



## **DigiGen Index**

### **RACK MOUNTABLE SERIAL DIGITAL AND ANALOG MULTI FORMAT WAVEFORM GENERATOR**

#### **OPERATOR'S HANDBOOK ISSUE A1 (SD SDI & CST)**

© 2005 Hamlet Video International Ltd. All rights reserved

This handbook contains proprietary information of Hamlet Video International Limited and may not be copied in whole or in part nor its contents disclosed to any third parties without the express written consent of the company.

Hamlet Video International Limited  
Maple House 11 Corinium Business Centre Raans Road Amersham Bucks HP6 6FB England  
Main Line: +44 (0)1494 729 728 Fax Line: +44 (0)1494 723 237 Free phone (UK) 0500 625 525  
E-mail: [sales@hamlet.co.uk](mailto:sales@hamlet.co.uk) Web site: [www.hamlet.co.uk](http://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](mailto:service@hamlet.us.com) Web site: [www.hamlet.us.com](http://www.hamlet.us.com)

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



## CONTENTS

<b>LIST OF FIGURES .....</b>	<b>4</b>
<b>GENERAL INFORMATION .....</b>	<b>5</b>
WARRANTY .....	5
SAFETY COMPLIANCE .....	6
<b>FRONT AND REAR PANELS.....</b>	<b>7</b>
<b>OVERVIEW.....</b>	<b>8</b>
<b>OPERATING INSTRUCTIONS.....</b>	<b>9</b>
CONTROL SECTION .....	9
STANDARDS SECTION .....	9
OUTPUT SECTION.....	9
AUDIO SECTION .....	11
PATTERN SECTION .....	11
TEXT SECTION .....	11
<b>ADDITIONAL FUNCTIONS.....</b>	<b>11</b>
STEREO AUDIO IDENT.....	11
<b>PATTERNS .....</b>	<b>12</b>
<b>PATTERNS.....</b>	<b>13</b>
<b>TECHNICAL SPECIFICATION.....</b>	<b>14</b>
<b>CALIBRATION.....</b>	<b>15</b>
<b>ANALOG BASICS.....</b>	<b>16</b>
<b>SC-H RELATIONSHIP .....</b>	<b>19</b>
<b>SERIAL DIGITAL BASICS.....</b>	<b>20</b>
<b>DIGITAL ERROR DETECTION OVERVIEW .....</b>	<b>21</b>
<b>EMBEDDED AUDIO OVERVIEW .....</b>	<b>22</b>
<b>USEFUL WEBSITES .....</b>	<b>26</b>
<b>CONTACT DETAILS AND CUSTOMER SUPPORT.....</b>	<b>26</b>

## LIST OF FIGURES

Fig 1	Front View	.....	7
Fig 2	Rear View	.....	7
Fig 3	PAL Basics	.....	16
Fig 4	NTSC Basics	.....	17
Fig 5	Serial Digital Basics	.....	22
Fig 6	625 Field Blanking	.....	23
Fig 7	525 Field Blanking	.....	24

## **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  
BUCKS  
HP6 6FB  
ENGLAND

declare under our sole responsibility that the product

### HAMLET DIGI GEN

to which this declaration relates are in conformity with the following standards:

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 be used in operation.

