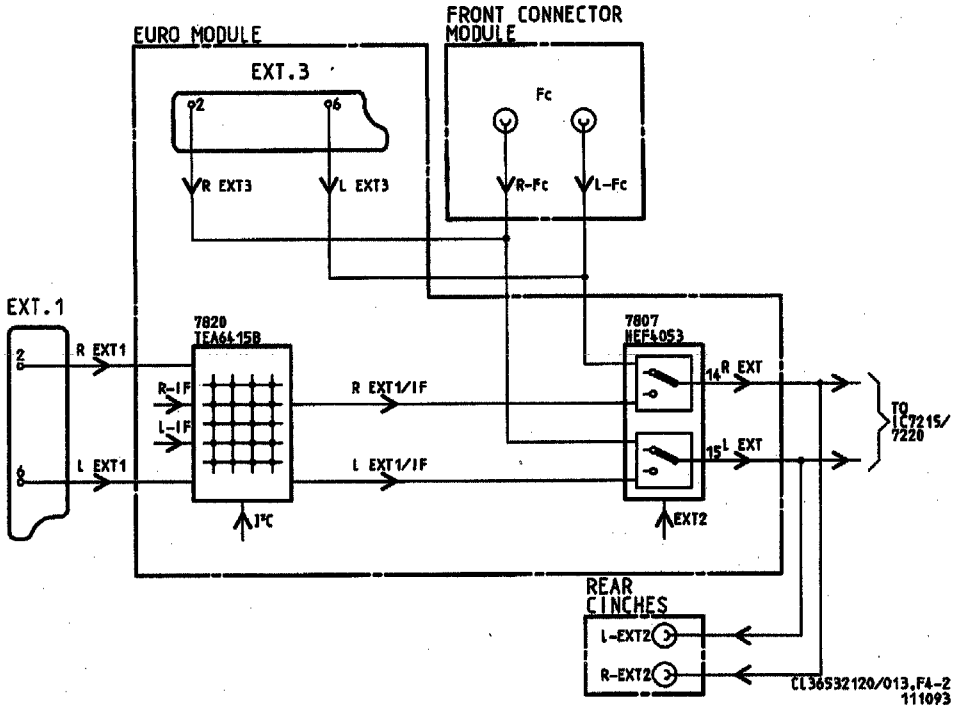


Picture IF circuitry

1. External sound can be delivered in 4 different ways:
   - Via EXT-1 (L-EXT-1 and R-EXT-1) at chassis
   - Via EXT-3 (L-EXT-3 and R-EXT-3) at EURO module
   - Via "rear" socket EXT-2 (L-EXT-2 and R-EXT-2) at EURO module
   - Via "front" sockets (L-FC and R-FC) at "front" connector panel

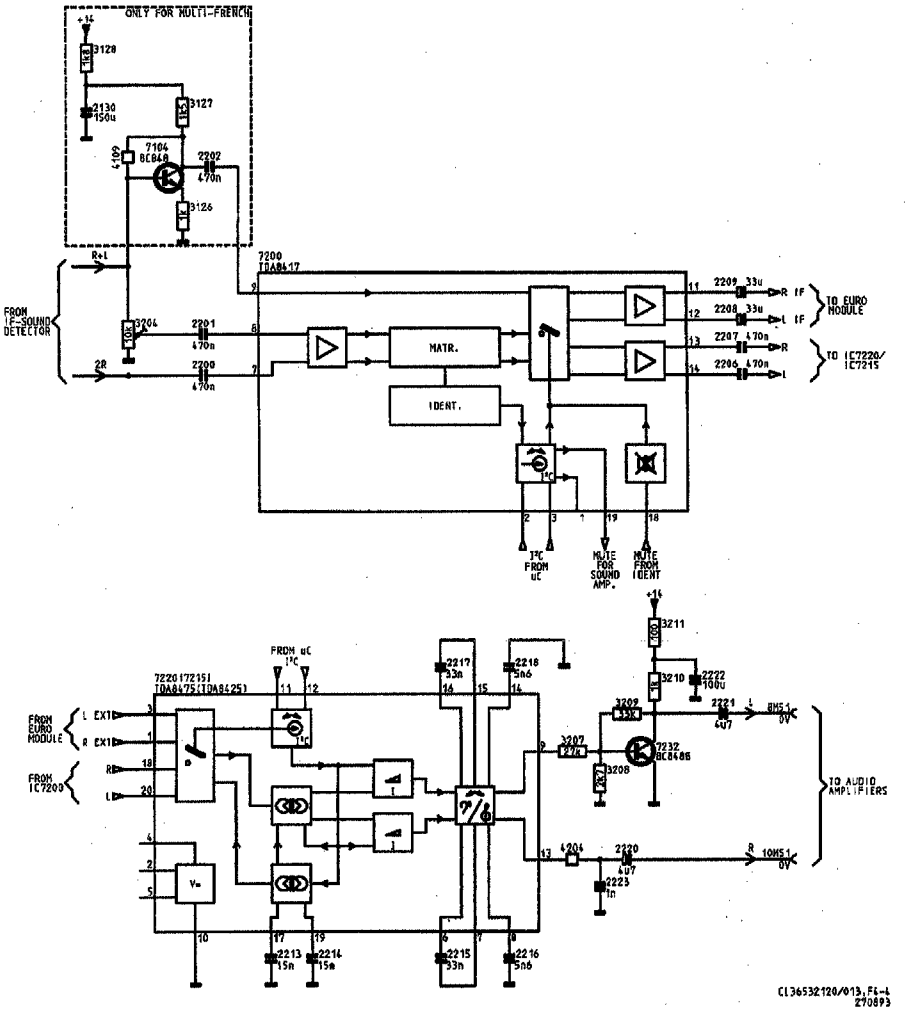
2. Selection:
   - Via I^2C selection in matrix IC7820 (TEA6415B) between:
     * External sound of EXT-1
     * Internal sound of IF (tuner)
   - Via switching signal "EXT 2" selection in IC7807 (HEF4053) between:
     * Selected sound of IC7820 (EXT-1/IF)
     * External sound EXT-3 & "front" sockets (EXT-3 and "front" sockets are wired in parallel; no switching possibility)
   - Output signals at pin 15-4 from IC7820 (L-EXT and R-EXT) are wired in parallel with L-EXT-2 and R-EXT-2 of "rear" socket EXT-2 (no switching possibility). This "parallel" signal is fed to the IF/sound-module
   - Each IF/sound-module can select again (via IC7220/IC7215) between:
     * External sound of EURO module (EXT-1/EXT-2/ EXT-3/"front" sockets)
     * Internal sound of IF (tuner)

GR2.3 AUDIO PROCESSING 4.1
Sound source select



1. Stereo decoder IC7200 (TDA8417)
   - FM-demodulated 2R and L+R to pin 7-8 IC7200
   - AM-demodulated L+R via TS7104 to pin 9 IC7200 (Multi-France only)
   - IC7200 gives status (MONO, DUAL LANGUAGE or STEREO). Depending on status, µC drives de-matrix-circuitry via I^2C
   - LF outputs R and L (pin 13-14 IC7200) to control-amplifier IC7220
   - LF outputs R IF and L IF of aerial-signal (pin 11-12 IC7200), to EXT-1 and EXT-3 and via AUDIO module, to outgoing "constant level" "rear" sockets
   - Incoming mute, pin 18, (driven by identification circuitry) interrupts the sound:
     * Pin 18 = "high", then no mute
     * Pin 18 = "low", then mute
   - Outgoing mute, pin 19, gives "forced mute" in case the received signal becomes lower than a certain threshold:
     * Pin 19 = "high", then no forced mode
     * Pin 19 = "low", then forced mute

2. Control-amplifier IC7220/7215 (TDA8425)
   - Via I^2C selection between L & R of stereo decoder and L & R EXT of EURO module
   - Via I^2C control and/or of "Bass, Treble, Volume, Balance, Spatial, Pseudo and Mono/Stereo"
   - Controlled sound-signals at pin 9-13 IC7220 to sound-output stage (at chassis). L signal 180° shifted in phase via TS7232 to connect an eventual subwoofer up to ± 800Hz between L and R

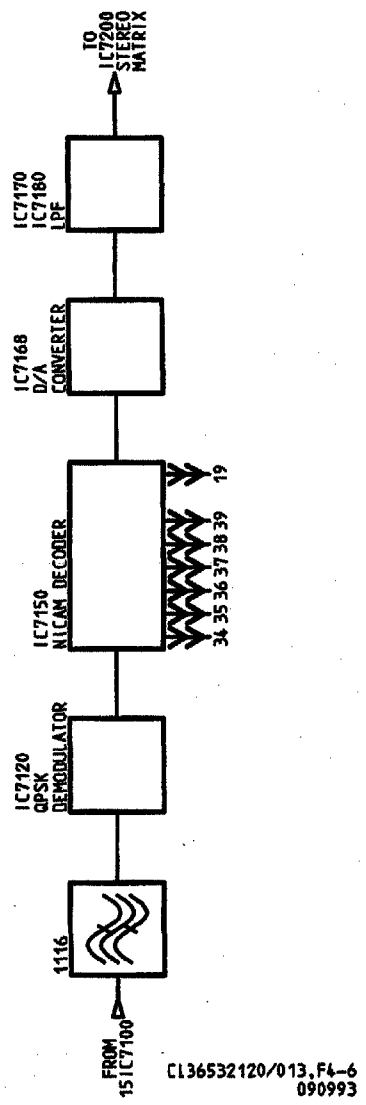


1. On NICAM IF/sound-module, 2 paths are possible:
   - FM path for analog sound
   - NICAM path for digital sound

2. FM sound path
   - FM path at NICAM module is the same as stereo module (see 4.2) except the stereo decoder IC7200, is now TDA8415.
     * TDA8415 selects FM or NICAM sound
     * TDA8417 selects FM or AM sound

3. NICAM sound path
   - NICAM mid-frequency from pin 15 IC7100 (TDA3857), is fed to bandpass-filter (1116) with bandpass-frequency:
     * 5,85 MHz for PAL/NICAM BG
     * 6,552 MHz for PAL/NICAM I
   - QPSK demodulator IC7120 (TDA8732) for phase demodulation
     * 2 bits digital info at pin 6-7 via filters back to pin 5-8
     * Differential encoder gives digital coded info at 728 kHz at output pin 16
   - QPSK data to NICAM decoder IC7150 (SAA7280)
     * Digital coded info at pin 21
     * Via I^2C, status info about received NICAM signal to µC
   - D/A converter IC7168 (TDA1543) translates I^2S info into LF L & R signal
   - Via lowpass-filter around IC7170 and 7180, to stereo dematrix IC7200

For a more detailed description see:
CIRCUIT DESCRIPTION Chassis GR2.1



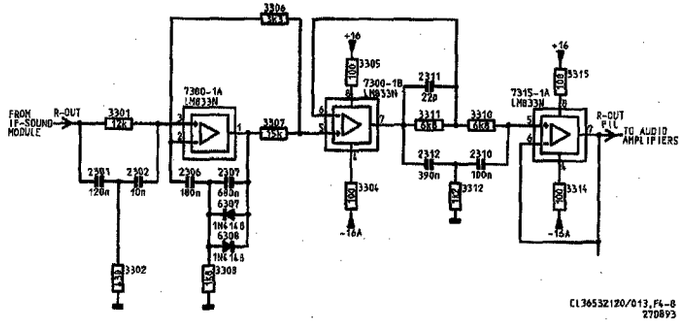
1. **Active filters**

- **Function:**

  2 identical filters for R and L

- **Operation (for right filter):**

  - Highpass-filter with C2301, 2302
  - IC7300 lowpass-filter with limiter
  - IC7315 buffer



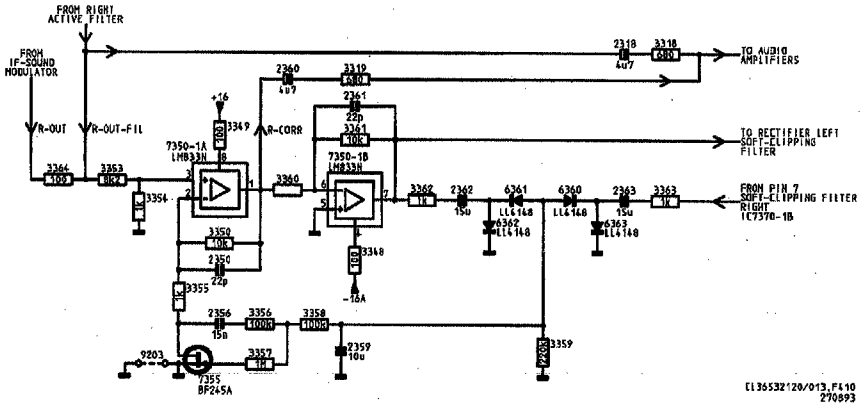
2. Soft-clipping

- **Function:**

  Prevent overload of output stages

- **Operation (for right soft-clipping):**

  - Signals R-OUT and R-OUT-FIL (filtered R-OUT) are added and then fed to amplifier IC7350-1A
  - Amplification-gain of IC7350-1A is determined by FET TS7355 (BF245A)
  - Output pin 1 IC7350-1A is integrated by IC7350-1B, R3360 and C2361 to a negative voltage at pin 7 IC7350-1B
  - This DC-voltage is middled out with the DC-voltage of pin 7 IC7370-1B, so both soft-clipping circuitries work into the same direction
  - This middled DC-voltage is rectified and charged into C2359
  - A more negative DC-voltage across C2359 makes FET high-resistance
  - Gain amplifier IC7350-1A decreases
  - Output pin 1 IC7350-1A is corrected R signal (R-CORR) and is added with R-OUT-FIL to sound output stage
  - Sound output stage will not be overloaded by too large input signals from the control-amplifier IC7220/7215 on the IF-module



3. "Forced mute"

"Forced mute" of the stereo decoder is "low" if poor signal or by switching on the set, therefore OUTPUT R and OUTPUT L will be shorted via TS7246 and TS7247

