



MGD 221 MKII
Medical Greyscale
Display

Installation & User Manual

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Trademark information

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SAFETY INSTRUCTIONS



Regulations

- This apparatus conforms to: IEC601-1, UL2601-1, cUL2601-1, EN 60601-1
- This apparatus is classified as Type B without Applied Part.

Usage in Hazardous locations

- Class I equipment
- Equipment **not** suitable for use in the presence of a **flammable anaesthetic mixture with air or with oxygen or nitrous oxide**.

FCC notice

This equipment has been tested and found to comply with the limits of a class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



Power connection

- Power cord: Utilise a UL-listed detachable power cord, 3-wire, type SJ or equivalent, 18 AWG min., rated 300 V min., provided with a hospital-grade type plug 5-15P configuration for 120V application, or 6-15P for 240V application.
- **Warning:** This apparatus must be earthed!
- Power requirements: connect the apparatus

- Read the safety and operating instructions before operating the apparatus.
- Retain safety and operating instructions for future reference.
- Adhere to all warnings on the apparatus and in the operating instructions manual.
- Follow all instructions for operation and use.

to an AC voltage as indicated at its back. Using a lower voltage, the apparatus will not be able to operate. Using a higher voltage may damage the apparatus.

If you are not sure of the type of power supplied, consult the power company.

- Do not overload wall outlets and extension cords as this may result in fire or electric shock.
- Mains lead protection (U.S.: Power cord): Supply cords should be routed so that they are not likely to be walked upon or pinched by items placed upon or against them, paying particular attention to cords at plugs and receptacles.

Water and moisture

- Never expose the apparatus to rain or moisture.
- Never use the apparatus near water - e.g. near a bathtub, washbasin, swimming pool, kitchen sink, laundry tub or in a wet basement.

Ventilation

- Do not cover or block the ventilation openings in the cover of the set. When installing the apparatus in a cupboard or another closed location, heed the necessary space between the set and the sides of the cupboard.

Installation

- Place the apparatus on a flat, solid and stable surface that can bear the weight of at least 3 monitors. If you use an unstable cart or stand, the set may fall, causing serious injury to a child or adult, and serious damage to the equipment.
- More warnings in the Installation chapter.

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1. INTRODUCTION

1.1 Overview

Resolution and bandwidths

The BARCO MGD 221 is a high resolution, greyscale portrait display. Its outstanding visual performance, combining a 2 MegaPixel resolution with a high brightness, makes it ideal for medical imaging and many other medical and scientific applications.

The MGD 221 is compatible with any AC power system worldwide and automatically synchronizes to a wide range of sync frequencies. Its high-speed video amplifier supports pixel clocks up to 250 MHz.

The memory system

The internal memory system can contain the adjustments for 8 different scanning formats, the so-called scanning modes. Each scanning format is characterized by its sync signals. The display's internal micro controller continuously samples the connected sync signals and compares them to the scanning modes already stored in the memory. If the connected signal has already been stored, the micro controller adapts the image to the corresponding adjustment values in the memory, and further adjustments are unnecessary.

Image conformity and consistency

Image conformity and consistency are the keywords. In our factory, the MGD 221 displays are perfectly adjusted and calibrated before they are shipped to the customer. Internal circuits, like the TrueGrey® and Automatic White Stability (AWS) systems, ensure display consistency over time.

Conformity with the original image quality is guaranteed by the automatic calibration, which can be done by means of an optical sensor, connected to the Sensor connector on the display. The sensor is not supplied with the display.

Calibration and adjustments

The conformity calibration, as well as the complete adjustment of the display, can be performed by means of the remote, user-friendly MediCal® software package. MediCal, is especially developed to adjust and check BARCO's medical displays.

A lot of adjustments can also be done on the monitor itself, by means of an extensive on-screen menu system, accessible from the rear panel controls.

Power saving system

The MGD 221 is equipped with a power saving system.

When left idle for a certain time, the computer, connected to the display, will power down the display in several steps. The power saving system can be switched on or off during the installation or adjustment of the display.

This system requires a computer imaging board that supports power saving management.

1.2 Versions and options

The MGD 221 comes in 2 different versions: With an anti-reflective panel in front of the picture tube, and without panel (No Panel version).

In both cases, the phosphor is a B4-L8 type.

The type of CRT phosphor and the presence of the coating are indicated on the label at the rear of the display.

The video input is terminated to 75 Ohm.

Important: It is absolutely necessary that the impedances of imaging board and display are the same. If not, the image quality will be inferior.

The MGD 221 can be delivered with the following options: Southern Hemisphere Compensation and Ambient Light Compensation (ALC).