## FRONT AND REAR PANELS

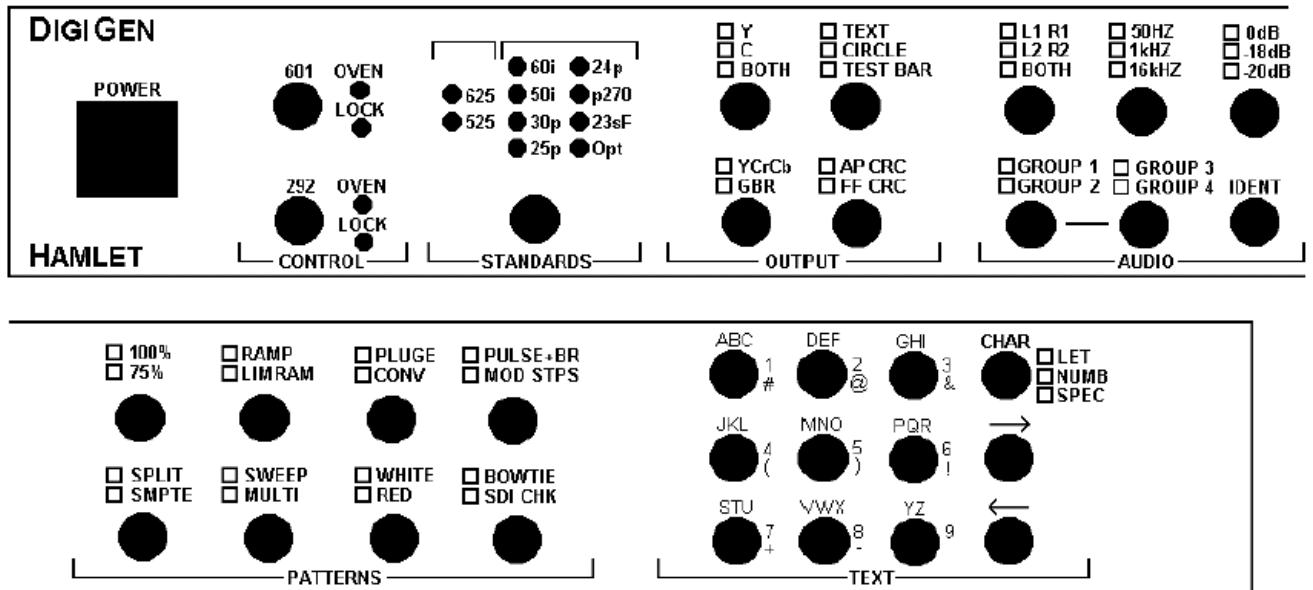


Fig 1 Front Panel

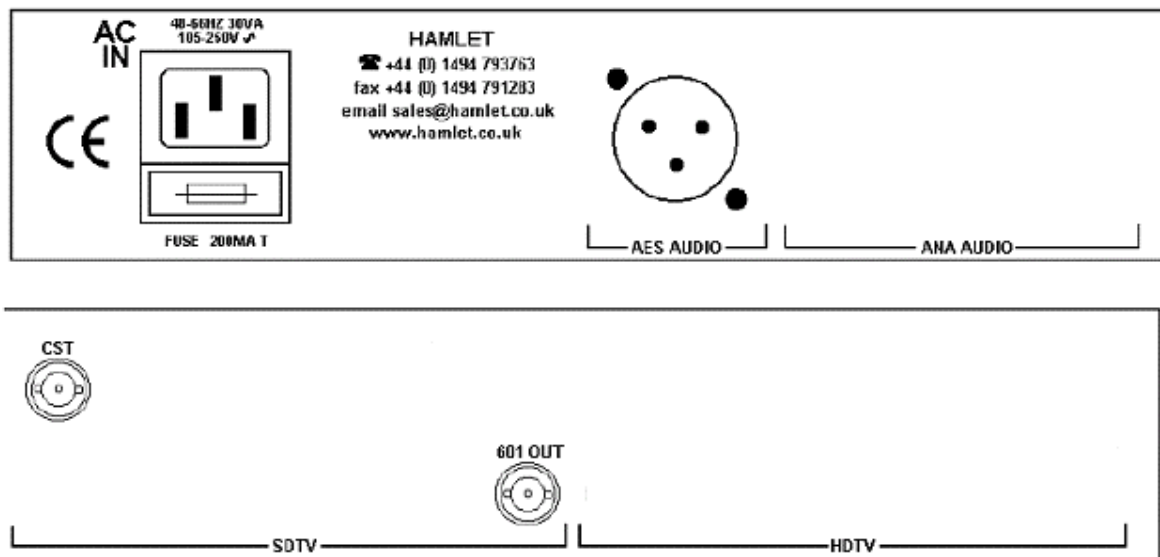


Fig 2 Rear Panel

Note:-

**Active Inputs:-** Mains input  
**Active Outputs:-** AES Audio XLR,  
 Out 601 BNC (RH of 2),  
 CST out BNC

All other holes are plugged or blanked off.

## OVERVIEW

The Hamlet DigiGen Index is a rack mountable test signal generator designed to output SD serial digital (SMPTE 259) video together with embedded audio and CRC checksums. There are additional outputs of analogue composite video, AES/EBU digital audio and analogue audio. All signals are digitally derived for accuracy and stability.

16 different patterns can be selected for both formats and standards, including colour bars, frequency sweeps and the SDI test matrix pattern. The serial digital output is generated in full ten bit specification and the composite output is from a 9 bit digital to analogue converter.

Both output formats can be switched to 625 (PAL) or 525 (NTSC) standards. PALM is available on request.

The video Y and C components can be individually disabled from both outputs and the CRC checksum word and embedded audio packets can be disabled from the SDI output.

Embedded tone can be on any of the four groups. It can be on Ch1, Ch2 or both and on Left, Right or both.

All settings are stored on power down

Note: -

**Active Inputs: - Mains input**

**Active Outputs: - AES Audio XLR,  
Out 601 BNC (RH of 2),  
CST out BNC**

**All other holes are plugged or blanked off.**



## OPERATING INSTRUCTIONS

### Power

Toggles power on and off.

### Control Section

LEDs on            Green                            601, Oven and Lock

### Standards Section

625 or 525 ONLY selectable

625 LED on        Green                            Television standard 625 (PAL) output  
525 LED on        Green                            Television standard 525 (NTSC) output

### Output Section

GBR not selectable  
AP CRC not selectable

Y LED on         Green                            Y component is on.  
C LED on         Red                                C component is on.  
Both LED on     Yellow                            Both Y and C components on.  
LED off            Off                                 No Luminance or Chrominance on output

Text LED on     Green                            Up to 16 characters of text can be superimposed on  
pattern  
To enter text:-  
push ident  
push text  
amend text  
push text again, scroll through circle, circle and  
bar, back to TEXT  
push ident (text saved into memory)  
push ident

Circle LED on    Red                                4:3 circle overlaid on test pattern  
The 625 circle display is 512 pixels high x 469 pixels  
wide.  
The 525 circle display is 426 pixels high x 469 pixels  
wide.

Second press     Red                                16:9 circle overlaid on test pattern  
Test Bar LED on Yellow                            MPEG pattern. A moving horizontal bar is provided  
to identify frame interpolation errors in MPEG  
systems or stuck frames in field stores.

