



PC Scope Plus

VIDEO MONITORING SYSTEM OPERATOR'S HANDBOOK

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IN CORRESPONDENCE CONCERNING THIS INSTRUMENT
PLEASE QUOTE THE SERIAL NUMBER PRINTED ON THE
LABEL AT THE REAR OF THE UNIT

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GENERAL INFORMATION

WARRANTY

This product is manufactured by Hamlet Video International Ltd and is warranted to be free from defects in components and factory workmanship under normal use and service for a period of one year from the date of purchase.

FREE EXTENDED WARRANTY

The warranty period can be extended to two years by registering the instrument on the Hamlet web site

<http://www.hamlet.co.uk/serv.html>

TERMS AND CONDITIONS

During the warranty period, Hamlet Video International Ltd will undertake to repair or at its option, replace this product at no charge to its owner when failing to perform as specified, provided the unit is returned shipping prepaid, to the factory or authorised service facility.

No other warranty is expressed or implied. Warranty shall not be applicable and be void when this product is subjected to:

1. Repair work or alteration by persons other than those authorised by Hamlet Video International Ltd in such a manner as to injure the performance, stability, reliability or safety of this product.
2. Misuse, negligence, accident, act of God, war or civil insurrection.
3. Connection, installation, adjustment or use otherwise than in accordance with the instructions in this manual.

Hamlet Video International Ltd reserves the right to alter specifications without notice. This warranty does not affect the statutory rights of the UK customer.

GENERAL INFORMATION

SAFETY COMPLIANCE

This product is manufactured and tested to comply with:

BS EN 61010-1 : 1993

Safety requirements for electrical equipment for measurement, control and laboratory use.



EMC COMPLIANCE

We: HAMLET VIDEO INTERNATIONAL LTD
MAPLE HOUSE
11 CORINIUM BUSINESS CENTRE
RAANS ROAD
AMERSHAM
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HP6 6FB
ENGLAND

declare under our sole responsibility that the product

HAMLET PCSCOPE PLUS

to which this declaration relates is in conformity with the following standard,

EN50081-1

Generic emissions standard for light industrial applications.

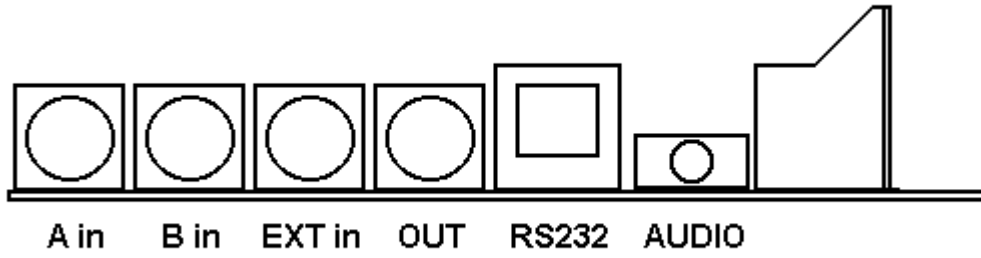
EN50082-1

Generic immunity standard for light industrial applications.

following the provisions of EU EMC Directives 89/336/EEC and 92/31/EEC.

NOTE. During the EMC certification of this product, shielded cables were used. We recommend that they are used in operation.

REAR PANEL



INTRODUCTION

The PC Scope Plus is a waveform, vector and stereo audio monitoring device on a pc expansion card. The supplied software runs under Windows and provides a virtual instrument control panel. The digitally generated displays can be shown on any standard video monitor or LCD display unit.

The card has two BNC video inputs (both internally terminated) an external reference BNC input, a 3.5mm jack stereo audio input, an RJ11 RS232 input and a 75 ohm BNC video output.

The PC Scope Plus provides full broadcast standard measurements and displays conventional waveform, vector and audio displays cut into the television picture. It is available for PAL, NTSC or PAL-M formats.

The unit provides an accuracy of better than 1%, 1 deg, and includes individual or combination full screen displays of both waveform and vectors, 1/2 and 1/4 size screen displays, plus mix display. Waveform functions include H, 2H, HMAG, 2V, V, VMAG, Chroma Pass, Low Pass and Flat filtering, vertical and horizontal shift and gain magnification.

