



## **MONITOR TEST & SETUP TOOL**

Welcome

Before You start





How to start?

To use HELP: Open Toolboxes


Make You own copy to diskette, after installation


Feedback to NOKIA


# SCREEN REGULATION


-  What is screen regulation?
-  How to use screen regulation tools?
-  What you can do?
-  Recommendations!

# COLOUR TOOLS

 [What are Colours?](#)

 [How to use Colour Tools](#)

 [How the Monitor make Colours?](#)

 [How many colour?](#)

 [What You can do?](#)

# START-UP TEST PATTERN



How to use Start-up Tool?



Recommendations!

## GEOMETRY TOOLS

The geometry-parameters is affected of the resolution that you are using on your monitor. This means that you will have to adjust your monitor for all different resolutions that you are using. If your monitor has capability of storing more than one set of adjustments. In that case you should use this program to adjust and store these adjustments for all different resolutions that you are using. If your monitor could not store this adjustments you should try to use only one resolution if possible. If this in not possible you can choose between adjusting your most critical or most commonly used resolution or to readjust your monitor when changing resolution.




[How to use Geometry Tools](#)


## BRIGHTNESS AND CONTRAST TOOL


 What makes light on your monitor?


 Why brightness and contrast control?

 What makes brightness control?







 What makes contrast control?

 How to adjust brightness?


 How to adjust contrast?


 Recommendations!


## CONVERGENCE TOOLS

-  What is Convergence?
-  How to use Convergence Tool
-  How to identify convergence error ?
-  How to measure convergence error ?
-  What you can do ?
-  Recommendations!

## FOCUS TOOLS






 What is Focus?

 How to use focus tools?

 What you can do?



## RESOLUTION TOOLS

-  What Is Resolution ?
-  How to use Resolution Tools?
-  Maximum Resolution
-  Common problems and solutions.
-  Recommendations

# READABILITY TOOLS



How to use readability tools?

See also: [Resolution](#), [Convergence](#), [Focus](#)

# Welcome to Nokia Monitor Test

Version: 1.0

This program:

Will guide You in setting the parameters, controls and adjustments of the monitor.  
Will guide You how to measure picture quality.

NOTE: This program is designed for one purpose only, TO HELP Monitor USERS.

©1994 by NOKIA Monitors All rights reserved.

This application is Freeware. This application is copyrighted and is NOT in the public domain.  
You are free to use, and make copies of, this application as long as no fee is charged.

DISCLAIMER: You use this application at your own discretion.  
NOKIA Monitors not liable for any damages that may result from the use of this application.  
No warranties, expressed or implied, exist.

Windows is a registered trademark of Microsoft.  
Trinitron is a registered trademark of Sony Corporation.  
Macintosh is a registered trademark of Apple Computers.  
VGA is a registered trademark of IBM.  
DPSM is a registered trademark of VESA.

# SAFETY INSTRUCTIONS

Read all of these instructions. Follow cautions and instructions marked on the monitor.

## **Do not attempt to service or open monitor yourself.**

To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

Never push objects of any kind into this monitor through cabinet slots as they may touch dangerous voltage points that could result in a fire or electric shock.

Never spill liquid of any kind on the monitor.

Unplug the monitor for added protection when the monitor is left unattended and unused for a long period of time.

Do not use any attachments not recommended by your sales representative as they may cause hazards.

**Unplug damaged monitor immediately from the power outlet.**

## **Connection to Power System**

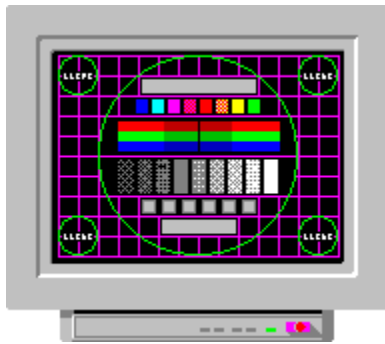
Do not connect the power cord of the monitor to power outlet with a voltage or frequency different from that indicated on the commercial label of the monitor. Always use a grounded power outlet.

Use the attached specified power cable that will not interfere with radio and television reception.

Do not expose the power cord to mechanical stress.

# START-UP TEST PATTERN

How to use it?



Use this test pattern to check: picture size and place, focus, convergence, adjust brightness and contrast.  
For more detailed information follow the instructions of every test pattern.



## Nokia Monitor Test



Start-up



Geometry



Brightness and Contrast



Convergence



Focus



Resolution



Readability



Moire




Colours




Screen regulation

# GEOMETRY TOOLS


Use this test pattern to adjust and check picture

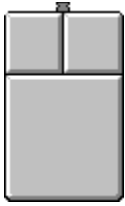
 size, position

 pincushion or barrel,

 tilt or rotation

 trapezoid

 orthogonality or parallelogram



How to use the Geometry tools: Push mouse left button to see.( left change colours, right go to next image)

HERE IS INFORMATION OF YOUR GRAPHICS ACCELERATOR CARD, RESOLUTIONS AND USED COLOURS.



USE THAT TO CHECK THE APPEARANCE OF THE STANDARD COLOURS.

USE THAT TO CHECK LINEARITY AND FOCUS ON THE CORNER(S) .

USE THAT TO CHECK THE APPEARANCE OF THE GRAY-SCALE.  
USE THAT TO ADJUST BRIGHTNESS AND CONTRAST OF YOUR SCREEN.

USE THAT TO CHECK THE APPEARANCE OF THE MAIN COLOURS-SCALE.

USE THESE ELEMENTS TO CHECK PICTURE PLACE AND SIZE.

USE THESE ELEMENTS TO CHECK OVERALL LINEARITY AND CONVERGENCE.

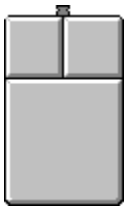
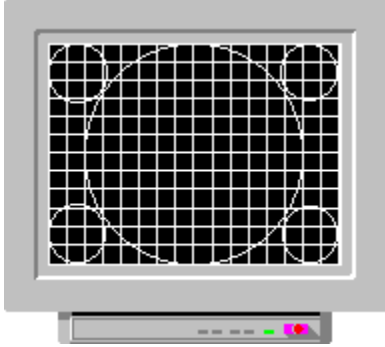
USE THESE BUTTONS TO SELECT USEFUL TESTS PATTERN FOR YOUR PURPOSE.

## **RECOMMENDATIONS**

USE START-UP TEST PATTERN REGULARLY TO CHECK PICTURE QUALITY ON YOUR MONITOR.  
FOR EXAMPLE EVERY TIME YOU START WINDOWS.  
( YOU ONLY MOVED PROGRAM ICON TO START-UP PROGRAM GROUP OF WINDOWS ).  
IT'S HIGHLY RECOMMENDED TO USE IT, AT LEAST YOU CHANGE RESOLUTION OR COLOURS!  
FOR FINAL ADJUSTMENTS USE GEOMETRY AND BRIGHTNESS TEST PATTERNS OF THIS  
PROGRAM.



# GEOMETRY

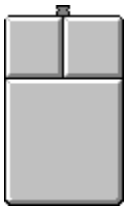
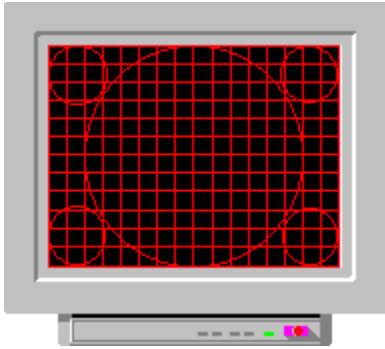


Left: Change Colour    Right: Next Pattern

Use this test pattern to adjust and check picture

- size, position
- pincushion or barrel,
- tilt or rotation
- trapezoid
- orthogonality or parallelogram

# GEOMETRY

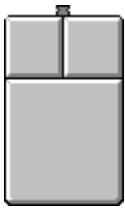
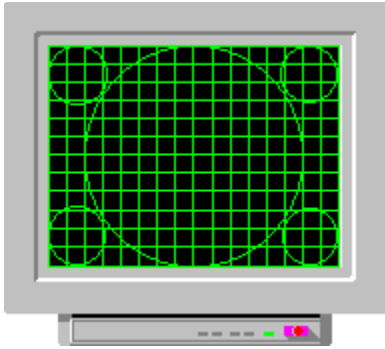


Left: Change Colour    Right: Next Pattern

Use this test pattern to adjust and check picture

- size, position
- pincushion or barrel,
- tilt or rotation
- trapezoid
- orthogonality or parallelogram

# GEOMETRY

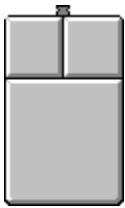
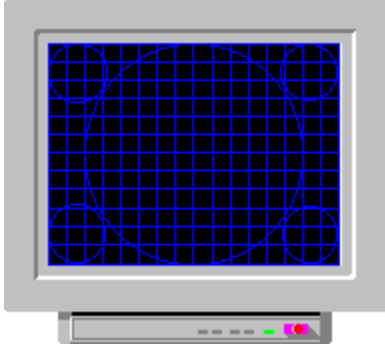


Left: Change Colour    Right: Next Pattern

Use this test pattern to adjust and check picture

- size, position
- pincushion or barrel,
- tilt or rotation
- trapezoid
- orthogonality or parallelogram

# GEOMETRY



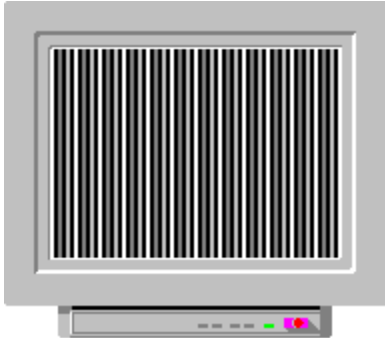
Left: Change Colour    Right: Next Pattern

Use this test pattern to adjust and check picture

- size, position
- pincushion or barrel,
- tilt or rotation
- trapezoid
- orthogonality or parallelogram

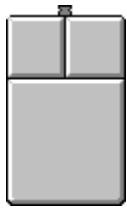
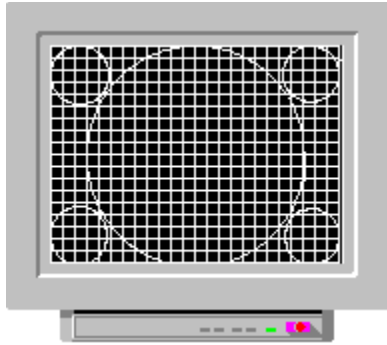
## What is Moire?

Moiré is a natural interference phenomenon that appear in all colour CRT monitors. It's a interference between shadow mask (or aperture grill) and used resolution.



