5. Service modes, error codes, protections, faultfinding and repair tips

In this chapter the following paragraphs are included:
1. Test points.
2. Service modes.
3. Problems and solving tips (related to CSM).
4. ComPair.
5. Error codes.
6. Protections.
7. Repair tips.

5.1 Test points

The EM2E chassis is equipped with test points in the service printing. These test points are referring to the functional blocks:
- P1-P2-P3, etc. on LSP: Test points for the power supply.
- L1-L2-L3, etc. on LSP: Test points for the line drive and line output circuitry.
- F1-F2-F3, etc. on LSP: Test points for the frame output circuitry.
- R1-R2 on LSP: Test points for the rotation circuitry.
- A1-A2-A3, etc.: Test points for the audio circuitry.
- I1-I2-I3, etc. on SSB:Test points for the Tuner/IF part.
- S1-S2-S3, etc. on SSB: Test points for the synchronisation circuitry.
- V1-V2-V3, etc. on SSB: Test points for the video processing circuitry.
- C1-C2-C3, etc. on SSB: Test points for the control and teletext circuitry.
- F1F-F2F-F3F, etc.: Test points for the CRT-panel circuitry.
- SC1-SC2-SC3, etc: Test points for the SCAVEM circuitry.

The numbering is done in a for diagnostics logical sequence; always start diagnosing within a functional block in the sequence of the relevant test points for that functional block.

5.2 Service modes and ComPair

5.2.1 Service Default Mode (SDM)

The purpose of the SDM is to provide a situation with predefined settings to get the same measurement results as given in this manual.

Specification of the SDM:
- Tuning frequency 475.25 MHz.
- TV-system for BGLM sets set to BG.
- All picture settings at 50 % (brightness, colour, contrast, hue).
- All sound settings at 50 % except volume at 25 % (so bass, treble, balance at 50 %, volume at 25 %).
- All service-unfriendly modes are disabled (like sleep timer, child lock, blue mute, AVL and SDLP).

Entering the SDM can be done in 4 ways:
- Via a standard RC-handset by entering the code '062596' followed by the 'MENU' button (it is possible that, together with the SDM, the main menu will appear. To switch it off, push the 'MENU' button again).
- Via ComPair.
- By the 'DEFAULT' button on the DST while the set is in the normal operation mode.
- By short-circuiting for a moment the two solder-pads with the indication 'SDM' (item 4006) on the A-side of the SSB (activation can be performed in all modes except when the set has a problem with the main-processor).

Note: If the SDM is entered via the pins, all the software-controlled protections are de-activated.

Exiting the SDM can only be done via the STANDBY command. By switching off-on the set with the mains switch the set will come up again in the SDM.

5.2.2 Service Alignment Mode (SAM)

The purpose of the SAM is to align the set and/or adjust the settings.

Specification of the SAM:
- Software alignments (see chapter 8).
- Option settings (see chapter 8).
- Error buffer reading and erasing. The most recent error code is displayed on the left side.
- Operation counter.
- Software version.

Entering the SAM can be done in 4 ways:
- Via a standard RC-handset by entering the code '062596' followed by the 'OSD' button [i +] (it is possible that, due to the button sequence, the channel will change to channel 9. To return to the channel of your selection, push the appropriate button on the RC).
- Via ComPair.
- By the 'ALIGN' button on the DST while the set is in the normal operation mode (or SDM). Enter the password '3140' and press OK.
- By short-circuiting for a moment the two solder-pads with the indication 'SAM' (item 4005) on the A-side of the SSB (activation can be performed in all modes except when the set has a problem with the main-processor).

Note: If the SAM is entered via the pins, all the software controlled protections are de-activated.

The Service Alignment Mode menu will now appear on the screen. The following information is displayed:
- Date: the software date.
- ID: the software version of the ROM (Example: EM2E11.0_01501. This software-code stands for EM2E (chassis), E = Europe, 1 = language, 1.0 = software version, xxxxx = latest 5 digits of 12nc code software).
- Operation Hours: the accumulated total of operation hours.
- Errors: followed by maximal 10 errors. The most recent error is displayed at the upper left. For explanation errors see (table 5.1).
- Defect. Module: here the module that generates the error is displayed. If there are multiple errors in the buffer that have not all been generated by a single module, there is probably another defect. The message 'Unknown' will then be displayed here.
- Reset Error Buffer: pressing the 'OK' key can reset the error buffer.
- Functional Test: all devices are tested via the 'OK' key. Eventual errors are displayed in the error buffer. The error buffer is not erased, the content returns when the Functional Test is terminated.
- Alignments: this enables the Alignments sub-menu to be called up.
- Dealer Options: extra features for dealers.

Exiting the SAM can be done via the 'MENU' command or via switching OFF-ON the set with the mains switch.

5.2.3 Customer Service Mode (CSM)

All EM2E sets are equipped with the 'Customer Service Mode' (CSM). This 'Customer Service Mode' is a special service

mode, which can be activated and deactivated by the customer upon request of the service technician/dealer during a telephone conversation in order to identify the status of the set. This CSM is a 'read only' mode, therefore modifications in this mode are not possible.
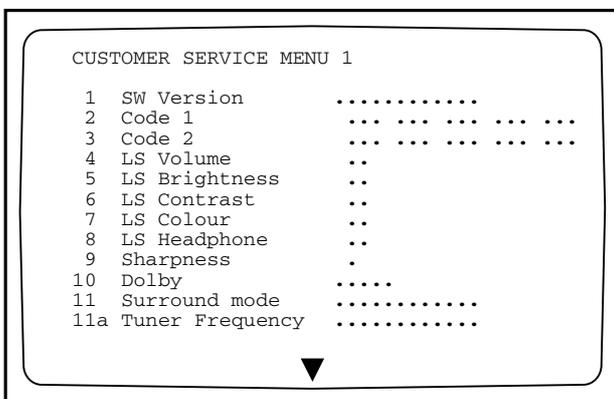
Switching-on of the Customer Service Mode:
The Customer Service Mode will switch-on after pressing simultaneously the 'MUTE' knob on the remote control handset and the 'MENU' button on the TV for at least 4 seconds. This activation only works if there is no menu on the screen.

Switching-off the Customer Service Mode:
The Customer Service Mode will switch-off after pressing any key of the remote control handset (with exception of the 'cursor-up' and 'cursor-down' keys), or the buttons on the TV or by switching off the TV set with the mains switch.

Detailed explanation of the Customer Service Mode
After switching on the Customer Service Menu the following screen will appear:

```
CUSTOMER SERVICE MENU 1

 1   SW Version          ...........
 2   Code 1              ... ... ... ... ...
 3   Code 2              ... ... ... ... ...
 4   LS Volume           ..
 5   LS Brightness       ..
 6   LS Contrast         ..
 7   LS Colour           ..
 8   LS Headphone        ..
 9   Sharpness           .
10   Dolby               .....
11   Surround mode       ...........
11a  Tuner Frequency     ...........
                ▼
```
CL96532137_024.eps
101199

Figure 5-1

Note: Following text is an explanation of the CSM. Be aware that these descriptions are depending on the set hardware.

Line 1:
Software version; the build in software version (AAABCX.Y)
• AAA = chassis name (EM1 = Painter processor, EM2 = OTC processor)
• B = country (E = Europe, A = Asian Pacific, U = USA)
• C = 1 (language cluster)
• X = main version number
• Y = sub version number
Details on the software version can be found in the chapter 'Software Survey' of the publication 'Product Survey - Colour Television'.

Line 2:
Code 1; gives the last 5 errors of the error buffer. As soon as the built-in diagnose software has detected an error the buffer is adapted.

Line 3:
Code 2; gives the first 5 errors of the error buffer. As soon as the built-in diagnose software has detected an error the buffer is adapted.
The last occurred error is displayed on the leftmost position of code 2. Each error code is displayed as a 3 digit number. When less than 10 errors occur, the rest of the line(s) is (are) empty. In case of no errors the text 'No Errors' is displayed. See paragraph 5.5 of this chapter for a description of the error codes.

Line 4:
LS Volume; gives the Last Status of the volume as set by the customer for this selected transmitter. The value can vary from 0 (volume is minimum) to 24 (volume is maximum). Volume values can be changed via the volume key on the remote control handset.

Line 5:
LS Brightness; gives the Last Status of the brightness as set by the customer for this selected transmitter. The value can vary from 0 (brightness is minimum) to 63 (brightness is maximum). Brightness values can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'PICTURE' and 'Brightness'.

Line 6:
LS Contrast; gives the Last Status of the contrast as set by the customer. The value can vary from 0 (contrast is minimum) to 63 (contrast is maximum). Contrast values can be changed via 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'PICTURE' and 'Contrast'.