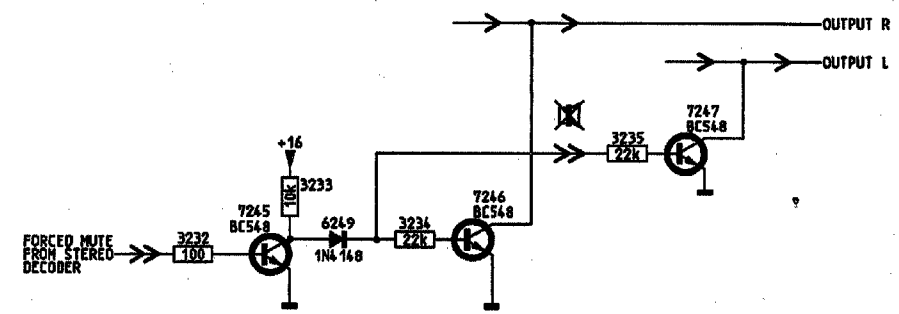
4. Anti-plop

- Function:

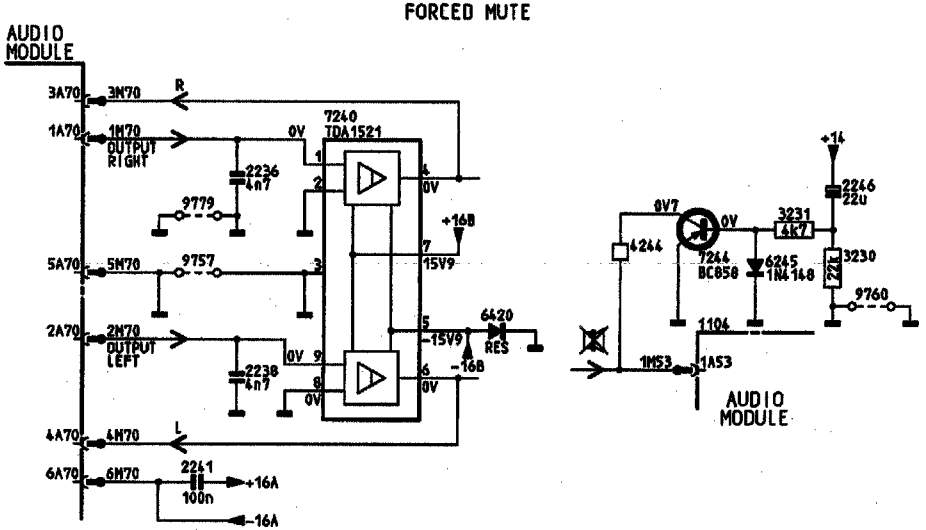
Prevent disturbing plops at switching "off" the set:

- Operation:

- At "switch-off" the +14 drops very fast while C2246 is still charged
  - → Negative voltage at base TS7244
  - → TS7244 conducts
  - → Forced mute pin 1M53 is pulled "low"
  - → Forced mute



FORCED MUTE



SOUND AMPLIFIER STAGE

ANTI PLOP

CL36532120/013,F412
270893

5. Output stage

- OUTPUT L and OUTPUT R of AUDIO module, is fed to output stage IC7240 (TDA1521) on the chassis
- Symmetrical supply voltage of +16V and -16V
- Amplified output signal:
  * or direct to loudspeakers
  * or to loudspeakers via EXT-LS module and headphone on separate control module

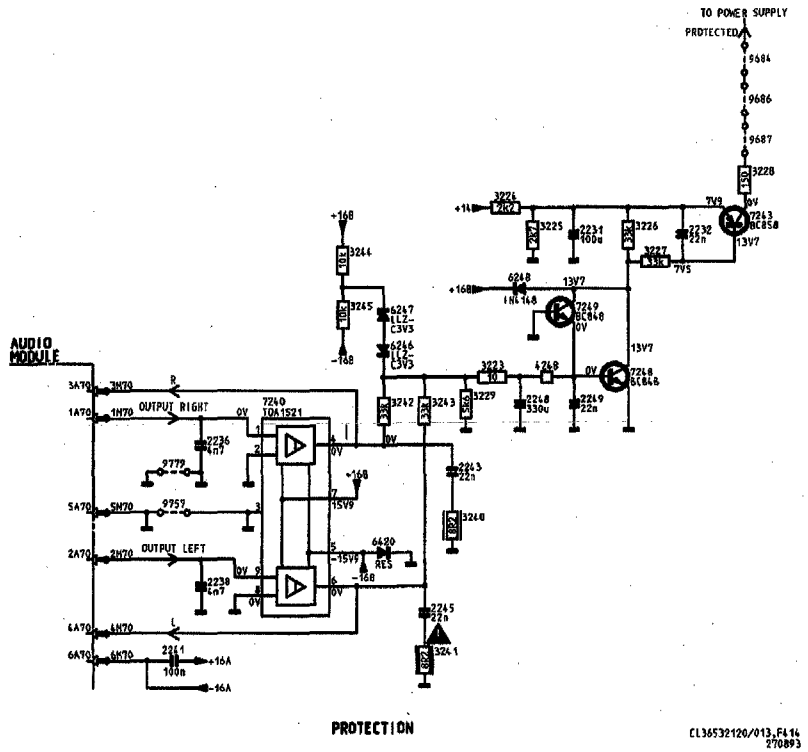
6. Protection

- Function:

To switch off the power supply at certain error conditions of the sound system

- Operation:

Switching signal PROTECTED becomes "low" in the event of :
- Sum of outputs pin 4-6 of IC7240 is not 0V (L and R are 180 degrees in phase):
  → TS7248 or TS7249 conducts
  → TS7243 conduct
- Supply +16A or -16A is not correct, one of the zeners D6247 or D6246 will conduct :
  → TS7248 or TS7249 conduct
  → TS7243 conduct
- Supply +16A and -16A both fail D6248 conducts and so TS7243 conducts



Introduction

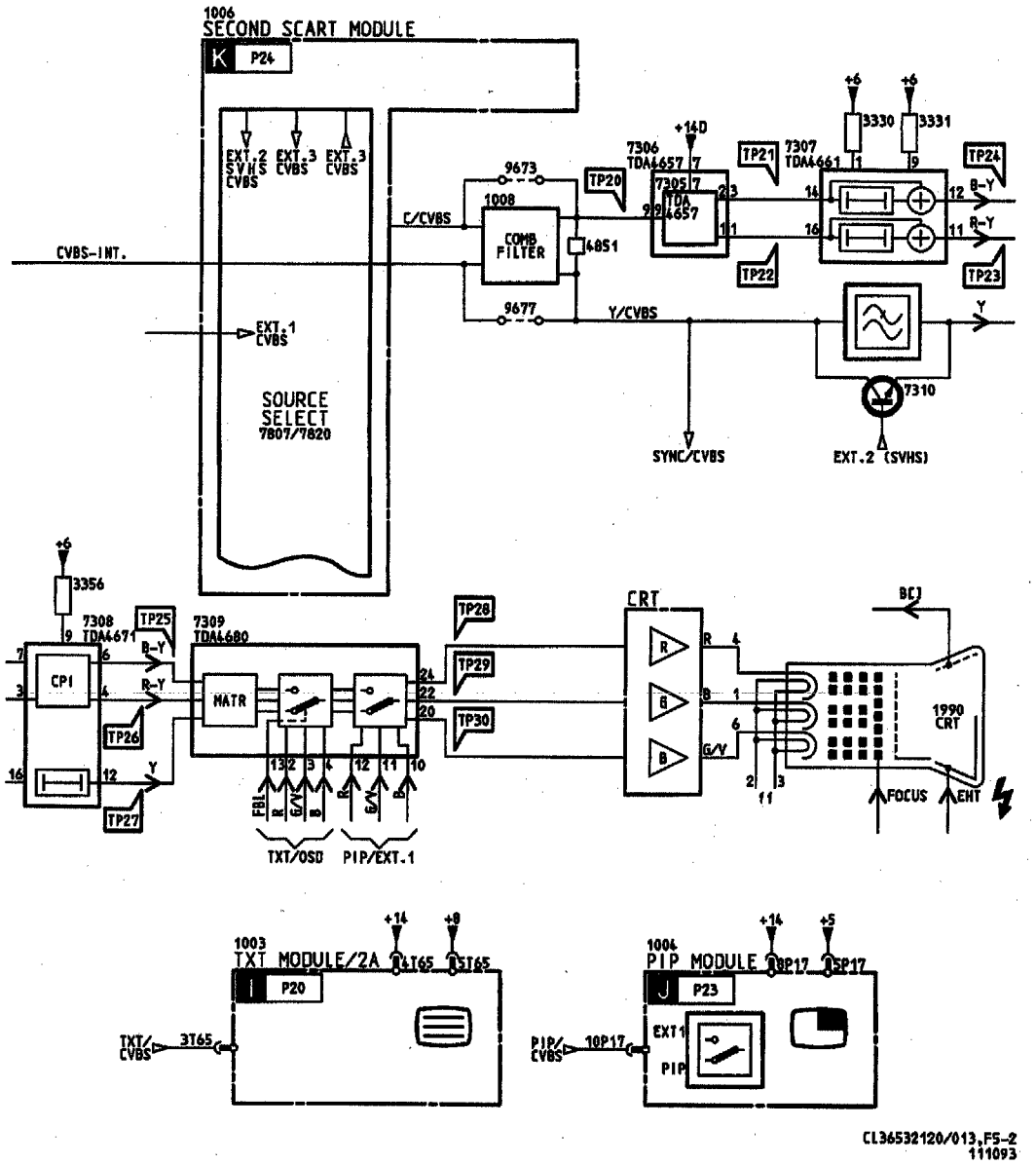
1. Versions

   - PAL only
   - PAL and SECAM
   - Version with COMB filter module 1008

2. The video path

   - Source selection
   - The CVBS signal via COMB-filter, module 1008
   - Chroma-bandpass-filter
   - PAL decoding IC7305;
     PAL/SECAM decoding IC7306
   - Baseband delay-line IC7307
   - Chroma-filter in the luminance path
   - Signal Transient Improvement IC7308
   - Videocontroler and RGB source selection switches IC7309
   - RGB amplifiers and peak white limiting
   - Picture in Picture (PIP) module

Introduction



CL36532120/013,F5-2
111093

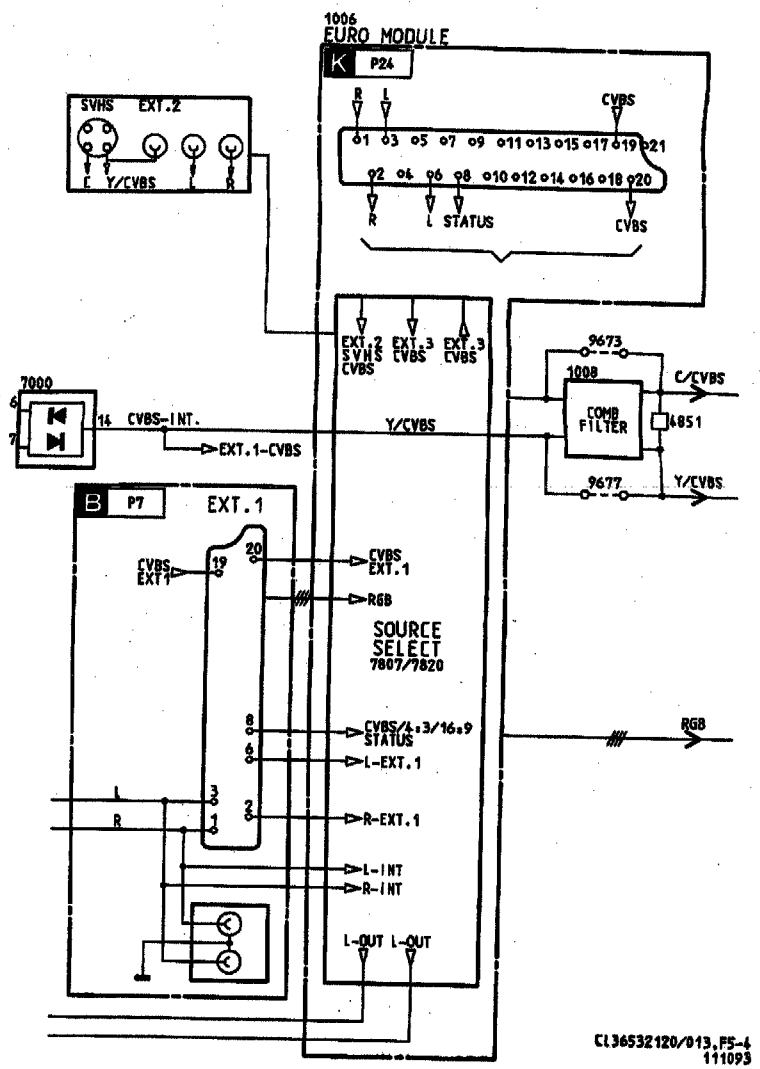
1. Sets without Euro module 1006

   - Source selection between:
     * Internal CVBS from the tuner
     * EXT.1: CVBS or RGB via the euroconnector
   - Selection of internal CVBS or external CVBS is done on the IF/sound module 1001
   - Selection of external RGB, eventually combined with Picture In Picture (PIP), is done in the videocontroler/RGB source selection IC7309

2. Sets with Euro module 1006

   - Source selection between:
     * Internal CVBS from the tuner
     * EXT.1 : CVBS or RGB via euroconnector 1
     * EXT.2 :
   - CVBS via sockets at the front side
   - SVHS signal via the SVHS plug at the front side
     * EXT.3 : CVBS via euroconnector 2 on the Euro module 1006
   - Selection of the CVBS signals and SVHS signal is done in the switch IC7807. This is directly controlled by the µP IC7708 and matrix IC7820, via the I^2C bus. Both switch IC's are located on the Euro module 1006
   - Selection of external RGB, eventually combined with Picture In Picture (PIP), is done in the videocontroler/RGB source selection IC7309

