Courtyard

CY460 & CY460D

Sync Pulse & Test Pattern Generator

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Courtyard Electronics Limited
8 Campbell Court, Bramley, Hampshire RG26 5EG. England.
Telephone : +44 (0)1252 712030.
http : //www.courtyard.co.uk e-mail : info@courtyard.co.uk

This Manual

Scope

This manual provides all the information you will need to effectively operate and maintain your CY460 Sync Pulse & Test Pattern Generator. It describes installation, operation, maintenance and troubleshooting.

Locating Information

Following this introduction is a Table of Contents that indicates on which page in this manual a topic can be found.

Organisation

The manual is divided into two main parts: *Installation & Planning* and *Operation & Maintenance*. The first part describes the product from a technical standpoint and provides details and procedures regarding the installation of the product. The second part describes how to use and look after the product, and also provides important specifications and connectivity information.

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General Safety Summary

Symbols and Terms

The CY460 SPG is available with either:

a.	a single fixed PSU,	i.e. model number CY460
b.	a dual hot swappable N+1 redundant PSU.	i.e. model number CY460D

In this manual both models are referred to as CY460, except when a significant difference is explained where a reference to the CY460D may be used.

Terms in this Manual

These terms may appear in this manual:

WARNING: *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION: *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product

These terms may appear on the product:

DANGER – indicates an injury hazard immediately accessible as you read the marking.

WARNING – indicates an injury hazard not immediately accessible as you read the marking.

CAUTION – indicates a hazard to property including the product.

Symbols on the Product

The following symbols may appear on the product:

DANGER
High Voltage

Protective Ground
(Earth) Terminal

ATTENTION
Refer to Manual

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

***CAUTION** : Only qualified personnel should perform service procedures.*

Avoiding Fire or Personal Injury

Use Approved Power Cords.
Use only the power cords specified for this product and certified for the country of use.

Ground the Product.
This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded. Additional safety earth studs are also provided for earth bonding the chassis if you so require.

Observe All Terminal Ratings.
To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do Not Operate Without Covers.
Do not operate this product with covers or panels removed.

The fuse only disconnects the live connection.
Be aware the neutral connection is still present when the fuse is activated.
Only replace fuse with the correctly rated replacement part.

Continued on next page.

Avoiding Fire or Personal Injury (continued)

Avoid Exposed Circuitry.
Do not touch exposed connections or components when power is present.

Do Not Operate With Suspected Failures.
If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation.
Refer to the manual's installation instructions for details on installing the product to ensure it has proper ventilation.

Continued on next page.

Avoiding Fire or Personal Injury (continued)

No Power Switch.
Removing the Power Supply Cord(s) disconnects the device from the mains power. Ensure easily accessible socket outlets are available near the unit to power the device.

Disconnect both power cords.
If two power entry connectors are present on the rear panel the unit will still be powered until both power cords are removed. Always disconnect both power cords.

Hot-Swap Removable Power Supplies.
Only qualified service personnel should swap the power supplies while the unit is powered.
Do not put your fingers or any tools into the opening when the power supply is removed.
While the power supply is removed from the rack, the mating connector is exposed 100mm behind the opening. This connector does not directly expose dangerous voltages.

Do not use the power supply handles to carry the unit.
The handles are not primarily designed for this purpose, and property damage or personal injury may result.

Environmental Considerations

RoHS & WEEE

These European Union directives implement environmental legislation which seeks, in the case of the RoHS directive, to reduce the quantity of hazardous material in electrical and electronic equipment, and via the WEEE directive, to promote more environmentally friendly design and the greater recycling of materials in associated products.

An FAQ document is available for access in order to clarify most of the commonly occurring aspects of the directives:

http://ec.europa.eu/environment/waste/pdf/faq_weee.pdf

Restriction of Hazardous Substances (RoHS)

The RoHS (Restriction of Hazardous Substances) Directive seeks to minimise the amounts of specific elements and compounds in electrical and electronic products.

The text of the current directive (2011/65/EU) in English, and the details of prohibited substances and scope can be viewed at:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:174:0088:0110:EN:PDF

Guidance for implementing the RoHS directive can be found at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/31363/12-582-implementation-restriction-hazardous-substances-directive-consultation.pdf

Subsequent amendments may also be available, further categorising changed or additional parameters of the directive.

This product is classified under *Category 3. IT and Telecommunications Equipment*, and is therefore inside and complies with the scope of the (2011/65/EU) RoHS Directive.

Waste Electrical and Electronic Equipment (WEEE)

The WEEE (Waste Electrical and Electronic Equipment) Directive aims to encourage producers of electrical and electronic equipment to design in an environmentally friendly way in order to maximise the potential for recyclability or re-use of the product.

The text of the original directive (2002/96/EC) in English, can be viewed at:
http://www.rohs.eu/english/legislation/docs/launchers/launch-2002-96-EC.html
Subsequent amendments may also be available, further categorising changed or additional parameters of the directive.

Equipment Recycling

When it appears on a product (in accordance with European Standard EN50419), the "crossed-out wheelie bin" symbol (shown left) indicates that the product complies with the European Union's requirements according to Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE). It indicates that end-of-life electrical and electronic products should not be mixed with general household waste. For proper treatment, recovery and recycling, please take the product(s) to designated collection points where it/they will be accepted free of charge.

Alternatively, you may be able to return your products to your local retailer or original supplier, who will undertake the necessary reprocessing in accordance with the specific WEEE recycling requirements.

Courtyard Electronics Ltd finances the collection and processing of non-household (B2B) WEEE and operates a system to help its business customers handle waste electrical equipment responsibly. Business customers that have waste electrical products to dispose of should contact Courtyard Electronics Ltd to access this service. Courtyard Electronics Ltd may also enter into formal agreements with business customers to pass on the end-of-life responsibilities for WEEE.

Courtyard Electronics Ltd's Producer Registration Number is WEE/ED0116XU. This registration number will remain unchanged between compliance periods for the foreseeable future.

Disposing of this product correctly will help save valuable natural resources and prevent any potentially negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

This symbol is only valid within the European Union. Users outside this area wishing to discard a product should contact their local authorities or dealer and comply with the correct method of disposal.

For information about recycling options, check the Support/Service section of the Courtyard web-site (www.courtyard.co.uk).

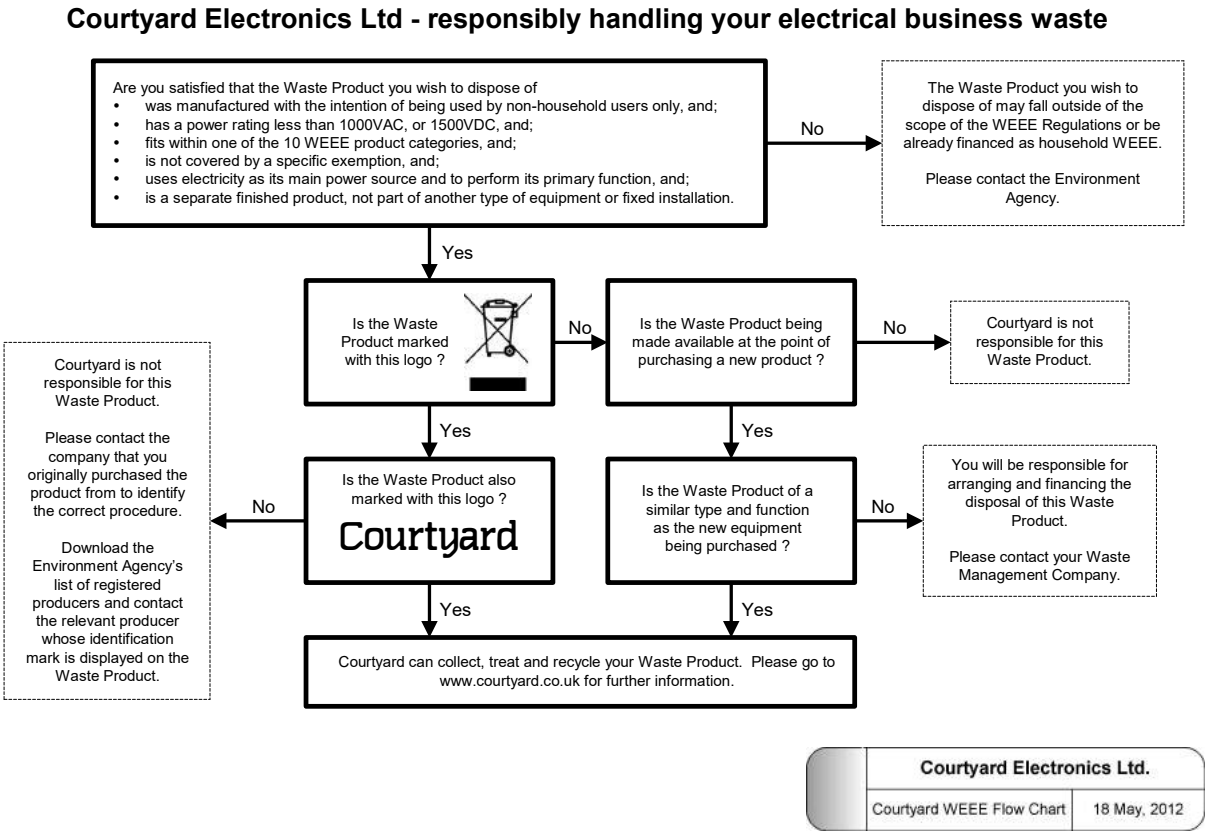


Figure 1.1 : Courtyard WEEE Flow Chart

Preface

This manual describes the capabilities, features, and specifications of the CY460 Sync Pulse and Test Pattern Generator.

About This Manual

This manual is provided as an Adobe PDF document. An optional printed version of this user manual is available from Courtyard (see *Section 1.8*). This manual contains the following sections:

- *Getting Started*
  provides a Product Description, Installation Instructions, and a Functional Check Procedure. Standard and Optional Accessories are also listed.

- *Operating Basics*
  briefly describes the front-panel controls and rear-panel connections.

- *Reference*
  provides detailed information about the menu functions.

- *Appendices*
  contains reference information such as specifications, instructions for operating the Logo Generator application, and how to use the remote interface(s).

Related Documents

The following related documents are also available:

- *CY460 Sync Pulse and Test Pattern Generator – Quick Reference Manual*
  contains information to enable you to quickly get an overview of front-panel buttons, rear-panel connectors, and menus.

- *CY460 Sync Pulse and Test Pattern Generator – Service Manual*
  is an optional accessory that provides module-level service information and a complete performance verification procedure.

1.0 Getting Started

This section contains the following information:

- Product Description
- Functional Diagrams
- Initial Product Inspection procedure
- Installation and Planning
- Instructions for Repackaging the Instrument for Return Shipment
- Functional Check Procedure
- Standard and Optional Accessories
- Product Options

1.1 Product Description

The CY460 Sync Pulse & Test Pattern Generator is designed for high stability Master Sync operation. The product provides a comprehensive range of accurate reference and test signals including: Analogue Composite Video, Analogue Composite Black-Burst, Tri-Level Sync, Serial Digital (SDI) Test & Black (SD, HD, 3G & 4K (Quad), analogue audio, AES/EBU Audio, DARS, Wordclock, plus inputs for an external frequency reference and a GPS reference input.

Applications

- SPG and time reference generator for broadcast, studio, outside broadcast, SNG and post-production facilities
- Master or slave (genlock) operation
- Link testing, Fly-Away packs and others

Key Features

The CY460 Sync Pulse and Test Pattern Generator key features include:

- High Stability Internal Reference
- Genlock to the following signals:
    - NTSC/PAL Black-Burst signal
    - Tri-Level Sync
    - GPS satellite (Frequency, Phase, UTC)
    - Time to remote NTP Server

- Frequency Lock to the following signals:
    - 1, 5, 10 MHz
    - NTSC/PAL Subcarrier signals
    - GPS
- 2 Composite Analogue Video signal outputs + 2 Composite Analogue Black-Burst signal outputs
- 2 Independent Serial Digital Video signal outputs + 2 SDV Black outputs
- Optional 2 additional Independent Serial Digital Video signal outputs + 2 SDV Black outputs
- 5 Independent Pattern Generators
- 5 Independent Monochrome ID text and Monochrome Logo Generators supporting international characters.
- 3 Independent and Timeable Black-Burst or Tri-Sync Generators
- 11 Independent channels of Timecode:
    - 4 Longitudinal Timecode (LTC) outputs (Balanced)

    - 2 Serial Digital VITC / ATC
    - 5 Analogue Video VITC
- 82 channels of Audio:
    - 16 channels of Embedded Audio in each of 4 SDI outputs
    - 16 channels of Audio in 8 AES/EBU Serial Digital Audio outputs (8 Balanced and 2 BNC)
    - 1 Stereo Analogue Audio output (Balanced)
- 2 AES/EBU DARS Serial Digital Audio outputs (1 Balanced and 1 BNC)
- 48 kHz and 44.1 kHz Word Clock output
- 1Hz, 6Hz and 10MHz Reference output
- GPI (General Purpose Interface) for error status report and user preset
- Ethernet (100 BASE-T) Interface for Remote Control & SNMP status and alarms
- Ethernet (1G) Interface for PTP Grandmaster & Slave (Optional)
- N+1 Power Redundancy - fitted as part of the CY460D
- Tight integration with CY465 SPG changeover unit

The CY460 Sync Pulse and Test Pattern Generator, in its base configuration, is supplied as a Composite SPG with multiple Colour Black and SD-SDI outputs. The Colour Black outputs are configured to be capable of providing Tri-level Syncs. A sub-module also provides an interface for additional signals including AES/EBU Digital Audio outputs, Analogue Audio outputs, LTC outputs, a GPS input, and an external frequency reference input.

Additional options above the base configuration are enabled using special Option Keys. These options are: HD-SDI, 3G-SDI, GPS and NTP. The connectors and associated hardware for these options will already be present – the Option Keys simply extend the range of signal options on the associated video outputs (see diagrams below), or enable the option in the case of GPS or NTP.

Two hardware options are also available. One add 2 additional SDI pairs of Test and Black. The second is a Lip Sync Measurement option.

The CY460 Sync Pulse and Test Pattern Generator must be ordered with either one or two power supply units (PSUs). The single PSU variant has one PSU installed internally. The dual PSU variant has two PSUs installed into the front of the unit in an N+1 Redundant configuration, and can be “hot swapped” whenever problems are encountered. These two frame types are neither interchangeable nor retrofittable.

When used in conjunction with a CY465 SPG Changeover unit, faults detected by the Changeover are reported on the relevant display of the “failed” CY460 SPG.

The diagrams below show the functionality of the CY460 Sync Pulse and Test Pattern Generator. In addition, there is a module interconnection diagram showing how all the internal modules and assemblies are connected together.

1.2 Functional Diagrams

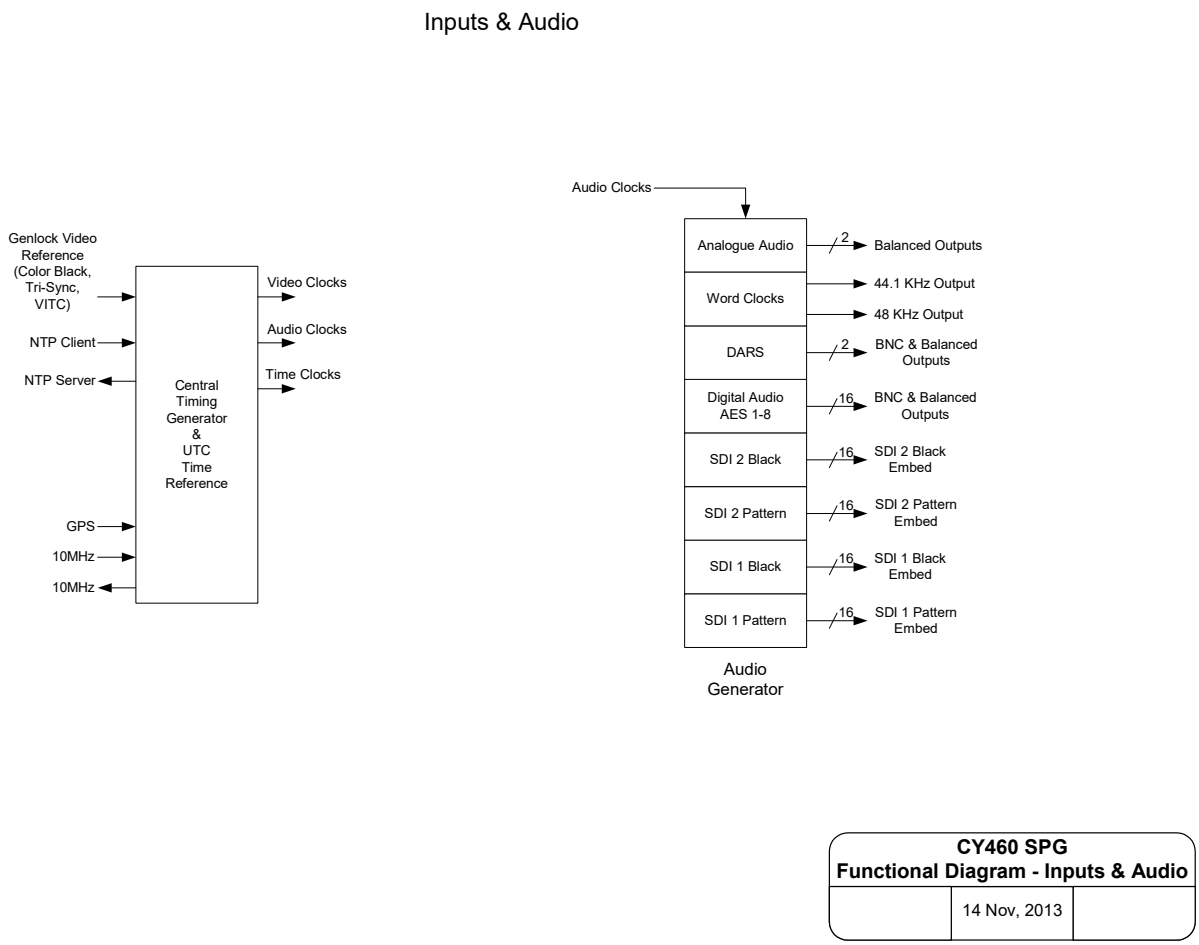


Figure 1.2a : CY460 SPG – Inputs and Audio Outputs

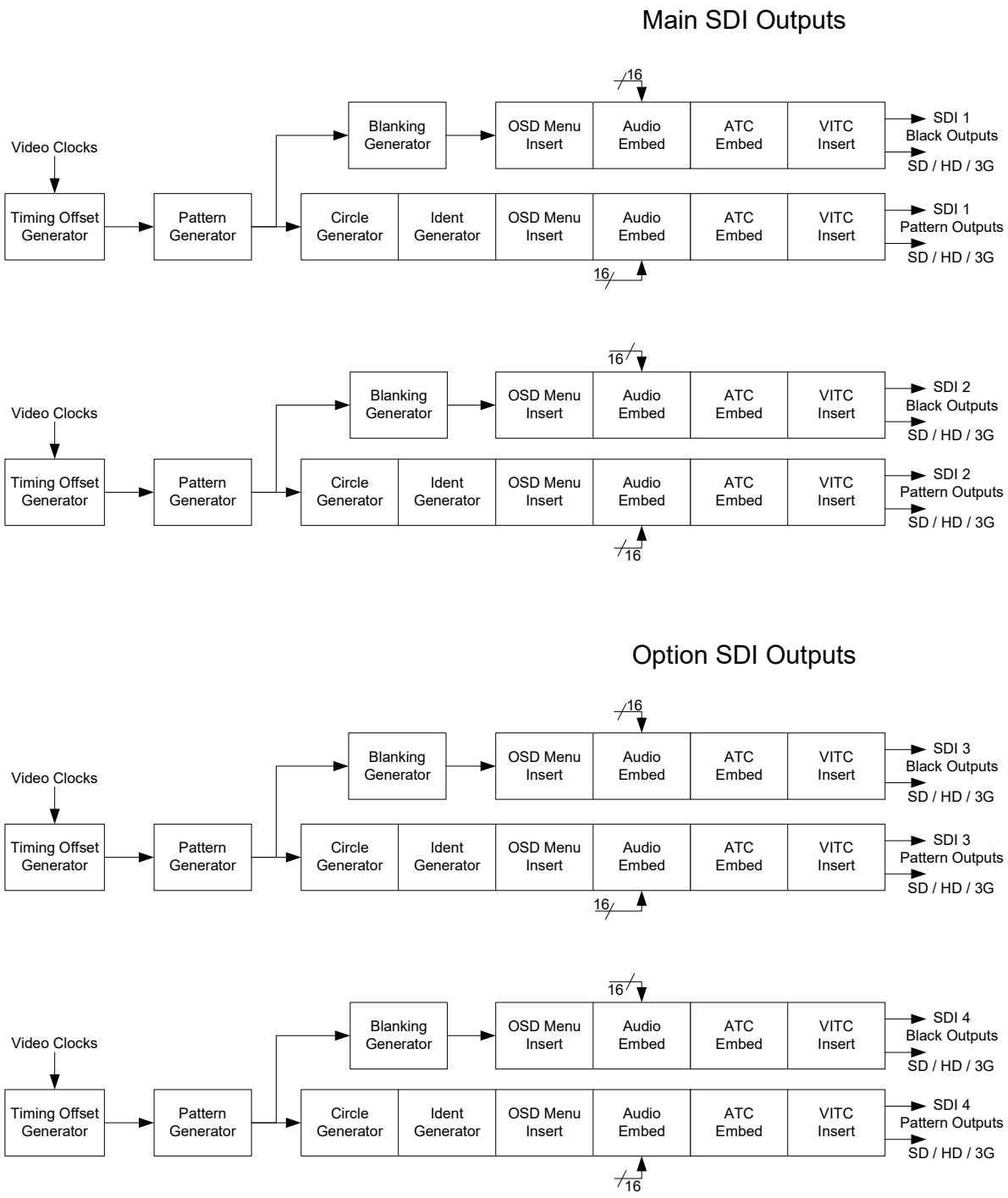


Figure 1.2b : CY460 SPG – SDI Pattern and Black Outputs

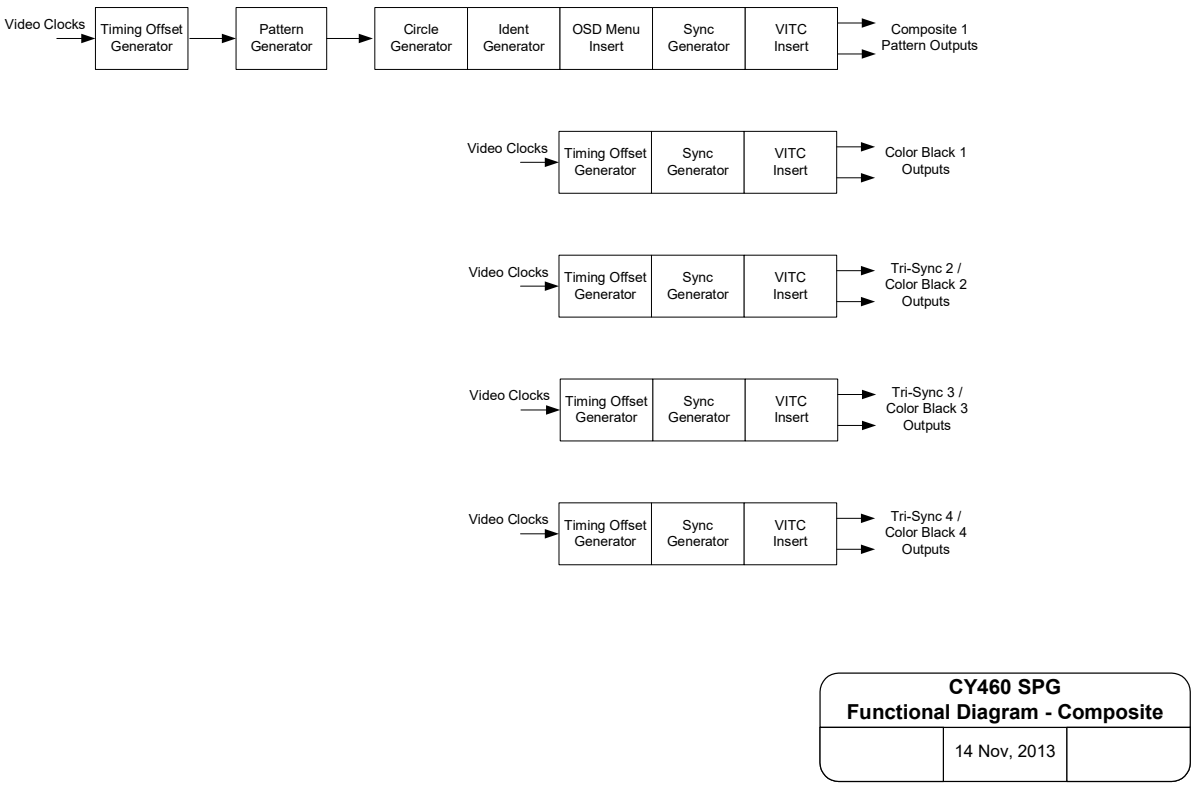


Figure 1.2c : CY460 SPG – Composite Pattern & Tri-Sync/Composite Black Outputs

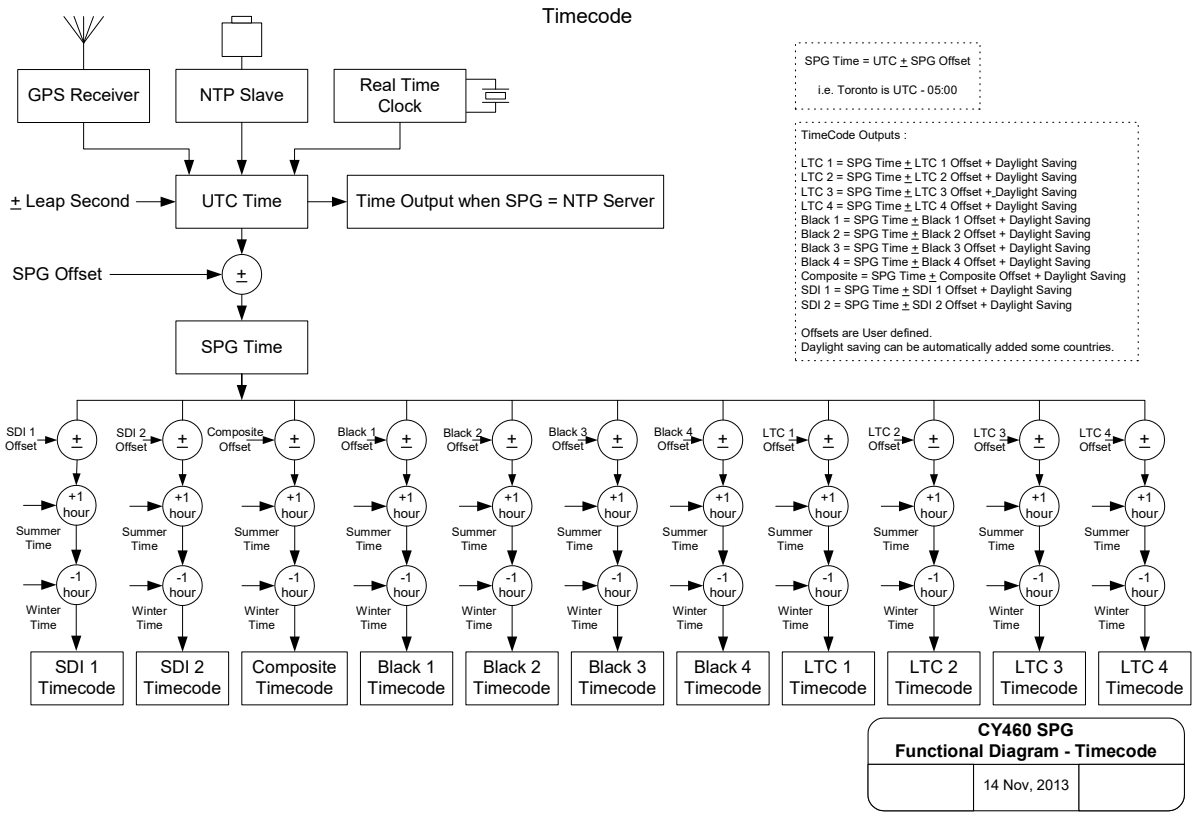
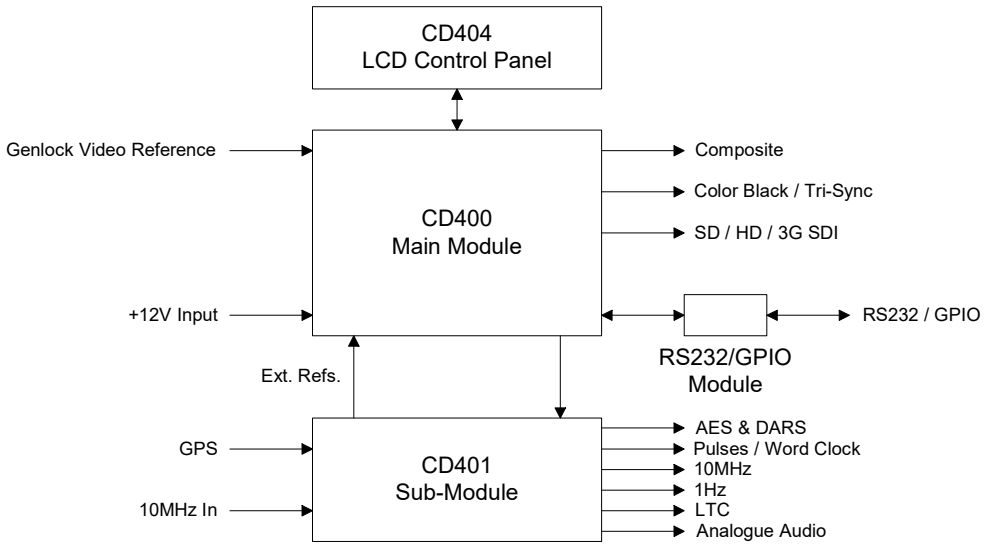
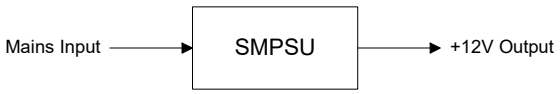


Figure 1.2d: CY460 SPG – TimeCode

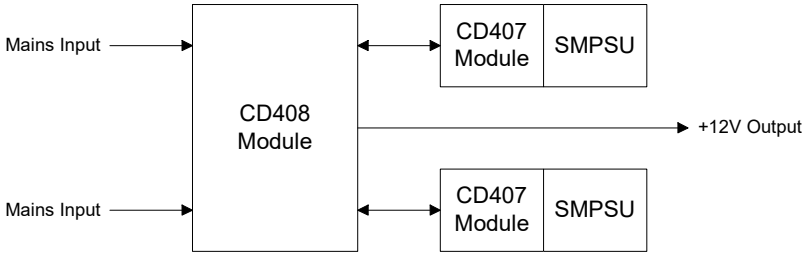
Signal Processing Modules



Single Power Supply Frame



Dual N+1 Redundant Power Supply Frame



CY460(D) Module Count

	CD400	CD401	Comms	CD404	SMPSU	CD407+ SMPSU	CD408
CY460	1	1	1	1	1	---	---
CY460D	1	1	1	1	---	2	1

CY460 SPG Module Interconnect		
	14 Nov, 2013	

Figure 1.2e: CY460 SPG – Module Interconnect

1.3 Initial Product Inspection

Perform the following Initial Product Inspection Procedure when you receive your instrument:

1. Inspect the shipping carton for external damage, which may indicate possible damage to the instrument. If damage exists, document it, including photographs, to support any insurance claim.

2. Remove the instrument from the shipping carton.

3. Check that the instrument has not been damaged in transit. The exterior should not have any scratches or impact marks. Prior to shipment the instrument is thoroughly inspected for mechanical defects.

4. Verify that the shipping carton contains the instrument, the standard accessories, and any optional accessories that you ordered.

5. Perform the Functional Check Procedure (refer to *Section 1.6: Functional Check Procedure*) after installing the instrument.

***NOTE**: Save the shipping carton and packaging materials for instrument repackaging in case return shipment becomes necessary.*

1.4 Installation and Planning

Before installing the CY460 Sync Pulse and Test Pattern Generator, refer to the *General Safety Summary* section at the front of this manual for power source, grounding, and other general safety information.

Rack Mount Installation

You can install the CY460 Sync Pulse and Test Pattern Generator into an equipment rack. It is recommended to use the option rack mount kit (Option R1) and to loom the cables so that they do not introduce extra weight or twisting force on the front panel rack mountings or rear panel connectors. If installed in a mobile application, the rack mount kit is essential. For information on how to install the CY460 Sync Pulse and Test Pattern Generator into the rack, refer to *Appendix D : Rack Mounting.*

Do not use the rack handles to carry the unit.
The rack handles are not primarily designed for this purpose, and property damage or personal injury may result.

Operating Environment – Requirements

Verify that the location of your installation has the proper operating environment. The CY460 Sync Pulse and Test Pattern Generator operates correctly in ambient temperatures from 0 °C to +40 °C and relative humidity from 20% to 80%. For complete environmental operating information, refer to *Appendix A: Specifications*.

The CY460 Sync Pulse and Test Pattern Generator requires 50 mm (2 inches) of side clearance for counter top use. Also, ensure sufficient rear clearance, e.g. 75mm (3 inches), so that cables are not compromised.

The CY460 Sync Pulse and Test Pattern Generator does not have an internal fan to assist with ventilation or cooling. Therefore, when you install the unit in an equipment bay, it is imperative that you ensure there is sufficient space all around the unit to allow the airflow to vent away any excess heat generated by the unit.

***CAUTION**: The instrument could be damaged if it is powered on at temperatures or humidities outside the specified ranges.*

Connecting Power

No Power Switch.
Removing the Power Supply Cord(s) disconnects the device from the mains power. Ensure easily accessible socket outlets are available near the unit to power the device.

