Glossary

This glossary explains the meaning of many of the terms used in this manual related to video, image capture, image scanning, the storage, processing and display of images. If you know of any words that ought to be included in this glossary (or any that are wrong!), please fill in the "Manual Errata Report Form" in the Appendices section of the manual and fax it to technical support, and they will be included in manual updates.

2:1:1 Similar to 4:2:2 except that at ½ the data rate. 2:1:1 is typically used in video conferencing applications.

3:3:2 True Colour Also referred to as 3:3:2 Direct Colour. This is a colour scheme designed to give an even spread of colours, based on 3 bits of red, 3 bits of green and 2 bits of blue. Thus in total 256 colours can be represented, using 8 (2^3) levels of red, 8 levels of green and 4 levels of blue.

4:1:1 This suffix, when appended to YCbCr, indicates that for every 4 samples of luminance data (Y) there is only one sample of Cb and Cr data available. In other words the colour resolution is ¼ that of the black and white resolution.

4:2:2 This suffix, when appended to YCbCr, indicates that for every 4 samples of luminance data (Y) there are two samples of Cb and Cr data available. In other words the spatial colour resolution is ½ that of the black and white resolution. The two colour samples are interleaved.

4:4:4 This suffix, when appended to YCbCr, indicates that for every 4 samples of luminance data (Y) there are 4 samples of Cb and Cr data available. In other words the colour resolution is the same as the black and white resolution.

601 See CCIR 601.

Active Area The parts of a video signal which are acquired and/or displayed.

Area Scan Camera Refers to a camera that outputs an image *m* pixels by *n* lines generated from a CCD of that size. A standard CCIR camera is an example of an area scan camera, where *m* is 768 and *n* is 576. See also "Line Scan Camera".

ADC Stands for analogue to digital converter. It is a piece of hardware that converts an analogue signal to a digital one. It is one of the fundamental hardware blocks within a video capture system or scanner etc and is used to digitize the light sensor output (often a CCD).

AGC Automatic Gain Control senses the signal amplitude and automatically adjusts amplifier gain to increase or decrease the signal level to the desired level.

Analogue Signal A signal, representing intensity, that has a continuous range of levels.

Aspect Ratio The ratio of the width to height of an image. If an image has been sampled with a square pixel aspect ratio, the ratio of the number of horizontal pixels to the number of vertical pixels will be the same as the aspect ratio. The aspect ratio for NTSC and PAL video systems is 4:3. This is generally true for computer displays as well.

Baseline JPEG This refers to the basic JPEG functionality - that is lossy compression and decompression of grayscale and colour images. Baseline JPEG excludes "progressive" modes (where the image is constructed over repeated scans) and lossless compression.

Baud Rate The speed at which serial data is transferred in bits per second.

BetaCam A high quality ("studio standard") component video recording and playback standard.

Binary Executable Essentially an executable program, but in more detail, a binary file that is pre-compiled and linked.

Binary Image File A file which contains only raw image data stored as binary data - usually in a raster format.

BIOS Basic Input/Output System. Firmware, typically stored in ROM, that acts as a low level software interface to the hardware.

BIOS Remapping The process of loading the ROM BIOS code into RAM so that it can be executed faster, thus speeding up overall system performance.

Bit A single piece of information which can have two states - 0 or 1.

Bitmap A bitmap refers to an image which is represented using 1 bit per pixel, thus each pixel can have one of two states - usually black or white.

Blanking The parts of a video signal which are not displayed. These include the sync pulses.

BMP BitMaP file. A file format used by Microsoft Windows which is based on a Device Independent Bitmap (DIB).

B-Y One of the colour difference signals derived from multiplying RGB values by various constants. The other difference signal, R-Y, is derived in conjunction with B-Y:

$$B\text{-}Y = -0.299R - 0.587G + 0.866B$$

Byte A unit of 8 bits.

CAV Component Analogue Video: Three analogue video signals which together provide a colour image. Examples are RGB and YCbCr.