The MediCal software and the X-Rite DTP92 sensor are not delivered with the display.

MediCal can be ordered separately.

1.3 About the manuals

This guide is meant for people who want to install and use the MGD 221 display, as well as people who need to install and adjust the display. The chapter "Advanced Adjustments" is meant for trained engineers only, because it describes actions and procedures that require a technical skill to be performed properly.

The use of the software MediCal is described in the MediCal User's Manual.

2. INSTALLATION

2.1 Precautions

- Keep your original packaging. It is designed for this display and is the ideal protection during transport.
- Do not lift the display all by yourself to avoid injury.
- Avoid reflections in the picture tube to reduce eye strain.
- Place the display on a strong and stable table or desk if used as desktop display.
- Keep the display away from heat sources and provide enough ventilation in case it is built in a rack or console.
- Keep the display away from strong sources of magnetic fields.
- Make sure the display and computer are both switched off before connecting the signals.

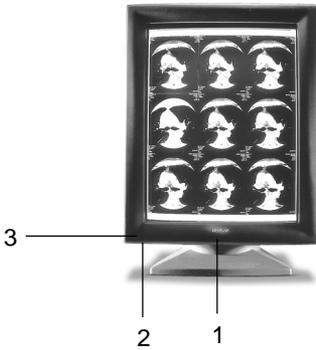
2.2 The package contents

- The MGD 221 display
- The accessory box (in which you found this manual)

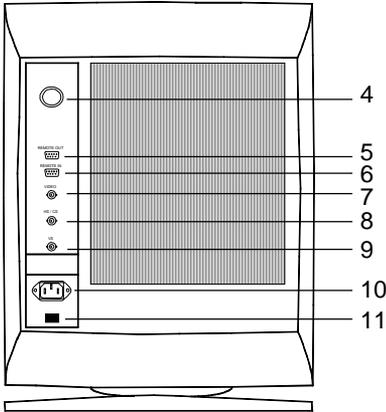
Notes:

- The MGD 221 can be part of a complete MeDis® system, consisting of the display itself, an imaging board and software. In that case, the package contains a lot more items. The contents of the package is then described in the manual of the complete system.
- The ambient light shield inside the accessory box should always be used during conformity calibration with the X-Rite DTP92 optical sensor.

2.3 Controls and connectors



- {1} Optical sensor plug
- {2} Ambient Light Compensation (ALC) sensor (optional)
- {3} Green power LED
- {4} Control knob, combination of a push button and a turning knob. The control knob is used for switching the power on/off, and selecting and performing functions in the OSD (on-screen display) menu.



- {5} Remote (RS-232) output
- {6} Remote (RS-232) input
- {7} Video input
- {8} Horizontal / composite sync. input
- {9} Vertical sync. input
- {10} Power input
- {11} Power button

2.4 Signal connection

a) Connection of video signals



The connected equipment must comply to all relevant safety demands.

Important: The use of low-quality video cables can distort the video signal and influence diagnosis.

1. Check the **impedance** of the imaging board that produces the video signals you want to connect. It must be 75 Ohm (just like the input of the display). If not, the quality of the images on the display will be inferior.
2. Connect the video output of the computer's imaging board to the **video and sync inputs** on the display's rear panel. Use a proper video cable. The video cable is not supplied with the display, unless the display comes as part of a complete BARCO MeDis system, that also contains an imaging board.

The inputs accept the following signals:

- Video with separate horizontal and vertical sync.
 - The video cable has 3 wires.
 - Connect the video signal to the connector Video **{7}**.
 - Connect the horizontal sync signal to the connector HS/CS **{8}**.
 - Connect the vertical sync signal to the connector VS **{9}**.
- Video with external composite sync.
 - The video cable has 2 wires.
 - Connect the video signal to the connector Video **{7}**.
 - Connect the composite sync signal to the connector HS/CS **{8}**.
- Video with internal composite sync (sync on video).
 - The video cable has 1 wire.
 - Connect the video (with sync) signal to the connector Video **{7}**.

Notes:

- The video inputs cannot be connected in loop-through (daisy-chain).
- The required video amplitude: 700 mV \pm 3 dB.
- The required sync. amplitude: 500 mV.

b) Connection of data signals

The display can be controlled remotely by a computer through the serial data bus. A typical example of this, is the **MediCal** software that controls the display. MediCal runs on a PC that is connected through the serial data bus. This PC is not necessarily the same computer as the one that produces the video signals.

Unlike the video signals, it is possible to daisy-chain the serial data bus. This means you can control different displays from one PC.