Line 7:
LS Colour; gives the Last Status of the colour saturation, as set by the customer. The value can vary from 0 (colour is minimum) to 63 (colour is maximum). Colour values can be changed via 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'PICTURE' and 'Colour'.

Line 8:
LS Headphone; gives the Last Status of the headphone volume, as set by the customer. The value can vary from 0 (volume is minimum) to 24 (volume is maximum). Headphone volume values can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'SOUND' and 'Headphone'.

Line 9:
Sharpness; gives the sharpness value. The value can vary from 0 (sharpness is minimum) to 7 (sharpness is maximum). In case of bad antenna signals a too high value of the sharpness can result in a noisy picture. Sharpness values can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'PICTURE' and 'Sharpness'.

Line 10:
Dolby; indicates whether the received transmitter transmits Dolby sound (present) or not (not present). Attention: The presence of Dolby can only be tested by the software on the Dolby Signalling bit. If a Dolby transmission is therefore received without a Dolby Signalling bit, then this indicator will show 'not present' even though such a Dolby transmission is received.

Line 11:
Surround Mode; indicates the by the customer selected surround mode. In case the set is a Non-Dolby set there will be displayed '0'. If it is a Dolby-set then is displayed: 'Pro Logic', 'Dolby 3 Stereo', 'Hall' or 'Off'. For Dolby-set surround mode can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'SOUND' and 'Surround settings'.
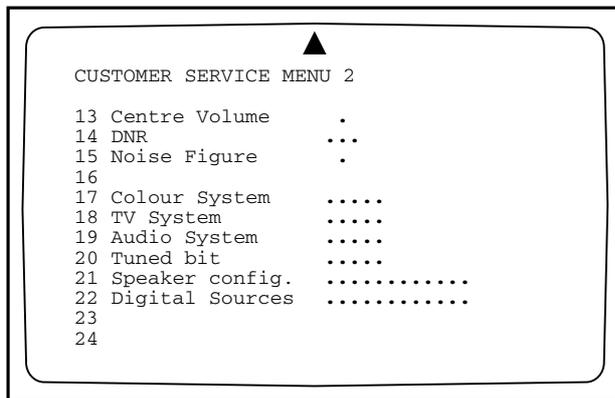
Line 11a:
Tuner Frequency; indicates the frequency the selected transmitter is tuned to. The tuner frequency can be changed via the "cursor left" and "cursor right" keys for fine tune or by entering directly with the digit keys 0 to 9 on the remote control

handset after opening the installation menu and selecting "manual installation".
The installation menu can be opened by pressing "timer" and "enlarge" at the same time.

By means of the 'cursor-down' knob on the remote control handset the Customer Service Menu 2 will appear. By means of the 'cursor-up' knob on the remote control handset the Customer Service Menu 1 will appear again.
Customer Service Menu 2 represents following information:


```
                      ▲

    CUSTOMER SERVICE MENU 2

    13 Centre Volume      .
    14 DNR                ...
    15 Noise Figure       .
    16
    17 Colour System      .....
    18 TV System          .....
    19 Audio System       .....
    20 Tuned bit          .....
    21 Speaker config.    ...........
    22 Digital Sources    ...........
    23
    24
```

CL96532156_036.eps
210100

Figure 5-2

Line 13:
Centre Volume; gives the volume value of the centre loudspeakers. This value can vary from 0 (minimum volume) to 63 (maximum volume). Centre volume can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'SOUND', 'Dolby Pro Logic' and 'Centre volume'. This feature is only available when surround mode is in 'Dolby Pro Logic' or 'Dolby 3 Stereo'.

Line 14:
DNR; gives the setting of the DNR for the selected transmitter. The following selections are possible:
'off', 'min', 'med' or 'max'. The DNR is changed automatically when 'Active Control' is 'ON'.

Line 15:
Noise Figure; gives the noise ratio for the selected transmitter. This value can vary from 0 (good signal) to 127 (average signal) and to 255 (bad signal).

Line 16:
Digital Option; gives the selected digital mode, '100 Hz' or 'Digital Scan'. Digital option can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset, after pressing the "MENU" button and selecting 'PICTURE', 'Digital Options'.

Line 17:
Colour System; gives information about the colour system of the selected transmitter.
• Black and white: No colour carrier received
• PAL: PAL signal received
• SECAM: SECAM signal received
• NTSC: NTSC signal received

Line 18:
TV System; gives information about the video system of the selected transmitter.
• BG: BG signal received
• DK: DK signal received

• I: PAL I signal received
• L: SECAM L signals received
• M38.9: NTSC M signal received with video carrier on 38.9 MHz
• MN: NTSC M signal received

Line 19:
Audio System; gives information about the audio system of the selected transmitter.
• Sound Muted: No sound
• Dolby Pro Logic: Dolby Pro Logic sound received
• Mono: Mono sound received
• Stereo: Stereo sound received
• Dual I: Language I received
• Dual II: Language II received
• Digital Mono: Digital mono sound is received
• Digital Stereo: Digital stereo sound is received
• Digital Dual I: Digital language I is received
• Digital Dual II: Digital language II is received

Line 20:
Tuned bit; gives information about the tuning method of the stored pre-set. If the value is 'Yes' the pre-set is stored via manual entry of the frequency when a transmitter was not present on that frequency. In that case the TV will attempt to perform a micro-search every time the pre-set number is selected. Once the micro-search has been successful the Tuned Bit will be set to 'No'.

Line 21:
Speaker config.; gives the configuration setting for the speakers. In case the set is a Non-Dolby set there will be displayed '0'. If it is a Dolby-set then is displayed: 'Full internal', 'L/R external', 'Surround external' or 'Full external'. For the Dolby-set the speaker configuration can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after opening the installation menu and selecting 'SETUP'. The installation menu can be opened by pressing 'timer' and 'enlarge' at the same time. This feature is only available when the set has virtual Dolby.

Line 22:
Digital Sources; gives the configuration setting for the digital source. This can be 'FRONT', 'EXT1', 'EXT2' or 'None'. If one of these is selected the starting point is a top quality signal on that input and a number of settings are therefore changed automatically. The digital source can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after opening the installation menu and selecting 'SETUP'. The installation menu can be opened by pressing 'timer' and 'enlarge' at the same time.

5.3 Problems and solving tips

Below described problems are all related to TV-settings. The procedures to change the value or the status of the different settings are described in the paragraph 'Detailed explanation of the Customer Service Mode'.

5.3.1 Picture problems

Worse picture quality in case of DVD pictures
Check line 22 'Digital sources'. In case line 22 gives the indication 'Not Present' change the setting into 'Present'.

Snowy/noisy picture
1. Check line 15 'Noise Figure'. In case the value is 127 or higher and the value is also high on other programs check the aerial cable/aerial system.

2. Check lines 9 'Sharpness' and 15 'Noise Figure'. In case
   the value of line 9 is 3 or 4 and the value of line 15 is high
   (127 or higher), lower the value of line 9 'sharpness'.

Picture too dark
1. Press 'Smart Picture' button on the Remote Control
   handset. In case picture improves, raise the brightness
   value or raise the contrast value. The new value(s) are
   automatically stored for all TV channels.
2. After switching on the Customer Service Mode the picture
   is OK. Raise the brightness value or raise the contrast
   value. The new value(s) are automatically stored for all TV
   channels.
3. Check lines 6 'LS Brightness' and 7 'LS Contrast'. The
   value of line 6 is low (<10) or the value of line 7 is low ((10).
   Raise the brightness value or raise the contrast value.

Picture too bright
1. Press 'Smart Picture' button on the Remote Control
   handset. In case picture improves, reduce the brightness
   value or reduce the contrast value. The new value(s) are
   automatically stored for all TV channels.
2. After switching on the Customer Service Mode the picture
   is OK. Reduce the brightness value or reduce the contrast
   value. The new value(s) are automatically stored for all TV
   channels.
3. Check lines 6 'LS Brightness' and 7 'LS Contrast'. The
   value of line 6 is high (>40) or the value of line 7 is high
   ((50). Reduce the brightness value or raise the contrast
   value.

White line around picture elements and text
1. Press 'Smart Picture' button on the Remote Control. In
   case picture improves, reduce the sharpness value. The
   new value(s) are automatically stored for all TV channels.
2. After switching on the Customer Service Mode the picture
   is OK. Reduce the sharpness value. The new value(s) are
   automatically stored for all TV channels.
3. Check line 8 'Sharpness'. Reduce the sharpness value.
   The new value(s) are automatically stored for all TV
   channels.