This is an example of pure video moiré, normally you can also see some ripples, waves, and wisps of intensity fluctuations that are superimposed on the screen. They occur most frequently in **displays that have finally focused beams.**

# GEOMETRY

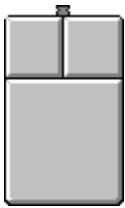
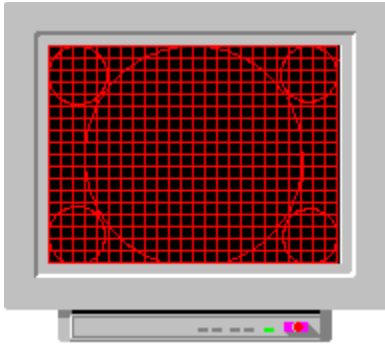


Left: Change Colour    Right: Quit

Use this test pattern to adjust and check picture

- size, position
- pincushion or barrel,
- tilt or rotation
- trapezoid
- orthogonality or parallelogram

# GEOMETRY

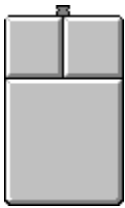
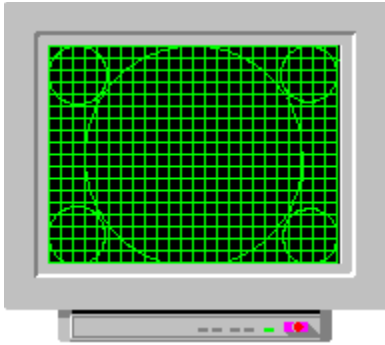


Left: Change Colour    Right: Quit

Use this test pattern to adjust and check picture

- size, position
- pincushion or barrel,
- tilt or rotation
- trapezoid
- orthogonality or parallelogram

# GEOMETRY



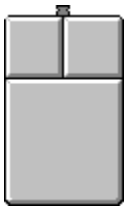
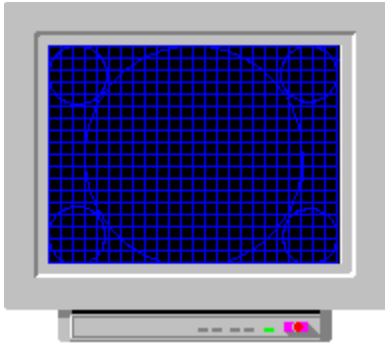
Left: Change Colour    Right: Quit

Use this test pattern to adjust and check picture

- size, position
- pincushion or barrel,
- tilt or rotation
- trapezoid
- orthogonality or parallelogram



# GEOMETRY

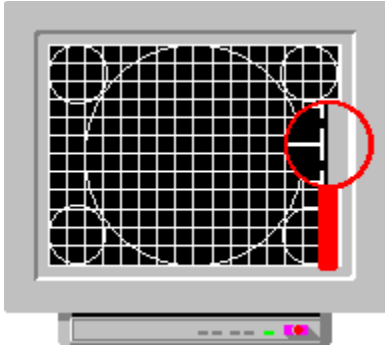


Left: Change Colour    Right: Quit

Use this test pattern to adjust and check picture

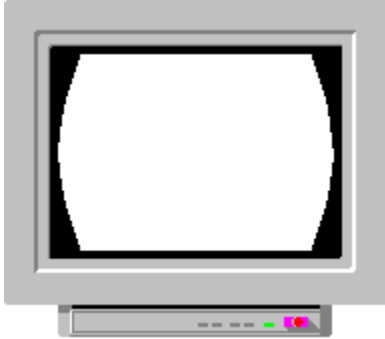
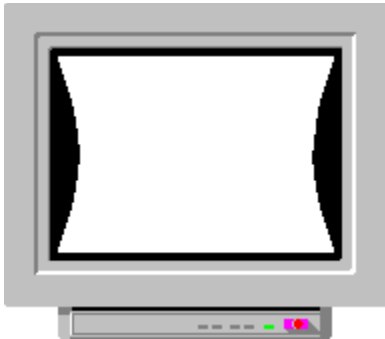
- size, position
- pincushion or barrel,
- tilt or rotation
- trapezoid
- orthogonality or parallelogram

## SIZE AND POSITION

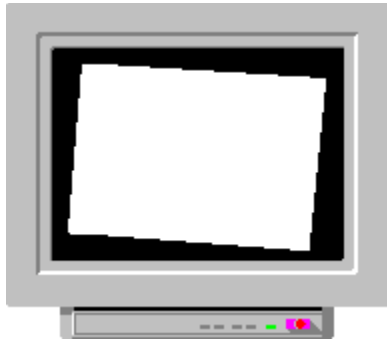


Adjust the size and position controls so that the broken line almost disappears behind the screen bezel. If the shape of the broken line distorted try to adjust other adjustments ( trapezoid, tilt, pincushion etc.) The inner circle should be perfectly round, measure picture width and high, aspect ratio should be 4/3 (width/height).If not readjust picture size a little bit.

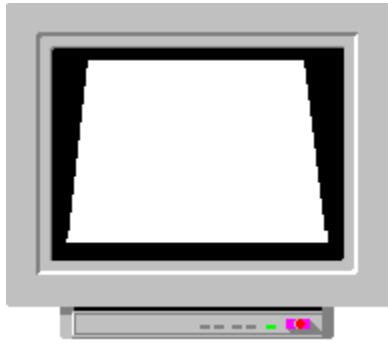
**PINCUSHION or BARREL**



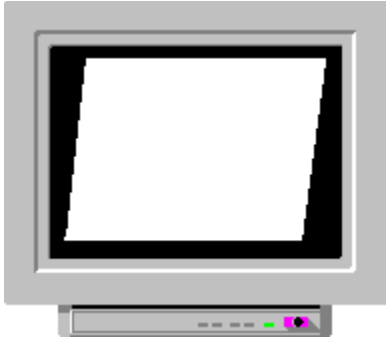
## TILT or ROTATION



# TRAPEZOID



## ORTHOGONALITY or PARALLELOGRAM



## **WHAT MAKES LIGHT ON YOUR MONITOR**

A so called video-signal is sent from the control-circuitry in your "computer" to the monitor telling the monitor where on the screen and the light output intended ranging from zero (black) to maximum light output.

In the monitor this signal is converted to light on the monitor screen.

## **WHY BRIGHTNESS AND CONTRAST CONTROL**

There are normally 2 controls to set the light output on a monitor called BRIGHTNESS and CONTRAST-control.

The brightness control is used to adjust the video-signal`s zero-level to equal black on the monitor screen.

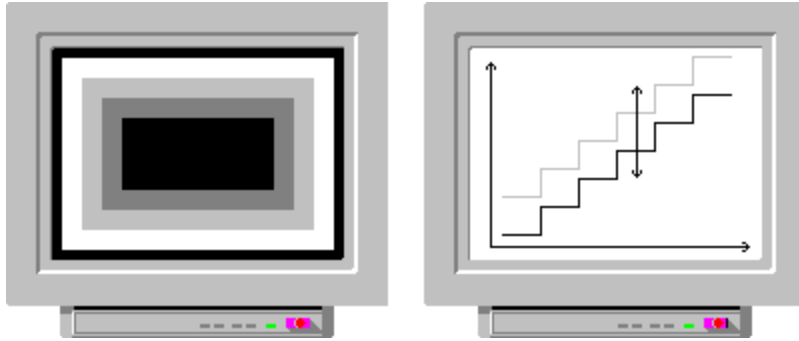
The contrast control is then used to set the amplification of the video-signal or in practice to set the light output on the monitor screen to a comfortable level.

The cause of the brightness control is to adjust the low light output-levels and contrast control to adjust the ratio between low and high level light output. Both of these adjustments are dependent of ambient light, application (program) being used and also the operators own needs.



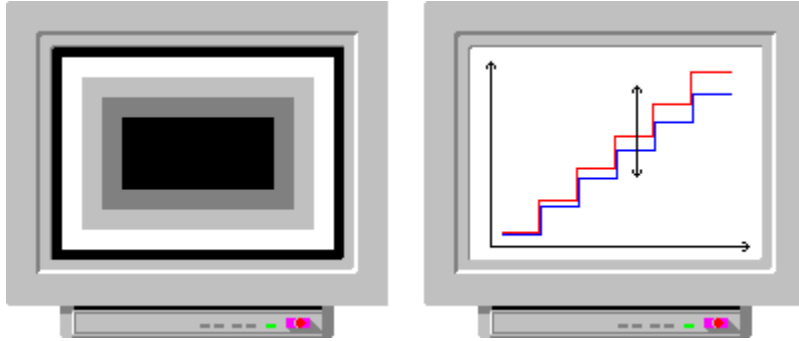
## BRIGHTNESS - CONTROL

The Brightness Control determines the Black-Level of the Picture.

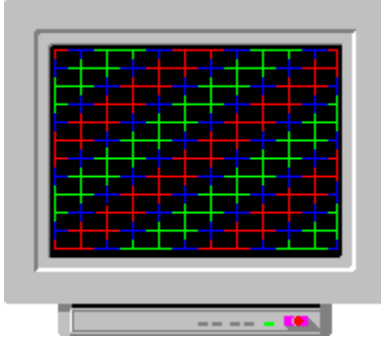


## CONTRAST - CONTROL

The Contrast Control determines the White-Level of the Picture. (Video amplifiers gain)

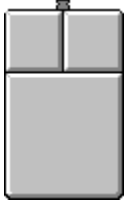


## How to use Convergence Tool?



left;change colours

right;back to start-up tool



Use this test pattern to check convergence error, How, look:  
MISCONVERGENCE / How to identify it?

## BRIGHTNESS - ADJUSTMENT

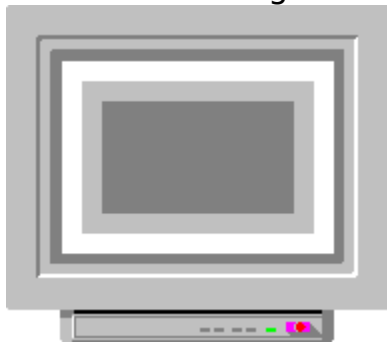
Use the brightness adjustment pattern. 

The brightness control should be used to adjust the low level light output from your monitor for different ambient light.

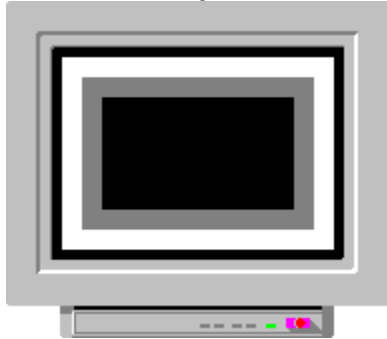
Increase the brightness control until you can see background (part intended to be black) and all dark gray squares marked 1-9%.

Decrease it again until you can just distinguish the dark gray squares brighter than 1-3%.

If You set the Brightness Control too high, the monitor cannot produce black.



If You set the Brightness Control too low (blacker than black), then the dimmer Grays will be lost and will reproduce as black.



see:[How to adjust Contrast of the Monitor ?](#)

see:[Recommendations !](#)

## CONTRAST - ADJUSTMENT

Use the brightness adjustment pattern. 