Disconnect both power cords.
If two power entry connectors are present on the rear panel, the unit will still be powered until both power cords are removed.

The CY460 Sync Pulse and Test Pattern Generator operates from a single-phase power source with the neutral conductor at or near earth ground. The line conductor is fused for over-current protection. A protective ground connection through the grounding conductor in the power cord is essential for safe operation. Earth studs are also provided for earth bonding the chassis if you so require.

If you have the CY460D Sync Pulse and Test Pattern Generator which includes the N+1 Dual power supplies, you need to provide two power connections. For full power security, these should be on separate, independent and secure power grids. However, you still gain the security of power supply failure redundancy if you use the same power grid for both connections.

AC Power Requirement

Check that your location provides the proper electrical power requirements as listed in Table 1.1.

Table 1.1: CY460 SPG – A.C. Line Power Requirement

Parameter	Description
Line voltage range	120 to 230 V
Line frequency	50 - 60 Hz
Fuse	5mm x 20mm Antisurge 2A 250V Fuse identification marking T2A H250V
Maximum power CY460 (Single PSU)	31VA (≈14 Watts - calculated)
	< 130mA @ 230 VAC < 210mA @ 120 VAC
Maximum power CY460D (N+1 Dual PSU)	46VA (≈21 Watts - calculated)
	< 130mA @ 230 VAC < 210mA @ 120 VAC Each PSU

Connecting the Power Cable

Connect the power cable to the instrument first, and then connect it to the AC power source. Note that connecting a live power cable causes the instrument to power on.

1.5 Repackaging for Shipment

If you need to return this instrument for service or repair, if possible use the original packaging materials. If the original packaging is unfit for use, or is not available, you will need to repackage the instrument with suitable materials. For both scenarios, use any applicable steps in the following guidelines:

1. Obtain a corrugated cardboard shipping carton having inside dimensions at least six inches greater than the instrument dimensions and having a carton test strength of at least 125 kg (275 pounds).

2. If the instrument is being shipped to our Service Centre for repair or calibration, attach a tag or document to the instrument showing the following information:
    - The owner of the instrument (i.e. full company address / telephone number / e-mail).
    - The name of a person at your company who may be contacted if additional information is needed.
    - The complete instrument type and serial number.
    - A description of the service required.
    - The return delivery address (if different from above).
    - When applicable, include a Purchase Order document (not just a number).

3. Wrap the instrument with polyethylene sheeting (or equivalent) to protect the outside finish and prevent entry of packing materials into the instrument.

4. Cushion the instrument on all sides by tightly packing suitable material or urethane foam between the carton and the instrument, allowing for three inches (7.62 cm/3 inches) of padding on each side (including top and bottom).

   For re-used packaging, add extra foam or bubble-wrap in the spaces to further protect against handling damage.

5. Seal the carton with shipping tape or with an industrial stapler.

Courtyard Electronics Limited may refuse delivery of any package that consists of improper or inadequate packaging materials, or is not accompanied by suitably accurate documentation. If the instrument has been damaged in transit, Courtyard Electronics Limited will determine whether the unit is economically repairable, and contact the sender accordingly.

1.6 Functional Check Procedure

Perform the following procedure if you are operating the instrument for the first time (to verify that the instrument shipped without damage), or you suspect that the instrument is not working properly.

Required Equipment

The following equipment is required for the functional check:

1. TV Signal Generator
2. Waveform / Picture Monitors (multi-format)
3. Serial Digital Video Analyser (with Embedded Audio functionality)
4. Digital Audio De-Embedder
5. AES / EBU Digital Audio Analyser
6. Analogue Audio Analyser
7. Oscilloscope
8. 75Ω BNC cables
9. 75Ω terminations
10. Breakout cable/box for the rear panel 30-way multi-way connector (part of the CD401 sub-module) - optional/not supplied

Functional Check Procedure and First Time Operation

These procedures will guide you through the steps required to check the operation of the CY460 Sync Pulse and Test Pattern Generator unit. The most common scenarios will be explored to enable the user to familiarise themselves with the operation of the unit. Although some steps are included which suggest cycling through menu options in order to check operation, this is not mandatory – a simple check for presence or absence of a signal will suffice. Full details regarding the options available in each of the menus are described in *Section 3.x* of this manual. The scenarios to be explored are:

Initial Power-Up
Initial Configuration
Check Outputs
Time and Timecode settings
Genlock Mode
System Functions
Operational Configuration

Initial Power-Up

1. Ensure that the CY460 Sync Pulse and Test Pattern Generator is not powered.

2. Connect any relevant video cables to the CY460 Sync Pulse and Test Pattern Generator, with reference to the Rear Panel layout diagram in *Section 2.2* of this manual.

3. Apply power to the CY460 Sync Pulse and Test Pattern Generator by connecting it to the power source(s). The instrument runs its power-on initialization process.

4. Check that no error messages appear on the LCD display.

5. The Front Panel Menu display can also be made to simultaneously appear on any of the video outputs – there is a menu entry for each output to enable this facility. By default, the Menu is enabled on all video outputs.

6. Much of the functional check can be carried out immediately. However, some calibration settings are only guaranteed once functional temperature has stabilised (which should occur after 20 minutes). It is good practice to soak the instrument before proceeding.

7. Selecting or editing Menu items requires you to turn the Rotary Control in order to select or change the highlighted Menu item / setting, then to press the Rotary Control to select or confirm that Menu item / setting. Pressing the Rotary Control will either select the highlighted Menu item for editing, exit Menu item editing, or take you to the next Menu level. Note that there may be more Menu lines available than can be displayed on the LCD screen or video outputs; be sure to scroll down (or up) to find the required entry.

8. Pressing the dedicated push-button once will exit the current Menu level or item. When you have finished editing the Menu options, you should use the dedicated push-button to exit the Menu system completely. You need to press the button a suitable number of times to get back to the stand-by screen (the one with the "Courtyard" logo, one press "up" from the "Top Level" Menu) – this will save any changes that you have made to the non-volatile memory.

Recommendation

The Courtyard CY460 Sync Pulse and Test Pattern Generator Menu System contains an appreciable number of pre-programmed and user selectable settings. All of these settings are programmed using a "Factory Default" procedure, and a select few are then adjusted during testing and alignment. This is especially true of the Calibration Menu, where settings relating to the fundamental operation of each individual CY460 SPG are stored. If memory corruption occurs, some or all of the settings may need to be re-instated. *Section 3.x* of this manual contains details regarding the entire menu system; each sub-section starts with a menu listing, which when printed out could be used to record your individual menu settings.

Initial Configuration

The CY460 Sync Pulse and Test Pattern Generator should arrive configured to a "factory default" condition, i.e. all video outputs will have a pattern selected that is relevant to the format of the output, all of the audio channels will be configured for "1kHz Tone and Silence", etc. This may also include adjustments to the Timecode settings to configure the unit for the expected destination country.

Additionally, any pre-ordered options (i.e. Tri-Syncs, HD SDI, 3G SDI, GPS or NTP) will have been enabled. This can be confirmed by viewing the Option Enable page in the Menu – enabled options will have valid Option Keys entered for them. See *Section 3.6 : System Setup Menu* of this manual for more details.

The following procedures will systematically progress through all of the outputs available from the CY460 Sync Pulse and Test Pattern Generator. The range of menu entries available for each procedure may relate to whether associated options have been enabled.

In all but the first of the procedures that follow, some intermediate instructions relating to cursor movements and control button presses may have been omitted for clarity.

Also, menu screens almost always contain more lines then can be displayed on the LCD or the OSD – be sure to scroll up/down to find the menu entry you require.

Note: [Confirm] indicates that you should press the Rotary Control, and [Back] indicates that you should press the blue push-button.

Check Outputs

Composite (Analogue) Video Signal Outputs:

From the Top Level menu:

1. Highlight < **-Video** >.
2. [Confirm].
3. Highlight the top menu line.
4. [Confirm].
5. Select < **Video Channel 05 = Composite 1** >.
6. [Confirm].
7. Connect the Composite Video output to a Waveform / Picture Monitor using a 75Ω BNC cable.
8. Set the Waveform / Picture Monitor to view the Composite signal.
9. Check that the Waveform / Picture Monitor displays the appropriate Composite signal.
10. Check that the Composite signal is as configured in the menu, and that selecting and editing entries in the menu by using the rotary/push control, the configuration of the Composite signal changes accordingly.
11. Return to the Top Level menu using the [Back] button.

Black 1 (Analogue) Video Signal Outputs:

Note: the format of the Analogue Black 1 output follows that of the Composite output; consequently, the format of this output cannot be changed from within the < **Black 1** > menu.

From the Top Level menu:

1. Select < **-Video** >.
2. Select < **Video Channel 07 = Black 1** >.
3. Connect the Black 1 video output to the Waveform / Picture Monitor using a 75Ω BNC cable.
4. Set the Waveform / Picture Monitor to view the Black 1 signal.
5. Check that the Waveform / Picture Monitor displays the appropriate Black 1 signal.
6. Check that the Black 1 signal is as configured in the menu, and that selecting and editing entries in the menu by using the rotary/push control, the configuration of the Black 1 signal changes accordingly.
7. Return to the Top Level menu using the [Back] button.

Tri-Black 2 / 3 / 4 Tri-Level Sync Outputs:

Note : the Tri-Black 2 / 3 / 4 outputs can be configured to produce either traditional “bi-level” Colour Black (i.e. PAL / NTSC) or Tri-Level syncs.

Bi-Level Colour Blacks are always available, as are Tri-Level Syncs (TB Option Key is always enabled).

From the Top Level menu:

1. Select < **-Video** >.
2. Select < **Video Channel 08 = Tri Black 2** >.
3. Connect the TriBlack 2 output to an oscilloscope or suitable analyser using a 75Ω BNC cable.
4. Set the oscilloscope / analyser to view the TriBlack 2 signal.
5. Check that the oscilloscope / analyser displays the appropriate TriBlack 2 signal.

6. Check that the TriBlack 2 signal is as configured in the menu, and that selecting and editing entries in the menu by using the rotary/push control, the configuration of the TriBlack 2 signal changes accordingly.
7. Return to step 2, set for < **Video Channel 09 = Tri Black 3** >, and repeat steps to check the TriBlack 3 outputs.
8. Return to step 2, set for < **Video Channel 10 = Tri Black 4** >, and repeat steps to check the TriBlack 4 outputs.
9. Return to the Top Level menu using the [Back] button.

Serial Digital Video Signal Outputs:

Note: the format of the SDI Black 1 (& 2) output(s) follows that of the associated SDI Pattern output; i.e. they operate as a pair of "linked" outputs.

Each SDI Video output channel can be configured to produce SD-SDI, HD-SDI or 3G-SDI.

SD-SDI Video outputs are always available. HD- and 3G-SDI outputs are only available if the associated Option Keys have been entered; otherwise, the selection of output format is restricted.

From the Top Level menu:

1. Select < **-Video** >.
2. Select < **Video Channel 01 = SDI+Black 1** >.
3. Connect the SDI1 Pattern output to the Serial Digital Video Analyser using a 75Ω BNC cable.
4. Set the Serial Digital Video Analyser to view the Serial Digital Video signal.
5. Check that the Serial Digital Video Analyser displays the appropriate Serial Digital Video signal. If available, check the status of the Serial Digital Video signal on the Analyser by setting it to display the relevant data.
6. Check that the Serial Digital Video signal is as configured in the menu, and that selecting and editing entries in the menu by using the rotary/push control, the configuration of the Serial Digital Video signal changes accordingly.
7. Move the 75Ω BNC cable to the SDI1 Black output.
8. Repeat steps 4 – 6 to confirm the configuration of the SDI1 Black output.
9. Return to step 2, set for < **Video Channel 02 = SDI+Black 2** >, and repeat steps to check both of the SDI2 outputs.
10. Return to the Top Level menu using the [Back] button.

SDI Embedded Audio Settings:

Note: Audio channels on the SDI outputs are arranged as 8 stereo pairs on each video output:
SDI 1 Pattern 01 … 16
SDI 1 Black 01 … 16
SDI 2 Pattern 01 … 16
SDI 2 Black 01 … 16

From the Top Level menu:

1. Select < **-Audio** >.
2. Select < **SDI 1 Pattern Left = Audio 01** >.
3. Connect the SDI1 Pattern video output to the Serial Digital Video Analyser or to a Digital Audio De-Embedder using a 75Ω BNC cable.
4. Set the Analyser / De-Embedder to display the status of the audio data, and to receive a signal through the connected input.
5. Check that the Analyser / De-Embedder does not report any data errors, etc.

6. Check that the Digital Audio signal is as configured in the menu, and that selecting and editing entries in the menu by using the rotary/push control, the configuration of the Digital Audio signal changes accordingly.
7. Repeat steps 3 – 6 for menu selection:
   < **SDI 1 Pattern Right = Audio 02** > on SDI1 Pattern video output.
8. Repeat steps 3 – 6 for menu selections:
   < **SDI 1 Pattern Left / Right = Audio 03….16** > on SDI1 Pattern video output.
9. Repeat steps 3 – 6 for menu selections:
   < **SDI 1 Black Left / Right = Audio 01….16** > on SDI1 Black output.
10. Repeat steps 3 – 6 for menu selections:
    < **SDI 2 Pattern Left / Right = Audio 01….16** > on SDI2 Pattern video output.
11. Repeat steps 3 – 6 for menu selections:
    < **SDI 2 Black Left / Right = Audio 01….16** > on SDI2 Black output.
12. Return to the Top Level menu using the [Back] button.

AES / EBU Audio Outputs:

Note: AES/EBU Audio Outputs are only available when the multifunction sub-module is installed.

Note: Audio channels on the AES outputs are arranged as stereo pairs on each output:
AES 1 01 …. 02
AES 2 01 …. 02
etc, to
AES 8 01 …. 02

Connect a suitable Breakout cable/box to the 30-pin Multiway connector on the rear panel.

From the Top Level menu:

1. Select < **-Audio** >.
2. Select < **Audio AES1 Left = Audio 01** >.
3. From the Breakout cable/box, connect AES Audio Channel 01 to your Digital Audio Analyser input.
4. Set the Digital Audio Analyser to display the status of the audio data, and to receive a signal through the connected input.
5. Check that the analyser does not report any data errors, etc.
6. Check that the Digital Audio signal is as configured in the menu, and that selecting and editing entries in the menu by using the rotary/push control, the configuration of the Digital Audio signal changes accordingly.
7. Repeat steps 3 – 6 for menu selection
   < **Audio AES1 Right = Audio 02** > and breakout connection AES Audio Channel 02.
8. Repeat steps 3 – 6 for menu selections:
   < **Audio AES 2….6 Left / Right = Audio 03….12** > and breakout connections AES Audio Channel 03 through 12.
9. AES7 & AES8 Audio outputs will only appear on the rear panel multiway connector of the sub-module if the relevant menu items have been suitably configured. See “System Functions” below for more details on where these settings are.
10. Repeat steps 3 – 6 for menu selections:
    < **Audio AES 7….8 Left / Right = Audio 13….16** > and breakout connections AES Audio Channel 13 through 16.
11. Return to the Top Level menu using the [Back] button.

Analogue Audio Outputs:

Note: Analogue Audio Outputs are only available when the multifunction sub-module is installed.

Note: Audio channels on the Analogue Audio outputs are arranged as a stereo pair:
Analogue 01 … 02

Connect a suitable Breakout cable/box to the 30-pin Multiway connector on the rear panel.

From the Top Level menu:

1. Select < **-Audio** >.
2. Select < **Audio Analogue1 Left = Audio 01 >** [2nd to last entry in the list].
3. From the Breakout cable/box, connect Analogue Audio Channel 01 to your Analogue Audio Analyser input or to an oscilloscope.
4. Set the Analogue Audio Analyser / oscilloscope to display the audio signal, and to receive a signal through the connected input.
5. Check that the Analogue Audio signal is as configured in the menu, and that selecting and editing entries in the menu by using the rotary/push control, the configuration of the Analogue Audio signal changes accordingly.
6. Repeat steps 3 – 5 for menu selection:
   < **Audio Analogue1 Right = Audio 02** > [Last entry in the list] and breakout connections Analogue Audio Channel 02.
7. Return to the Top Level menu using the [Back] button.

Time & Timecode Settings

Each video output has its own dedicated Timecode generator, which can be offset from the main SPG Time. Additionally, there are dedicated LTC outputs which can be similarly offset. There are also several Timecode system-related setup screens. This procedure will acquaint the user with the available options. See *Figure 1.2c* in *Section 1.0 : Getting Started* for a functional diagram of the Timecode system.

The following Timecode menu screens are available:

SDI 1 & SDIBlack 1 Timecode
SDI 2 & SDIBlack 2 Timecode
Composite 1 VITC
Black 1 VITC
Tri-Sync Black 2 VITC
Tri-Sync Black 3 VITC
Tri-Sync Black 4 VITC
LTC 1 Timecode
LTC 2 Timecode
LTC 3 Timecode
LTC 4 Timecode
SPG Time
UTC DateTime
GPS DateTime (UTC)
NTP DateTime (UTC)
Analog REF VITC (UTC)
Digital REF TC (UTC)
Summer DST Event (UTC)
Winter DST Event (UTC)
Leap Second Event (UTC)

From the Top Level menu:

1. Select < **-Timecode >**.
2. Select < **SDI 1 & SDIBlack 1 Timecode** >.
3. Line 2 of the menu confirms the format of the selected video output.
4. Line 3 of the menu displays the channel time – "Running Time".
5. Line 4 of the menu allows the user to input an offset from the current SPG Time to appear on the selected video output.
6. < **Offset = SPGTime + hh.mm.ss.ff** > (where hh.mm.ss.ff are hours. minutes. seconds. Frames – may have non-zero entries relating to an offset that has already been entered).
7. Repeat steps 3 – 6 for < **SDI 2 & SDIBlack 2 Timecode** >.
8. Repeat steps 3 – 6 for < **Composite 1 VITC** >.
9. Repeat steps 3 – 6 for < **Black 1 VITC** >.
10. Repeat steps 3 – 6 for < **Tri-Sync Black 2-4 VITC** >.
11. Repeat steps 3 – 6 for < **LTC 1-4 Timecode** >.
12. Return to the Top Level menu using the [Back] button.

Full details regarding the setting of UTC Time, SPG Time, Summer & Winter DST Events, and Leap seconds can be found in *Section 3.4 : Timecode Menu* of this manual. A flow chart outlining the Time and Date Configuration sequence is shown in *Figure 3.2 : CY460 SPG – Setting Time and Date Parameters* in the same section.

Genlock Mode

From the Top Level menu:

1. Select < **–Genlock** >.
2. Select < **Lock Mode** >.
3. Select < **Internal Lock** > from the list.
4. Check that < **–Lock Status** > confirms the instrument is using the internal reference.
5. Check that < **–Ref Status** > confirms the instrument has not detected an external reference.
6. Using a 75Ω BNC cable, connect Colour Black from the TV signal generator to the CY460 Sync Pulse and Test Pattern Generator **REF-LOOP** input BNC connector. Terminate the unused **REF–LOOP** connector with a 75Ω termination.
7. Check that < **–Lock Status** > confirms the instrument is locked. If a valid signal has been connected, < **–Lock Status** > will usually sequence through the states:
    - Internal Lock
    - Locking
    - Locked
8. Check that < **–Ref Status** > confirms the instrument has detected an external reference by indicating the format of the signal you have connected to the **REF–LOOP** input.
9. Select < **Lock Mode** >.
10. Select < **Genlock 1** > from the list.
11. Check that < **–Lock Status** > confirms the instrument is locked to the external reference.
12. Once you have selected < **Genlock 1** > the SPG will genlock the video outputs to the external reference if it is a valid signal. This can be confirmed on an oscilloscope or a vectorscope.
13. Disconnect the external reference from the **REF–LOOP** connector
14. < **–Lock Status** > should now indicate **Internal Lock**, and < **–Ref Status** > should now indicate **No signal**.
15. Return to the Top Level menu using the [Back] button.

System Functions

From the Top Level menu:

1. Select < **–System Setup** >.
2. Select < **–Temp Report** >.
3. This screen displays the current temperatures of any installed sensors.
4. Return to the System Setup menu using the [Back] button.
5. Select < **–Event Report** >.
6. This screen displays the latest reported system events.
7. Return to the System Setup menu using the [Back] button.
8. Select < **–System Report** >.
9. This menu screen reports the various system version numbers.
10. Return to the System Setup menu using the [Back] button.
11. Select < **–GPS Report** >.
12. This menu screen reports the status of the GPS receiver sub-system.
13. Return to the System Setup menu using the [Back] button.
14. Select < **Configuration** >.
15. Select < **Changeover** > to define whether the SPG is the Primary or the Backup unit in a changeover pair.
16. Select < **LCD Brightness** > to select the brightness of the LCD screen.
17. Select < **AES1-8 + Analog** > to select the reference source for the AES and Analogue audios.
18. Select < **AES7 Output is** > to select AES channel 7 or LTC channel 3 to appear on the relevant pin(s) of the multiway connector on the multifunction sub-module.
19. Select < **AES8 Output is** > to select AES channel 8 or LTC channel 4 to appear on the relevant pin(s) of the multiway connector on the multifunction sub-module.
20. Select < **Pulse 1** > to select a pulse type to appear at the relevant rear panel BNC of the multifunction sub-module.
21. Repeat with < **Pulse 2** > and < **Pulse 3** >to select pulse types at the relevant rear panel BNCs of the multifunction sub-module.
22. Select < **10MHz Mode** > to select the source of a 10MHz reference.
23. Return to the Top Level menu using the [Back] button.

Network Settings

The Network Menu can be reached via the < **–System Setup** > menu option.

Many of the parameters that can be configured in this menu require the operator to obtain details from a Network Administrator. Once configured, they are unlikely to change.

Changes to this menu are likely to occur very rarely, and so no formal description will be outlined here. For the purposes of this functional check, simply scroll through the menu (and sub-menus) to check for any corrupted entries. Refer to the relevant pages in *Section 3.6 : System Setup Menu* for details of the various options.

Option Enable Settings

The Option Enable Menu can be reached via the < **–System Setup** > menu option.

This menu screen lists the installed Option Keys for enabled options within the CY460 SPG.

Changes to this menu are extremely unlikely to occur, and so no formal description will be outlined here. For the purposes of this functional check, simply scroll through the menu to check for any corrupted entries. Refer to the relevant pages in *Section 3.6 : System Setup Menu* for details of the various options.

Calibration Settings

The Calibration Menu can be reached via the < **–System Setup** > menu option.

This menu screen lists the system calibration values for the CY460 SPG.

Changes to this menu are extremely unlikely to occur, and so no formal description will be outlined here. For the purposes of this functional check, simply scroll through the menu to check for any corrupted entries. Refer to the relevant pages in *Section 3.6 : System Setup Menu* for details of the various options.

Return to the Top Level menu using the [Back] button.

This completes the Functional Check Procedure for the CY460 Sync Pulse and Test Pattern Generator.

Operational Configuration

There are several configuration factors that will influence the initial installation of your CY460 Sync Pulse and Test Pattern Generator, namely:

Mains Power
Time, Date, DST etc.
Video & Audio outputs.
References (Genlock, 10MHz, GPS, NTP, etc).
Network.
Connection to CY465 SPG Changeover unit.

The user should refer to the various sections of this manual that explain each of these features, so that they may correctly configure the CY460 SPG to their requirements.

1.7 Standard Accessories

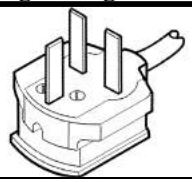
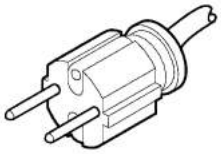
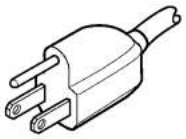
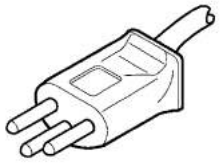
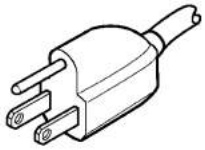
The following accessories are shipped with the CY460 Sync Pulse and Test Pattern Generator:

Documents and CD-ROM

Power Cords

All CY460 Sync Pulse and Test Pattern Generators are shipped with one of the following power cord options. Power cords for use in the United Kingdom are BS1363 approved. Power cords for use in North America are UL listed and CSA certified. Power cords for use in Europe conform to CEE7, DIN49441 and VDE standards. Cords for use in other areas are approved by at least one authority acceptable in the country to which the product is shipped.

Table 1.2 : Power Cord Identification

Plug configuration	Normal usage	Option number
	United Kingdom 240 V	Standard (A0)
	Universal Euro 220 V	A1
	North America 115 V	A2
	Australia 240 V	A3
	Switzerland 240V	A4
	Japan 100 V	A5
	China 240 V	A6
	Argentina (no power cord shipped with the instrument)	A99

1.8 Optional Accessories:

You can order the following optional accessories to use with the CY460 Sync Pulse and Test Pattern Generators.

Documents

The following documents are optional accessories:

CY460 Sync Pulse and Test Pattern Generator - User Manual (printed manual),

1.9 Options:

The CY460 Sync Pulse and Test Pattern Generator can be ordered with the following instrument options:

Rack mount

Option RS : Adds the additional hardware for retention of the rear of the CY460 Sync Pulse and Test Pattern Generator into a standard 19-inch rack.

Molex to D Type Breakout

Adds the additional hardware to break out the 30Way and 10 Way Molex connectors to D25 and D15 connectors and support the breakout board.

Additional Features

You can add additional features to your CY460 Sync Pulse and Test Pattern Generator:

Option 02 : Adds 2 extra SDI Pattern & Black channel pairs.
Option 03 : Enables HD SDI video outputs (Software option).
Option 04 : Enables 3G SDI video outputs (Software option).
Option 05 : Enables NTP (Software option).
Option 06 : Enables GPS (includes antenna & cable) (Software option).
Option 07 : Spare PSU for CY460D
Option 08 : Lip-Sync Measurement and Embedded Audio Channel Monitor.

2.0 Operating Basics

This section outlines the basics of operating the CY460 Sync Pulse and Test Pattern Generator. The information is divided into the following sub-sections:

- Front-Panel Controls and Indicators
- Rear Panel Connectors
- Operating Basics

2.1 Front Panel Buttons and Indicators

Figure 2.1 shows the CY460 Sync Pulse and Test Pattern Generator Front Panel. Descriptions of the Front Panel controls and indicators appear below.

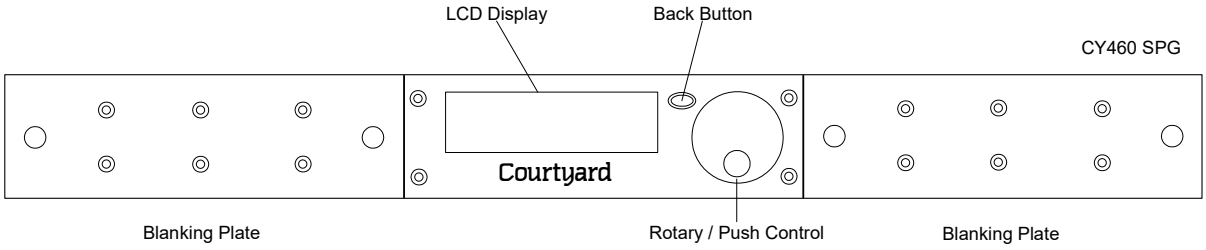


Figure 2.1: CY460 Sync Pulse and Test Pattern Generator – Front Panel (Single Supply option)

CY460 Sync Pulse and Test Pattern Generator – Front Panel Controls and Indicators

LCD Display

The dot-matrix LCD display is used to show system status, fault indications, and general in-use information, as well as being used to configure the Menu system items.

Rotary / Push Control

The Rotary / Push control has two functions:

the rotary function is used to navigate up or down items in a Menu, or to cycle through a range of values relating to a Menu item,

the push function is used to confirm a Menu item selection for editing, to exit Menu item editing, or take you "forward" to the next Menu item.

Selecting or editing Menu items requires you to turn the Rotary Control in order to select or change the highlighted Menu item / setting, then to press the Rotary Control to select or confirm that Menu item / setting. Pressing the Rotary Control will select the highlighted Menu item for editing, exit Menu item editing, or take you to the next Menu level. Note that there may be more Menu lines available than can be displayed on the LCD screen; be sure to scroll down (or up) to find the required entry.

Ballistic Response

For some menu items, there may be many values to scroll though. In order to assist in quickly accessing the required value(s), software monitoring the signals from the

rotary control applies a ballistic response to modify the rate at which the menu values change:

If the rotations/second occur at a reasonably constant rate, the speed at which menu values change will increase exponentially.

If the rotations/second decreases, the ballistic response also decreases.

If the rotations/second stops for more than 1 second, then the ballistic response resets to normal action.

Switching the rotation direction will preserve the modified rate, assuming that the direction change occurred with minimal delay.

Back button

The Back push-button is used to exit the current Menu screen, and to traverse back through the Menus, ultimately to the stand-by screen.

Pressing the dedicated push-button once will exit the current Menu level. When you have finished editing the Menu options, you should use the dedicated push-button to exit the Menu system completely. You need to press the button a suitable number of times to get back to the stand-by screen (the one with the "Courtyard" logo, one press "up" from the top level Menu) – this will save any changes that you have made to the non-volatile memory.

Single Supply option

For this build option, there is only one Power Supply assembly, installed inside the instrument. It is necessary for the unit to be completely removed from the equipment bay in order to replace the Power Supply assembly. Blanking panels are fitted in place of the removable PSU versions.

Removable PSU (N+1 Power Redundancy option) (not shown)

For this build option, there are two Removable Power Supply assemblies, installed and secured into the front of the CY460 Sync Pulse and Test Pattern Generator, either side of the LCD display. These PSUs can be "hot swapped", i.e. they can be removed or inserted while mains power is still present. Should it become necessary to replace one or both of the Removable Power Supply assemblies, the instrument does not have to be removed from the bay.

2.2 Rear Panel Connectors

Figure 2.2 shows the CY460 Sync Pulse and Test Pattern Generator Rear Panel. Descriptions of the rear-panel connectors appear on the following pages.

In the standard configuration, all connectors are populated except SDI 3, SDI 3 Black, SDI 4 & SDI 4 Black. When these are populated either of the available options CY460/02 (2 additional SDI output pairs) or CY460/08 (Lip Sync measurement option) will be fitted.

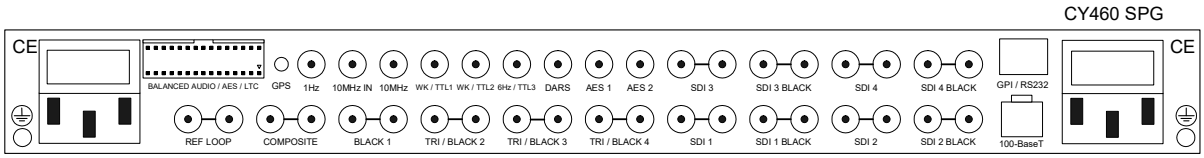


Figure 2.2: CY460 Sync Pulse and Test Pattern Generator – Rear Panel

CY460 Sync Pulse and Test Pattern Generator – Rear Panel Connectors

Power Connectors (inputs)

The CY460 Sync Pulse and Test Pattern Generator is designed to operate from a single-phase power source with the neutral conductor at or near earth ground. The line conductor is fused for over-current protection. A protective ground connection through the grounding conductor in the power cord is essential for safe operation. Safety earth studs are also provided for earth bonding the chassis if you so require.

Do Not Operate Without Covers.
Do not operate this product with covers or panels removed.

The CY460 Sync Pulse and Test Pattern Generator operates from an AC line frequency of 48 to 63 Hz, over the range of 85 to 250VAC, without the need for user configuration. Refer to *Appendix A : Specifications* for additional information on power and environment requirements.

If your CY460 Sync Pulse and Test Pattern Generator has the single supply option, you only need to provide one power connection (usually the left-hand connector when viewed from the rear).

If your CY460 Sync Pulse and Test Pattern Generator includes the N+1 Power Redundancy option, you need to provide two power connections (for the two Power Connectors). For full power security, these should be on separate, independent and secure power grids. However, you still gain the security of power supply failure redundancy if you use the same power grid for both connections.

REF LOOP (loop)

This pair of BNCs allow the input of a remote reference signal. This signal may be one of several different formats, ranging from PAL or NTSC Black-Burst, or any format of Tri-Level Sync.

With the reference signal applied to one BNC, the other BNC must be terminated (or connected to another unit which is ultimately terminated).

If the CY460 Sync Pulse and Test Pattern Generator is to be used as a Master reference (i.e. not genlocked), you do not have to supply a signal, and you may leave these BNCs unconnected. However, it is always wise to add a termination onto one BNC of an unused looping pair, in order to avoid having a "floating" input.

COMPOSITE (output)

This pair of BNCs provides two outputs of the selected Analogue Composite Video Pattern. The output format can be PAL, NTSC-M or NTSC-J.

BLACK 1 (output)

This pair of BNCs provides two outputs of Analogue Composite Video Black-Burst. The output format is always the same as that selected on the COMPOSITE output.

TRI / BLACK 2, 3 & 4 (outputs)

These three pairs of BNCs provide two outputs each of either Analogue Composite Video Black-Burst in PAL, NTSC-M or NTSC-J, or any one of the supported (and option enabled) Tri-Level Sync formats. These three pairs of outputs are completely independent from each other. Additionally, they are able to output a selection of fixed frequency signals, namely PAL or NTSC Subcarrier, 10MHz, etc.

SDI 1 & SDI 1 BLACK (outputs) & SDI 3 & SDI 3 BLACK

These two pairs of BNCs provide two outputs each of the selected pattern and black in Standard Definition, and when the relevant options are enabled, High Definition and 3G Video, in any of the supported formats. The signal format of the black output follows that of the Pattern output.

SDI 2 & SDI 2 BLACK (outputs) & SDI 4 & SDI 4 BLACK

These two pairs of BNCs provide two outputs each of the selected pattern and black in Standard Definition, and when the relevant options are enabled, High Definition and 3G Video, in any of the supported formats. The signal format of the black output follows that of the Pattern output.

