

## A guide to setting up Test Chart 2000

Test Chart 2000 will run on virtually any PC running Windows 95, 98, 2000, XP or NT. We do not at present supply the computer hardware because all the components that are required can be obtained from your local computer shop.

However the following information may help you when purchasing the equipment and setting it up in the consulting room.

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### **Choosing a PC**

Test Chart 2000 will run on virtually any PC as long as it is running Windows 95, 98, Me, 2000, XP or NT. You do not need a state of the art machine but you may find that the old machine that you have rescued from the loft may be a bit too slow when it comes to drawing the more complex displays. Also, older machines may not be capable of generating high enough screen resolutions - we recommend a minimum of 800 x 600 but 1024 by 768 (or higher) is better.

If you are buying a new computer, the entry level specification (currently something like a 500MHz processor, 64MB Ram and a 10GB hard disc) is more than adequate for the task. Read the section on graphics cards below before ordering. Also have a look at some reviews in computer magazines to find the best value for money.

### **Laptop or Desktop?**

For domiciliary work a laptop is ideal. Place the laptop on a suitable flat surface, measure the distance to the patient and enter this into Test Chart 2000. The program will then scale everything appropriately for this distance

and you have your full battery of consulting room tests available wherever you are. The IR remote control is very useful under these conditions as it allows you to control the program from up to 10 metres away which avoids having to walk to and fro to use the keyboard.

Some practitioners also use a laptop in the consulting room, either using the laptop display or plugging in a separate monitor.

To use the laptop display you obviously need to mount the laptop at a suitable position in the consulting room, either above the patient's head (for mirror viewing) or at the other end of the consulting room for direct viewing. In either case you will probably need to use the remote control to operate the program.

Alternatively, you can plug an external monitor into most laptops. This allows you to have the laptop in front of you and a second display for the patient to view. This can work well but make sure that the laptop can support the resolution of the second monitor, i.e. if the second monitor has a resolution of 1024 by 768, check that your laptop can support this resolution. The only problem with this arrangement is that the two monitors will display the same image. This is not a problem while you are using the test chart program (indeed it allows you to see what the patient is looking at). However, if you want to run any other programs, these will also be displayed on the patient's screen.

Laptops do have the big advantage that they take up less room so for a small consulting room this is a good solution provided that you don't want to run any other software on the laptop during the examination

Desktop PCs are generally cheaper than laptops for a given specification. However they do take up a bit more room in the consulting room. One of the main advantages of a desktop is that they can support two monitors (when equipped with two graphics cards or a Matrox G450 graphics card- see below). This means that one monitor can be dedicated for displaying the test chart while the other can be used for operating practice management software, imaging programs, word-processing or whatever. This is probably the ideal setup in the consulting room.

## Summary

For domiciliary work a laptop is ideal. In the consulting room a laptop is worth considering if space is limited. However, it is very useful to have two independent displays - one for the patient to look at and one for the practitioner to look at and at present this can only be achieved using a desktop

## Choosing an operating system

Test Chart 2000 will run under Windows 95, 98, ME, 2000, XP or NT. Most stand alone PCs now run Windows 98, ME or 2000 while networked systems often use 2000 or NT.

The only consideration in terms of Test Chart 2000 is that Windows NT does not provide full support for two independent monitors at present. It may be

worth checking on the Microsoft ([www.microsoft.com](http://www.microsoft.com)) or Matrox ([www.matrox.com](http://www.matrox.com)) websites for the latest developments in this respect.

### Choosing a graphics board

Test Chart 2000 will operate with most graphics boards. The important features are the following:

- resolution
- refresh rate (for CRT monitors)
- colour resolution

**Resolution** refers to the number of pixels that can be displayed on the screen. The more pixels you have, the “crisper” the image is. For Test Chart 2000 we recommend a minimum resolution on 800 x 600 although 1024 x 768 (or higher) will produce better results, particularly for shorter working distances.

**Refresh rate** refers to the number of times per second the screen is refreshed. This only really applies to raster scanned CRT monitors where low refresh rates will result in the perception of flicker on the screen. Images on TFT flat panel display are generated in a different manner and refresh rate is much less important.