LED off            Off                                 No overlaid

FF CRC LED on Red                            When no overlay or audio selected FF CRC inserted  
in data stream

LED off            Off                                 FF CRC not inserted

**NB. When TEXT is selected the (Green) IDENT LED also comes on and the (Red) L audio bars on the RH and LH embedded audio displays pulse up and down. To restore full audio bars then switch IDENT off (TEXT LED also goes off) and select L1R1, L2R2, BOTH buttons in sequence.**  
**N.B There is no 0 on key pad for text entry should use O instead**

### Audio Section

50Hz/1KHz/15KHz not selectable – red LED on permanently

0dB/-18dB/-20dB not selectable – red LED on permanently

L1R1 LED on	Green	The embedded audio on CH1 ONLY
L2R2 LED on	Red	The embedded audio on CH2 ONLY
Both LED on	Yellow	The embedded audio on CH1 and CH2
LED off	Off	No embedded audio inserted
Group 1,2 LED on	Green	Selects the embedded audio group: GP 1
Group 1,2 LED on	Red	Selects the embedded audio group: GP 2
Or		
Group 3,4 LED on	Green	Selects the embedded audio group: GP 3
Group 3,4 LED on	Red	Selects the embedded audio group: GP 4

### Pattern Section

Pressing any of the pattern keys selects that set of patterns in a cyclic sequence

See below for pattern explanations

### Text Section

Char LED on	Green	Keyboard used to enter the required letters
Char LED on	Red	Keyboard used to enter the required numbers
Char LED on	Yellow	Keyboard used to enter the required special characters

**N.B There is no 0 on key pad for text entry should use O instead**

Arrow buttons to move to required character location

## ADDITIONAL FUNCTIONS

### STEREO AUDIO IDENT

**NB. When TEXT is selected the (Green) IDENT LED also comes on and the (Red) L audio bars on the RH and LH embedded audio displays pulse up and down. To restore full audio bars then switch IDENT off (TEXT LED also goes off) and select L1R1, L2R2, BOTH buttons in sequence.**

**N.B There is no 0 on key pad for text entry should use O instead**

## PATTERNS

### **100% BARS LED Green**

100% full colour bars. Composite video 1V p/p.

Digital levels are Yblack =64, Ywhite = 940, Cr and Cb are 512 +/- 448 max.

NTSC/525 option set has SMPTE bars in this position.

### **75% BARS LED Red**

White as 100% bars. Colours reduced to 75% level.

### **SPLIT LED Green**

Top half of screen is 100% colour bars, bottom half is red.

NTSC/525 option set has 75% colours in this position

### **SMPTE LED Red**

Standard SMPTE test pattern.

### **RAMP LED Green**

Y waveform is an ascending ramp, running from 64 bits (0mV) to 940 bits (700mV).

Cr and Cb waveforms are ascending ramps, running from 64 (-350mV) to 960 (+350mV)

### **LIM RAMP LED Red**

Y waveform is an ascending ramp, running from 1 bit (50 mV below black) to 1022 bits (66 mV above peak white).

### **SWEEP LED Green**

Sweeps from 500KHz to 5MHz over the line period, with markers at 1,2,3,4,5 MHz.

Waveform is 600bits (480mV) p/p centred on 502 bits (350mV).

When using the composite output, disable the C component to avoid Y/C beating.

### **MULTI LED Red**

White bar at 765 bits (560mV) followed by six frequency bursts at 500KHz, 1MHz, 2MHz, 3MHz, 4MHz, 5MHz at 526 bits (370mV) p/p centred on 502 bits (350mV).

When using the composite output, disable the C component to avoid Y/C beating.

NTSC option set is 500KHz, 1.25MHz, 2MHz, 3MHz, 3.58MHz, 4.2MHz.

### **PLUGE LED Green**

Grey scale block for colour monitor gain tracking adjustment and grey/superblack stripes for brightness setting.

Block is 940 bits (700mV), 502 bits (350mV), 239 bits (140mV).

Stripes are at 64 +/- 18bits (+/- 14mV).

### **CONVERGE LED Red**

Crosshatch pattern for colour monitor convergence adjustment.

23 Horizontal lines and 23 Vertical lines.

### **WHITE LED Green**

Plain full white screen.

Y waveform 940 bits (700mV), Cr at 512 bits, Cb at 512 bits.

## PATTERNS

### **RED LED Red**

Plain full red screen.

Y waveform is 326 bits (209mV), Cr at 960 bits, Cb at 361 bits.

### **PULSE+BR LED Green**

2T luma pulse at 940 bits (700mV), 10T chroma pulse at 502 bits (350mV), 20 uSec bar at 940 bits (700mV).

### **MOD STPS LED Red**

5-step ascending staircase, equal steps of 175 bits (140mV) each.

Added chroma of Cr at 638 bits and Cb at 652 bits.

### **BOWTIE LED Green**

Y channel is 500KHz. Cr,Cb channels are 502KHz phase adjusted so equal to Y in mid line. Suitable monitoring equipment, eg the Hamlet DigiScope 601AX, produce (Y-Cr) and (Y-Cb) displays to accurately check system gains and timings, with the traditional bowtie displays. Y Waveform is 438 bits (350mV) p/p centred on 502 bits (350mV).

C Waveform is 448 bits (350mV) p/p centred on 512 bits (350mV).

Timing markers at +/-5nSec and at every 20nSec.

### **SDI CHK LED Red**

Top half of the screen is the equaliser test and contains several examples of 19 "0"s followed by 2 "1"s per frame. Bottom half of the screen is the phase locked loop test and contains several examples of 20 "0"s followed by one "1" per frame.

### **RAMP**

Y waveform is an ascending ramp, running from 64 bits (0mV) to 940 bits (700mV).

Cr and Cb waveforms are ascending ramps, running from 64 (-350mV) to 960 (+350mV)

### **LIM RAMP**

Y waveform is an ascending ramp, running from 1 bit (50 mV below black) to 1022 bits (66 mV above peak white).

### **OPTION**

Future or optional patterns, e.g. SMPTE colour bars.

In PAL/625 mode set to SMPTE color bars

In NTSC/525 mode set to 100% color bars

## TECHNICAL SPECIFICATION

### OUTPUTS

#### Serial digital

BNC connector. Output impedance 75 ohms.  
SMPTE 259M, ITU-R BT.601/656 serial component.  
800mV pp  
Full 10 bit pattern generation.  
Addition of CRC checksum word.  
Addition of embedded tone at -18db.