GR2.3 VIDEO PROCESSING 5.2
Source selection

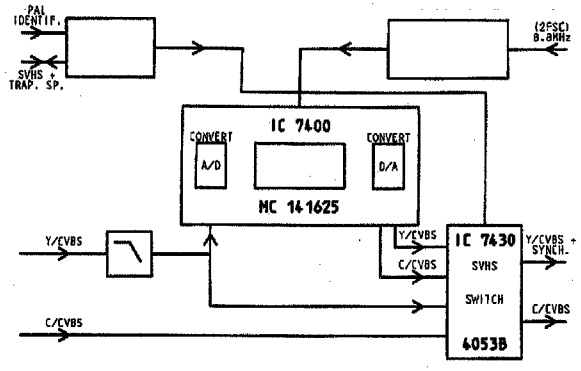


- **Function:**

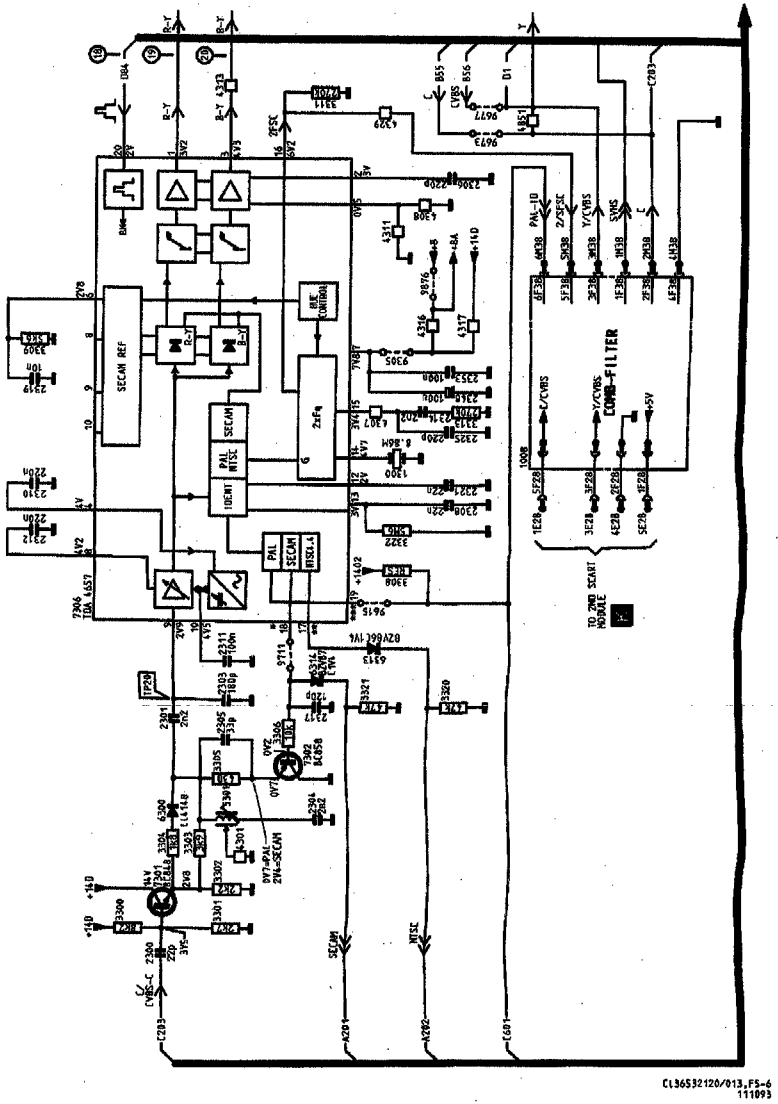
  Better separation of the PAL chroma and luminance signals from the CVBS signal

- **Operation:**

  - The COMB filter operates only for PAL signals
  - The CVBS/SVHS chroma signal enters at pin 5 of plug F28 on the COMB-filter module 1008
  - The CVBS/SVHS luma signal enters at pin 3F28
  - The double chroma-frequency 2FSC, at pin 5F38, serves as a reference
  - By the digital process of the COMB-filter, the chroma and luminance components are separated from each other (as filtered through a comb)
  - The filtered chroma-signal at pin 1F38, is connected to the PAL or PAL/SECAM decoding circuit
  - The filtered luminance signal is available at pin 3F38
  - The COMB-filter will be switched off if the PAL identification signal at pin 6F38 is low



COMB-FILTER GR2.3



CL36532120/013.FS-6 111093

Chroma-bandpass-filter

- **Function:**

  Separation of the chroma-signal from the CVBS signal

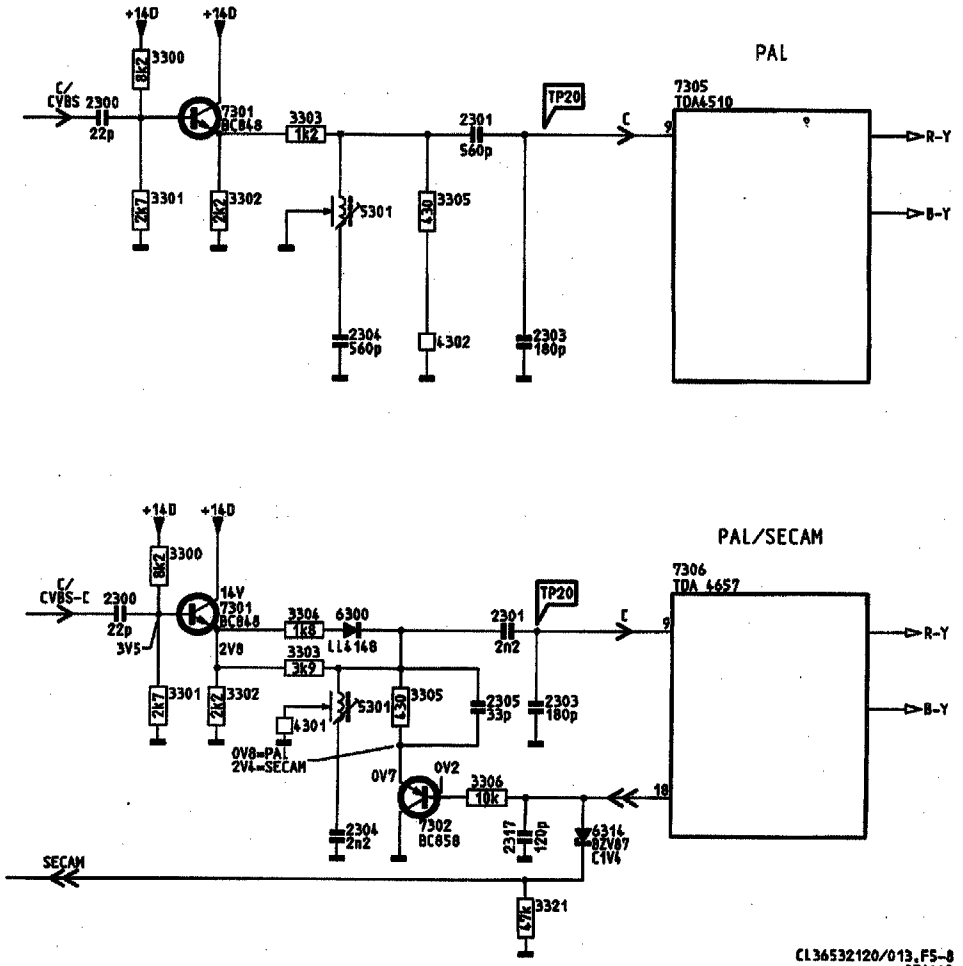
- **Operation: for PAL sets:**

  - Highpass filter C2300 and R3301
  - almost flat characteristic for high frequencies:
  i.e. more than 3 MHz
  *** L5301 and C2304 in parallel with C2301, C2303 forms a bandpass-filter at 4,3 MHz**
  *** R3305 causes a strong damping effect;**
  → This gives a flat characteristic

- **Operation: for PAL/SECAM sets:**

  - Highpass-filter C2300 and R3301
  - For SECAM; TS7302 is non-conducting
  *** L5301 and C2304 in parallel with C2301, C2303 forms a bandpass-filter at 4,3 MHz**
  - For PAL; TS7302 is conducting
  *** L5301, C2304 in parallel with C2301, C2303 form a bandpass-filter at 4,3 MHz**
  *** R3305 causes a strong damping and C2305 causes an additional damping for high frequencies;**
  → This gives a flat characteristic between 3 MHz and 5 MHz

Chroma-bandpass-filter

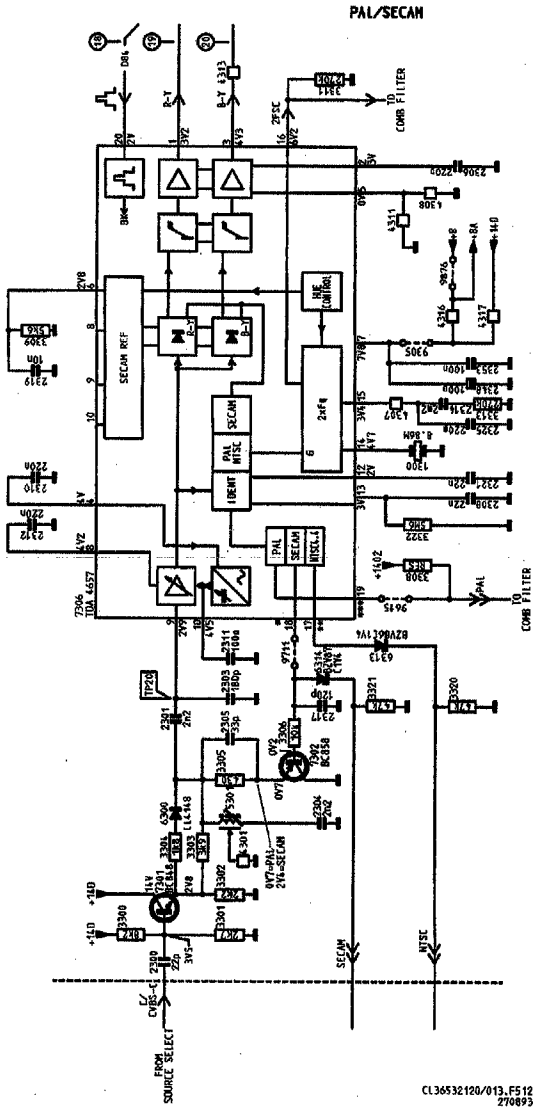


PAL decoding; PAL/SECAM decoding

- **Operation: for PAL/SECAM sets**

  - The chroma-signal is connected via pin 9 IC7306 (TDA4657) to the Automatic Gain Control (AGC)
  - The IC switches automatically to PAL or SECAM
    * PAL: the burst-signal always has a frequency of 4,43 MHz
    * SECAM: the burst-signal is 4,406 MHz during R-Y and is 4,25 MHz during B-Y
  - For PAL, pin 19 is high; for SECAM, pin 18 is high
  - The input-signal at pin 9 is split into a chroma-signal and a burst-signal
  - The selection is done with the aid of the sandcastle-pulse at pin 20
  - The demodulated burst-signal, controls the AGC amplifier, the colour-killer and sets, with aid of the PAL Flip Flop, the correct PAL phase
  - The reference oscillator, with crystal 1300 at pin 14 IC7306, operates at 8,86 MHz, double the chroma-subcarrier frequency
  - C2325, C2314 and R3313 are used as the flywheel function of this reference oscillator
  - Alignment of the nominal frequency is not necessary
  - The oscillator directly controls the B-Y demodulator
  - For PAL, the R-Y signal is phase shifted by 180° on every other line.
  - For SECAM, on one line the output-signal is only the R-Y signal, and for the next line the output signal is only the B-Y signal
  - The demodulators give a low frequency R-Y signal at pin 1 and B-Y at pin 3

PAL decoding; PAL/SECAM decoding

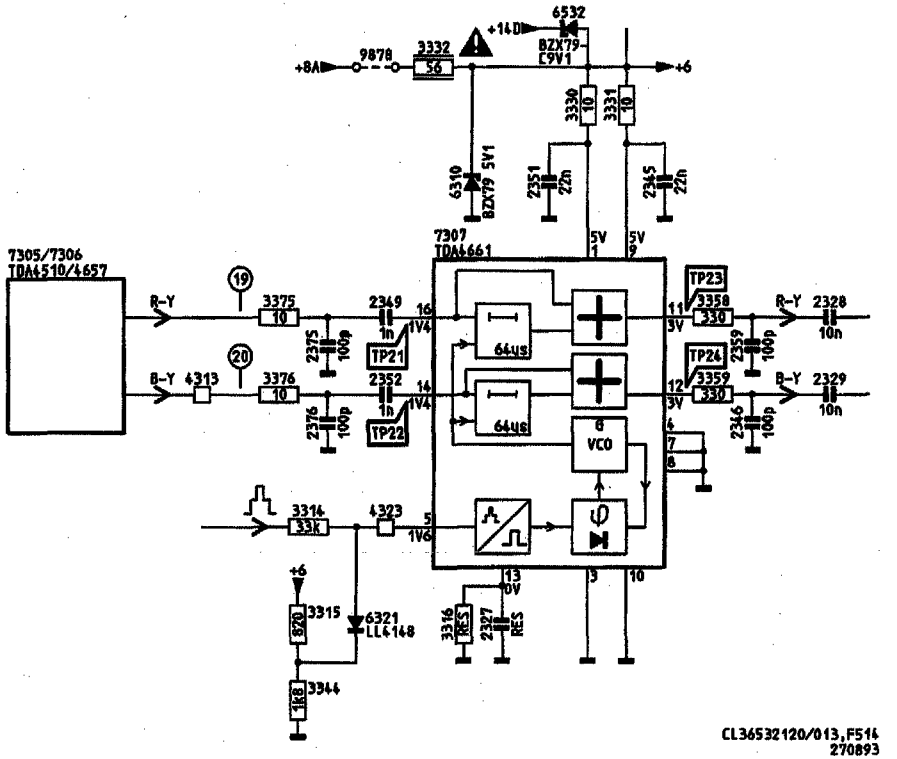


- **Functions:**

  - Elimination of crosstalk and phase errors of R-Y and B-Y for PAL
  - To fill the missing colour information at every other line for SECAM