To connect the data signals:

1. Connect one end of the serial data cable to one of the PC's **COM ports**. If the COM port has a 25-pin connector, you will need to use a **D25-to-D9 interface connector**. The cable and the interface connector are both supplied with **MediCal**.
2. Connect the other end of the serial data cable to the **Remote In** connector **{6}** on the display's rear panel.
3. For a daisy-chain application, connect the **Remote Out** connector **{5}** of the first display to the **Remote In** connector **{6}** of the next display.

c) Connection of optical sensor

To calibrate the display, connect the optical sensor to the **Sensor** connector **{1}** at the front.

Notes:

- The display supports the DTP 92 from X-Rite as optical sensor.
- The optical sensor is not supplied by BARCO.
- Calibration can be done by means of MediCal only.
- **Always use the Ambient Light Shield during calibration.**



At the front, the sensor plug is located under the bezel.

d) Connection of power

1. Power cord: Utilize a UL-listed detachable power cord, 3-wire, type SJ or equivalent, 18 AWG min., rated 300 V min., provided with a hospital-grade type plug 5-15P configuration for 120V application, or 6-15P for 240V application.
2. Plug one end of the power cord into the rear of the display (connector LINE {10}). Plug the other end into a **grounded AC** power outlet. The display automatically adapts to the voltage. The voltage range is: 100-240 VAC +/- 10%.

2.5 Positioning the display

The tilt and swivel base allows you to adjust the height and viewing angle of the display to obtain an optimal viewing comfort.

Important considerations

- The best environment for diagnostic imaging is one with controlled and dimmed ambient light. The human eye's sensitivity depends on the ambient light strength. It is most sensitive to small contrast changes (or subtle image details) at limited ambient light levels.
- The best ambient light level, expressed in Lux, depends on the application. An office illumination typically requires 500 Lux. A dimmed environment, like a softcopy room, requires less than 100 Lux.
- Using your display in a controlled and dimmed environment also extends its lifetime, because the display can operate at limited brightness and contrast. These levels correspond to the calibrated position in most cases.
- A controlled ambient light environment implies the ambient light is as constant as possible. Cover windows to keep out the daylight. Avoid switching the lights and viewing boxes on and off. A consistent environment results in more image consistency and less eye fatigue.
- Avoid reflections in the picture tube. Provide indirect lighting. Don't place the displays in front of or close to a light source like a window or viewing box, although this may be very tempting. As a rule of thumb, keep viewing boxes at least one metre (3 feet) away from the displays.

3. OPERATION: USER CONTROLS

Important:

The best way to adjust and control the display is by using MediCal, which displays the ideal test patterns for correct adjustment. However, in case you do not dispose of MediCal, you can control and adjust the display by means of the built-in On-Screen Display (OSD).

3.1 Switching on / off

Power on/off

Press the Power button {11} on the rear panel to switch on the display. **The green LED at the front is off when the display is operating.**

If the display starts up with no image and the green LED {3} on, it is in stand-by. This is the case when the display was powered down while in stand-by.

Manual stand-by

To put the display in manual stand-by mode, press the control knob {2} shortly. As a result, the green LED is ON continuously.

Note: You cannot switch the display in manual stand-by when the on-screen display (OSD) is visible. In that case, first exit the OSD, and then press the control knob to switch to stand-by mode.

To activate the display from stand-by mode, press the control knob {2} again. As a result, the LED is switched off again.

Automatic power saving system (DPMS)

The power saving system, if switched on, can power down the display when you don't use the computer that produces the video and sync. signals for a while. In that way, the system reduces the display's power consumption.

While the display is powered down, the picture tube will be blanked, and **the green LED on the front is blinking**. In the last DPMS mode, the LED will be on continuously.

The power saving system is switched off when the display is produced. It can be switched on by a qualified technician.

Note: The power saving system can only work if the connected imaging board supports power management.

For more details, please read Appendix A, "Background information".

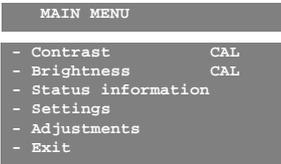
3.2 Contrast and brightness control

Contrast and brightness can be controlled through the OSD menus.

To activate the OSD

Turn the control knob {4} from left to right or from right to left. As a result, the OSD main menu appears.

Note: The control knob should turn over at least 30 degrees before the OSD becomes visible.



The OSD main menu

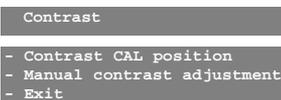
The main menu indicates the current setting for contrast and brightness.