Cb Scaled version of U from the YCbCr colour space.

CCD Stands for Charged Coupled Device. A CCD is a semiconductor based light sensor array consisting of many individual elements.

CCIR The standards body which has defined 50 Hz frame rate video signals. CCIR stands for Consultative Committee of International Radio.

CCIR 601 Refers to CCIR Recommendation 601-4, which defines the quantizing levels and sampling rates for digitizing YCbCr component video into a 27 MHz data stream. It covers both 50 Hz and 60 Hz video. Many computer imaging boards (including Snapper) use parts of CCIR 601, but products which are 100% compliant are generally only found in TV studios. The USA version is SMPTE 125.

CCIR 656 This defines both serial and parallel methods of sending CCIR 601 coded video between pieces of equipment. This standard includes the insertion of special codes into the CCIR 601 coded video data to indicate line and frame timing. Much of this standard has been superseded by SMPTE 259.

Chroma The colour information in a video signal, also refers to the encoded colour signal used in S-Video. An abbreviation for chrominance.

Chroma Keying A video special effect that allows one image to be superimposed over another. A foreground image (e.g. a weather forecast presenter) is keyed over with a background image (e.g. a weathermap) whenever there is a specific colour (usually blue or green) found in the background image.

CIF Common Input Format. A video resolution of or 352 x 288 at 25 Hz (and sometimes also used for 352 x 240 at 30 Hz), which is comparable to domestic VHS video cassette recorder quality. See also QCIF and SIF.

Class Library An object orientated software library.

CMYK Stands for Cyan Magenta Yellow and "Black". This 'subtractive' representation of colour is used in hard copy output devices such as colour printers etc. Subtractive means that colours are subtracted out - for example a yellow piece of paper appears yellow because the blue content has been removed from light reflected from it. Thus, yellow and cyan are printed to produce green - the yellow removes the blue content and the cyan removes the red content - just leaving green.

CPU Central Processing Unit. The core processing part of a computer. Intel's 80486 and Pentium processors are examples of CPUs.

Colour Banding When a limited number of colours are used to represent a smooth changing tone, colour contours can be seen. This effect is referred to as colour banding. Dithering is a method for reducing this.

Colourcell A single colour in a Colourmap.

Colourmap A colourmap is a Look Up Table (LUT) that outputs an RGB colour triple when a pixel is input. Usually, colourmap refers to a 'software' colourmap which represents as abstraction from the hardware colourmap, of which there is often only one. Thus many concurrent applications can have there own software colourmaps, but only one will be installed in the hardware colourmap at any one time.

Colourmap Flashing Colourmap flashing is the effect produced when two software applications are using different (private) software colourmaps. These different colours are swapped in and out of the hardware Colourmap when the input focus changes from one application to the other. The result is one application displayed in 'false' colours - generally resulting in a messy display.

Colourspace A term used to describe the coordinate system used to uniquely identify a colour. For example in RGB colourspace, each colour is represented by the amplitude of its red, green and blue component. Other examples are YCbCr, YIQ and YUV.

Colourspace Converter A device used to convert between one colourspace and another. For example YUV 4:2:2 to RGB conversion. This could be implemented in either hardware or software.

Composite Composite Video Signal: A single video signal coded to include luma, chroma and syncs. For example - composite PAL or NTSC from a colour camera.

Composite Sync A sync signal which includes both horizontal and vertical timing information. A Composite sync signal is generally a combination of HSYNC and VSYNC. Often abbreviated to "CSYNC".

Compression Compression refers to the reduction in size of a file using an algorithm that may or may not be 'lossy'. Lossless means that when a file is decompressed, its contents are identical to the original file. A lossy algorithm results in different data from the original, but for imaging applications the 'loss' of data may not be visually noticeable and has the benefit of a greater compression ratio.

Compression Ratio The ratio of the original data file to the compressed data file. For example a 2:1 compression ratio means the compressed file is half the size of the original.