100-Base T (input / output)

This rear-panel connector is a standard RG45 Ethernet connector. This is used initially at the factory to upload the SPG software. After installation, it may be used to upload software updates. Additionally, other remote connections are achieved through this interface, i.e., to the remote control desktop program DashBoard, and when the CY460 Sync Pulse and Test Pattern Generator is configured as an NTP Server, etc.

GPI / RS232 (input / output)

This rear-panel connector is a 10-pin male dual-in-line type. This allows for RS232 communication, GPI/O functionality, and provides On-Air status.

BALANCED AUDIO / AES / LTC (outputs)

This 30-pin multi-way connector provides outputs of Analogue Balanced Audio, AES Audio, and LTCs.

GPS (input with +5v DC output to power antenna)

This coaxial connector is used to connect a suitable GPS aerial in order to be able to genlock the CY460 Sync Pulse and Test Pattern Generator, and to provide accurate time and date information.

1Hz (output)

This BNC provides an output of the 1Hz pulse derived from the incoming GPS signal.

10MHz IN (input)

This BNC allows the user to supply a 10MHz reference from an external device.

10MHz (output)

This BNC provides an output of 10MHz derived from either the extremely stable internal oscillator, or looped-through from the 10MHz IN. A relay controls which signal is routed to this output.

WK/TTL1, WK/TTL2 & 6Hz/TTL3 (outputs)

These three BNCs each provide independent outputs of either Word Clock (on "1" or "2") or 6Hz (on "3"), or any one of a selection of traditional pulses, e.g. Mixed Sync, Mixed Blanking, etc.

DARS (output)

This BNC provides an output of DARS (Digital Audio Reference Signal).

AES1 & AES2 (outputs)

These two BNCs provide outputs of the associated AES audio channels in serial format

2.3 Operating Basics

The CY460 Sync Pulse and Test Pattern Generator unit produces a wide variety of video and audio references and test pattern signals suitable for distribution within a typical television engineering installation.

The CY460 Sync Pulse and Test Pattern Generator can be configured in a number of ways:

- Free Run, or Genlock / Time-Lock to a selection of sources
- Configurable Video Outputs (Format, Ident, Timecode, Audio, etc)
- Ethernet connectivity for software updates, Remote Control, NTP & SNMP

Refer to *Section 3* of this manual, which contains detailed information regarding the configuration parameters within entire menu system.

2.4 Software Field Upgrade

This upgrade procedure applies to CY460 SPG systems where an Ethernet connection is installed. It outlines the steps necessary to upgrade the software programmed on the main module.

Before starting, ensure that you comply with the following requirements:

- Connect the CY460 SPG via an Ethernet cable to your local network;
- A PC, also connected via Ethernet to your local network, with the supplied update program(s) and associated data file(s) available – ideally, the data file(s) should be located in the same folder as the associated update program(s);
- A power-cycle could be required as part of the data file update – ensure that the unit is not in service during the update process.

There are four different files that can be uploaded to the CY460 SPG. Each is loaded at a specific memory address included as part of the filename:

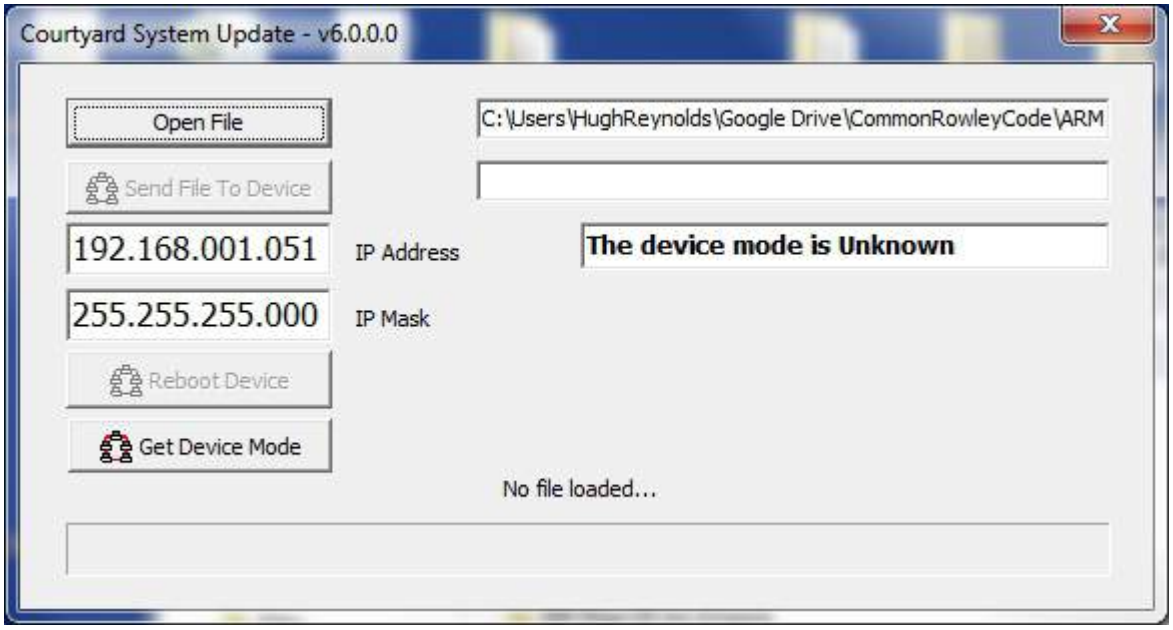
Bootware
: At present, the Bootware file can only be uploaded at the factory.

Patfile (the Pattern Files for the CY460 SPG)
: Can be uploaded while the CY460 SPG is in operation. When complete, a power re-boot is required.

Xilfile (the FPGA file)
: Can be uploaded while the CY460 SPG is in operation. When complete, a power re-boot is required.

ArmFile (the CY460 SPG Software)
: Requires that the CY460 SPG is in Bootloader mode. A power re-boot is required to start the process, and when complete, a further power re-boot is required.

Screen-shot of the "CourtyardSystemUpdate_v6.0.0.0.exe" program.



Note: As part of a Software Upgrade, you may have been supplied with a more recent version of the CourtyardSystemUpdate program – always use the most recent version to upload your new software.

Uploading Patfiles & Xilfiles

Ensure that the CY460 SPG is ON.

On your PC, run the "CourtyardSystemUpdate_v6.0.0.0.exe" program.

In the dialog boxes, enter the IP Address and IP Mask to be those of the CY460 SPG.

Select the [Get Device Mode] button.

The status dialog window should confirm the mode :

"The device is in APPLICATION mode" confirmation appears in the window.

If the CY460 SPG is "not found", check again that all connections have been made and that the IP Addresses have been entered correctly, then try repeating the above procedure after re-booting the CY460 SPG, and then restarting the CourtyardSystemUpdate program.
If the CY460 SPG still cannot be found, contact Courtyard for further assistance.

Select the [Open File] button.

Select the relevant " *.ATA " file i,e, XIL……ata or PAT……ata.

Select the [Send to device] button. Upload of file takes ~ 1 min.

The progress bar message should confirm that the upload was completed successfully. If not, try selecting [Send File To Device] again. If the file still cannot be uploaded, contact Courtyard for further assistance.

Now Power Cycle the CY460 SPG.

Uploading ArmFiles

To upload ArmFiles to a CY460 SPG, the CY460 SPG needs to be in "Bootloader" mode. This is achieved by holding down the blue push button on the front panel, before applying power to the unit. After 5 seconds, the LCD screen should confirm that the CY460 SPG is in Bootloader Mode, and should also confirm the IP addresses and current software version numbers of the unit. You can now release the button.

Continuing similar to above :

On your PC, run the "CourtyardSystemUpdate_v6.0.0.0.exe" program.
:
:
After [Get Device Mode], "The device is in BOOT LOADER mode" confirmation appears in the window.
:
:
Select the relevant " *.ATA " file i,e, ARM……ata
:
:

Now Power Cycle the CY460 SPG.

Your CY460 SPG is now upgraded and ready for use.

Device Mode

More recent versions of the CourtyardSystemUpdate program auto-detect the programming mode of the CY460 SPG. Pressing the [Get Device Mode] button will confirm the current "Device Mode". If the "Device Mode" is not "Bootloader", when [Send File To Device] is pressed, a dialog box is displayed, warning that the CY460 SPG needs to be rebooted and that all outputs will be corrupted. Press [Ok] to confirm. The program will then reboot the CY460 SPG into Bootloader Mode and upload the file.

F.A.Q's.

Why 192.168.001.044 ?

During initial factory default boot-up programming, the CY460 SPG is set to IP Address 192.168.001.044. However, this address may have been changed during testing to avoid IP conflicts with other units under test. The user may change this address to any valid address, without affecting the operation of the software update program. Simply ensure that you enter the relevant addresses of the CY460 SPG in the IP Address and IP Mask dialog boxes.

Program and Data files sent by e-mail

You should receive your Software Update file(s) in the form of a ZIP file. It should contain any relevant .ATA data files, and additionally, may contain the .EXE Software Update program file.

Alternatively, only the .EXE Software Update file may have been zipped, and then the zip file renamed. You will need to rename this zip file by removing the extra .ATA extension from the filename before you can un-zip the .EXE file.

Even though we are sending you a zipped .EXE program file, it is quite possible that your e-mail server may detect this and may have blocked either the ZIP file attachment, or the whole e-mail document including the attachment. If this is the case, contact Courtyard regarding alternative arrangements.

DO NOT rename any of the Software Update files.

3.0 Menu System

The CY460 Sync Pulse and Test Pattern Generator provides the user with a menu interface to control the functions and options of the instrument.

3.1 Menu Screens and Maps

The menus can always be viewed on the front panel LCD display, and optionally "in-vision" in an "on-screen-display" (OSD) viewable on any pattern output. By default, the OSD is set "On" for each pattern output, but can be independently disabled if desired.

The menus are accessed from the initial start-up (Time) screen by pressing the rotary control. To return to the Time screen, press the blue escape/back button. If you repeatedly press the escape button, the LCD display will cycle between the display of time and the display of logo. Additional status information is also included.

Picture 3.1 : CY460 SPG – Time Screen.

In this display of time, the additional status information is:

Device Name	GPS / NTP status
Current Date	
Current Time	
SPG IP address (when connected) / Lock Status	Software Version number

Picture 3.2 : CY460 SPG – Logo Screen.

In this display of logo, the additional status information is:

Time	GPS / NTP status
Logo	
SPG IP address (when connected) / Lock Status	Software Version number

For both of these screens, the top and bottom lines are animated, cycling between the information detailed above.

Time Screen "SPG IP address" or "Ethernet…No Link"
& "Free Running" or "Locked to Video" or "Genlock ERROR --- No Video Ref"

Logo Screen "SPG IP address" or "No Ethernet"
& "Free Running" or "Locked to Video" or "Genlock ERROR --- No Video Ref"

Immediately after reconnection of the Ethernet cable, or a video reference, the respective line may appear momentarily as:

"Ethernet...negotiating"
or "Genlocking....."

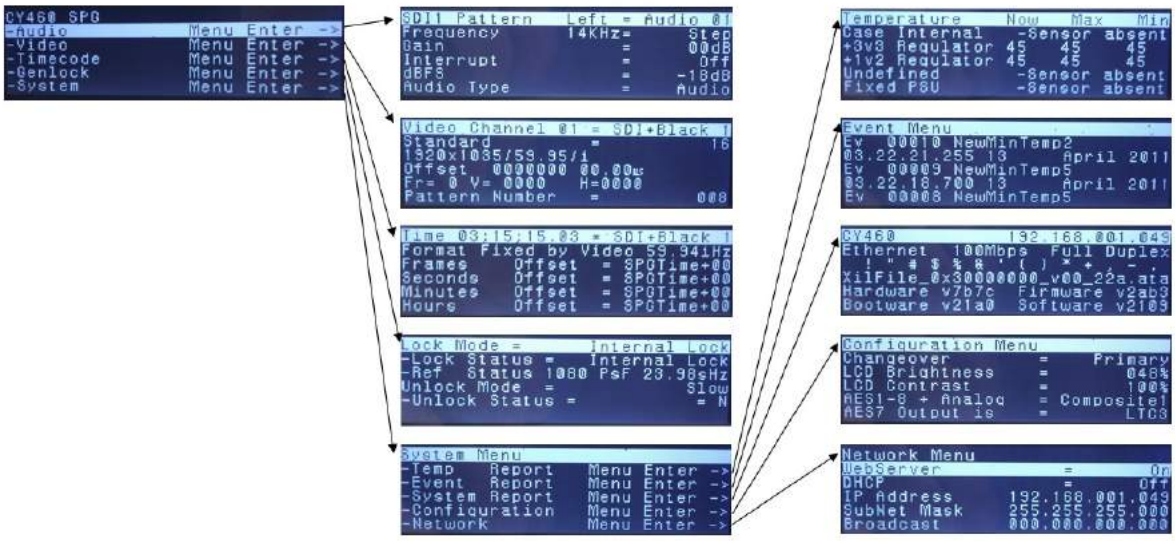
By pressing the rotary control from either of the above screens, you access the Top Level Menu. This menu gives you access to the 5 key menus that are used to control and configure the CY460 SPG:

1. Audio Menu
2. Video Menu
3. Timecode Menu
4. Genlock Menu
5. System Setup Menu

When viewing the Top-Level Menu screen on a picture monitor, flashing text in the top-right corner of the menu will indicate which video output you are actually connected to.

Full details outlining how to use the front panel controls to navigate and change entries in the menus are given in *Section 2 – Operating Basics* of this manual.

A pictorial map showing a selection of the menu screens is provided below for quick reference.



Picture 3.3 : CY460 SPG – Menu Map (pictorial).

A diagrammatic map of the complete menu structure is provided below for quick reference.

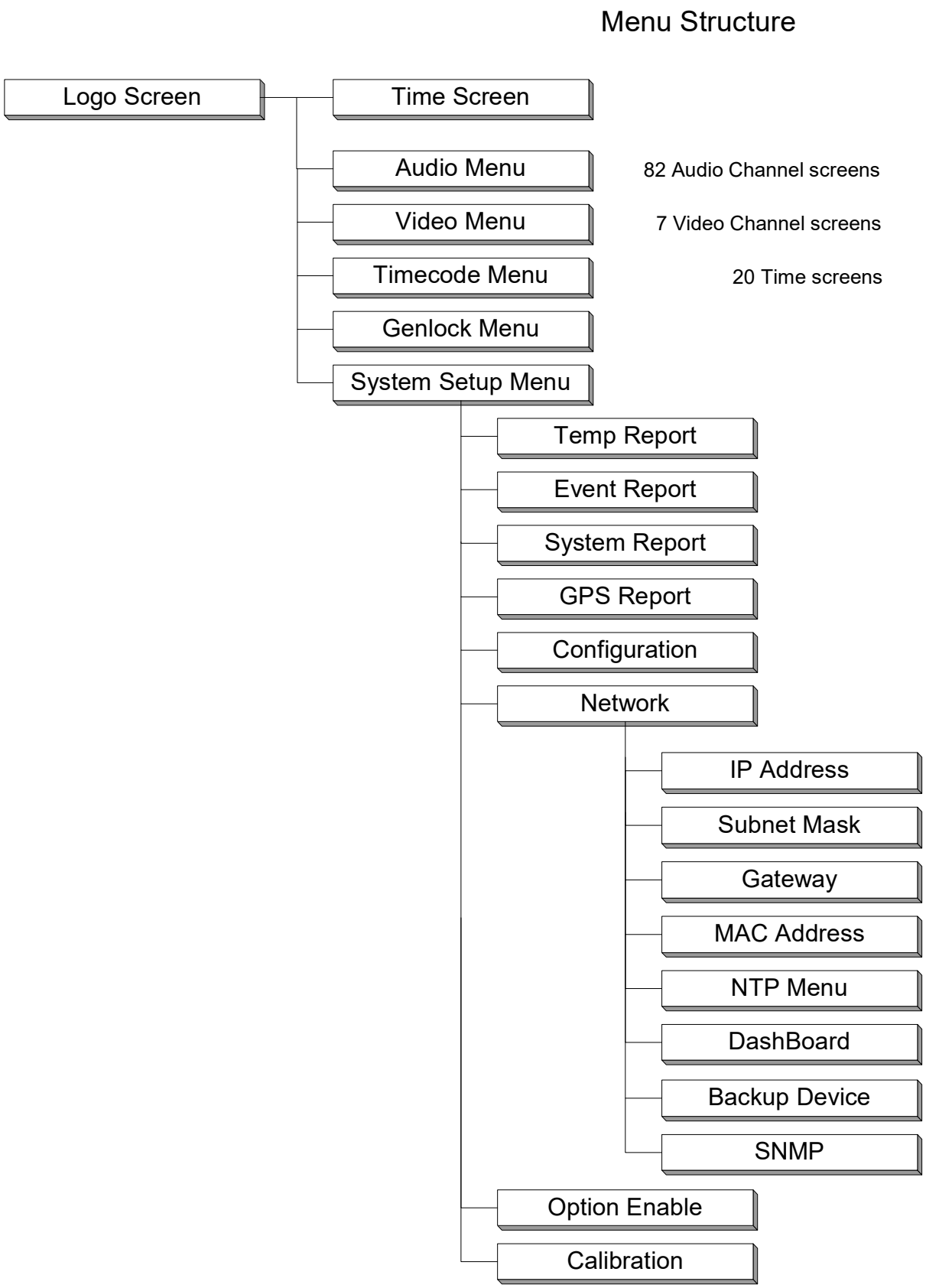


Figure 3.1 : CY460 SPG – Menu Map (diagrammatic).

3.2 Audio Menu

Each video output has audio channels associated with it:

SDI 1	-	has 16 embedded audio channels,
SDI Black 1	-	has 16 embedded audio channels,
SDI 2	-	has 16 embedded audio channels,
SDI Black 2	-	has 16 embedded audio channels,
Composite 1	-	has 16 audio channels in 8 AES pairs,
Analog Audio	-	has 2 audio channels in a stereo pair.

This makes a total of 82 audio channels.

Each channel can be individually controlled for frequency, gain, interrupt and dBFS.

Odd numbered channels 1, 3, 5, 7, 9, 11, 13 and 15 are referred to as LEFT.
Even numbered channels 2, 4, 6, 8, 10, 12, 14 and 16 are referred to as RIGHT.

In some circumstances, channels are grouped in pairs, or larger formations. When this occurs, associated menu selections are unavailable and 'menu information' is substituted:

Glits groups channels in pairs.
Blits groups the first 6 channels.

The general form of the Audio menu appears below for the SDI 1, SDI 2 and AES channels:

```
"AudioChannel        = Audio nn"
"Tone Type           =      xxx"
"Spot Frequency      =       nn"
"Gain                =     nndB"
"Interrupt           =       xx"
"dBFS                =    -nndB"    (Not on Analogue channels)
"Audio Type          =      xxx"    (Not on Analogue channels)
"Sequence            =      xxx"    (Not on Analogue channels)
```

Definitions for each of these menu lines appear on the following pages.

Definition for:

```
"AudioChannel        = Audio nn"
```

This menu item allows the user to select which audio output they are operating on.

The field “AudioChannel” consists of three sub fields. One item from each of the following columns will always appear in the three sub-fields, although not all combinations are valid:

SDI1 SDI2	Pattern Black	Left Right
Audio	AES1 AES2 AES3 AES4 AES5 AES6 AES7 AES8 Analog1	 Left Right

“SDI1” and “SDI2” will only ever be followed by “Pattern” or “Black”, and “Audio” will only ever be followed by “AES1” through “AES8”, or “Analog1”. All combinations will be followed by either “Left” or “Right”.

The options in the field “nn” are:

01 through 02 or 16 (depending on the selected “AudioChannel”).

Some examples from the complete list are shown below:

```
"SDI1 Pattern   Left = Audio 01"
"SDI1 Pattern  Right = Audio 02"
:
"SDI1 Black     Left = Audio 05"
"SDI1 Black    Right = Audio 06"
:
"Audio AES6     Left = Audio 11"
"Audio AES6    Right = Audio 12"
:
"Audio Analog1  Left = Audio 01"
"Audio Analog1 Right = Audio 02"
```

Definition for:

```
"Tone Type          =      xxx"
```

The options in the field “xxx are:

400Hz
800Hz
1KHz
Sweep
Step
A-Maj Chord
A-Maj Scale
Spot Frequency
Sample 1 *not available for all channels*
Sample 2 *not available for all channels*
Sample 3 *not available for all channels*
Sample 4 *not available for all channels*

Sweep ramps the frequency from 20Hz to 20KHz in 3 seconds.

Step includes spot tones of:

400Hz	800Hz	1KHz	2KHz	3KHz
4KHz	5KHz	6KHz	7KHz	8KHz
9KHz	10KHz	11KHz	12KHz	13KHz
14KHz	15KHz	16KHz		

A-Maj Chord uses the first 8 channels and includes the frequencies (from the Equi-Tempered Scale):

329.628Hz = E
440.000Hz = A
554.276Hz = C#
659.256Hz = E
880.000Hz = A
1108.552Hz = C#
1318.512Hz = E
1760.000Hz = A

A-Maj Scale is similar to Step but uses only the notes from the C-Major chord (from the Harmonic Scale):

1056Hz = C
1187Hz = D
1319Hz = E
1407Hz = F
1584Hz = G
1760Hz = A
1979Hz = B
2112Hz = C

Spot Frequency allows the user to select any frequency between 20Hz and 20KHz (in 1Hz steps).

Sample n are available only on the left channels of SDI1 Pattern = Audio 01, SDI1 Black = Audio 01, SDI2 Pattern = Audio 01 SDI2 Black = Audio 01, Audio AES1 = Audio 01, Audio AES2 = Audio 01, Audio Analog = Audio 01.

Definition for:

```
"Gain                =      nndB"
```

The options in the field “nndB” are:

Silence
-60dB.....+18dB (in 1dB steps)

The upper limit is actually set by the dBFS menu (detailed below).

Definition for:

```
"Interrupt           =        xx"
```

The options in the field “xx” are:

Off
1 sec
3 sec
Glits
Blits

Glits can only be selected on odd (left) channels. Glits also uses the associated even (right) channel in the pair to create a stereo audio identification sequence.

Blits can only be selected on channel 01. Blits also uses the next five channels to create a 5.1 Surround Sound Audio Identification sequence.

Definition for:

```
"dBFS                =     -nndB"
```

The options in the field “-nndB” are:

-24dB.....-18dB (in 2dB steps)

Definition for:

```
"Audio Type          =       xxx"
```

The options in the field “xxx” are:

Audio
Silence

Definition for:

```
"Sequence          =      xxx"
```

The options in the field “xxx” are:

Tone
Sample
Tone.Sample
Squawk
Squawk.tone
Squawk.sample
Squawk.Tone.Sample
Squawk.Sample.Tone

3.3 Video Menu

The Video menu for the SDI 1 and SDI 2 channels appears below:

SD-SDI formats	HD-SDI formats
"Video Channel nn = xx"	
"Standard = nn"	
"Description....."	
"Offset 0000000 00.00u "	"Offset 0000000 00.000000 "
" V= 0000 H=0000 "	
"Pattern Number = nnn"	
"Description....."	
"ID Memory = n"	
"Character n/mm = yyy"	
"Description....."	
"ID Vertical Pos = nnnn"	
"ID Char Size = n"	
"ID Visible Chars = nn"	
"ID Visible Rows = n"	
"ID Black Edge = Off"	
"ID Off/Opacity = nnn%"	
"ID Row Motion = Static"	
"ID Box Motion = Static"	
"Pattern Bounce = Off"	
"Pattern Output = Pattern"	
"Black Output = Black"	
"Circle Type = Off"	
"Circle Size = nnn"	
"Circle Aspect = 16:9"	
"OSD Time & Date = xx"	
"Pattern OSD = On"	
"Black OSD = Off"	
"Number Of OSDRows= 6"	
"OSDEvent Warning = Off"	
"Pattern Embedder = Off"	
"Black Embedder = Off"	
"Pattern ToneSil = Tone"	
"Black ToneSil = Tone"	
"Pattern ATC = Off"	("ATC" in HD formats)
"Black ATC = Off"	("ATC" in HD formats)
"Pattern CRC/EDH = On"	("CRC" in HD formats)
"Black CRC/EDH = On"	("CRC" in HD formats)

The Video menu for the Composite 1 channel appears below:

```
"Video Channel nn =          xx"
"Standard         =          nn"
"Description....................."
"Offset 000000000 00.00u 000.0°"
"Fr= 0 V= 0000  H=0000 Sc= 0000"
"Pattern Number   =         nnn"
"Description....................."
"ID Memory        =           n"
"Character           n/mm = yyy"
"Description....................."
"ID Vertical Pos  =        nnnn"
"ID Char Size     =           n"
"ID Visible Chars =          nn"
"ID Visible Rows  =           n"
"ID Black Edge    =         Off"
"ID Off/Opacity   =        nnn%"
"ID Row Motion    =      Static"
"ID Box Motion    =      Static"
"Bounce           =         Off"
"Circle Type      =         Off"
"Circle Size      =         nnn"
"Circle Aspect    =        16:9"
"OSD Time & Date  =          xx"
"OSD              =          On"
"Number Of OSDRows=           6"
"Event Warnings   =         Off"
"VITC             =         Off"
"Pattern F1L7     =          On"    ("Pattern F1L10" for NTSC)
"No S318M    in this format...."    (this row only for NTSC)
```

The Video menu for the Black 1 channel appears below:

```
"Video Channel nn =          xx"
"Standard - same as Composite 1"
"Description....................."
"Offset 000000000 00.00u 000.0°"
"Fr= 0 V= 0000  H=0000 Sc= 0000"
"Black  VITC      =         Off"
"Black   F1L7     =          On"    ("Black   F1L10" for NTSC)
"Black  S318M     =          On"    (this row only for NTSC)
```

The Video menu for the Tri-Black 2, 3 and 4 channels appears below:

PAL / NTSC formats | Tri-Black formats

```
"Video Channel nn =          xx"
"Standard         =          nn"
"Description....................."
"Offset 000000000 00.00u 000.0°"    "Offset   0000000 00.000000    "
"Fr= 0 V= 0000  H=0000 Sc= 0000"    "      V= 0000  H=0000         "
"Black  VITC      =         Off"    (this row only for NTSC or PAL)
"Black   F1L7     =          On"    (this row only for NTSC or PAL) #
"Black  S318M     =          On"    (this row only for NTSC)

                                    # : ("Black   F1L10" for NTSC)
```

Definitions for the menu lines in each of these menus appear on the following pages.

Definition for:

```
"Video Channel nn =          xx"
```

This menu item allows the user to select which video output they are operating on.

The options in the field “xx” are:

“SDI+Black 1”	for SDI 1 and SDI Black 1 outputs
“SDI+Black 2”	for SDI 2 and SDI Black 2 outputs
“Composite 1”	for Composite 1 output
“Black 1”	for Black 1 output
“Tri Black 2”	for Tri-Black 2 output
“Tri Black 3”	for Tri-Black 3 output
“Tri Black 4”	for Tri-Black 4 output

The options that appear in the field “nn” follow the selection made above, and are:

“01”	for SDI 1 and SDI Black 1 outputs
“02”	for SDI 2 and SDI Black 2 outputs
“05”	for Composite 1 output
“07”	for Black 1 output
“08”	for Tri-Black 2 output
“09”	for Tri-Black 3 output
“10”	for Tri-Black 4 output

Definitions for:

```
"Standard         =          nn"
"Description....................."
```

This menu pair allows the user to select the video format for the video output they are operating on.

The options in the field “nn” are:

nn = “05” through “36”	for SDI 1 and SDI Black 1 outputs
nn = “05” through “36”	for SDI 2 and SDI Black 2 outputs
nn = “04” through “06”	for Composite 1 output
nn = “Same as Composite 1”	for Black 1 output
nn = “00” through “36”	for Tri-Black 2, 3 & 4 outputs

Each of the 6 pattern generators is independent in format and pattern. So, for example, SDI 1 can be outputting 1080i/60Hz while SDI 2 is outputting 720p/24Hz and Composite 1 is outputting NTSC-M. Black 1 will also be outputting NTSC-M Color Black because it always mirrors the Composite 1 output format. Each of the three Tri-Black outputs can be simultaneously outputting formats differing again from those on the pattern outputs. So, the CY460 Sync Pulse and Test Pattern Generator could be configured to provide up to 6 different output formats simultaneously.

The number “nn” is decoded into a description:

```
nn = "00" : Description = "10MHz Sinewave                "   #
nn = "01" : Description = "SLOW PAL 720x 625/48/i        "
nn = "02" : Description = "NTSC Subcarrier 3.58MHz       "
nn = "03" : Description = "PAL Subcarrier 4.43MHz        "
nn = "04" : Description = "720x 525/59.94/i   NTSC-J     "
nn = "05" : Description = "720x 525/59.94/i   NTSC-M     "
```

```
nn = "06" : Description = "720x 625/50/i      PAL        "
nn = "07" : Description = "1280x720/60/p                 "
nn = "08" : Description = "1280x720/59.94/p              "
nn = "09" : Description = "1280x720/50/p                 "
nn = "10" : Description = "1280x720/30/p                 "
nn = "11" : Description = "1280x720/29.97/p              "
nn = "12" : Description = "1280x720/25/p                 "
nn = "13" : Description = "1280x720/24/p                 "
nn = "14" : Description = "1280x720/23.98/p              "
nn = "15" : Description = "1920x1035/60/i                "
nn = "16" : Description = "1920x1035/59.94/i             "
nn = "17" : Description = "1920x1080/30/p                "
nn = "18" : Description = "1920x1080/29.97/p             "
nn = "19" : Description = "1920x1080/25/p                "
nn = "20" : Description = "1920x1080/24/p                "
nn = "21" : Description = "1920x1080/23.98/p             "
nn = "22" : Description = "1920x1080/60/i                "
nn = "23" : Description = "1920x1080/59.94/i             "
nn = "24" : Description = "1920x1080/50/i                "
nn = "25" : Description = "1920x1080/48/i                "
nn = "26" : Description = "1920x1080/47.95/i             "
nn = "27" : Description = "1920x1080/30/psf              "
nn = "28" : Description = "1920x1080/29.97/psf           "
nn = "29" : Description = "1920x1080/25/psf              "
nn = "30" : Description = "1920x1080/24/psf              "
nn = "31" : Description = "1920x1080/23.98/psf           "
nn = "32" : Description = "1920x1080/60/p                "
nn = "33" : Description = "1920x1080/59.94/p             "
nn = "34" : Description = "1920x1080/50/p                "
nn = "35" : Description = "1920x1080/48/p                "
nn = "36" : Description = "1920x1080/47.95/p             "
```

Standard 00 on the Timeable Black outputs is currently disabled.

Definitions for:

SD SDI channels:

```
"Offset  0000000 00.00µ        "
"      V= 0000   H=0000        "
```

HD SDI channels:

```
"Offset  0000000 00.000000     "
"      V= 0000   H=0000        "
```

Composite 1, Black 1, & Tri-Black channels:

```
"Offset  0000000 00.00µ 000.00°"
"Fr= 0 V= 0000   H=0000 Sc= 000"
```

This menu pair allows the user to select the timing offset from the SPG reference datum for the video output they are operating on. The timing offset is defined in two rows which are intimately linked. Either menu line can be edited – each menu line reflects changes in the other line. A brief description of the timing offset calculations is given here.

In the top line; the timing offset is a number of pixels delayed from the SPG reference datum. Where displayed, the offset is also decoded, **for information only**, as an H offset (in microseconds) and SC offset (in degrees).

In the top line, the timing offset is editable and is represented as a "large number":

e.g. 0 – 2474999 for Standard = "23",
Description = `"1920x1080/59.94/i                "`

e.g. 0 – 726404095 for Standard = "05",
Description = `"720x 525/59.94/i   NTSC-M      "`

This "large number" will vary depending on the selected format.

In the bottom line, the timing offset is decoded into picture offsets expressed as:

Frame offset:	`"Fr= 0"` where Fr = 0 - 1 or 0 - 3 depending on the selected video format.
Line offset:	`"V= 0000"` where V = 0 up to the total number of video lines in the selected format.
Pixel offset:	`"H=0000"` where H = 0 up to the total number of video pixels in each line of the selected format.
Subcarrier offset:	`"Sc= 000"` where Sc = 0 up to the total number of sub-pixels that equate to one cycle of subcarrier in the selected format.

Frame and Subcarrier offsets only appear when PAL or NTSC is selected on Composite 1, Black 1 and the Tri-black outputs.

Each of these fields is editable. Together with the timing offset in the top row, these fields enable the user to apply offsets rapidly to individual video outputs.

Definitions for:

```
"Pattern Number   =         nnn"
"Description..................."
```

This menu pair allows the user to select the pattern for the video output they are operating on.

The options in the field “nnn” are:

> “nnn” = 0 up to the maximum number of patterns allowed for the output being configured.

Patterns are selectable on:

> SDI 1 output
> SDI 2 output
> Composite 1 output

Additionally, patterns may also be selected to appear on the SDI Black outputs (same pattern as selected on the associated Pattern outputs).

All other outputs normally produce only “Black”.

Each pattern generator is independent in both format and pattern. So, for instance, SDI 1 can be outputting a “RP219 bars” in 1080i/60Hz while SDI 2 is outputting “Pathological Test” in 720p/24Hz and Composite 1 is outputting SMPTE bars in NTSC-M.

The list of available patterns in each format can be different. Some patterns are format specific, and so do not appear in the list for other formats, e.g. the SDI specific Pathological test pattern does not appear in the list for an analogue NTSC output.

Pattern descriptions are as detailed as possible within the limitation of 30 characters.

The list of patterns is constantly changing as we add more patterns to the “Pattern Library”. Pattern lists can be found in *Appendix I* at the end of this manual. These new patterns can be uploaded to your CY460 SPG over the Ethernet interface. You will need to find some maintenance time to do this as a power cycle may be required.

Definitions for:

```
"ID Memory        =           n"
"Character           n/mm = yyy"
"Description..................."
```

This menu triplet allows the user to select and edit the ID Text / Image for the video output they are operating on.

