19in monitors

We put 15 of the best CRTs through our demanding tests

If you didn't think you could afford a 19in monitor, think again. With prices starting at £135, and flat-screen displays available from £199, there's never been a better time to upgrade your old monitor. If there's enough space on your desk, one of these 15 displays will show you what you've been missing.

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The chief benefit of a larger screen is obvious: more Desktop space. All the 19in screens on test perform at their best at 1,280 x 1,024, with flicker-free and generally sharp images. Some can even be pushed to 1,600 x 1,200, providing enough screen estate to open apps side by side. This extra space isn't just a luxury either. Research shows that the bigger the screen, the more effectively we work.

But you shouldn't buy a monitor just because it supports higher resolutions. Sharp focus, good geometry and colour purity are all key factors in a display's performance, which is why we test these screens so thoroughly (*see Performance analysis, p74, for more details*).

We also go through the looking glass (*p82*) to see how the different monitor technologies work. But the main purpose of this group test is to highlight the best 19in monitors out there, and no matter how much money you have to spend, this comprehensive group test will hold the answer.

As our tests show, even the least expensive screen can't be dismissed as a bargain-basement offering – in fact, it walks away with an award. But if you've got slightly more money in the bank, our Labs Winner, costing a very reasonable £248, might just persuade you to opt for the bigger picture.

CONTENTS

Performance analysis

How we test the monitors and what the results mean in practice

Many monitors use the same cathode ray tubes and boast the same specifications, but they don't all offer the same level of performance. Manufacturers like to differentiate their offerings, by adding bonus features or advanced electronics. So, the 15 monitors we test this month all have different characteristics that aren't immediately obvious to the eye.

We use DisplayMate for Windows Multimedia Edition 2 for examining each monitor. It's a comprehensive suite of tests for most types of computer-based displays, and it generates hundreds of test patterns specifically designed to highlight flaws. As this test methodology is almost entirely subjective, two people assess each monitor independently.

We test each 19in monitor at a resolution of 1,280 x 1,024 at a 32-bit colour depth with a refresh rate of 85Hz. We use the cable supplied with the monitor, as its quality can affect the image displayed. Each monitor is connected to our *PC Pro* test rig, which is fitted with a Matrox Millennium G450 graphics card. We connect each monitor in turn, install any colour profiles they come with and let them warm up for 30 minutes.

All the results for the tests can be found in the table below, while the three graphs summarise the monitors' performance in the areas of geometry and distortion, sharpness and resolution, and colour and greyscale.

BASIC SETUP

Before testing, we make sure the contrast and brightness controls are correctly set against grey and black level test screens. We also use several geometry test screens to adjust the monitor's geometry, particularly linearity, to ensure the fairest conditions. We then use 34 test images to examine the following areas.

Geometry and distortion

First, we look at the geometry of the screen, checking whether images are properly shaped. For instance, squares should be truly square, lines straight and a ten-pixel gap should be the same size all over the screen.

To test the overall shape of the image, we use the keystone/trapezoid and pincushion/barrel distortion screens. These highlight a monitor's tendency to distort at the edges of the screen. We also check for both horizontal and vertical bow and curvature. CRTs, by their nature, turn straight lines into curved lines, which have to be straightened by the display's circuitry. We look at the screen from a face-on position and check that parallel straight lines actually appear straight and parallel.

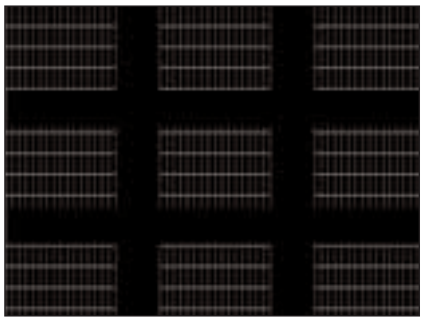
The geometric and block linearity tests look for geometric distortion by displaying a crosshatch pattern across the screen. We check the boxes are the same size and perfectly square.

Our final check in this section is for power

DISPLAYMATE TEST RESULTS

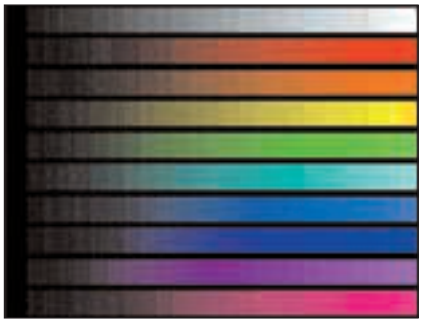
	ADI MicroScan M900	CTX PR960F	Eizo FlexScan T766	Hansol 920D	Hansol 920P	Hitachi CM715ET	Hitachi CM721FET	Iiyama Vision Master Pro 454	LG Flatron 915FT Plus	Mitsubishi Diamond Pro 920	NEC MultiSync FE950+	Philips 109S40	Samsung SyncMaster 959NF	Sony Multiscan CPD-G420	ViewSonic G90f
GEOMETRY AND DISTORTION															
Keystone/trapezoid	1	0	1	1	0	0.5	1	0.5	1	0.5	1	1	0	1	1
Pincushion/barrel distortion	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1
Horizontal bow and curvature	0.5	0	0.5	0.5	0	0.5	0	1	0	1	0.5	0	1	0	1
Vertical bow and curvature	0.5	0	0	0	1	0.5	0.5	0.5	1	0	1	0.5	0.5	1	1
Geometric linearity*	1	0.5	1	0.5	1.5	0	0.5	1	1	0.5	1.5	0.5	0	1	1
Block linearity	0.5	0	1	0	0.5	0	0	1	1	0.5	1	0.5	0	0.5	1
Screen regulation	1	0	1	0.5	1	1	1	1	1	0	0	1	1	1	1
SHARPNESS AND RESOLUTION															
Focus of text*	0.5	0.5	1.5	1	1	0.5	1	2	1	1	1	0.5	1	2	1
Focus matrix*	0	0.5	1	1	1.5	1	1	2	1.5	1	1.5	0.5	2	2	1
Horizontal bar resolution	0	0	1	0	1	0	0	1	1	1	1	0.5	0.5	1	0
Full-screen H-line resolution	0	0	0	0	0.5	0	0	1	1	1	0.5	0.5	0	0.5	0
Horizontal resolution wedge	0	0	0.5	0	0	0	0	0	0.5	0.5	0	0	0	0.5	0
Full-screen V-line resolution*	1	0.5	2	1	1	0	1	1.5	1.5	1.5	1.5	1	1.5	2	1
Vertical resolution wedge*	1	1	2	1	1	0	1	2	1	1.5	1	0.5	1	2	0
Corner resolution	0	0	0.5	0	0	0	0.5	1	0.5	1	1	0.5	0.5	0.5	0
Transient response	0	0	0	0	0	0	0	0.5	0.5	1	0.5	0	0	0.5	0
Video bandwidth and modulation test	0	0	1	1	0	0	0	1	1	1	0.5	0	1	1.5	0
Line moiré	0.5	0.5	1	0	0	0	0	0	1	1	0.5	1	1	1	1
Fine line moiré	0	0	0.5	0	0	0	0	0	0	0.5	0.5	0	0	0	0
Fine dot moiré	0.5	0	0	0	0	0.5	0.5	0	0	0.5	0	1	0.5	0	0.5
COLOUR AND GREYSCALE															
Horizontal colour registration*	1.5	0	1.5	1	1	1	0	0.5	0	1.5	0.5	2	1	1	1
Vertical colour registration	0.5	0	1	1	0	0.5	0	0.5	0.5	0.5	1	1	1	0.5	0
Colour timing	0	0	0.5	0	0.5	0	0	1	1	0	0	0	0.5	0	0.5
Colour purity R	0.5	0.5	1	0	0	0.5	0	1	0	0	0.5	0	0.5	0	1
Colour purity G	0	0.5	0.5	0.5	0	0.5	0.5	1	0	0	1	0	1	0	0
Colour purity B	0.5	0.5	1	1	0.5	1	1	1	0.5	0	1	1	1	0	0.5
Colour purity white	0	0	1	0	0	0.5	0	1	0	0	1	0	1	0	0
Colour scales (fading consistency)	0	1	1	1	1	1	1	1	1	1	0.5	0.5	0	1	0.5
MISCELLANEOUS															
Screen reflectivity*	0	0.5	1	1	0	0	1	1	2	1.5	2	1	1	0.5	0
Background noise	1	0	1	0	0.5	0	0.5	0.5	1	0.5	0.5	1	1	1	0
Defocusing, blooming & halo	0.5	0	1	0.5	0.5	0.5	1	0.5	0.5	0	0.5	0.5	1	1	1
Mid-range streaking	1	0	1	0	0	0	0	0	0	0.5	0.5	0.5	0	0.5	0.5
White level shift	1	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1
Black level shift	1	0	0	0.5	0	0	0.5	0	0.5	0	0	0.5	0	0	0.5
TOTAL SCORE	15.5	7.5	28	15	15	11	14.5	28	23	21.5	25.5	18.5	21.5	25.5	18