Cr Scaled version of V from the YUV colour space.

CSYNC See Composite Sync.

D1 Video D1 is a tape recorder format for recording CCIR 601 component digital video, however many people use the terms D1 and CCIR 601 (or CCIR 656) interchangeably.

DCI Display Control Interface. A driver level software interface for Microsoft Windows 3.1 specified by Microsoft and Intel. It allows direct access to the

	graphics card which can result in much faster display update speeds, as well as potentially coping with YUV pixel formats and overlays.
Depth	In imaging, depth refers to the number of bits used to represent a colour (or grayscale tone). For example, a true colour 24 bit scanned image would have a depth of 24 bits (or 8 bits per pixel per colour).
DIB	Device Independent Bitmap. An image format used by Microsoft Windows and other operating systems designed to be independent of the display device.
Digital Signal	A signal which has a finite number of levels and therefore can be represented as a number, e.g. each pixel in a grayscale image is digitized to one of 256 levels.
Digitize	The process of converting an analogue signal to a digital signal.
DIN	Deutsche Industrie Norm. A standards organisation that has specified common connector types.
Dithering	Colour dithering is the process of using a limited number of colours to create the effect of more colours. This is done by placing different colours next to each other in a certain, generally random, pattern (a 'dither' pattern), so that collectively they appear to be another colour. The same applies to monochrome dithering, in which black and white are 'dithered' to create the effect of shades of gray.
DLL	Dynamic Link Library. A library that contains software functions that do not need to be part of the application program that requires the use of these functions. Windows programs can use DLLs. This has the benefit that applications can use functions without the need to reproduce these functions in each application, and thus allowing them to be far smaller (in terms of memory size) than they would otherwise need to be.
DMA	Direct Memory Access. A method of transferring data between two system components (e.g. video card and system memory) without processor intervention.
DPI (or dpi)	Stands for Dots per Inch and is a measure of resolution. A good example is the familiar laser printer, which has a typical resolution of 300 to 600 dpi.
DVMA	Direct Virtual Memory Access. A variant of DMA used on SBus systems.
EIA	The standards body which has defined 60 Hz frame rate video signals. These include RS-170, RS-170A, RS-343A. EIA stands for Electronic Industries Association.
EPS	Stands for Encapsulated PostScript and refers to a PostScript language file describing the appearance of a single page or less, that can be included, or "encapsulated" in another PostScript file. Often images are stored in EPS files so that they can be conveniently included into text files, thus producing combined text and graphics output.
Field	Half an interlaced frame, comprising every other line of the frame.
Field 1	The first field of the two field sequence that makes up a frame. Traditionally referred to as the even field by CCIR standards.
FIFO	First In First Out: Describes a way in which RAM may be accessed.
Flicker	A disturbing fast periodic change of brightness. Flicker is more noticeable at low frame rates, and is negligible with 60 Hz or faster non-interlaced frame rates.
Focus	An application is said to receive input focus when the mouse pointer is moved into its base window. On receiving focus the window manager will install the applications private Colourmap (if it has one).
FPGA	Field Programmable Gate Array. A high density programmable logic device