No picture
Check line 20 'Tuned bit'. In case the value is 'Yes', install the
required program again: open the installation menu by pressing
'timer' and 'enlarge' at the same time and perform manual
installation.

Blue picture
No proper signal is received. Check the aerial cable/aerial
system.

Blue picture and/or unstable picture
A scrambled or decoded signal is received.

Black and white picture
Check line 5 'LS colour'. In case the value is low ((10) raise the
value of colour. The new value(s) are automatically stored for
all TV channels.

No colours/colour lines around picture elements
1. Check lines 17 'Colour System' and 18 'TV System'. In
   case line 17 is 'PAL' and line 18 is 'M38.9', the installed
   system for this pre-set is 'USA', while 'West Europe' is
   required. Install the required program again: open the
   installation menu by pressing 'timer' and 'enlarge' at the
   same time and perform manual installation. Select
   'System; West Europe'.
2. In case line 17 is 'PAL' and line 18 is 'L', the installed
   system for this pre-set is 'France', while 'West Europe' is
   required. Install the required program again: open the

installation menu by pressing 'timer' and 'enlarge' at the
same time and perform manual installation. Select
'System; West Europe'.

No colours/noise in picture
1. Check lines 17 'Colour System' and 18 'TV System'. In
   case line 17 is 'Black and White' and line 18 is 'BG', the
   installed system for this pre-set is 'West Europe', while
   'USA' is required. Install the required program again: open
   the installation menu by pressing 'timer' and 'enlarge' at the
   same time and perform manual installation. Select
   'System; USA'.
2. In case line 17 is 'Black and White' and line 18 is 'L', the
   installed system for this pre-set is 'France', while 'USA' is
   required. Install the required program again: open the
   installation menu by pressing 'timer' and 'enlarge' at the
   same time and perform manual installation. Select
   'System; USA'

Colours not correct
Check lines 17 'Colour System' and 18 'TV System'. In case
line 17 is 'PAL' and line 18 is 'L', the installed system for this
pre-set is 'France', while 'West Europe' is required. Install the
required program again: open the installation menu by pressing
'timer' and 'enlarge' at the same time and perform manual
installation. Select 'System; West Europe'.

Colours not correct/unstable picture
Check lines 17 'Colour System' and 18 'TV System'. In case
line 17 is 'SECAM' and line 18 is 'BG', the installed system for
this pre-set is 'USA', while 'France' is required. Install the
required program again: open the installation menu by pressing
'timer' and 'enlarge' at the same time and perform manual
installation. Select 'System; France'.

Unstable picture
Check lines 17 'Colour System' and 18 'TV System'. In case
line 17 is 'SECAM' and line 18 is 'M 38,9', the installed system
for this pre-set is 'West Europe', while 'France' is required.
Install the required program again: open the installation menu
by pressing 'timer' and 'enlarge' at the same time and perform
manual installation. Select 'System; France'.

Menu text not sharp enough
1. Press 'Smart Picture' button on the Remote Control
   handset. In case picture improves, reduce the contrast
   value. The new value(s) are automatically stored for all TV
   channels.
2. After switching on the Customer Service Mode the picture
   is OK. Reduce the contrast value. The new value(s) are
   automatically stored for all TV channels.
3. Check line 7 'LS Contrast'. The value of line 7 is high (>50).
   Reduce the contrast value.

5.3.2 Sound problems

No sound from left and right speaker
1. Press 'Smart Sound' button on the Remote Control
   handset. In case sound improves, raise the volume value.
   The new value(s) are automatically stored for all TV
   channels.
2. After switching on the Customer Service Mode the volume
   is OK. Raise the volume value. The new value(s) are
   automatically stored for all TV channels.
3. Check line 4 'LS Volume'. The value is low. Raise the value
   of 'Volume'. The new value(s) are automatically stored for
   all TV channels.

Sound too loud for left and right speaker
1. Press 'Smart Sound' button on the Remote Control
   handset. In case sound improves, reduce the volume

value. The new value(s) are automatically stored for all TV channels.

2. After switching on the Customer Service Mode the volume is OK. Reduce the volume value. The new value(s) are automatically stored for all TV channels.

3. Check line 4 'LS Volume'. The value is high. Reduce the value of 'LS Volume'. The new value(s) are automatically stored for all TV channels.

5.4 ComPair

5.4.1 Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the DST service remote control allowing faster and more accurate diagnostics. ComPair has three big advantages:

- ComPair helps you to quickly get an understanding how to repair the EM2E in short time by guiding you step by step through the repair procedures.
- ComPair allows very detailed diagnostics (on I^2C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I^2C commands yourself; ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the EM2E (when the micro processor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan EM2E electronic manual, schematics and PWB's are only a mouse-click away.

ComPair consists of a Windows based fault finding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial or RS232 cable. In case of the EM2E chassis, the ComPair interface box and the television communicate with each other via a bi-directional service cable.
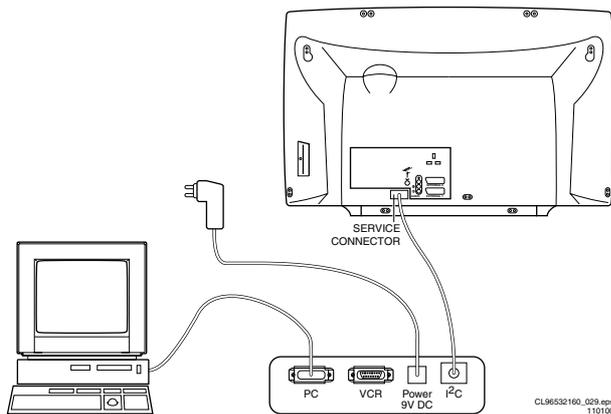

Figure 5-3

The ComPair fault finding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in 2 ways:
1. Communication to the television (automatic)
2. Asking questions to you (manually)
ComPair combines this information with the repair information in its database to find out how to repair the EM2E.

Automatic information gathering
Reading out the error buffer, ComPair can automatically read out the contents of the entire error buffer.
Diagnosis on I^2C level. ComPair can access the I^2C bus of the television without a physical connection. ComPair can send and receive infrared commands to the micro controller of the

television. These commands are translated by the controller to I^2C commands and vice versa. In this way it is possible for ComPair to communicate (read and write) to devices on the I^2C busses of the EM2E.

Manual information gathering
Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through the fault finding tree by asking you questions and showing you examples. You can answer by clicking on a link (e.g. text or an oscillogram) that will bring you to the next step in the faultfinding process.

A question could be: Does the screen give a picture? (Click on the correct answer) YES / NO
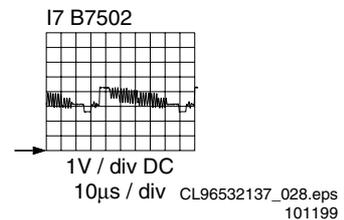An example can be: Measure test point I7 and click on the correct oscillogram you see on the oscilloscope

Figure 5-4

By a combination of automatic diagnostics and an interactive question/answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Additional features
Beside fault finding, ComPair provides some additional features like:
- Uploading/downloading of pre-sets
- Managing of pre-set lists
- Emulation of the Dealer Service Tool

5.4.2 SearchMan (electronic service manual)

When ComPair is installed in combination with SearchMan, all schematics and PWB's will be directly available while you repair a television if you click on a PWB or schematic link.
Example: Measure the DC voltage on C2568 (PWB/schematic) on the small signal level.
Clicking on PWB will automatically pop-up a picture of the PWB with the location of C2568 marked. Clicking on schematic will automatically pop-up the schematic with the location of C2568 marked.

5.4.3   Stepwise Start-up / Shutdown feature of set can be used via ComPair

Under normal circumstances, a fault in the power supply or an error during start-up will switch the television to protection-mode. ComPair can take over the initialisation of the television. In this way it is possible to distinguish which part of the start-up routine (hence which circuitry) is causing the problem.

Stepwise start-up explanation
Via ComPair the stepwise start-up can be realised. This is very helpful when a protection is activated (see also chapter 5.6).

State	Description mode	Display LED (Red)	Activate protection
0	Low Power Standby: 5V2/3V3 present, uP in Standby.	On	None
1	High Power Standby: TV-set in Standby.	Wait 1s, flash 1 time	None
2	Main Power On: 5V/ 8V present, HOP in Standby.	Wait 1s, flash 2 times	4, 5
3	HOP On: EHT startup, blackcurrent stabilisation off, picture blanked.	Wait 1s, flash 3 times	Plus 6, 2 & 1
4	Initialised. All IC's are initialised, blackcurrent stabilisation is on.	Wait 1s, flash 4 times	Plus rest
5	TV On: TV-set operates, unblanked picture.	Wait 1s, flash 5 times	

Stepwise shutdown explanation
In the stepwise shutdown mode, state 2 is skipped. (IC's can not be de-initialised).