*Distinction (two points) awarded in these categories. Guide to scores: 0 = failed by both assessors; 0.5 = passed by one, failed by another; 1 = pass by both assessors; 1.5 = pass by one assessor, distinction from another; 2 = distinction from both assessors



These boxes should be exactly the same size across the entire screen.

We reduce the font size to 6.8 and check that it's readable in all four corners of the monitor.



Each colour should fade out at exactly the same point to obtain accurate reproduction.

regulation. On most CRTs the image expands in size in brighter areas of the screen and contracts when they're dim, causing distortion. This test uses large blinking boxes of different sizes, surrounded by a thin line. As the box flashes, the line moves, giving an indication of the monitor's power regulation.

Sharpness and resolution

Focus is one of the most important aspects of any monitor. Although all of these 19in displays provide admirable focus in the middle of the screen, they find it more difficult to sustain this quality in the corners. We check all four corners for the focus of text (font size 6.8) and the focus of a tiny geometric image.

The resolution tests assess each monitor's ability to show fine detail, using patterns made of narrow horizontal and vertical lines – each white line is just one pixel thick, and there's a gap of one pixel between each line. We check to see how clearly we can make out the alternate black and white stripes at the tested resolution (1,280 x 1,024). The different resolution tests examine the performance of the monitors across the screen.

The transient response screen checks how much the monitors are affected by the electronics in the display, graphics card and the video cable that connects them. We look out for lines appearing grey rather than black or white and for any fuzziness. We also assess video bandwidth, checking for crisp images.

Our final tests are for moiré. Wave-like patterns mean a lack of synchronisation between the beam and the holes in the shadow mask or aperture grille. We use three checks and pass judgement after using any moiré reduction controls in the monitor's OSD.

Colour and greyscale

In this section, our first tests are for misregistration of the red, green and blue beams. Misregistration can cause coloured fringes around the edges of a line, for example, and is prevalent in the corners of the screen. Many monitors have convergence controls in the OSD and we use these where appropriate.

Colour timing errors have a similar effect to misregistration and are a consequence of the colour signals hitting the phosphor at different times. There are three test bands in the test screen, with an error if blocks have a white gap on one side and a black gap on the other.

We also test for colour purity in red, green, blue and white. This refers to how accurately the RGB beams hit the relevant phosphors on the screen. For example, if the red purity is off slightly, the intensity of red across the screen will vary. If a monitor is particularly bad, you could even see patches of green or blue instead.

Photographers should take particular note of the colour intensity scales test. This highlights how well each monitor displays ten principal colours in 25 intensity levels, which is important when it comes to mixing and matching colours.

Miscellaneous

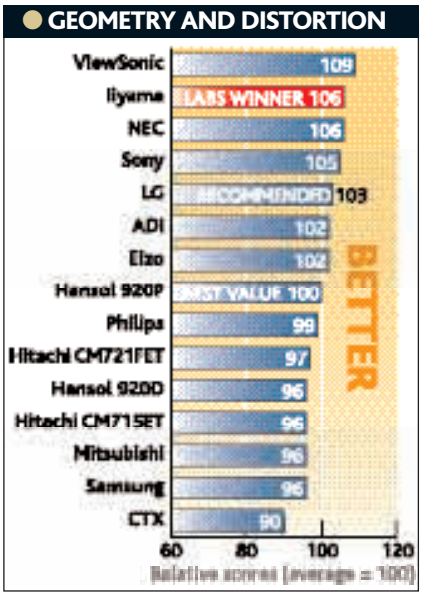
Every monitor includes anti-glare and anti-reflective coating, but some are more effective than others. Setting the screen background to black, we examine the reflected image for distractions such as lights, which make it more difficult to see the display. We also check for electrical or magnetic interference, which should be blocked by the monitor's shielding.

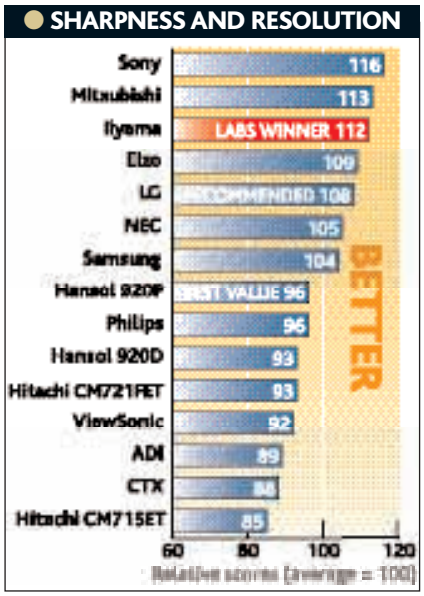
The defocusing, blooming and halos test checks the sharpness of bright image detail. For instance, at high intensities the beam begins to lose focus, so pixels and lines become fuzzy – otherwise known as blooming.

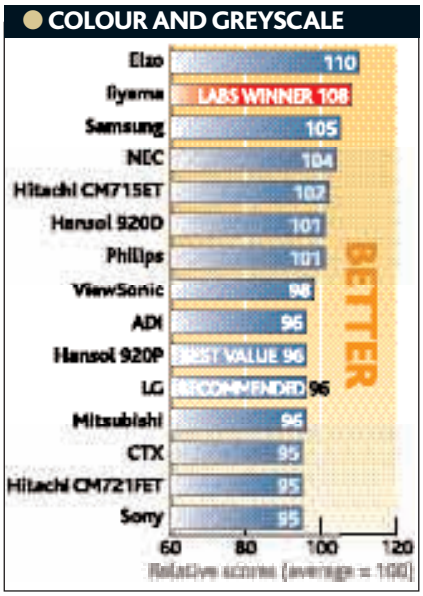
Features

Image quality forms a huge part of our assessment of these monitors, but we also consider their features in our overall rating. The most obvious are extras like USB hubs, speakers and extra inputs, but we also look at the controls offered by the OSD.

