COVER Book Cover

IBM Personal System/2 8511 and 8518 Color Displays
Hardware Maintenance - Service supplement

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FIGURES Figures

March 1992

This pamphlet contains display test information and a parts listing for the IBM Personal System/2 8511 and 8518 Color Displays.

It is intended to be used with the *IBM Personal System/2 Hardware Maintenance Service* (part number 15F2200, form number S15F-2200).

Refer to the *Hardware Maintenance Service General Information* for the following information:

- General safety
- Electrical safety
- Safety inspection guide.

Part Number 41G2925
Form Number S41G-2925-00

FRONT_1 Notices

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1.0 Diagnostic Guide

This section describes the procedures for diagnosing and correcting problems on the Color Display. Instructions on how to adjust the display are included.

Refer to the *IBM Personal System/2 8511 and 8518 Color Displays Hardware Maintenance Reference* for details of how to get access to the controls on the video assembly.

DANGER

+--+
¦ Some areas of the analog and video card assembly (shown shaded in ¦
¦ Figure 1) carry high voltages. ¦
+--+

CAUTION:
Use extreme caution when making adjustments with the display powered on; these adjustments should not be performed unattended.

The display must never be left unattended with the covers removed and powered on in a customer environment.

DO NOT adjust RV100 (factory adjustment only).

To prevent electrical shock, power off the display and disconnect the power cord before you change any part.

High voltages may remain on the anode of the CRT after the display is powered off. Discharge in accordance with CRT safety instructions.

CRTs are under vacuum. All persons working near an exposed CRT must wear safety glasses and long-sleeved clothing (or comparable protection).

PICTURE 1

Figure 1. Analog and Video Cards: High Voltage Areas

Subtopics

1.1 Initial Checks

The initial checks, visual and power, confirm whether or not the display is ready for operation.

Subtopics
1.1.1 Visual check 0100
1.1.2 Power check 0110

1.1.1 Visual check 0100

001

- Check the display and connectors visually for damage, and ensure that the connectors are properly attached.

IS THE DISPLAY DAMAGED?

Yes → **002**

Go to Power check.

No → **003**

- Exchange the damaged parts.

Go to Power check.

1.1.2 Power check 0110

Note: If you change the card tray assembly or the Integrated Tube Component (ITC), you must then check all the adjustments for the display.

001

- Remove the power cord from the power outlet, and then from the display.

- Set the power switch to On and to Off several times.

DOES THE POWER SWITCH OPERATE NORMALLY?

Yes → **002**

002

Install new card tray assembly.

No → **003**

003

- Set the power switch to Off.

- Connect a power cord (that is known to be good) to the display and then to the electrical power outlet.

- Set the power switch to On.

IS THE POWER LED ON?

Yes → **004**

004

Install new card tray assembly.

No → **005**

005

Continue with Self-Test.

1.2 Self-Test

The display must be powered on for five minutes before starting the test.

1. Power off the display.
2. Ensure that the signal cable is disconnected.
3. Power on the display.
4. Set the contrast and brightness controls to maximum (from left to right).
5. The self-test pattern on the screen should be a full white raster (a pattern of horizontal scanned lines) with a black border 2 mm to 20 mm (0.08 in. to 0.79 in.). The black border may not be on all four sides.
6. If the self-test pattern does not appear, go to "Basic Function Checks" in topic 1.3.

PICTURE 2

Figure 2. Self-Test Pattern

1.3 Basic Function Checks

Basic functions can be checked using the self-test raster.

Refer to "Alignment Procedures" in topic 2.0 when adjustments are required after replacing components.

Refer to the *IBM Personal System/2 8511 and 8518 Color Displays Hardware Maintenance Reference* for removal and replacement procedures.

