# Video Special

We look at the current state of the art in VCRs

MR Anderson

March 1992 • £1.50

# PRACTICAL NEW ELECTRONICS

SCIENCE AND TECHNOLOGY

## Kodak Colour
Photo-quality prints from a computer

## Image Scanning
The ultimate colour test

## Micronet
An obituary from its editor

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Video recorders from the inside

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Cognito E-Mail WAN
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Plus CAD software

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**Build a video fader**
**Video jargon explained**
**Barry Fox talks teletext**

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## This month...

*Welcome to this bumper edition of Practical Electronics. We've crammed more into the mag than ever before this month.*

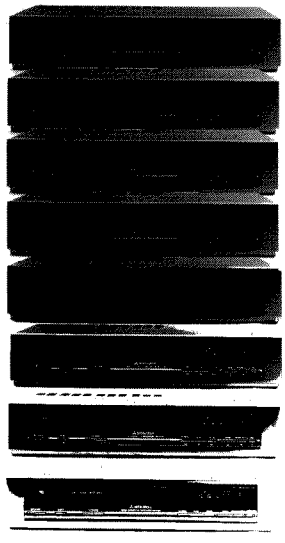
*The video special examines the world of video players and recorders in detail. We not only review four top models, we've also taken the lids off for a peek at their insides.*

*If you are looking to buy a VCR take a look at the new 'info pages' section at the back – it also explains all the jargon you'll need to know to understand the sales pitch.*

*As well as videos, this month sees features on Kodak's new photo-quality printer and a very reasonably priced image scanner – we actually used it to produce some of the magazine.*

*For the constructionally minded there is a video fader system. This simple project not only serves as a practical example of how easy video is to manipulate, it illustrates many of the principles behind the technology.*

*Kenn Garroch, Editor*



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Out On 6 February

Cover photography: Ed Davis

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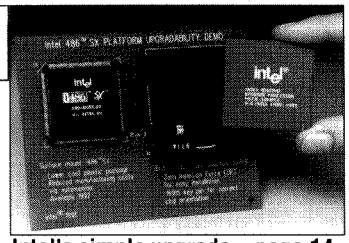

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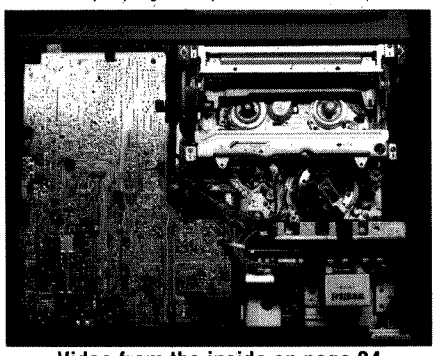

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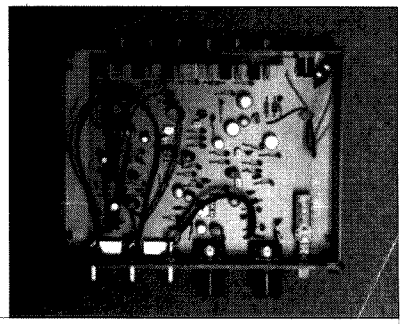

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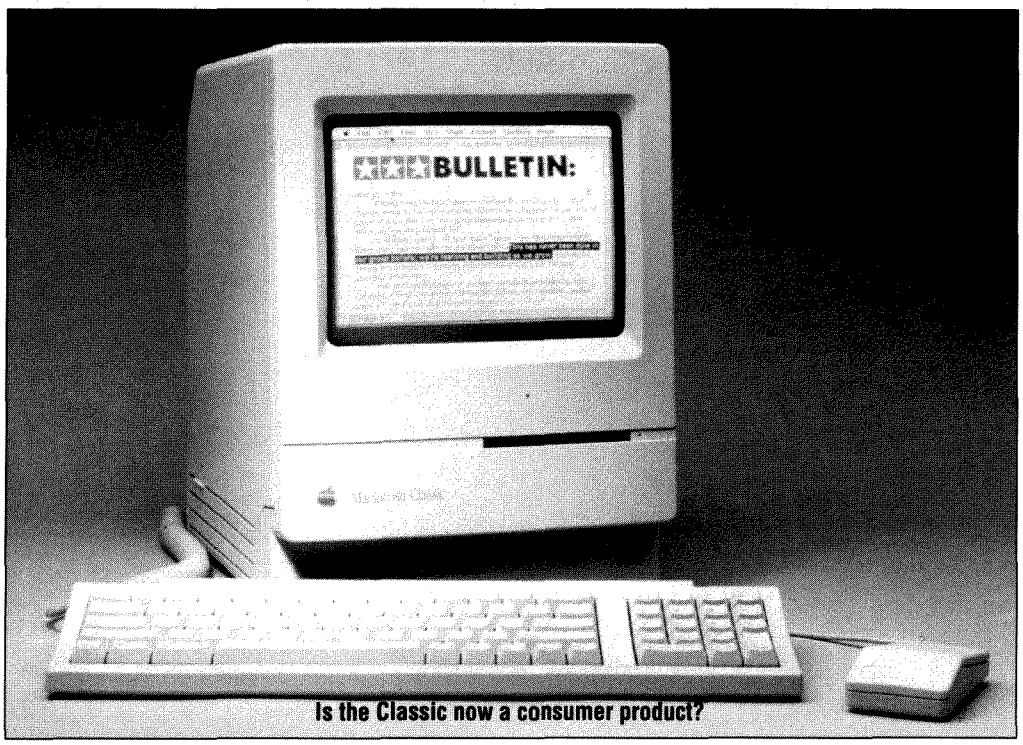
# Innovations

*Apple goes consumer, Toshiba with its new portables and virtual reality in the classroom.*



Is the Classic now a consumer product?

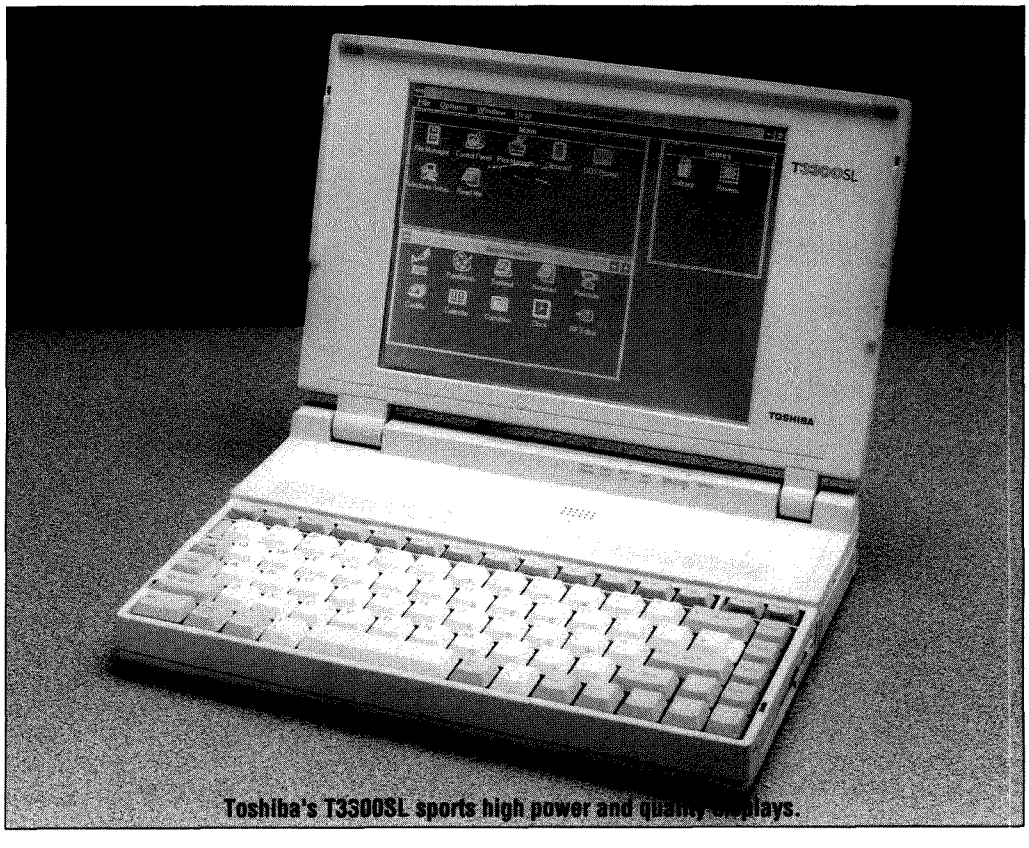
## Apple Consumer

Apple, the makers of the Macintosh range of computers, recently announced that it would be entering the consumer market. Although most people may think that they have been selling consumer products for years, in practice Apple has been trying to penetrate the strongly IBM orientated corporate market – Macs account around 9% of the market compared to 40% for PC compatibles.

The new consumer systems will be based on a CD-ROM based desktop computer using Quicktime, Apple's proprietary multimedia software.

Another concept is the idea is of the 'personal digital assistant' which aims to transform existing analogue media into digital form. This is currently happening in many instances, compact disks, CD-ROM and wordprocessors are all examples of using digital technology to store what was previously analogue information. Apple's new gadgets will take the form of electronic books, organisers, note takers, telephones and other types of personal communicator.

Apple also announced that its recent alliance with IBM will soon take more concrete form in the shape of a company called Kaleida. The idea is to create a standard multimedia format to be used by the whole electronics industry. Whether there are any Japanese partners in the enterprise is not yet known but this could be an important feature – all that Apple will say is that



Toshiba's T3300SL sports high power and quality displays.

The Toshiba 6400 transportable computers.

'other computer and consumer electronics vendors are expected to announce agreements with Kaleida in the near future.'

## New Portables

Toshiba has been a market keader in the field of portable computers since 1986 when it launched its first 8088 based laptop. It has just announced the launch of its latest models, the T3300SL and 6400 series. The first is a notebook type machine that features an Intel 80386SL microprocessor running at 25MHz. An 80MB hard disk and 241mm screen for VGA compatible display make the machine more powerful than many deskbound systems. Weighing in at 2,7kg and £3475 this lightweight is not cheap.

The 6400 series are mains based portables offerring top of the range speed and power with 80486DX/33MHz microprocessors, monochrome gas plasma or TFT (thin film transistor) colour screens . At the bottom of the range is the gas plasma model at £4450 and at the top a whopping £6499 for the colour machine. The systems are designed to appeal to users who require power, transportability and colour for applications such as CAD, DTP and sales presentations.

## Virtual Schools

Virtual reality (VR) systems have recently become very popular with most media interest focussing on their enternainment value. Now, VR has moved into schools.

As part of a £100,000 project funded by the Department of Employment with some commercial partners, West Denton School in Newcastle upon Tyne has recently had its own VR computers and software installed.

Designed to be used by pupils studying 'A' Level Design, Art, Physics, Computer Sciences and Information Technology the project will run three basic projects over the course of this year.

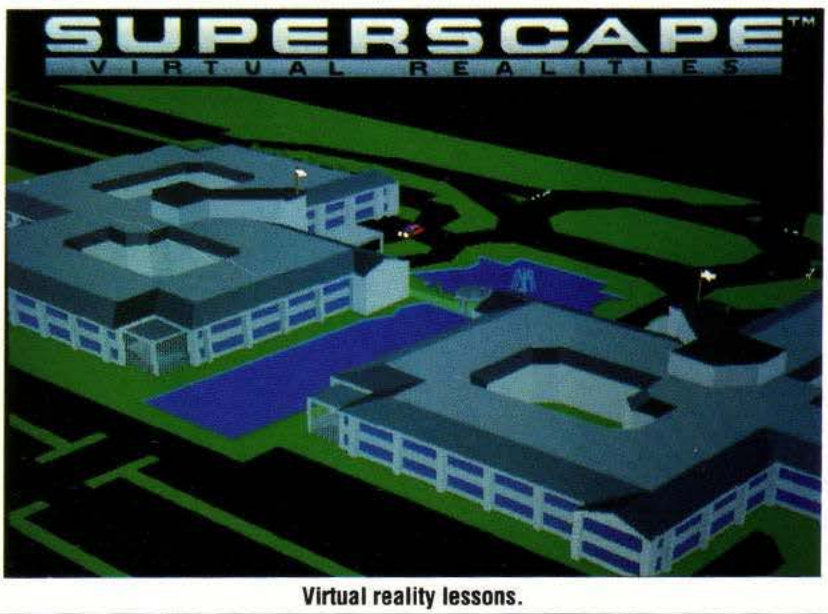
Dangerous Workplace is designed to improve health and safety in industrial environments.

Intelligent City is programmed to help pupils learn foreign languages by placing them in a foreign city.

Outdoor Gallery is set up for sculptors, architects and town planners. It uses well known works by Henry Moore and should help them decide where to best site works of art for the benefit of the artist and the public.

The virtual reality system has been specially designed by Dimension International using the Virtual Reality Toolkit (PE Jan) which allows VR worlds to be created and modified.

For more information on VR systems, write to Dimension International, Zephyr One, Calleva Park, Aldermaston, Berkshire, RG7 4QW ■




Virtual reality lessons.

# Colour In Continuous Tones

*The ability to produce photo-quality prints from computer based images is now a reality with Kodak's XL7700 as Kenn Garroch explains.*

The name Eastman Kodak has been associated with photography almost since its inception and is one of the industry leaders. With the upsurge of electronic media and the use of computers to edit and create images, it is not surprising that Kodak has added to its range of purely photo-chemical processes a number of electronic imaging gadgets. These include an electronic camera, a high definition scanner, the Photo CD (see PE Feb 92) and now the XL 7700 Digital Continuous Tone Printer.

**High quality colour from the XL7700.**

## Quality Digital Colour

Colour printers have been available for a number of years but, until recently, their output quality has usually not been all that good – compared to a photograph. Of course, commercial printing used in magazines has been around for a long time and the ability to print purely computer generated images out with them is possible (the PE covers from Oct 91 to Jan 92 were created in this way). However, these process are either expensive or only work with large runs and have a number of drawbacks when it comes to quality. It has not really been possible to produce a high quality photographic quality print from a computer file until now. The Kodak XL 7700 is able to produce pictures on photographic quality paper that are almost indistinguishable from images produced in the traditional way.

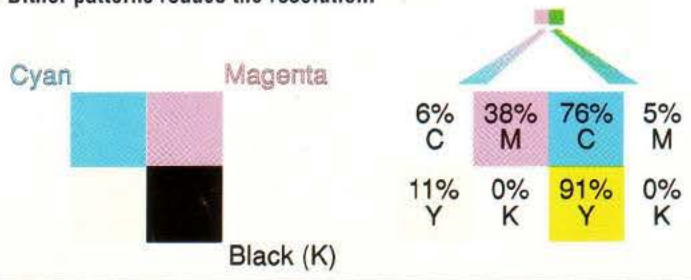
## Other Ways

In the early days, colour printers for microcomputers used coloured ribbons with standard dot matrix technology to produce coloured dots. Unfortunately, at around 72 dots per inch (dpi) the quality was never very good and the number of colours available rather limited.

Recently, a number of new printers have become or are becoming available. Both Hewlet Packard and Canon have ideas that use ink-jet technology combined with four colour printing (the complementary colours Cyan, Magenta, Yellow and Black or CMYK) to produce 300dpi printouts and at under £3000 the printers are relatively cheap. The trouble is that the results are not of high quality and would never be mistaken for photographs.

Many printing systems, such as that used to produce this page, use a technique called dithering to fool the eye into thinking that there is

**Fig. 1. Dither patterns reduce the resolution.**



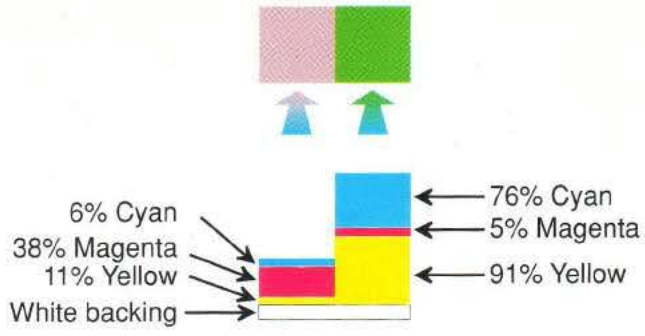



Fig. 2. Continuous tone printing.

Kodak's continuous tone process lays down different thicknesses of yellow, magenta and cyan dye on a white background. When all of these are full thickness a black pixel results. Changing the relative thicknesses of each colour allows almost any colour to be reproduced.

Because the dyes are semi-transparent the light goes through them twice before being seen by the eye.

solid colour where there isn't. A minimum colour dither pattern uses four dots, cyan, magenta, yellow and black placed next to each other. The relative brightness of each of these dots gives rise to pretty well all the colours in the spectrum – in practice it is difficult to produce good royal blues and real golds and silvers are virtually impossible. The drawback with dithering is that it reduces the resolution of the image by a factor of at least 2. A 300dpi printer using a four dot or pixel dither pattern can only print 150dpi images at best (see Fig. 1). One solution uses semi-transparent inks superimposed on top of each other with the different density mixes giving different colours. Each pixel can have any colour with no loss of resolution (Fig. 2). This is the technique used in the Kodak XL7700 and with 256 different levels for each colour (only CMY as black is not used) a total of 16777216 colours from white to black are possible.

## Box Of Tricks

In the flesh, the XL7700 looks like it was built to withstand the harshest use. Its 19in rack front is cased in what appears to be quarter inch steel and it is finished in a rather military looking grey/green. In fact, the system was originally designed for military reconaissance work and was used in the Gulf War to produce aerial pictures. However, there are plans to re-box it in a case more suited to the office environment.

At the moment, all of the driver software for the printer is designed to work with Apple Macintosh type systems. All the user has to do is plug the printer into the computer via a SCSI (Small Computer Systems Interface) connection, install the software, load up the paper and ribbon cartridge and switch on. It is then ready to go. Up to 100 prints can be made from one paper refill and ribbon cartridge with the cost being around £4 per

Arc of a diver.

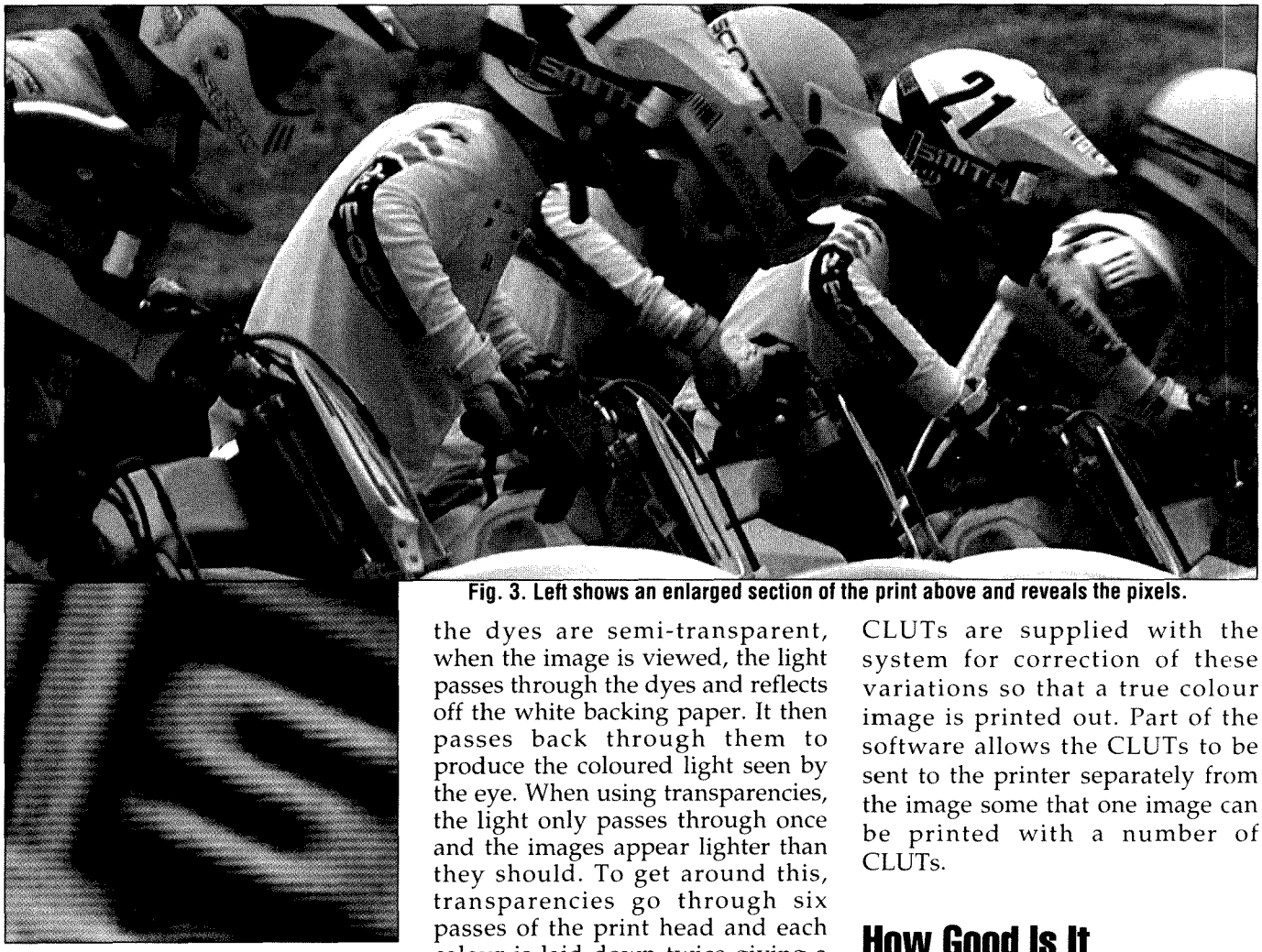


Fig. 3. Left shows an enlarged section of the print above and reveals the pixels.

print. Two sizes are possible, 8.5in x11in and 11in x11in and the special paper can either be opaque white or transparent, for the production of overheads.

Because the printouts are designed to resemble photographs, the special Ektatherm paper is of photographic weight with a glossy finish.

It is not the fastest printer in the world but then, its 200dpi results are of exceptional quality – equivalent to around 400dpi dithered images but of better quality because there is no dithering. It takes three passes to produce one print, one for each colour, plus a finishing stage which drives the inks further into the paper to increase the life of the image to that of a standard photograph. Each pass of the printer heats the paper up so that the surface can accept the dye which had been sublimated into a gas by the heat. After cooling down, the dye becomes part of the paper coating with each pass laying down coat of a different colour. Because the dyes are semi-transparent, when the image is viewed, the light passes through the dyes and reflects off the white backing paper. It then passes back through them to produce the coloured light seen by the eye. When using transparencies, the light only passes through once and the images appear lighter than they should. To get around this, transparencies go through six passes of the print head and each colour is laid down twice giving a double thickness of dye and, hence, the correct colours.

It takes around three minutes to produce one print with facilities such as multiple copies, various colour look-up tables (CLUT) and automatic sizing and orientation being performed by the printer if necessary. In some cases it can take longer for the image data to be downloaded to the printer than it does to actually make the print so the built in extra facilities are quite useful.

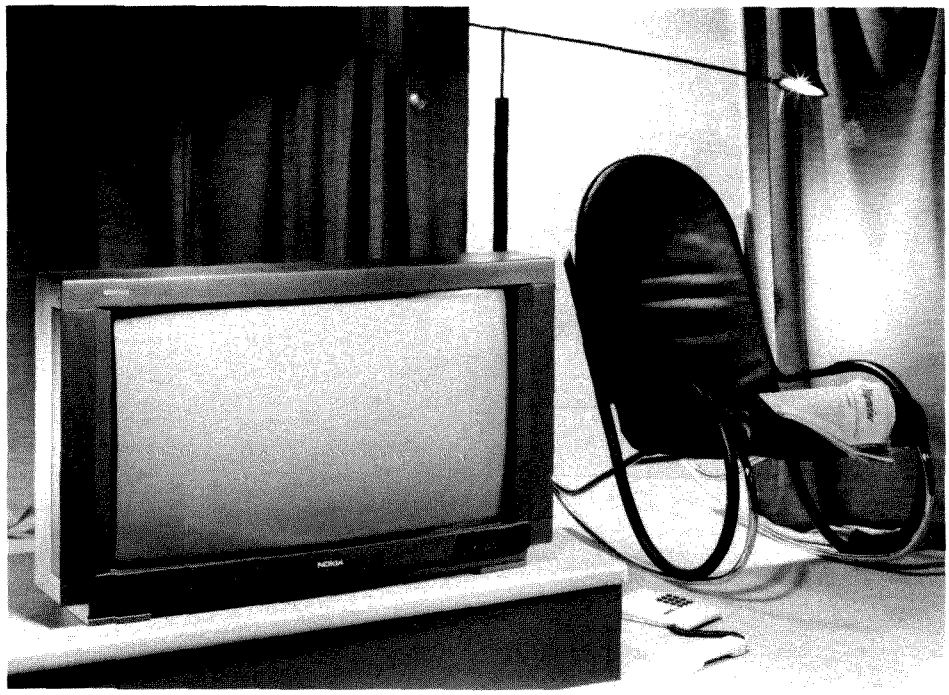
One interesting feature is the ability to use different colour mapping for the digital image. In the computer, the amount of each colour is stored as a number. This number is looked up in a CLUT to translate it into a real colour that is printed. This is necessary since different computer systems and data gathering devices 'see' colours in different ways. A scanner might view oranges and greens as brighter than the equivalent reds and blues and a colour display monitor might display more blues than are actually in the real picture. A number of CLUTs are supplied with the system for correction of these variations so that a true colour image is printed out. Part of the software allows the CLUTs to be sent to the printer separately from the image some that one image can be printed with a number of CLUTs.

## How Good Is It

The printouts from the XL7700 are almost indistinguishable from normal photographs. It takes a powerful lens and a sharp eye to actually see the pixels (Fig. 3). Some example printouts are shown here although they will have suffered a little due to the extra photographic and printing processes they have been through.

The main drawback with Kodak's baby is that it costs around £15,000. This puts it completely out of the range of most people. However, anyone who uses a Mac II for image processing work would find it well worth a look. For the rest of us, the development of such high quality printing via a relatively simple process augers well for the future. The way prices drop in the field of electronics, it should only be a few years before printers like the XL7700 will come as part of a combined VCR/TV/Computer /Communications/ISDN system allowing any image to be printed out in perfect colour. ■

# What's New



This new wide screen TV (36in) from Nokia retails at £2650 and features the latest 16:9 screen ratio and the latest video technology. As well as being able to 'zoom' normal TV pictures to fill the screen, the set allows four TV channels to be viewed at once in windows on the main picture. To 'future proof' the TV, separate sockets are built in for a videocrypt decoder for satellite broadcasts and a MAC decoder for programs transmitted in D2-MAC format.
The set is not strictly high definition TV (HDTV) since it currently accepts only PAL signals and HDTV 1250 line transmissions will not begin in Europe until 1995 at the earliest.

Also from NOKIA are some remote control handsets designed to make operation much easier. Instead of using conventional buttons, the TV mouse uses hand movements. For example, pressing a button and moving handset in a clockwise direction increases the volume – moving it anti-clockwise decreases the volume. Functions such as channel access, colour and brightness control and available through on-screen menus. The TV mouse is available with Nokia's three new Eurostereo colour televisions bringing remote control to TV, VCR and satellite.
The handset works by using a steel ball-bearing which rolls around a five position light sensor. When it comes to rest in a particular position, it blocks a light source and changes a binary code. This code is then sent out via infra-red transmitter to the TV, VCR or satellite.

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**22-166** ..... **£29.95**

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**Mini DMM.** With built-in test leads. Measures 1000 VDC, 750V AC, 200mA DC current. Resistance to 2 megohms. Built-in transistor checker NPN/PNP hFE, 1.5 and 9v battery checker. Requires 9v battery.
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# Low Cost Colour Image Scanning

*Kenn Garroch hooks up a high quality, low cost, colour scanner to the PE desktop publishing system. The results can be seen below.*

Methods of converting images into digital form are getting cheaper and cheaper. They are also achieving qualities only possible on equipment normally costing tens of thousands of pounds. The Scan Xpert scanner used in this review is priced at a modest £2495 but is capable of scanning full 24-bit colour at up to 2400dpi.

Cheap image scanners have a wide variety of applications. At the simple end they can be used as basic capture devices for computers allowing pictures to be used in desktop publishing applications. More complex possibilities are to use extra software to read scanned in text. Optical character recognition systems are now capable or reading almost any printed typeface and will soon be able to decipher handwriting. Another possibility is to use to use the scanner as an archive system. This would allow precious books and paintings to be scanned and stored on computer – in full colour of course. A database system coupled to a high grade display would then allow anyone to read the books and view the pictures without causing them any damage. They could also be printed out again where necessary.

The scanner used for this test measures approximately 52cm x 33cm x 12cm (LxWxH) and is light enough to fit on most desks beside a computer. Its interface and software are designed to be used with a Macintosh but the same system can also be configured to run with an IBM-PC compatible computer. It can scan flat paper images up to 35cm x 25cm in colour or black and white.

Inside the machine is a wide bright fluorescent tube which

**The above was scanned from a photograph at 150dpi in 24-bit colour – file size 1,798k.**

**This version is the same as the top but using 8-bit colour – file size 1,480k.**

Originated on standard chemical film, this images was scanned and stored on a Kodak Photo CD. It was then been printed using an XL7700, scanned at 150dpi in 24-bit colour and printed here at 70.7% its original size – the file was .

The pictures on these pages were all scanned using various resolutions and settings. They can be compared with pictures in the rest of the magazine which were inserted using traditional methods.

A section of the picture on the right scanned at 150dpi in 24-bit colour. The file size is 80k.

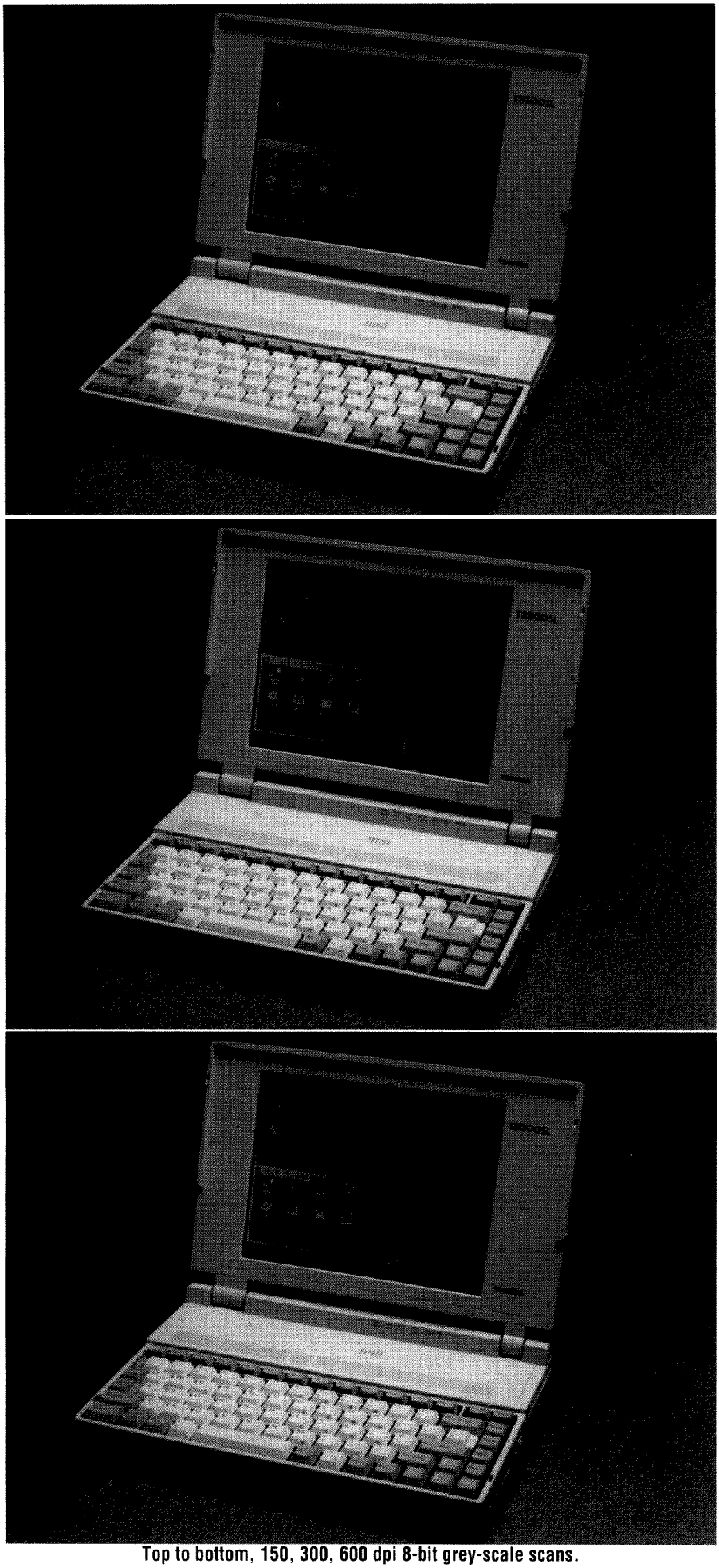
The same picture at 300dpi in 24-bit colour. File size is 302k.

