15in TFTs

We put 14 of the best 15in TFTs through their paces

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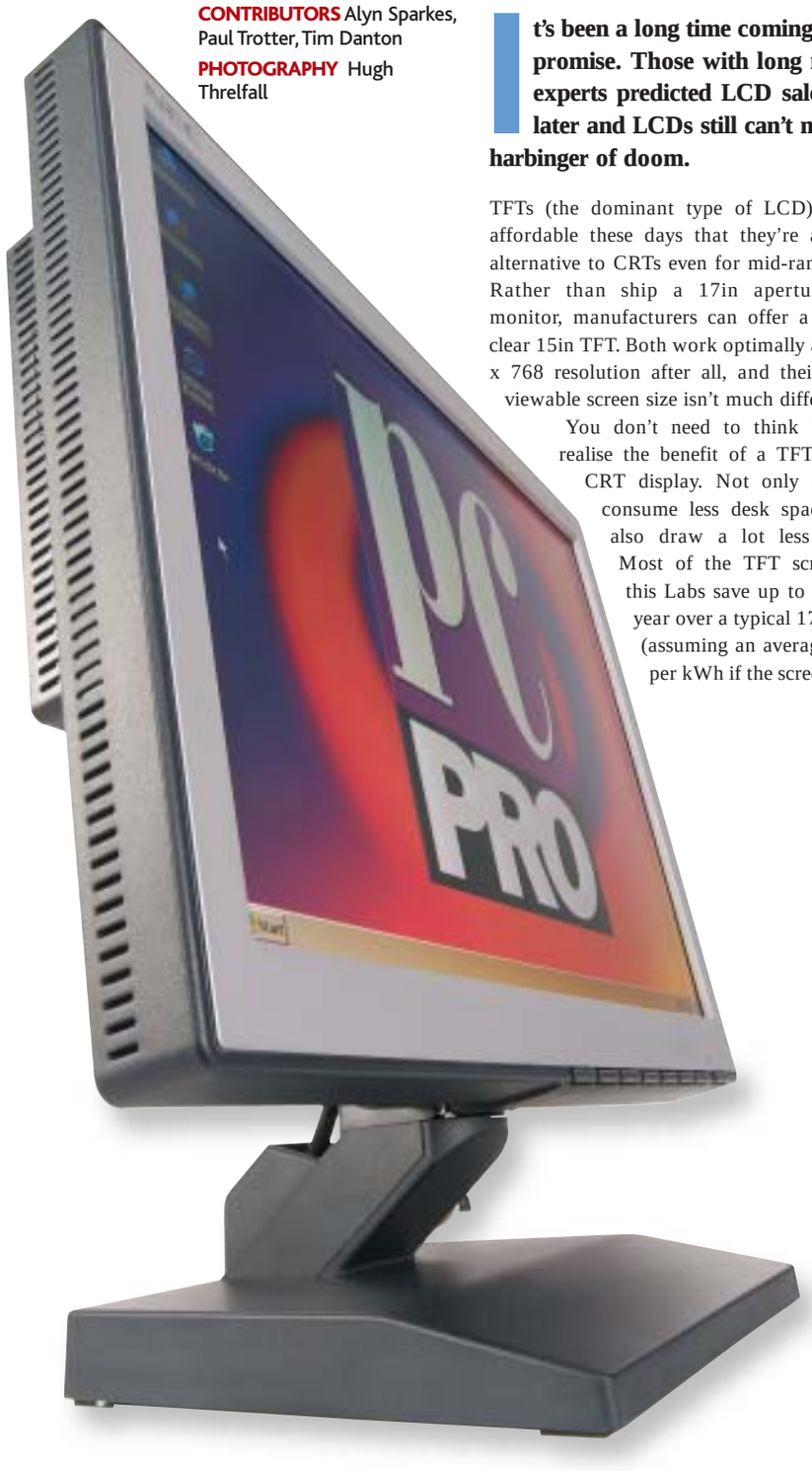
PHOTOGRAPHY Hugh Threlfall



It's been a long time coming, but LCDs are finally starting to live up to their promise. Those with long memories will remember that in 1992, industry experts predicted LCD sales would outstrip CRTs by 1995. Eleven years later and LCDs still can't match CRTs for sales, but this Labs is the CRT's harbinger of doom.

TFTs (the dominant type of LCD) are so affordable these days that they're a viable alternative to CRTs even for mid-range PCs. Rather than ship a 17in aperture-grille monitor, manufacturers can offer a crystal-clear 15in TFT. Both work optimally at 1,024 x 768 resolution after all, and their actual viewable screen size isn't much different.

You don't need to think hard to realise the benefit of a TFT over a CRT display. Not only do they consume less desk space, they also draw a lot less power. Most of the TFT screens in this Labs save up to £19 per year over a typical 17in CRT (assuming an average of 6p per kWh if the screen is left on all the time). Not a lot individually, but in an office with 100 machines the difference starts to add up.

In terms of image quality, TFTs always give perfect geometry. Colour reproduction can be variable, but our tests pick this up so you can be sure we've weeded out those with weak or oversaturated colours. Viewing angles still can't match CRT levels, but this isn't a problem if the monitor is positioned correctly initially. The only people who shouldn't buy any of the TFTs here are die-hard gamers who'll still be happier with a CRT.

For a full explanation of the tests and what they mean in the real world, see Performance analysis on p128. Then read on to see which monitor is the best replacement for the CRT that came with your last PC.

Performance analysis

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

Some people believe that one TFT screen is the same as the next and that they all produce the same perfect, crisp images. This is far from true. As our results show this month, there are huge variations in how well screens handle colour, contrast and real-world tasks such as 3D games.

One important factor is the type of connection used. We prefer a digital DVI connection to an analog D-SUB, and for two very good reasons. First, the analog signal means that the clock and phase have to be synchronised to avoid the dreaded pixel jitter, which looks like a lack of focus. Second, there's no loss of information as in the digital-to-analog, analog-to-digital conversion process.

The other big influence on image quality is the type of panel. It's not enough for the manufacturer to state 'active matrix', as this hides a multitude of technologies. The major offerings are TN+film, IPS (In-Plane Switching), MVA (Multidomain Vertical Alignment) and Super-IPS, although the latter isn't represented in this Labs.

HOW WE TEST

We use DisplayMate for Windows Multimedia Edition 2 (available from **www.displaymate.com**) to examine each monitor. It's a comprehensive suite of tests for most types of computer-based display 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 TFT screen at its native resolution of 1,024 x 768 at 32-bit colour depth with a refresh rate of 60Hz. When using an analog connection, we make sure we use the cable supplied with the monitor, as its quality can have an effect on the image displayed. Each monitor is connected to our *PC Pro* test rig, which is fitted with a Matrox Millennium G550 graphics card. We connect each monitor in turn and install any colour profiles they come with before starting the tests. It's worth pointing out that we're not interested in dead pixels – the number we see will be different to the number in any other screen (see the Feature table for each panel's pixel fault tolerance).

All the results for the tests can be found in the table below, while the three graphs summarise the monitors' performance in the key areas of sharpness and resolution, colour and greyscale and other areas considered to highlight concerns similar to real-world issues.