#### Composite

BNC connectors. Output impedance 75 ohms.  
1 volt p/p +/- 1% PAL, NTSC or PALM from 9 bit dac.  
Differential gain and phase +/- 1% and +/- 1 deg.  
Sch phase 0 +/- 5 deg.

#### Audio

3 pin XLR plug.  
Analogue: 1KHz tone 0db to +8db balanced to 600 ohms Thd <0.5%.  
Digital: AES/EBU encoded 1KHz tone, balanced output to 110 ohms.

### POWER

Current draw is 600mA

Mains supply 220/110VAC +/-20% 50/60Hz 10VA max.

### ENVIRONMENT

Indoor use, 5 to 45 deg.C. ambient to 2,000m.

Max humidity 80% to 31 deg.C decreasing to 50% at 40 deg.C.

Overvoltage category 2. Pollution degree 1.

Weight 2.2Kg.

## **CALIBRATION**

### **EQUIPMENT REQUIRED**

Accurately calibrated waveform monitor and audio monitor, e.g. Hamlet DigiScope 601AX. Frequency standard, e.g. off air signal from reputable tv broadcaster.

As all signals are digitally derived, the only adjustments are to the master clock frequency, the analog composite output gain and response and the analogue audio output level.

To access the adjustments, remove the four screws in the case bottom and separate the case halves. Adjustments are made through the holes provided in the upper circuit board.

All adjustments should be carried out after 30 minutes warm up.

### **MASTER CLOCK FREQUENCY**

If not used for more than one month, run the unit for 2 hours to re-age the crystal. Compare the tv line frequency derived from either output with a known reference and adjust CV1 (FREQ) with a plastic tool for a run through of less than 2 uSec per second. Adjust R14 (DC) so it is in the centre of the range which gives stable pattern outputs.

### **ANALOGUE COMPOSITE OUTPUT**

Select PAL, 100% BARS pattern. Connect a 75 ohm terminated waveform monitor or oscilloscope to the composite output. Adjust R3 (CST) for 1V +/- 1% p/p video and L1 (RESP) for 885mV +/- 1% p/p chroma.

### **ANALOGUE AUDIO OUTPUT**

With an oscilloscope, adjust R23 (AUDIO) for 0db output, 2.19V p/p +/- 1%. Or with an accurate ac voltmeter, adjust for 775mV RMS +/- 5mV.

## 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 3 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 4 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

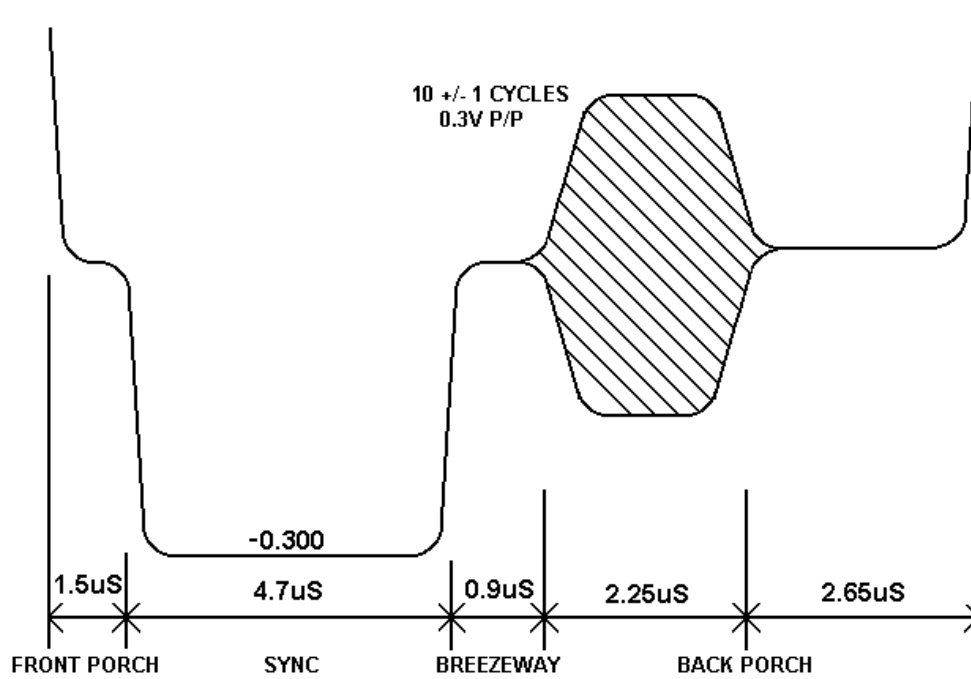
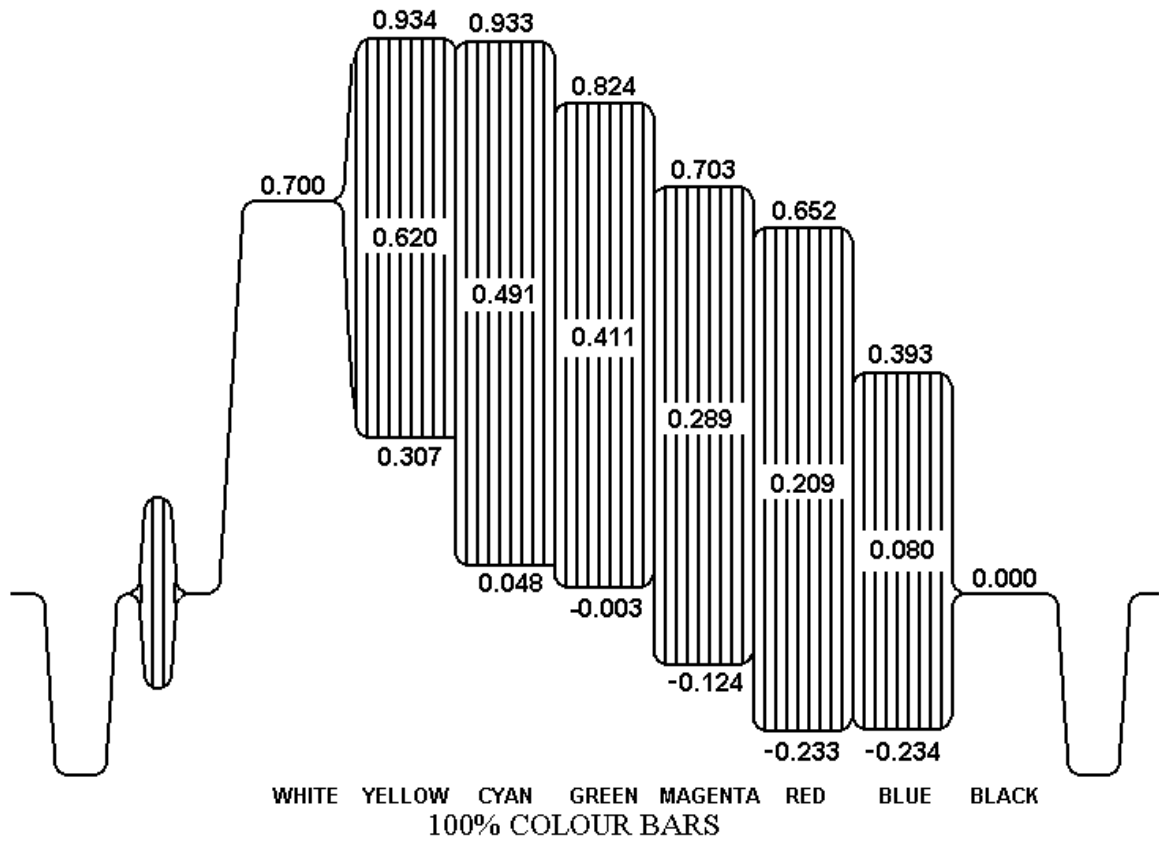