This can be:

- CAL: The calibrated position. This is the preferred setting in a controlled environment.
- ALC: For contrast only. This indicates the Ambient Light Compensation (ALC) is on, and contrast is controlled automatically, depending on the ambient light. ALC is an option.
- <empty> When the main menu does not specify a setting, contrast or brightness is manually set to a different value than the calibrated position.

To put contrast in calibrated position

- 1 Turn the control knob to select **Contrast** in the OSD main menu.
- 2 Press the control knob shortly. The contrast control menu appears.
- 3 In the contrast control menu, select **Contrast CAL position** and press the control knob shortly.



Contrast control menu

To control contrast manually

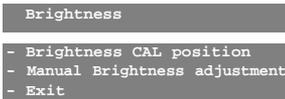
- 1 Turn the control knob to select **Contrast** in the OSD main menu.
- 2 Press the control knob shortly. The contrast control menu appears.
- 3 In the contrast control menu, select **Manual contrast adjustment** and press the control knob shortly. The contrast scroll bar appears.
- 4 Turn the control knob until you have reached the desired contrast.
- 5 Press the control knob shortly or wait a few seconds to return to the contrast control menu.
- 6 In the contrast control menu, select **Exit** and press the control knob shortly to return to the main menu. Alternatively, you can just wait a few seconds, and the OSD returns to the previous menu automatically.

To put brightness in calibrated position



Contrast scroll bar. The short stroke in the bar indicates the calibrated position, the long stroke indicates the current setting.

- 1 Turn the control knob to select **Brightness** in the OSD main menu.
- 2 Press the control knob shortly. The brightness control menu appears.
- 3 In the brightness control menu, select **Brightness CAL position** and press the control knob shortly.



Brightness control menu

To control brightness manually

- 1 Turn the control knob to select **Brightness** in the OSD main menu.
- 2 Press the control knob shortly. The brightness control menu appears.
- 3 In the brightness control menu, select **Manual brightness adjustment** and press the control knob shortly. The brightness scroll bar appears.



Brightness scroll bar. The short stroke in the bar indicates the calibrated position, the long stroke indicates the current setting.

- 4 Turn the control knob until you have reached the desired brightness.
- 5 Press the control knob shortly or wait a few seconds to return to the brightness control menu.
- 6 In the brightness control menu, select **Exit** and press the control knob shortly to return to the main menu. Alternatively, you can just wait a few seconds, and the OSD returns to the previous menu automatically.

3.3 Viewing Status information

You can view the status and actual settings of the display. You cannot change them in the Status Menu. Changing the settings is reserved for trained service staff only.

To view the status information

Turn the control knob to select **Status information** in the OSD main menu.

The Status information menu appears. The only control in the menu is **Exit**.

STATUS INFORMATION	
Display Name:	MGD 221MKII
Serial Number:	5114147
Mode Name:	New mode
Mode H-frequency:	48.32 kHz
Mode V-frequency:	59.94 Hz
Software Version:	V 1.01
Run time:	50 hours
White level:	215 cd/m2
Activity timeout	30s
SH compensation	OFF
Actual H-frequency:	72.02 kHz
Actual V-frequency:	75.00 Hz
- Exit	

Status information menu

Explanation of the Status information menu items

Display Name:

This is the display type.

Serial Number:

This is the display's serial number.

Mode Name:

The currently selected scanning mode.

Mode H-frequency, Mode V-frequency:

These are the horizontal and vertical sync frequencies of the currently selected scanning mode. These are the figures stored in the memory.

Software Version:

The internal software version.

Run time:

The total operating time since production, including burn-in time.

White level:

The display's white level or light output after calibration, in calibrated position.

Activity timeout :

This is the time, expressed in seconds, before the display interrupts the data communication with the computer (e.g. during a computer session with MediCal) if the computer does not respond anymore.

SH compensation (optional):

Indicates if Southern Hemisphere compensation is switched on or off. Note: Southern Hemisphere compensation is an option. If the option is not installed in the display, this line does not appear in the menu.

Actual H-frequency, Actual V-frequency:

These are the actual horizontal and vertical sync frequencies of the connected video signal. They are measured constantly by the display.

3.4 Other adjustments

The main menu items **Settings** and **Adjustments** are reserved for trained service staff and are therefore password - protected.

4. ADVANCED SETTINGS AND ADJUSTMENTS (FOR SERVICE STAFF ONLY)

Important:

The functions and controls described in this chapter can have a serious impact on the performance of the display. They should be touched by trained service staff only!