State	Description mode	Display LED (Red)	De-activate protect.
5	TV On: TV-set operates, unblanked picture.	Wait 1s, flash 5 times	-
4	Initialised. All IC's stay initialised, blackcurrent stabilisation is on.	Wait 1s, flash 4 times	-
3	HOP On: EHT startup, blackcurrent stabilisation off, picture blanked.	Wait 1s, flash 3 time	6, 2, 1
1	High Power Standby: TV-set in Standby.	Wait 1s, flash 1 time	4, 5
0	Low Power Standby: 5V2/3V3 present, uP in Standby.	On	

Note: When set is in stepwise-mode and due to stepping-up a protection is activated, the set really will go into protection (blinking red led). The set will not leave the stepwise-mode however. By stepping up the set can be activated again, until state X, where protection was activated. At state (X-1) diagnostic measurements can be performed.

5.5   Error codes

5.5.1   Reading error codes from the error buffer

The error buffer can be read in 3 ways:
1. On the screen via the Service Alignment Mode (SAM). In case picture is OK, the error buffer can be read easiest via the SAM. In the main menu of the SAM the last 10 different error codes occurred are displayed. The most recent detected error code is displayed on the left side, so e.g.:
   – 0 0 0 0 0   means no error codes present in the buffer
   – 3 0 0 0 0   means one error code present in the buffer; error code 3
   – 2 3 0 0 0   means two error codes present in the buffer; error code 2 is the most recent, error code 3 is detected before 2.
2. Via the blinking LED procedure. The contents of the error buffer can also be made visible through the "blinking LED" procedure. This is especially useful when there is no picture. There are two methods:
   – When the SDM is entered, the LED will blink the number of times, equal to the value of the last (newest) error code (repeatedly).
   – Via the 'DIAGNOSE' key of the DST. If an error has been detected by the EM2E chassis, the set might go into protection. Without the presence of a picture, the errors can be displayed via the red LED on command of the DST, as long as the main-processor is still active. To display the errors via the red LED by the DST:
     1. Press the 'DIAGNOSE' key (in all modes except the SAM).
     2. Press '1' to view the last error detected (or '2', etc. to show the errors before).
     3. Press the 'OK' key. The blinking Red LED on the TV will now give the requested error.

       Example:
       Error code position 1 - 2 - 3 - 4 - 5
       Error buffer: 12 - 9 - 5 - 0 - 0

       After entering SDM: blink 1x long (750 ms for tens) - pause (1.5 s) - blink 8 x short (250 ms for units) - etc.
       After transmitting 'DIAGNOSE-2-OK' with the DST: blink 9 x short - pause (250 ms) - blink 9 x short - etc.
       After transmitting 'DIAGNOSE-3-OK' with the DST: blink 5 x short - pause (250 ms) - blink 5 x - etc.
       After transmitting 'DIAGNOSE-4-OK' with the DST: nothing happens
3. Via ComPair.

5.5.2   Clearing the error buffer

The error buffer can be cleared in 3 ways:
1. In the SAM by selecting the item 'RESET ERROR BUFFER' in the main menu.
2. By the 'DIAGNOSE 99' command of the DST (in all modes except the SAM). Press the DIAGNOSE key on the DST, followed by 9, 9 and then 'OK'.
3. Via ComPair.
Note: When error buffer is full (10 codes), no new error can be stored anymore. However of every error raised is monitored how long it exists in the error buffer. When for any reason a false raised error exists in the buffer, it will be deleted after 50 hours. If this error is still present after 50 hours, it will be raised again. In this way it is safeguarded that the error codes history is stored. Sometimes it is an option to first write down the error buffer content, reset the buffer, and look again which error codes are generated by the set.

5.5.3 Error code table

Error	Device	Description	Defective item	Diagram	Defect. module indication
1	ST24E32	NVM	7011	B5	Control
2	H fail protection	HFB			Horizontal Flyback
3	SAA4978	PICNIC	7709	B3	Feature Box
4	Supply 5 V	5V2			+5 V Supply
5	Supply 8 V	8V6			+8 V Supply
6	Slow I^{2}C-bus blocked				Slow I^{2}C blocked
7	TDA9330	HOP video control/geometry	7301	B4	Video Controller
8	TDA9320	HIP I/O-video processing	7323	B2	Chroma IF IO
9	X-ray protection			A3	
11	HOP protection				
12	Tuner protection	TUNER_PROT			+8 V (Tuner) Supply
13	UV1316	Tuner	U1200	A7	Tuner
14	MSP3451/3415	ITT sound processor + Dolby	7651	B6	Audio Module
15	Flash protection				
16	Featurebox protection	FBX_PROT			

Remark:If on the DST the text 'ERROR 2' is displayed, this means that the communication from the TV to the DST has failed.

5.6 Protections

5.6.1 General

The EM2E has only one micro-processor (OTC) which remains active during Standby. This because power of the microprocessor and the attached memory chip set is coming from the 3V3 supply, which is derived from the 5V Standby-circuitry. So in both Power-on as in Standby-mode the microprocessor is connected to this power supply.

If a fault situation is detected an error code will be generated and if necessary the set will be put in the protection-mode. The protection-mode is indicated by blinking of the red LED at a frequency of 3 Hz. In some error cases the micro processor does not put the set in the protection-mode. The error codes of the error buffer can be read via the service-menu (SAM), the blinking LED procedure or via DST/ComPair. The DST diagnose functionality will force the set into the Service-standby, which is alike the usual Standby, however the micro-processor has to remain in normal operation completely.

To get a quick diagnosis the EM2E has 3 service-modes implemented:
- The Customer Service Mode (CSM).
- The Service Default Mode (SDM). Start-up of the set in a predefined way.
- The Service Alignment Mode (SAM). In this mode items of the set can be adjusted via a menu and with the help of test patterns.

Both SDM & SAM modes can be entered via the 'service pads' on the SSB, via a RC (DST or standard RC) or via ComPair. The SAM can not be entered in Standby, the set has to be in normal operation.

The EM2E 'Protection Diagram' shows the structure of the protection system. See diagram below.
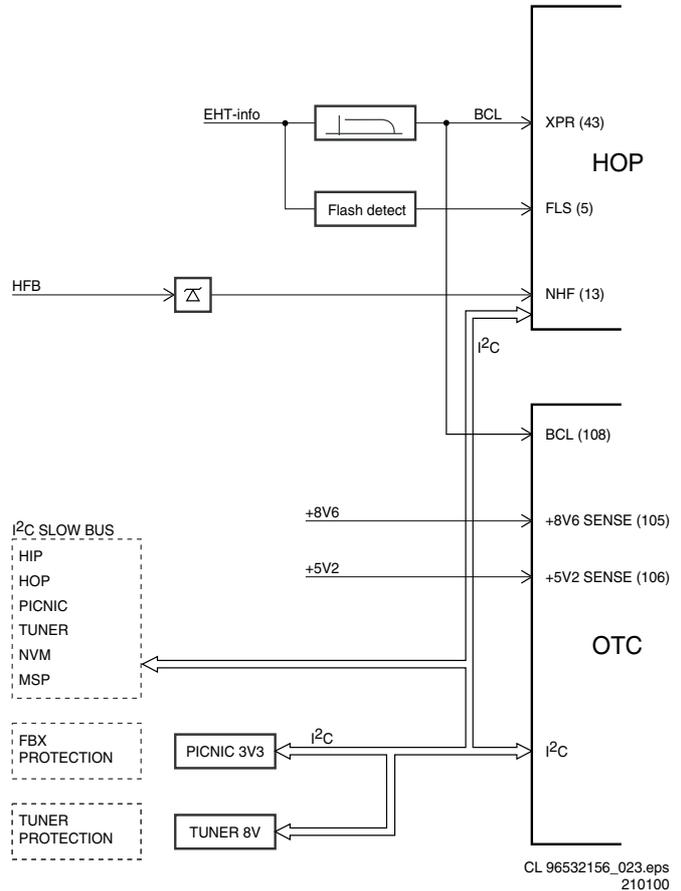

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Figure 5-5

There are several types of protections:
- I^{2}C related protections
- OTC related protections (via polling on I/O pins or via algorithms).
- HOP related protections (mainly for deflection items).
- Hardware errors which are not sensed by the OTC (e.g. BRIDGE_PROT)

I^{2}C related protections
In normal operation some registers of the I^{2}C controlled IC's will be refreshed every 200 msec. During this sequence the I^{2}C-busses and the I^{2}C -IC's as well will be checked. The I^{2}C

protection will take place if the SDA and SCL are whether short circuited to ground or to each other. An I^2C error can also occur, if the power supply of the IC is missing (e.g. TUNER_PROT (error 12) & FBX_PROT (error 16)).