And again but at 600dpi in 24-bit colour. File size is 1,192k.

Yet again again but at 1200dpi in 24-bit colour. File size is 4,738k.

At 2400dpi, the highest resolution, in 24-bit colour. File size is an amazing 18,922k.

Picture scanned at 75dpi and 24-bit colour – file size is 464k.



Top to bottom, 150, 300, 600 dpi 8-bit grey-scale scans.

moves down the image being scanned. As the light rays reflect off the image they are filtered to obtain red, green and blue and captured on a CCD (Charge Coupled Device) sensor that gives a maximum resolution of 2400 dots per inch (dpi). All control is from the computer with the only switch on the scanner being used to switch it on.

Information and control signals are transferred over a small computer system interface, better known as SCSI (pronounced scuzzy). Operation is simply a matter of clicking buttons with a mouse and, one whole, is easy.

All of the pictures in this article (and a few in the rest of the magazine) were scanned in and transferred straight to the page using two software packages, Photoshop and Quark Express – the first is bundled with the scanner and is used to manipulate and convert the format of the image and the second to create the layout and reduce/position the images.

Once the images have been transferred to the computer they are stored in files. The size of these files has a direct relation to the quality of the final result. A low resolution scan – say 75dpi – in black and white produces a relatively small file. Moving on to colour increases this dramatically. Increasing the resolution puts up the file size yet again. The problems really start when trying to scan an A4 image at 2400dpi in full colour – 24-bits means 8-bits each for red, green and blue and results in 16777216 possible colours (256 x 256 x 256). The file would be well over 200M bytes, far larger than the average large hard disk drive and difficult to manipulate. The upshot of this is that to use this scanner efficiently, a very large hard disk drive is needed (600M bytes plus) as is a very fast computer, a Mac Quadra or a Mac with a 68040 accelerator, and a 24-bit colour monitor to see what the image will look like. This should come in at under £15,000, just. On the other hand, for black and white images and their smaller file sizes, a complete system should be under £7000. ■

For more information contact
MacEurope
14/15 Morgan Way
Bowthorpe, Norwich, NR5 9BR

# Moving Data At Giga Bits Per Second

*Simon Valence describes a research project in progress at AT&T's Bell Labs in the USA which is aiming to get the world communicating even higher speeds.*

Following on from the revolution in microcomputers and the idea of one machine per desk comes the concept of the network.

In the old days of minis and mainframes many people would share the use of a large machine and any facilities such as printers, storage plus the ability to easily keep tabs on and control what the users were up to was easy. The separation of processing with their individuals having their own machines has meant providing specific facilities for each user – a printer and mass storage system every micro. In practice, this is not possible, purely on grounds of cost. The solution is to connect the microcomputers together in a network so that they can share facilities, storage, swap files and even use the same file and program on a number of machines at once. Basic local area networks (LAN) are now quite common with many offices sharing their files, printers and storage.

The next step is to connect the LANs together to form wide area networks (WAN). This allows companies that have a number of sites or buildings in a small area, to connect their micros together and share their data – additional facilities such as electronic mail (E-mail), voice mail, on-line conferencing and video conferencing also become feasible. Since the whole system is kept within one company matters of security and access are not too much of a problem. However, at the next stage of development, metropolitan area networks (MANs) and ISDN (Integrated Services Digital Network) where a number of different companies, universities and even individuals have access poses a few more problems. The prospects of being able to access a super computer in a university of company on the other side of the country with the ability to hold face to face conversations are the final step. The current ISDN systems are based on relatively narrow bandwidth connections and have a number of inherent limitations. A research project in progress at AT&T's Bell Labs in the USA is aiming to change all this with the development of LuckyNet, a broadband ISDN system with a bandwidth in the region of 2Gbps – over two thousand million bits per second.

LuckyNet doesn't refer to how good the system is, it is named after the man who came up with the idea, Robert W Lucky (see box). Currently, three Bell installations, at Holmdel, Crawford Hill and Murray Hill are connected via a 2.5Gbps network. The link from Holmdel to Crawford Hill runs through 12 fibre optic cables in each direction, each having a capacity of 155Mbps to give the final gigabit

## Who Needs A Gigabit Network?

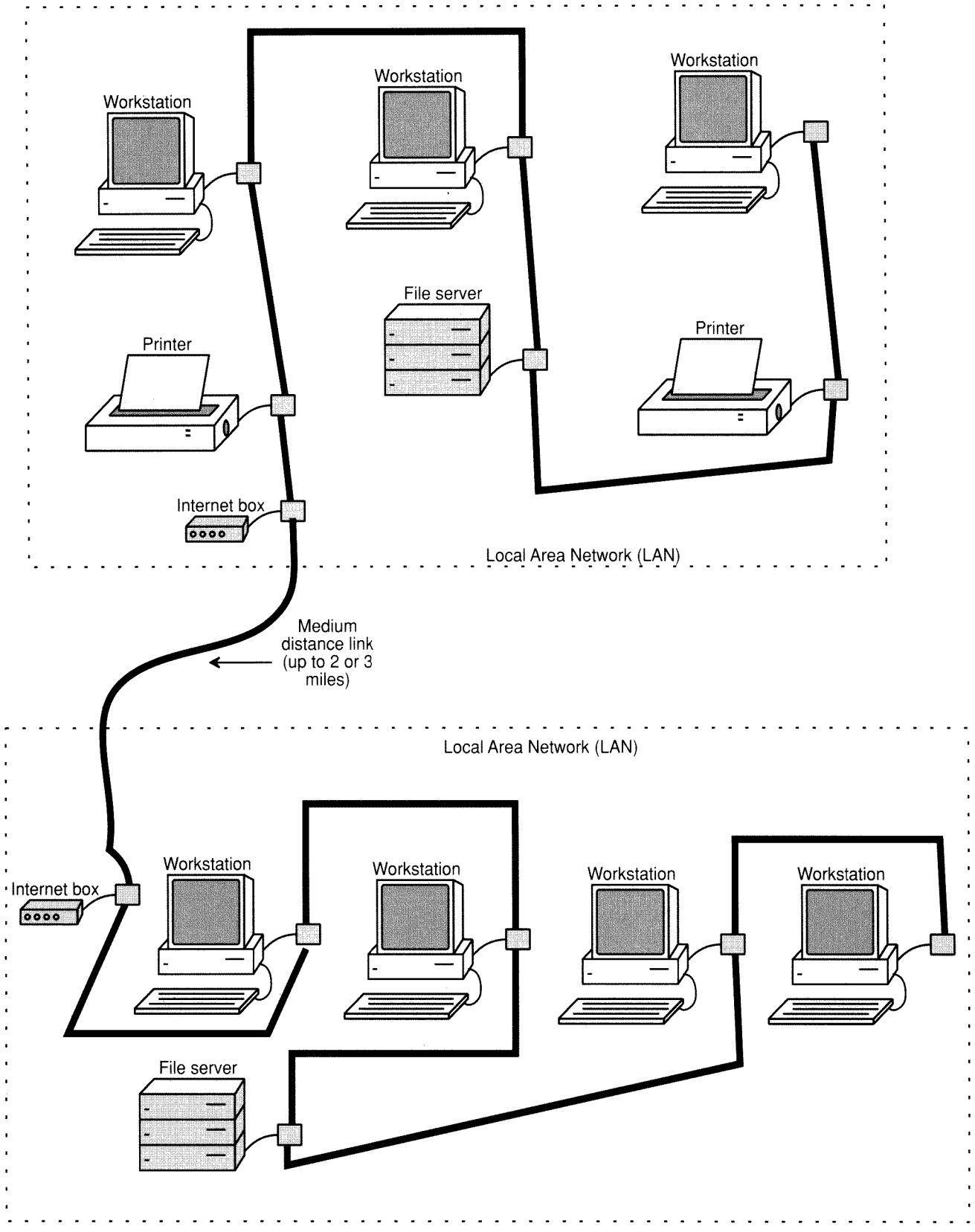
A bill pending before the US Congress would authorise the construction of a nationwide gigabit network to connect educational and research institutions. The issue that keeps being raised is: what would a user do with a gigabit data link?

Good question. A few years ago I did not even know what a gigabit was; now I need one desperately. Otherwise, I may be seriously disadvantaged in this fast-paced information age environment.

So people are mumbling about access to supercomputers and talking about the lagging educational system. This conjures up the image of the disadvantaged student in the ghetto doing three-dimensional visualisations of her computational fluid dynamics on the Cray which this wonderful gigabit network has made accessible to all. If this picture does not ring true, it is because we are not very good at predicting uses until the actual service becomes available. I am not too worried, we will think of something when it happens.

Where will this evolution end? Our optic nerves carry several gigabits per second of information to the cerebral cortex for visual processing. How could we ever use more than that? On the other hand, we aren't the only users of a network. There are machines out there, too, and who knows what they need? Do you think they would settle for a terabit?

Robert W Lucky in IEEE Spectrum, September 1989.



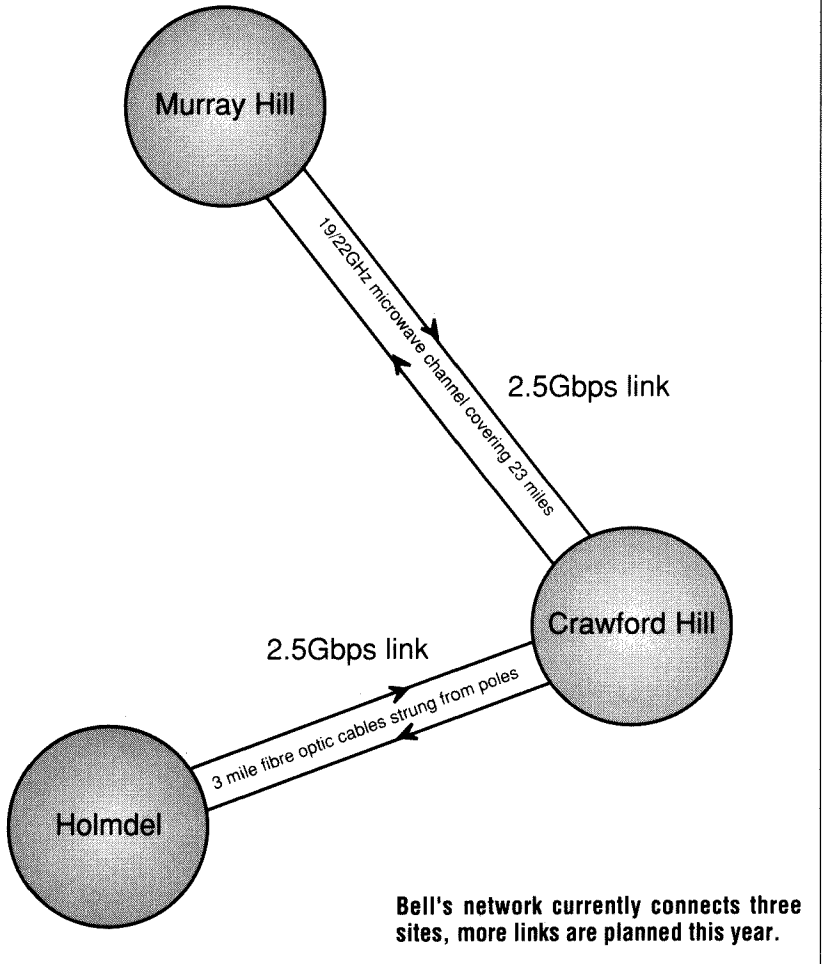

**Networking computers not only allows data to be transferred between machines, it also allows it to be shared via communal data files. The two local area networks shown above are linked together to form a wide area network. Another possibility would be an ISDN link to allow the whole system to access to systems worldwide.**

capacity. The current cost effectiveness of such cables compares well with the equivalent microwave links up to about 15 miles. Over this, radio links in the millimetre region offer better value for money. They also have advantage of being able to cross terrain that would otherwise be difficult – there is no need to negotiate passage rights with a radio beam whereas a fibre optic link requires cables to be strung from poles or buried in the ground and consequently, permission from the land owner.

Although it may seem that expanding the bandwidth of a normal megabit system would produce a gigabit service, there are difficulties. Because information is moving so quickly, faster in fact that many of the computers and telephone systems attached to it, special protocols have to be developed.

One of the standard ways to transmit data over a network system is to chop it into discrete chunks addressed to the destination. This allows it to be multiplexed the data down a single cable. Unfortunately, this has drawbacks at gigabit rates and an alternative is to allow a source and destination to take over a complete cable while they talk. The protocols required for this and the prospects of the congestion it may generate are still being researched by Bell Labs. The LuckyNet provides a test bed for trying out codes and possible solutions.

The prospect of an ultra-high speed network that allows real time access to a super computer or video conferencing with sites dotted all around the globe is still a number of years away. By the beginning of the 21st century such things should start to become a reality and it telecommunications companies can wire a fibre into everybody's home, real global multimedia (sound, vision, data, virtual reality and so on) communications will become an everyday tool. ■




**Bell's network currently connects three sites, more links are planned this year.**

## Jargon

bps – bits per second. This is a measure of the number of data bits that can be transferred over a link. Using standard coding, a letter of the alphabet can be represented by eight bits or a byte so a 60,000 word novel should come to something like 420,000 bytes or 3,360,000 bits and transfer over a 1 giga bps link in around 0.3ms.

Bandwidth – this is a measure of the capacity of a link to transfer data.
multiplex – a process by which a single wire link can be used by a number of different messages at, effectively, the same time. A number of methods are possible. One is to a lot a set amount of time to each message, this time being shorter than any change of the messages data. By synchronising the start and end multiplexing the message appear to run down the link in parallel. An alternative is to assign each message its own carrier frequency in much the same way as radio transmission.

ISDN – Integrated Services Digital Network. By converting all information into digital form and using high speed transmission links, communications can be in the form of speech, video and computer data. This is the largest form of network possibly being international in scope.

LAN – Local Area Network. This is usually confined to one building or a set of connected rooms. A number of computers can be linked together so that information can be exchanged, common facilities such as printers used more efficiently and mass storage devices such as file servers used to provide commonly available files and programs. It is the smallest form of network.

WAN – Wide Area Network. This is made up from a collection of LANs and may also include access to mainframes and mini systems. Generally its size is kept down to a few square miles and is used by one company.

MAN – Metropolitan Area Network. A collection of WANs make up a MAN with access to public telephone systems and possibly video conferencing. This is a city wide network and might be available to a number of establishments.

# Video Programming By Numbers

*Ian Burley examines Video Plus, Sharp's pocket computer, a radio E-mail system and Cambridges super fast network system.*

The average person's inability to program the record timer on a video recorder is now regularly the butt of many a joke at the expense of so-called high technology. It would seem that only eleven year old whizz-kid school children or consumer electronics journalists know how to fathom the secretive codes for recording your favourite programs while you're out. In fact even journos have problems and I'm speaking from experience! Fear not, perhaps the problem has been finally licked by a new invention from the US, called Video Plus.

Various ingenious devices have been cooked up to make life easier for the technophobic video-owner. The remote control made crouching at the video a thing of the past, Panasonic brought in bar-codes, several manufacturers now offer programming via teletext TV listings and Philips in particular has introduced a teletext-based system, called Startext which will even change the recording times when the Channel 4 decides snooker should over-run The Magic Roundabout by fifteen minutes.

But none of these systems are what I'd call "idiot-proof." Moving a cursor around a teletext screen or even selecting the correct bar codes to swipe are still beyond the apparent capabilities of many.

Video Plus can't anticipate when the TV schedulers decide to exercise their last minute whims, but it does appear to provide an extraordinarily simple way of programming video timers. All you need to do is tap in up-to six numbers into the Video Plus unit. Anybody who can use a pocket calculator should have no problem with it. These number codes contain the information for programme start and finish times, plus the

**Video Plus, an end to programming woes?**

# Happy Memories

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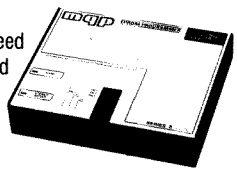

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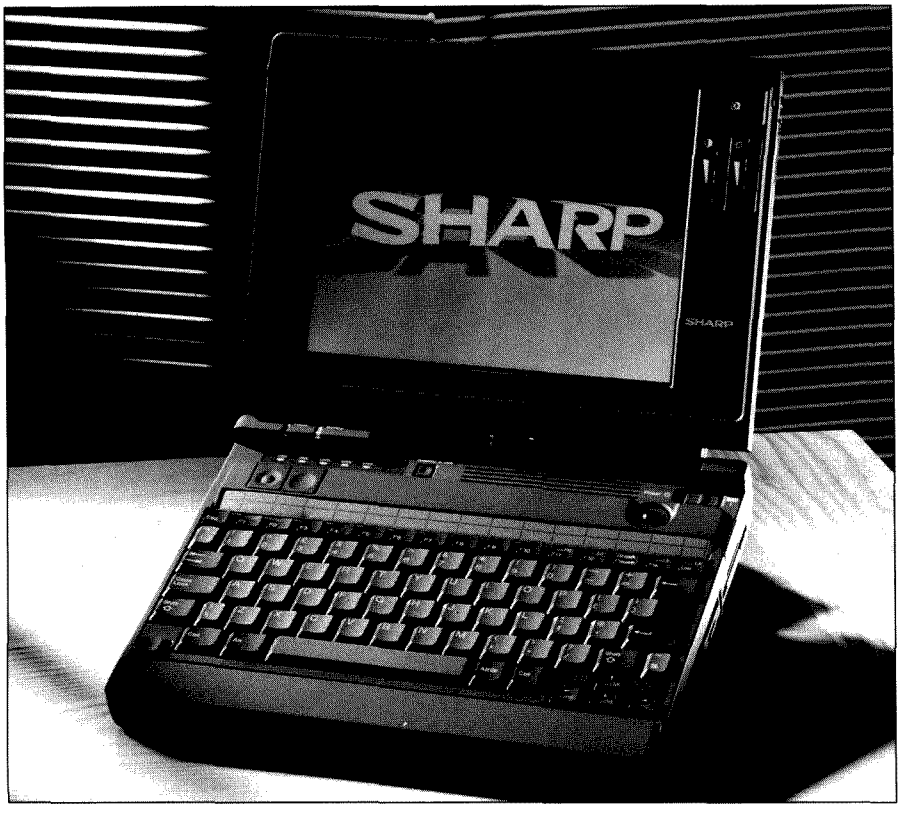



**The new Sharp.**

channel required. It's much like the Panasonic bar-code system except it's easier to use, not restricted to one brand of machine and already appears to be widely supported by the national papers and TV magazines.

Almost any owner of a remote-controlled video recorder can use Video Plus. The unit "learns" the infra-red signalling patterns of the standard remote so that it can take over the functions of remotely switching the video recorder on and off as programmed. Care is needed to position the Video Plus unit so it is in infra-red range with the video recorder at all times. A holster is supplied with the unit for optimum positioning. Besides a numeric keypad, the unit has a clock display and a handy tape time required indicator. A bonus is the fact that if there's a temporary power cut, although the video recorder's clock might be wrong and or the programming lost, the Video Plus unit will be unaffected as it is battery powered. Up to fourteen programmes can be programmed in at one time, which exceeds the capacity of most video recorder timers. Currently Video Plus isn't compatible with certain Philips and Ferguson video recorders, but the US manufacturer Gemstar Development Corporation is promising a more compatible updated model later this year.

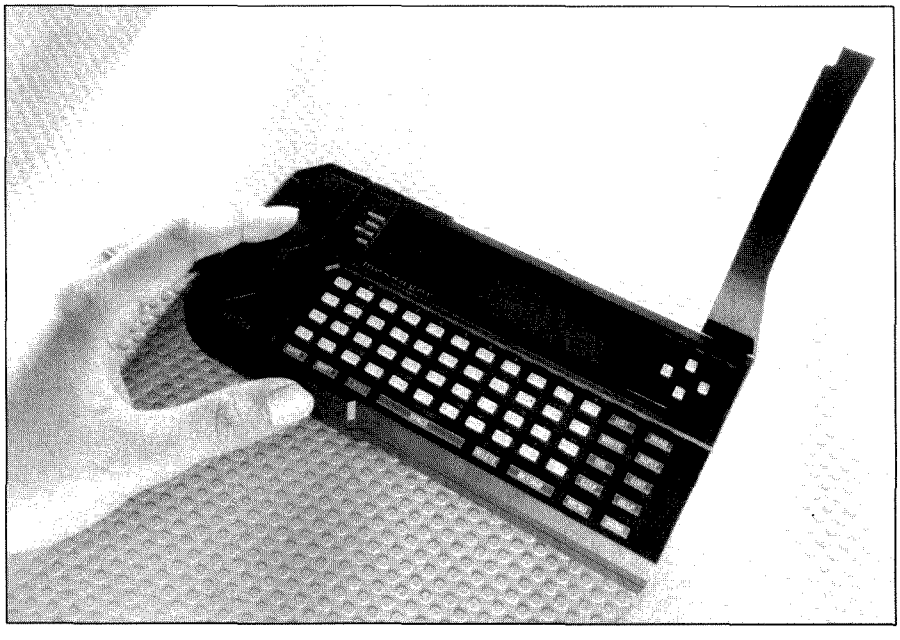
The history behind Gemstar is quite interesting. Co-founders Henry Yuen and Daniel Kwoh have between them PhDs in applied mathematics and physics from the California Institute of Technology, but their video recorder simply laughed at this impressive string of qualifications one evening in 1986 when the pair misguidedly thought they had recorded a baseball game. Along with fellow-graduate Louise Wannier, they set about venting their frustration by devising a compact timer coding system and a suitable Aries-red remote unit which eventually became Video Plus (VCR Plus in the US).

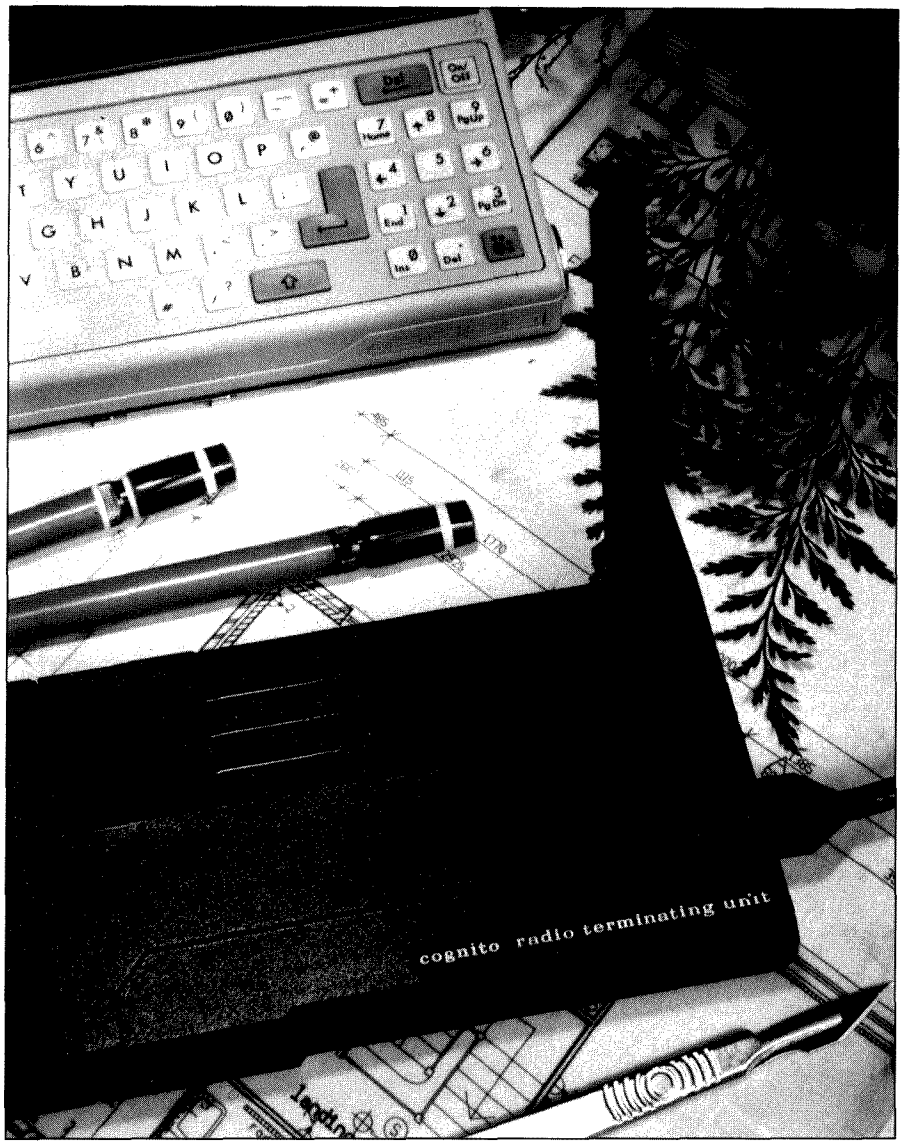
The device was first shipped in the US in November 1990 and it has been a great hit, allegedly being the biggest selling new consumer electronics product ever since. Now over 300 US newspapers and TV publications regularly accompany their TV listings with Video Plus codes. Here in the UK, Video Plus (marketed by Video Technology Marketing Ltd) has gained support from the TV Times, Associated Newspapers (The Daily Mail, Mail on Sunday and the London Evening Standard), Mirror Group Newspapers and News International (The Times and Today newspapers).

Gemstar believes its coding system will become a world standard for video recorders. So far no attempts at setting a standard for video recorder programming have been successful. Panasonic's bar-code system now looks like a technological over-kill in comparison with Video Plus and because of its limited adoption by other manufacturers, support by the press TV listings compilers has been very limited; the Radio Times only published bar codes for movies for example.

Only launched at the end of

**Cognito radio net.**






**Cognito in use.**

November here in the UK, Video Plus proved to be an immediate hit. Most stockist were sold out by the New Year. That means yours truly hasn't yet seen or used a Video Plus, but with its stated specifications and feedback from a few lucky users, it appears hard to beat – much to the chagrin of stand up comics no doubt.

Video Technology Marketing Ltd. Tel. 081 748 5373.

## Sharp In UK Pocket

Last month I brought news of Sharp's new PC-3000 pocket PC. What I forgot to mention then was that the new baby Sharp clothed leading edge UK technology from Guildford-based DIP Ltd. DIP produced the first truly pocketable PC-compatible which is also marketed by Atari as the Portfolio.

There has been much industry speculation that the up-market rival Poqet PC, now owned by Fujitsu, was developed from DIP ideas – much to DIP's annoyance at the time. If revenge was being sought, DIP's link up with Sharp has certainly provided it. The PC-3000 is an unashamed Poqet-basher. DIP and Sharp have effectively produced a second-generation Poqet for less money (£799 versus £995). Sharp's well-practiced production engineering talents show through and the 1lb PC-3000 has a nicely rounded case with neatly finished controls and a superbly crisp (though unlit) LCD screen. The PC-3000 uses interchangeable PCMCIA memory and compact device cards, the standardisation of which is another goal close to DIP's corporate aims.

Meanwhile, Sharp has also introduced its latest notebook PC, the PC-6781. At just 4.9lbs, this notebook is among the very lightest of its type. Intel's latest 386SL low-power microprocessor is used. 50% extra battery life is claimed through the use of Phoenix Technologies' Superset Systems power management software – the first laptop to use this system. Battery notebooks usually claim around 3 hours of continuous use but Sharp is claiming 4.5 hours for the PC-6781. A 1.44Mb floppy drive and a 80Mb hard drive are standard as is a PCMCIA card slot and unusually, a tracker ball pointing controller. A very crisp monochrome VGA LCD screen is supplied. A prototype active matrix colour version was shown at the big Comdex trade fair in the US last October. At press-time no price had been set for the PC-6781.

Sharp UK: Tel. 061 205 2333.

## In Cognito

Dowty Information Technology has launched a wireless text messaging system called Cognito. The guys behind Cognito describe their system as a wireless wide area network or WAN. Users get a hand-held Radio Terminating Unit (RTU) which at first glance resembles a pocket PC with a flip-up aerial.

In effect, the Cognito RTU is a two-way alpha-numeric message pager with its own keyboard. It's possible to receive and store messages, compose and transmit your own and even have dynamic interactive textual conversations with the user of another RTU. The Cognito RTU can also be hooked up to a PC (or even a Unix workstation) in order to exchange text files locally.

The Cognito network is nationwide and data is transmitted in packets in much the same way as terrestrial data networks like BT's PSS (Packet Switched Stream) service. The RTU incorporates a radio modem to convert the broadcast signals into text. Besides simple messaging, Cognito users can access information databases on suitably connected systems, ideal for off-site workers. The suggestion that the Cognito RTU is an over-blown alpha-numeric message pager with its own keyboard is frowned upon by Cognito – my personal background is in electronic

mail and Cognito is really a wireless electronic mail system.

Cognito unashamedly says it is competing with a section of the cellular phone business. Nattering on the phone is all very well and usually desirable – but is it logical? Electronic mail is still struggling to grow in the UK yet those who have persisted with it usually end up swearing by it. The high cost of operating cellular phones is apparently causing many businesses to abandon them. Cognito hopes to switch a good proportion of ex-cellular users to the Cognito network.

## Cheaper Than Cellular

Cognito costs £55 a month regardless of use. A Cellular phone costs £25 plus call costs – it's not difficult to exceed £55 in a week let alone a month. When you phone somebody up they are likely to be unobtainable and even when you do get to speak to somebody, the information you might be discussing is transient, unless you make notes. With electronic mail, messages are stored and make for instant notes. There's also the added benefit of being able to gain access to a chosen information source on a linked computer system – you have a mobile terminal. Deskbound staff can communicate with their field working colleagues conveniently by sending messages via PC local area network (LAN) to a centralised RTU, and vice-versa of course.

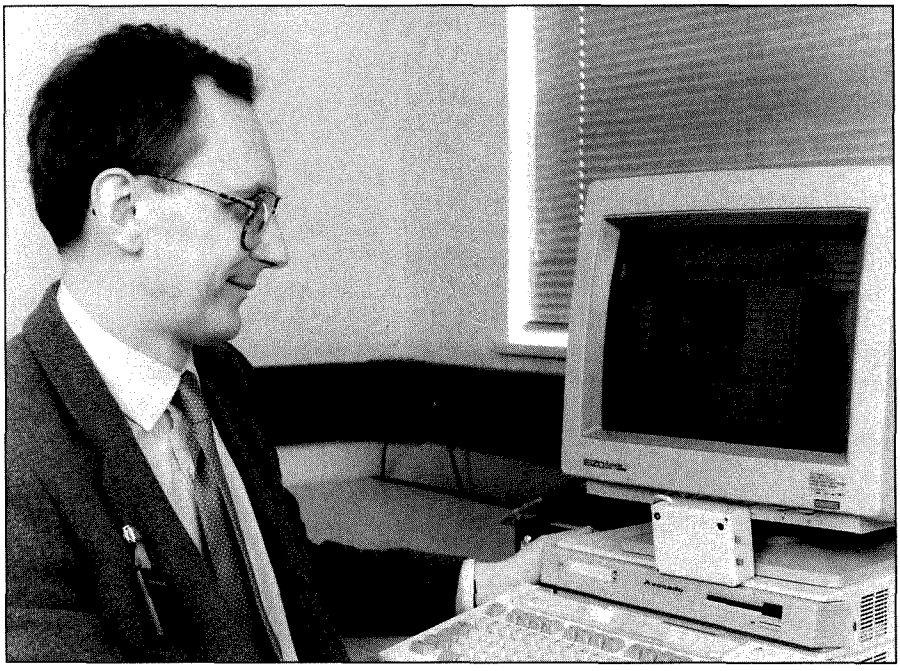
There's a lot of logic in the Cognito system, but logic is often not enough. The failed telepoint public cordless phone system seemed sensible enough, but its one major weakness (no acceptance of incoming calls) combined with poor marketing proved fatal. Cognito deserves to succeed, but will the managers and workers it is aimed at prefer the status symbol of a cellular phone, even if it's less useful or efficient for the purpose of their particular jobs?

Cognito Group Ltd: Tel.0635 508 213.

## Phoning The Future

Last month we featured the Active Badge from Cambridge-based Olivetti Research Laboratories (ORL). The Active Badge project overlaps with a rather more sophistaicated and ambitious project called Pandora. This explores the prospects for versatile video-telephone systems of the future. In fact, ORL and the nearby Cambridge University Computer Laboratory now has a fully working video phone and mail service as a result of the Pandora project. The key to a useful video communications system which can be used in conjunction with desktop workstations or even PCs is a very high speed network. Pandora currently uses the Cambridge Fast Ring (CFR) system which has a data transfer rate of 50 megabits per second – that's five times faster than the fastest widely used PC networking system, Ethernet. The bandwidth provided by the CFR means a Pandora user can simultaneously look into the rooms of up to twenty other Pandora users – though the rules say you can't listen in that mode. A prototype network operating at 500 megabits per second is working in the lab and the overall target is a data transfer rate of two gigabits per second. To handle the networked data an impressive "black box" containing half a dozen parallel processing transputer chips is required. The latest super-powerful RISC processors now emerging will mean one chip will eventually be more than able to do the work of six.