Basic setup

Before testing, we make sure the contrast and brightness controls are correctly set by examining grey and black-level test screens. There's no need to set the geometry, thanks to the perfect alignment of pixels on a TFT screen. We then use 19 test images to examine the following areas.

Sharpness and resolution

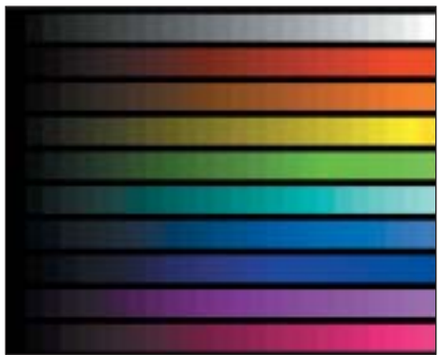
Despite being exactly aligned, TFT screens have the ability to lose focus, particularly due to pixel jitter over an analog interface. Two of the tests in this section examine this effect, although we're pleased to report that none of the screens suffered from a lack of focus or a halo effect from over-bright blocks.

Where some of this month's analog-only screens fell down was in the pixel-tracking and timing-lock test. This displays a set of dark-grey, one-pixel lines; a set of mid-level grey, one-pixel dots; and a set of light-grey, one-pixel by two-pixel slots. It's designed to test the mapping of image pixels onto screen pixels as the displays have to match the timing of the signal and accurately sample the centre of the pixel and then hold it in position. Problems in this area lead to wave patterns moving over the dithered areas. These can be adjusted using the clock and pixel-tracking

QUALITY RESULTS

	ADI MicroScan S600/S	AOC LM520A	CTX S530	Eizo FlexScan L367	Hansol H530	Hitachi CML152XW2	Iiyama AX3819UT	LG L1510P	NEC LCD1501	Philips Brilliance 150P3A	Samsung SyncMaster 152T	Sharp LL-T1520H	Sony SDM-X52B	ViewSonic VG150m
SHARPNESS AND RESOLUTION														
Halo effect (defocusing and blooming)	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5
Fine focus	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1
Pixel tracking and timing-lock check*	1	2	1.5	2	0.5	1.5	1.5	0.5	2	1.5	2	1	2	1
COLOUR AND GREYSCALE														
Green colour purity	0.5	0.5	0.5	1	0.5	1	1	0	0	1	1	1	1	0
White colour purity*	0	1	1	2	1	1.5	2	0.5	1	1.5	1	2	1.5	0
Colour combinations*	1.5	1	0.5	1	1.5	1	1.5	1.5	1.5	1.5	1	1	1.5	1.5
Colour tracking	1	0	0.5	1	0	0.5	0.5	1	0.5	1	1	1	1	0.5
White-level saturation	1	0	0.5	1	0.5	0	1	0	1	0	0.5	0	1	1
Dark-grey scale test	1	1	0.5	1	1	1	1	0.5	1	1	1	1	0.5	1
256 intensity-level colour ramp*	2	1	1.5	2	1	0.5	1	1	1.5	1	0.5	1	0.5	1
256 intensity-level greyscale ramp	1	0.5	1	1	0.5	0.5	0.5	0	1	0	0.5	0.5	0.5	0.5
Colour scales	1	1	1	0	1	1	1	0	1	1	0.5	1	1	1
Colour spectrum	0	0	0.5	1	1	0.5	0.5	0	0.5	1	0.5	1	1	1
REAL-WORLD TASKS														
3D game*	1	0.5	1	1	1	1	1	0.5	1	1	1	0	1	1
Vertical viewing angle*	0.5	0	0	0	1	0	0	0	0	0	0.5	2	0.5	0
Horizontal viewing angle*	1	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	1	0.5	2	1	1
Clarity of Desktop*	1	0.5	0.5	2	1.5	2	1	1	1.5	1	1.5	1	1.5	1
Ghosting	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL QUALITY	16.5	12.5	14	21	15.5	15.5	17	10	17	16.5	16	18	18.5	14

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



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

controls in most OSDs, but they're almost impossible to remove altogether without using a digital connection.

Colour and greyscale

The first two tests in this section look at colour accuracy. Green and then white are displayed over the whole screen to check for dark patches. The patches are primarily caused by irregularities in the coating on the front of the monitor and the placement of the fluorescent tubes making up the backlight.

The next test looks at colour combinations. Some screens have difficulty in clearly displaying specific colours on certain backgrounds. This test examines this and, while all the screens passed, some did so well they were awarded distinctions.

Next up is colour tracking. This checks that the red, green and blue channels vary identically with the signal level. If they don't, some of the different intensity greys will display slight tinges of colour. In our tests, we found purple to be the most common tinge, indicating that the green channel was dropping to zero too soon.

The next two tests ensure that the light and dark ends of the spectrum aren't being clipped. The first test displays a white background overlaid with light-grey blocks. If there's a problem, the grey blocks at the higher end become indistinguishable from the white background. The second test does the same, but with a black background and dark-grey blocks.

The following pair of tests looks at how well the TFT can ramp up the intensity. The first is for red, green and blue; the second for white. Problems manifest themselves as either vertical lines running through the ramp as the TFT switches between levels, or compression at the dark or light ends of the spectrum.

The next test is specifically designed to look at compression problems. Ten sets of gradually more intense colours are displayed, divided into discrete blocks. There are 25 blocks for each colour, covering the 256 intensity levels. If there's a problem, two adjacent blocks appear as the same colour at the top or bottom of the scale.

The final test in this section is a colour spectrum. This is a full-screen horizontal fade from magenta through red, yellow, green, cyan, blue and back to magenta. It checks whether any colour or group of colours is over-intense and drowning out another. In monitors that performed badly, we typically found that red, green and blue spread too far into the cyan, magenta and yellow areas.

Real-world tasks

These tests look at how the monitors will perform in day-to-day situations. In the past, TFT monitors have been criticised for poor response times, leading to blurring and poor performance in 3D games and DVD playback. We use Quake 2 to test 3D performance, as we don't want to stress the graphics card or processor. Screens using old TN+film active-matrix panels did worse, but most were acceptable.

Viewing angles were checked both horizontally and vertically and, for the most part, performance was in line with specifications and the type of TFT. General clarity of the Desktop was also rated and we tested for ghosting, which tends to affect IPS screens. However, no panels failed this test.

TFT technologies

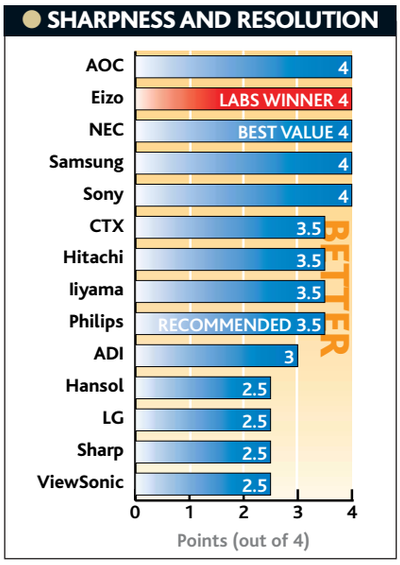
Three main types of TFT panel are represented in the screens in this month's Labs. The oldest type, TN+film, has relatively poor viewing angles and tends to have slower response times.