OTC related protections

If a protection is detected at an input of the OTC, all protection inputs of the OTC will be scanned every 200 msec. for 5 times. If the protection on one of the inputs is still activated after 1 sec., then the set will be put in the protection-mode. Before the scanning is started a so-called ESD-refresh will be carried out first, because the interrupt on one of the inputs may be caused either by a FLASH or by ESD. As a FLASH or ESD can harm the settings of some IC's, the HOP-HIP-MSP-PICNIC-NVM and Tuner are initialised again to ensure the normal picture and sound conditions of the set.
• 8.6 V and 5.2 V protection. The presence of the 8.6 V and 5.2 V is sensed by the OTC. If these voltages are not present, then an error code is stored in the error buffer of the NVM, and the set is put in the protection-mode.

HOP related protections

Every 200 msec. the status register of the HOP is read by the OTC via I^2C. If a protection signal is detected on one of the inputs of the HOP, then the relevant error bit in the HOP register is set to 'high'. If the error bit is still 'high' after 1 sec., the OTC will store the error code in the error buffer (NVM) and depending on the relevancy of the error bit the set will either go into the protection-mode or not.
• HFB: Horizontal Flyback. If the horizontal flyback is not present, then this is detected via the HOP (HFB_X-RAY_PROT). One status bit is set to 'high'. The error code is stored in the error buffer and the set will go into the protection mode
• Flash detection. From the EHT-info, via D6303 and T7303 a flash will stop the H-drive and line output stage immediately. The FLS-bit in the status register of the HOP is set to 'high'. As the duration of a flash is very short the FLS-bit will be reset to 'low' again after the flash refresh, so via a slow start the set will be started again.

Hardware related protections

Due to the architecture (with 'hot' deflection) there are two protections that are 'unknown' to the microprocessor, namely the 'BRIDGE_PROT' from the line-stage and the 'NO_VFB' protection form the frame-stage. If one of these protections is triggered, the set is positioned in 'Standby'-mode. The OTC will now try to re-start the set. If this will not succeed after 5 times (after ≈ 1 minute), the OTC will generate error 15 (Flash protection) and will start the blinking red LED.
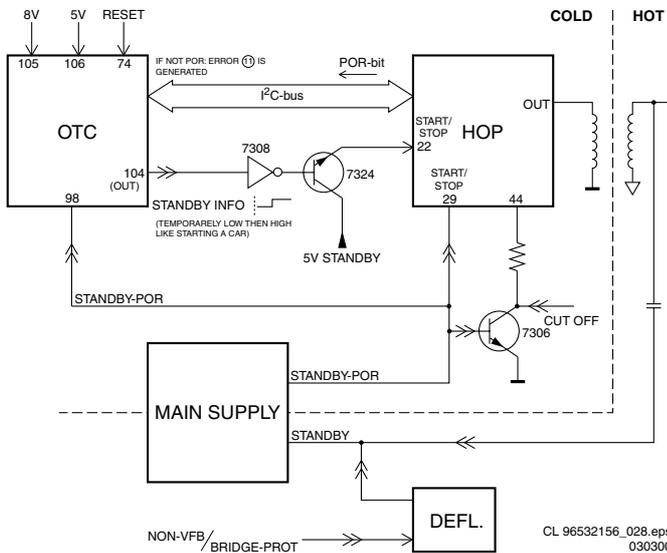
5.7   Repair tips

5.7.1   General

Figure 5-6

The start-up of the set is very different as of other sets:
1. When the set is switched 'ON', first the HOP is placed in 'low power start-up' mode (HOP-standby-mode). This means that 5 V (derived from available Standby-supply) is connected to pin 22 of the HOP-IC.
2. Now the HOP is driving the line-circuitry with 50 kHz pulses. At the base of the line-transistor this is sensed via the 'STANDBY'-line.
3. This signal triggers the Main supply to operate. Now the line-stage has 'BAT'-voltage (141 V), it will also start.
4. After the 5 and 8 V-supply lines are sensed by the OTC, it will read the POR-bit from the HOP via the I²C-bus.
5. Now the HOP is switched in 'ON'-mode and the set will start-up further with normal drive (31.25 kHz for PAL).
6. The last step will be the unblanking of the picture.

SO STANDBY IS NOT CONTROLLED VIA A STANDBY-LINE FROM MICROPROCESSOR, BUT IS ACHIEVED INDIRECTLY VIA THE HOP-CIRCUITRY.

Notice that a very big part of the set (Large Signal Panel) is 'hot', meaning the primary part of the Standby supply, the whole Main supply (except for the secondary Audio supply) and the complete deflection circuit. SO NOTICE THAT THE DEFLECTION-COIL IS HOT!

This set does not have an IR transmitting-LED anymore. In its place, a Service (ComPair) connector is implemented at the rear of the set, which is directly accessible. In addition to this, there is a blinking LED procedure to show the contents of the error buffer.

The relay you hear during switching 'ON' (via the main switch) is from the degaussing-circuitry. So it is not used for switching the supply as in the MG-chassis.

When using ComPair (connect cable to ComPair-connector at the rear of the set, placed behind a separate cover), there exists the possibility to have a stepwise start-up procedure. With this mode one can startup the set step-by-step. This also means that in certain steps some protections will not be activated. This can sometimes be convenient during repair. See table in 5.4.3, which is describing the stepwise start-up mode with belonging LED behaviour.

On the SSB there are 'service pads' implemented to activate (via bridging) the SDM- or SAM-mode (see chapter 4). When the SDM-mode is activated, the processor-controlled protections (so not the Hardware and HOP-protections) can be overruled. This means that the ADC-input protections (5- and 8 V) and the I²C not-acknowledging info from Tuner and FBX can be overruled.
WHEN DOING SO THE SERVICE-ENGINEER MUST KNOW WHAT HE IS DOING, AS IT COULD LEAD TO DAMAGING THE SET.

'Repair-tips how to repair the Main power supply:
•   Simplest way is to replace components of the Main supply with repair kit (3122 785 90100)
•   More detailed way:
    –   Replace FET 7504 and zener 6505
    –   Remove SSB-panel
    –   Short-circuit BE of TS7529 in order to put supply in 'on'-mode (TS7529 is blocking then)
    –   Load capacitor C2515 (V_{BAT}) with a load of 500 ohm. Supply can not work without a minimum load.
    –   Use a variac to slowly increase the V_{MAINS}. Measure over sensing-resistors R3514/15 whether a nice sawtooth-voltage becomes available. Also measure the V_{BAT}-output
    – V_{BAT} may never exceed 141 V. If so there is something wrong in the feedback-circuitry (e.g. regulator 7506)

Repair-tips how to repair the Standby power supply:
•   Simplest way is to replace components of the Standby supply with repair kit (3122 785 90110)

Repair-tips how to repair the Deflection-circuitry:
•   Simplest way is to replace components of the Deflection-circuitry with repair kit (3122 785 90120)

Service-tips:
•   Be careful measuring on gate of FET 7504. Circuitry is very high ohmic and can easily be damaged.
•   Take care not to touch 'hot' heatsink while disconnecting SSB, despite the fact that mains cord is out of mains socket. There still is an annoying rest-voltage for a short while.
•   Do not try to measure on side of SSB directed to the hot heatsink. This is dangerous. All service test points are guided to the Tuner side and are pointed out by service printing. Where the circuitry was too crowded to place this service-printing it has been explained on the Test point overviews in this manual