Vector controls include 75% and 100% set positions for vectorscope, x3 magnification, phase rotation and pal switch defeat.

A calibrator is built-in to check waveform and vector calibration, and there is an internal broadcast quality mono P.G. to maintain a display with no input-can also be used to black component tapes!

There are eight full function control memories, plus further memories for horizontal and vertical shifts and vector phase.

INSTALLATION

The PC Scope Plus is designed to fit PC compatibles and the compatible slot in an Amiga.
To install:

Turn the computer off, remove the mains lead and take off the top cover.
Remove the rear plate covering the desired slot and slide the PC Scope board into the slots and plug firmly into the socket. Screw the PC Scope Plus front bracket in place.
Refit the computer top cover, connect the PC Scope Plus RS232 and video/audio leads. Refit the computer mains lead and switch on.

The software package is for remote control of the Hamlet PC_SCOPE from a personal computer via an RS 232 serial link. It is recommended that the disk be copied to your hard disk drive and then kept safely as a back up. Please note this version is for a Microsoft Windows Environment. A DOS version is available from the factory if required.
Before installation of the application please ensure that your system is able to run it correctly.

HARDWARE REQUIRED

IBM PC or 100% compatible personal computer.
At least 1M Byte of RAM.
A VGA type colour monitor.
A Hard Disk Drive.
An RS-232 Serial Port for connection to the PC Plus.
A Mouse.
A 3.5" Floppy Disk Drive.

SOFTWARE REQUIRED

Microsoft Windows Version 3.0 or greater with MS DOS Version 3.3 or greater.
Hamlet Video PC Scope Plus software (disk supplied)

INSTALLATION FROM WINDOWS:

To install the software on your hard disk first ensure the computer is running Windows, fit the application disk in the floppy drive,

From Windows Program Manager select the FILE RUN option then type

A:SETUP if you are using drive A:

The application will create a directory called C:\HAMLET, the files will be copied to it.

SETUP also adds a line to the AUTOEXEC.BAT file to setup the serial port. This may also be done manually as shown below if required.

SETTING UP THE SERIAL PORT MANUALLY

The serial port used for the PC Scope Plus needs to be in the following format:

A baud rate of 9600, 8 Data bits, 1 stop bit no Parity.

Use a text editor in non-document mode to add the following line to the AUTOEXEC.BAT file, found in your top level directory CD\

```
MODE COM2: 9600,N, 8,1
```

If, for example, you wish to use serial port COM3 merely substitute that in the command line above. After altering the AUTOEXEC.BAT file, your computer must be re-booted.

RUNNING THE PROGRAM

To run the installed software from Windows, from the Windows Program Manager select the HAMLET group window, then double click on the PC PLUS icon.

OPERATION

BUTTONS

Use the mouse to point and click the required buttons.

VARIABLE CONTROLS

These use Arrow symbols. Point the mouse at the arrow of a variable control and hold down the left mouse button, this causes the control to increment or decrement slowly.

OPTIONS MENU.

BEEP ON/OFF.

When each control is pressed the computer issues a beep, this may be disabled if not required by clicking the "BEEP" control.

PORT SUB MENU

Used to change the serial port used to control the PC PLUS. See installation instructions. This command will usually only be used when the PC PLUS card is first installed.

THE SAVE MENU

Selecting MEM1 - MEM8 stores the current panel settings in computer memory for later recall.

THE RECALL MENU

Selecting MEM1 - MEM8 recalls the panel settings previously saved in computer memory.

THE CALIBRATE OPTION

The gain of both audio channels can be adjusted. This should only be done on installation.

THE HELP WINDOW

Click on the HELP caption for the information text. The text can be scrolled using the mouse on the "vertical scroll bar" at the right hand side of the Window or from the keyboard by using the cursor keys or the PgUp and PgDn keys.