The contrast control should be used set a comfortable light output from your monitor. This is depend of your application (program) as well as the ambient light. Remember that if the ambient light has changed you should first adjust the brightness control.

You can use this test pattern to set the contrast control in a default position ( best position for all possible information on your screen). When you are running new programs you should use the contrast control to set the light output from the screen to a comfortable level.

Adjust the Contrast Control so that all big squares are visible, sharp, clearly distinct and graduated in intensity.

see:[How to adjust Brightness of the Monitor ?](#)

see:[Recommendations !](#)


## **BRIGHTNESS AND CONTRAST RECOMMENDATIONS**

The light output from your screen can under certain conditions be affected of resolution you are using. This means that you might have to use different settings on brightness and contrast-controls if you are using more than one resolution.


It's better to set Black-Level a little bit too low and lose some darkest-Grays than too high and lose a black background and good contrast between black and white.

In Windows, don't set Contrast Control too high, because Your eyes will tire more quickly!

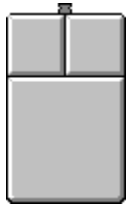
## MOIRE TOOLS

 What is Moire?

 How to use Moire-Tools?

 What you can do?

## How to use screen regulation tools



Click right button of mouse to change next picture(s).  
When picture start blinking, check the white line in left and right side.  
Blinking is merely used to make the effect easier to detect.



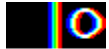
## WHAT IS CONVERGENCE ( MISCONVERGENCE)

A White line on the Screen consists of three coloured lines: Red, Green and Blue lines. If no convergence error exists in the Screen, The Lines are exactly overlaid and the resulting colour is White.

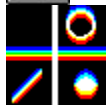


NO MISCONVERGENCE

In case of convergence error separate Red, Green and Blue lines can be seen instead of White. It is similar than out of FOCUS image, except You will see thin coloured fringes around the edges of image detail.



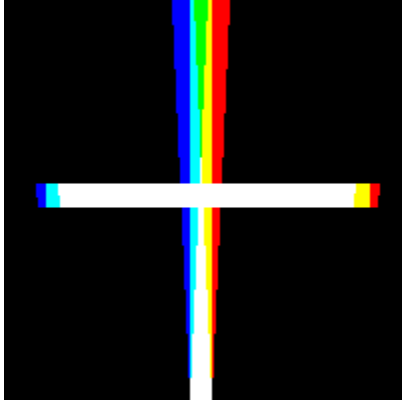
HORIZONTAL MISCONVERGENCE

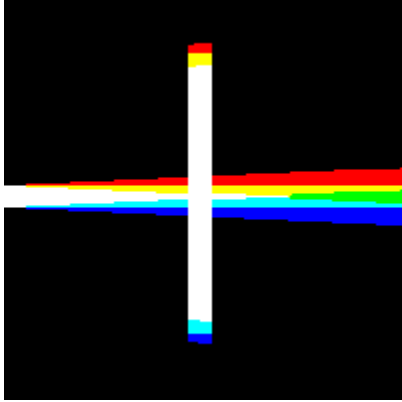


VERTICAL MISCONVERGENCE



The convergence error will vary with location on the screen and will be different for each of the primary colours. Generally, convergence will be best near the center and worst in the corners. As You can see, it has also bad influence on FOCUS.





## CONVERGENCE / How to identify it?

To find The place of MISCONVERGENCE is more easily if You use:

1. Convergence test picture:

No Misconvergence,

Horizontal Misconvergence,

Vertical Misconvergence

2. Start-up Test Pattern Crosshatch lines (Red, Blue)

No Misconvergence,

Horizontal Misconvergence,

Vertical Misconvergence.

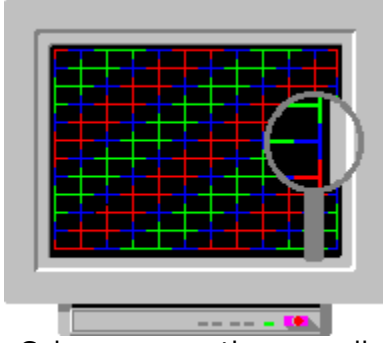
## Recommendations!

If the white line moves less than is visible, you have a very good monitor, (screen regulation)

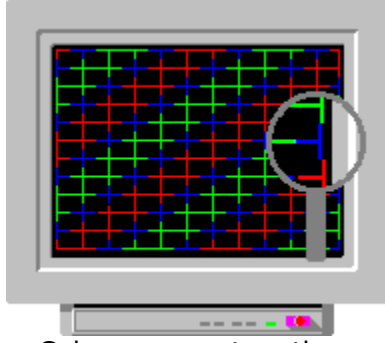
If the white line moves less than 1mm, screen regulation is quit good.

If the white line moves from 1 to 2mm, screen regulation is " fair".

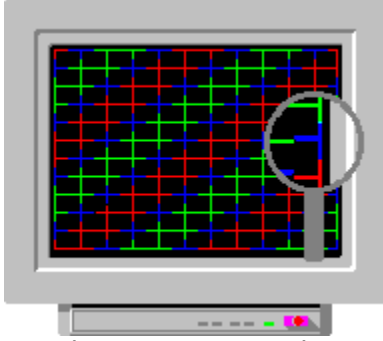
If the white line moves from 3 to 5 mm, screen regulation is unsatisfactory, more than 5mm is catastrophic or your monitor is broken.



Colours are on the same line NO MISCONVERGENCE

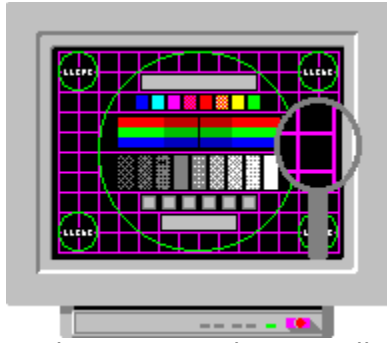


Colours are not on the same Vertical line; Horizontal Misconvergence

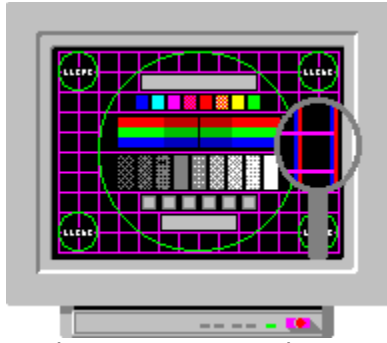


Colours are not on the same Horizontal line; Vertical Misconvergence

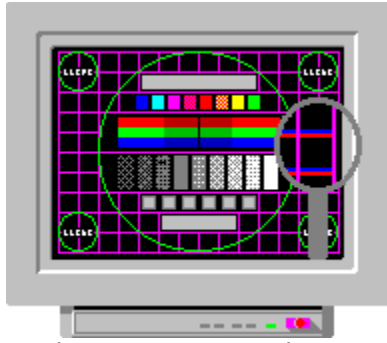




Colours are on the same line NO MISCONVERGENCE



Colours are not on the same Vertical line; Horizontal Misconvergence



Colours are not on the same Horizontal line; Vertical Misconvergence

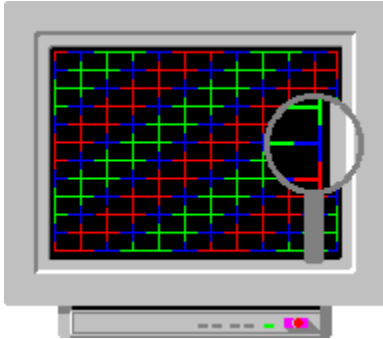
## **CONVERGENCE / How to measure it?**

 Use convergence test pattern.

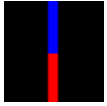
For services and other monitor expert users:

 Use a Convergence-meter; Convergence Gauge.

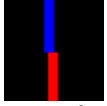
## CONVERGENCE / "Measure convergence error"



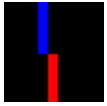
"Click" magnifying glass



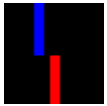
No convergence error.



"a Little" convergence error.




"One pixels width" converge error.

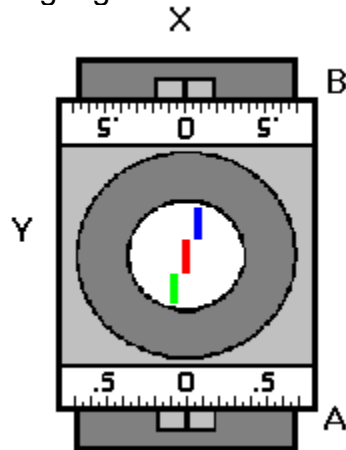


"Big" convergence error.

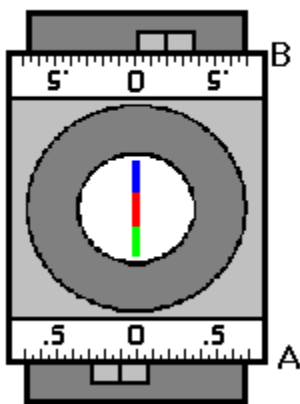
## CONVERGENCE / "Measure convergence error"

1. Use white crosshatch  test pattern
2. Adjust contrast to near maximum
3. Adjust brightness so that background just disappears

The use of Klein CM7AR Convergence Gauge has been explained here but other types of gauges can be used as well.



4. Place the Gauge on the line with marking Y up upwards when measuring horizontal line.
5. Place the Gauge on the line with marking X up upwards when measuring vertical line.
6. If the line has convergence error, the line in the window seems to be broken.
7. Use knobs A and B to adjust the line continuous.



8. If the readings are on the opposite side of zero, the convergence error is  $A+B$  (e.g.  $0.2+0.1 \rightarrow 0.3$ ).
9. If readings are on the same side of zero, the convergence error is equal to A if  $A > B$  and B if  $B > A$ .

## **CONVERGENCE / What you can do?**

READ THE OWNER`S MANUAL OF THE MONITOR.

- DEGAUSSING
- CHANGE IMAGE POSITION
- CHANGE IMAGE SIZE
- CHANGE RESOLUTION
- USE DIFFERENT COLOURS
- COLOUR COMBINATIONS
- ADJUST STATIC CONVERGENCE
- ADJUST DYNAMIC CONVERGENCE

ATTENTION



## Degaussing

Stray magnetic field can affect convergence.

Press Manual Degaussing, once, if Your monitor does not have a Manual Degaussing possibility, then Degaussing is performed automatically, but only when the monitor is powered on after 1/2 hours off-time.

## Change image position

Convergence is generally worst on the periphery of the image ( one side or corner ).

Shift the image away from the worst side or corner, this will reduce the problem.

## Change image size

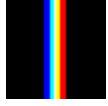
Convergence is generally worst on the periphery of the image ( one side or corner ).

Resize the image away from the worst side or corner, this will reduce the problem.

## Change resolution

The same Convergence error is not so visible into smaller resolution, because Theoretical Pixel Size is bigger.

e.g. 0.30mm convergence error is clearly visible if Your pixel size is



0.25mm, but the same error is not so critical, if Your pixel size is



0.40mm.

