Mentor XL

SYNC AND TEST SIGNAL GENERATOR

User Guide

Issue 5.30

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Issue	Date	Reason for Change	Approved
5.00	2 November 2011	V5.0.0.0 software	
5.10	30 November 2012	V5.0.0.9, changes to GPS menus	
5.20	14 May 2013	Introduced GPS option board 360-15-10	
5.30	31 May 2013	Added extra detail for GPS	

CONTENTS

1. APPLICATION

1.1 INTRODUCTION

The Trilogy 360-00-xx Mentor XL Synchronising Pulse Generator is one of the most flexible units available on the market today. It is suitable for any digital or mixed format environment where a high quality digital SPG is required. The part suffix xx denotes minor variations and updates which fall within the scope of this document.

- 5 analogue outputs
- 3 SD-SDI black outputs with 4 channels of embedded AES silence and EDH
- 2 AES-3 silence outputs
- 10 MHz / 27 MHz/Word Clock output
- Each output individually timed
- Each output selectable to either 525 or 625 operation
- 10 MHz reference input
- Looping Genlock input

All SDI and analogue black/burst outputs offer full control over timing and are individually selectable for 525 / 625 standard operation.

Mentor XL is fitted, as standard, with an oven-controlled reference oscillator allowing the unit to be used either as station master, or as a slave.

The main black/burst generator provides 5 independently timed outputs, giving total timing freedom with adjustment of ±4 fields (±2 fields 525) relative to the main timing plane in 0.5 ns steps.

Software upgrades are available to add HD-SDI capability, test patterns (for analogue and/or digital outputs), audio test signals, full field test patterns, LTC, VITC, D-VITC, ATC, NTP and SNMP. Optional hardware options are available to add a GPS module for high stability time and oscillator referencing, an HD tri-level sync option module and SDI option modules providing additional SD, HD and 3G SDI outputs.

In addition, an internal redundant power supply is available to increase MTBF, or to allow AC power diversity in critical applications.

An Ethernet port is provided for software upgrades via TFTP (Trivial File Transfer Protocol), and synchronising time by means of NTP (Network Time Protocol).

This User Guide concentrates on the operational aspects of the unit and includes a full technical specification.

1.2 VECTOR FOR MENTOR XL

For a Mentor XL running version 4.0.0.4 (or later) software, a browser based configuration tool is provided, offering:

- Online editing of Mentor XL configurations
- Partial or incremental updates without causing disruption (where possible)
- The ability to copy, backup and restore configuration data.

Please see Section 3.10 of this manual for information on getting started with Vector.

1.3 AVAILABLE OPTIONS

Three option card slots are available. The Mentor XL auto detects which type of option card is fitted and presents the user with appropriate menu options.

A number of additional features and options are available for the Mentor XL.
At the time of writing in November 2012, these are:

Part Code	*Description*	*Note*
360-09-00	Optional redundant power supply	
360-10-00	Video test signals	Software option to add composite analogue and SDI test signals.
360-11-00	Audio test signals	Software option to add analogue and AES test tones (including GLITS interrupted channel ident tone)
360-12-00	Full field test patterns	Software option to generate FUBK test pattern, selectable 4:3 & 16:9. Requires 360-10-00 video test signals as pre-requisite.
360-13-00	HD test patterns	Software option to add HD-SDI test patterns. Requires 360-10-00 video test signals as pre-requisite.
360-14-00	Timecode	Software option to provide two LTC outputs with VITC, D-VITC and ATC.
360-15-01	GPS Time Reference	Includes receiver module. Replaced by 360-15-19, May 2013
360-15-02	Unbalanced AES Output card	Activates the 2 x AES unbalanced outputs. Requires 360-11-00 as pre-requisite. Not required if 360-15-01 fitted.
360-15-03	GPS Antenna and Universal mount	Bullet III Dome 5V antenna. Supplied with F - type connector.
360-15-10	GPS Time Reference	Hardware option board replacing 360-15-01, May 2013
360-16-01	HDTV tri-level sync board	Provides 4 x individually configurable tri level sync outputs. Replaces 360-16-00.
360-17-00	SD/HD SDI Expansion Module (now replaced by 360-20-00)	Provides 4 additional SD or HD-SDI outputs in any combination. Requires options 360-10-00 (SD) or 360-13-00 (HD) as pre-requisite. See Note 1.
360-18-00	NTP Server Option	Order Server or Client ONLY
360-18-01	NTP Client Option	Order Server or Client ONLY
360-19-00	SNMP Support	Software option to enable Simple Network Management Protocol support.
360-20-00	HD/3G-SDI Expansion Module	Provides 4 additional HD or 3G-SDI outputs in any combination. Requires options 360-13-00 (HD) as pre-requisite. See Note 1.

Notes:

1. Normally only a single 360-17-00 or 360-20-00 will be fitted to each Mentor XL.

Please see section 10 of this manual for more information on setup and configuration of options.
Additional hardware and software options will be offered in the future: please contact your supplier or Trilogy for more information.

1.4 TECHNICAL SUPPORT

UK & International

Please contact Trilogy at the UK headquarters.

Trilogy Communications Ltd
26 Focus Way
Andover
Hampshire
SP10 5NY
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2500 E. Hallandale Beach Blvd, Suite 808
Hallandale Beach, FL 33009-4841
E-mail: support@trilogyus.com
Phone and Fax: +1 847-461-1480
Toll Free Phone and Fax from US: 800-372-3198

In other regions please contact your local dealer. Current contact details may be found at www.trilogycomms.com then follow links to the Broadcast division site.

1.5 WARRANTY

Conditions of the warranty may vary according to your terms of purchase. Please consult your sales documentation or if in doubt, contact your original supplier or Trilogy at the offices above, quoting date of purchase and unit serial number.

1.6 COMMON CONFIGURATIONS

To cater for different system design philosophies and installations of varying complexity, we have tried to make the Mentor XL as flexible as possible. Some common system modes and configurations are described in section 0 on page 85.

2. INSTALLATION

2.1 UNPACKING

Carefully unpack the unit from its transit material and check the unit for signs of damage. Check the contents of the box against our despatch note and your original order to ensure that you have received the correct parts.

In the event that the unit has been damaged or does not match your order, immediately contact your supplier or Trilogy at the address given at the front of this guide.

2.2 RACK MOUNTING

The 1U rack frame has integral 19" mounting ears for direct mounting in a standard 19" rack. Carefully place the unit in your rack and firmly attach it to the rack using 4 bolts.

IMPORTANT: This unit has air intakes on one side of the unit and fan assisted exhaust vents on the other side of the unit. Ensure that these have an unobstructed air flow, otherwise the unit will overheat. Pay particular attention to ensure that any rack wiring or cable trays do not obstruct the vent. 60mm of clear space should be allowed between the vents and any potential obstruction.

2.3 EARTHING REQUIREMENTS

The unit is provided with a single 4mm earthing stud on the rear panel. Incoming mains earth from the IEC connector is internally bonded to both the chassis and technical 0V to meet safety requirements and performance specifications. The stud allows the addition of an earth strap, if required, in rack installations.

2.4 MAINS CONNECTION AND FUSING

Important

Power Supply Cord Used as Disconnect Means

CAUTION: THE POWER SUPPLY CORD IS USED AS THE MAIN DISCONNECT DEVICE. ENSURE THAT THE SOCKET-OUTLET IS LOCATED / INSTALLED NEAR THE EQUIPMENT AND IS EASILY ACCESSIBLE.

ATTENTION: LE CORDON D'ALIMENTATION EST UTILISÉ COMME INTERRUPTEUR GÉNÉRAL. LA PRISE DE COURANT DOIT ÊTRE SITUÉE OU INSTALLÉE À PROXIMITÉ DE L'ÉQUIPMENT ET ÊTRE FACILE D'ACCÉS.

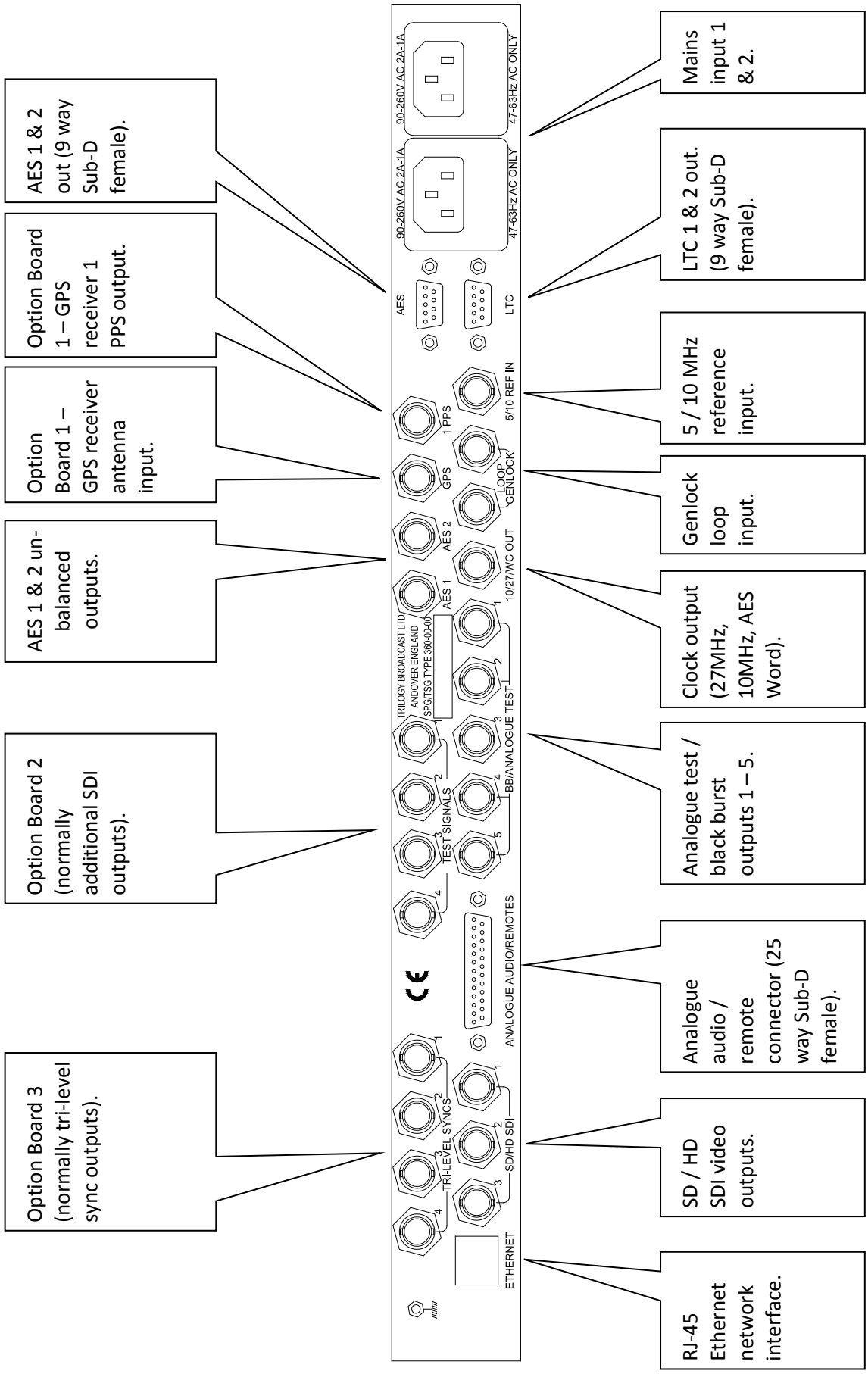
The power supplies within the unit are a switched mode design and will cope automatically with a wide input voltage range (see specification, section 17.3)

The standard Mentor XL is fitted with a single mains power supply unit (PSU), with an option to fit a second PSU. Each power supply has its own, dedicated, IEC mains plug on the rear of the Mentor XL. These should be wired according to the instructions provided with a mating mains socket using suitable cable. See above for earthing requirements.

Mains cable conductors are to be three-core (two-wire with ground), wire gauge 18 AWG (cross sectional area 0.75mm²) Jacket to be type SJT.

Covers are only to be removed by trained personnel. Shock hazard exists with covers removed; therefore disconnect mains supply before removal. Interconnection between circuit boards and panels are all safety extra low voltage (SELV) as defined by IEC/EN/CSA/UL 60950-1-200X. The equipment signal connections must only be connected to SELV circuits to prevent hazards from improper connection.

2.5 REAR PANEL CONNECTIONS



2.6 ANALOGUE AUDIO / REMOTE CONNECTOR PINOUT

The chassis is fitted with a fixed D25 socket.

Pin	Description	Notes
1	Fan OK - 1	Pair with 16. Closed if OK.
2	RS422 CTS-	
3	RS422 RXD+	or RS232 RX
4	RS422 TXD+	or RS232 TX
5	RS422 RTS-	
6	RS422 TXD-	
7	GND	
8	RS422 RXD-	
9	GND	
10	+ 12V DC./ 0.3A	Internal 0.5A self-resetting thermal fuse.
11	Analogue Audio Out 1+	
12	Analogue Audio Out 2 +	
13	GND	
14	Power OK 1	Pair with 15. Closed if OK.
15	Power OK 2	Pair with 14. Closed if OK.
16	Fan OK - 2	Pair with 1. Closed if OK.
17	GPIO - Output 1	
18	GPIO - Input 2	
19	GPIO - Input 1	
20	RS422 CTS+	or RS232 CTS
21	GPIO - Output 2	
22	RS422 RTS+	or RS232 RTS
23	Analogue Audio Out 1-	
24	Analogue Audio Out 2-	
25	GND	

2.6.1 Remote Connector

2.6.1.1 Serial Communications Port

The serial port is used during manufacturing test and alignment. The port may be configured for RS232 or RS422 operation from the System menu. The configuration menu is shown in section 8.

2.6.1.2 Analogue Audio Outputs

The analogue audio output is provided by an independent audio generator.

2.6.1.3 Power Fail Output

This is a status output provided by a single relay contact. During normal operation, the contact is closed. The unit senses a failure of any internal voltage rail, causing the relay contact to open.

2.6.1.4 Fan Fail Output

This open collector status output indicates correct operation of the internal cooling fan. Open circuit / short circuit and stalled fans are detected.

2.6.1.5 GPI Inputs 1 and 2

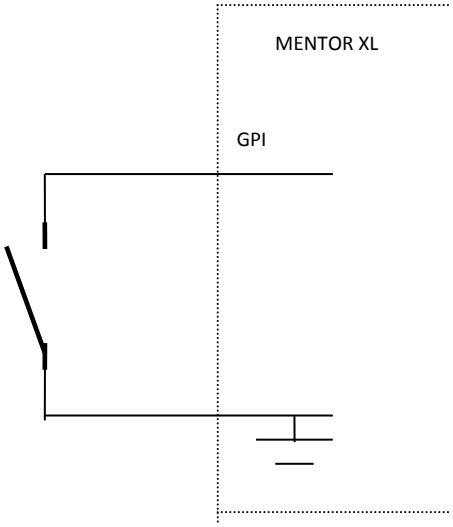
The general purpose interface inputs (GPI) 1 and 2 are configured in software, using the menus described in section 8.1.1, to provide any of the following functions:

- Force free run mode
- Force genlock mode
- Force external 10MHz lock mode
- Step through SDI output 1 test patterns
- Step through SDI output 2 test patterns
- Step through SDI output 3 test patterns
- Step through set-up memory locations

2.6.1.6 Connecting to GPI Inputs

Mentor XL GPI inputs comprise single ended ground-to-operate inputs. The inputs can withstand +/-20V and draw approx. 600uA when operated.

To use a GPI input, connect the input to the Mentor XL ground.



2.6.1.7 GPI Outputs 1 and 2

General purpose interface outputs 1 and 2 are configured in software, using the menus described in section 8.1.1 to provide any combination of the following functions:

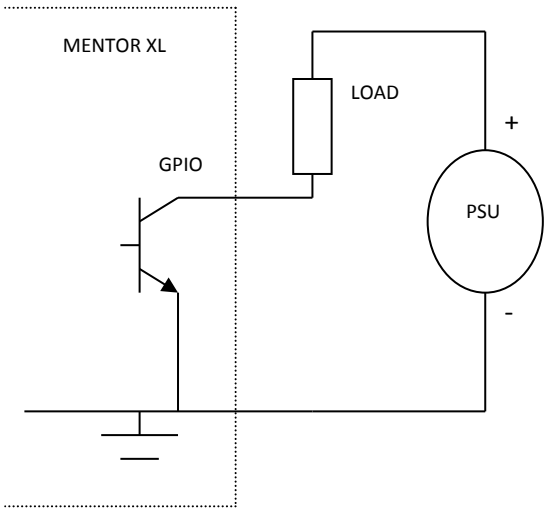
- Loss of genlock input
- Loss of external 10MHz reference
- Line lock error
- Field lock error
- Subcarrier lock error
- Illegal input ScH
- Diagnostic state alert
- Currently locked to external clock reference 5 / 10 MHz
- Currently locked to external genlock
- Currently internal/free-run mode

By combination it is intended that the output can be asserted when one or more conditions is true (for example, loss of genlock input and/or line lock error).

2.6.1.8 Connecting to GPI Outputs

Mentor XL GPI outputs comprise single ended open collector outputs with a 30V / 190mA rating, 600mW dissipation.

To use an output, a load should be connected between the output and an external power supply, with the negative end of the power supply connected back to the ground pin on the D type. As an alternative to an external power supply, a +12V, 300 mA feed is available on pin 10 of the D25 connector.



2.7 AES

The chassis is fitted with a fixed D9 socket.

Pin	Description
1	AES 1 +
2	AES 1 -
3	Shield
4	n/c
5	0V GND
6	Shield
7	AES 2 +
8	AES 2 -
9	Shield

A parallel, unbalanced output for each AES signal may be provided on rear panel BNC connectors as an option.

2.8 LTC

The chassis is fitted with a fixed D9 socket.

Pin	Description
1	LTC 1 +
2	LTC 1 -
3	Shield
4	n/c
5	0V GND
6	Shield
7	LTC 2 +
8	LTC 2 -
9	Shield

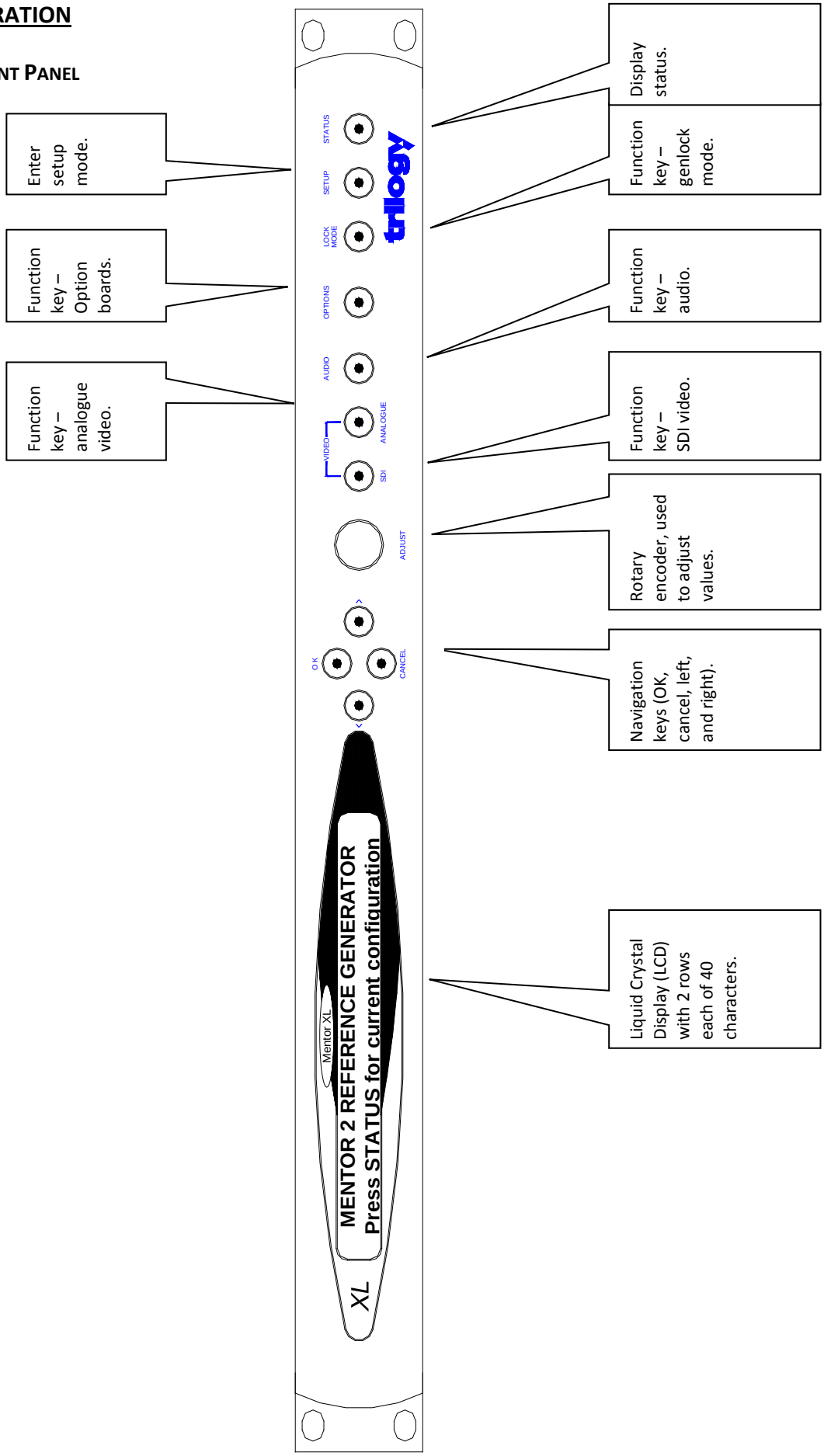
2.9 ETHERNET

The Mentor XL is equipped with a 10/100 Base-T Ethernet port. This port may be configured for either dynamic (DHCP) address mode, or static address mode. These options are located in the Setup menu. The Mentor XL should be connected to the network in the same way as any other networked device (e.g. computer or laptop) using a 1:1 CAT 5 RJ45 cable.

If connected directly to a computer or laptop, a crossover style Ethernet cable should be used.

3. OPERATION

3.1 FRONT PANEL



3.2 POWER ON DISPLAY

When the unit is powered, the LCD will display initialisation messages, as it configures the internal hardware of the unit. Once initialisation is complete, a message indicating a normal operational status is displayed, as shown below.

MENTOR XL Main Menu
<Digital Video> Analogue Video Audio ->

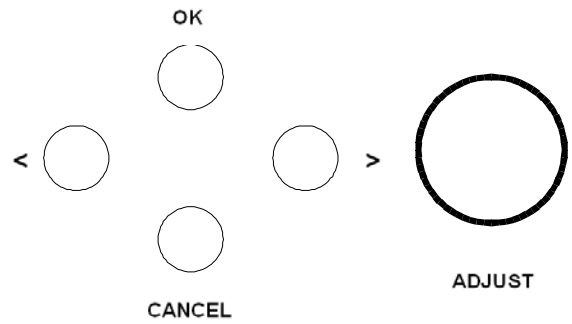
The top line gives the name of this unit (i.e. Mentor XL). The lower line displays the first available main menu items.