TO QUIT THE PROGRAM

Double click on the "control menu box" (top left window button)

FRONT PLATE WIRING

RJ11 SOCKET

PC Scope Plus RJ11 6 pin	Computer 9 Way D con
1 TX DATA	3
2 GROUND	5
- DTR	4
- DSR	6
- RTS	7
- CTS	8

3.5mm STEREO AUDIO JACK

TIP	= LEFT
SLEEVE	= RIGHT
BARREL	= GROUND

VIDEO BNCS

TOP OUT TO 75 OHM

NEXT EXT IN TO 75 OHM

NEXT B IN TO 75 OHM

BTM A IN TO 75 OHM

OPERATING INSTRUCTIONS

DISPLAY SECTION

IN A/B (2 way toggle)

Takes the input from the Ain or' Bin' BNC sockets.

SYNC (three way toggle)

INT Takes signal synchronisation from the video signal on the rear Input BNC connector.

EXT takes synchronisation from the EXT BNC connector.

HFT 'Hands Free Timing'^(TM) alternates between INT and EXT every 1/2 second.

CAL (2 way toggle)

OFF displays the signal at the input connector.

ON toggles between the input signal and the internally calibration signal, every 1/2 second.

WFM/VEC (3 way toggle)

WFM displays the full size video waveform.

VEC displays the full size vector.

BOTH displays WFM & VECT together.

TOP BTM (2 way toggle)

TOP displays the small or half size waveform & vector at the top of the screen.

BTM displays the small or half size waveform & vector at the bottom of the screen.

SIZE (2 way toggle)

displays half size waveform & vector.

displays quarter size waveform & vector.

MIX (3 way toggle)

NORM displays the PC PLUS output on the video background.

MIX displays the PC PLUS signal overlaid on the video background.

BLK displays the PC PLUS signal with a black background.

STORE (3 Way toggle)

RUN Display runs in real time.

FRZ Freezes the current display.

STORE Integrates the display. (Infinite persistence)

ON (2 way toggle)

ON displays the PC PLUS output.

OFF displays the video signal only

SCALE ARROWS (variable control)

Pressing the left mouse button on this control adjusts the brightness of the graticules (scale).

WAVEFORM SECTION

FILTER (3 way toggle)

FLAT In WFM mode the unfiltered signal is displayed.

LPASS In WFM mode the signal is filtered to display the luminance component only.

CPASS In WFM mode the signal is filtered to display the chrominance component only.

GAIN (2 way toggle)

1.0 Video gain is 100%, VAR Video gain is variable. (On board control)

VERTICAL ARROWS (variable control)

Pressing the left mouse button on this control adjusts the vertical position of the signal in the waveform display.

The Vertical shift control has 2 small buttons marked S and R.

The S button stores the current position of the vertical shift. This would typically be used to align a standard waveform with the base line.

The R button recalls the stored value of the vertical position... i.e. a calibrated position.

RANGE SELECTION BUTTONS

Selects horizontal ranges: H, 2H or H Mag, or Vertical ranges: V, 2V or V MAG.

HORIZONTAL CURSOR

Pressing the left mouse button on this control adjusts the horizontal position of the signal in the waveform display. The Horizontal shift control has a small button which is used to set the control to a preset central position.

VECTOR SECTION

GAIN 3 way toggle sets gain to 100%, 75% or M (On board control).

PAL SW (2 way toggle)

Toggles between PAL switch on and off.

PHASE ARROWS

Pressing the left mouse button on these controls adjusts the phase angle of the signal in the vector display clockwise or anticlockwise. The Phase shift control has a small button which is used to set the control to a preset central position.

AUDIO SECTION

OFF/ON Disables/enables the Audio display.

PPM/VU Selects audio PPM or VU characteristics.

CALIBRATE LEFT AND RIGHT GAIN ARROWS

The gain of both audio channels can be adjusted by the user. This would normally only be done on installation.

TECHNICAL SPECIFICATION

DISPLAY AREA

- The waveforms are in square boxes burnt into the video signal.
- Small mode: Video and vector boxes are each 128 lines high with a width of 8.5uSec in PAL and 10uSec in NTSC
- Half mode: Video and vector boxes are each 256 lines high with a width of 17uSec in PAL and 20uSec in NTSC
- Expand mode: Video and/or vector boxes, are each 512 lines high with a width of 34uSec in PAL and 40uSec in NTSC

SIGNAL CONNECTIONS

- IN A: BNC connector for input A. Zin of 75 ohms. Max d.c.+/- 3V.
- IN B: BNC connector for input B. Zin of 75 ohms. Max d.c.+/- 3V.
- EXT BNC connector for external ref. Zin of 75 ohm. Max d.c. +/- 3V.
- OUT: BNC connector for output to monitor. 1 Volt to 75 ohms.
- AUDIO: 3.5mm stereo jack. Impedance 30K ohms
- RS232: RJ11 6 pin socket.

