User Manual

Tektronix

TPG 20/21
Test Pattern Generator
SN GB20478 & Above

070-8938-02

First Edition: July 1997
Last Revised: February 1998

Printed in the U.S.A.

Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; or c) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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TPG20/21

Test Pattern Generator

Operator's Manual

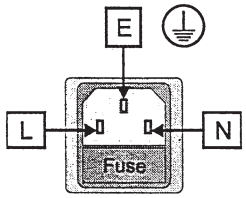
Snell & Wilcox Ltd, Durford Mill, Petersfield, Hampshire, GU31 5AZ, United Kingdom.
Tel: +44(0) 1730 821188. Fax: +44(0) 1730 821199.

Safety Warnings

Always ensure that the unit is properly earthed and power connections correctly made.

This equipment shall be supplied from a power system providing a **PROTECTIVE EARTH** ⏚ connection and having a neutral connection which can be reliably identified.

The power terminals of the IEC mains input connector on the rear panel are identified as shown below:



E = Protective Earth Conductor

N = Neutral Conductor

L = Live Conductor

Power cable supplied for countries other than the USA

The equipment is normally shipped with a power cable with a standard IEC moulded free socket on one end and a standard IEC moulded plug on the other. If you are required to remove the moulded mains supply plug, dispose of the plug immediately in a safe manner. The colour code for the lead is as follows:

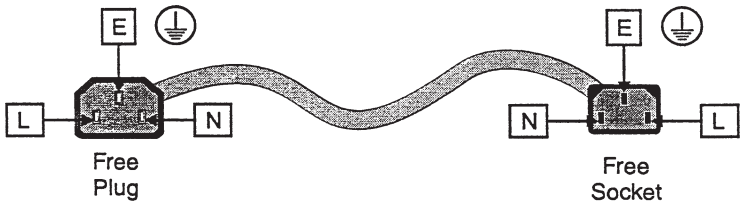
GREEN/YELLOW lead connected to E (Protective Earth Conductor)
BLUE lead connected to N (Neutral Conductor)
BROWN lead connected to L (Live Conductor)

Power cable supplied for the USA

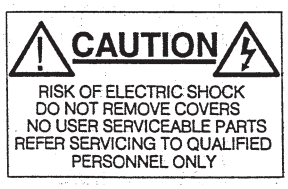
The equipment is shipped with a power cord with a standard IEC moulded free socket on one end and a standard 3-pin plug on the other. If you are required to remove the moulded mains supply plug, dispose of the plug immediately in a safe manner. The colour code for the lead is as follows:

GREEN lead connected to E (Protective Earth Conductor)
WHITE lead connected to N (Neutral Conductor)
BLACK lead connected to L (Live Conductor)

The terminals of the IEC mains supply lead are identified as shown opposite:



Note that for equipment that is not fitted with a mains power switch, to comply with BS60950 Clauses 1.7.2 and 2.6.9, the power outlet suppling power to the unit should be close to the unit and easily accessible.



⚠ Warnings ⚠

Voltages within this unit can be lethal under certain circumstances. Where power is required to be connected to the unit during servicing great care must be taken to avoid contact with these voltages.

Maintenance should only be carried out by suitably qualified personnel.

EMC Standards

This unit conforms to the following standards:

Electromagnetic Compatibility-Generic Immunity Standard BS EN 50082-1:1992

The European Standard EN 50082-1:1992 has the status of a British Standard and is related to European Council Directive 89/336/EEC dated 3rd May 1989.

Electromagnetic Compatibility-Generic Emission Standard BS EN 50081-1:1992

The European Standard EN 50081-1:1992 has the status of a British Standard and is related to European Council Directive 89/336/EEC dated 3rd May 1989.

Safety Standards

This unit conforms to EN60950:1992 as ammended by ammendment A1(May 1993) and ammendment A2(March 1994). Specification for safety of technology equipment, including electrical business equipment.

EMC Performance of Cables and Connectors

Snell & Wilcox products are designed to meet or exceed the requirements of the appropriate European EMC standards. In order to achieve this performance in real installations it is essential to use cables and connectors with good EMC characteristics.

All signal connections (including remote control connections) shall be made with screened cables terminated in connectors having a metal shell. The cable screen shall have a large-area contact with the metal shell.

COAXIAL CABLES

Coaxial cables connections (particularly serial digital video connections) shall be made with high-quality double-screened coaxial cables such as Belden 8281 or BBC type PSF1/2M.

D-TYPE CONNECTORS

D-type connectors shall have metal shells making good RF contact with the cable screen. Connectors having "dimples" which improve the contact between the plug and socket shells, are recommended.

Software Version Number

TPG20 Software	Version 11.1
Waveform View Program Software	Version 3.1

Packing List

The unit is supplied in a dedicated packing carton provided by the manufacturer and should not be accepted if delivered in inferior or unauthorised materials. Carefully unpack the carton and check for any shipping damage or shortages.

Any shortages or damage should be reported to the supplier immediately.

Enclosures:

- TPG20/21 Test Pattern Generator
- Power cable
- Parallel Data Load Cable (Shielded 25 way D, 1.5 m long)
- Operator's Handbook

Table of Contents

SECTION

Manual Revision Record

Date	Version No.	Issue No.	Change	Comments
May 96	1	1		Existing Manual
030497	2	1	New graphic links added	
270597	2	2	0.3 Safety standard added 0.2 New warnings page added	New section 0
260697	2	3	View program version No. added	New section 0 issued
080797	2	4	0.4 Cable added to packing list & TPG Software Version No. added 3.1 25 way cable data added 3.18 Baud rate 19,200 added 3.19 Default Baud rate 19,200 added	New section 0 issued Pages 3.1, 3.18 and 3.19 issued Version 2, Issue 2

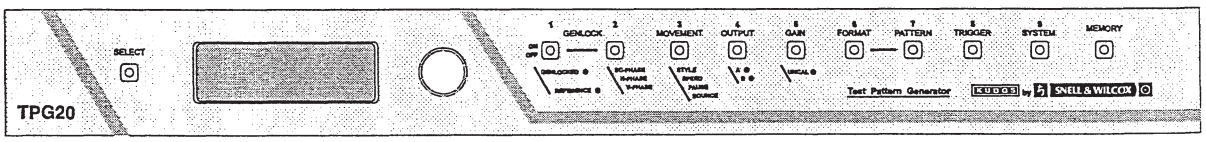
Description & Features

The TPG20 provides a complete source of digitally synthesised still & moving mathematically correct test patterns.
The Kudos TPG20 is a standard, format and hardware independent, programmable test pattern image generator. It can be instantly configured to supply ultra-precise test images with no drift or approximation in all current standards and formats as well as current and future standards and formats such as 16:9 and PALplus.

The TPG20s programmability means that the user can define custom patterns/images to aid in-depth analysis of new technology. There are more than 500 resident signals in the unit. It is the ideal tool for today's complex environments where it is necessary to assess technically, calibrate and quality-check increasingly complex new technologies such as digital VTRs, compression engines, aspect ratio converters and sophisticated decoders.

Features

- The only complete reference test source for multi-standard, multi-format environments
- Continuously expanding range of ultra high quality, mathematically generated precision test signals
- Currently approximately 500 patterns available as standard
- Patterns available in all broadcast standards and formats
- Line-based patterns, frame-based patterns, moving patterns and real pictures
- All composite test patterns are resident in their encoded form - zero encoding errors or drift
- Fully genlockable
- Outstandingly easy to use
- Output exceeds specification for testing CCIR 601 digital equipment
- Two complete frames of storage, allowing instant switching between patterns
- An unlimited number of patterns, including full-frame real images, may be downloaded from a PC
- Serial and parallel composite and component digital outputs
- Analogue composite, Y/C, YPbPr and GBR outputs
- 10-bit resolution on three independent channels
- Compatible with 16:9 aspect ratio, EDTV, PALplus standards and low bandwidth HDTV
- Format independent structure gives compatibility with future standards and patterns
- Kudos TPG20PP PALplus features (PALplus Patterns available on request):
- Full PALplus specification reference encoding to the White Book specification
- Vertical conversion from 4:3 to 16:9 letterbox picture
- Colour Plus processing with infra-frame HF luminance averaging
- Chrominance vertical pre-filtering
- 13.5MHz sampling rate composite PALplus, Y and C outputs with 10-bit quantisation scale
- Reference luminance and reference helper signals on lines 23 and 623
- Widescreen 16:9 pictures originated in 4:2:2 component format with 10-bit accuracy
- PALplus specific original test patterns in film mode and camera mode
- Import and subsequent PALplus encoding of any still or grabbed 4:2:2 picture



Description & Features

The TPG21 is a fully programmable test pattern generator with non-volatile memory for customised patterns, designed to be used in conjunction with Kudos Pattern Master software.

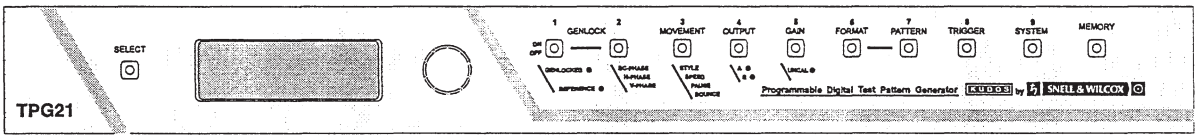
It delivers the same features and functionality as the Kudos TPG20, with the additional capability of downloading line, field and frame-based patterns as well as reference pictures to a non-volatile memory via the Kudos Pattern Master software. This eliminates the need to download patterns repeatedly from an external source and enables the user to customise the TPG21 generator in the most appropriate way for their application.

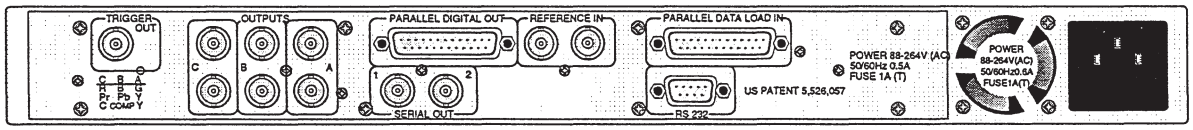
Features

The TPG21 offers the same performance and specification as the Kudos TPG20 with the addition of:

- 24 Megabits of flash PROM enabling patterns to be downloaded and stored easily via the Kudos
- Pattern Master software and computer interface
- Downloadable patterns are stored in non-volatile memory enabling user to define custom patterns
- and charts most appropriate to their application
- Instant programmability supplied via Kudos TPG Pattern Master software

Note: The Kudos TPG21 is not available as an upgrade option to the Kudos TPG20.





Specifications

Signal Inputs

Reference	Composite Video or Black Burst (loop-through)

Signal Outputs

Analogue	Component YPbPr, GBRS, Composite and Separated Y-C
Serial	2 sets of Serial Digital (Composite/Component)
Parallel	1 output (Composite/Component)
Trigger	1 output

Interfaces

Data In/Out	Parallel Centronics
Control	RS232

Front Panel Controls

Spinwheel Operated LCD Menu
Genlock
Genlock H,-V and Sc-Phase
Movement
Output A or B
Gain
Format
Pattern
Trigger
System
Memory

Specifications

Output Standard	625: PAL, D2, D1, YPbPr, GBR, & SECAM 525: NTSC, D2, D1, YPbPr, GBR
Bandwidth	6.5 MHz ±0.1 dB Typically 8.0 MHz ±0.1 dB
2 x Oversampling Filter	12-Bit 55 tap
Amplitude Accuracy	Better than 1%
Non-Linearity	Better than 1%
Differential Gain	Better than 0.75%
Differential Phase	Better than 0.75%
Differential Channel Delay	<3 ns between channels
Reference Subcarrier Stability	±1 ppm
Subcarrier Initial Setting Accuracy	±1 Hz (PAL) ±2 Hz (NTSC)
Sch Phase	0° ±3°
Genlock Crystal Stability	±5 ppm (PAL & NTSC) ±10 ppm (601, PAL-M & PAL-N)
Genlock Crystal Initial Setting Accuracy	±1 Hz (PAL) ±2 Hz (NTSC)
Genlock H-Jitter	<5 ns (PAL) <2 ns (NTSC)
Genlock Fsc Jitter	<1°
Reference Input Standard	525/625
Composite or Black Burst Reference Level	Standard level ±6 dB
Reference Input Return Loss	Better than 38 dB at 4.5 MHz

Specifications

Control Ranges

Genlock H-Phase	±½ Line (by pixel increments)
Genlock V-Phase	1 Frame in increments of 1 line
Genlock Subcarrier Phase	360° in increments of 1°
Moving Pattern Style	Horizontal, Vertical, Diagonal, Circular
Moving Pattern Speed	Pixel increments/field, field steps, frame steps, 3:2 pull-down, pause and bounce
Output	Select pattern A or B
Gain	+3 dB to -25 dB in increments of 0.1 dB
Format Select	625: PAL, D2, D1, YPbPr, GBR, & SECAM 525: NTSC, D2, D1, YPbPr, GBR
Pattern Select	Allows over 450 patterns to be selected
Trigger	0.5 V pulse, 1 H duration at any line position in up to 4 frames
System	Allows system variables to be set up, changed and saved
Memory	Up to 9 front panel settings may be stored

Power

Rated Voltage Range	90 V to 250 V 50/60 Hz A.C.
Consumption	75 VA maximum.

Mechanical

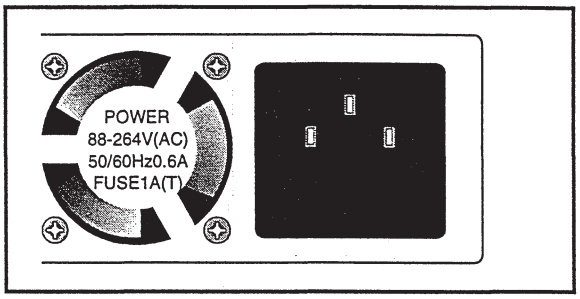
Temperature range	0 to 40°C Operating
Case Type	1U Rack Mounting
Dimensions	483mm x 456mm x 44.4mm (w,d,h)
Weight	7 kg

Operation

POWER CONNECTIONS

This is the mains power connector suitable for a standard IEC type power cable and contains a 1A(T) fuse. If a plug is fitted to the cable a fuse of 7A (Fast) should be installed.

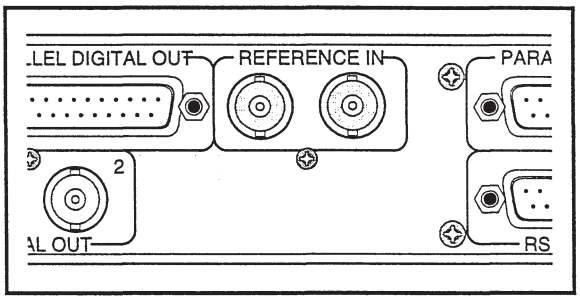
The Power On/Off switch is located behind the drop down front panel in the left hand corner.



INPUT CONNECTIONS

REFERENCE INPUT

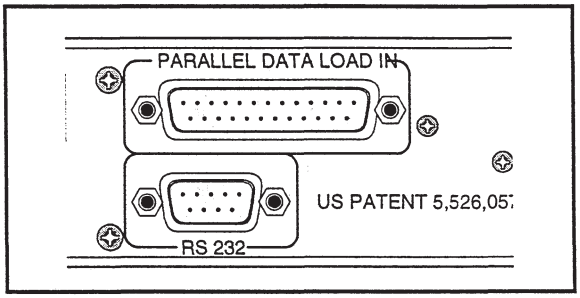
When a suitable signal is connected to this input, the output of the unit will be fully synchronised to this signal source. The signal may be black burst or standard composite video via loop through BNC connectors for 75 Ohms. If no signal is present the unit will automatically revert to internal SPG operation.



PARALLEL DATA LOAD INPUT

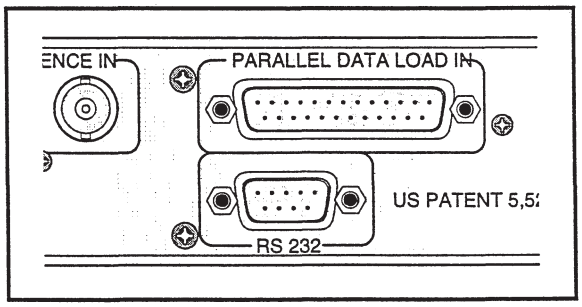
This 25 way female D connector is the interface port to the computer that allows patterns to be loaded into the TPG20. (Standard Centronics connector)

WARNING
The unit is supplied with a 1.5 m, shielded, 25 way interface cable and it is recommended that only this cable be used.
If any other type of cable is used (e.g. unshielded, twisted, flat or over 2m long) problems may be encountered.
Note that only compatible files are allowed to be loaded.



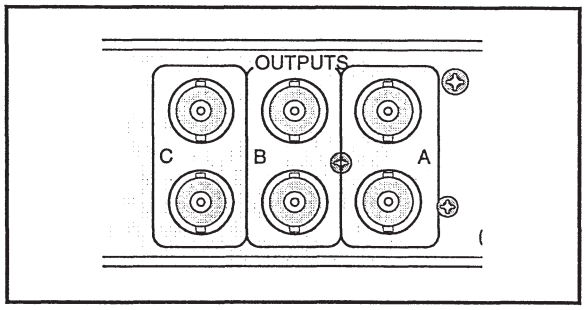
RS232 REMOTE

The TPG20 preset memory locations may be recalled via this interface port. See `Remote Control Commands'



Operation

OUTPUT CONNECTIONS



ANALOGUE

Analogue outputs are made available via three pairs of BNC connectors and the pairs are marked A, B, and C. Each socket of the pair provides an isolated output of the signal and outputs signals appropriate to the pattern loaded.

COMPOSITE

Two isolated composite outputs are available from the B pair of BNC connectors. Output level is standard 1V p-p into 75 Ohms.

Y-C SEPARATED OUTPUTS

Two isolated Y-C (S-VHS/Hi-8) output signals are available from the A and C pairs of BNC connectors

A connectors	Y output. Level is a nominal 1V p-p into 75 Ohms
C connectors	C output. Level is a nominal 0.3V p-p colour burst into 75 Ohms

COMPONENT OUTPUT

Two isolated outputs of component signals YPbPr at EBU, Betacam or M11 levels are available from the A, B and C pairs of BNC connectors. Nominal EBU output levels for 100% colour bars into 75 Ohms are as follows:-

A connectors	Y signal 1V p-p
B connectors	Pb(U) signal 0.7V p-p
C connectors	Pr (V) signal 0.7V p-p

RGB OUTPUT

Two isolated outputs of analogue Red, Green, and Blue signals are available from the A, B and C pairs of BNC connectors.

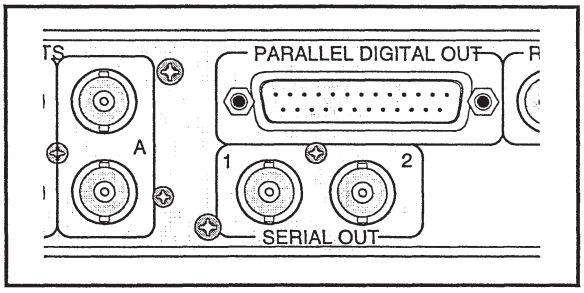
A connectors	Green signal 0.7V p-p + 0.3V p-p syncs into 75 Ohms
B connectors	Blue signal 0.7V p-p + 0.3V p-p syncs into 75 Ohms
C connectors	Red signal 0.7V p-p + 0.3Vp-p syncs into 75 Ohms

Operation

DIGITAL OUTPUTS

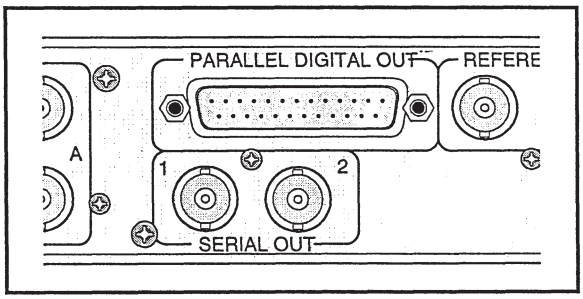
SERIAL 1 & 2

Two isolated outputs are available from these BNC connectors at standard level. Output may be composite or component depending on the format selected.(D1, D2/D3)



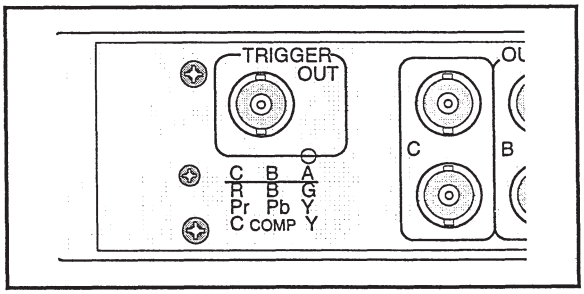
PARALLEL

One output of digital parallel is available from this 25 way D connector conforming to format selected. Output may be composite or component depending on the format selected. (D1, D2 and D3)



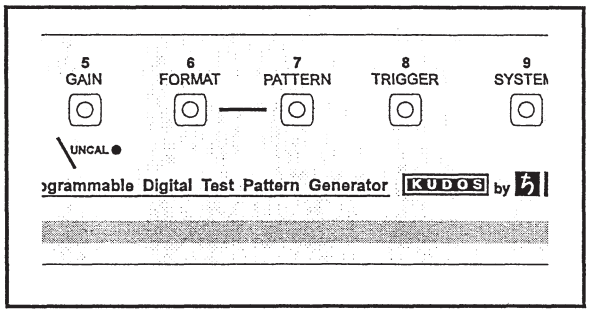
TRIGGER OUTPUT

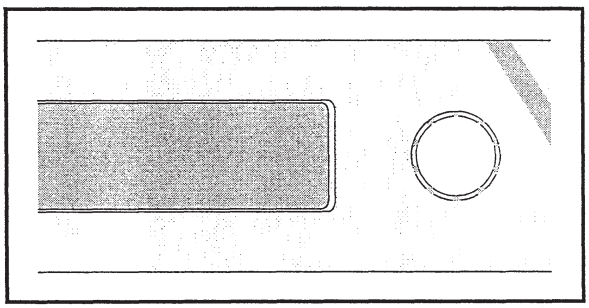
A trigger output is available on a BNC connector and supplies a 0.5V negative going pulse (from +0.5V to 0V) into 75 Ohms and has a duration of 1 TV Line. It may be programmed to correspond to any TV line in a frame or colour frame. This trigger pulse may be used to trigger an oscilloscope etc. so that a line waveform may be easily displayed and analysed.



Operation

FRONT PANEL CONTROLS





General Mode of Operation

The TPG20 is operated by two basic methods:-

1. By operating illuminated push buttons
2. By use of a continually rotating knob connected to a optical digital shaft encoder which allows alpha numeric data to be shown in a Liquid Crystal display. This will be referred to hereafter as the `CRK' It may be rotated in either direction

When certain parameters (such as SC-PHASE) are being set using this control, the number will increment in the least significant steps. However the numerical value displayed will increase at a rate proportional to the speed that the knob is rotated. i.e. when the knob is rotated slowly the number will increase by least significant steps and when rotated quickly the number will increase by greater steps.

When the maximum limit of the range is reached (clockwise rotation) the number will restart at the minimum value and then increase again. When the minimum limit of the range is reached (anticlockwise rotation) the number will restart at the maximum value and then reduce again.

This system allows large changes in values to be made with ease while maintaining maximum resolution.

NOTE that if a button is pressed that expects a subsequent action to be performed, and no action is taken, the LED indication will be extinguished and the unit will default to the condition before the button was pressed after approximately 30 seconds.

To CANCEL an illuminated button, press the button again so that the LED is extinguished.

NOTE that some functions may require a button to pressed a number of times to de-activate the function. However, at any time the SELECT or any other button may be pressed to de-activate the current button and select a new function.