Fig 3.

# NTSC BASICS

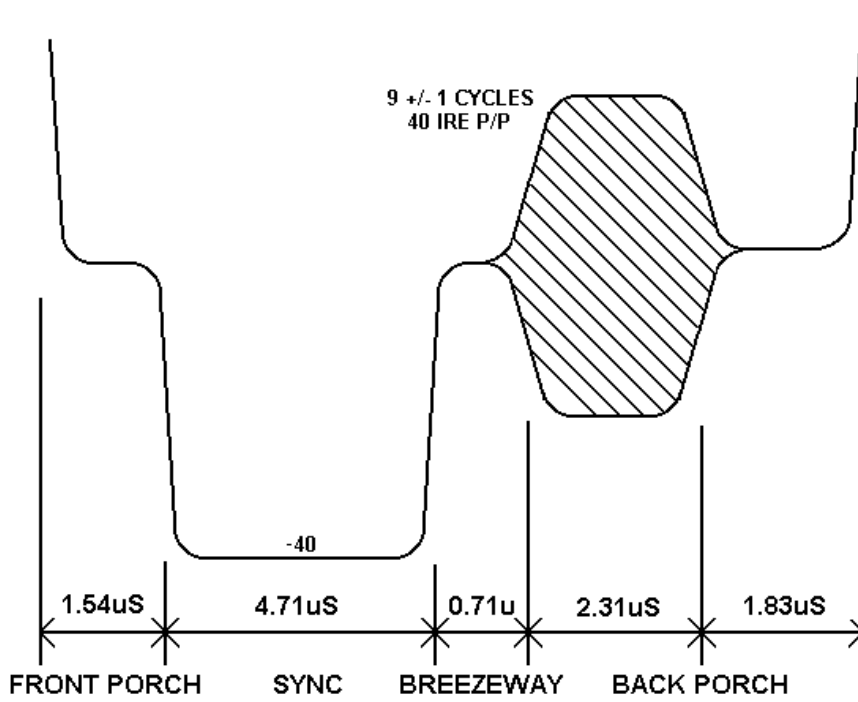
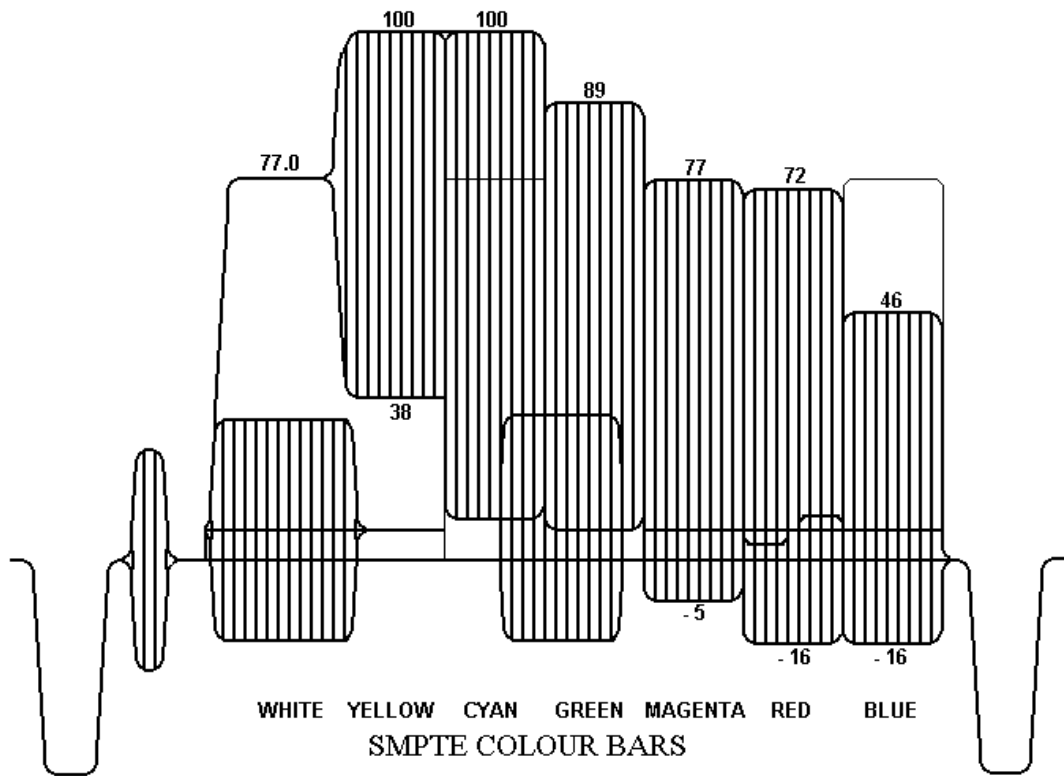