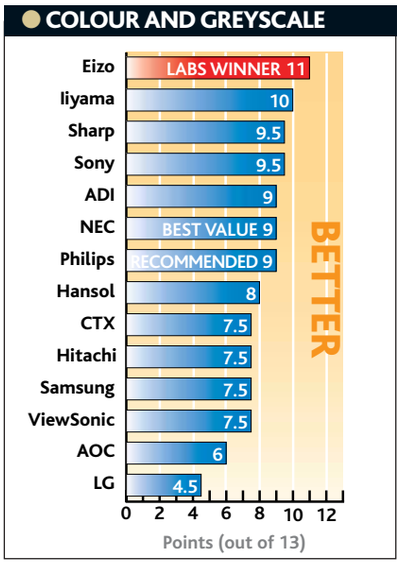
Next up the ladder is IPS, or in-plane switching. This is an improvement, mainly in terms of viewing angles. While ordinary active-matrix screens have viewing angles of around 115 degrees, IPS improves this to around 160 degrees.

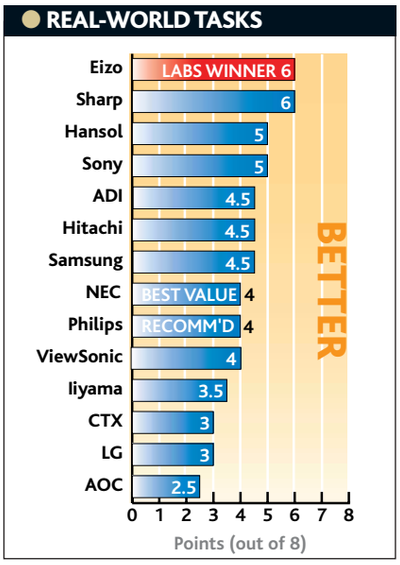
A slightly different method is used by MVA (Multidomain Vertical Alignment) panels, where each pixel is given four areas. These areas adjust their intensity to even out the brightness when viewed from different angles. They also have viewing angles around 160 degrees and boast faster response times.

At the top of the pile are the screens based on Super-IPS panels. These are a development of the original IPS and give massive viewing angles of up to 170 degrees. They also boast even faster response times, generally providing the best games performance in our tests. Super-IPS panels tend to be found in 17in or larger screens.

Development is in progress on a further advancement of TFT technology in the form of the PenTile Matrix. For more details on this, see Joining the dots on p134.







FEATURE TABLE

	ADI MicroScan S600/S	AOC LM520A	CTX S530	Eizo FlexScan L367	Hansol H530	Hitachi CML152XW2	Iiyama AX3819UT
Overall score	101	93	94	111	95	99	103
Street price[1] (inc VAT)	£200 (£235)	£179 (£210)	£239 (£281)	£309 (£363)	£249 (£293)	£215 (£253)	£321 (£377)
Supplier	PC Nextday 0870 162 6342	Watford Electronics 0870 220 0700	dabs.com via website only	Bechtle Direct 01249 467944	dabs.com via website only	dabs.com via website only	CCL Computers 01274 471201
Supplier's website	www.pcnextday.co.uk	www.watford.co.uk	www.dabs.com	www.bechtle.co.uk	www.dabs.com	www.dabs.com	www.cclcomputers.co.uk
Manufacturer's website	www.adiuk.com	www.aoc-europe.com	www.ctxeurope.com	www.eizo.co.uk	www.hansol-uk.com	www.hitachi digitalmedia.com	www.iiyama.co.uk
Warranty	3yrs on-site	3yrs RTB	3yrs on-site	3yrs RTB	3yrs on-site	3yrs on-site	3yrs on-site
Backlight warranty	3yrs	3yrs	3yrs	3yrs	3yrs	3yrs	3yrs
Pixel fault tolerance[2]	8	ISO 13406-2	101 days 0 dead pixel, then 6 or 2 pairs	ISO 13406-2	6 or 4 in cluster	ISO 13406-2	ISO 13406-2
DISPLAY							
Viewable diagonal (in)	15	15	15	15	15	15	15
Native resolution	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768
TFT technology[3]	TN+film	TN+film	TN+film	TN+film	IPS	TN+film	TN+film
Pivot support	X	X	X	X	X	X	X
Viewing angle vertical (degrees)	115	100	100	150	115	100	100
Viewing angle horizontal (degrees)	140	120	120	160	140	130	120
Number of colours supported	16m	16.7m	16m	16m	262,144	16.7m dithered	16m
Response time (ms)	25	40	40	25	25	35	30
Brightness rating (cd/sq m)	250	250	250	250	250	250	250
Contrast ratio	300	350	300	450	300	350	350
CONNECTORS							
D-SUB	✔	✔	✔	✔	✔	✔	✔
DVI	X	X	X	DVI-D	X	X	DVI-I
Captive cable	X	✔	✔	X	X	✔	X
USB hub	X	X	X	X	X	X	X
USB downstream ports	X	X	X	X	X	X	X
Extra connectors	X	Audio input	X	Audio input, USB upstream	12V output	X	X
CABLES SUPPLIED							
VGA signal cable	✔	✔	✔	✔	✔	✔	✔
DVI signal cable	X	X	X	X	X	X	X
Other	X	Audio cable	X	Audio cable, USB cable	X	X	VGA to DVI-A
GENERAL SPECIFICATIONS							
External PSU	✔	✔	✔	X	Optional	X	X
Typical power consumption (W)	27	25	35	28	35	25	60
Power consumption in standby mode (W)	5	3	5	3	5	5	5
Horizontal scan range (kHz)	31-60	30-60	30-60	25-61	31.5-60	24-61	31-61
Vertical scan range (Hz)	56-74	55-75	60-75	55-75	60-75	56-75	56-75
IMAGE ADJUSTMENTS							
Brightness	✔	✔	✔	✔	✔	✔	✔
Contrast	✔	✔	✔	✔	✔	✔	✔
Auto phase	✔	✔	✔	✔	✔	✔	✔
Auto positioning	✔	✔	✔	✔	✔	✔	✔
Colour temperature	✔	✔	✔	✔	✔	✔	✔
Extra adjustments	Noise	RGB	X	Saturation, hue, gain, audio controls, smoothing, OSD lock out	Sharpness	Saturation, hue	X
AUDIO							
Speakers	X	2 x 1.5W	X	2 x 1W	X	X	Optional (2 x 2W)
Headphone connector	X	✔	X	✔	X	X	X
ERGONOMICS							
Tilt angle in degrees (up, down)	20, 5	15, 5	20, 5	30, 5	31, 4	30, 5	35, 0
Swivel angle in degrees (left, right)	0, 0	0, 0	0, 0	0, 0	0, 0	0, 0	30, 30
Standard VESA bracketing	✔	✔	✔	✔	✔	✔	✔
Kensington lock	X	✔	✔	✔	✔	✔	✔
TCO 99	✔	✔	✔	X (TCO 95)	✔	✔	✔ (TCO 95 if black)
Extra features	X	X	X	Height adjustment	X	X	Height adjustment, slim bezel
DIMENSIONS							
W x H x D with base (mm)	360 x 355 x 158	356 x 360 x 165	372 x 355 x 171	326 x 330 x 173	358 x 346 x 128	353 x 370 x 204	344 x 342 x 212
Weight with base (kg)	3.2	4.7	3.7	3.7	3.8	3	6