Operation

OPERATION FROM SWITCH-ON

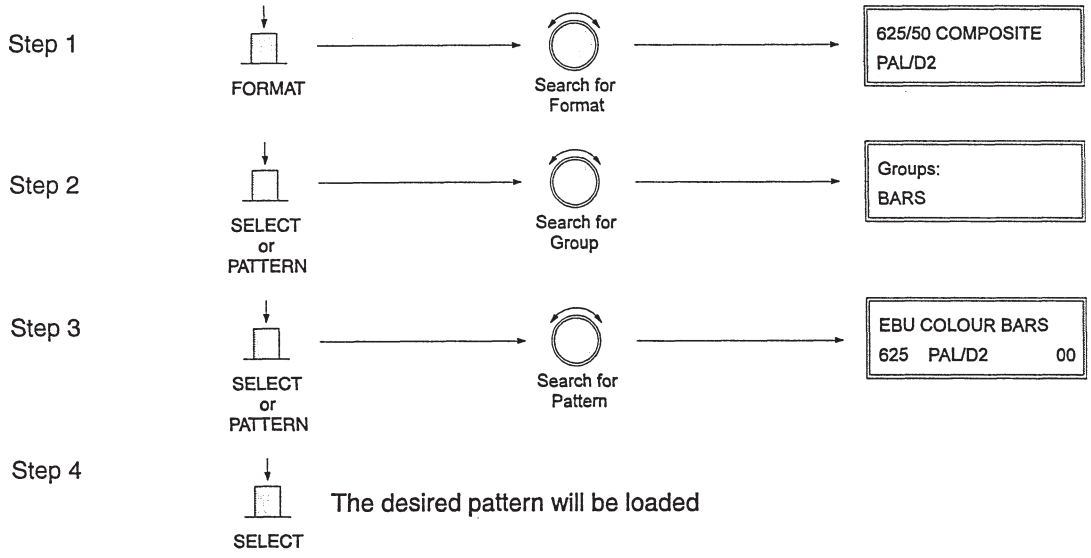
When first switched on the unit will output the pattern and the setup that was last loaded. Normally the unit will leave the factory with the following pattern loaded:-

EBU Colour Bars, 625 line 50Hz (Europe) SMPTE Colour bars, 525 line 60Hz (USA)

The pattern type and its parameters will be shown in the LCD window, and the number in the right hand lower corner will correspond to the number assigned to that pattern. (see `Numerical Listings of Patterns' for details)

TO SELECT A PARTICULAR PATTERN

The basic procedure is as follows:



Operation

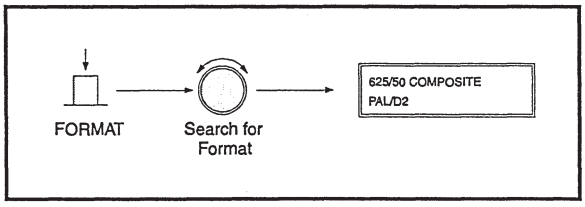
DETAILED PROCEDURE FOR SELECTING A PARTICULAR PATTERN

FORMAT select

This button allows the FORMAT of the pattern to be set.

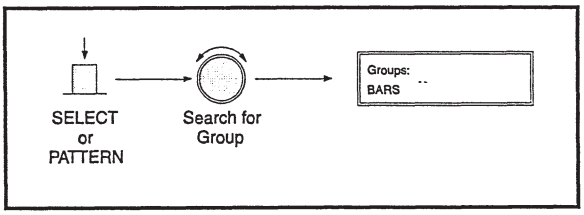
When this button is pressed it will become illuminated green and the LCD will display the current pattern format. e.g. 625/50 etc.

The CRK may now be rotated and the LCD will show alternative formats
e.g. 625 D1, SECAM Y/C etc. and should be left showing the desired format.



PATTERN/SELECT

Either the PATTERN or SELECT button may be pressed and the LCD window will display the GROUP of patterns available.

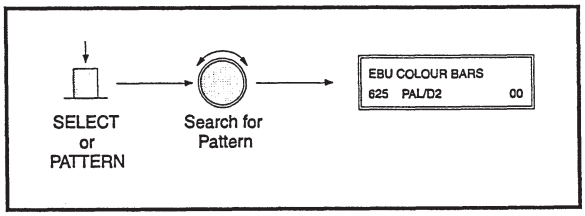


GROUP:

By rotating the CRK the various groups may be displayed:

BARS
FLAT FIELDS
MONITOR SETUP
LINEARITY
PULSES
SWEEPS
TIMINGS
TEST LINES
OTHERS

Either the PATTERN or SELECT button should be pressed andthe type of pattern and its assigned number will be shown in the LCD
e.g. EBU COLOUR BARS
625/50 PAL/D2 00



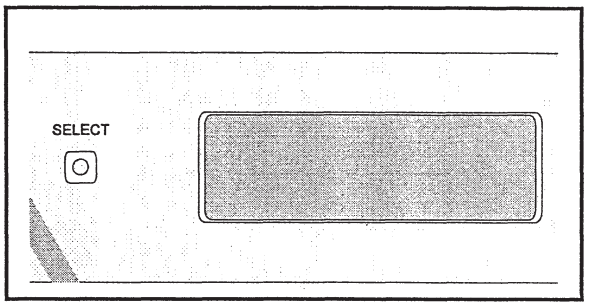
The CRK may now be rotated and the alternative patterns available will be shown in the LCD.

NOTE that the actual patterns available will depend on the format of the pattern.

The CRK should be left in the position when the desired pattern is shown in the LCD.

Operation

SELECT



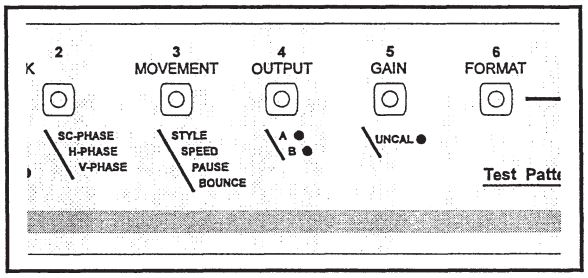
The SELECT button will allow whatever parameter is shown in the LCD to be selected.

The LED indicator in this button will flash while the parameter is being selected as in the previous steps. When the desired parameter has been found and is displayed in the LCD, the SELECT button should be pressed and the parameter will be loaded as indicated in the LCD. The button will now cease flashing.

NOTE that when selecting a pattern the new pattern will, (after loading), appear as an output signal associated with the output in use and the previously selected pattern will be stored in the other output store.(see below OUTPUT Select)

SPECIFIC BUTTON FUNCTIONS

OUTPUT Select



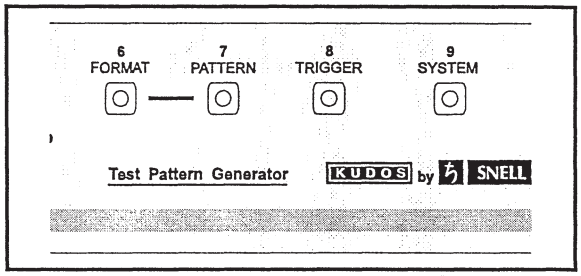
The TPG20 has two completely separate memory banks and each bank can store a full frame pattern. Either of the stored patterns (which may be of different formats) can be accessed and made to appear at the output connectors by operating the OUTPUT select button. The storage banks are designated Output A and Output B and can be selected by operating the toggle action OUTPUT button. This button will be illuminated green when bank A is in use and will be illuminated red when bank B is in use. Press this button to change from bank A to bank B.

NOTE

If a pattern containing movement has been selected it will occupy both A and B memory banks so that only the one pattern will be available.

Operation

TRIGGER Select



Pressing this button allows the trigger pulse position (which is timed to correspond to a particular TV line within a picture frame) to be repositioned.

When a Composite PAL pattern is selected, any line in any or all of the 4 frames of the 8-field sequence may be chosen.

When a Composite NTSC pattern is selected, any line in any or all of the 2 frames of the 4-field sequence may be chosen.

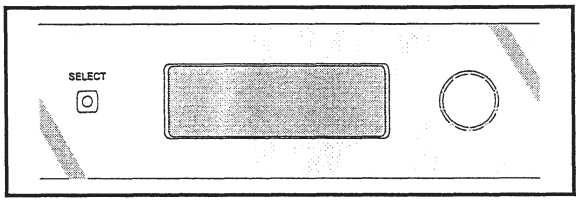
It can be used to trigger, for example, an oscilloscope to enable a particular line to be displayed and easily analysed.

When pressed the button will be illuminated and the LCD will indicate on which frame, or All Frames, that the trigger pulse is being generated.

e.g. SCOPE TRIGGER
FRAME 1

To change the frame number the TRIGGER button should be pressed again until the desired frame number is indicated.

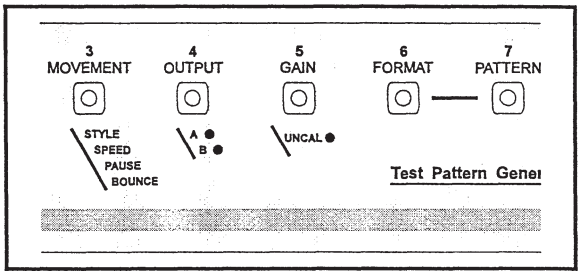
To change the line number the CRK should be rotated until the desired line number is indicated.



The SELECT button may then be pressed and the desired trigger pulse will appear at the Trigger Pulse connector.

Operation

GAIN

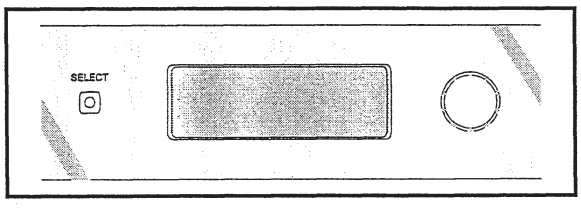


This function allows the overall amplitude of all the generated ANALOGUE signals to be changed from standard level (0dB) to the level desired.

For example if the 0dB level for a particular pattern is 1V p-p (0.7V video and 0.3V syncs) and the GAIN function is reset to -6dB, the output signal amplitude will become 0.5V p-p (0.35V video and 0.15v syncs)

To enable this function the GAIN button should be pressed and the button will be illuminated. The LCD will then show the output level in dB.

e.g. GAIN:
0.0dB.



To change the output level the CRK should be rotated until the desired output level is displayed. The level now set will be the new amplitude of the output signal. The gain setting will change in 0.1dB steps as the CRK is rotated with limits of -20dB to +3db.

When the desired setting is reached it may be stored by pressing the SELECT button.

Note that when the GAIN is changed from the default condition (0dB) the UNCAL LED next to the GAIN button will become illuminated to indicate that the unit is in the UNCALibrated mode.

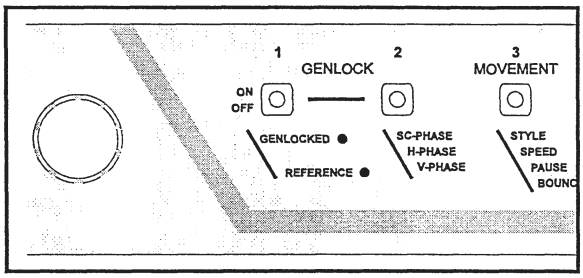
To return to the 0dB setting the GAIN button should be pressed twice.

Operation

GENLOCK FACILITIES

REFERENCE

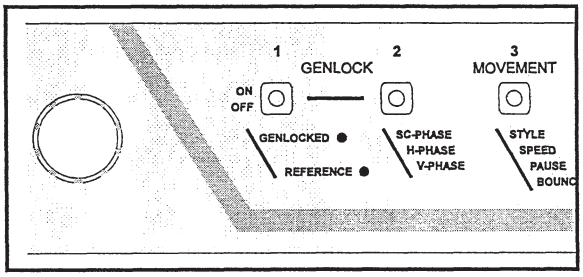
Note that when the unit is not receiving an external reference signal the unit will be locked to an internal high stability crystal source (if fitted) and the REFERENCE LED will be illuminated if an appropriate Reference crystal is fitted.



ON/OFF

When it is required to genlock the unit to an external reference the appropriate reference signal should be connected to the REFERENCE INPUT
(see Section 3 `INPUT CONNECTIONS')

The GENLOCK ON/OFF button should then be pushed and the LED in this button will then be illuminated.



If a composite pattern has been selected the display window will offer the options of either SC (subcarrier) lock or SYNC lock and these options may be selected by rotating the CRK.

If a component pattern has been selected the display window will offer SYNC lock only.

If a composite pattern has been selected, the SC lock option should normally be selected as this will give the most accurate lock with minimum jitter. The unit will then genlock to the reference input vertical sync, horizontal sync, subcarrier frequency/phase and also to the colour framing sequence.

This assumes that the reference input is similar to a broadcast specification signal and has a fixed Sc/H relationship and a correct colour framing sequence; if, however, the reference signal does not have a fixed Sc/H relationship and/or an incorrect colour framing sequence, the SYNC lock option should be chosen.

This is because the unit will not be able to extract enough information from the reference signal to allow correct genlock to be achieved. Under these conditions the unit will genlock to the reference signal vertical sync and horizontal sync only.
The output signal will, however, have a correct Sc/H relationship and correct colour framing sequence.

Operation

Generally, the SC lock option should be used whenever possible and the SYNC lock option should only used when the reference signal quality is insufficient to allow the unit to successfully genlock or the reference signal is a monochrome signal. The green GENLOCKED LED will now flash while the unit is locking up and when genlocked will remain illuminated.

NOTE

When the SC lock option is selected for genlocking to composite reference signals the unit can take up to 20 seconds to achieve lock. This is quite normal. When the SYNC lock option is selected lock will be achieved within 2 seconds.

If the reference signal is not available or is not an appropriate signal source the LED will continue to flash.

To change the timing parameters the button marked

SC-PHASE/H-PHASE/V-PHASE

should be pressed and will become illuminated.

When the button is pressed for the first time this will allow the Subcarrier phasing between the reference and the output to be changed and the LCD will show

SC-Phase: 0 (in degrees)

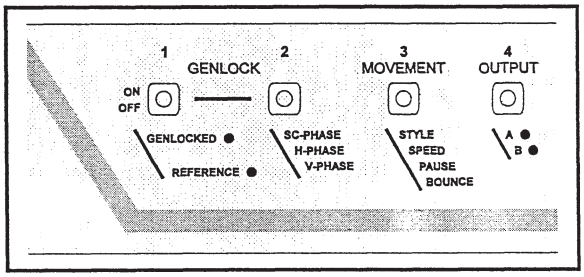
(normal default setting; to change default settings see SYSTEM setup)

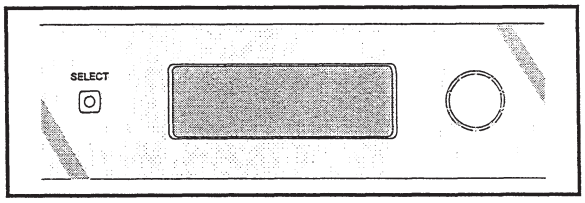
The CRK can now be rotated until the desired setting (shown in degrees) is displayed or the desired result is obtained.

Operating the button a second time allows the H-PHASE or horizontal/Sync timing to be changed from the default settings and the LCD will show
H-Phase 0ns

The CRK may now be rotated until the desired setting (shown in ns) is displayed or the desired result obtained.

When the button is pressed a third time it will allow the V-PHASE or vertical Sync timing to be changed from the default settings and the LCD will show
V-Phase Line 1





The CRK may now be rotated until the desired setting (shown in number of TV lines) is displayed or the desired result obtained.

NOTE

If the unit is already genlocked to an external reference signal using the SC lock option and the H-Phase or V phase setting changed, the unit will lose lock with the reference signal. This will occur because the correct colour framing sequence will have been lost. The unit will then re-lock within 20 seconds.

Operation

FURTHER NOTES CONCERNING GENLOCK OPERATION

ScH Relationship

The output signal of the TPG will always have a 0°ScH relationship. i.e. the first cycle of extrapolated subcarrier in the first field of the 8-field sequence, will start to rise from zero after an integer number of cycles of subcarrier from the HAD point of the leading edge of the horizontal sync pulse.

This condition will be true even when the unit is genlocked to a reference signal that has a ScH relationship other than 0°.

Genlocking

When the TPG is asked to genlock to a reference signal in the SC LOCK mode, the system computes the reference signal colour framing sequence (based on the ScH definition given above) and uses this information to set the output signal colour framing sequence. Output colour framing will always be correct regardless of the input ScH relationship. However, if the reference input ScH relationship is close to +90° or -90°, the unit will experience difficulty computing the colour framing sequence and a reference-to-output signal colour framing error may occur. The output signal will maintain a correct colour framing sequence even under these conditions.

When considering the subcarrier genlock functions, it may be helpful to consider the genlock variables in terms of coarse and fine, as opposed to degrees of subcarrier, us and lines. If the subcarrier phase is altered, the horizontal position will alter as a consequence, ultimately changing the selected vertical phasing. The unit will display degrees, us and lines, since when a genlock system is being set up, it would be normal to use a vector scope (displaying degrees of offset) to set the subcarrier phasing, and an oscilloscope (displaying µs, ns etc.) to set up the horizontal and vertical phasing.

To avoid the genlocked line number changing when the subcarrier phasing or the horizontal phasing is changed, various limits and modes of operation have been incorporated into the function of the genlock as described below.

Subcarrier Phasing Adjustment

When the SC-Phase function is selected (unit genlocked in the SC LOCK mode) the subcarrier phasing between the reference signal and the output signal may be set within the range +180° and -179° (subject to any offset entered in the system `Subcarrier Offset Compensation') It should be noted that when the subcarrier phasing is changed the complete sync train of the output signal will move by a time corresponding the phase change introduced.

Horizontal Phasing (unit genlocked in the SC LOCK mode)

The horizontal phasing moves in steps of 1 cycle of subcarrier, across the line. The number of ns displayed in the LCD when adjusting horizontal phasing is the total H-Phase position, taking into account the required subcarrier phasing, i.e. when 0° phase is required, then the horizontal phasing displayed will increment in steps of 225ns for PAL and steps of 279ns for NTSC, with no offset. If, however a subcarrier phasing offset is required, then this offset is converted to equivalent ns of horizontal delay and added to the displayed number.

Operation

Under normal circumstances line number boundaries occur at the HAD point on the leading edge of sync, but in the TPG genlock system an artificial line boundary is incorporated at approximately half way across the line for two reasons:-

1) When changing the horizontal phasing, (advance and delay) the vertical genlock position should appear to remain unchanged.

2) Both NTSC and PAL have a non-integer number of cycles of subcarrier in a line, so if the normal method of line numbering were to be adopted (and the vertical phasing was not changed), as the horizontal phasing crossed the leading edge of sync then a horizontal movement corresponding to a non-integer number of subcarrier cycles would have to occur as the 0ns horizontal phasing position was crossed.
Vertical Phasing

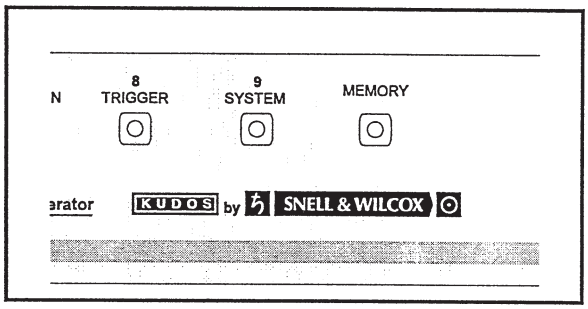
The vertical phasing control moves the genlocked position in integer numbers of TV lines. This results in the following phenomenon:-

1) The apparent subcarrier phasing as viewed on an externally locked Vectorscope will change by 180° for each change of 1 line for NTSC, since there are 227.5 cycles of sub carrier per line. This maintains the same relative position between the reference sync edge and output sync edge.

2) For PAL a slightly more complex effect occurs. The apparent subcarrier offset as indicated by a vectorscope will change by -89.42° for each line delay of vertical genlock position and not 90°. This is because there are 283.75161129 cycles of subcarrier per line and not exactly 283.75 cycles. The extra 0.00161129 of a cycle occurs because of the non orthogonal sampling structure of PAL, and is made up of the half a cycle of subcarrier gained across 1 field of a PAL signal.

Operation

MEMORY



Operating the button marked MEMORY allows the settings of any parameters set up by any of the front panel controls to be memorised and stored in up to 9 locations.

To store the settings set up by the front panel controls press the MEMORY button (after setting the desired parameters using the front panel controls) and the button will be illuminated. Decide on a desired location (Numbered 1 to 9 inclusive above the front panel buttons) press and hold down until all button LED's are extinguished. The settings will now be stored in that location.

To RECALL settings stored in a location, three methods may be used.

1. Press the MEMORY button and then press the button number corresponding to the location required. All the stored settings will now be recalled and the parameters will be changed to the stored values.

2. Press a memory button. All the buttons will become illuminated. The CRK may now be rotated. The patterns stored in memory will now be shown in the display and its memory location will be indicated by the appropriate button flashing on and off. Pressing this button will then select the pattern shown in the display window.
This method allows previewing of the patterns stored in memory before selection using the CRK to scroll through a list of stored patterns.

MOVEMENT (Patterns and Bounce)

When first pressed the window will display either Styles: (if a pattern capable of movement is selected)or Bounce Rate: (if two patterns of the same format are loaded into the A and B output memory banks)

The Movement function will then operate in the appropriate manner.

MOVEMENT

This function allows the parameters of a moving pattern to be defined. The parameters of the moving pattern that may be defined are the Style, Speed and Pause Timing and Mode. To define the parameters the MOVEMENT button should be pressed which will cause the LED to become illuminated. The LCD will now show STYLE and by rotating the CRK the desired style may be selected.

Operation

STYLE

The STYLE menu allows the type of movement for the pattern to be defined. NOTE that movement can only be applied to patterns configured to allow movement in defined areas. The different types of movement available are selected by rotating the CRK and are as follows:

Off
Horizontal (moves at constant speed)
Vertical (moves at constant speed)
Diagonal (moves at constant speed)Circular (moves at constant speed)
SHM Horizontal (moves at Sinusoidal speed)
SHM Vertical (moves at Sinusoidal speed)

Where SHM stands for Simple Harmonic Motion and the speed of movement follows a Sinusoidal function.

The MOVEMENT button should be pressed again and the LCD will now show SPEED and the desired speed may be selected by rotating the CRK to the desired setting.

SPEED

The SPEED menu allows the speed of the movement to be set. The speed is defined by increments of Pixels per field (if FIELD is selected in the MOVEMENT MODE Menu) or pixels per frame (if FRAME is selected in the MOVEMENT MODE Menu).

When the MOVEMENT button is pressed for the third time the PAUSE menu will be shown in the LCD.

PAUSE

The Pause time (in numbers of TV frames up to 255) is the time that the movement is inhibited at the end of its travel. This function is only available for the Vertical, Horizontal and Diagonal styles of movement.At the end of the Pause period the movement will then restart. Frames can be set to any number from 0 to 255 frames. When the MOVEMENT button is pressed for the fourth time the MOVEMENT MODE will be shown in the LCD.

MOVEMENT MODE

Rotating the CRK will enable the following movement modes to be selected:

Field	Movement increments in field steps
Frame	Movement increments in frame steps
3:2 Pull Down	Still for 3 fields then still for 2 fields then still for 3 fields etc. (Simulates film based material displayed at 60 Hz)

BOUNCE

A Bounce signal is a waveform that alternates from one pattern e.g. Black, to another e.g. White at a regular rate imitating a signal that has a continuously changing A.P.L. (Average Picture Level)This type of waveform is often used to check the correct operation of black level clamp circuits.

To produce a Bounce pattern, different patterns OF THE SAME FORMAT should be loaded into the A and B memory banks. (See `OUTPUT Select')

The MOVEMENT button should then be pressed and the window will display Bounce Rate:Off

Rotating the CRK will allow the rate at which the output alternates from pattern A in the memory bank to pattern B in the memory bank to be set. The fastest rate is every other frame. i.e. pattern A for one frame, pattern B for the next frame etc. The slowest rate is pattern A for 100 frames and pattern B for 100 frames. Any value between 1 and 100 frames, in 1 frame steps, may be set. Note that the bounce rate cannot be stored.

Operation

SYSTEM

When pressed the window will display

Set: D2 OutputParallel

Rotating the CRK will show the alternative display

Set: D2 OutputSerial

NOTE that either Parallel or Serial Digital outputs may be set but not both. This is because TRS (Timing Reference Signals) codes are inserted in Serial Data signals but not in Parallel Data signals.

SUBCARRIER OFFSET COMPENSATION

When the button is pressed again the window will display

Set: PAL Subcar Offset

or Set: NTSC Subcar Offset

depending on the output pattern format selected.

Rotating the CRK will allow the phase of the subcarrier at the output relative to the phase of the subcarrier at the reference input to be changed and set.

The factory default settings provide calibration to give 0 degree subcarrier offset between the actual output of the unit and the reference (loop-through) output. The offset may be varied by +179 degrees to -180 degrees, in steps of 1 degree.

This function may be used to compensate for the delay produced by cabling between the output of the unit and its final destination where the relative phase at that point is required to be displayed as zero or a particular fixed value.
This would normally be aligned using a dual channel Vectorscope at the destination of the reference and the video signal.

NOTE that this function is only available for PAL and NTSC patterns and offsets apply to all NTSC and PAL patterns. Offsets may be set independently for both NTSC and PAL formats.

When pressed a third time the window will display
Set: PAL Standard
System B/G (or System I)

By rotating the CRK either PAL Standard B/G or PAL Standard I may be displayed in the window. The SELECT button should then be pressed to select the desired PAL standard.