WAVEFORM MONITOR

- Response: FLAT is +/- 1% from 25Hz to 5.5MHz, -5% at 10MHz
LPASS is a low pass filter -1db at 1MHz, -40db at 3.58 / 4.4MHz
CPASS is a bandpass filter -3db at +/- 750KHz
- Sensitivity: 1V video-in displays 100% (140 IRE) in CAL mode
Gain variable between 1.0 and 3.0.
Error in CAL position is less than 1%.
- D.C. Restorer: Attenuation of less than 30% to line hum signals
Display level change less than 2% for 1 volt change in signal level.
- Timebase: 2V, V, VMAG, 2H, H, HMAG.
Accuracy limited only by display resolution due to crystal sweep.

VECTOR MONITOR

- Accuracy: Better than 1% in 75% or 100% positions
Variable up to 3 times gain
Display phase is continuously variable by +/- 45 degrees.

POWER

Derived from PC bus:
+12V @ 300mA, -12V @ 60mA.
Consumption: 4.2 Watts nominal.

TEMPERATURE

0 to 50 deg.C. ambient to 10,000 ft.

WEIGHT

270gms.

GRATICULES

PAL WAVEFORM GRATICULE

In the WFM mode, the waveform graticule divides the vertical axis into twelve amplitude steps of 100mV each, with markings on levels 0 to 1.0. At the 1 volt level, there are additional

K factor marks for $\pm 2\%$ and $\pm 5\%$.

The horizontal axis graticule marks are placed on the black level line.

Horizontal calibration is: 1 uS per division in HMAG

5 uS per division in H

10uS per division in 2H

In small mode, a simpler graticule is used, with amplitude lines drawn at 0V, black level and 1V.

PAL VECTOR GRATICULE

In the VEC mode, the vector graticule shows the vector amplitude and phase positions for standard input 75% or 100% colour bars together with the U and V axis. The boxes represent limits of $\pm 5\%$ amplitude and ± 3 deg phase and are labelled with the appropriate colour letter. Burst marks are provided for 75% and 100% gain settings.

Differential phase marks are provided every 90 degrees on the vector circle and are spaced 2 degrees apart. Differential gain marks are on the left hand axis and are 2.5% apart.

The audio graticule can be specified for PPM, NORDIC or VU.

In small mode, a simpler graticule is used, without the lettering or diff phase marks.

NTSC WAVEFORM GRATICULE

In WFM mode, the waveform graticule divides the vertical axis into 140 IRE units, with markings at levels -40 to +100 and % marks at 0, 12.5, 75 and 100.

At the one volt level there are additional marks for K factor levels of $\pm 2\%$ and $\pm 5\%$.

The horizontal axis graticule marks are on the zero IRE line

Horizontal calibration is: 1 uS per division in H MAG

5 uS per division in H

10uS per division in 2H

In small mode, a simpler graticule is used, with amplitude lines drawn at 0V, black level and 1V.

NTSC VECTOR GRATICULE

In VEC mode, the vector graticule shows the vector amplitude and phase positions for standard colour bars, together with the U, V, I & Q axis. Boxes represent limits of $\pm 3.5\%$ of amplitude and ± 2.5 deg of phase and are labelled with the appropriate colour letter. A burst cal mark is provided on the left U axis

Differential phase measurement marks are provided at each 90 deg point on the vector circle and are spaced 2 degrees apart Differential gain measurement marks are provided on the left hand U axis at 2.5% intervals

The audio graticule can be specified for PPM, NORDIC or VU.

In small mode, a simpler graticule is used, without the lettering or diff phase marks.

ADJUSTMENTS AND CALIBRATION

AMPLITUDE CALIBRATION

Preset controls are provided for fine adjustment of waveform and vector gain in relation to the electronic graticule.