**Colour resolution.** Most graphics cards can be set to 4, 8, 16, 24 or 32 bit colour. This means that each pixel can display  $2^4$ ,  $2^8$  .....  $2^{32}$  colours respectively. The number of colours that can be displayed by the graphics card will affect the number of contrast levels that can be displayed by Test Chart 2000 and the range of colours that can be used for the duochrome and binocular vision tests. In practice, 16 bit colour is perfectly adequate.

**Memory and Speed.** Each pixel is mapped onto the memory of the graphics card. Therefore, the more pixels that are displayed, the more memory is required on the graphics card and the faster the graphics processor has to work to update the display. Likewise, the more colours that can be displayed by each pixel the more memory is required to store each pixel. Therefore increasing the resolution and colour depth increase the demands on memory and processor speed. Likewise, increasing the refresh rate increases the demand on processor speed. As a result, one often has to compromise between resolution, colour depth and refresh rate. However, the speed and memory capacity of graphics cards has increased dramatically in recent years and most graphics cards are easily capable of meeting the demands of Test Chart 2000.

### Dual monitor support

Windows 98, ME, 2000 and XP support the use of two independent monitors. This is particularly useful for Test Chart 2000 as one monitor can be used to display the test chart while the other can be used by the practitioner to run other software.



To drive two monitors you will need to either install two graphics cards into your PC or install a dualhead card such as the Matrox G450. You will also need to set up Windows for dualhead support by selecting Display from the Control Panel.

The Matrox G450 card is a good all round graphics card. Its ability to drive two independent monitors makes it ideal for running Test Chart 2000 in the consulting room.

The card is available from most computer suppliers for a cost of approximately £100



### Choosing a display

**CRTs or TFTs:** Standard CRT-based monitors are generally adequate for displaying test stimuli although some flicker may be apparent even at high refresh rates as a result of the interaction between eye movements and the raster scan. Furthermore, there is often some variation in screen luminance over time and the contrast of the display is less than printed charts particularly when ambient light falls on the screen.

Most of these problems are overcome by the new generation of Flat Panel Displays (FPDs). A variety of display technologies are employed by these monitors but the best in terms of displaying test stimuli are the Thin Film Transistor Liquid Crystal Displays (TFT LCD). These displays consist of a thin layer of liquid crystal material sandwiched between a vertical and horizontal polarizer. The liquid crystal material is made up of long crystalline molecules. The individual molecules are arranged in a spiral fashion such that the direction of polarization of light passing through is rotated by 90 degrees. Light entering through the vertical polarizer is thus rotated by 90 degrees and passes through the horizontal polarizer. However, when an electric field is applied to the crystals, they all line up and lose their polarizing characteristics. Without the polarizing effect of the liquid crystal layer, the vertical and horizontal polarizers will attenuate most of the light.

Conventional Liquid Crystal Displays use horizontal and vertical grids of wires to generate a matrix of electric fields. Individual cells within the matrix can then be turned on or off by applying a current across specific elements in the grid.

Thin Film Transistor (active matrix) LCD panels have a transistor for each cell in the matrix. The transistors allow the state of the crystals to be changed more rapidly allowing images to be moved without smearing. The transistors also allow the degree of polarization to be varied giving a range of grey levels between on and off. The transistor also serves as a memory for the cell allowing it to stay on without being refreshed. TFT LCD panels are therefore virtually flicker-free.

Colour displays are possible by dyeing the liquid crystals and juxtaposing red, green and blue cells. The individual coloured cells are too small to be

resolved by the eye. Therefore a wide gamut of colours can be produced by varying the relative intensity of the red, green and blue cells in each triad.

TFT LCD Flat Panel Displays are used by most laptop computers and are becoming increasingly popular for desktop PCs as an alternative to CRT monitors.

FPDs are light (easy to wall mount), have excellent resolution and contrast (typically 250:1) and are flicker-free. They are also capable of producing adequate luminance (200 cdm<sup>-2</sup>), good uniformity across the screen and are very stable over time. They are therefore ideal for presenting test stimuli.