Fig 4.

## 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.

## SERIAL DIGITAL BASICS

625 and 525 digital component video is produced by applying a 4:2:2 sampling structure to the analog signal. This process is defined by a sub-set of international standards ITU-R BT.601 and BT.656. (these were formerly known as CCIR-601 and CCIR-656. The label 'CCIR601' is commonly applied to digital video coded in this manner.)

The luminance (Y) component is sampled at 13.5 MHz, and the colour difference components (U and V) are both sampled at 6.75 MHz. With 10 bit quantisation, this results in a data stream of 10 bit words at a clock frequency of 27 MHz. If the signal source uses 8 bit quantisation, 10 bit data is used with the two least significant bits of each sample code set to binary zero. This is to maintain the same data rate.

The quantizing levels employed in the analog to digital conversion are set to give 66.4mV headroom above peak white and 51.1mV below black. Coded U and V signals have 50mV above and below their normal maximum and minimum excursions.

The synchronisation pulses are discarded in the coding process, and are replaced by Timing Reference Signals (TRS) which are inserted into the data stream to serve the same purpose. Two TRS's are used to synchronise the data stream, EAV (End of Active Video) and SAV (Start of Active Video). These are placed at the beginning and end of the horizontal video blanking period. see fig 5.

Each TRS consists of 4 words:

- 1) 3ff hex i.e. all '1's
- 2) 000 hex i.e. all '0's
- 3) 000 hex i.e. all '0's
- 4) XYZ, which determines the type of TRS pulse:

XYZ:

- Bit 9: always '1'
- Bit 8: 0 = frame 1    1 = frame 2
- Bit 7: 0 = normal    1 = field blanking
- Bit 6: 0 = SAV       1 = EAV
- Bit 5: Bits used for Hamming correction.
- Bit 4: Bits used for Hamming correction.
- Bit 3: Bits used for Hamming correction.
- Bit 2: Bits used for Hamming correction.
- Bit 1: Always '0'
- Bit 0: Always '0'

## SERIAL DIGITAL BASICS

The period between EAV and SAV is not used by normal video and is available for other purposes e.g.: error checking, timecodes or embedded audio.

**Illegal Values:** The values 0 and 3FF hex are used solely by TRS pulses (EAV and SAV) they must not appear anywhere in the active video area.

**Out of Gamut:** Values apart from the illegal values which should not be used.

Luminance is defined as being between peak white, 700mV, 3AC, hex and black, 0mV, 040 hex.

Chroma is defined as being between max positive, 350mV, 3C0, hex and max negative, -350mV, 040 hex.

The values above and below these are termed "out of gamut".

The data is serialised using an NRZ (None Return to Zero) code to produce a 270 Mb/s signal. This coding method removes any low frequency component and is insensitive to polarity. The data has to be scrambled first to avoid the possible transmission of all '0's. This data is output at 800mV p-p to normal 75 ohm video coaxial cable.

Due to the high frequencies, the cable losses are quite high, typically 10dB per 100 metres at 270 MHz. To allow acceptable cable lengths, automatic cable equalisers are used at the receiver which usually allow up to 300 metres of cable to be used. It is important that standard cable is used, otherwise the equaliser will not compensate correctly.

Suitable cable is:      PSF 2/3      BELDEN 8281      F&G 1.0/6.6

## DIGITAL ERROR DETECTION OVERVIEW

In order to check if the digital video signal has been received correctly a Cyclic Redundancy Check (CRC) can be made on each frame in the generating equipment, this four digit number is then placed in a 'packet' and put in the EAV-SAV space of one line of each field.

At the receiving equipment the incoming video field also has a Cyclic Redundancy Check number calculated, this value is then compared with the 4 digit number sent in the packet. If the two numbers are not identical an error has occurred between transmission and reception of the signal.

## SERIAL DIGITAL BASICS

This type of error detection is known as Error Detection and Handling or EDH and is defined by SMPTE RP165. In practice two check sums are sent per frame, one for the active video period and one for the full frame. A typical packet consists of:

The Header: (000, 3FF, 3FF) This always precedes an EDH packet.

Data ID: (1F4)  
Block Number: (200)  
Data Count: This contains the number of words that follow.  
Active picture CRC: 3 words  
Full-field CRC: 3 words  
Error flags: 3 words  
Reserved: 7 words  
Check Sum: This is used to test for transmission errors.  
Note, all values in Hex.