## Use different colours

You can use different colours to have a good contrast, because in lower contrast (and brightness) level convergence error is not so visible.

## Colour combinations

You can use different colour combinations depending what kind of convergence error you have on your monitor.

What are the combinations.

-  Red +
-  Blue ->
-  Magenta
-  Green +
-  Blue ->
-  Cyan
-  Green +
-  Red ->
-  Yellow

If You have RED-BLUE convergence error

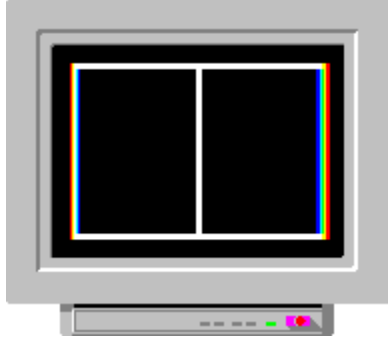
Don`T use Magenta, Red and Blue together but use Cyan, Green and Blue together or use Yellow, Green and Red together.

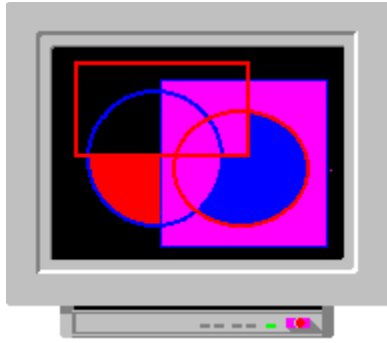
If You have RED-GREEN convergence error

Don`T use Yellow, Red and Green together but use Cyan, Green and Blue together or use Magenta, Red and Blue together.

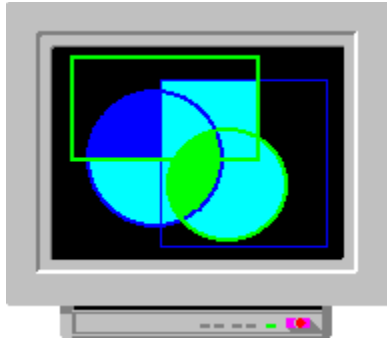
If You have GREEN-BLUE convergence error

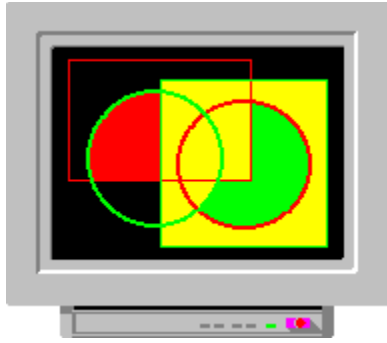
Don`T use Cyan, Green and Blue together but use Magenta, Red and Blue together or use Yellow, Green and Red together.

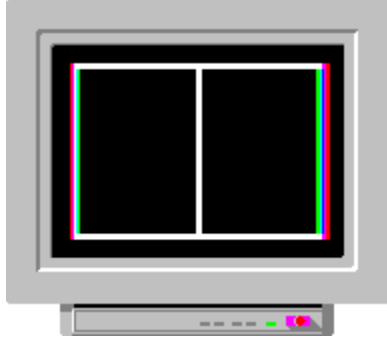


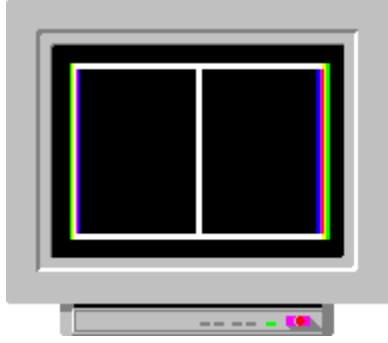












## Static convergence adjustment

Static convergence is usually set by convergence magnets that are mounted on the yoke assembly on the neck of the picture tube.

Some of the Monitors has also 1 or 2 Convergence Controls, they affect convergence over the entire screen. Each control is used to converge Red and Blue lines onto the Green line as closely as possible. If there are 2 controls, one affect vertical convergence and the other horizontal.

## Dynamic convergence adjustment


Dynamic convergence is usually adjusted with various internal potentiometers that vary the voltages to the deflection coils in the yoke assembly.

Some of the Monitors includes Dynamic Convergence Controls. It generally divide the screen up into zones, and allow the convergence in each zone to be independently adjusted.

FIRST ADJUST/CHECK ANY STATIC CONVERGENCE FOR PERFECT CONVERGENCE AT THE CENTER OF THE SCREEN.

## CONVERGENCE / Recommendations

Nominally The Misconvergence is specified like : less than 0.25 mm (center) and less than 0.35 mm (elsewhere).

That CENTER means that big circle in the middle of the test picture .

It`s highly recommended that misconvergence is smaller than theoretical pixel size.

## Change system colours intensity

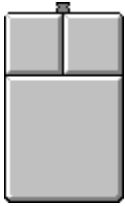
Use Windows Control Panel to change system colours intensity.  
(follow Windows Control Panel Help instructions how to do this).



PICTURE WIDTH / RESOLUTION -> THEORETICAL PIXEL SIZE

MONITOR SIZE	RESOLUTION	THEORETICAL PIXEL SIZE
21"	1600 x 1200	0.25mm
	1280 x 1024	0.31mm
	1152 x 870	0.35mm
	1024 x 768	0.39mm
	832 x 624	0.48mm
	800 x 600	0.50mm
	640 x 480	0.63mm
17"	1280 x 1024	0.25mm
	1152 x 870	0.27mm
	1024 x 768	0.31mm
	832 x 624	0.38mm
	800 x 600	0.39mm
	640 x 480	0.49mm
15"	1024 x 768	0.27mm
	832 x 624	0.34mm
	800 x 600	0.35mm
	640 x 480	0.44mm

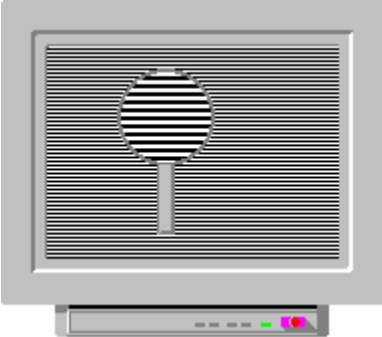
## RESOLUTION TOOLS



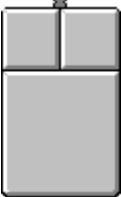
How to use the Resolution tools: Push mouse left button to see ( left change resolution, right go to next image).

This tool is useful for checking whether the CRT is capable of displaying finely spaced lines across the entire CRT image area. Both horizontal and vertical resolution can be checked.

# RESOLUTION TOOLS

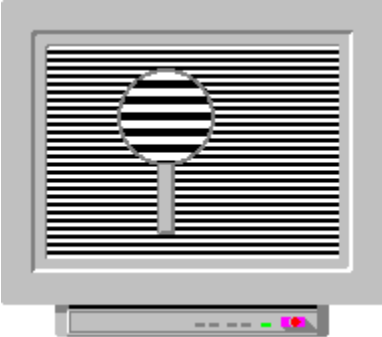


Testing; Vertical Resolution 1/1 pixels

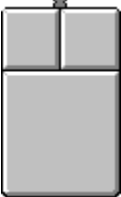


Left:Change resolution    Right: Horizontal resolution

# RESOLUTION TOOLS

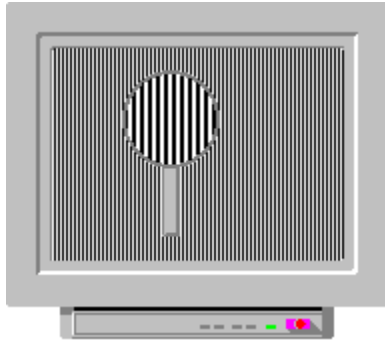


Testing; Vertical Resolution; 2/2 pixels

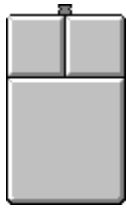


Left:Change resolution    Right: Horizontal resolution

# RESOLUTION TOOLS



Testing; Horizontal Resolution 1/1 pixels

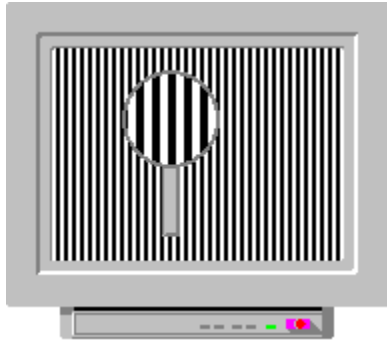


Left: Change resolution    Right: Quit

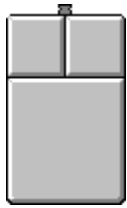
Note: This is an extreme test for CRTs running in high(800x600 +) resolution modes(especially 15" or smaller monitors). Because of the way the electron beams scan the CRT screen, the beams must turn completely on and then completely off within the span of 1 pixel. This stresses both the electronics of the video adapter card and the monitor.

If you can't see the individual white lines you might see interference patterns, indicating the dot pitch is probably too coarse, or you might see a gray screen, indicating the video adapter or the video amplifier of the monitor is probably too slow for this resolution/image-size combination. The solution to this kind of problem is to either run your monitor at a lower resolution, or get a monitor with a larger image area.

# RESOLUTION TOOLS

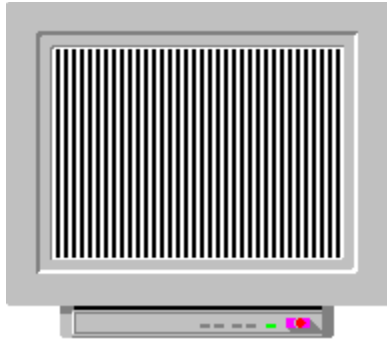


Testing; Horizontal Resolution 2/2 pixels

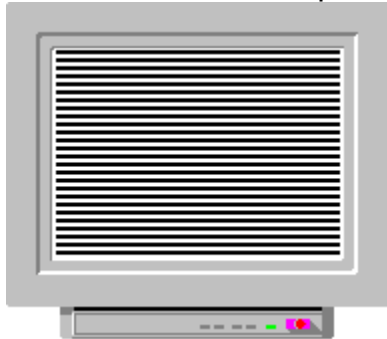


Left: Change resolution    Right: Quit

## RESOLUTION / What is it ?



This is a number of Picture Elements or Pixels, that are used to produce image on the display. The Pixel Resolution of image is specified by: the number of pixels in each Horizontal Row e.g. How many Vertical lines is possible to see, if the horizontal resolution is 800 it's possible to see 400 white/black lines ( 1pixel/1pixel).



And by the number of pixels in each Vertical Column on the screen, e.g. How many Horizontal lines is possible to see, if the vertical resolution is 600 it's possible to see 300 white/black lines ( 1pixel/1pixel).

Nominally used formula is  $H \times V$  e.g.

640 x 480 -> 307200 addressable pixels.

800 x 600 -> 480000 addressable pixels.