Adjust RV6 for waveform and RV10 for vector calibration.

Adjust RV8 for waveform and RV7 for vector magnified.

FILTERS

Adjust L2 for minimum chroma in low pass mode.

Adjust L1 for maximum chroma in chroma pass mode.

CALIBRATOR

Only adjust if an accurate comparison source is available!

Adjust RV12 for 1 volt luminance display.

Adjust RV9 for 1 volt chroma display.

MIX LEVEL

Adjust RV13 for desired background level in mix mode.

DIGITAL VCOS

Using a meter with input resistance greater than 1M ohm:

Adjust CV2, with a plastic tool, for 2.5 volts at U15 pin 9

Adjust CV3, with a plastic tool, for 2.5 volts at R79

TIMEBASE CALIBRATION

As the horizontal sweep and graticule are both derived from a crystal reference, there is no need, nor is there provision for any adjustments.

VECTORSCOPE LINE-UP

With colour bars applied to the input, select VEC mode

Adjust RV2 and RV1 for centring

Adjust L8 and RV11 for balanced display

Adjust L3 for straight lines between the vector dots

Adjust L6 for centred phase control action.

AUDIO

Adjust RV5 so bottom of bars touch bottom of graticule.

ANALOG BASICS

COMPONENT COLOUR

The colour picture can be distributed in two forms, whether in 625 or 525 line standards:

RGB

This is the basic signal produced by a camera etc and fed to a colour c.r.t. It consists of three primary signals, **Red**, **Green** and **Blue**. By convention, black level is at 0mV and peak brightness is at + 700mV.

YCrCb

As the human eye can see less resolution with colours, the video can be modified to take advantage of this to reduce the amount of information needed. The picture is separated into monochrome and colour components. The monochrome Y signal is formed from:

$Y = (0.3 \times \text{Red}) + (0.59 \times \text{Green}) + (0.11 \times \text{Blue})$ approximately.

This signal has black level at 0mV and maximum white level at + 700mV.

The colour components are two colour difference signals:

$Cr = (R - Y)$ and $Cb = (B - Y)$

These are weighted to give maximum values of +/- 350mV and are bandwidth restricted to half that of the Y component.

PAL

Fig 2 shows an encoded 100% colour bar signal. The two colour components of Cr and Cb are used to amplitude modulate a 4.43361875Mhz carrier signal. The two carriers are arranged to be 90 degrees apart before they are combined with the Y luminance signal, so that they can be decoded separately. The PAL system is designed to minimise hue errors by phase reversing the Cr axis on alternate lines (**Phase Alternate Line**). This reversal is copied by the decoder, so that the hue error will now alternate in phase. By combining the chrominance from two adjacent lines, the error is thus cancelled out.

NTSC

Fig 3 shows an encoded SMPTE (75%) colour bar signal. The two colour components of Cr and Cb are used to amplitude modulate a 3.579545Mhz carrier signal, but they are first modified into I and Q signals to reduce the overall maximum chrominance level when combined.