The current Pandora system allows two way conversations or conferencing with up to five participants. The monochrome video quality is not brilliant, but fine for the purpose. Audio quality is similar to an ordinary phone. Besides interactive conversations you can store messages, video mail, which can be viewed and reviewed by the recipient at a later date. Another project hopes to provide a sound-track annotation facility so messages can be textually searched after audio conversations have been converted into textual transcripts.



**Opening Pandora's Box.**

There are multimedia inputs to the Pandora system from the radio, music CD and video or live TV broadcast. The latter was very popular when Mrs.Thatcher resigned apparently!

Pandora is a typical ORL project; pushing the boundaries of technology and getting to grips with the concepts, problems and issues concerning future standards. It will be a long time before homes around the country will be linked by a powerful Pandora-like a multimedia comms system and 2 gigabit networks, but the work at Olivetti in Cambridge is laying the foundation stones for the technology which will inevitably arrive. ■

# Video Recorders... Setting The Scene

*Seventy five percent of UK homes have video cassette recorders and ninety percent of them are VHS. This month's Practical Electronics takes an in depth look at the technology.*

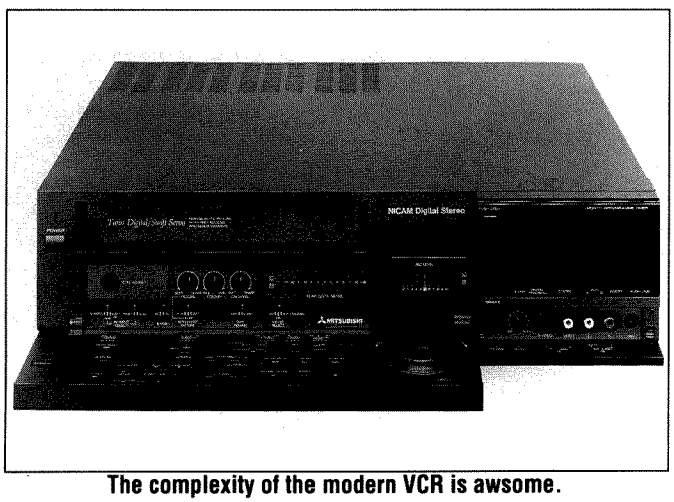
With the development of TV and video in the 1950s, a medium for recording images was required . Although it was possible to use cine cameras to record the output of the video cameras, this was not a satisfactory solution and the best idea would have been magnetic tape.

The main difference between sound and vision is one of quantity of information. Video requires a lot more information to be transferred per second than sound giving it a higher bandwidth. The reel to reel tapes used in the 50s for sound recording usually used quarter inch tape running at around two inches per second. The amount of information that could be stored on this was nowhere near that needed by video so the speed at which the tape was transported and its width were increased. The early two inch tape required expensive machines to work well and it was unthinkable that they could be used in the home.

Improvements in the way magnetic tape was made and the introduction of the helical scanning head changed everything. Today's VHS cassettes use half inch tape running slowly enough to provide up to four hours recording time at normal speeds and the recent introduction of the long play feature, where the tape speed is halved, has increased the standard recording time to eight hours.

## Different Standards

As with all new technologies, a number of different standards developed early on. V2000, Betamax and VHS were just three of a variety of systems available in the mid to late 70s. Eventually, through aggressive marketing and inter-company agreements, the VHS system won out. It now accounts for 90% or all home video systems. This is not the end of the story however. A couple of new standards are now creeping in. Super VHS or S-VHS offers higher resolution pictures with 400 horizontal lines rather than the old 250. Compact VHS is and 8mm are battling it out for the camcorder market. C-VHS has the advantage of being compatible with standard VHS machines – an adaptor is all that is needed in most systems and some will play the cassettes directly.




**The complexity of the modern VCR is awsome.**

## Getting It Right

Apart from watching hired or bought video cassettes of cinema films, a large use for VCRs is to record TV programs so that they can be viewed at a more convenient time – known as time shifting. The main problem with this is that most modern video recorders seem to be too complicated. Many people have problems programming them to record programs at the right time. One view is that people are just plain stupid. An alternative and more likely explanation is that the programming systems are badly designed. A number of solutions have recently cropped up, one of which uses bar codes printed in TV listings magazines which, when scanned by an optical reader in the remote control handset, set the start and stop recording times. Another system uses teletext to define the recording times. An alternative teletext service can be monitored by the VCR which can then see when the programs start and end – this also holds the promise of getting rid of adverts. The latest and, possibly most popular, system took hold over the Christmas period. The Video Plus with its code numbers looks like it may leave the rest standing though only time will tell.

## What Of The Future

As TV's become smaller, flatter and generally less bulky and HiFis become midi and mini, the largest item in the home entertainment outfit is the VCR. All current models are roughly the same size and shape and most manufacturers offer machines with the same functions. The manufacturer who brings out a tiny VCR should have a winner, compare the Sony Walkman with the cassette recorders of the 70s. ■

# Review... Toshiba V-7116

*Timothy Lyster believed a VCR is a VCR Is a VCR. One Christmas vacation and the Toshiba V-7116 later he recognises the error of his ways..*

With video cassette recorders (VCRs) becoming more popular in the home, buying the right one will, like most purchases, depend on a mixture of affordability, features, and product quality. Price will be a personal decision; I shall discuss features in terms of usefulness and ease of function; quality is my subjective appraisal of picture and sound quality.

With the majority of its controls stationed discretely behind matching flaps, the V-7116s lines are clean and uncluttered. To make operation easier, tape functions are separated from TV ones. The look of the machine generally met with my approval although I wasn't so sure about the LCD indicators for audio input. I think these are somewhat superfluous (and a bit distracting) for all but audio purists. The rest of the display is taken up with the channel number and several indicators for tape functions.

Features-wise the Toshiba is fairly well appointed with Nicam Digital Stereo, digital auto tracking, one touch recording, audio dubbing, indexing and various playback options – forwards at 1/25th, 1/12th, 1/6th, 5x and 9x. There is also a picture softening button which can be used to blur out the blemishes tracking will not remove.

On-screen programming (OSP) makes the whole process of recording very easy. Once the details have been input into the VCR, the start and finish times can be displayed for confirmation. Eight programmes are available. OSP is also used for setting the clock, the language and many of the other options. I particularly liked the calendar function, which displayed any month from the year 1900 to 2099; this provided almost endless entertainment on Boxing Day as me and my family discovered birthdays of close relatives.

Perhaps the most useful feature was the 9x fast forward. This speed is slower than the fast forward in stop mode (that is, no picture) and is obtained by keeping the fast forward button depressed. It is appreciable faster than the ordinary fast forward and means that a tape can be accessed much quicker.

In the main, forward and backward picture search produced stable images with little or no interference. What picture disturbance there was confined itself to the lowest quarter of the screen and was quite unobtrusive. Similar results occurred on freeze frame – any interference there could usually be removed by playing with the tracking controls. Another feature on the video is a bass enhancement control. It has three settings, off, 1 and 2. One is recommended for use with music, while two is to be used with 'action movies'. These worked well but had to be used sparingly.

So it is fair to say I was impressed by this VCR. Clear, steady pictures, easy to programme features and good quality sound reproduction combine to produce a commendable package that really did make my Christmas. ■

## Verdict

Likes
Easy to program
Good picture quality
Bass enhancement

Dislikes
Fussy display

# Review... The Ferguson FV57H

*Julie Saunders looks at a top of the range Videostar and finds a number of things that impress and a few that annoy.*

On opening the box and removing the packing, the main elements of the system are revealed. The main unit looks just like any other VCR, a plain mat black metal case with a slot for the cassette, an on/off switch and an LED display. The first obvious problem was the lack of mains plug. In these days of safety consciousness it ought to be mandatory to supply the plug already fitted – it would also help sell the machine as the competitors don't seem to supply them either. As well as the main VCR, a remote control, batteries, aerial lead and manual are supplied as standard.

After finding and putting on a mains plug, connecting up the machine to the TV via the aerial socket and to the HiFi for stereo sound proved to be pretty straight forward. On switching everything on, setting the clock, and tuning in the TV and VCR channels, everything was set.

## Features

The main use for a VCR of this sort is time-shifting, programming the machine to tape all of those vital programs (Star Trek, Neighbours, Eastenders and Thunderbirds) while I slave away at the office.

All programming is performed from the remote control handset which features an impressive total of 60 buttons, many of which have multiple uses. Up to eight events can be timed either as one-off or with daily or weekly repeats. The current program status is displayed both on the front of the VCR and on the TV screen.

Having selected an option it is changed by pressing a + or – set buttons, say to step through the channels or set the date. It would have been nice to be able to use the numeric keypad instead – pressing the '4' key is a lot easier than stepping through four channels. One major drawback with the remote control handset cropped up at this point. There is a cancel button right between the select and program buttons. Pressing this (usually by accident) clears the current program entry and is easy to do since all attention is focussed on the TV screen and not the remote control.

Being able to record only eight events is a bit limiting although the repeat options help. Leaving the machine to record while going away on holiday should have ensured that nothing was missed. The unfortunate fact that both BBC and ITV schedules change at a moments notice can make the contents of a week's taping somewhat mysterious. The need to make sure the system was in timer mode before leaving it to record programs seemed unnecessary Surely a computerised system would know that programmes were pending and do this automatically when switched to standby?

Perhaps the most striking feature of the FV57H was the Nicam Digital Stereo. When connected to a HiFi it made a huge difference in sound quality over the standard TV sound. Films such as Star Wars and Superman were audibly stunning as were a number of advertisements.

On the down side, the LEDs on the front of the machine were bright enough to light up the room on their own and the remote control handset had to be aimed quite accurately for it to work. Apart from this, features such as variable speed picture searches, indexing, on-screen displays and picture enhancement made the machine easy and fun to use. ■

## Verdict

Likes:
Nicam built in
Simple and fast picture searching
Good picture quality
Dislikes:
LEDs too bright with no adjustment
Badly designed remote layout
Clumsy programming system

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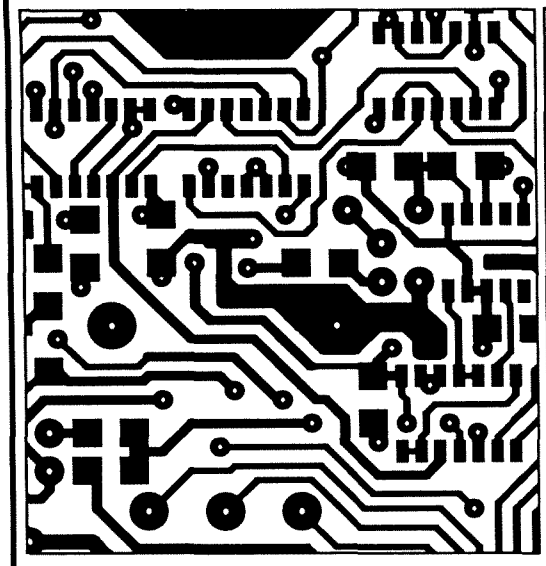

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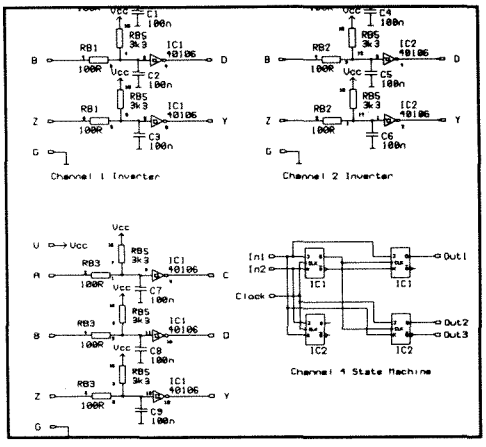


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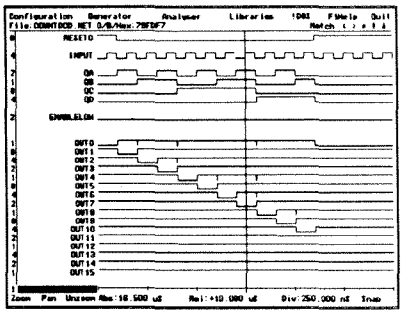

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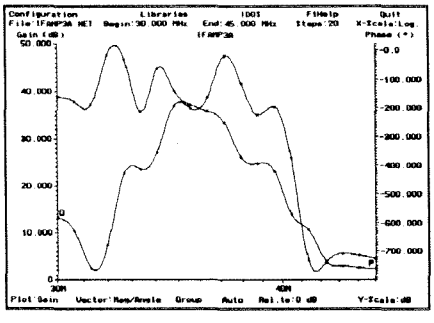

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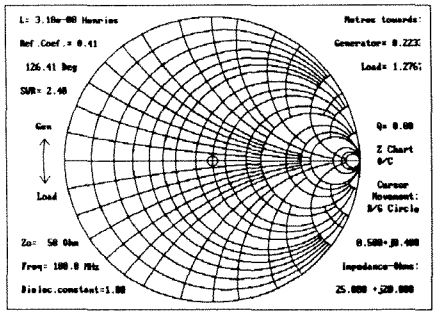

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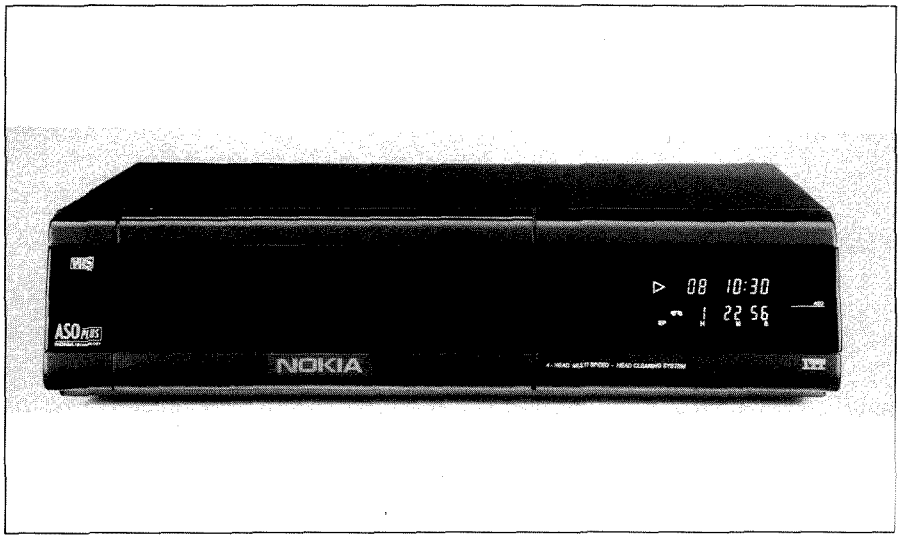
# Review... ITT Nokia 3782

*Ian Burley takes a look at the special features of the ITT Nokia 3782 and compares it with his Panasonic NVJ65.*

ITT Nokia makes a big deal about being a European company and indeed its roots are in Finland, but the firm's top of the range 3782 HIFI VHS deck relies firmly on Japanese parts and construction. The 3782 falls firmly into one of the most competitive VCR bands; it's a Nicam HiFi stereo deck with basic editing facilities for about £500. This makes it a direct competitor to the VCR I use at home, the slightly older in Panasonic NV J65 design.

Both decks have their "special features" – there's ASO Plus for the Nokia and a bar-code timer programming facility for the Panasonic. ASO Plus is an interesting Nokia exclusive which makes bold claims about sharpening up the replayed picture from any tape. Unlike many other dubious-sounding claims, this one really does work. Flick the ASO switch and the picture definitely loses some fuzziness. ASO stands for Active Sideband Optimum. Basically the system gets rid of some signal sideband distortion – it sort of cleans the signal up. It only works on play-back. ASO is proving popular with users who have ageing tapes which have started to exhibit the ravages of time, but there was a notable improvement even on the best tape I could lay my hands on (a TDK HDX-PRO). Nokia points out that copies are enhanced by ASO as well.

So far so good, but what is the catch? Inevitably, when you start meddling with any original signal, it will suffer somewhere. I would be quite happy to put my money where my mouth is and say that the Nokia's non-ASO picture doesn't quite stay with my Panasonic. With




ASO on, the Nokia is perceptibly sharper, but the picture also gets a bit grainier and the contrast harder – I still prefer my Panasonic. Still-frame display was just about perfect – until you switched off ASO. Then the picture became slightly unstable. If you really want top quality recordings, it might be better to spend a couple of hundred quid extra and go for a S-VHS hi-band deck.

As for the Nokia deck itself, I wondered why it took approaching twice as long to wind tapes compared with my Panasonic, the chunky LED display looked a bit old-fashioned and slightly illegible, tape loading and unloading is fast but noisy and while two SCART connectors and a pair of HiFi audio phono sockets are fitted supplied, BNC video connectors are omitted. The flip down control panel which hides the tape slot looks decidedly flimsy as well. The remote control is reassuringly solid and possesses a complement of teletext TV controls (the deck itself doesn't have teletext built in), though once again I'd question the chosen mode of operation compared to my Panasonic. At least true long-play recording mode is offered, which, sadly, my Panasonic lacks.

Overall, the Nokia 3782 is not a deck to avoid and indeed it may be just what you're looking for if you either want to make lots of tape to tape dubs without investing in S-VHS or if your tape library is quite old. However, I wasn't moved to swap it for my Panasonic. ■

## Verdict

Likes: ASO for sharpening up old tapes. Good Nicam performance. Easy to use remote timer programmer. Insert editing and VISS indexing.

Dislikes: Size, noise, slow tape wind, LED display design, flimsy construction in places, tricky tuner setting.

# Review
# Toshiba VCP B1B

*Alan Jones plugs in, switches on and tunes in to a play-only video machine. It may not sing and dance but what it does do it does well.*

The VCP-B1B is a bare-bones video player aimed at the person who needs a machine for display purposes only. Unlike many other machines it has no TV tuner and, indeed, no way of recording. It is solely a player, hence the designation VCP for Video Cassette Player.

Also unlike many other video machines, the B1B is relatively small – the lack of a TV tuner and recording circuitry seems to save an inordinate amount of space. It is meant to be portable and comes complete with built in carrying handle.

The contents of the box are the VCP itself, a remote control handset plus batteries, a manual and an aerial lead for connection to a TV.

Setting up is very easy, simply plug in to the mains and TV, switch everything on and insert a cassette. Since the machine is designed to be portable, ease of use is essential though there is room for improvement.

No mains plug was supplied with the unit (tut, tut) and there was no place to wrap up the cable while the machine was being moved. Making the case a little larger and providing built in storage for the mains and TV cables and remote control unit would have made the whole thing a good deal neater. As it is, the cables trail and the remote can easily get lost.

There aren't very many features as such on the VCP – trickery seems to have been kept to the minimum for simplicity's sake. On the front panel are the play, cue, review, rewind and fast forward controls plus stop. This is all that will be needed by the average user who just wants to play back cassettes.

For fine tuning a picture sharpener and softener control is provided as is manual tracking adjustment.

Two video formats are supported, the usual PAL and MSECAM as used by the French. It would have been useful to have been able to play NTSC cassettes as well as they crop up quite often.

The remote control offers a few more functions than the buttons on the front of the machine itself. Freeze frame is possible as is a slow play mode – runs the tape at 1/30th speed.

As well as being used to simply playback pre-recorded video cassettes, the B1B can be used for tape to tape editing. A special edit control is provided which optimises the video signals so that they will be accepted by a video recorder (VCR). This will allow tapes or portions of tapes for be copied from the B1B to another machine, which might be useful for editing home videos although the same thing can usually be done directly from a camcorder. The other obvious possibility is to copy pre-recorded cassettes which may, or may not, be illegal depending on the content of the cassette.

Overall, the VCP-B1B is a nice, simple, easy to use machine. It is light enough to be easily portable although the lack of storage space for video lead, remote and TV connection lead is a little annoying. It would have been nice to have had stereo sound capability since so many pre-recorded cassettes are now available with high quality stereo sound and the lack of this will limit the appeal of the machine for users who simply want to watch films. The main use for the machine will probably be in corporate and advertising situations where simple display is all that is needed. The ability to play a tape over and over is missing so loop playback is out so it will never find a place behind a Post Office counter. ■

**Verdict**

Likes
Easy to set up and use
Fold away carrying handle

Dislikes
No storage for mains lead
No mains plug provided

# Review... Ferguson FC37

*Laura Esterman gets out her directors chair and takes some shots with the Ferguson FC37 camcorder.*

Now that most of the major consumer electronic companies are manufacturing relatively affordable, easy to use camcorders, it seems everyone's jumping on the video bandwagon. Technology is addictive and since many households are now equipped with high-performance video cassette recorders and perhaps digital stereo television sets, owning a camcorder seems the next logical step for the home-entertainment buff.

The latest camcorder to come from Ferguson, the FC37, should appeal to the amateur video maker. It combines ease of use with high-tech options and, weighing in at just under a kilogram, it's lighter than many SLR 35mm still cameras.

The FC37 comes packaged with just bout everything you'll need: AV lead (unfortunately no plug), battery pack and charger, 30 minute VHS-C compact video cassette, cassette adaptor for use in a standard VHS recorder, even a battery for the clock. Charging the main battery only takes an hour and twenty minutes, but during this time the camcorder cannot be used at all. The battery automatically protects itself from overcharging and lasts for several hours, though this varies depending on the use of the various features.

Recording is simple. Features include auto or manual focus, x6 zoom lens, high speed shutter for fast moving subjects, superimposing time and date capabilities and editing functions. It is also possible to fade a recording in and out and the "gain up" button is a light amplifier, which allows recording in low light conditions.

As with all camcorders, recording with the amplifier on makes the picture a bit grainier, but I was able to record city streets from a moving car at night with impressive results.

The editing functions are fairly straightforward. A quick review feature shows the final seconds of the last recording, which would be the edit point to the next, and a picture search feature allows the user to locate where on the tape they would like to next record. There is no flying erase head, which would facilitate clean edits; I assume this helps keep the price down (rrp £599), but camcorders with this feature have the ability to do far more accurate editing. The FC37 is, however, equipped to allow editing in conjunction with the Master Edit Control facility provided on many VCRs. This capability allows the user further control on edits.

In the end, as with any other consumer item, deciding which camcorder to buy depends on which features you find most relevant for your own uses. The FC37 is very easy to use and extremely lightweight and portable. Both are advantages if you plan to take your camcorder on holiday or videotape your nephew's wedding. If you want to make movies with various camera angles and complicated shots, then this is probably not the easiest camcorder to work with. For the price, however you get a good range of features and a high quality colour picture. Who said toys were just for kids? ■

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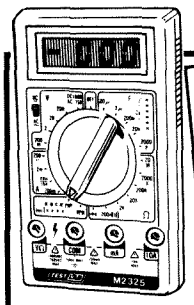

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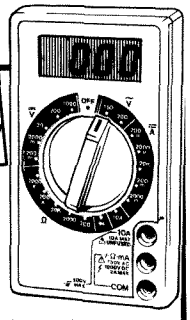

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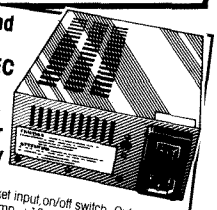

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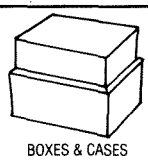
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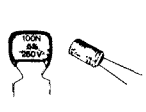
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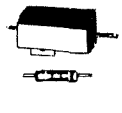
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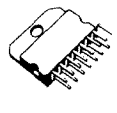
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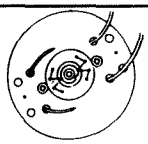
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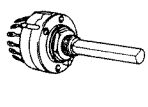
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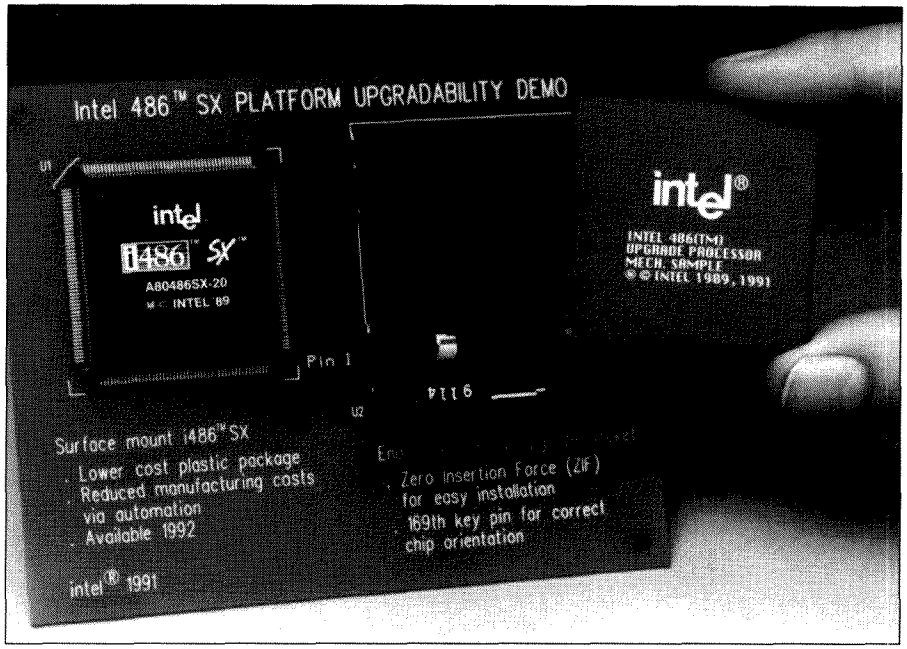
# Intel Doubles Its Processor Speeds

*Many IBM PCs could be going twice as fast simply by installing an extra chip. Alan Ringmer describes how it is done.*

Anyone watching TV over the Christmas period will have notice a rather unusual advert by Intel. It was unusual for a couple of reasons. Firstly, chip manufactures don't usually go in for mass media advertising and secondly, what they were advertising was rather unusual.

The concept of the mid-life kicker for microprocessor chips is a new one. Intel is offering a simple plug in upgrade that will double the processing speed of an i486 microprocessor – of course, it must be of the right type and the expansion slot must be available. This means that a standard 25MHz machine will run at something approaching the capabilities of a 50MHz system – a significant increase in performance.

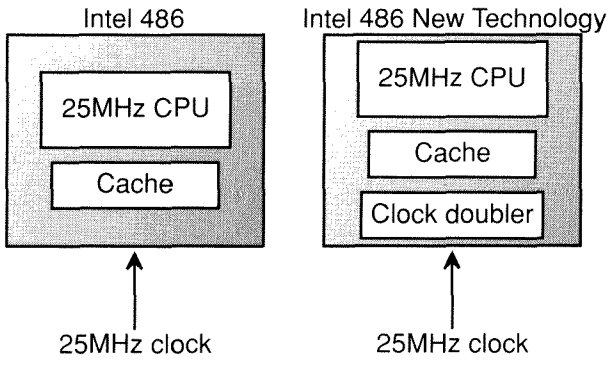



**The upgrade is specially designed for easy installation.**

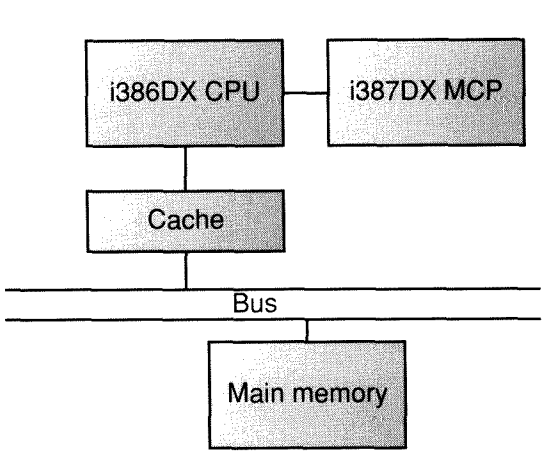
## All On Silicon

The Intel 486 is the top of the range microprocessor used in IBM PC type computers. Looking at it from the silicon point of view, it is actually a i386 (the i denotes an Intel chip) with a memory cache and a floating point co-processor built in. The cache helps to speed processing by performing memory accesses for the main processor. It loads up from the main memory a section which contains the next several instructions and keeps track of frequently used memory locations by maintaining their contents 'on chip'. The main bottleneck in a computer is the external data bus – this is used to connect the memory, microprocessor and input output chips. Because it has a limited bandwidth, only a certain amount of information can be moved along it at any one time. By moving as much memory and processing as possible onto one piece of silicon, the data paths become much shorter and bandwidth can be increased. The i486 cache is made up from 8k bytes of fast RAM and keeps the main processor fed with data and instructions as fast as possible.

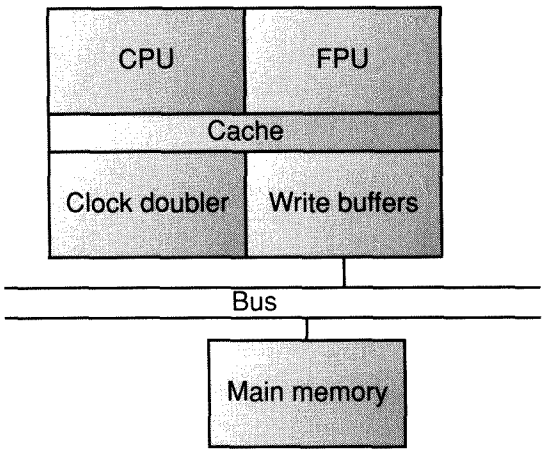
The floating point co-processor (FPU) is used to perform complex




**On the left, the standard i486. On the right, the clock doubler improves performance.**




**The i386 is a conventional microprocessor system which has any add-ons such as cache and co-processors on separate chips.**




**The i486, on the other hand, has all its main elements on a single piece of silicon. Only variable size elements such as memory are external.**

mathematical calculations at very high speed. From the main microprocessor point of view, it simple shoves the number at the FPU and asks it to perform an instruction. With almost no delay, the answer is then fed back. This increases performance in numerical processing functions such as spreadsheets quite remarkably.

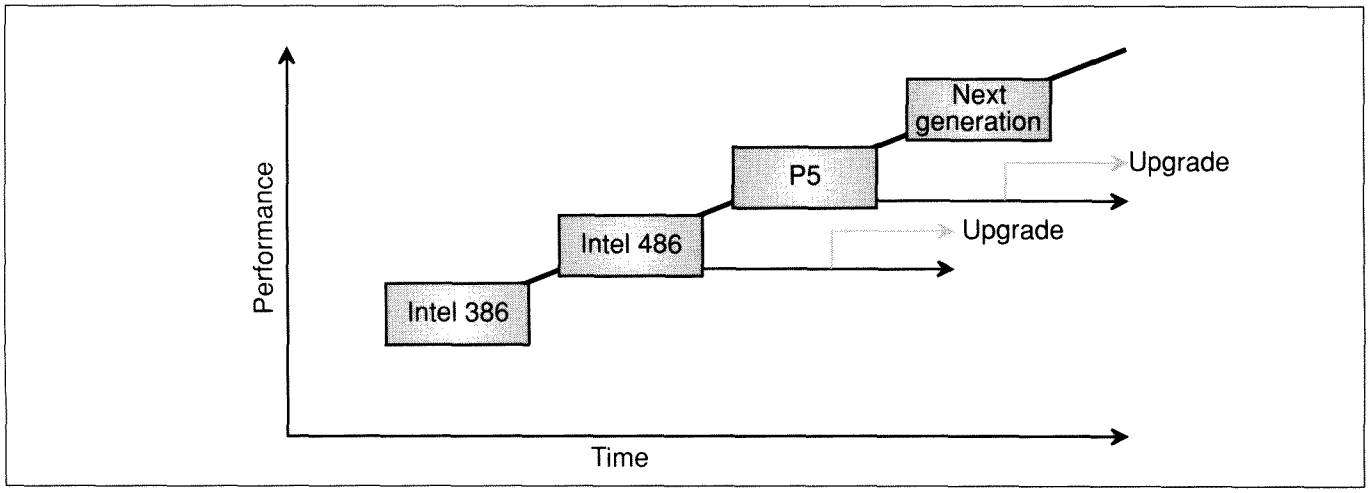
What determines the speed of operation of the microprocessor is the system clock. To maintain synchronisation between the memory, peripheral chips and the microprocessor, this must be the same for them all – this is especially true in systems where the cache and FPU are separate from the main microprocessor such as 2i86 and i386 based computers. However, by putting as much as possible onto one chip, the possibility of increasing its internal clock speed arises since internal operations can be seen to be independent of the main memory and peripherals most of the time.