Symptom	**Action**
Any problems.	First, check all connections and plugs for continuity.
Green LED lit but test raster missing.	Adjust G2 control clockwise until test raster appears AGAINST background raster. If no raster appears, replace ITC.
Test raster is not white.	Adjust gain controls for missing colors. If colors reappear, reset color point of ITC. Otherwise replace ITC.
Background raster is not white.	Adjust cutoff controls for missing colors. If colors reappear, reset color point of ITC. Otherwise replace ITC.
Test raster scan is collapsed horizontally or vertically.	If partially collapsed, adjust as appropriate. If fully collapsed, replace card tray assembly.

Note: The integrated tube component (ITC) includes the CRT, yoke assembly, and associated components. The card tray assembly includes the video, analog, control, and ac inlet cards.

1.4 Pattern Checks

These symptoms relate to operating the display with a crosshatch pattern displayed.

Before starting any checks, ensure that all plugs and connectors are positioned correctly and securely.

Refer to "Alignment Procedures" in topic 2.0 when adjustments are required.

Refer to the *IBM Personal System/2 8511 and 8518 Color Displays Hardware Maintenance Reference* for removal and replacement procedures.

Symptom	**Action**
Displayed image width is too large or too small.	Adjust RV303. If symptom persists, replace card tray assembly.
Displayed image height is too large or too small.	Adjust RV400. If symptom persists, replace card tray assembly.
Color purity of displayed image is poor.	Check degauss circuit. Ensure that P100 is connected. Power off for 30 minutes. Power on again to check degauss action. If symptom persists, replace card tray assembly. ITC defective. Replace ITC.
Contrast or brightness controls are not working.	Check connections between P400 and P802. If good, replace card tray assembly.
Maximum or minimum white is poor.	Video color point is not set. Adjust as appropriate.
East west pincushion correction (EWPCC) is poor (vertical lines are bowed or barrel shaped).	Adjust RV302 for optimum vertical lines. If this is not possible, replace the card tray assembly.
No horizontal or vertical synchronization. One or more colors missing.	If good with test raster (signal cable disconnected), replace signal cable.
Displayed image does not synchronize horizontally.	Ensure that P300 is connected. If symptom persists, replace card tray assembly.
Displayed image does not synchronize vertically.	Ensure that P300 is connected. If symptom persists, replace card tray assembly.
Displayed image is not centered horizontally.	Adjust RV304. If image cannot be centered, centering circuit is faulty. Replace card tray assembly.
Displayed image height varies excessively between modes.	Height selection circuit is faulty. Replace card tray assembly.
Displayed image appears broken up horizontally.	Width regulation is unstable. Ensure that P300 is connected. If symptom persists, replace card tray assembly.

2.0 Alignment Procedures

CAUTION:
Use extreme caution when making adjustments with the display powered on; these adjustments should not be performed unattended.

The display must never be left unattended with the covers removed and powered on in a customer environment.

Refer to the *IBM Personal System/2 8511 and 8518 Color Displays Hardware Maintenance Reference*, for details of how to get access to maintenance controls.

All adjustments must be completed in the sequence given here.

Subtopics

2.1 Test Equipment

Refer to "Tools and Test Equipment" for details of tools and test equipment required.

Subtopics
2.1.1 Setup of Test Equipment

2.1.1 Setup of Test Equipment

Ensure that the connections of all cables are set up as shown in "Tools and Test Equipment" in topic 3.0.

2.2 Maintenance Controls and Internal Connectors

PICTURE 3

Figure 3. Analog and Video Cards

Subtopics
2.2.1 Analog Card - Potentiometers
2.2.2 Connectors - Internal
2.2.3 EHT Transformer
2.2.4 Video Card - Potentiometers

2.2.1 Analog Card - Potentiometers

- RV100 Factory Adjustment Only
- RV400 Vertical Height
- RV302 East West Pincushion Correction (EWPCC)
- RV401 Vertical Centering
- RV303 Horizontal Width
- RV304 Raster Centering

2.2.2 Connectors - Internal

- P100 Degauss
- P103 Mains Input
- P300 Synchronization
- P401 Horizontal and Vertical Coils
- P301/P601 Video Card Supply Interface (Fixed)
- P400/P802 Control Card Interface
- P600 Video/Test Signal