5.7.2 Repair tips

Phenomenon	Possible Cause	Repair-tip
No picture, no LED.	Standby Supply defective.	Measure circuitry (see diagram A2). Start at testpoint P16. Regardless the mode of the set, this voltage should always be available.
No picture, red LED (high intensity) despite expectation the set should be 'on' (this looks like Standby).	There are 2 protections that are not 'seen' by processor, that force set in 'Standby'-mode, namely 'NO-VFB-prot' (= no frame-deflection), or 'BRIDGE_PROT' (safety error).	If protection is activated by 'NO_VFB-prot', this can be measured with a scope on service test point F10 (diagram A4). Before this protection is activated, a few seconds a horizontal white line is visible. The 'BRIDGE_PROT' error may never occur. Is implemented due to legal requirements. Flash protection error (15) will be generated in both cases after 5 restart attempts. Visible via blinking LED procedure. NO_VFB-prot can be determinated by white line.
No picture, red LED blinking (3 Hz).	Set is in protection due to various causes. For error codes see error-code list.	You have no picture, so: - or you read out error buffer via ComPair - or you read out blinking LED information via 'diagnose' x dealer remote - or you read out blinking LED sequence via <default>-button dealer remote - or you read out blinking LED sequence via service default mode entered via RC-command 062596 + 'menu' When error is known, check circuitry related to supply-voltage and I^2C-communication.
No picture, red LED blinking code 6,6,6 or 1,1,1	No communication on I^2C-bus or NVM-I^2C-bus to processor. Set is in protection-mode	As processor cannot communicate with one of the 2 busses it spontaneously starts blinking. Measure dependent of the error on the I^2C-bus which device is loading the bus. This protection can be overruled via SDM-entry on SSB or via stepwise start-up mode step 'MainPowerOn'.
No picture, no sound, set is making audible squeaking sound	Supply could be in hiccup-mode which can be heard via supply-transformer squeaking	This could be caused by: - Short-circuited V_{BAT} (caused by short circuited line transistor 7421) or - Short-circuited sound-winding (amplifier is short-circuiting 28 V) or - Short-circuited D6514 (due to a too high V_{BAT}). Delete excessive load to see where failure is caused by or check feed back circuit. See repair-tip main power supply (supply needs a minimal load).
No picture, no sound, LED works fine	Supply does not work correctly	If e.g. V_{BAT} is only about 90 V, regulator-IC 7506 could be damaged.
No RC5-reception. Red LED does not echo RC-commands.	Processor-circuitry or RC-receiver is wrong.	In case set reacts on local keyboard operation, error must be found in the IR-receiver circuitry (diagram E).
Relay-activation (degaussing) not audible when switch set 'on' from 'off'.	Processor not working correctly.	Check RESET-circuitry on diagram B5. When switching on the set all i/o-pins of processor should become high for a moment, so also the degauss-input signal.
No sound, but picture.	Measure P7 on diagram A1. Possible sound-amplifier is broken (but not short-circuited), or sound-enable line is high (see diagram A5). Further the audio-signal path must be measured (HIP, MSP, switch-IC's, amplifier).	Measure and repair. With ComPair there is a beep-test that can determine where the signal stops (use loudspeakers, headphone).
No sound at headphone output.	Discrete amplifiers or supply to it could be damaged.	Measure A12, A13, A14, A15 and supply-line on diagram A6.
Picture is rotated.	Rotation-circuitry or supply to it could be damaged.	Measure test points F3, R1, R2 on diagram A4.
No picture.	Check functionality and cabling Tuner to SSB.	Notice cable 0946.
Picture looks like cushion, further O.K.	Or NVM-content is overwritten or E/W-MOSFET is short-circuited	First check in Service Alignment Mode, whether geometry can be restored. If not check testpoint L4 and diagram A3, or measure with an ohm-meter whether TS7480 is defective.
Very white picture, with flyback lines visible	180 V is missing on CRT-panel	Probably R3468 on LSP (diagram A3) is interrupted, or bad connection plug 0324 to 0224 (CRT-panel).
Un-sharp picture	Focus could be mis-aligned or SCAVEM-circuitry does not work correctly	Align focus-potmeter of Line Transformer; check SCAVEM-circuitry on CRT-panel [F].
Un-synced picture	Sync is derived in HIP-IC from X-tals 1305 and/or 1308	Maybe a X-tal is making bad contact.
Picture distorted.	Check video-path, service default mode.	Investigate whether there exist an error code in the error buffer. In case there is an error code, check I^2C-bus and/or supply-lines (see overview supply-lines). Measure and check signal path Tuner, HIP, PICNIC, HOP, RGB-amplifier. In case it is a geometry-issue, check Frame-circuitry, alignments or possible corrupted NVM (7011)
No menu, OSD.	Probably processor is defective.	Measure test points C7, C8, C9, C10 on diagram B5.

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Personal notes:

Personal notes:

Personal notes:

Personal notes:

8.   Electrical alignments

8.1   General alignment conditions

All electrical alignments should be made under the following conditions:
- Power supply voltage: 230 V $\pm$ 10 %; 50 - 60 Hz $\pm$ 5 %. Should be applied via an isolating transformer with low internal resistance.
- Warm-up time $\approx$ 20 minutes.
- Voltages and oscillograms are measured in relation to Tuner earth (with exception to the voltages on the primary side of the power supply). Never use the cooling fins/plates as ground: they are 'hot' ! ! !
- Test probe: Ri > 10 MΩ, Ci < 20 pF.
- Use an isolated trimmer/screwdriver for the alignments

8.2   Alignments on the large signal panel (LSP)

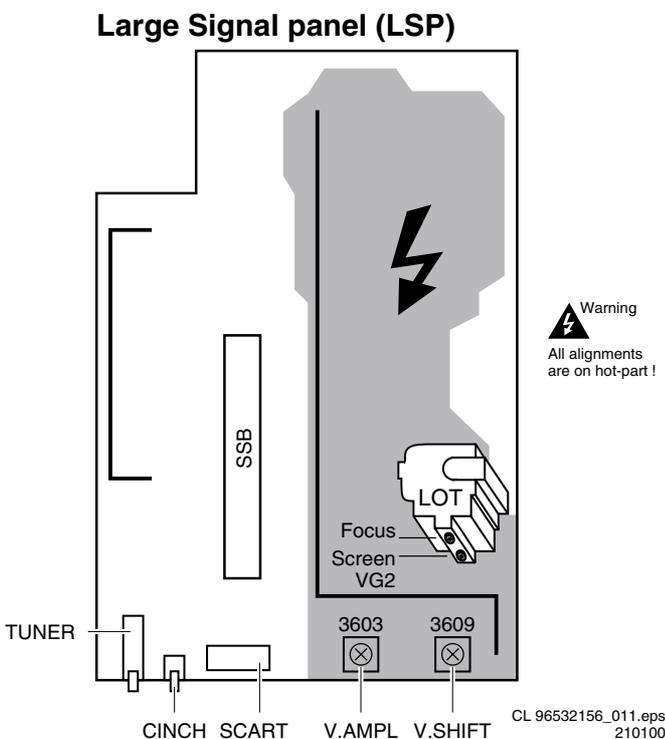### Large Signal panel (LSP)

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Figure 8-1

8.2.1   Focusing

1. Tune the set to a crosshatch test pattern (use an external video pattern generator).
2. Adjust the Focus potentiometer (upper potmeter, see figure 8-1) for an overall optimum focusing of the picture.

8.2.2   Vg2 adjustment
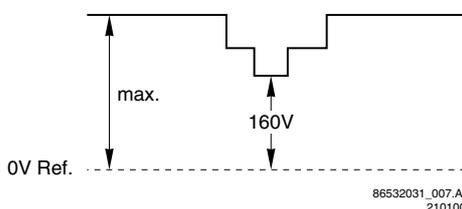

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Figure 8-2

Elucidation: In the frame blanking period of the R, G and B signals applied to the CRT, a measuring pulse with different DC levels is inserted by the 'HOP' video processor. Measure the black level pulse during the vertical flyback at the RGB cathodes of the CRT.
1. Put the set in the SDM mode (see chapter 5.2.1).
2. Insert a black test-pattern signal (carrier 475.25 MHz) to the Tuner input.
3. Connect an oscilloscope (position 50 V/Div DC and 2 ms/Div) alternately to the CRT cathodes (Red pin 8, Green pin 6, Blue pin 11) and measure for each cathode the DC level of the measuring pulse (see elucidation above and figure 8-2) and write down each value. Remark: Trigger the scope external via a CVBS signal (for instance via pin 19 of the SCART1 connection).
4. Adjust the Vg2 potentiometer (lower potmeter, see figure 8-1) so that the measuring pulse with the highest noted level is on 160 $\pm$ 3 V$_{DC}$ level.

8.3   Vertical amplitude alignment

1. Tune the set to a crosshatch test pattern (use an external video pattern generator).
2. Align the vertical amplitude with R3603 (see Fig. 8-1) so that the complete test pattern is visible.

8.4   Vertical shift alignment

1. Tune the set to a crosshatch test pattern (use an external video pattern generator).
2. Align the vertical centering with R3609 (see Fig. 8-1) so that the test pattern is located vertically in the middle.
3. Repeat the 'vertical amplitude' alignment if necessary.