### **IMPORTANT**

FPDs have a “native” resolution – that is they are designed to be used at a particular resolution. While they can be used at different resolutions, there is usually some degradation of image quality. It is vital therefore that the graphics card in your computer is set to the native resolution of the FPD.

### **Which Flat Panel Display should I buy?**

Most of the major monitor manufacturers now produce a range of flat panel displays. Most are suitable for use with Test Chart 2000 although you should check the following:

**Size:** A 15” flat panel display is perfectly adequate for displaying Test Charts. These are currently selling for between £300 and £1000. The price jumps significantly for larger displays and they have no major advantage in terms of displaying test charts.

**Resolution:** Most 15” displays have a resolution of 1024 x 768. We would not recommend lower resolutions than this.

**Viewing Angle:** Modern flat panel displays have very wide viewing angles (i.e. the luminance remains constant from a wide range of viewing angles). In the consulting room the display will be viewed from at least 3 metres so this is not a major consideration.

**Screen luminance and contrast:** Most flat panel displays are capable of producing luminances of 150 cdm<sup>2</sup> or more and contrasts in excess of 200:1. This is perfectly adequate for displaying test charts.

**Screen uniformity.** Flat panel displays generally have very uniform luminance across the screen and are very stable over time - much better than the average projector chart!

### **IMPORTANT**

If you want to mount the flat panel display directly on the wall (the neatest solution) check the following:

- It has VESA compliant fittings (screw holes in standard locations so that a standard wall mounting bracket can be used - available from Thomson-Software-Solutions if required)
- It has a separate power supply - some models have the power supply built in to the base unit

### So which one then?

Having tested half a dozen different models, I am not convinced that there is very much to choose between them in terms of image quality.

We have installed Samsung flat panel displays in the City University clinics and have been very pleased with their performance. Make sure that you choose a model with a separate power supply if you want to wall mount it.

### Positioning the monitor

The monitor may be viewed directly or via a mirror.

#### Direct viewing

Place the monitor at or slightly above the patient's eye level. The program can be configured for any viewing distance but in practice viewing distances of less than 3 metres are not advised because:

- The smaller letter sizes will not be reproduced well on the monitor
- Some refractive compensation for viewing distance may become necessary

#### Viewing via a mirror



Mount the monitor on a shelf or bracket above the patient's head. Ensure the mirror is correctly positioned so that the monitor is seen in the centre of the mirror.

Select Mirror optotypes from the Options screen to reverse the optotypes.

In our view, refraction is best carried out with the patient looking as far as possible into the distance. The mirror arrangement usual provides the maximum possible viewing distance within a consulting room.

### Mounting Flat Panel Displays

Flat panel displays are relatively light and can be mounted on a shelf or fixed directly to the wall. The latter option is rather neater but you will need a monitor that:

- Has VESA compliant fittings (most do but check)
- A separate power supply (not incorporated into the base unit)

Several types of mounting brackets are available and can be supplied by Thomson Software Solutions



## Controlling the Program

Considerable effort has gone into ensuring that Test Chart 2000 is quick and easy to use. Most of the time, a single key press is all that is required to rotate around your favourite sequence of charts and displays.

The program can be controlled using the keyboard, the mouse or using the optional IR remote control.



The remote control system consists of an IR receiver that plugs into the serial port and a customised handset. All aspects of the program can be controlled using the remote control - you can even point at letters on the charts from the comfort of your stool.

Driver software for the remote control is fully integrated into Test Chart 2000. Installing the remote control option is therefore as simple as plugging it in and selecting ENABLE REMOTE CONTROL.

The remote control system therefore saves space (no keyboard or mouse required), gives rapid access to all the display options and provides complete freedom in the consulting room.

If you have any further queries about setting up Test Chart 2000, please contact us at:

[support@thomson-software-solutions.co.uk](mailto:support@thomson-software-solutions.co.uk) or by telephone on 01707 851051