2.2.3 EHT Transformer

- G2 Control
- Focus

2.2.4 Video Card - Potentiometers

- RV600 White Video Gain
- RV652 Green Video Gain
- RV632 Red Video Gain
- RV651 Green Video Cutoff
- RV631 Red Video Cutoff
- RV671 Blue Video Cutoff

PICTURE 4

Figure 4. Video Card, Gain and Cutoff Controls

2.3 Preliminary Steps

1. Insert the IBM PS/2 Color Display 8518 Setup Diskette into drive A of the system unit.

   Note: The IBM PS/2 Color Display 8518 Setup Diskette is used for setting up both the 8511 and 8518 Color Displays.

DANGER

+--+
¦ Use caution when making adjustments with the cover removed. There are ¦
¦ high voltages on the analog and video cards. ¦
+--+

2. Power on the system unit and the Display. The system unit runs its internal checks, and then loads the program from the diskette.
3. With the Brightness control set to center detent (midpoint), adjust G2 and Focus until the setup menu is visible. Select pattern C and adjust the G2 control to give minimum background illumination.
4. Allow 20 minutes for the display to warm up before making any further adjustments.
5. Set the Contrast control to midpoint.

2.4 Geometry

1. Select pattern A, green rectangle on a black background:
   a. Adjust RV304 (Raster Centering) to center the rectangle.
   b. Adjust RV303 (Width) for a gap of:

      16 mm (for 8511 Color Displays),

      11 mm (for 8518 Color Displays),

      (measured at the horizontal center line of the screen) between the vertical edges of the green rectangle and the inner edges of the bezel.
   c. Adjust RV302 (East West Pincushion) to set the most straight vertical lines.
   d. You may have to repeat steps a, b, and c.
2. Using the same test pattern, adjust sequentially RV400 (Vertical Height) and RV401 (Vertical Centering). Set the picture in the center of the screen with a gap of:

   11 mm (for 8511 Color Displays),

   7.5 mm (for 8518 Color Displays),

   (measured at the vertical center line of the screen) between the horizontal edges of the green rectangle and the inner edges of the top and bottom of the bezel.

2.5 Video Levels and Cutoff Voltages

1. Select pattern C, black field:
    a. Set RV600, RV631, RV651, and RV671 (cutoff potentiometers) fully clockwise, as viewed from the video card shield.
    b. Set RV632 and RV652 (gain potentiometers) fully clockwise, as viewed from the top of the video card.
    c. Set the Brightness control to center detent (midpoint), and the Contrast control to midpoint.
    d. Adjust G2 so that the screen is just not illuminated. Set the Brightness control to maximum.
    e. Adjust the cutoff potentiometers for a correct white color point.
    f. Set the Brightness control to center detent (midpoint). If necessary, adjust G2 to ensure that the screen is just not illuminated.
2. Select Pattern B, white block.
3. Ensure that the Contrast control is at midpoint.
4. Adjust RV652 (green) and RV632 (red) for correct white color points.
5. Set Contrast to maximum.
6. Set RV600 to midpoint.
7. Select pattern E, gray scale blocks.
8. Check, at maximum and minimum contrast, that the gradation of the blocks is even from black through white with no color tinges.
9. Check that there is no color smearing.

If steps 8 and 9 are not satisfactory, repeat this complete procedure.

Note: The use of a color analyzer is recommended for steps 1e, 4, and 6.

Subtopics

2.5.1 Procedure Using a Color Analyzer

The use of a Minolta TV Color Analyzer (**), or equivalent, is recommended for setting the white color point and maximum brightness.