3.3 FRONT PANEL CONTROLS

The panel has four functional areas.

- A Liquid Crystal Display (LCD) used to show information to guide the user through operating the various functions and show status information
- Front panel buttons:
  - LEFT, RIGHT buttons for menu navigation
  - OK and CANCEL buttons to execute or exit the currently selected option.
  - Rotary encoder for parameter adjustment and/or left/right menu navigation
  - SDI button to access menus for main board SDI outputs
  - ANALOGUE VIDEO button to access menus for main board analogue video outputs
  - AUDIO button, to access menus for analogue audio and AES audio outputs
  - OPTIONS button to access option board menus
  - LOCK MODE button to configure genlock modes
  - SETUP button, for miscellaneous configuration options
  - STATUS button used to access diagnostic and status information

3.4 BASIC OPERATIONAL TECHNIQUE



There are a number of basic concepts, which once appreciated, will simplify the use of the Mentor XL.

Valid button pushes are indicated by a lamp lit in a button. In most cases, buttons without a lamp lit will not be prohibited, allowing rapid changes between functions of different types.

Invalid button pushes will result in an informative message on the LCD.

3.5 SELECTING A FUNCTION

To change any parameter, the appropriate function button must first be pushed. Once a function button is pushed, that button will illuminate to provide a reminder of which function is active.

Pushing a function button that has sub-functions under the first menu will cause the bottom row of the LCD to show the lower level functions.

To choose which of these sub-functions is required, the encoder or left – right keys may be used to step between the sub-functions. The current selection is marked with chevron symbols < >.

The top row of the LCD provides a fuller explanation of the function.

Once the required sub-function is selected, the OK button is used to choose it. Depending on the sub-function chosen, either a further set of sub-functions or the current value of that function is displayed. Where appropriate, the currently active option is indicated by square brackets (e.g. [ON]). If the active option is also selected, it is indicated by asterisks (e.g. *ON*).

3.6 CHANGING VALUES

To change a setting, the encoder control or left – right buttons may be used.

In the case of numerical values there are two functional modes. If the overall range of adjustment is small the encoder always alters the value by the smallest possible amount. If a wider range of adjustment is required, a “Delta value” system is used. Use the left/right buttons to switch between the setting and delta values and use the rotary encoder to adjust the selected value.

As the parameter is changed, the new value will be shown on the LCD. For some functions the unit responds by altering that value immediately - it is not necessary to confirm or otherwise activate the change. Otherwise the new value is applied when the **OK** button is pressed.

3.6.1 Leaving the Selected Function

Once the parameter has been set the unit can be returned to its normal operating mode, or another function chosen by one of three methods.

Pressing the current (lit) function button will step up through the menu structure one level at a time. Thus another parameter related to that function button may be changed without having to start again at the top-level menu.

The **OK** button allows you to descend the menu structure and the current Function or **CANCEL** key allows you to ascend the menu structure.

At any time, any other function button may be pressed to access a different menu. For example, having set an **OUTPUT CONTROL** function, the **SETUP** key may be pushed without having to first step back up through the menus.

3.7 MENU TIMEOUT

There is an in-built time-out mechanism that will automatically step back up through the menu structure one level at a time, until the top level is reached, if a key is not pressed within a preset time period.

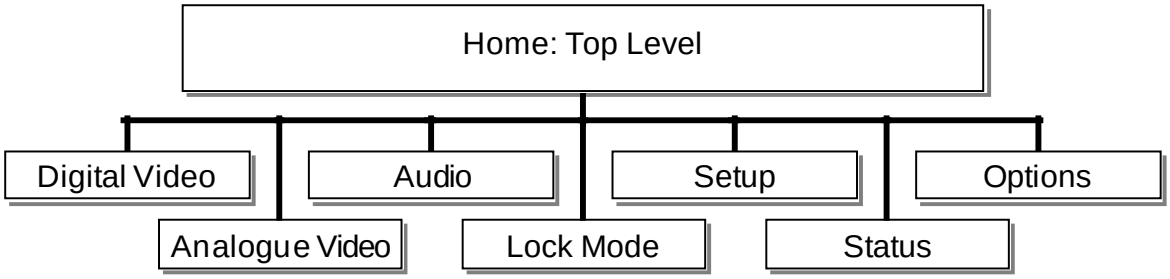
The option to configure this feature is located under the Setup >> More >> Display >> Menu Timeout menu.

3.8 FRONT PANEL LOCK

Front panel controls may be locked to prevent inadvertent changes of settings. To lock or unlock the controls, press the **LEFT** and **RIGHT** buttons simultaneously.

3.9 TOP LEVEL MENU

The top level menu currently holds these branches:



The content and features of each branch are explained briefly below: a more detailed view of each section is provided in later sections of this manual. Note that the Options branch (above) is only displayed if hardware option modules have been installed.

3.9.1 Digital Video

The SDI menu provides full control of the configuration of each of the three SDI outputs. The video standard, timing and appearance of each output are controlled from this sequence of menus. In addition, the embedded AES audio is enabled and configured for each output. If the high definition (HD) option is activated, additional choices will appear on this menu. For more details, see section 4.

3.9.2 Analogue Video

The video menu controls the format of the five analogue video signals provided on the Mentor XL. These are arranged as a group of three plus a second group of two outputs. This allows, for example, the group of three to be set as RGB or YUV in a single operation. See section 5.

3.9.3 Audio

The audio menu controls both non-embedded AES and analogue audio outputs. For all outputs, control of frequency and amplitude is available. In addition, for each AES output, the sample rate and source ident may also be configured. See section 6.

3.9.4 Lock Mode

The genlock input menu sets the required format of the incoming video signal and defines the behaviour of the Mentor XL when the genlock signal is applied, or removed. See section 7.

3.9.5 Setup

The System Setup menu provides control of the basic configuration of the Mentor XL, and will be used primarily during the installation phase. These include:

- Configuration of the LTC option (when available).
- Configuration of the Clock Output.
- Comprehensive control of General Purpose Inputs and Outputs, including
    - the input signal response mode
    - the action resulting from a GPI trigger
    - the event causing a GPO state change
- Check and control the internal memory
- Setup of the real time clock (RTC)
- Configuration of the Network Time (NTP) option (when available)
- Via the Comms menu:
    - configuration of the Ethernet port
    - configuration of the serial port
- Via the Display menu:
    - enable and control timing of the menu timeout
    - set the display contrast
- Configuration the Mentor as “slave”, allowing settings to be retrieved from a “Master”.
- Upgrade the Mentor XL, including the addition of features and test patterns.

See section 8 for more details.

3.9.6 Status

The Status menu provides, for information only, the current version numbers of the hardware and software of the Mentor XL. These values will be required when speaking to Trilogy Technical Support.

In addition, a series of status error messages may be enabled for display on the LCD screen. The final option on this menu displays a summary of the current configuration status. See section 9 for more details.

3.9.7 Options

The Options menu shows the type of board fitted in each of the three option slots. If no board is currently fitted, the text “OPTION” will be displayed. The text “TLS” refers to the tri-level sync option board. Note that the Options branch is only displayed if hardware option modules have been installed.

3.10 USING VECTOR

For a Mentor XL running version 4.0.0.4 (or later) software, a browser based configuration tool is provided, offering:

- Greatly simplified initial setup
- Online editing of Mentor XL configurations
- Partial or incremental updates without causing disruption (where possible)
- The ability to copy, backup and restore configuration data

Vector is compatible with Internet Explorer 8 (and later) plus Mozilla Firefox web browsers.

To start using Vector, follow these simple steps:

- Power up the Mentor XL and wait until it has initialised: this takes around 60 seconds.
- Using the front panel controls, navigate to:
  SETUP >> MORE >> COMMS >> NETWORK.
- Enter IP ADDRESS and SUBNET MASK values which are appropriate for your network. The gateway address is optional. Static IP addresses are preferred although DHCP is also offered. If you are unsure, consult your IT Administrator.
- Connect the Ethernet port on the Mentor XL to your network, using a standard RJ-45 cable.
- On a PC connected to the same network as the Mentor XL, open your web browser.
- Navigate to the address http://<address> where <address> is that which you entered on the Mentor XL front panel. For example, http://192.168.1.50.

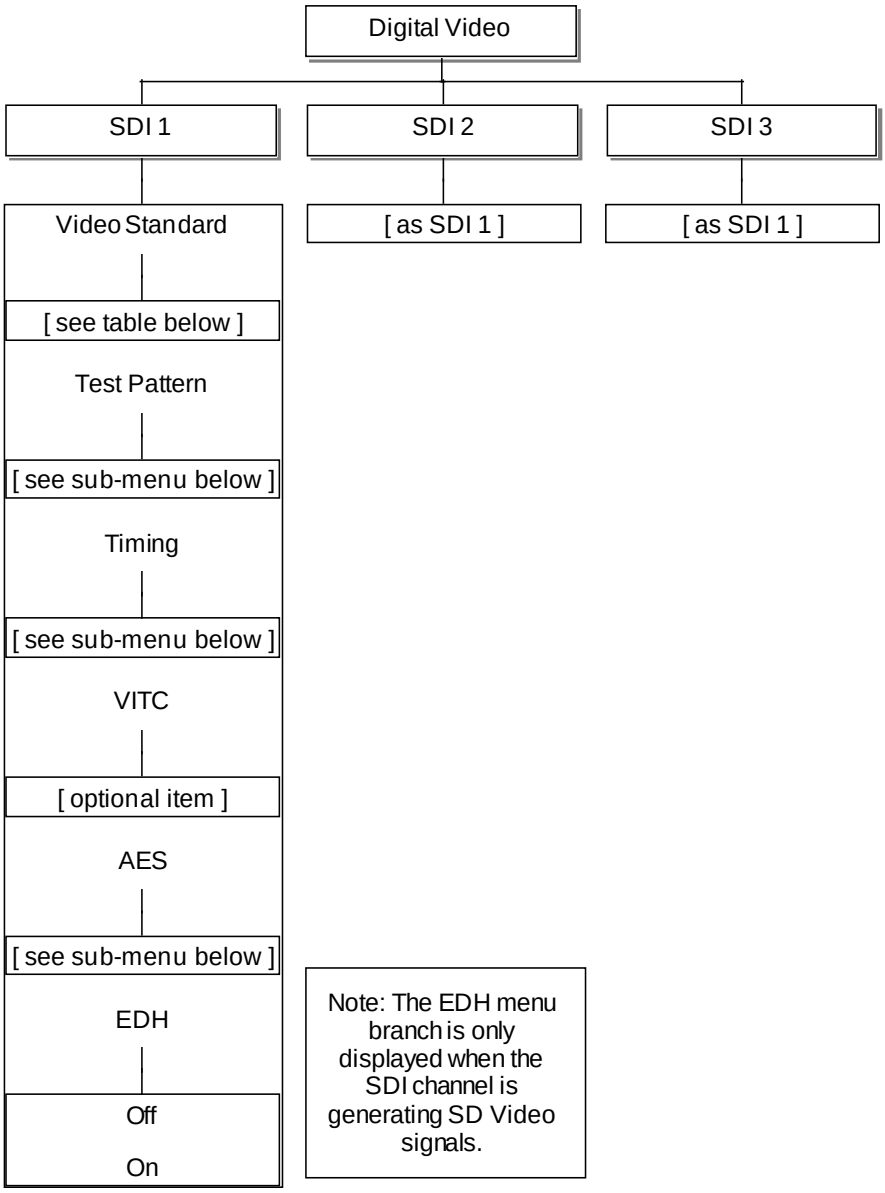
At the log-in screen, enter the username and password which by default are both set as ***admin***.

4. DIGITAL VIDEO

The Digital Video menu provides control and configuration of the three SDI video outputs. If the HD video option is present, the menu is extended to include further options.

From the top level, the menu branches to three identical sections. For clarity, only SDI 1 is shown below. SDI 2 and SDI 3 are identical.

The SDI 1 menu then holds five branches, as shown below. If the timecode option has been enabled, an extra entry "VITC" is also available. See section 11.4 for more details.



Factory Default Settings:
Embedded audio defaults to "ON"; VITC defaults to "OFF".

4.1 DIGITAL VIDEO – VIDEO STANDARD

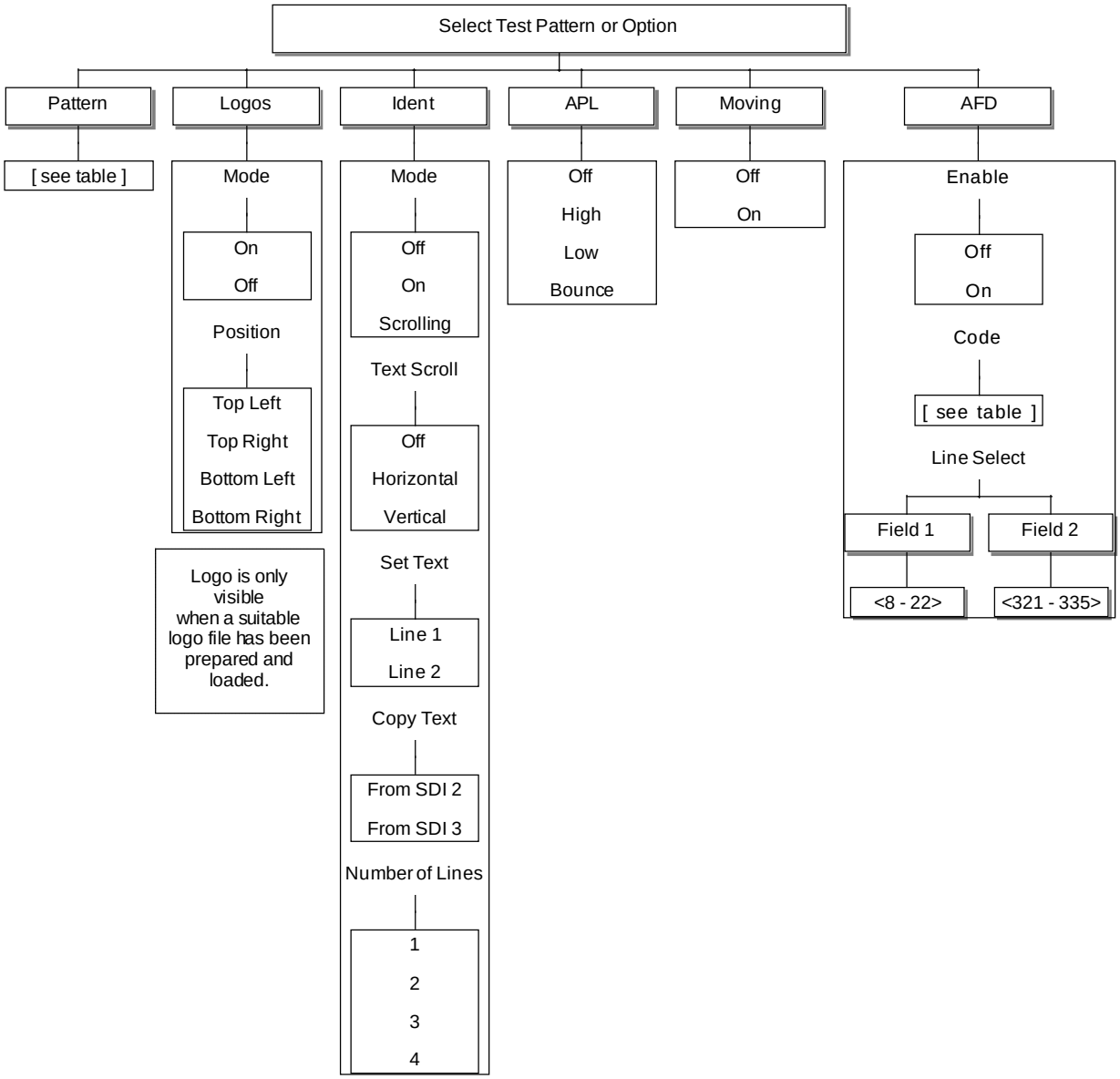
Currently available standards from the mainboard outputs are shown in the table below. For details of the standards supported by the 360-17-xx and 360-20-xx Option Boards, see section 15.2.

Description	Lines/ Frame	Frame Rate (Hz)	Scan
525			
625			
1080i / 60	1080	60	I
1080i / 59.94	1080	59.94	I
1080i / 50	1080	50	I
1080p / 30	1080	30	P
1080p / 29.97	1080	29.97	P
1080p / 25	1080	25	P
1080p / 24	1080	24	P
1080p / 23.98	1080	23.98	P
720p / 60	720	60	P
720p / 59.94	720	59.94	P
720p / 50	720	50	P
720p / 30	720	30	P
720p / 29.97	720	29.97	P
720p / 25	720	25	P
720p / 24	720	24	P
720p / 23.98	720	23.98	P

Note:

- I denotes Interlace scan
- P denotes Progressive scan.

4.2 DIGITAL VIDEO – TEST PATTERNS



Note: Using the ident menu, choose the "Number of Lines" of text prior to entering text using the "Set Text" option. The "Set Text" menu branch will change accordingly.

4.2.1 Digital Video – Available Patterns

The range of available patterns depends on the line standard selected. Additional patterns are available if the HD SDI option is enabled. See the following tables for details.

4.2.2 SD SDI Patterns

Pattern	525	625
Full Field Black	•	•
75% White Field	•	
Full Field White	•	•
Full Field Yellow	•	•
Full Field Cyan	•	•
Full Field Green	•	•
Full Field Magenta	•	•
Full Field Red	•	•
Full Field Blue	•	•
Digital Grey	•	•
100% Colour Bars	•	•
100% Colour Bars & Split	•	•
75% Colour Bars	•	
75% Colour Bars & Split	•	
EBU Bars		•
EBU Bars & Split		•
100% VT Bars	•	•
VT Bars & Split	•	•
SMPTE Bars	•	
Co-Siting Check	•	•
SDI Check Field	•	•
SDI Green Check Field		•
Linearity Grille		•
Convergence Grille		•
17x14 Convergence Grille	•	
3T 2T Pulse and Bar	•	•
5 Riser Luma Stair	•	•
5 Riser Stair	•	•
Valid 5 Riser Stair	•	•
Luminance Ramp	•	•
Limit Ramp	•	•
Valid Ramp	•	•
Shallow Ramp	•	•
PLUGE	•	•
SPLUGE		•
Multiburst	•	•
6.0 MHz Line Sweep	•	•
25Hz Lip Sync		•
Bowtie	•	•
Sin(x)/x	•	•
30Hz Lip Sync	•	
Clean_Aperture_4_3	•	
Clean_Aperture_16_9	•	
4:3 Test Card		•
16:9 Test Card		•
Clean Aperture		•

HD SDI Patterns

Pattern	720	1080
Full Field Black	•	•
Full Field White	•	•
Full Field Yellow	•	•
Full Field Cyan	•	•
Full Field Green	•	•
Full Field Magenta	•	•
Full Field Red	•	•
Full Field Blue	•	•
Digital Grey	•	•
100% Colour Bars	•	•
100% Colour Bars & Split	•	•
75% Colour Bars	•	•
EBU Bars & Split		•
75% Colour Bars & Split	•	
SMPTE Bars	•	•
100% VT Bars		•
100% VT Bars & Split		•
VT Colour Bars	•	
VT Colour Bars & Split	•	
SDI Check Field	•	•
16x9 Grille	•	•
10 Riser Stair	•	•
Valid Ramp	•	•
RP219 Option 1	•	•
RP219 Option 2	•	•
RP219 Option 3	•	•
RP219 Option 4	•	•
Multiburst 100		•
Multiburst	•	
PLUGE	•	•
Bowtie	•	•
Clean Aperture		•
24Hz Lip Sync	•	•
25Hz Lip Sync	•	•
30Hz Lip Sync	•	•
50Hz Lip Sync	•	
60Hz Lip Sync	•	

4.2.3 Digital Video – Active Format Description (AFD)

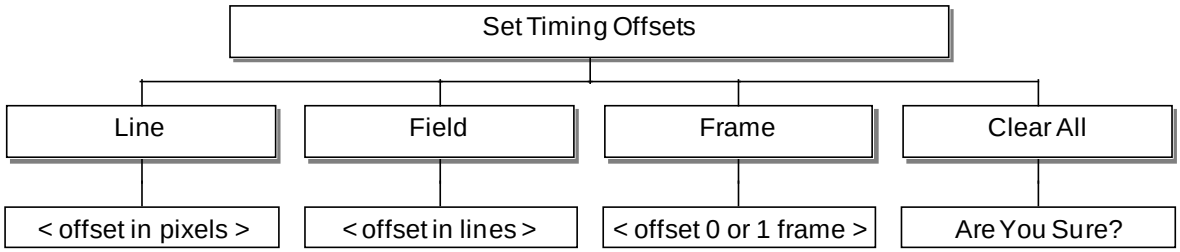
Active Format Description (AFD) is a standard set of codes that can be sent in the video signal that carries information about their aspect ratio and active picture characteristics. It is used by television broadcasters to enable both 4:3 and 16:9 television sets to optimally present pictures transmitted in either format. It is also used by broadcasters to dynamically control how down-conversion equipment formats widescreen 16:9 pictures for 4:3 displays.

AFD is available on Mentor XL units loaded with software version 3.0.0.8 and later. The code can be enabled on mainboard outputs, 360-20 options boards and 360-17 options boards with version 10 (or later) hardware revision. Check the hardware revision from the Status > Options menu.

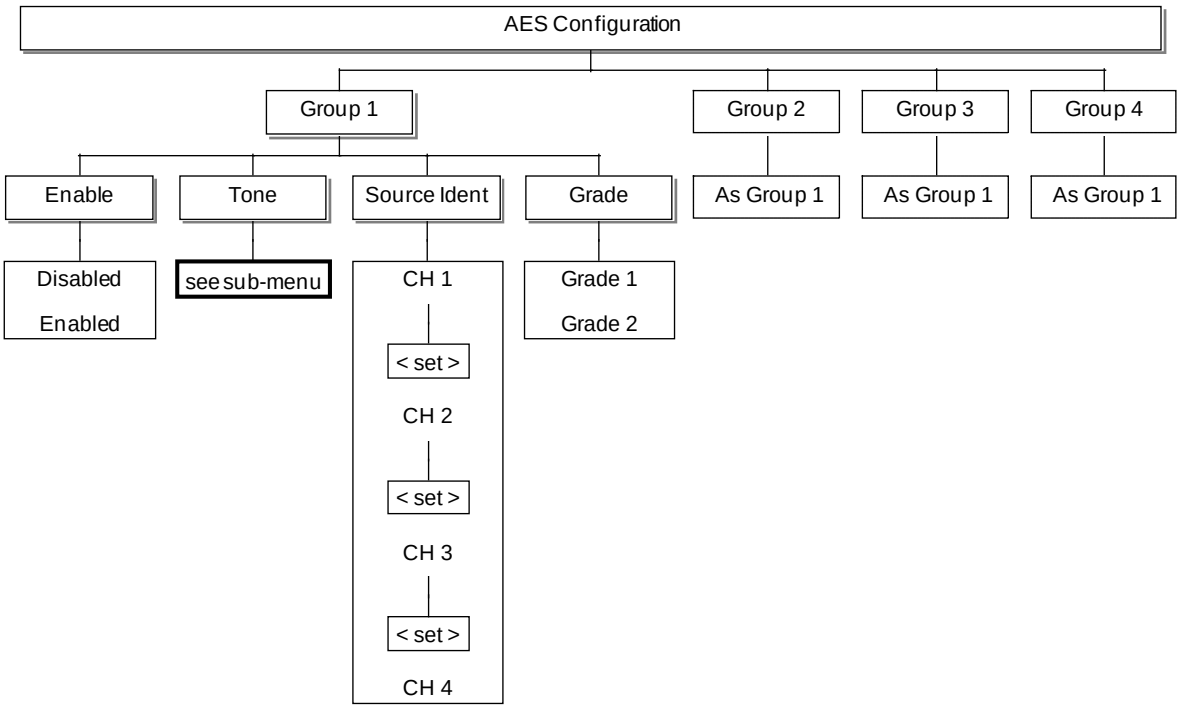
Three menu entries allow the AFD feature to be turned on or off, the insertion line to be selected (on Fields 1 & 2) and the AFD code to be set according to the table below. Note that the precise interpretation of the code may depend on the standards authority being studied. The code may be represented as decimal or 4 bit binary.