Note that the major difference between PAL B/G and PAL I standards is the rise and fall times of the sync and equalising pulses. See `Generalised Parameters of Waveforms' for more details.

When the SYSTEM button is pressed a fourth time the firmware version and the TPG model type will be displayed in the window.

SYSTEM (Calibration Mode)

Operation of this button allows the system variables to be set up, changed and saved.

Switch off power to the unit and wait for a few seconds. Press and hold down the SYSTEM button, switch on the power and release the after 3-4 seconds.

A pattern in the required format should now be loaded. The SELECT button should now be pressed. The system variables may now be set-up for the current format.

The window will display CalibrationSetup Mode It is important to note that once the system variables have been changed and saved, these values will be stored in a non-volatile memory and will be invoked when the unit is powered up again.

To change the system variables proceed as follows:-

GAIN CALIBRATION FOR FORMATS

Press the SYSTEM button once

The window will now display the first system variable that may be changed. e.g. Set:625 COMPS 0.0dB

NOTE This operation changes the values for the specified format only. To calibrate for any given format, a pattern of that format MUST be loaded first.

Operation

The SELECT button should then be pressed to select the desired PAL standard. Note that the major difference between PAL B/G and PAL I standards is the rise and fall times of the sync and equalising pulses. See `Generalised Parameters of Waveforms' for more details.

When the SYSTEM button is pressed a fourth time the firmware version and the TPG model type will be displayed in the window.

SYSTEM (Calibration Mode)

Operation of this button allows the system variables to be set up, changed and saved.

Switch off power to the unit and wait for a few seconds. Press and hold down the SYSTEM button, switch on the power and release the after 3-4 seconds.

A pattern in the required format should now be loaded. The SELECT button should now be pressed. The system variables may now be set-up for the current format.

The window will display CalibrationSetup Mode It is important to note that once the system variables have been changed and saved, these values will be stored in a non-volatile memory and will be invoked when the unit is powered up again.

To change the system variables proceed as follows:-

GAIN CALIBRATION FOR FORMATS

Press the SYSTEM button once

The window will now display the first system variable that may be changed. e.g. Set:625 COMPS 0.0dB

NOTE This operation changes the values for the specified format only. To calibrate for any given format, a pattern of that format MUST be loaded first.

The value can now be changed by rotating the CRK. Clockwise rotation increases the value and anti-clockwise rotation reduces the value. When the desired value has been reached the SELECT button should be pressed and that value will be loaded and saved in the units non-volatile memory and the window will display "Settings Saved". To select the next or another parameter, the SYSTEM button should be pressed until the desired variable is displayed in the window and the process repeated for that particular parameter.

Note that to cancel the setup function press any button that is not flashing.

The parameters that may be changed can be selected by successively pressing the SYSTEM button (progresses forward through the list) or the TRIGGER button (progresses backwards though the list) and are displayed (forward progression) in the following order:-

Signal level at the A output.

The absolute value of the signal level at the output is set against a highly accurate calibrated source at the factory.
This value is defined as 0dB relative to the pattern selected. e.g. a 625 PAL Composite waveform with 100% white will have a value of exactly 1V p-p (Video + Syncs) at 0dB setting measured at the A output.
The level may be changed within the limits of +3dB to -25dB in steps of 0.1dB. Default value is 0.0dB

Relative signal levels between the A and B outputs (offset)

NOTE that to correctly align the relative signal levels at the outputs, a pattern that would normally produce the same output level at both connectors should be selected. A suitable pattern would be one that contained a peak white signal in RGB format and the white section used for alignment.

The signal level at the B output relative to the A output (depending on the pattern selected) may be changed using this function. Default value will be the factory settings in arbitrary units.

Relative signal levels between the A and C outputs (offset)

NOTE that to correctly align the relative signal levels at the outputs, a pattern that would normally produce the same output level at both connectors should be selected. A suitable pattern would be one that contained a peak white signal in RGB format and the white section used for alignment.

The signal level at the C output relative to the A output (depending on the pattern selected) may be changed using this function. Default value will be the factory settings in arbitrary units.

Operation

RS232 Baud Rate

The Baud rate of the remote control facility may be set using this function. It may be set to the following values:- 300,600,1200,2400,4800, 9600 or 19,200. The factory setting is 19,200. Other parameters are fixed at 8 Bits data, no parity 1 stop Bit, and are not adjustable.

Crystal Selections

Note that this function is for information only. Under no circumstances should these parameters be changed as the unit will fail to operate correctly if they are changed and saved. Up to six Crystals may be installed in the unit depending on the type of unit supplied. For the unit to operate correctly the correct crystal values must be fitted for the type of unit supplied. The correct value of crystal required in the particular position will be displayed in the window indicating that this value has been factory installed. Note that not all crystals need to be fitted for the unit to operate correctly.

RETRIEVE FACTORY PRESETS

To retrieve the factory settings (which cannot be changed) proceed as follows:- Switch off power to the unit and wait for a few seconds. Press and hold down the SYSTEM button, switch on the power and release the after 3-4 seconds.

The window will display

CalibrationSetup Mode

Press the SYSTEM button repeatedly until the window displays

Set:FactoryPresets

Press the flashing SELECT button
The window will display

Set: FactoryPresets loaded

Press any non-illuminated button

Switch off power and wait for a few seconds.
Switch on power and operate as normal.
The unit will now have reverted to the original factory settings.

Operation

REMOTE CONTROL COMMANDS FOR THE TPG20M

The default speed setup is 19,200 bits/second, 8 bits data, 1 stop bit, no parity.

All commands begin with the ESCAPE character (0x1B HEX)
and is terminated by a RETURN character (0x0D HEX).

For example:
<ESC> T <RETURN>
toggles the between output frame A and B.

If the command is successful, the TPG20 will return "OK <RETURN>" or else it will return

"? <RETURN>".

1. <ESC> D n <RETURN>
Recalls Memory, where n is ASCII 1 to 9 (0x31 to 0x39 HEX). This function recalls hardware memories 1 to 9 from the TPG20.

2. <ESC> P n <RETURN>
Program memory, where n is ASCII 1 to 9. This function saves the current status of the machine into memories 1 to 9.

3. <ESC> T <RETURN>
This toggles between output frames A and B. No parameters required.

4. <ESC> B n <RETURN>
Set bounce rate, where n is "0" to "200". This command sets the bounce rate if available. In order for bounce to be available, both frames of memory must have the same pattern format.

5. <ESC> G n <RETURN>
Set genlock mode, where n is "0" - genlock off, "1" - H-lock and "2" - SC-lock.

6. <ESC> V n <RETURN>
Set vertical phase, where n is "1" to maximum number of lines in frame.

7. <ESC> H n <RETURN>
Set horizontal phase, where n is "0" to maximum line length time. Since the horizontal phase of the TPG20 can only move in whole samples, the actual position is rounded to the nearest sample.

8. <ESC> S n <RETURN>
Set Sub-carrier phase, where n is "-179" to "180". This sets the sub-carrier phase for SC-lock.

9. <ESC> M n <RETURN>
Set movement mode, where n is "0" - field movement, "1" - frame movement and "2" - 3:2 telecine mode.

10. <ESC> U n <RETURN>
Set movement pause, where n is "0" to "255" This sets the pause time for linear movement.

11. <ESC> R n <RETURN>
Set movement speed, where n is "0" to "10". This sets the movement speed in pixels and lines per field or frame dependent on the movement mode.

12. <ESC> Y n <RETURN>
Set movement style, where n is "0" - Off, "1"- vertical, "2" - horizontal, "3" - diagonal, "4" - circular, "5" - Horizontal SHM, "6" - Vertical SHM.

13. <ESC> C <RETURN>
Restores gain calibration. No parameters required.

14. <ESC> L f g nnn <RETURN>
Load internal pattern, where f is the format number:

"0" - PAL
"1" - 625 D1
"2" - 625 YPbPr
"3" - 625 RGB
"4" - SECAM
"5" - NTSC
"6" - 525 D1
"7" - 525 YPbPr
"8" - 525 RGB
"9" - NTSC4.43
"A" - PAL-M
"B" - PAL-N
"C" - USER-COMPOSITE
"D" - USER D1
"E" - USER YPbPr
"F" - USER RGB

g is the group number:
"0" - UNSPECIFIED
"1" - COLOUR BARS
"2" - FLAT FIELDS
"3" - MONITOR SETUP
"4" - LINEARITY
"5" - PULSES
"6" - SWEEPS
"7" - TIMING
"8" - TEST LINES
"9" - OTHERS/CHARTS

Operation

nnn is the internal index number of the pattern (shown on bottom right of front panel display).

For example:

To load 625 RGB EBU colours bars, the command sequence would be:

<ESC>L3100<RETURN>

15. <ESC> I n <RETURN>
Sets gain level, where n is a "0" to "4095". This sets the gain of the current frame. In calibration mode, this command can be used to set the default calibration levels.

16. <ESC> A n sss xxx <RETURN>
This starts a read sequence from a ROM device. "n" defines the slot number 0-4, "sss" defines the packet size 128, 256 or 512, and "xxx" defines the number of bytes to read. Note that the number of bytes to read must be exactly divisible by the packet size. Binary data of exactly the defined packet size is returned by the TPG with no headers.

17. <ESC a <RETURN>
This command prompts for the next read packet. Binary data of exactly the defined packet size is returned by the TPG with no headers. The TPG sends OK <RETURN> to signify end of read data.

18. <ESC> N x <RETURN>
This command is used to retrieve the pattern listing from a PROM slot. "x" defines the slot 0-4.
The returned data takes the form: F,G,XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX <RETURN>, where F is the format number, 0-F, G is the group number 0-9, and XXX.. is the 32 character pattern title.

19. <ESC> n <RETURN>
This prompts for the next pattern name. The TPG sends OK <RETURN> for end of list.

20. <ESC> J x <RETURN>
This retrieves the device types from the PROM slots. "x" defines the slot 0-4. The TPG returns the device type and its location.

21. <ESC> Z <RETURN>
This command instructs the TPG to perform a power-on reset. This should be performed whenever a FLASH device has been programmed and the pattern list changed.

Note the following (22 to 26 inclusive) are only valid when in factory or calibration mode. (TPG20 and TPG21)

22. <ESC> i <RETURN>
Save gain calibration level

23. <ESC> W n <RETURN>
Set DAC B offset, where n is "-1000" to "1000".

24. <ESC> w <RETURN>
Save DAC B offset value.

25. <ESC> X n <RETURN>
Set DAC C offset, where n is "-1000" to "1000".

26. <ESC> x <RETURN>
Save DAC C offset value.

Note that the following commands (27 to 29 inclusive) apply only to the TPG21.

27. <ESC> E n sss xxx <RETURN>
Start program sequence for FLASH PEROM where "n" is the slot position 0-4, "sss" is the sector size 128, 256 or 512, and xxx is the file size (this must not exceed 1048576 bytes). The TPG echoes OK <RETURN> when ready.

28. <ESC> e ...
Once the program sequence has been started, each packet of data is sent with this header. The exact number of bytes as specified by the sector size must follow immediately after the character "e". There is no <RETURN> character at the end of the packet.

29. <ESC> Q ...
This command is used to quit the programming sequence. The exact number of bytes as specified by the sector size must follow immediately after the character "Q". The data sent is ignored and therefore can be set to any value.

Pattern Information

625PAL/D2

BARS

00 EBU COLOUR BARS (100.0.75.0)	625 PAL/D2
01 100% COLOUR BARS (100.0.100.0)	625 PAL
02 100% COLOUR BARS (100.0.100.0)	625 D2
03 EBU BARS & RED (100.0.75.0)	625 PAL/D2
04 EBU SPLIT BARS (100.0.75.0)	625 PAL/D2
05 95% COLOUR BARS (100.0.95.0)	625 PAL/D2
06 TARTAN BARS (75.0.75.0)	625 PAL/D2
07 75% HORZ. BARS (75.0.75.0)	625 PAL/D2
08 100% HORZ. BARS (100.0.100.0)	625 PAL
09 100% HORZ. BARS (100.0.100.0)	625 D2
10 VIDIPLEX BARS (100.0.75.0)	625 PAL/D2
11 ANTIPAL BARS/RED (100.0.75.0)	625 PAL/D2
12 SATURATION TEST	625 PAL/D2

FLAT FIELDS

00 BLACK BURST	625 PAL/D2
01 BLACK BURST	625 PAL
02 BLACK BURST	625 PAL-I/D2
03 BLACK WITH VITS	625 PAL/D2
04 WHITE 100%	625 PAL/D2
05 GREY 50%	625 PAL/D2
06 YELLOW 75%	625 PAL/D2
07 CYAN 75%	625 PAL/D2
08 GREEN 75%	625 PAL/D2
09 MAGENTA 75%	625 PAL/D2
10 RED 75%	625 PAL/D2
11 BLUE 75%	625 PAL/D2

MONITOR SET-UP

00 CROSS HATCH	625 PAL/D2
01 CROSS HATCH/DOTS	625 PAL/D2
02 BLK CROSS HATCH	625 PAL/D2
03 BLK CRS/HTH/DOTS	625 PAL/D2
04 CROSS MATRIX	625 PAL/D2
05 EBU PLUGE 1-5	625 PAL/D2
06 100% WINDOW	625 PAL/D2
07 50% WINDOW	625 PAL/D2
08 15% WINDOW	625 PAL/D2

LINEARITY

00 RAMP 100%	625 PAL/D2
01 RAMP 120%	625 PAL/D2
02 MODULATED RAMP	625 PAL/D2
03 ULTRABLACK RAMP	625 PAL/D2
04 SHALLOW RAMPS	625 PAL/D2
05 100% VALID RAMP	625 PAL
06 100% VALID RAMP	625 D2
07 STAIRCASE - 5	625 PAL/D2
08 STAIRCASE - 10	625 PAL/D2
09 MOD/STAIRCASE 5	625 PAL/D2

PULSES

00 PULSE & BAR 2T	625 PAL/D2
01 SIN X/X	625 PAL/D2
02 MULTIPULSE 5.8	625 PAL/D2
03 COLOUR M-PULSE	625 PAL/D2

SWEEPS

00 MULTI-BURST 5.8	625 PAL/D2
01 MULTI-BURST 6.5	625 PAL/D2
02 HORZ. MULTIBURST	625 PAL/D2
03 LINE SWEEP 6.5	625 PAL/D2
04 LINE SWEEP 8.0	625 PAL/D2
05 COLOUR SWEEP	625 PAL/D2
06 YELLOW M-BURST	625 PAL/D2

TIMING

00 SQUARE FIELD	625 PAL/D2

TEST LINES

00 VITS 17	625 PAL/D2
01 VITS 18	625 PAL/D2
02 UK ITS-1 LINE 19	625 PAL/D2
03 UK ITS-2 LINE-20	625 PAL/D2
04 VITS 330	625 PAL/D2
05 VITS 331	625 PAL/D2

OTHERS

00 ZERO R-Y COLOURS	625 PAL/D2
01 ZERO G-Y COLOURS	625 PAL/D2
02 ZERO B-Y COLOURS	625 PAL/D2
03 ZERO COLOURS	625 PAL/D2
04 SDI CHECK FIELD	625 PAL/D2
05 AUTO-TEST MATRIX	625 PAL/D2
06 APL 12.5%	625 PAL/D2
07 APL 87.5%	625 PAL/D2
08 STREAK TEST	625 PAL/D2

NOTE

625 PAL/D2 refers to simultaneous outputs of Analogue and Digital signals.

625 D2 refers to output of Digital signal only.

625 PAL refers to output of Analogue signal only.

625 PAL-I/D2 refers to a signal conforming to PAL System I specifications.

Pattern Information

625D1/YPrPb

BARS (Note that all 10-bit patterns have embeded EDH codes)

00 EBU COLOUR BARS (100.0.75.0)	625 D1/YPrPb
01 EBU COLOUR BARS (100.0.75.0)	625 D110-BIT
02 100% COLOUR BARS (100.0.100.0)	625 D1/YPrPb
03 100% COLOUR BARS (100.0.100.0)	625 D110-BIT
04 EBU BARS & RED (100.0.75.0)	625 D1/YPrPb
05 EBU BARS & RED (100.0.75.0)	625 D110-BIT
06 EBU SPLIT BARS (100.0.75.0)	625 D1/YPrPb
07 TARTAN BARS (75.0.75.0)	625 D1/YPrPb
08 VIDIPLEX BARS (100.0.75.0)	625 D1/YPrPb
09 75% HORZ. BARS (75.0.75.0)	625 D1/YPrPb
10 100% HORZ. BARS (100.0.100.0)	625 D1/YPrPb

FLAT FIELDS

00 BLACK	625 D1/YPrPb
01 WHITE 100%	625 D1/YPrPb
02 GREY 50%	625 D1/YPrPb
03 YELLOW 75%	625 D1/YPrPb
04 CYAN 75%	625 D1/YPrPb
05 GREEN 75%	625 D1/YPrPb
06 MAGENTA 75%	625 D1/YPrPb
07 RED 75%	625 D1/YPrPb
08 BLUE 75%	625 D1/YPrPb

MONITOR SET-UP

00 CROSS HATCH	625 D1/YPrPb
01 CROSS HATCH/DOTS	625 D1/YPrPb
02 BLK CROSS HATCH	625 D1/YPrPb
03 BLK CRS/HTH/DOTS	625 D1/YPrPb
04 CROSS MATRIX	625 D1/YPrPb
05 EBU PLUGE 1-5	625 D1/YPrPb
06 EBU PLUGE 1-5	625 D110-BIT
07 100% WINDOW	625 D1/YPrPb
08 50% WINDOW	625 D1/YPrPb
09 15% WINDOW	625 D1/YPrPb

LINEARITY

00 RAMP 100%	625 D1/YPrPb
01 RAMP 100%	625 D110-BIT
02 RAMP 115%	625 D110-BIT
03 ULTRABLACK RAMP	625 D110-BIT
04 MODULATED RAMP	625 D1/YPrPb
05 MODULATED RAMP	625 D110-BIT
06 SHALLOW RAMPS	625 D1/YPrPb
07 SHALLOW RAMPS	625 D110-BIT
08 VALID RAMP	625 D1/YPrPb
09 VALID RAMP	625 D110-BIT
10 STAIRCASE-5	625 D1/YPrPb
11 STAIRCASE-5	625 D110-BIT
12 STAIRCASE-10	625 D1/YPrPb
13 STAIRCASE-10	625 D110-BIT
14 MOD/STAIRCASE 5	625 D1/YPrPb
15 MOD/STAIRCASE 5	625 D1 10-BIT

PULSES

00 PULSE & BAR 2T	625 D1/YPrPb
01 PULSE & BAR 2T	625 D1 10-BIT
02 PULSE & BAR 2T/4T/8T	625 D1/YPrPb
03 PULSE & BAR 2T/4T/8T	625 D1 10-BIT
04 PULSE-BAR 2T/4T/10T	625 D1/YPrPb
05 PULSE-BAR 2T/4T/10T	625 D1 10-BIT
06 SIN X/X	625 D1/YPrPb
07 SIN X/X	625 D1 10-BIT
08 MULTI-PULSE 5.8	625 D1/YPrPb
09 MULTI-PULSE 5.8	625 D1 10-BIT

SWEEPS

00 MULTI-BURST 5.75	625 D1/YPrPb
01 MULTI-BURST 5.75	625 D1 10-BIT
02 MULTI-BURST 5.8	625 D1/YPrPb
03 MULTI-BURST 5.8	625 D1 10-BIT
04 HORZ. MULTIBURST	625 D1/YPrPb
05 HORZ. MULTIBURST	625 D1 10-BIT
06 SWEEP 5.5/2.75	625 D1/YPrPb
07 SWEEP 5.5/2.75	625 D1 10-BIT

TIMING

00 BOWTIE (1ns RES)	625 D1/YPrPb
01 BOWTIE (1ns RES)	625 D1 10-BIT
02 BOWTIE (5ns RES)	625 D1/YPrPb
03 BOWTIE (5ns RES)	625 D1 10-BIT

TEST LINES

00 VITS 17	625 D1/YPrPb
01 VITS 17	625 D1 10-BIT
02 VITS 18	625 D1/YPrPb
03 VITS 18	625 D1 10-BIT
04 UK ITS-1 LINE 19	625 D1/YPrPb
05 UK ITS-1 LINE 19	625 D110-BIT
06 UK ITS-2 LINE 20	625 D1/YPrPb
07 UK ITS-2 LINE 20	625 D110-BIT
08 VITS 330	625 D1/YPrPb
09 VITS 330	625 D110-BIT
10 VITS 331	625 D1/YPrPb
11 VITS 331	625 D110-BIT
12 MULTI-VITS	625 D1/YPrPb
13 MULTI-VITS	625 D110 BIT

OTHERS

00 SDI EQU TEST	625 D110-BIT
01 SDI PLL TEST	625 D110-BIT
02 SDI CHECK FIELD	625 D110-BIT
03 BLANKING TEST	625 D110-BIT
04 AUTO-TEST MATRIX	625 D1/YPrPb
05 AUTO-TEST MATRIX	625 D110-BIT

Pattern Information

625YPrPb

BARS

00 EBU COLOUR BARS (100.0.75.0)	625 YPrPb
01 100% COLOUR BARS (100.0.100.0)	625 YPrPb
02 EBU BARS & RED (100.0.75.0)	625 YPrPb
03 EBU SPLIT BARS (100.0.75.0)	625 YPrPb
04 BETACAM BARS 75% (100.0.75.0)	625 YPrPb
05 TARTAN BARS (75.0.75.0)	625 YPrPb
06 VIDIPLEX BARS (100.0.75.0)	625 YPrPb
07 75% HORZ. BARS (75.0.75.0)	625 YPrPb
08 100% HORZ. BARS (100.0.100.0)	625 YPrPb

FLAT FIELDS

00 BLACK	625 YPrPb
01 WHITE 100%	625 YPrPb
02 GREY 50%	625 YPrPb
03 YELLOW 75%	625 YPrPb
04 CYAN 75%	625 YPrPb
05 GREEN 75%	625 YPrPb
06 MAGENTA 75%	625 YPrPb
07 RED 75%	625 YPrPb
08 BLUE 75%	625 YPrPb

MONITOR SET-UP

00 CROSS HATCH	625 YPrPb
01 CROSS HATCH/DOTS	625 YPrPb
02 BLK CROSS HATCH	625 YPrPb
03 BLK CRS/HTH/DOTS	625 YPrPb
04 CROSS MATRIX	625 YPrPb

LINEARITY

00 RAMP 100%	625 YPrPb
01 RAMP 120%	625 YPrPb
02 SHALLOW RAMPS	625 YPrPb
03 VALID RAMP	625 YPrPb
04 STAIRCASE-5	625 YPrPb
05 STAIRCASE-10	625 YPrPb

PULSES

00 PULSE & BAR 2T	625 YPrPb
01 PULSE & BAR 2T/4T/8T	625 YPrPb
02 PULSE-BAR 2T/4T/10T	625 YPrPb
03 SIN X/X	625 YPrPb
04 MULTI-PULSE 5.8	625 YPrPb

SWEEPS

00 MULTI-BURST 5.8	625 YPrPb
01 HORZ. MULTIBURST	625 YPrPb
02 SWEEP 5.5/2.75	625 YPrPb
03 SWEEP 8.0/4.0	625 YPrPb

TIMING

00 BOWTIE (5ns RES)	625 YPrPb
01 SQUARE FIELD	625 YPrPb

OTHERS

00 LUMA CORING	625 YPrPb
01 UV CORING	625 YPrPb
02 AUTO-TEST MATRIX	625 YPrPb

Pattern Information

625RGB

BARS

00 EBU COLOUR BARS (100.0.75.0)	625 RGB
01 EBU BARS NOSYNC (100.0.75.0)	625 RGB
02 100% COLOUR BARS (100.0.100.0)	625 RGB
03 EBU BARS & RED (100.0.75.0)	625 RGB
04 EBU SPLIT BARS (100.0.75.0)	625 RGB
05 TARTAN BARS (75.0.75.0)•	625 RGB
06 VIDIPLEX BARS (100.0.75.0)	625 RGB
07 75% HORZ. BARS (75.0.75.0)•	625 RGB
08 100% HORZ. BARS (100.0.100.0)	625 RGB

FLAT FIELDS

00 BLACK	625 RGB
01 WHITE 100%	625 RGB
02 GREY 50%	625 RGB
03 YELLOW 75%	625 RGB
04 CYAN 75%	625 RGB
05 GREEN 75%	625 RGB
06 MAGENTA 75%	625 RGB
07 RED 75%	625 RGB
08 BLUE 75%	625 RGB

MONITOR SET-UP

00 CROSS HATCH	625 RGB
01 CROSS HATCH/DOTS	625 RGB
02 BLK CROSS HATCH	625 RGB
03 BLK CRS/HTH/DOTS	625 RGB
04 CROSS MATRIX	625 RGB
05 GAMMA TEST	625 RGB
06 EBU PLUGE 1-5	625 RGB