1 Street prices were all correct at time of going to press. 2 ISO 13406-2 states that a maximum of two pixels and four subpixels may be defective per million pixels. 3 TN = Twisted Nematic, IPS = In-Plane Switching, MVA = Multidomain Vertical Alignment

	LG L1510P	NEC LCD1501	Philips Brilliance 150P3A	Samsung SyncMaster 152T	Sharp LL-T1520H	Sony SDM-X52B	ViewSonic VG150m
	90	103	107	104	103	106	93
	£275 (£323)	£219 (£257)	£269 (£316)	£251 (£295)	£349 (£410)	£289 (£340)	£244 (£287)
	Bechtle Direct 01249 467944	Bechtle Direct 01249 467944	Watford Electronics 0870 220 0700	Bechtle Direct 01249 467944	Bechtle Direct 01249 467944	dabs.com via website only	dabs.com via website only
	www.bechtle.co.uk	www.bechtle.co.uk	www.watford.com	www.bechtle.co.uk	www.bechtle.co.uk	www.dabs.com	www.dabs.com
	www.lge.co.uk	www.nec-mitsubishi.com	www.ce.philips.co.uk	www.samsungelectronics.co.uk	www.sharp.co.uk	www.sony-cp.com	www.viewsoniceurope.com/uk
	3yrs on-site	2yrs on-site	3yrs on-site	3yrs on-site	3yrs on-site	3yrs C&R	3yrs on-site
	3yrs	2yrs	3yrs	3yrs	3yrs	3yrs	3yrs
	ISO 13406-2	ISO 13406-2	4	ISO 13406-2	ISO 13406-2	9	ISO 13406-2
	15	15	15	15	15	15	15
	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768
	TN+film	TN+film	MVA	Not stated	Sharp ASV	TN+film	TN+film
	✔	x	✔	x	x	x	x
	120	120	110	150	170	115	110
	120	160	150	160	170	150	120
	16.1m	16.2m	16.7m	16.2m	16.7m	16.2m	16.7m
	30	30	25	Not stated	25	30	30
	250	250	250	350	250	300	260
	350	350	400	450	400	400	400
	✔	✔	✔	✔	✔	✔	✔
	DVI-I	x	DVI-D	DVI-D	DVI-I	DVI-D	x
	x	x	x	x	x	x	x
	✔	x	x	x	x	x	x
	2	x	x	x	x	x	x
	x	x	Audio input, microphone output, audio output, microphone input	x	Audio input, microphone output	x	Audio input
	✔	✔	✔	✔	✔	✔	✔
	x	x	x	✔	x	✔	x
	x	x	Audio cable (2)	x	Audio cable	Audio cable	Audio cable
	x	x	✔	✔	x	x	✔
	28	20	23	31	36	28	30
	3	2	2	2	3	3	3
	31-63	31.5-60.5	30-61	30-61	31.5-60	28-61	30-62
	56-75	56-75	56-76	56-75	56-75	56-75	50-85
	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	x	✔
	x	OSD lock out	x	OSD lock out	x	Gamma adjust, RB gain, ECO mode, advanced smoothing, OSD lock out	Audio controls
	x	x	2 x 2W	x	2 x 1W	2 x 1W	2 x 2W
	x	x	✔	x	x	✔	x
	145, 55	30, 5	25, 5	90, 5	30, 5	80, 0	85, 5
	0, 0	0, 0	175, 175	0, 0	45, 45	0, 0	0, 0
	✔	✔	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔
	✔	✔ (TCO 95 if black)	✔	✔	✔	x (TCO 95)	✔
	Height adjustment, Colorific	x	Height adjustment, microphone	Natural Color software	x	ECO mode	x
	356 x 380 x 229	345 x 344 x 166	343 x 354 x 179	358 x 347 x 185	337 x 354 x 180	392 x 358 x 199	359 x 325 x 191
	5.1	3.7	4.6	2.9	4.9	4.8	3.3

ADI MicroScan S600/S

PRICE £200 (£235 inc VAT)
SUPPLIER PC Nextday 0870 162 6342
VERDICT **It's no match for the best when it comes to performance, but a low price and solid image quality make it an attractive buy.**

In common with most of the monitors here, the ADI uses a TN+film panel. These are now two or three generations behind the best TFT panels, which use Super-IPS technology. In theory, this leaves the screens with narrower viewing angles, lower brightness and contrast figures, as well as slower screen updates.

In the MicroScan's case, our tests certainly bore out the theory about smaller viewing angles. Both horizontally and vertically, the colour and contrast changed significantly at relatively narrow angles. It performed respectably in the rest of the real-world tests, though. The analog connection was noticeable in our pixel-tracking and timing-lock check, but it wasn't too distracting in practice.

However, the TN+film panel can't be blamed for the S600/S's poor results in our colour purity tests, with a noticeable dark patch at the top of the screen, probably caused by inconsistent backlighting. When it came to colour handling, the MicroScan managed to pull back some kudos, reproducing the colour ramp excellently with an even gradient and no over-saturation. Unfortunately, the colour spectrum wasn't so well handled. Both cyan and yellow were drowned out by red, green and blue.

The OSD is controlled by five buttons on the underside of the monitor, one of which activates the auto-setup feature. The menu itself is easy to understand, but this is partially due to its basic nature, the only advanced options being separate controls for red, green and blue.

This all adds up to a basic but respectable screen, which wouldn't have jumped out at us apart from one thing: its price. Only the AOC costs less, but the MicroScan is a leap ahead in terms of quality. If you desperately want a TFT screen but can't stretch over £200, the S600/S is the one to go for.

PC PRO RATINGS
OVERALL
101
QUALITY 102 | FEATURES 88 | VALUE 111
100 IS THE AVERAGE

AOC LM520A

PRICE £179 (£210 inc VAT)
SUPPLIER Watford Electronics 0870 220 0700
VERDICT **Despite the amazingly low price, the AOC's poor image quality means it can't compete with more costly screens.**

We checked and double-checked the price, but this AOC really is selling for £179, making it the cheapest TFT we've seen. The question is, how many sacrifices are you making for the low price?

The first sign of compromise was in our real-world tests. It only gained full points in the ghosting test, with the viewing angles particularly disappointing. Also, the 3D game was badly affected by the 40ms response time, which blurred movement. This was in contrast to the sharpness and resolution tests, which the AOC breezed through despite only having a captive VGA cable to carry the signal. The colour and greyscale tests were more of a mixed bunch. Colour purity was acceptable, but the colour-tracking test showed up a green tint and the white level saturated too early – not that this will have too much effect in everyday use.

Photos won't look as natural as we'd have liked, though. Colour scales scored well, with all colours ending at the same point and no over-saturation, but we found the primary colours crowded out the secondary colours in the spectrum test.

The OSD is controlled by a jog wheel, which you push to select. It's simple to navigate, but it makes setting up the options a bit more difficult. It includes separate controls for the primary colours, allowing you to fine-tune the screen.

There's no doubt that the AOC offers superb value for money, especially considering the integrated speakers, but if you're looking for a cheap 15in TFT we recommend the more expensive, but better-quality, ADI MicroScan.