### EMBEDDED AUDIO OVERVIEW

The period between the EAV and SAV markers can be used to send embedded digital audio signals. This is known as SMPTE 272M. Up to 16 separate audio signals may be sent in a single video channel. These are organised as four GROUPS of four signals, the four signals are often two stereo pairs. Typically only one group will be used, giving two stereo pairs of audio. The audio data is digitised in the sending equipment to 20 bits of resolution, usually at a 48 KHz sample rate. Often only 16 bits are used in practice. The digitised data is arranged in packets which are placed in the EAV-SAV space.

A typical packet consists of:

The Header: (000, 3FF, 3FF) This always precedes an audio packet.  
Data ID: This contains the Audio Group number.  
Block Number: AES blocks have 192 'frames' of audio data  
Data Count: This contains the number of words that follow.  
Audio Sample:  
Audio Sample:  
Audio Sample:  
Audio Sample:  
Check Sum: This is used to test for transmission errors.

Each audio sample consists of a sample of all four audio signals,  
eg: Channel 1 left, Channel 1 right, Channel 2 left, Channel 2 right.

Each signal requires 3 words to hold all 20 bits data, thus each audio sample has 12 words in it. Typically 3 or 4 audio samples are sent in each EAV-SAV period.

As with the video signal, words which consist of all '1's or all '0's are not allowed.

# SERIAL DIGITAL BASICS

## EAV and SAV

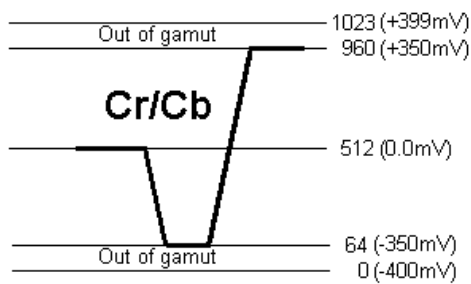
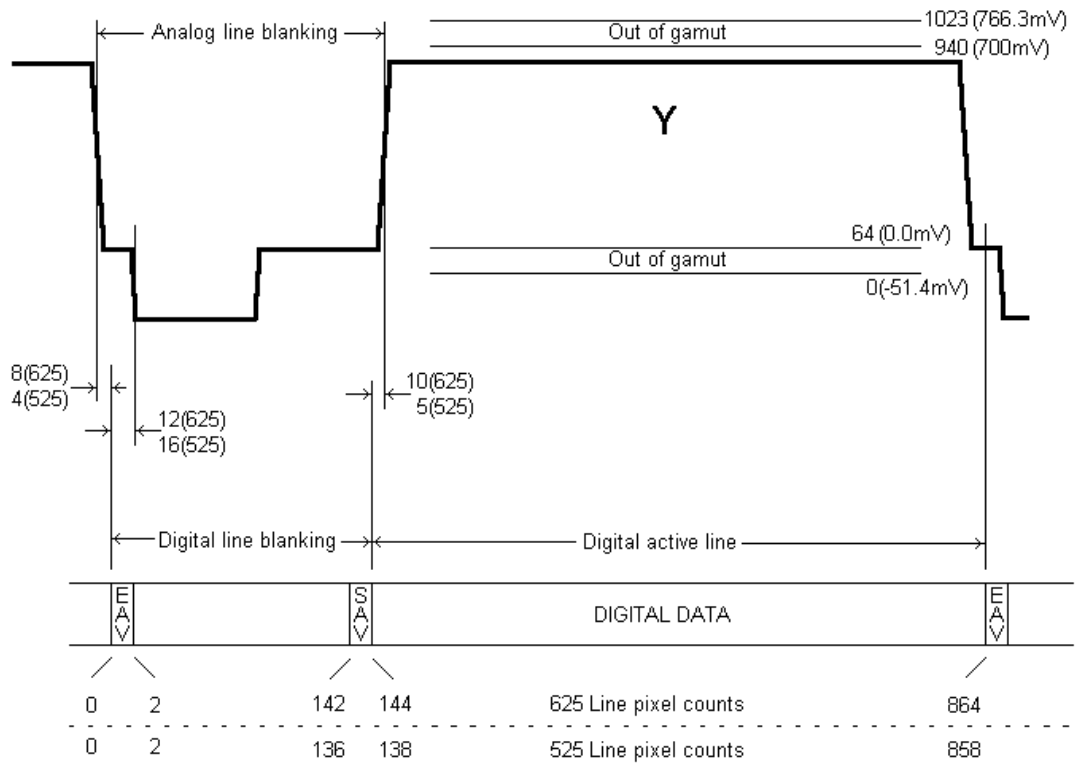


Fig 5.