LINEARITY

00 RAMP 100%	625 RGB
01 SHALLOW RAMPS	625 RGB
02 VALID RAMP	625 RGB
03 STAIRCASE-5	625 RGB
04 STAIRCASE-10	625 RGB

PULSES

00 PULSE & BAR 2T	625 RGB
01 SIN X/X	625 RGB
02 MULTIPULSE 5.8	625 RGB

SWEEPS

00 MULTI-BURST 5.8	625 RGB
01 HORZ. MULTIBURST	625 RGB
02 LINE SWEEP 8.0	625 RGB

TIMING

00 SQUARE FIELD	625 RGB

TEST LINES

00 VITS 17 NOSYNC	625 RGB

OTHERS

00 COMBINATION TEST	625 RGB

Pattern Information

625SECAM

BARS

00 EBU COLOUR BARS (100.0.75.0)	625 SECAM
01 EBU BARS / BOT'S (100.0.75.0)	625 SECAM
02 100% COLOUR BARS (100.0.100.0)	625 SECAM
03 100% BARS /BOT'S (100.0.100.0)	625 SECAM
04 EBU BARS & RED (100.0.75.0)	625 SECAM
05 EBU BARS/RED/BOT (100.0.75.0)	625 SECAM
06 EBU SPLIT BARS (100.0.75.0)	625 SECAM
07 TARTAN BARS (75.0.75.0)•	625 SECAM
08 25% COLOUR BARS	625 SECAM
09 75% HORZ. BARS	625 SECAM
10 SATURATION TEST	625 SECAM

FLAT FIELDS

00 BLACK	625 SECAM
01 WHITE 100%	625 SECAM
02 GREY 50%	625 SECAM
03 YELLOW 75%	625 SECAM
04 CYAN 75%	625 SECAM
05 GREEN 75%	625 SECAM
06 MAGENTA 75%	625 SECAM
07 RED 75%	625 SECAM
08 BLUE 75%	625 SECAM

MONITOR SET-UP

00 CROSS HATCH	625 SECAM
01 BLK CROSS HATCH	625 SECAM

LINEARITY

00 RAMP 100%•	625 SECAM
01 STAIRCASE-5	625 SECAM

SWEEPS

00 LINE SWEEP 3.5	625 SECAM

OTHERS

00 RED/CYAN RAINBOW	625 SECAM
01 BLUE/YEL RAINBOW	625 SECAM
02 MIXED RAINBOWS	625 SECAM
03 COMBINATION TEST	625 SECAM

Pattern Information

525NTSC/D2

BARS

00 SMPTE COLOR BARS (100.7.5.75.7.5)	525 NTSC/D2
01 SMPTE BARS (0% Set-up) (100.0.75.0)	525 NTSC/D2
02 FULL FIELD BARS (100.7.5.75.7.5)	525 NTSC/D2
03 F/FIELD BARS (0% Set-up)(100.0.75.0	525 NTSC/D2
04 100% COLOR BARS (100.7.5.100.7.5)	525 NTSC/D2
05 100% BARS (0% Set-up) (100.0.75.0)	525 NTSC/D2
06 BARS & RED (100.7.5.75.7.5)	525 NTSC/D2
07 BARS & RED (0% Set-up) (100.0.75.0)	525 NTSC/D2
08 SPLIT BARS (100.7.5.75.7.5)	525 NTSC/D2
09 SPLIT BARS (0% Set-up) (100.0.75.0)	525 NTSC/D2
10 TARTAN BARS (75.7.5.75.7.5)	525 NTSC/D2
11 TARTAN BARS (0% Set-up) (75.0.75.0)	525 NTSC/D2
12 75% HORZ. BARS (75.7.5.75.7.5)	525 NTSC/D2
13 75% HZ.BARS (0% Set-up) (75.0.75.0)	525 NTSC/D2
14 100% HORZ. BARS (100.7.5.100.7.5)	525 NTSC/D2
15 100% HZ.BARS(0% Set-up)(100.0.100.0)	525 NTSC/D2
16 VIDIPLEX BARS (100.7.5.75.7.5)	525 NTSC/D2
17 SATURATION TEST	525 NTSC/D2
18 SAT'N TEST (0% Set-up)	525 NTSC/D2

FLAT FIELDS

00 BLACK	525 NTSC/D2
01 BLACK (0% Set-up)	525 NTSC/D2
02 WHITE 100 IRE	525 NTSC/D2
03 GREY 50 IRE	525 NTSC/D2
04 YELLOW 75%	525 NTSC/D2
05 YELLOW 75% (0% Set-up)	525 NTSC/D2
06 CYAN 75%	525 NTSC/D2
07 CYAN 75% (0% Set-up)	525 NTSC/D2
08 GREEN 75%	525 NTSC/D2
09 GREEN 75% (0% Set-up)	525 NTSC/D2
10 MAGENTA 75%	525 NTSC/D2
11 MAGENTA 75% (0% Set-up)	525 NTSC/D2
12 RED 75%	525 NTSC/D2
13 RED 75% (0% Set-up)	525 NTSC/D2
14 BLUE 75%	525 NTSC/D2
15 BLUE 75% (0% Set-up)	525 NTSC/D2

MONITOR SET-UP

00 CROSS HATCH	525 NTSC/D2
01 CROSS HATCH/DOTS	525 NTSC/D2
02 CROSS HATCH/MRKR	525 NTSC/D2
03 BLK CROSS HATCH	525 NTSC/D2
04 BLK CRS/HTH/DOTS	525 NTSC/D2
05 BLK CRS/HTH/MRKR	525 NTSC/D2
06 CROSS MATRIX	525 NTSC/D2
07 100% WINDOW	525 NTSC/D2
08 50% WINDOW	525 NTSC/D2
09 15% WINDOW	525 NTSC/D2

LINEARITY

00 RAMP 100%	525 NTSC/D2
01 RAMP 120%	525 NTSC/D2
02 MODULATED RAMP	525 NTSC/D2
03 ULTRABLACK RAMP	525 NTSC/D2
04 SHALLOW RAMPS	525 NTSC/D2
05 VALID RAMP	525 NTSC/D2
06 STAIRCASE-5	525 NTSC/D2
07 STAIRCASE-10	525 NTSC/D2
08 MOD/STAIRCASE-5	525 NTSC/D2

PULSES

00 PULSE & BAR 2T	525 NTSC/D2
01 SIN X/X	525 NTSC/D2
02 MULTI-PULSE 5.8	525 NTSC/D2
03 MULTI-PULSE 4.2	525 NTSC/D2
04 COLOR MULTIPULSE	525 NTSC/D2

SWEEPS

00 MULTI-BURST 5.8	525 NTSC/D2
01 100% M-BURST 5.8	525 NTSC/D2
02 MULTI-BURST 4.2	525 NTSC/D2
03 HORZ. MULTIBURST	525 NTSC/D2
04 LINE SWEEP 6.5	525 NTSC/D2
05 COLOR SWEEP	525 NTSC/D2
06 YELLOW M-BURST	525 NTSC/D2

TIMING

00 SQUARE FIELD	525 NTSC/D2

TEST LINES

00 NTC-7 COMPOSITE	525 NTSC/D2
01 NTC-7 COMBINAT'N	525 NTSC/D2
02 FCC COMPOSITE	525 NTSC/D2
03 FCC MULTIBURST	525 NTSC/D2
04 VIRS	525 NTSC/D2

OTHERS

00 ZERO R-Y COLORS	525 NTSC/D2
01 ZERO G-Y COLORS	525 NTSC/D2
02 ZERO B-Y COLORS	525 NTSC/D2
03 SDI CHECK FIELD	525 NTSC/D2
04 AUTO-TEST MATRIX	525 NTSC/D2
05 APL 10%	525 NTSC/D2
06 APL 90%	525 NTSC/D2
07 STREAK TEST	525 NTSC/D2

Pattern Information

525D1YPrPb

BARS (Note that all 10-bit patterns have embeded EDH codes)

00 SMPTE COLOR BARS (100.0.75.0)	525 D1/YPrPb
01 SMPTE COLOR BARS (100.0.75.0)	525 D110-BIT
02 FULL FIELD BARS (100.0.75.0)	525 D1/YPrPb
03 FULL FIELD BARS (100.0.75.0)	525 D110-BIT
04 100% COLOR BARS (100.0.100.0)	525 D1/YPrPb
05 100% COLOR BARS (100.0.100.0)	525 D110-BIT
06 EBU BARS & RED (100.0.75.0)	525 D1/YPrPb
07 EBU BARS & RED (100.0.75.0)	525 D110-BIT
08 EBU SPLIT BARS (100.0.75.0)	525 D1/YPrPb
09 TARTAN BARS (75.0.75.0)	525 D1/YPrPb
10 VIDIPLEX BARS (100.0.75.0)	525 D1/YPrPb
11 75% HORZ. BARS (75.0.75.0)	525 D1/YPrPb
12 100% HORZ. BARS (100.0.100.0)	525 D1/YPrPb

FLAT FIELDS

00 BLACK	525 D1/YPrPb
01 WHITE 100%	525 D1/YPrPb
02 GREY 50%	525 D1/YPrPb
03 YELLOW 75%	525 D1/YPrPb
04 CYAN 75%	525 D1/YPrPb
05 GREEN 75%	525 D1/YPrPb
06 MAGENTA 75%	525 D1/YPrPb
07 RED 75%	525 D1/YPrPb
08 BLUE 75%	525 D1/YPrPb

MONITOR SET-UP

00 CROSS HATCH	525 D1/YPrPb
01 CROSS HATCH/DOTS	525 D1/YPrPb
02 CROSS HATCH/MRKR	525 D1/YPrPb
03 BLK CROSS HATCH	525 D1/YPrPb
04 BLK CRS/HTH/DOTS	525 D1/YPrPb
05 BLK CRS/HTH/MRKR	525 D1/YPrPb
06 CROSS MATRIX	525 D1/YPrPb
07 100% WINDOW	525 D1/YPrPb
08 50% WINDOW	525 D1/YPrPb
09 15% WINDOW	525 D1/YPrPb

LINEARITY

00 RAMP 100%	525 D1/YPrPb
01 RAMP 100%	525 D110-BIT
02 RAMP 115%	525 D110-BIT
03 MODULATED RAMP	525 D1/YPrPb
04 MODULATED RAMP	525 D110-BIT
05 ULTRABLACK RAMP	525 D110-BIT
06 SHALLOW RAMPS	525 D1/YPrPb
07 SHALLOW RAMPS	525 D110-BIT
08 VALID RAMP	525 D1/YPrPb
09 VALID RAMP	525 D110-BIT
10 STAIRCASE-5	525 D1/YPrPb
11 STAIRCASE-5	525 D110-BIT
12 STAIRCASE-10	525 D1/YPrPb
13 STAIRCASE-10	525 D110-BIT
14 MOD/STAIRCASE-5	525 D1/YPrPb
15 MOD/STAIRCASE-5	525 D1 10-BIT

PULSES

00 PULSE & BAR 2T	525 D1/YPrPb
01 PULSE & BAR 2T	525 D1 10-BIT
02 PULSE-BAR 2T/4T/10T	525 D1/YPrPb
03 PULSE-BAR 2T/4T/10T	525 D1/ 10BIT
04 SIN X/X	525 D1/YPrPb
05 SIN X/X	525 D1 10-BIT
06 MULTI-PULSE 4.2	525 D1/YPrPb
07 MULTI-PULSE 4.2	525 D1 10-BIT

SWEEPS

00 MULTI-BURST 5.8	525 D1/YPrPb
01 MULTI-BURST 5.8	525 D1 10-BIT
02 MULTI-BURST 4.2	525 D1/YPrPb
03 MULTI-BURST 4.2	525 D1 10-BIT
04 HORZ. MULTIBURST	525 D1/YPrPb
05 HORZ. MULTIBURST	525 D1 10-BIT
06 SWEEP 5.5/2.75	525 D1/YPrPb
07 SWEEP 5.5/2.75	525 D1 10-BIT

TIMING

00 BOWTIE (1ns RES)	525 D1/YPrPb
01 BOWTIE (1ns RES)	525 D1 10-BIT
02 BOWTIE (5ns RES)	525 D1/YPrPb
03 BOWTIE (5ns RES)	525 D1 10-BIT

TEST LINES

00 NTC-7 COMPOSITE	525 D1/YPrPb
01 NTC-7 COMPOSITE	525 D1 10-BIT
02 NTC-7 COMBINAT'N	525 D1/YPrPb
03 NTC-7 COMBINAT'N	525 D1 10-BIT
04 FCC COMPOSITE	525 D1/YPrPb
05 FCC COMPOSITE	525 D1 10-BIT
06 FCC MULTIBURST	525 D1/YPrPb
07 FCC MULTIBURST	525 D1 10-BIT
08 VIRS	525 D1/YPrPb
09 VIRS	525 D1 10-BIT

OTHERS

00 LUMA CORING	525 D1/YPrPb
01 UV CORING	525 D1/YPrPb
02 SDI EQU TEST	525 D1 10-BIT
03 SDI PLL TEST	525 D1 10-BIT
04 SDI CHECK FIELD	525 D1 10-BIT
05 BLANKING TEST	525 D1 10-BIT
06 AUTO-TEST MATRIX	525 D1/YPrPb
07 AUTO-TEST MATRIX	525 D1 10-BIT

Pattern Information

525YPrPb

BARS

00 FULL FIELD BARS (100.0.75.0)	525 YPrPb
01 100% COLOR BARS (100.0.100.0)	525 YPrPb
02 EBU BARS & RED (100.0.75.0)	525 YPrPb
03 BETACAM BARS 75% (100.7.5.75.7.5)	525 YPrPb
04 MII BARS 100% (100.7.5.100.7.5)	525 YPrPb
05 MII BARS 75% (100.7.5.75.7.5)	525 YPrPb
06 EBU SPLIT BARS (100.0.75.0)•	525 YPrPb
07 TARTAN BARS (75.0.75.0)•	525 YPrPb
08 VIDIPLEX BARS (100.0.75.0)•	525 YPrPb
09 75% HORZ. BARS (75.0.75.0)	525 YPrPb
10 100% HORZ. BARS (100.0.100.0)	525 YPrPb

FLAT FIELDS

00 BLACK	525 YPrPb
01 WHITE 100%	525 YPrPb
02 GREY 50%	525 YPrPb
03 YELLOW 75%	525 YPrPb
04 CYAN 75%	525 YPrPb
05 GREEN 75%	525 YPrPb
06 MAGENTA 75%	525 YPrPb
07 RED 75%	525 YPrPb
08 BLUE 75%	525 YPrPb

MONITOR SET-UP

00 CROSS HATCH	525 YPrPb
01 CROSS HATCH/DOTS	525 YPrPb
02 CROSS HATCH/MRKR	525 YPrPb
03 BLK CROSS HATCH	525 YPrPb
04 BLK CRS/HTH/DOTS	525 YPrPb
05 BLK CRS/HTH/MRKR	525 YPrPb
06 CROSS MATRIX	525 YPrPb

LINEARITY

00 RAMP 100%	525 YPrPb
01 RAMP 120%	525 YPrPb
02 SHALLOW RAMPS	525 YPrPb
03 VALID RAMP	525 YPrPb
04 STAIRCASE-5	525 YPrPb
05 STAIRCASE-10	525 YPrPb

PULSES

00 PULSE & BAR 2T	525 YPrPb
01 PULSE-BAR 2T/4T/10T	525 YPrPb
02 SIN X/X	525 YPrPb
03 MULTI-PULSE 4.2	525 YPrPb

SWEEPS

00 MULTI-BURST 4.2	525 YPrPb
01 HORZ. MULTIBURST	525 YPrPb
02 SWEEP 5.5/2.75	525 YPrPb

TIMING

00 BOWTIE (5ns RES)	525 YPrPb
01 SQUARE FIELD	525 YPrPb

OTHERS

00 LUMA CORING	525 YPrPb
01 UV CORING	525 YPrPb
02 AUTO-TEST MATRIX	525 YPrPb

Pattern Information

525RGB

BARS

00 FULL FIELD BARS (100.0.75.0) 525 RGB	
01 F/F BARS NO SYNC (100.0.75.0)	525 RGB
02 100% COLOR BARS (100.0.100.0)	525 RGB
03 EBU BARS & RED (100.0.75.0)	525 RGB
04 EBU SPLIT BARS (100.0.75.0)	525 RGB
05 TARTAN BARS (75.0.75.0)•	525 RGB
06 VIDIPLEX BARS (100.0.75.0)	525 RGB
07 75% HORZ. BARS (75.0.75.0)•	525 RGB
08 100% HORZ. BARS (100.0.100.0)	525 RGB

FLAT FIELDS

00 BLACK	525 RGB
01 WHITE 100%	525 RGB
02 GREY 50%	525 RGB
03 YELLOW 75%	525 RGB
04 CYAN 75%	525 RGB
05 GREEN 75%	525 RGB
06 MAGENTA 75%	525 RGB
07 RED 75%	525 RGB
08 BLUE 75%	525 RGB

MONITOR SET-UP

00 CROSS HATCH	525 RGB
01 CROSS HATCH/DOTS	525 RGB
02 CROSS HATCH/MRKS	525 RGB
03 BLK CROSS HATCH	525 RGB
04 BLK CRS/HTH/DOTS	525 RGB
05 BLK CRS/HTH/MRKS	525 RGB
06 CROSS MATRIX	525 RGB
07 GAMMA TEST	525 RGB

LINEARITY

00 RAMP 100%	525 RGB
01 SHALLOW RAMPS	525 RGB
02 VALID RAMP	525 RGB
03 STAIRCASE-5	525 RGB
04 STAIRCASE-10	525 RGB

PULSES

00 PULSE & BAR 2T	525 RGB
01 SIN X/X	525 RGB
02 MULTI-PULSE 4.2	525 RGB

SWEEPS

00 MULTI-BURST 4.2	525 RGB
01 HORZ. MULTIBURST	525 RGB
02 LINE SWEEP 5.5	525 RGB

TIMING

00 SQUARE FIELD	525 RGB

OTHERS

00 COMBINATION TEST	525 RGB

Pattern Information

Descriptions for some of the various patterns that are available in the TPG.

EBU Colour bars.
All 625 and 525 component signals - 100% (700mV) pk. luma. 75% chroma.
NTSC - 100% (714mV) pk. luma. 75% chroma.

BBC colour bars.
625 formats only. 100% (700mv) pk. luma. 95% chroma.

Tartan bars.
All formats. 75% (525mv) pk.luma. 75% chroma.

Vidiplex bars.
All formats. Field one EBU bars. Field two inverse EBU bars.

75% Horizontal bars.
All formats. 75% pk. luma. 75% chroma. 8 Colours from white to black.

100% Horizontal bars.
Selected formats. 100% pk. luma. 100% chroma. 8 Colours from white to black.

Ramp 100%
All formats. 100% luminance ramp. 0% chroma.

Ramp 120%
Selected formats. Luminance ramp from -10% to +110%. 0% chroma.

Modulated ramp.
625 formats. 100% luminance ramp. 284 mV pk.pk modulated sub-carrier.
525 formats. 100% luminance ramp. 286 mV pk.pk modulated sub-carrier.

Ultra black modulated ramp.
Selected formats. -10% (70mV) to 100% (700mV) luminance ramp. 140 mV pk.pk chroma. NTSC format. -10% (71mV) to 100% (714mV) luminance ramp. 142 mV pk.pk chroma.

Staircase 5.
Selected formats. Steps at 0%, 20%, 40%, 60%, 80% and 100% luma steps. 0% chroma.

Staircase 10
In PAL/D2. Peak value is 690mV.

Modulated staircase 5.
Selected formats. Steps as Staircase-5. Modulated with sub-carrier with 280mV pk.pk. chroma. NTSC format. Luma steps as Staircase-5. Modulated with sub-carrier with 286mV pk.pk. chroma.

Shallow ramps.
Selected formats. 12 ramps starting at -5% to +105%. Each ramp is 10% pk.pk. 0% chroma.

EBU pluge 1-5.
625 formats. 0mV, 110mV, 200mV, 450mV and 700mV pluge.

Multi-burst 5.8.
Selected formats. Bursts at 0.5, 1.0, 2.0, 4.0, 4.8, 5.8 MHz. Centred at 350mV. Burst amplitude 420mV pk.pk. 0% Chroma.

Horizontal multi-burst.
Selected formats. Bursts at 1.0, 2.0, 3.0, 4.0, 5.0, 6.0 MHz. Burst amplitude 700mV pk.pk. 0% Chroma.
Line sweeps
All sweep patterns (except SECAM) have frequency markers. The luminance channel has markers at 1MHz intervals, first marker at 1MHz; and chrominance channels have markers at 0.5MHz intervals, first marker at 0.5MHz.

Pattern Information

Center sweep 5.75MHz
Selected formats. Symmetrical sweep centered at 5.75MHz. Amplitude 700mV pk.pk. 0% Chroma.

Center sweep 3.5MHz
Selected formats. Symmetrical sweep centered at 3.5MHz. Amplitude 700mV pk.pk. 0% Chroma.

Colour sweep.
PAL format. 50% (350mV) luminance. 420mV pk.pk chroma sweep from 2.4MHz to 6.43 MHz. NTSC format. 428mV luminance. 428mV pk.pk chroma sweep from 1.58 to 5.58MHz.

Multipulse 5.8.
Selected formats. 100% white bar, 100% 2-T pulse, pulses at 1,2,4,4.8,5.8MHz. 0% chroma.

Colour multipulse.
PAL format. 100% white bar, 100% 2-T pulse, colour pulses luma amplitude 350mv. Pulse frequencies at 3.184, 3.496, 3.809, 4.121, 4.434, 4.746, 5.059 5.371 and 5.684 MHz. NTSC format.

Pulse and bar 2T.
All formats. White bar 100%. 2-T pulses. 0% chroma.

Sin X/X
All formats. Luma amplitude 700mV.

VITS 17.
625 formats. 100% white bar. 2-T pulse, modulated pulse 700mV pk.pk. 5 step staircase.

VITS 18.
625 formats. bursts at 0.5, 1, 2, 4, 4.8, 5.8 MHz.

UK ITS 19.
625 formats. 100% white bar. 2-T pulse, modulated pulse 700mV pk.pk. 5 step modulated staircase.

UK ITS 20.
625 formats. 700mV pk.pk PAL sub-carrier on 50% luma level. 300mV pk.pk. PAL sub-carrier on black level.

VITS 330.
625 formats. 100% white bar. 2-T pulse, modulated PAL sub-carrier on 5 step staircase.

VITS 331
625 formats. 50% grey luma. 140mV, 420mV and 700mV PAL sub-carrier on chroma.

Zero R-Y colours.
PAL format. 50% grey luma. 300mV pk.pk PAL sub-carrier phases at 270 and 90 degrees.

Zero G-Y colours.
PAL format. 50% grey luma. 300mV pk.pk PAL sub-carrier phases at 326 and 146 degrees.

Zero B-Y colours.
PAL format. 50% grey luma. 300mV pk.pk PAL sub-carrier phases at 0 and 180 degrees.

Cross hatch.
All formats. 100% cross hatch. 12 x 9 squares.

Pattern Information

Generalised Parameters of Waveforms

VIDEO HALF-LINES IN PATTERNS

It should be noted that only some patterns include video half-lines at the beginning and end of field blanking.

The following patterns include video half-lines in all formats except those listed below under `Exceptions':

625 EBU Bars
625 100% Bars
625 EBU BARS and RED
525 SMPTE Bars/Full field
525 100% Bars
525 BARS and RED
525 FULL FIELD

Exceptions:

1.	D1/YPrPb	Patterns in this format do not have half lines in any pattern
2.	D1 10-Bit	Patterns in this format comply with the requirements of CCIR Rec. 656

TIMING ACCURACY

The accuracy of timings shown on the following pages is limited by the quantisation processes.