Decimal	Binary	Summary
2	0010	16:9 top of frame
3	0011	14:9 top of frame
4	0100	16:9 vertically centred
8	1000	4:3 same as frame
9	1001	4:3 same as frame
10	1010	16:9 vertically centred
11	1011	14:9 vertically centred
13	1101	4:3 – alternate 14:9 centre
14	1110	16:9 - alternate 14:9 centre
15	1111	16:9: alternate 4:3 centre

4.3 DIGITAL VIDEO – TIMING



4.4 DIGITAL VIDEO – AES

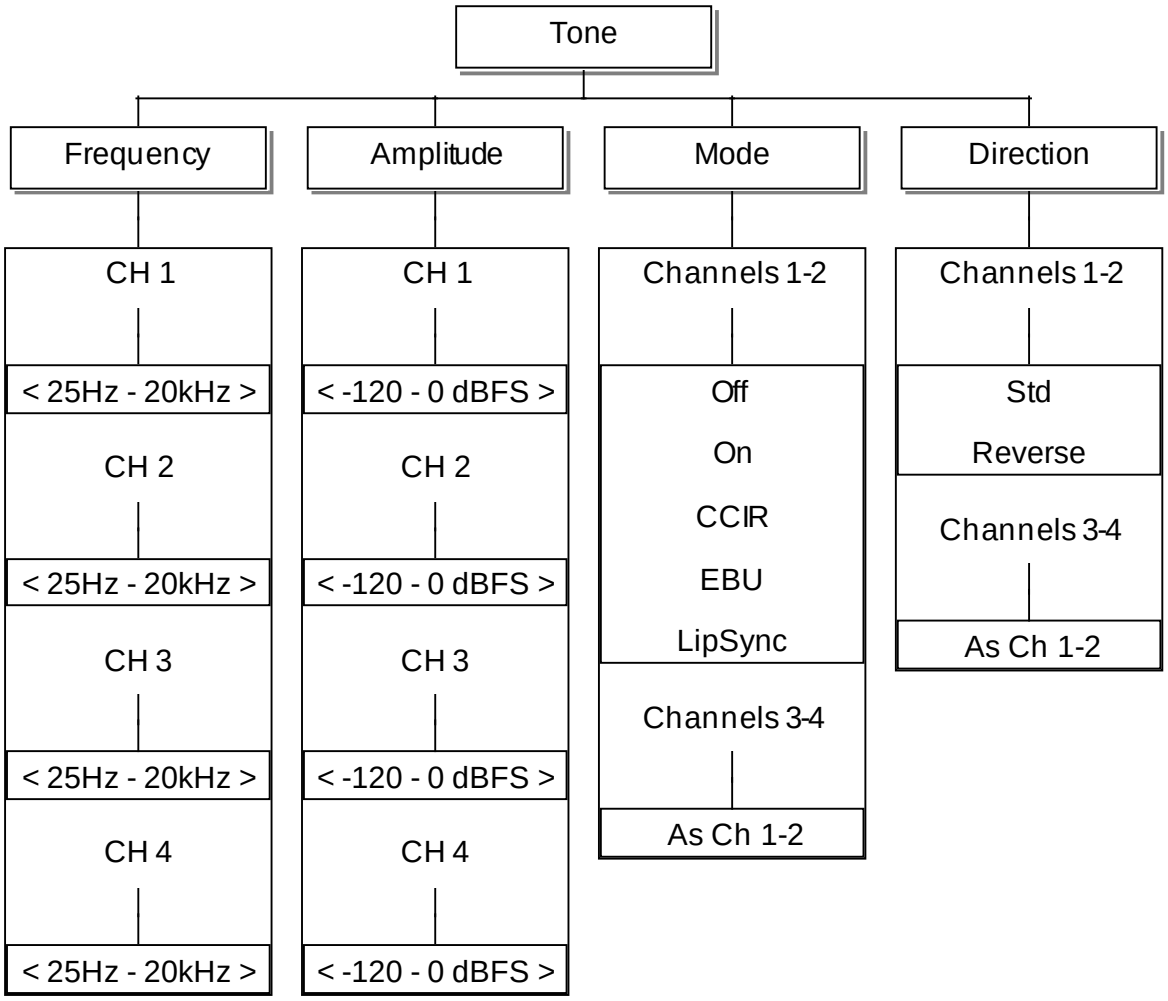


Setting the Enable mode to "Disabled" will remove Tones and Source Ident from the stream.

Four simultaneous AES groups are available with software release 3.0.0.8 and later: prior to this, only one of the four groups may be enabled at once. In addition, four simultaneous groups are available on the 360-17 SD/HD-SDI Options Board with version 10 (or later) hardware revision. Check the hardware revision from the Status > Options menu. The 360-20 HD/3G-SDI Option Board also supports four simultaneous AES groups.

The factory default setting is for the embedded AES to be enabled. However, the tones are initially set to silence and should be configured using the sub-menu in Section 4.4.1.

4.4.1 Digital Video – AES – Tone Sub-menu



Setting Tone mode to “Off” mutes the signal but retains the AES data within the stream. Setting Tone Mode to “On” will provide continuous tone.

If the AES Group is disabled in the previous menu (see section 4.4) then tones will not be provided, regardless of any settings in the above Tone sub-menu.

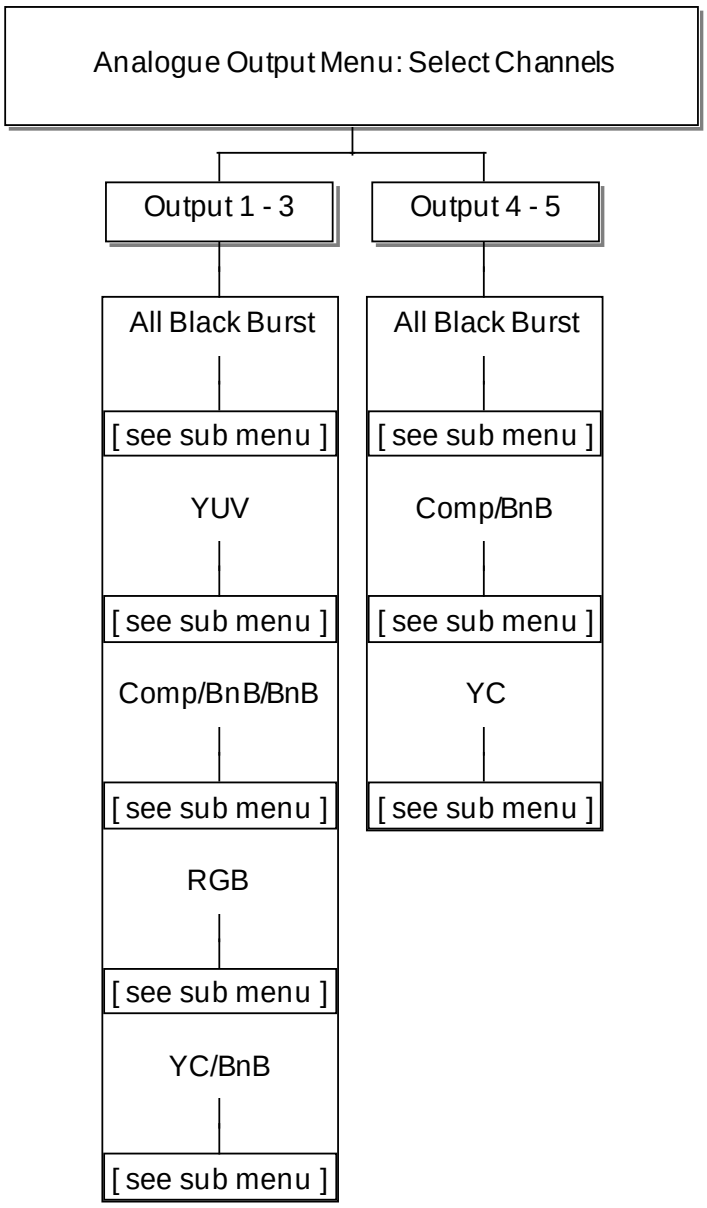
The initial factory default setting is for the tones to be “Off”.

5. ANALOGUE VIDEO

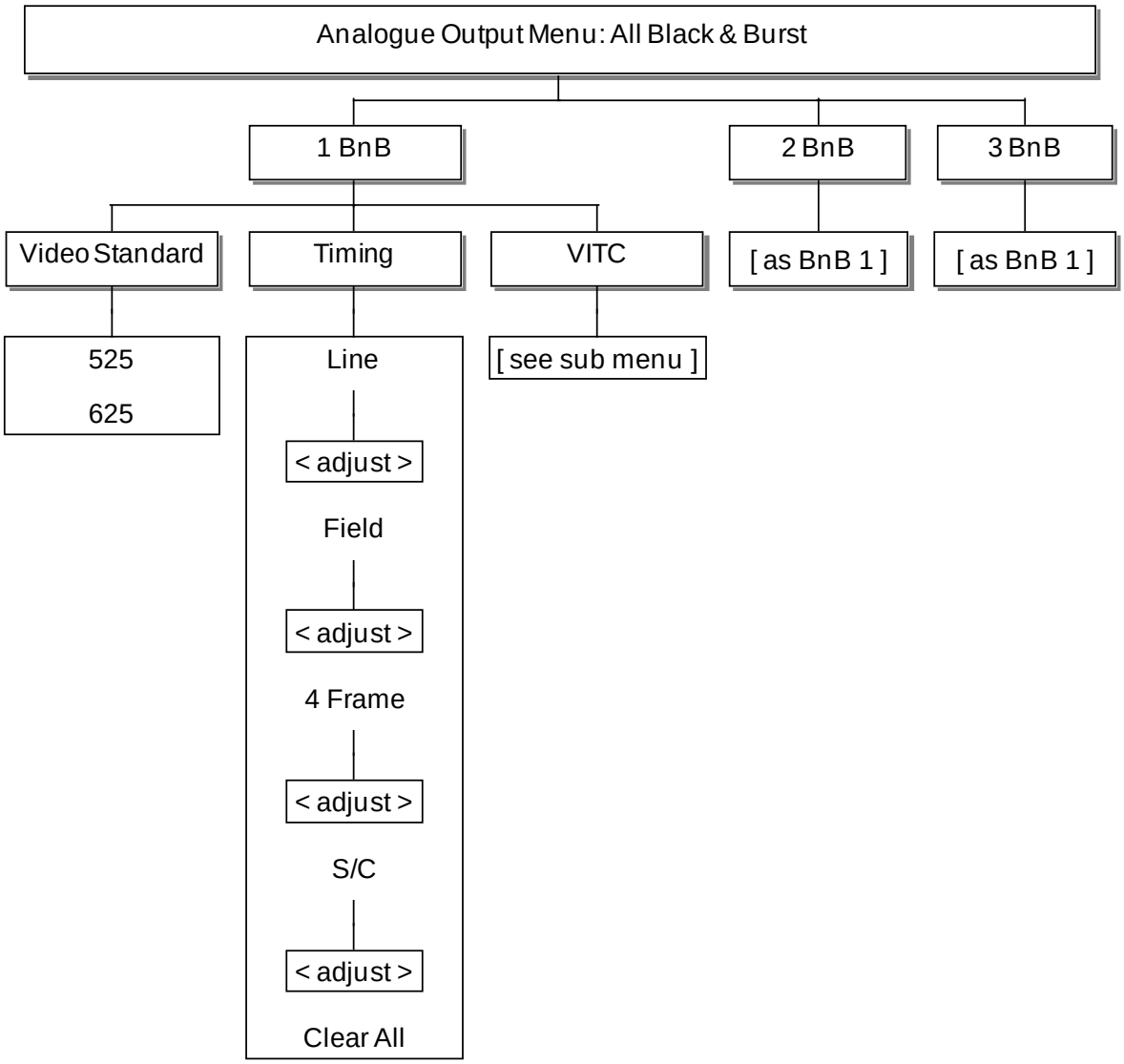
The analogue video top level menu is shown below. The five available analogue output connectors are arranged as:

- A group of three, configured as:
  - All Black and Burst. See section 5.1
  - YUV test pattern. See section 5.2
  - A single composite video signal, plus two Black and burst outputs. See section 5.3
  - RGB test pattern. See section 5.4
  - YC test pattern plus a single black and burst output. See section 5.5
- A group of two, configured as:
  - Both Black and Burst. See section 5.1
  - A single composite video signal, plus one Black and burst output. See 5.3.
  - YC (luminance / chrominance)

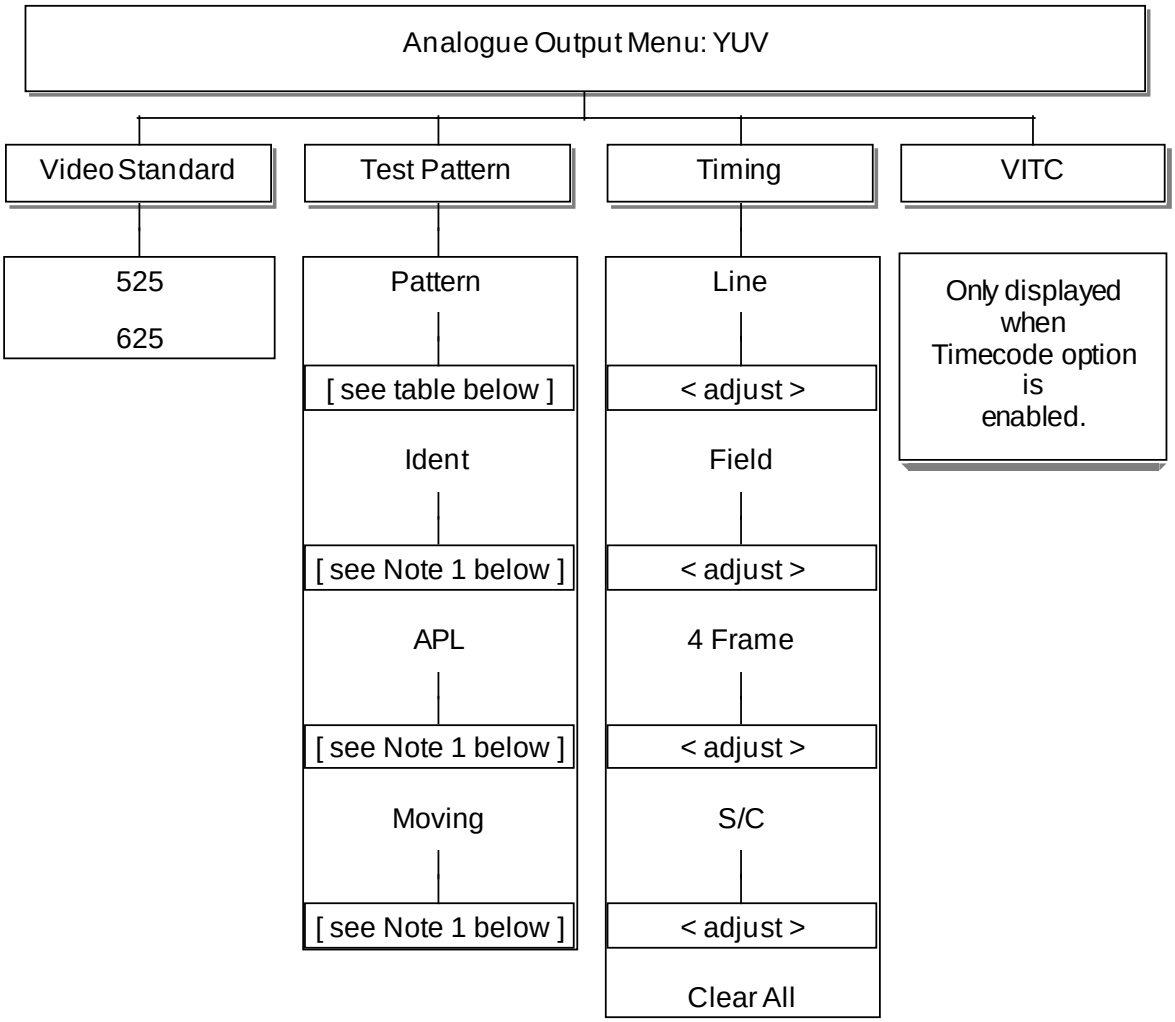
The menus follow two common themes, either for the Test Pattern signals, or for Black and Burst configuration.



5.1 ANALOGUE VIDEO – ALL BLACK & BURST



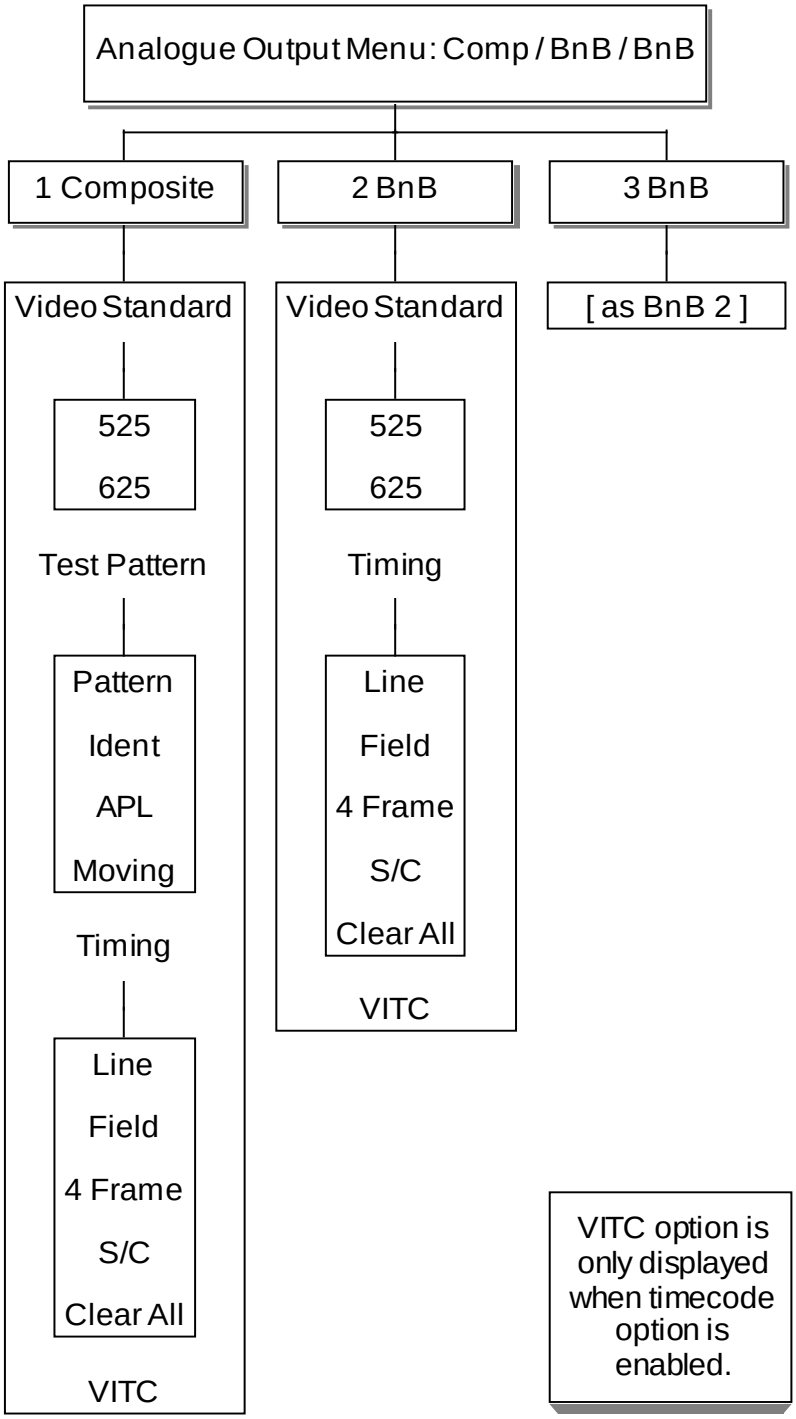
5.2 ANALOGUE VIDEO – YUV



Note 1: For details of these menus, see section 4.2.
Note 2: Within the Timing menu, "4 Frame" is shown for PAL: "2 Frame" for NTSC.