- **Operation:**

  The delayline IC7308 (TDA4661):
  - Internal oscillator of 3 MHz, synchronised by the sandcastle-pulse at pin 5
  - The circuit takes 192 samples, each 0,333 µS, of the input-signals
  - Result: delay lines of (192x0,333)=64 µs
  - A delayed and an un-delayed signal are added
    * PAL:
      - The result is an average of the present line and the previous line
      - This will reduce phase and saturation errors
    * SECAM:
      - R-Y and B-Y signals are available on every alternate line
      - On the line where there is no R-Y signal, this will be added to the previous line where the R-Y signal is present; by this method, there will always be an R-Y signal available at pin 11
      - The same principle also applies to the B-Y signal



Chroma filter in the luminance path

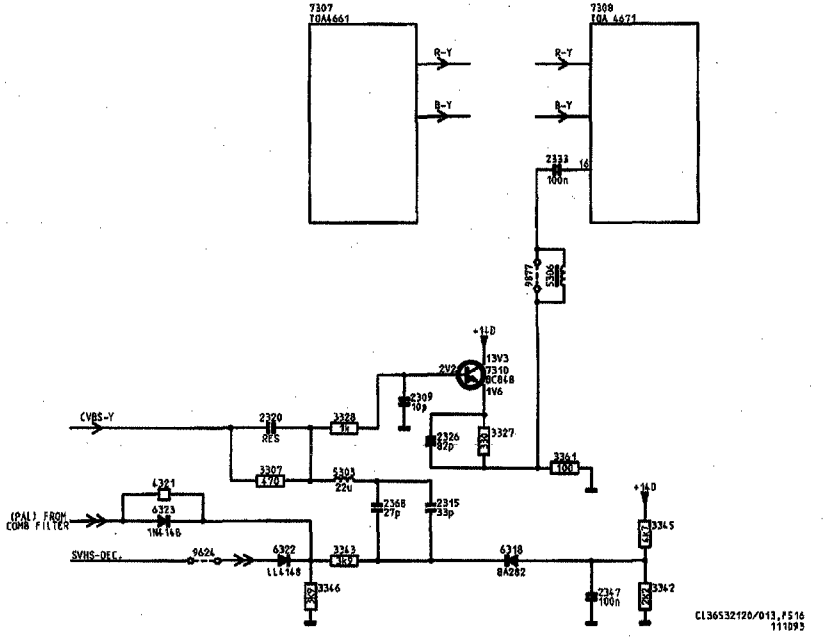
- **Function:**

  Suppressing the chroma subcarrier in the luminance signal

- **Operation:**

  - The CVBS signal is fed via R3307 to the chroma filter circuit
  - This circuit, L5303 in series with C2368 and C2315, acts as a notch filter and creates a low impedance for the 4,43 MHz signal
  - The ground connection of this circuit is comprised of diode D6318, which is normally conducting, and C2347
  - The circuit at the emitter of the emitter-follower TS7310 is needed for a correction in the frequency characteristic
  - The adapted Y signal is fed to IC7308
  - In the case of an SVHS signal, the Y signal will be on the CVBS line
  - The positive level of the SVHS indication is applied, via D6322, to the ground connection of the chroma-trap:
    → D6318 will become non-conducting and the circuit will be high resistance

Chroma filter in the luminance path

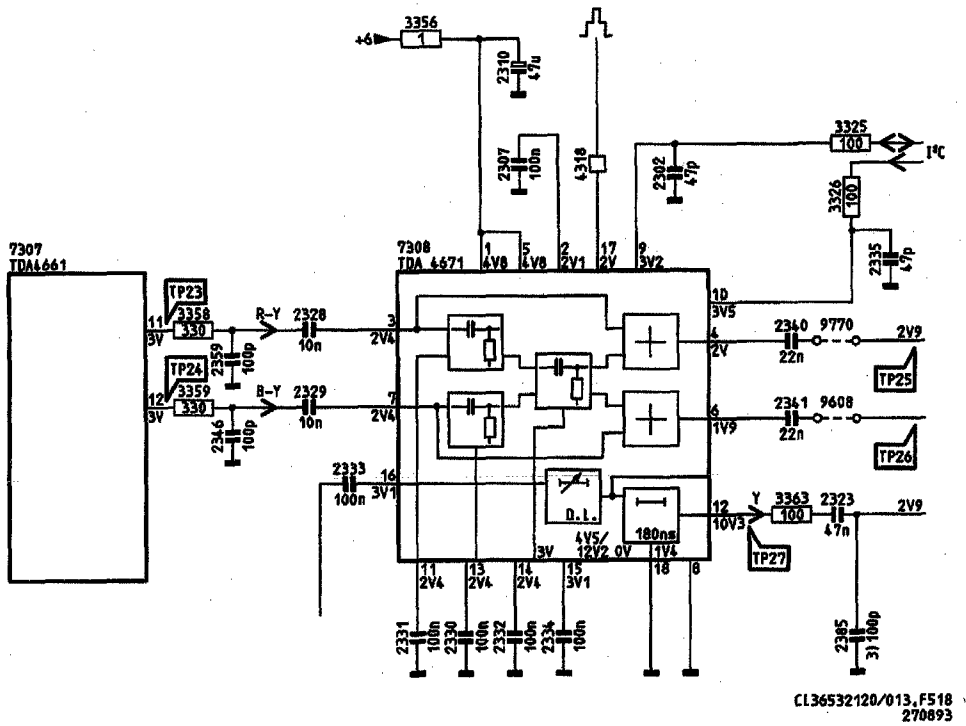


- **Function:**

  - Colour Transient Improvement (CTI)
  - Noise-reduction
  - Picture-sharpness control

- **Operation:**

  - Input-signals to the CTI IC7308 (TDA4671)
    * R-Y and B-Y signals of baseband delay line IC7307, are connected to pins 3 and 7 IC7308
    * The Y signal from the chroma filter is connected to pin 16
  - The I^2C control-signals are available at pins 9 (SDA) and 10 (SCL)
  - Adaptation of the chroma signals
    * Colour transient improvement (CTI)
      - The colour transients in R-Y and B-Y are adapted by internal filters
      - The level of adaptation can be adjusted in steps (via I^2C)
  - Adaptation of the Y signal
    * Noise-reduction
      - Via a switchable (I^2C) internal filter
    * Picture-sharpness control
      - Via switchable internal adaptations (I^2C)
    * Delay of the Y signal
      - for timing correction with the adapted chroma signals, R-Y and B-Y
      - A part of the delay is switchable (via I^2C). This is needed for filtering and adaptation as mentioned earlier
  - The output of R-Y, B-Y and Y signals, are located at pins 4, 6 and 12



Video controller and RGB source selection switches

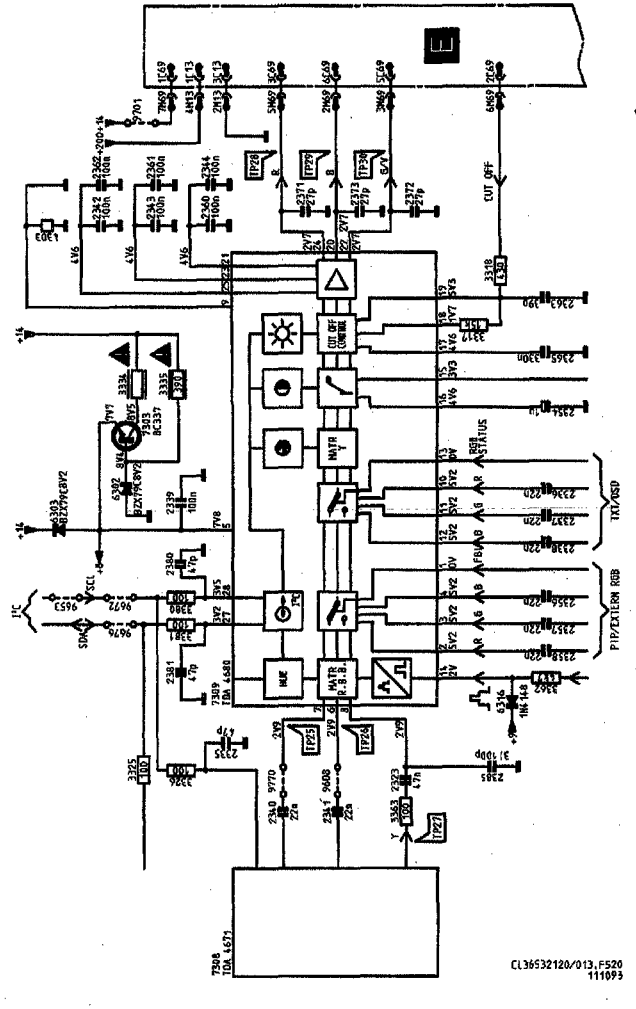
- **Function:**

  - Conversion of R-Y, B-Y and Y into R,G and B signals
  - RGB source selection, TXT/OSD and PIP/external RGB
  - Controlling of the picture-settings

- **Operation:**

  - The signals R-Y, B-Y and Y enter at pins 7, 6 and 8 of IC7309 (TDA4680)
  - The I^2C control signals are available at pins 27 and 28
  - Conversion of R-Y, B-Y and Y into R,G and B signals:
    * R-Y, B-Y and Y signals determine the G-Y signal
    * Next, the Y signal is added to each of the signals R-Y, G-Y and B-Y: result R, G and B signals
  - RGB source selections:
    * The combined TXT/OSD RGB signals enter at pins 2, 3 and 4 of IC7309
    * The TXT and OSD signals (for the menu) cannot be displayed at the same time
    * The combined picture in picture (PIP)/external RGB signals enter at pins 10, 11 and 12 of IC7309
    * The PIP signal has, via the PIP module, priority on the external RGB signal
    * Combination of PIP and OSD (menu) is possible
  - Controlling the picture-settings:
    * Via the I^2C bus, the colour-saturation, contrast and brightness are controlled, and combined with the factory adjustments for the picturetube
    * The Cut-Off voltage at pin 19 controls, via the brightness-control, the black level for the set
    * The beam-current information controls, via TS7370 to pin 15 of IC7309, the peak white limiting

Video controller and RGB source selection switches



RGB amplifiers and peak white limiting (at the picturetube-panel)

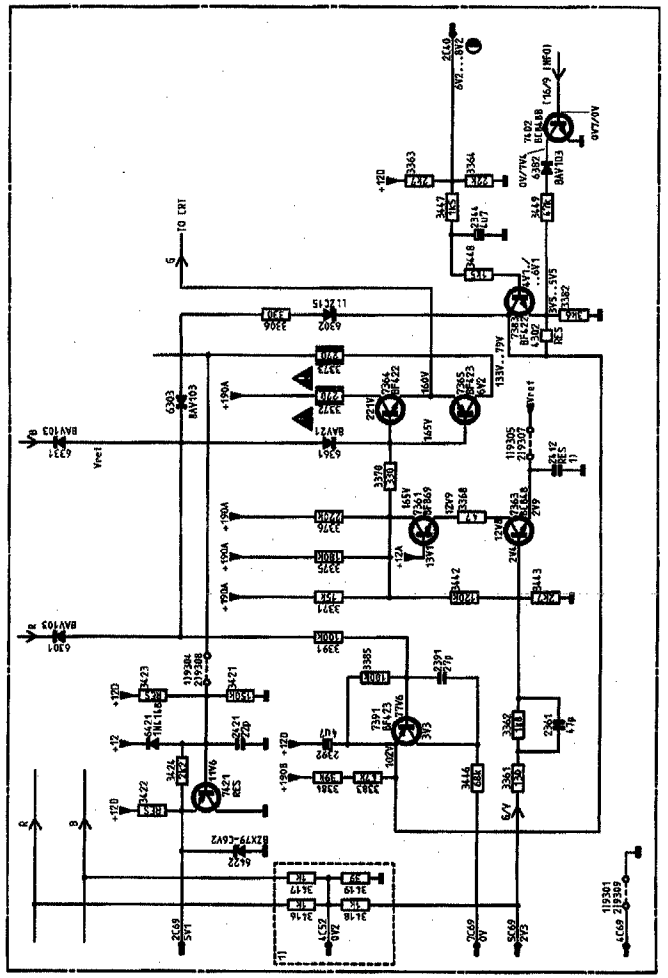
- **Function:**

  - R, G and B power amplifiers
  - Picturetube protection: via peak white limiting

- **Operation:**

  - Amplifiers (equal for R, G and B)
    * TS7361 and TS7363 form an operational amplifier
    * The base of TS7363 is the - input
    * The emitter of TS7363 is the + input
    * The feedback-resistor R3442 and input-resistors R3361+R3362 determine the amplification: this is roughly 120k/2k = 60x
    * TS7364 and TS7365 are emitter-followers and sample the cathode-current
    * Normally TS7365 conducts and the beamcurrent flows to earth
    * At steep voltage-transients TS7364 conducts for a short moment and quickly loads the stray capacitance of the picturetube
  - Peak White Limiting
    * The base of TS7391 is normally about 50V
    * At moderate beamcurrent:
      → D6301, D6331 and D6361 are non-conducting
    * If the R, G or B signal is lower then 48V:
      → D6301, D6331 or D6361 conducts, and hence TS7391 conducts
    * The limiting-signal is sent via plug 7C69, to IC7309, TDA4680

RGB amplifiers and peak white limiting (at the picturetube-panel)