	(hardware). Xilinx Logic Cell Arrays (LCA) are an example of FPGAs.
FRAM	Frame or Field RAM. VLSI devices used to store a complete video field or frame. Can also refer to RAM configured for use as a FIFO.
Frame	One complete video image. In interlaced video systems (e.g. NTSC and PAL) one frame is made up from two fields.
Frame Grabber	A frame grabber is piece of hardware that can capture and store video images in memory.
Frame Rate	The number of frames transmitted, processed, or displayed per second.
Gamma Correction	A term used for removing non-linear intensity variations in an image. Often given the wider meaning of modifying an image to improve its subjective quality.
GPIB	Stands for General Purpose Interface Bus - an 8 bit parallel bus designed for connecting up computer peripherals.
Grayscale	Refers to the use of more than 1 bit to represent either a primary or complementary colour, or a shade of gray. Typically an 8 bit representation would be used.
H.261	A video compression standard for real-time video communications - for example videophone applications. It is designed to deal with a maximum resolution of 352 x 288 (CIF).
Halftone	Halftone is a technique used in printing to create the effect of smooth shades or grayscales by varying the size of a printing dot on a plain background.
Horizontal Sync	A sync signal which separates lines within a frame. Often abbreviated to "HSYNC".
HSV or HSI	A format of representing a colour image where three components are used; one for hue (H), one for saturation (S) and one for value (intensity) (V or I).
HSYNC	See Horizontal Sync.
Hue	The attribute of a colour which allows it to be classified accurately within the colour spectrum.
I2C	A serial 2 signal interface between integrated circuits used to set up and control those circuits.
ICR	Stands for Intelligent Character Recognition. It means 'Intelligent' OCR (see OCR).
Indexed	When used in "indexed display" or "indexed file" it means the same as a colourmapped display or file.
Interlace	A method of splitting a frame into two (or more) fields to reduce the flicker for a given frame rate. In NTSC and PAL video systems an image is scanned in two passes. The scanned lines of the first pass (field) are interlaced with the lines of the second pass. The interlaced lines do not overlap each other, but fill in the space between lines of the next pass. See also "Progressive Scan".
Interpolation	The process of producing pixels at a particular point by using information from the surrounding pixels. For example, a 10 x 10 image could be interpolated to have a 'resolution' of 20 x 20 - in which case every other pixel would need to be generated using only information from surrounding (input) pixels. A simple algorithm would be to just take the average of the pixels either side of the one to be generated. Note that in the true sense of the word, the resolution has not really increased, because there is no more information in the picture.
ISA Bus	Industry Standard Architecture: The standard PC bus, originally used in the PC/AT. Now being superseded for video and imaging applications by "Local

	Bus" standards. The ISA bus, by modern computer standards, is very slow, achieving transfer rates of 1 to 4 Mbytes/sec.
ISO	International Standards Organisation. An international standards body as the name implies!
JFIF	JPEG File Interchange Format. A file format, very similar to JPEG, but with extra fields for such things as comments and a raw "thumb nail" image (to save having to decompress the image to see what's in it).
JPEG	Joint Photographic Experts Group. JPEG is a joint ISO/CCITT technical committee whose goal has been to develop a general purpose international standard for the compression of continuous tone (grayscale or true colour) digital images. JPEG is also referred to as a file format (as defined in the JPEG specification) and a compression technique. It is pronounced "Jay-peg".
Landscape Scanning	This refers to using a scanner to scan an image with the view window in the landscape position.
Line	Refers to one raster line on an image.
Line Art	Refers to black and white images, represented by 1 bit per pixel.
Line Scan Camera	Refers to a camera that outputs a line of data at a time from a one dimensional CCD element. See also "Area Scan Camera".
Local Bus	Refers to a fast bus for data transfer in a PC that is local to the CPU. "VESA Local Bus" and "PCI Local Bus" are examples of local bus standards.
Luma	The intensity part of a video signal. An abbreviation for luminance. When it is combined with chrominance, the result is composite video.
LUT	A LUT (Look up Table) is a means of providing an arbitrary mapping between input pixels to the LUT and those output. Usually refers to hardware when used in the context of a colour LUT. For example, most 8 bit plane colour displays use a 256 entry LUT to display up to 256 colours from a palette of 16.7 million (or sometimes from 262,144) colours. A colour LUT is also referred to as a "Hardware Colourmap".
Monochrome	An image which has variations in intensity of only one colour (including gray). Monochrome images which only have gray levels are also referred to as black and white.
MPEG	Motion Picture Experts Group. MPEG is a joint ISO/CCITT technical committee whose goal has been to develop a general purpose International standard for the compression of motion continuous tone (grayscale or true colour) digital images. It is based on JPEG, but also includes interframe coding. MPEG-1 is capable of dealing with SIF/CIF resolution video and MPEG 2 is capable is dealing with CCIR 601 video.
NTSC	A colour television systems developed by the National Television Standards Committee that is used in North America, Japan, most of Eastern Europe and other parts of the world. NTSC is characterised by 59.94 fields per second, 29.97 frames per second and 525 lines per frame.
OCR	Stands for Optical Character Recognition. A method of automatically converting a raster image of characters to ASCII characters suitable for word processing etc.
Off Air	Refers to a video signal decoded from a TV tuner. The syncs contained within this signal are very stable.
Overlay	A computer/video graphics operation where coloured text, patterns or even images are written on top of a displayed image without modifying that image. In hardware, this is generally done using a section of video memory separate from the main image memory. This effect can also be simulated in software, but is