Each monitor's overall rating is calculated using a weighted combination of its image quality, features and price.







SPECIFICATIONS AND FEATURES

	ADI MicroScan M900	CTX PR960F	Eizo FlexScan T766	Hansol 920D	Hansol 920P	Hitachi CM715ET	Hitachi CM721FET
Overall score	**100**	**95**	**96**	**100**	**103**	**97**	**97**
Price* (inc VAT)	£159 (£187)	£275 (£323)	£409 (£481)	£199 (£234)	£135 (£159)	£175 (£206)	£239 (£281)
Supplier	Technoworld 020 8200 2000	CCL Computers 01274 471201	Bechtle Direct 01249 467951	dabs.com 0800 138 5182	Jungle 0870 728 7777	dabs.com 0800 138 5182	NexNix 01403 756777
Supplier's Web site	www.technoworld.co.uk	www.cclcomputers.co.uk	www.bechtle.co.uk	www.dabs.com	www.jungle.com	www.dabs.com	www.nexnix.co.uk
Manufacturer's Web site	www.adiuk.com	www.ctxeurope.com	www.eizo.co.uk	www.hansol-uk.com	www.hansol-uk.com	www.hitachi digitalmedia.com	www.hitachidigitalmedia.com
Warranty	3yrs on-site	3yrs on-site	3yrs RTB	3yrs on-site	3yrs on-site	3yrs on-site	3yrs on-site
SCREEN							
Tube type	FST shadow mask	Flat aperture grille (FD Trinitron)	Flat aperture grille (FD Trinitron)	Flat shadow mask (Samsung DynaFlat)	FST shadow mask	FST shadow mask	Flat shadow mask (Samsung DynaFlat)
Measured visible diagonal (in)	18	18.2	17.8	18	17.9	18	17.8
Dot/grille pitch (mm)	0.26	0.24	0.25	0.25	0.26	0.21 (Horizontal)	0.25
Surface treatment (see Key below)	AG, AR, AS	AG, AR, AS	AG, AS, ASc	AG, AR, ASc	AG, AR, ASc	AR	AG, AS
SPECIFICATION							
Maximum resolution @ vertical refresh frequency (Hz)	1,600 x 1,200 @ 75	1,600 x 1,200 @ 87	1,920 x 1,440 @ 76	1,600 x 1,200 @ 75	1,600 x 1,200 @ 75	1,600 x 1,200 @ 75	1,600 x 1,200 @ 75
Recommended resolution @ vertical refresh frequency (Hz)	1,280 x 1,024 @ 85	1,280 x 1,024 @ 102	1,280 x 1,024 @ 85	1,280 x 1,024 @ 85	1,280 x 1,024 @ 85	1,280 x 1,024 @ 85	1,280 x 1,024 @ 85
Horizontal scan range (kHz)	30-96	30-110	30-115	30-96	30-96	31-95	31-95
Vertical scan range (Hz)	50-160	50-160	50-160	50-150	47-160	50-120	50-120
Video bandwidth (MHz)	203	232	280	230	203	79	205
Typical power consumption (W)	115	125	120	110	95	100	110
Power consumption in sleep mode (W)	3.2	<8	3	5	3	<5	<5
CONNECTORS							
D-SUB	✔	✔	✔	✔	✔	✔	✔
BNC	✖	✔	✔	✖	✖	✖	✖
USB upstream	✖	✔	✔	✖	✖	✖	✖
USB downstream	✖	4	4	✖	✖	✖	✖
Captive cable	✔	✖	✖	✔	✔	✔	✔
STANDARDS COMPLIANCE							
sRGB	✖	✖	✔	✔	✔	✖	✖
DDC level (plug and play)	1, 2B	1, 2B	2B	1, 2B	2B	1, 2B	1, 2B
VESA DPMS	✔	✔	✔	✔	✔	✔	✔
EPA Energy Star	✔	✔	✔	✔	✔	✔	✔
MPR-II	✔	✔	✖	✔	✔	✔	✔
TCO 99	✔	✔	✔	✔	✔	✔	✔
BASIC IMAGE ADJUSTMENT CONTROLS							
Brightness	✔	✔	✔	✔	✔	✔	✔
Contrast	✔	✔	✔	✔	✔	✔	✔
Horizontal/vertical position	✔	✔	✔	✔	✔	✔	✔
Horizontal/vertical size	✔	✔	✔	✔	✔	✔	✔
Zoom	✔	✖	✖	✔	✔	✖	✖
Colour temperature	✔	✔	✔	✔	✔	✔	✔
Colour temperature user presets	✔	✔	✖	✔	✔	✖	✖
Degauss	✔	✔	✔	✔	✔	✔	✔
Factory settings recall	✔	✔	✔	✔	✔	✔	✔
GEOMETRY CONTROLS							
Barrel/pincushion	✔	✔	✔	✔	✔	✔	✔
Pin balance	✔	✔	✔	✔	✔	✔	✔
Keystone (trapezoid)	✔	✔	✔	✔	✔	✔	✔
Parallelogram	✔	✔	✔	✔	✔	✔	✔
Rotate/tilt	✔	✔	✔	✔	✔	✔	✔
Horizontal linearity	✖	✖	✖	✖	✖	✖	✖
Vertical linearity	✖	✖	✖	✖	✖	✖	✖
Other	✖	✖	✖	Top and bottom hooking	Top and bottom hooking	✖	✖
ADVANCED CONTROLS							
Horizontal convergence	✖	✔	✔	✖	✖	✖	✖
Vertical convergence	✖	✔	✔	✖	✖	✖	✖
Horizontal moiré	✔	✖	✖	✔	✔	✔	✔
Vertical moiré	✔	✖	✖	✔	✔	✔	✔
General moiré (if neither of the above)	✖	✔	✔	✖	✖	✖	✖
Corner purity	✖	✖	✖	✖	✖	✖	✖
OSD lockout	✖	✖	✖	✖	✖	✖	✖
Other	✖	✖	✖	✖	✖	✖	✖
Cables and other accessories	✖	USB cable	USB cable	✖	✖	✖	✖
Bundled software	✖	✖	✖	✖	✖	E-Color Colorific	✖
DIMENSIONS							
H x W x D (mm)	481 x 470 x 462	469 x 460 x 485	455 x 452 x 478	466 x 470 x 467	466 x 470 x 463	462 x 452 x 472	462 x 452 x 469
Weight (kg)	21	26	27	23	20	21	23

*Prices were correct at time of going to press and include delivery where applicable. Key: AG = Anti-glare, AR = Anti-reflection, AS = Anti-static, ASc = Anti-scratch, HC = High contrast