5.3 ANALOGUE VIDEO – COMP / BB / BB

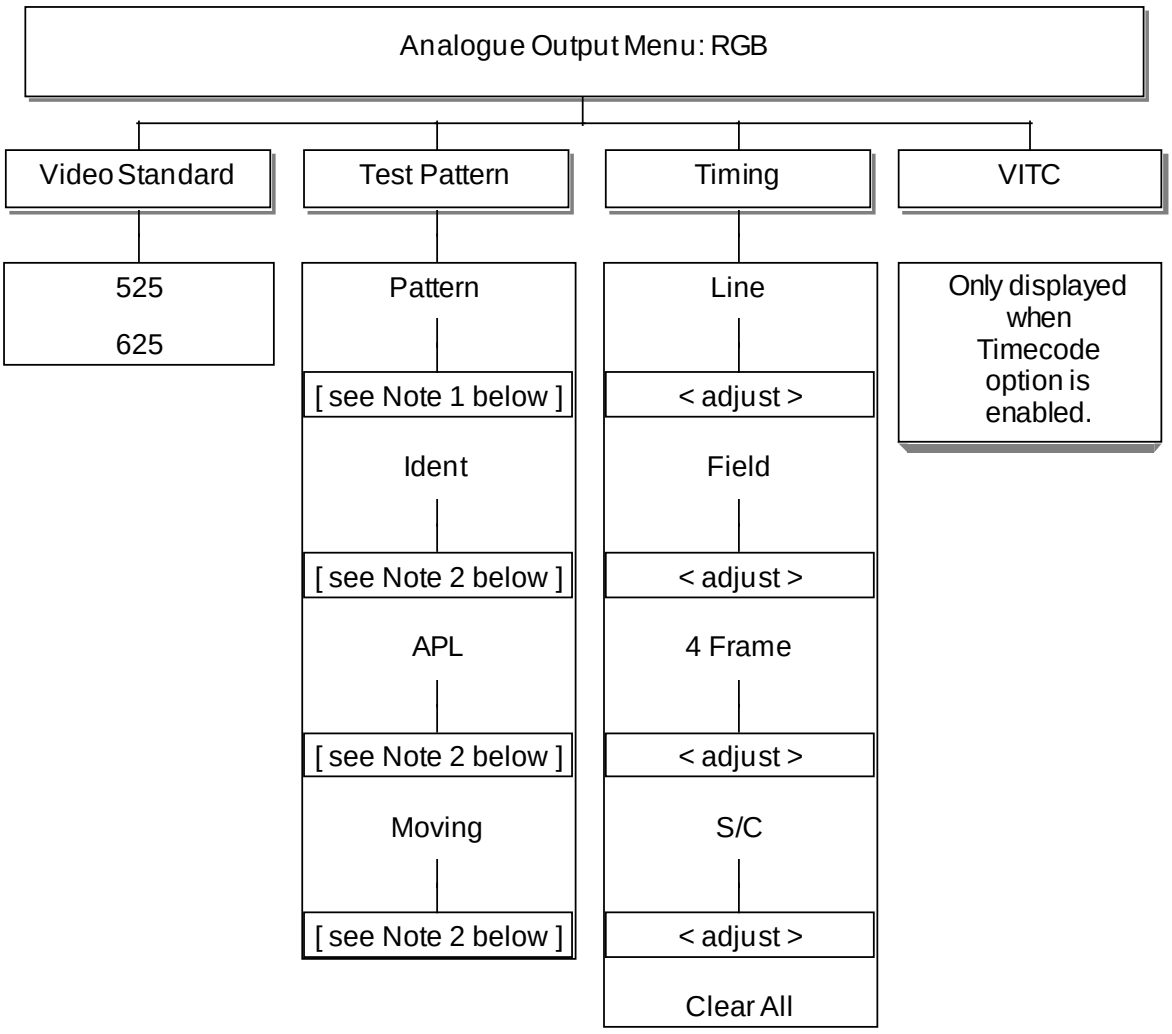
This follows the patterns established in preceding sections.



Note: For further detail of the Test Pattern menu, see previous section.

5.4 ANALOGUE VIDEO – RGB

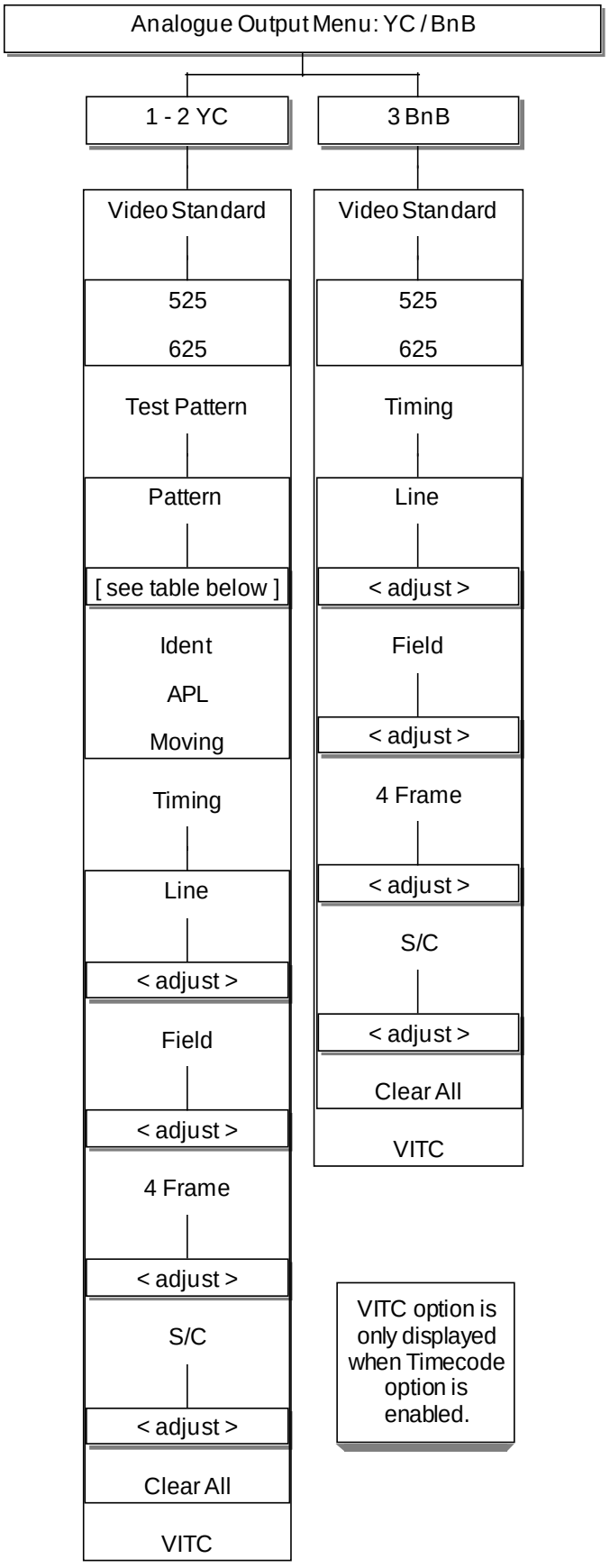
This follows the patterns established in preceding sections.



Note 1: For details of available patterns, see section 5.6.
Note 2: For details of these menus, see section 4.2.

5.5 ANALOGUE VIDEO – YC / BB

This follows the patterns established in preceding sections.



5.6 Available Test Patterns

The range of available patterns depends on both the line standard selected and the output configuration (composite, YUV etc.).

5.6.1 525 Line Standard

Pattern	Composite/YC	RGB	YUV
Full Field Black	•	•	•
Full Field White	•	•	•
Full Field Red	•	•	•
Full Field Red 75%	•	•	•
Luminance Ramp	•	•	•
75% Colour Bars	•	•	•
5 Step Stair	•	•	•
SMPTE Bars	•	•	•
PLUGE	•	•	•
Multiburst	•	•	
Sin(x)/x	•	•	•

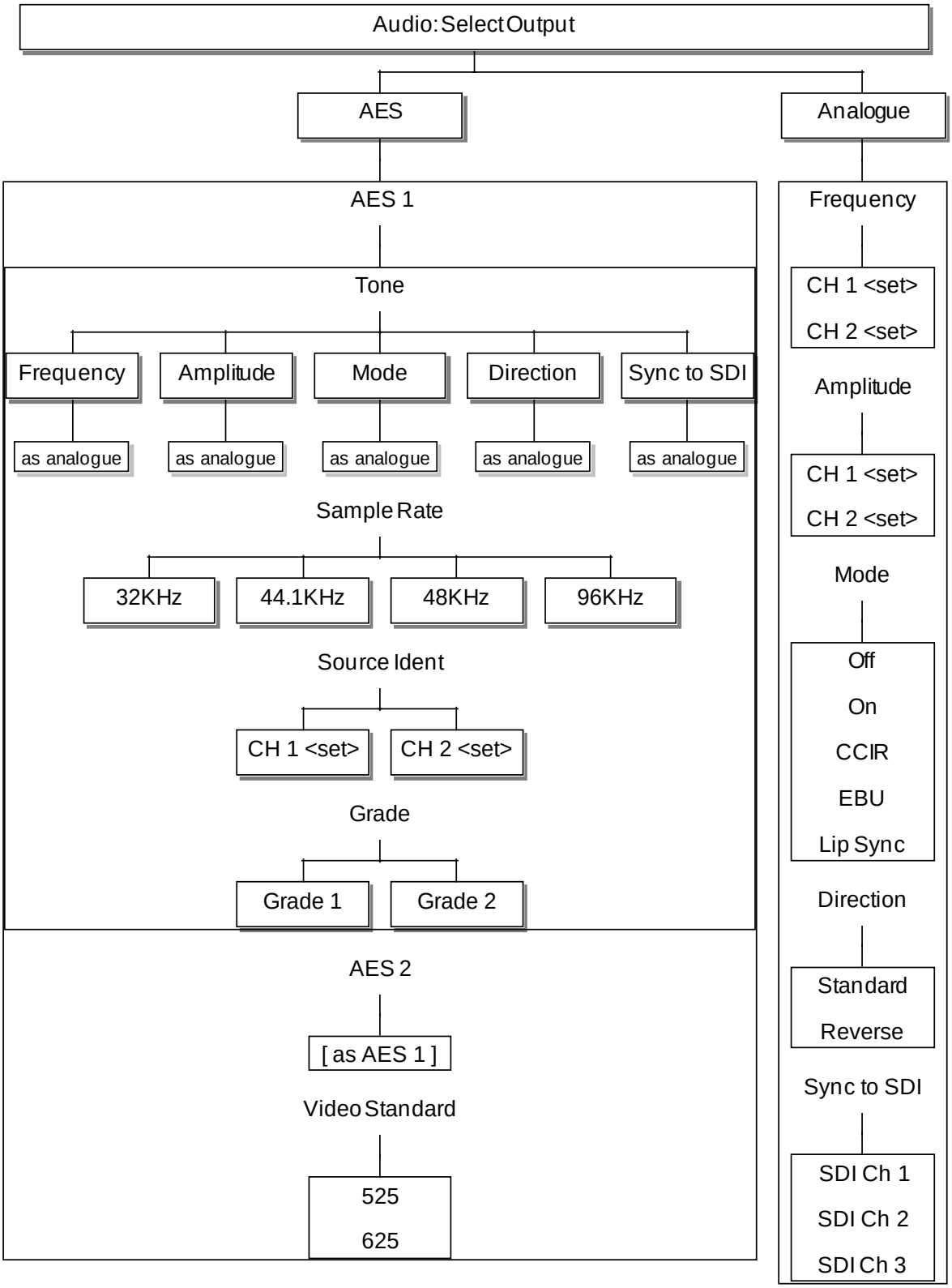
5.6.2 625 Line Standard

Pattern	Composite/YC	RGB	YUV
Full Field Black	•	•	•
Full Field White	•	•	•
Full Field Red	•	•	•
100% Colour Bars	•	•	•
100% Colour Bars & Split	•	•	•
EBU Colour Bars & Split	•	•	•
EBU Colour Bars	•	•	•
VT Colour Bars	•	•	•
VT Bars & Split	•	•	•
2T Pulse & Bar	•	•	•
20T Chroma + 2T Pulse & Bar	•		•
Valid Stair			•
5 Riser Luma Stair	•	•	•
5 Riser Chroma Stair	•		•
Luminance Ramp	•	•	•
Valid Ramp			•
14 x 19 Grille	•	•	•
Linearity Grille	•	•	•
Convergence Grille	•	•	•
PLUGE	•	•	•
SPLUGE	•	•	•
15% White Window	•	•	•
100% White Window	•	•	•
Multiburst	•	•	
Sin(x)/x	•	•	•

6. AUDIO

6.1 AUDIO – MENU TREE

The Audio menu has two branches, AES and Analogue.



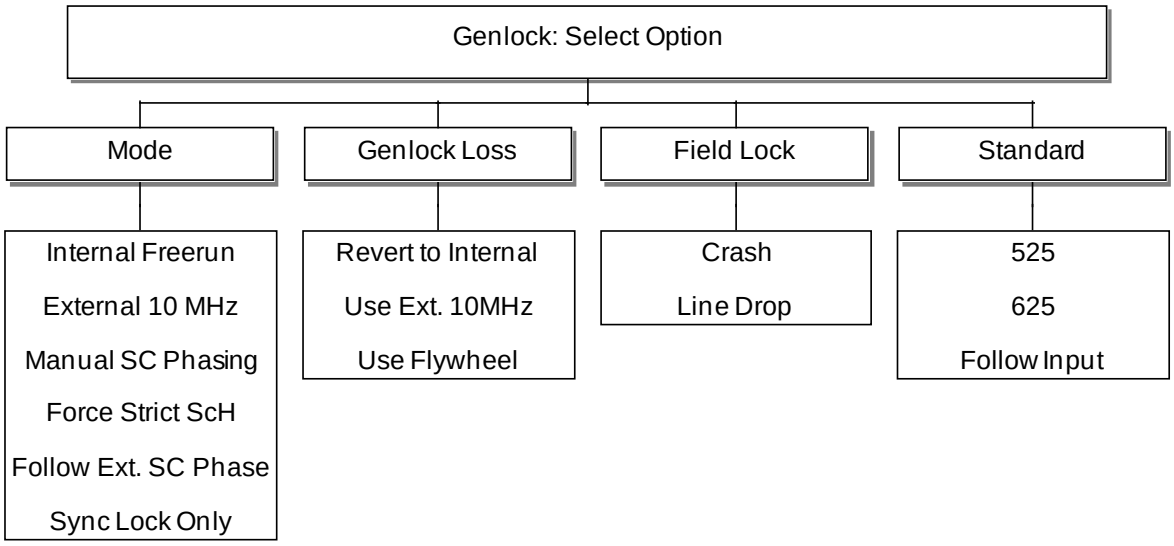
6.2 AUDIO: AES 1 / AES 2.

The AES 2 sub-menu is identical to AES 1.

6.3 AUDIO: ANALOGUE

The Direction option swaps the CCIR/EBU tone blips between left and right channels

7. LOCK MODE



The Genlock (or Generator Lock) settings of the unit (for example, the current Genlock mode and timing offsets) may be changed as follows. Enter the Genlock menu. The following options are available:

- **Mode**: changes the basic genlock mode i.e. internal (free run), lock to video etc. See section 7.1.
- **Genlock Loss** sets the behaviour of the unit following loss of the genlock signal. See section 7.2.
- **Field Lock**: alters the field lock action - instantaneous or slow lock. See section 7.3
- **Input Standard:** See section 7.4.

To enter any of these sub-menus, press **OK.** The sub-menus are described below.

7.1 GENLOCK - MODE

Select the mode required using the encoder control. Please be aware that the mode will change immediately each option is selected.

- **Internal Free Run**: sets the unit to be free running, relying on the internal oven oscillator for stability. The ScH. of the unit will be set to zero. ***Note:*** the Mentor XL **must** be set to free run when locking to a GPS signal.
- **External 10MHz**: sets the unit to genlock to the 10MHz input. There will no fixed phase relationship with any other units locked to this signal. The ScH. of the unit will be set to zero.
- **Manual SC Phasing**: sets the unit to genlock to the video input. The subcarrier phase offset may be adjusted as required.
- **Force Strict ScH**: sets the unit to genlock to the video input. The ScH. of the outputs of the unit is forced to be zero regardless of the genlock input ScH. This is achieved by moving the line timing with respect to the genlock input until the correct ScH. phase results.
- **Follow External SC Phase**: sets the unit to genlock to the video input. The subcarrier output phase is set to be the same as the input genlock video.
- **Sync Lock Only**: sets the unit to genlock to the video input. The system is genlocked using only the sync information of the genlock video input. The ScH. phase of the output is forced to be zero - i.e. “correct”.

7.2 GENLOCK LOSS

Set the operational mode of the unit following loss of the genlock signal.

- **Revert to Internal**: If the external reference input is removed, the unit will use the internal oven maintained oscillator or GPS signal (when available) as its master oscillator.
- **External 10 MHz**: If the genlock video input is removed, the unit will use the 10 MHz input as its master oscillator. If the 10 MHz input is not present when the video input fails, the unit will use the internal oven maintained oscillator or GPS signal (when available) as its master oscillator.
- **Flywheel**: If the genlock video input is removed, the unit will continue to operate - "flywheel" - at the same frequency as the genlock input just removed. Note that if the unit is powered up in this mode with no genlock input applied, the Mentor XL timing may not be within specification.

7.3 GENLOCK – FIELD LOCK

Select the mode required using the encoder control or left – right keys.

- **Crash**: Sets the unit to lock near instantaneously to the field information of an applied genlock video input. This is the normal mode of operation.
- **Line Drop**: Sets the unit to lock to the field information of an applied genlock video input by moving the outputs one line nearer to the genlock video input every 5 fields until the unit is locked. This mode is useful if the instant locking of the crash mode is found to upset any downstream equipment.

7.4 GENLOCK – INPUT STANDARD

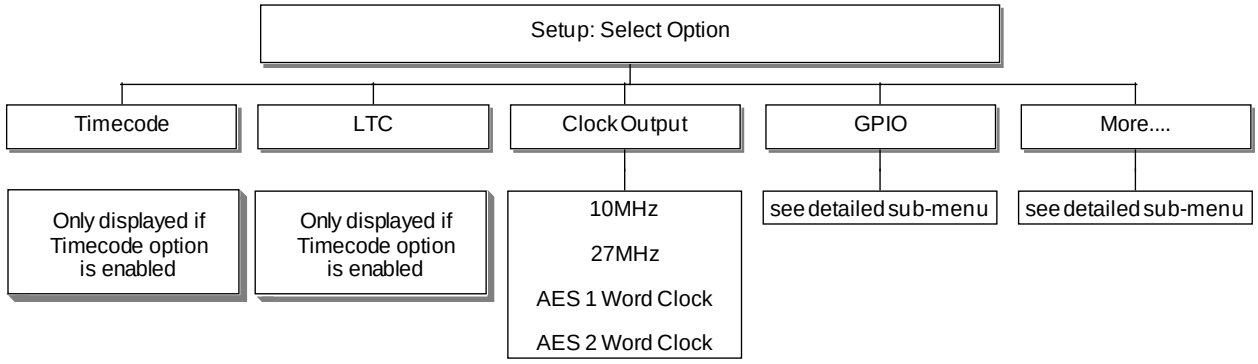
Select the video line standard of the input signal.

- **525**
- **625**
- **Auto detect (follow input)**

8. SETUP

8.1 SETUP – TOP LEVEL

The top level Setup menu is shown below.



This has the following branches:

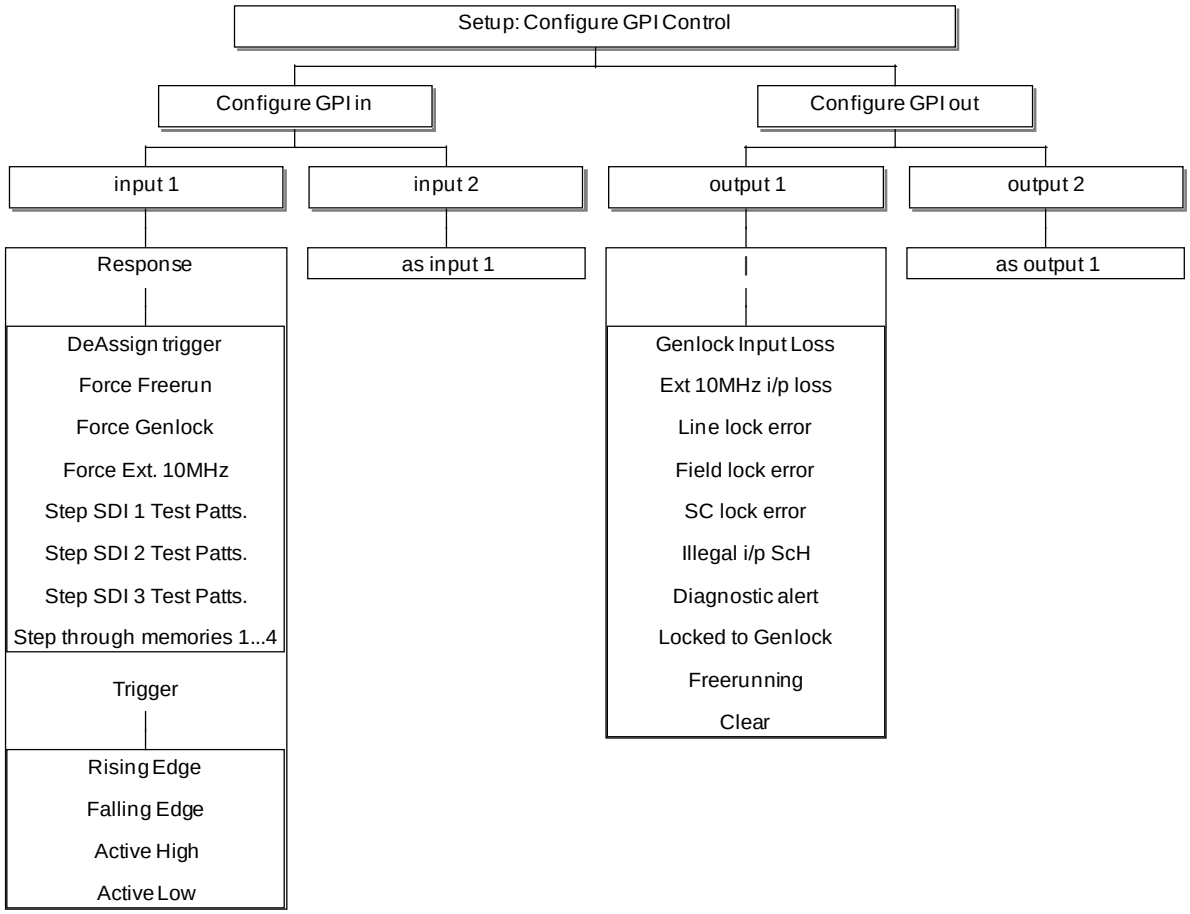
- Configuration of the mode of the Clock Output.
- comprehensive control of General Purpose Inputs and Outputs, including
    - the input signal response mode
    - the action resulting from a GPI trigger
    - the event causing a GPO state change

The GPIO sub-menu is shown in section 8.1.1.

The additional options within Setup >> More appear in section 8.2.

Additional branches will be displayed on this menu if the Timecode option is enabled. See sections 11 and 11.2 for more information.

8.1.1 Setup – GPI Control



The charts above show:

- Configure GPI in: the actions which the Mentor XL will carry out when a control signal is applied to GPI input 1 or 2.
- Configure GPI out: the events which will trigger the Mentor XL GPI outputs. The available output conditions include error and status indications.