1600 x 1200 -> 1920000 addressable pixels.

Most popular resolutions are 640x480, 800x600, 832x624, 1024x768,

1152x870, 1280x1024 and

1600x1200. see: [theoretical pixel size.](#)

## Maximum resolution

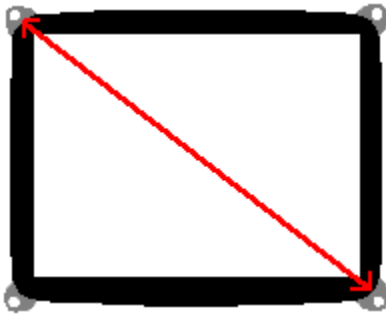
Maximum resolution depends:

- + CRT-size,
- + Dot pitch or
- + Aperture Grill,
- + Video Amplifier`s Bandwidth
- + Dot Frequency
- + Rise-Fall time and

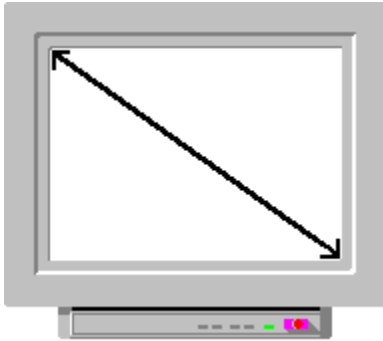
Video adapter card and it's always a combination of them.



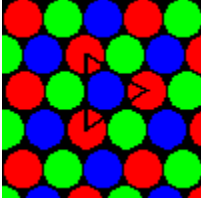
Most popular CRT-sizes are 14", 15", 17", 20" and 21".



CRT size is measured diagonal dimension of TUBE



Visible area is always smaller than CRT`s face value e.g. 15" CRT gives You 13.7" diagonal visible.



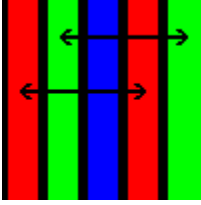
Dot-pitch is a shortest distance between same coloured dots. Most common dot-pitches are 0.31mm, 0.28mm, and 0.26mm.

Low resolution. Dot pitch 0,44 to 0,47 mm

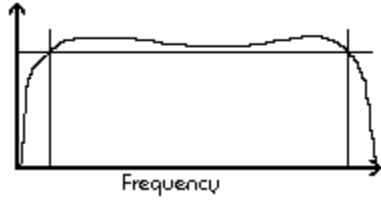
Medium resolution. Dot pitch 0,32 to 0,43 mm

High resolution. Dot pitch 0,28 to 0,31 mm


Ultrahigh resolution. Dot pitch 0,21 to 0,27 mm

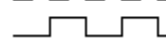


"Dot-pitch" is a shortest distance between same coloured grills. Most common dot-pitches are 0.31mm, 0.28mm, and 0.26mm.



Amplifier bandwidth is specified -3dB points. Bandwidth;  $F_{max} - F_{min}$  (-3dB). But it's more realistic to talk about Video Dot Frequency and Rise/Fall times.

 **Dot Frequency**

 **Video Signal**

Dot Frequency is two times higher than Video Frequency.  $1/\text{PIXEL TIME} \rightarrow \text{DOT FREQUENCY}$ .

e.g. 200MHz dot frequency  $\rightarrow$  pixel time is 5ns ( $1/200\text{MHz}$ )  $\rightarrow$  100MHz video signal frequency ( $1/(5\text{ns}+5\text{ns})$ ).

This is one most important property of video amplifier.  
Factor between rise/fall-times and bandwidth:  
 $0.35/(\text{rise-time}) \rightarrow \text{bandwidth}$ .

Example:

$0.35/3.5\text{ns} \rightarrow 100 \text{ MHz}$

## Recommendations

It's recommend to use following maximum resolutions:

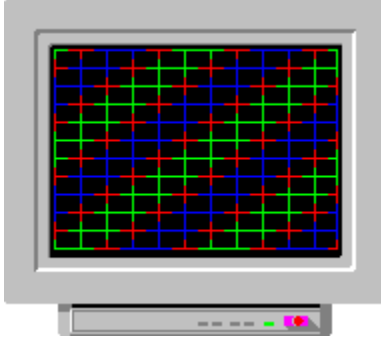
15"    800 x 600    highly recommended  
      1024 x 768    recommended  
      1280 x 1024    very special applications, see dot pitch

17"    1024 x 768    highly recommended  
      1280 x 1024    recommended, some applications  
      1600 x 1200    very special applications, see dot pitch

21"    1280 x 1024    highly recommended  
      1600 x 1200    recommended

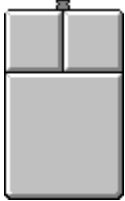
Note: Using a high resolution on a too small screen makes the characters unreadable at normal viewing distance. Closer viewing distance to the monitor can cause eye strain or musculoskeletal fatigue.

## How to use Convergence Tool?



left;change colours

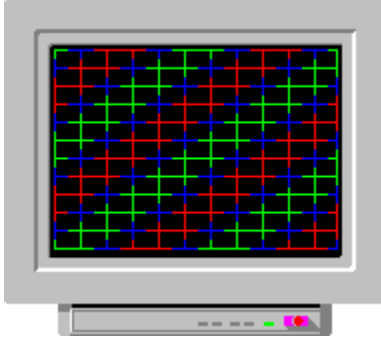
right;back to start-up tool



Use this test pattern to check convergence error, How, look:  
MISCONVERGENCE / How to identify it?



## How to use Convergence Tool?



left;change colours

right;back to start-up tool

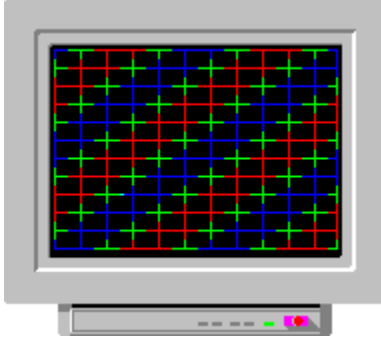


Use this test pattern to check convergence error, How, look:  
MISCONVERGENCE / How to identify it?

## How to start?

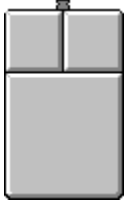
1. Use "Geometry Tools" to adjust picture in correct shape
2. Tune Brightness and Contrast by using "Brightness and Contrast Tool"

## How to use Convergence Tool?



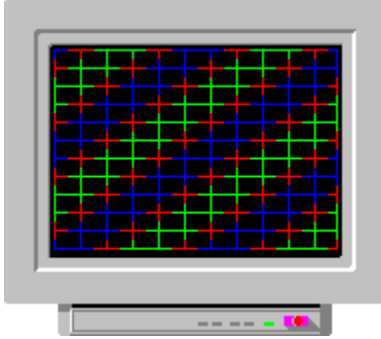
left;change colours

right;back to start-up tool



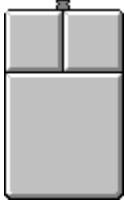
Use this test pattern to check convergence error, How, look:  
MISCONVERGENCE / How to identify it?

## How to use Convergence Tool?



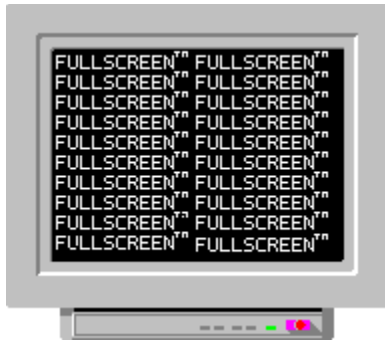
left;change colours

right;back to start-up tool

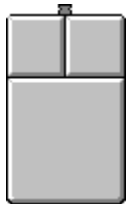


Use this test pattern to check convergence error, How, look:  
MISCONVERGENCE / How to identify it?

## How to use Readability Tools

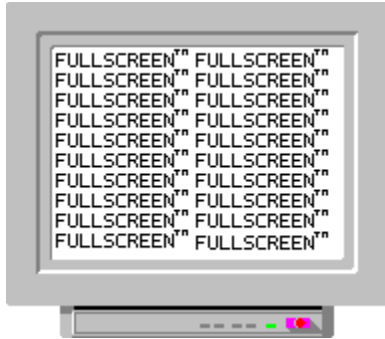


Use this pattern to check whether text is readable across the screen. The text should be readable, and all parts of each letter should be clear. If there are alignment problems you might notice color fringing or bad focus; in any case the text will not appear sharp, possibly even unreadable.

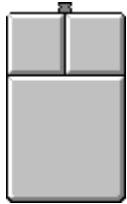


**How to use the Resolution tools:** Push mouse left button to see. ( left invert, right go to main menu)  
Note: If you have too high resolution on a small screen, it will be extremely difficult to get readable text because the alignment tolerances are too tight.

## How to use Readability Tools

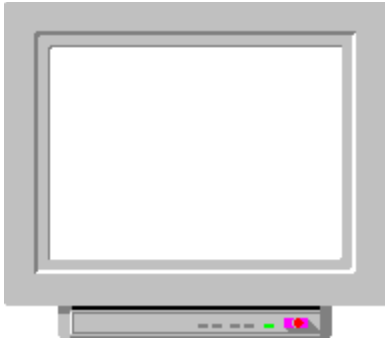


Use this pattern to check whether text is readable across the screen. The text should be readable, and all parts of each letter should be clear. If there are alignment problems you might notice color fringing or bad focus; in any case the text will not appear sharp, possibly even unreadable.

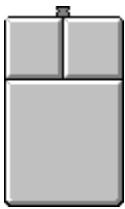


**How to use the Resolution tools:** Push mouse left button to see. ( left invert, right go to main menu)  
Note: If you have too high resolution on a small screen, it will be extremely difficult to get readable text because the alignment tolerances are too tight.

## How to use Colour Tools?



This is for testing; White Uniformity and Flickering




left;change colour

right;next step

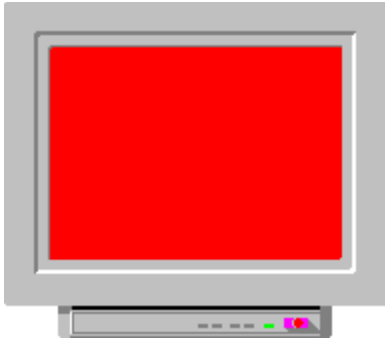
## Common problems.

 Bandwidth, rise/fall-time problem.

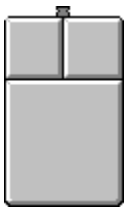
 Over shooting problem.