	Iiyama Vision Master Pro 454	LG Flatron 915FT Plus	Mitsubishi Diamond Pro 920	NEC MultiSync FE950+	Philips 109S40	Samsung SyncMaster 959NF	Sony Multiscan CPD-G420	ViewSonic G90f
	107	104	100	102	101	102	97	100
	£248 (£291)	£245 (£288)	£272 (£320)	£269 (£316)	£178 (£209)	£239 (£281)	£369 (£434)	£209 (£246)
	CCL Computers 01274 471201	dabs.com 0800 138 5182	Jungle 0870 728 7777	Jungle 0870 728 7777	Jungle 0870 728 7777	dabs.com 0800 138 5182	dabs.com 0800 138 5182	Insight 0870 700 7350
	www.cclcomputers.co.uk	www.dabs.com	www.jungle.com	www.jungle.com	www.jungle.com	www.dabs.com	www.dabs.com	www.insight.com/uk
	www.iiyama.co.uk	www.lge.co.uk	www.nec-mitsubishi.com	www.nec-mitsubishi.com	www.pcstuff.philips.com	www.samsung electronics.co.uk	www.sony-cp.com	www.viewsonic europe.com/uk
	3yrs on-site	3yrs on-site	3yrs on-site	3yrs on-site	3yrs on-site	3yrs RTB	3yrs RTB	3yrs on-site
	Flat aperture grille (Diamondtron M²)	LG Flat Tension Mask	Flat aperture grille (Diamondtron NF)	Flat aperture grille (Diamondtron NF)	FST shadow mask	Flat aperture grille (Diamondtron M²)	Flat aperture grille (FD Trinitron)	Flat shadow mask (Samsung DynaFlat)
	17.9	17.9	18.2	17.9	17.9	18	18	17.8
	0.25	0.24	0.24	0.27	0.27	0.24	0.25	0.25
	AR, AS	AR, AS	AR	AR	AG, AR, AS, HC	AR, AS	AR, AS, HC	AG, AR,
	2,048 x 1,536 @ 80	1,600 x 1,200 @ 85	1,920 x 1,440 @ 72	1,792 x 1,344 @ 68	1,920 x 1,440 @ 60	1,920 x 1,440 @ 73	1,600 x 1,200 @ 89	1,600 x 1,200 @ 77
	1,600 x 1,200 @ 100	1,600 x 1,200 @ 85	1,280 x 1,024 @ 85	1,280 x 1,024 @ 85	1,280 x 1,024 @ 86	1,280 x 1,024 @ 85	1,280 x 1,024 @ 104	1,280 x 1,024 @ 89
	30-130	30-107	30-108	31-96	30-92	30-110	30-110	30-97
	50-200	50-200	50-140	50-160	50-160	50-160	48-170	50-180
	345	235	240	270	234	290	120	200
	145	140	120	95	95	110	130	120
	3	3	<5	<5	<3	<3	<3	<3
	2	✔	✔	✔	✔	✔	2 (1 captive)	✔
	✖	✔	✖	✖	✖	✖	✖	✖
	✔	✔	✖	✖	✖	✖	✔	✖
	4	4	✖	✖	✖	✖	4	✖
	✖	✖	✖	✔	✔	✔	✔	✔
	✔	✖	✖	✔	✔	✖	✔	✖
	2B	1, 2B	1, 2B	2B, CI	2B	2B, 2Bi	2B, 2Bi	1, 2B
	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✖	✔
	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✖	✖	✖	✔	✔	✖	✔
	✔	✔	✔	✔	✔	✔	✔	✔
	✖	✔	✖	✔	✔	✔	✔	✔
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	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔	✔
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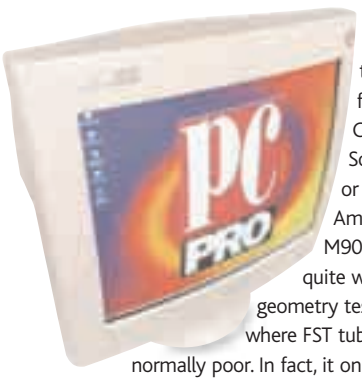
	✖	✖	✖	✖	✖	✖	✖	✖
	✖	✖	✖	✖	✖	✔	✖	✖
	Corner landing	Top and bottom hooking	Top and bottom hooking	Corner balance	✖	Corner balance	✖	Top and bottom hooking
	✔	✔	✔	✔	✖	✔	✔	✖
	✔	✔	✔	✔	✖	✔	✔	✖
	✔	✔	✖	✔	✔	✖	✖	✔
	✖	✔	✖	✖	✔	✖	✖	✔
	✖	✖	✔	✖	✖	✔	✔	✖
	✖	✔	✔	✔	✖	✔	✖	✖
	✔	✖	✔	✔	✖	✖	✔	✖
	OPQ high brightness, save/recall settings	✖	✖	Edge lock	✖	Focus, highlight zone	Top and bottom convergence	✖
	2 built-in 1W speakers, audio cable, USB cable	USB cable	✖	✖	✖	✖	✖	✖
	✖	✖	✖	✖	LightFrame	✖	✖	E-Color Colorific
	450 x 450 x 447	480 x 470 x 470	462 x 454 x 456	449 x 442 x 445	447 x 440 x 440	454 x 440 x 461	471 x 451 x 461	465 x 448 x 459
	24	27	23	23	20	19	26	22

ADI MicroScan M900

PRICE £159 (£187 inc VAT)
SUPPLIER Technoworld 020 8200 2000
VERDICT **The MicroScan acquits itself well against pricier competition, but can't match the cheaper Hansol 920P for quality or features this month.**

As one of the few monitors this month to squeeze under the £200 mark, even including tax, ADI is certainly aiming for the lower end of the market with the MicroScan M900. This isn't necessarily a bad thing, and since £159 isn't an unusual price for a 17in monitor you're effectively given all that extra screen estate for free.

The primary reason for the low price is the M900's FST shadow-mask tube, which remains significantly cheaper than the flat-screen CRTs from Sony, Samsung or Mitsubishi. Amazingly, the M900 performed quite well in the geometry tests – one area where FST tubes are normally poor. In fact, it only failed the pincushion test.



It couldn't continue this form in the sharpness and resolution section of our tests, gaining full passes in just two of the 13 taxing screens and only scraping passes in three. Most notably, it only managed one pass in the two focus tests. The M900's colour performance wasn't brilliant either, but it still outperformed several of its more expensive competitors. A bigger problem is the reflectivity of the screen, which could lead to eyestrain and headaches unless a filter is used.

The OSD is well featured, only missing advanced controls like convergence and linearity. However, there are both horizontal and vertical moiré controls, which allowed most of the interference patterns to be dialled out.

Although you get a lot of monitor for your money with the M900, Hansol's 920P offers slightly better image quality and is £24 cheaper – a large margin at this end of the budget spectrum. If you're looking for a budget buy, the Hansol is a better overall choice than the ADI.

PC PRO RATINGS
OVERALL
100
QUALITY 98 | FEATURES 84 | VALUE 111
100 IS THE AVERAGE

CTX PR960F

PRICE £275 (£323 inc VAT)
SUPPLIER CCL Computers 01274 471201
VERDICT **A poor showing from a monitor based on Sony's FD Trinitron tube. The image quality can't match the asking price.**

The PR960F is no stranger to our Labs. It was a contender 16 months ago (*see Labs, issue 80, p102*) when we praised it for its features but found problems with the image quality.

This time round, our image-quality criticisms remain, but its feature set looks less exceptional. While BNC connectors were a rarity in consumer 19in monitors then, several screens have them this month – the same goes for USB hubs. The OSD is where the CTX loses out, as many of the advanced features we now expect are missing. Most disappointing is the lack of separate horizontal and vertical moiré controls. All you get is a single 'general' moiré control and this was unable to completely remove the moiré in any of our tests.