System facilities external to the main microprocessor will be running at the old clock speed and special interfacing is needed to allow the i486 to talk to the main data bus. This comes in the form of the upgrade 'mid-life kicker' chip which plugs into a socket next to the microprocessor. It is designed to be installed by the user and a zero insertion force (ZIF) socket is provided on the main circuit board.

System upgrades in the form of co-processors have been around for years but they have generally been used to tailor the system to perform is a particular way – most co-processors implement high level maths functions, others increase network capabilities. Many general purpose system didn't need them so they weren't fitted as standard. The clock doubler for the i486 is a different matter. It increases the speed of the whole system and is somewhat like installing a faster CPU. In the past this has only been possible by monkeying with the circuitry to increase the clock speed and installing a faster microprocessor – possibly causing memory and interface speed problems. The beauty of the Intel MLK is that it only increases the performance of the main processor. The only question that remains to be answered is: why doesn't Intel build its chips to run twice as fast as standard? ■

## The i486 Upgrades

| | | |
|---|---|---|
| i486SX 16MHz | ➡ | 33MHz |
| i486SX 20MHz | ➡ | 40MHz |
| i486SX 25MHz | ➡ | 50MHz |
| i486DX 25MHz | ➡ | 50MHz |
| i486DX 33MHz | ➡ | 66MHz |
| i486DX 50MHz | ➡ | Not yet |



# How It Works... A Video Enhancer

*Many modern video recorders have them built in and they are available as separate units for use with older machines. Howard Jones explains how they work.*

Like audio signals, video signals can be modified by filtering. Unfortunately, there is a little bit more processing involved.

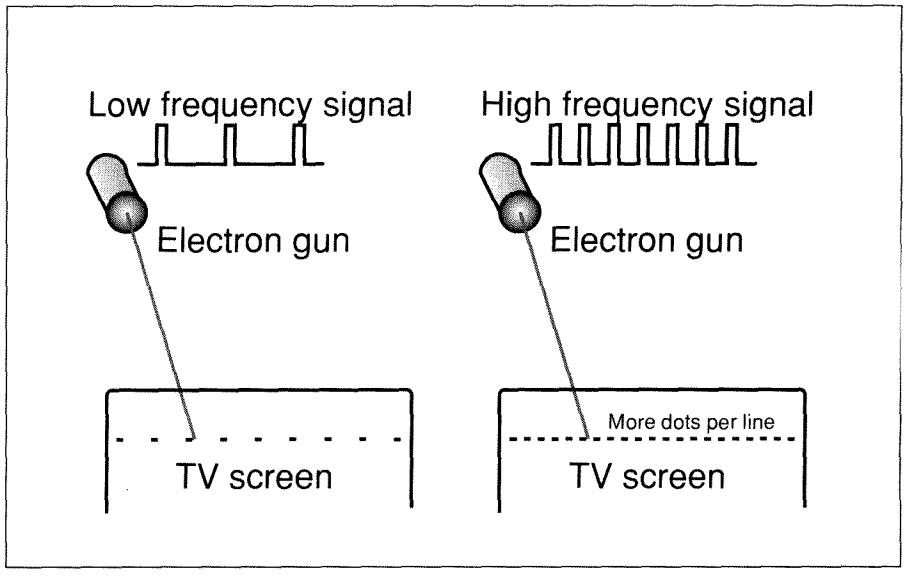
Passing an audio signal through a high pass filter cuts down low frequency content leaving the higher ones untouched. Amplifying the result produces a signal rich in high frequency or sharp sounds and poor in low frequency or duller sounds. Because a video signal is also electronic in nature it can be subjected to a similar process. Unfortunately, it is not as simple as pushing it through a filter.

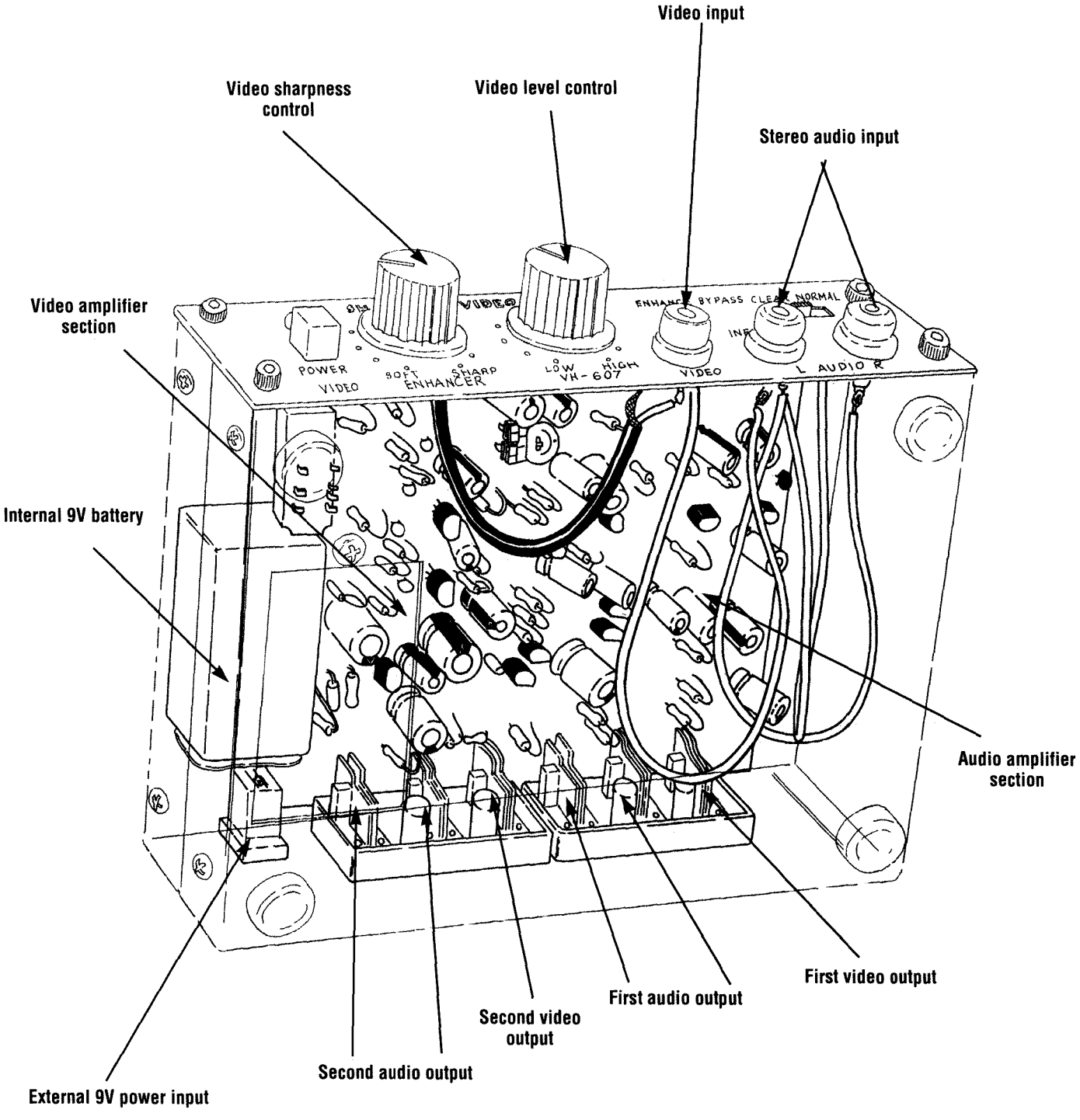
A video signal consists of a number of sections. Some of these are used purely for picture information and others for timing. The picture seen on a TV screen is actually made up from a series of frames or screen-fulls which are updated 25 times a second. Each frame is made up from a number of lines starting at the top left and scanning first horizontally and then vertically to finish at the bottom right. To tell the TV where each frame and line starts, timing information is transmitted as part of the video signal. These frame and line synchronisation pulses have to be set sizes and durations, otherwise, the TV will not know where to put the picture on the screen – a common effect of loss of the frame synch pulse is that the picture rolls vertically as the TV tries to start the picture at a specific point on the screen. Loss of line synchronisation causes a picture made up from distorted horizontal lines.

The picture and colour information is carried in two separate places on the video signal. The colour burst comes first and is a chunk of information that tells the TV what colours will appear on the following line of TV. The brightness information follows and is a voltage level that defines the brightness of the screen as the TV scans across a line. Filtering can be applied to both colour and brightness signals but they must be separated from the synch to avoid distorting this as well.

Pushing the brightness information through a high-pass filter and amplifying it should have the effect of sharpening the image slightly. The reason form this lies with the way in which the TV scans a line. This is performed at a set speed. The brightness of the signal varies as the sweep across the screen is made. For a detailed image, the brightness must change at a faster rate – as shown in Fig. 1. To increase the sharpness, the higher frequency components of the brightness signal must be increased in size or amplified. The opposite process – decreasing the higher frequencies – will have the effect of blurring the image. Of course, you never get something for nothing and this messing around with the signal effects it in other ways. The most obvious is that there can be an overall change of level in the brightness signal so an adjustment for this must be available.

After the video signals have been modified, the synchronisation signals are replaced and the whole thing amplified to adjust it back to the correct voltage levels. This has the added advantage in that it allows the signals to be sent to more than one output or over a much longer distance (up to 100m). A normal video signal is only strong enough to drive one output and trying to run two VCRs or monitors at once results in a drastic loss in picture quality amplifying the signal gets around this problem. ■




Video input
Video sharpness control
Video level control
Stereo audio input
Video amplifier section
Internal 9V battery
Audio amplifier section
First video output
First audio output
Second video output
Second audio output
External 9V power input
POWER
VIDEO
SOFT
SHARP
ENHANCER
LOW
HIGH
VH-607
VIDEO
BYPASS
NORMAL
L AUDIO R

# Taking The Covers Off

*VHS is the preferred medium for home video which makes pretty well all video recorders look the same on the inside.*

In audio tape recorders, the frequency range being recorded lies between 20Hz and 20kHz, the range of human hearing. In video tape recorders, the range that must be recorded is from 0Hz to 5.5MHz, a massive difference. The amount of information that can be put onto a tape is directly proportional to the speed at which the tape moves past the record head. Using conventional audio methods of tape recording, early experimenters worked out that a tape speed of around 8 metres per second would be needed for video. Clearly this posed a few problems, not the least of was the large amounts of tape needed.

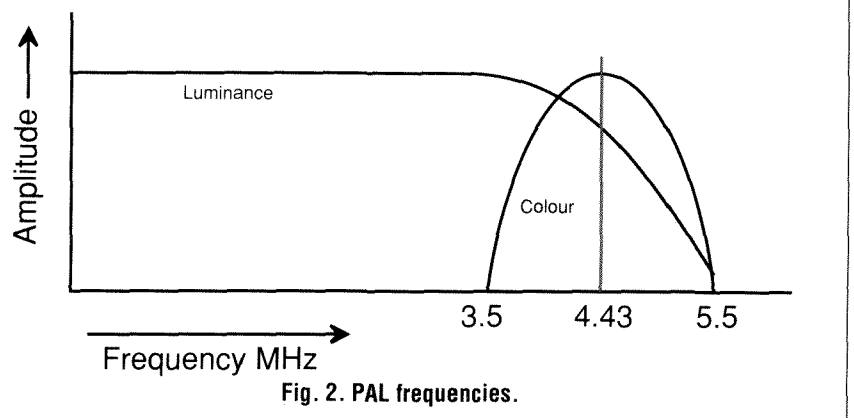



**Fig. 2. PAL frequencies.**

The solution to the problem lay with the idea of a moving record and playback head. Instead of simply moving the magnetic tape past a single head, the relative speed between the head and the tape could be increased by moving it as well. Mounting the head on a spinning cylinder and passing the tape around it was the solution. As the cylinder and its integral head spins, the tape moves past. Because there is an angle between the head and the tape, about 6°, tracks are laid down on the tape as a series of diagonal stripes (Fig. 1). Using a number of heads on the cylinder and switching between them as they come upon the tape allows enough information for video to be recorded. If each of stripe is used to record one picture field, any switching between heads can take place during the 'dead' period when the TV monitor is moving its electron beam from the bottom of the tube to the top – the flyback time.

As well as video, space is left on the tape for two audio tracks and a control track. This allows stereo sound to be recorded and control information written so that, on playback, the various mechanisms

## VHS Mechanical Data

| | |
|---|---|
| Head cylinder diameter | 62mm |
| Head spin speed | 1500/min |
| Tape/head relative speeds | 4.86m/s |
| Tape speed | 2.339cm/s |
| Video track width | 49μm |
| Distance between video tracks | 0m |
| Audio track width | 1mm |
| COntrol track width | 0.75mm |

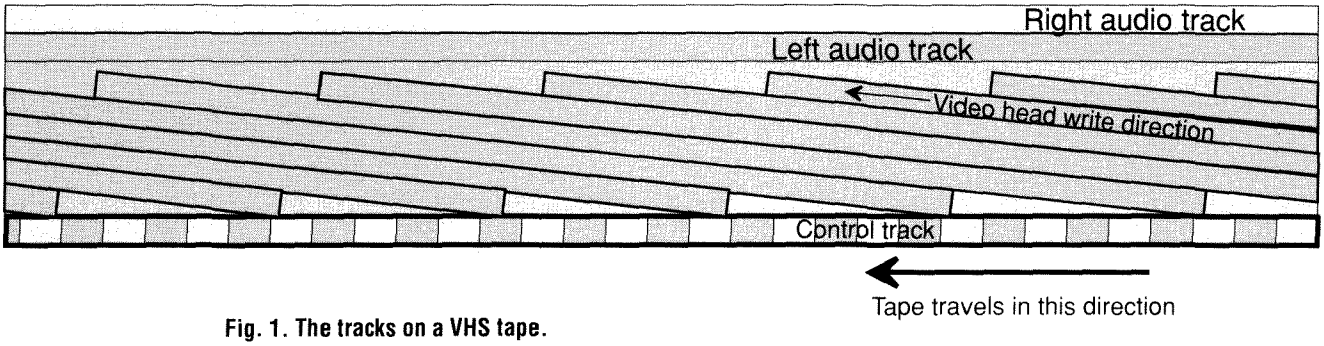
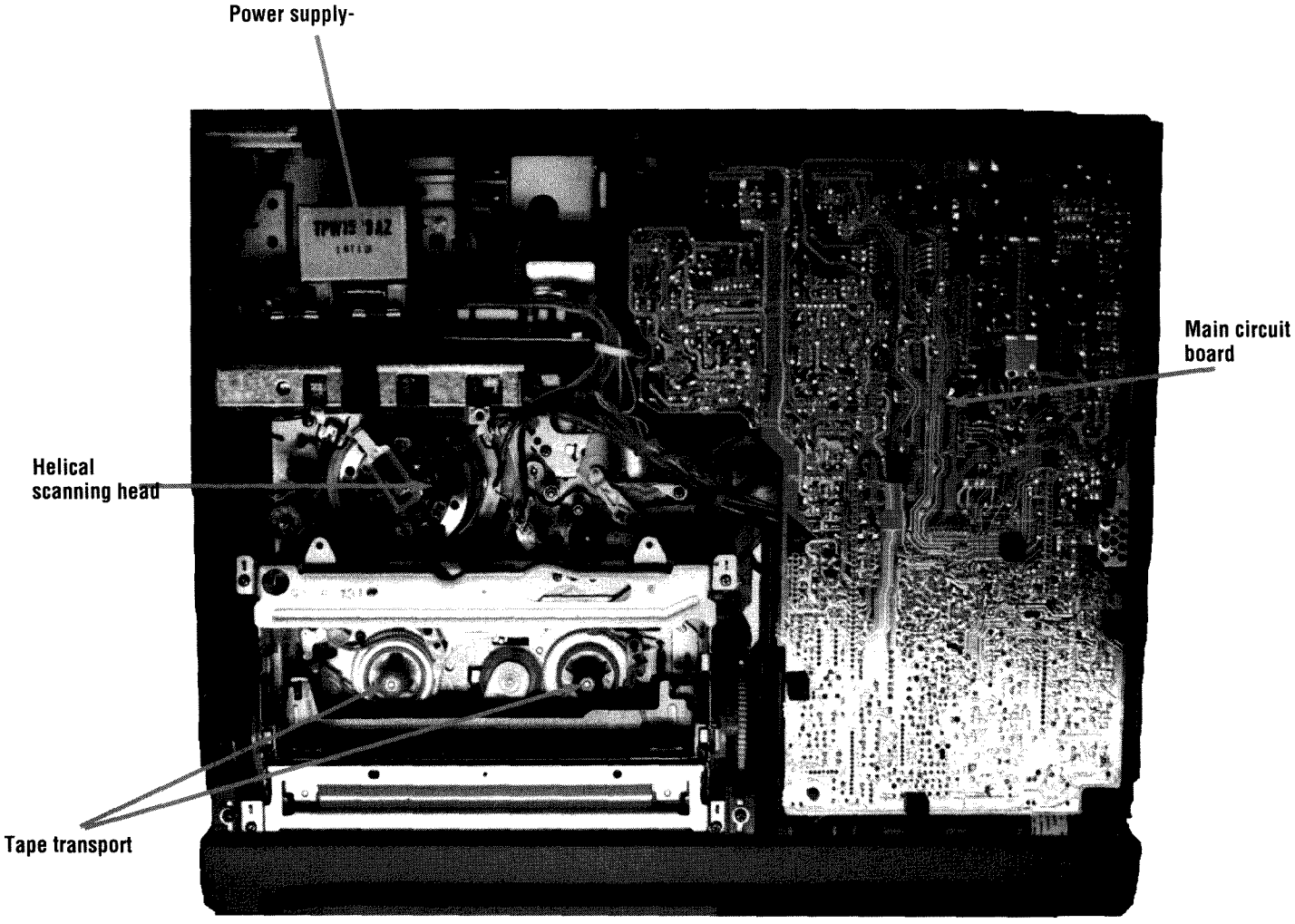
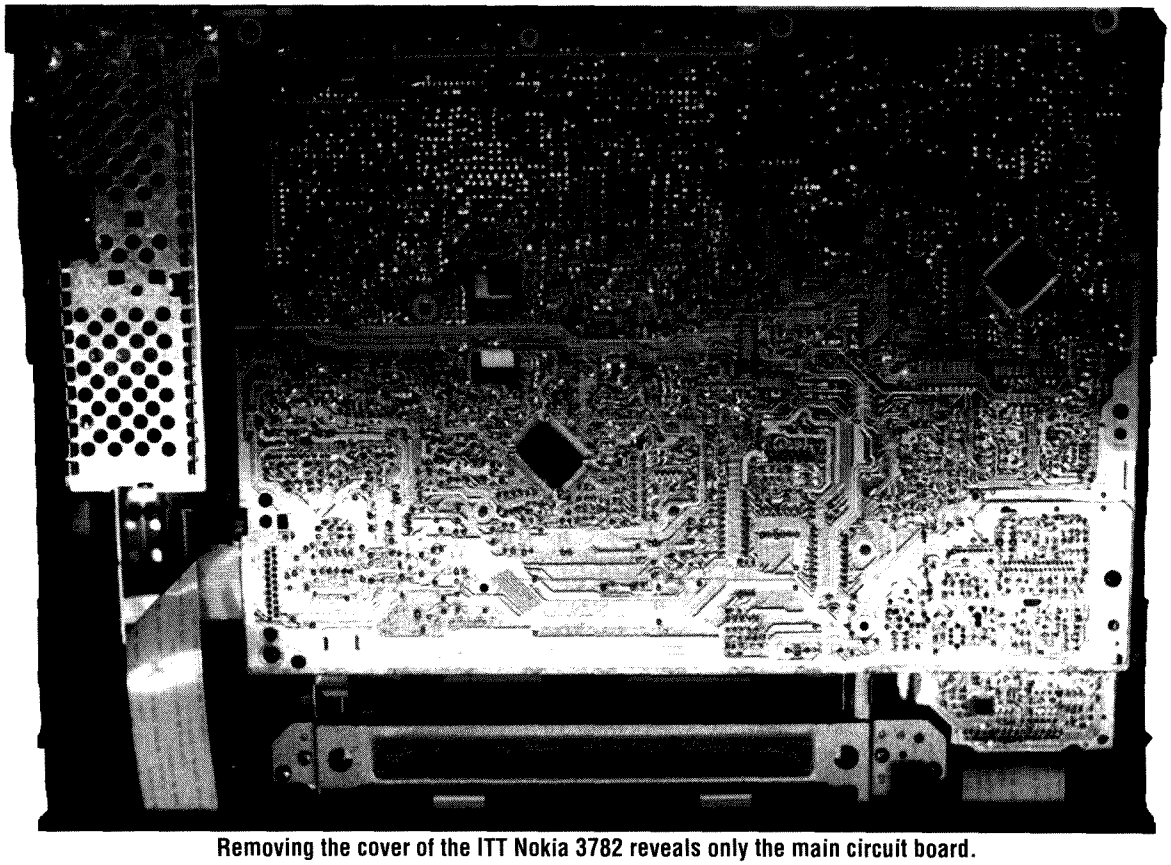


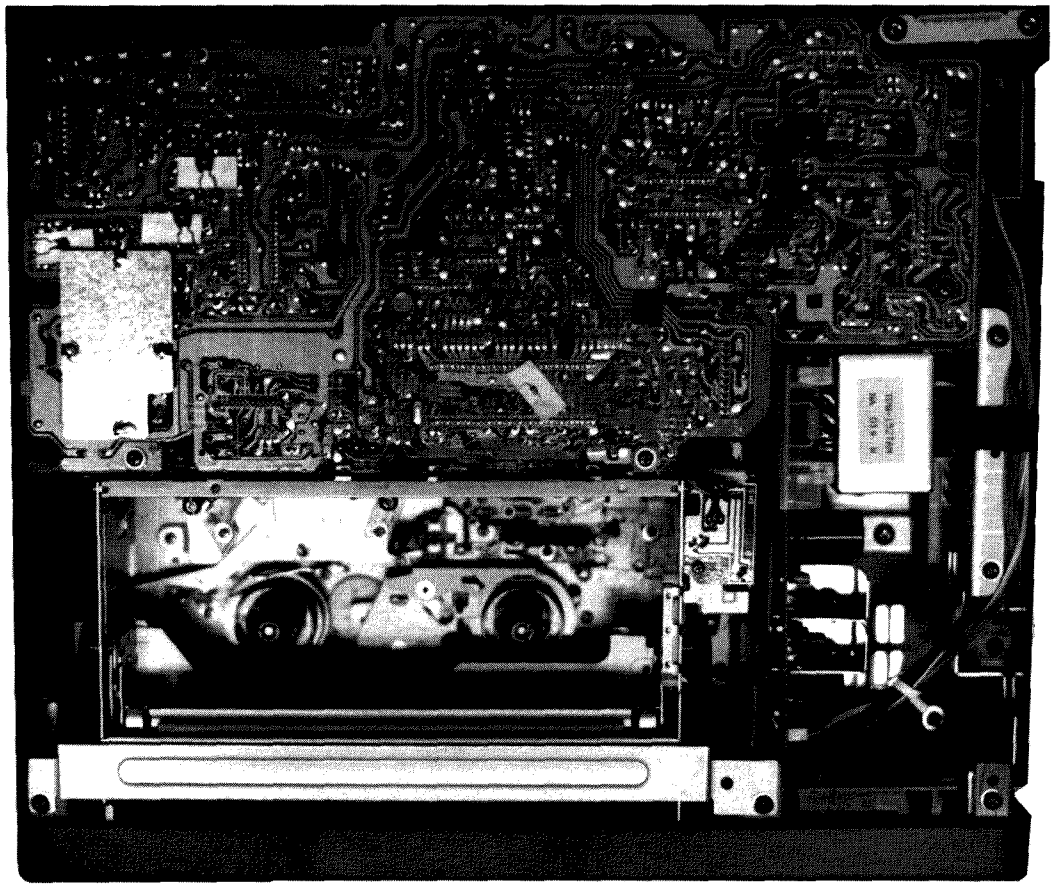

**Fig. 1. The tracks on a VHS tape.**



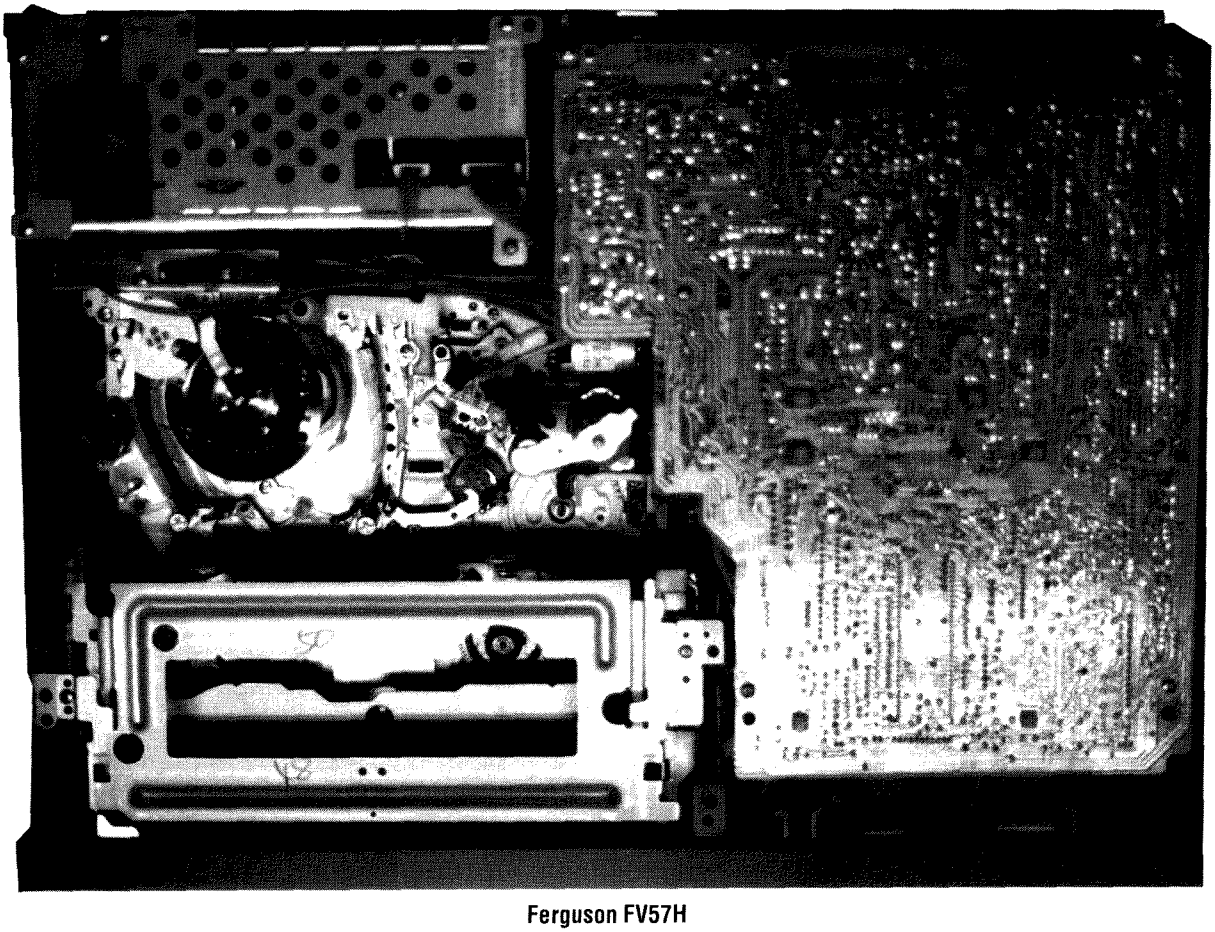

Toshiba V-7116



Removing the cover of the ITT Nokia 3782 reveals only the main circuit board.



Toshiba VCP B1B.z



Ferguson FV57H

know the tape positioning.

Because of possible fluctuation is tape distance from the heads and distortion due to the frequency response of magnetic tape, the video data is frequency modulated before it is put on the tape. The advantage of this is that interference can come mainly from speed changes and not amplitude variation and the transport speed of the tape through the recorder can be controlled reasonably precisely.

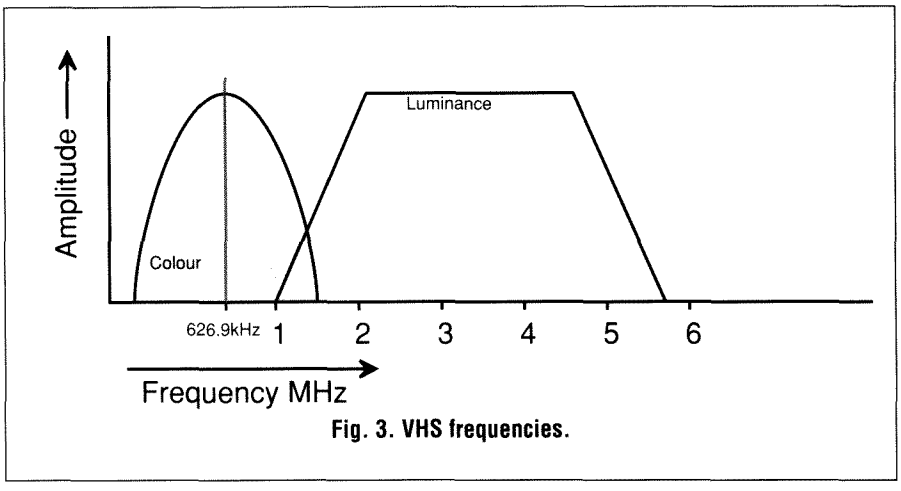



**Fig. 3. VHS frequencies.**

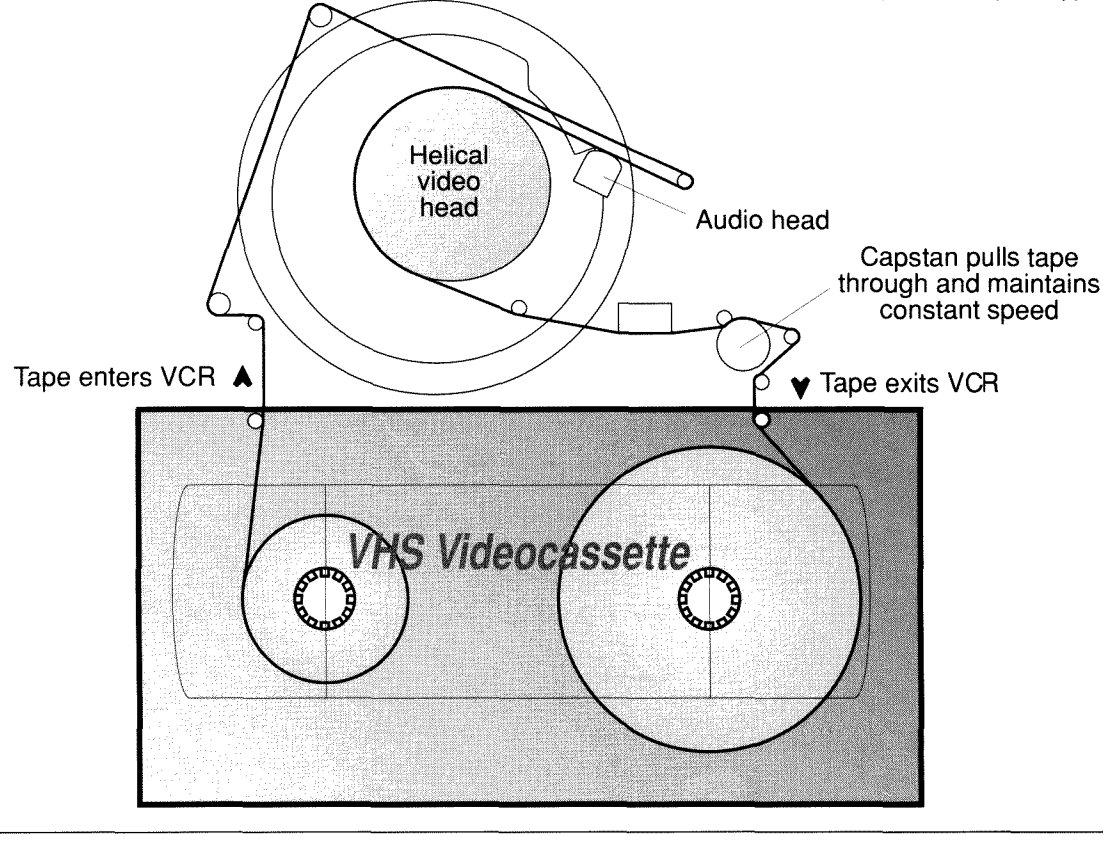
## PAL

In the PAL system used to distribute TV signals in the UK, the luminance or brightness signal occupies frequencies up to 5.5MHz although, in practice, this begins to fall off at around 3.5MHz (Fig. 2). The luminance is used to control the brightness of the dot as it scans across the screen resulting in a black and white picture. To maintain compatibility between colour and black and white TVs, the colour information is added to the signal in the fall off region above 3.5MHz. Its is because the two signals are mixed in this way that fine patterns on the screen produce flickering effects – the finer the patter, the faster the luminance signal changes and the higher its frequency. High frequency luminance changes tend to interfere with the colour information.