## How to use Colour Tools?



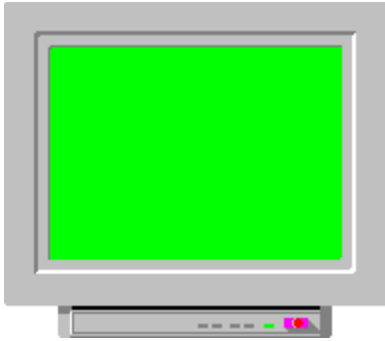
This is for testing; Red Uniformity, Colour Purity and flickering



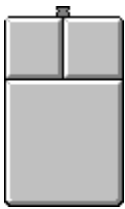
left;change colour

right;next step

## How to use Colour Tools?



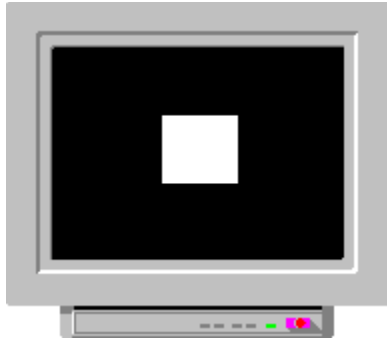
This is for testing; Green Uniformity, Colour Purity and Flickering



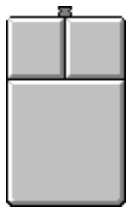
left;change colour

right;next step

## How to use Colour Tools?



This is for testing; White amplitude



left;change colour

right;Quit

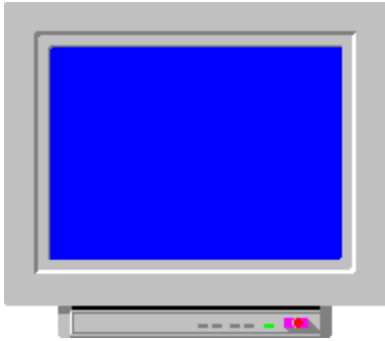
The test pattern is not a full screen pattern, since then the electron guns would be working "full power" all the time. The best pattern is square in the middle of a black screen. This will give more natural "average picture level" i.e. a more normal level of average beam current.

## Degauss the screen

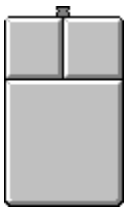
On colour monitors, stray or varying external magnetic fields will affect colour purity. Whenever the monitor is moved or rotated in position, it experiences a change in the earth`s magnetic field, which also affects colour purity. Degaussing removes the effects of all magnetic field changes.

see: [What to do / Misconvergence.](#)

## How to use Colour Tools?



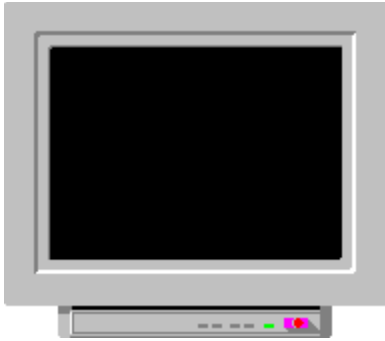
This is for testing; Blue Uniformity, Colour Purity and Flickering



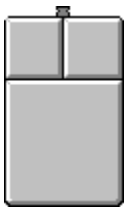
left;change colour

right;next step

## How to use Colour Tools?



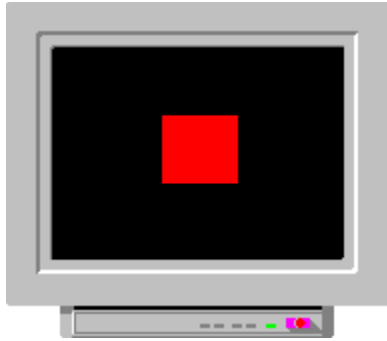
This is for testing; Black level or "Cut-off"



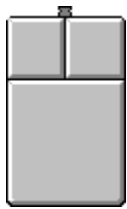
left;change colour

right;next step

## How to use Colour Tools?



This is for testing; Red amplitude

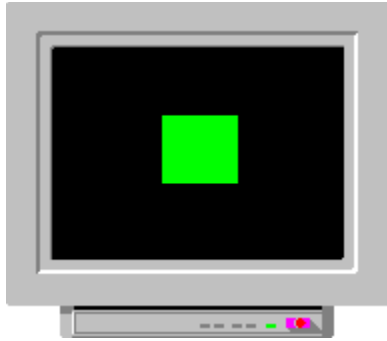


left;change colour

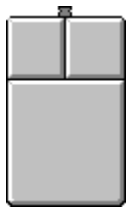
right;next step

The test pattern is not a full screen pattern, since then the electron guns would be working "full power" all the time. The best pattern is square in the middle of a black screen. This will give more natural "average picture level" i.e. a more normal level of average beam current.

## How to use Colour Tools?



This is for testing; Green amplitude



left;change colour

right;next step

The test pattern is not a full screen pattern, since then the electron guns would be working "full power" all the time. The best pattern is square in the middle of a black screen. This will give more natural "average picture level" i.e. a more normal level of average beam current.



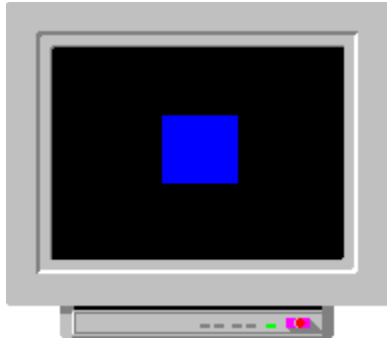
## What are Colours?

Colours are something we see with our eyes. This something is rays of light, electromagnetic waves between 380 nm and 780 nm.

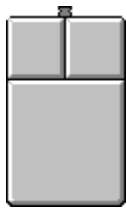
Your eyes pick up the electromagnetic waves, and then your brain translates this into something we call "colour".

Colours Only Exist Inside Our Brains, this means that one person may see colours slightly differently than the next.

## How to use Colour Tools?



This is for testing; Blue amplitude



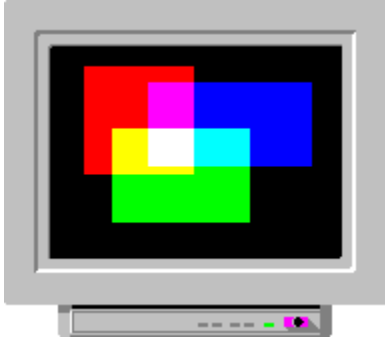
left;change colour

right;next step

The test pattern is not a full screen pattern, since then the electron guns would be working "full power" all the time. The best pattern is square in the middle of a black screen. This will give more natural "average picture level" i.e. a more normal level of average beam current.

## How Monitor make Colours?

Monitor use as called "additive colours mixing".



This is because when we add red, green and blue light together to get white. This is exactly what happens in a colour monitor. When we want white on the screen, we turn on the electron gun hitting the red, green and blue phosphors, together the phosphors then emit white light.

## How many colour?

### 16 Color Modes

To make 16 different colours on your screen takes 4bit/pixel of video memory. If you are running Windows in a 16 color mode, then you will see dithered patterns. Switch to a 256 color mode, which doesn't use dithering.

### 256 Color Modes

To make 256 different colours on your screen takes 8bit/pixel of video memory. In 256 color modes, the video board can display any 256 colors from a palette of 262,144 available colors. Each primary color has 64 intensity levels.

### High Color

To make 65K different colours on your screen takes 16bit/pixel, of video memory. In "High Color" modes, the video board can display either 32,768 colors or 65,536 colors.

Each primary color has 32 intensity levels, except for green in the 65K mode, which has 64 levels.

For using this colour mode you need at least 2M video memory in 1024 x 768 (or 1152 x 882) resolution.

### True Color

To make 16.8M different colours (more than the eye can readily distinguish) on your screen takes 24bit/pixel of video memory.

Each primary colour have 256 intensity levels.

For using this colour mode you need at least 2M video memory in 800 x 600 resolution.

## Before You start

Be sure that the monitor has been on at least 20-30 minutes before you start doing any Comparisons

**Copy following files to diskette:**

NTEST.EXE	Program file
NHELP.HLP	This help file
NTEST.INI	Initialization file

## What You can do?

- Demagauss the Screen
- Change Monitors direction
- Nearby Equipments

FOR SPECIALIST ONLY, Like monitor services, technical people etc.

- Badly aligned Colours
- Correctly aligned Colours
- Adjust Black Level or "Cut-off"
- Adjust High Level White Balance or Tint

## Change Monitors direction

By convention, monitors are generally adjusted in the factory Facing East. The monitor should produce it's best colour purity in that direction.



## Nearby Equipments

Any nearby equipments which generates a magnetic fields , speakers, computers, old telephones, external disk drivers, CD-roms etc. can affect colour purity.

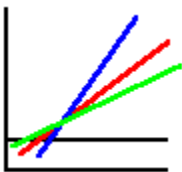
Make sure that you don` t have Fans, External power transformers (fluorescent lights), any motorized or solenoid actuated appliances nearby your Monitor.

## Adjust Black Level or "Cut-off"

**THIS IS NOT RECOMMENDED, IF YOU DON'T HAVE A INSTRUMENTS LIKE A COLOUR ANALYZER. TAKE A CONTACT TO THE SERVICE**



The first step is to feed the monitor a signal which is black. You should now adjust the brightness so you are just able to see the background ( 2 cd/m<sup>2</sup>, if you have a color analyzer to do this). The second step is to adjust the red, green and blue cut-off controls of the monitor until the colour analyzer says you have the colour of "daylight" at low level.



What we are doing here is adjusting the position of each of the individual curves up and down until we have the correct balance in low level. That means: all three lines cross each other in low level.

## Adjust High Level

**THIS IS NOT RECOMMENDED, IF YOU DON'T HAVE A INSTRUMENTS LIKE A COLOUR ANALYZER. TAKE A CONTACT TO THE SERVICE**



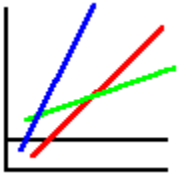
Feed the monitor a white signal. Use a colour analyzer to check if the colour is "daylight", at the correct level e.g. 100 cd/m<sup>2</sup> (adjusted by contrast control). Adjust the red, green and blue gain controls of the monitor until it does.



What we are doing here is adjusting the position of each of the individual curves up and down until we have the correct balance in low and high level . That means: all three lines cross each other in low level and the maximum light output level.

**REPEAT CUT-OFF ADJUSTMENTS AND THEN WHITE LEVEL UNTIL YOU HAVE THE SAME COLOURS ON "BLACK" AND "WHITE".**

## Badly aligned Colours



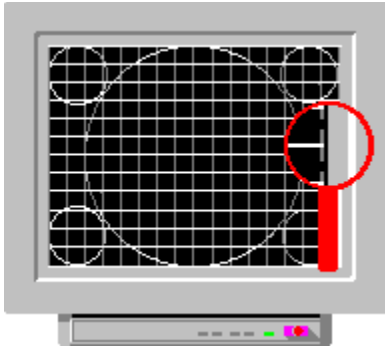
Here you'll see how the light output of red, green and blue phosphors vary with the beam current of the three electron guns. This is a badly aligned monitor.

## Correctly aligned Colours



Here you`ll see how the light output of red, green and blue phosphors vary with the beam current of the three electron guns. This is a correctly aligned monitor.