ID Text / Image is selectable on:

SDI 1 output
SDI 2 output
Composite 1 output

Each of the three outputs has a separate set of ID Text / Image memories.

When the ID Memory is selected to be ordinary text, the options in the field "n" are:

"n" = 1 through 3.

These are ID Text memories. Each memory is edited individually. "n" selects which memory is 'active' and hence enabled and editable in the menu. When "n" is selected in the "ID Memory" line, "n" in the "Character" line follows.

The options in the field "mm" are:

"mm" = 01 through 30.

There are a maximum of 30 characters in each ID Text memory (some formats are limited to 26 characters). "mm" selects which character is 'active' and hence editable in the menu. In the selected `"Description....................."` line, as "mm" is changed, a cursor gives a visual indication of which character is active.

The options in the field "yyy" are:

"yyy" = 000 through 255.

There are 256 characters in the extended ASCII font. Each ID character is edited individually. "yyy" is adjusted to display the required character in the selected ID Text memory.

Not all the characters 000 through 255 are allowed. The ones that are not allowed are automatically skipped.

Notes :

- After adjusting the field "yyy", use the Escape/Back button to select the next character to edit, then press Select to edit the next character, etc.
- When using the available front panel controls, editing of the characters in ID Text memories is performed in "Overtype" mode, i.e., it is not possible to "Insert" or "Delete" characters.
- When you edit the pre-programmed ID Text memories, start from character position 1, then overtype with spaces (char.#32) any extraneous characters at the end of the line.
- To quickly edit ID text memories, please use the DashBoard interface (see *Appendix J : Connecting to DashBoard* of this handbook for more details).

Sub-definitions for:

```
"ID Memory        =           n"
"-ID Image                    "
"-Description..................."
```

When the ID Memory is selected to be an ID Image, the menu appears as above.

The options in the field “n” are:

“n” = 4 through 64.

These are ID Image memories. Each memory is edited individually. “n” selects which memory is ‘active’ and hence enabled in the menu.

Each memory contains an imported 3-bit bitmap image. Details regarding the format of the bitmap image and how to import images can be found in the appendices.

Additional image specific menu items appear when the ID Image option is active:

```
"ID Vertical Pos  =        mmmm"
"ID Logo Horiz Pos=        nnnn"
"-ID Logo Height  =        xxxx"
"-ID Logo Width   =        yyyy"
```

The options in the field “mmmm” are:

“mmmm” = from 0000 up to a value less than the number of vertical lines in the currently selected video format.

The options in the field “nnnn” are:

“nnnn” = from 0000 up to a value less than the number of horizontal pixels in the currently selected video format.

The fields “xxxx” and “yyyy” display numbers relating to the height and width of the imported image. These numbers are fixed during the import process and are not adjustable in this menu.

Definition for:

```
"ID Vertical Pos  =        nnnn"
```

This menu item allows the user to select the vertical position of the ID Text box for the video output they are operating on. This setting is valid for static ID Text boxes, and may be restricted for animated ID Text boxes.

The options in the field “nnnn are:

“nnnn” = the TV line on which the top of the ID Text box sits.

The field “nnnn” is a value less than the number of lines in the prevailing video format.

When adjusting this value, other parameters relating to the ID Text box may restrict this range, or may be recalculated, in order to keep the ID Text box visible within the picture area.

Definition for:

```
"ID Char Size     =           n"
```

This menu item allows the user to select the size of the text in the ID Text box for the video output they are operating on.

The options in the field “n” are:

“n” = 1 through 7.

The number “n” is a representation of the size of the font in use.

When adjusting this value, other parameters relating to the ID Text box may restrict this range, or may be recalculated, in order to keep the ID Text box visible within the picture area.

Definition for:

```
"ID Visible Chars =          nn"
```

This menu item allows the user to select the number of characters that are visible in all rows of the selected ID Text box for the video output they are operating on.

The options in the field “nn” are:

0 through 30
Automatic

The maximum number of characters allowed per row depends on the video format selected on the associated output. For example, the 1920x1080/50/i format is allowed 30 characters, while all 1280x720p formats, plus PAL and NTSC formats are only allowed 26.

This can be set to create a ‘text box’ of any width cutting a hole in the video. The number of characters in the ID and the number of “ID Visible Chars” do not have to be the same. The displayed characters are always centred in the row on a pixel basis. When “nn” is adjusted, automatic re-centring occurs to best position the text within the ID Text box.

For “nn” = Auto, the ID Text box width is handled automatically so as to include all of the characters of the longest ID line to be displayed (up to the maximum allowed for the selected format).

When adjusting this value, other parameters relating to the ID Text box may restrict this range, or may be recalculated, in order to keep the ID Text box visible within the picture area.

Definition for:

"ID Visible Rows = n"

This menu item allows the user to select the rows of ID Text that are to be visible in the ID Text box for the video output they are operating on.

The options in the field “n” are:

1
2
3
1 & 2
2 & 3
3 & 1
1 & 2 & 3

This can be set to create a text box of any height, cutting a hole in the video. The number of user-programmed ID rows and the number of “ID Visible Rows” do not have to be the same.

When adjusting this value, other parameters relating to the ID Text box may restrict the options, or may be recalculated, in order to keep the ID Text box visible within the picture area.

Definition for:

“ID Black Edge = Off”

This menu item allows the user to control the border around the text box.

This option is currently non-functional.

Definition for:

"ID Off/Opacity = nnn%"

This menu item allows the user to control the opacity of the background of the ID Text box or the ID Image for the video output they are operating on.

The Opacity in the field “nnn” can be selected to be:

0 (ID off completely) through 100 (white text on a black background) in 16 steps
Animated

The “Animated” mode can be useful to indicate the video output is ‘live’.

Note: When Black is selected as the pattern on the video pattern output, the “Animated” mode is inhibited (e.g. to reduce APL effects).

Definition for:

```
"ID Row Motion    =      Static"
```

This menu item allows the user to control the animation of the text rows within the ID Text box for the video output they are operating on. These animated modes can be useful to indicate the video output is 'live'.

Several row animation modes are available:

Static	Text row(s) motionless
Flash	Text row(s) flash on and off
Sequence	Text row(s) appear in sequence when set for 1 or 2 visible rows, i.e. 1 then 2 then 3, or 1+2 then 2+3 then 3+1 (3 text rows in 3 visible rows ≡ "Flash" mode)
Roll	Text row(s) roll continuously from the bottom of the box to the top
Reveal	Text row(s) are revealed downwards using a "vertical wipe"
Zip	Text row(s) are revealed in row order, character-by-character

When selecting these modes, other ID Text parameters may restrict what is visible within the ID Text box.

Definition for:

```
"ID Box Motion    =      Static"
```

This menu item allows the user to control the animation of the entire ID text box or ID Image for the video output they are operating on. These animation modes can be useful to indicate the video output is 'live'.

Several box animation modes are available:

Static	Text / Image box motionless
Horizontal	Text / Image box bounces from side-to-side
Vertical	Text / Image box bounces up and down
Elliptical	Text / Image box moves in an elliptical motion
Box	Text / Image box describes a rectangle
Cross	Text / Image box moves in a "bow tie" motion
Pong	Text / Image box moves in a Pseudo-random motion (similar to the popular first generation computer game)

The ID Box Motion extents in animation modes may be limited by one or more other menu or ID settings.

Definition for:

```
"Pattern Bounce   =         Off"
```

This menu item allows the user to control the Bounce animation on applicable patterns. Not all patterns bounce. Bounce is a useful test as it dynamically changes the average picture level (APL) of the pattern. This can be used to help diagnose errors in downstream video equipment.

For the Composite 1 output, the menu line appears as:

```
"Bounce           =          On"
```

The options in the field “On” are:

Off	The Bounce function is disabled for the selected video output.
On	The Bounce function is enabled for the selected video output.

Definition for:

```
"Pattern Output   =     Pattern"
```

This menu item allows the user to control the SDI Pattern output.

The SDI Pattern output can be selected to be:

Black
Pattern
DualA
DualB

The user may require more SDI Black outputs than SDI Pattern outputs.

If DualA or DualB is selected, the output is configured to be the 1st half of a SDI Dual Link interface together with the SDI Black output (see below).

Definition for:

```
"Black   Output   =       Black"
```

This menu item allows the user to control the SDI Black output.

The SDI Black output can be selected to be:

Black
Pattern

The user may require more SDI Pattern outputs than SDI Black outputs.

When the associated SDI Pattern output is selected to be DualA or DualB, the SDI Black output is forced to be the 2nd half of an SDI Dual Link interface together with that SDI Pattern output.

Definition for:

```
"Circle  Type     =         Off"
```

This menu item allows the user to enable the circle feature on the Pattern video output they are operating on.

For the Composite 1 output, the menu line appears as:

```
"Circle Type      =         Off"
```

The options in the field “Off” are:

Off
Static
Animated

Animated circles are useful as a lip-sync test as the circle and audio are synchronised together. Animated circles are also useful for indicating the video output is ‘live’.

Definition for:

```
"Circle  Size     =         nnn"
```

This menu item allows the user to control the size of the circle on the Pattern video output they are operating on.

For the Composite 1 output, the menu line appears as:

```
"Circle Size      =         nnn"
```

The options for the field “nnn” are:

“nnn” = 0 up to a maximum of 551.

The maximum number is related to the selected video format. The maximum circle size is approximately half the number of visible lines in that video format, e.g. for NTSC, the maximum size = 245, PAL = 282, 720p = 362, 1080i = 551, etc.

Definition for:

```
"Circle  Aspect   =        16:9"
```

This menu item allows the user to control the aspect ratio of the circle on the Pattern video output they are operating on.

For the Composite 1 output, the menu line appears as:

```
"Circle Aspect    =        16:9"
```

The options in the field “16:9” are:

4:3	For SD formats.
16:9	For SD formats.
Fixed	For HD formats only (fixed at 16:9).

Definition for:

```
"OSD Time & Date          =          xx"
```

This menu item allows the user to control the behaviour of the ‘on screen display’ (OSD) when it is not being used for menus.

The options in the field “xx” are:

Off
Time
Date
Time-Date
GPS

When “on” and not in a menu, the selected information will appear cut into a text box on the relevant video pattern output.

The Time being displayed is the timecode being output on the video channel you are looking at. Thus if you are looking at two screens to inspect SDI1 output and SDI2 output the time displays may be offset from each other.

There may be an extra character to the right of the frames-units number. This is a field/frame marker.

1. In interlaced video formats, the top-left block appears in the first field, the bottom-right block appears in the second field.

2. In progressive video formats at frame rates above 30Hz, the same timecode is output for each frame pair due to a limitation defined in SMPTE-12M. In these “higher frame rates”, the top-left block appears in the first frame of the pair, the bottom-right block appears in the second frame of the pair.

3. In progressive video formats at frames rates at or below 30Hz, the field/frame marker is not displayed, as a unique timecode exists for each frame.

Definitions for:

```
"Pattern OSD      =          On"
"Black   OSD      =         Off"
```

These menu items allow the user to enable the ‘on screen display’ (OSD) for the video output they are operating on.

For the Composite 1 video output, the menu line appears as:

```
"OSD              =          On"
```

The options in the field “On” / “Off” are:

Off	The OSD does not appear on the selected video output.
On	The OSD does appear on the selected video output.

Definition for:

```
"Number Of OSDRows=           6"
```

This menu item allows the user to select the number of rows of text in the OSD menus.

This is currently fixed at 6 rows.

Definition for:

```
"Event Warnings  =         Off"
```

This menu item allows the user to control the behaviour of the LCD when an “event” occurs.

The options in the field “Off” are:

Off	no warning messages will pop-up in the LCD or on the Video Outputs.
On	warning messages will pop-up in the LCD and on the Video Outputs.

“Events” include:

- Ethernet loss of cable
- Ethernet find cable
- Max temperature limit reached

Definitions for:

```
"Pattern Embedder =         Off"
"Black   Embedder =         Off"
```

These menu items allow the user to control the channel allocation of the audio embedders on the SDI Pattern and SDI Black video output signals. The options are different in SD SDI and HD SDI.

The SD embedder can embed a maximum of 4 channels into the video signal.

The options in the fields “Off” are:

Off
Group 1
Group 2
Group 3
Group 4

The HD embedder can embed a maximum of 16 channels into the video signal.

The options in the fields “Off” are:

Off
Audio 1..4
Audio 1..8
Audio 1..12
Audio 1..16

Definitions for:

```
"Pattern ToneSil  =        Tone"
"Black   ToneSil  =        Tone"
```

These menu items allow the user to control the audio content of the audio embedders on the SDI Pattern and SDI Black video output signals.

The options in the fields “Tone” are:

Tone	Audio is embedded as configured in the associated Audio menus.
Silence	Overrides any selections made in the associated Audio menus.

Definitions for:

```
"Pattern VITC     =         Off"    ("Pattern ATC" in HD formats)
"Black   VITC     =         Off"    ("Black   ATC" in HD formats)
```

These menu items allow the user to control the behaviour of the timecode inserters on the SDI Pattern and SDI Black video output signals. The options are different in SD SDI and HD SDI.

The SD SDI inserter can insert VITC into appropriate lines in the SD SDI video. The options are different in NTSC and PAL (see SMPTE 266M-2002).

NTSC options in the field “Off” are:

Off
On 14
On 14 &16

PAL options in the field “Off” are:

Off
On 19
On 19 &21

The HD SDI inserter can embed ATC into the HD SDI video.

HD options in the field “Off” are:

Off
LTC
VITC

Definitions for:

```
"Pattern EDH      =          On"
"Black   EDH      =          On"
```

These menu items allow the user to control whether EDH (Error Detection and Handling) data is included on the SD-SDI Pattern and SD-SDI Black video output signals.

The options in the field "On" are:

Off	No EDH data added to the SDI output.
On	EDH data is added to the SDI output.

Definitions for:

```
"Pattern CRC      =          On"
"Black   CRC      =          On"
```

These menu items allow the user to control whether CRC (Cyclic Redundancy Check) data is included on the HD-SDI Pattern and HD-SDI Black video output signals.

The options in the field "On" are:

Off	No CRC data added to the SDI output.
On	CRC data is added to the SDI output.

Definitions for:

```
"VITC             =          Off"
"Black  VITC      =          Off"
```

These menu items allow the user to control the behaviour of the timecode inserters on the Composite 1, Black 1 and Tri-Black video output signals.

The Composite, Black and Tri-Black inserters can insert VITC into appropriate lines in the video. The options are different in NTSC and PAL (see SMPTE RP188-1999).

NTSC options for the field "Off" are:

Off	
On 10 through 20	One-line VITC
On 10 &12, 11 &13, 12 &14, through 18 &20	Two line VITC

PAL options for the field "Off" are:

Off	
On 06 through 22	One line VITC
On 06 &08, 07 &09, 08 &10, through 20 &22	Two line VITC

Definitions for:

```
"Pattern F1L7     =          On"    ("Pattern F1L10" for NTSC)
"Black   F1L7     =          On"    ("Black   F1L10" for NTSC)
```

These menu items allow the user to control whether the F1L7 (Field 1 Line 7) or F1L10 (field 1 Line 10) ident signals appear on the Composite 1, Black 1 and Tri-Black video output signals. The F1L7 signal is defined for the PAL format, the F1L10 signal for NTSC.

The options in the field "On" are:

Off	F1L7 / F1L10 does not appear on the selected video output.
On	F1L7 / F1L10 appears on the selected video output.

Definition for:

```
"No S318M    in this format...."
```

This menu line appears on the Composite menu (NTSC version) to indicate that the S318M ident signal is not defined for this output.

Definition for:

```
"Black  S318M     =          On"
```

This menu line allows the user to control whether the S318M ident signal appears on the Black 1 or Tri-Black video output signals. This signal is only defined for colour black in the NTSC format (see SMPTE 318M-1999).

The options in the field "On" are:

Off	S318M does not appear on the selected video output.
On	S318M appears on the selected video output.

3.4 Timecode Menu

Each Video output has a counting timecode channel associated with it:

SDI 1 and SDI Black 1 output
SDI 2 and SDI Black 2 output
Composite 1 output
Black 1 output
Tri-Sync Black 2 output
Tri-Sync Black 3 output
Tri-Sync Black 4 output

There are 4 linear counting timecode (LTC) channels:

LTC 1
LTC 2
LTC 3
LTC 4

There are five counting times that are important in the system. These are:

SPG Time
UTC DateTime
GPS DateTime – extracted from the optional GPS receiver
NTP DateTime – extracted from a suitable NTP server via the Ethernet interface
Analog Video Reference VITC – extracted from VITC on the analog video reference #

There are three more non-counting times that are important in the system. These are:

Summer DST Event
Winter DST Event
Leap Second Event

UTC DateTime is locked to one of Real Time Clock (RTC), GPS DateTime, NTP DateTime or Analog Ref VITC.

SPG Time is locked to UTC DateTime. UTC DateTime is the datum from which SPG Time is offset.

SPG Time is the central time to which all Video and LTC timecodes are locked. SPG Time is also the datum from which all Video and LTC timecodes are offset.

Summer DST Event, Winter DST Event and Leap Second Event each define times and dates at which TC-events occur.

The inter-relationships between the times and timecode is fixed. Only the offsets and TC-events affect the times for each timecode.

See Figure 1.2d : CY460 SPG – Timecode in *Section 1.2 : Functional Diagrams* for a functional diagram of the CY460 Timecode system.

See Figure 3.2 : CY460 SPG – Setting Time and Date Parameters at the end of this section for a flowchart outlining the procedure to initially set your local time and date parameters.

The Timecode menu for all the Video timecodes appears below:

```
"Description..................."
"Format Fixed by Video    nnx  "
"Running Time     = hh:mm:ss:ff"
"Offset = SPGTime + 00:00:00:00"
"                              "
"USERBITS                      "
```

The Timecode menu for all the LTC timecodes appears below:

```
"Description..................."
"Format           =       nnx  "
"Running Time     = hh:mm:ss:ff"
"Offset = SPGTime + 00:00:00:00"
"                              "
"USERBITS                      "
```

The Timecode menu for SPG Time appears below:

```
"                      SPG Time"
"                              "
"Running Time     = hh:mm:ss:ff"
"Offset     = UTC + 00:00:00:00"
"                              "
"USERBITS                      "
```

The Timecode menu for UTC Date & Time appears below:

```
"                   UTC DateTime"
"                              "
"Running Time     = hh:mm:ss:ff"
"Nudge            = 00:00:00:00"
"Weekday   Date   Month    Year"
"Leap Second      =         Off"
"Daylight Saving  =         Off"
"Country Code     =         nnn"
"Description..................."
```

The Timecode menu for GPS Date & Time (when enabled and locked) appears below:

```
"            GPS DateTime (UTC)"
"GPS Solution found:           "
"Running Time (UTC) hh:mm:ss:ff"
"SVs in View = xx   in Fix = xx"
"Weekday   Date   Month    Year"
"xLocked to GPS                "
```

The Timecode menu for NTP Date & Time (when enabled) appears below:

```
"            NTP DateTime (UTC)"
"NTP Solution found:           "
"Running Time (UTC) hh:mm:ss:ff"
"-NTP time Uncertainty = nnnnms"
"Weekday   Date   Month    Year"
"tLocked to NTP                "
```

The Timecode menu for Analog Ref VITC appears below:

```
"               Analog Ref VITC"
"                               "
"VITC Ref Time      hh:mm:ss:ff"
"Locked - PAL VITC on line = nn"
"                               "
"Locked to Video + VITC         "
```

The Timecode menus for Summer DST Event, Winter DST Event and Leap Second Event are very similar – the Summer DST Event (UTC) menu appears below:

```
"         Summer DST Event (UTC)"
"                               "
"                               "
"Action DateTime  = hh:mm:ss:ff"
"Weekday   Date   Month    Year"
"                               "
```

Additional information regarding the Timecode menus:

Video Timecodes count at the frame-rate defined by the video format of the selected video channel.

LTC Timecodes count at the frame-rate defined by the format selected in this menu.

SPG Time and UTC DateTime are both “FIXED”, counting at 50Hz.

GPS DateTime and NTP DateTime are “FIXED”, being displayed at 50Hz – they only count if a GPS or NTP reference is present.

Summer DST Event, Winter DST Event and Leap Second Event do not count.

The system has a battery backed real-time-clock. This runs independently of any other reference. It can maintain reasonably accurate time over a few days while the unit is powered down. It is **NOT** to be trusted as reliable where your application requires accurate time. As the GPS system is so inexpensive, we recommend its use in all vehicle installations where power may switch on and off regularly.

Several menu lines are identical between menu screens. Where possible, to avoid obvious repetition, in the definitions outlined below, identical menu lines are grouped under one definition.

Definition for:

```
"Description..................."
```

The options that appear in this menu line are:

“SDI 1 & SDIBlack 1 Timecode”	for SDI and SDI Black 1 output
“SDI 2 & SDIBlack 2 Timecode”	for SDI and SDI Black 2 output
“Composite 1 Timecode”	for Composite 1 output
“Black 1 Timecode”	for Black 1 output
“Tri-Sync Black 2 Timecode”	for Tri-Black 2 output
“Tri-Sync Black 3 Timecode”	for Tri-Black 3 output
“Tri-Sync Black 4 Timecode”	for Tri-Black 4 output
“LTC 1 Timecode”	for LTC1 output
“LTC 2 Timecode”	for LTC2 output
“LTC 3 Timecode”	for LTC3 output
“LTC 4 Timecode”	for LTC4 output
“SPG Time”	for SPG Time
“UTC DateTime (set by user”	for UTC Date & Time
“GPS DateTime (UTC)”	for GPS Date & Time
“NTP DateTime (UTC)”	for NTP Date & Time
“Analog Ref VITC (UTC)”	for Analog Ref VITC Time
“Summer DST Event SPG)”	for Summer DST Event Date & Time
“Winter DST Event (SPG)”	for Winter DST Event Date & Time
“Leap Second Event (UTC)”	for Leap Second Event Date & Time
“Jam Event (SPG)”	for Jam Event Time

The menu line “UTC DateTime (manual)” indicates that UTC Time and Date parameters are manually adjustable. When either GPS or NTP are enabled and locked, this menu line changes to reflect the status of the external time reference source, and will appear as either:

“UTC DateTime from GPS”

or

“UTC DateTime from NTP”

Definition for:

```
"Format Fixed by Video    nnx  "
```

The options in the field “nnx” for the Video channels are defined by the Video format of the selected Video channel. These options are for information only, and cannot be changed in this menu. Sub-field “nn” describes the frame rate, and “x” describes the scanning system:

e.g. `"Format Fixed by Video    50i  "`
e.g. `"Format Fixed by Video 23.98p  "`

Definition for:

```
"Format            =       nnx  "
```

This menu item allows the user to select the required format for the LTC output they are operating on.

The options in the field “nnx” for the LTC channels are limited to:

“nnx” = "   30p"
“nnx” = "29.97p"
“nnx” = "   25p"
“nnx” = "   24p"
“nnx” = "23.98p"

where sub-field “nn” describes the frame rate, and “x” describes the scanning system.

Definition for:

```
"Running Time     = hh:mm:ss:ff"
```

This menu item displays the current time on the selected Video Output or LTC Timecode channel, or the SPG Time or UTC DateTime menus. This time display includes any offset that has already been entered for that channel.

The field “hh:mm:ss:ff” displays hours, minutes, seconds and frames in the 24-hour format.

Where the Running Time relates to a Video Output or an LTC Timecode channel, the separators between the sub-fields change, depending on the format selection:

Separator	Format
“ ; ”	All 59.94, 47.95 & 29.97 frame rates
“ : ”	All other frame rates

Definition for:

```
"Offset = SPGTime + 00:00:00:00"
```

This menu item allows the user to offset the time on the selected Video or LTC Timecode channel with respect to SPG Time.

The field “00:00:00:00” is used to add / subtract time to / from SPG Time in the selected Video or LTC Timecode channel. The sub-fields in the field “00:00:00:00” represent hours : minutes : seconds : frames. When sub-fields are adjusted, the corresponding fields in “Running Time” reflect the changes.

Only the “seconds” and “frames” sub-fields are editable. A highlight cursor is displayed showing which sub-field is active and hence editable in the field. The “seconds” sub-field is adjustable from -15 to +15. The “frames” sub-field” is adjustable according to the timecode format that is defined by the associated video or, for LTC, defined by the operator.

These sub-fields always display any offset that has been entered by the user.

If the offset time is zero or positive, a plus sign is displayed (as above); if the offset time is negative, a minus sign is displayed.

Definition for:

"Offset = UTC + 00:00:00:00"

This menu item allows the user to offset SPG Time with respect to UTC Time.

This is where the user should enter their current time-zone offset from UTC. This offset should not include any daylight saving offset that may be in force – Daylight Saving adjustments are handled separately (see below).

The field "00:00:00:00" is used to add / subtract time to / from UTC Time in the SPG Time menu. The sub-fields in the field "00:00:00:00" represent hours : minutes : seconds : frames. When sub-fields are adjusted, the corresponding fields in "Running Time" reflect the changes.

Only the "hours" and "minutes" sub-fields are editable. A highlight cursor is displayed showing which sub-field is active and hence editable in the field. The "hours" sub-field is fully adjustable from -12 to +12. The "minutes" sub-field" is only adjustable in 15 minute intervals – this is because the smallest defined increment in the list of global time-zones is 15 minutes.

These sub-fields always display any offset that has been entered by the user.

If the offset time is zero or positive, a plus sign is displayed (as above); if the offset time is negative, a minus sign is displayed.

Definition for:

"Running Time (UTC) hh:mm:ss:ff"

This menu item displays the current time, as received by the GPS system, on the GPS DateTime (UTC) menu. This time only displays when a GPS solution has been found, and the system is locked to the received data.

The field "hh:mm:ss:ff" displays hours, minutes, seconds and frames in the 24-hour format. Note : frames are always displayed as 00, because this information is not included in the GPS data stream.

Definition for:

```
"Nudge              = 00:00:00:00"
```

This menu item allows the user to manually adjust UTC Time (where the SPG is not synchronised to an external time source, such as GPS or NTP, i.e. when neither option is enabled in the "Option Enable" menu).

The field "00:00:00:00" is used to add / subtract time in the UTC DateTime menu. The sub-fields in the field "00:00:00:00" represent hours : minutes : seconds : frames. When sub-fields are adjusted, the corresponding fields in "Running Time" reflect the changes.

Each sub-field (except "frames") is edited individually. A highlight cursor is displayed showing which sub-field is active and hence editable in the field.

UTC time counts continuously. Note that each time the seconds field is nudged, the frames field is reset to zero. This provides an easy way to set the UTC time to be coincident with your temporary reference.

This field always displays zeros in each of the sub-fields.

When GPS or NTP are enabled, the Nudge feature is disabled, and this menu line appears as either:

```
      "Fixed by GPS      = 00:00:00:00"
```

or:

```
      "Fixed by NTP      = 00:00:00:00"
```

Definition for:

```
"Weekday   Date   Month    Year"
```

This menu item allows the user to set or adjust the date parameters for the UTC DateTime menu (where the SPG is not synchronised to an external time source, such as GPS or NTP, i.e. when neither option is enabled in the "Option Enable" menu), or for the Summer DST Event, Winter DST Event or Leap Second Event menus (when in "User Defined" mode).

The field "Weekday" is not adjustable. It is calculated using the settings in the "Date", "Month" and "Year" fields. The options in the field "Weekday" appear as:

Monday through Sunday

The options for the field "Date" are:

1 through 28, 29.30 or 31 according to the setting of the "Month" field

The options for the field "Month" are:

January through December

The options for the field "Year" are:

2000 through 2034	for the Summer DST, Winter DST and Leap Second menus
2007 through 2034	for the UTC DateTime menu

Note : these dates may already have been pre-set using the "Daylight Saving" and "Leap Second" menu options detailed below.

Definition for:

```
"Leap Second      =         Off"
```

The options in this menu line are:

Off
User Defined

If set to “User Defined”, then the time and date will automatically adjust at the time and date set in the Leap Second Event (UTC) menu.

Definition for:

```
"Action DateTime  = hh:mm:ss:ff"
```

This menu items allows the user to set or adjust the time at which a Summer DST Event, a Winter DST Event, or a Leap Second Event occurs.

The field “hh:mm:ss:ff” is used to set the time at which the event happens. The sub-fields in the field “hh:mm:ss:ff” represent hours : minutes : seconds : frames. Sub-fields are adjusted directly, and automatically reflect any changes.

For these menus, only the “hours” sub-field is adjustable. A highlight cursor is displayed showing which sub-field is active and hence editable in the field.

Note : these times may already have been pre-set using the “Daylight Saving” and “Leap Second” menu options detailed below.

Definition for:

```
"Daylight Saving  =         Off"
```

“Daylight Saving” mode should be selected only after setting the required “Country Code”.

The options in this field are:

Off	No daylight saving services are provided by the CY460 SPG.
User Defined	A single spring and autumn daylight saving service is provided.

If set to “User Defined”, then the Video and LTC menu times will automatically adjust at the times and dates set in the Summer DST Event and Winter DST Event menus. Once a spring event is completed, the year of the programmed event is changed to 2035 so that it will never repeat. Once the autumn event is completed, the year of the programmed event is changed to 2035 so that it will never repeat, and the “Daylight Saving” mode is also set to “Off”. To program the next pair of events, set the mode to “User Defined”, and then enter the next pair of times and dates in the Summer DST Event and Winter DST Event menus.

The semi-automated DST support requires the operator to enter location information. A “Country Code” is mandatory to correctly index the required DST information. For Australia, Brazil, Canada and United States of America, you will also be required to enter a “State Code”, as different states may or may not implement DST.

Even if you don’t implement DST, it is still useful to enter your country code, as this informs the CY460 SPG of its location in either the Northern or Southern hemisphere. The menus adjust to the location information. The “Country Code” and “State Code” definitions are detailed below.

Definitions for:

```
"Country Code     =         nnn"
"Description..................."
```

This menu item allows the user to adjust the Country Code to suit the actual location of the CY460 SPG. This should be adjusted before selecting the “Daylight Saving” mode.

The options in the field “nnn” for the Country Code are from ISO 3166-1 Numeric Code:

http://en.wikipedia.org/wiki/ISO_3166-1

The description field displays the ISO 3166-1 English short name**.**

The ISO 3166-1 table is reproduced at the end of this section.

If the selected Country has multiple states that are defined to have differing Daylight Saving criteria, and the CY460 SPG has support for these countries, then the menu items in the following paragraph become available.

Definitions for:

```
"StateCode        =          nn"
"Description..................."
```

This menu pair allows the user to set the geographical State Code of the CY460 SPG, but they only appear in the menu when the preceding menu option regarding “Country Code” is set for a country that has multiple states defined as having differing Daylight Saving criteria.

Some countries span more than one time zone, and in these countries, state codes are useful in defining summer daylight saving time behaviour.

The options in the field “nn” for the state code are from ISO 3166-2:

http://en.wikipedia.org/wiki/ISO_3166-2

The description field displays the ISO 3166-2 Subdivision name**.**

The ISO 3166-2 tables for supported countries are reproduced at the end of this section.

Definitions for:

GPS DateTime (UTC) menu

The menu for GPS DateTime (UTC) is for information only – there are no editable fields. If the GPS option is not enabled, the menu is displayed as:

```
"            GPS DateTime (UTC)"
"GPS option is not enabled....."
"No GPS Time..................."
"                              "
"                              "
"GPS is not being used........."
```

If the GPS option is enabled, the menu reports whether a solution is being searched for:

```
"            GPS DateTime (UTC)"
"Searching for GPS Solution...."
"No GPS Time..................."
"SVs in View = xx   in Fix = xx"
"                              "
"Acquiring GPS Time            "
```

When a GPS solution has been found, the last line changes to report that the GPS system is actively locking to the received satellites:

```
"Acquiring GPS Lock            "
```

When a GPS solution has been found and locked, the current time and date are displayed as received from GPS. Also displayed are the number of detected satellite vehicles (SVs in View), and the number of satellites the GPS system has locked to (SVs in Fix). The last line reports the lock status of the GPS system (see GPS Status in *Section 3.5 : Genlock Menu* for more details). GPS periodically provides time synchronisation with the CY460 SPG, which maintains the count between the synchronisation events by counting field or frame pulses.

```
"            GPS DateTime (UTC)"
"GPS Solution found:           "
"Running Time (UTC) hh:mm:ss:ff"
"SVs in View = xx   in Fix = xx"
"Weekday   Date   Month    Year"
"xLocked to GPS                "
```

If the CY460 SPG is set for a Genlock Mode other than one of the GPS options, the following menu is displayed. The current time and date are displayed as received from GPS. The last line of the menu reports that the selected Genlock Mode is not associated with the GPS system..

```
"            GPS DateTime (UTC)"
"GPS Solution found:           "
"Running Time (UTC) hh:mm:ss:ff"
"SVs in View = xx   in Fix = xx"
"Weekday   Date   Month    Year"
"Locked to Video               "
```

Definitions for:

NTP DateTime (UTC) menu

The menu for NTP DateTime (UTC) is for information only – there are no editable fields. If the NTP option is not enabled, the menu is displayed as:

```
"            NTP DateTime (UTC)"
"NTP option is not enabled     "
"Running Time       xx:xx:xx:xx"
"                              "
"                              "
"Locked to Video               "
```

The sub-fields "xx" in the field Running Time may contain random characters.