PAL BASICS

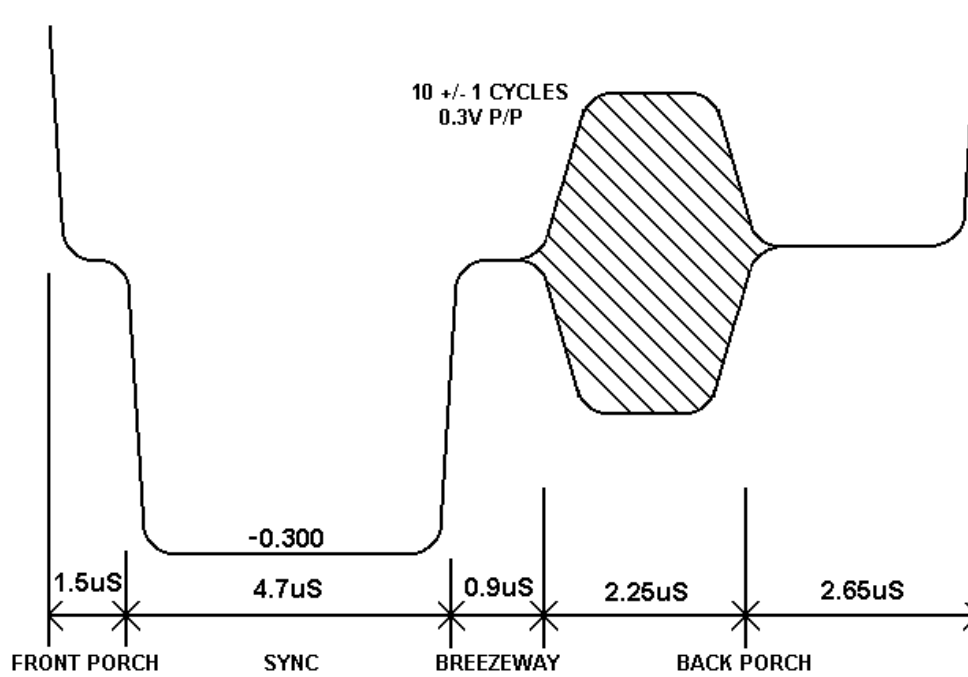
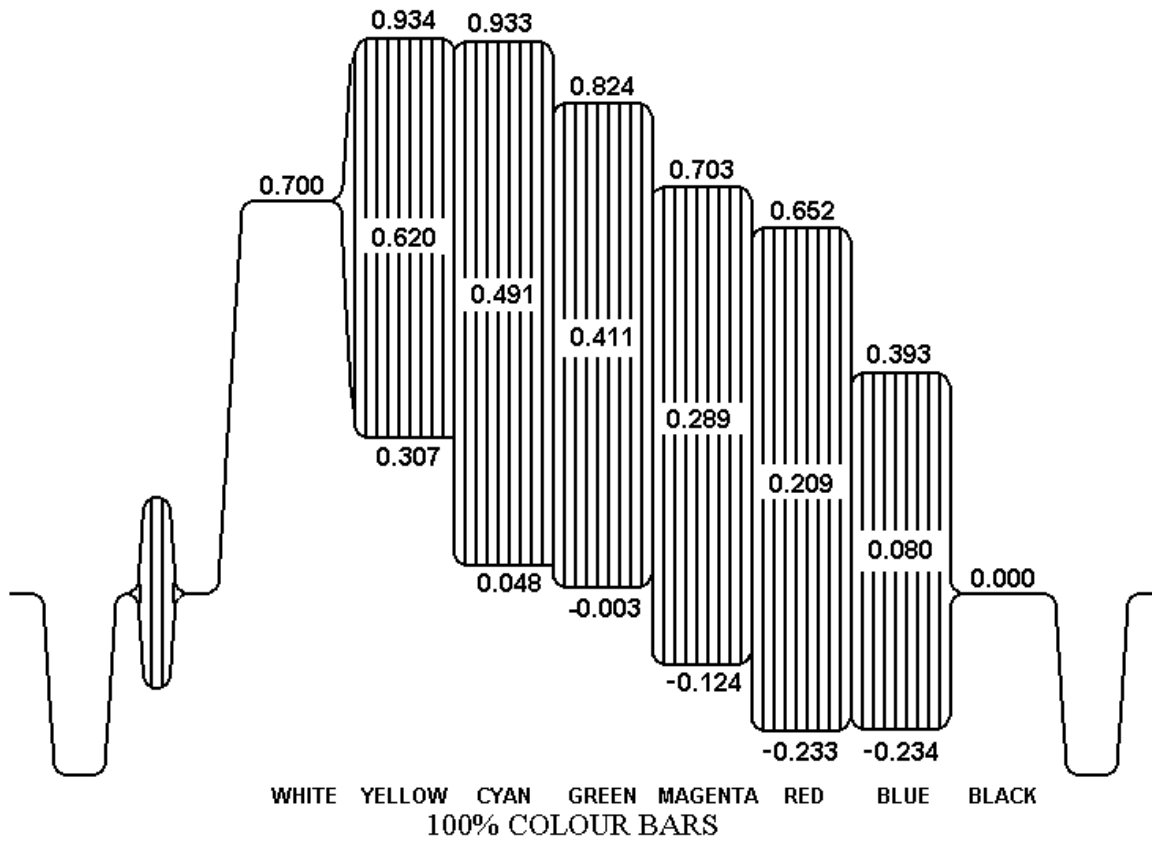


Fig 2 .