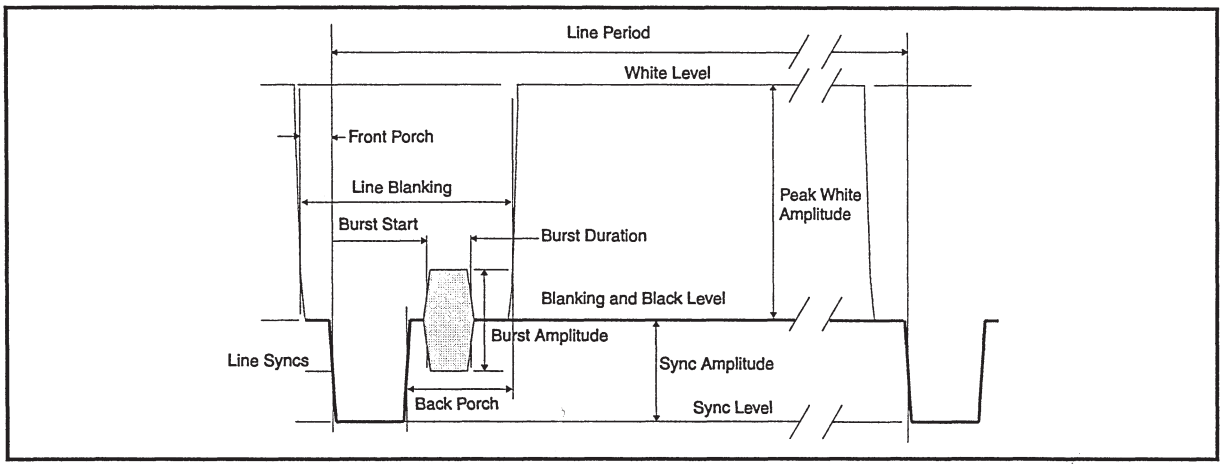
Synchronising pulses are quantised at 10-Bit in all formats except for the D1/YPrPb format which uses 8-Bits.

The static error in the duration of the line synchronising pulses (4.7µs) for example, will be approximately 1ns for 10-Bit quantisation and 5ns for 8-Bit quantisation.

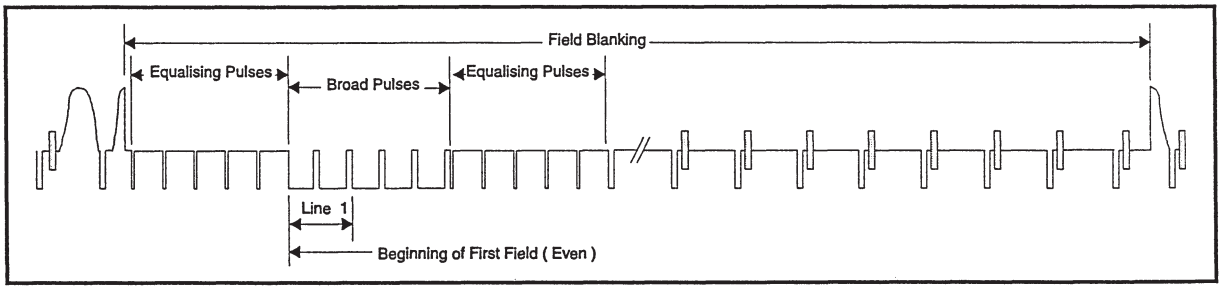
Dynamic errors are possible in the PAL format where the sample positions vary from line to line due to the subcarrier to line frequency relationship. These errors will be of similar magnitude to the static errors.

Pattern Information

PAL 625 COMPOSITE/Y-C Waveforms



Line Period	64µs (15.625kHz Line rate)	Subcarrier Frequency	4.43361875MHz ±1Hz
Line Blanking	12.00µs	When fitted with 0.2ppm crystal)	
Line Syncs	4.7µs	Subcarrier Calculation	283.75fh +25Hz
Line Front Porch	1.50µs (1.65µs for PAL-I)	Sync Amplitude	300mV ±1%
Line Back Porch	5.8µs (5.65µs for PAL-I)	Peak White Amplitude	700mV ±1%
Burst Start	5.64µs		
Burst Duration	2.25µs (10 cycles of SC)	Rise and Fall Times:	
Burst Amplitude	300mV ±1%	Line Syncs	200ns (10% to 90%) 250ns (10% to 90%) for PAL-I

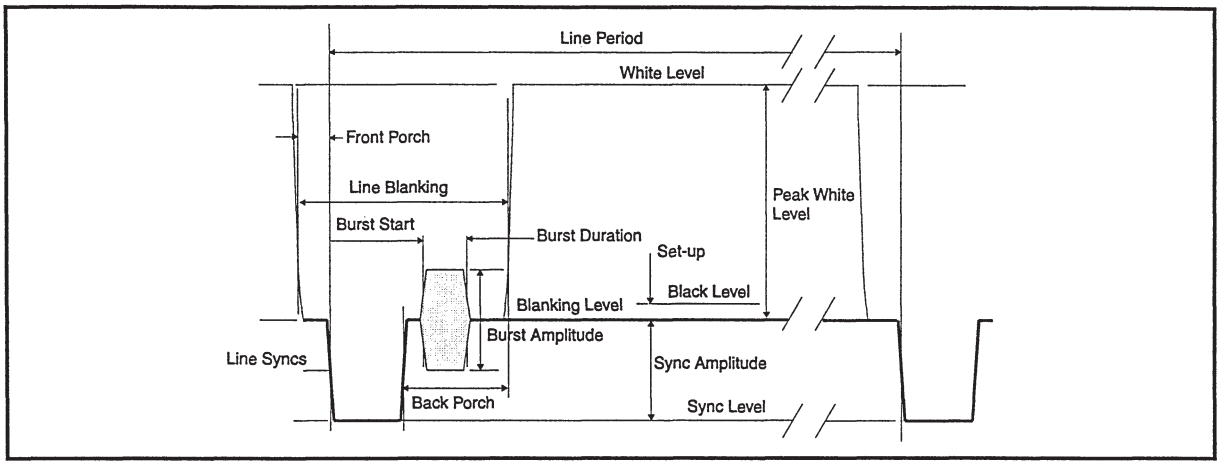


Number of Lines	625	Field Blanking	25 lines + 12µs
Field Period	20ms (50Hz)	Rise and Fall Times:	
Pre-equalising Pulses	5 at 2fh 2.35µs wide	Equalising Pulses	200ns (10% to 90%) 250ns (10% to 90%) for PAL-I
Post equalising Pulses	5 at 2fh 2.35µs wide.		
Broad Pulses	5 at 2fh 27.3µs wide		

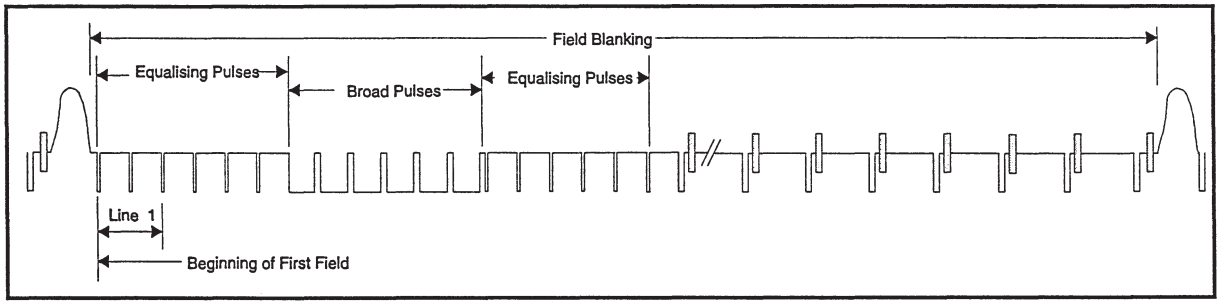
Note that only some patterns have video half lines as shown above.

Pattern Information

NTSC 525 COMPOSITE/Y-C Waveforms



Line Period	63.556µs (15.734kHz Line rate)	Subcarrier Frequency	3.579545MHz ±5Hz (1Hz for 0.2ppm crystal)
Line Blanking	10.70µs		
Line Syncs	4.7µs	Subcarrier Calculation	227.5fh
Line Front Porch	1.50µs	Sync Amplitude	40 IRE Units ±1%
Line Back Porch	4.50µs	Peak White Amplitude	100 IRE Units ±1%
Burst Start	19 cycles of SC	Black Level Set-up	7.5 IRE Units ±1%
Burst Duration	9 cycles of SC	Rise and Fall Times:	
Burst Amplitude	40 IRE ±1%	Line Syncs	140ns (10% to 90%)

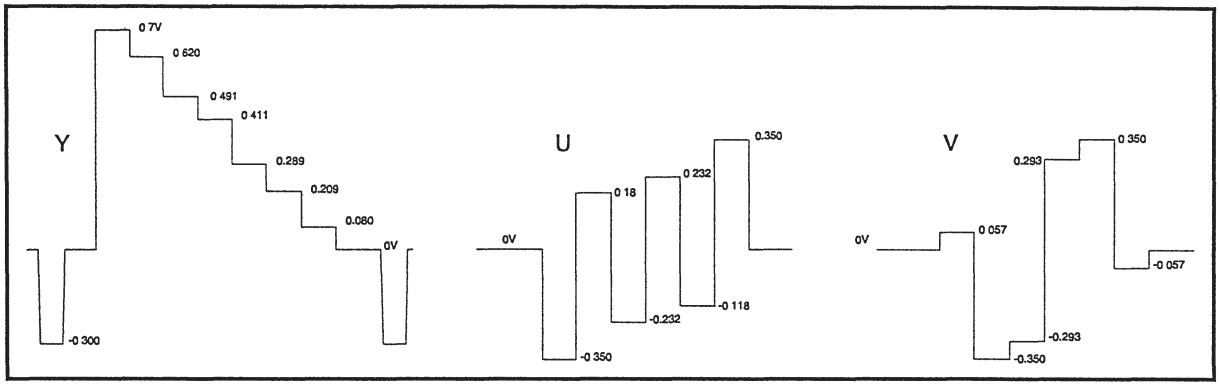


Number of Lines	525	Field Blanking	20 lines +1.5µs SMPTE 20 lines +10.7µs CCIR
Field Period	16.6833ms (60Hz)		
Pre-equalising Pulses	6 at 2fh 2.30µs wide.	Rise and Fall Times:	
Post equalising Pulses	6 at 2fh 2.30µs wide.	Equalising Pulses	140ns (10% to 90%)
Broad Pulses	6 at 2fh 27.1µs wide		

Note that only some patterns have video half lines as shown above.

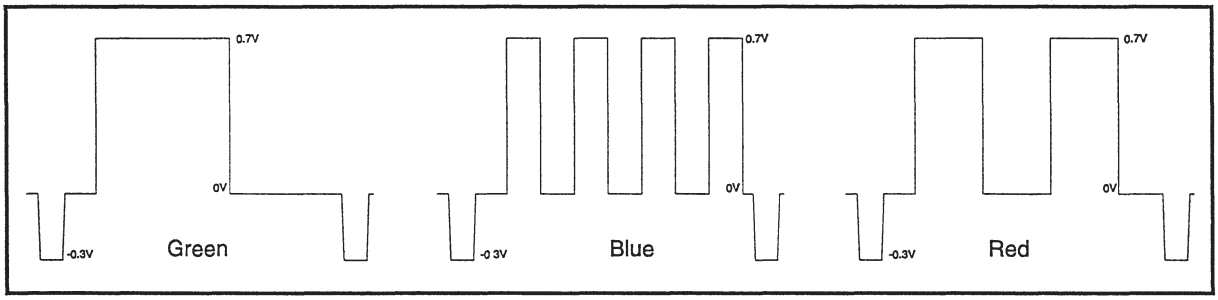
Pattern Information

Component Waveforms EBU Specifications



Values shown are for 100% Colour bars

Luminance rise and fall times	200ns
U and V rise and fall times	200ns for YPrPb, 300ns for D1/YPrPb



GBR Waveforms

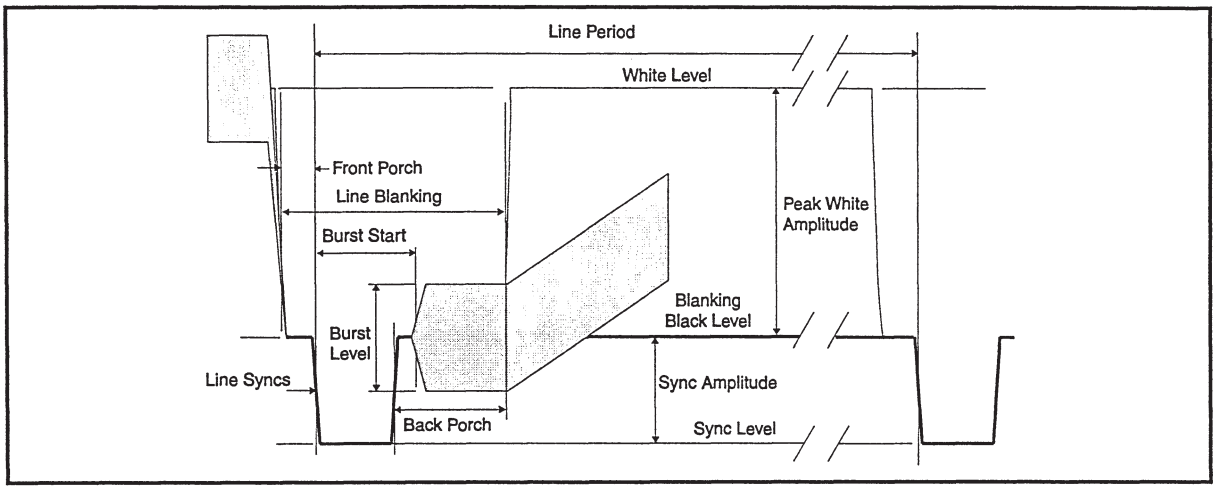
Values shown are for 100% Colour bars

Rise and fall times 200ns

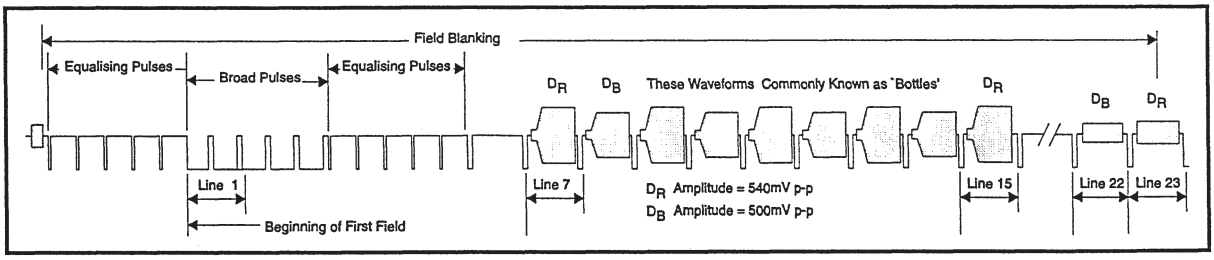
Other parameters as per specifications for 625/525 waveforms.

Pattern Information

SECAM 625



Line Period	64µs (15.625kHz Line rate)	Subcarrier Frequency	4.43361875MHz 1Hz (With 0.2ppm crystal)
Line Blanking	12.00µs	Subcarrier Calculation	272fh (Db) 4.25000MHz
Line Syncs	4.7µs		282fh (Dr) 4.40625MHz
Line Front Porch	1.50µs	Sync Amplitude	300mV ±1%
Line Back Porch	5.8µs	Peak White Amplitude	700mV ±1%
SC Start	5.6µs	Rise and Fall Times:	
SC Start Duration	2.25µs (10 cycles of SC)	Line Syncs	200ns (10% to 90%)
SC Amplitude (unmodulated)	168mV ±1%(Db) 211mV ±1%(Dr)		



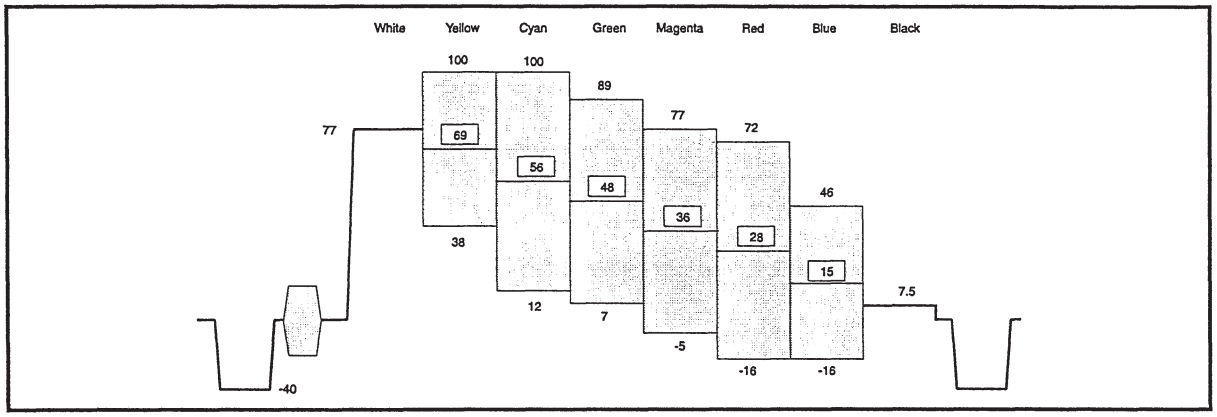
Number of Lines	625	Field Blanking	25 lines + 12.0µs
Field Period	20ms (50Hz)		
Pre-equalising Pulses	5 at 2fh 2.35µs wide.	Rise and Fall Times:	
Post equalising Pulses	5 at 2fh 2.35µs wide.	Equalising Pulses	200ns (10% to 90%)
Broad Pulses	5 at 2fh 27.3µs wide		

Note that only some patterns have video half lines as shown above and most patterns do not have bottles.

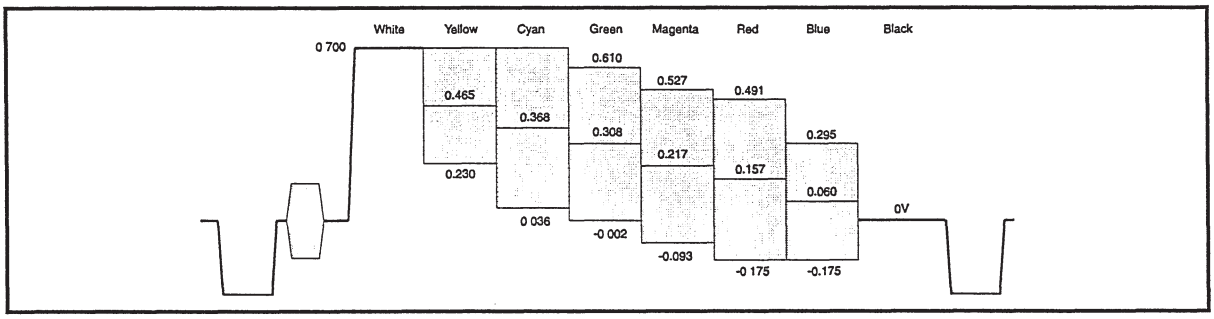
Pattern Information

Specific Parameters of Waveforms

Colour Bars EBU/525

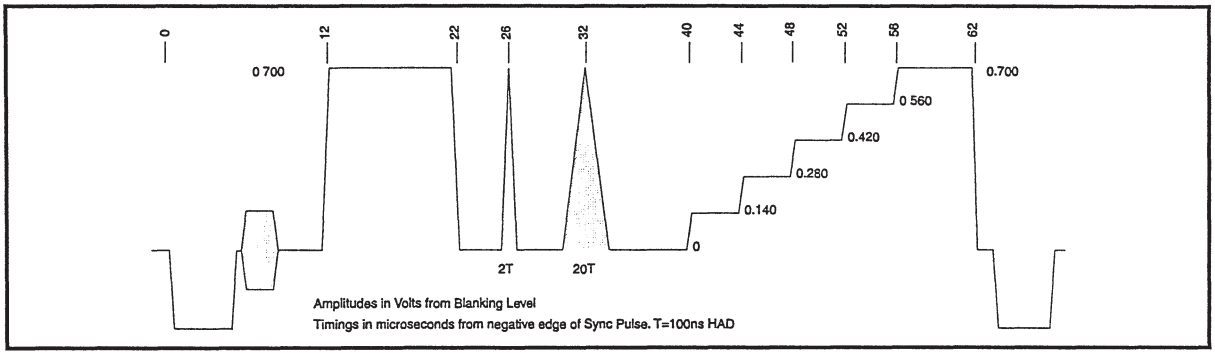


EBU Colour bars (PAL Format)