PC PRO RATINGS
OVERALL
93
QUALITY 89 | FEATURES 88 | VALUE 108
100 IS THE AVERAGE

CTX S530

PRICE £239 (£281 inc VAT)
SUPPLIER dabs.com via website only
VERDICT **The zero dead-pixel warranty sets the CTX apart, but its image quality and feature set are disappointing for the price.**

CTX's S530 is the only TFT monitor to include a guarantee that there will be no dead pixels, albeit only for 101 days from purchase. It covers any pixel fault, even down to individual subpixels failing. This undoubtedly increases the cost of the monitor, but it's a welcome move and one that other manufacturers are sure to follow.

The panel itself isn't as good as we'd hoped. Its viewing angles are comparatively poor, with the S530 dropping points for both horizontal and vertical viewing angles in the real-world tests. The colour and greyscale tests proved equally tricky. It struggled with the colour-tracking test – some of the dark greys had a purple tinge, while several squares disappeared in the dark greyscale check.

However, the electronics behind the S530 are certainly up to scratch, as the sharpness and resolution tests prove. It was impressive over its analog VGA connection and up to the standards of the Hitachi, Iiyama and Philips screens.

The bezel isn't one of the thinnest on test, and is painted a curious champagne colour that's unlikely to match any PC or peripheral. However, the OSD controls at the bottom are simple and offer direct access to brightness and contrast, although the menu itself has no advanced features besides auto-setup.

With no USB hub, speakers or pivot facility, the CTX is lacking the features that would help it get further up the rankings this month. As it is, the quality of the TN+film panel isn't good enough to justify the extra outlay required as a result of the dead-pixel warranty.

If you're looking for a basic TFT screen without the fripperies of speakers and USB hubs, the NEC LCD1501 offers the best value.

PC PRO RATINGS
OVERALL
94
QUALITY 94 | FEATURES 93 | VALUE 99
100 IS THE AVERAGE

Eizo FlexScan L367

PRICE £309 (£363 inc VAT)
SUPPLIER Bechtle Direct 01249 467944
VERDICT **It may be expensive, but Eizo's latest screen is well worth the extra cost if you want the best image quality.**

The L367 shot onto our A List after we saw it last month (*see Reviews, issue 101, p114*), thanks to a host of image-enhancing features that helped to produce the best quality we'd seen on a TFT. But now comes the real test: a head-to-head with a whole host of competing screens.

Our first look confirmed last month's impressions. Even though we tested the L367 using its VGA input – the FlexScan includes a DVI-D input but Eizo doesn't supply a DVI cable – its sharpness and resolution were as good as they come. Horizontal viewing angles were similarly excellent, although it was let down by disappointing vertical viewing angles.

But it was the colour and greyscale tests where the Eizo excelled. It gained full marks for the colour purity tests and both the colour and greyscale intensity ramps. This is partially thanks to the L367's advanced 10-bit (rather than 8-bit) colour handling. The sole blot on its copybook was the colour scales test, where four colours were over-saturated.

Thankfully, the OSD is comprehensive, with options for saturation, hue, gain and smoothing. It's simple to navigate using the buttons, but Eizo uniquely also provides a USB connection, so you can control it all via software, making adjustments easier still. Bizarrely, though, it doesn't include a USB hub.

With a thin bezel, the L367 stands out in terms of looks, and it also includes a pair of reasonable speakers. Despite the high price, the quality produced by the panel is second to none and it boasts some great features. It therefore fully deserves its A-List status and Labs Winner award this month.

PC PRO RATINGS
OVERALL
111

QUALITY	FEATURES	VALUE
117	104	99

100 IS THE AVERAGE

Hansol H530

PRICE £249 (£293 inc VAT)
SUPPLIER dabs.com via website only
VERDICT **With average image quality and features, and an above-average price, the H530 trails some way behind the winners.**

The Hansol is the only screen here to use an IPS TFT panel, a technology designed to give wider viewing angles than its TN+film counterpart. In the H530's case, this wasn't immediately obvious from its horizontal viewing angles, but it did better than most in the vertical viewing angles check.

The other real-world tests were passed without any problem, although the H530's sharpness and resolution were affected by the absence of a DVI connector. Also, there was a slight waver in the pixel-tracking and timing-lock test screen, which we couldn't completely remove using the OSD.

The OSD itself is simple to navigate. Three buttons on the bezel allow direct access to brightness, contrast and auto-setup as well as the menu system. The only advanced control is for sharpness, although we failed to see any difference between its two modes – text and graphics.

We noticed a couple of problems in the colour and greyscale tests. The first was colour tracking, where several of the supposedly neutral greys had a distinct purple tint. The other issue was a slight over-saturation in the white-level test where the final grey block disappeared. However, it wasn't too obvious that the H530's panel only supports 262,144 colours rather than the typical 16 million.

At £249, the Hansol is too expensive when compared with other screens around the £200 mark. True, there's an optional power supply should you wish to mount the screen on something other than its supplied stand, but that's no reason to choose the Hansol over the NEC or ADI.

PC PRO RATINGS
OVERALL
95

QUALITY	FEATURES	VALUE
99	91	99

100 IS THE AVERAGE

Hitachi CML152XW2

PRICE £215 (£253 inc VAT)
SUPPLIER dabs.com via website only
VERDICT **A basic TFT with respectable image quality, but it needs a further price drop to make an impact in this competitive market.**

In our recent 17in and 18in TFTs group test (*see Labs, issue 97, p79*), Hitachi's submission was praised for decent quality at a reasonable price. This month, it has kept the price down again – only two monitors cost less. As with most TFTs at this price, the panel is of the TN+film type, offering quite narrow viewing angles of 100 degrees vertically and 130 degrees horizontally.

This was borne out in our real-world tests, where the Hitachi earned poor marks for its viewing angles. On the other hand, general clarity was superb and there were no other problems. Despite the analog rather than digital connection, via a captive VGA cable, it coped well in the sharpness and resolution tests. Its colour and greyscale performance was more mixed. Colour purity was excellent, as were the colour combinations and colour scales. However, the white level saturated too early and the intensity ramps suffered from obvious banding.

Only auto-setup is directly accessible from the buttons on the front of the display. Brightness, contrast and everything else must be accessed through the OSD. The hue and saturation settings aren't very obvious, as they're hidden behind the colour management menu, but everything else is simple to find and adjust.

There are no speakers or USB hub and the stand is a basic tilt-only device, but it's good to see a built-in power supply, saving the use of an external transformer.

Overall, the CML152XW2 is a basic screen for a reasonable price. However, Hitachi needs to drop the price further if it wants to steal sales from the even cheaper ADI MicroScan.

PC PRO RATINGS
OVERALL
99

QUALITY	FEATURES	VALUE
99	94	107

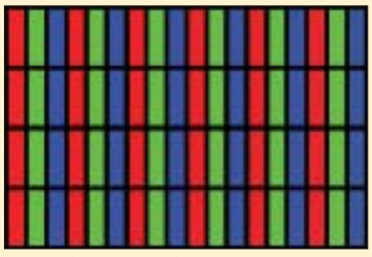
100 IS THE AVERAGE

Joining the dots

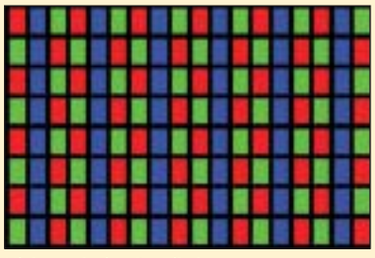
The PenTile Matrix could render current flat-panel technologies obsolete

Billions of pounds of investment is poured into the development of flat-panel technology every year, with some of the world's top electronics companies targeting the 'perfect' display. Indeed, there are several trade shows that exhibit ideas from these companies as well as dozens of little-known R&D firms. Most of the research falls by the wayside, but occasionally a technology makes its way onto your desk.

