
4 Alignment and Adjustments

This section of the service manual explains how to make permanent adjustments to the monitor. Directions are given for adjustments using the monitor interface board Ver. 2.0 and software (Softjig).

4-1 Adjustment Conditions

Caution: Changes made without the Softjig are saved only to the user mode settings. As such, the settings are not permanently stored and may be inadvertently deleted by the user.

4-1-1 Before Making Adjustments

4-1-1 (a) ORIENTATION

When servicing, always face the monitor to the east.

4-1-1 (b) WARM-UP TIME

The monitor must be on for 30 minutes before starting alignment. Warm-up time is especially critical in color temperature and white balance adjustments.

4-1-1 (c) SIGNAL

Analog, 0.7 Vp-p positive at 75 ohm, internal termination

Sync: Separate

(TTL level negative/positive)

4-1-1 (d) SCANNING FREQUENCY

Horizontal : 30 kHz to 85 kHz (Automatic)

Vertical : 50 Hz to 160 Hz (Automatic)

Unless otherwise specified, adjust at the 1024 x 768 mode (68 kHz / 85 Hz),

Refer to Table 2-1 on page 2-3.

4-1-2 Required Equipment

The following equipment may be necessary for adjustment procedures:

4-1-2 (a) DISPLAY CONTROL ADJUSTMENT

1. Non-metallic (–) screwdriver:
1.5, 2.5, 3 mm
2. Non-metallic (+) screwdriver:
1.5, 2.5, 3 mm
3. Digital Multimeter (DMM), or
Digital Voltmeter
4. Signal generator, or
DM200 software
5. Personal computer

4-1-2 (b) COLOR ADJUSTMENTS

1. All equipment listed in 4-1-2 (a), above
2. Color analyzer, or any luminance
measurement equipment

4-2 Display Control Adjustments

4-2-1 HIGH VOLTAGE ADJUSTMENT

Signal: 1024 x 768 (68 kHz / 85 Hz)
 Display image: Don't care
 Contrast: Minimum
 Brightness: Minimum
 Limit: 26.0 kV \pm 0.3 kV

Measure the high voltage level at the anode cap.
 High voltage should be within the limit as above.

4-2-2 CENTER RASTER

Adjust SW401 so that the back raster comes to the center when you apply basic mode for 17".

4-2-3 Centering

Centering means to position the center point of the display in the middle of the display area.
 Horizontal size and position and vertical size and position control the centering of the display.

Adjust the horizontal size and vertical size to their optimal settings: 312 mm (H) x 234 mm (V).

Adjust the horizontal position and vertical position to ≤ 4.0 mm of the center point of the screen.

$|A-B| \leq 4.0$ mm. $|C-D| \leq 4.0$ mm.

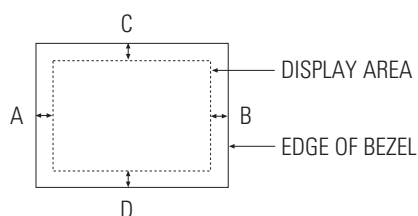


Figure 4-1. Centering

* In Softjig window, "Geometry" has to be selected for GD adjustment.

4-2-4 (a) HORIZONTAL SIZE ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Display image: Crosshatch pattern
 Brightness: Maximum
 Contrast: Maximum

Click Standard Dump on the right Menu in the general field.

Use control bar after selecting "SIZE B+" in the left Menu to adjust the horizontal minimum size of the display, Pattern to 285 mm (Tolerance : ± 3 mm.)

Use control bar after selecting "H-SIZE" in the left menu to adjust the horizontal size of the display pattern to 312 mm (Tolerance : ± 3 mm)

Run the All Mode save in the Right Menu.

Caution : Do not Run the All mode Save at the other scanning times except for 1024x768 (68 kHz / 85 Hz).

4-2-4 (b) VERTICAL SIZE ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Display image: Crosshatch pattern
 Brightness: Maximum
 Contrast: Maximum

Use control bar after selecting "V-SIZE" in left menu to adjust the vertical size of the display pattern to 234 mm.(Tolerance: ± 3 mm.)

4-2-4 (c) HORIZONTAL POSITION ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Display image: Crosshatch pattern

Use control bar after selecting "H-POSITION" in left menu to center the horizontal image on the raster.

4-2-4 (d) VERTICAL POSITION ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Display image: Crosshatch pattern

Use control bar after selecting "V-POSITION" in left menu to center the vertical image on the raster.

4-2-4 Linearity

Linearity affects the symmetry of images as they appear on the screen. Unless each row or column of blocks in a crosshatch pattern is of equal size, or within the tolerances shown in Tables 4-2 and 4-3, an image appears distorted, elongated or squashed.