NTSC BASICS

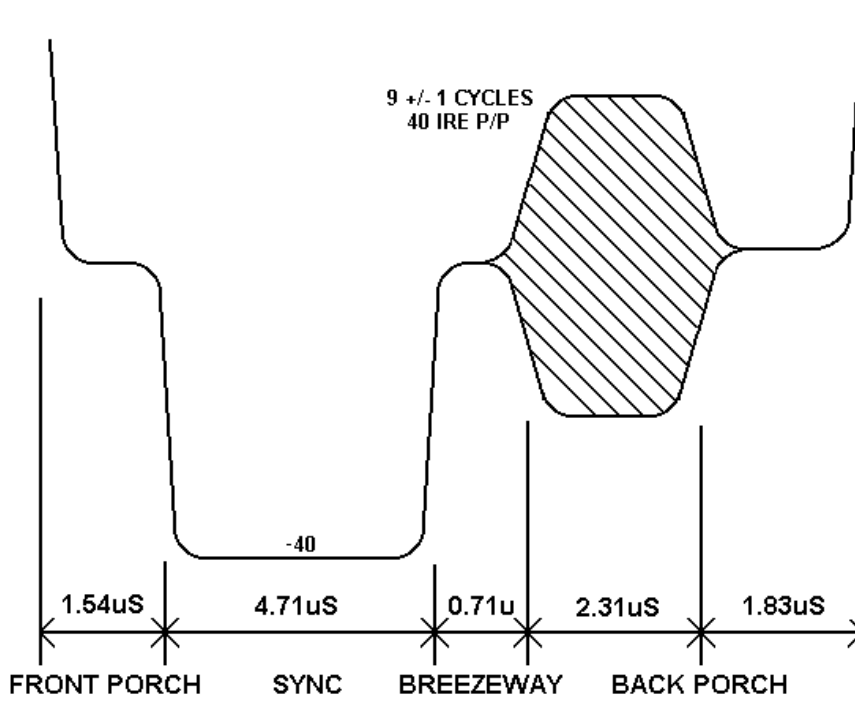
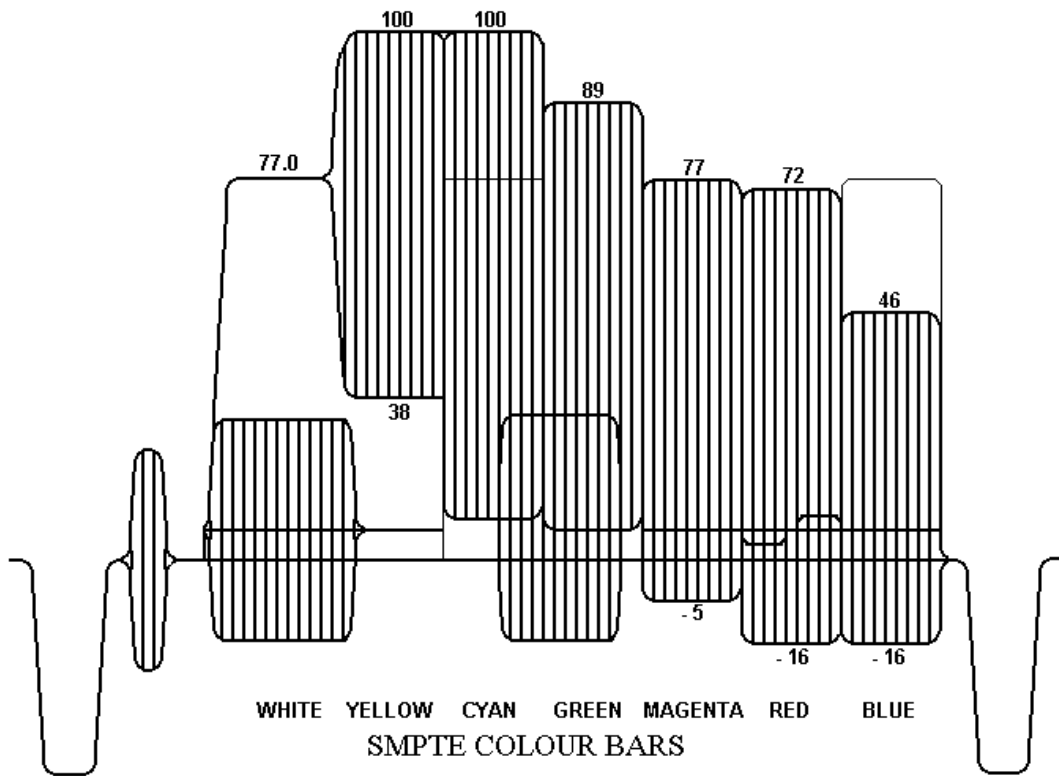