If the NTP option is enabled, the status information that the menu reports will depend on the configuration settings made in the NTP sub-menu (-System Setup | Network), e.g., whether the NTP System is turned off:

```
"            NTP DateTime (UTC)"
"NTP Client is turned off      "
"No NTP Time..................."
"                              "
"                              "
"Locked to Video               "
```

or whether a solution is being searched for:

```
"            NTP DateTime (UTC)"
"Searching for NTP Server......"
"No NTP Time..................."
"                              "
"                              "
"Acquiring NTP Time            "
```

When an NTP solution has been found, the current time and date are displayed from the user-defined NTP server. NTP periodically provides time synchronisation with the CY460 SPG, which maintains the count between the synchronisation events by counting field or frame pulses.

```
"            NTP DateTime (UTC)"
"tLocked to NTP                "
"Running Time     = hh:mm:ss:ff"
"-NTP time Uncertainty = nnnnms"
"Weekday   Date   Month    Year"
"tLocked to NTP                "
```

If the CY460 SPG is set for a Genlock Mode other than NTP, the following menu is displayed. The current time and date are displayed as received from NTP. The last line of the menu reports that the selected Genlock Mode is not associated with the NTP system.

```
"            NTP DateTime (UTC)"
"tLocked to NTP                "
"Running Time     = hh:mm:ss:ff"
"-NTP time Uncertainty = nnnnms"
"Weekday   Date   Month    Year"
"Locked to Video               "
```

Definition for:

```
"Analog Ref VITC      hh:mm:ss:ff"
```

This menu line reports a valid VITC time detected from the external Video Reference.

The field “hh:mm:ss:ff” displays hours, minutes, seconds and frames in the 24-hour format.

The separators between the sub-fields change, depending on the detected format:

Separator	Format
“ ; ”	NTSC
“ : ”	PAL

Definition for:

```
"Locked – PAL VITC on line = nn"
```

This menu line reports that the CY460 SPG is genlocked to the external Video Reference, the format of the external Video Reference, and the line on which valid VITC data is present.

The options in the field “– PAL” will depend on the format of the external Video Reference:

–NTSC	for an NTSC Video Reference
– PAL	for a PAL Video Reference

The options in the field “nn” will depend on the format of the external Video Reference:

10 through 20	for NTSC
6 through 22	for PAL

Initially, when VITC data has been found, one of the following menu lines appears momentarily:

```
"PAL VITC found on line    = nn"
"NTSC VITC found on line   = nn"
```

Note : valid VITC data may not be detected if that data is inserted on a field blanking line already occupied by another ancillary signal.

Definition for:

```
"Locked to Video + VITC         "
```

This menu line reports the Lock Status relating to the external Video Reference when it includes a valid VITC signal.

This menu line appears at the end of a successful genlocking sequence.

When an external Video Reference is not present, the following menu line appears:

```
"Genlock ERROR --- No Video Ref"
```

After an external Video Reference with valid VITC data has been applied, the following menu line appears momentarily:

```
"Genlocking....................."
```

If an external Video Reference with no VITC data is present, the following menu line appears:

```
"Locked to Video No VITC......."
```

Definitions for:

```
"No AREF Time.................."
"AREF VITC is not being used..."
```

These alternative menu lines appear when either there is no VITC data on the reference, the Genlock Mode is not set for Video+VITC, or there is no Genlock Video reference at all.

These menu lines report that VITC from the external Video Reference is not being used, even if it is present and valid.

Additional Information for the Summer DST Event (UTC) and Winter DST Event (UTC) menus

If the menu line “Daylight Saving” in the UTC DateTime menu is set to “User Defined”, the time and date fields of these menus can be edited. If the menu line “Daylight Saving” is set to Off, editing is disabled.

The menus for Summer DST Event and Winter DST Event indicate the time and date for the next change in daylight saving time. At the indicated time and date, an hour will be added to or subtracted from SPG Time. For some countries these dates are automated. The dates of a change to or from daylight saving time are dictated well in advance, and by using the “Country Code” in the UTC DateTime menu, these dates are automatically implemented. As an example:

EU Daylight Saving:

This applies to most states in Europe, even those not in the European Economic Union (EU). Note: In the United Kingdom, Daylight Saving Time is referred to as British Summer Time (BST).

Summer Time Rule:

Start: Last Sunday in March
End: Last Sunday in October
Time: 1.00 am (01:00) Greenwich Mean Time (GMT)

Equation used to calculate the beginning of European Summer Time:

Sunday (31 - (5*y/4 + 4) mod 7) March at 01.00 UTC

Equation used to calculate the end of European Summer Time:

Sunday (31 - (5*y/4 + 1) mod 7) October at 01.00 UTC

For 2012 the menu settings for European summer time are:

```
"         Summer DST Event (UTC)"
"                                "
"                                "
"Action DateTime  = 01:00:00:00"
"Sunday    25     March    2012"
```

Additional Information for the Leap Second Event (UTC) menu.

If the menu line “Leap Second” in the UTC DateTime menu is set to User Defined, the time and date fields of this menu can be edited. If the menu line “Leap Second” is set to Off, editing is disabled. If the menu line “Leap Second” is set to “Auto from GPS” , the time and date of the event is automatically determined via the GPS connection.

The menu for Leap Second Event (UTC) indicates the time and date for the next addition or subtraction of a Leap Second. At the indicated time and date, a second will be added to or subtracted from UTC Time. See previous paragraphs regarding editing of the available menu lines.

This is an unusual event - UTC Time is being modified.

Leap Seconds event:

http://en.wikipedia.org/wiki/Leap_second

The Leap Second event is not regular; indeed it is usually only decided a few months in advance when a Leap Second is to be added. For this reason it is not possible for all versions of the CY460 SPG software to have the time and date of the next event coded into the software. Historically the Earth’s spin is slowing down but some scientists think that global warming may make the Earths spin increase. In this case, Leap Seconds would occasionally need to be subtracted.

When a positive leap second is added at 23:59:60:00 UTC, it delays the start of the following UTC day (at 00:00:00:00 UTC) by one second, effectively delaying the UTC clock.

Announcement of Leap Seconds:

The International Earth Rotation and Reference Systems Service (IERS) announces the insertion of a Leap Second whenever the difference between UTC and UT1 approaches 0.6 s, to keep the difference between UTC and UT1 from exceeding 0.9 s. IERS publishes announcements every six months, detailing whether Leap Seconds are to occur or not, in its "Bulletin C". Such announcements are typically published well in advance of each possible Leap Second date - usually in early January for June 30 and in early July for December 31. Because the Earth's rotation rate is unpredictable in the long term, it is not possible to predict the need for them more than six months in advance.

For 2012, there was a Leap Second event, and the menu would have looked like this:

```
"       Leap Second Event (UTC)"
"                               "
"                               "
"Action DateTime  = 00:00:00:00"
"Saturday  30      June    2012"
```

Leap Seconds have been added since 1972:

Year	Jun 30	Dec 31		Year	Jun 30	Dec 31		Year	Jun 30	Dec 31
1971	----	----		1987	0	+1		2003	0	0
1972	+1	+1		1988	0	0		2004	0	0
1973	0	+1		1989	0	+1		2005	0	+1
1974	0	+1		1990	0	+1		2006	0	0
1975	0	+1		1991	0	0		2007	0	0
1976	0	+1		1992	+1	0		2008	0	+1
1977	0	+1		1993	+1	0		2009	0	0
1978	0	+1		1994	+1	0		2010	0	0
1979	0	+1		1995	0	+1		2011	0	0
1980	0	0		1996	0	0		2012	+1	0
1981	+1	0		1997	+1	0		2013	0	0
1982	+1	0		1998	0	+1		2014	0	
1983	+1	0		1999	0	0		2015		
1984	0	0		2000	0	0		2016		
1985	+1	0		2001	0	0		2017		
1986	0	0		2002	0	0		2018		

Semi automated support for Leap Seconds is built-in until 2034.

The operator programs in a UTC date and UTC time at which the Leap Second event is required. On this date, at this time, a Leap Second is automatically added. International convention is that Leap Seconds are added, so the time sequence is:

23 : 59 : 59 UTC
23 : 59 : 60 UTC
00 : 00 : 00 UTC
00 : 00 : 01 UTC

In a television station, 00:00:00 UTC might be in the middle of your busy schedule. If this is so, you can choose another UTC time at which to action the Leap Second; for instance at 02:00:00 UTC the following morning. Only the date and hour at which the Leap Second occurs is programmable. These dates are input as UTC so you may have to take account of your time zone and daylight saving status.

Once the Leap Second event occurs, all the subsequent timecodes are recalculated so that they will also have moved by one second. Subsequent Leap Seconds can be added by the operator as they are announced.

Useful resources:

You can sign up for an email notification of the next leap second at:
http://hpiers.obspm.fr/eop-pc/index.php?index=bulletins&lang=en

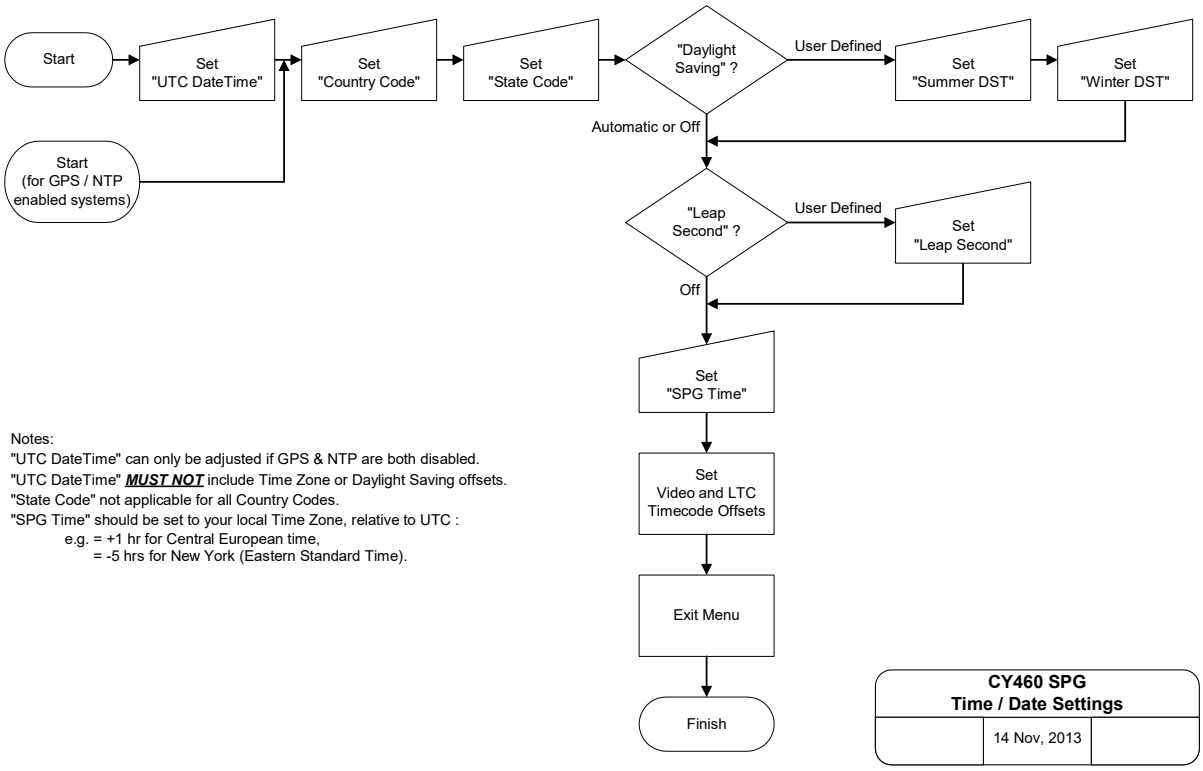


Figure 3.2 : CY460 SPG – Setting Time and Date Parameters

ISO 3166-1 Country Code list

English short name	Alpha-2 code	Alpha-3 code	Numeric code	ISO 3166-2 codes
Afghanistan	AF	AFG	004	ISO 3166-2:AF
Åland Islands	AX	ALA	248	ISO 3166-2:AX
Albania	AL	ALB	008	ISO 3166-2:AL
Algeria	DZ	DZA	012	ISO 3166-2:DZ
American Samoa	AS	ASM	016	ISO 3166-2:AS
Andorra	AD	AND	020	ISO 3166-2:AD
Angola	AO	AGO	024	ISO 3166-2:AO
Anguilla	AI	AIA	660	ISO 3166-2:AI
Antarctica	AQ	ATA	010	ISO 3166-2:AQ
Antigua and Barbuda	AG	ATG	028	ISO 3166-2:AG
Argentina	AR	ARG	032	ISO 3166-2:AR
Armenia	AM	ARM	051	ISO 3166-2:AM
Aruba	AW	ABW	533	ISO 3166-2:AW
Australia	AU	AUS	036	ISO 3166-2:AU
Austria	AT	AUT	040	ISO 3166-2:AT
Azerbaijan	AZ	AZE	031	ISO 3166-2:AZ
Bahamas	BS	BHS	044	ISO 3166-2:BS
Bahrain	BH	BHR	048	ISO 3166-2:BH
Bangladesh	BD	BGD	050	ISO 3166-2:BD
Barbados	BB	BRB	052	ISO 3166-2:BB
Belarus	BY	BLR	112	ISO 3166-2:BY
Belgium	BE	BEL	056	ISO 3166-2:BE
Belize	BZ	BLZ	084	ISO 3166-2:BZ
Benin	BJ	BEN	204	ISO 3166-2:BJ
Bermuda	BM	BMU	060	ISO 3166-2:BM
Bhutan	BT	BTN	064	ISO 3166-2:BT
Bolivia, Plurinational State of	BO	BOL	068	ISO 3166-2:BO
Bonaire, Saint Eustatius and Saba	BQ	BES	535	ISO 3166-2:BQ
Bosnia and Herzegovina	BA	BIH	070	ISO 3166-2:BA
Botswana	BW	BWA	072	ISO 3166-2:BW
Bouvet Island	BV	BVT	074	ISO 3166-2:BV
Brazil	BR	BRA	076	ISO 3166-2:BR
British Indian Ocean Territory	IO	IOT	086	ISO 3166-2:IO
Brunei Darussalam	BN	BRN	096	ISO 3166-2:BN
Bulgaria	BG	BGR	100	ISO 3166-2:BG
Burkina Faso	BF	BFA	854	ISO 3166-2:BF
Burundi	BI	BDI	108	ISO 3166-2:BI
Cambodia	KH	KHM	116	ISO 3166-2:KH
Cameroon	CM	CMR	120	ISO 3166-2:CM
Canada	CA	CAN	124	ISO 3166-2:CA
Cape Verde	CV	CPV	132	ISO 3166-2:CV
Cayman Islands	KY	CYM	136	ISO 3166-2:KY
Central African Republic	CF	CAF	140	ISO 3166-2:CF
Chad	TD	TCD	148	ISO 3166-2:TD
Chile	CL	CHL	152	ISO 3166-2:CL
China	CN	CHN	156	ISO 3166-2:CN

Christmas Island	CX	CXR	162	ISO 3166-2:CX
Cocos (Keeling) Islands	CC	CCK	166	ISO 3166-2:CC
Colombia	CO	COL	170	ISO 3166-2:CO
Comoros	KM	COM	174	ISO 3166-2:KM
Congo	CG	COG	178	ISO 3166-2:CG
Congo, the Democratic Republic of the	CD	COD	180	ISO 3166-2:CD
Cook Islands	CK	COK	184	ISO 3166-2:CK
Costa Rica	CR	CRI	188	ISO 3166-2:CR
Côte d'Ivoire	CI	CIV	384	ISO 3166-2:CI
Croatia	HR	HRV	191	ISO 3166-2:HR
Cuba	CU	CUB	192	ISO 3166-2:CU
Curaçao	CW	CUW	531	ISO 3166-2:CW
Cyprus	CY	CYP	196	ISO 3166-2:CY
Czech Republic	CZ	CZE	203	ISO 3166-2:CZ
Denmark	DK	DNK	208	ISO 3166-2:DK
Djibouti	DJ	DJI	262	ISO 3166-2:DJ
Dominica	DM	DMA	212	ISO 3166-2:DM
Dominican Republic	DO	DOM	214	ISO 3166-2:DO
Ecuador	EC	ECU	218	ISO 3166-2:EC
Egypt	EG	EGY	818	ISO 3166-2:EG
El Salvador	SV	SLV	222	ISO 3166-2:SV
Equatorial Guinea	GQ	GNQ	226	ISO 3166-2:GQ
Eritrea	ER	ERI	232	ISO 3166-2:ER
Estonia	EE	EST	233	ISO 3166-2:EE
Ethiopia	ET	ETH	231	ISO 3166-2:ET
Falkland Islands (Malvinas)	FK	FLK	238	ISO 3166-2:FK
Faroe Islands	FO	FRO	234	ISO 3166-2:FO
Fiji	FJ	FJI	242	ISO 3166-2:FJ
Finland	FI	FIN	246	ISO 3166-2:FI
France	FR	FRA	250	ISO 3166-2:FR
French Guiana	GF	GUF	254	ISO 3166-2:GF
French Polynesia	PF	PYF	258	ISO 3166-2:PF
French Southern Territories	TF	ATF	260	ISO 3166-2:TF
Gabon	GA	GAB	266	ISO 3166-2:GA
Gambia	GM	GMB	270	ISO 3166-2:GM
Georgia	GE	GEO	268	ISO 3166-2:GE
Germany	DE	DEU	276	ISO 3166-2:DE
Ghana	GH	GHA	288	ISO 3166-2:GH
Gibraltar	GI	GIB	292	ISO 3166-2:GI
Greece	GR	GRC	300	ISO 3166-2:GR
Greenland	GL	GRL	304	ISO 3166-2:GL
Grenada	GD	GRD	308	ISO 3166-2:GD
Guadeloupe	GP	GLP	312	ISO 3166-2:GP
Guam	GU	GUM	316	ISO 3166-2:GU
Guatemala	GT	GTM	320	ISO 3166-2:GT
Guernsey	GG	GGY	831	ISO 3166-2:GG
Guinea	GN	GIN	324	ISO 3166-2:GN
Guinea-Bissau	GW	GNB	624	ISO 3166-2:GW
Guyana	GY	GUY	328	ISO 3166-2:GY

Haiti	HT	HTI	332	ISO 3166-2:HT
Heard Island and McDonald Islands	HM	HMD	334	ISO 3166-2:HM
Holy See (Vatican City State)	VA	VAT	336	ISO 3166-2:VA
Honduras	HN	HND	340	ISO 3166-2:HN
Hong Kong	HK	HKG	344	ISO 3166-2:HK
Hungary	HU	HUN	348	ISO 3166-2:HU
Iceland	IS	ISL	352	ISO 3166-2:IS
India	IN	IND	356	ISO 3166-2:IN
Indonesia	ID	IDN	360	ISO 3166-2:ID
Iran, Islamic Republic of	IR	IRN	364	ISO 3166-2:IR
Iraq	IQ	IRQ	368	ISO 3166-2:IQ
Ireland	IE	IRL	372	ISO 3166-2:IE
Isle of Man	IM	IMN	833	ISO 3166-2:IM
Israel	IL	ISR	376	ISO 3166-2:IL
Italy	IT	ITA	380	ISO 3166-2:IT
Jamaica	JM	JAM	388	ISO 3166-2:JM
Japan	JP	JPN	392	ISO 3166-2:JP
Jersey	JE	JEY	832	ISO 3166-2:JE
Jordan	JO	JOR	400	ISO 3166-2:JO
Kazakhstan	KZ	KAZ	398	ISO 3166-2:KZ
Kenya	KE	KEN	404	ISO 3166-2:KE
Kiribati	KI	KIR	296	ISO 3166-2:KI
Korea, Democratic People's Republic of	KP	PRK	408	ISO 3166-2:KP
Korea, Republic of	KR	KOR	410	ISO 3166-2:KR
Kuwait	KW	KWT	414	ISO 3166-2:KW
Kyrgyzstan	KG	KGZ	417	ISO 3166-2:KG
Lao People's Democratic Republic	LA	LAO	418	ISO 3166-2:LA
Latvia	LV	LVA	428	ISO 3166-2:LV
Lebanon	LB	LBN	422	ISO 3166-2:LB
Lesotho	LS	LSO	426	ISO 3166-2:LS
Liberia	LR	LBR	430	ISO 3166-2:LR
Libyan Arab Jamahiriya	LY	LBY	434	ISO 3166-2:LY
Liechtenstein	LI	LIE	438	ISO 3166-2:LI
Lithuania	LT	LTU	440	ISO 3166-2:LT
Luxembourg	LU	LUX	442	ISO 3166-2:LU
Macao	MO	MAC	446	ISO 3166-2:MO
Macedonia, the former Yugoslav Republic of	MK	MKD	807	ISO 3166-2:MK
Madagascar	MG	MDG	450	ISO 3166-2:MG
Malawi	MW	MWI	454	ISO 3166-2:MW
Malaysia	MY	MYS	458	ISO 3166-2:MY
Maldives	MV	MDV	462	ISO 3166-2:MV
Mali	ML	MLI	466	ISO 3166-2:ML
Malta	MT	MLT	470	ISO 3166-2:MT
Marshall Islands	MH	MHL	584	ISO 3166-2:MH
Martinique	MQ	MTQ	474	ISO 3166-2:MQ
Mauritania	MR	MRT	478	ISO 3166-2:MR
Mauritius	MU	MUS	480	ISO 3166-2:MU
Mayotte	YT	MYT	175	ISO 3166-2:YT
Mexico	MX	MEX	484	ISO 3166-2:MX

Micronesia, Federated States of	FM	FSM	583	ISO 3166-2:FM
Moldova, Republic of	MD	MDA	498	ISO 3166-2:MD
Monaco	MC	MCO	492	ISO 3166-2:MC
Mongolia	MN	MNG	496	ISO 3166-2:MN
Montenegro	ME	MNE	499	ISO 3166-2:ME
Montserrat	MS	MSR	500	ISO 3166-2:MS
Morocco	MA	MAR	504	ISO 3166-2:MA
Mozambique	MZ	MOZ	508	ISO 3166-2:MZ
Myanmar	MM	MMR	104	ISO 3166-2:MM
Namibia	NA	NAM	516	ISO 3166-2:NA
Nauru	NR	NRU	520	ISO 3166-2:NR
Nepal	NP	NPL	524	ISO 3166-2:NP
Netherlands	NL	NLD	528	ISO 3166-2:NL
New Caledonia	NC	NCL	540	ISO 3166-2:NC
New Zealand	NZ	NZL	554	ISO 3166-2:NZ
Nicaragua	NI	NIC	558	ISO 3166-2:NI
Niger	NE	NER	562	ISO 3166-2:NE
Nigeria	NG	NGA	566	ISO 3166-2:NG
Niue	NU	NIU	570	ISO 3166-2:NU
Norfolk Island	NF	NFK	574	ISO 3166-2:NF
Northern Mariana Islands	MP	MNP	580	ISO 3166-2:MP
Norway	NO	NOR	578	ISO 3166-2:NO
Oman	OM	OMN	512	ISO 3166-2:OM
Pakistan	PK	PAK	586	ISO 3166-2:PK
Palau	PW	PLW	585	ISO 3166-2:PW
Palestinian Territory, Occupied	PS	PSE	275	ISO 3166-2:PS
Panama	PA	PAN	591	ISO 3166-2:PA
Papua New Guinea	PG	PNG	598	ISO 3166-2:PG
Paraguay	PY	PRY	600	ISO 3166-2:PY
Peru	PE	PER	604	ISO 3166-2:PE
Philippines	PH	PHL	608	ISO 3166-2:PH
Pitcairn	PN	PCN	612	ISO 3166-2:PN
Poland	PL	POL	616	ISO 3166-2:PL
Portugal	PT	PRT	620	ISO 3166-2:PT
Puerto Rico	PR	PRI	630	ISO 3166-2:PR
Qatar	QA	QAT	634	ISO 3166-2:QA
Réunion	RE	REU	638	ISO 3166-2:RE
Romania	RO	ROU	642	ISO 3166-2:RO
Russian Federation	RU	RUS	643	ISO 3166-2:RU
Rwanda	RW	RWA	646	ISO 3166-2:RW
Saint Barthélemy	BL	BLM	652	ISO 3166-2:BL
Saint Helena, Ascension and Tristan da Cunha	SH	SHN	654	ISO 3166-2:SH
Saint Kitts and Nevis	KN	KNA	659	ISO 3166-2:KN
Saint Lucia	LC	LCA	662	ISO 3166-2:LC
Saint Martin (French part)	MF	MAF	663	ISO 3166-2:MF
Saint Pierre and Miquelon	PM	SPM	666	ISO 3166-2:PM
Saint Vincent and the Grenadines	VC	VCT	670	ISO 3166-2:VC
Samoa	WS	WSM	882	ISO 3166-2:WS
San Marino	SM	SMR	674	ISO 3166-2:SM

Sao Tome and Principe	ST	STP	678	ISO 3166-2:ST
Saudi Arabia	SA	SAU	682	ISO 3166-2:SA
Senegal	SN	SEN	686	ISO 3166-2:SN
Serbia	RS	SRB	688	ISO 3166-2:RS
Seychelles	SC	SYC	690	ISO 3166-2:SC
Sierra Leone	SL	SLE	694	ISO 3166-2:SL
Singapore	SG	SGP	702	ISO 3166-2:SG
Sint Maarten (Dutch part)	SX	SXM	534	ISO 3166-2:SX
Slovakia	SK	SVK	703	ISO 3166-2:SK
Slovenia	SI	SVN	705	ISO 3166-2:SI
Solomon Islands	SB	SLB	090	ISO 3166-2:SB
Somalia	SO	SOM	706	ISO 3166-2:SO
South Africa	ZA	ZAF	710	ISO 3166-2:ZA
South Georgia and the South Sandwich Islands	GS	SGS	239	ISO 3166-2:GS
Spain	ES	ESP	724	ISO 3166-2:ES
Sri Lanka	LK	LKA	144	ISO 3166-2:LK
Sudan	SD	SDN	736	ISO 3166-2:SD
Suriname	SR	SUR	740	ISO 3166-2:SR
Svalbard and Jan Mayen	SJ	SJM	744	ISO 3166-2:SJ
Swaziland	SZ	SWZ	748	ISO 3166-2:SZ
Sweden	SE	SWE	752	ISO 3166-2:SE
Switzerland	CH	CHE	756	ISO 3166-2:CH
Syrian Arab Republic	SY	SYR	760	ISO 3166-2:SY
Taiwan, of China	TW	TWN	158	ISO 3166-2:TW
Tajikistan	TJ	TJK	762	ISO 3166-2:TJ
Tanzania, United Republic of	TZ	TZA	834	ISO 3166-2:TZ
Thailand	TH	THA	764	ISO 3166-2:TH
Timor-Leste	TL	TLS	626	ISO 3166-2:TL
Togo	TG	TGO	768	ISO 3166-2:TG
Tokelau	TK	TKL	772	ISO 3166-2:TK
Tonga	TO	TON	776	ISO 3166-2:TO
Trinidad and Tobago	TT	TTO	780	ISO 3166-2:TT
Tunisia	TN	TUN	788	ISO 3166-2:TN
Turkey	TR	TUR	792	ISO 3166-2:TR
Turkmenistan	TM	TKM	795	ISO 3166-2:TM
Turks and Caicos Islands	TC	TCA	796	ISO 3166-2:TC
Tuvalu	TV	TUV	798	ISO 3166-2:TV
Uganda	UG	UGA	800	ISO 3166-2:UG
Ukraine	UA	UKR	804	ISO 3166-2:UA
United Arab Emirates	AE	ARE	784	ISO 3166-2:AE
United Kingdom	GB	GBR	826	ISO 3166-2:GB
United States	US	USA	840	ISO 3166-2:US
United States Minor Outlying Islands	UM	UMI	581	ISO 3166-2:UM
Uruguay	UY	URY	858	ISO 3166-2:UY
Uzbekistan	UZ	UZB	860	ISO 3166-2:UZ
Vanuatu	VU	VUT	548	ISO 3166-2:VU
Venezuela, Bolivarian Republic of	VE	VEN	862	ISO 3166-2:VE
Viet Nam	VN	VNM	704	ISO 3166-2:VN
Virgin Islands, British	VG	VGB	092	ISO 3166-2:VG

Virgin Islands, U.S.	VI	VIR	850	ISO 3166-2:VI
Wallis and Futuna	WF	WLF	876	ISO 3166-2:WF
Western Sahara	EH	ESH	732	ISO 3166-2:EH
Yemen	YE	YEM	887	ISO 3166-2:YE
Zambia	ZM	ZMB	894	ISO 3166-2:ZM
Zimbabwe	ZW	ZWE	716	ISO 3166-2:ZW

We will endeavour to keep this list updated in future versions of the software.

ISO 3166-2 State Code lists

Some countries stretch across more than one time zone (longitude) and over a wide geographic latitude. In these countries state codes are useful in defining summer daylight saving time behaviour. Currently the CY460 SPG supports three countries with subdivisions. These are Australia, Canada and USA. We will add more state codes in future versions of software.

Listed below are details relating to the ISO 3166-2 State Codes of countries supported by the CY460 SPG.

Australia:

Code	Subdivision name	SPG Offset	Daylight Saving
AU-NSW	New South Wales	+10	YES
AU-QLD	Queensland	+10	NO
AU-SA	South Australia	+9	YES
AU-TAS	Tasmania	+10	YES
AU-VIC	Victoria	+10	YES
AU-WA	Western Australia	+8	NO
AU-ACT	Australian Capital Territory	+10	YES
AU-NT	Northern Territory	+9	NO
AU-AS	Ashmore and Cartier Islands	+0	YES
AU-CR	Coral Sea Islands	+0	YES

Canada:

Map of Canada with each territory labelled with the second part of its ISO 3166-2 code.

Code	Subdivision name (en)	Subdivision name (fr)	SPG Offset	Daylight Saving
CA-AB	Alberta	Alberta	-7	YES
CA-BC	British Columbia	Colombie-Britannique	-8	YES
CA-MB	Manitoba	Manitoba	-6	YES
CA-NB	New Brunswick	Nouveau-Brunswick	-4	YES
CA-NL	Newfoundland and Labrador	Terre-Neuve-et-Labrador	-4	YES
CA-NS	Nova Scotia	Nouvelle-Écosse	-4	YES
CA-ON	Ontario	Ontario	-5	YES
CA-PE	Prince Edward Island	Île-du-Prince-Édouard	-4	YES
CA-QC	Quebec	Québec	-5	YES
CA-SK	Saskatchewan	Saskatchewan	-6	NO
CA-NT	Northwest Territories	Territoires du Nord-Ouest	-7	YES
CA-NU	Nunavut	Nunavut	-5	YES
CA-YT	Yukon Territory [note 1]	Territoire du Yukon	-8	YES

China:

Code	Subdivision name	SPG Offset	Daylight Saving
CN-11	Beijing		
CN-50	Chongqing		
CN-31	Shanghai		
CN-12	Tianjin		
CN-34	Anhui		
CN-35	Fujian		
CN-62	Gansu		
CN-44	Guangdong		
CN-52	Guizhou		
CN-46	Hainan		
CN-13	Hebei		
CN-23	Heilongjiang		
CN-41	Henan		
CN-42	Hubei		
CN-43	Hunan		
CN-32	Jiangsu		
CN-36	Jiangxi		
CN-22	Jilin		
CN-21	Liaoning		
CN-63	Qinghai		
CN-61	Shaanxi		
CN-37	Shandong		
CN-14	Shanxi		
CN-51	Sichuan		
CN-71	Taiwan		
CN-53	Yunnan		
CN-33	Zhejiang		
CN-45	Guangxi		
CN-15	Nei Mongol (mn)		
CN-64	Ningxia		
CN-65	Xinjiang		
CN-54	Xizang		
CN-91	Xianggang (zh), Hong Kong (en)		
CN-92	Aomen (zh), Macao (en)		

Russia:

Code	Subdivision name 1	SPG Offset	Daylight Saving
RU-AD	Adygeya, Respublika		
RU-AL	Altay, Respublika		
RU-BA	Bashkortostan, Respublika		
RU-BU	Buryatiya, Respublika		
RU-CE	Chechenskaya Respublika		
RU-CU	Chuvashskaya Respublika		
RU-DA	Dagestan, Respublika		
RU-IN	Ingushetiya, Respublika		
RU-KB	Kabardino-Balkarskaya Respublika		
RU-KL	Kalmykiya, Respublika		
RU-KC	Karachayevo-Cherkesskaya Respublika		
RU-KR	Kareliya, Respublika		
RU-KK	Khakasiya, Respublika		
RU-KO	Komi, Respublika		
RU-ME	Mariy El, Respublika		
RU-MO	Mordoviya, Respublika		
RU-SA	Sakha, Respublika [Yakutiya]		
RU-SE	Severnaya Osetiya-Alaniya, Respublika		
RU-TA	Tatarstan, Respublika		
RU-TY	Tyva, Respublika [Tuva]		
RU-UD	Udmurtskaya Respublika		
RU-ALT	Altayskiy kray		
RU-KAM	Kamchatskiy kray		
RU-KHA	Khabarovskiy kray		
RU-KDA	Krasnodarskiy kray		
RU-KYA	Krasnoyarskiy kray		
RU-PER	Permskiy kray		
RU-PRI	Primorskiy kray		
RU-STA	Stavropol'skiy kray		
RU-ZAB	Zabaykal'skiy kray		
RU-AMU	Amurskaya		
RU-ARK	Arkhangel'skaya		
RU-AST	Astrakhanskaya		
RU-BEL	Belgorodskaya		
RU-BRY	Bryanskaya		
RU-CHE	Chelyabinskaya		
RU-IRK	Irkutskaya		
RU-IVA	Ivanovskaya		
RU-KGD	Kaliningradskaya		
RU-KLU	Kaluzhskaya		

RU-KEM	 Kemerovskaya		
RU-KIR	 Kirovskaya		
RU-KOS	 Kostromskaya		
RU-KGN	 Kurganskaya		
RU-KRS	 Kurskaya		
RU-LEN	 Leningradskaya		
RU-LIP	 Lipetskaya		
RU-MAG	 Magadanskaya		
RU-MOS	 Moskovskaya		
RU-MUR	 Murmanskaya		
RU-NIZ	 Nizhegorodskaya		
RU-NGR	 Novgorodskaya		
RU-NVS	 Novosibirskaya		
RU-OMS	 Omskaya		
RU-ORE	 Orenburgskaya		
RU-ORL	 Orlovskaya		
RU-PNZ	 Penzenskaya		
RU-PSK	 Pskovskaya		
RU-ROS	 Rostovskaya		
RU-RYA	 Ryazanskaya		
RU-SAK	 Sakhalinskaya		
RU-SAM	 Samarskaya		
RU-SAR	 Saratovskaya		
RU-SMO	 Smolenskaya		
RU-SVE	 Sverdlovskaya		
RU-TAM	 Tambovskaya		
RU-TOM	 Tomskaya		
RU-TUL	 Tul'skaya		
RU-TVE	 Tverskaya		
RU-TYU	 Tyumenskaya		
RU-ULY	 Ul'yanovskaya		
RU-VLA	 Vladimirskaya		
RU-VGG	 Volgogradskaya		
RU-VLG	 Vologodskaya		
RU-VOR	 Voronezhskaya		
RU-YAR	 Yaroslavskaya		
RU-MOW	 Moskva		
RU-SPE	 Sankt-Peterburg		
RU-YEV	 Yevreyskaya		
RU-CHU	 Chukotskiy		
RU-KHM	Khanty-Mansiyskiy		
RU-NEN	Nenetskiy		
RU-YAN	Yamalo-Nenetskiy		

USA:

Map of the United States with each state and the District of Columbia labelled with the second part of its ISO 3166-2 code.