4.1 Settings

SETTINGS INFORMATION	
- LUC	OFF
- ALC	OFF
- Orbiter	OFF
- Power save	ON
- Display address	1
- User controls disable	OFF
- Exit	

The Settings menu

To change the settings

- 1 Turn the control knob at the rear from left to right or from right to left to activate the On-Screen Display (OSD) main menu.
- 2 In the main menu, turn the control knob to select **Settings**.
- 3 Press and hold the control knob **for a few seconds**.
The Settings menu appears. It displays each setting and its current status.
Note: If you press only shortly, the message "Service protected" appears.
- 4 Turn the control knob to select the setting you want to change.
- 5 Press the control knob shortly to change the selected setting.
- 6 For **Display address**, you can change the setting by turning the control knob. Return to the Settings menu by pressing the control knob.
For the other settings, the new status instantly appears in the Settings menu.

Explanation of the Settings menu items

LUC:

LUC is short for Luminance Uniformity Control. When switched on, the internal waveform processor will modulate the gain of the video amplifier so that the luminance is equal all over the screen (within a tolerance of +/- 5%).

The LUC system can be calibrated in the Adjustments menu (see further).

ALC (optional):

ALC is short for Ambient Light Compensation. When this setting is on, the contrast is controlled automatically, depending on the ambient light, measured by the ALC sensor {6} in the bezel.

Orbiter:

The Orbiter is an internal circuit that, when switched on, will slightly and slowly move the image to prevent pixel burn-in.

Power save:

This setting can switch the automatic power saving system (see Introduction chapter) on or off.

Display address:

In multi-head systems (multiple displays controlled by one system), each display must have a different address. With this setting you can set the display address from 1 to 16.

User controls disable:

With this setting you can enable or disable the user controls.

When **OFF**, the user controls are not disabled, and the user can activate and use the OSD menus.

When **ON**, the user controls are disabled. After quitting the OSD, the user will no longer be able to activate the OSD.

To activate the OSD again when the user controls are disabled, use the following "code":

- 1 Turn the control knob 3 times counter-clockwise (seen from the rear).
- 2 Turn the control knob 3 times clockwise.
- 3 Turn the control knob 3 times counter-clockwise.

Note: This should be done in quite a short time!

Saving the settings

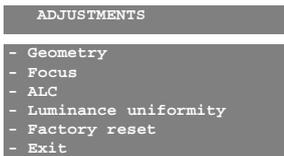
The settings are automatically saved after changing them.

4.2 Adjustments

a) How to make the adjustments

- 1 Turn the control knob at the rear from left to right or from right to left to activate the On-Screen Display (OSD) main menu.
- 2 In the main menu, turn the control knob to select **Adjustments**.
- 3 Press the control knob **for a few seconds**.
The Adjustments menu appears.
Note: If you press only shortly, the message "Service protected" appears.
- 4 Turn the control knob to select the category of adjustments you want to make.
- 5 Press the control knob shortly to enter the selected category.
- 6 In the selected menu, select the adjustment you want to make and press the control knob shortly to display the adjustment scroll bar.
- 7 Turn the control knob to perform the adjustment. After adjusting, press the knob shortly to confirm the adjustment and return to the menu, or press for a longer time to undo the adjustment and return to the menu.
- 8 Return to the previous menu by pressing the control knob *shortly* or selecting **Exit** when present.

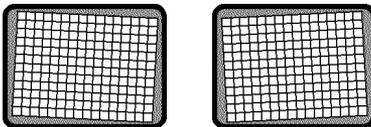
b) Description of the adjustments



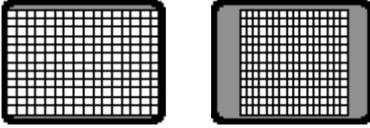
Adjustments menu

Geometry

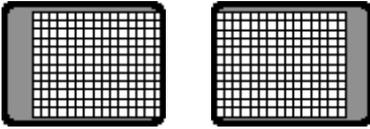
Rotation



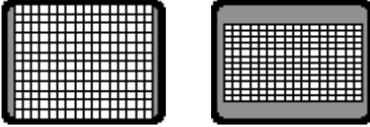
Width



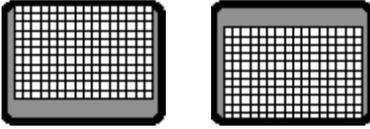
Horizontal position



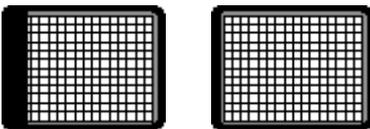
Height



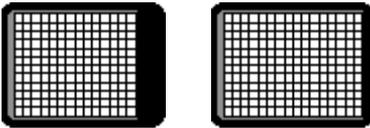
Vertical position



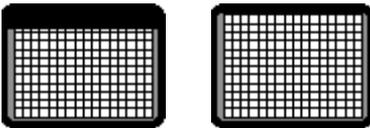
Blanking - Blanking left



Blanking - Blanking right



Blanking - Blanking top



Interlacing - Pre correction

In most cases you do not need to change this adjustment.