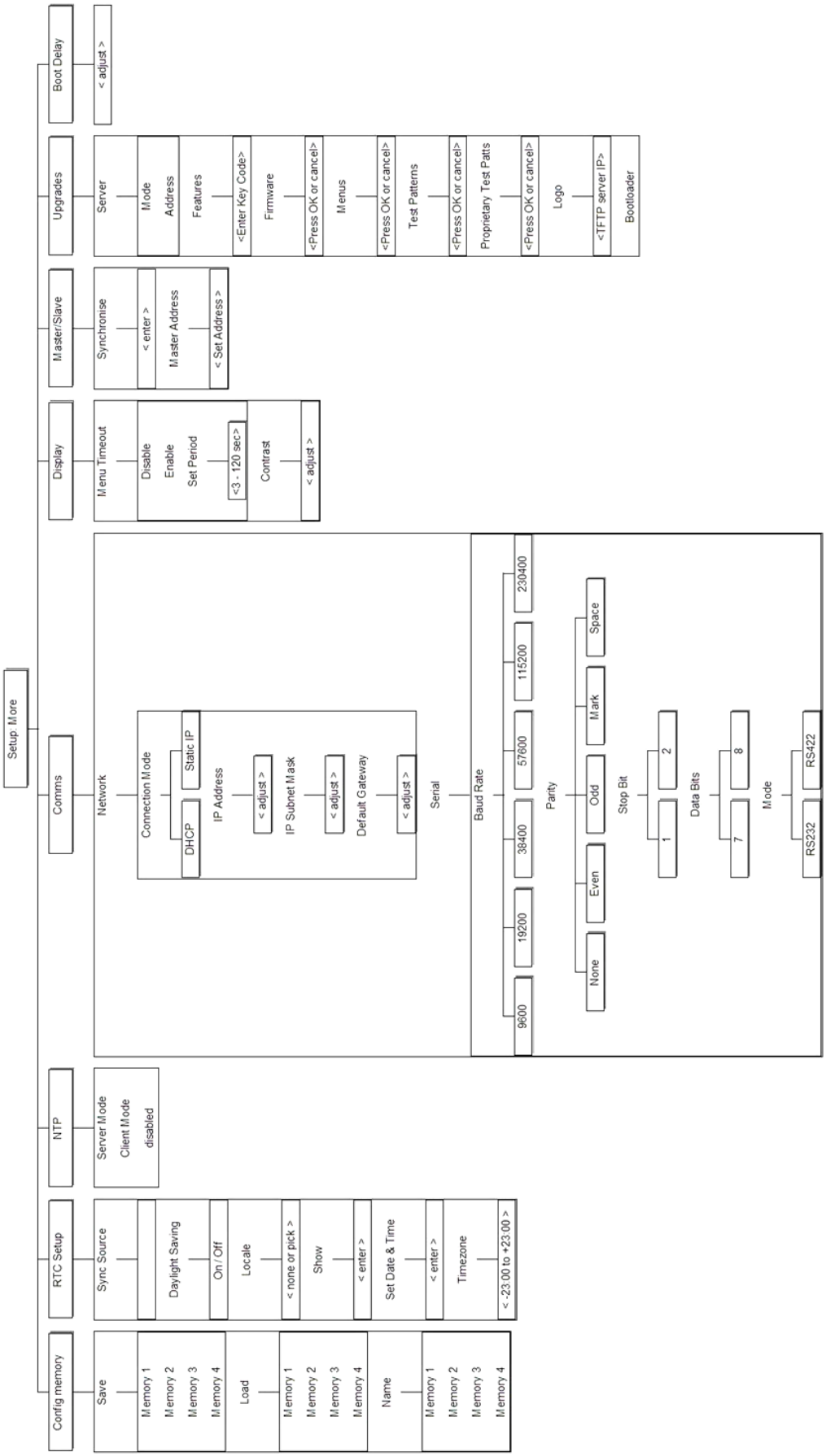
For connector wiring, see section 2.6.

8.2 SETUP – MORE

The "Setup - More…" branch includes options to:

- Manage internal memory banks 1-4. A complete operational setup may be stored or retrieved at any time.
- Setup the real time clock (RTC)
- Configure the Network Time (NTP) option (when available). See section 14.
- Configure communication with the Mentor by:
    - **Ethernet port.** The Ethernet port is used to connect the Mentor to a LAN, or to a laptop PC when carrying out upgrades. The settings required are primarily governed by the network arrangements at the site location. A network connection will also be required if either the NTP option or Vector software is purchased.
    - **Serial port (RS 232 or RS 422).** The serial port is used primarily during manufacture but also offers remote control of a range of functions. Please contact Trilogy for more information.
- Adjust the Display by:
    - Setting the display contrast.
    - Controlling the menu timeout whereby the menu steps back to the top-level.
- Configure the Mentor as "slave", allowing settings to be retrieved from a "Master". This is useful when configuring a pair of units in failsafe style. Only the Master need be configured; the Slave can request settings from the Master.
- Update the Mentor XL (Section 8.3), including:
    - Additional features and test patterns.
    - Software updates.

The menu diagram is shown on the following page.


Setup. More
Config memory
Save
Memory 1
Memory 2
Memory 3
Memory 4
Load
Memory 1
Memory 2
Memory 3
Memory 4
Name
Memory 1
Memory 2
Memory 3
Memory 4
RTC Setup
Sync Source
Daylight Saving
On / Off
Locale
< none or pick >
Show
< enter >
Set Date & Time
< enter >
Timezone
< -23:00 to +23:00 >
NTP
Server Mode
Client Mode
disabled
Comms
Network
Connection Mode
DHCP
Static IP
IP Address
< adjust >
IP Subnet Mask
< adjust >
Default Gateway
< adjust >
Serial
Baud Rate
9600
19200
38400
57600
115200
230400
Parity
None
Even
Odd
Mark
Space
Stop Bit
1
2
Data Bits
7
8
Mode
RS232
RS422
Display
Menu Timeout
Disable
Enable
Set Period
<3 - 120 sec>
Contrast
< adjust >
Master/Slave
Synchronise
< enter >
Master Address
< Set Address >
Upgrades
Server
Mode
Address
Features
<Enter Key Code>
Firmware
<Press OK or cancel>
Menus
<Press OK or cancel>
Test Patterns
<Press OK or cancel>
Proprietary Test Patts
<Press OK or cancel>
Logo
<TFTP server IP>
Bootloader
Boot Delay
< adjust >

8.3 ENABLING ADDITIONAL FEATURES ON THE MENTOR XL

Depending on the current version of software running on the Mentor XL, there are three possible methods of enabling new features.

1. For all software versions - additional features within the Mentor XL software may be enabled using a Trivial File Transfer Protocol (TFTP) server with a series of programming files which are available from Trilogy. Some features are only appropriate with the installation of additional hardware.
2. For software versions 3.0.0.3 and later – additional features may be enabled using the Vector editor application.
3. For software versions 3.0.0.3 and later – additional features may be enabled by entering a 12 character code using the Mentor XL display and controls.

8.3.1 Additional Features and Options

A number of additional features and options are available for the Mentor XL.
At the time of writing in November 2012, these are:

Part Code	*Description*	*Note*
360-09-00	Optional redundant power supply	
360-10-00	Video test signals	Software option to add composite analogue and SDI test signals.
360-11-00	Audio test signals	Software option to add analogue and AES test tones (including GLITS interrupted channel ident tone)
360-12-00	Full field test patterns	Software option to generate FUBK test pattern, selectable 4:3 & 16:9. Requires 360-10-00 video test signals as pre-requisite.
360-13-00	HD test patterns	Software option to add HD-SDI test patterns. Requires 360-10-00 video test signals as pre-requisite.
360-14-00	Timecode	Software option to provide two LTC outputs with VITC, D-VITC and ATC.
360-15-01	GPS Time Reference	Includes receiver module. Replaced by 360-15-19, May 2013
360-15-02	Unbalanced AES Output card	Activates the 2 x AES unbalanced outputs. Requires 360-11-00 as pre-requisite. Not required if 360-15-01 fitted.
360-15-03	GPS Antenna and Universal mount	Bullet III Dome 5V antenna. Supplied with F - type connector.
360-15-10	GPS Time Reference	Hardware option board replacing 360-15-01, May 2013
360-16-01	HDTV tri-level sync board	Provides 4 x individually configurable tri level sync outputs. Replaces 360-16-00.
360-17-00	SD/HD SDI Expansion Module (now replaced by 360-20-00)	Provides 4 additional SD or HD-SDI outputs in any combination. Requires options 360-10-00 (SD) or 360-13-00 (HD) as pre-requisite. See Note 1.
360-18-00	NTP Server Option	Order Server or Client ONLY
360-18-01	NTP Client Option	Order Server or Client ONLY
360-19-00	SNMP Support	Software option to enable Simple Network Management Protocol support.
360-20-00	HD/3G-SDI Expansion Module	Provides 4 additional HD or 3G-SDI outputs in any combination. Requires options 360-13-00 (HD) as pre-requisite. See Note 1.

Notes:
1. Normally only a single 360-17-00 or 360-20-00 will be fitted to each Mentor XL.

If you wish to purchase any of these features, please contact your usual Trilogy sales representative with the following information:

- The part number of the feature you require

- The serial number of the Mentor XL which you wish to upgrade. Alternatively, if the serial number is difficult to find, please supply the unit MAC address which may be read from the Status >> Information menu
- A valid e-mail address

NOTE: If the unit was tested before week 45 of 2006, the board serial number may be required instead of the unit serial number. This can be found on the orange sticker on the rear of the unit.

8.3.2 Enabling additional Mentor XL features using Vector

Vector provides full control over all aspects of the Mentor XL. Vector version 3.4 (and later) includes the ability to enable Mentor XL features by entering a 12 digit code. The code is unique to each Mentor XL and will be supplied by Trilogy following the procedure in section 8.3. Note that in order to use this process, the Mentor XL must be running software version 3.0.0.3 or later.

8.3.3 Enabling additional Mentor XL features via the front panel

By far the simplest method of enabling additional features is directly on the front panel of the Mentor XL. This avoids the requirement for any network connection or additional software. From the front panel menus, navigate to ***Setup >> More >> Upgrades >> Features*** and enter the 12 character code using the rotary control and <enter> key. The code is unique to each Mentor XL and will be supplied by Trilogy following the procedure in section 8.3. Note that in order to use this process the Mentor XL must be running software version 3.0.0.3 or later.

8.4 UPDATING THE MENTOR XL

From time to time, new code may be released for the Mentor XL. This falls into one of three categories:

- Software
- Changes to test patterns
- Changes to menu structure

The exact procedure depends on the current version of installed software and the hardware revision of your Mentor XL. Please contact your supplier or Trilogy Technical Support at the address at the front of this manual for more information.

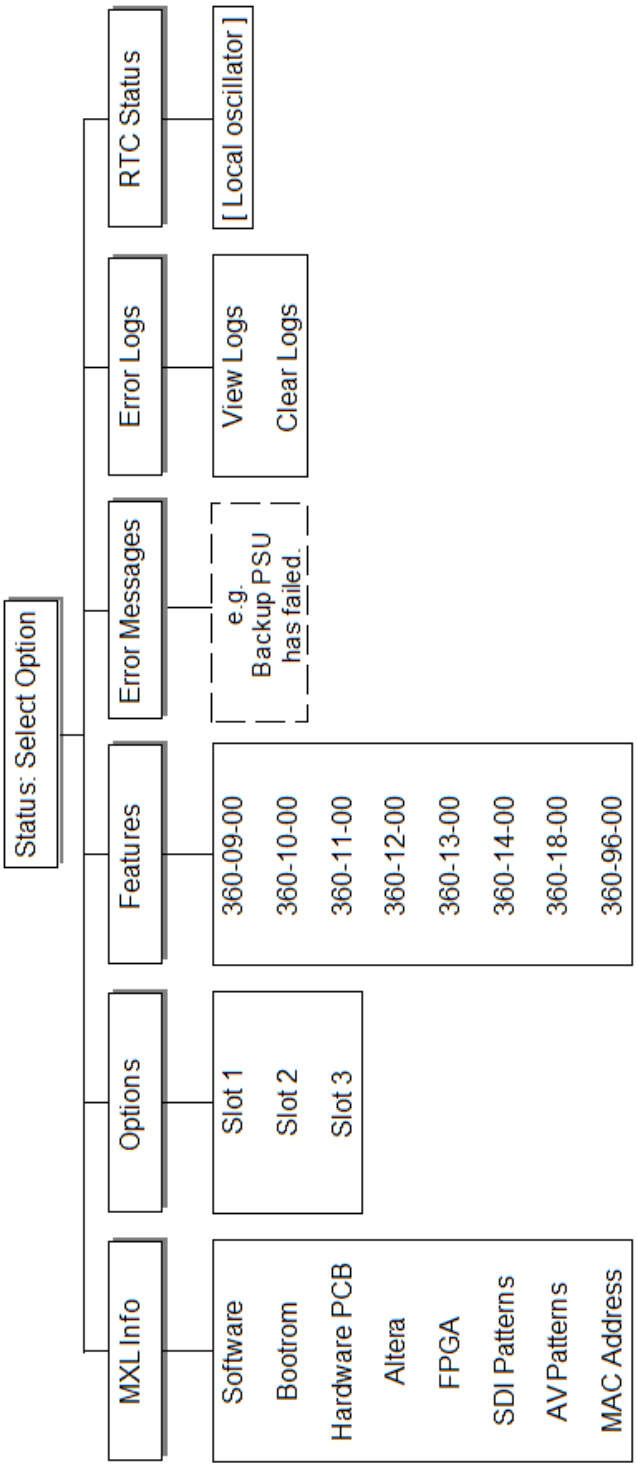
9. STATUS

A dedicated **STATUS** button provides diagnostic and status information. The Information sub-menu provides information about the software versions currently loaded on the Mentor XL. The Options and Features sub-menus show any additional hardware and software components. If an error condition such as loss of genlock occurs, the lamp in the **STATUS** button will flash. The display text, which can be displayed by pressing the **STATUS** key, will change to indicate that an error message is available. Error logs also carry a date and time stamp and may be viewed or cleared from their sub-menu.

Pressing the **STATUS** button at any time will display the unit's current status.

If you contact Trilogy Technical Support, our engineers will most likely request some information from this menu to assist in answering your question.

The status menu provides read-only information.


Status: Select Option
MXL Info
Software
Bootrom
Hardware PCB
Altera
FPGA
SDI Patterns
AV Patterns
MAC Address
Options
Slot 1
Slot 2
Slot 3
Features
360-09-00
360-10-00
360-11-00
360-12-00
360-13-00
360-14-00
360-18-00
360-96-00
Error Messages
e.g.
Backup PSU
has failed.
Error Logs
View Logs
Clear Logs
RTC Status
[Local oscillator]

10. OPTIONS : INTRODUCTION

The Mentor XL has three internal option slots. The suggested configuration for option boards is:

- **Slot 1**
  - *Either* - 360-15-xx GPS receiver. See section 11.
  - *Or* -- 360-15-02 Unbalanced AES Output card may be fitted.

- **Slot 2**
  - *Either* - 360-17-00 provides four additional SD or HD SDI outputs in any combination. Requires software option 360-10-00 (SD) or 360-13-00 (HD) as pre-requisite.
  - *Or* – 360-20-00 which provides four additional HD or 3G SDI outputs in any combination. Requires software option 360-13-00 (HD) as pre-requisite.

- **Slot 3**
  - *360-16-00 / 01 Tri-level sync option board. See section 13.*

The rear panel is engraved accordingly. Note:

- Any option module ***other than*** the GPS receiver may be fitted to any slot but fitting any board to slot 1 other than the GPS board or the 360-15-02 Unbalanced AES Output board, removes the unbalanced AES output facility.

- The GPS receiver must ***only*** be fitted to option slot 1.

- Option boards are automatically recognised and the correct menus displayed.

Other options, e.g. SDI video test patterns require a software upgrade but no additional hardware.

Additional hardware and software options will be offered in the future: please contact your supplier or Trilogy for more information.

See a complete table of options in section 8.3.1.

11. OPTION : 360-14-00 TIMECODE

11.1 INTRODUCTION

Timecode is available as a software only upgrade for the Mentor XL. The unit will then provide:

- Two outputs of Longitudinal Timecode (LTC) on the D9 connector (see section 2.8 for connector pin-out).
- Vertical Interval Timecode (VITC) superimposed on analogue waveforms. This is enabled or disabled in accordance with the current group arrangement of the analogue signal outputs.
- Each SDI output offers a combination of:
    - Digital VITC (SMPTE S266) for standard definition SDI signals only.
    - Ancillary Timecode (ATC) -- (SMPTE RP188) for standard definition or high definition SDI signals.

Additional menu items appear as follows:

- Within the Setup menu branch, “Timecode” and “LTC” as shown in the following diagrams.
- Additional entries also appear in the relevant sections of both analogue and digital video menus. See 11.3 and 11.4.

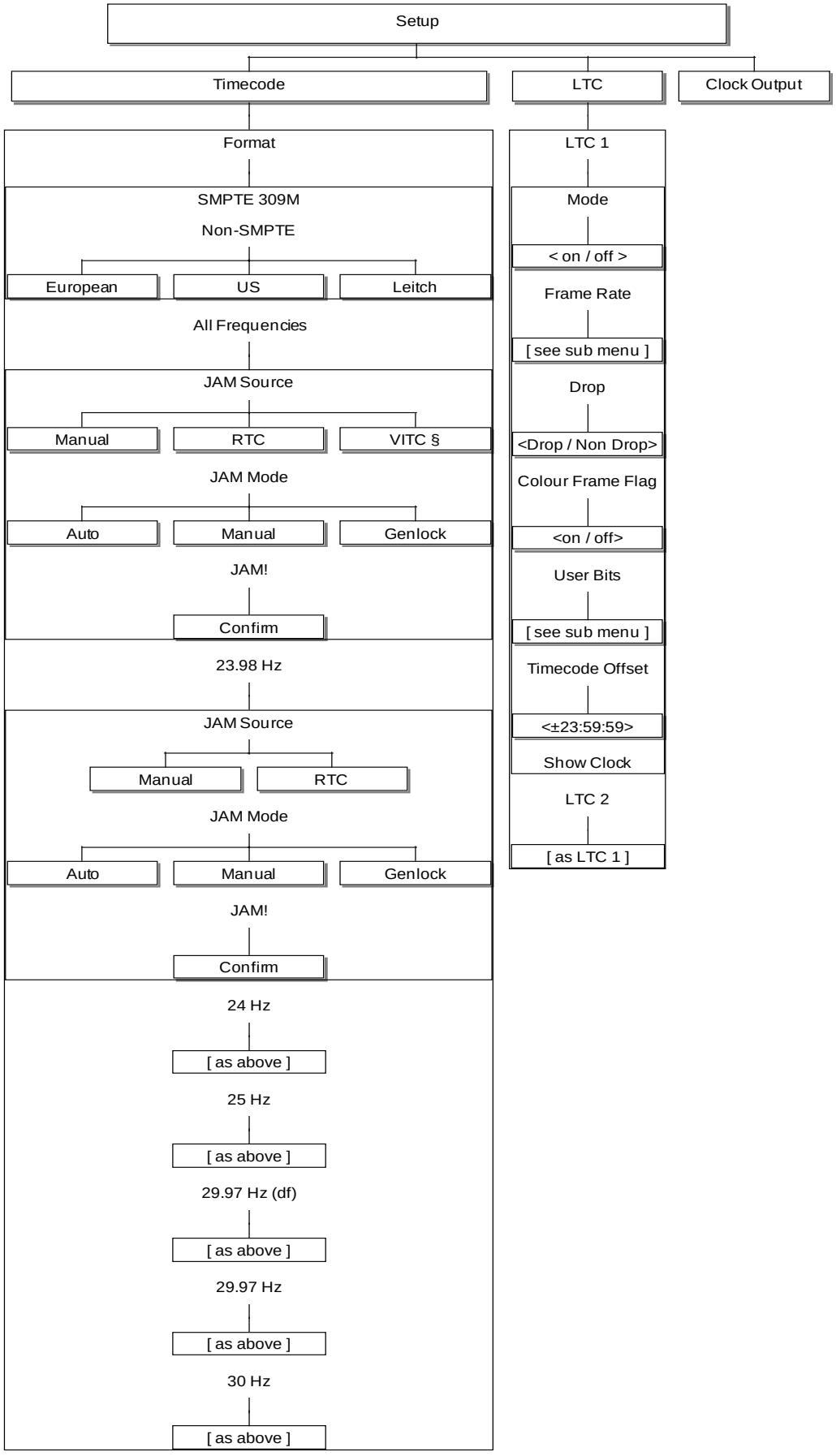
Timecode can be:

- synced to RTC (real-time clock)
- set manually and frequency locked to the internal clock
- time and frequency locked to VITC which is present on the Genlock input feed.
  Note: this option is only available with software version 4.0.0.5 and later.

If the GPS Option is present and the Mentor XL real-time clock is locked to GPS, it follows that timecode is synced to GPS when the first of the three options above is used.

For some common configuration suggestions, please see section 0.

11.2 TIMECODE OPTION - EXTENDED SETUP MENU



11.2.1 Timecode Jamming

Timecode jamming is the process of setting the time carried on the timecode stream. To avoid discontinuity, it is important to carry this out carefully. Some menu options apply to all "base" clock frequencies and are presented under the "All Frequencies" branch. Other options are available under individual frequencies (e.g. 23.98 Hz etc.) used to derive specific output signals. For example, to jam the timecode for a 625 PAL signal, follow the 25 Hz menu branch.

11.2.2 Timecode sub-menu

Four timecode formats are supported from the format menu: the chosen format applies to all timecode generated by the Mentor XL. The different format options place date/time data into the binary groups of the VITC/LTC codeword in a different sequence. See the table in section 11.2.3 (below) for more detail.

- **Format**
  - SMPTE 309M
  - Non SMPTE
    - European
    - US
    - Leitch
- **JAM Source**
  - Manual: enter values manually from the front panel or browser
  - RTC: uses the Real Time clock
  - VITC: jams the timecode by sampling VITC on the Mentor XL Genlock input. *Note: This option is only displayed when a suitable signal is detected and is only available under the "All frequencies" branch of the menu. Software version 4.0.0.5 or later is required.*
- **JAM Mode**
  - Auto: sets a scheduled time for jamming to take place. This is a recurring action
  - Manual: on command
  - Genlock: when this option is selected, jamming takes place every time genlock is achieved
- **JAM!:** initiates the JAM procedure with OK / cancel options.
- **Show Clock:** shows the current timecode clock for each "base" frequency as read-only. This option is not displayed on the "All Frequencies" menu branch.