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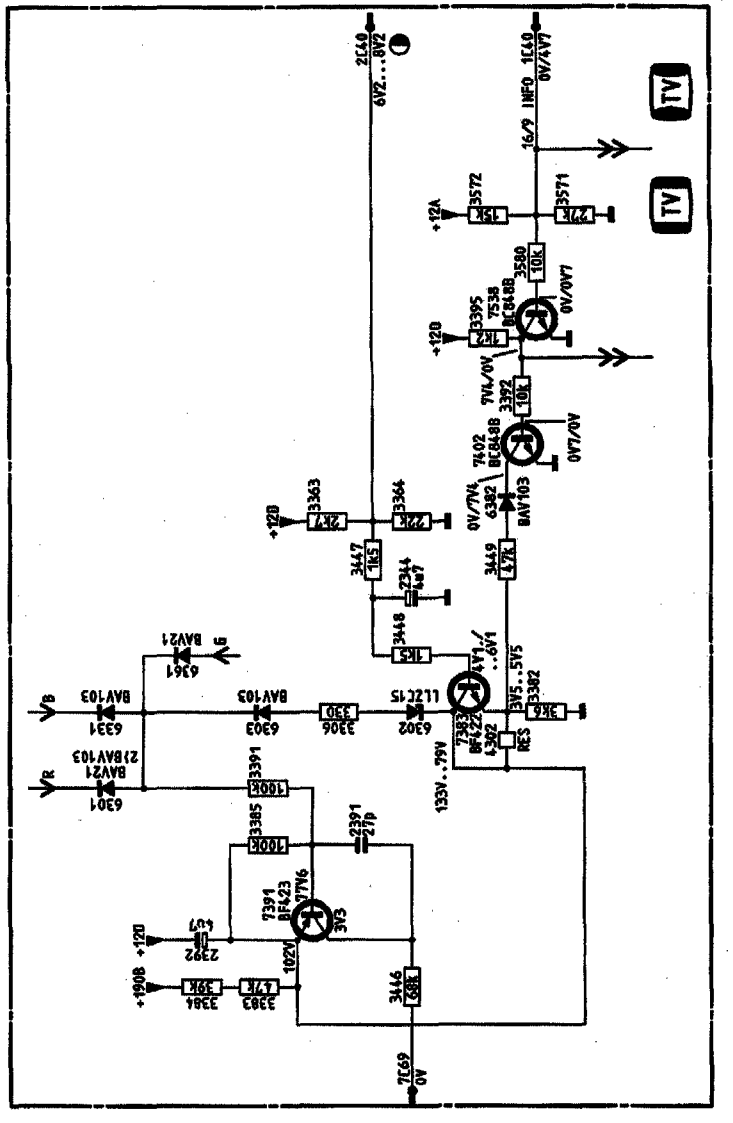
RGB amplifiers and peak white limiting (at the picturetube-panel)

- **Operation (continued):**

  - **Peak White Limiting for a 4:3 set with a 16:9 picture signal**
    - *** The beamcurrent remains the same, but is spread out over a smaller area**
    - *** The limiting should react earlier**
    - *** The 16:9 information signal at 1C40, controls TS7538**
    - *** For 16:9 signal:**
      - **→ Base of TS7538 is high; TS7538 conducts**
      - **→ TS7402 is non-conducting**
      - **→ Parallel-resistor R3449 is decoupled**
      - **→ Emitter-voltage of TS7383 increases**
      - **→ Collector-voltage of TS7383 increases to ± 60V**
      - **→ Reduction of contrast in the TDA4680 will now take place at an R, G or B signal voltage lower than about 58V (instead of lower than 48V)**

RGB amplifiers and peak white limiting (at the picturetube-panel)

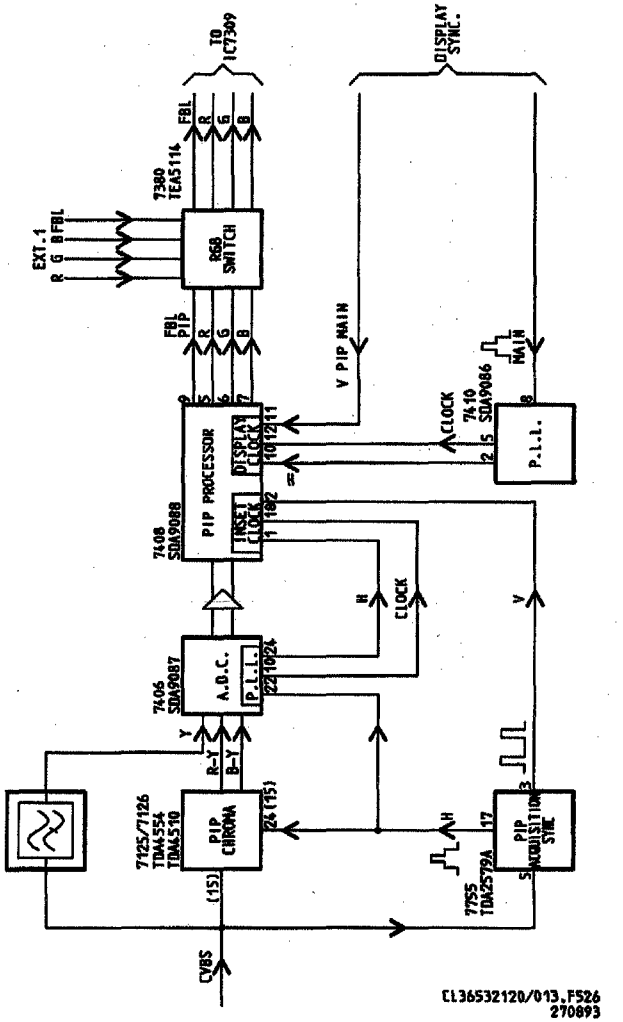


- **Function:**

  Displaying a 2nd, smaller picture into the main picture

- **Operation:**

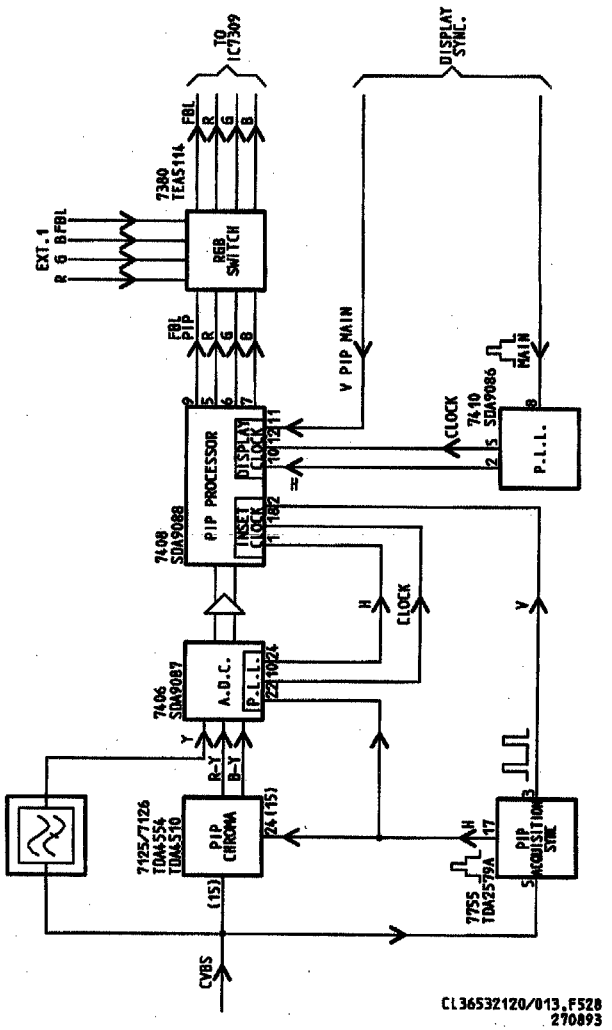
  - The desired CVBS signal for the Picture In Picture (PIP) signal is selected in the matrix IC7820 (TEA6415B), on Euro module 1006
  - This CVBS signal is fed to:
  → Luminance separation-filter
  → Chroma decoding, IC7126/IC7125 for PAL or PAL/SECAM decoding
  → Sync IC7755 (TDA2579A) for the synchronisation signal of the PIP picture
  - The Y signal and the R-Y and B-Y signals are fed to an Analog to Digital Converter (ADC) IC7406 (SDA9087)
  - The digital signals in the PIP processor IC7408 (SDA9088), are reduced by limiting and averaging the number of lines and the number of picture-dots per line
  - The digital signals are converted to R, G and B signals and made analog again in the PIP processor IC7408
  - The sync-signals of the PIP picture and the main picture have to be synchronised:
  → The Phase Locked Loop (PLL) in IC7410 (SDA9086) takes care for clock-frequency synchronisation with the main picture
  → The PIP processor IC7408 synchronizes the PIP picture and main picture



- Operation (continued):

  - The RGB signals, of the PIP processor IC7408, are fed to the RGB switch IC7380 (TEA5114). Here:
    - → The external RGB of EXT.1 are displayed without PIP
    - → Or the external RGB are displayed including PIP
    - → Or only PIP (if required) is displayed
  - With an external RGB signal, the PIP picture is switched at the right moment with the RGB switches IC7380
  - Next, the combined RGB signals are fed to the Video controller IC7309 (TDA4680) on the mainpanel
  - With an internal RGB signal (in the video controller IC7309) the PIP picture is switched at the right moment with the RGB switches in the video controller IC7309

For a more detailed description see:
CIRCUIT DESCRIPTION Chassis GR2.1



Block diagram

- Line and frame synchronization takes place in IC7470, TDA2579. The synchronization pulses are separated from the CVBS signal, and IC7470 delivers:
  - 50 Hz frame pulses
  - Sandcastle signal
  - 15625 Hz line pulses

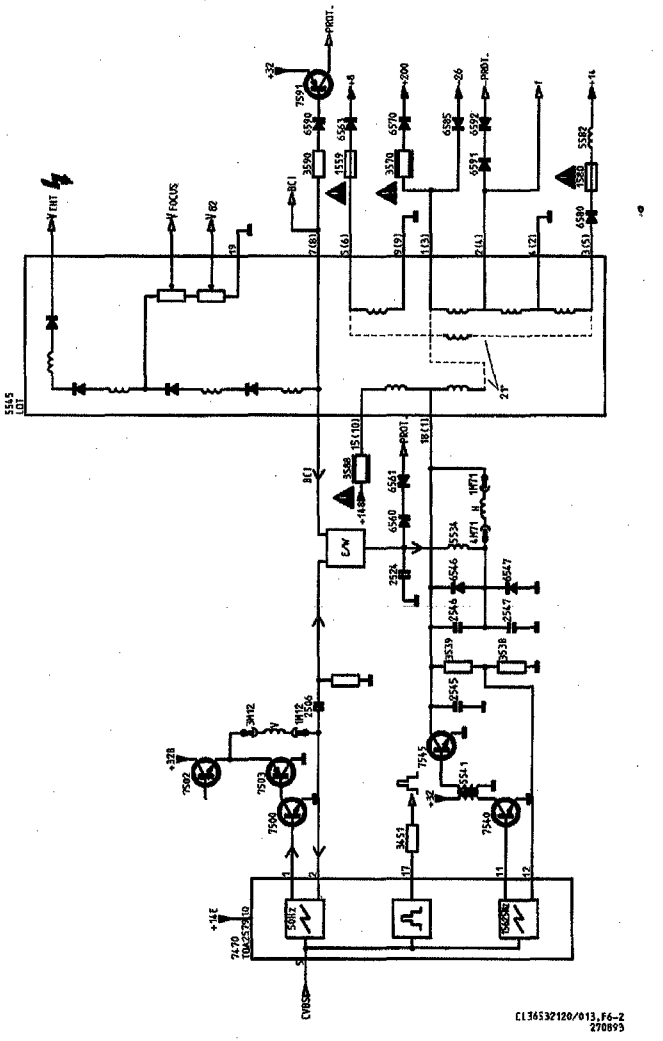
- The frame output stage is built up with transistors TS7500, TS7502 and TS7503 and receives its supply current from the +32B of the SOPS.

- The line output stage is built up with TS7540, T5541, TS7545 and T5545 and receives its supply current from the +148 of the SOPS. The line output stage supplies the set with:
  - Several supply voltages
  - Extra High Tension, Focus and VG2 voltage

- An overvoltage protection signal (PROT) is delivered to the SOPS via D6591/D6592 for the line circuitry, via D6560/D6561 for the frame circuitry and via D6590 and TS7591 for the beam current protection: The SOPS switches the set in "hickup" mode, see §8.2 point 6

- The frame deflection signal is combined with the beamcurrent information (BCI) and suppiied to the line output stage via an East-West modulator (E/W), for parabolic correction and prevention of picture width fluctuations at varying beam current.

Block diagram



Synchronization

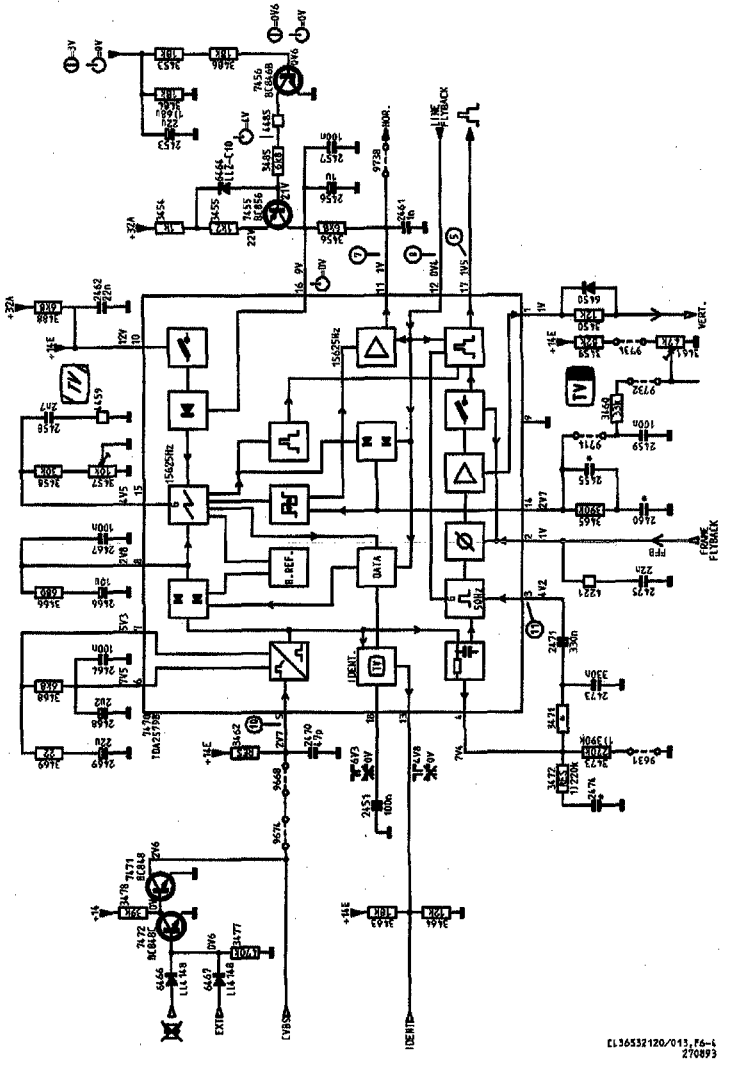
1. **Sync separator**
   - CVBS via pin 5 IC7470
     Transmitter identification on pin 18 and 13:
     * no picture, pin 18 = 0 - 1.25V; pin 13 = low
     * "locked" on strong signal, pin 18 = 6.25V; pin 13 = high
     * weak signal, pin 18 = 10V; pin 13 = high
     Top-sync detection on pin 6 and C2468
     Black level detection on pin 7 and C2469