1. Select pattern C, black field:
   a. Set RV600, RV631, RV651, and RV671 (cutoff potentiometers) fully clockwise, as viewed from the video card shield.
   b. Set RV632 and RV652 (gain potentiometers) fully clockwise, as viewed from the top of the video card.
   c. Set the Brightness control to center detent (midpoint), and the Contrast control to midpoint.
   d. Adjust G2 so that the screen is just not illuminated. Set the Brightness control to maximum.
   e. Adjust the cutoff potentiometers for a correct white color point. Using a Minolta Color Analyzer, or equivalent, in accordance with the manufacturer's instructions, this is: **x=0.267 ± 0.01, y=0.282 ± 0.01**.
   f. Set the Brightness control to center detent (midpoint). If necessary, adjust G2 to ensure that the screen is just not illuminated.
2. Select pattern B, white block.
3. Ensure that the Contrast control is at midpoint.
4. Adjust RV652 (green) and RV632 (red) for correct white color points. Using a Minolta Color Analyzer, or equivalent, in accordance with the manufacturer's instructions, this is: **x=0.297 ± 0.01, y=0.320 ± 0.01**.
5. Set Contrast to maximum.
6. Set RV600 using the color analyzer, to give 200 nits ± 5nits (cd/m^2) in the white block.
7. Select pattern E, gray scale blocks.
8. Check, at maximum and minimum contrast, that the gradation of the blocks is even from black through white with no color tinges.
9. Check that there is no color smearing.

If steps 8 and 9 are not satisfactory, repeat this complete procedure.

(**) Trademark of the Minolta Corporation. For a list of trademarks see page FRONT_1.

2.6 Focus

1. Select pattern D, red crosshatch pattern.
2. Adjust the Focus control to give sharp vertical and horizontal lines.
   Take care not to disturb the G2 setting.

This completes the alignment procedures.

2.7 Degaussing

The effect of stray magnetic fields on the color purity of an ITC depends on the orientation of these fields with respect to the ITC. Color displays have a magnetic shielding system, consisting of a magnetic screen, internal to the ITC, and the shadow mask together with its mounting frame, to combat stray magnetic fields.

To be effective, the shielding system must be degaussed by applying a strong alternating magnetic field which decays gradually and symmetrically to zero.

This is achieved by using dual, positive temperature coefficient resistors (PTC) in conjunction with a degauss coil on the ITC. When the mains input voltage is applied to the display, the peak inrush current through the coil is limited by one half of the dual PTC, while the other half is heated by the current flow in it. Equilibrium is achieved when the heat in one half of the PTC is sufficient to prevent current flow in the other half, and consequently in the degauss coil.

When degaussing is required, for example, if a display is relocated, the heating associated with a degauss action means that another degauss action cannot be started until the circuit has cooled down.

Allow at least 30 minutes with the display powered off, before starting another degauss action.

3.0 Tools and Test Equipment

The following equipment is required to repair an IBM 8511 or 8518 Display:

- IBM Personal System/2 system unit
- IBM PS/2 8518 Color Display Setup Diskette (part 91F8838 for all locations except EMEA; 87F3667 EMEA only)
- Meter Lead kit (part 6428104), instead of jumper lead
- Two rear-cover delatching tools (IBM part 59X6319)
- Hex-head 2 mm trimming tool (part 39F8405)
- Screwdriver (flat blade)
- Socket set 1/4 in.-drive, (part 1650830)
- Torx (**) kit (part 39F8407)
- Nonmagnetic metric rule
- Safety glasses.

Optional equipment: TV Color Analyzer (Minolta or equivalent).

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Subtopics

3.1 Test Equipment Setup

Set up the equipment as shown in Figure 5.

PICTURE 5

Figure 5. Test Equipment Setup

3.2 8511 Color Display Parts

Note: Order the appropriate Field Replacement Unit (FRU) for the display you are servicing from this list. The FRU number includes the packaging.