To put PAL onto a tape, the colour and luminance signals are separated and then repositioned as in Fig. 3. The sound is separated completely and recorded on the separate tracks. Note that in the case on Nicam digital stereo, the signals are decoded and recorded in analogue form resulting in a small loss of quality.

Putting a cassette into the video recorder and pressing play or record causes two rollers to pull a string of tape from the cassette and wrap it around the head cylinder (Fig. 4). This then spins and the tape transport gets underway. Various mechanical systems are used by different manufacturers to increase the start-up speed – the time taken for the head to get up to the right number of revs and the transport to hit the correct velocity. These are needed by the video editing functions which require quick access to fast and slow forward, pause and slow and fast reverse. In most systems the pause or 'freeze frame' is generated by repeatedly scanning the same diagonal strip of tape. More advanced systems use a digital memory to hold the image resulting in a much clearer picture.■

**Fig. 4. VHS tape wrapping.**



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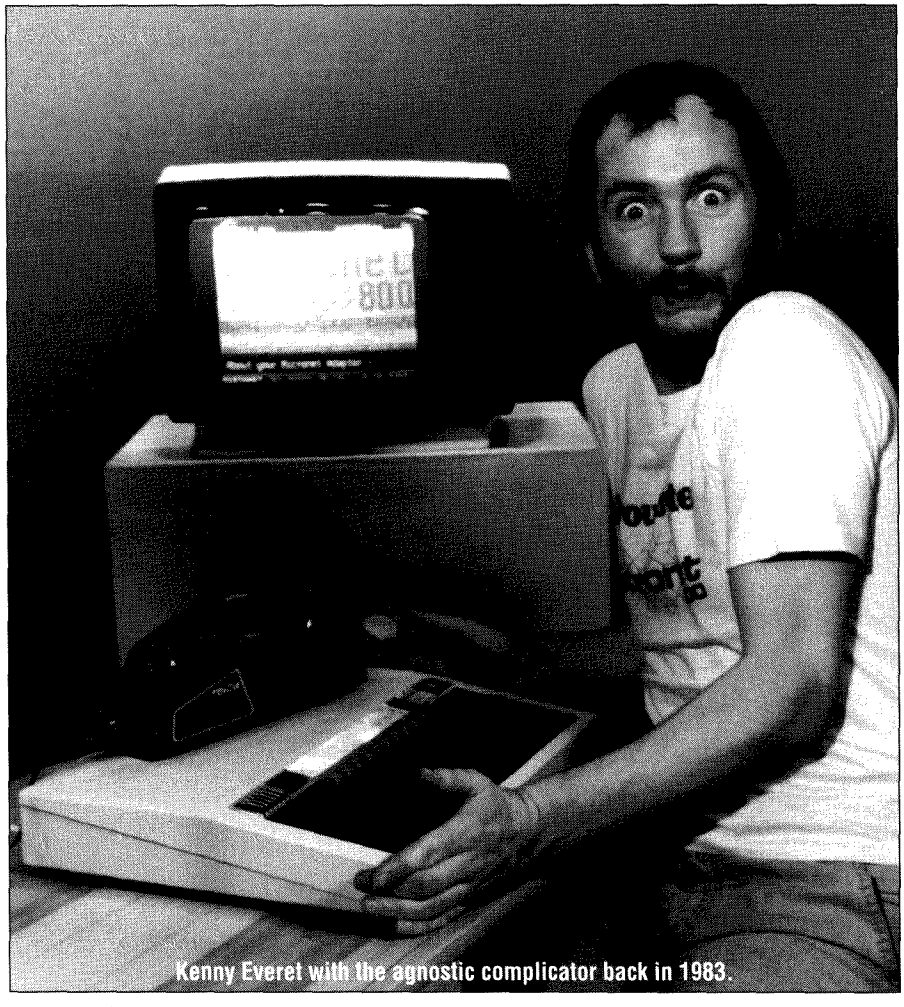
# The Rise And Fall Of An Electronic Community

*Micronet was one of the first major bulletin board systems in the UK. In its lifetime it had many highs and lows as Ian Burley, its last editor, relates.*

Micronet is now no more, but at its peak the 'Net gathered together 20,000 people from all corners of the country and a good few from abroad as well. What these people had was a 24-hour living on-line electronic and fully interactive community, its populous linked via modem.

The Net's official birthday was March 1983. Preparations started a year earlier when East Midlands Allied Press (Emap) decided to undertake an experiment in online magazine publishing. I had the dubious and rather sad honour of being Micronet's last editor.

The colourful and friendly teletext-style Prestel viewdata network was chosen to be Micronet's home. Prestel at the time was rapidly gaining the reputation of a white elephant. It had been launched ahead of its time in the late seventies and failed to capture the public's imagination. Originally aimed as an information service for domestic users, Prestel had evolved into a ghetto for travel agents and business users wanting to keep an eye on the stock market. Micronet was just the boost Prestel was looking for.



Kenny Everet with the agnostic complicator back in 1983.

## In The Beginning

Back in 1983 things were very primitive indeed. A national mailbox messaging system was only partially in place and only the privileged few registered on a local Prestel computer called Enterprise could communicate with fellow users around the country. I decided to subscribe to Micronet late in 1983 after seeing Prestel demonstrated on one of the early Making the Most of the Micro BBC series. Teletext was already established but suitably equipped TV sets were still a premium priced novelty. On TV Prestel looked seductively elegant as each page appeared, character by character and line by line. Also you could actually download programs for your BBC or Sinclair Spectrum micros, for free!

'This is the communications revolution.' this young lad in his early twenties thought.

Little did I know, when my ID and password arrived, that in less than a year I would be a full time member of the Micronet editorial team and in the following seven years there would be such a mixture of joy, opportunity, severe disappointment and frustration.

The frustration started straight away. I was unlucky enough to have been allocated an acoustic coupler instead of a hard-wired modem. Remember, plug-in BT wall sockets were quite rare then.

The 'agnostic complicator', as it was fondly referred to, was slightly too large for our household's phone. Plastic would creak under the strain while I was online and the line noise was often horrendous. It wasn't long before I, and a lot of others, had shelled out for decent plug-in modems. In fact Micronet actually gave away tens of thousands of cheap but effective modems to subscribers buying an annual subscription. We were probably the biggest national modem supplier at some point in our history.

## High-Tech Image

Contrary to its high-tech IT image, the reality of Micronet's offices in Herbal Hill, Farringdon was a bit hard to swallow when I arrived for my interview. There were no plate glass door, air-conditioned designer offices and space-age PCs and terminals. Net Towers in 'Orrible 'Ill' became the nickname for our place of work, a very run-down Emap building we shared with the Motorcycle News classified ads department and the fledgling Emap Exhibitions company. It was several years before we even got a fax machine installed. Here was an outfit whose aim was to keep its subscribers up-to-date with the latest news and information about information technology and we were using some pretty clapped out stuff.

## Low Tech Kit

The editorial department made do with a pair of decidedly second hand viewdata editing computers made by an obscure company called Technalogics. These monsters were built into the sides of two desks, where the drawers would usually be. I later discovered that the Technalogics were based on 8-bit Motorola 6800 processors. Each machine had a pair of 8in floppy drives and disks were unreadable until the machines had warmed up for at least ten minutes in the morning. Thinking about the Technalogics 'operating' system still makes me shudder. It was all incredibly primitive compared to my beloved BBC Micro.

Next door in the technical support department, they were a bit more organised. Telesoftware was managed by a Dec PDP/11 mini with its 'massive' 10Mb removable hard drives and a RML 380Z, again sporting 8in floppy drives, was used for downloading mailbox messages each day.

## Free Software

In the early days, the main attraction of Micronet was definitely the free downloadable telesoftware. For some, interest waned after they had downloaded all there was to have. For there rest, there was chargeable commercial telesoftware, the news service and of course advice to help you make the best of your home computer. Micronet membership included access to the rest of Prestel. If you lived in Birmingham you could use a teleshopping service on Prestel for buying your groceries. American Express sponsored a service for checking flight arrivals and departures. There was a limited theatre ticket booking service. Of course there were loads of travel databases, though many of these were for travel agents only.

Eventually everybody was given access to the mailbox system. Suddenly, Micronet felt just that little bit more sophisticated. You could amaze your friends by logging on to the system and have real messages waiting for you from some new-found friend hundreds of miles away. Next, Micronet's technical director, Mike Brown, hit upon the idea of making a BBC Micro download messages and redisplay them for all to see in loops of pages called 'chatlines'. This was an immediate hit. Within minutes you could have a message which thousands of other Micronet users could see and respond to. People would use the chatline for posting technical queries or for plain chit-chat. The idea of a program written in Basic running on a Beeb

regulating a conversation between hundreds of people in a day was quite a marvel. Unfortunately, it wasn't very reliable. If Prestel's mailbox system went down, even for just a few minutes, the chatline system would also grind to a halt and require a manual re-start. I once drove into London from Essex on a Christmas evening to restart the Beeb much to the gratitude of the online revellers.

Another fundamental problem with the Beeb-moderated chatline was that it was quite slow and a message queue quickly built up with delays of up to an hour. In the end a much more efficient chatline facility was added to the main Prestel Mailbox system. Delays were a thing of the past and it didn't hang so often. It also meant an almost limitless number of chatlines could be created.

Meanwhile the Beeb wasn't simply retired, instead it was adapted as a portable interviewing device for a feature called Celebrity Chatline. Either we would visit homes or workplaces of a willing celebrity, or they would visit us and we'd run a chatline with Netters' questions answered personally by the guest. Celebs included Sir Clive Sinclair, Heinz Wolf, pop-star Fergal Sharkey (himself a Net member), magician Paul Daniels, various MPs, members of the aristocracy, disc jockeys, Rolf Harris, superman Christopher Reeve, Stephen Fry (another Netter) a whole host of computer industry VIPs and more. Gallery was introduced, a service where keen users could run their own mini-magazines online with up to 26

pages - online publishing for the masses!

## The Great Prestel Hack

Talking of celebrities, Micronet was associated with the so-called Prestel Hack back in 1984 when the Duke of Edinburgh's Prestel mailbox was 'broken into'. The day Robert Schifreen turned up at our offices and demonstrated he had full system operator access to Prestel was one I will never forget. It was an early introduction to the now much topical problem of computer security.

Celebrity Chatline was a key attraction of our various skirmishes with broadcasting. We got involved with Capital Radio's Help a London Child Easter time fund raising efforts running online auctions and pledges. One year, with a Beeb at the heart of Capital's studios, we raised about £5,000 – a good proportion of it pledged well outside Capital's London catchment area. In league with the national network of ITECs or Information Technology Centres, about £40,000 was raised for Children In Need one year – Micronet was allocated its very own dressing room in TV Centre and unsuspecting celebs like the East Enders cast, Charles Dance, Selina Scott, Frankie Howerd, Patrick Moore and many others were plucked from the corridor to be interviewed 'live' in exchange for pledges.

We discovered that TV producers were using Micronet for keeping in touch. This lead to the idea of using a Micronet page online to be used as a scoreboard on the Whistle Test New Years pop video vote on BBC2. Netters could also vote online. Those were some heady days indeed.

## Dissapointements

But as Micronet grew, so did its problems. Emap was disappointed that the set up still wasn't profitable after several years. Micronet's attempt at selling magazine-style advertising space was quite successful at signing companies up but bad debt was a big problem – you can pick up a magazine and check your ad but most Micronet advertisers weren't part of the modem revolution. In some ways, online advertising caused its own downfall as online ordering and feedback was offered. Although in my opinion many firms got good value for money from advertising on Micronet, the level of online

response was often used as an excuse for advertisers not to pay up. Some firms were very successful and made a lot of money selling consumables, software and hardware online. When the advertising department was disbanded, there were several pleas from frustrated advertisers who wanted to continue.

## Multi-User Games

The chatlines were joined by on-line multi-user games. First there was Shades and later the ecologically friendly world of Trash. The former proved to be a big success. Shades ran on a home-built PDP/11 minicomputer accessed via a gateway link from Prestel. The scenario was a magic land with strange buildings and even stranger beings – often other Netters – to explore and encounter. Finding treasure while staying 'alive' built up points culminating in the top honour of becoming a Witch or a Wizard. The game became addictive for some and there was gossip about quarterly bills running into several hundred and even thousands of pounds. The Shades adventure land was also a place to meet people and act out one's fantasies. Several Netters now in long-term relationships met 'electronically' via Shades and at least one couple got married as a result, attracting attention from the London Evening Standard newspaper.

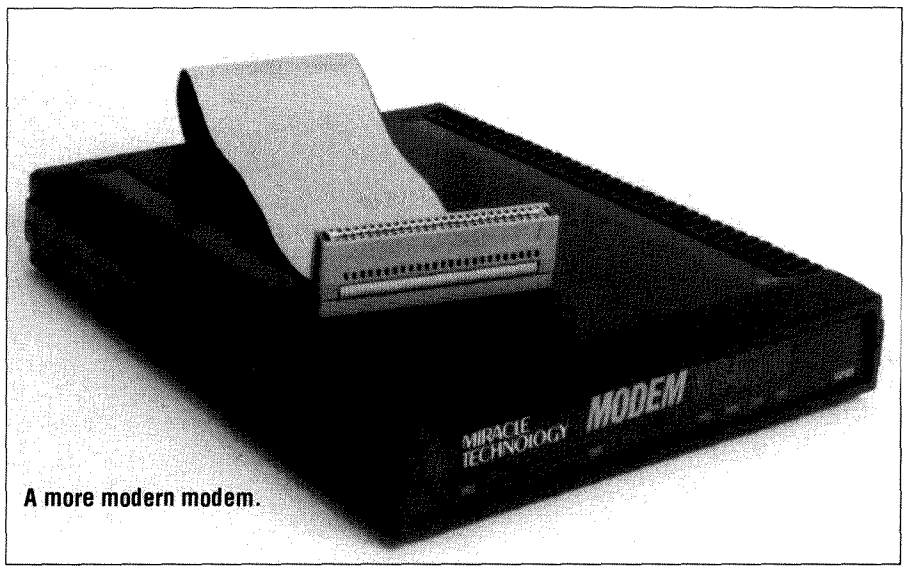
Things started to go wrong when in 1988 Prestel insisted that a 1p a minute tariff be imposed on off-peak usage, the main period when Micronetters were online. Previously Micronetters only paid peak time charges over their quarterly fixed subscription. In hindsight, the decision, or at least the way it was implemented was wrong, but the reaction of so many Netters – up to 20% – deciding to quit over the issue was a major disappointment. Netters took the tariff change very personally yet they didn't really realise how cheap the service was. Nothing remotely comparable was as affordable.

Micronet's gradually improving finances were hit hard. Emap parted company and Prestel's parent company, BT, became the major shareholder. Financial worries lessened, but new problems arose. Just as we were admitted to the fold, BT decided against a big push into public videotext modelled on the French Minitel system. Micronet's main problem was always critical-mass. Beyond about 19,000 users, every new user recruited was profitable. At Micronet's peak in 1988 we boasted just over 20,000 users. A big subsidised public network could have multiplied Micronet's subscribers several times over.

Instead we discovered that BT's commitment to online publishing was waning. BT wasn't willing to deal with problematical issues like bad language on the chatlines and to our dismay chatlines were suspended and later abandoned. Prestel's ageing technology had for some time caused us some difficulties as well. Despite a doubling of connect speed to 2400 bits per second over the years, smaller and more dynamic rival systems offered faster operation and better software libraries. Although we had a unique editorial service with the most up-to-date news and reviews around, Micronet's subscriber base was bleeding to death.

## The End Of An Era

In the end the fervent hard core of about 13,000 subscribers logged on at the end of September last year to be informed that the Net was to be closed a month later. The news hit the national press and one obituary in particular in The Guardian, penned by Micronet's erstwhile technical director Mike Brown, rammed the message home that Micronet was brave and exciting experiment in popular information technology which in the end had not been allowed to prosper as it deserved to. ■

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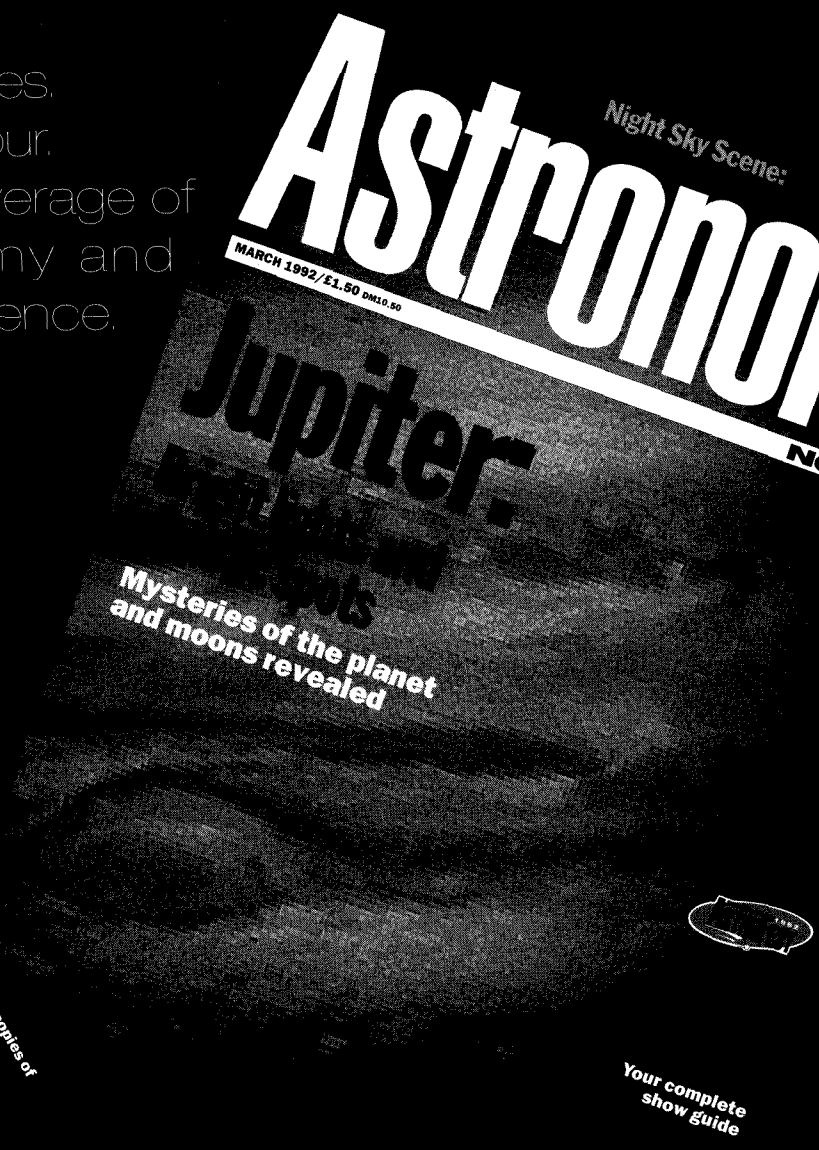


March issue on sale from the 6th February includes Astroscan telescope competition voucher and European AstroFest 1992 preview. Ask for it at your local newsagent.

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# Making The Connection

*SCART plugs and sockets are now a common sight on the backs of video cassette recorders and television sets. Harry Field explains what all those pins are about.*

Look on the back of almost any video recorder and most modern TV sets and you'll find a SCART connector – also known as Peritel. It uses an unusual and flimsy looking plug and socket arrangement with 21 pins. These are used to carry information between two pieces of video equipment; sound, controls, colour, brightness and synchronisation. All of the connections are shown in the figure below but connecting up is not as easy as it may seem.

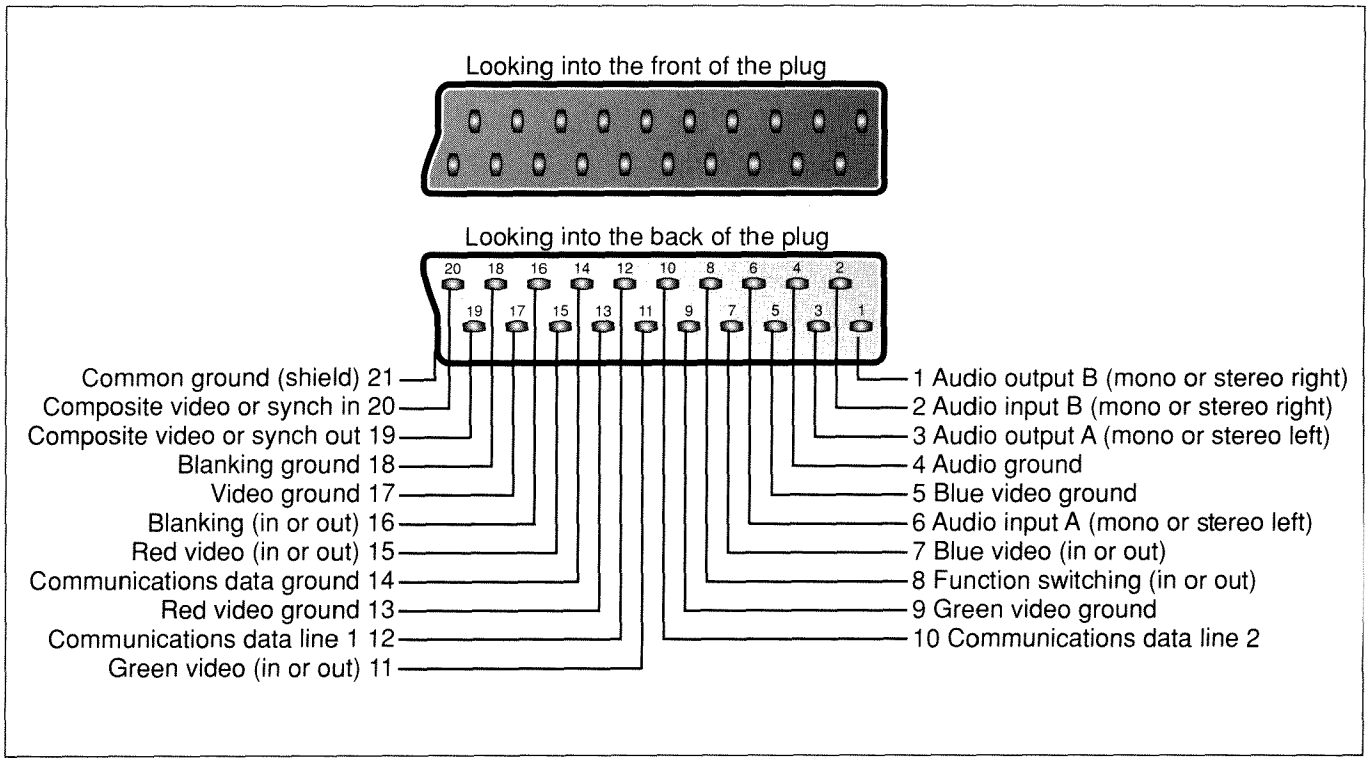
When connecting a plug to a plug, usually to connect two VCRs for tape to tape dubbing, the audio outputs must be crossed to the relevant audio inputs as must the video inputs and output. All other lines are connected directly, that is the same pin numbers should be connected on each plug. For socket to plug connections, useful as extendors or for some TVs to VCRs, all lines go direct – pin 1 to pin 1, 2 to 2 and so on.

## Making Up

Assembly is relatively straight forward and all that is required is a soldering iron, solder, wire and wire strippers and cutters (or a sharp knife). It is important to use the correct type of cable for some connections. Video signals and their associated synchronisation must use 75Ω coaxial. Audio connections should use screen cable and the rest can use simple insulated wire. Take care when soldering to make sure that the joints are solid and able to resist a good tug – it is a good idea to place the plug or socket being 'operated on' in a vice to hold it steady.

## Soldering

Apply solder to each of the pins of the plug or socket and to the cables – a process known as tinning – as this makes the final joint much easier to fix. Put the tinned wire against the relevant pin and heat them both with the tip of the soldering iron. When the solder begins to flow, remove the iron and let the solder set. If the joint is particularly dull then re-apply the heat until the solder runs again. This should stop dry joints occurring. Obviously, an alternative is to buy a ready made cable available from a number of suppliers. ■



# Silicon Valley... The Latest From Siemens

*The European Electronics Group Siemens has announced a number of new products aimed at modern TV, video systems and a 64-bit RISC..*

The SDA20560 is a microcontroller designed to be used with a TV tuning system. When combined with a 16k EEPROM (electrically erasable programmable read only memory) it provides on-screen programming and channel tuning with no loss of data in the event of a power cut.

The SDA5231 and SDA5243 are existing text processors that provide on-screen text access in a number of languages. The latest version, the SDA5248 can access up to 128 pages when used with an external 1Mbit RAM. The soon to be released Megatext chip will support all European languages and can hold 12 pages of text on-chip. It also offers improved graphics resolution and a full screen display.

Stereo sound using Nicam is becoming very popular in the UK and Siemens latest support chip, the TDA6612 offers a compact solution in which the stereo decoder can be turned off to allow for the tone control of Nicam signals.

## Smart Cards

Another interesting product from Siemens is a chip-card processor. This is designed to be placed on a credit card to store and manipulate PIN numbers, fingerprints, signatures or voice-prints.

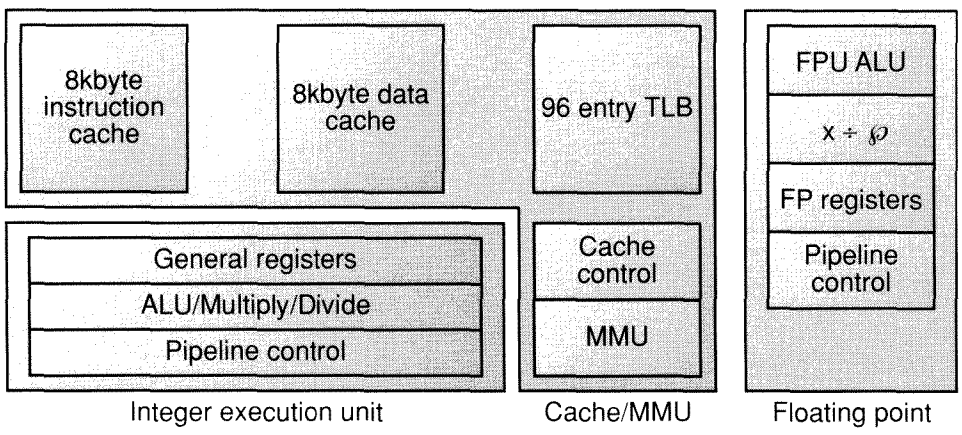
The SLE4420 is an 8-bit microcontroller with built in 2kbyte EEPROM and 4.5kbyte program memory. It is intended for complex security systems; typical applications include pre-paid vending such as telephone cards, pay TV and public transport, information storage such as car service records and personal medical records can also be stored.

## 64-bit RISC

Probably the most interesting new product from Siemens is a 64-bit RISC (reduced instruction set computer) Siemens are the first company to produce a commercial 64-bit chip although a number of others are planned. The R4000 is able to address up to 64 gigabytes of physical memory and 4 terabytes of virtual memory. It comes in three models and at the bottom of the range is the R4000PC, designed to be used in small desktop computers and embedded control systems. The R4000SC is aimed at technical workstations and is able to control secondary caches. The R4000MC is at the top end of the range and should be used in multi-processor and fault-tolerant systems. All three processors have eight stage 100MHz pipelines, a full 64-bit internal architecture resulting in mainframe performance levels for both integer and floating point operations – around 50MIPS (millions of instructions per second) which compares well with an Intel 486 which delivers a mere 15MIPS.

The existing software range includes C, Pascal, Ada and Cobol as well as the ability to run Unix and X-Windows. This should allow it to fit into its niche in the high end CAD (computer aided design) and graphics workstation market. ■

**Block diagram of the R4000.**



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Friday 14th - Saturday 15th February 1992

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## Friday 14th and Saturday 15th February

# Wavelengths

*If you have any comments, suggestions, subjects you think should be aired, write to PE*

With reference to the letter from M Mathews 'Flat Presentation' (Wavelengths, Jan 1992), I would like to add the following comments.,

After reading the comments made by M Mathews concerning flat screen television and Sharp's hanging TV screen, I really felt compelled to write and convey thoughts from another part of the general public.

How can anyone condemn the application of technology in the market place because of reasons like 'Any technology that wants to replace them will have to look like them'.

This sort of attitude slows technological breakthroughs down and progression deteriorates.

It would be a sorry world if manufacturers and designers were to lend themselves solely to the whims of the, so called, general public and not their own ideas an dreams of future products; it is to products like these that we consumers owe so much.

M Mathews may not like the product but what about the technological spin-offs? Or would he be satisfied if the same product was mounted in a big plastic box (with teak effect) mounted on a stand and placed in a corner because... it has to look the same? The rhubarb about it being knocked off the wall, ever heard of screws? Oh, so now its a permanent fixture eh! When was the last time you put a TV somewhere else in the living room?

Personally I would welcome a wall mounted TV alleviating the need for the TV that 'sits noisily in the corner' and its associated furniture, giving me back that for ever needed space.

Now, where can I hide the VCR, or have the engineers at Sharp something else up their sleeves?

Well done Sharp!

S Ashton, Cheltenham

## More Radio 4

I was intrigued to read James Higgins letter in the February issue of PE. I live in London and have come across the same problem. The solution is easy. Radio 4 is also transmitted on medium wave. I don't know the exact frequency but hunt around and you'll find it.

Alan Perkins
Hampstead
London

## Sharp Comment

After seeing the Sharp pocket computer in the February issue of PE, I must write and say how much it bears a resemblance to the Poqet computer. Is there any connection between the two? The Poqet is not, as far as I know, easily available in this country so perhaps the Sharp would be a good alternative. Any chance of a review in PE?

W Howe
Brighton
West Sussex

*Take a look on page 17 for more info on the Sharp – there is a possibility of a review next month but no promises.*

## Photo Enthusiasm

Where can I get a Photo CD? This gadget looks like the answer to my prayers. I take lots of pictures – photography is my hobby, electronics is just very interesting – and leafing through photo-albums is something of a chore. What kind of equipment will I need to be able to edit my photographs, adjust the colour, move heads around and so on? Will I be able to get the results printed out easily? Is there any loss of quality in the scanning process? Thanks for a very interesting article and magazine in general.

S Trevor
Wrexham
Clwyd

*When it comes out this summer, Photo CD should be available from high street retailers, Dixons and such like. To actually manipulate the pictures digitally you'll need an Apple Mac with colour capabilities, say an LC, a CD ROM XA drive and some software, Adobe Photoshop is probably the best. Printing out is a little more difficult. It should be possible to get prints done by a Kodak dealer but they may only operate with the standard Kodak CDs. Another option, rather expensive I admit, is to get hold of Kodak's XL7700 printer or perhaps find someone who has access to one and is Mac compatible.*

*The scanning process is very good but you have to remember that the pictures are destined for a CD and display on a TV set. There is necessarily a loss in quality in the process but judging by the results I have seen, it is not very great.*

## Against Badges

Just a comment about the recent active badge article (PE Feb). It seems that the spirit of Big Brother is alive and well. When I leave my office I don't want to be followed by my phone calls (it is for this reason that I would never have a portable telephone) . The idea of a badge that can be tracked is outrageous and an invasion of privacy. With any luck, the idea will never take off.

## And For

Ian Burley's report on active badges in the Feb issue of PE was fascinating. The idea that my work could follow me around and that I need never rush back to my office to answer the phone is fantastic. Just like something out of Star Trek. Congratulations on a great mag and keep up the good work.

J Stamford
Woodbridge
Suffolk

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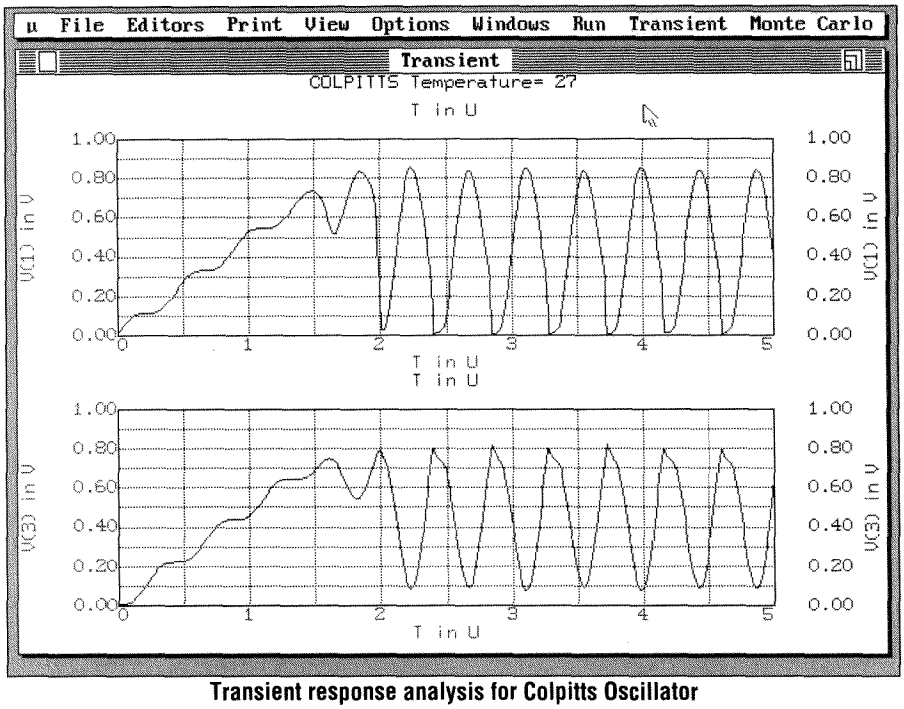
# Advanced Circuit Design Software

*Dave Jewell boots up the Micro-Cap III V3.08 circuit simulation software and puts it through its paces*

In recent years, an increasing number of circuit designers have come to rely upon CAE (Computer Assisted Engineering) packages to assist them in developing circuits and testing out new ideas. With the advent of the popular, inexpensive and much-cloned IBM PC, such packages are now within reach of serious hobbyists and amateurs. This article takes a look at the latest version of Micro-Cap III, a comprehensive and well-respected circuit analysis program from Spectrum Software. The version reviewed was intended to run on any PC, but 386-specific versions are available, which can make use of more memory and can analyse larger circuits.