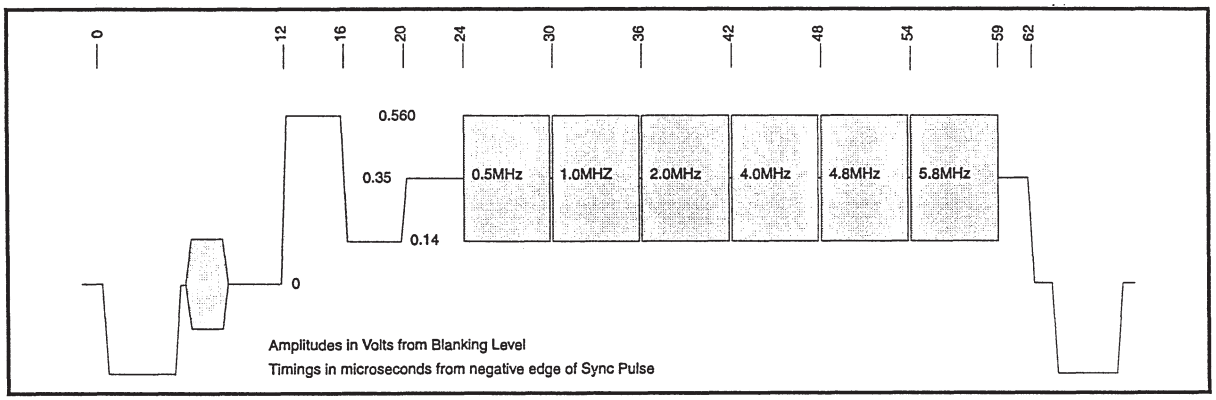


Pattern Information

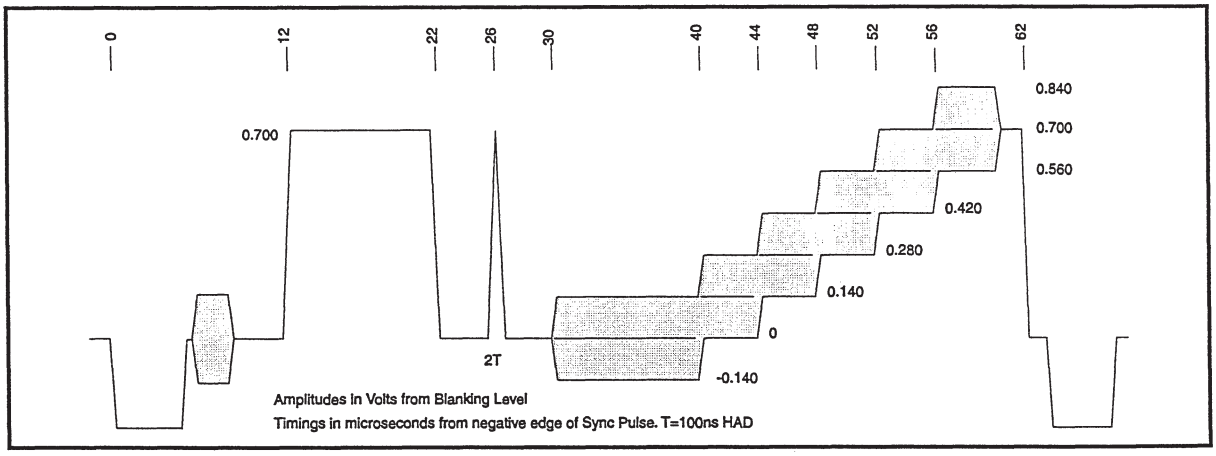
VITS Line 17 625/PAL



VITS Line 18 625/PAL

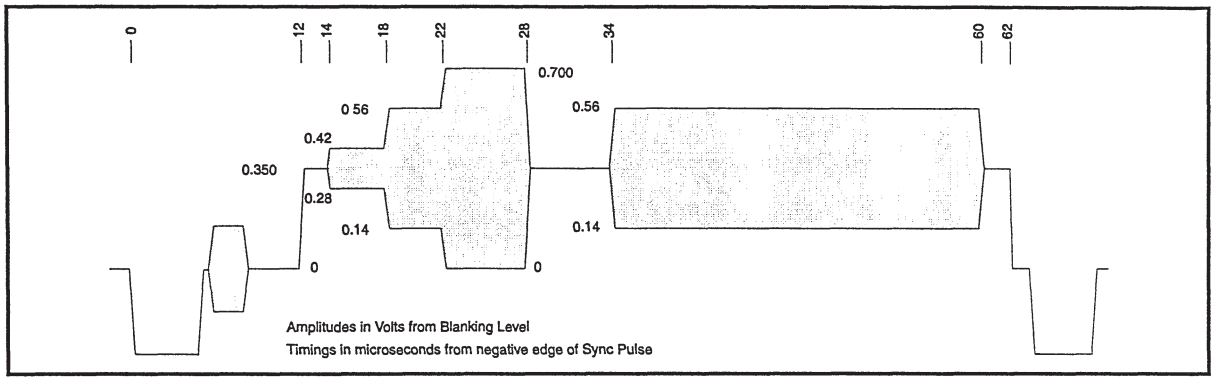


VITS Line 330 625/PAL

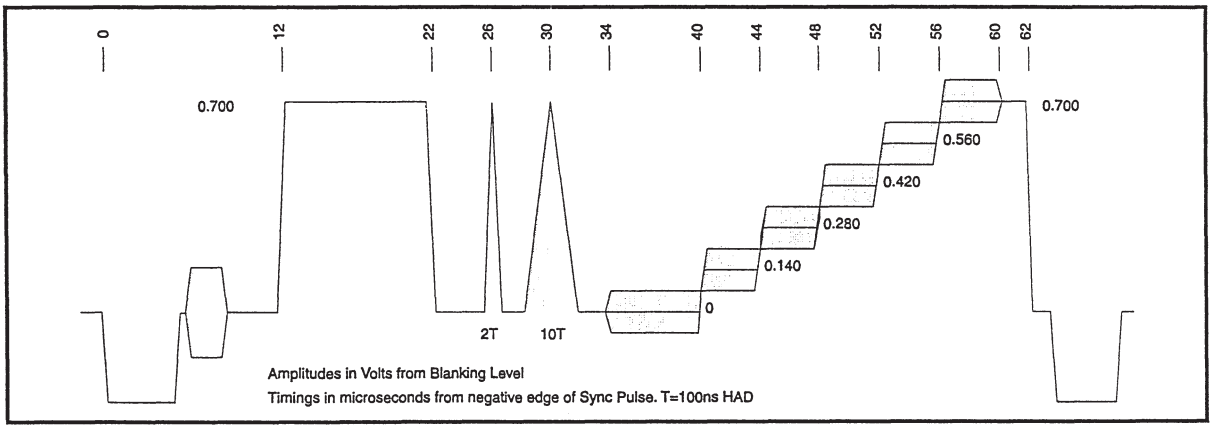


Pattern Information

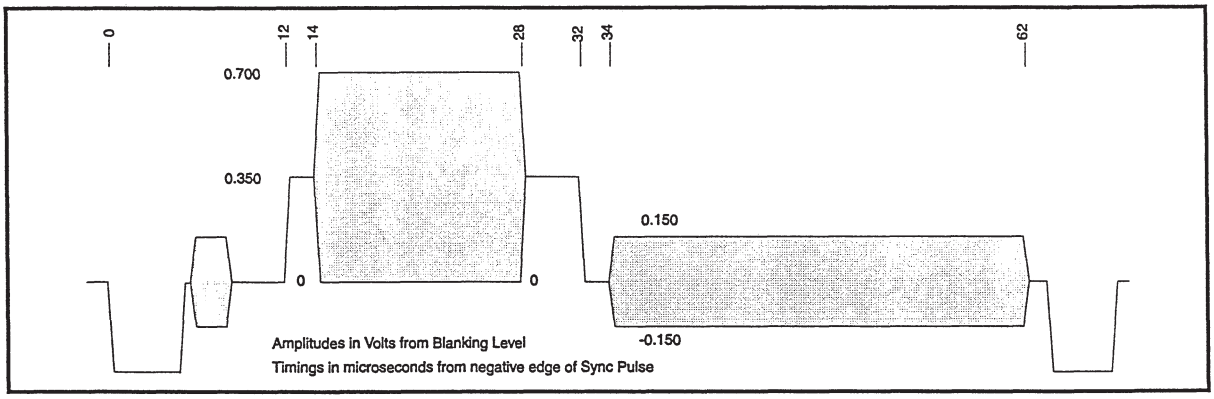
VITS Line 331 625/PAL



VITS UK ITS-1 Line 19 625/PAL

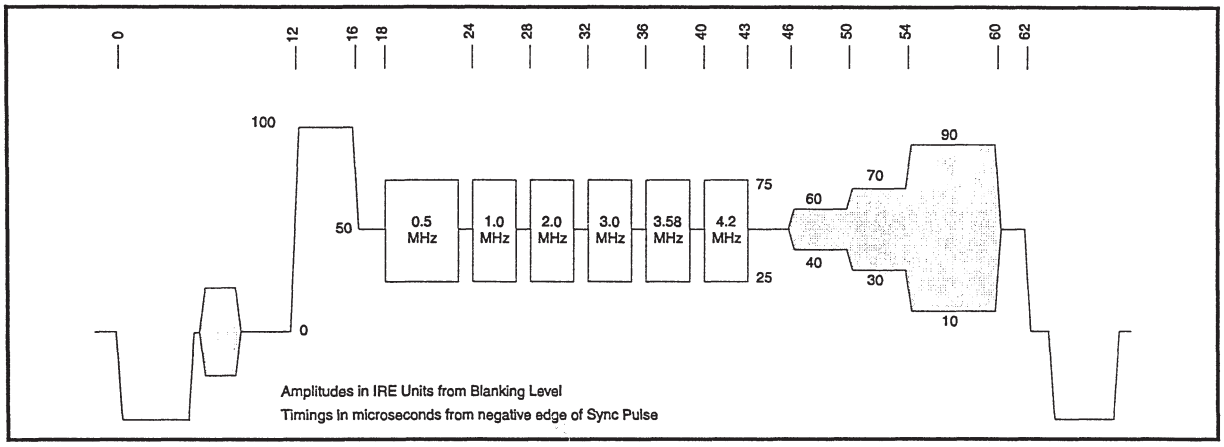


VITS Line 20 625/PAL

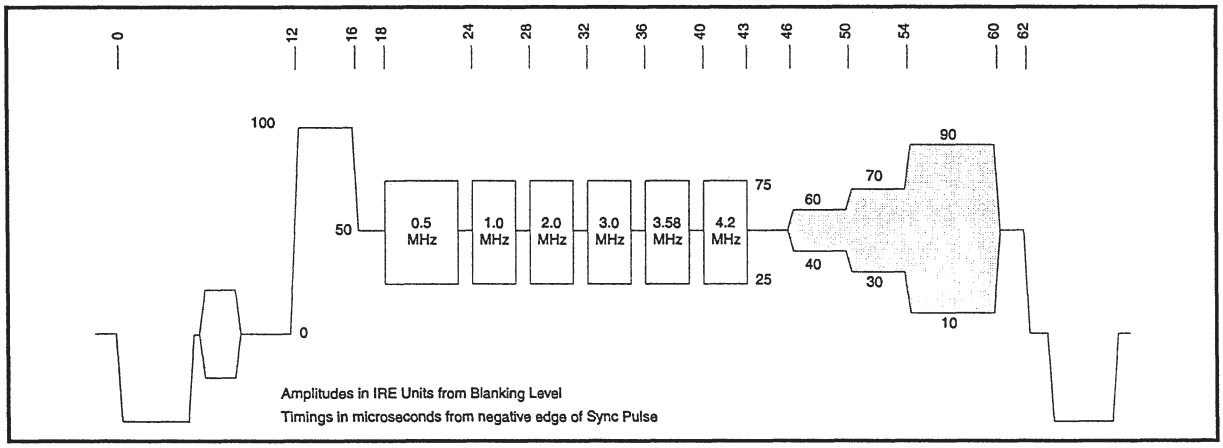


Pattern Information

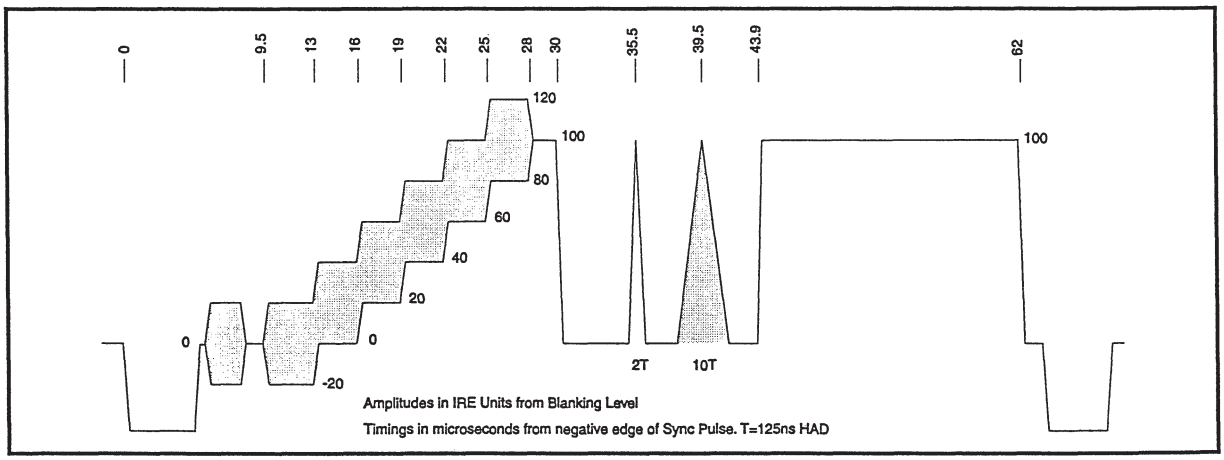
NTC-7 Composite



NTC-7 Combination

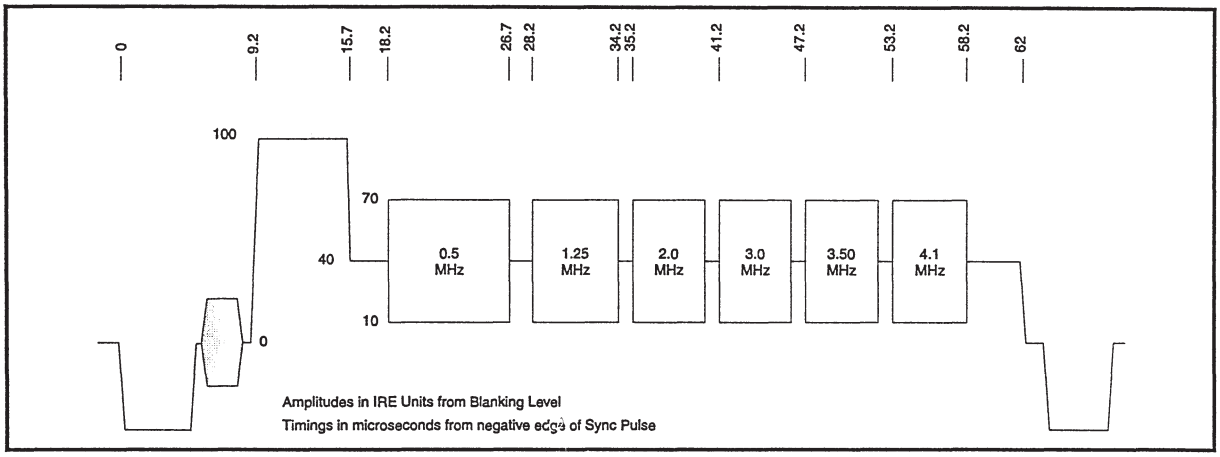


FCC Composite

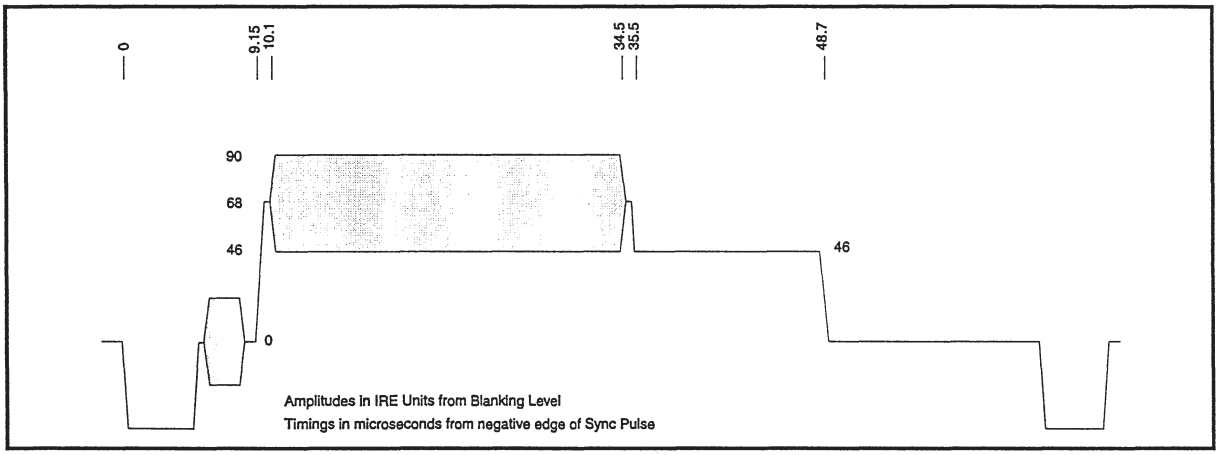


Pattern Information

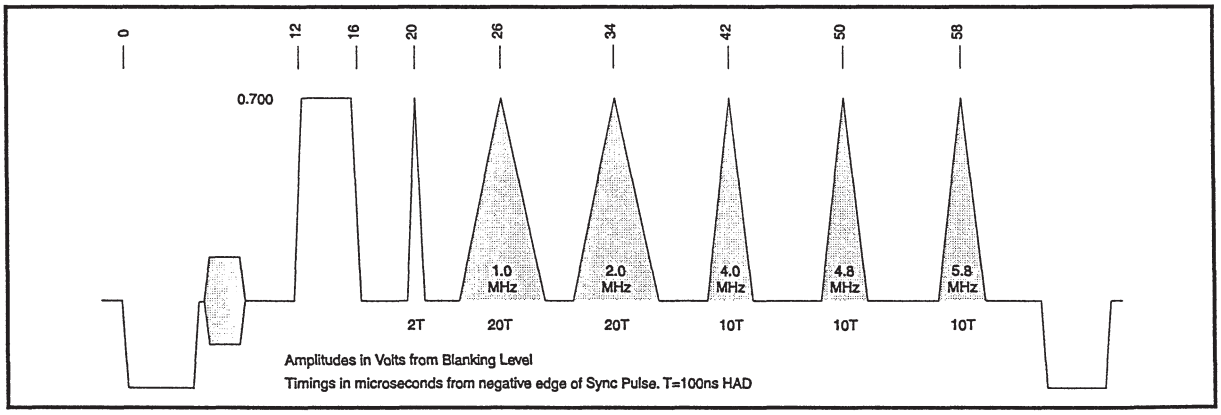
FCC Multiburst



VIRS

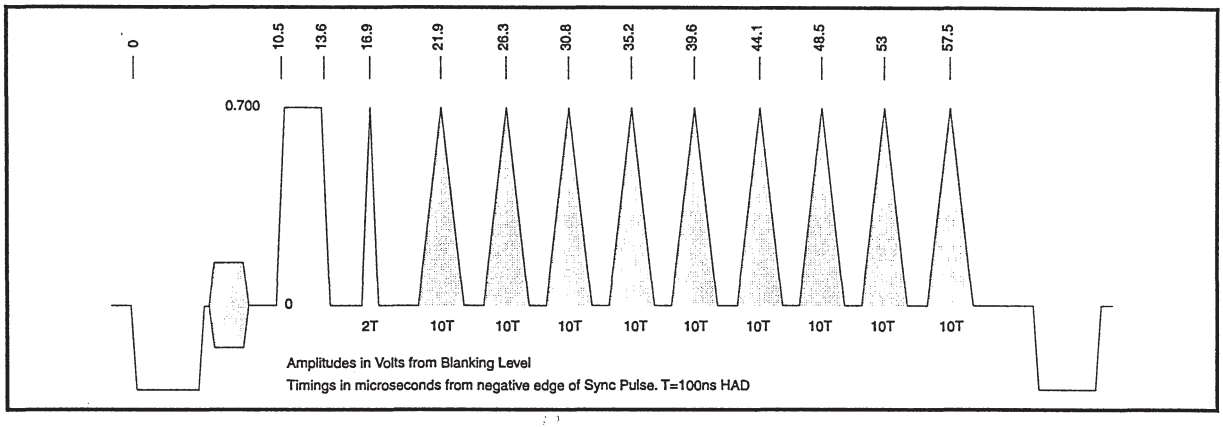


Multipulse to 5.8 MHz 625

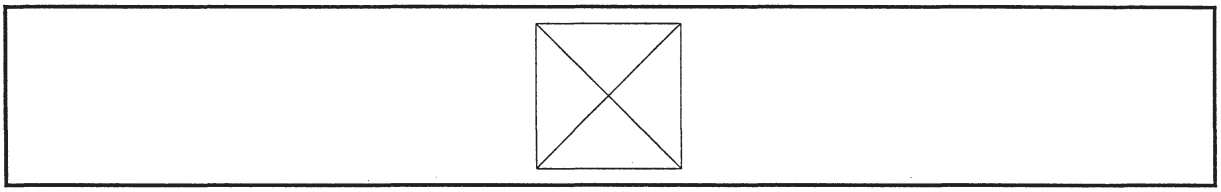


Pattern Information

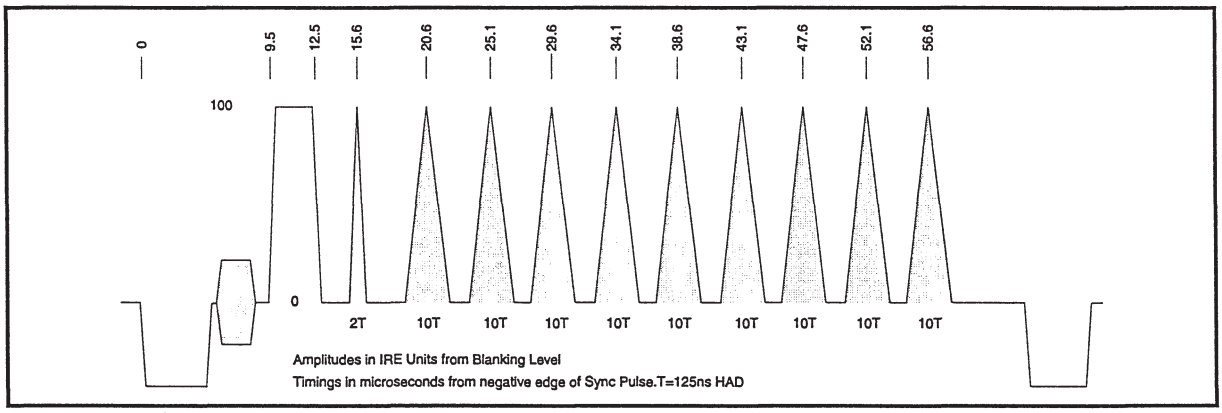
Colour Multipulse 625



Multipulse to 5.8 MHz 525

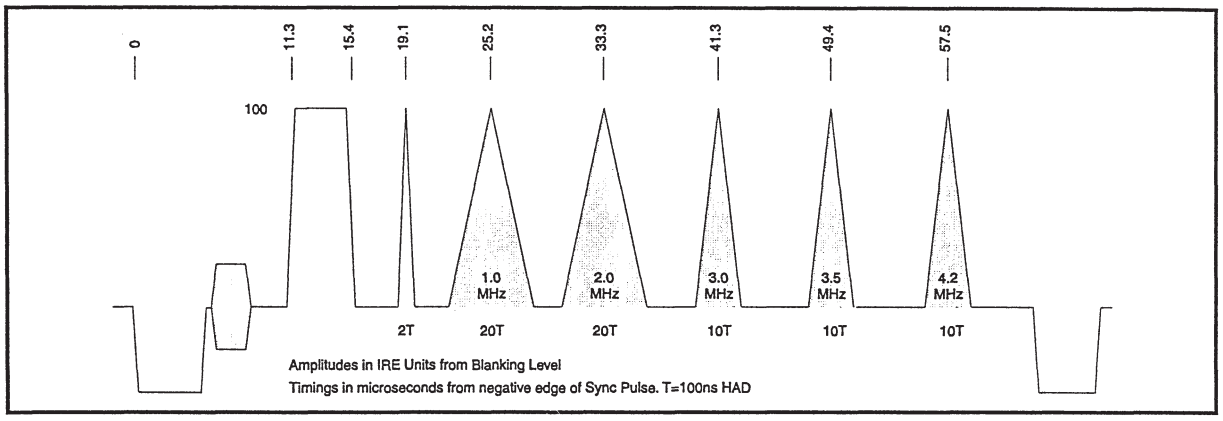


Colour Multipulse 525

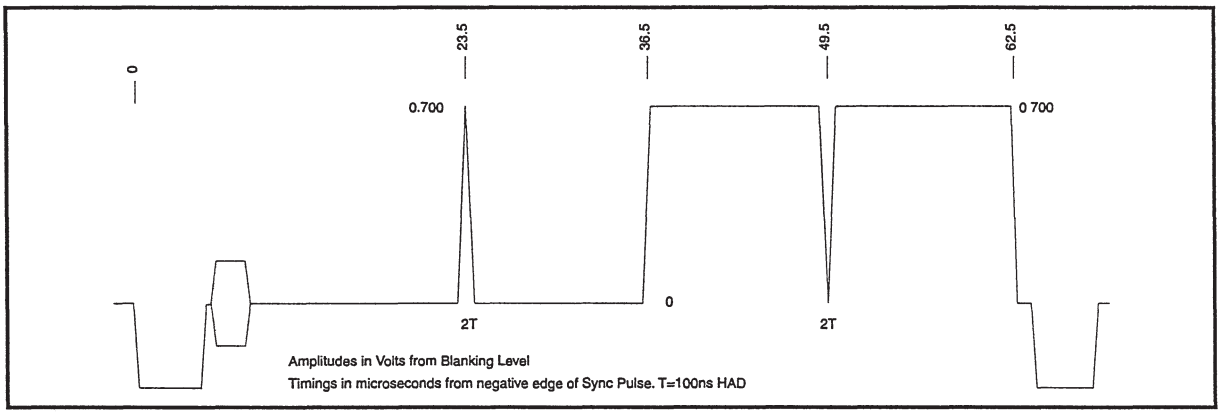


Pattern Information

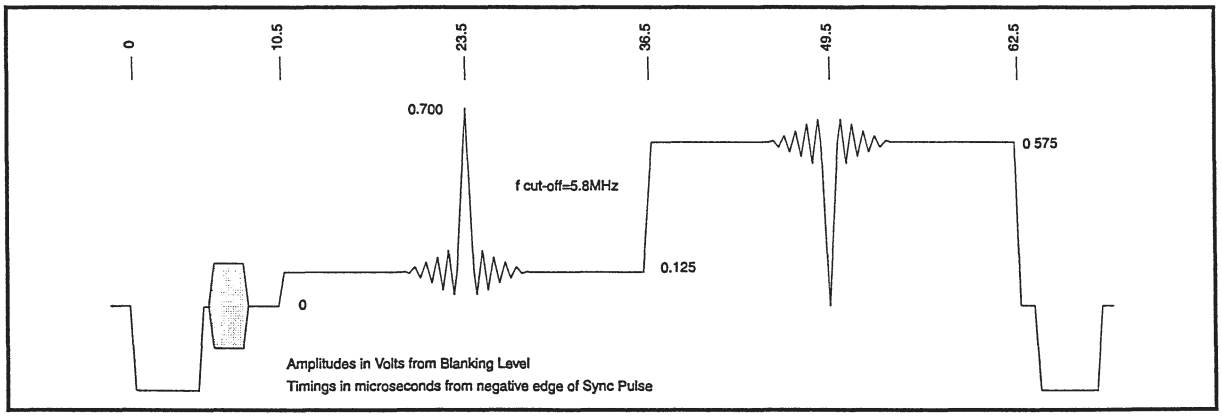
Multipulse to 4.2 MHz 525



Pulse and Bar 2T 625 PAL

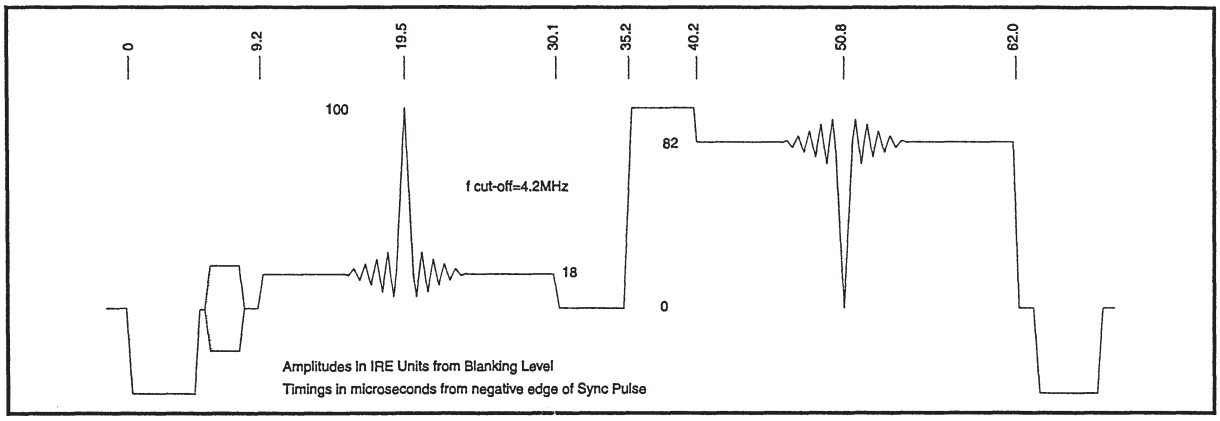


Sinx/x 625 PAL

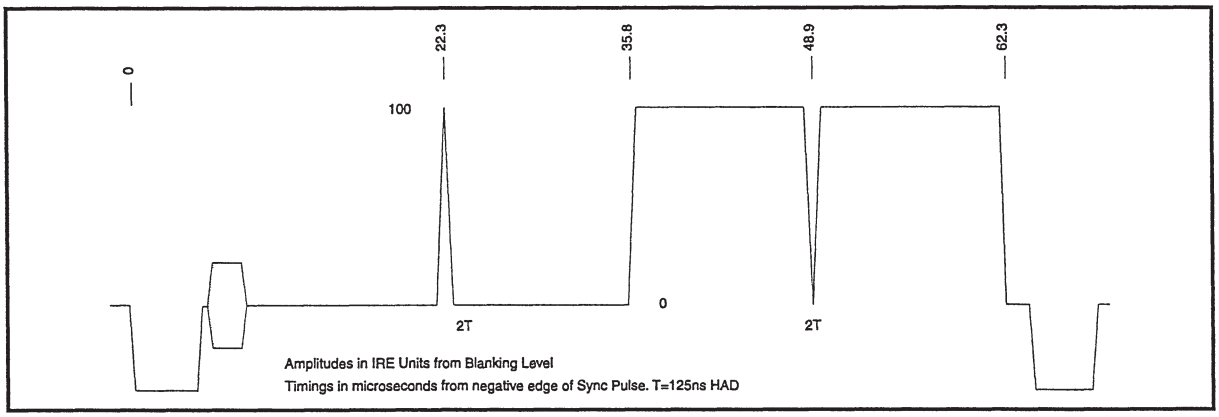


Pattern Information

Sinx/x 525 NTSC

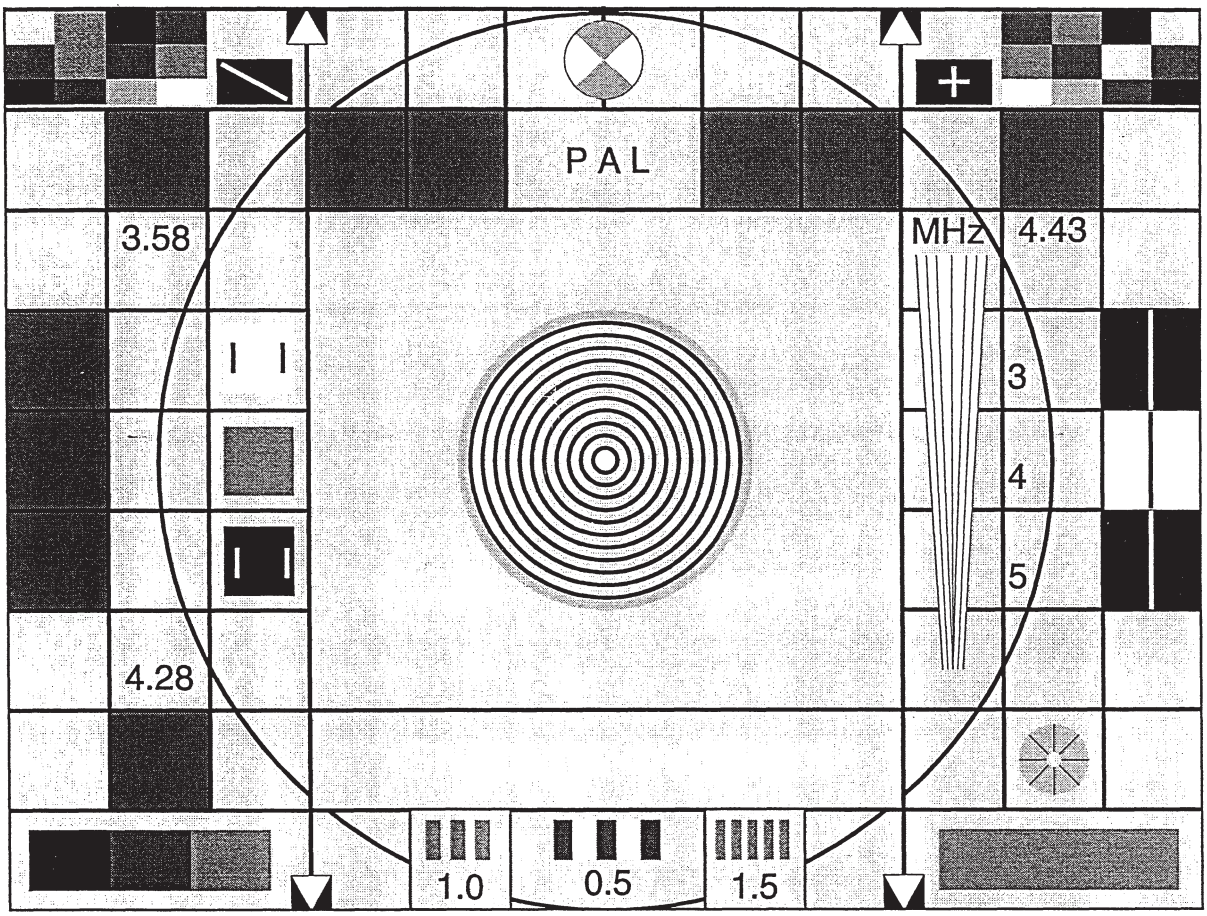


Pulse and Bar 2T 525 NTSC



Pattern Information

Snell & Wilcox Test Chart # 2 (PAL version)



The Snell & Wilcox Test Chart # 2 is a general purpose TV test chart.

It can be used for testing signal processors, mixers, decoders, encoders, standard converters and display devices. This document describes of SW2 test chart. The composite PAL waveform is generated using 10 bit quantisation giving 588 levels from black to white. Sync level is 4 (-300 mV), black is 256 (0 mV), white is 844 (700 mV). The chart background grey level is 548 (347.6 mV). If not otherwise specified all lines, bursts and other chart components mentioned in this document are 100 % contrast (covering full range from black to white).

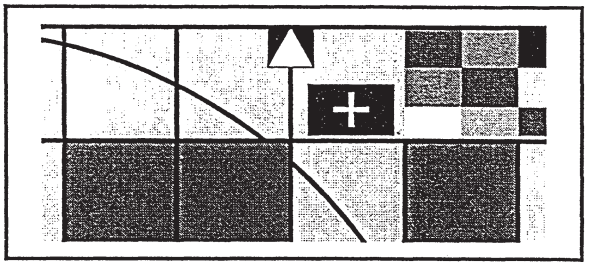
The rectangular black grid is superimposed over the grey background. The purpose of this grid is mainly for a fast visual check of the display device geometry. Three primary colour rasters for registration checks. Vertical and horizontal lines of the grid have sine squared waveform shape with equal width; along the TV line they form 2T pulses (200 ns HAD). Geometry also can be evaluated using the black circle with the diameter equal to the picture height. Circumference line width is 168 ns.

Pattern Information

DETAILED DESCRIPTION

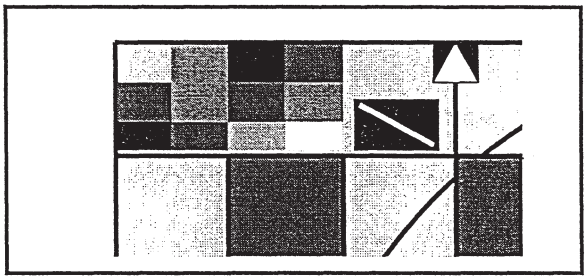
BOUNDARIES

Top and bottom boundaries of the active part are designated by four white triangular markers on black boxes.



TARTAN BARS

These are 75 % tartan colour bars. The purpose of this test pattern is to measure the chroma sharpness both horizontally and vertically; it shows the comb type Y/C separators failure on sharp vertical transients. Below the tartan bars is a grey scale with 20%, 40%, 60% and 80% levels useful for non-linearity tests.

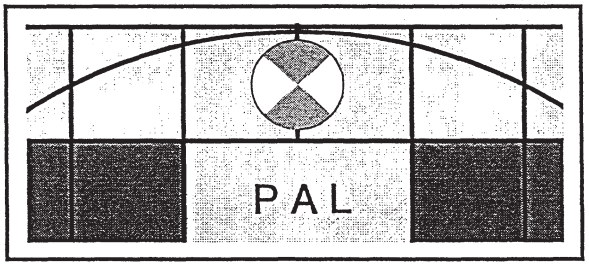


CIRCULAR GREY SCALE

The grey scale circular pattern (grey cone) is useful for visual assessment of quantisation distortion, dither etc.

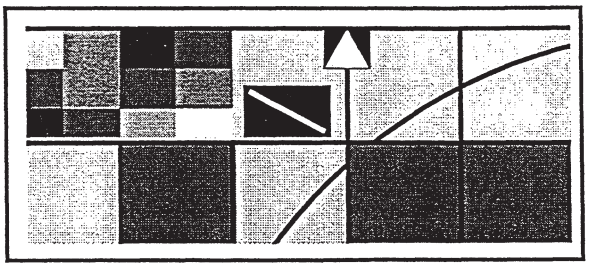
CHART FORMAT

This is the text information about chart format, e.g. 'PAL'.



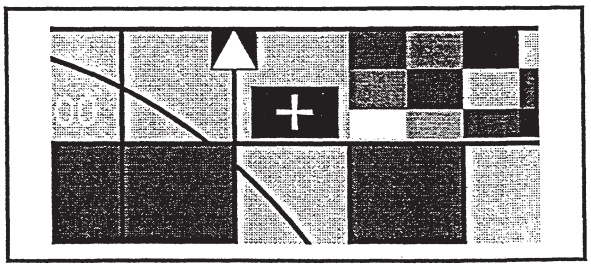
INTERLACE CHECK

This black box contains a narrow (horizontal cross-section 168 ns) oblique white line. The purpose of this test is to show the effect of lack of roper interlacing. It appears as a staircase instead of the smooth line in the case of incorrect interlacing.



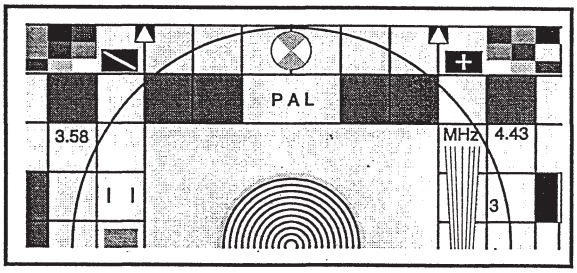
REGISTRATION CHECK