2. **Time-constants**
   - Flywheel time constants are switched depending upon the level on pin 18:
     * 0 - 1.25V → fast
     * 6.25V → normal
     * 10V → slow

3. **Horizontal oscillator**
   - Sawtooth generation using C2458
   - Free running frequency adjustment with R3457 by grounding pin 5 and aligning for stable picture
   - Output signal on pin 11 is compared with line flyback signal of pin 12 and controlled in phase
   - Via pin 14, a DC-voltage is added for horizontal centring: adjustable with R3461
   - On pin 11, a pulse signal is fed to drive the line output stage

4. **Sandcastle generator**
   - On pin 17 the sandcastle signal is available with 3 levels:
     * 11V → Burst keying
     * 4.5V → Line flyback suppression
     * 2.5V → Frame flyback suppression

Synchronization



Synchronization

5. Vertical oscillator
   - The vertical synchronization pulses are derived by from the horizontal pulses by division
   - 50/60Hz recognition via pin 13:
     * 50Hz, → pin 13 = 12V
     * 60Hz, → pin 13 = 7.8V
   - A sawtooth waveform is generated by means of C2471. C2473 is controlled in phase by the frame flyback signal fed back on pin 2
   - Via an output-driver on pin 1, a sawtooth frame drive signal is fed to drive the vertical output stage

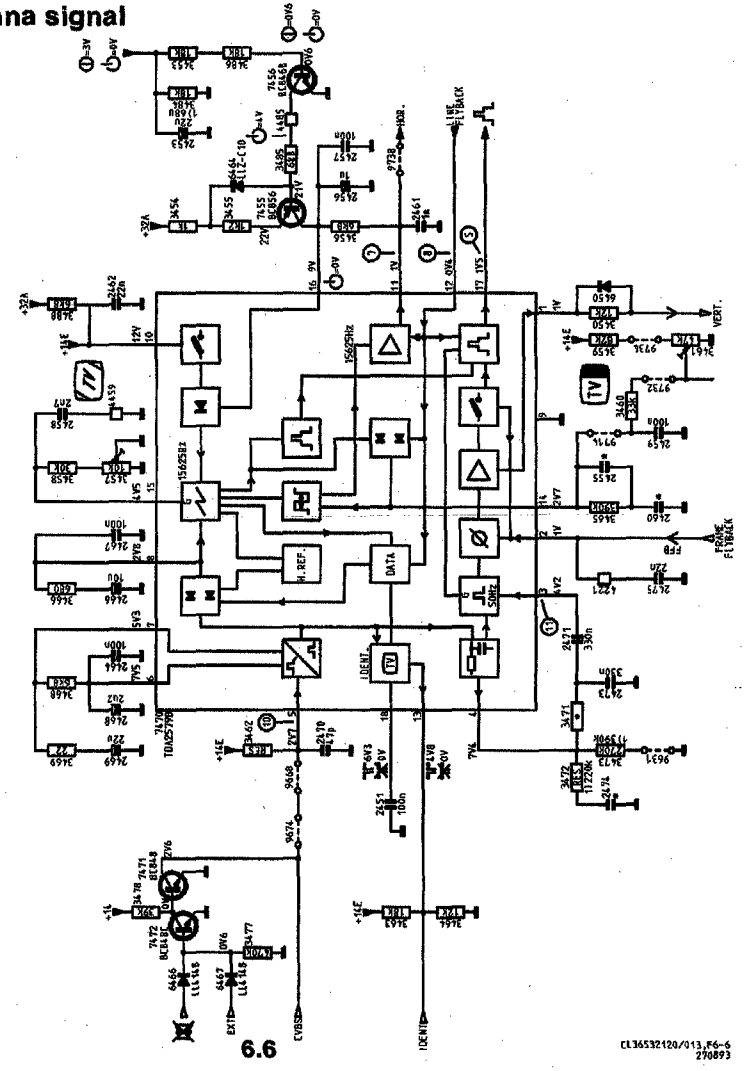
6. Start up
   - Start-up voltage is supplied to pin 16, supplied from the +32A of the SOPS
     Horizontal oscillator and output stage start operating
   - The +14E on pin 10 from the line output stage starts working and takes over the supply: the complete IC can start up

7. Stand-By
   - In stand-by, the line output stage is switched off:
     "Stand-By" is low: TS7456 blocks: TS7455 blocks: pin 16 = 0V, the IC switches off
     "Stand-By" becomes high: TS7456 and TS7455 conduct:
     pin 16 = 9.1V: the IC starts up again, the +14E takes the supply over again

8. Picture tube protection
   - If the frame flyback pulse on pin 2 becomes less than 0.9V or more than 1.9V, incorrect frame deflection is apparent
   - Sandcastle generator output becomes 2.5V
   - The picture is blanked to prevent phosphor burn

Synchronization

9. Stable On Screen Display - OSD
   - The signal on pin 5 is suppressed by means of TS7471, TS7472 to obtain a stable OSD during:
     * Transmitter search
     * No antenna signal



6.3 SYNCHRONIZATION AND DEFLECTION GR2.3

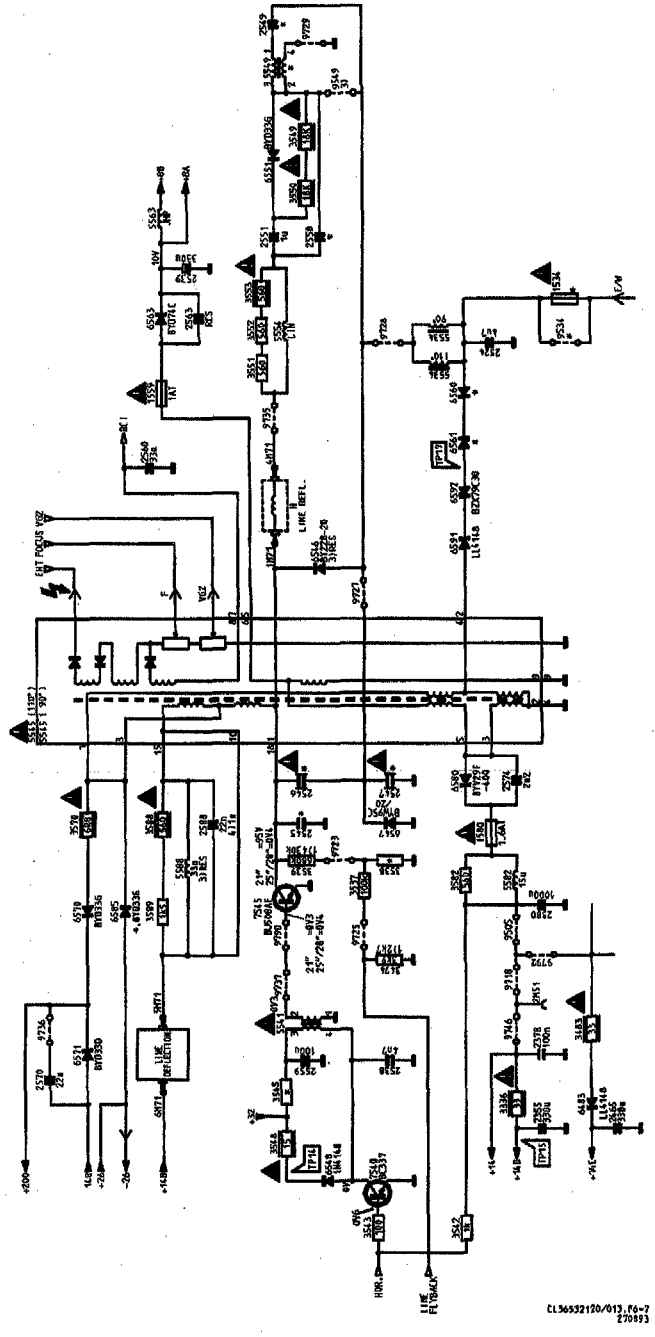
The line output stage

- **Function:**

  - Takes care of horizontal deflection
  - Delivers various supply voltages

- **Operation:**

  - The horizontal drive pulses are flowing via TS7540 and T5541 to the deflection circuitry:
    * Deflection coil (Line deflection)
    * Flyback capacitors C2545, C2546, C2547
    * Linearity coil L5554
    * Switching transistor TS7545
    * Line output transformer (LOT) T5545
  - Drive pulse = low, TS7545 is conducting
    Linear current through: T5545, Defl. coil and L5549
    → The beam is scanning across the screen
  - Drive pulse becomes high, TS7545 blocks, the voltages across the coils change polarity
    The current continues to flow, however with negative polarity
    Capacitors C2546, C2547 and C2545 are charged until the current becomes 0
    The capacitors will be discharged across L5549 and the defl. coil with the same negative polarity
    → The beam quickly flies back
  - Drive pulse becomes low again, TS7545 conducts and the cycle continues
  - During the scan the LOT will be charged with energy
    During flyback this energy is supplied in a very short period of time to generate:
    * Focus-, VG2- and extra high tension
    * +200 and -26 for the picture tube panel
    * +8 and +14 for various circuits
  - The Beamcurrent information (BCI) is measured across C2560



6.4 SYNCHRONIZATION AND DEFLECTION GR2.3

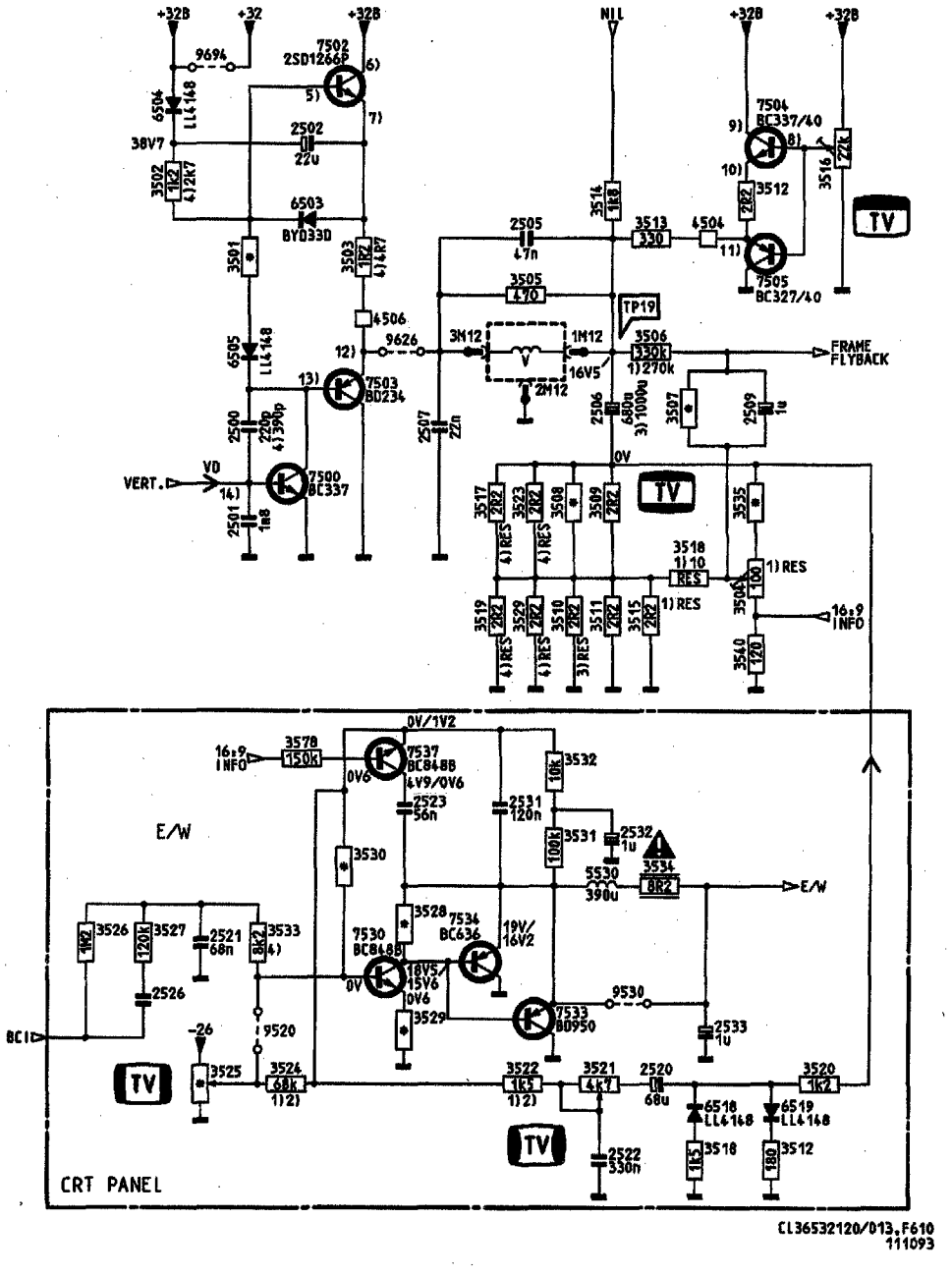
The frame output amplifier

- **Function:**

  Delivers the vertical deflection current

- **Operation:**

  - **The sawtooth output voltage is supplied via TS7500 to the amplifier TS7502, TS7503**
    The emitter voltage is supplied to the coil resulting in the desired deflection current
  - **C2502 is charged during the scan period and discharged during flyback. This leads to a voltage doubling needed for a quick flyback**
  - **The deflection current through C2506 is partially integrated by C2570 and R3521 to produce S-correction. A DC-voltage derived from R3525 is added and picture width adjustment and beamcurrent info (BCI) are added to prevent picture height fluctuations due to varying beam current**
  - **Via R3516, TS7504 and TS7505, a DC-voltage is added for vertical position adjustment**
  - **With R3504, the frame flyback amplitude is determined and hence, the frame amplitude is adjusted**
  - **Via TS7530, TS7534 and TS7533 the East/West (E/W) modulator, the east/west correction signal is supplied to the line circuitry**
  - **During teletext reproduction a 25Hz block signal is supplied via the NIL (Non-Interlace) which shifts the even and odd frames on top of each other, therefore giving no interlace**
  - **Via the 16:9 switching signal, the frame of the 4:3 sets is limited in amplitude to obtain a 16:9 picture format**



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1. Suitable for processing the following teletext signals accordingly:
   - the "World Teletext System" (WST)
   - the "UK" page choice system; FLOF (Full Level One Features)
     The teletext page is extended with a status line which gives information about pages coupled by the transmitter to the coloured RC-buttons (FastText)
   - the "german" choice system; TOP (Table Of Pages)
     the teletext page is extended with a status line which gives information about the next information block and group.
   - WST level 1,5; use of special characters necessary for some (via ghost row 26 [1]).