You may need to increase this adjustment only when the connected video and sync signal contains an abnormally big number of equalization pulses before the vertical sync (more than 8 lines), resulting in a phase error (geometry distortion) at the bottom of the image.

Interlacing - Post correction

In most cases you do not need to change this adjustment.

You may need to increase this adjustment only when the connected video and sync signal contains an abnormally big number of equalization pulses after the vertical sync (more than 8 lines), resulting in a phase error (geometry distortion) at the top of the image.

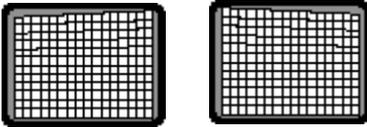
SH Compensation (optional)

If your display is equipped with the Southern Hemisphere option, the on-screen display menu contains additional functions to adjust the image geometry. If the option is not installed in the display, this menu does not appear.

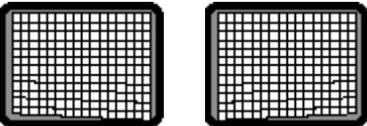
SH Compensation - SH Compensation ON/OFF

For proper geometry adjustment in the Southern Hemisphere, you must switch SH Compensation ON. If not, the SH controls will not function.

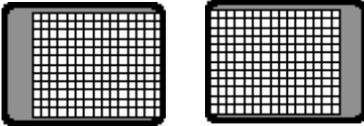
SH Compensation: SH Top



SH Compensation: SH Bottom

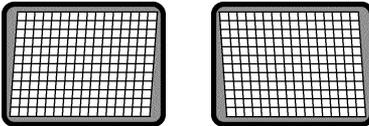


SH Compensation: SH Position

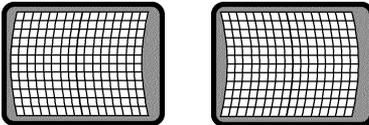


With SH Compensation on, we advise to use the SH Position control instead of the Horizontal Position control in the Geometry menu.

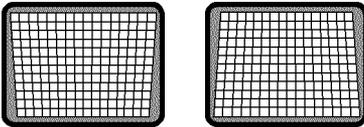
Advanced geometry - Horizontal skewing



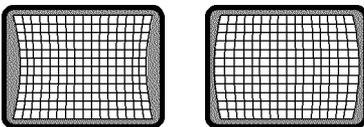
Advanced geometry - Horizontal bowing



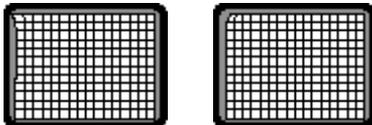
Advanced geometry - Horizontal trapezium



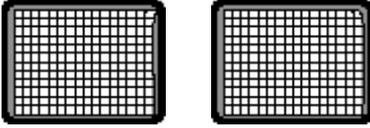
Advanced geometry - Horizontal parabola



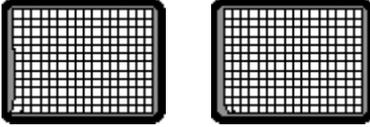
Advanced geometry - Corner top left



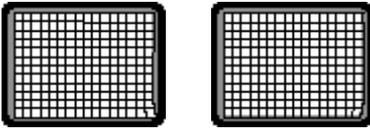
Advanced geometry - Corner top right



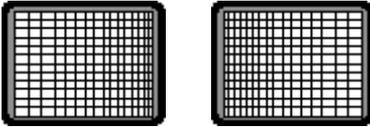
Advanced geometry - Corner bottom left



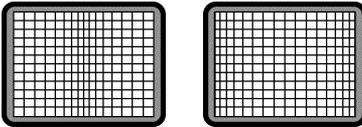
Advanced geometry - Corner bottom right



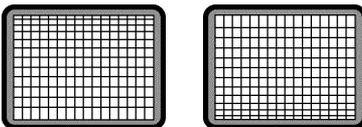
**Advanced geometry - Linearity & S-correction -
Horizontal linearity**



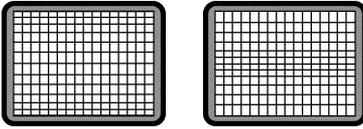
**Advanced geometry - Linearity & S-correction -
Horizontal S-corr**



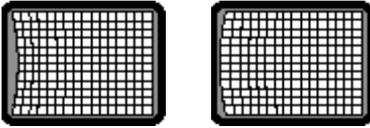
**Advanced geometry - Linearity & S-correction -
Vertical linearity**