This area contains black box with white cross (200 ns). It can be used for raster registration check, 2D aperture correction symmetry measurement etc.



Pattern Information

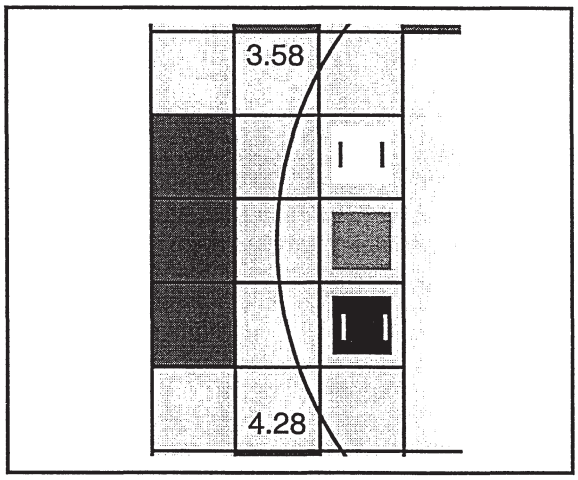
HORIZONTAL AND DIAGONAL
FREQUENCY RESPONSE CHECK



Bursts with frequencies correspondingly to 3.58 MHz verticals (NTSC SC), 300 tvl verticals, 300 tvl diagonals, 400 tvl diagonals, verticals (PAL SC). They are useful for quick check of frequency response, testing 2D aperture correction devices and evaluation of cross-colour effects with conventional and comb type decoders. (tvl=television lines; for verticals 1 tvl is approx. .0128MHz)

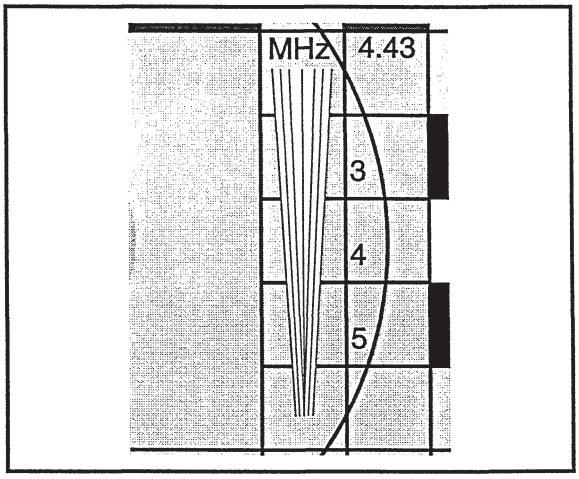
Note
For 625/50/2:1 interlaced systems 1 MHz is equivalent to 78 tvl so 400 tvl is about 5.1 MHz.
All frequencies shown as tvls are in white text and frequencies in MHz are in black text.

FREQUENCY/VERTICAL RESPONSE CHECK



This section contains slightly oblique bursts (almost horizontals) with frequencies 100, 200 and 300 tvl. They are useful for testing scan converters and vertical enhancers.

FREQUENCY RESPONSE WEDGE

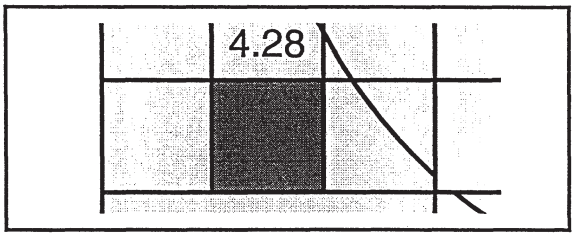


This wedge covers the band from 1.5 MHz to 5.5 MHz

Pattern Information

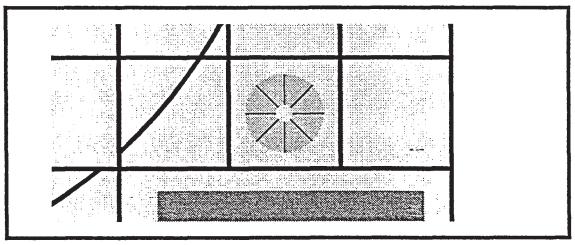
SECAM BELL FILTER CHECK

This area contains a 4.286 MHz burst (SECAM bell filter centre frequency).



RADIAL WEDGE

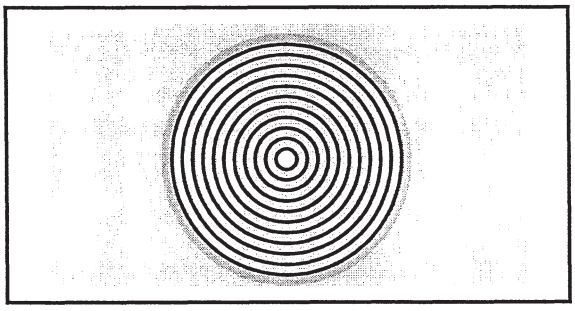
This radial wedge covers spatial frequencies up to 200 tvl. It shows decoding cross-effects and horizontal/vertical enhancement proportion.



MOVING ZONE PLATE

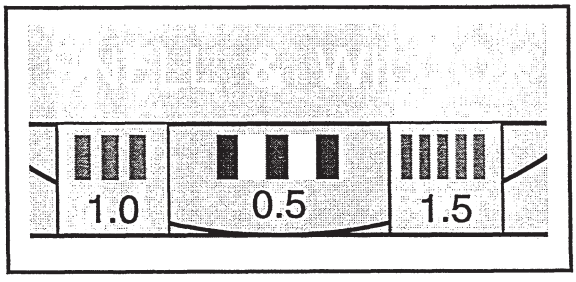
This area is occupied by a static or moving circular grating (Fresnel zone plate) covering spatial frequencies range up to 429 tvl (5.5 MHz).
The radius of this grating is 0.15 of picture height.
The moving zone plate is especially useful for checking line or frame based comb decoders and scan converters performance.

Movement type and speed may be set using the MOVEMENT control function described in `Operation' Section 3.



CHROMA FREQUENCY RESPONSE
Y/C TIMING CHECKS

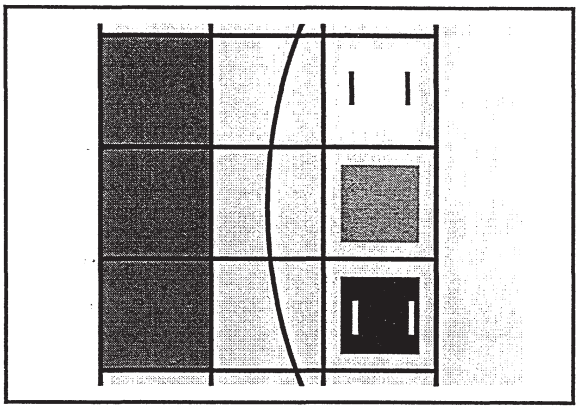
This area contains blue/yellow and green/magenta bursts with frequencies 1.0, 0.5 and 1.5 MHz. They are useful for chroma resolution and Y/C timing tests.



Pattern Information

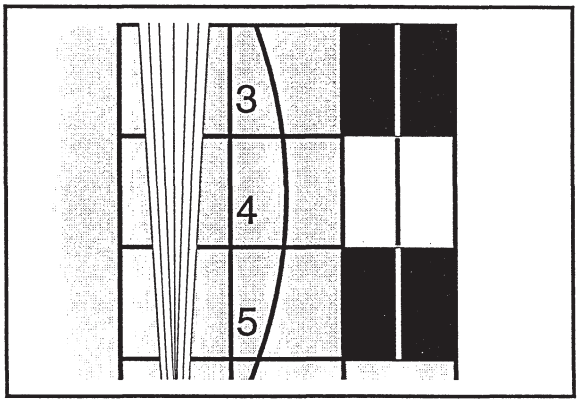
PLUGE (Picture Line Up Generator)

Area 3.4..6 contain PLUGE signals with small 93.75% white box on 100% white background, grey level (35%) box, and small dark grey (7.5%) box on black background. They allow display brightness and contrast adjustments to be easily made. For better visibility small boxes are accompanied by short higher contrast vertical lines.



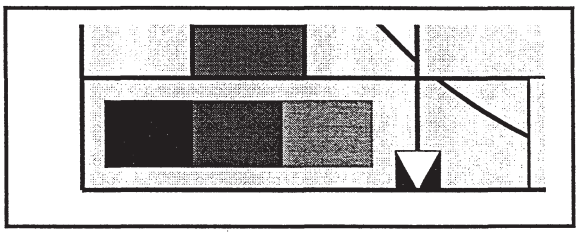
PULSE AND BAR TESTS

Three types of 2T (200ns) pulses are provided: white on black, black on white and white on dark grey (20%). This last pulse is useful for ringing and echo measurements if equipment under test includes black clipper concealing distortions below black level.



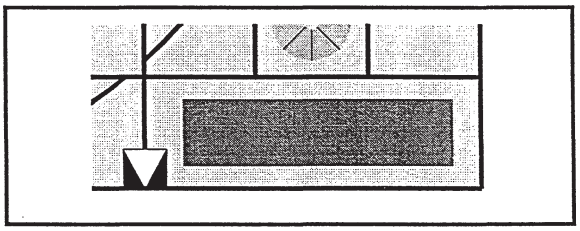
CHROMA NON-LINEARITY TESTS

This area contains a 3 level chroma staircase in the form of 33.3%, 66.6% and 100% magenta boxes. It can be used for chroma nonlinearity and differential phase measurements.



LARGE AREA CHROMA TESTS

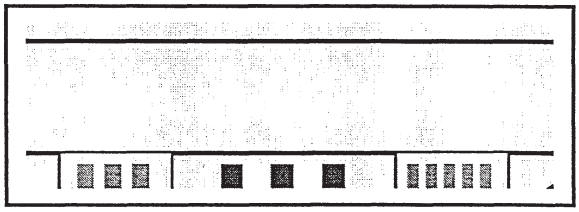
A 100% red box is provided for visual assessment of chroma noise, large area chroma flicker, and Hanover bars type distortions.



Pattern Information

LOGO

This area is reserved for user logo or text info message, e.g. 'Snell & Wilcox'.

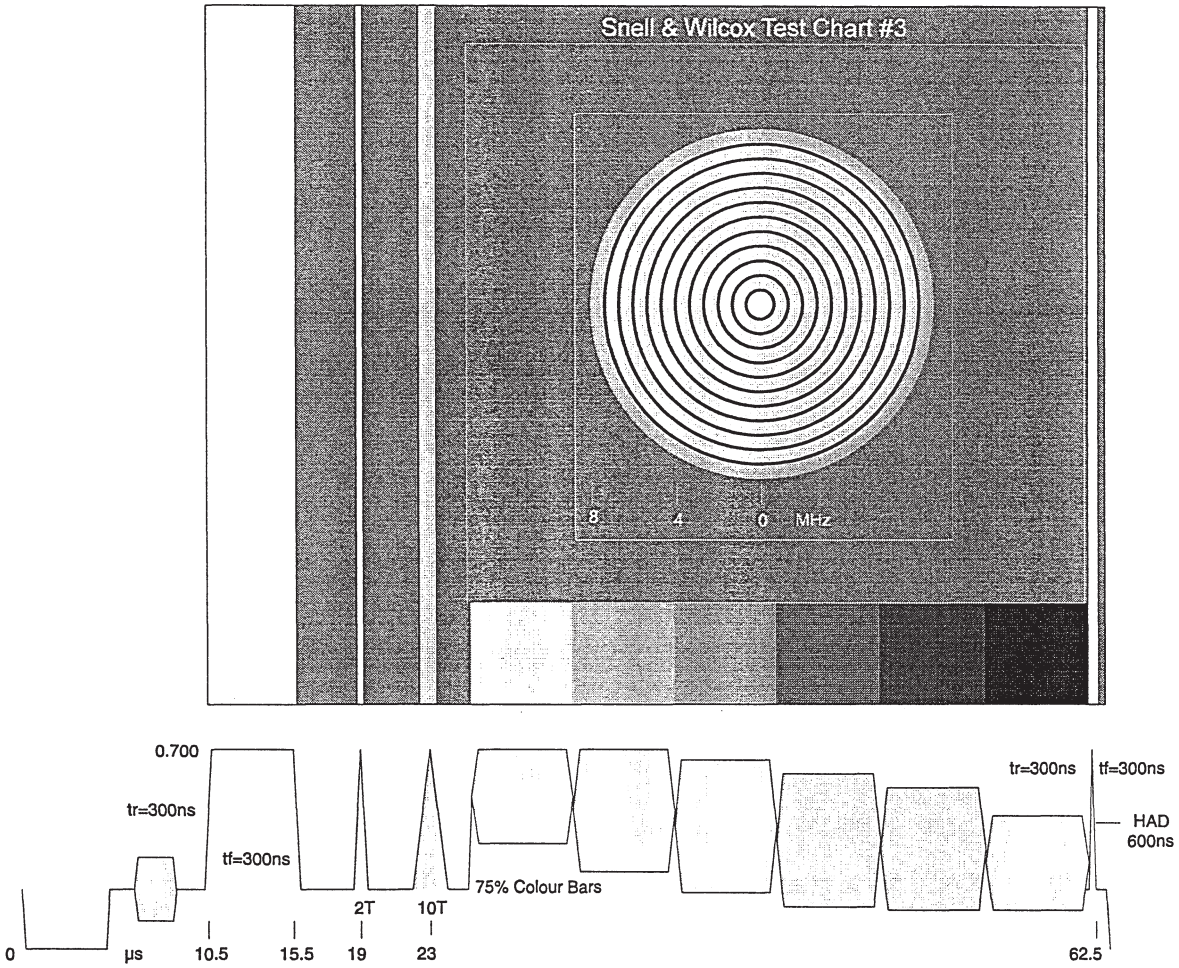


TEST CHART IN FORMATS OTHER THAN PAL

In some other formats the Snell & Wilcox 2 test chart looks very similar, but some values could differ.
For instance in NTSC format the 2T value is not 200 but 250 ns and black level set-up is added etc.