[1] For a detailed description of the operation of TXT, see "CCT Circuit Description" the functions described in this training manual VIP and CCT are processed by the IVT processor (see also section 7.2)

2. Possibility to store 6 pages:
   - 1 display memory; for pages on the TV screen
   - 5 background memories; for reducing the waiting time
   - the content of the background memory depends on the teletext system.

   This content is as follows:
   * WST with pages <u>without</u> sub-codes: page-1, page+1, page+2, page+3, page+4
   * WST with pages <u>with</u> sub-codes: page-1 or page-1 with preceding sub pages page+1, page+2
   * FLOF: 5 pages coupled to the coloured RC-buttons (red/green/yellow/cyan/white)
   * TOP: basic TOP table, page+1, next group

3. Possibility for programming 6 preferred teletext pages.

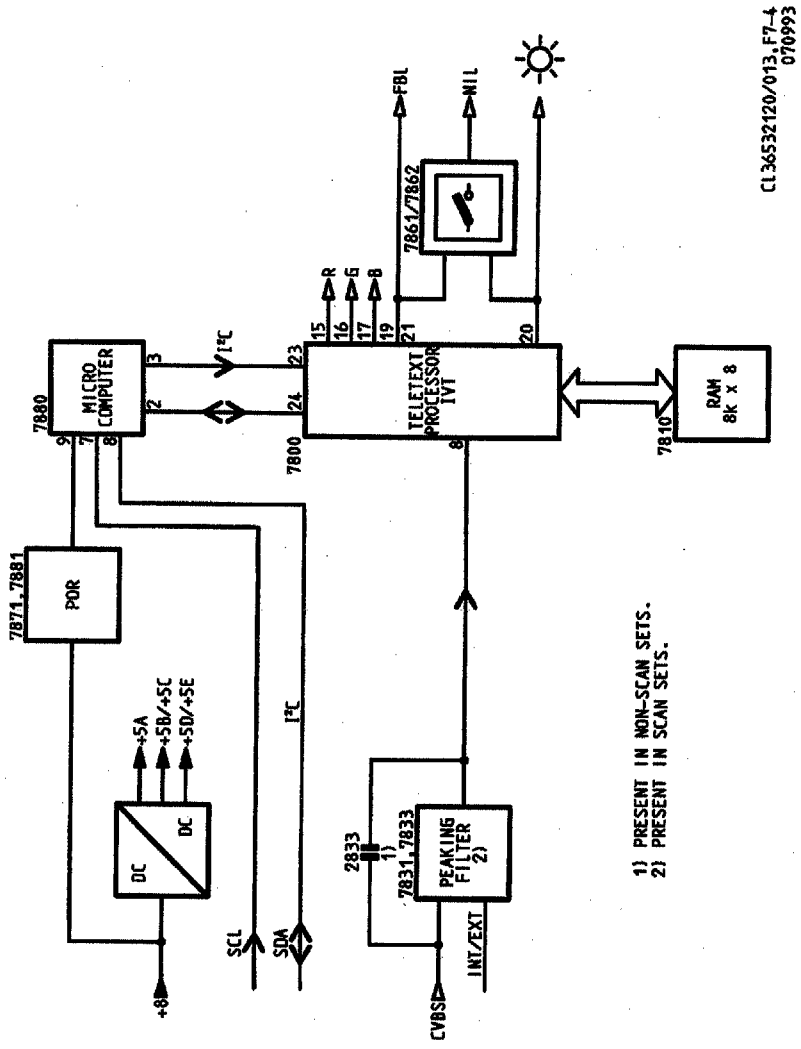
4. Upon reception of WST and FLOF, the "Page Look UP Table" (PLUT) will be built up after switch-on of the set or switching to another program.
   - PLUT = identify pages which are not broadcasted.
     The page-numbers stored in PLUT table are not stored into the background memory.

- **Function:**

  - Convert TXT information present in the CVBS signal into RGB signals.

- **Operation:**

  - IC7800 (IVT TXT processor-SAA5246) filters TXT signal from CVBS signal.
  - "Peaking filter", necessary for the Scandinavian execution, corrects errors which occur because of differences in envelope delay time. For other countries this correction is already present in the broadcasted signal. If this filter is switched on with correction already present, problems with TXT processing can occur.
  - IC7810 (8k RAM) is used as display and background memory.
  - IC7880 (microcomputer P83C528EBPN) controls the IVT-TXT processor and receives control-instruction via the IC bus. The microcomputer is also used for storage of language-sensitive information for the control menu's, with the exception of the French menu.
  - The contrast reduction signal is present at pin 20-IC7800
  - FBL and $\overline{\text{COR}}$ are converted by TS7861 and TS7862 into a NIL signal used for the deactivation of frame interlacing in the TXT mode
  - Via TS7871 and TS7881, a reset pulse is generated at start up.
  - The TXT circuitry is supplied by the +8 line, from the derived voltages +5A, +5B, +5C, +5D, +5E.

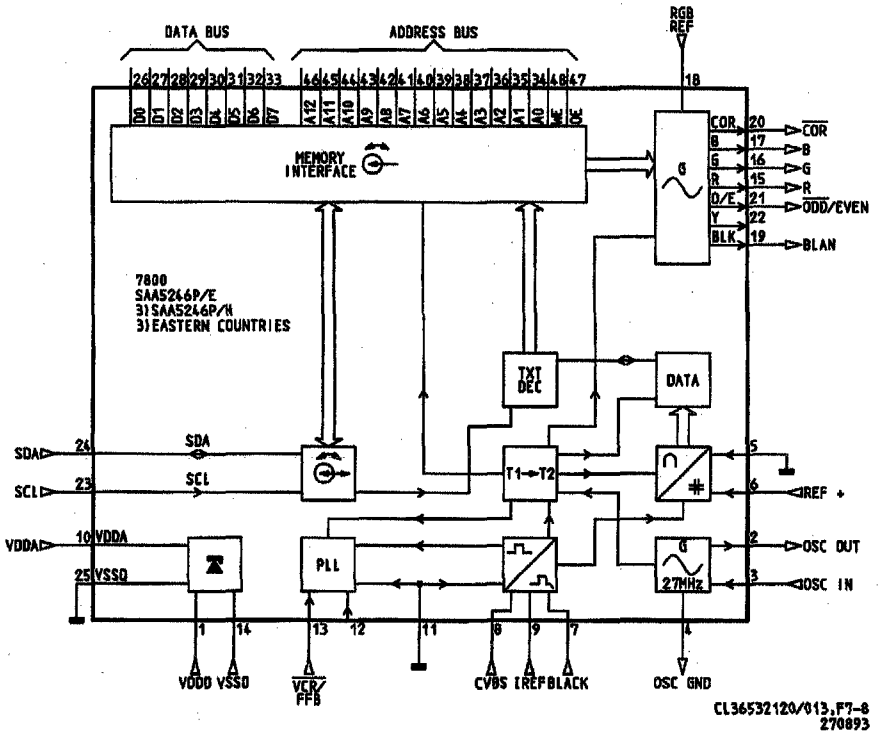


1. Pin description

1.	VDDD	+5 volt supply for digital circuitries in the IC.
2.	OSCOUT	output 27 MHz crystal oscillator
3.	OSCIN	input 27 MHz crystal oscillator
4.	OSCGND	crystal oscillator earth
5.	VSSA	analog earth
6.	REF+	positive reference voltage for the ADC.
7.	BLACK	black level reference capacitor.
8.	CVBS	input composite video
9.	IREF	input reference current
10.	VDDA	+5 volt supply for the analog circuitries
11.	POL	STTV/LFB/FFB polarity pin
12.	STTV/ LBF	Sync to TV output pin/ line flyback input pin. Function is controlled by internal register bit.
13.	$\overline{\text{VCR}}$/ FFB	PLL time constant switch/ frame flyback input pin. Function is controlled by internal register bit.
14.	VSSD	connected to +5
15.	R	output for R signal
16.	G	output for G signal
17.	B	output for B signal
18.	RGBREF	input for definition of high level on the RGB outputs
19.	$\overline{\text{BLAN}}$	output for blanking signal
20.	$\overline{\text{COR}}$	output for contrast reduction in mixed TV mode and TXT pictures for subtitling.

21.	$\overline{\text{ODD}}$/ EVEN	25 Hz output signal, synchronised with frame-sync. pulses of the CVBS signal for control of the non-interlaced display.
22.	Y	output for Y signal
23.	SCL	input for clock signal, I^2C bus
24.	SDA	in- and output for data signal, I^2C bus
25.	VSSD	digital earth
26.	D0..	data-bus, for page memory
33.	..D7	
34.	A0..	address-bus, for page memory
46.	..A12	
47.	OE	output-enable, for page memory
48.	WE	write-enable, for page memory

IVT processor



Introduction and block diagram

- The power supply is a mains isolated, self oscillating power supply (SOPS), suitable for 220V +- 10%, 50Hz operation.

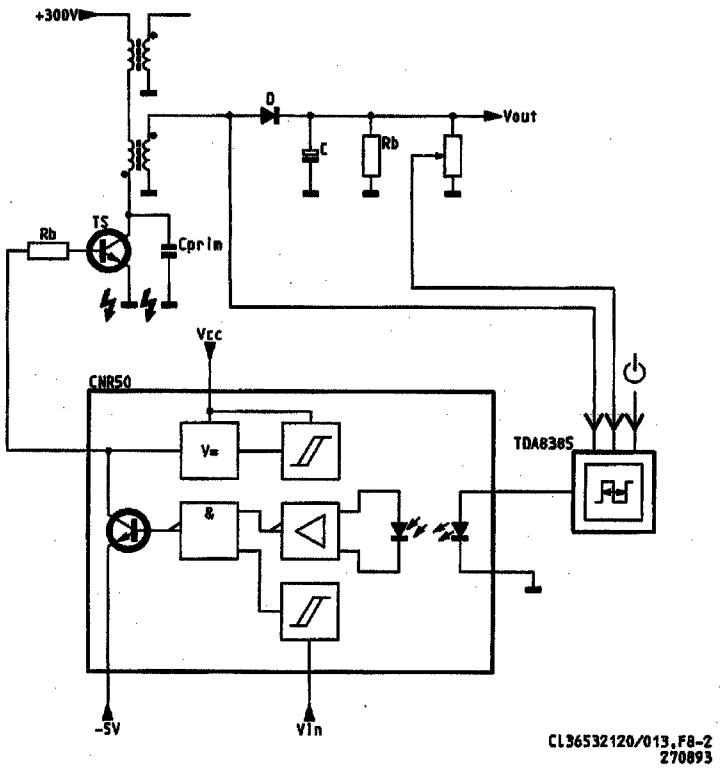
- Function:

  Deliver the supply voltages:
  - +148V for the line output stage
  - +5V for the microprocessor
  - +32V for the frame output stage
  - +16V/-16V for the sound output stage
  - Switch off the set in case of overvoltage, undervoltage and/or overload

- Operation:

  - The rectified mains voltage, +300V, is fed via a transformer to switching transistor.
    The switching transistor is controlled by the SOPS control IC (TDA8385), and is switched on and off via the opto coupler (CNR50)
  - At the secondary side of the transformer, some AC-voltages are extracted and rectified
  - The Duty-Cycle of the switching transistor determines the value of the output voltages.
    The output voltages are measured via a voltage-divider and fed back to the control IC for adjustment and stabilisation.
  - In "Stand-by" the SOPS is switched in "burst-mode"; the output voltages will decrease and the line output stage will be switched off

Introduction and block diagram



- Here the CNR50 and the TDA8385 are situated
  The CNR50 takes care of: start-up of the power supply and switching off the switching transistor
  The TDA8385 takes care of: "Slow-start", "Duty-Cycle", "Stand-by" and protection

1. Start-up of the power supply :
   - The + 300V is fed to the control panel U1007 via 4M36:
     The voltage at pins 7 and 8 of the CNR50 will rise. When they are high enough (pin 7 > 2,9V; pin 8 > 14,8V), pin 6 will drive the switching transistor TS7625 into conduction: via winding 9-10 and 1M36, the supply voltage to the CNR will be taken over.

2. Switching off the switching transistor :
   - The voltage at pin 7 CNR50 drops under 2,35V; the driving transistor in the CNR50 will conduct and the switching transistor TS7625 will block.
   - The power supply voltage of the CNR50 at pin 8 drops under 3,9V, then the driving transistor conducts, TS7625 blocks.
   - The current trough the LED (pins 2 and 3) gets 5mA, then the driving transistor conducts, TS7625 blocks.

3. "Slow-start"
   - The capacitor C at pin 7 of the TDA8385 gets charged with a constant current.
     The Duty-Cycle of the switching transistor depends on the voltage across this capacitor.
     In case of Stand-by, overload or protection, the capacitor C gets discharged via a zenerdiode Z so a slow-start always takes place.