Surprisingly for an FD Trinitron-based screen, the PR960F's geometry results were poor, with just a single pass in geometric linearity to its credit. It was also poorly focused compared with most of the other screens on test, only managing a good pass in the vertical resolution wedge test; the others were either passes or fails.

Colour purity was better, with it managing passes for red, green and blue. It failed to translate this into an accurate white, though. The reasons were clear, as the colour registration was out by a significant amount and wasn't correctable despite the OSD's controls.

The more costly Eizo shows what can be achieved with an FD Trinitron CRT. But the PR960F itself looks overpriced next to the superb Iiyama.

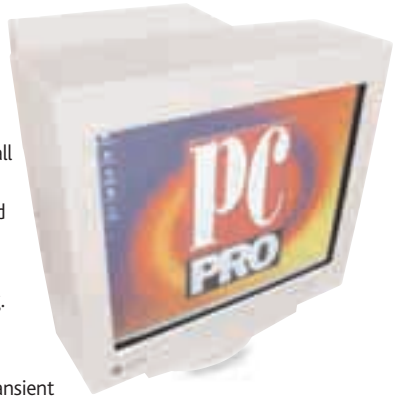
PC PRO RATINGS
OVERALL
95
QUALITY 91 | FEATURES 107 | VALUE 89
100 IS THE AVERAGE

Eizo FlexScan T766

PRICE £409 (£481 inc VAT)
SUPPLIER Bechtle Direct 01249 467951
VERDICT **Superb colour and greyscale performance along with BNC connectors will attract graphics professionals, but everyone else will find better value elsewhere.**

Eizo has always been praised in our CRT monitors Labs for the quality of its displays and this month is no exception. Using a Sony FD Trinitron aperture-grille tube and allying it to well-designed electronics, the T766 is a worthy successor to the T761 (*see Labs, issue 80, p102*).

We expect monitors based on Sony's tube to exhibit good geometry, but the T766 failed both the pincushion distortion and vertical curvature checks. Overall scores for sharpness and resolution were also disappointing. The tests for horizontal resolution, transient response and one moiré test were failed outright. This was enough to drag it down, despite the distinctions gained for two of the vertical resolution tests.



But the Eizo outperformed its competitors in the colour and greyscale tests, with the only failure occurring in the black-level shift check. The horizontal colour registration gained it a partial distinction, but scraped passes in colour timing and green colour purity held it back.

We were disappointed that the FlexScan's OSD was lacking a couple of basic adjustments; namely, zoom and user presets for the colour temperature. It also only provided a general moiré control rather than separate horizontal and vertical adjustments.

Overall the Eizo is too expensive to justify a recommendation. Despite generally impressive image quality, we prefer the Iiyama, which outperforms the T766 in almost every area. The only people who should opt for the Eizo are graphics professionals, as the great colour and greyscale performance and BNC connectors may outweigh the cost.

PC PRO RATINGS
OVERALL
96
QUALITY 106 | FEATURES 100 | VALUE 74
100 IS THE AVERAGE

Hansol 920D

PRICE £199 (£234 inc VAT)
SUPPLIER dabs.com 0800 138 5182
VERDICT **The cheapest flat-screen monitor here will win fans for precisely this reason, even if it can't beat the 920P for outright quality.**

The first of Hansol's two entries this month is based on Samsung's DynaFlat shadow-mask tube. It's the second time we've seen this monitor, as we tested it in our last 19in CRTs group test (*see Labs, issue 80, p102*) where we appreciated its low price, but found the relative image quality lacking.

Things haven't changed greatly since last year. In the geometry and distortion tests, we found that even the 920P (*see right*) with its curved screen performed better, mainly due to its distinction for geometric linearity. The 920D only scraped a pass in this test and it also had poor power regulation.

Its results in the sharpness and resolution section were also disappointing – its cheaper sibling outperformed it again. But the 920D gained clear passes in the two focus checks, which are the most important areas for many users. When it came to displaying fine detail though, the 920D struggled, with particularly poor results for horizontal resolution and in the moiré tests.

The 920D outshone the 920P in the area of colour performance. Both horizontal and vertical colour registration were within acceptable limits, and with good screen reflectivity characteristics, plus clean passes in the black and white-level shift tests, the 920D pulled further ahead.

The OSD is well equipped, including controls for top and bottom corner hooking as well as the basic geometry settings. However, there are no convergence or corner purity controls. Menus are intuitive, with direct access to brightness and contrast – commonly accessed controls that most other monitors hide away in the OSD.

The 920D's price has dropped £50 in the last year, but it has serious competition from Hansol's own 920P. However, despite the 920D's flat CRT, it's the 920P that walks away with an award, thanks to its incredible value.

PC PRO RATINGS
OVERALL **100**
QUALITY 97 | FEATURES 98 | VALUE 106
100 IS THE AVERAGE

Hansol 920P

PRICE £135 (£159 inc VAT)
SUPPLIER Jungle 0870 728 7777
VERDICT **The amazing price makes the 920P a good choice for anyone desperate for Desktop space, but low on cash. A worthy award winner.**

There were two things that struck us as soon as we attached the 920P to our test rig. The first was the curvature of the screen, which forms quite a contrast to the majority of its rivals this month. The second was its reflectivity, which was among the poorest this month – it doesn't help that the curve of the glass means that more ceiling lights are visible, and these form a big distraction even on a white background.

Then we discovered the 920P's price. At £135, it rivals 17in monitors rather than 19in screens, and it copes well at 1,280 x 1,024. In fact, the 920P surprised us with its consistent performance in our tests, where it even managed to outscore the 920D for geometry and distortion. However, it still failed three of our six geometric tests.

More importantly, its focus far exceeded expectations. Even in the corners, text is easy to read, and it was just a whisker away from a distinction for its handling of the focus matrix test (*see Performance analysis, p74*). The 920P failed half of the colour and greyscale tests, but scored two good passes for horizontal colour registration and colour fading consistency. However, this is acceptable in such a well-priced monitor.

We don't expect a great deal of features either, so the captive VGA cable was no surprise. When it comes to OSD, however, Hansol includes all the necessary controls for correcting geometric problems, even if it lacks advanced options.

These plus points and the sharp focus make the 920P a fine choice for those who can't stretch above £150 and are desperate for Desktop space.

PC PRO RATINGS
OVERALL **103**
QUALITY 97 | FEATURES 87 | VALUE 121
100 IS THE AVERAGE

Hitachi CM715ET

PRICE £175 (£206 inc VAT)
SUPPLIER dabs.com 0800 138 5182
VERDICT **Poor quality image and a significant jump in price over the Hansol 920P leave the CM715ET without an award this month.**

Hitachi's first monitor this month is based around an ordinary shadow-mask screen. These CRTs are manufactured by numerous plants in the Far East, but this means there's no way of knowing which tube is in a particular monitor without opening it. Even then, it isn't a guarantee that the same tube would be in the monitor you buy.

In common with the other FST shadow-mask monitors, the CM715ET had problems in our geometry and distortion tests. It managed a full pass in just one test – screen regulation – and failed both the linearity tests. However, it scraped passes for both vertical and horizontal curvature, which is impressive for a curved screen.

Its sharpness and resolution were poor, with a full pass in just one of the 13 tests – the focus matrix. All the other tests showed some failing, with the fine dot moiré and text focus just managing a pass. This was disappointing, even for a low-cost shadow-mask display. Every other monitor based on the same type of tube performed better. The CM715ET's performance improved in the colour tests, but still wasn't overly impressive.