Table 4-1. Non-Linearity Limits

		Overall	Cellto cell
1024 x 768 @ 96 Hz		8 %	4 %
Pre-load Modes	Aver than 406Hz	14 %	5 %
	Less than 406Hz	20 %	8 %

4-2-4 (a) VERTICAL LINEARITY ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Crosshatch pattern
Brightness: Maximum
Contrast: Maximum

To adjust the Vertical Linearity, refer to Tables 4-2 and 4-3 for the tolerance range.

Use control bar after selecting “V-LINEARITY BAL” in left menu to optimize the image.

4-2-5 Trapezoid Adjustment

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Crosshatch pattern
Brightness: Maximum
Contrast: Maximum

Use control bar after selecting “TRAPEZOID” in left menu to make the image area rectangular.

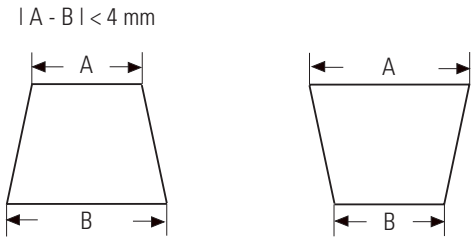


Figure 4-2. Trapezoid

4-2-6 Pinbalance Adjustment

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Crosshatch pattern
Brightness: Maximum
Contrast: Maximum

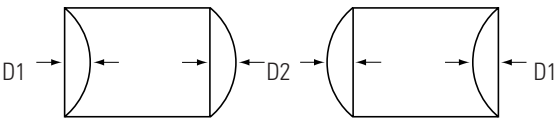


Figure 4-3. Pinbalance

Use control bar after selecting “PINBALANCE” in left menu to optimize the image.

4-2-7 Parallelogram Adjustment

CONDITIONS

Scanning Frequency: 68 kHz / 85 Hz
 Display image: Crosshatch pattern
 Brightness: Maximum
 Contrast: Maximum

Use control bar after selecting **"PARALLEL"** in left menu to make the image area rectangular.

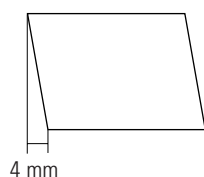


Figure 4-4. Parallelogram

4-2-8 Side Pincushion Adjustment

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Display image: Crosshatch pattern

Use control bar after selecting **"PINCUSHION"** in left menu to straighten the sides of the image area.

$|C1|, |C2| \leq 2.0 \text{ mm}, |D1|, |D2| \leq 2.0 \text{ mm}.$

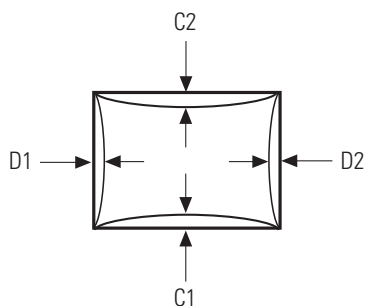


Figure 4-5. Pincushion

4-2-9 Degauss

No adjustments are available for the degaussing circuit. The degaussing circuit can effectively function only once per 30 minutes.

4-2-10 To Delete the User Mode Data

To delete the adjustment data from the user modes, click **"@4: USER DELETE"** in right ment.

4-2-11 Save the Data

To save the adjustment data for a mode, press **"@3: ALL MODE SAVE"** in right ment.

4-3 Color Adjustments

4-3-1 Color Adjustments

4-3-1 (a) HOW TO ADJUST THE COLOR

Refer to the contents from 4-3-1 to 4-3-5.

1. Choose the MDL file of the relevant model on MDL file.
2. Delete the user.
3. Dump the stand color after choosing the color1 from the soft jig color mode.
4. Save the all color after adjusting the color1 .
5. Choose the color 2 and then adjust the color and then save.
6. Choose the color 3 and then adjust the color and then save.

Notice : Don't save the all color after adjusting color 2 and 3.

4-3-2 Color Coordinates (Temperature)

Color temperature is a measurement of the radiant energy transmitted by a color. For computer monitors, the color temperature refers to the radiant energy transmitted by white. Color coordinates are the X and Y coordinates on the chromaticity diagram of wavelengths for the visible spectrum.