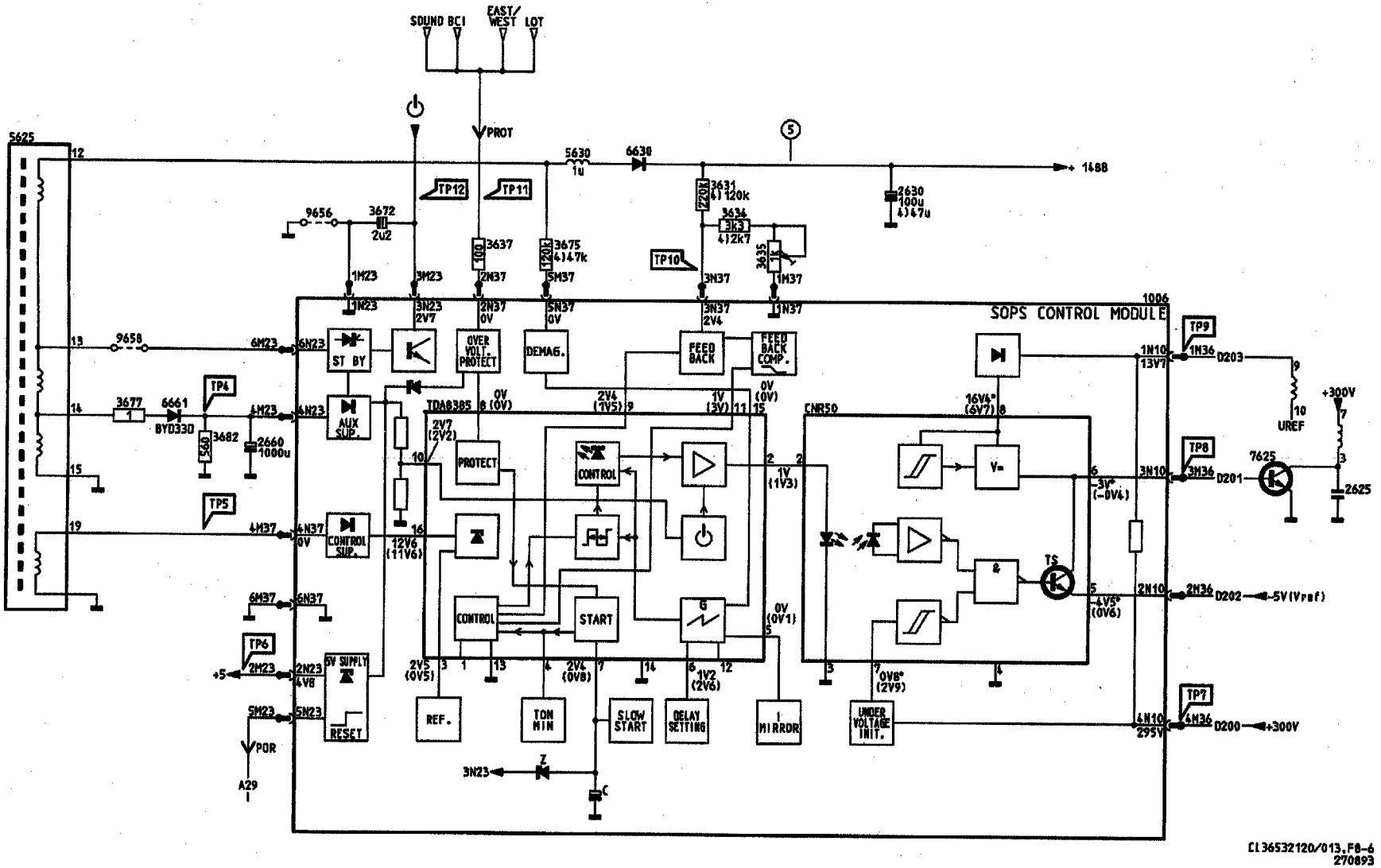
4. "Duty-Cycle"
   - The pulse-width modulator in TDA8385 controls the Duty-Cycle of the switching transistor via the opto coupler.
     It is controlled by a sawtooth generator and a control block.
     If the sawtooth is high enough, the switching transistor is switched off.
     The control block can switch on and off the switching transistor dependent of it's inputs.

5. "Stand-By"
   - "Stand-By" goes high: the voltage at 4N23 is fed, via the "aux sup.", to pin 10 of the TDA8385. If 4N23 goes ≥ 2,5V higher when pin 2 is high, the LED in the CNR50 lights continuously: the switching transistor is blocked and all secondary voltages drop.
     Also the voltage at 4N23 and pin 10: the power supply will start up: "Stand-By" is still high: power supply switches off: etc.
     → Power supply operates in Burst-mode !

6. Protection
   - The protection lines are fed to pin 8 of the TDA8385.
     If the voltage here is more then 2,5V, then the slow-start capacitor is discharged and the set is brought into standby via pin 10. The power supply voltage at pin 16 decreases and also the voltage at pin 8. A slow-start takes place, the set goes in protection again, etc.
     → The power supply is in Hick-up mode

   - Protections:
     * Audio amplifiers
     * Beam current limiting (BCI)
     * East/west modulator
     * Line Output Transformer (LOT)

GR2.3 POWER SUPPLY 8.2
SOPS control module U1007



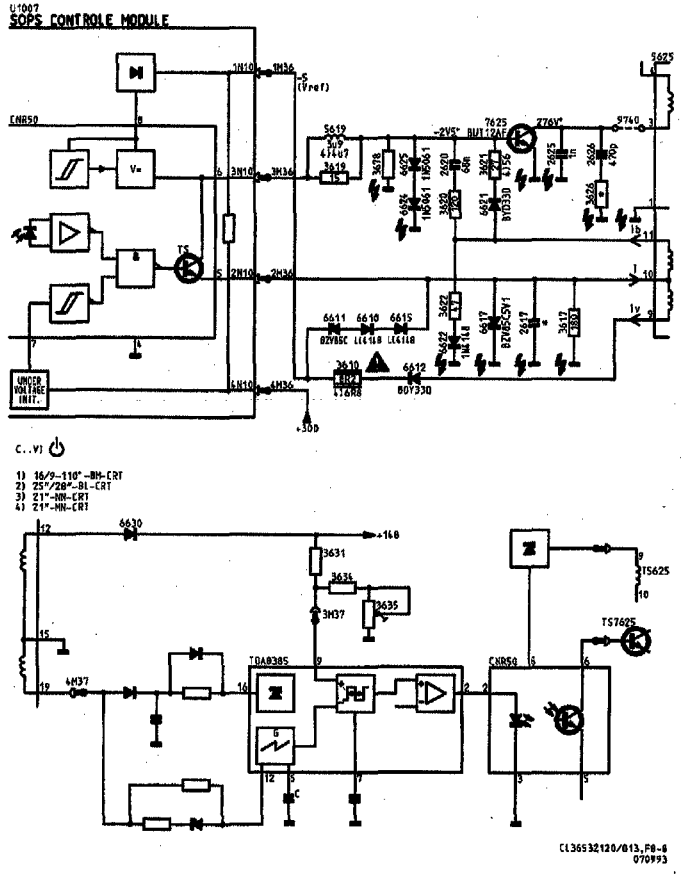
- The CNR50 is supplied from the rectified mains voltage, and will supply the switching transistor with a start-up current. After that, the power supply will be taken over by winding 9-10.

- The switching transistor conducts, the base-current I_B is delivered by winding 10-11.
  Switching off takes place by a negative switch-off voltage V_{ref}, which is built up by the sum of I_B and the CNR power supply voltage I_V, or by driving the LED by the TDA8385.

- The TDA8385 is supplied by winding 15-19 and only works if the voltage at pin 16 is between 7,5V and 20V.
  The switching transistor conducts: a current flows through the transformer.
  The voltage across winding 19 is a measure of the collector current and the mains voltage. This is measured at pin 12 of the TDA8385.
  C is charged with an internal current source and so a sawtooth is generated. The slope depends of the height of the voltage at pin 12.
  → This gives mains voltage stabilisation

- The sawtooth voltage is compared with the +148V output feedback voltage via 3M37.
  If the sawtooth voltage becomes higher, then via the pulse-width modulator, pin 2 becomes high: The LED in the CNR50 lights: the transistor is switched off.

- The energy in the transformer is delivered to the secondary side. When all of the energy is given away, the secondary voltage will drop.
  The polarity across the windings reverse: the switching transistor will be driven into conduction again by winding 10-11.



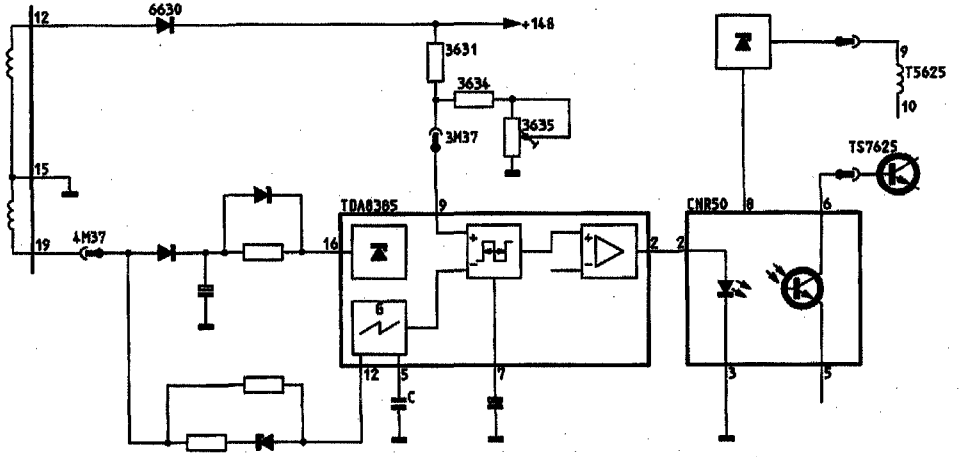
Overload and shortcircuiting

- The secondary voltages will drop in case of an overload.
  The Duty-Cycle will become maximum.
  The fedback output voltage (pin 9) drops under 2,5V; this will be detected by the TDA8385.
  The Duty-Cycle is adjusted back, and so the secondary voltages will drop and the current will decrease.

- In case of a short circuit, the fedback output voltage will drop drastically.
  The overload protection will be activated.
  The voltages will keep on dropping.
  The power supply voltage of the CNR50 drops under 3,9V.
  The CNR50 blocks the start current for the switching transistor: the switching transistor blocks.
  Voltage at pin 8 of CNR50 will charge up to 15,3V.
  The CNR50 will deliver again a start-up current.
  The overload protection will be activated again.
  → The power supply will be in hick-up mode with a squeaking sound

- The power supply voltage of the CNR50 also serves as undervoltage protection.
  If the power supply voltage drops under 3,9V, then the switching transistor continuously drops.
  → Undervoltage protection !

Overload and shortcircuiting



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µP = µC	Microprocessor
16:9	16 at 9 width at height ratio
2FSC	Double chroma frequency
4:3	4 at 3 width at height ratio
ADC	Analog Digital Converter
AM	Amplitude Modulation
AGC	Automatic Gain Control
B-Y	Blue - Luminance signal
BCI	Beam Current Info
C-SVHS	Chrominance signal of the SVHS-input
CNR50	Opto coupler of the SOPS control module
COR	Constant Output Regulation
CRT	Picture tube
CTI	Colour Transient Improvement
CVBS	Colour Video Blanking Sound
DAC	Digital Analog Converter
E/W	East/West (modulator)
EEPROM	Electrical Erasable Programmable Read Only Memory
EURO	Euro module (interface-module with euroconnectors)
EXT. LS	External loudspeakers
EXT1	Euroconnector nr. 1
FBL	Fast blanking signal for 25 Hz frame-frequency by teletext
FF	Flip Flop
FLOF	Full Level One Feature (see chapter 7)
FM	Frequency Modulation
HF	High Frequency
I^2C	Digital control-bus of the microprocessor
IVT-TXT	Integrated video-input processor and teletext-decoder
COMB	Comb filter in the IF-part which gives a better split-up of the chrominance and the luminance
L	Left audio-signal
LED	Light Emitting Diode
LOT	Line Output Transformer
IF	Intermediate Frequency
MHz	Mega Hertz
NICAM	Near Instantaneous Companding Audio Multiplex
NIL	Non Interlace
OSD	On Screen Display
PAL	Phase Alternating Line
PIP	Picture In Picture
PLL	Phase Locked Loop tuning system
PLUT	Page Look Up Table
POR	Power On Reset
QPSK	Quadratale Phase Shift Keying
R	Right audio-signal
R-Y	Red - Luminance signal
RAM	Read Only Memory
RC5	Remote Control 5 system
RGB	Red Green Blue
SAW	Surface Acoustic Wave filter in the IF-part
SCAVEM	SCAn VElocity Modulation
SCL	Clock of the I^2C-bus
SDA	Data of the I^2C-bus
SECAM	Sequential Couleur á Memoire
SOPS	Self Oscillating Power Supply
SVHS	Super Video Home System
SYNC	Synchronisation
TDA8385	Regulation IC of the SOPS control module
TOP	Table Of Pages (see chapter 7)
TP	Test Point
TXT	Teletext
VG2	Voltage on Grid 2 of the picture tube
VST	Voltage Synthesized Tuning system
WST	World Teletext System (see chapter 7)
Y-SVHS	Luminance signal of the SVHS-input

- **Function:**

  Decoding of chroma in R-Y and B-Y signals

- **Operation: for PAL sets**

  - The chroma-signal is connected via pin 9 IC7305 (TDA4510) to the Automatic Gain Control (AGC)
  - Next, the signal is split into a chroma-signal and a burst-signal
  - The separation is done with the aid of the sandcastle-pulse at pin 15
  - The demodulated burst-signal controls the AGC amplifier, the colour-killer and sets, with the aid of the PAL Flip Flop, the correct PAL phase
  - The reference oscillator, with crystal 1301 at pin 13 IC7305, operates at 8,86 MHz, double the chroma-subcarrier-frequency
  - C2325, C2314 and R3313 are used as the flywheel-function of this reference oscillator
  - Alignment of the reference oscillator frequency is achieved by temporarily connecting pin 11 of IC7305 to ground and adjusting C2313
  - The oscillator directly controls the B-Y demodulator
  - The R-Y demodulator is controlled via the PAL switch
    * For +(R-Y) the reference signal is not shifted in phase
    * For -(R-Y) the reference signal is phase shifted by 180°
  - The demodulators give a low frequency R-Y signal to pin 1 and B-Y signal to pin 2