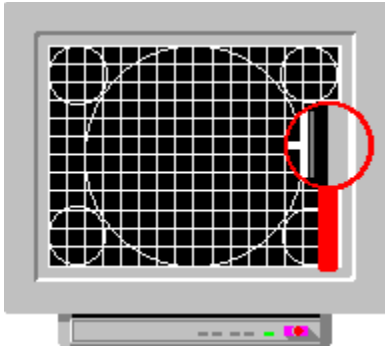
## Bandwidth, rise/fall-time problem



If your picture look like this. You have a problem.

1. Check all cabling between monitor and computer.
2. You have a poor video board in the your computer, this is quit common problem (in cheep video boards). Even the best monitors can` t solve this problem, only solution is to buy a new video board or cheeper way is to use lower resolution.
3. You have a poor video amplifier in your monitor or you try to use monitor out of it`s specified properties. Solutions is a same as before (section 2).





## Over shooting problem



If you have picture like this, you might have a "over shooting" problem, and you see like a "shadows" behind the white line ( or black line if you have a white background like in windows for example). Normally this is a problem of video card, one way to make video board`s out put faster and it start oscillating.

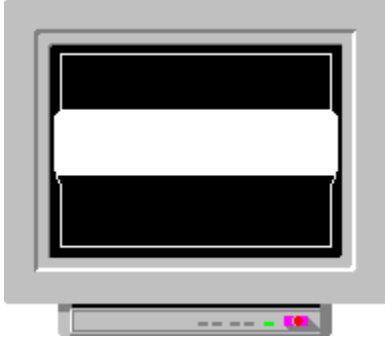
1. Check all cabling between monitor and computer.
2. You have a poor video board in the your computer, this is quit common problem (in cheep video boards). Even the best monitors can`t solve this problem, only solution is to buy a new video board or cheeper way is to use lower resolution.
3. You have a poor video amplifier in your monitor or you try to use monitor out of it`s specified properties. Solutions is a same as before (section 2).

## What you can do?

-  Adjust Focus Control, if available
-  Adjust picture size
-  Decrease Contrast
-  Use different colours. See also: [Convergence/ Use different colours](#)

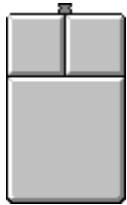
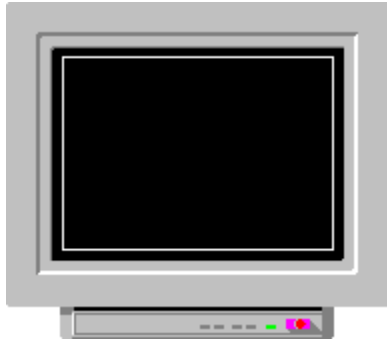
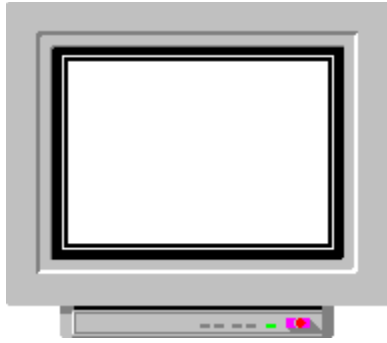


## What is screen regulation?







Some of monitors the image expands in bright areas and contracts in dimmer areas. That is happening because monitor has a poor high-voltage regulation. This effect is more or less visible in all monitors, normally in very cheap monitor models, because design and produce a very good high-voltage regulation system is not inexpensive. If your monitor has a very bad screen regulation, picture is "zooming" when you adjust brightness control. **Example of where this commonly occurs includes bar graphs, Windows Title Bars.**

## How to use screen regulation tools



Click right button of mouse to end the test.  
When picture start blinking, check the white line in left/right side and up/bottom.  
Blinking is merely used to make the effect easier to detect.

## What you can do?

-  Reduce brightness and contrast
-  Reduce background intensity
-  Use different system colours intensity
-  Use primary colours

## Reduce Brightness and Contrast

Reduce Brightness and Contrast controls, so will beam current level decrease and the effect will be smaller.

## Reduce background intensity

Use Windows Control Panel to change background intensity, from white to gray, example.

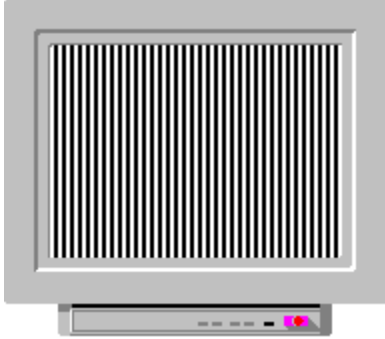
(follow Windows Control Panel Help instructions how to do this).

## Use primary colours

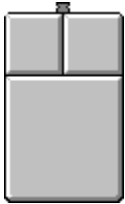
White is made by using all three primary colours, and it will load beam current three times more than only red, green or blue.

Secondary colours like magenta, yellow, and cyan loads beam current two times more than primary colours.

## How to use Moire-Tools?



Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.



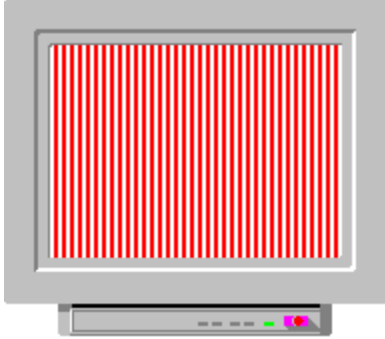
Left:Change colour Right:Change pattern

## What you can do?

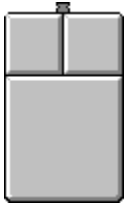
- Adjust Focus
- Increase Contrast
- Change image size
- Change resolution
- Don't use gray or dark gray (dim) backgrounds
- External filters



## How to use Moire-Tools?

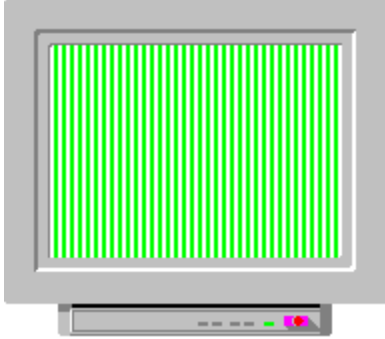


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

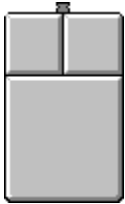


Left:Change colour Right:Change pattern

## How to use Moire-Tools?

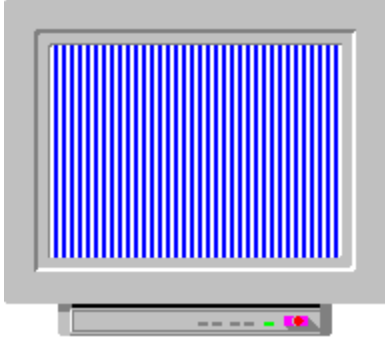


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

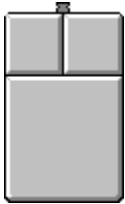


Left:Change colour Right:Change pattern

## How to use Moire-Tools?

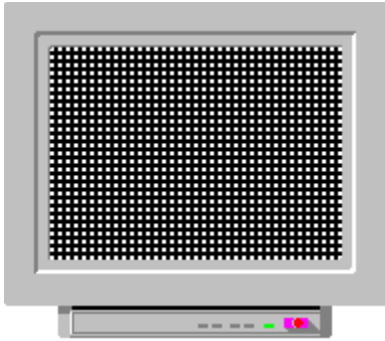


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

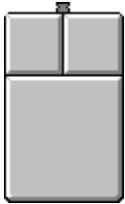


Left:Change colour Right:Change pattern

## How to use Moire-Tools?

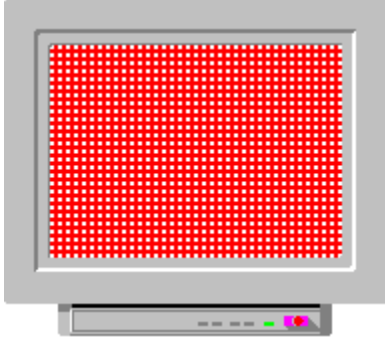


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

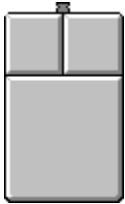


Left:Change colour Right:Change pattern

## How to use Moire-Tools?

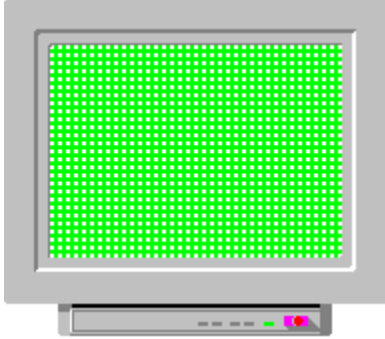


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

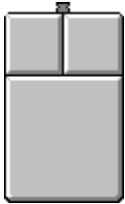


Left:Change colour Right:Change pattern

## How to use Moire-Tools?

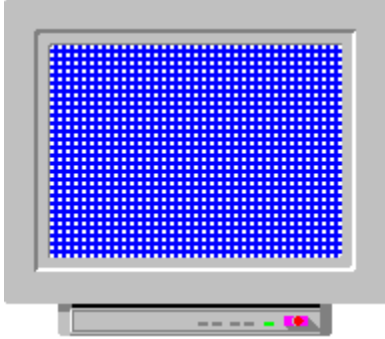


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

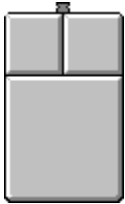


Left:Change colour Right:Change pattern

## How to use Moire-Tools?

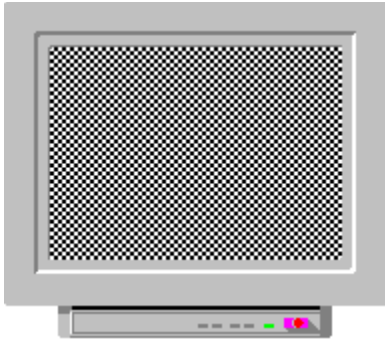


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

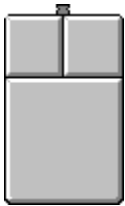


Left:Change colour Right:Change pattern

## How to use Moire-Tools?



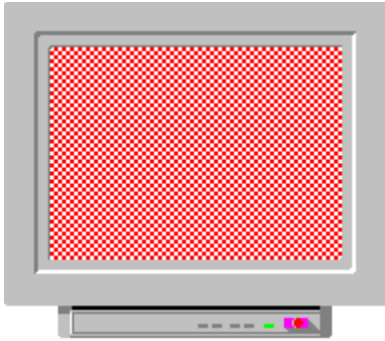
Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.