	usually slower.
PAL	Phase Alternate Line. The system of coding composite video signals used in much of Europe. PAL is characterised by 50 fields per second, 25 frames per second and 625 lines per frame.
Palette	A look up table (LUT) used for providing a wide choice of colours on a displayed image.
Paletted Image	This is an image containing pixels which index a palette of colours. A common palette size for images is 256 – thus a maximum of 256 colours can be represented in the image. The image must be displayed using the correct palette data, therefore the palette is often stored with the image. The same as a colourmapped image.
PCI Local Bus	A Local Bus standard used in PCs and workstations and originally defined by Intel. In its most common form it is a 32 bit bus offering typical data transfer speeds of 20 to 80 Mbytes/sec. (The maximum transfer rate is 132 Mbytes/sec.)
Phase Locked Loop	In video applications this is the circuit that generates the ADC clock to sample the incoming video signal(s). Note that VCRs are more difficult to lock to than a stable video signal from a camera or "off air". Often abbreviated to PLL.
Pixel	A single element in a digitized image.
PLL	See Phase Locked Loop.
Portrait Scanning	This refers to using a scanner to scan an image with the view window in the portrait position.
PostScript	A powerful and comprehensive device independent language to represent printed and graphical images. See also EPS (Encapsulated PostScript) and RIP.
PostScript Interpreter	A software program that reads PostScript files - i.e. interprets the PostScript language. Usually the output is some type of raster format.
Private Colourmap	A Colourmap which is private to one application and installed in the hardware colourmap when the colourmap's application receives input focus.
Process	A process is an executing instance of an application and will run in its own virtual machine. It may not know of the existence of other processes running on the machine.
Processed Image	Refers to captured, scanned or loaded image data that has been processed or modified, usually to enhance it. See Raw Image.
Progressive Scan	A non-interlaced scanning method where one frame consists of "progressive" lines, usually top to bottom. See also "Interlace".
QCIF	Quarter CIF. A video resolution of 176 x 144 at 25 Hz (sometimes also used for 176 x 120 at 30 Hz).
QSIF	Quarter SIF. A video resolution of 176 x 120 at 30 Hz (sometimes also used for 176 x 144 at 25 Hz).
Raster Image	An image data format such that the image is represented by a series of scan lines, usually starting at the top left and working down to the bottom right.
Raw Image	Refers to captured or scanned image data with no processing done on it - in other words data exactly as it was output from the camera or scanner. See Processed Image.
RBT	Abbreviation for Xilinx FPGA Rawbit files.
Real-time	A frame grabber is described as real-time if it can capture one or more frames at the standard video frame rate, i.e. capture one frame from a 50 Hz video source in