**Transient response analysis for Colpitts Oscillator**

## Spicing It Up...

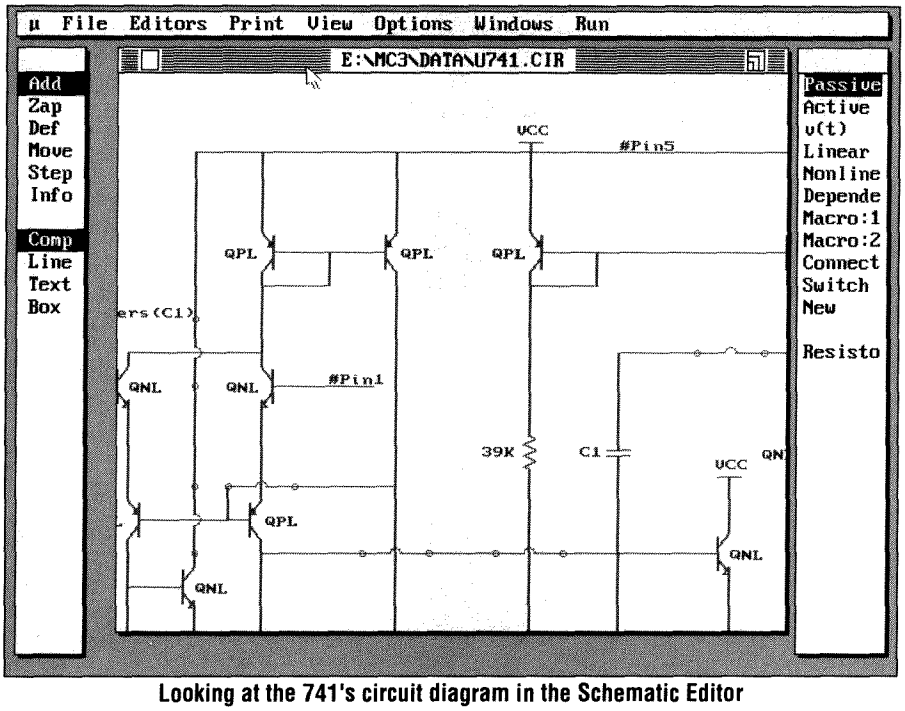
It's important to distinguish between linear circuit simulators such as Analyser III (reviewed in the January, 1992 issue of PE) and programs such as PSPICE and Micro-Cap III. Many linear circuit simulators take little or no account of the biasing conditions for each transistor, and simply assume that each active device has been biased into a linear region of operation. Such programs often use a simplified device model, which means (amongst other things) that the program has no way of knowing when a particular transistor is overdriven into a non-linear state. Information on gain and input/output impedance is about all that can be provided, and no actual waveforms can be seen. This isn't a criticism of linear circuit simulators; provided you're aware of their limitations, good results can be obtained, but like everything else in life, you get what you pay for.

Micro-Cap III, PSPICE, ECA and others use a more sophisticated approach and are all derived from the original SPICE algorithms developed at the University of California at Berkeley. Micro-Cap III is capable of performing DC and AC analysis, Transient and Fourier analysis and can perform Monte-Carlo statistical analysis in order to provide information on how likely it is that a finished design will work. If you're not familiar with these terms, look at the accompanying 'Terminology' box.

## Setting Up

This is an expensive and specialised package, so it's not too surprising that Micro-Cap III is copy-protected. Rather than using the familiar hardware 'dongle', Spectrum Software use a special 'key disk'. You can install the software twice and thereafter any subsequent installations require the key disk to be inserted before the program will run. I wasn't able to run the program without the key disk – I suspect that the review copy had already been installed from twice. You can, of course, uninstall the program and subsequently install onto another system. The software was supplied on four 5.25 inch disks.

A single, weighty, ring-bound manual is provided with dividers for each section. I found the documentation very easy to use, and a simple tutorial-style section is provided to get you started.




Looking at the 741's circuit diagram in the Schematic Editor

## Using Micro-Cap III

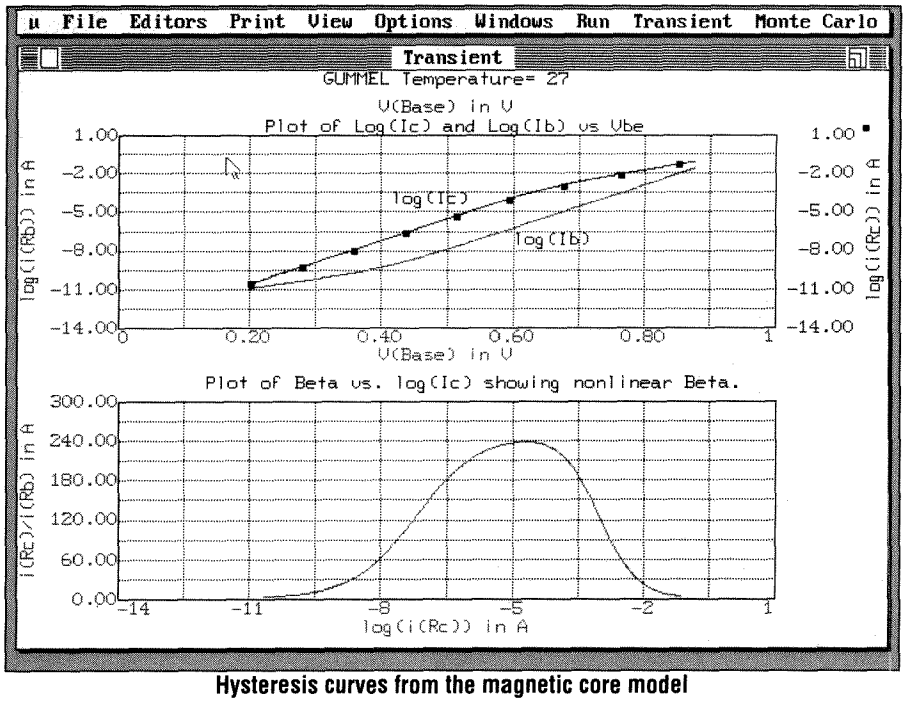
An increasing number of circuit analysis programs are sporting a new, user-friendly graphical user interface and Micro-Cap III is no exception. Analyser III has recently been revamped in this way, and I can think of a few other products where an overhaul is long overdue. A big advantage of a graphical user interface is that the program can actually draw the circuit which is being analysed, rather than presenting the engineer with a confusing netlist which has to be laboriously drawn out on paper. Micro-Cap has a built in schematic editor, which means you can develop your circuit, analyse it, make changes, and so on, all without having to use a third party schematic capture package such as OrCAD. Micro-Cap comes with a utility for creating SPICE compatible netlists if required.

The program comes with device models for bipolar transistors, MOS, JFET's, MOSFET's and OPAMP's. A reasonable number of actual devices are contained in the supplied device libraries, and obviously, you can add new devices as required. The device models used by Micro-Cap are sophisticated, which ensures accurate analysis, but it makes the process of adding a new device quite difficult. In order to simplify the process, Spectrum supply a utility program called PEP (Parameter Estimation Program) which is designed to simplify the process. In essence, it attempts to determine a consistent set of model parameters for a new device, based on whatever parameters you are able to supply. Unusually, for a general purpose circuit analysis package, Micro-Cap includes the Jiles-Atherton model for non-linear magnetic cores.

Once the circuit has been designed, a variety of different analyses can be run on it to determine how well the circuit will perform in practice. In DC analysis mode, the program effectively replaces all inductors with 0.001Ω resistors, and replaces all capacitors with high value resistors. One or more current and voltage sources can be stepped through a range of values, plotting the resulting output voltages and currents on the screen. One of the supplied circuit files demonstrates how to plot characteristic curves for bipolar transistors.

AC analysis allows plotting of input/output impedance and admittance, gain and noise. The noise calculation is particularly useful for the design of low-noise circuits such as audio pre-amplifiers and RF front-ends. All the various analysis modes in Micro-Cap can produce numerical data as well as plots, and both types of result can be printed or saved for later examination. The Transient Analysis part of the program is used to determine the response of a circuit to initial conditions. It's particularly interesting running a transient analysis on the Colpitts oscillator supplied, and watching the oscillator 'start up' from cold. Finally, the Fourier analysis option allows the spectral components of a generated waveform to be examined.

Micro-Cap allows you to set up many different types of sources for feeding to a test circuit as input. In addition to the device models used for defining components, models are provided for time dependent sine and pulse sources, voltage and current sources, polynomial sources




Hysteresis curves from the magnetic core model

and other formula based sources. The capabilities provided in this area are very comprehensive.

Micro-Cap supports EGA, VGA and MCA adaptors and even the lowly CGA adaptor is compatible with the program (provided that your eye sight is up to it!). The program can be used with 'generic' dot-matrix printers and with the popular HP LaserJet. HP and Houston Instrument plotters are also supported.

Unlike MicroSim's PSPICE program, Micro-Cap isn't capable of doing mixed analogue and digital simulations. That is to say, you can't directly mix discrete analogue circuitry with (say) TTL or CMOS logic. However, the program does have a powerful macro facility and this allows simple logic gates to be assembled into a macro definition, with internal 'programmed' switches defining the operation of the gate. Because Micro-Cap allows macros to be nested within other macro definitions, you can then build upon these simple gates to create more complex circuits. A sample circuit provided shows a simple counter built from three JK flip-flops.

The price of the package may seem high, but it could undoubtedly save the practicing circuit designer a great deal of time and effort. Datech, the UK distributors of Micro-Cap, states that unlimited telephone technical support is included in the purchase price of £1495 + VAT. Within a few days of this review, version 3.09 of the product was released. ■

```
Alias:2N3996      Memo: JFET high frequency amplifier N-cha  Library: STD

 JFET                                          Active
MC3 Library type  Unassigned      PEP Library type 7
Parameter:          Value:        Parameter:          Value:
  1.VTO             4               1.VP(BETA)        4
  2.BETA            1.2500E-004     2.IDss(BETA)      0.002
  3.LAMBDA          0               3.RD              0
  4.RD              0               4.RS              0
  5.RS              0               5.PB              1
  6.CGS             4.5000E-012     6.IS              1.0000E-014
  7.CGD             4.2426E-012     7.KF              0
  8.PB              1               8.AF              1
  9.IS              1.0000E-014     9.FC              0.5
 10.KF              0              10.LAMBDA          0
 11.AF              1              11.Ciss            6.0000E-012
 12.FC              0.5            12.VGS at Ciss     0
                                   13.VDG at Crss     7
                                   14.Crss            1.5000E-012
                                   15.VTO             4

F1-Help F2-Edit F3-LeftPage F4-RightPage ESC-Quit
```

▲ Running PEP – the Parameter Estimation Program – and the built-in library part editor ▼

```
Alias:2N3996      Memo: JFET high frequency amplifier N-cha  Library: STD

 JFET                                          Active
MC3 Library type  Unassigned      PEP Library type 7
Parameter:          Value:        Parameter:          Value:
  1.VTO             4               1.VP(BETA)        4
  2.BETA            1.2500E-004     2.IDss(BETA)      0.002
  3.LAMBDA          0               3.RD              0
  4.RD              0               4.RS              0
  5.RS              0               5.PB              1
  6.CGS             4.5000E-012     6.IS              1.0000E-014
  7.CGD             4.2426E-012     7.KF              0
  8.PB              1               8.AF              1
  9.IS              1.0000E-014     9.FC              0.5
 10.KF              0              10.LAMBDA          0
 11.AF              1              11.Ciss            6.0000E-012
 12.FC              0.5            12.VGS at Ciss     0
                                   13.VDG at Crss     7
                                   14.Crss            1.5000E-012
                                   15.VTO             4

F1-Help F2-Edit F3-LeftPage F4-RightPage ESC-Quit
```

## A Guide To Circuit Analysis Terminology

| | |
|---|---|
| DC Analysis | Investigating the DC characteristics of a circuit. AC effects in inductors and capacitors are ignored, and the test circuit is stepped through a series of voltages or currents to allow appropriate bias points, and so forth to be determined. |
| AC Analysis | Measuring the AC characteristics of a circuit such as frequency response, input/output impedance and noise figures. Micro-Cap will also provide Nyquist plots. |
| Transient Analysis | Testing response to 'switch-on' conditions and time-varying sources. |
| Fourier Analysis | Breaking down a waveform into it's spectral components. (Any periodic waveform can be represented by one or more other waveforms of differing frequency. For example, an amplitude modulated signal breaks down into a carrier and two sidebands). |
| Device Model | A collection of 'idealised' components used to model a real world device. For example, a diode might be modelled with several idealised diodes and voltage sources. Micro-Cap uses the Ebers-Moll and Gummel-Poon models for bipolar transistors. |
| Monte Carlo Analysis | This involves looking at the tolerances of all the components in a circuit and applying statistics to estimate the likely range of some property such as gain, input impedance, etc. Micro-Cap can apply 'worst-case' tolerancing (everything stacks up against you !) or can show a more likely real-world spread of values. |

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| Kikusui AVM23 AC Voltmeter Dual Ch 10Hz–500KHz 300μV–100V | £75 |
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# What's In A Video Signal

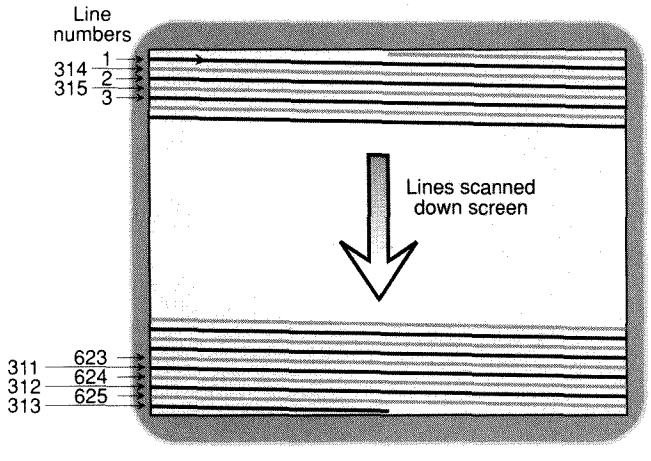
*Colin Macliesh explains how a the information coded up in a video signal is converted into a visible picture.*

Because of the large amount of information it contains, the whole of a video image cannot be transmitted at one time unlike say, an audio signal. It requires a scanning process known as a raster with the whole picture or frame being sent as a series of stacked lines.

The path of the varying point of light that makes up the image is controlled by two waveforms. The first of these causes it to travel from the left of the screen to the right and the second slowly sweeps it from the top of the screen to the bottom. The result of these two motions is to trace a series of lines moving down until the whole screen has been scanned.

To initiate these waveforms in the video monitor or TV set, synchronising pulses are added to the picture information. A small negative pulse lasting 4.7μs (micro seconds) is recognised as horizontal sync, resetting the scan to the left of screen. A larger, more complicated pulse 2.5 lines in duration and containing within it smaller 'equalising' pulses, is seen as vertical sync and returns the scan to the top of the screen.

Cinema film equipment usually runs at 24 frames a second and when TV was first being set up it was an obvious step to try and make video compatible to this standard – but it was also desirable to relate it to the 50Hz mains supply. The solution chosen was a picture made up from 625 lines, initially 405 lines, with a frame rate of 25Hz – cinema films playback a fraction fast. However, this results in a noticeable flicker at higher intensities due to the low 'refresh rate' of the screen. To transmit all 625 lines 50 times a second certainly reduces this flicker but uses up far too much bandwidth. The compromise arrived at is a frame of 625 lines made up of two interleaved images or fields (odd and even) each of 312.5 lines repeating at 50Hz. See illustration.




**Interlace of odd and even fields.**

The idea of a 1/2 line may seem complicated but it has the effect of interlacing the lines of adjacent fields between each other.

Why isn't the flicker on films noticeable? Because the shutter can be opened twice on each frame changing the apparent refresh rate from 24Hz to 48Hz (or 25Hz to 50Hz).

We now have a varying voltage with synchronising pulses added to identify a position in the frame. This is all that's required for a monochrome (black and white) system. When it was decided to transmit colour TV, compatibility with monochrome sets was vital and the designers had the difficult task of introducing the extra colour information onto the existing signal without impairing monochrome reception, or increasing transmission bandwidth.

By suitable manipulation of the red, green and blue colour signals generated by a typical colour camera, a monochrome picture with two colour difference signals is produced. These colour signals are the electrical difference between the monochrome picture and the red and blue content of the coloured picture (the green component can then be calculated from these).

The colour signals are then used to phase modulate a high frequency subcarrier which, for our UK system, is 4.43361875MHz – carefully chosen for minimum interference on the monochrome picture into which it is inserted. As the original carrier is supressed a short burst of 'subcarrier' is added to the signal just after the horizontal sync pulse, to keep the decoding circuit in step and ensure correct colours. Monochrome receivers just ignore all this.

One more cunning twist is left. The red colour difference signal is phase inverted every alternate line. When this is suitably corrected for and averaged over a period of two lines, most of the noticeable errors that can occur between transmission and reception are cancelled out. The name given to the system is ' Phase Alternation Line' or PAL. That in a very small nut shell is all there is to it. The following project puts the theory into practice. ■

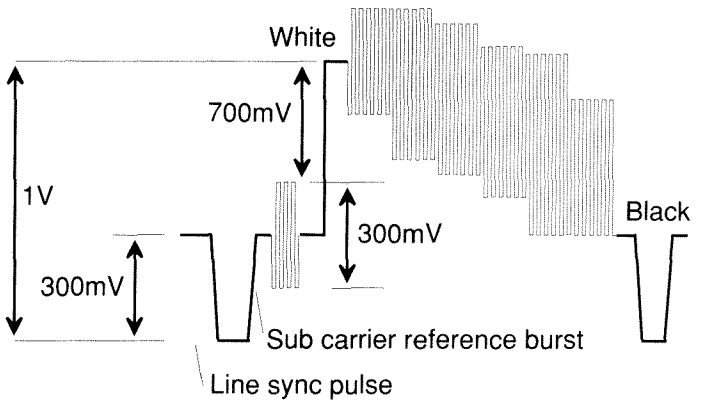
# Build It... A Video Fader

*The circuit in this article is based on one recently designed by Colin Macliesh for a professional video duplication facility.*

If you mess around with video, then sooner or later you will need to fade or cut to black. Black is to video as silence is to audio. When you find yourself doing a copy of Jason's fourth birthday party for the grandparents, making pirate copies of Carry On Soldering for your friends(?) or just editing the good bits from your camcorder onto your main recorder, fading into and out of black can give a more professional touch, resulting in an easier to watch video. The circuit shown here is easy to construct and test, all the components are readily available, and the performance is extremely good.

The main problem with fading video is that part of the signal cannot be varied, specifically the sync pulses and subcarrier burst (Fig.1). These both have amplitudes of 300mV regardless of the picture content.

Fig. 1.

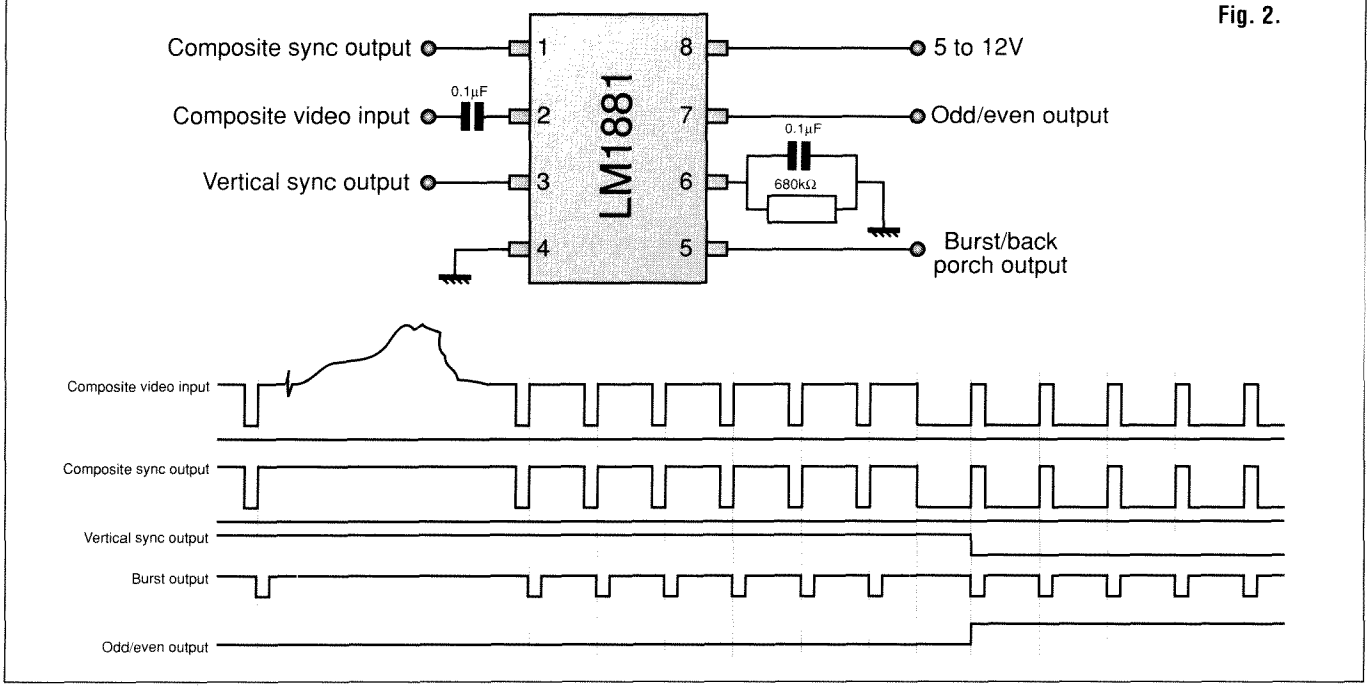



The solution to the problem is to split the signal into two paths, one fixed at standard level and the other variable, with an electronic switch selecting between the two.

As with most video manipulations the circuit divides into three main blocks:

A input termination, sync pulse

Fig. 2.



extraction and DC clamping

B signal processing (in this case level adjustment)

C output driver

The first thing to do to a video signal is to terminate it with an impedance of 75Ω. The second is to extract the synchronising pulses and the third is to clamp the video signal to a DC reference. This gives you the 'when and where' of the signal.

A 75Ω resistor performs the first function, and the rather useful LM1881 video sync separator (Fig.2) does the rest. Four synchronising signals are detected by this IC – composite sync (horizontal for our purpose), vertical sync, burst position, and odd/even field.

Next the circuit must identify which part of the waveform has to remain at standard level and which part can be faded.

A glance at Fig.4 shows that the sync and burst signals are encompassed between the high to low transition of the line sync pulse and the low to high transition of the burst position pulse. This isolates the standard level section enabling the electronic switch to select the appropriate path. By clamping the video black level to 0V, the variable portion of the signal can simply be attenuated by a potentiometer also referenced to 0V. The picture content of the signal is proportionally removed as the variable resistor wiper approaches 0V and fades to black.

The option of 'cutting to black' simply means the electronic switch selects 0V instead of the variable resistor. However, another factor must now be taken into account, as the switching should not take place during the picture scans, but in the gaps in between. This happens as the vertical sync pulse arrives and is referred to as 'vertical interval switching' and provides a clean transition from one field to the other. It is achieved by setting a flip-flop as 'cut to black' is selected with the panel switch but not actually enabling the control output until the vertical sync pulse is present.

All that remains now is to amplify the signal by two times and buffer it so that it can drive a 150Ω load. The x2 gain is required due to the voltage dividing nature of the double terminating process (Fig.5). By terminating each end of a connecting cable (of characteristic impedance 75Ω) with 75Ω, the cable is fooled into thinking it is infinitely long and therefore no reflections can occur at its ends. Incorrect termination and more than a few metres of cable will cause interesting colour effects as the subcarrier oscillations bounce back and forth causing phase and level inaccuracies.

Fig. 3a

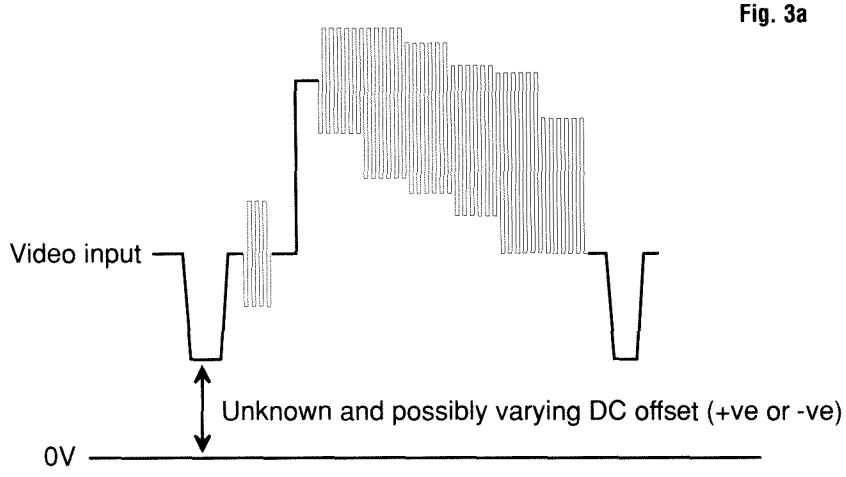



Fig. 3b

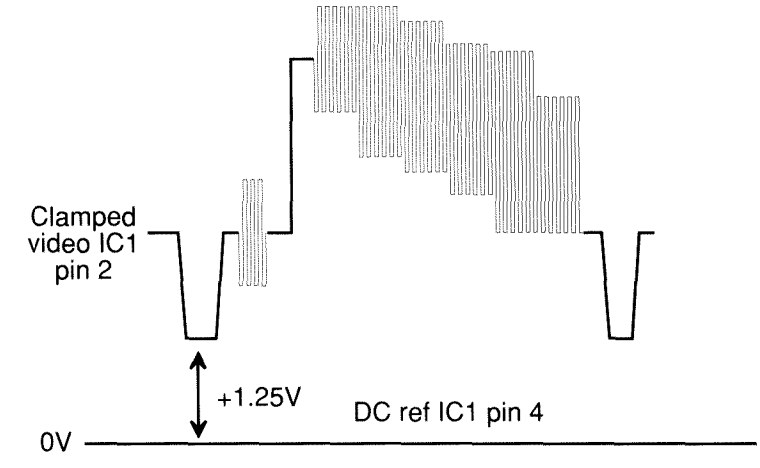
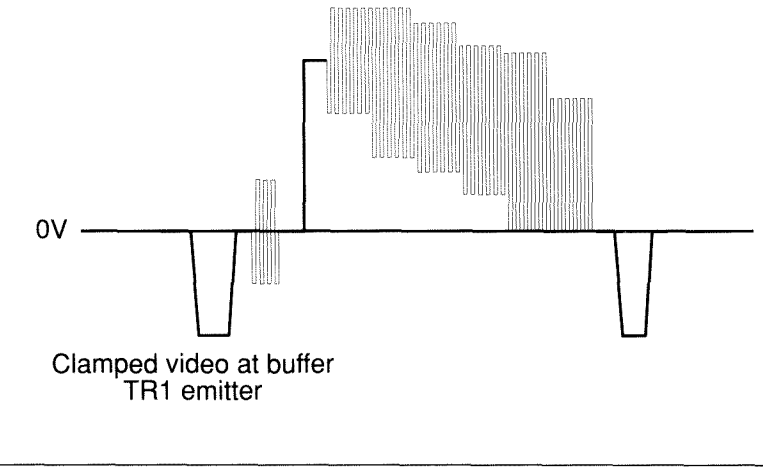



Fig. 3c

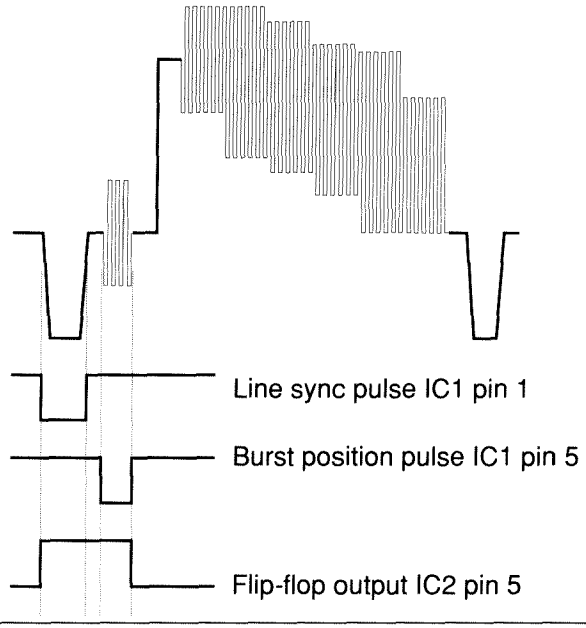



Power Requirement is a modest ±5v at about 50mA

## In More Detail

The input is AC coupled to the LM1881 which provides horizontal and vertical sync separation, identifies the odd and even fields of the PAL system, outputs a gating pulse to locate the subcarrier burst

Fig. 4.




and clamps the sync tip of the incoming video signal to a positive DC voltage. This doesn't leave much left to do except shift the DC offset so that the black level coincides with 0V, see Fig.3. The voltage drop across TR1 lowers the offset slightly and taking pin 4 below its normal 0V to about -1.1V completes the process. Adjustment is by VR1, fed from the negative rail.

The signal path now splits into two, either through VR2 or not through VR2. This decision is taken by the first half of IC2, a D type flip-flop. The falling edge of the composite sync pulse sets the flip-flop to output a logic high, which shortly after is changed to a logic low as the rising edge of the burst position pulse clocks in a low. TR1 provides a buffered feed to VR2 (the fader) and the 4052 electronic switch IC3 selects the appropriate signal. The resistance of the fader was set at 250Ω as higher values introduce high frequency losses and anything much lower is hard to drive.

Cut to black is controlled by the second half of IC2. When the panel switch goes high the D type flip-flop is loaded and, as the vertical sync pulse is applied to the clock input, this high is transferred to the flip-flop output, causing the switching action to be in time with the vertical interval. Similarly when the switch is deselected a logic low is clocked through. IC4 is an NE592 differential amplifier set at a gain of two by R7 but as it does not have sufficient output capability for our purpose, emmiter follower TR2 is required. You will notice there are no capacitors in the drive and input sections, as with 75Ω impedances and a frequency response of 10Hz to beyond 5MHz, the values are large and DC coupling is usually preferred.

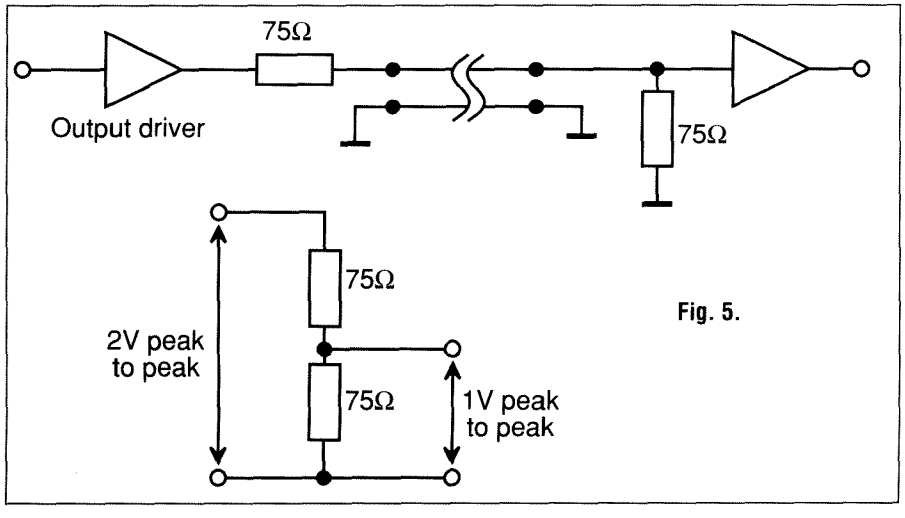



Fig. 5.