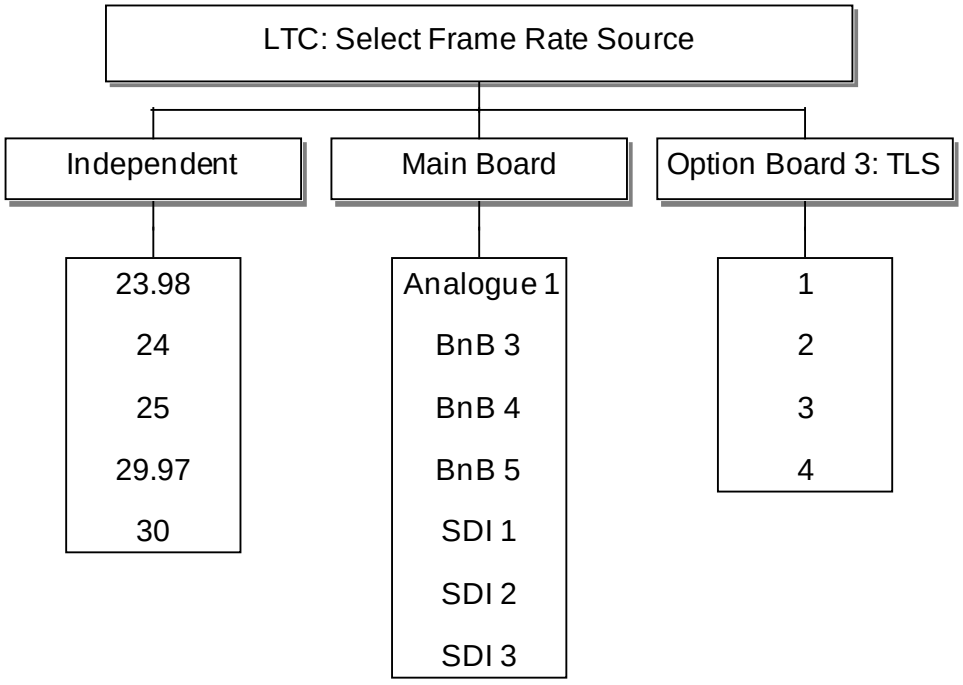
11.2.3 Timecode formats: SMPTE and non-SMPTE

	SMPTE 309M	**--------- Non-SMPTE 309M ---------**		
		European	US	Leitch
Binary Group 1	Day units			
Binary Group 2	Day tens			Day units
Binary Group 3	Month units	Day units	Month units	Month units
Binary Group 4	Month tens	Day tens	Month tens	Month tens/Day tens
Binary Group 5	Year units	Month units	Day units	
Binary Group 6	Year tens	Month tens	Day tens	Year units
Binary Group 7		Year units	Year units	
Binary Group 8		Year tens	Year tens	Year tens

11.2.4 LTC sub-menu

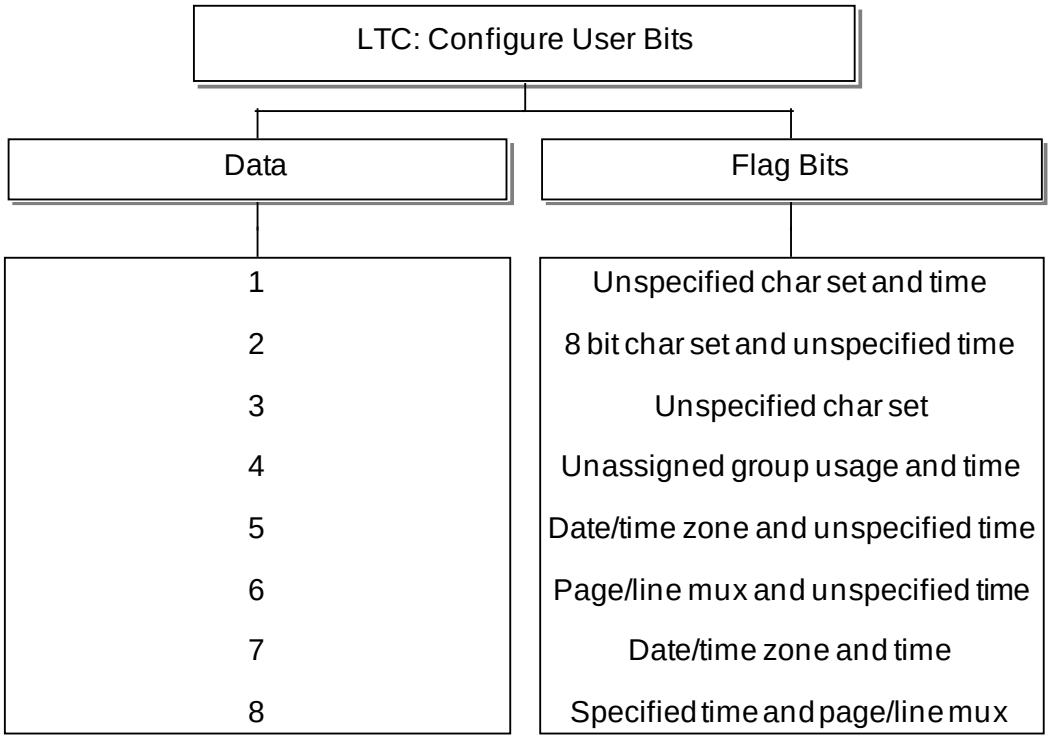
- **Mode**: turns the LTC timecode on and off. Factory default setting is “Off”.
- **Frame Rate**. Since LTC is not encoded within a video signal, the frame rate must be set either explicitly or by linked association with another system output.
- **Drop / Non-Drop**. Relates to 525/NTSC line timecode and determines whether frames are dropped to compensate for the non integer number of NTSC frames per second.
- **Colour Frame Flag**. This is a single bit within the data stream which indicates whether timecode is related to the video signal. This menu option allows the operator to turn this bit on or off.
- **User Bits**: the primary function of the User Bits is to allow the operator to embed a date code within the data stream since timecode represents only embedded time. This conforms to SMPTE S309.
- **Timecode Offset**. An additional offset may be applied to any timecode output, with a value between -23h: 59m: 59s and +23h: 59m: 59s. The default is 0h: 0m: 0s. This offset is applied immediately. Timecode outputs using the same oscillator frequency will remain “in-step”, using the Timecode JAM settings applied in section 11.2.1.
- **Show Clock:** displays the current LTC1 or LTC2 clock as read-only.

11.2.5 LTC – Frame Rate sub-menu



Since LTC is not contained within a video waveform, the timing must either be set explicitly or allied to one of the signal outputs.

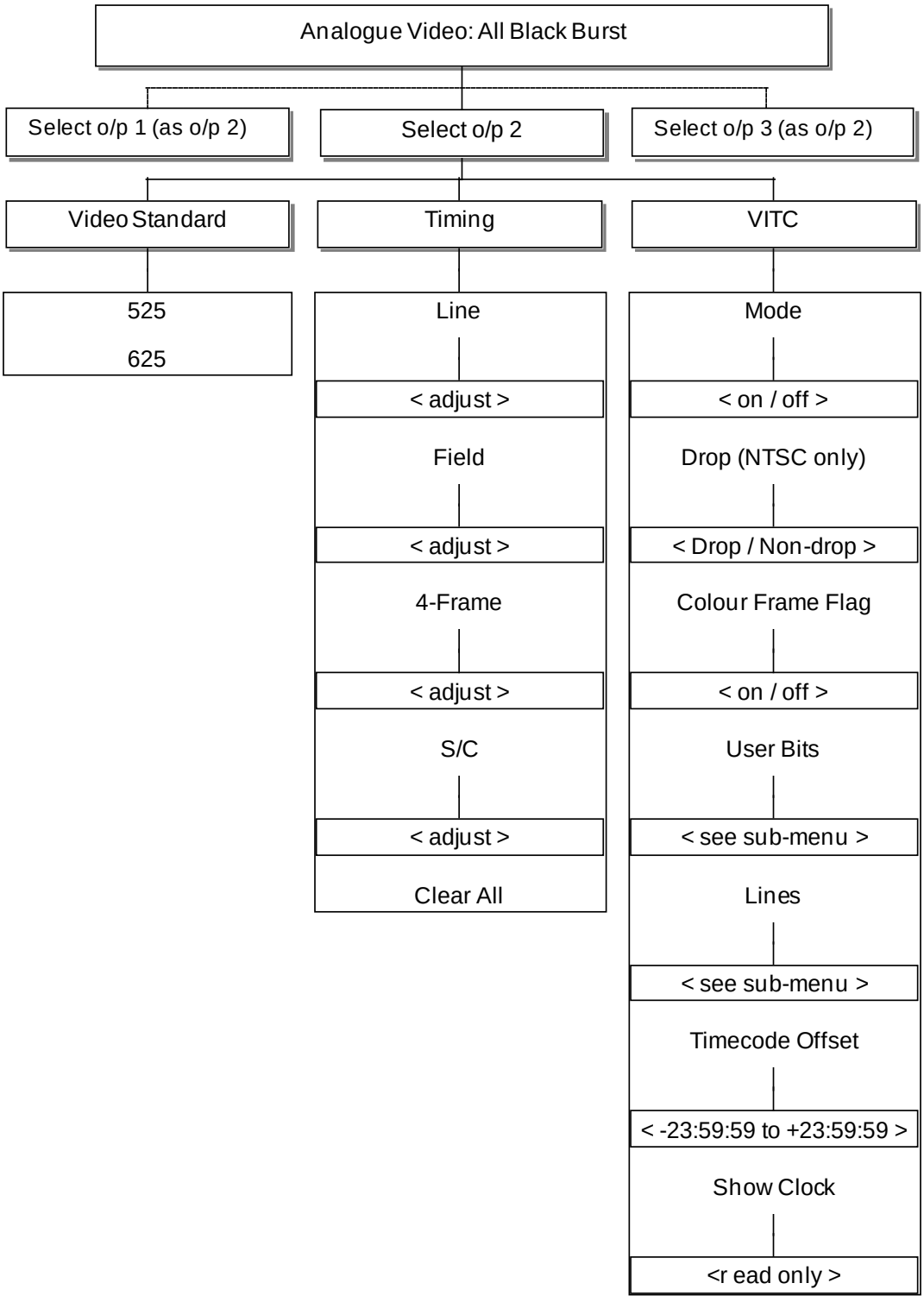
11.2.6 LTC – User Bits Menu



11.3 VITC WITHIN ANALOGUE WAVEFORM

11.3.1 VITC menu

Once the timecode software option has been enabled, an extra menu item will be shown. The example below shows the VITC item added to the Black & Burst o/p 2 menu tree.



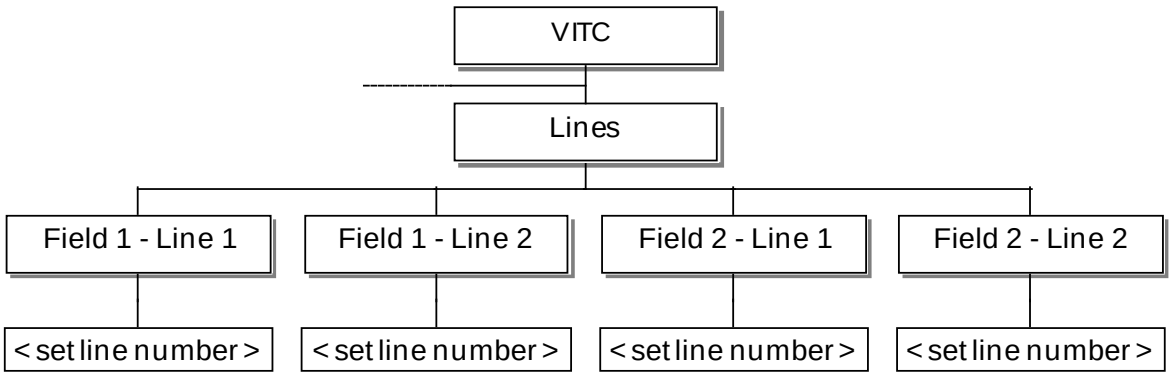
For more information on the analogue video settings, see section 5.1.

11.3.2 Notes

1. The factory default setting for VITC mode is “Off”.
2. The sub menu for User Bits is the same as for LTC: see section 11.2.4.
3. There is no “Drop” entry on the menu when the output in question is set to PAL mode.

11.3.3 Lines sub-menu

The “Lines” option menu provides control over which line of the video signal VITC is inserted into.

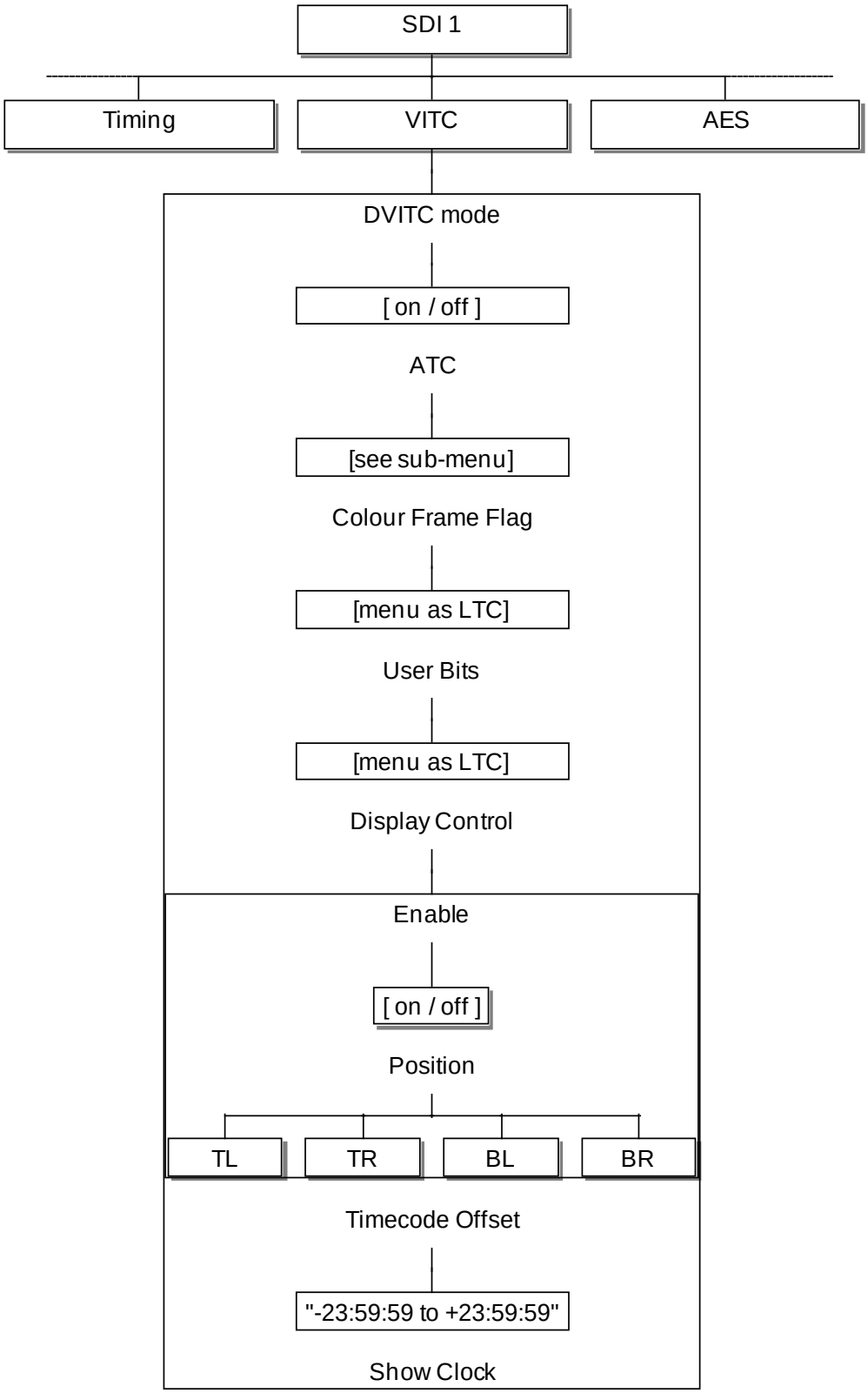


Here, “Line1” or “Line 2” indicates the first and second lines in each Field which have VITC inserted.

11.4 VITC WITHIN SDI

11.4.1 VITC menu

Once the software option has been enabled, an extra item will be shown in the menu tree for each SDI output. For more information on the general SDI settings, see section 11.3.

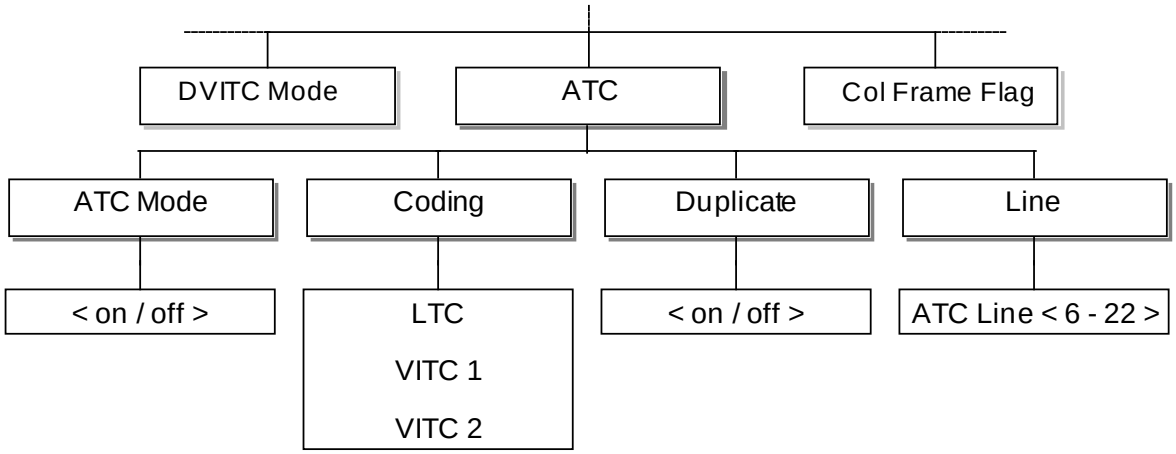


11.4.2 DVITC mode

The factory default mode for DVITC is “Off”. DVITC is only available with standard definition SDI outputs.

11.4.3 ATC sub-menu

The factory default mode for ATC is “Off”. ATC is available with both standard and high definition SDI outputs.



- **ATC Coding:**
- **ATC Duplicate** flag indicates, were the ATC data to be re-encoded as a VITC signal, whether it would appear on 1 or 2 lines in each field.
- **ATC Line**: were the ATC data to be re-encoded as a VITC signal, it would appear on the line number defined here.

11.4.4 On-screen timecode

With version 3.0.0.8 (and later) software installed on the Mentor XL, and the optional timecode feature enabled, the following SDI outputs are capable of displaying on-screen timecode:

- Main unit
- 360-17 SD/HD SDI Expansion module (hardware revision 10 or later only)
- 360-20 HD/3G SDI Expansion module

Once enabled, the on-screen timecode position may be set to each of the four corners of the screen (top left, top right, bottom left or bottom right) using the “Position” menu. The hardware revision of any fitted expansion modules may be checked from the Status menu: see section 9 for details.

12. OPTION : 360-15-10 GPS

12.1 INTRODUCTION

The **Global Positioning System** (**GPS**), is currently the only fully-functional **Global Navigation Satellite System** (**GNSS**). More than two dozen GPS satellites are in medium Earth orbit, transmitting signals allowing GPS receivers to determine the receiver's location, speed and direction. GPS also provides a precise time reference used in many applications including synchronization of telecommunications networks.

This revision of the User Manual (5.20) describes the Trilogy Option Board type 360-15-10, introduced in May 2013. For information about the previous generation GPS Option Board, please see manual version 5.10, obtainable from Trilogy using the contact information at the front of this manual.

The 360-15-10 option module may be connected to either a conventional GPS antenna, utilising the internal receiver (see 12.4), or alternatively to an external receiver / antenna (see 12.5). This choice is largely driven by consideration of the distance between the antenna site and the Mentor XL. Please see the following sections for information on recommended antennas.

12.2 DISCLAIMER

Trilogy Communications Ltd. is not connected in any way with any of the companies mentioned in this manual. The information is given in good faith from information in the public domain at the time of going to press. Many different antennas are available and specifications change over time. Some degree of experimentation may be required if the location is shrouded by adjacent structures, buildings etc. Excessive cable length will adversely affect performance.

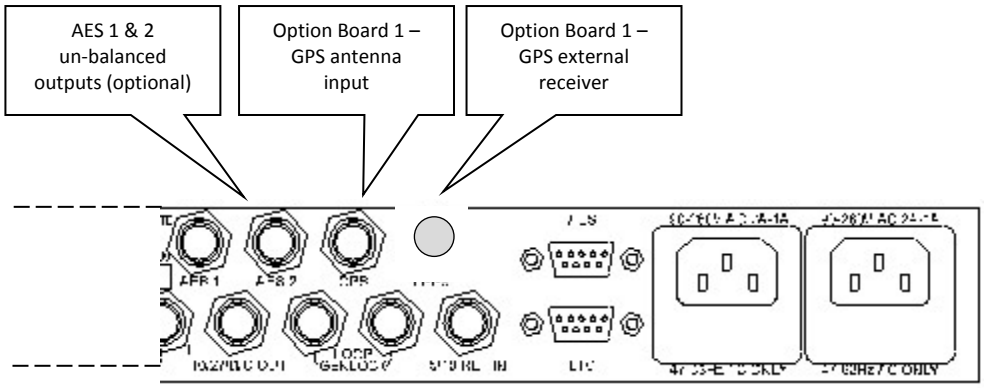
Trilogy Communications Ltd has no control over the local conditions in which the equipment is installed and the customer is expected to have carried out a site survey to ensure that that sufficient signal can be provided for the equipment to work in a satisfactory manner. Trilogy Communications Ltd. will not be held responsible for failures caused by poor installation, maintenance or changes in local conditions in which the required signals have been degraded such that time synchronisation is lost.

12.3 INSTALLATION

12.3.1 Hardware

This is a hardware option, module type 360-15-10. It must only be fitted in option slot 1: if fitted into any other position, an error message will be displayed. After installation, the module is automatically detected and new menus displayed. See 12.9.

Viewed from the rear of the unit, the connectors are:



- **Either** - the antenna input should be connected to a high quality 50Ω GPS antenna. See section 12.4 for more information.
- **Or** - the external receiver input connector is designed specifically for the Trimble Acutime GG external GPS receiver and antenna. This permits installations with cable lengths greater than 80 m between the Mentor XL and the antenna site. With appropriate wiring, a single external receiver / antenna can support a pair (main plus reserve) of Mentor XL reference generators.
- The AES 1 & 2 outputs provide an unbalanced duplicate of the signals on the D9 connector (see section 2.7). These are not related to GPS operation and are merely provided here for convenience. If GPS functionality is ***not*** required then a 360-15-02 board may be fitted which simply provides the duplicate AES outputs described above.

12.3.2 Antenna Location – site considerations

Ideally, the GPS antenna should have an unobstructed line of sight to the sky. Rooftops that are clear of other structures or geographic features overhead, with views to the horizon, generally make good installation locations. Such a clear view allows the antenna to track the maximum number of satellites throughout the day. A location on the side of a building can also offer good results but should be tested before completing the installation. Installations with obstructed views may experience impaired reception quality and may not be able to track simultaneously the maximum number of satellites.

When installing a GPS antenna, select a site at which the antenna will not become buried in drifting or accumulated snow. It should not be covered by foliage, fallen leaves or placed in a position where it could become obstructed in this way.

Whenever possible, avoid placing the GPS antenna in close proximity to broadcast antennae or near television or FM radio transmitters. Certain frequencies are harmonics of the GPS signal and can impair reception.

12.4 GPS ANTENNA – INTERNAL RECEIVER

When using the internal receiver, each Mentor XL fitted with the 360-15-10 GPS Module requires a separate outdoor antenna with the following characteristics:

- Active single antenna powered from the receiver module via the Mentor XL antenna connector.
- 360-15-10 requires a 5 Vdc antenna
- Reception frequency optimised for 1575.42 MHz
- 10 dB to 50 dB gain as measured at receiver input (antenna performance dictated by antenna manufacturer). Antenna types with lower gain performance cannot support longer cable runs: please see antenna and cable recommendations below.
- Connection by co-axial cable terminated at the Mentor XL rear panel with 50Ω BNC male connector.

Magnetic patch antennae suitable for vehicle mounting will also be satisfactory but only with very short cable runs (10 metres or less).

12.4.1 Recommended antenna type

- Trimble Bullet III with TNC or F termination. 5 Vdc.