CONDITIONS

Measurement instrument: Color analyzer
 Scanning frequency: 68 kHz / 85 Hz
 Display image: White flat field at Center of display area
 Brightness: Cut-off
 Contrast: Maximum

PROCEDURE

Use the directions in sections 4-3-2 through 4-3-4 to adjust the color coordinates for:

9300K to $x = 0.283 \pm 0.015$, $y = 0.298 \pm 0.015$

5000K to $x = 0.346 \pm 0.015$, $y = 0.359 \pm 0.015$

sRGB to $x = 0.283 \pm 0.015$, $y = 0.298 \pm 0.015$

4-3-3 Color Adjustments for 9300K

4-3-3 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Screen: Back raster pattern
 Brightness: MAX
 Contrast: MAX

1. Select **COLOR CHANNEL 1** to control the color for 9300K.
2. Adjust the luminance of the back raster to between 0.5 to 0.7ft-L using the "**GREEN CUTOFF**" controls.
3. Use control bar after selecting "**BLUE CUTOFF**" in left menu to set the "y" coordinate to 0.298 ± 0.015
4. Use control bar after selecting "**RED CUTOFF**" in left menu to 0.283 ± 0.015

Notice : If color values do not match desirable values, repeat sequence 3 and 4 after slightly readjusting "GREEN CUTOFF" control a little different.

4-3-3 (b) GAIN (WITHOUT ABL) ADJUSTMENT

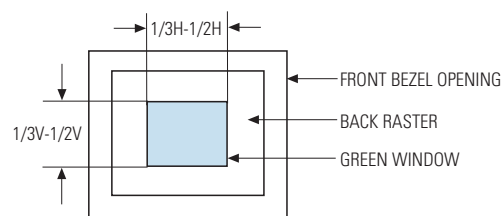


Figure 4-6. Green Box Pattern

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Screen: White square
 Brightness: Cut off
 Contrast: MAX

1. Bright should be cut off .
2. Save after adjusting like this (Color coordinates $x=0.283 \pm 0.02$, $y=0.298 \pm 0.02$ Brightness 40 ± 1 F/L with R, G, B gain key.

4-3-3 (c) MODIFY WITH ABL ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Screen: Full White Pattern
 Brightness: Cut off
 Contrast: MAX

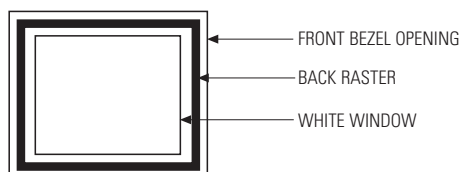


Figure 4-7. Full White Pattern

1. Bright should be cut off .
2. Save after adjusting the brightness 30 F/L with ABL key .
3. Save all colors.

Notice : Save all color only to color1 .
 The value of color while adjusting ABL is hardly changed.

Luminance Table (9300K) 4-2.

With ABL	30 ft-L
Without ABL	40 ft-L

4-3-3 (d) WHITE BALANCE ADJUSTMENT VERIFICATION

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Display image: Back raster pattern
 X-Y Coordinates: $x = 0.283 \pm 0.02$,
 $y = 0.298 \pm 0.02$
 Raster Luminance $0.3 \sim 1$ ft-L
 ABL Luminance 30 ± 1 ft-L
 Brightness: Cut-off
 Contrast: Maximum

1. Check whether the color coordinates of the back raster satisfy the above spec.
 If they do not, return to 4-3-2 (a) and readjust all settings.
2. Display a full white pattern.

Notice: Do not touch the **G_GAIN** controls.

3. Adjust the Contrast Control on the monitor so that the luminance of the video is about 5 ft-L.
4. Check whether the white coordinates of the video meet the above coordinates spec.
5. Adjust the Contrast Control again so that the luminance of the video is about 20 ft-L.
6. Check whether the white coordinates of the video satisfies the above spec.
 If they do not, return to 4-3-2 (a) and readjust all settings.

4-3-4 Color Adjustments for 5000K

4-3-4 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Display image: Back raster pattern
 Brightness: MAX
 Contrast: MAX

1. Select **COLOR CHANNEL 2** to control the color for 5000K.
2. Adjust the luminance of the back raster to between 0.5 to 0.7 ft-L using the **G_CUT** controls.
3. Click on the << or >> boxes next to **R_CUT** and **B_CUT** to adjust the R-Bias to $x = 0.346 \pm 0.02$ and the B-Bias to $y = 0.359 \pm 0.02$

4-3-4 (b) GAIN (WITHOUT ABL) ADJUSTMENT

1. Bright should be cut off .
2. Save after adjusting like this Color coordinates $x=0.346 \pm 0.03$, $y=0.359 \pm 0.03$ Brightness 38 ± 1 F/L with R, G, B gain key .

Notice : The condition for adjusting is the same as 9300K. Modify to ABL adjustment.