Fig 3.

SC-H RELATIONSHIP

PAL appears, at first sight, to be a four field system: field 1 being identical to field 5, and field 3 having the opposite pal switch phase. However, if a switch or edit is made between two video sources which are in the same pal sequence only, a small horizontal picture shift will often be noticed, this is due to the relationship between subcarrier and line frequencies. In order to avoid chroma patterning on monochrome receivers the PAL subcarrier frequency was chosen to have a 90 degree offset per television line, with 25Hz added on so that any remaining patterning would run through the picture:

$$F(\text{pal}) = (283.75 \times 15.625\text{KHz}) + 25\text{Hz} = 4.43361875\text{MHz}$$

The drawback of this is that after one PAL frame of four fields the subcarrier will have executed exactly 354689.50 cycles, so it will be 180 degrees shifted from its original phase at the same sync point. Hence the subcarrier to horizontal sync (SC-H) phase will only repeat every EIGHT fields.

A similar problem also exists in NTSC, except that it is a four field system rather than eight field.

$$F(\text{ntsc}) = (227.5 \times 15.73426373\text{KHz}) = 3.579545\text{MHz}$$

After one NTSC frame of two fields, the subcarrier will have executed exactly 119437.50 cycles, so it will then be exactly 180 degrees shifted from its original phase at the same sync point hence the sc-h phase will only repeat every FOUR fields.

If a video edit or switch is made without regard to the above field sequence, there is a 50/50 chance of picking the wrong eight field match. This will cause an SC-H phase jump producing a picture shift of half a cycle of subcarrier. Whilst this may be acceptable if cutting to a different shot, in animation or tag-editing the shift would be very noticeable.

To produce reliable match frame edits it is therefore necessary to identify the correct field sequence. In addition, if due to misalignment, the SC-H phase was displaced from the ideal by 90 degrees, the field relationship would be uncertain.

Both these problems can be addressed by having an instrument which displays the subcarrier phase to horizontal sync phasing. Zero SC-H phase has been defined as a positive zero-crossing of subcarrier at the vertical sync point on field 1.

Systems can now be adjusted in the exactly correct SC-H phase to avoid uncertainty when near to the 90 degree point. A video signal in the exactly wrong eight-field sequence would show up as an 180 degree SC-H phase error.

USEFUL WEBSITES

HAMLET	www.hamlet.co.uk	
HAMLET (USA)	www.hamlet.us.com	
SMPTE	www.smpte.org	Society of Motion Picture Television Engineers
DIN	www.din.de	German Standards Institute
EBU	www.ebu.ch	European Broadcasting Union
AES	www.aes.org	Audio Engineering Society
ITU	www.itu.int	International Telecommunication Union

CONTACT DETAILS AND CUSTOMER SUPPORT

For any form of assistance in maintaining your PC Scope Plus, please contact:

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E-mail: sales@hamlet.co.uk Web site: www.hamlet.co.uk

Hamlet Video International USA service center , Tecads Inc, 23 Del Padre St, Foothill Ranch, CA 92610, U.S.A.
Tel: +1 (949) 597 1053,
Fax: +1 (949) 597 1094.
Toll Free Tel number: (866) 4 HAMLET
E-mail: service@hamlet.us.com Web site: www.hamlet.us.com

In correspondence concerning this instrument, please quote the serial number, which you will find printed on the label at the back of the unit.