8.5   Alignments and settings in the Service Alignment Menu

8.5.1   General

Put the set in the SAM mode (see chapter 5.2.2). The Service Alignment Mode menu will now appear on the screen. Via 'Alignments' the following submenu's can be selected:
- General:
  – Drive
  – Luminance Delays
  – EHT Compensation
  – Soft clipper
  – Luma gain
  – IF AFC
  – Tuner AGC
  – Blend intensity
  – Adjust Peak White Limiter
  – Vg2 Test Pattern
- Normal Geometry: General geometry alignments.
- Super Wide Geometry: Geometry alignments for the 'Panorama' position in 16:9 sets (only valid for wide screen sets; alignments can be performed, however, it is better to set values as mentioned below).
- Options: Setting the initialisation codes in the set via text.
- Option Numbers: All options together, expressed in two long numbers. The original factory setting for these numbers can be found on the picture tube sticker on the inside of the set.
- Store: Store all alignments.

The alignments are explained now in the sequence of the sub-menu:

8.5.2 'General' alignments in Service Alignment Menu:

- Once all alignments/settings have been completed the item 'Store' must be selected to record all the values in the permanent memory of the set.
- If the Option codes have been changed and stored, the set has to be switched 'OFF' and 'ON' using the mains switch to activate the new settings (when switching via Standby, the option code settings are NOT read by the microprocessor).
- If an empty EAROM (permanent memory) is detected, all settings are set to pre-programmed default values.
- A built-in test pattern can be called up in various sub-menus. The test pattern generator can be switched on using the item 'Test pattern on/off'. The test pattern only appears AFTER the specific alignment has been selected. The test patterns are generated by the Teletext-IC (OTC).

'Drive'
- Method 1 (with colour analyser):
  1. If you want to align tint-settings with a colour-analyser, the Test pattern must be switched on. You get a white block in middle of the image now.
  2. Before doing the Tint-settings the 'Cathode'-parameter must be aligned. This is dependent of the picture tube size and brand. See table "Cathode parameter" for the colour-analyser readings.
  3. Tint-settings: Set the white levels for the 3 Tint-settings 'Normal', 'Warm' and 'Cool'. The next values must be aligned (see table "White levels").

Cathode parameter	
CRT	Light output (cd/m^2)
25" FS	500
28" FS	350
29" SF	400
28" WS	450
32" WS	400

White levels			
	Cool	Normal	Warm
X	280	289	303
Y	287	299	314
Temp. (K)	10200	8700	7200

- Method 2 (without colour analyser):
  1. Without having a colour-analyser one can set some parameters. This is the next best solution. The setting-parameters are average values coming from production (statistics).
  2. Before doing the Tint-settings the 'Cathode'-parameter must be set. For all picture tubes the value '5' must be entered.
  3. The 'Tint' setting must be on 'normal'.
  4. Tint-settings: Set the Red, Green and Blue parameters for the 3 Tint-settings 'Normal', 'Warm' and 'Cool'. See table 8.4 for the values.
  5. Red BL offset: herewith the Black Level can be aligned very precise. Pre-set value is 7.
  6. Green BL offset: herewith the Black Level can be aligned very precise. Pre-set value is 7.

Tint settings			
	Cool	Normal	Warm
R	24	25	27
G	20	20	20
B	18	14	10

'Luminance delays'
With the 'Luminance delays' alignment the luminance information is placed on the chrominance information (brightness is pushed onto the colour). Use a colour bar/grey scale pattern as test signal.
- Lum. Delay Pal: Apply a PAL colour bar/grey scale pattern as a test signal. Adjust 'Lum. Delay Pal' until the transients of the colour part and black and white part of the test pattern are at the same position.
- Lum. Delay Secam: Apply a SECAM colour bar/grey scale pattern as a test signal. Adjust 'Lum. Delay Pal' until the transients of the colour part and black and white part of the test pattern are at the same position.
- Lum. Delay Bypass: apply a NTSC colour bar/greyscale pattern as a test signal. Adjust value until the transients of the colour and black & white part of the test area are at the same position.

'EHT compensation'
Fixed setting: 0

'Soft clipper"
Fixed setting:Pwl + 0%

'Luma gain'
Fixed setting:1

'IF AFC'
The SAM-mode is needed to make alignment, a test generator to make signal and the Installation-menu to check the 'Fine Tune' value.
Supply, via a video generator (e.g. PM5518), a TV-signal with a signal-strength of at least 1 mV and a frequency of 475.25 MHz. Use BG if possible, otherwise match the system of your generator with the received signal in the set.

Alignment procedure:
1. Go to the 'Installation' menu.
2. Select 'Manual installation'.
3. Tune the TV-set to the system and frequency described above via 'Search' - '475' - 'OK'.
4. If the frequency showed in the line 'Fine tune' is between 475.18 MHz and 475.31 MHz, you don't need to re-adjust the IF-AFC.
5. If not, adjust the frequency in the 'Fine tune' line to 475.25 MHz and 'Store' the program (this is very important because this will disable the AFC algorythm).
6. Now go to the SAM and select 'Alignments' - 'General' - 'IF AFC'.
7. During the 'IF AFC'-parameter adjustment, one can see OSD feedback in the top of the screen. The OSD feedback can give 4 kind of messages:

AFC-window	AFC-frequency versus reference
Out	High
In	High
In	Low
Out	Low

The first item (In or Out) informs you whether you are in or out the AFC-window.
The second item (High or Low) informs you about whether the AFC-frequency is too high or too low.
1. First you must align the 'IF AFC'-parameter such that you come into the AFC-window (= 'In')
2. Then you must look for the point where the 'IF AFC'-parameter changes from High to Low. This level is the value you are looking for.
3. After adjustment 'Store' the value.
4. Now return to the 'Installation' menu.
5. Select 'Manual Installation' - 'Search' - '475' - 'OK' and 'Store'. This will set the AFC 'on' again.

Service-tip: If you do not trust the accuracy of the frequency of your Service-generator, first 'measure' with 'Fine tune'-line (manual install-menu) of a good set your video generator.

'Tuner AGC'
The SAM-mode is needed to make alignment, a test generator to make signal, a DC-Voltmeter to measure at pin 1 of Tuner.

Supply a TV-signal, with a frequency of 475.25 MHz and a signal-strength of about 2 mV. Measure the DC-voltage on pin 1 of the Tuner (position 1200). With the 'Tuner AGC'-alignment in the SAM-menu, this voltage can be aligned. Alignment is correct when DC-voltage is just below 3.5 V.

'Blend intensity'
(This alignment could be used when micro controller or HOP-IC has been replaced).
It aligns the level of transparency of the menu-picture blended into the main-picture.
1. Position the brightness-, contrast- and colour setting in the middle position (picture-menu).
2. Apply a signal with a 100 % white video-pattern.
3. Connect an oscilloscope to pin 7 of connector 0340 of the CRT panel and measure the Red output level.
4. Align 'blending intensity'-parameter such that the blended signal is 65 % of the black-white amplitude. Practically this will be about 1.3 V (blended signal) versus 2 V (full white signal).
5. The parameter can be adjusted in between 0 and 31.

'Adjust Peak White Limiter'
Depending on the picture-tube size, the next value of the table must be entered:

Peak White Limiter	
25" FS	4
28" FS	4
29" SF	4
24" WS	4
28" WS	4
32" WS	4

'Vg2 Test Pattern'
Here the Vg2 Test pattern can be switched on.

8.5.3 'Normal Geometry' alignments in the Service Alignment Menu

Warning: At this moment, the 'INTERNAL TEST PATTERN' of the set software will lead to a mis-alignment of the picture geometry. Therefor use an external generator with a geometry pattern (e.g. crosshatch) to align the set (only for the 'Vertical slope' adjustment the internal test pattern can be used).

'Vertical slope'
Select 'Test Pattern on' (read warning above).
1. Set the start conditions for 16:9 sets: 'V. S-correction' value on 8 for the 28" and on 7 for the 32" set. The boundary-stripes of the test pattern should be positioned on the edge of the picture tube.
2. Align 'V. slope' (when aligning the below half of the picture is blanked). The middle line of the test pattern must be matched with the edge of this blanking/picture transient in the middle of the picture. Pushing 'MENU' button again, gives you previous menu again. (This alignment is meant to align the zero crossing of the frame-deflection to the mechanical middle of the picture tube.)

'Horizontal amplitude and centring'
Use an external pattern generator with a geometry pattern (e.g. crosshatch).
1. Using 'H. amplitude' align the horizontal amplitude so that the entire test pattern is visible.
2. Use an external test signal, with a centre-reference from a service-generator. Use 'H shift' to align the picture horizontally in the middle.
3. Repeat the 'H amplitude' alignment if necessary.