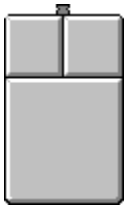
Left:Change colour Right:Quit



## How to use Moire-Tools?

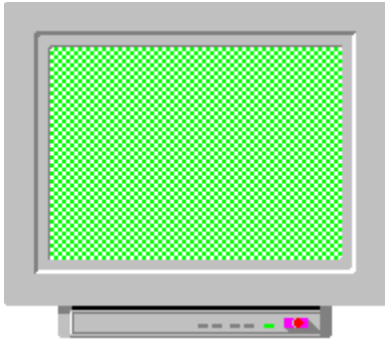


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

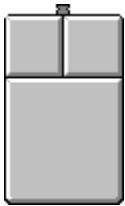


Left:Change colour Right:Quit

## How to use Moire-Tools?

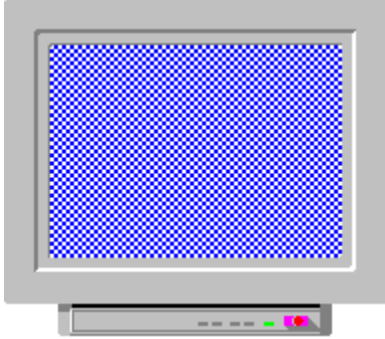


Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.

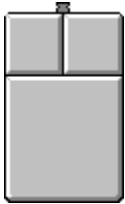


Left:Change colour Right:Quit

## How to use Moire-Tools?



Search for waves, wisps, bundles and shimmers of intensity variations. Use all test tools to check Moire, because the visibility of Moire patterns varies with colours.



Left:Change colour Right:Quit

## Feedback to NOKIA

Dear Madam/Sir

All kind of feedback is very welcome, so please don` t hesitate to take contact to us.

Fax: +46-8-7938441

or by Mail, to following address:

NOKIA MONITORS  
"Nokia Monitor Test V1.0"  
P.O. Box 37  
S-164 93 Kista  
SWEDEN

## Adjust Focus

If Focus adjustment is available, defocus the image, but only slightly. Check the picture focusing by using Focus Tools and/or Readability Tools.

## Increase Contrast

Add Contrast, this will increase the beam current and spot size and defocusing your picture. Check the picture focusing by using Focus Tools and/or Readability Tools.

## Change image size

Adjust picture smaller or bigger, to make Moire less noticeable.

## Change resolution

Reduce resolution, this works allways.



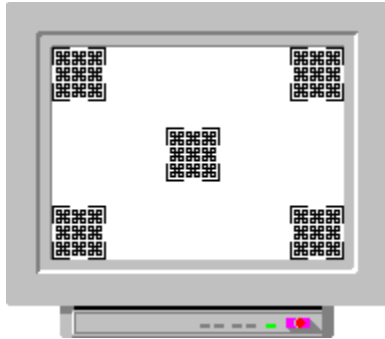
## Don't use gray or dark gray (dim) backgrounds

Use White background colour, this will increase beam current and defocusing your picture. Check the picture focusing by using Focus Tools and/or Readability Tools.

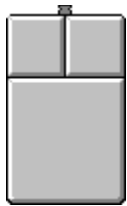
## External filters

Some of external "Low Radiation" filters produces Moire. Check your monitor with and without filter.

## How to use Focus Tools?

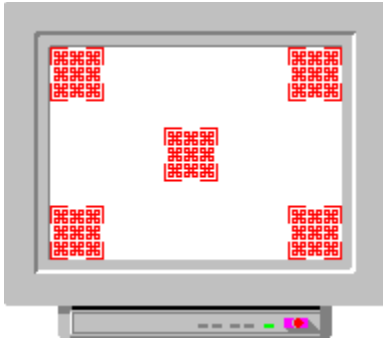


The Focus Tools displays a special patterns in each corner of the screen and in the center. The patterns are displayed in black on white and then main colours on white. This is a difficult test for most monitors when close to their rated resolution. In particular, watch out for differences between the center and corners.

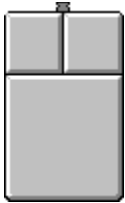


Left:Change colour Right:Change pattern

## How to use Focus Tools?

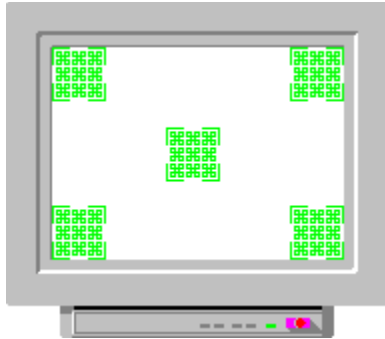


The Focus Tools displays a special patterns in each corner of the screen and in the center. The patterns are displayed in black on white and then main colours on white. This is a difficult test for most monitors when close to their rated resolution. In particular, watch out for differences between the center and corners.

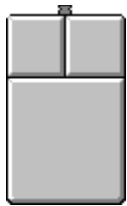


Left:Change colour Right:Change pattern

## How to use Focus Tools?

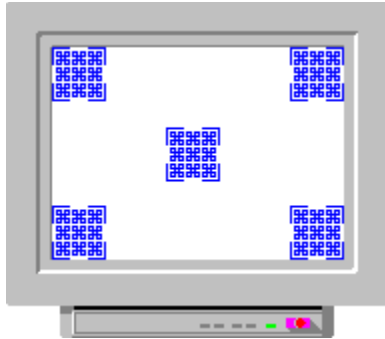


The Focus Tools displays a special patterns in each corner of the screen and in the center. The patterns are displayed in black on white and then main colours on white. This is a difficult test for most monitors when close to their rated resolution. In particular, watch out for differences between the center and corners.

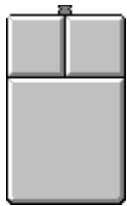


Left:Change colour Right:Change pattern

## How to use Focus Tools?

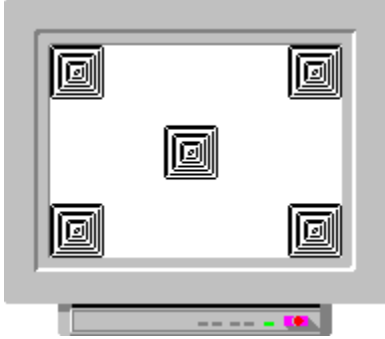


The Focus Tools displays a special patterns in each corner of the screen and in the center. The patterns are displayed in black on white and then main colours on white. This is a difficult test for most monitors when close to their rated resolution. In particular, watch out for differences between the center and corners.

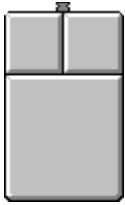


Left:Change colour Right:Change pattern

## How to use Focus Tools?

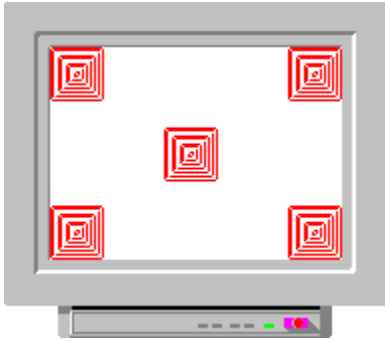


The Focus Tools displays a special patterns in each corner of the screen and in the center. The patterns are displayed in black on white and then main colours on white. This is a difficult test for most monitors when close to their rated resolution. In particular, watch out for differences between the center and corners.

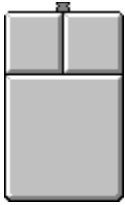


Left:Change colour Right:Quit

## How to use Focus Tools?



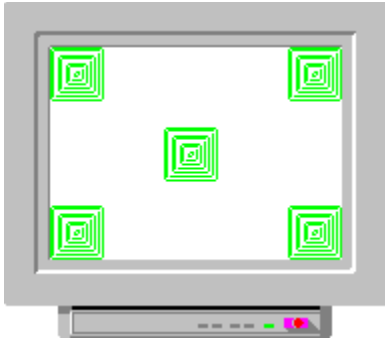
The Focus Tools displays a special patterns in each corner of the screen and in the center. The patterns are displayed in black on white and then main colours on white. This is a difficult test for most monitors when close to their rated resolution. In particular, watch out for differences between the center and corners.



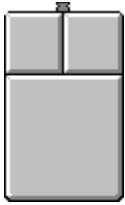
Left:Change colour Right:Quit



## How to use Focus Tools?

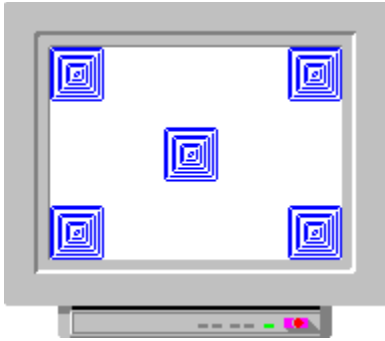


The Focus Tools displays a special patterns in each corner of the screen and in the center. The patterns are displayed in black on white and then main colours on white. This is a difficult test for most monitors when close to their rated resolution. In particular, watch out for differences between the center and corners.

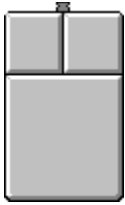


Left:Change colour Right:Quit

## How to use Focus Tools?



The Focus Tools displays a special patterns in each corner of the screen and in the center. The patterns are displayed in black on white and then main colours on white. This is a difficult test for most monitors when close to their rated resolution. In particular, watch out for differences between the center and corners.



Left:Change colour Right:Quit

## What is Focus?

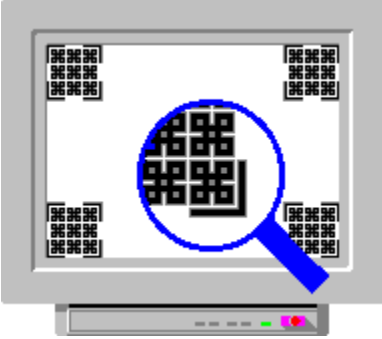
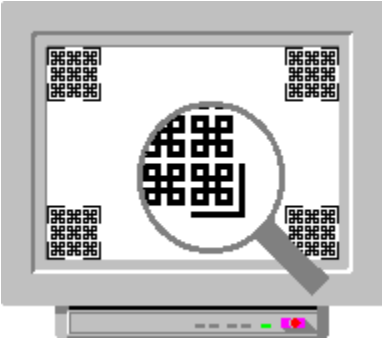


Monitors with good and bad focusing

At bad focused monitor, beam spread, specially in corners.

Focus is not only effect that influence image sharpness, other main reasons are Convergence, Blooming, Video amplifiers bandwidth, and Resolution.

Blooming; if you increase Brightness to high, it will cause the beam to spread and if this spreading is excessive, the monitor will lose sharpness.



## Adjust Focus Control

Adjust from Focus Control so that the pattern are as sharp as possible.

## Adjust picture size

If the focus in corners is a major problem, readjust picture size.

See also: [Convergence](#), [Change image size](#) and [Change image position](#).

## Use different colours

You can use more different colours to make a good contrast than contrast control, then it's possible to use lower contrast-level and have better FOCUS, for example use blue and cyan.



## Decrease Contrast

Decreasing contrast will sharpen the image, by reducing the thickness of the beam.