One particular annoyance is the poor screen reflectivity, with the Hitachi being one of the few monitors to fail this test. The OSD lacks a couple of useful controls too – zoom and user presets for colour temperature – but does include separate horizontal and vertical controls for moiré. However, as our tests showed, these weren't very effective.

Those looking for an inexpensive 19in monitor would be better off with the Hansol 920P. This produces a better-quality image and costs £40 less, making it something of a bargain.

PC PRO RATINGS
OVERALL **97**
QUALITY 94 | FEATURES 84 | VALUE 104
100 IS THE AVERAGE

Through the looking glass

How CRT monitors work and the differences between aperture-grille, shadow-mask and Flat Tension Mask technologies

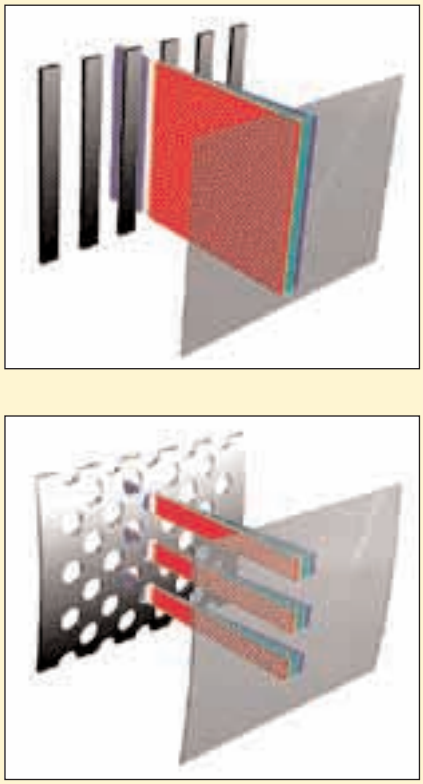
The first cathode-ray tube scanning device was built in 1897, although it took ten years for it to be incorporated into anything resembling a monitor screen. As you can imagine, the pace of development has slowed somewhat, with no real steps forward since 1995 when the aperture grille first appeared.

Once it's through the control electronics, the signal from the graphics card inside your PC is fed to three specially adapted vacuum tubes – one each for red, green and blue. These heat up and produce a stream of electrons. Around the open end of the tubes is a powerful electro-magnet which, under the control of the electronics in the monitor, varies its intensity in order to bend the streams of electrons and aim them at a specific point on the screen.

To build up the image, the beam is swept from the top-left corner across to the top right. On reaching this position, it's immediately switched back to the left, but one line further down. It then sweeps across to the right again and this process continues all the way down the screen. When it reaches the bottom-right corner, it's switched back to the top left to begin the whole screen again.

In our feature table (*see p76*) we include values for horizontal and vertical frequencies. The former is the range of times it takes the monitor to move the beam from a left position, across the screen and back to the left. Thus a specification of 30-115kHz means that, depending on the resolution displayed, the electron beam will sweep across the screen up to 115,000 times a second – far too fast for the human eye to distinguish.

The vertical frequency specification is a measurement of how many times the monitor can complete a full sweep over the whole screen per second. This takes much longer and, depending on the resolution, could be as few as 60 times a second. This is easily detectable to the human eye as flicker and is one of the main causes of eye-strain. A monitor can only truly be called flicker-free at 85Hz or above.



Aperture-grille tubes (top) have thin strips of metal to ensure the correct phosphors are lit, while shadow-mask tubes use a metal sheet with holes punched out of it.

Generating three colours – red, green and blue – from a CRT requires the inside of the tube to be coated with three different phosphors. One property of these chemicals is to emit light when struck by electrons, and each phosphor emits either red, green or blue light. The phosphors are arranged in groups of three in shadow-mask screens or stripes down the face of the tube in aperture-grille monitors.

In order to stop stray electrons lighting up phosphors that should remain dark, a mesh is placed immediately behind the front of the tube. This is where the most recent development has taken place. Prior to 1995, every colour CRT used a shadow mask. This is a thin metal sheet with very fine holes punched in it. So, if the beam is aimed at a 'red' hole, the nearby metal will stop the blue and green phosphors around the red one from lighting up.

With the introduction of aperture-grille monitors, this changed slightly. Instead of the sheet of holes, fine wires are stretched vertically from the top to the bottom of the screen and stop electrons straying from one strip of phosphor to the next. The advantage of aperture-grille screens is that without all the metal of the shadow mask, more electrons reach the phosphors, which makes it brighter. However, the difference is much less than it used to be when aperture grilles were first introduced, especially with Philips' LightFrame in its 109S40 and Samsung's Highlight Zone on the SyncMaster 959NF – these technologies boost the brightness of specific areas of the screen.

A disadvantage of the aperture grilles produced by Sony and Mitsubishi is that to stop the wires sagging or bending, two damping wires have to be mounted horizontally across the screen. These are clearly visible on a light background, and can prove distracting. One company has tried to meld the two types of screen, offering the advantages of both.

LG's Flatron range of monitors use what it calls a Flat Tension Mask. This is similar in design to the shadow mask, but uses vertically aligned slots to keep the electron beams pointing at the same strips of phosphors used in aperture-grille screens. This technology also uses damping wires, but these run from the top of the screen to the bottom. As they're aligned with the slots and phosphor strips, they aren't noticeable.

Each type of screen has its own advantages: shadow masks typically give better colour accuracy, while aperture-grille and Flat Tension Mask screens give better geometric accuracy. Our tests take every aspect of a monitor's image quality into account, so you can be sure that whichever technology lies behind the glass, the best monitor will win.

ALYN SPARKES

Hitachi CM721FET

PRICE £239 (£281 inc VAT)
SUPPLIER NexNix 01403 756777
VERDICT **Despite sporting a price that matches the likes of the LG and Samsung monitors, the CM721FET doesn't produce the same image quality.**

The second of Hitachi's entries this month is based on a flat-screen, shadow-mask CRT from Samsung. The DynaFlat tube is designed to offer aperture grille-like flatness without the damping wires and at a lower price. Unfortunately, the CM721FET costs almost the same as the LG Flatron 915FT Plus and precisely the same as Samsung's SyncMaster 959NF, both of which performed better in our quality tests.

Another problem for Hitachi is the G90f from ViewSonic, especially as this outclassed the CM721FET in the geometry and distortion section and costs £30 less. The Hitachi passed the keystone and screen regulation tests, scraped passes for vertical bow and geometric linearity, but failed everything else in this section. The colour and greyscale tests were again disappointing. It failed both horizontal and vertical colour registration and, with no controls in the OSD, this was uncorrectable. It passed the screen reflectivity test, but didn't do so well in the colour purity tests. If accurate colours are important to you, steer clear.

Sharpness and resolution results were almost identical to Hansol's 920D, which uses the same CRT, but nowhere near the similarly priced LG and Samsung. Significant failings were apparent in all the horizontal resolution tests, and the moiré results were also poor, with just one scraped pass from the three tests conducted.

The OSD is identical to that of the CM715ET, so it lacks the same controls, which is less acceptable in a monitor costing this much. At the same price as the Samsung and just cheaper than the Iiyama, the CM721FET needs to shed £40 around if Hitachi hopes for success.