'East/west alignment'
Use an external pattern generator with a geometry pattern (e.g. crosshatch).

East/West Trapezium

East/West Parabola

Horizontal Bow

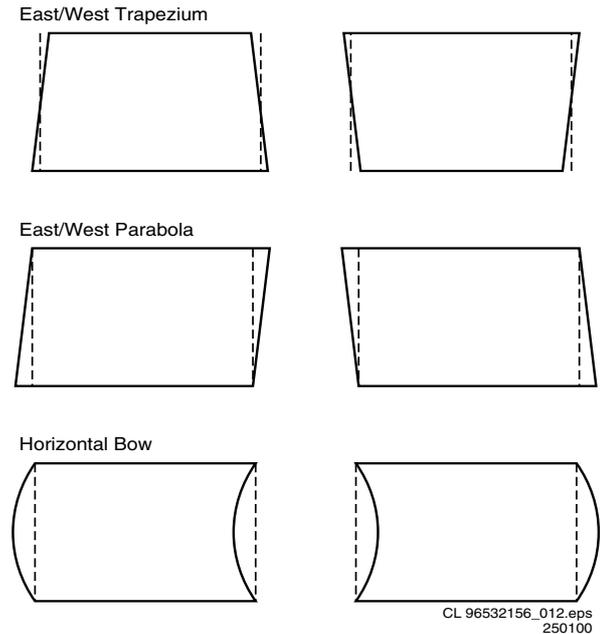CL 96532156_012.eps
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Figure 8-3

1. Use 'East/West Parabola' to align the vertical lines until straight.
2. 'Upper East/West corner' to align the vertical lines in the upper corners until straight.
3. 'Lower East/West corner' to align the vertical lines in the lower corners until straight.
4. Use 'East/West Trapezium' to align for a rectangular.
5. Use 'Horizontal Parallelogram' to align for straight vertical lines if necessary.
6. Horizontal Bow' (neutral value 31. With this alignment the E/W parabola can be corrected such that it becomes symmetrical).
Repeat steps 1 to 6 if necessary.

8.5.4 'Super wide geometry' alignments (for widescreen sets) in the Service Alignment Menu

The header of this paragraph and also the menu's are somewhat misleading. We only need to set the following values (if the normal geometry alignment has been performed correctly):
1. V. S-Correction: enter value of 'normal geometry' alignment.
2. H. amplitude: enter value of 'normal geometry' alignment subtracted by 4.
3. East/west Parabola: enter value of 'normal geometry' alignment.

8.6 Option menu

8.6.1 Introduction:

The microprocessor communicates with a large number of I^{2}C-IC's in the set. To ensure good communication and make digital diagnosis possible, the microprocessor has to know which IC's have to be addressed. The presence of specific IC's or functions is made known by means of the option codes.

All options codes can be manipulated using both the option numbers and/or the Option menu.
All hardware related options are incorporated under the heading 'Options' of the 'Alignments' sub-menu of the 'Service Alignment Mode'. All software related options that are incorporated under the heading 'Dealer Options' of the 'Service Alignment Mode", can also be reached directly via the 'DEALER' button of the DST.

8.6.2 Options in the Service Alignment Mode

Menu-item	Subjects	Options	Physically in the set
Dual screen/PIP	Aux type	Yes	Dual Screen / PIP module present
		No	Dual Screen / PIP module not present
Teletext/EPG	TXT	Yes	Teletext present
		No	Teletext not present
	NextView present	Yes	NextView set
		No	NextView not set
	NextView type	Flashram	Flash-RAM present
		No Flashram	Flash-RAM present
Communication	Easylink Plus	Yes	Easylink Plus set
		No	Easylink Plus not set
Picture Tube	CRT Type	4:3	4:3 picture tube
		16:9	16:9 picture tube
	Picture Rotation	Yes	Frame rotation circuitry present (diagram A4)
		No	Frame rotation circuitry not present
	Dynamic focus	Yes	Dynamic focus picture tube present
		No	Dynamic focus picture tube not present
	Dooming prevent	Off	
		4:3	
		SF 16:9	
		RF 16:9	
Video repro	Featurebox type	Eco	PROZONIC not present
		Prozonic	PROZONIC present
	Field memories	2	
		3	
	Lightsensor	Yes	Lightsensor present
		No	Lightsensor not present
	PALplus	Yes	PALplus module present
		No	PALplus module not present
	Combfilter	Yes	Not valid for Europe
		No	
	Picture improvement	Yes	
		No	
	Picnic	Yes	PICNIC present
		No	PICNIC not present
	Picnic AGC	Yes	In normal operation: Yes
		No	During 'Drive' alignments: No
	Signalling bits	Yes	
		No	
Source Selection	External 3	Yes	3rd EURO connector present
		No	No 3rd EURO connector present
	External 4	Yes	4th EURO connector present
		No	No 4th EURO connector present
Audio Repro	Dolby	None	
		Pro Logic	
	Rear speakers	Corded	Passive surroundbox present
		Virtual	
		Cordless	Active surroundbox present
	Acoustic system	FL7	Applicable for sets with subwoofer
		FL8	Applicable for sets without subwoofer
		FL9 Monitor	Monitor look (only tweeters at both sides)
		FL9 DAS	FL9 with full range speakers at both sides
	MSP type	MSP3411	
		MSP3415	
		MSP3451	
	AVL enable	On	
		Off	
Miscellaneous	Heatsink Present	Yes	Heatsink present on CRT/SCAVEM panel (diagram F)
		No	Heatsink not present on CRT/SCAVEM panel (diagram F)
	Tuner type	UV1316	
		TEDE9	

8.6.3 Dealer Options in the Service Alignment Mode

- After the option(s) have been changed, they must be stored via the 'STORE' command.
- The new option is only active after the TV is switched off and then back on again using the mains switch (the EAROM is then read out again).

8.6.4 Option number

In case the EAROM has to be replaced, all the options will also require resetting. To be certain that the factory settings are reproduced exactly, both option numbers have to be set. These numbers can be found on a sticker on the picture tube.

Example: Option number 28PT7306/12 could be:
04929 04418 04417 00016
08199 00001 00000 00000

The first line indicates the hardware options 1 to 4, second line is reserved for the software options.
Every 5-digit number represents 16 bits (so maximum number can be 65536 if all options are set).

Bit	HW1	HW2	HW3	HW4	SW1	SW2	SW3	SW4
0 (1)	FBX (1)		EXT3	MSP (8)	Auto TV	CTI		
1 (2)	FBX (1)	Dolby PL	EXT4	MSP (8)	Auto Store mode (10)			
2 (4)	FBX (1)	Virtual rear spkrs		China IF	Auto Store mode (10)			
3 (8)	Combfilter	Cordless rear spkrs		Tuner (9)				
4 (16)	PAL-Plus	Dolby Digital	Dual Screen (6)	TXT	Picture mute			SLDP (13)
5 (32)	Field mem. (2)		Dual Screen (6)	China TXT	Demo			SLDP (13)
6 (64)	Light sensor	Cabinet (4)	TXT-EPG-DS		Virgin			AVL
7 (128)	LTP	Cabinet (4)	Aux-headphone					
8 (256)	PICNIC	P50	Aspect Ratio (7)					
9 (512)	PICNIC-AGC		Tilt					
10 (1024)			DAF					
11 (2048)	LNA (3)							
12 (4096)	WSS	EPG	Heatsink		TXT pref. (11)			
13 (8192)	Time constant	EPG type (5)	Home Cinema		TXT region (12)			
14 (16384)								
15 (32768)								

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All bits can be set 'On' (= 1) when the option is available or 'Off' (= 0) when it is not, except for:
(1) 0 = Eco, 1 = PROZONIC, 4 = Eco-DNR.
(2) 0 = 2 Field memories, 32 = 3 Field memories.
(3) 0 = Normal, 8192 = Fast.
(4) 0 = FL7, 64 = FL8, 128 = FL9.
(5) 0 = Type 2, 8192 = Type 2C3.
(6) 0 = None, 16 = PIP, 32 = Dual Screen.
(7) 0 = 4:3, 256 = 16:9.
(8) 0 = MSP3415, 1 = MSP3451, 2 = MSP3411.
(9) 0 = Philips, 8 = Alps.
(10) 0 = None, 2 = PDC/VPS, 4 = TXT-Page, 6 = PDC/VPS/ TXT-Page.
(11) 0 = TOP, 4096 = FLOF.
(12) 0 = East, 8192 = West.
(13) 0 = Off, 16 = 4:3, 32 = SF16:9, 48 = RF16:9.
When all the correct options are set, the sum of the decimal value (between brackets in 1st column) of each column will give the option number.