Model 8511001 Low Voltage (N. Hemisphere - restricted part)	14G3051
Model 8511002 Universal Voltage (N. Hemisphere - restricted part)	14G3052
Model 8511003 Universal Voltage (Equatorial - restricted part)	14G3053
Model 8511004 Universal Voltage (S. Hemisphere - restricted part)	14G3054
ITC assembly for Model 8511001	14G3045
ITC assembly for Model 8511002	14G3046
ITC assembly for Model 8511003	14G3047
ITC assembly for Model 8511004	14G3048
Card Tray assembly LV for Model 8511001	14G3049
Card Tray assembly UV for Models 8511002, 8511003, 8511004	14G3050
Cover set for Model 8511001	14G3056
Cover set for Model 8511002	14G3057
Cover set for Model 8511003	14G3058
Cover set for Model 8511004	14G3059
Signal cable	45F1544
Tilt Swivel Stand	38F3909
Small parts kit	45F1545
FRU packaging with cushion (USA)	92F8592
FRU packaging with cushion (EMEA)	7312115
Display Power Cords 1.8 m (6 ft) for:	
U.S., Canada, Taiwan, S.Korea, Mexico, Central and Southern America, Saudi Arabia, Japan (low voltage), Peru (low voltage)	38F3908
Ireland, U.K.	38F3972
Austria, Belgium, Finland, France, Germany, Netherlands, Norway, Portugal, Spain, Sweden	38F3970
Italy, Chile	38F3981
Australia, New Zealand	38F3974
Uruguay, Paraguay	6952292
Denmark	13F9996
Israel	14F0086
Pakistan, South Africa	14F0014
Switzerland	38F3983
Japan (high voltage), Peru (high voltage)	1838576
Brazil (low voltage)	38F3968
Brazil (high voltage)	13F9939

3.3 Color Display 8518 Parts

Note: Order the appropriate Field Replacement Unit (FRU) for the display you are servicing from this list. The FRU number includes the packaging.

Model 8518001 Low Voltage (N. Hemisphere - restricted part)	45F1746	
Model 8518002 Universal Voltage (N. Hemisphere - restricted part)	34G5714	
Model 8518003 Universal Voltage (Equatorial - restricted part)	45F1748	
Model 8518004 Universal Voltage (S. Hemisphere - restricted part)	45F1749	
Model 8518022 High Voltage (N. Hemisphere - restricted part)	14G3068	
ITC assembly for Model 8518001	45F1534	
ITC assembly for Models 8518002 and 8518022	45F1535	
ITC assembly for Model 8518003	45F1536	
ITC assembly for Model 8518004	45F1537	
Card Tray assembly LV for Model 8518001	45F1538	
Card Tray assembly UV for Models 8518002, 8518003, 8518004	45F1539	
Card Tray assembly HV for Model 8518022	34G6591	
Cover set for Model 8518001	45F1540	
Cover set for Model 8518002	34G5715	
Cover set for Model 8518003	45F1542	
Cover set for Model 8518004	45F1543	
Cover set for Model 8518022	14G3069	
Signal cable	45F1544	
Tilt Swivel Stand for Models 8518001, 8518022		38F3909
Lift Tilt Swivel Stand for Models 8518002, 8518003, 8518004	6398210	
Small parts kit	45F1545	
FRU packaging with cushion (USA) for Models 8518001, 8518003 and 8518004	74F8717	
FRU packaging with cushion (EMEA)		
- for Model 8518002	7312115	
- for Model 8518022	8119215	

Display Power Cords 1.8 m (6 ft) for:

U.S., Canada, Taiwan, S.Korea, Mexico, Central and Southern America, Saudi Arabia, Japan (low voltage), Peru (low voltage)	38F3908

8518 Display Power Cords 1.8 m (6 ft) (continued) for:

Ireland, U.K.	38F3972
Austria, Belgium, Finland, France, Germany, Netherlands, Norway, Portugal, Spain, Sweden	38F3970
Italy, Chile	38F3981
Australia, New Zealand	38F3974
Uruguay, Paraguay	6952292
Denmark	13F9996
Israel	14F0086
Pakistan, South Africa	14F0014
Switzerland	38F3983
Japan (high voltage), Peru (high voltage)	1838576
Brazil (low voltage)	38F3968
Brazil (high voltage)	13F9939

3.4 Notes:

Subtopics
3.4.1 RID Tag

3.4.1 RID Tag

If the cover set or display is exchanged, a repair identification (RID) tag must be applied. Use a blank RID tag (part 6342125), and complete it with the name, type, and serial number of the original tag.

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