PC PRO RATINGS
OVERALL 97
QUALITY 97 | FEATURES 95 | VALUE 95
100 IS THE AVERAGE

Iiyama Vision Master Pro 454

PRICE £248 (£291 inc VAT)
SUPPLIER CCl Computers 01274 471201
VERDICT **Phenomenal focus, great geometry and good colour handling combine with an equally impressive set of features to win Iiyama this Labs.**

Iiyama pulls off quite a coup this month – not only did the Vision Master come top of the pile in our quality tests, it also wins for features. Add the competitive price of £248 and it's no wonder the Pro 454 claims the Labs Winner award.

To be fair, you don't need our range of tests to see this monitor's quality. As soon as the Desktop loads at its optimum 1,280 x 1,024 resolution, it's obvious the focus and geometry are excellent. But DisplayMate soon confirmed that focus was superb in all corners. Even the tough resolution tests couldn't ruffle it. The Vision Master's only problem was moiré interference, which the OSD's horizontal moiré control couldn't iron out.

This monitor's geometry was again difficult to fault. In fact, the Pro 454 passed all our geometry tests and managed the same feat for colour and greyscale. Only some mid-range streaking (*see Performance analysis, p74*) let it down in the miscellaneous section.

When it comes to features, it's difficult to know where to start our praise. Not content with integrating a four-port USB hub, there's a pair of stereo speakers as well. You can also hook up two video inputs, thanks to the dual D-SUBs. Add the fact that it supports resolutions up to 1,600 x 1,200 at 85Hz and the Pro 454 only lacks advanced OSD controls like corner purity and linearity.

Despite tough opposition from Eizo, LG and NEC, the Iiyama was a clear winner.

PC PRO RATINGS
OVERALL 107
QUALITY 106 | FEATURES 121 | VALUE 106
100 IS THE AVERAGE

LG Flatron 915FT Plus

PRICE £245 (£288 inc VAT)
SUPPLIER dabs.com 0800 138 5182
VERDICT **It may be over a year old, but the Flatron 915FT Plus remains a great monitor thanks to good focus and plenty of features.**

The Flatron 915FT Plus first burst onto the scene just over a year ago (*see Reviews, issue 83, p154*) when it gained praise for offering great image quality yet undercutting the Vision Master 451 by £40. Iiyama has since released the 452, 453 and now the 454, but the 915FT Plus remains LG's flagship 19in monitor.

And LG has good reason for sticking with this model; as our tests showed, it remains an incredibly strong all-round performer. Its best showing was in our sharpness and resolution tests, where it easily passed all the tests bar two of the tough moiré checks. Most important of all, its focus was good in all corners, and it breezed through our resolution checks.

LG's Flatron tube (*see Through the looking glass, p82*) wasn't so impressive in our colour and greyscale tests, with only one scraped pass in the colour purity check, so colours don't look entirely even in intensity across the screen. Its horizontal colour registration was also poor.

However, we were more impressed with its geometry. Its only notable problem was with some horizontal bowing of lines at the top of the screen, which we couldn't iron out despite the OSD's comprehensive controls – we doubt you'll notice a problem in practice. LG's OSD deserves praise as well, with its touch-sensitive buttons and easy navigation being an excellent blueprint for others to follow.

There's also a huge range of controls on offer, and when added to the four-port USB hub this combination makes it one of the best-featured screens on test. With excellent screen reflectivity thrown in, the 915FT Plus remains one of the best 19in monitors around.

PC PRO RATINGS
OVERALL 104
QUALITY 103 | FEATURES 113 | VALUE 104
100 IS THE AVERAGE

Mitsubishi Diamond Pro 920

PRICE £272 (£320 inc VAT)
SUPPLIER Jungle 0870 728 7777
VERDICT **The 920 is another strong unit from Mitsubishi, largely thanks to its excellent focus, but it lacks features and value compared to the Iiyama.**

Mitsubishi may have reached the 50s in its 17in range with the Diamond Pro 750SB (*see p124*), but the pace of development in its 19in monitors is rather more sedate. But even though the Pro 920 has been in existence for some time, it's still a force to be reckoned with.

Its strongest suite of tests was for sharpness and resolution, where it passed all of our 13 checks – quite a feat. Although we didn't rate it on a par with the Iiyama for focus in the corners, the rest of the screen is crisp.

It's also one of the best on test when it comes to screen reflectivity; you can see ceiling lights but little else. Unfortunately, this good form wasn't continued in our colour purity tests, with the image brighter in the middle than it was at the left and right, which is enough to put off graphics professionals looking for accuracy across the screen.

The 920 couldn't match the best on show for geometry either, although it only just failed our tests. What perhaps let it down most of all was its screen regulation, which was notably worse than other monitors on show. This is a sign of some economies in the electronics.

Despite this, the Diamond Pro supports one of the highest resolutions on test at 1,920 x 1,440 (at 72Hz). We wouldn't push this monitor to that height, but if you've got good eyesight it's comfortable at 1,600 x 1,200.

Unfortunately for Mitsubishi, without a USB hub or speakers it falls behind others for features. If the 920 is bundled with a system you won't be disappointed, but it needs a price drop to be competitive.

PC PRO RATINGS
OVERALL 100
QUALITY 102 | FEATURES 106 | VALUE 95
100 IS THE AVERAGE

NEC MultiSync FE950+

PRICE £269 (£316 inc VAT)
SUPPLIER Jungle 0870 728 7777
VERDICT **This screen performed well in all areas of testing, making it a heavyweight contender in this Labs.**

The FE950+ and Iiyama's Pro 454 were locked in battle this month, both producing magnificent image quality matched by great features. Iiyama took pride of place on the winners' podium, but the FE950+ emerged with plenty of kudos.

The main reason for its success was incredible consistency across all our tests – it only failed five out of 34 checks, which is an unparalleled victory this month. Its best performance came in the colour and greyscale category, where it cleanly passed all the colour purity tests (bar red, where it scraped through), making it an excellent choice for graphics and photography professionals.

Its focus was hard to fault too, although it didn't gain any full distinctions here. It was helped by good moiré-reducing measures, which tuned out most of the inevitable moiré problems. The FE950+ was also superb at reproducing fine detail, as it proved in our horizontal and vertical resolution tests.

Although both the Iiyama and the MultiSync are based on Mitsubishi Diamondtron tubes, the 454 uses the latest M^2 version. This offers higher brightness levels for watching video, which you can limit to smaller areas of the screen or stretch over the whole surface. Where the MultiSync fights back is with almost all the OSD controls you could wish for. Also, thanks to using English text rather than icons, it's easy enough to follow.

Unfortunately for NEC, it doesn't beat the Iiyama on features – partially because it lacks a USB hub. But if the FE950+ drops significantly in price, it's worth considering.

PC PRO RATINGS
OVERALL 102
QUALITY 105 | FEATURES 109 | VALUE 99
100 IS THE AVERAGE

Philips 109S40

PRICE £178 (£209 inc VAT)
SUPPLIER Jungle 0870 728 7777
VERDICT **A surprisingly good performer in our quality tests considering the low price, but the non-flat screen detracts from its overall appeal.**

The 109S40 is a brand-new offering from Philips, but unlike most new additions to the 19in fray it doesn't boast a flat-screen tube. Instead, it's aimed at the budget area of the market and, if the price drops a little bit further, it looks set to make an impact.