Code	Subdivision name	SPG Offset	Daylight Saving
US-AL	Alabama	-6	YES
US-AK	Alaska	-9	YES
US-AZ	Arizona	-7	YES
US-AR	Arkansas	-6	YES
US-CA	California	-8	YES
US-CO	Colorado	-7	YES
US-CT	Connecticut	-5	YES
US-DE	Delaware	-5	YES
US-FL	Florida	-5	YES
US-GA	Georgia	-5	YES
US-HI	Hawaii	-10	YES
US-ID	Idaho	-7	YES
US-IL	Illinois	-6	YES
US-IN	Indiana	-5	YES
US-IA	Iowa	-6	YES
US-KS	Kansas	-6	YES
US-KY	Kentucky	-5	YES
US-LA	Louisiana	-6	YES
US-ME	Maine	-5	YES
US-MD	Maryland	-5	YES
US-MA	Massachusetts	-5	YES
US-MI	Michigan	-5	YES
US-MN	Minnesota	-6	YES
US-MS	Mississippi	-6	YES
US-MO	Missouri	-6	YES
US-MT	Montana	-7	YES
US-NE	Nebraska	-6	YES
US-NV	Nevada	-8	YES
US-NH	New Hampshire	-5	YES
US-NJ	New Jersey	-5	YES

US-NM	 New Mexico	-7	YES
US-NY	 New York	-5	YES
US-NC	 North Carolina	-5	YES
US-ND	 North Dakota	-6	YES
US-OH	 Ohio	-5	YES
US-OK	 Oklahoma	-6	YES
US-OR	 Oregon	-7	YES
US-PA	 Pennsylvania	-5	YES
US-RI	 Rhode Island	-5	YES
US-SC	 South Carolina	-5	YES
US-SD	 South Dakota	-6	YES
US-TN	 Tennessee	-5	YES
US-TX	 Texas	-6	YES
US-UT	 Utah	-7	YES
US-VT	 Vermont	-5	YES
US-VA	 Virginia	-5	YES
US-WA	 Washington	-8	YES
US-WV	 West Virginia	-5	YES
US-WI	 Wisconsin	-6	YES
US-WY	 Wyoming	-7	YES
US-DC	 District of Columbia	-5	YES
US-AS	 American Samoa		
US-GU	 Guam		
US-MP	 Northern Mariana Islands		
US-PR	 Puerto Rico		
US-UM	United States Minor Outlying Islands		
US-VI	 Virgin Islands, U.S.		

3.5 Genlock Menu

The CY460 SPG has a very stable 10MHz internal oscillator. The CY460 SPG can free-run on this 10MHz reference and maintain long term stability.

Alternatively, the CY460 SPG can genlock to an NTSC, PAL or Tri-Sync video reference. In this mode, the long term stability is defined by the external reference.

In a third mode the CY460 SPG can frequency lock to a reference from an external oscillator. Again, in this mode, the long term stability is defined by the external oscillator.

In a fourth mode the CY460 SPG can genlock to a reference from GPS, with the 10MHz internal oscillator being disciplined by the GPS system.

When locked to a Composite or Tri-Sync video signal, the lock will be frequency and phase related.

When locked to an external oscillator, the lock will be frequency related only.

When locking to GPS, the lock mode can be selected. The options are:

Frequency lock
Frequency and Phase lock

Genlocking to an external video reference

The CY460 SPG genlocks to an external video reference in the following manner. As soon as a video reference is applied, it is evaluated, usually within 2 seconds, and, if valid, the genlock system performs an initial “quick-lock” to quickly achieve field and line lock. Then, a “slow-lock” is performed in order to achieve subcarrier lock, and ultimately Sc-H lock. Both of these lock modes are designed to “glide” the CY460 SPG video output(s) smoothly towards the required lock point.

For situations where the reference and the SPG output are quite close to each other timing-wise, this genlocking process may happen quite quickly, within a few seconds or so. At other times, especially when a PAL reference is four fields removed from the required lock point, the process to complete the full genlock process may take as long as 15 seconds.

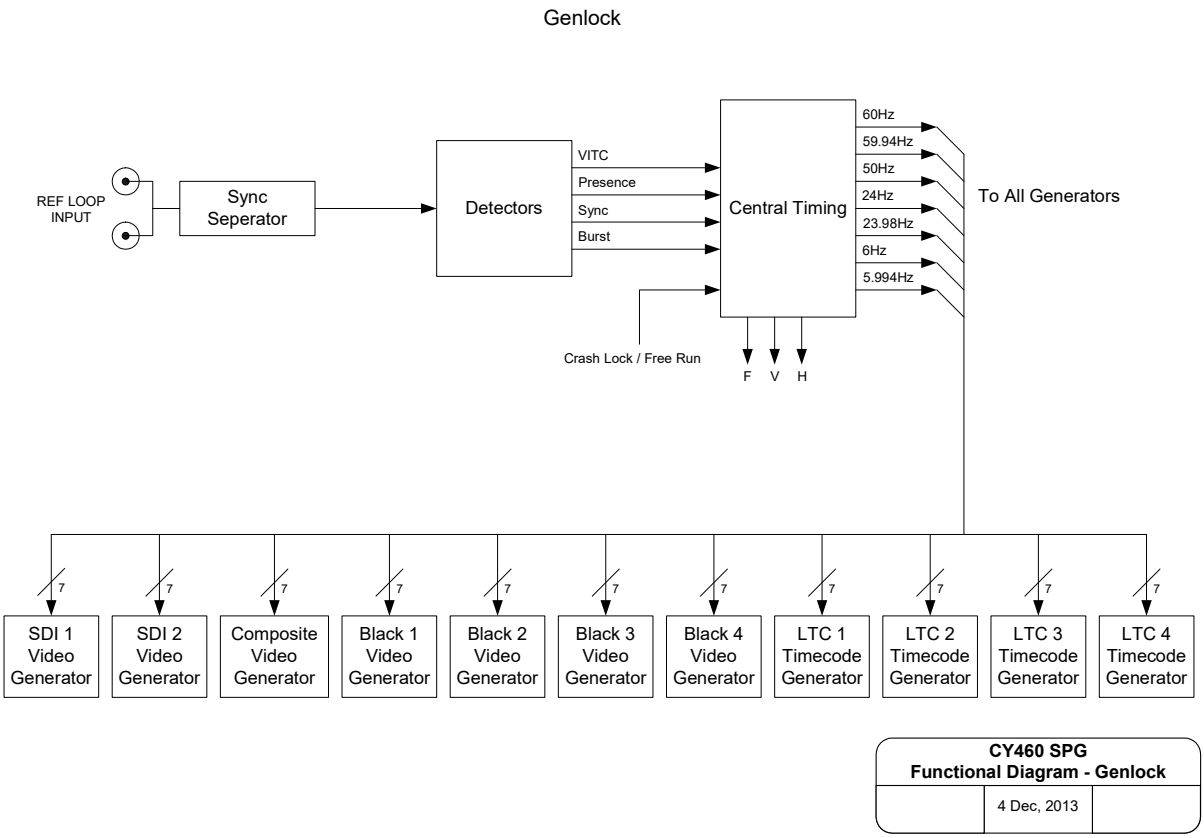


Figure 3.3 : CY460 – Genlock to External Video Reference.

The Genlock Menu appears below:

```
"Lock Mode    =          xxx"
"Unlock Mode  =          xxx"
"-Lock Status =          xxx"
"-Ref  Signal =          xxx"
"-GPS  Status =          xxx"
"-NTP  Status =          xxx"
"-VITC Status =          xxx"
"-MHz Status  =          xxx"
```

The top 2 lines are user selectable; all other lines are displayed for information only.

Definitions for:

```
"Lock Mode =                xxx"
```

This menu line allows the user to select the required genlock mode of the CY460 SPG.

The options in the field “xxx” are:

Internal Lock	Lock to the internal 10MHz oscillator.
Genlock	Lock to an external CVBS Video signal.
Genlock+VITC	Lock to VITC on an external CVBS Video signal.
MHz Lock	Lock to an external frequency reference signal.
GPS F+Phase Lock	\ Lock to a GPS signal from a connected antenna.
GPS Freq Lock	/

The “GPS” Lock options are only available when this option is enabled.

Definitions for:

```
"UnLock Mode =              xxx"
```

This menu line allows the user to select the required action when reference is restored in gunlock mode.

The options in the field “xxx” are:

Internal Lock	Lock to the internal 10MHz oscillator.
Relock	ReLock to external reference.

Definition for:

```
"-Lock Status =              xxx"
```

This menu line reports the status of the Genlock system.

For Video and Frequency Lock Modes, the options in the field “xxx” will appear as:

Internal Lock
Lost Lock
Locking
Locked
Locked to 10MHz

“Internal Lock” appears under two conditions:
when the CY460 SPG is set for Lock Mode = Internal Lock, and
when Lock Mode = Genlock(+VITC) and the external video reference is absent.

“Lost Lock” appears when the CY460 SPG detects that the external genlock video reference has changed, is missing, or is of an un-recognised format.

“Locking” is displayed while the CY460 SPG is actively genlocking to the external genlock video reference.

“Locked” is displayed when the CY460 SPG has successfully genlocked to the external genlock video reference.

“Locked to 10MHz” is displayed while the CY460 SPG has locked to the external 10MHz frequency reference.

Additional options will appear in this field, mirroring a subset of the field options detailed in the following definitions.

Definition for:

```
"-Ref  Signal =            xxx"
```

If an external genlock reference is present, details regarding the format of the reference are displayed in this menu line.

The options in the field “xxx” will appear as:

```
"       No signal"
"525 NTSC59.94i  "
"625  PAL   50i  "
"720        60p  "
"720     59.94p  "
"720        50p  "
"720        30p  "
"720     29.97p  "
"720        25p  "
"720        24p  "
"720     23.98p  "
"1080       60p  "
"1080    59.94p  "
"1080       50p  "
"1080       30p  "
"1080    29.97p  "
"1080       25p  "
"1080       24p  "
"1080    23.98p  "
"1080       60i  "
"1080    59.94i  "
"1080       50i  "
```

While the CY460 SPG is actively evaluating the external reference format, an additional option will appear in this field. This option appears as:

```
"  Unknown format"
```

The following genlock reference formats are not supported by the CY460 SPG:

```
"1080       48i  "
"1080    47.95i  "
"1080       48p  "
"1080    47.95p  "
"1080       24psf"
"1080    23.98psf"
```

The following genlock reference formats are reported as detailed below:

```
"1035       60i  "      as    "1080       60i  "
"1035    59.94i  "      as    "1080    59.94i  "
"1080       30psf"      as    "1080       60i  "
"1080    29.97psf"      as    "1080    59.94i  "
"1080       25psf"      as    "1080       50i  "
```

Definition for:

```
"-GPS  Status =              xxx"
```

This menu line reports the status of the GPS system.

The options in the field “xxx” will appear as:

Option is Off
Acquiring GPS
tLocked to GPS
iLocked to GPS
aLocked to GPS
pLocked to GPS

“Option is Off” appears when the GPS Option is not enabled.

“Acquiring GPS” is displayed when the CY460 SPG is actively searching for satellites and locking to the time information within the GPS signal.

“xLocked to GPS” (where x = t, i, a or p) is displayed when the CY460 SPG has successfully locked to the pre-selected mode of GPS Locking (the display progresses in sequence, as listed):

tLocked to GPS	GPS Time Locked
iLocked to GPS	Basic Frequency acquired
aLocked to GPS	Better Frequency acquired
pLocked to GPS	GPS Phase Locked

Definition for:

```
"-NTP  Status =              xxx"
```

This menu line reports the status of the NTP system.

The options in the field “xxx” will appear as:

Option is Off
NTP is Off
Acquiring NTP
tLocked to NTP
Server Mode

“Option is Off” is displayed when the NTP Option is not enabled.

“NTP is Off” is displayed when NTP Option has been enabled, but is set to be neither a Client nor a Server.

“Acquiring NTP” is displayed when the CY460 SPG is actively searching for and time-locking to NTP information from a remote server.

“tLocked to NTP” is displayed when the CY460 SPG has successfully time-locked to a remote NTP Server.

“Server Mode” is displayed when the CY460 SPG is configured to be an NTP Server.

Definition for:

```
"-VITC Status =              xxx"
```

This menu line reports the status of the VITC system.

The options in the field “xxx” will appear as:

Ignoring VITC
Start VITC loop
Searching VITC
VITC Found
Locking to VITC
tLocked to VITC

“Ignoring VITC” appears when the Lock Mode is not Genlock+VITC, and indicates that there is no VITC to search for or lock to.

“Start VITC loop” appears briefly as the Lock Mode is set to Genlock+VITC.

“Searching VITC” appears while the CY460 SPG is searching for a valid VITC signal.

“VITC found” appears briefly when the CY460 SPG has found a valid VITC signal.

“Locking to VITC” appears while the CY460 SPG is actively genlocking to the VITC signal.

“tLocked to VITC” appears when the CY460 SPG has successfully genlocked to the VITC signal.

If you have more than 1 valid genlock reference source available or connected to lock to, the Lock Status setting will follow a hierarchy to lock to the most suitable reference.

i.e. GPS Locking has priority over Genlock+VITC Locking.

Additionally, the current Lock Status is reported on the bottom line of the Logo and Time stand-by screens on the Front Panel Display.

3.6 System Setup Menu

The System Setup Menu appears below:

```
"System Setup Menu             "
"-Temp   Report   Menu Enter ->"
"-Event  Report   Menu Enter ->"
"-System Report   Menu Enter ->"
"-GPS    Report   Menu Enter ->"
"-Configuration   Menu Enter ->"
"-Network         Menu Enter ->"
"-Option Enable   Menu Enter ->"
"-Calibration     Menu Enter ->"
"-LipSync Report  Menu Enter ->"
```

When the GPS option is not installed/enabled, the "GPS Report" line appears as:

```
"-GPS........Option not enabled"
```

The System Setup Menu provides a gateway to the less frequently used options in the CY460 SPG.

These options include:

Extended information in the form of reports,
Extended configuration options,
Access to factory settings that the user should never have to access or adjust, but may contain useful information to communicate to the factory during a service event.

Note: "Reports" contain information only; there are no editable fields in these menus.

Temperature Report

The Temperature Report appears below (general form):

```
"Temperature    Now   Max   Min"
"+3v3 Regulator                "
"+1v2 Regulator                "
"N+1 Interface                 "
"N+1 Left  PSU                 "
"N+1 Right PSU                 "
"L PSU turned on nnnnnn times  "
"L PSU on for hhhhhh.ddd hours "
"R PSU turned on nnnnnn times  "
"R PSU on for hhhhhh.ddd hours "
```

The Temperature Report provides information on the temperature sensors within the CY460 SPG. A typical example might look like:

```
"+3v3 Regulator 42   45    41  "
```

Depending on the exact configuration and options in the CY460 SPG, only those sensors that are detected will be displayed.

Definitions for:

```
"L PSU turned on nnnnnn times  "
"L PSU on for hhhhhh.ddd hours "
"R PSU turned on nnnnnn times  "
"R PSU on for hhhhhh.ddd hours "
```

These menu lines report the power cycle counts and “in service” times for both of the PSUs installed in the N+1 Dual Redundant PSU CY460D SPG.

When there is only one PSU, as in the single PSU variant of the frame, the CY460 SPG, these menu lines appear as:

```
"PSU turned on nnnnnn times    "
"PSU on for hhhhhh.ddd hours   "
```

The sub-field “nnnnnn” is a numerical count of the number of times the respective PSU has been power cycled.

The sub-field “hhhhhh.ddd” is a numerical count of the number of hours the respective PSU has been powered, where “hhhhhh” displays whole hours, and “ddd” displays fractions of an hour to 3 decimal places.

Because the temperature report includes not only the current, minimum and maximum temperatures detected by the installed temperature sensors, but also power supply “in-service” data, this information is useful if you are experiencing reliability problems in an extreme environment.

Event Report

The Event Report appears below (example form):

```
"Event Menu                    "
"Ev     50 EthernetLinkMade    "
"23.59.59.999 12 September 2012"
"Ev     18 NewMaxTemp0         "
"23.59.59.999 12 September 2012"
"Ev      1 PowerOn             "
"23.59.59.999 12 September 2012"
```

The Event Report provides access to the last 99 events recorded by the CY460 SPG. These events may relate to normal expected functionality or to systemic errors. This information might be useful in monitoring and diagnosing a system problem outside the CY460 SPG, or a reliability problem within the CY460 SPG.

Definitions for:

```
"Ev  nnnnn NewMinTempAlarm0    "
"23.59.59.999 01 September 2012"
```

This menu row pair provides details of the reported event.

The first row provides an event number and the description of the event.
The second row provides the event time expressed as hours : minutes : seconds : milliseconds, and the event date.

The most recent event is always displayed at the top of the menu.

A large number of different events can potentially be reported. A small relevant number are currently reported.

The current list of possible reportable events is:

```
//Event type
EventDefault
EventPowerOn
EventWatchdogReturn
EventLVDReturn

EventPowerOff
EventLVDEvent

EventSetUTCTimeFromGPS
EventGPSTimeLost

EventSetUTCTimeFromNTP
EventNTPTimeLost

EventLeftPSUfail
EventLeftPSUreturn
EventRightPSUfail
EventRightPSUreturn

EventPSULCDCancelManual
EventPSULCDCancelAuto
EventPSULCDRepeatManual
EventPSULCDRepeatAuto
```

```
EventNewMaxTemp0
EventNewMaxTemp1
EventNewMaxTemp2
EventNewMaxTemp3
EventNewMaxTemp4
EventNewMaxTemp5
EventNewMaxTemp6
EventNewMaxTemp7

EventNewMaxTempAlarm0
EventNewMaxTempAlarm1
EventNewMaxTempAlarm2
EventNewMaxTempAlarm3
EventNewMaxTempAlarm4
EventNewMaxTempAlarm5
EventNewMaxTempAlarm6
EventNewMaxTempAlarm7

EventNewMinTemp0
EventNewMinTemp1
EventNewMinTemp2
EventNewMinTemp3
EventNewMinTemp4
EventNewMinTemp5
EventNewMinTemp6
EventNewMinTemp7

EventNewMinTempAlarm0
EventNewMinTempAlarm1
EventNewMinTempAlarm2
EventNewMinTempAlarm3
EventNewMinTempAlarm4
EventNewMinTempAlarm5
EventNewMinTempAlarm6
EventNewMinTempAlarm7

EventEthernetLinkMade
EventEthernetLinkLost

EventGPSSetTimecodeFromGPSFlag
EventGPSUnSetTimecodeFromGPSFlag
```

System Report

The System Report appears below:

```
"CY460 SPG      xxx.xxx.xxx.xxx"
"Ethernet  100Mbps  Full Duplex"
"ArmFile_0x00200000_vxx_xxx.ata"
"XilFile_0x30000000_vxx_xxx.ata"
"PatFile_0x34000000_vxx_xxx.ata"
"LogFile --------- none present"
"BMPFile --------- none present"
"AudFile --------- none present"
"Bootware vxxxxxSoftware vxxxxx"
"Hardware vxxxx Firmware vxxxx "
```

The System Report provides complete version information for the hardware, firmware and software elements that make up the CY460 SPG.

Definition for:

```
"CY460 SPG      xxx.xxx.xxx.xxx"
```

This menu line reports the user programmed Ethernet IP Address of the CY460 SPG (see "Network Menu" below for user configuration details).

The options in the sub-fields "xxx" appear as:

"xxx" = 0 through 255

Definition for:

```
"Ethernet  100Mbps  Full Duplex"
```

This menu line reports the detailed Ethernet link status of the CY460 SPG.

The options in the first sub-field appear as:

"Blank"
10Mbps
100Mbps

The options in the second sub-field appear as:

No link
Full Duplex
Half Duplex

Additionally, the current Ethernet link status is reported on the bottom line of the Logo or Time stand-by screens on the Front Panel Display.

Definition for:

"ArmFile_0x00200000_vxx_xxx.ata"

The Arm File menu line is in the form:

"ArmFile_0x00200000_vxx_xxx.ata".

The sub-field “0x00200000” is the load address.
The sub-field “vxx_xxx” is the version number.

Updates of this file may be uploaded via the Ethernet interface using the procedure outlined in *Section 2.4 : Software Field Upgrade*.

Note : this file is same as the “Software” file detailed below.

Definition for:

"XilFile_0x30000000_vxx_xxx.ata"

The Xilinx File menu line is in the form:

"XilFile_0x30000000_vxx_xxx.ata".

The sub-field “0x30000000” is the load address.
The sub-field “vxx_xxx” is the version number.

Updates of this file may be uploaded via the Ethernet interface using the procedure outlined in *Section 2.4 : Software Field Upgrade*.

Definition for:

"PatFile_0x34000000_vxx_xxx.ata"

The Pattern File menu line is in the form:

"PatFile_0x34000000_vxx_xxx.ata".

The sub-field “0x34000000” is the load address.
The sub-field “vxx_xxx” is the version number.

Updates of this file may be uploaded via the Ethernet interface using the procedure outlined in *Section 2.4 : Software Field Upgrade*.

Definition for:

```
"LogFile --------- none present"
```

This menu line reports whether there is a user-uploaded Bitmap Logo file stored in the CY460 SPG.

If the Bitmap Logo file is absent or empty, the menu line appears as above.

If there is a valid Bitmap Logo file present, this menu line appears as:

```
"LogFile_0x38000000__xx_xx_.ata"
```

The sub-field “0x38000000” is the load address.
The sub-field “xx_xx” is the version number.

Definition for:

```
"BMPFile --------- none present"
```

This menu line reports whether there is a user-uploaded Image file stored in the CY460 SPG.

If the Image file is absent or empty, the menu line appears as above.

If there is a valid Image file present, this menu line appears as:

```
"BMPFile_0xyy000000__xx_xx_.ata"
```

The sub-field “0xyy000000” is the load address.
The sub-field “xx_xx” is the version number.

Definition for:

```
"AudFile --------- none present"
```

This menu line reports whether there is a user-uploaded Audio Literal file stored in the CY460 SPG.

If the Audio Literal file is absent or empty, the menu line appears as above.

If there is a valid Audio Literal file present, this menu line appears as:

```
"AudFile_0xyy000000__xx_xx_.ata"
```

The sub-field “0xyy000000” is the load address.
The sub-field “xx_xx” is the version number.

Definition for:

```
"Bootware vxxxxxSoftware vxxxxx"
```

The “Bootware vxxxxx” field indicates the bootware version in use. This is not usually modified by field upgrades as it relates to the motherboard bootware components in the CY460 SPG.

The “Software vxxxxx” field indicates the software version in use. This can be modified in the field when new versions of the software are uploaded via the Ethernet interface

Definition for:

```
"Hardware vxxxx Firmware vxxxx "
```

The “Hardware vxxxx” field indicates the hardware version in use. This is not usually modified by field upgrades as it relates to the motherboard hardware components in the CY460 SPG.

The “Firmware vxxxx” field indicates the firmware version in use. This is not usually modified by field upgrades as it relates to the motherboard firmware components in the CY460 SPG.

GPS Report

The GPS Report appears below:

```
"SVs in  Fix     = nn"
"GPS SVs in view = nn"
"GLO SVs in view = nn"
"Leapsecond pend = No"
"Lxx SV = mm                  "
"Lxx SV = mm                  "
```

The GPS Report displays information regarding the current status of the GPS system. Access to this report will only be possible if the GPS option has been installed and enabled.

The CY460 SPG GPS system is currently capable of detecting satellites from both the American GPS (Global Positioning System) and the Russian GLONASS (GLObal NAvigation Satellite System) systems. The GPS Report always lists the American GPS satellites before the Russian GLONASS satellites.

The information that appears in this report consists of a list of detected satellite vehicles (SV) and their signal-to-noise ratio (SNR). Note : SNR is not defined for the GLONASS satellite system. Additionally, a “map” is displayed (currently only on the Front Panel LCD) showing a graphical representation of the satellite locations in the sky.

Definition for:

```
"GPS Report  Fix = yy         "
```

The sub-field “yy” in this menu line indicates the total number of satellites currently being detected, and appears as:

00 through 24

Definitions for:

```
"Pxx SV = mm SNR = nn          "
"Lxx SV = mm                   "
```

The menu lines starting with “P” and “L” represent which satellite system is being referred to:

P	for the American GPS system
L	for the Russian GLONASS system

The first sub-field “xx” is used to chronologically index the list of detected satellites, and has the following value range:

“xx” = 01 through 12	for both systems

The second sub-field “mm” indicates the assigned PRN of the satellite vehicle, and has the following value ranges:

“mm” = 01 through 32	for the American GPS system
“mm” = 65 through 88	for the Russian GLONASS system
“mm” = xx	for a non-detected satellite

The third sub-field “nn” indicates the signal-to-noise ratio of the received signal from the satellite vehicle, and has the following value range:

“nn” = 00 through 58	for the American GPS systems
“nn” = xx	for a non-detected satellite

See http://www.ni.com/white-paper/7189/en/ for more detailed information.

Configuration Menu

The Configuration Menu appears below:

```
"Configuration Menu            "
"Changeover        =    Primary"
"LCD Brightness    =        48%"
"LCD Flash on Error=        xxx"
"LCD Animation     =        xxx"
"LCD Timecode      =        xxx"
"AES1-8 + Analog   = Composite1"
"Pulse 1   =              xxxxx"
"Pulse 2   =              xxxxx"
"Pulse 3   =              xxxxx"
"10MHz Mode=                xxx"
"Balanced Pins  3+  4-  =  xxxx"
"Balanced Pins  5+  6-  =  xxxx"
"Balanced Pins  7+  8-  =  xxxx"
"Balanced Pins  9+ 10-  =  xxxx"
"Balanced Pins 11+ 12-  =  xxxx"
"Balanced Pins 13+ 14-  =  xxxx"
"Balanced Pins 15+ 16-  =  xxxx"
"Balanced Pins 17+ 18-  =  xxxx"
"-Balanced Pins 19+ 20- =  AES2"
"-Balanced Pins 21+ 22- =  AES1"
"-Balanced Pins 23+ 24- =  DARS”
```

The Configuration Menu provides access to a range of features that determine the functionality of the CY460 SPG not otherwise covered by other menu settings. These options are typically set up during the system commissioning of the CY460 SPG, and thereafter are unlikely to be changed.

Definition for:

```
"Changeover        =    Primary"
```

The options in the sub-field appear as:

Primary
Backup

The CY460 SPG can be installed with a partner CY460 SPG and a CY465 Changeover unit. In this configuration, one of the CY460 SPGs is defined as PRIMARY and the other as BACKUP. This menu row item allows the selection of PRIMARY or BACKUP. The polarity of the ONAIR tally is also controlled by this selection.

Definition for:

```
"LCD Brightness    =        48%"
```

This menu row allows the user to select the best LCD display parameters for the ambient lighting conditions.

The options are:

0% through 100% in 16 steps.

Definition for:

```
"LCD Flash on Error     =        xxx"
```

This menu row allows the user to select the LCD and Button to Flash or not when an error is reported.

The options are:

Off	No Flash
On	LCD & Select Button Flash when errors are reported

Definition for:

```
"LCD Animation     =        xxx"
```

This menu row allows the user to select the animation mode on the LCD. When the Timecode screen is selected, the display will be either static, or will cycle alternately with the Logo screen.

The options are:

Off	No animation
On	Animation when display is left in Timecode screen

Definition for:

```
"LCD Timecode     =        xxx"
```

This menu row allows the user to select the Time to display on the LCD. When the Timecode screen is selected, the display will be show the Time Selected

The options are:

SDI1
SDI2
SDI3
SDI4
Composite1
Black 1
TriBlack 2
TriBlack 3
TriBlack 4
LTC1
LTC2
LTC3
LTC4
SPG Time
UTC Time
GPS Time

Definition for:

```
"AES1-8 + Analog   = Composite1"
```

This menu item allows the user to select the appropriate video from which the AES and Analog Audio are referenced. This is usually only relevant where lip-sync test pattern elements are being used.

The options are:

SDI1
SDI2
Composite1

Definitions for:

```
"Pulse 1   =              xxxxx"
"Pulse 2   =              xxxxx"
"Pulse 3   =              xxxxx"
```

This menu row triplet allows the user to select which pulse type appears on the rear panel BNCs of the multifunction sub-module.

Note: options 1 through 7 produce pulses determined by the format of the CVBS output.

The options in the field “xxxxx” are:

1. Mixed Sync
2. Mixed Blanking
3. Burst Gate
4. PAL Square
5. Line Drive
6. Field Drive
7. F1/L7 or F1/L10
8. 6Hz/30Hz
9. 6Hz/29.97Hz
10. Word Clock 48KHz
11. Word Clock 44.1KHz
12. 0
13. 0
14. 0
15. 0
16. 1

Definition for:

```
"10MHz Mode=                xxx"
```

The CY460 SPG can lock to an external 10MHz reference. This reference can be sine, square or pseudo-sine. It is passed to the CY460 SPG main module via the multifunction sub-module.

The CY460 SPG generates its own 10MHz with pseudo-sine wave output.

There is a changeover relay on the sub-module within the CY460 SPG selecting either the CY460 SPG generated 10MHz or the external 10MHz. This is used to allow 10MHz to be passed to other external equipment if the CY460 SPG is powered down either purposefully or due to failure.

This menu item selects the operation mode of the 10MHz relay. The options are:

1. External
2. Internal
3. Automatic

Definition for:

```
"Balanced Pins  3+  4-  =  xxxx" --- Programmable
"Balanced Pins  5+  6-  =  xxxx" --- Programmable
"Balanced Pins  7+  8-  =  xxxx" --- Programmable
"Balanced Pins  9+ 10-  =  xxxx" --- Programmable
"Balanced Pins 11+ 12-  =  xxxx" --- Programmable
"Balanced Pins 13+ 14-  =  xxxx" --- Programmable
"Balanced Pins 15+ 16-  =  xxxx" --- Programmable
"Balanced Pins 17+ 18-  =  xxxx" --- Programmable
"-Balanced Pins 19+ 20- =  AES2" --- Fixed as AES2
"-Balanced Pins 21+ 22- =  AES1" --- Fixed as AES1
"-Balanced Pins 23+ 24- =  DARS" --- Fixed as DARS
```

These menu rows allow the user to select which balanced signal types appear on the rear panel 30-pin Molex Microclasp connector of the multifunction sub-module. Any of the following signal types may be selected on any programmable balanced pin output pair, i.e. all 8 programmable outputs may be the same signal, or may be all different, etc.

The options in the field “xxxx” are:

1. LTC 1
2. LTC 2
3. LTC 3
4. LTC 4
5. AES 1
6. AES 2
7. AES 3
8. AES 4
9. AES 5
10. AES 6
11. AES 7
12. AES 8
13. DARS

Network Menu

The Network Menu appears below:

```
"Network Menu                    "
"IP Address     000.000.000.000"
"SubNet Mask    000.000.000.000"
"Gateway        000.000.000.000"
"-MAC Address    0000.0000.0000"
"-NTP             Menu Enter ->"
"-PTP             Menu Enter ->"
"-DashBoard       Menu Enter ->"
"-Backup device   Menu Enter ->"
"-SNMP             Menu Enter ->"
```

When the NTP option is not enabled, the “NTP Menu Enter ->” line appears as:

```
"-NTP........Option not enabled"
```

The Network Menu, and the associated sub-menus, allows the user to configure and control the behaviour of the Ethernet system within the CY460 SPG.

Before proceeding, the user must contact their Network Administrator, and obtain suitable IP addresses, etc., that will need to be programmed within this menu.

Definition for:

```
"IP Address     000.000.000.000"
```

This menu line allows the user to enter the pre-determined IP address of the CY460 SPG.

The options in the sub-fields “000” are:

000 through 255. “000” is the default “no action” setting.

To change the settings:

pressing the rotary control advances through each sub-field,
rotating the rotary control changes the value of the currently selected sub-field.

Definition for:

```
"SubNet Mask    000.000.000.000"
```

This menu line allows the user to enter the pre-determined SubNet Mask address of the CY460 SPG

The options in the sub-fields “000” are:

000 through 255. “000” is the default “no action” setting.

To change the settings:

pressing the rotary control advances through each sub-field,
rotating the rotary control changes the value of the currently selected sub-field.

Definition for:

```
"Gateway         000.000.000.000"
```

This menu line allows the user to enter the pre-determined Gateway address of the CY460 SPG. Typically, this might be the IP address of a network hub to which the CY460 SPG is connected.

The options in the sub-fields “000” are:

000 through 255.	“000” is the default “no action” setting.

To change the settings:

pressing the rotary control advances through each sub-field,
rotating the rotary control changes the value of the currently selected sub-field.

Definition for:

```
"-MAC Address    0000.0000.0000"
```

This menu line displays the MAC Address (Media Access Control), a unique, read-only identifier assigned to network interfaces for communications on the physical network segment.

This menu item cannot be changed – the MAC address is stored in a hardware device - and is unique to each CY460 SPG.