## SERIAL DIGITAL BASICS

### SD SDI Field Blanking – 625

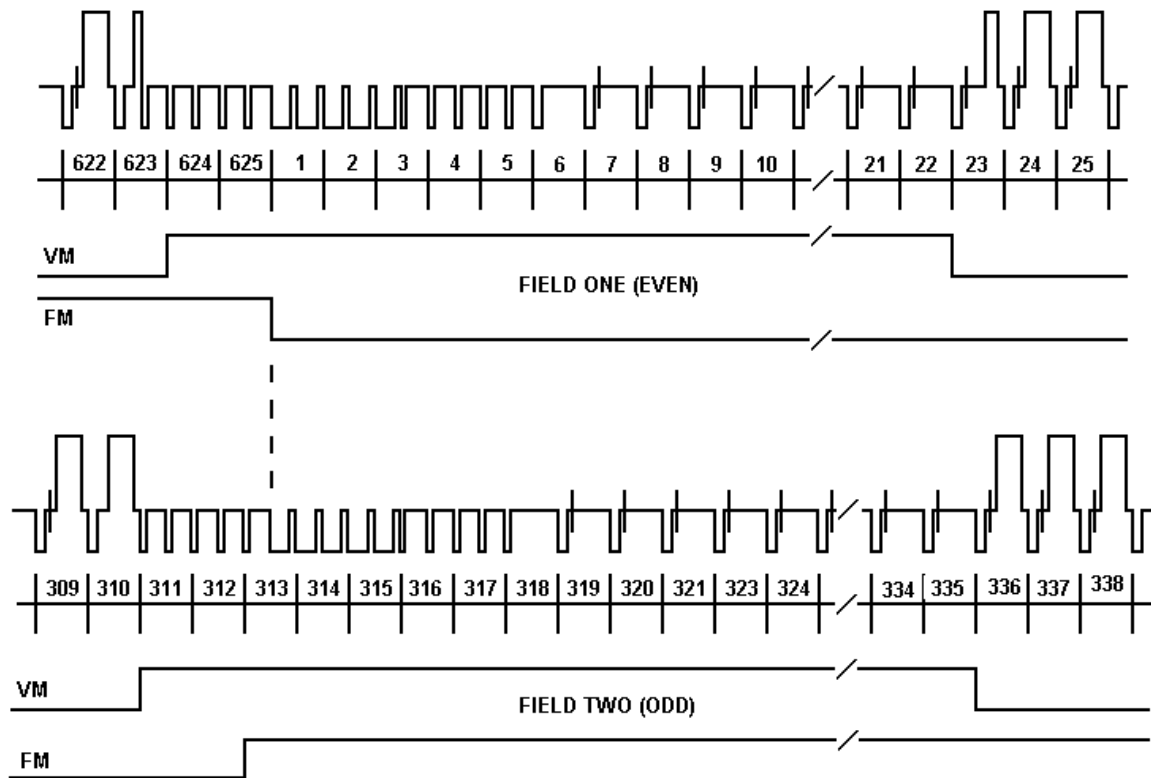


Fig 6 .



# SERIAL DIGITAL BASICS

## SD SDI Field Blanking – 525

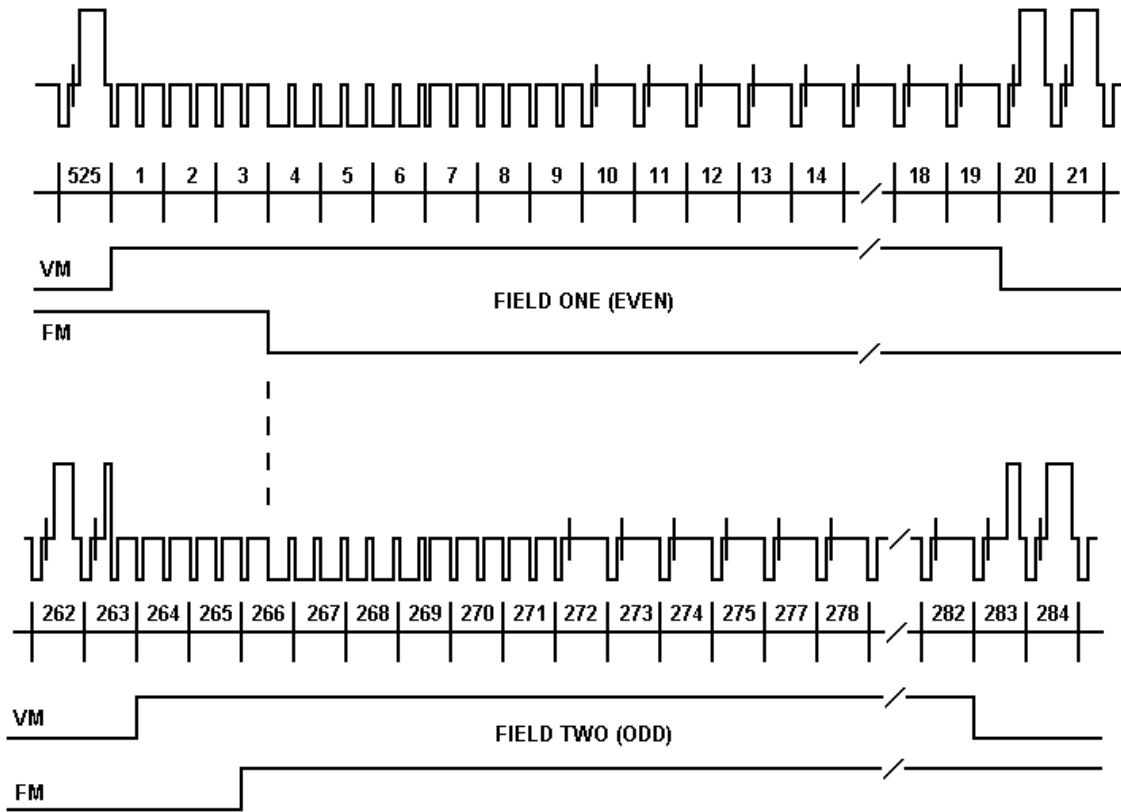


Fig 7 .

## USEFUL WEBSITES

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

## CONTACT DETAILS AND CUSTOMER SUPPORT

For any form of assistance in maintaining your Digi Gen, please contact:

Hamlet Video International Limited  
Maple House 11 Corinium Business Centre Raans Road Amersham Bucks HP6 6FB  
England  
Main Line: +44 (0)1494 729 728  
Fax Line: +44 (0)1494 723 237  
Free phone (UK) 0500 625 525  
E-mail: sales@hamlet.co.uk Web site: [www.hamlet.co.uk](http://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](http://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.