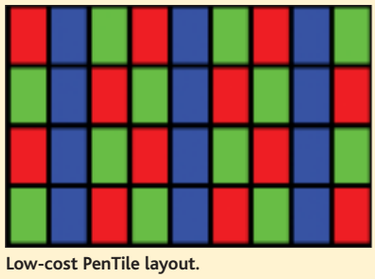
ClairVoyante Laboratories could well be developing one of those ideas. The US firm has been working on a novel idea that alters the pixel layout inside a flat panel in a bid to improve image quality and/or reduce production costs. It's a combination that has attracted the interest of Samsung, which has already shown prototypes using the technology.



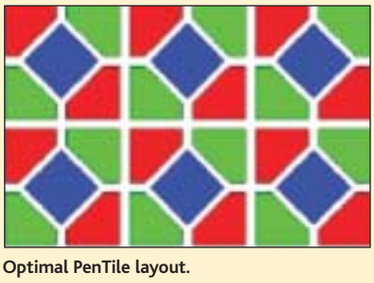
Conventional RGB stripe.



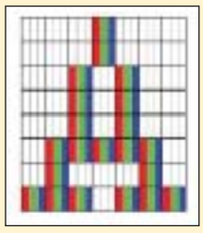
High-resolution PenTile layout.



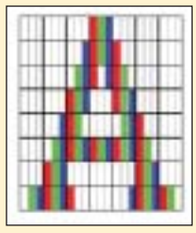
Low-cost PenTile layout.



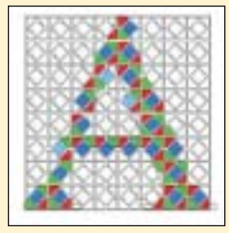
Optimal PenTile layout.



Conventional rendering on an RGB stripe display.



Microsoft ClearType subpixel rendering on an RGB stripe display.



PenTile subpixel rendering on a PenTile Matrix display.

ClairVoyante claims that understanding how the human visual system works can lead to new ways of handling display data, and its PenTile Matrix concept does just that. The company has designed a pixel layout that could replace the standard red, green and blue horizontal stripes that are used in LCDs.

Its design exploits the fact that the human eye doesn't use blue for resolving detailed images – in fact, the human visual system sacrifices the ability to pick up blue so it can focus on red and green. Many more receptors in the eye pick up red and green than they do blue, leading ClairVoyante to claim that almost a third of the information presented on current panels is wasted.

With this in mind, the company says it's possible to reduce the amount of blue information displayed by an LCD without significantly affecting the image. This would free up space so a greater area could be devoted to the more important red and green subpixels.

The alternative pixel layout patented by ClairVoyante places the blue subpixel in the middle of four other subpixels – two red and two green. As well as making better use of the space available, this design allows for a more uniform image due to the symmetrical distribution of colours.

However, convincing the world's flat-panel display manufacturers to alter their already expensive production processes to take account of a different pixel layout is a difficult task. Aware of this, ClairVoyante has developed an alternative design that it claims could be implemented easily into current manufacturing processes. Like present designs, it distributes subpixels horizontally, although red and green subpixels alternate vertically.

Furthermore, the PenTile Matrix employs subpixel rendering in an extension of the ClearType technology Microsoft includes in Windows XP. On a PenTile Matrix display, a pixel consists of six subpixels, centring on any green or red subpixel on the display. But unlike a typical RGB layout, where the three subpixels are always used as a set combination to make up one logical pixel, ClairVoyante's design allows for subpixel sharing. Each of the red and green subpixels is used five times – once as the centre of a logical pixel and four times as the edge of a neighbouring logical pixel. The brightness of each subpixel is adjusted to create the desired composite colour.

ClairVoyante has adopted two approaches to this design in an attempt to convince display manufacturers. Doubling the number of rows would have obvious resolution benefits, but the company also claims costs could be reduced while maintaining comparable performance to a traditional RGB stripe panel.

Since the design uses subpixels more efficiently, ClairVoyante claims it can halve the number of horizontal subpixels compared with a traditional display and match the resolution. This design would use the same number of row drivers as current displays while halving the number of column drivers.

It would also save power. First, because there are fewer drivers to switch, and second, as the pixels are larger, less power is required to achieve the same brightness. This is because there are fewer subpixel spacers in the way to block light.

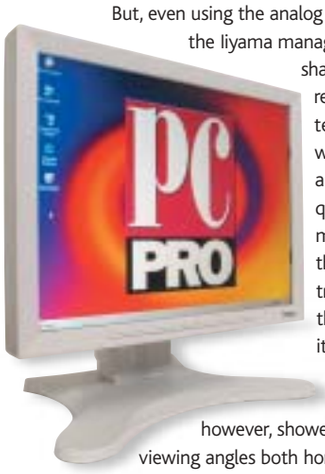
Their arguments have convinced independent display experts and manufacturers. Samsung has already shown 15in LCDs displaying UXGA (1,600 x 1,200) and QXGA (2,048 x 1,536) resolution, while ClairVoyante claims the technique is just as valid for notebooks, TVs, mobile phones and PDAs. The company told us to keep an eye out for products in 2004.

PAUL TROTTER

Iiyama AX3819UT

PRICE £321 (£377 inc VAT)
SUPPLIER CCL Computers 01274 471201
VERDICT **Despite the extra features and high-quality TFT panel, the Iiyama is simply too expensive for us to recommend it.**

The Iiyama is one of the few screens this month to include a height-adjustable stand. This is more useful than it sounds, as it allows you to position the monitor at eye level and keep the screen completely horizontal. The AX3819UT also has the strangest cable pack this month. As well as a VGA-to-VGA cable, it includes a VGA-to-DVI-A cable. This latter has no notable benefit over a standard VGA cable and it's puzzling why Iiyama includes this instead of a true DVI-D cable.



But, even using the analog connection, the Iiyama managed the sharpness and resolution tests well, with only a slight question mark over the pixel tracking – the Eizo beat it here. The real-world tests, however, showed up narrow viewing angles both horizontally and vertically, but the other tests in this section were fine.

The Iiyama made up most of its points in the colour tests. Superb colour purity and colour combinations results were followed by clear passes in the saturation and dark-level tests. The only problems were with the colour tracking where a faint tint showed, the greyscale intensity ramp where banding was evident, and the colour spectrum where yellow and cyan were drowned out.

The Iiyama boasts an excellent TFT panel matched by a well-designed OSD offering direct access to brightness, contrast, auto-setup and input selection. However, it's too expensive when compared with the Eizo, which manages to offer better image quality for £10 less. If you can find the AX3819UT cheaper, though, it will make a great purchase.