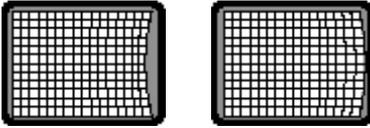
**Advanced geometry - Linearity & S-correction -
Vertical S-corr**



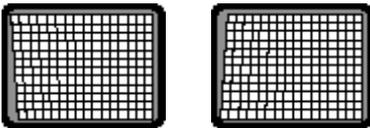
**Advanced geometry - Advanced bowing & skewing -
Horizontal bowing left**



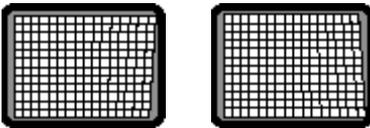
**Advanced geometry - Advanced bowing & skewing -
Horizontal bowing right**



**Advanced geometry - Advanced bowing & skewing -
Horizontal skewing left**



**Advanced geometry - Advanced bowing & skewing -
Horizontal skewing right**



Focus

Static focus

Adjust Static focus to obtain an image as sharp as possible in the center.

Focus zone

You can adjust the focus in 9 independent zones. Turn the control knob to obtain an image as sharp as possible in the selected zone. Press the control knob to switch to the next zone.

ALC (optional)

Ambient Light Compensation (ALC) is an optional system that automatically adapts the display contrast and brightness level to the ambient light in the room. The system has to be adjusted by setting the contrast and brightness in the darkest ambient light conditions the user works, and then repeating this in the brightest conditions.

To adjust the ALC system, proceed as follows:

1. Dim the light in the room to create the darkest ambient light condition the user normally works in.
2. Enter the **Minimum illuminance** menu.
3. Select **Measure ambient light**. The display now stores the ambient light level that corresponds to the darkest condition.
4. Select **Contrast** and set the display contrast to the desired level.
5. Select **Brightness** and set the display brightness to the desired level.
6. **Exit** the Minimum illuminance menu.
7. Increase the light in the room to create the brightest ambient light condition the user normally works in.
8. Enter the **Maximum illuminance** menu.
9. Select **Measure ambient light**. The display now stores the ambient light level that corresponds to the brightest condition.
10. Select **Contrast** and set the display contrast to the desired level.
11. Select **Brightness** and set the display brightness to the desired level.
12. **Exit** the Maximum illuminance menu.

Luminance uniformity

This menu allows you to calibrate the display, including the Luminance Uniformity circuit.

Proceed as follows:

- 1 Connect the X-Rite DTP92 sensor and apply the black shield (see chapter "Installation").
- 2 Follow the instructions on the screen.

Factory reset

This function allows you to undo all adjustments you have made since the display left the factory.

Select **Go ahead** to restore the factory settings.

Select **Exit** to return to the previous menu without erasing the adjustments.

c) How to save changes

Proceed as follows:

- 1 After having made the adjustments, select **Exit** in each appearing menu until the **Save Changes?** message appears.
- 2 Select **Yes** to save the changes.
Select **No** to exit the OSD menus without saving the changes.

What happens upon saving?

- When the current scanning mode was already stored in the display memory, the scanning mode is updated with the new adjustment values.
- When the scanning mode was not yet stored in the memory, the display will create a new scanning mode in the memory.
However, when the memory was full, the monitor will display a list of scanning modes in the memory and ask if you wish to overwrite one of them. If you want to store the adjustments you have made, you will have to overwrite one of the scanning modes in memory.

5. MAINTENANCE

Picture tube

The glass panel of the picture tube is handled with a special coating. Take care not to damage or scratch the coating.

Clean the picture tube with a soft woolen or cotton cloth.

The cloth should be moist, not wet!

Use a watery solution or a mild commercial glass cleaning solution.

Apply (e.g., spray) the solution on the cloth, not on the picture tube.

Cabinet

Clean the cabinet using a recognized cleaning product for medical equipment. The cloth you use must be moist, not wet!

The cabinet has been tested for resistance to the following products: Cidex, Betadine, Alcohol (Isopropyl and Ethyl), Ammonia-based cleaners (Windex) and Aquasonic Gel.

6. TROUBLESHOOTING

There appears no image on the picture tube, the green LED at the rear is out

- Check if the power cord is properly connected to the power outlet and to the display.
- Check if the power button is switched on.

There appears no image, the green LED is on

The display is switched in Stand-by, manually or by the automatic Power saving system.

- Press the control knob at the rear shortly.
- Try to switch on the display by pressing any key on the keyboard of the computer that produces the video and sync. signals for the display.
- Check if both horizontal and vertical sync. signals are connected to the display and to the computer.