The main reason for our confidence is that it outperformed all the other sub-£200 monitors in our tests. With an FST (Flatter Squarer Tube) rather than a flat-screened tube, it was never going to win for geometry, but it passed five of our seven tests. However, you only need to look at the image to see how curved it is compared to flat-screen affairs.

This monitor was also a capable performer when it came to the sharpness and resolution section, although it only scraped a pass in the checks for focus in the corners. It surprised us in the resolution tests, though, with a clear line visible between very fine lines.

For colour handling, the 109S40 again put in a mixed performance, claiming mid-table respectability, but nothing more. Its colour registration was extremely good, but its red, green and white colour purity let it down. You'll also be able to note the fine gauze of the shadow mask itself on white backgrounds, which detracts from the image.

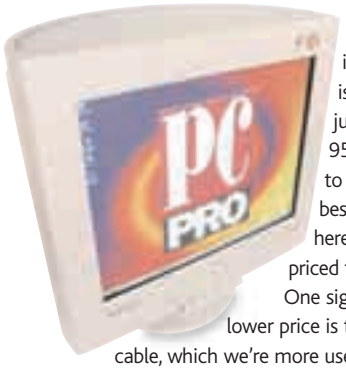
At this price, we didn't expect many features, and we didn't find many. The D-SUB cable is captive, there's no USB hub and the OSD controls are far from comprehensive. It does offer one-button access to the contrast and brightness settings, though, and the text-based menu is easy to use. But sadly for Philips, the Hansol 920P steals the Best Value award due to its incredibly competitive price.

PC PRO RATINGS
OVERALL 101
QUALITY 100 | FEATURES 91 | VALUE 110
100 IS THE AVERAGE

Samsung SyncMaster 959NF

PRICE £239 (£281 inc VAT)
SUPPLIER dabs.com 0800 138 5182
VERDICT **Another great monitor from Samsung, with focus and colour handling its greatest triumphs. But its price needs to drop further to win an award.**

It's ironic that Samsung's entry into this Labs is based on a Mitsubishi Diamondtron M² tube, while four of its flat-screen competitors use Samsung's own DynaFlat technology. Not that the company doesn't have faith in its 19in tube, as you can buy the DynaFlat-based 957DF for £185.



However, its choice is largely justified, as the 959NF proved to be one of the best monitors here, and it's well priced too.

One sign of its lower price is the captive cable, which we're more used to in sub-£200 monitors. There isn't a huge range of features either, with most of the 959NF's feature points coming courtesy of the OSD. This not only gives excellent control over the highlight area – a feature of the Diamondtron M² tube – but also over a wide range of geometry and purity settings. We also like the way the button panel flips out of the way when not in use.

Of course, quality is more important, and the 959NF generally put in a superb performance. We say 'generally' as it slipped up in the geometry tests, only managing a clean pass in two other checks. In the others, a mixture of uncorrectable keystoning and pincushion distortion let it down.

However, the SyncMaster bounced back in the sharpness and resolution tests, scoring a distinction in one of the focus checks. Wherever you look on this screen, it's sharp. We were more impressed by its colour handling, with fantastic purity and good colour registration its hallmark.

Unfortunately for Samsung, there are better deals on offer this month.

PC PRO RATINGS
OVERALL
102
QUALITY 101 | FEATURES 106 | VALUE 102
100 IS THE AVERAGE

Sony Multiscan CPD-G420

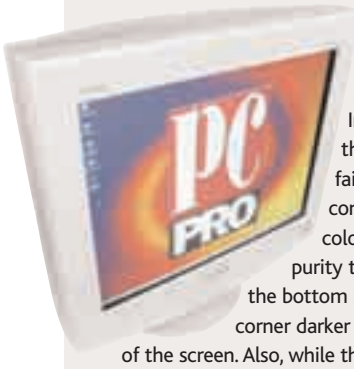
PRICE £369 (£434 inc VAT)
SUPPLIER dabs.com 0800 138 5182
VERDICT **An excellent screen in almost every way, but Sony needs to price it more realistically if it actually wants to sell any.**

Most manufacturers make do with a small logo at the front of their screens, but it's no surprise to see a large Sony badge in the middle of the bezel here. Even the asking price of £369 screams exclusivity, so we were keen to see if the G420 could live up to the branding expectations.

It started off well in our geometry and distortion tests. The whole image kept its shape well, with just some bowing in horizontal lines at the extremes of the image – not a big problem.

The G420's fine form got even better when it came to focus, winning distinctions thanks to crisp character edges in all four corners. It wasn't quite so exceptional when it came to our horizontal resolution checks, but managed to pass them all nonetheless.

The only area where it fell behind the Iiyama was for colour and greyscale. In particular, the G420 failed to convince in our colour purity tests, with the bottom right-hand corner darker than the rest of the screen. Also, while the anti-reflection coating applied to the screen was good, reflections were more visible here than on the Iiyama.



Sony also loses out when it comes to the OSD. Not only is it tricky to activate the buttons on occasion, it also lacks some advanced geometric controls. But there are some nice touches elsewhere: the three picture effects (Standard, Dynamic for added brightness and Professional), the dual inputs and the four-port USB hub spring to mind. But we'd expect all this and more for the price, which is out of tune with the rest of the 19in monitor market.

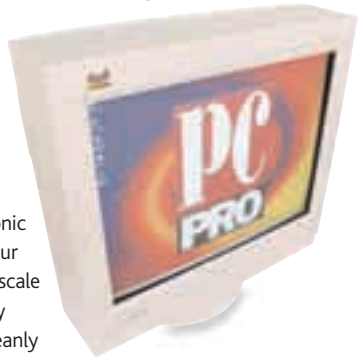
PC PRO RATINGS
OVERALL
97
QUALITY 105 | FEATURES 105 | VALUE 80
100 IS THE AVERAGE

ViewSonic G90f

PRICE £209 (£246 inc VAT)
SUPPLIER Insight 0870 700 7350
VERDICT **Exceptional geometry and good focus make this budget buy potentially attractive, even though it falls down in several other areas.**

If you thought flat-screen 19in monitors were beyond your reach, the G90f – together with Hansol's similarly priced 920D – might be enough to change your mind. In terms of quality per buck, both are among the best here, and it could be that the areas where they fall down won't affect your day-to-day usage.

For instance, the G90f didn't score highly in our sharpness and resolution tests because it can't match the best when it comes to showing detail at 1,280 x 1,024. In general use, this results in very thin lines becoming blurred and indistinct.



However, the G90f's focus was good enough for our judges to pass it in both tests.

The ViewSonic didn't excel in our colour and greyscale tests either, only managing to cleanly pass two out of the eight tests. Its vertical colour registration was particularly poor, although this will only be noticeable at extremes of the screen. We're slightly more concerned by this monitor's reflectivity. This isn't such a problem if you're usually working on a white background, but with dark backgrounds it's too close to a mirror effect.

But the G90f does excel in one area – geometry. We might have been lucky with the sample we were sent, but the G90f was virtually flawless and beat every other monitor on test.

We can't get so excited about its features, because there are virtually none. The VGA cable is captive, there aren't a huge number of OSD controls, and its maximum resolution of 1,600 x 1,200 is only supported at 77Hz, not a flicker-free 85Hz.

Nevertheless, we have a masked respect for this screen. It does the basic things well and, if that's all you need, save your money and opt for the ViewSonic G90f.

PC PRO RATINGS
OVERALL
100
QUALITY 99 | FEATURES 95 | VALUE 104
100 IS THE AVERAGE