This antenna provides a maximum gain of 38 dB when powered with 5 Vdc. Trilogy can provide the Trimble Bullet III, 5V model suitable for the 360-15-10 Trilogy GPS module, complete with Universal Mount. Order as Trilogy part no. **360-15-03.**

Other antennae may be suitable: please check manufacturer's specifications.

12.4.2 Cable considerations

Theoretically, 50Ω cable should be used to connect the GPS antenna. However, extensive testing by Trimble, manufacturer of our recommended antenna, has shown negligible attenuation differences between 50Ω and 75Ω cable types. In practice, it is far more important to select a cable with low attenuation characteristics around 1.6 GHz.

Using the recommended antenna, the overall attenuation of the installed antenna cable run should not exceed 20 dB. In addition to the attenuation specified by the cable supplier, a number of additional factors can influence the overall result:

- Quality of terminations. Incorrectly terminated connectors can each contribute an additional 2 dB to the overall attenuation.
- Multiple cables joined with barrels. Each join of this type can contribute an additional 3 dB to the overall attenuation figure. Use a single, continuous cable.
- Cable location. Do not allow the cable to rest in standing water: the water will gradually permeate the cable jacket and degrade the signal. If a cable is run over a flat roof, suspend the cable from suitable cable hangers.
- At the point of connection to the antenna, arrange the cable to form a drip loop, to eliminate water ingress.

12.4.3 Suggested cable types

- For cable runs <35 m (120 feet) use RG59 cable. This is a low cost 75Ω cable but is relatively easy to source and terminate.
- For cable runs <70 m (230 feet) use cable type CT125 (known as CX125 in some markets). This is a 75Ω cable used for CCTV and Satellite TV installations.
- For cable runs <100 m (320 feet) use cable type LMR-400. This is a high quality 50Ω cable. An ultra-flexible version is also available but with slightly higher attenuation, reducing the maximum cable length to 85 m. BNC connectors are available for the LMR-400 series. Cable type CT150 can also be used for cable runs approaching 100 m but it has 75Ω impedance so LMR-400 is preferred.
- For cable lengths >80m, consider the use of the external receiver described in section 12.5

Recommended Cable Types For Use With Trimble Bullet III Antenna

	RG59	CT125	CT167	LMR400
Nominal Impedance (Ω)	75	75	75	50
Nominal Diameter (mm)	6.15	7.8	10.1	10.3
Cable run <35 metres	✔	✔	✔	✔
Cable run <50 metres		✔	✔	✔
Cable run <70 metres		✔	✔	✔
Cable run <100 metres			✔	✔

*CT125 also marketed as CX125

12.5 External GPS Receiver / Antenna Combination

Use of an external receiver / antenna combination is recommended for installations where the antenna cable length exceeds 80 m. The Trilogy 360–15–10 option module has been optimised to work with the Trimble Acutime GG Multi-GNSS Smart antenna. Similar devices from other manufacturers may be suitable but they will require changes to the antenna settings before operating correctly. Trilogy has not tested and cannot endorse any other products.

12.5.1 Recommended external receiver / antenna

- Trimble Acutime GG Multi-GNSS smart antenna

Trilogy can supply the recommended antenna complete with Universal Mount. Order Trilogy part no. **360-15-04.**

12.5.2 Connection

The following tables show the connector types and interconnecting cable.

	Fixed connector	Mating connector	Available as
Mentor XL 360-15-10	8 pin Lemo socket	Lemo FGG.1B.308.CLAD62Z	Farnell 3817349
Trimble Acutime GG Smart Antenna	12 pin †	Deutsch IMC26-2212X PLUG, IN-LINE, 12 pin	Farnell 1019239
		Deutsch 6862-201-22278 CRIMP SOCKET, 22AWG	Farnell 1019253
		Deutsch 681020720012250 BOOT, PVC, 6.35MM	Farnell 2072428

† The 3 Deutsch parts comprising the antenna mating connector are available from Trilogy as part 360-15-07.

Mentor XL Lemo Pin Number	Mentor XL Signal	Acutime GG Pin Number	Acutime Signal
1	Serial TX+ (output)	3	Port B: Receive +
2	Serial TX- (output)	2	Port B: Receive -
3	Serial RX+ (input)	10	Port A: Transmit +
4	Serial RX- (input)	8	Port A: Transmit -
5	1PPS+ (input)	11	1PPS Transmit +
6	1PPS- (input)	12	1PPS Transmit -
7	24V	1	DC Power
8	GND	9	DC Ground

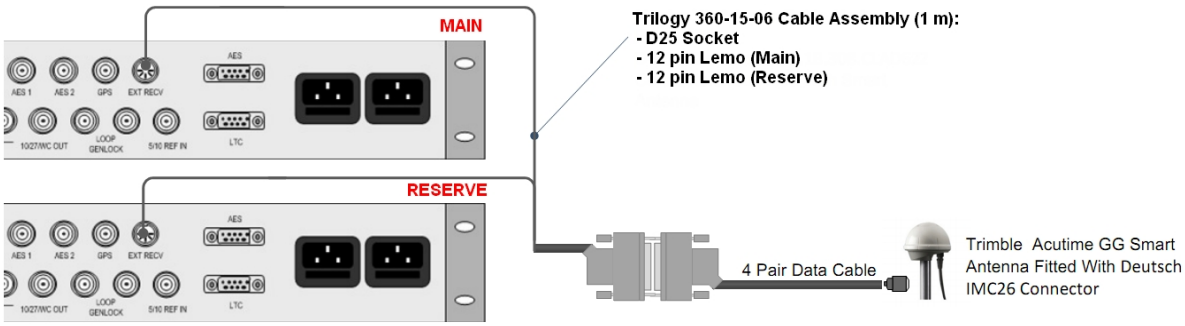
12.5.3 Cable Specification

Cable type	Four twisted pair, 8 conductors
Conductor size	22 AWG
Shielded	Yes
Outer sheath	PVC-U/V: outdoor, weather resistant
Outer diameter (max)	6.2mm

Trimble supply a range of ready-made cables – please contact them directly for further details. These are available either un-terminated or terminated with a D25 plug (male) connector. The terminated version interfaces directly to the Trilogy break-out cable assembly (see 12.6.1).

12.6 CONNECTING A SINGLE EXTERNAL RECEIVER TO TWO MENTOR XL

A single external receiver may be deployed and connected to a pair of Mentor XL generators. This simplifies the installation but will require a small amount of additional wiring adjacent to the Mentor. Some data signals require termination and this should be configured using the appropriate setup menus as shown in section 12.9.1. The table below shows wiring appropriate for a pair of Mentors. A cable break out assembly, part code **360-15-06**, is included with every 360-15-04 smart antenna purchased from Trilogy. See below for details.



The quantity of break-out cables required for particular applications is shown in the table below.

	Number of Mentor XL	Number of smart antennas	Number of cable assemblies needed
Single SPG - single antenna	1	1	1
Main / reserve dual SPG – single antenna	2	1	1
Main / reserve dual SPG – dual antenna †	2	2	2 †

† Connect each SPG using the connectors marked “Main”. Do not connect the “Reserve” connectors.

12.6.1 Mentor XL Break-out cable 360-15-06

Trilogy includes a break-out cable assembly, to be fitted at the rear of a main / reserve pair of Mentor XL generators. This is fitted with two Lemo connectors, to connect to main and reserve GPS option boards, plus a single D25 socket (female) which interfaces directly with a cable assembly purchased from Trimble, or with custom external wiring. The Lemo connectors are marked to indicate “main” and “reserve”.

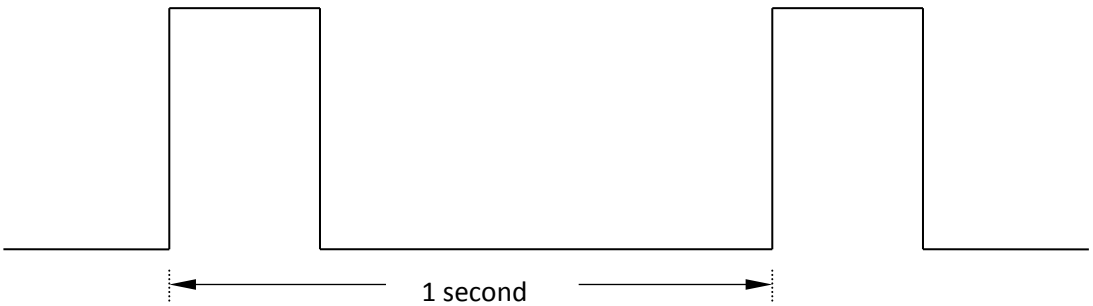
Acutime GG	D25 Male	D25 Female	Main Mentor XL (set to unterminated)	Reserve Mentor XL (set to terminated)
3	13	13	1	No connection
2	25	25	2	No connection
10	22	22	3	3
8	10	10	4	4
11	21	21	5	5
12	9	9	6	6
1	1	1	7	7
9	7	7	8	8

12.7 ACQUISITION PROCESS

With satisfactory reception, the acquisition process commences automatically and takes around 15 minutes. The front panel display provides information on both tracked and used satellites. An indication of suitable values is given below for guidance.

Satellites	Minimum	Optimum	Notes
Tracked	8	10-12	not supported with 360-15-10
Used	5	8-10	

12.8 1 PULSE PER SECOND (1 PPS) SIGNAL WAVEFORM



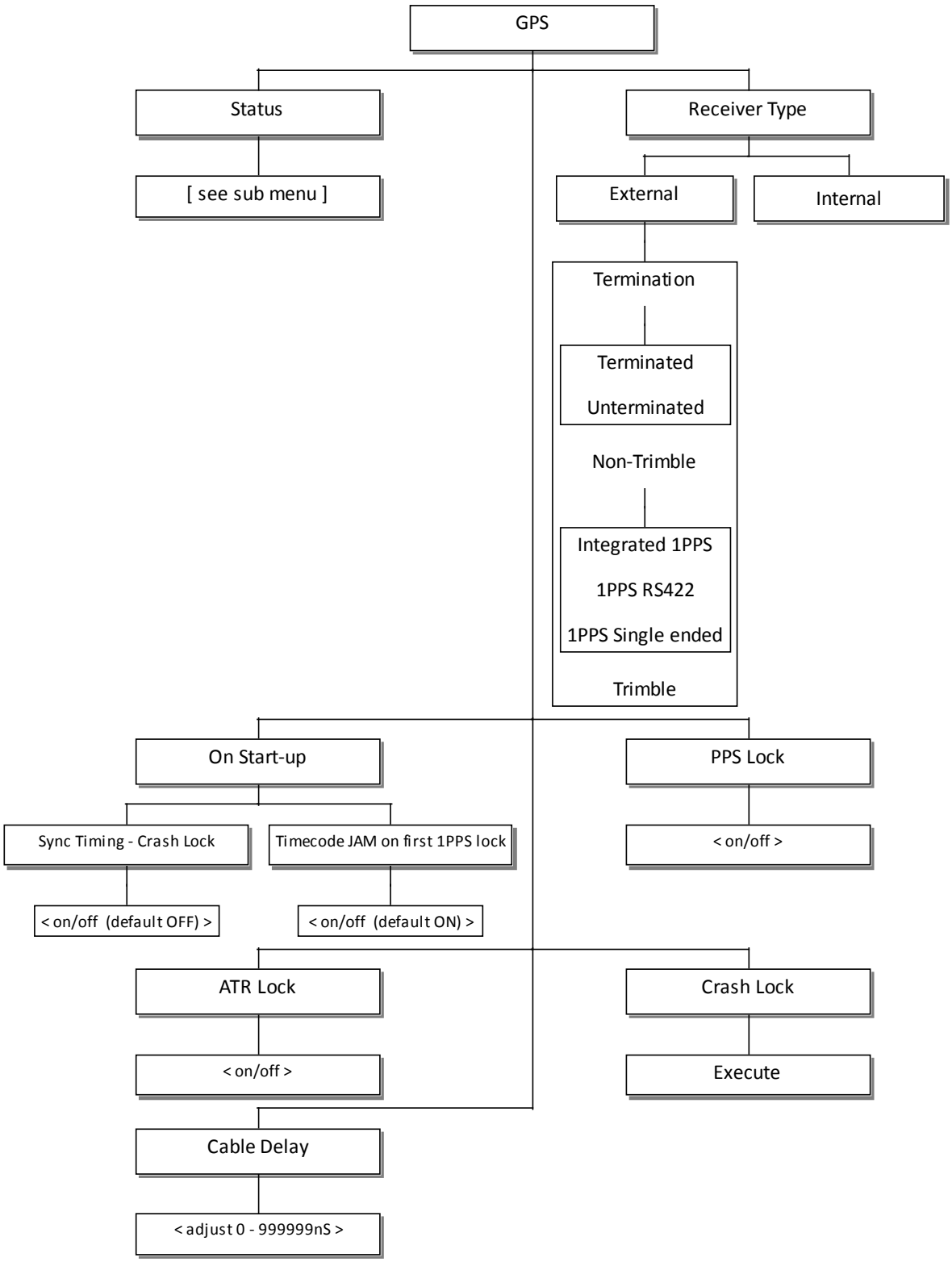
The leading edge of the positive going pulse provides the timing reference plane for locking external equipment. There is no agreed standard for the pulse width.

With “Lock to 1 PPS” turned on, this signal locks the internal 27 MHz PLL oscillator such that PAL output signals are both frequency locked and phase locked. Any NTSC output signals are frequency locked but cannot be phase locked. In addition, the real-time clock (RTC) is locked to GPS time.

12.9 GPS MENU STRUCTURES

After the option board is added, an extra entry “GPS” will appear on the Options branch of the top level menu. This opens the following sub-menu.

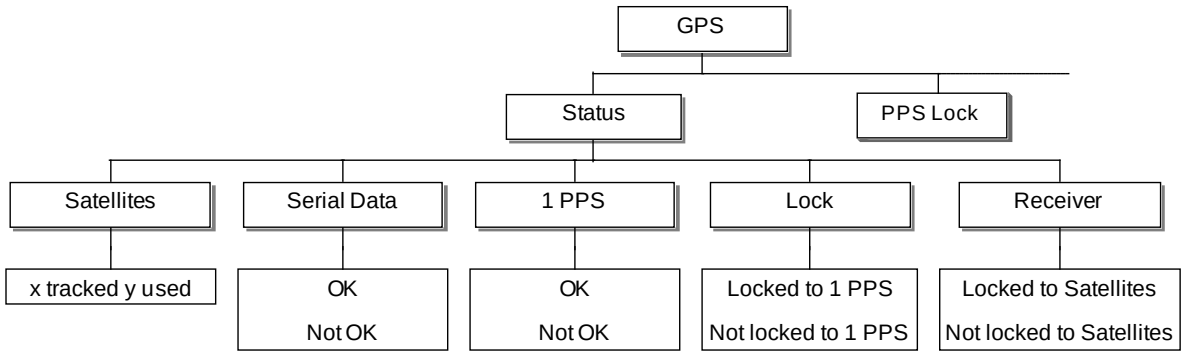
12.9.1 GPS Control Menu



- **Status**. Detail of the Status sub menu is shown below.
- **Receiver type** must be configured during installation.
    - **Termination.** If the external receiver / antenna is feeding a pair of Mentor XL reference generators, this parameter must be set to “terminated” for one SPG and “unterminated” for the second unit.
    - **Trimble / Non-**Trimble. Please set accordingly. We have not tested the 360-15-10 GPS Option module with other manufacturers’ receivers and some adjustment of those products may be required.
- **PPS Lock**. If the PPS Lock mode is set to ON, it only affects the “Internal Free Run” mode of genlock. The internal oscillator is then locked to the GPS reference.
- **On Start-up:**
    - Crash Lock will cause sync timing to be very unstable until 1 PPS lock has occurred although it will considerably speed up the process.
    - Time code Jam on first 1PPS lock will Jam the timecode clock to the RTC automatically when a system is reset or powered on and it achieves its first 1 PPS lock. The Mentor XL will not Jam on subsequent loss and return of 1 PPS lock.
- **ATR Lock**. ATR (Absolute Time Reference) is explained in section 12.10. If ATR Lock Mode is ON, the unit will also perform a fast lock, independently of the Crash Lock mode described above.
- **Cable Length**. Provides compensation for the propagation delay of the antenna cable.

The GPS receiver has an automatic “site survey” function. A site survey can take some time to complete and may occur during the initial installation phase.

12.9.2 GPS Status Menu (read only)



- **Satellites**. The time taken to acquire satellites can be 10 or 15 minutes, since the almanac data is broadcast fairly infrequently. The menu displays the number of satellites tracked and those actively used. Note that the 360-15-10 module only supports the number of satellites used. The tracked value is no longer provided.
- **Serial Data OK / Not OK:** indicates whether the serial data from the receiver is present or not.
- **1 PPS OK / Not OK:** reports the presence of 1 PPS as a general diagnostic aid.
- **Lock** indicates whether the board is locked to the GPS 1 PPS signal.
- **Receiver** indicates the current status of the GPS receiver.

12.10 Absolute Time Reference (ATR)

The concept of ATR is covered by SMPTE Proposal 404 and is also known as “SMPTE epoch”. It defines a starting point of midnight on January 1st 1958, at which time all generating equipment is deemed to be phase locked.

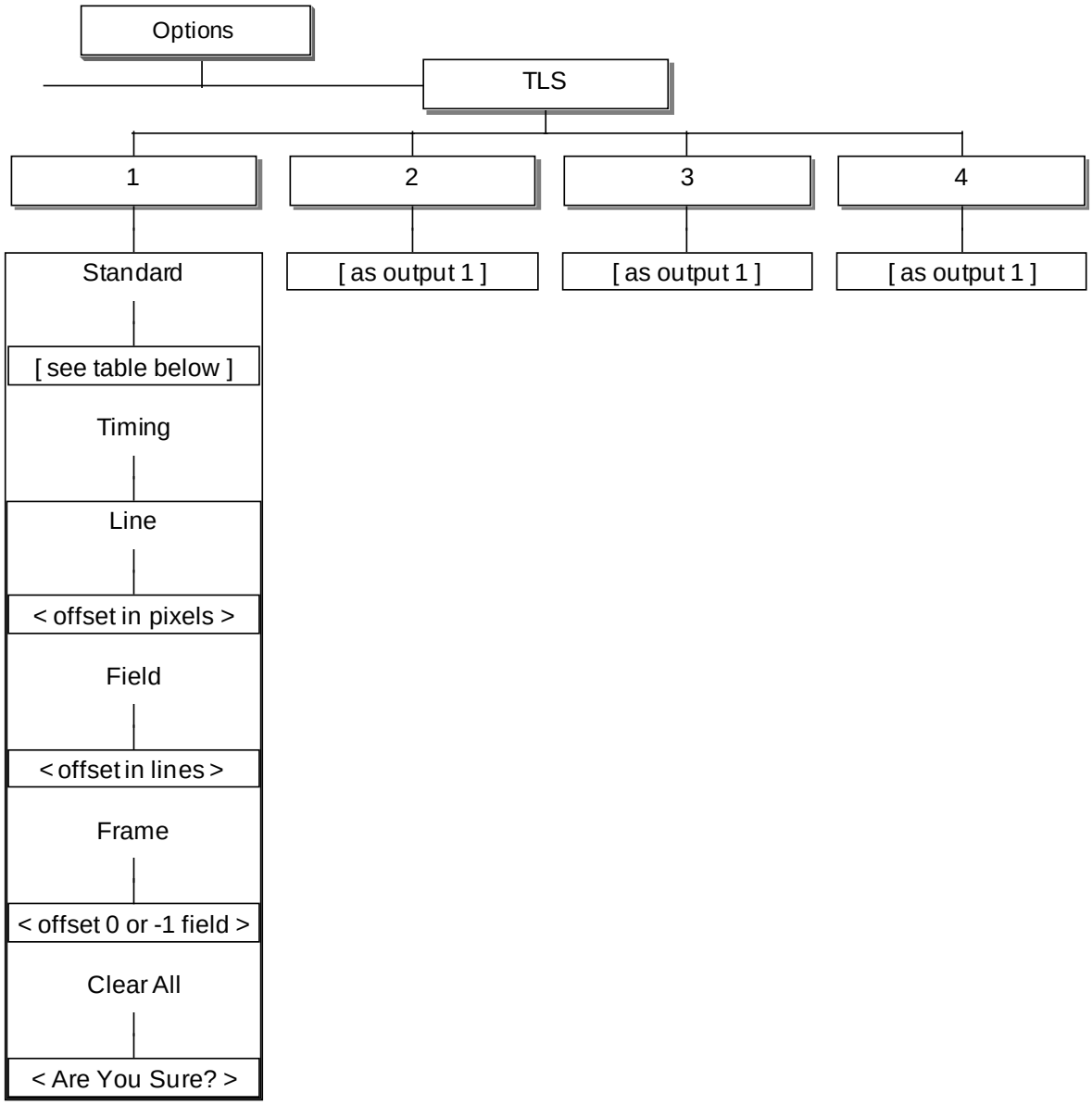
In order to make use of the ATR definition, precise date/time provided by the GPS receiver is required. This allows the current state of the Mentor XL to be computed with regard to the epoch as defined by ATR. By accurate determination of current time, any ATR equipped items may be locked together again.

13. OPTION : 360-16-01 TRI-LEVEL SYNC

13.1 INTRODUCTION

High definition (HD) applications require a special synchronising signal which is termed “tri-level sync” or TLS. This differs from conventional reference signals since the horizontal and vertical timing components are combined within a single waveform. The 360-16-01 module replaces the earlier 360-16-00 and allows each output to be individually configured and timed. When fitted in expansion slot 3, an additional menu branch will appear under the Options section.

13.2 MENU STRUCTURE



13.3 AVAILABLE STANDARDS

The standard of each of the four outputs may be individually configured from the menu according to the following table. The scan format is indicated by P (Progressive) or I (Interlaced). “sF” within the description is used to denote “segmented frame”.

Some timing options are not available with specific standards as indicated in the following table.

Description	Lines/ Frame	Frame Rate	Scan	Timing		
				Line	Field	Frame
1920x1080/60/1:1	1125	60	P	Y	N	Y
1920x1080/59.94/1:1	1125	60	P	Y	N	Y
1920x1080/50/1:1	1125	50	P	Y	N	Y
1920x1080/60/2:1	1125	60	I	Y	Y	Y
1920x1080/59.94/2:1	1125	60	I	Y	Y	Y
1920x1080/50/2:1	1125	50	I	Y	N	Y
1920x1080/30/1:1	1125	30	P	Y	N	Y
1920x1080/29.97/1:1	1125	30	P	Y	N	Y
1920x1080/25/1:1	1125	25	P	Y	N	Y
1920x1080/24/1:1	1125	24	P	Y	N	Y
1920x1080/23.98/1:1	1125	24	P	Y	N	Y
1920x1080/30/sF	1125	30	I	Y	Y	Y
1920x1080/29.97/sF	1125	30	I	Y	Y	Y
1920x1080/25/sF	1125	25	I	Y	Y	Y
1920x1080/24/sF	1125	24	I	Y	Y	Y
1920x1080/23.98/sF	1125	24	I	Y	Y	Y
1280x720/60/1:1	750	60	P	Y	N	Y
1280x720/59.94/1:1	750	60	P	Y	N	Y
1280x720/50/1:1	750	50	P	Y	N	Y
1280x720/30/1:1	750	30	P	Y	N	Y
1280x720/29.97/1:1	750	30	P	Y	N	Y
1280x720/25/1:1	750	25	P	Y	N	Y
1280x720/24/1:1	750	24	P	Y	N	Y
1280x720/23.98/1:1	750	24	P	Y	N	Y
6Hz(30/24)	6Hz	-	-	N	N	N
6Hz(29.97/23.97)	6Hz	-	-	N	N	N
625/50	625	50	I	Y	Y	Y
525/59.94	525	60	I	Y	Y	Y

14. OPTIONS : NTP AND SNMP

14.1 360-18-00 / 360-18-01 NETWORK TIME PROTOCOL (NTP) OPTION

This is a software only optional upgrade: please contact your usual Trilogy sales representative for details.