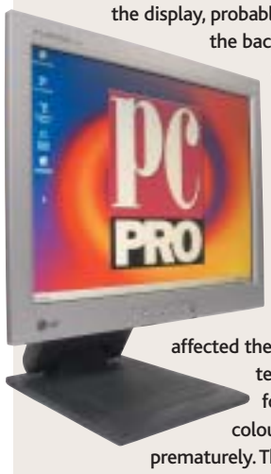
PC PRO RATINGS
OVERALL
103
QUALITY 104 | FEATURES 110 | VALUE 92
100 IS THE AVERAGE

LG L1510P

PRICE £275 (£323 inc VAT)
SUPPLIER Bechtle Direct 01249 467944
VERDICT **Its pivot function marks it out from the crowd, but its poor image quality stops it challenging for awards.**

There are only two monitors in this Labs that allow the screen to be pivoted into portrait mode: this LG and the Philips. Pivot support is particularly beneficial to those who work in print media, as an A4 page can fit on the screen in the portrait position, albeit without menus and so on. The stand allows the screen to be tilted 145 degrees back for mounting inside a desk; it can then be swivelled around – perfect for a point-of-sale or customer-service role.

Unfortunately, the LG fell down in a few key image quality areas. Sharpness and resolution tests were affected by the analog connection – LG doesn't include a DVI cable to take advantage of the DVI-I interface. Colour purity was marred by a variation in brightness from the top to the bottom of the display, probably caused by the backlight. The screen also suffered from poor contrast (despite its 350:1 claims), which caused it to fail the white-level saturation test. This affected the colour scales test too, where four of the colours saturated prematurely. The L1510P also disappointed in our real-world tests, only earning full marks in the ghosting check.



At least the OSD makes it easy to get the most out of the panel: it's well laid out and intuitive to navigate using the five buttons on the bezel. Two of them double up as direct access to brightness and auto-setup. Even more usefully, there's a small two-port USB hub in the arm of the base.

Despite its impressive feature set, poor image quality means we can't recommend the LG. There are other screens that cost less and give better image quality, including the pivot-supporting Philips.

PC PRO RATINGS
OVERALL
90
QUALITY 81 | FEATURES 115 | VALUE 88
100 IS THE AVERAGE

NEC LCD1501

PRICE £219 (£257 inc VAT)
SUPPLIER Bechtle Direct 01249 467944
VERDICT **A sharp-looking screen with performance to match, the NEC makes a compelling low-cost option.**

Although the LCD1501 is one of the least expensive TFTs here, it certainly doesn't look it. The silver-coloured bezel is complemented by a black base and outer rim, making it an attractive addition to any desk. There are no buttons to spoil the effect either, as they're camouflaged in the black trim.

It's good to see direct access to brightness and contrast even if the buttons aren't labelled, but the menu system itself is cumbersome, with six options screens. That said, it doesn't really offer any advanced features. There are six settings for colour temperature, but that's about it.

At £219, NEC is in obvious competition with Hitachi this month. The Hitachi performed better in the real-world tests due to the LCD1501's relatively poor viewing angles, despite NEC's generous quotes of 120 and 160 degrees (vertical and horizontal respectively). However, we were very impressed by how well this TFT locked onto the analog signal – a good thing, as there's no DVI connection – which helped the NEC to perform superbly in the sharpness and resolution tests.

The NEC finally pulled ahead of the Hitachi when it came to the tough colour tests. The only real problems were issues with colour purity caused by the backlight. The colour combinations were all perfectly readable, and the colour intensity ramp was almost free of banding and showed an even spread.

One slight compromise at this price is the two-year rather than three-year warranty, although it's good to see on-site rather than return-to-base cover. However, it's the LCD1501's decent image quality, great design and even better value that earn it our Best Value award this month.

PC PRO RATINGS
OVERALL
103
QUALITY 104 | FEATURES 93 | VALUE 112
100 IS THE AVERAGE

Philips Brilliance 150P3A

PRICE £269 (£316 inc VAT)
SUPPLIER Watford Electronics 0870 220 0700
VERDICT **With a superb feature set and good image quality, the 150P3A is a great alternative to the more pricey Labs Winner.**

The Brilliance only lost its position on our A List due to the arrival of Eizo's superb FlexScan L367, and this month Philips again demonstrates why the 150P3A is such a good buy. For a start, it includes lots of great features. Quite apart from its pivoting ability, it boasts a stand that sets it aside from the competition. This includes a pair of speakers and a microphone as well as sockets for attaching separate devices such as a headset.

There's a DVI input on the panel itself, but sadly Philips doesn't supply an appropriate cable. As such, we tested the Brilliance with the supplied D-SUB cable. Thankfully, the automatic setup works perfectly, with no pixel jitter, which can lead to an apparent loss of focus. This helped the 150P3A to good scores in the sharpness and resolution tests.

The Brilliance also performed well in the colour and greyscale tests, with only a couple of problems. The saturation test showed the final grey block disappearing into whiteness, while the 256-level grey test also saturated too early and showed some banding.

With an MVA panel rather than TN+film, we expected good viewing angles from the 150P3A. This was true horizontally, but we were slightly disappointed by its vertical viewing angles, with both colour and contrast changing dramatically. However, the panel's good response time helped it to perform well in our remaining real-world tests.

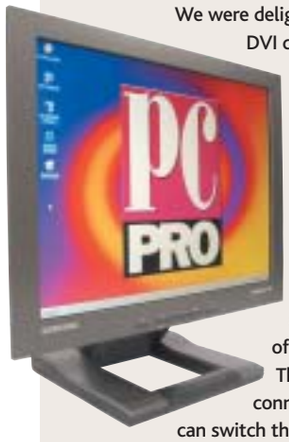
You should also find the 150P3A easy to use, thanks to a well laid-out OSD, although only brightness is directly accessible. The Brilliance can't match the Eizo for sheer image quality, but, if you'll take advantage of the pivoting ability and flexible stand, it makes an excellent, cheaper alternative.

PC PRO RATINGS
OVERALL
107
QUALITY 102 | FEATURES 112 | VALUE 100
100 IS THE AVERAGE

Samsung SyncMaster 152T

PRICE £251 (£295 inc VAT)
SUPPLIER Bechtle Direct 01249 467944
VERDICT **The cheapest DVI-equipped TFT here. A good buy if you only need a basic screen but want sharp results.**

Finished in an understated charcoal colour, the SyncMaster will look swish on any desk, even though the chance of it matching any PC or peripheral is slim. Then again, Samsung seems to have similar point-of-sale aspirations to LG, with the panel folding back onto its stand. If you intend to attach the monitor to a wall, note that the VESA mount is on the bottom face of the stand so the whole monitor must be attached.



We were delighted to see a DVI cable in the box. Although seven of the monitors here include a DVI connector, only Samsung and Sony save you the inconvenience and cost (£20) of buying one. There's a VGA connector too; you can switch the source directly using the control on the front of the screen. Brightness and auto-setup are also directly accessible, but changing anything else involves using the menu.

The SyncMaster romped through the sharpness and resolution tests with no problem. The only slight issues in the colour and greyscale tests were some banding in the intensity ramps and two colours over-saturating in the colour scales test. However, the viewing angles were disappointing given that Samsung claims 150 degrees vertically and 160 degrees horizontally: the contrast changed dramatically in the vertical test, even when looked at close up straight on, and colours also faded quickly in the horizontal test.

If you don't need speakers, pivoting screens or USB hubs, the Samsung offers a good, basic screen with a DVI connector.