Definitions for:

```
"-NTP             Menu Enter ->"
"-PTP             Menu Enter ->"
"-DashBoard       Menu Enter ->"
"-Backup device   Menu Enter ->"
"-SNMP             Menu Enter ->"
```

These menu lines provides access to subsequent menu levels, as indicated. These are defined in the following paragraphs.

NTP Menu

The NTP Menu appears below:

```
"NTP    Menu        hh:mm:ss:ff"
"The NTP system is          off"
"                              "
"                              "
"                              "
"                              "
```

The NTP Menu allows the user to configure the Ethernet port to provide (Server Mode) or request (Client Mode) time information using Network Time Protocol. Access to this menu will only be possible if the NTP option has been enabled.

Definition for:

```
"NTP    Menu        hh:mm:ss:ff"
```

This menu line reports the current NTP time.

The field “hh:mm:ss:ff” displays hours, minutes, seconds and frames in the 24-hour format.

If the NTP Client system has yet to receive a valid time, the menu line appears as:

```
"NTP    Menu        No NTP time"
```

Definition for:

```
"The NTP system is          off"
```

This menu line allows to user to control whether the CY460 SPG is configured to be an NTP Client or NTP Server, or whether the NTP System is Off.

The options in this menu line appear as:

```
"The NTP system is          off"
"This is an NTP.........Client"
"This is an NTP .........Server"
```

Definition for Client Mode:

```
"NTP    Menu        hh:mm:ss:ff"
"This is an NTP.........Client"
"Find server on 000.000.000.000"
"Poll Server every     240 secs"
"-Poll Status = tLocked to  NTP"
"-NTP time Uncertainty = nnnnms"
```

Sub-definition for:

```
"Find server on 000.000.000.000"
```

This menu line allows the user to define the IP address of a remote Web-based NTP Server from which the CY460 SPG will periodically request time information. The address can be changed to one preferred by the user.

The options in the sub-fields “000” are:

000 through 255. “000” is the default “no action” setting.

To change the settings:

pressing the rotary control advances through each sub-field,
rotating the rotary control changes the value of the currently selected sub-field.

Sub-definition for:

```
"Poll Server every     240 secs"
```

This menu line allows the user to set the interval (in seconds) at which the CY460 SPG requests NTP time information from the specified time server.

The options in the sub-field “240” are:

Never
60 secs
2 / 5 / 10 / 30 / 60 minutes
2 / 4 / 8 hours

When the Poll Interval is set to “Never”, the menu line appears as:

```
"Poll Server....        ...Never"
```

On initial power-up, the CY460 SPG will poll the NTP Server every 10 seconds until a reply is received, and then drop back to the user-selected value as programmed in this menu sub-field.

Sub-definition for:

```
"-Poll Status = xxxxxxxxxxxxxx"
```

This menu line reports the current poll status of the designated NTP Server address.

Initially, the sub field “xxxxxxxxxxxxxx” will report that the CY460 SPG is currently waiting for replies from the designated NTP Server:

```
"-Poll Status = Acquiring   NTP"
```

When replies from the designated NTP Server produce consistently accurate time stamps, the sub-field will change to:

```
"-Poll Status = tLocked to  NTP"
```

During NTP acquisition, the following menu line appears below the Poll Status line:

```
"-Unlocked Poll every  010 secs"
```

This menu line reports the polling interval when the NTP Server is being actively polled during initial acquisition. The interval of 10 seconds should ensure that at least one reply will be found very quickly, After a reply has been received, the polling interval drops back to the user setting made in the menu entry “Poll Server every 240 secs” above, and the following menu line appears.

Sub-definition for:

```
"-NTP time Uncertainty = nnnnms"
```

This menu line reports the average variation in successive NTP replies.

Definition for Server Mode:

```
"This is an NTP.........Server"
"Serve NTP if 'No GPS'?.....xxx"
"Serve NTP if 'SPG Failed'?.xxx"
"                              "
"                              "
"                              "
```

Sub-Definition for:

```
"Serve NTP if 'No GPS'?.....xxx"
```

This menu line determines whether the CY460 SPG will serve NTP requests when the GPS option is either not enabled or is not locked.

The options in the sub-field “xxx” are:

No	NTP Server will not reply to NTP requests while GPS is disabled.
Yes	NTP Server will reply to NTP requests while GPS is disabled.

When set for “Yes”, NTP time will be used to serve time requests for a limited time, after which NTP time requests will be ignored.

Sub-Definition for:

```
"Serve NTP if 'SPG Failed'?.xxx"
```

This menu line determines whether the CY460 SPG will serve NTP requests while an accompanying Changeover unit has detected an error on the unit.

The options in the sub-field “xxx” are:

No	NTP Server will not reply to NTP requests while the SPG has ‘failed’.
Yes	NTP Server will reply to NTP requests while the SPG has ‘failed’.

PTP Menu

The PTP Menu appears below:

```
"The PTP system is.....off"
```

This is a Future Option

DashBoard Menu

The DashBoard Menu appears below:

```
"DashBoard                    "
"Port                      nnnn"
"Enable Automatic Discovery=xxx"
"Connection URM - yyyyyyyyyyyyy"
"Character             nn = nnn"
"DashBoard Password = Alpha----"
```

The DashBoard Menu displays information relating to communications between the CY460 SPG and the external PC-based Remote Control Program.

Definition for:

```
"Port                      nnnn"
```

This menu line allows the user to set the Ethernet Port through which the CY460 SPG communicates with the external PC-based Remote Control Program.

The options in the sub-field “nnnn” are:

5253 (default)
6666

Definition for:

```
"Enable Automatic Discovery=xxx"
```

This menu line allows the user to select if Dashboard can automatically discover the device.

The options in the sub-field “xxx” are:

```
"Enable Automatic Discovery= No"
```
(default)

~~"Enable Automatic Discovery=Yes"~~

Definition for:

```
"Connection URM - yyyyyyyyyyyyy"
```

This menu line allows to user to control whether the Dashboard User Rights Management (URM) is used.

The options in this menu line appear as:

```
"Connection URM - Not supported"
"Connection URM - Unconditional"
"Connection URM -       Managed"
```

Definitions for:

```
"Character              mm = yyy"
"DashBoard Password = Alpha----"
```

These menu lines only appear when the “Connection URM” menu line is set for “Managed”.

This menu doublet allows the user to select and edit the Dashboard password.

The options in the field “mm” are:

“mm” = 01 through 09.

There are a maximum of 9 characters in the password. “mm” selects which character is ‘active’ and hence editable in the menu.

In the selected `"DashBoard Password = Alpha----"` line, as “mm” is changed, a cursor gives a visual indication of which character is active.

The options in the field “yyy” are:

“yyy” = any valid alpha-numeric character from the lists below:

	“Space”
Numeric:	0123456789
Uppercase:	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Lowercase:	abcdefghijklmnopqrstuvwxyz

The first non-alpha-numeric character terminates the password. The only character available to do this is the space character, which is accessed by rotating the control fully anti-clockwise. The edited password is applied as the menu is exited.

Notes :

- After adjusting the field “yyy”, use the Escape/Back button to select the next character to edit, then press Select to edit the next character, etc.
- When using the available front panel controls, editing of the characters in the Dashboard Password is performed in “Overtype” mode, i.e., it is not possible to “Insert” or “Delete” characters.
- When you edit a pre-programmed Dashboard Password, start from character position 1; do not use spaces between the characters (see above); overtype with spaces (char.#32) any extraneous characters at the end of the password.

Backup Device Menu

The Backup Device Menu appears below:

```
"Poll the Primary SPG on...... "
"IP Address     000.000.000.000"
"SubNet Mask    000.000.000.000"
"Poll is disabled............."
"This is PRIMARY..so never poll"
"                               "
```

The Backup Device Menu is only used when the CY460 SPG is set to be the Backup unit in a Changeover pair.

Definition for:

```
"Poll the Primary SPG on...... "
```

This menu line informs the user that these menu items relate to the Primary CY460 SPG of the Changeover pair.

Definitions for:

```
"IP Address     000.000.000.000"
"SubNet Mask    000.000.000.000"
```

These menu lines allow the user to set the IP and SubNet Mask addresses for the Primary CY460 SPG of the Changeover pair.

The options in all menu sub-fields “000” are:

000 through 255. “000” is the default “no action” setting.

To change the settings:

pressing the rotary control advances through each sub-field,
rotating the rotary control changes the value of the currently selected sub-field.

Definition for:

```
"Poll is disabled..............."
```

This menu line appears if the CY460 SPG is set as the Primary unit in a Changeover pair. It informs the user that the CY460 SPG is the Primary unit of a Changeover pair, and consequently, polling (of the remote device) is disabled.

When the CY460 SPG is set as the Backup unit in a Changeover pair, this menu line appears as:

```
"Poll every            nnn secs"
```

This menu line enables the user to set the Polling Interval (in seconds).

The options in the field “nnn” are:

010 through 240 or “…Never”

Definition for:

```
"This is PRIMARY..so never poll"
```

This menu line appears if the CY460 SPG is set as the Primary unit in a Changeover pair. It informs the user that the CY460 SPG is the Primary unit of a Changeover pair, and consequently, polling (of the remote device) is disabled.

When the CY460 SPG is set as the Backup unit in a Changeover pair, this menu line appears either as:

```
"-Completed Polls        = nnn"
```

The field “nnn” will increment in conjunction with the number of successful polls of the Primary unit.

or as :

```
"-Completed Polls             "
```

The field “= nnn” is blank if the previous line regarding the Polling Interval is set for “Never”.

SNMP Menu

The SNMP Menu appears below:

```
"SNMP Mode                =      xxxx"
"-SysContact          -
      "Description"
"-Sys Name            -"
      "Description"
"-Sys Description     -"
      "Description"
"-Sys Location        -“
      "Description"
"SNMP Trap Mode               =      xxxx"
      "Description"
      "Description"
```

Option Enable Menu

The Option Menu appears below:

```
"Option Menu                    "
"Key            00000-0000-0000"
"TB              xxxx-xxxx-xxxx"
"HD  Enable?  No 0000:0000:0000"
"3G  Enable?  No 0000:0000:0000"
"NTP Enable?  No 0000:0000:0000"
"GPS Enable?  No 0000:0000:0000"
```

The Option Menu allows the user to enable options designed into the CY460 SPG. Authorised users enter Option Update Keys, supplied only after consultation with Courtyard Electronics Limited.

IMPORTANT

Option Update Keys are in the form of a 12-character string. Each key is completely unique to a specified option in a particular CY460 SPG. Keys will not work for other options on the same CY460 SPG, nor for any option on any other CY460 SPG.

Remember to store these keys in a safe place – you may need to re-enter them if a system error necessitates a system reconfiguration.

Definition for:

```
"Key            00000-0000-0000"
```

Every time the CY460 is powered up, this entry displays a pseudo-randomly generated 13-character key.

This menu item cannot be changed by the user. This key is unique to each CY460 SPG, and should be quoted when requesting any additional Option Enable Keys.

Definitions for:

```
"TB               xxxx-xxxx-xxxx"
"HD  Enable?  No 0000:0000:0000"
"3G  Enable?  No 0000:0000:0000"
"GPS Enable?  No 0000:0000:0000"
"NTP Enable?  No 0000:0000:0000"
```

These menu lines allow the user to either view the Option Keys, or to input supplied Option Update Key(s) in order to enable the related option(s). Updates can be performed "live" – there is usually no requirement to re-boot or re-power the unit after key entry.

These menu lines will contain non-zero entries. For invalid keys, these will be factory default values, and will be confirmed by the " : " between the character groups. For valid keys, the character groups will be separated by " – ".

The Timeable Black ("TB") Option is always enabled, is not changeable, and will always contain character groups separated by " – ".

These menu lines are always set to "No" upon entry – it requires a conscious action on the part of the user to set the option to "Yes" and thereby enable Option Update Key editing.

To enter an Option Update Key, highlight the line for which you have a key, and press the rotary control. The cursor moves to the word "No". Rotate the rotary control to select "Yes", then press the rotary control. The cursor highlights the first character pair of the key. Rotate the rotary control to select the desired character pair. Confirm your selection by pressing the rotary control. The cursor moves to the next character pair. Repeat through all 6 character pairs until you get back to the highlighted line. When completed correctly, the separators between the character groups change from " : " to " – " to indicate that a valid key has been entered.

Exit properly from the Menu system to permanently save your new settings.

Your enabled option(s) should now be operational.

Note : for the GPS and NTP systems, a power cycle may be required to fully complete the Option Update process.

Calibration Menu

The Calibration Menu appears below:

```
"Calibration                    "
"Enable adjustments           No"
"Oven Frequency           =+00000"
"PAL  IPSCH                  000"
"PAL  HGenlockPoint         0000"
"PAL  OPScH                  000"
"PAL  SCPhase               0000"
"NTSC IPSCH                  000"
"NTSC HGenlockPoint         0000"
"NTSC OPScH                  000"
"NTSC SCPhase               0000"
"Comp          Gain=000  DC=000"
"Black1        Gain=000  DC=000"
"Black2        Gain=000  DC=000"
"Black3        Gain=000  DC=000"
"Black4        Gain=000  DC=000"
```

IMPORTANT

The Calibration Menu contains fundamental settings relating to the functionality and accuracy of the CY460 SPG. These settings are programmed during initial testing, configuration and alignment. Under normal circumstances, it should not be necessary to adjust any of these settings after the unit has been installed.

It is a good idea to make a manual record of these settings in case they become corrupted or are inadvertently changed. A convenient way to achieve this is to print this page, record the stored values alongside the respective menu lines, then store the list in a safe place.

Definition for:

```
"Enable adjustments           No"
```

This menu line enables the user to change any of the calibration settings in the remainder of this menu.

The options are:

No	Calibration Disabled	(Default)
Yes	Calibration Enabled	

This menu option is always set to “No” upon entry – it requires a conscious action on the part of the user to set the option to “Yes” and thereby enable calibration value adjustments.

When set to “No”, the user may view the menu values at any time.

When set to “Yes”, the user is able to change any of the preset values.

Definition for:

```
"Oven Frequency          =+00000"
```

This menu line allows the user to adjust the frequency of the internal 10MHz oscillator.

When the CY460 SPG is configured for "Internal Lock" (see *Section 3.5 : Genlock Menu*), the video outputs on the CY460 SPG will "free run" compared to an external video signal from a known reference. To set the 10MHz oscillator, view both the Composite output and the known reference on a vectorscope. On the vectorscope, ensure that the known reference is also looped through to the EXT REF input, and that the EXT REF function is enabled. Adjust the "Oven Frequency" menu value so that the Composite video output signal rotates at less than 1 cycle/second compared to the known reference.

When the CY460 SPG has a GPS receiver installed and enabled, this value is automatically adjusted by the CY460 SPG, using embedded clock data in the GPS signal.

This setting varies from unit to unit.

Definitions for:

```
"PAL  IPSCH                 000"
"NTSC IPSCH                 000"
```

These menu lines allow the user to adjust the Sc-H settings relating to the genlock video signal present at the REF-LOOP BNCs on the rear panel. This setting ensures that the 4-frame (PAL) or 2-frame (NTSC) SC-to-H relationship of the incoming signal will be reliably determined.

To set either of these values, access to test points on the main module is required. Therefore, no specific adjustment details will be outlined here.

These settings vary from unit to unit.

Definitions for:

```
"PAL  HGenlockPoint        0000"
"NTSC HGenlockPoint        0000"
```

These menu lines allow the user to set the value of the window used to align the H-timing system with the REF LOOP signal, and thereby control Sc-H locking.

To set either of these values, access to test points on the main module is required, as well as access to a special engineering sub-menu. Therefore, no specific adjustment details will be outlined here.

These settings are unlikely to change significantly from unit to unit.

The default value for both PAL and NTSC is 0063.

Definitions for:

```
"PAL  OPScH                  000"
"NTSC OPScH                  000"
```

These menu lines allow the user to adjust the SC Phase of the video output relative to the reference input. This setting is used to provide “co-timed” video outputs when they are set for a video timing offset of 0°.

Specialised equipment is required in order for these settings to be determined. Therefore, no specific adjustment details will be outlined here.

These settings vary from unit to unit.

Definitions for:

```
"PAL  SCPhase              0000"
"NTSC SCPhase              0000"
```

These menu lines allow the user to adjust the Sc-H settings relating to the video outputs.

Specialised equipment is required in order for these settings to be determined. Therefore, no specific adjustment details will be outlined here.

These settings vary from unit to unit.

Definitions for:

```
"Comp          Gain=000  DC=000"
"Black1        Gain=000  DC=000"
"Black2        Gain=000  DC=000"
"Black3        Gain=000  DC=000"
"Black4        Gain=000  DC=000"
```

These menu lines allow the user to adjust the Gain and DC settings of the respective video outputs.

Each menu line displays the calibration values relating to the gain and d.c. settings of the relevant video channel DAC. Gain values are typically in the range 0-60; d.c. values are typically in the range 382-390.

Disclaimer

Courtyard retains a record of the calibration settings for each CY460 SPG that leaves the factory. Most of these settings are determined during initial testing, configuration and alignment. They should not normally require adjustment or reconfiguration during service. In some cases, specific test equipment or even custom apparatus is required to perform calibration and configuration.

On no account should the user attempt to alter any of these settings without proper authorisation from Courtyard Electronics Limited.

If problems are encountered, these settings can be re-instated. Contact Courtyard for further instructions.

These calibration values are obtained during initial testing using a DVM to measure pre-defined DC levels produced by each video channel DAC. The procedure requires that a suitable adapter cable including a 75Ω termination will be needed to connect the CY460 SPG output BNC to the connector(s) on your DVM.

To adjust a video output, follow these instructions:

> After highlighting a menu line, the first press of the rotary control sets the DAC to the designated minimum video level. The video output, therefore, produces a 0 (zero) signal level, and the menu line reads "Memorise Gain Min". Note the DVM reading. A second press will set the DAC to the "peak" video level, which should result in the video output producing a signal level equal to 1V above the previous level. The menu line now reads "Set Gain +1V". Rotate the rotary control so that the DVM reads "(zero) + 1.00V". A third press allows the user to set the DC level of the video output to 0.00V. A fourth press will exit menu editing, ready to select and adjust the next output. When finished, exit from the menu system in the normal way to permanently save your settings.
>
> Record your new settings and store in a safe place.

Summary version:

Highlight output to adjust	Connect "DVM-BNC cable" to this output.
[Select]	"Memorise Gain Min"
Read voltage on DVM – this is (zero).	Typically -0.615V.
[Select]	"Set Gain +1V"
Set DVM = (zero) +1.00V.	Typically +0.385V.
[Select]	
Set DVM = 0.00V.	
[Select]	
Adjust next output(s).	
Exit Menu.	

To re-install one or more calibration settings:

> For the case where calibration values are simply being re-instated, proceed in a similar manner to that noted above – note that this time, the DVM and cable are not required.
>
> Simply advance the menu highlight to each parameter in turn, and rotate the rotary control to select the required value. Be careful not to rotate the rotary control for any setting that does not need to be changed. Be sure to exit from the menu to permanently save your settings.

Note: during this calibration procedure, the Composite video output does not produce a video output while that output is being adjusted. Make sure that you are viewing the menu on another video output, or alternatively, use the front panel LCD.

4.0 Troubleshooting

Generally speaking, the CY460 SPG is extremely reliable under normal “steady state” operating conditions. If you are having problems, select the symptom from the list below that closely relates to your particular problem, and perform the checks / actions listed.

Observe all cautions and warnings listed in General Safety Summary at the front of this manual.

Symptom(s)	Cause(s)	Checks / Actions
LCD not operational Video / Audio outputs missing	Mains Power missing SMPSU faulty Bad power connection(s)	• Check Mains Power • Check Mains lead integrity • Check rear panel Mains fuse • Check SMPSU fuse • Possible low volts at DC-IN on CD400 module
Front Panel Display / Controls intermittent	Bad ribbon cable connection	• Check ribbon cable to front panel
Intermittent Operation	Bad power connection(s)	• Check Mains Power connections • Possible low volts at DC-IN on CD400 module
Corrupted output(s)	Corrupted data	• Remove power, wait 10 seconds, then re-power the unit
“Limited” range of Video formats/standards	“Option” not enabled	• Ensure Option Key has been entered for applicable option • Contact Courtyard to obtain additional Option Key(s)
GPS / NTP not operational	“Option” not enabled	• Ensure Option Key has been entered for applicable option • Contact Courtyard to obtain additional Option Key(s)

(continues…./)

If your problem is not resolved after following these checks / actions, the fault is likely to be related to a mechanical or electrical component failure. Please contact Courtyard Electronics Limited for further assistance.

When you contact Courtyard Electronics Limited regarding an issue on your unit, and so that we can process your enquiry efficiently, you should have available at least one of the following items of information in addition to your personal / company details (name, company, telephone, email):

- the frame serial number of the unit
- the MAC address of the unit
- original delivery / invoice date
- whether supplied direct or through a distributor or systems assembler

5.0 Warranty

One Year Limited Warranty

Courtyard Electronics Ltd. warrants all models in its CY460 Sync Pulse and Test Pattern Generator range against defects in parts and labour for one year from receipt of the product by the end user. Courtyard Electronics Ltd reserves the right to choose whether to repair or replace defective equipment.

Extended Warranty

The end user may choose to extend the standard warranty period. This must be ordered as part of the original shipment, i.e. it cannot be added retrospectively to cover a defect that may occur after the standard warranty period expires. Contact Courtyard Electronics Limited for further details.

Exclusions

The warranty shall not apply to defects arising from:

- cosmetic/handling damage,
- unauthorised modification,
- misuse,
- exceeding component duty cycles,
- connection of signals outside defined ranges,
- third party interfacing products.

Warranties are non-transferable. If you sell on a product that has a valid warranty, that warranty becomes null and void.

Reduction of Hazardous Substances (RoHS)

Courtyard Electronics Ltd warrants all models in its CY460 Sync Pulse and Test Pattern Generator range are manufactured and supplied in accordance with the RoHS 2011/65/EU regulations.

Appendix A : Specifications

This section lists the electrical, mechanical, and environmental characteristics, as well as the national and international standards to which the CY460 Sync Pulse and Test Pattern Generator complies.

General Characteristics

All listed specifications are guaranteed unless labelled with “Typical”. Typical specifications are provided for your convenience, but are not guaranteed.

Performance Conditions

The electrical characteristics listed on the following pages are valid under the following conditions:

- The CY460 Sync Pulse and Test Pattern Generator must be in an environment where the temperature, altitude, humidity, and vibration conditions are within the operating limits described in Table A.34.
- The CY460 Sync Pulse and Test Pattern Generator must have a warm-up period of at least 20 minutes.
- The CY460 Sync Pulse and Test Pattern Generator must have been calibrated and adjusted at an ambient temperature between +20 °C and +30 °C at an altitude of less than 2000m.
- The following label is used to indicate the altitude limitation.

Table A.1 : Video Reference Inputs

Characteristic	Performance Requirement		Reference Information
Input connector type	2 x 75Ω BNC (loop through)		
Input Return loss	> 30dB to 10MHz		
Inputs	NTSC Black Burst 525 Sync PAL Black Burst 625 Sync Tri-Level Sync		
Input requirements	Amplitude	-6 dB to +6 dB	
	S/N ratio	> 40 dB	
	ScH phase	± 20 °	
Pull-in range	± 50 ppm		
Jitter	Burst < 0.5 °		
	Sync < 1 ns		
Genlock time offset range	Range	Full colour frame	
	Resolution	< 0.5 degree of subcarrier	

Table A.2 : Frequency Reference Inputs

Characteristic	Performance Requirement		Reference Information
Input connector type	1 x 50Ω BNC (terminating)		
Input Return loss	> 30dB to 10MHz		
Inputs	10 MHz continuous wave		
Input requirements	Amplitude	1 Vp-p (nominal); 2.5 Vp-p (maximum).	For 1 Vp-p input, Signal Detector has a 0 to -18dB range.
	S/N ratio	> 40 dB	

Table A.3 : GPS Receiver Antenna Input

Characteristic	Performance Requirement	Reference Information
Input connector type	1x 50Ω SMB Jack (terminating)	
Input Return loss	>8dB @ 1575MHz	
Antenna voltage	+5.0 V ± 5%	Sourced by the SPG
Antenna current	Internally limited to 50mA	Sourced by the SPG
Type	GPS L1 Frequency (1575.42MHz) C/A Code	12 Channels
Time stamp accuracy	<= 150ns to GPS/UTC	

Table A.4 : Frequency Reference Outputs

Characteristic	Performance Requirement	Reference Information
Output connector type	1 x BNC	
Output impedance and required termination	50Ω	
Signal amplitude	1.0 V ± 10%	
Rise and fall time	5ns > Rise /Fall < 44ns	10% to 90%
Jitter	8ns	Typically 2ns
Outputs	10 MHz continuous wave	

Table A.5 : 1Hz Frequency Reference Output

Characteristic	Performance Requirement	Reference Information
Output connector type	1 x BNC	
Output impedance and required termination	75Ω	
Signal amplitude	3.3 V ± 10%	TTL CMOS compatible
Rise and fall time	5ns > Rise /Fall < 44ns	10% to 90%
Jitter	8ns	Typically 2ns
Output	1Hz ± 5 ppm	

Table A.6 : Analog Video Outputs

Characteristic	Performance Requirement		Reference Information
Output connector type	75Ω BNC		
Number of outputs	Composite Pattern Output on 2 BNCs Composite Black Burst Output on 2 BNCs Tri-Black 2 Output on 2 BNCs Tri-Black 3 Output on 2 BNCs Tri-Black 4 Output on 2 BNCs		10 BNCs in total
Output impedance	75Ω		
Return loss	> 30 dB to 5 MHz		
Formats	NTSC-M (with Setup) SMPTE-170M		See notes on field blanking
	NTSC-J (no Setup) SMPTE-170M		See notes on field blanking
	PAL CCIR-656 ITU-R BT 1700-1(PAL-B)		See notes on field blanking
	Tri-Sync SMPTE-274M		Tri-Sync available only on Tri-Black 2, Tri-Black 3 and Tri-Black 4 outputs.
Burst amplitude accuracy	± 5%		Typically ± 2%
Burst frequency accuracy	± 1 Hz		Typically ± 0.25Hz
Burst frequency long term	< 1 ppm / year		
Sync amplitude accuracy	± 3%		Typically ± 1%
SCH phase accuracy	<± 5 °		
Blanking level	± 50 mV		Typically ± 10mV
Timing offset	Range	Full colour frame	
	Resolution NTSC and PAL	< 0.5 degree of subcarrier	
	Resolution Tri-Sync	< 1/54 MHz	
Monochrome bitmap logo or ID Text	Maximum 26 character in each of 3 rows		Animation effects
	Gray scale	8 level	
Full color bitmap logo	Any size up to full frame.		Keyed over test pattern

Notes:

Field blanking

Composite output

NTSM-M, NTSC-J

- Field 1 lines 1 – 20 inclusive are blanked, i.e. there is no pattern information, but there may be VITC etc.
- Field 2 lines 263 – 283 inclusive are blanked, i.e. there is no pattern information, but there may be VITC etc.
    - Line 263 and Line 283 are specified as active half lines in SMPTE RS170M, but they are fully blanked in this SPG/TSG.

SDI output

NTSC-M, NTSC-J

- SMPTE 125M says 1 – 20 inclusive and 264 – 282 inclusive are blanked.
- CCIR 656-4 says 1 – 20 inclusive and 264 – 282 inclusive are blanked.
- Tek WFM601M says 1 – 20 inclusive and 264 (1) – 283(20) inclusive are blanked.

Composite output

PAL

- Field 1 lines 623 – 23 inclusive are blanked, i.e. there is no pattern information, but there may be VITC etc.
    - Line 623 and Line 23 are specified as active half lines in CCIR-624, but they are fully blanked in this SPG/TSG.
- Field 2 lines 311 – 336 inclusive are blanked, i.e. there is no pattern information but there may be VITC etc.

SDI output

PAL

- EBU tech3267 says 624 – 22 inclusive and 311 – 335 inclusive are blanked.
- CCIR 656-4 says 624 – 22 inclusive and 311 – 335 inclusive are blanked.
- Tek WFM601M says 624 – 23 inclusive and 311 – 336 inclusive are blanked.

Table A.7 : Serial Digital Interface

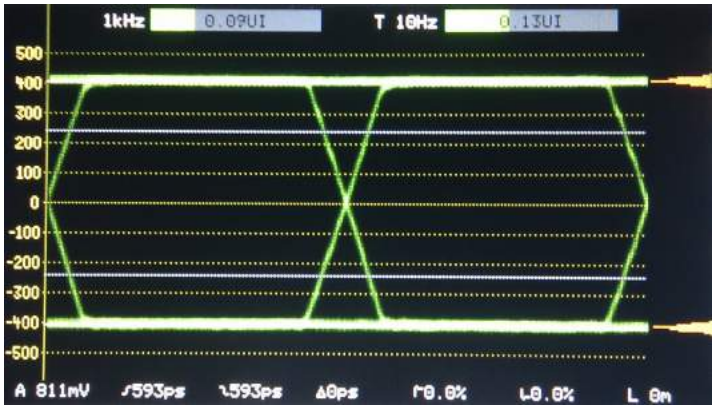
Characteristic	Performance Requirement			Reference Information
Output connector type	75Ω BNC			
Number of outputs	SDI 1 Pattern Output on 2 BNCs. SDI 1 Black Output on 2 BNCs. SDI 2 Pattern Output on 2 BNCs. SDI 2 Black Output on 2 BNCs.			8 BNCs in total
Output impedance	75Ω			
Return loss	> 15 dB to 270 MHz > 15 dB to 1.5GHz > 10dB to 3GHz			
Formats [1]	525i / 625i – 270Mbps			
	720p – 1.5Gbps			
	1035i – 1.5Gbps			
	1080i – 1.5Gbps			
	1080p – 3Gbps			
Signal amplitude	800mV ± 10%			
Rise and fall time	270Mbps		<= 600ps ± 15ps	< 1000ps ± 500ps
	1.5Gbps		<= 130ps ± 20ps	< 270ps ± 50ps
	3Gbps		<= 120ps ± 15ps	< 135ps ± 25ps
Jitter	270Mbps	Timing	<=0.16 UI	< 0.2 UI @ 10Hz
		Alignment	<=0.10 UI	< 0.2 UI @ 1KHz
	1.5Gbps	Timing	<=0.30 UI	<1.0 UI @ 10Hz
		Alignment	<=0.07 UI	< 0.2 UI @ 100KHz
	3Gbps	Timing	<=0.65 UI	< 2.0 UI @ 10Hz
		Alignment	<=0.15 UI	< 0.3 UI @ 100KHz
Timing offset	Range	Full colour frame		
	Resolution 270Mbps	< 1/54.00 MHz		
	Resolution 1.5Gbps	<1/74.25 MHz		
	Resolution 3Gbps	<1/148.50 MHz		

Table A.7 : Serial Digital Interface (continued)

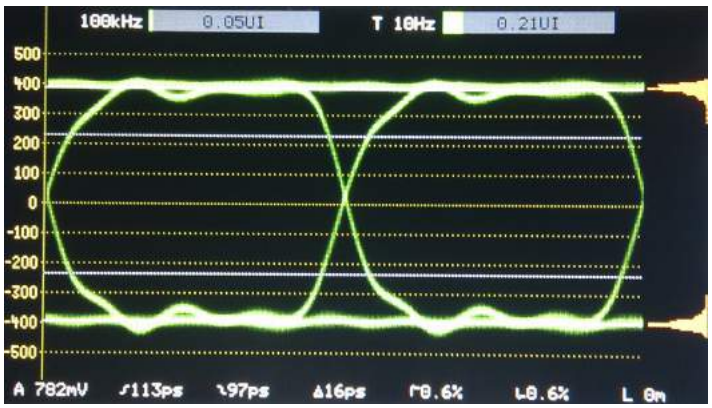
Characteristic	Performance Requirement			Reference Information
Monochrome bitmap logo or ID Text	Maximum 30 character in each of 3 rows			Animation effects
	Gray scale	4 level		
Full color bitmap logo	Any size up to full frame.			Keyed over test pattern
Embedded audio	270Mbps	Number of channels	4 per SDI	20 bit audio
	1.5Gbps	Number of channels	16 per SDI	24 bit audio
	3Gbps	Number of channels	16 per SDI	24 bit audio
	Frequency	1Hz – 20KHz		1Hz resolution
	Amplitude	Silence and -78dBFS to 0dBFS		1dB resolution
	Pre-emphasis	None		
	Interruption	Programmable		1 second, 3 second, EBU Tech 3304, Glits, Blits
Quantized resolution	270Mbps	16 or 20 bits		(user selectable)
	1.5Gbps, 3Gbps	16, 20 or 24 bits		

Note 1:

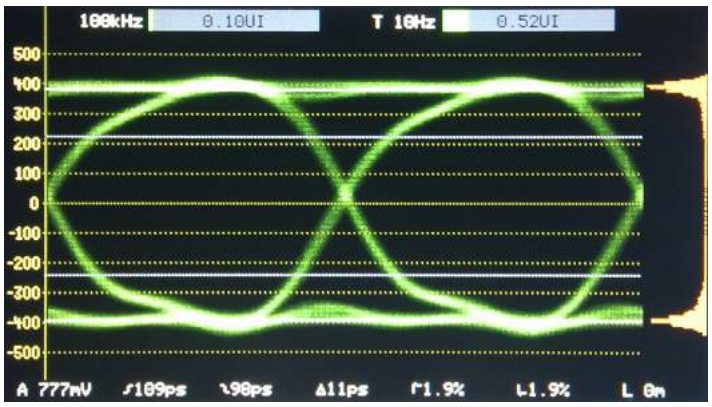
270Mbps SDI	SMPTE 259M
1.5Gbps SDI	SMPTE 292M
3Gbps SDI	SMPTE 424M