- Both server (360-18-00) and client (360-18-01) modes are offered. Only one of these modes may be enabled at one time.
- If installed, the menu will offer “Server”, “Client” and “Disabled”: client and server are mutually exclusive.
- The client can sync to any Internet NTP server.
- When acting as a server the Mentor XL should, ideally, be fitted with a GPS board but this is not essential. Even if the server is free running, a client can still sync to it.

14.2 360-19-00 SNMP SUPPORT

Simple Network Management Protocol (**SNMP**) is a component of the Internet Protocol Suite as defined by the Internet Engineering Task Force (IETF). SNMP is used in network management systems to monitor network-attached devices for conditions that warrant administrative attention.
The 360-19-00 software upgrade implements an SNMP agent on the Mentor XL, allowing events on the Mentor XL to be monitored by a third-party management system.
The following conditions and events are reported:

State information is provided as per the Mentor XL error message screen:

- DHCP server status
- NTP server status
- External 5 / 10MHz status
- S318 presence
- Line lock status
- Subcarrier lock status
- Genlock input status
- Genlock ScH status
- Genlock video standard status
- Backup power supply status

GPS status reporting (if GPS option is fitted):

- GPS status
- GPS antenna status
- GPS 1pps lock status
- GPS: number of visible satellites
- GPS: number of tracked satellites

The following SNMP relevant variables can be set:

- If notification is enabled the Mentor XL will generate a trap on the change in value of any of the state variables.
- The IP address where notification traps are sent.

The GPI Outputs may also be controlled using SNMP:

- When set to 'triggered' mode will force the GPO 1 state
- When set to 'triggered' mode will force the GPO 2 state

Please contact your usual representative or Trilogy Support (broadcastsupport@trilogycomms.com) to request the SNMP MIB.

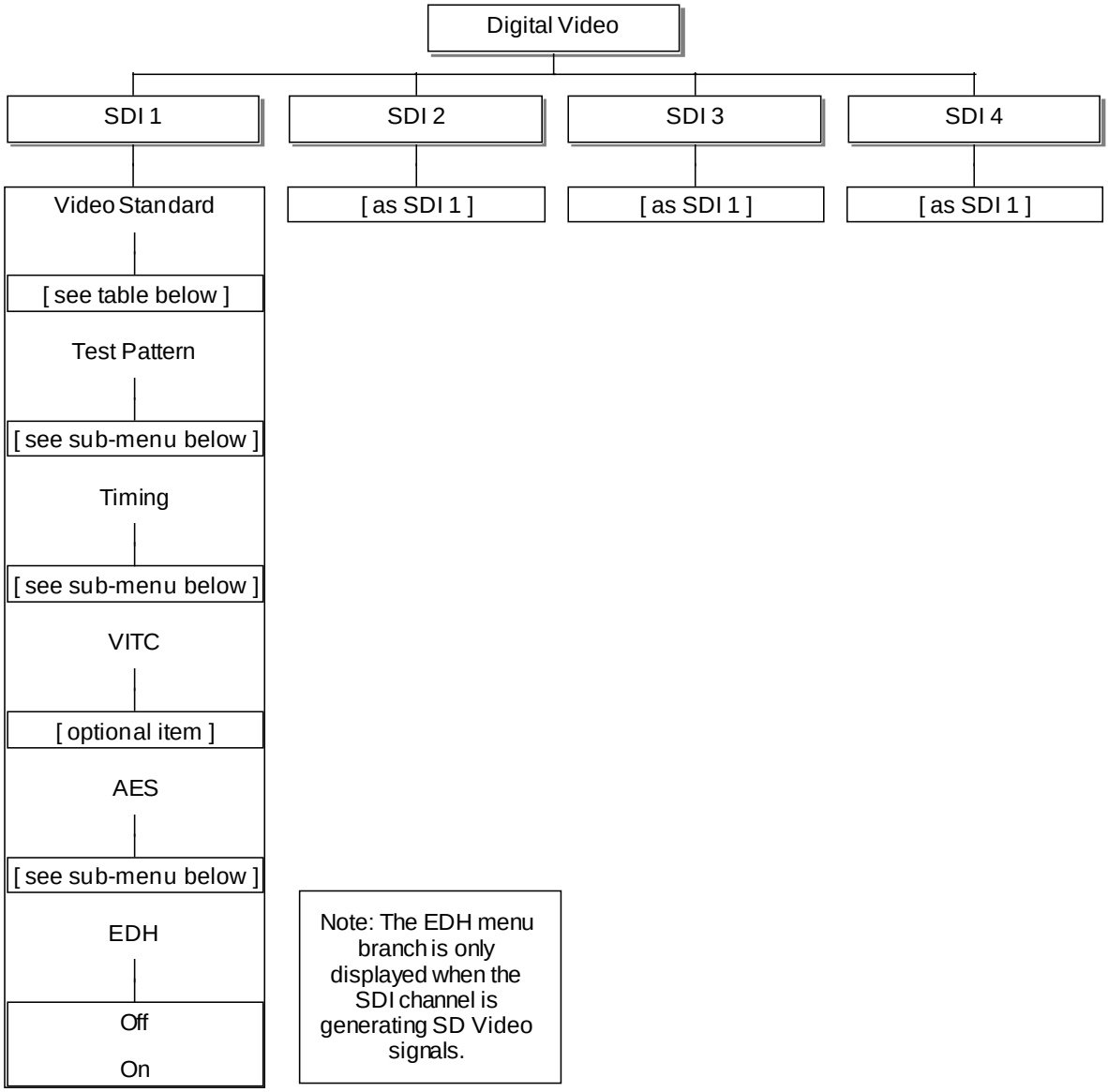
15. OPTION : 360-17 SD/HD - 360-20 HD/3G-SDI MODULE

- The 360-17 module provides four additional SD or HD SDI outputs in any combination. It requires software option 360-10-00 (SD) or 360-13-00 (HD) as pre-requisite. The 360-17 series option board does not provide 3G capability. It has now been replaced by the 360-20.
- The 360-20 module has 3G capability, allowing the choice of three additional video standards as shown in section 15.2. The 360-20 expansion module does not support SD SDI standard signals. It requires software option 360-13-00 (HD) as pre-requisite.

Normally, only a single 360-20 or 360-17 will be fitted in expansion slot 2 of the Mentor XL.

15.1 360-17 - 360-20 MENU TREE

System menus follow the same layout as the on-board SD/HD SDI signals – see section 4. Four outputs are provided and the menu diagram below reflects this change. Sub menus are identical to those shown in Section 4.



15.2 360-17 - 360-20 Available Video Standards

The 360-20 option board provides three additional video standards when compared to the main board or 360-17 option board. The 360-20 does not support SD video standards.

Description	Lines/ Frame	Frame Rate (Hz)	Scan	360-17	360-20
525				YES	NO
625				YES	NO
1080i / 60	1080	60	I	YES	YES
1080i / 59.94	1080	59.94	I	YES	YES
1080i / 50	1080	50	I	YES	YES
1080p / 60	1080	60	P	NO	YES
1080p / 59.94	1080	59.94	P	NO	YES
1080p / 50	1080	50	P	NO	YES
1080p / 30	1080	30	P	YES	YES
1080p / 29.97	1080	29.97	P	YES	YES
1080p / 25	1080	25	P	YES	YES
1080p / 24	1080	24	P	YES	YES
1080p / 23.98	1080	23.98	P	YES	YES
720p / 60	720	60	P	YES	YES
720p / 59.94	720	59.94	P	YES	YES
720p / 50	720	50	P	YES	YES
720p / 30	720	30	P	YES	YES
720p / 29.97	720	29.97	P	YES	YES
720p / 25	720	25	P	YES	YES
720p / 24	720	24	P	YES	YES
720p / 23.98	720	23.98	P	YES	YES

15.3 360-17 Available Test Patterns

15.3.1 360-17

The 360-17 option board supports the same range of test patterns as the mainboard. See section 4.2.1 on page 29.

15.3.2 360-20

The 360-20 does not support SD SDI. The patterns listed in section 0 on page 31 are available in both HD and 3G SDI formats.

16. COMMON CONFIGURATIONS

This section provides instructions on setting up your Mentor XL in a number of commonly used modes. Some of these require certain hardware and software options to be present: these are outlined within each sub-section.

16.1 GPS LOCKED SPG AND TIMECODE GENERATOR.

Ensure you have the 360-15 GPS Board fitted, and connect a suitable 50Ω cable and antenna. The 360-14-00 Timecode option is also required. See section □for guidance on selecting antenna and cable.

1. Press Options on the front panel and select GPS. Set PPS lock and ATR lock on.
2. With version 5.0 and later software, Crash Lock will default to “off” on start-up. Use of Crash lock will cause sync timing to be unstable until PPS lock is achieved although it will speed the process.
3. Select Options >> GPS >> Status and wait for <Locked to 1 PPS> to be indicated.
4. Navigate to Setup >> More >> RTC Setup >> Sync Source and select <GPS>.
5. Go to Setup >> Timecode >> All Frequencies, ensure <RTC> is selected in Jam Source. Then press <JAM!>.
6. Press Options on the front panel and select GPS. From the “on start-up” menu, set Crash lock to off.

The Mentor XL Timecode will now reflect GPS time and the Black and Burst outputs will be locked to the GPS 1 PPS signal.

16.2 GPS LOCKED NTP SERVER.

Ensure you have the 360-15 GPS Board fitted, and connect a suitable 50Ω cable and antenna. See section □for guidance on selecting antenna and cable. The 360-18-00 NTP server option is also required.

1. Press Options on the front panel and select GPS. Set PPS lock, Crash lock and ATR lock on.
2. Select Options >> GPS >> Status and wait for <Locked to 1 PPS> to be indicated.
3. Navigate to Setup >> More >> RTC Setup >> Sync Source and select <GPS>.
4. Go to Setup >> More >> NTP >> Mode and select <Server Mode>.
5. Go to Setup >> More >> Comms >> Network and enter appropriate values for IP Address, IP Subnet Mask and Default Gateway. The Mentor XL must be configured with a fixed (static) IP Address: DHCP is not suitable for this application.

The Mentor XL will now be serving requests for NTP time at the configured IP Address.

16.3 DAYLIGHT SAVING TIME

Mentor XL has an automatic daylight saving time adjustment feature. To enable this from the front panel controls, go to:

1. Setup >> More >> RTC Setup >> Timezone

2. Select your locale from the list and press OK to confirm

The real-time clock will now automatically adjust at the start and end of daylight saving time. However, to ensure continuity, timecode will not change until Jam! occurs. For more information on the different Jam modes available, please see section 11.1.

16.4 VITC AS A JAM! SOURCE

The 360-14-00 Timecode option is required for this mode. With software release V4.0.0.5 and later, VITC, DVITC, ATC and LTC are optionally able to Jam to VITC on a genlock input. VITC input timecode lock is activated from the front panel menus as follows:

- Setup >> Timecode >> All Frequencies >> JAM Source >> VITC
- Setup >> Timecode >> All Frequencies >> JAM! >> OK

Upon jamming, the VITC on the genlock input is sampled and all timecode outputs are updated. Timecode outputs then increment from this point, until another Jam! is initiated. If the Mentor XL is genlock referenced and is set to output the same frame rate as the genlock input, then timecode will remain locked to the genlock input.

If the input genlock VITC changes, the Mentor will require a Jam! to reflect this change. This ensures continuity of output timecode.

17. SPECIFICATION

Note. All measurements are made assuming, where appropriate, that the various offsets controlled from the front panel are set to zero unless otherwise stated. All signal measurements are made with inputs and outputs terminated in 75R unless otherwise stated.

17.1 GENERAL

Width	19" rack mounting
Height	44 mm (1U)
Depth	433 mm (excluding connectors)
Weight	4kg, no option boards 5kg max. with option boards
Operating temperature range	0 to 50°C
Storage temperature range	-25 to 70°C
Operating humidity	95%RH non-condensing

17.2 EMC

Emissions	EN55103-1, Environment E2
Radiated	EN55103-2, Environment E2
Safety	EN60950

NOTE: Immunity is specified to criterion B - the outputs may suffer some degradation during the disturbance, but will recover on removal of the disturbance source and continue to operate as intended.

17.3 POWER

Mains input x 2	90-264 VAC, 45-63Hz, auto select
Power consumption	60VA max. (depending on number of option boards fitted)
Internal Fuse	3.15A

17.4 INTERNAL REFERENCE OSCILLATOR STABILITY

Nominal error	< ±0.5Hz (0.1ppm)
Temperature stability (over operating temperature range)	< ±0.05ppm
Ageing rate (per year)	< 0.5ppm
Warm up settling time to <0.05ppm	10 minutes @ 25C

17.5 GENLOCK VIDEO INPUT PERFORMANCE

The unit's lock mode is assumed set to manual subcarrier phasing, correct Sc.H or follow-external SC phase, unless otherwise stated.

Video input type	2 BNC high impedance loop through
Return loss @ subcarrier	< -40dB
Video D.C. range	< ±12V
Video signal amplitude (to keep unit within specification)	300mV sync/burst ±6 dB (285mV 525 operation)
Sync attenuation below which signal will be indicated as missing.	-8dB (with respect to 300mV/625 or 285mV/525)
Burst attenuation below which signal will be indicated as monochrome.	-8dB (with respect to 300mV/625 or 285mV/525))
Sync frequency lock range	15.625kHz ± 1.5Hz (±100 ppm) - 625 15.734kHz ± 1.5Hz (±100 ppm) - 525
Subcarrier lock range	4.43361875MHz (625) 3.579545MHz (525) ± 200Hz (±50 ppm) (see note 1)
Genlock video lock up time	< 7 seconds
Output sync jitter with respect to 'clean' genlock video input	< ± 3ns
Output subcarrier jitter with respect to 'clean' genlock video input, lock mode = EXT1/2/3	< ±0.25°
Output subcarrier jitter with respect to 'clean' genlock video input, lock mode = EXT 4	< ±2°
Input video ScH. phase over which ScH. error is indicated.	+90±15°, -90±15° (approx.)
Genlock video sync to output sync timing accuracy, over full operating temperature range	< 5ns
Genlock video subcarrier to output subcarrier phase accuracy over full operating temperature range	< 5°
Vertical lock up rate, genlock video to output, when unit set to line drop mode	1 line / 5 field

Note1: Assumes 15625Hz (15734.268Hz NTSC) line frequency and subcarrier varied about nominal subcarrier frequency.

17.6 GENLOCK OPERATIONAL CONTROL

Horizontal offset adjustment range	±32 µS
Horizontal offset resolution	1ns
Horizontal offset accuracy	±5ns over full range
Subcarrier phase adjustment range	0 to 359.9°
Subcarrier phase resolution	0.1°
Line offset adjustment range	1 line steps over entire 525/625 range

17.7 10 MHz Input Performance

The lock mode is assumed set to external 10 MHz.

10MHz input type	1 BNC, 75Ω terminated
10MHz input return loss @ 10 MHz	< -35dB
10MHz D.C. range	< ±3V
10MHz signal amplitude (to keep unit within specification)	0.5V to 3V p to p (terminated)
Signal amplitude below which signal will be indicated as missing.	0.4V
10MHz frequency lock range	10 MHz ±200 Hz (±20 ppm.)
Lock up time	< 0.1 seconds
Output sync jitter with respect to 'clean' 10MHz input	< ±2 ns
Output subcarrier jitter with respect to 'clean' 10MHz input	< ±0.2°

17.8 SD-SDI Outputs

General		
	Format	270 Mbit/s 10 bit
	Standards	ITU-R BT 601, 656, EBU Tech 3267, SMPTE 125M, 244M, 259M, 272M, RP165, RP178)
Video		
	Output impedance	75Ω
	Amplitude	800 mV pk-pk ±10%
	Return loss to 270MHz	> 15dB
	Overshoot	<10%
	Jitter	<0.2UI, above 10Hz jitter frequency
	Rise/Fall times	0.4 to 1.5ns (20-80%)
	DC offset (AC coupled)	0 ±0.5V
	Time offset with respect to Main black burst signal	< ±100 ns
Embedded audio		
	Active channels	4
	Group	1, 2, 3, 4 any / all, freely selected.
	Sample frequency	48kHz
	Digital coding	24 bits
	Audio Tone	25 Hz to 20 kHz in 25 Hz steps
	Audio Level	0 to –120dBfs
	Tone modes	On, Off, CCIR and EBU

17.9 HD-SDI Outputs

General	
Standards	SMPTE 272M, 292M, 296M
Formats	1080i 60Hz, 59.94 Hz, 50 Hz 1080p 30 Hz, 29.97 Hz, 25 Hz, 24 Hz, 23.98 Hz 1080psF 30 Hz, 29.97 Hz, 25 Hz, 24 Hz, 23.98 Hz 720p 60 Hz, 59.94 Hz, 50 Hz, 30 Hz, 29.97 Hz, 25 Hz, 24 Hz, 23.98 Hz
Video	
Output impedance	75Ω
Amplitude	800mV pk-pk ±10%
Return loss to 270MHz	>15dB 5 MHz – 750 MHz >10dB 750 MHz – 1.485 GHz (typical)
Overshoot	<10%
Jitter	<135ps
Rise/Fall times	<270ps (20-80%)
DC offset (AC coupled)	0 ±0.5V
Embedded audio	
Active channels	4
Group	Selectable 1, 2, 3 or 4.
Sample frequency	48kHz
Digital coding	24 bits
Audio Tone	25 Hz to 20 kHz in 25 Hz steps
Audio Level	0 to –120dBfs
Tone modes	On, Off, CCIR and EBU

17.10 3G SDI Outputs

As above with the following additional formats in accordance with SMPTE 424 M standards:

- 1080p/50 Hz
- 1080p/59.94 Hz
- 1080p/60 Hz

17.11 ANALOGUE VIDEO OUTPUT PERFORMANCE

Output impedance	75Ω ±0.2%
Sync amplitude	300mV ± 3mV (625) 285mV ± 3mV (525)
Burst amplitude	300mV ± 9mV (625) 285mV ±9mV (525)
Black level D.C.	0V ± 20mV
Noise to 20MHz	< -60dB (with respect to 700mV)
Noise above 20MHz	< -40dB (with respect to 700mV)
ScH. accuracy, all controls set to zero	± 5°
Sync edge risetime	250ns, Gaussian (625) 140ns, Gaussian (525)
Burst edge risetime	350ns, Gaussian (625) 300ns, Gaussian (525)
Difference in timing between any analogue video output and any other (all controls set to zero)	±10 ns
Difference in timing between any black/burst output and the genlock video input (all controls set to zero).	±10 ns
Generation Accuracy	10bit
Timing Accuracy channel to channel	<±5ns
Level, 0dB:pk-pk:	1V±1%
Black level DC:	0V ±25mV
Chrominance/Luminance gain:	<1%
Chrominance/Luminance delay:	<5ns
Chrominance phase accuracy:	<±5°
Linearity:	<0.25%
Frequency Response to 6MHz	±0.2dB
Diff. Gain:	< 0.5%
Diff. Phase:	< 0.5°
2T K rating:	< 0.5%K
ScH accuracy:	±5°
Line tilt:	<0.5%
Field tilt:	<0.5%
Channel crosstalk 0-5.8MHz	<-60dB

17.12 AES/EBU Outputs

Standard	ANSI S4.40 (AES3)
Output Channels	4 (2 AES/EBU pairs)
Synchronism	The signal timing is derived from the video clock source, either the internal oven oscillator or the genlock feed. 48kHz signal is related to video frame as per SMPTE/EBU recommendations.
Grade * see note 1	Meets grade 1 when genlock lock mode = internal or stable 10MHz reference used.
Clock jitter * see note 1	< 1ns
Output Connectors	D9 socket (balanced) BNC (unbalanced) - optional
Signal amplitude	5V ±0.3V
Impedance	110Ω ±10%
Tone resolution	24 bit
Tone linearity error	< 1ppm
Sample frequency control	Selectable, 32kHz, 44.1kHz, 48kHz, 96kHz
Tone frequency adjustment	25Hz to 20kHz in 25Hz steps. Left/right channel independent adjustment.
Tone amplitude adjustment	0 to -120dBfs left/right channel independent adjustment.
Tone identification	Left/right channels can pulse according to EBU/CCIR recommendations.
Grade	Grade bit manually adjustable between grade 1 and grade 2.
User data	User configurable
Other	Both channels may be set to silence. Channels can be swapped.

Note 1. When the unit is locked to a genlock feed, the frequency stability of the AES signal is dependent on the quality of that feed.

17.13 Analogue Audio Output Performance

Signal source	Independent audio generator.
Number of Channels	2
Output type	Differential, electronically balanced
Output impedance	Low impedance, < 10Ω.
Tone Amplitude	+20dBU to –40dBu adjustable.
Tone Frequency	100Hz to 20kHz in 25Hz steps. Left/right channel independent adjustment.
Tone identification	Left/right channels can pulse according to EBU/CCIR recommendations.

17.14 Clock Output

Frequency	Selectable 10MHz, 27MHz or Word Clock
Output Impedance	75Ω ±1%
Word Clock	CMOS compatible 32kHz, 44.1 kHz, 48kHz or 96kHz (AES1 or AES2 sample frequency)
10MHz	1.2V ±100mV
27MHz	1V ± 100mV

17.15 GPI Inputs and Outputs

GPI Inputs	
Number	2
Type	Grounding
Max voltage	±20V
Operating current	≈600µA
GPI Outputs	
Number	2
Type	Open Drain
Max Voltage	30V
Max Current	190mA
Max dissipation	600mW

17.16 LTC Timecode

Standard	SPMTE S12M, S309M
Output Channels	2, electronically balanced
Connector	9 way Sub-D Socket
Level	2V peak-peak into 1kR
Impedance	<25 R per leg
Risetime	40 ±10µSec between 10% and 90% points
Jitter	<2µSec
Overshoot	<5%

17.17 Miscellaneous

Setup data retention when unit not powered	>1000 hours. Unit must have been powered for >24 hours prior to this.
Serial communication type	RS422 / 232 (software configured).
Power fail indication	Relay contact, closed under normal operation, open for any failure state.
Fan fail indication	Relay contact, closed under normal operation, open for any failure state.
Option interfaces	Up to three single width option boards may be fitted to the unit.
Ethernet	RJ-45 interface. Software configured for DHCP or static IP address.