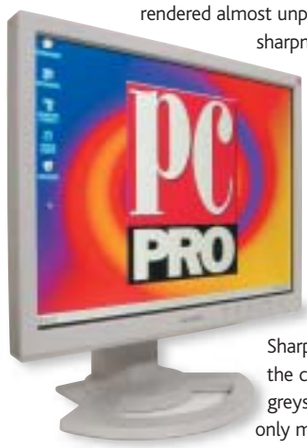
PC PRO RATINGS
OVERALL
104
QUALITY 100 | FEATURES 106 | VALUE 102
100 IS THE AVERAGE

Sharp LL-T1520H

PRICE £349 (£410 inc VAT)
SUPPLIER Bechtle Direct 01249 467944
VERDICT **Although an excellent monitor, the Sharp is too expensive when there's the likes of the Eizo around at £40 less.**

In the recent 17-18in TFTs group test (*see Labs, issue 97, p79*), we commended the quality and feature set of Sharp's LL-T1820H but couldn't see any way to justify the price. Unfortunately, the same is true of the 15in version. As with its larger brother, the LL-T1520H uses ASV technology, which gives it the widest viewing angles of any screen here, although the stated 170 degrees is a bit optimistic.

The LL-T1520H performed all but one of the other real-world tests very well, with the exception being the game. This showed a lot of blurring around fast-moving objects and was rendered almost unplayable. The sharpness and resolution tests lacked a bit of polish, but this can be cured by the purchase of a DVI cable. Even over analog, the Sharp shone in the colour and greyscale tests. Its only major problem was with over-saturation in the white-level test, which the control in the OSD couldn't correct.



The OSD itself is awkward, with the options split over four screens that can only be navigated in one direction and can't be exited except by going to the end. Also, there's no direct access to any screen setting unless you count the volume of the built-in speakers. The menu is well featured though, with three colour settings, including sRGB for those concerned about colour accuracy.

The real problem for Sharp is this monitor's price. When you can buy the Eizo for £309, there's no justification for the £349 price tag here. We'll only be able to recommend this screen when it drops to well below £300.

PC PRO RATINGS
OVERALL
103
QUALITY 107 | FEATURES 109 | VALUE 90
100 IS THE AVERAGE

The price is right

TFT sales look set to rise, but so could their prices

TFT sales look set to explode in 2003, with market research firm DisplaySearch (www.displaysearch.com) predicting 29 per cent growth in the last quarter of 2002, and this against a backdrop of falling PC sales.

There's one obvious driver for DisplaySearch's optimism: price. With a 15in TFT now costing the same as a high-quality 17in CRT, buying a flat panel makes sense for businesses and consumers alike. Not only do you get a better image – forget geometry issues, for a start – but also lower running costs, a better-looking PC and more space on your desk.

In the past, TFT pricing has been extremely volatile due to the quirks of the supply-demand equilibrium, but the new generation of TFT fabs has now arrived. These fabs produce larger sheets of glass, which can then be cut down to produce more panels per sheet. This increases factory output and reduces unit cost.

There are other efficiency savings too. The new fabs promise better yields, with fewer dead pixels per million, while the whole process has become even more automated than before. On *PC Pro*'s visit to the LG.Philips plant in South Korea, we spotted just five workers on the entire factory floor.

However, each new generation of fabs has produced similar grounds for optimism, only for prices to rise again as demand outstrips short-term supply. This time around, one area that could prove particularly important in this equilibrium is the OEM market – will manufacturers follow Dell's lead and promote TFT screens over and above the CRT? If so, prices could easily rise, just as memory prices rose when manufacturers started including 256MB as standard rather than 128MB.

We still think that TFT prices will continue to drop, but there'll be months when they'll rise too. And who knows, that month might be April, May or June 2003, which is why we advise you to buy now rather than wait and suffer with your old screen.

TIM DANTON

Sony SDM-X52B

PRICE £289 (£340 inc VAT)
SUPPLIER dabs.com via website only
VERDICT **A DVI connection and bundled DVI cable help get the best out of this top-quality screen. The only problem is the high price.**

We're almost always impressed by the quality of Sony screens, be they TFT or CRT, but the company has recently failed to win any awards in our Labs due to high asking prices. This time, £289 isn't far away from Sony's DVI-equipped competitors, so we had high hopes for the SDM-X52B.

One advantage Sony immediately holds over the majority is the bundled DVI cable – only Samsung matched this thoughtful inclusion. The all-digital connection helped Sony's screen to shine through in our tests too. As we expected, it passed the sharpness and resolution tests with flying colours, and it performed equally well in the colour purity tests, with no changes of shade across the screen.

The only slight problems we noticed were in the dark-greyscale test where some blocks weren't visible, plus the two intensity ramps showed some banding. In the real-world tests, our sole criticism concerned the vertical viewing angles from the TN+film panel. Although better than some, the contrast ratio declined and colours inverted at relatively low angles.

The bezel is one of the widest, over 4cm on either side of the screen. One reason for this is that the speakers aren't directly underneath the screen. This gives a wider stereo image, but like all the speakers here the sound quality won't do justice to your CD collection. The volume controls on the right double as menu controls and there's a button for activating the ECO mode, which dims the backlight, saving 20-40 per cent power.

But it's image quality that concerns us most, and there's no disputing the SDM-X52B's calibre. Unfortunately for Sony, Eizo takes image quality one step further, while Philips steals the Recommended award due to its marginally better features and lower price.

PC PRO RATINGS
OVERALL
106

QUALITY	FEATURES	VALUE
109	103	99

100 IS THE AVERAGE

ViewSonic VG150m

PRICE £244 (£287 inc VAT)
SUPPLIER dabs.com via website only
VERDICT **A respectable screen, but it's nothing special. Cheaper monitors beat it on features and image quality.**

If there's one thing this Labs shows, it's that you can now buy a 15in TFT for £200 and expect good image quality. The question is, what does the VG150m offer that you can't buy for £50 less? In terms of technology, there's nothing to get excited about. It uses a TN+film panel, and thus mediocre viewing angles, and there's a solitary D-SUB connector, so you're not buying the luxury of a digital connection.

This isn't a problem in itself, as several of this month's monitors have shone even with an analog connection. Unfortunately, the VG150m isn't one of them. Pixel jitter – a result of the digital-to-analog, analog-to-digital conversion process – was very noticeable in the pixel-focus and timing-lock check. We also noticed some colour purity problems, with slight dark patches at the top and bottom of the screen.

The stand is one of the few non-detachable ones here. The first few degrees of movement require only a little force. However, moving from 20 degrees back to 85 degrees takes some effort. This is because the VESA mounting holes are in the base and, once fully folded, allow the whole monitor to be fixed to the wall. The extra effort required is to stop it folding forwards off the wall once mounted.

The bezel includes buttons for controlling the on-board speakers as well as accessing the OSD. This is easy to navigate, but having buttons labelled '1' and '2' instead of 'select' and 'exit' makes life harder.

This is by no means a bad screen, but ViewSonic needs to price the VG150m more aggressively if it wants to compete with ADI, AOC and NEC.

PC PRO RATINGS
OVERALL
93

QUALITY	FEATURES	VALUE
94	95	98

100 IS THE AVERAGE