Pattern Information

Snell & Wilcox Test Chart # 3 (PAL only)



The Snell & Wilcox Test Chart # 3 is a general purpose TV test chart that allows the measurement of amplitudes and timings to be easily made.

The composite PAL/D2 waveform is generated using 10 Bit quantisation giving 588 levels from black to white. Sync level is 4 (-300 mV), black is 256 (0 mV), white is 844 (700 mV). If not otherwise specified all lines, bursts and other chart components mentioned in this document are 100 % contrast (covering full range from black to white).

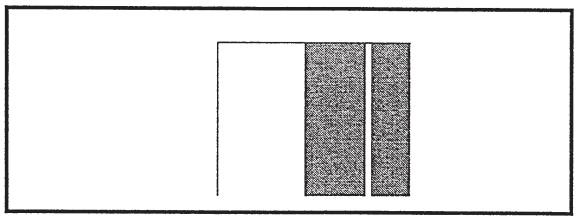
This pattern contains all active picture half-lines at the start and end of fields and is designed primarily for making measurements on analogue oscilloscopes. Waveforms are generated as non-orthogonal PAL to avoid the problems of measuring apparently jittery signals, (orthogonal PAL produces this effect) which makes accurate measurements difficult.

Pattern Information

PEAK WHITE LEVEL

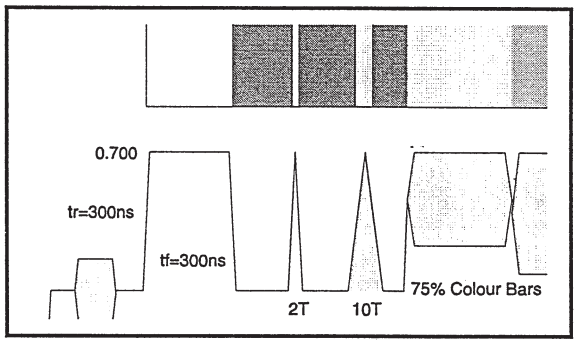
A peak white bar is provided to check luminance levels.
The bar has an amplitude of 700mV, is 5µs wide (Half Amplitude Duration) with rise and fall times of 300ns (10% to 90% amplitude, sin2 form)

The front edge defines the start of active picture time.



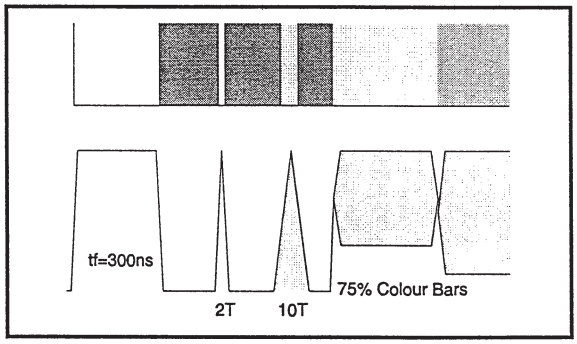
SIN^2 PULSE RESPONSE

A 3.5µs period of black is followed by a 2T (200ns HAD) pulse having a sin^2 form at 700mV amplitude.
This may be used to check the frequency response of a system by comparing the amplitude of the pulse to that of the white bar. (Pulse to Bar response)
Any rings or under/over-shoots on the front and/or back of the pulse edges will indicate poor frequency and/or phase response of a system.



AUGMENTED COLOUR PULSE RESPONSE

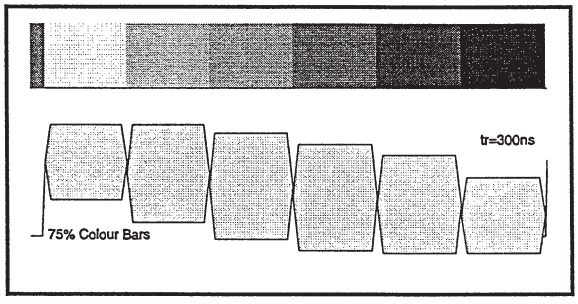
A 10T (1µs HAD) sin2 pulse, modulated with subcarrier, is provided to allow chroma to luma gain and delay inequalities of a transmission system to be easily seen. The bottom of the pulse should be flat; any symmetrical deviations from flat indicates a gain error and asymmetrical deviations will indicate chroma/luma timing errors.



75% COLOUR BARS

A small section comprising 75% Colour Bars is provided so that vector positions and amplitudes may be checked on a suitable vectorscope.
They may also be seen on a normal oscilloscope at low intensity in the background (as they are only generated for a small proportion of the picture time) when all lines are displayed on the screen.

The colours follow the normal sequence i.e. yellow, cyan, green, magenta, red and blue. Note that there is no black section to this set of colour bars.



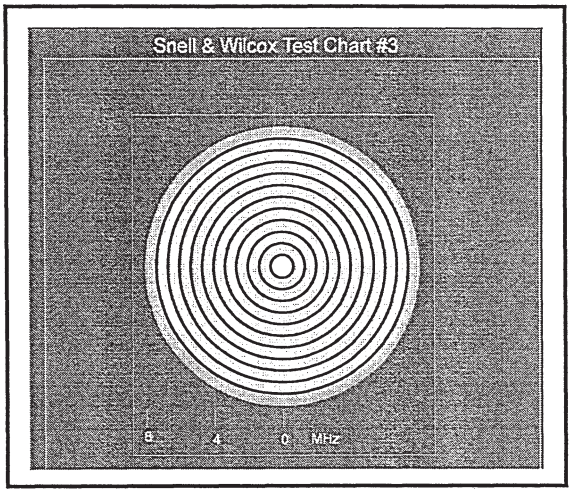
Pattern Information

MOVING ZONE PLATE

A Fresnel zone plate on a black background is provided covering spatial frequencies up to 8MHz with markers at 0,4MHz and 8MHz. It may be moved in all of the modes available using the MOVEMENT function of the TPG.

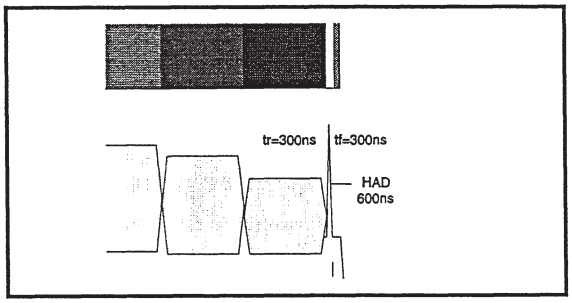
The zone plate and markers are contained within an invisible rectangle which defines the extremities. Movement of this rectangle is confined to the area contained within the larger invisible rectangle.

The zone plate is especially useful for checking line or frame based comb decoders and scan converters performance.



PEAK WHITE PULSE

This peak white pulse (700mV) has a HAD of 600ns with rise and fall times of 300ns. The falling edge (at HAD) defines the end of active picture time.



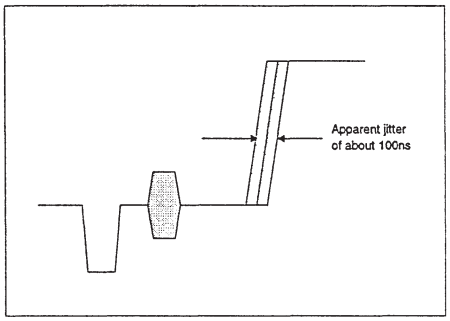
Pattern Information

Important Information

The following information concerns oscilloscope viewing of line-based patterns produced by the TPG20, in PAL/D2 and PAL-N formats.

When the above mentioned patterns are viewed on an oscilloscope at line rate, e.g. 20µs per division, and the signal triggered from internal line sync, a picture edge will appear to have a horizontal jitter component of about 100ns as shown below. (exaggerated for clarity)

This is quite normal and correct and does not indicate that the TPG is malfunctioning



The reason for this phenomenon is explained as follows:

In the TPG20 the above mentioned line based patterns are produced by combining two separate waveforms.

One waveform is a standard black burst signal generated as *a full frame of non-orthogonal PAL.*

The other waveform (pattern signal) is generated as a single line of *orthogonal PAL* and is overlaid over the black burst waveform.

It is this difference in signal generation that produces the jitter shown above.

The pattern signal could be generated as a full frame of non-orthogonal PAL, but would consume vast quantities of ROM storage space as a full frame of memory would be required for each and every pattern.

It should be noted that there are two patterns available from the TPG which *are* generated as a full frame of non-orthogonal PAL. These are S & W Test Pattern No. 2 and S & W Test Pattern No. 3.

To view a picture edge generated as orthogonal PAL without displayed jitter, two methods may be used:

1. Trigger the oscilloscope with line trigger from the TPG, as this signal is timed to the picture information.
   Jitter will now be seen on the black burst part of the waveform.

2. Internally trigger the oscilloscope to field sync and use the oscilloscope delay function to display a single line.

Pattern Information

A more detailed explanation now follows.

NON-ORTHOGONAL PAL

This is the term used to describe the mathematically-correct generation of PAL format signals.
This signal has a defined relationship between the horizontal scanning frequency and the colour subcarrier frequency given by the equation

$$fh = \frac{4fsc}{1135 + \frac{4}{625}} Hz \ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where fh = Horizontal scanning frequency
fsc = Colour sub-carrier frequency

This may re-arranged as:

$$4fsc = fh\left(1135 + \frac{4}{625}\right) Hz \ldots\ldots\ldots\ldots\ldots\ldots 2$$

or

$$4fsc = 1135fh + \frac{4fh}{625} Hz \ldots\ldots\ldots\ldots\ldots\ldots 3$$

or

$$4fsc = 1135fh + 0.0064fh\ Hz \ldots\ldots\ldots\ldots\ldots\ldots 4$$

or

$$4fsc = 1135.0064fh \ldots\ldots\ldots\ldots\ldots\ldots 5$$

It is clear from equation (5) that 4fsc is not an integer multiple of fh (the horizontal scanning rate)

However, when PAL signals are digitised or generated as a digital source, the sampling frequency used is 4fsc.

If equation (5) above was 4fsc = 1135fh it would mean that there would be exactly 1135 samples during each line (sync edge to sync edge) and each sample point would occur at exactly the same place on each line. But, as 4fsc is actually a frequency slightly greater than 1135 times fh, there will be slightly more than 1135 samples during each line (1135.0064 samples per line) and the sampling point will occur slightly earlier on subsequent lines. Normally this is of no consequence as when the signal is converted from digital to analogue, 4fsc is again used for sampling and the signal is correctly re-constituted.

This is the way non-orthogonal PAL is produced.

Pattern Information

Now consider the generation of a line based signal, i.e. a pattern that has the same picture information on all lines of the frame.

If there were an integer number of samples during each line, a single line representing the pattern could be stored within a ROM and read out for all other lines as the sampling point will occur at exactly the same time for every line (when measured from a datum point e.g. a sync edge)

However, in non-orthogonal PAL, there are not an integer number of samples during each line and (if a single line representing the pattern was stored within a ROM and read out for all other lines) the sampling points would not be coincident with the same point in the pattern.

This would result in the waveform being sampled at a slightly different (earlier) point on each line. This effect would be seen on a monitor display as a vertical line of a pattern being skewed slightly to the right at the bottom of the picture. Also, when the wave form is displayed on an oscilloscope at line rate (all lines overlaid), the edge will show a horizontal jitter component equivalent to the shift in the timing of the edge during the period of a frame.

To avoid this effect every line in the frame could be generated such that the same point in the waveform would be coincident with a sample point; however, this would mean that every line would have a different timing and would require a large amount of memory to store all lines in a frame. For this reason only two non-orthogonal patterns are generated in the TPG and all other line based patterns are generated in orthogonal PAL.

It should be remembered (as mentioned previously) that the black burst part of all waveforms in the TPG is generated as non-orthogonal PAL; it is only the pattern information that is generated as orthogonal PAL.

Waveform View Program Facility

GENERAL INFORMATION

To allow all parameter details (timings, amplitudes etc.) of the waveforms produced by the test pattern generator to be found, a floppy disk is provided with this manual which contains detailed information of all the waveforms and patterns available from the unit

INSTALLATION

The program may be run on any IBM compatible P.C. with a colour VGA monitor. Approximately 2 Megabytes of free hard disk space will be required.

To install the disk proceed as follows:

Place the disk in the floppy disk drive. e.g. A:
Change the drive to A: by typing A: <return>
Now type INSTALL C: <return>
where C: refers to the computer Hard Disk Drive.

All files will then be copied into a directory C:\TPG.

Waveform View Program Facility

BACKGROUND INFORMATION

All waveforms and signal patterns produced by the test pattern generator are generated by the summation of various combinations of waveforms stored in pre-programmed devices. These devices are programmed with information such as timing and amplitude details for each TV line and frame for each particular waveform. This information is contained in numbered files which may be read using this View Program Facility. The waveform (or section of the waveform) may then be displayed on the computer screen (similar to an oscilloscope display) and particular parameters of the waveform accessed by use of the facilities provided.

TO USE THE VIEW PROGRAM

The file name of the section of the pattern that you wish to view must first be found. This may be achieved by viewing the file:

\TPG\PATTERNS.TXT using any ASCII text viewing program.

This file contains a list of groups of file names, arranged in the same order as the groups shown in the `Numerical Listings of Patterns' section of this manual. The first line of each paragraph is a string defining a particular pattern and corresponds to the description that appears in the LCD window of the TPG20.

To View a Particular Section of a Pattern

As an example, let us assume that it is required to inspect and measure parameters of the super-black section of SMPTE COLOR BARS 525/NTSC/D2.

This list should be searched for the string:
SMPTE COLOR BARS 525/NTSC/D2

Listed below this title will be a list of files:

```
SMPTE COLOR BARS 525/NTSC/D2
\TPG\LLN\NTSC
L[21:182]=SMPTE1.LCP
L[183:201]=SMPTE2.LCP
L[202:262]=SMPTE3.LCP
L263=SMPTE3R.LCP
L283=SMPTE1L.LCP
L[284:445]=SMPTE1.LCP
L[446:464]=SMPTE2.LCP
L[465:525]=SMPTE3.LCP
```

This list shows all the files required to make the pattern SMPTE COLOR BARS 525 NTSC/D2 with the exception of the basic black signal.

The section of the pattern we require to view (the super-black section) is known to be in the lower section of the picture, so by inspecting the list of files it can be seen that the file L[465:525]=SMPTE3.LCP represents this part of the pattern.

Waveform View Program Facility

A note should now be made of this file name:
SMPTE3.LCP

Next EXIT the ASCII text viewing program.

Note: To avoid repetition, waveforms are divided into their basic sections followed by specific details for particular parts of the waveform.

For example, all waveforms in the 525/NTSC format are composed of file names specifying standard mixed synchronising pulses and colour burst. This represents the basic section. i.e. Black, and will be common to all waveforms in this format. The group file names which then follow specify the actual pattern produced in addition to black.

File Name String Explanation

Example:
L[465:525]=SMPTE3.LCP

L refers to the line numbers in the brackets (a single line will not have brackets)[465:525] refers to line numbers between, and including, 465 and 525.=The file name after the equals sign is the file used to define the characteristics of the line numbers in brackets SMPTE3.LCP This is the file used to define the characteristics of the line numbers in the brackets.

To run the View program type

TPGVIEW <return>

Using the up down keys select the

LLN directory <return>

Using the up down keys select the desired directory for that format i.e. NTSC <return>

Using the up down keys select the desired file name noted above i.e. SMPTE3.LCP<return> The view program will then display the waveform corresponding to this file name in the style of an oscilloscope display. In addition to this display the screen contains many useful facilities that may be used to analyse the waveform.

IMPORTANT NOTE CONCERNING VIEWING OF PAL FILES

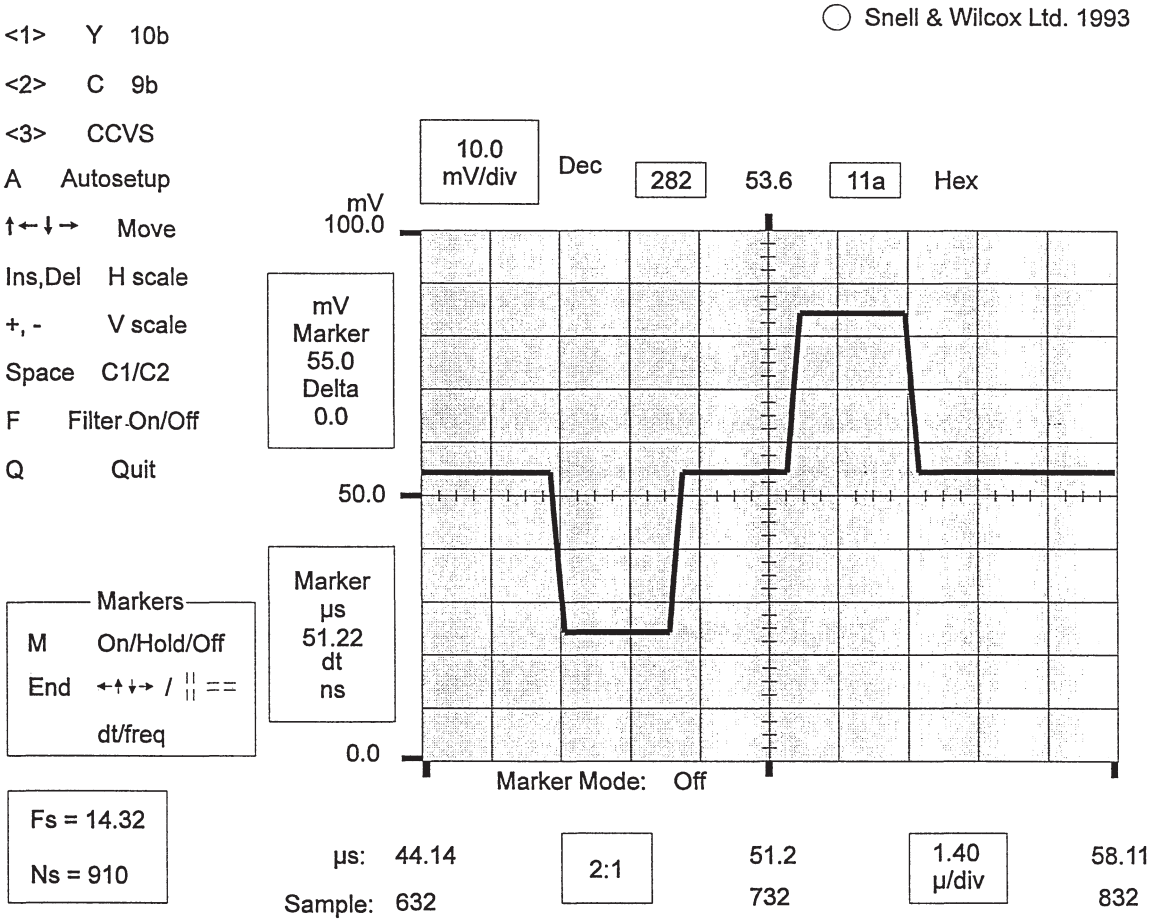
Patterns with a 25 Hz offset relationship between the colour subcarrier frequency and the line frequency are generated in two parts. The Black Burst waveform is loaded into the TPG20 memory first, followed by the active signal data.

The TPGVIEW program can only display the active signal file data.

i.e. the black burst signal cannot be viewed

Waveform View Program Facility

VIEW PROGRAM DISPLAY



FILE: C:\TPG\LLN\NTSC\SMPTE3

DESCRIPTION OF FACILITIES AVAILABLE

<1> Y 10b Displays the Y (luminance) part of the signal. 10b indicates the signal is 10 Bit
<2> C 9b Displays the C (chrominance) part of the signal. 9b indicates the signal is 9 Bit
<3> CCVS Displays the complete composite signal if applicable.

This function selects the waveform that will be displayed. The number refers to the normal 1 to 0 keys on the keyboard.

A Autosetup

Pressing the A key clears any changes made to the settings and allows the complete line waveform to be displayed.

Waveform View Program Facility

Move

The waveform may be moved or positioned within the display graticule using the four up/down/left/right keys.

Ins,Del H scale

Pressing the Insert key expands the waveform in the horizontal direction and pressing the Delete key compresses the waveform in the horizontal direction.
The scale is indicated in the box (this example shows 1.4 µs/div) and reference timing points indicated in this example as: us: 44.14 51.2 58.11

+.- V scale

Pressing the + key expands the waveform in the vertical direction and pressing the - key compresses the waveform in the vertical direction. The scale is indicated in the box (this example shows 10.0mV/div) and reference levels indicated in this example as: 100.0mV 50.0 0.0

Space C1/C2

Pressing the space bar allows the two phases of a colour signal to be viewed. This is a toggle function.

Q Quit

Pressing the Q key quits or exits the program.

Markers

M On/Off/Hold

When the M key is pressed once (On) cursor markers are provided on the screen. Two markers appear in both the vertical and horizontal planes; one a broken line (reference) and one continuous line (measurement). When pressed for a second time (hold) the positions of the markers are fixed. Pressing the key a third time turns the markers Off.

End

One of the pair of markers or cursors may be moved over the display area by means of the up/down/left/right keys in steps or continuously when held down. Pressing the End key enables the other marker to be moved. This key has a toggle action.

T dt/freq

Pressing the T key enables the distance between the two vertical markers to be expressed as either a time difference dt or as a frequency and the value (ns) is given in the Marker box. The value in us shown in the Marker box gives the time position of the reference marker line. This key has a toggle action.

The horizontal markers may be used to measure the amplitude of any part of the waveform. The markers should be positioned by means of the up/down/left/right keys The reference marker amplitude is given in the upper marker box in mV and the difference value given as Delta mV.

Marker Mode

This text indicates the state of the marker mode set by the M key.

Waveform View Program Facility

Fs

The number following the letters Fs= indicates the sampling rate in MHz.

Ns

The number following the letters Ns= indicates the number of samples per line.

Sample:/µs

These figures show the time position calibrated in either microseconds or the line sample number.

Dec

The value in the box is the decimal digital value of the amplitude of the waveform at the centre of the graticule.

Hex

The value in the box is the value in Hexadecimal of the amplitude of the waveform at the centre of the graticule.

Note that the figure given between the Dec and Hex value is the value in millivolts of the amplitude of the waveform at the centre of the graticule.

F

When this key is pressed a half-sample-rate filter is applied to the waveform. This key has a toggle on/off action. NOTE that the filter may only be enabled when the expansion ratio (shown in a box as 2:1 in this example) is 5:1 or greater.

END.

Operation

1st LINE MAINTENANCE

In the unlikely event of this unit failing to operate correctly no attempt should be made to repair the unit unless all the necessary test equipment, service manuals and technical expertise is available and permission has been granted in writing by Snell & Wilcox Ltd. or their official agents, for such repairs to be attempted.

Failure to comply with these conditions will void the warranty.

First line maintenance should be confined to the replacement of the plug-in card, the power supply module, the fan and the backplane assembly

CLEANING

It is important that the ventilation slots in the bottom of the front panel and the holes in the sides of the unit do not become obstructed or blocked in any way including the build-up of dust etc. as this will interfere with the ventilation and cooling of the unit.

A reduction of air flow through the unit may result in overheating and the power supply over-temperature cut-out may operate and shut down the unit.

The front panel slots, side panel holes and the cooling fan should be regularly inspected and cleaned if necessary.

TO REMOVE THE PCB CARD

IMPORTANT WARNING

Before attempting to remove the PCB card the two PCB retaining screws located on the bottom panel of the unit must be removed . The card may then be safely removed by means of the card ejectors.

TO REMOVE THE POWER SUPPLY MODULE

1. Disconnect power to the unit by removing the IEC power connector
2. Allow two minutes for capacitors to discharge
3. Remove the top cover of the unit (8 screws)
4. Pull off the insulating sheet covering the power supply module
5. Pull off the white plug-in connectors
6. Remove the four black M4 nuts securing the module
7. Withdraw the module

Operation

TO REMOVE THE COOLING FAN

1. Remove the top cover of the unit
2. Remove the two PCB retaining screws located in the bottom panel
3. Remove the PCB using the card ejectors
4. Unplug the fan connector cable
5. Remove the four M4 nuts and bolts securing the fan
6. Withdraw the fan unit

NOTE:-

When refitting the fan ensure that it is fitted such that the airflow is from inside the unit to the outside. i.e. air is sucked out of the unit.

TO REMOVE THE REAR BACKPLANE ASSEMBLY

1. Remove the fan assembly as detailed above
2. Unplug the white Power Supply Module connector
3. Remove the external backplane fixing screws (5 pieces M2.5)
4. Remove the right hand rear white plastic PCB runner. (Use a flat metal tool e.g. screwdriver, to lever off the runner. The runner is fixed to the metalwork by 2 lugs.)
5. The complete backplane assembly may now be withdrawn from the unit.