	1/25 of a second.
Resolution	Resolution in the context of a scanner refers to the dots per inch at which the image is scanned at. However in general terms it can refer to the number pixels and lines in an image, irrespective of the dots per inch. For example a 1,000 x 1,000 image is usually regarded as high resolution irrespective of the original dots per inch. Occasionally resolution can refer to the 'depth' of a colour - see Depth.
RGB	A format for representing a colour image where one component is used for each of the primary colours - red, green and blue.
RIP	Stands for Raster Image Processor and refers to software that processes image files, usually to produce a raster output format suitable for printing or imaging devices. Often the reference to RIP refers to a 'PostScript RIP', that is a software program that reads a PostScript file and converts it to a raster format suitable for printing or display. Also referred to as a 'PostScript Interpreter'.
ROI	Region Of Interest: Refers to a region within the full resolution image being acquired or processed.
RS-170, RS-170A, RS-343A	EIA standards. RS-170 is the standard for 60 Hz monochrome (grayscale) video; RS-170A is the standard for 60 Hz NTSC video; and RS-343A is a standard associated with video signals for computer displays. See also EIA.
R-Y	One of the colour difference signals derived from multiplying RGB values by various constants. The other colour difference signal, B-Y, is derived in conjunction with R-Y: R-Y = - 0.701R - 0.587G + 0.114B
Saturation	The attribute of a colour which indicates how much white has been added to a hue, e.g. pure red is strongly saturated, pink is weakly saturated.
Scaling	Means changing the size of an image in terms of its horizontal resolution (i.e. number of pixels in the X direction and/or the vertical resolution). See also "Subsampling" - a simple scaling method.
Scanner Head	The moving part internal to a scanner which contains the light source and CCD image sensor. This moves during scanning in a stepping fashion - one step for each scan line.
SCSI (and SCSI-2, SCSI-3)	Stands for Small Computer System Interface. It is a fast parallel data bus designed for connecting up computer peripherals over a distance of several metres. SCSI-2 and SCSI-3 are more recent, faster versions. Pronounced "Sku-zee")
SDK	Software Development Kit.
Serial Port	The RS-232C serial connector located on the computer. Also referred to as a 'TTY Port'.
SIF	Source Input Format. A video resolution of 352 x 240 at 30 Hz (and sometimes also used for 352 x 288 at 25 Hz), which is comparable to domestic VHS video cassette recorder quality. See also QSIF and CIF.
SMPTE 125	See CCIR 601.
SMPTE 259	This defines the most common method of sending CCIR 601 coded video between pieces of equipment. Data is sent as a 270 Mbits/sec serial stream on a coax cable which uses BNC connectors. See also CCIR 656.
Square Pixel Sampling	An image which has pixels with the same width and height. Most workstations have square pixel displays - thus the pixels per inch is the same in the horizontal and vertical directions.
Subcarrier	A signal which carries encoded colour information. Used in composite video and

	S-Video formats. In NTSC, the subcarrier frequency is 3.579545 MHz and in PAL the frequency is 4.433618 MHz. Amplitude Modulation (AM) of the subcarrier results in changes of colour saturation while phase modulation (PM) of the subcarrier results in changes of hue.
Subsampling	The process of reducing the resolution (and size) of an image by only storing or displaying 1 in N pixels (for example, every other pixel).
Sun Raster	A fairly simple image file format defined by Sun and readable by virtually every imaging software package designed to run on Sun workstations.
SVGA	Super VGA. A general term for display types that have a higher spatial or depth resolution than ordinary VGA. Typical standards are 800 x 600, 1024 x 768, and 1280 x 1024, with colour depths of 15 bit (32K colours), 16 bit (64K colours) and 24 bit (16.7 million colours).
SVHS	Super VHS is a VCR standard based on normal VHS VCRs, but with enhanced resolution. VHS tapes will play on SVHS machines, but in general the reverse is not true.
S-Video	A format of representing a colour image using two signals - one for the brightness (luma) information and the other for the colour (chroma) information. This is higher quality than composite, but not as good as full bandwidth component video such as YCbCr or RGB. (S-Video is equivalent to RGB component video apart from the chrominance bandwidth which is halved).
Sync	Short for synchronization. A signal used to provide the timing information for a video image, for example to convey information about the start of lines, fields and frames.
Sync on Green	A method of including sync information on the green part of an RGB signal.
TARGA	A relatively simple image file format created to support Truevision's line of Targa graphics cards.
Threads	A thread is a path of execution within a process. Any process can have 1 or more threads within it.
TIFF	Stands for Tagged Image File Format. TIFF is a versatile image file format (but because of its versatility, there are sometimes compatibility problems reading and writing files between different software packages).
True Colour	This is an image format which does not need a palette, because each pixel is represented by at least three values which directly give its colour. These are usually red, green and blue (RGB).
TTL	A digital signal which uses 0V to 0.4V to represent logical '0' and +3V to +5V to represent logical '1'. TTL stands for Transistor Transistor Logic.
TTY Port	Generally the same as "serial port".
Two Graduation	An image format which has 1 bit per pixel or per colour. A bitmap image is the same as 'a monochrome 2-graduation image'.
UL	Underwriters Laboratories. An American organisation specifying safety standards for electronic equipment.
VCR	Video Cassette Recorder.
Virtual Colourmap	The same as a "private Colourmap".
VRAM	A type of memory device (hardware) suitable for implementing video memory.
Vertical Sync	A synchronization signal which separates fields or frames. Often abbreviated to "VSYNC".