There appears no image, the green LED is blinking

The display is switched in a power saving mode by the automatic Power saving system.

- Press the control knob at the rear shortly.
- Try to switch on the display by pressing any key on the keyboard of the computer that produces the video and sync. signals for the display.
- Check if both horizontal and vertical sync. signals are connected to the display and to the computer.

On the picture tube appears the message "No Valid Sync Signal"

- Check if both horizontal and vertical sync. signals are connected to the display and to the computer.
- Check if the sync. signals are connected in the proper way (refer to the chapter "Installation").
- Check if both horizontal and vertical sync. frequencies match the display specifications (refer to the chapter "Technical specifications").

For other problems, please consult your technical service department.

APPENDIX A: BACKGROUND INFORMATION

Luminance Uniformity Correction

A characteristic (or limitation) of every picture tube (CRT) is that the luminance decreases towards the edge of the screen surface. The decrease is normally 20 to 30 %.

This is caused by the shape of the picture tube. Inside the CRT, a so-called *electron gun* shoots an electron beam towards the front (the glass panel). Because this panel is rather flat instead of having a spheric shape, the electron beam has to 'travel' a longer distance in the corners than in the center. So the intensity is higher in the center.

This phenomenon is even increased by the irregular distribution of the phosphor and aluminium layer on the glass panel. These tend to be thicker in the center.

BARCO has developed a special system, called Luminance Uniformity Correction (LUC), that solves this problem. The LUC system enhances the light output at the edges of the CRT, so that the luminance there is the same as in the center.

The LUC system is calibrated in the factory. From time to time, it has to be re-calibrated at the customer's site by means of the light sensor you use for normal color calibration. The system can be calibrated and switched on or off by a qualified technician.

Power saving system

The display is equipped with circuits that can handle power saving management. When the system is switched on, it can power down the display in several steps.

The system is controlled by the imaging board or the PC that delivers the video signals. When you are working on the computer, the imaging board delivers both sync signals, and the display is operating normally. When you don't touch the computer keyboard for a certain time, the imaging board only delivers vertical sync. This is sensed by the display's micro controller, that blanks the image on the CRT. This results in a drop of power consumption with about 25 %.

When you leave the computer idle for a longer period, the imaging board now delivers horizontal sync only. As a result, the display's micro controller switches off a number of internal circuits. The power consumption has now dropped with about 42 %.

At last, the imaging board delivers no sync signals at all, and the micro-controller switches off all but one power supplies in the display. Only the micro-controller's own supply keeps on running, resulting in a very low power consumption of 6 W.

If you start using the computer again, the imaging board switches on both sync signals, and the micro-controller switches on the display.

The times after which the different steps of power management must become active, is set in the PC's display properties.

APPENDIX B:

TECHNICAL SPECIFICATIONS

Picture tube:

Faceplate transmission:
No Panel: +/- 34%
AR panel: 30%

Faceplate type: AR panel or No Panel
Image representation: portrait
Phosphor: B4-L8

Light output:

Calibrated: 215 Cd/m²

Resolution:

Max. adress. pixels: 1280
Max. adress. lines: 1600

Scanning systems

Horizontal scanning:

Multi sync: -controller controlled
VGA boot range: 30-35 kHz
Normal operation range: 80-140 kHz

Minimum blanking : 2.4 s
Storable scan frequencies: 4
Prealigned scans: 1

Vertical scanning:

Minimum frequency: 48 Hz
Maximum frequency: 150 Hz
Minimum blanking: 250 s (after leading edge)

Geometry

Nominal size (4/3 ratio): 300mm x 400mm
Nominal size (4/5 ratio): 304mm x 380mm

Inputs

Video

BNC connectors 75 Ohm
Nominal level: 0.7 Vpp

Sync

BNC connectors 75 Ohm
Nominal level: 0.5 Vpp

Communication inputs/outputs

RS232 9-pin sub D connector
Baudrate: 9600

Power supply:

Voltage: 100 - 240 V +/- 10%
Frequency: 50/60 Hz
Current: 2.3 A

Environmental

Temperature range (°C):

Storage: -20/+65
Operation: 0/+45
Within specs: 15/+30

Altitude: storage: 25 000 ft
operational: 10 000 ft

Humidity (relative): 95 % max., non condensing

Weight: (No Panel version)

Unpacked	Packed
37.4 kg	55.9 kg

Dimensions packing:

H x W x D: 788mm x 630mm x 780mm

Dimensions monitor (mm):

Height: 558
Width: 400
Depth: 561

Modifications reserved.