## Operation.

With the fade to black switch enabled the output is black. When the switch is disabled the output is dependent on the position of the fader.

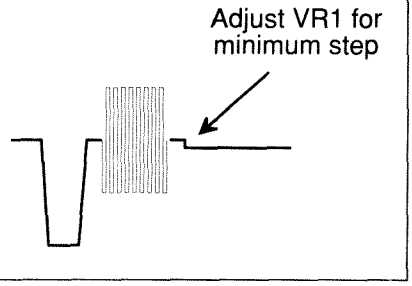
## Construction.

No special precautions are required except to keep the connections to VR2 as short as possible and if the input and output connections are kept to about six inches or less then screened cable is not needed. C2 should be a good quality modern low loss electrolytic, as excessive leakage through it causes IC1 to malfunction.

## Setting Up

A basic voltmeter is the only essential piece of test gear required. While the power to the circuit is on and a video signal applied to the input, connect a voltmeter to pin 4 of IC1, adjust VR1 to give an indication of -1.1v and hey presto. Do this slowly as reservoir capacitor C5 introduces a time lag to the finally settled result. If you have an oscilloscope then it will be possible to match the two black levels more precisely as shown in Fig.6.

Fig. 6.




It should be noted that the circuit runs off the incoming video signal and shouldn't be considered as a stand-alone generator of black in its existing form. Maplin can supply the LM1881 for about £5, all the other components are inexpensive and readily available. I found that a Harris (was RCA) CD4052BE for IC3, gave slightly better results than its Philips or Motorola counterparts. ■

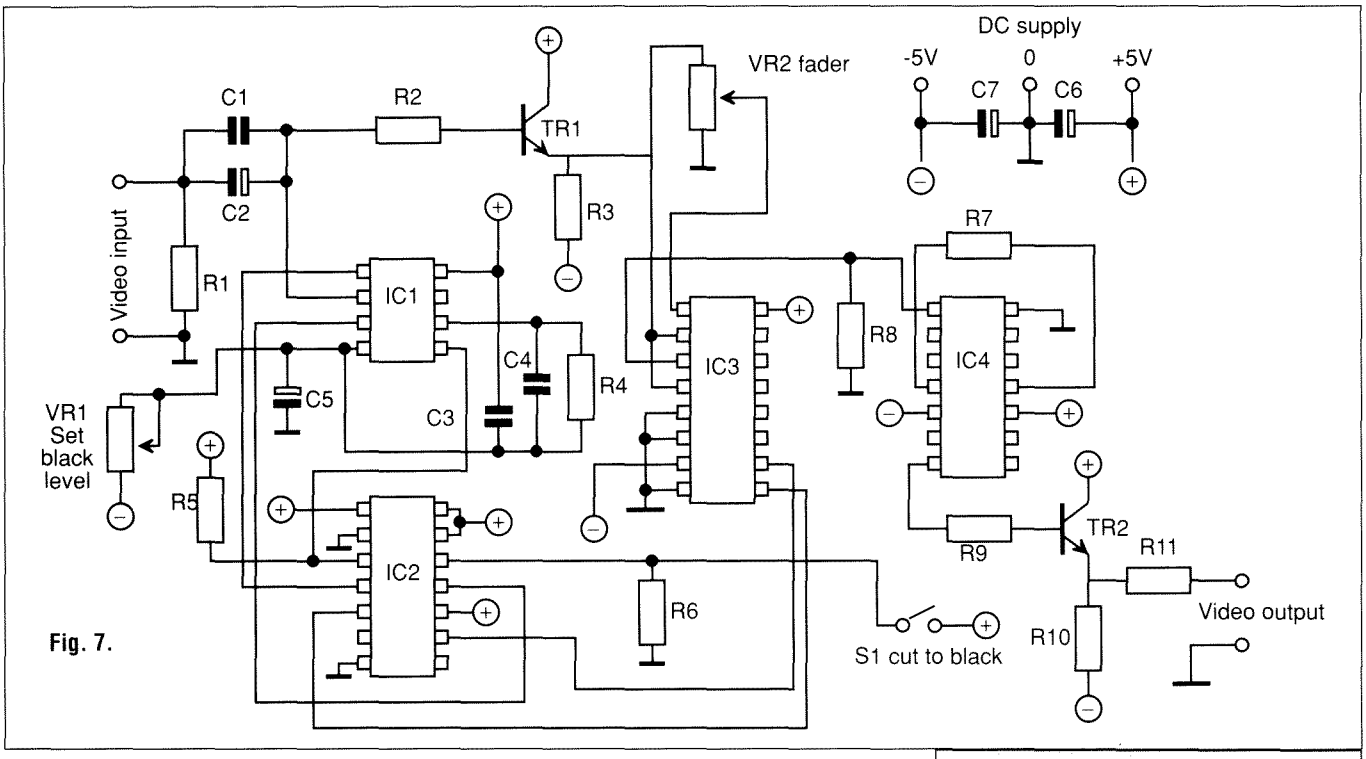
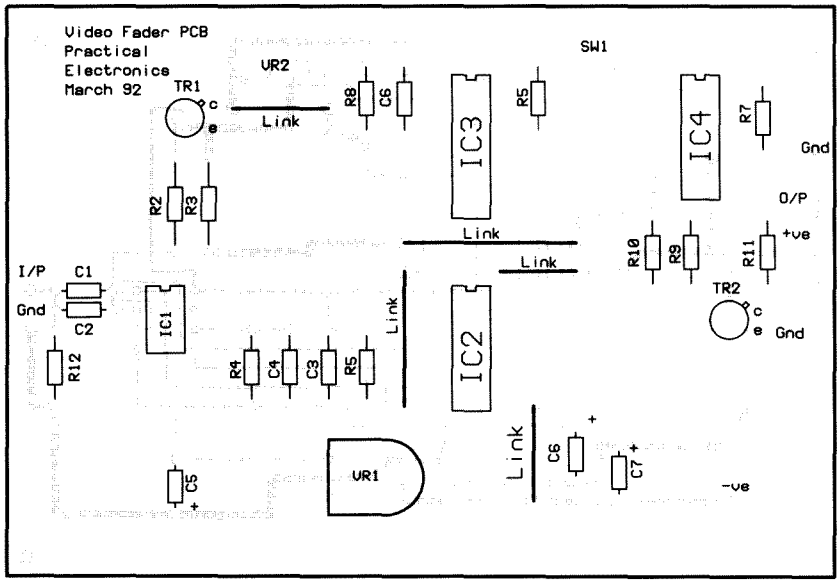
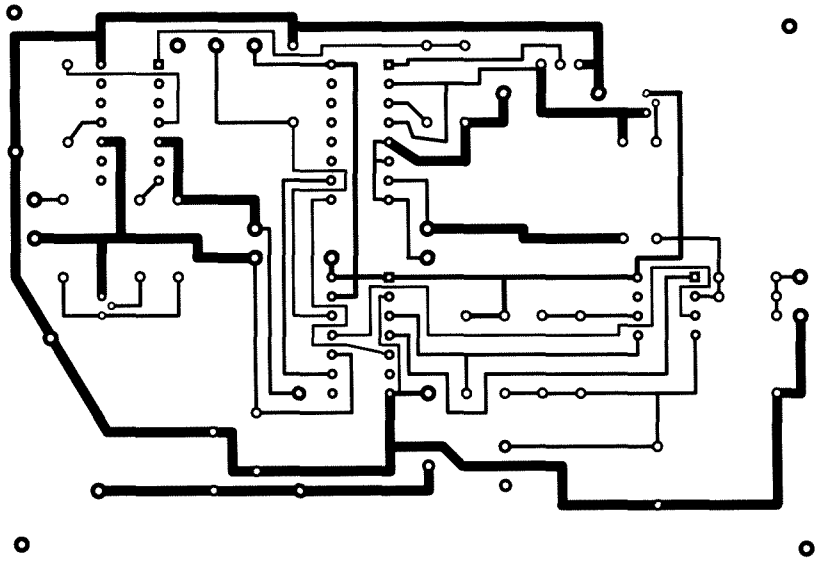



Fig. 7.



## Component List

Resistors

| | |
|---|---|
| R1 | 75R |
| R2 | 1k |
| R3 | 1k |
| R4 | 680k |
| R5 | 1k |
| R6 | 100k |
| R7 | 3k9 |
| R8 | 100k |
| R9 | 1k |
| R10 | 1k |
| R11 | 75Ω |
| P1 | 250Ω linear |

Capacitors

| | |
|---|---|
| C1 | 0µ1 |
| C2 | 4µ7 10V elec(good quality low leakage) |
| C3 | 0µ1 |
| C4 | 0µ1 |
| C5 | 1000µ 10V elec |

Chips

| | |
|---|---|
| IC1 | LM1881 |
| IC2 | 74HC74 |
| IC3 | CD4052 |
| IC4 | NE592 |
| TR1 | BC107/8/9 |
| TR2 | BC107/8/9 |

Input/output connectors BNC or RCA phono etc.

| | |
|---|---|
| S1 | SPST toggle etc. |

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# Techniques

*This month a video amplifier and information on large power supplies.*

This months Techniques query is from a video enthusiast who wants to be able to run several monitors from his video camera. He has found that if he simply joins the cables together at the output of the VCR or the camera, and runs them to the separate monitors, the picture becomes weak and fuzzy.

What you need in order to do this is a video distribution amplifier. If you do not have one of these, the situation is as shown in Fig. 1, in which a single video source with an output impedance of 75 ohms is feeding into several lengths of coaxial cable, each with a 75 ohm load at the end of it. This reduces the amplitude of the video signal to the point at which the picture is no good, and the monitor may even lose sync.

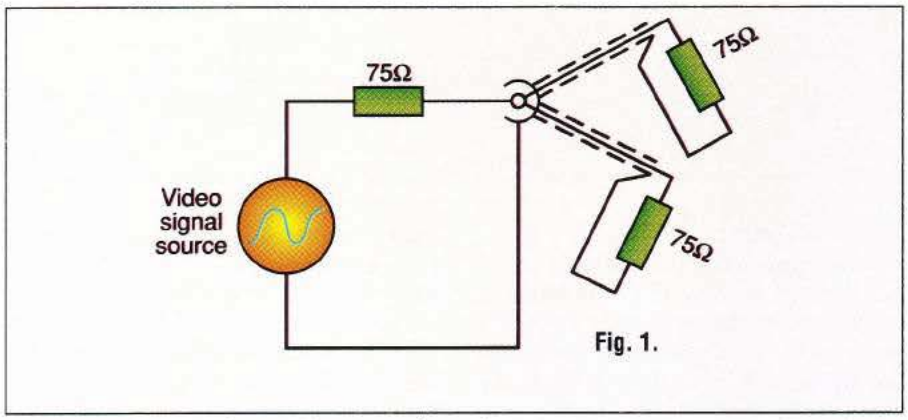


Fig. 1.

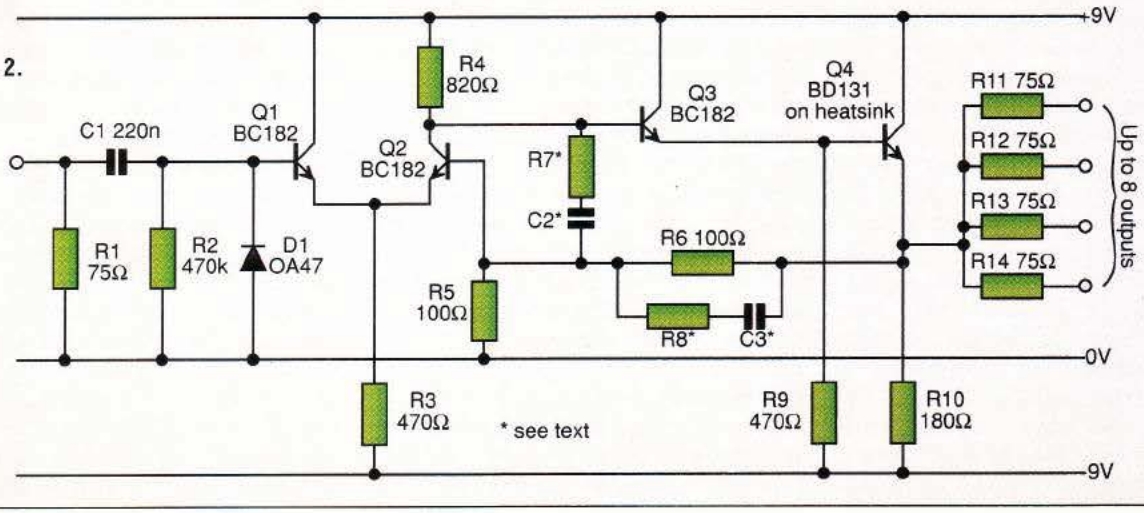
What is needed is a buffer amplifier with a 75 ohm input impedance and a number of outputs, each with an impedance of 75 ohms. Such an amplifier is shown in Fig. 2. The input signal is loaded with a 75 ohm resistor, and then AC coupled to the base of Q1, which forms part of a long-tailed pair. The base of Q1 is biased via R2 and D1, so that the negative sync tips of the video signal are clamped at the drop of one germanium diode below 0V. This removes any unwanted hum from the signal, while DC-restoring it to set the output to the correct DC level. The output from the long-tailed pair is the non-inverted signal from the collector of Q2. This is fed to the base of Q3, which provides extra current drive for Q4, the output transistor.

The loop gain of this amplifier is set at two by R5 and R6, because the attenuation caused by the output resistors reduces the signal to half its initial level, so the overall gain of the circuit is unity. If a degree of amplification or attenuation is required, a potentiometer could be inserted to adjust the feedback. Note, though, that the wires to the potentiometer must be kept short to avoid affecting the frequency response of the circuit, or even causing it to oscillate.

## Details

Several detailed points need to be considered in order to make the circuit function well. First of all, in order to minimise offsets, the currents in Q1 and Q2 must be made approximately equal. To achieve good linearity and frequency response, there must be sufficient current in the long tailed pair. Assuming that the emitters of Q1 and Q2 are at -1V, the current in R3 will be 17mA, which should be sufficient. The value of R4 is chosen on the assumption that during the sync tips the collector of Q2 will be at +0.6V. Taking into account the base current of Q3, the collector

Fig. 2.



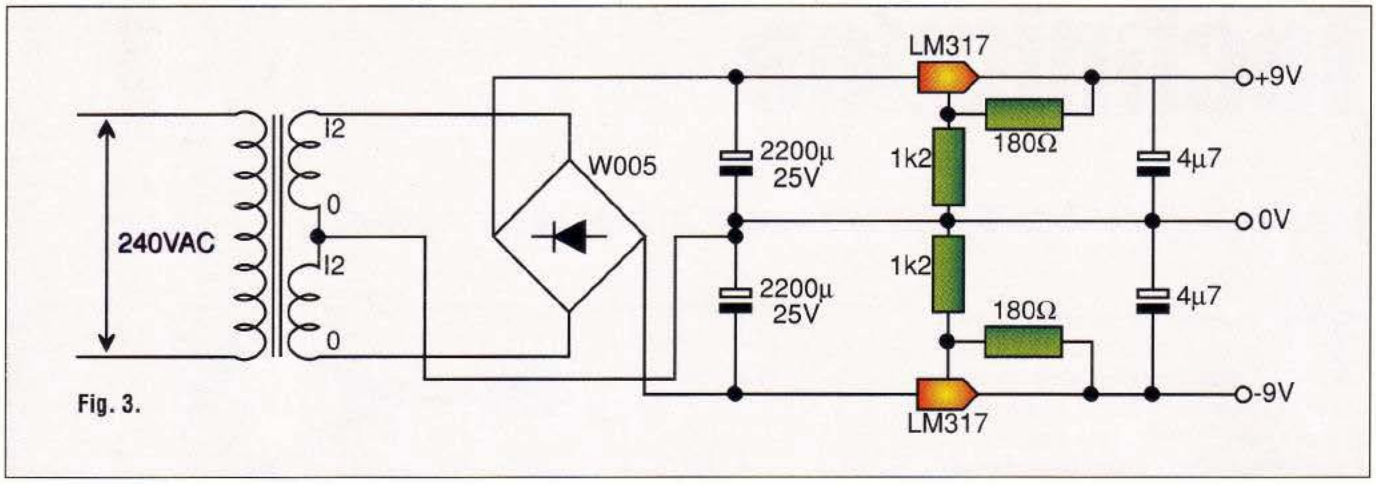



Fig. 3.

currents of Q1 and Q2 will be almost identical.

One potential problem is what happens if one of the monitors is disconnected from the far end of a long cable. Without a termination, the signal will be reflected from the end of the cable and will cause ringing on all sharp edges. This would give a double image if allowed to affect the signals to the other monitors, so it is important that the impedance seen on the emitter of Q4 is low enough to short out any such unwanted signals.

The circuit partly achieves this through the use of negative feedback, but the loop gain falls at higher frequencies, so the basic characteristics of the output transistor are important as well. It must have a high mutual conductance (that is, a large change in emitter current for a small change in base-emitter voltage) at the frequency of the colour burst (4.433MHz) in order to prevent interference with the colour. In general, the higher the current in the emitter the higher the mutual conductance, so approximately 40mA is passed through Q4.

No frequency shaping is shown in this circuit, because the response must be as flat as possible to avoid affecting the amplitude or phase of the colour burst. However some modification to the frequency response may be required, in certain cases, to prevent oscillation. Optional components R7 and C2 may be added if it appears that oscillation is caused via the feedback loop, while R8 and C3 may be added if feedback is occurring externally to the unit, or internally because inputs and outputs are too close to each other. The required values for these components should be found by experiment, but good values to start with are: R7 = 100 ohms, C2 = 47pf, R8 = 47 ohms, and C3 = 100pf.

This circuit should be built with RF construction techniques, and should ideally be on an earth plane. Power supplies should be decoupled, using ceramic or polyester capacitors, close to the circuitry.

A suitable power supply circuit is shown in Fig. 3. This type of circuit can give very good performance, and a design along these lines has met broadcasting standards.

## What A Turn-On

Ordinary off-line switched mode power supplies are of the general form shown in Fig.1a. The input connections are either to a bridge rectifier for high voltage mains, or to a voltage doubler arrangement for mains voltages of around 120 volts. Safety isolation of the output is provided by the switched mode transformer, and voltage control feedback is provided via an opto-isolator or an isolating transformer to maintain this isolation.

The disadvantage with this arrangement is that the charging current for the reservoir capacitors flows for a very short time around the tip of the mains sine wave, as illustrated in Fig. 2a. A subsidiary problem is that the reservoir capacitors must have a very high value. The switching circuit is designed to work with peak mains voltage, so the capacitor must hold up to a substantial proportion of this between mains half cycles.

The high peak line currents are sufficient in some areas to clip the tips off the mains sine wave. The line noise radiated by these current pulses is also a problem. Further, in buildings using a number of computer workstations on a three-phase supply, the circuit breakers tend to trip out at lower powers than a simple calculation would suggest. Meanwhile, the high harmonic content of the line current induces abnormally heavy neutral currents to flow, even if the loads are balanced with respect to the three phases. In fact, the neutral current can exceed the current in any one of the phases, and thus can exceed the rating of the cable.

All this will have to change. EEC regulations require that power supplies of above approximately 300 watts must draw current from the line approximately as a resistor would, i.e. with a high power factor, as shown by the preferred line current waveform in Fig. 2a. There are two main ways to improve the power factor. The first is to insert an inductor after the bridge rectifier to make the current pulses less sharp. This solution may be adequate for power supplies just on the borderline of the new regulations, where the degree of improvement required is not too great. However, for higher powered units the second approach, of using a switched mode pre-regulator, must be followed.

The general form of the pre-regulator system is as shown in Fig. 3a. In this system, a switching regulator which switches at a frequency much higher than line frequency is controlled so as to draw current in half sinusoids. The amplitude of these is controlled by a feedback circuit, whose bandwidth is well below line frequency. In this way, rapid load fluctuations are prevented from

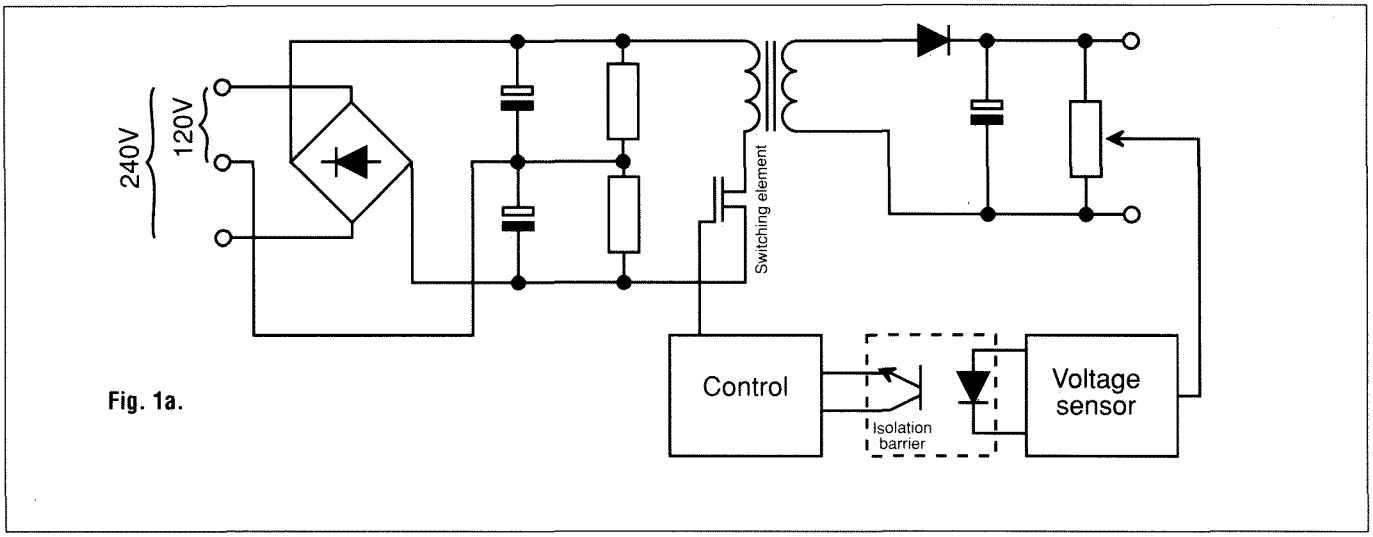



Fig. 1a.

distorting individual half sinusoids, but the average current required by the load is catered for. The load presented to the line still looks resistive, but with the value of the resistance varying over a period of several cycles.

The use of a pre-regulator before the main switched mode power supply must add to cost and to unreliability, but there are advantages to offset against this. First of all, because the voltage on the reservoir capacitor is regulated (within limits). This means that the capacitor need not be so large, because it will still be charged to the same voltage each half cycle, even if the mains is at the low end of its tolerance. The design of the switched mode output regulator may be able to be simplified because it receives a more constant voltage, and the overall power supply system is likely to be able to work over the full range of mains voltages without the need to switch voltage ranges.

A less obvious benefit is that, because current is drawn during the whole mains cycle, a computer with this sort of power supply will be able to work much better in conjunction with an uninterruptible power supply. A 500 watt uninterruptible power supply would be able to power a computer whose maximum load was 500 watts.

## Topology

Disregarding the Cuk converter, which would probably be over complicated for the purpose, there are three basic power circuit topologies which may be used in a high power-factor switching pre-regulator. These are boost, buck and flyback, as shown in Fig. 4a. Each has different strengths and weaknesses.

Probably the most popular topology is the boost regulator. This would normally work with continuous inductor current, so that there is only a small ripple in the line current at the switching frequency. Because the inductor current is the same as the input current, it is very easy to program the input current waveform.

The switching device need have a voltage rating no greater than the DC output voltage of the circuit, and if input spikes are present these will be absorbed by the inductor. Finally, the switching device is easy to control because its emitter is at 0V.

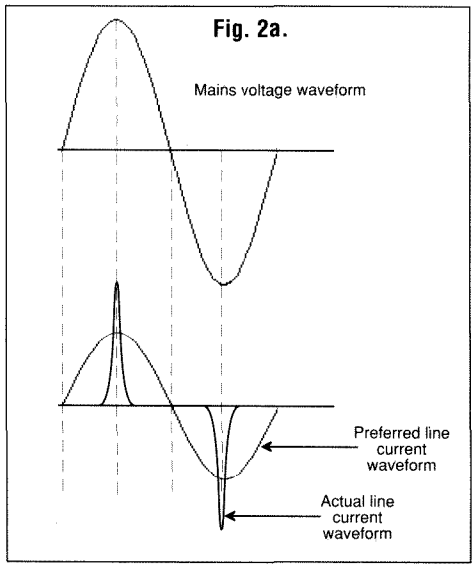
The disadvantages of this topology are that the peak input current at switch on is not limited until the capacitor has charged, and there is no protection against input over-voltages. One aspect of the control can present a problem: because the mark:space ratio of the switching can exceed 50%, sub-harmonic oscillation is possible unless the current control loop specifically includes slope compensation to avoid it. On the whole, however, the boost regulator is a good topology for this application.

The buck regulator, if it is to work over most of the mains cycle, must have a DC output voltage of only a few tens of volts. Therefore, it is unsuitable for use as a high power pre-regulator. It may be useful in conjunction with a boost pre-regulator, to add the facility of startup current limiting. An example of a combined topology is shown in Fig. 5a.

The flyback regulator topology has several advantages as well. Its output voltage can be above or below the input voltage, so for example, an output voltage of 300 volts could be provided from a 240V mains supply, and current could be drawn from the supply while the instantaneous voltage is within the range 30V to 350V. Overvoltage and inrush current protection can also be provided with this design.

Unfortunately, the switch voltage rating must be higher than with the boost regulator - it must be the sum of the input and output voltages. The input current is pulsed and thus has a much higher harmonic content than with the boost regulator, so extra input filtering would be required. It is also difficult to program an average input sinusoidal current waveform.

**Continued on page 69**



# Video Jargon

The world of video cassette recorders (VCRs) is chock full of jargon. It is almost impossible to talk intelligently about the capabilities of a VCR without having some idea what the jargon means – the following list is just a starter.

**ASO** – Nokia's picture enhancing system is Active Sideband Optimum and is an electronic way of improving picture quality. Most VCR manufacturers has some form of picture improvement circuitry though there doesn't seem to be any standard.

**Audio dub** – the soundtrack of the video recording can be replaced by something from another source such as a HiFi or a microphone using audio dub.

**Auto head cleaner** – every time the video tape is put onto or removed from the revolving record/playback head, the head is wiped clean to keep it free from dust and grime.

**Auto recording speed** – the machine monitors the amount of length of tape left during a recording and switches to long play if necessary to finish a recording off.

**Auto return** – when the tape reaches its end, it automatically rewinds. Some systems also auto-rewind to the beginning of a pre-recorded program.

**Bar code programming** – some VCRs have bar code reading wands fitted to their remote controls and a number of magazines have TV program times printed as bar codes. Simply swiping the wand across the code programs the VCR to record that program. Unfortunately, it doesn't take into account the whims of the TV program schedulers who suddenly decide that a snooker or golf game is more important than, say, Thunderbirds. To get around this, the program delivery control system is needed.

**Blank portion search** – when a new tape has only a few recordings on it, blank searching will skip forwards to find the empty spots.

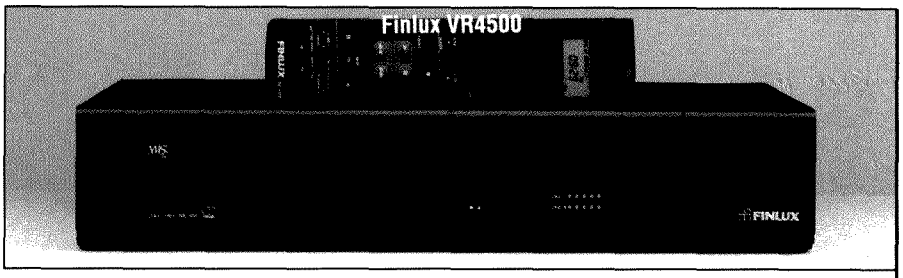
**C-VHS** – Compact VHS cassettes are used in many camcorders. Some video recorders allow this format to be put straight into the machine and played. Most other players are able to take an adaptor which, effectively, turns the C-VHS into a VHS cassette.

**Child lock** – a simple locking mechanism prevents any of the controls or recording times being altered by unauthorised persons.

**Digital auto tracking** – by adjusting the angle at which the head meets the tape, the quality of recording and playback are altered. The auto

| Model | Make | Timer | AV socket | Audio | LP | Insert edit | Audio dub | Auto tracking | Remote | Pic enhancer | Graphics | Index | Price | Features |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VSA650EK | Akai | 1Y/8E | scart | Nicam | ✓ | | | ✓ | ✓ | | ✓✓ | ✓ | £599.99 | Child lock, Dolby 12W stereo amplifier |
| VS F310EK | Akai | 1Y/8E | scart | mono | | | | ✓ | ✓ | | ✓✓ | ✓ | £299.99 | Child lock, shuttle control |
| VS F410EK | Akai | 1Y/8E | scart | mono | ✓ | | ✓ | ✓ | ✓ | | ✓✓ | ✓ | £349.99 | Child lock, shuttle/jog |
| VS F510EK | Akai | 1Y/8E | scart | Nicam | ✓ | | | ✓ | ✓ | | ✓✓ | ✓ | £449.99 | Child lock, shuttle control |
| VS F600EK | Akai | 1Y/8E | scart | Nicam | ✓ | | | ✓ | ✓ | | ✓✓ | ✓ | £449.99 | Child lock |
| VS X400EGN | Akai | 1Y/8E | | mono | | | | | ✓ | | ✓ | | £499.99 | Child lock, 7 type PAL, NTSC, SECAM compatibility |
| VS X470EGN | Akai | 1Y/8E | | mono | ✓ | | | | ✓ | | ✓ | ✓ | £569.99 | Child lock,10 type PAL, NTSC, SECAM compatibility |
| VCR2222 | Alba | 4W/8E | scart | mono | ✓ | | | | ✓ | | ✓ | ✓ | £400 | Twin tape system |
| VCR6700 | Alba | 1M/8E | phono/scart | mono | ✓ | | | | ✓ | | ✓ | ✓ | £230 | |
| VCR7800 | Alba | 2W/8E | phono | mono | ✓ | | | | ✓ | | ✓ | ✓ | £230 | |

Nokia ASO Plus VCR range.




tracking system continuously monitors the tape to get the best picture possible.

**Digital stills** – very advanced VCRs store picture frames in a computer memory for perfect stills.

**Dubbing** – in audio form, this allows a different soundtrack to be added to the video. In video form it means that different video sequences can be added to the soundtrack.

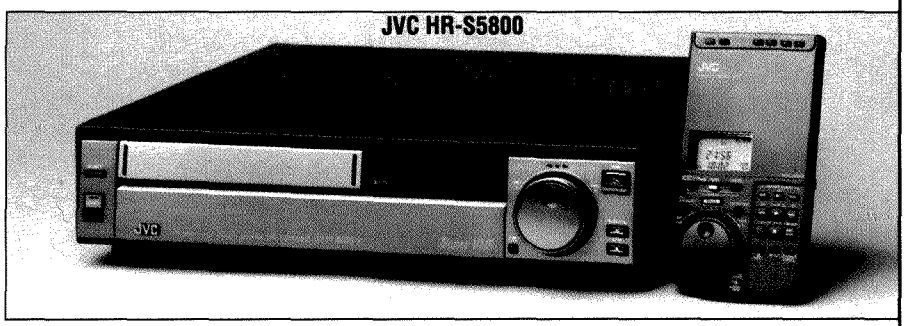
**Dynamic range improvement** – by removing the hiss and increasing the dynamic range of the sound, quiet concerts can be heard in more detail.

**Encore playback** – available on Mitsubishi systems, encore quickly rewinds the tape and replays the last five seconds of recording.

**Fastext** – an alternative way to program the recording time of a VCR is to use the codes in the teletext pages of Oracle or Ceefax. These will automatically program the VCR with the correct settings.

**Fastwind** – many VCRs now incorporate turbo-mechanisms to wind the tape from end to end at high speed whilst maintaining the alignment on the spools and the tension on the tape.

**Flying erase** – to make sure that there is no interference when one recording is directly followed by another – the picture rolling or noise on the screen – the flying erase ensures that one frame is placed directly after another. This allows clean editing such as chopping out commercials.




**Indexing** – the standard way to index a video tape is to place a magnetic marker on it that can be traced by the VCR. This allows particular programs to be found and repeated quickly and easily. One industry standard system is known as VISS, VHS Index Search System and is available on a number of machines.

**Insert edit** – when placing a newly recorded section between two existing sections, insert edit allows the process to be performed so that the start and end points are unnoticeable.