VESA Video Electronics Standards Association. Often used in with reference to SVGA cards conforming to the VESA graphics standard.

VESA Local Bus A local bus standard used in PCs defined by the Video Electronics Standards Association. This was the first "local bus" to appear in PCs and offers typical data transfer rates of about 15Mbytes/sec. It is a 32 bit bus. See also "PCI Local Bus".

VGA Video Graphics Array. A computer display standard that uses 640 pixels per line and 480 lines per frame non-interlaced. Note that this resolution is the same as square pixel sampled NTSC video. See also SVGA.

VSYNC See Vertical Sync.

X Windows X Windows is a network based graphics system developed by MIT.

Y The luminance component of video. For example the Y in YC, YCbCr, YIQ, and YUV all refer to the luminance component of the colour video signal. Y is calculated from red, green, blue as follows:

$$Y = 0.299R + 0.587G + 0.114B$$

YC A video component set which separates luminance (Y) and chrominance (C). S-Video is based on YC components.

YCbCr A format of representing a colour image where three signals are used; one for brightness and two for colour information. When compared to 4:4:4 RGB, this format has the same luminance bandwidth, but half the chrominance bandwidth. YCbCr is the component set used in CCIR 601 and D1 Video standards.

As analogue signals, Y has the range of 0 to 1V, and Cb and Cr are generated from B-Y and R-Y by scaling them to have a range of ±0.7V.

As eight bit digital signals, Y is scaled to a range of 0 to 255, and Cb and Cr to -128 to +127.

YIQ YIQ is a YCbCr format signal modified for use by the NTSC colour encoding system. The I and Q signals are generated from the U and V signals of YUV by rotating them by 33°.

As analogue signals, Y has the range of 0 to 1V, I of ±0.596V and Q of ±0.525V.

As eight bit digital signals, Y is scaled to a range of 0 to 255, and I and Q to -128 to +127. Note that while the range is the same as digital YCbCr, the signal is not the same because of the 33° rotation.

YPbBr The term YPbPr is being increasingly used instead of YCbCr.

YUV YUV is a YCbCr format signal. The term YUV is sometimes used interchangeably with YCbCr even though the two are not quite the same.

As analogue signals, YUV is the same as YCbCr except that the U and V are scaled differently for use with the PAL colour encoding system (U is scaled from Cb to have a range ±0.436V, V is scaled from Cr to have a range ±0.615V).

As eight bit digital signals, Y is scaled to a range of 0 to 255, and U and V to -128 to +127. Therefore digital YUV is identical to digital YCbCr. For brevity the TMG software library uses the term YUV in preference to YCbCr.

Zooming Enlarging a displayed image by enlarging each pixel within it.