4-3-3 (c) WHITE BALANCE ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Screen: Full White Pattern
 Bright: Cut off
 Contraster: MAX

1. Bright should be cut off.
2. Save after adjusting the brightness 30 ± 1 F/L with ABL key.

Notice : Don't save all colors after adjusting color save all color only to color1.
 The value of color coordinates while adjusting ABL is hardly changed.

4-3-4 (d) WHITE BALANCE ADJUSTMENT VERIFICATION

Refer to the procedure for 9300K, section 4-3-3 (d).

Luminance Table (5000K) 4-3.

Without ABL	38 ft-L
With ABL	30 ft-L

4-3-5 Color Adjustments for sRGB

4-3-5 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Screen: Back raster pattern
 Brightness: MAX
 Contrast: MAX

1. Select **COLOR CHANNEL 3** to control the color for sRGB.
2. Adjust the luminance of the back raster to between 0.5 to 0.7 ft-L using the **G_CUT** controls.
3. Click on the << or >> boxes next to **R_CUT** and **B_CUT** to adjust the R-Bias to $x = 0.312 \pm 0.02$ and the B-Bias to $y = 0.329 \pm 0.02$.

4-3-5 (b) GAIN (WITHOUT ABL) ADJUSTMENT

1. Bright should be cut off.
2. Save after adjusting like this (Color coordinates $x=0.313 \pm 0.015$, $y=0.329 \pm 0.015$ Brightness 17 inch : 24 ± 1 F/L) with R, G, B gain key.

Notice : The condition for adjusting is the same as 9300K.

4-3-5 (c) WHITE BALANCE ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
 Display image: Full white pattern
 Brightness: Cut-off
 Contrast: Maximum

1. Click on the << or >> boxes next to **R_GAIN** and **B_GAIN** to make the video white. (For sRGB color adjustment: $x = 0.312 \pm 0.02$, $y = 0.329 \pm 0.02$.)
2. Select **COLOR FACTORY SAVE** to save the data.

Luminance Table (6000K) 4-4.

Without ABL	24 ft-L
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4-3-6 Luminance Uniformity Check

Luminance is considered uniform only if the ratio of lowest to highest brightness areas on the screen is not less than 7.5:10.

CONDITIONS

Scanning frequency:

17 inch : 68 kHz / 85 Hz (1024 x 768)

Display image: White flat field

Brightness: Cut off point

Contrast: Maximum

PROCEDURE

Measure luminance at nine points on the display screen (see figure below).

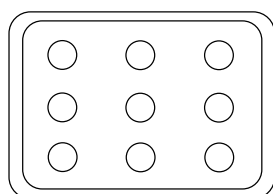


Figure 4-8 Luminance Uniformity Check Locations

4-3-7 Focus Adjustment

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz

Display image: "H" character pattern

Brightness: Cut off point

Contrast: Maximum

PROCEDURE

1. Adjust the Focus VR on the FBT to display the sharpest image possible.
2. Use Locktite to seal the Focus VR in position.

4-3-8 Color Purity Adjustment

Color purity is the absence of undesired color. Conspicuous mislanding (unexpected color in a uniform field) within the display area shall not be visible at a distance of 50 cm from the CRT surface.

CONDITIONS

Orientation: Monitor facing east

Scanning frequency: 68 kHz / 85 Hz

Display image: White flat field

Luminance: Cut off point at the center of the display area

Notice : Color purity adjustments should only be attempted by qualified personnel.

PROCEDURE

For trained and experienced service technicians only.

Use the following procedure to correct minor color purity problems:

1. Make sure the display is not affected by external magnetic fields.
2. Very carefully break the glue seal between the 2-pole purity convergence magnets (PCM), the band and the spacer.
3. Make sure the spacing between the PCM assembly and the CRT stem is $29 \text{ mm} \pm 1 \text{ mm}$.
4. Display a green pattern over the entire display area.
5. Adjust the purity magnet rings on the PCM assembly to display a pure green pattern. (Optimum setting: $x = 0.295 \pm 0.015$, $y = 0.594 \pm 0.015$)
6. Repeat steps 4 and 5 using a red pattern and then again, using a blue pattern.

Table 4-5. Color Purity Tolerances

Red:	$x = 0.620 \pm 0.015$	$y = 0.334 \pm 0.015$
Green:	$x = 0.289 \pm 0.015$	$y = 0.595 \pm 0.015$
Blue:	$x = 0.153 \pm 0.015$	$y = 0.072 \pm 0.015$

(For 9300K color adjustment: $x = 0.283 \pm 0.02$, $y = 0.298 \pm 0.02$)

7. When you have the PCMs properly adjusted, carefully glue them together to prevent their movement during shipping.