**Intelligent picture** – older tapes tend to be noisier than brand new tapes. A system within the VCR monitors the quality of the tape and adjusts the picture quality, softening the focus slightly on noisy tapes.

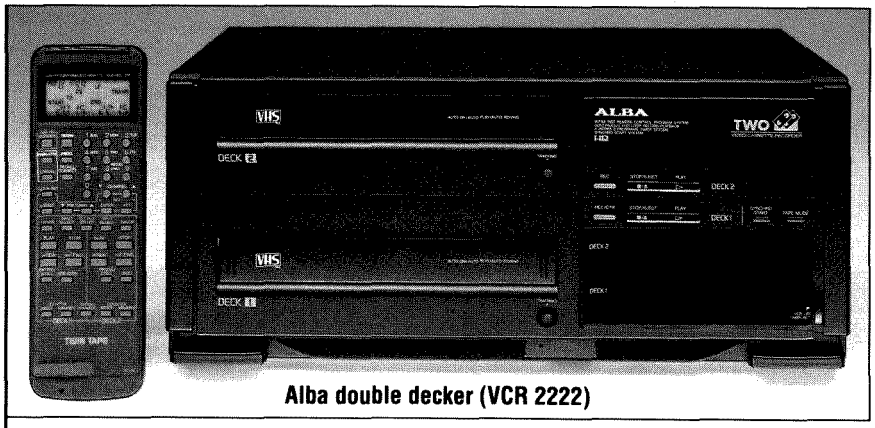
**Jog/shuttle** – based on video studio terminology, jog uses a dial to move from frame to frame. Spinning the dial faster moves the pictures faster. Shuttle moves the tape at a speed set by another dial, moving the dial changes the speed. Top of the range VCRs use concentric dials to control jog and shuttle whereas simpler systems use buttons.

**Just track heads** – since the width of the tracks in short play and long play modes differ, the information picked up from them is usually of differing quality. The Just track head system improves the playback of LP mode recordings.

**LP/SP** – to double the amount of time available on a video cassette many modern machines are able to record and playback at half speed. This

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VCR8800 | Alba | 2W/8E | phono | mono | ✓ | | £280 | | | | | |
| FV43H | Ferguson | 1Y/8E | scart | Nicam | ✓ | ✓ | £459.99 | Child lock | | | | |
| FV47S | Ferguson | 1Y/8E | scart | Nicam | ✓ | ✓ | £829.99 | Child lock, jog/shuttle, S-VHS | | | | |
| FV51R | Ferguson | 1Y/8E | scart | mono | | ✓ | £319.99 | Child lock | | | | |
| FV52L | Ferguson | 1Y/8E | scart | mono | ✓ | ✓ | £359.99 | Child lock | | | | |
| FV54LX | Ferguson | 1Y/8E | scart | mono | ✓ | ✓ | £399.99 | Child lock | | | | |
| FV57H | Ferguson | 1Y/8E | scart | Nicam | ✓ | ✓ | £499.99 | Child lock | | | | |
| FV58T | Ferguson | 1Y/8E | scart | Nicam | ✓ | ✓ | £569.99 | Child lock, jog/shuttle | | | | |
| FV59S | Ferguson | 1Y/8E | scart | Stereo | ✓ | ✓ | £799.99 | Child lock, jog/shuttle, 16:9 wide screen mode | | | | |
| VR4500 | Finlux | 1Y/8E | scart | Nicam | ✓ | ✓ | £499 | | | | | |
| VR5250 | Finlux | 1M/6E | scart | mono | | ✓ | £299 | | | | | |
| VS680 | Grundig | 1Y/8E | scart | Nicam | ✓ | ✓ | £1328.22 | Child lock, S-VHS, picture in picture, zoom | | | | |
| VS900 | Grundig | 1Y/4E | scart | mono | | ✓ | £299.99 | Child lock | | | | |
| VS920 | Grundig | 1Y/4E | scart | mono | | ✓ | £339.99 | Child lock, program delivery control uses teletext to start recording | | | | |
| VS960 | Grundig | 1Y/8E | scart | Nicam | ✓ | ✓ | £699.99 | Child lock, program delivery control, on-screen title archive index and search, jog/shuttle | | | | |

| Model | Make | Timer | AV socket | Audio | LP | Insert edit | Audio dub | Auto tracking | Remote | Pic enhancer | Graphics | Index | Price | Features |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HR-D560EK | JVC | 1Y/8E | scart | mono | | | | √ √ | √ √ | | | √ | £299.99 | Child lock |
| HR-D640EK | JVC | 1Y/8E | scart | mono | | | | √ √ | √ √ | | √ √ | √ √ | £339.99 | Child lock |
| HR-D720EK | JVC | 1Y/8E | scart | mono | √ | | | √ √ | √ √ | | √ √ | √ √ | £359.99 | Child lock |
| HR-D910EK | JVC | 1Y/8E | scart | Nicam | √ | | √ | √ √ | √ √ | | √ √ | √ √ | £459.99 | Child lock |
| HR-D980EK | JVC | 1Y/8E | scart | Nicam | √ | | √ | √ √ | √ √ | | √ √ | √ √ | £TBA | Child lock, jog/shuttle controls on remote |
| HR-S4700EK | JVC | 1Y/8E | scart | Nicam | √ | | √ | √ √ | √ √ | | √ √ | √ √ | £699.99 | Child lock, SVHS, jog/shuttle controls on remote |
| HR-S5800EK | JVC | 1Y/8E | scart | Nicam | √ | √ | √ | √ √ | √ √ | | √ √ | √ √ | £929.99 | Child lock, SVHS, jog/shuttle controls on remote |
| HS-B82 | Mitsubishi | 1M/8E | scart | Nicam | √ | | | √ √ | √ √ | | √ √ | √ √ | £1029.99 | Child lock, NTSC & PAL |
| HS-M34 | Mitsubishi | 1M/8E | scart | mono | √ | | | √ √ | √ √ | | √ √ | √ √ | £359.99 | Child lock |
| HS-M45 | Mitsubishi | 1M8E | scart | mono | √ | | | √ √ | √ √ | | √ √ | √ √ | £429.99 | Child lock, NTSC & PAL |
| HS-M54 | Mitsubishi | 1M/8E | scart | Nicam | √ | | | √ √ | √ √ | | √ √ | √ √ | £459.99 | Child lock |



Alba double decker (VCR 2222)

decreases the width of the recorded tracks and slightly reduces the quality of the image The reduction is not normally very noticeable and the double length gives very efficient tape usage – enough to record most daily and weekly soaps while away for a week's holiday.

**Next function** – where two functions are commonly used one after the other, they can be programmed to execute at the touch of one button. For example, rewind and then play or search for index and pause.

**Nicam** – digital stereo broadcasts are now quite common in the UK and both BBC and ITV use the NICAM standard. While most VCRs are still mono, some allow stereo playback of pre-recorded cassettes and many top-of-the-range machines now allow Nicam broadcasts to be recorded so that the playback is also in stereo. The quality difference between mono and Nicam can be quite astonishing especially in such programs as Star Trek and some soaps where sounds appear to happen behind the viewer.

**Noise reduction** – special circuitry removes clicks, pops and bumps from noisy soundtracks.

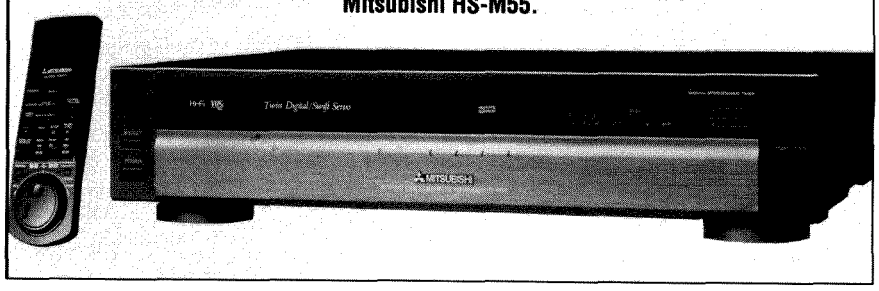
**NTSC/PAL/SECAM** – the majority of TV transmissions in the UK are coded using the PAL (Phase Alternating Line) system. In the USA, Japan, and other 'old fashioned' countries, the NTSC (Never Twice the Same Colour or National Television Standards Committee) is used. Parts of Europe including France use SECAM, a PAL variant, and a number of video recorders are able to cope with tapes using the different standards.

**On screen display** – the status of the VCR, channel, recording speed, time, date and so on as well as the set-up of the recording times can all be viewed on the TV screen. Some systems simply show this on a blue or green background, others allow it to be superimposed on the actual TV or video picture.

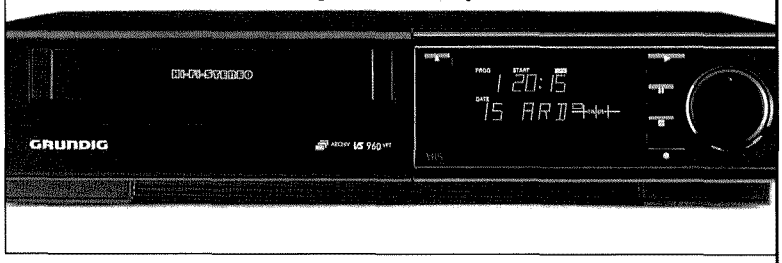
**Picture enhancer** – only applicable to tape playback, enhancement systems vary in capabilities from sharpeners and softners to colour noise elimination.

**Pre-roll** – this moves the tape back and then gets it up to normal speed before starting the next recording at the desired position to ensure that there is no jerkyness.

**Program Delivery Control** – featured currently by Grundig and a few other manufacturers, PDC monitors the teletext pages for information that tells the VCR what program is to be started or ended. Using this data, the VCR can turn itself on or off and circumvent any rescheduling whims of the BBC or ITV and give


Mitsubishi HS-M55.

**Grundig 960 archive system.**




perfect timeshifting. The service should be available on Channel 4 in the near future.

**Programmed play** – indexed sections of tape can be played in any order in a similar way to random play of a CD.

**S-VHS** – an improvement over the original VHS system devised by JVC. Super VHS improves the picture quality by offering more than 400 lines of horizontal resolution compared with the standard 250.

**SCART** – also known as a Peritel connector, SCART is a standardised way of connecting video and audio equipment and signals. Based around a unique 21 pin connector it is both a European (CENELEC EN 50 049) and a British standard (BS 6552) – details can be obtained from BSI Sales Dept., Linford Wood, Milton Keynes, MK14 6LE Tel. 0908 220022 and page 30 of this issue.

**Servo System** – microcomputer driven mechanics allow the motors that drive the head and tape transport to be stopped and started more quickly. They also allow for faster winding and sophisticated fast forward and rewind functions.

**Summer time adjustment** – in the UK the clock goes forward an hour in the spring and back in autumn. Some VCRs take care of the adjustment automatically.

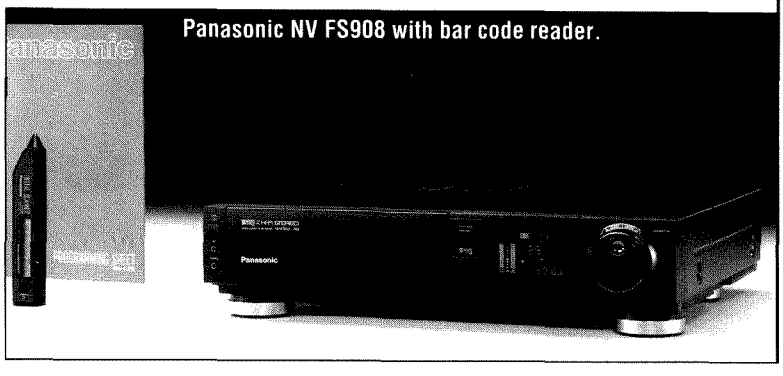
**Three head systems** – additional heads provide clear stills

**Time search** – most VCRs wind the tape forwards and backwards when a new cassette is inserted to work out the amount of program time that will be transported for each turn of the reels. This allows the system to search for specified positions on the tape according to how long they are away from the current position. The amount of time left on the tape can also be worked out with this method.

**VISS** – VHS Index Search System – see indexing

**YC** – there are a number of different ways in which video signals can be coded up in electronic form. Common ways are composite video where all of the picture information, including colour (but not sound) is sent down one line. RGB splits the information into red, green and blue data for the colours and either horizontal and vertical synchronisation (sync) or a composite sync. YC coding converts the image in two components, the hue and lightness, the amount of white added to the basic colour. The colours are coded from a circle with red being at 0°, green at 120° and blue at 240°. Moving from region to region gives the colours shades as does adding whiteness. ■

**Panasonic NV FS908 with bar code reader.**




| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HS-M55 | Mitsubishi | 1M8E | scart | Nicam | ✓ | ✓ | ✓ | £529.99 | Child lock, Plays PAL, NTSC & S-VHS |
| HS-MX1 | Mitsubishi | 1M/8E | scart | mono | ✓ | ✓ | ✓ | £299.99 | |
| SVR3799 | Nokia | 1Y/8E | scart | Nicam | ✓ | ✓ | ✓ | £750 | Child lock, S-VHS |
| VR3722 | Nokia | 1Y/6E | scart | mono | | ✓ | ✓ | £330 | Child lock |
| VR3742 | Nokia | 1Y/6E | scart | mono | ✓ | ✓ | ✓ | £350 | Child lock |
| VR3761 | Nokia | 1Y/6E | scart | Nicam | ✓ | ✓ | ✓ | £450 | Child lock |
| VR3782 | Nokia | 1Y/6E | scart | Nicam | ✓ | ✓ | ✓ | £500 | Child lock |
| NV-F55 | Panasonic | 1M/8E | scart | Nicam | ✓ | ✓ | ✓ | £495.95 | NTSC & PAL, bar code programmable |
| NV-FS90 | Panasonic | 100Y/1M/8E | scart | Nicam | ✓ | ✓ | ✓ | £799.90 | S-VHS, jog and shuttle, bar code programmable |
| NV-J40 | Panasonic | 1M/8E | scart | Mono | | ✓ | ✓ | £349.95 | Bar code programming, NTSC & PAL |
| NV-J45 | Panasonic | 1M/8E | scart | Mono | ✓ | ✓ | ✓ | £399.95 | Bar code programming and NTSC dubbing compatibility |
| NV-W1 | Panasonic | N/A | scart | Stereo | | | ✓ | £1800 | Compatible with PAL, SECAM & NTSC and can convert between them. No TV tuner |
| SV601 | Salora | 1Y/8E | scart | mono | | ✓ | ✓ | £300 | |
| SV9900 | Salora | 1Y/8E | scart | Nicam | ✓ | ✓ | ✓ | £450 | |
| SI1240 | Samsung | 1Y/8E | scart | mono | | ✓ | ✓ | £229.99 | |
| SI1260 | Samsung | 1Y/8E | scart | mono | ✓ | ✓ | ✓ | £239.99 | |
| VI1560 | Samsung | 1Y/8E | scart | mono | ✓ | ✓ | ✓ | £329.99 | |
| VI9860 | Samsung | 1Y/8E | scart | Nicam | ✓ | ✓ | ✓ | £399.99 | |

# Contacts

*The companies found in the information pages can be contacted at the following addresses.*

Akai UK
12 Silver Jubilee Way
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Heathrow Estate
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Middx
TW4 6NF
Tel. 081 897 6388

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Staples Corner
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Tel. 081 450 3282

Mitsubishi Electric
Travellers Lane
Hatfield
Herts
AL10 8XB
Tel. 07072 76100

ITT Nokia Consumer Electronics
Bridgemead Close
Westmead
Swindon
Wilts
SN5 7YG
Tel. 0793 644223

Panasonic
Panasonic House
Willoughby Road
Bracknell
Berks
RG12 4FP
Tel. 0334 853943

Salora
Bridgemead Close
Westmead
Swindon
Wilts
SN5 7YG
Tel. 0793 644223

Samsung
Unit 1
Hook Rise South
Surbiton
Surrey
KT6 7LD
Tel. 081 391 0168


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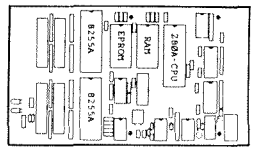
SINGLE BOARD COMPUTER "SBC-1"



£17.50 + 50p P&P + VAT

A computer doesn't *have* to look like you'd expect a computer to look. It doesn't have to *have* a keyboard and a screen and floppy disks and so on.

The SBC-1 has the bare minimum of chips a Z80 computer can have and still be a computer: A 4 MHz Z80-CPU chip, an EPROM chip (up to 32K), a static RAM chip (up to 32K) and a pair of 8255A I/O (input output) chips giving 48 individual lines to waggle up and down. There are one or two additional "glue" chips included, but these are simple "74LS" or "HC" parts.

A star feature is that no special or custom chips (ie PALs, ULAs, ASICs etc) are used — and thus there are no secrets. The Z80A is the fastest and best established of all the 8-bit microprocessors — possibly the cheapest too!

Although no serial interface is included, it is easy for a Z80A to waggle one bit up or down at the appropriate rate — the cost is a few pence worth of code in the program: why buy hardware when software will do?

Applications already identified include: Magnetic Card reader, mini printer interface, printer buffer, push button keypad, LCD alphanumeric panel interface, 40-zone security interface for auto sending of security alarms, code converter (eg IBM PC keyboard codes to regular ASCII), real time clock (with plug in module), automatic horticultural irrigation controller.

By disabling the on-board Z80A-CPU this card will plug into our Interak 1 CP/M Plus disk-based development system, so if you don't fancy hand-assembling Z80 machine code you don't have to!

The idea is (if you are a manufacturer) you buy just one development system and then turn out the cheap SBC-1 systems by the hundred. If you are really lazy we can write the program for you and assemble the SBC-1 cards so you can get on with manufacturing your product, leaving all your control problems to us.

Greenbank

For more details write or phone us:
Greenbank Electronics, Dept PE03 460 New Chester Road, Rock Ferry, Birkenhead, Merseyside. L42 2AE. Tel: 051-645 3391.


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Fig. 3a.

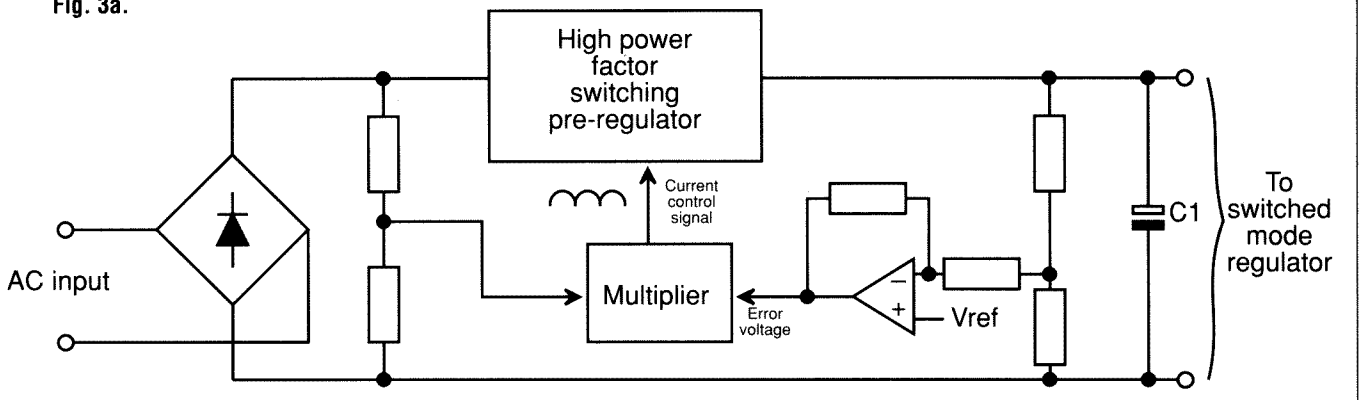



Fig. 4a.

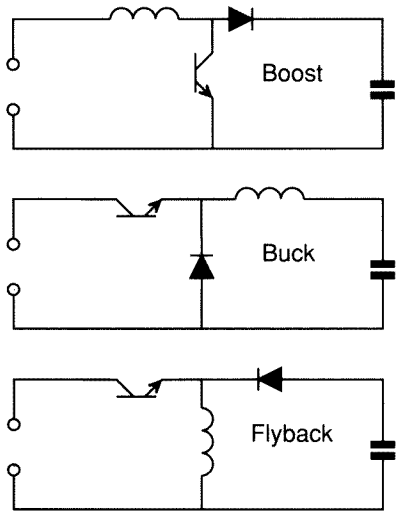
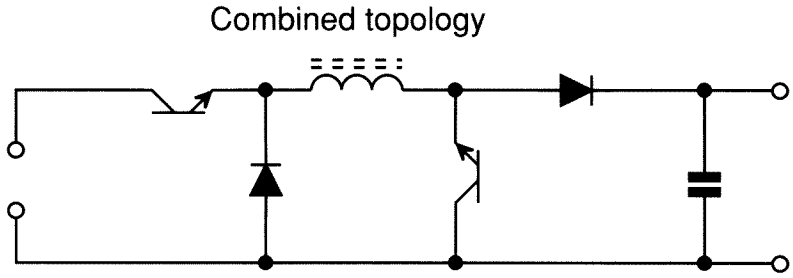



Fig. 5a.




**Techniques continued from page 62**

Slope compensation can also be required in this topology.

This completes a brief overview of the means of providing power-factor corrected switched mode power supplies. In actually designing the pre-regulator stage, many other details need to be considered. For example, how should the control system cope with rapid variations of load current without distorting the sinusoidal input current? A parallel problem but with an easier answer is that of how to adjust for rapid changes of input voltage while still keeping the general control loop slow. In this case, feed forward voltage error correction can be used.

Engineers trying to achieve power factors of 0.98 and above will have to consider these points, but from the viewpoint of the equipment user, it is sufficient to know that high-powered supplies will emit less interference and distort the mains waveform less, but will cost somewhat more - not an unalloyed benefit, but definitely technical progress. ■

**Barry Fox continued from page 70**

bidder. The IBA, and later ITC, saw that the highest bidders would be business users and there would be no more public teletext on commercial TV. After months of behind the scenes negotiation the IBA and ITC pushed the Home Office to a guarantee of 6 lines for public teletext and then 7.5 lines.

The single licence now being bid for by the five applicants creates a pool of 15 lines, spread between Ch 3 and 4.

Apologists, including the ITC, talk about future technical developments giving the appearance of faster access from fewer lines. What they mean is more memory. Each page of text needs 1 kilobyte and most of today's TV sets have only a 1K memory. In theory it should be cheap to put enough memory in the set to store all pages, ready for instant access. In practice, manufacturers scandalously overcharge even for the 1 K.

The commercial pool is six lines, a sixfold increase on the current business capacity. The ITC has split these into three franchises. One will get two lines on Channel 3, another will get two lines on Channel 4 and the third will get one line each on Channels 3 and 4.

This is good news for National Transcommunications Ltd, recently sold by the Home Office to Mercury Asset Management. NTL has a monopoly on carrying commercial text services until 1996.

Frankly I don't much care who wins the ITC's competition. But will the winner please do the commonsense thing that Oracle and the BBC have never yet the nous to do – match their numbering schemes, so that services e.g. TV schedules, have the same page number on any channel. ■

Barry Fox

# The Trouble With Teletext...

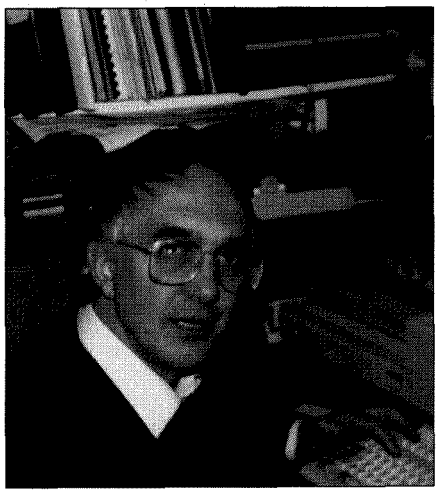
*Hot on the heels of the great ITV sell off comes the auction of the teletext services. Who they will go to is still a mystery. although Barry Fox has his suspicions.*

Even before the dust had settled on the bitter battle for Britain's commercial Channel 3 TV franchises, the Independent Television Commission was putting the teletext capacity on commercial TV up for auction. As with the commercial TV franchises, it will be sold to the highest acceptable bidder, with the money taken by the Treasury.

When bids closed in mid January there were five contenders. Oracle, current purveyor of teletext on ITV and Channel 4; Intelefax, backed by Carlton Communications, the company which toppled Thames out of the London Weekday Channel 3 franchise slot; Teletext UK, a consortium including Associated Newspapers and Philips; TV-AM, the Breakfast TV provider which also lost out in the Ch3 franchise auction; and Update Teletext, backed by ITN the TV news provider.

As with the Ch 3 competition, the public is invited to comment. But as with Ch3, the time scale is too tight to cater for monthly magazines. By the time you read this, the closing date for comment (17 February) will almost certainly have passed. Everything has to be done in a hurry because the ITC is committed by government policy to award a ten year contract which begins on 1 January 1993.

The uncertainty over both Ch3 TV and Ch3 teletext has fouled plans to introduce Startext, Europe's Programme Delivery Control system. PDC/Startext relies on codes buried in the teletext data stream to help viewers program a VCR. The codes then delay the start of recording until the programme



actually begins. So delays, for instance when a football match runs into extra time, do not leave a VCR missing the end of the following movie.

Channel 4 started broadcasting Startext codes at Christmas and several manufacturers now sell Startext VCRs. No-one can even think about Ch3 Startext until all the franchise auctions are out of the way. Even then, planning Startext will have a low priority. And the BBC is watching and waiting, reluctant to be first.

The limping start on Startext has given Californian company Gemstar the opportunity to jump in with Video Plus, a new remote control which makes setting a VCR even easier than Startext. The user just keys in a numerical code from the newspaper listings. More of Video Plus and Startext later, because there is now a long-overdue plan to make the two systems compatible.

The crippling of Startext is just one practical spin-off from the Ch3 franchise fiasco. The public will not realise what it has lost from the teletext auction until the new service goes on air.

The bare bones are that the teletext capacity on the commercial TV channels is being spilt in two. Part goes to big business, for a commercial service; part remains in use for public teletext. The commercial service will let banks and companies use scrambled text to send each other private messages which the public cannot decode.

The lucrative sale of a commercial service to the highest acceptable business bidders has been made possible by robbing the existing public service of 40% of its capacity. This has increased the capacity for commercial services sixfold over today's capacity. But the seven million people who have already bought teletext sets, and are buying at a rate of 0.1 million a month, will get a reduced domestic service after the end of this year. This is why the ITC is offering only one franchise, with capacity spread over the two channels, ITV (soon to be called Channel 3) and Channel 4.

Domestic viewers will either get fewer pages of text information to choose from, or will have to switch channels to find them, or will have to wait longer for selected pages to appear on screen, or pay more for their TV sets to compensate for the loss.

Out of the 25 Vertical Blanking Interval lines theoretically available for text data, only 12 are used. This avoids interference to non-teletext TV sets. Channel 4 uses all 12 lines and ITV sells off one line for commercial business services.

Two years ago the Home Office proposed that all the available lines should be flogged off to the highest

**Continued on page 69**

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- Dot matrix printer.
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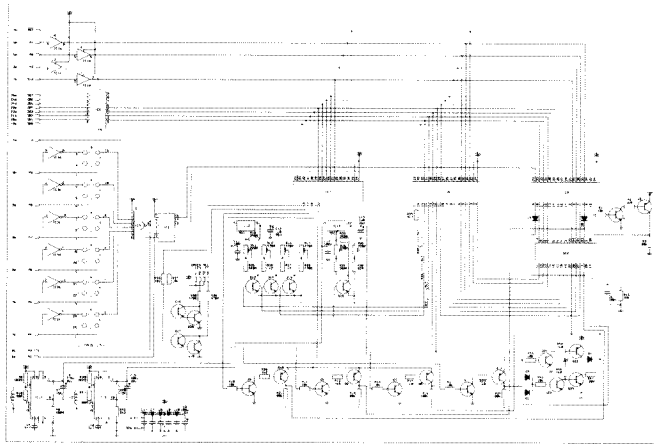

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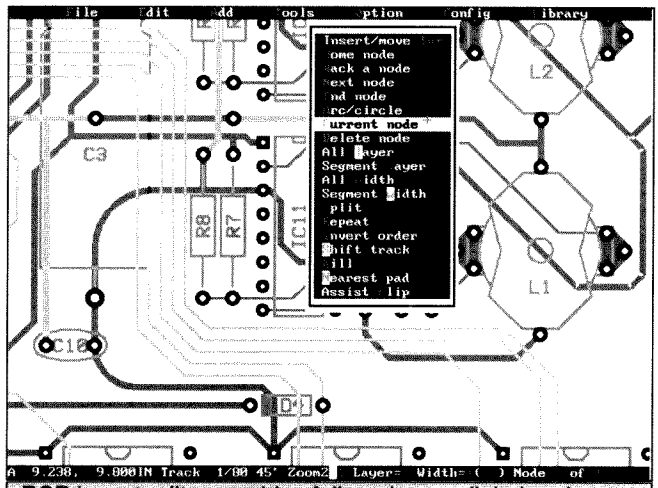


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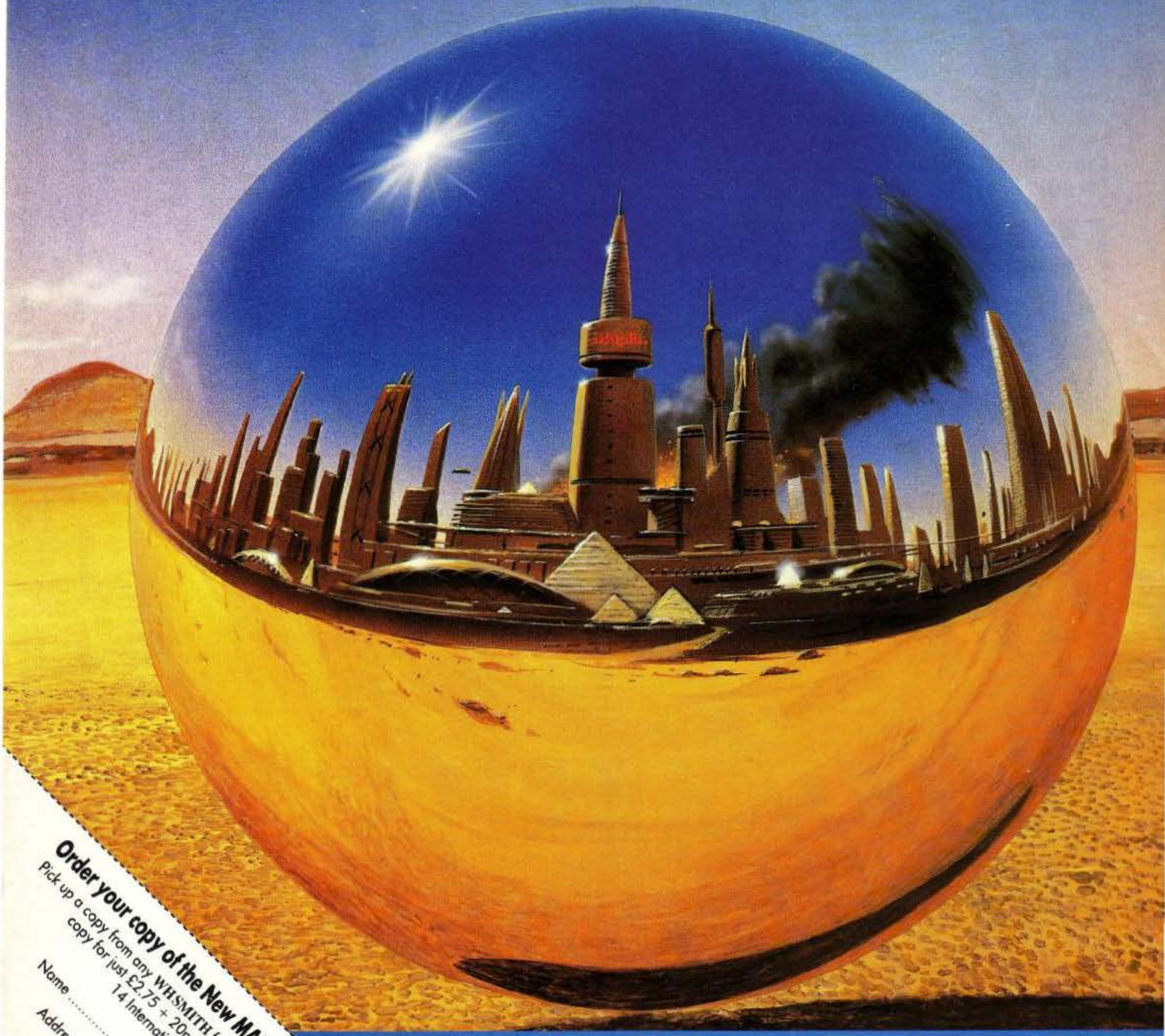

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