Picture A.1 : CY460 SPG – 270Mbps Eye and Jitter



Picture A.2 : CY460 SPG – 1.5Gbps Eye and Jitter



Picture A.3 : CY460 SPG – 3Gbps Eye and Jitter

Table A.8 : AES/EBU Audio Unbalanced Outputs

Characteristic	Performance Requirement		Reference Information
Output connector type	3 x BNC		
Number of outputs	2 x unbalanced Audio on BNC		AES-3 AES-3id
	1 x unbalanced DARS on BNC		AES-11 DARS is indicated as "non-PCM audio" and "Locked" and "Grade 1 reference signal".
Output impedance and required termination	75Ω		
Signal amplitude	1V ± 10%		
Rise and fall time	5ns > Rise /Fall < 44ns		10% to 90%
Jitter	8ns		Typically 2ns
Audio parameters	Frequency	1Hz – 20KHz	Steps of < 1Hz
	Amplitude	Silence and -78dBFS to 0dBFS	1dB resolution
	Pre-emphasis	None	
	Interruption	Programmable	1 second, 3 second, EBU Tech 3304, Glits, Blits
Quantized resolution	24 bits		

Table A.9 : AES/EBU Audio Balanced Outputs

Characteristic	Performance Requirement		Reference Information
Output connector type	Molex Micro Clasp 2mm 30 pin Part Number 0512423000		Shared with Analog Audio and LTC
Number of outputs	8 x Balanced Audio		AES-3
	1x DARS		AES-11 DARS is indicated as "non-PCM audio" and "Locked" and "Grade 1 reference signal".
Output impedance and required termination	Differential Balanced Line Driver output. The signal must be terminated at the receiver.		Use terminating resistor
Signal amplitude	5V ± 10% Balanced		
Rise and fall time	5ns > Rise /Fall < 44ns		10% to 90%
Jitter	8ns		Typically 2ns
Audio parameters	Frequency	1Hz – 20KHz	Steps of < 1Hz
	Amplitude	-60dBFS to 0dBFS	1dB resolution
	Pre-emphasis	None	
	Interruption	Programmable	1 second, 3 second, EBU Tech 3304, Glits, Blits
Quantized resolution	24 bits		

Table A.10 : LTC Outputs

Characteristic	Performance Requirement	Reference Information
Output connector type	Molex Micro Clasp 2mm 30 pin Part Number 0512423000	Shared with Analog Audio and AES/EBU Audio
Number of outputs	4 x Balanced	
Output impedance and required termination	Differential Balanced Line Driver output. The signal must be terminated at the receiver.	Use terminating resistor
Signal amplitude	5V ± 10% Balanced	
Rise and fall time	5ns > Rise /Fall < 44ns	10% to 90%
Type	LTC SMPTE-12M	

Table A.11 : Analog Audio Outputs

Characteristic	Performance Requirement		Reference Information
Output connector type	Molex Micro Clasp 2mm 30 pin Part Number 0512423000		Shared with AES/EBU Audio and LTC
Number of outputs	2 x Balanced		1 x Stereo balanced pair
Output impedance	50Ω ± 5%		
Termination impedance	600Ω ± 5%		Calibrated with 600Ω ± 1%
Audio parameters	Frequency	1Hz – 20KHz	Steps of < 1Hz
	Amplitude	Silence and -60dBm to +18dBm	1dB resolution
	Interruption	Programmable	1 second, 3 second, EBU Tech 3304, Glits, Blits
	Harmonic Distortion	< -50dB	Measured at 1KHz
DAC resolution	18bits		

Table A.12 : Programmable Pulse Unbalanced Outputs

Characteristic	Performance Requirement	Reference Information
Output connector type	3 x BNC	
Output impedance and required termination	75Ω	
Signal amplitude	3.3V ± 10%	CMOS compatible
Rise and fall time	5ns > Rise /Fall < 44ns	10% to 90%
Jitter	8ns	Typically 2ns
Pulse Type Individually programmable on each BNC	Mixed Sync	Video pulses are derived from the Black 1 output. Audio is derived from the Composite video AES 1- 8 generator and conforms to AES-3 and AES-11 Wordclock conforms to AES-11 Annex B
	Mixed Blanking	
	Burst Gate	
	PAL Square	
	Line Drive	
	Field Drive	
	F1 / L7 or F1 / L10	
	6Hz/30Hz	
	6Hz/29.97Hz	
	Word Clock 48KHz AES-11 Annex B	
	Word Clock 44.1KHz AES-11 Annex B	
	0	
	0	
	0	
	0	
	1	

Table A.13 : GPI (General Purpose Interface)

Characteristic	Performance Requirement	Reference Information
Connector type	Molex Micro Clasp 2mm 10 pin Part Number 0512421000	Shared with RS232 and ONAIR
Outputs	Pin 7: GP output 1 Open Collector Pin 8: GP output 2 Open Collector Pin 1: GND Pin 10: GND	
Output level	< 0.4 V	Measured at 100 mA sink
Inputs	Pin 5: GP input 1 Pin 6: GP input 2	
Input level	TTL compatible	Pulled up to 3.3V with 47kΩ

Table A.14 : RS232 Interface

Characteristic	Performance Requirement	Reference Information
Connector type	Molex Micro Clasp 2mm 10 pin Part Number 0512421000	Shared with GPI and ONAIR
Outputs	Pin 2: GND Pin 4: RS232 TX	
Inputs	Pin 3: RS232 RX	

Table A.15 : ONAIR Interface – for use with CY465 Changeover Unit

Characteristic	Performance Requirement	Reference Information
Connector type	Molex Micro Clasp 2mm 10 pin Part Number 0512421000	Shared with GPI and RS232
Bidirectional signal	Pin 9: ONAIR Open collector	Pulled up to 3.3V with 4k87Ω
Outputs	Pin 10: GND	

Table A.21 : Ethernet Interface

Characteristic	Performance Requirement	Reference Information
Connector type	1 x RJ45 - 8P8C	
IEEE Standards Compliance	IEEE 802.3i-1990	10BASE-T
	IEEE 802.3u-1995	100BASE-TX
	IEEE 1588-2008	Precision Time Protocol
IEEE RFC Compliance	791	IP
	793	TCP
	894	IP over Ethernet
	1027	Proxy ARP
	1157	SNMP
	1377	PPP
	1531	DHCP
	1812	IPv4
	1901	SNMPv2c
	2030	SNTP

Table A.22 : SNMP Error Report

Characteristic	Performance Requirement	Reference Information
Protocol		SNMP v1, v2c
Alarm		The same alarm as the GPI will be reported.
Status		Serial number, firmware and hardware Versions, hardware configuration/option, etc.

Table A.31 : AC Power Source

Characteristic	Performance Requirement		Reference Information
Operational Voltage range	120 - 230 VAC, 50 - 60 Hz		
Absolute Limits Voltage range	90 - 264 VAC, 47- 63 Hz		
Fuse	5mm x 20mm Antisurge 2A 250V Fuse identification marking T2A H250V		IEC 60127-2
Operational AC current	CY460 Single PSU	< 130mA @ 230 VAC < 210mA @ 120 VAC	
	CY460D Dual N+1 PSU	< 130mA @ 230 VAC < 210mA @ 120 VAC Each PSU	
Surge AC current	CY460 Single PSU	< 40 A @ 230 VAC < 20 A @ 120 VAC	
	CY460D Dual N+1 PSU	< 40 A @ 230 VAC < 20 A @ 120 VAC Each PSU	
Power consumption	CY460 Single PSU	31 VA	(≈14 Watts - calculated)
	CY460D Dual N+1 PSU	46 VA	(≈ 21 Watts - calculated)
Switched Mode Power Supply	Single output, AC-DC, 65W 12VDC / 5.4A output		XP Power ECS65US12

Table A.32 : Clearance

Characteristic	Performance Requirement		Reference Information
Clearance	Side	50 mm (2.00 in)	
	Rear	75 mm (3.00 in)	

Table A.33 : Mechanical characteristics

Characteristic	Performance Requirement		Reference Information
Dimensions	Height	43.5 mm (1.71 in)	
	Width	482.5 mm (19.00 in)	
	Depth	405 mm (15.95 in)	
	CY460 Single PSU SPG Net Weight	5.10 kg (11.3 lbs)	
	CY460 Single PSU SPG Net Weight	5.85 kg (12.9 lbs)	
Shipping box Dimensions	Height	150 mm (5.91 in)	*New box = 145 mm (5.71 in)*
	Width	590 mm (23.23 in)	*New box = 580 mm (22.84 in)*
	Depth	700 mm (27.56 in)	*New box = 590 mm (23.23 in)*
	CY460 Single PSU SPG Gross Shipping Weight including standard accessories.	6.98 kg (15.39 lbs)	*New box =* 6.40 kg (14.11 lbs)
	CY460D Dual PSU SPG Gross Shipping Weight including standard accessories.	7.73 kg (17.04 lbs)	*New box =* 7.20 kg (15.84 lbs)
Volumetric weight	DHL http://www.dhl.co.uk/en/tools/volumetric_weight_express.html	12.5 kg (27.5 lb) using (15x59x70)/5000	*New box = 10 kg (22 lb) using (14.5x58x59)/5000*
	FedEx http://www.fedex.com/gb/tools/dimweight.html	12.5 kg (27.5 lb) using (15x59x70)/5000	*New box = 10 kg (22 lb) using (14.5x58x59)/5000*
	TNT http://www.tnt.com/express/en_gb/site/home/support/paperwork_and_packaging/weights_and_measures.html	12.5 kg (27.5 lb) using (15x59x70)/5000	*New box = 10 kg (22 lb) using (14.5x58x59)/5000*
	UPS http://www.ups.com/content/gb/en/resources/ship/packaging/dim_weight.html	12.5 kg (27.5 lb) using (15x59x70)/5000	*New box = 10 kg (22 lb) using (14.5x58x59)/5000*

Table A.34 : Environment characteristics

Characteristic	Performance Requirement	Reference Information
Temperature	Operating	0 °C to +40 °C
	Non operating	-20 °C to +60 °C
Relative humidity	Operating	20% to 80% relative humidity (% RH) at up to +40 °C, non-condensing
	Non operating	5% to 90% relative humidity (% RH) at up to +60 °C, non-condensing.
Altitude	Operating	To 2,000 m (6,561 feet)
	Non operating	To 12,192 m (40,000 feet)
Vibration	Operating	2.65 m/s2 (0.27 Grms), 5 Hz to 500 Hz, 10 minutes per axis, three axes.
	Non operating	22.3 m/s2 (2.28 Grms), 5 Hz to 500 Hz, 10 minutes per axis, three axes.
Shock	Non operating	294 m/s2 (30 G), half-sine, 11 ms duration.

Certifications and Compliances:

Table A.35 : Certifications and Compliances

Category	Standards or Description
EC Declaration of Conformity-EMC	Meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities : EN55103 Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Environmental E2-commercial and light industrial Part 1 Emission EN55022 Class B radiated and conducted emissions EN55103-1, Annex A Radiated magnetic field emissions EN55103-1, Annex B Inrush current; I peak=14.6 amps Part 2 Immunity IEC61000-4-2 Electrostatic discharge immunity IEC61000-4-3 RF electromagnetic field immunity IEC61000-4-4 Electrical fast transient/burst immunity IEC61000-4-5 Power line surge immunity IEC61000-4-6 Conducted RF immunity IEC61000-4-11 Voltage dips and interruptions immunity EN55103-2, Annex A Radiated magnetic field immunity EN61000-3-2 AC power line harmonic current emissions EN61000-3-3 Voltage changes, fluctuations, & flicker
EC-Declaration of Conformity- Safety	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union : IEC 60950-1/A1:2009 EN60950-1/A12:2011 Safety requirements for electrical equipment for measurement, control, and laboratory use.
Australia/New Zealand Declaration of Conformity-EMC	Complies with the EMC Framework, demonstrated per Emission Standard AS/NZS 2064 (Industrial, Scientific, and Medical Equipment).
Safety	Complies with the following safety standards : UL 60950-1 CAN/CSA C22.2 No. 1010.1 IEC 60950-1/A1:2009
Installation (overvoltage) Category	Terminals on this product may have different installation (overvoltage) category designations. The installation categories are : CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location. CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected. CAT I Secondary (signal level) or battery operated circuits of electronic equipment.

Table A.35: Certifications and Compliances (continued)

Category	Standards or Description	
Pollution Degree	A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated. Pollution Degree 2 Normally only dry, nonconductive pollution occurs. Occasionally, a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.	
Manufacturing	All assemblies manufactured in an ISO9001:2008 registered facility. Steel is 18 swg (1.2mm) thickness CR4GP (Cold Reduced Mill Finish General Purpose) to BS 1449 Plating is zinc and clear passivated to BS EN 12329:2000 FE//ZN8//A (FE = Steel, ZN8 = 8 mic minimum zinc deposit, A = clear passivation).	All assemblies manufactured in accordance to IPC-A-610E class 2 suitability standard. All assemblies manufactured in accordance to ISO14001:2004 environmental standard.
IEC Characteristics	Equipment type : Test and Measuring Installation Category II (Single-phase, receptacle-connected loads) Pollution Degree 2 (Normally only nonconductive pollution occurs) Safety Class I (Grounded product) Temperature 5 °C to 40 °C	

Appendix B: Connector Pin-outs

This appendix lists the pin-outs of various multi-way connectors available on the rear panel of the CY460 Sync Pulse and Test Pattern Generator unit.

BALANCED AUDIO / AES / LTC Connector

Table B.1: BALANCED Connector pin-out.

Pin number	Signal	Function selection	Default selection
1	Ground		
2	Ground		
3	Pair 1+	Pair 1 can be selected to output any balanced signal	LTC 2
4	Pair 1-		
5	Pair 2+	Pair 2 can be selected to output any balanced signal	LTC 1
6	Pair 2-		
7	Pair 3+	Pair 3 can be selected to output any balanced signal	AES 8
8	Pair 3-		
9	Pair 4+	Pair 4 can be selected to output any balanced signal	AES 7
10	Pair 4-		
11	Pair 5+	Pair 5 can be selected to output any balanced signal	AES 6
12	Pair 5-		
13	Pair 6+	Pair 6 can be selected to output any balanced signal	AES 5
14	Pair 6-		
15	Pair 7+	Pair 7 can be selected to output any balanced signal	AES 4
16	Pair 7-		
17	Pair 8+	Pair 8 can be selected to output any balanced signal	AES 3
18	Pair 8-		
19	Pair 9+	Pair 9 can be selected to output any balanced signal	AES 2
20	Pair 9-		
21	Pair 10+	Pair 10 can be selected to output any balanced signal	AES 1
22	Pair 10-		
23	Pair 11+	Pair 11 can be selected to output any balanced signal	DARS
24	Pair 11-		
25	AUD1+ Left		
26	AUD1- Left		
27	AUD2+ Right		
28	AUD2- Right		
29	Ground		
30	Ground		

Type : 30-pin connector, Molex 2mm Micro-Clasp series, Plug (male).

Looking at the rear of the unit:

- bottom row = odd numbers, e.g. AUD1+
- top row = even numbers, e.g. AUD2-

See Appendix Table A-9, A-10 & A-11 for technical details regarding this connector.

A 30-way Molex Micro-Clasp Socket fitted with unconnected wires is supplied as part of the standard accessories shipment (see picture B.1 below). The end-user is required to fit their preferred connectors for each signal output onto this supplied cable assembly.

GPI / RS232 Connector

Table B.2: GPI/RS232 Connector pin-out

Pin number	Signal / Function
1	Ground
2	Ground
3	RS232 - RX
4	RS232 - TX
5	GP Input 1 - TTL compatible
6	GP Input 2 - TTL compatible
7	GP Output 1 - Open Collector
8	GP Output 2 - Open Collector
9	ON-AIR - Open collector
10	Ground

Type : 10-pin connector, Molex 2mm Micro-Clasp series, Plug (male).

Looking at the rear of the unit:

- bottom row = odd numbers, e.g. ON-AIR – Open Collector
- top row = even numbers, e.g. RS232 - TX

See Appendix Tables A-13, A-14 & A-15 for technical details regarding this connector.

A 10-way Molex Micro-Clasp Socket fitted with unconnected wires is supplied as part of the standard accessories shipment (see picture B.1 below). The end-user is required to fit their preferred connector onto this supplied cable assembly.

An example of a typical Breakout Cable is shown below. In this scenario, the user must supply the D9 Plug connector to attach to the supplied cable assembly.

Table B.3: GPI/RS232 Breakout Cable

10-pin Micro-Clasp	Signal / Function	D9 Plug (Male)
1	Ground	n/c
2	Ground	5
3	RS232 - RX	2
4	RS232 - TX	3
5	GP Input 1 - TTL compatible	n/c
6	GP Input 2 - TTL compatible	n/c
7	GP Output 1 - Open Collector	n/c
8	GP Output 2 - Open Collector	n/c
9	ON-AIR - Open collector	9
10	Ground	

Connector Types :

10-pin connector, Molex 2mm Micro-Clasp series, Socket (female),
9-pin connector, D-type, Plug (male).

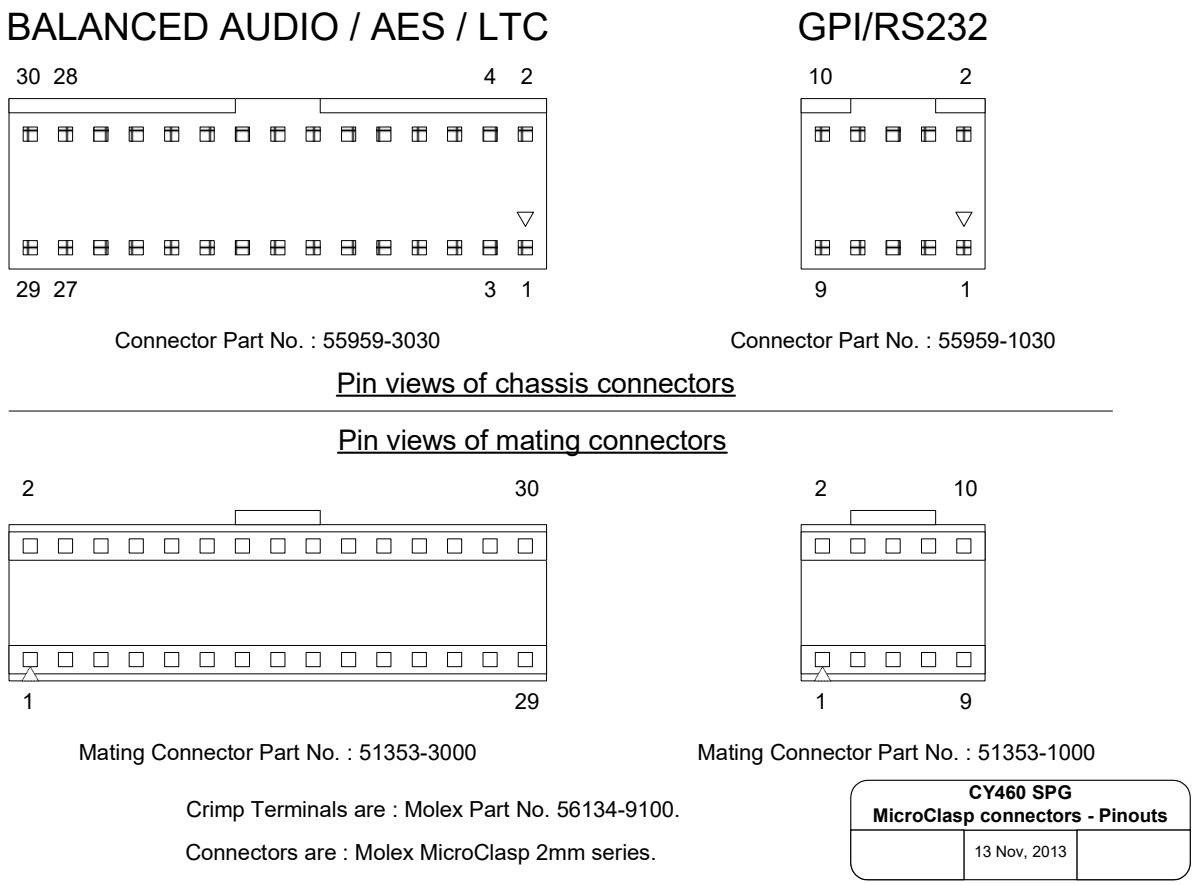


Figure B.1 : Molex MicroClasp Connector Pinouts

Picture B.1 : Molex Micro-Clasp Breakout Cable Assemblies

CD405 Breakout Option modules

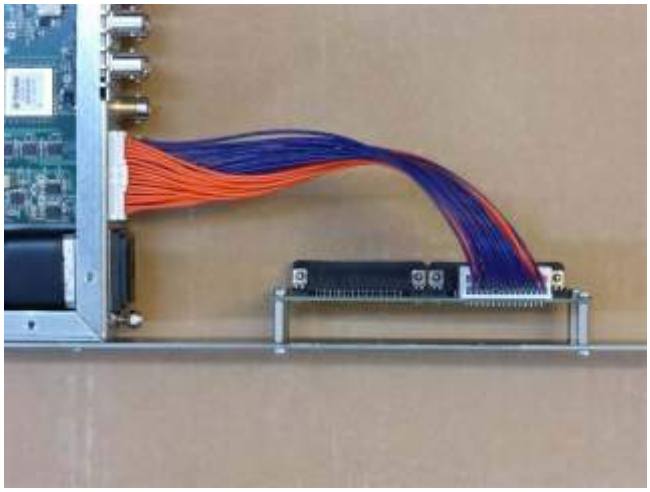
When the CD405 Breakout Option modules are used, they are connected to the CY460 Sync Pulse and Test Pattern Generator unit using multi-way cables.

Picture B.2 : Molex Micro-Clasp Breakout Option Cable Assemblies

There are two modules – a Molex 10-way to D9, and a Molex 30-way to 2 x D25.

Picture B.3 : CD405 Breakout Option Modules

The CD405 Breakout Option modules should be securely mounted to ensure reliable connectivity. These modules are designed to be mounted on the CY460 Rack Mounting option.



Picture B.4a : CD405 Breakout Option Modules – Typical Mounting (1)

Picture B.4b : CD405 Breakout Option Modules – Typical Mounting (2)

When the CD405 Breakout Option modules are used, the following connector schedules apply :

Table B.4 : Breakout Option – D9 Connector pin-out – P306

Pin number	Signal / Function
1	Ground
2	RS232 - TX
3	RS232 - RX
4	GP Output 1 - Open Collector
5	Ground
6	GP Input 2 - TTL compatible
7	GP Input 1 - Open Collector
8	GP Output 2 - Open Collector
9	ON-AIR - Open collector

Type : 9-pin connector, D-Type, Socket (female).

Table B.5 : Breakout Option – D25 Connector pin-out – P301

Pin number	Signal / Function
1	LTC2 +
2	Ground 0V
3	LTC1 -
4	LTC4 +
5	Ground 0V
6	LTC3 -
7	Ground 0V
8	Ground 0V
9	Ground 0V
10	AES6 +
11	Ground 0V
12	AES5 -
13	Ground 0V
14	LTC2 -
15	LTC1 +
16	Ground 0V
17	LTC4 -
18	LTC3 +
19	Ground 0V
20	Ground 0V
21	Ground 0V
22	Ground 0V
23	AES6 -
24	AES5 +
25	Ground 0V

Type : 25-pin connector, D-Type, Socket (female).

Table B.6 : Breakout Option – D25 Connector pin-out –P302

Pin number	Signal / Function
1	AES4 +
2	Ground 0V
3	AES3 -
4	AES2 +
5	Ground 0V
6	AES1 -
7	DARS +
8	Ground 0V
9	Ground 0V
10	AUD1 +
11	Ground 0VA

12	AUD2 -
13	Ground 0V
14	AES4 -
15	AES3 +
16	Ground 0V
17	AES2 -
18	AES1 +
19	Ground 0V
20	DARS -
21	Ground 0V
22	Ground 0V
23	AUD1 -
24	AUD2 +
25	Ground 0VA

Type : 25-pin connector, D-Type, Socket (female).

Appendix D : Rack Mounting

This appendix provides instructions for installing the CY460 Sync Pulse and Test Pattern Generator into a standard 19-inch equipment rack.

Minimum Tool and Equipment List

The following tools are required to install the rack mounting hardware into the equipment rack. All tools are standard tools that are readily available.

Table D.1 : Tools required for Rack Mount installation

Item	Name	Description
1	Screwdriver handle	Accepts 1/4 inch hex-head driver tips
2	No.1 Pozidrive tip	Pozidrive -driver tip for No.1 (i.e. M3 size) screw heads
3	No.2 Pozidrive tip	Pozidrive -driver tip for No.2 size screw heads

WARNING : *To prevent the rack mounted instrument from tipping forward onto the operator, install the instrument so that the operator will be able to access all of its rear-panel connectors without pushing down on the instrument. Verify that the rack does not become unstable with the instrument fully extended. Do not leave the instrument extended after accessing the rear panel.*

The Rack Mount Installation Instructions can be found on the following page.

Installation Instructions

This procedure describes how to assemble and install the slide-out tracks in the equipment rack, and then how to install the instrument into the rack.

Assembling the Slide-out Tracks

1. Identify the equipment rack right verses left slide-out track assemblies by finding the date code label on each assembly. The equipment rack left-side assembly has a date code that ends with "LH" for left hand. The equipment rack right-side assembly has a date code that ends with "RH" for right hand.

2. Measure the distance between the front and rear rail of the equipment rack.

3. Align the rear bracket to the right slide-out track. Note that the rear bracket has multiple pairs of mount-through holes. When aligning the bracket and track, be sure to select a pair of holes that mount the rear bracket so that the flange-to-flange distance matches the front-rail to rear-rail spacing of the rack-mount rack measured in step 2.

4. Using a screwdriver with a No.2 pozidriv tip, secure the rear bracket to the right slide-out track using two 10-32 screws and a bar nut. Leave the screws loose so that you can adjust the overall length of the slide-out track assembly in the rack.

5. Repeat steps 3 and 4 to assemble the left slide-out track assembly.

6. Tighten all screws and nuts securely.

Appendix E : User Maintenance

This appendix contains procedures for cleaning and performing preventive maintenance on the CY460 Sync Pulse and Test Pattern Generator.

General Care

Protect the instrument from adverse conditions, i.e. high humidity, high temperatures, etc. The instrument is NOT waterproof.

When handling the unit or any of its controls, do so with clean hands. If necessary, use latex gloves to protect the outer surfaces and controls from the accumulation of dirt and oil residues.

Do not use excessive force to operate any of the controls on the unit.

Exterior Cleaning

Clean the instrument periodically to prevent the accumulation of dust or dirt. Accumulated dust in the instrument acts like an insulating blanket, preventing proper cooling, resulting in overheating and ultimately premature component breakdown. Under high humidity conditions, accumulated dust can also result in an electrically conductive path.

WARNING : *To avoid personal injury, always remove the power cord before cleaning the instrument.*

A vacuum cleaner may be used to remove accumulated dust on the outside of the instrument. Ensure that the nozzle is fitted with a soft brush head (or similar) to avoid damaging the instrument.

CAUTION : *Avoid exposing the instrument to liquids, sprays or solvents, as this could damage the unit. Cleaning agents may also damage the instrument. Avoid solutions that contain harmful chemicals such as Acetone, Benzene, Toluene, Xylene, or similar.*

If the exterior surfaces or controls of the instrument require further cleaning, use a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a cloth or swab dampened with a 75% isopropyl alcohol solution. A swab is useful for cleaning in narrow spaces around the controls and connectors. Do not use excessive amounts of the approved cleaning solution when cleaning the instrument. Do not use abrasive compounds on any part of the instrument.

CAUTION : *Do not allow moisture or dust to enter the instrument during exterior cleaning. Only use enough solution to mildly dampen a cloth or similar. After cleaning, use de-ionised water on a clean cloth to "rinse" the instrument.*

Preventive Maintenance

Preventive Maintenance mainly consists of periodic cleaning. Periodic cleaning reduces instrument breakdown and increases reliability. Clean the instrument whenever needed (using the guidelines outlined above), based on the operating environment. Dirty conditions may require more frequent cleaning than a conventional "clean room" environment.

Servicing

The CY460 Sync Pulse and Test Pattern Generator unit should require little or no in-service maintenance to the installed electronics. Provided the measures outlined in the Preventative Maintenance paragraph above are adhered to, the product should perform for several years without any major user intervention.

Maintenance of components within the product is not usually required, except under exceptional circumstances. If a fault occurs, please follow the instructions listed in *Section 4 : Troubleshooting* before attempting to service the product. The servicing of any of the internal components requires the unit to be extracted from the bay and the top cover removed. If your problem cannot be resolved, contact Courtyard Electronics Ltd for further advice.

If you ordered a Service Option (as listed in *Section 1.9*), then removing the unit from the bay and returning it to Courtyard Electronics Ltd for updating will provide the user with the opportunity to inspect the unit for any problems relating to the operating conditions/environment.

Service Safety - Summary

Only qualified personnel should perform service procedures. Read this *Service Safety - Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, switch off the power to the instrument, then disconnect the power cord from the mains power.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Observe Static Precautions. Servicing of this product should be performed only in a static-safe environment, i.e. at a suitably configured ESD Workstation. Always use a Static Grounding Wrist-Strap connected to the ESD Workstation mat while servicing the product.

To avoid electric shock, do not touch exposed connections.

Important Information

Regarding the use of Switch Cleaner products:

Switch Cleaner products usually contain a lubricating additive (along with the “alcohol-based” propellant), intended to remain after spraying into relevant components.

Equipment produced by Courtyard Electronics Ltd contains components that should not be cleaned using these types of cleaners, due to the compact nature of the components, their operating characteristics, or their inaccessibility. This is because push-buttons, for example, rely on clean, dry, conductive contact surfaces to operate correctly. Applying Switch Cleaner lubricant only serves to attract dust, or worse still could “wash-in” grease and dust, which could severely reduce the conductivity of the component parts.

Therefore, Courtyard Electronics Ltd does not recommend the use of these Switch Cleaner products on their equipment, and will not be held liable for any fault caused by inadvertent or unqualified use or application of such products.

Appendix F : Circuit Description

Circuit Description

Power Supply section

The main board is supplied with +12V from an AC-DC system via a 4-pin Molex connector.
The AC-DC system is normally a single Switched Mode Power Supply Unit (SMPSU); alternatively, a dual redundant N+1 SMPSU option is available.

The single SMPSU system provides:

- +12V @ 5.4A
- A temperature sensor for the SMPSU via a 7-pin Molex connector

The N+1 option has an additional 10-pin box header that provides communication with the main board. The N+1 system provides:

- +12V @ 5.4A (redundant)
- For each SMPSU, feedback is provided to the main board of :
    - +12V fail

On-board the +12V is converted to:

Digital supplies

- +5V - linear
- +3V3 - switcher
- +1V2 - switcher
- 0V
- -12V - switcher

Analog supplies

- +8V - linear
- +5V - linear
- 0VA
- -5V - linear
- -8V - linear

Current measurement resistors are provided for each rail. These are normally short circuits in production units.
The analog supplies are isolated from the digital supplies by common mode chokes.

CPU section

The board uses an ARM CPU from ST. The STR9 device provides on-chip:

- Flash
- SRAM
- RTC
- 3 UART
- Interrupt controller
- Address decoding is provided by an XC95144
- External memory bus

Additional external memory consists of:

- 1G-bit of Flash organised as 1024 sectors each 64K x 16-bit word
- 16M-bit SRAM organised as 1M x 16-bit word

Peripherals and I/O interfaces are supplied:

- 1 off I^2C master
- 1 off USB master for Flash disk connection
- 1 off RS232 for remote control
- 1 off RS232 for GPS connection
- 1 off RS232 for front panel connection
- 1 off 100-BaseT connection
- 2 off GP outputs
- 2 off GP inputs
- 1 off byte wide front panel interface
- 1 off CPU expansion bus connector
- 1 off temperature sensor for the Spartan FPGA
- 1 off I^2C EEPROM
- 1 off I^2C 8-channel 8-bit DAC for analog control and setup:
    - Channel 1 = Analog Video gain 1
    - Channel 2 = Analog Video gain 2
    - Channel 3 = Analog Video gain 3
    - Channel 4 = Analog Video gain 4
    - Channel 5 = Analog Video gain 5

The CPU section has additional +1V8 and +2V0 digital rails that are both derived from +3V3.

Clock Oscillator section

The board uses the following frequencies:

- 10MHz – System Clock derived from TCXO Oscillator
- 24.576MHz – Audio Clock derived from 27MHz
- 148.500000MHz – Video Clock derived from LVDS VCXO
- 148.351648MHz (=(148.5/1001)* 1000) – Video Clock derived from LVDS VCXO

- Each oscillator runs from a dedicated +3V3 rail derived from the +5V linear regulator.
- The TCXO can be steered by a PWM in the Spartan.
- Each VCXO is controlled by a phase and frequency discriminator in the Spartan, and a loop filter with switchable characteristics.

Spartan section

The Spartan supports:

- CPU interface
- 96-bit SDRAM memory – available as dual 48-bit sections if required
- 4 channels of SDI output
- 5 channels of video DAC output
- Clock generation and distribution
- Pulse outputs
- High speed expansion connector
- Video genlock

SDI Video Output section

- The Gennum 3G-bit chip-set is used to provide SDI Video outputs. Each output device has its own dedicated +1V2 rail derived from +3V3.
- 4 SDI Video output channels are provided.
- Each SDI Video output channel has dual BNCs.

Analog Video Output section

- The Texas Instruments THS5651 10-bit DAC is used to provide Analog Video outputs.
- Each DAC has its own clock distributed from the Spartan, so mixed Analog Video formats across outputs are supported.
- Each DAC has its own gain control from an 8-bit DAC (see CPU section above).
- Analog Video channel TRI/BLK4 supplies all 5 Analog Video channels with a DC bias voltage.
- Each Analog Video output channel has dual BNCs.

Genlock Video Input section

- The Genlock Video Input is comprised of dual BNCs configured as a looping input.
- The Texas Instruments LMH1981 device is used to separate both bi-level and tri-level syncs.
- Where burst is available, genlock is burst-locked. Otherwise sync-lock is used.

A more detailed circuit description of the Genlock Video Input circuit follows.

Master Oscillator.

The 10MHz master oscillator around X210 provides stability better than 0.22ppm (1Hz) at subcarrier frequency, and allows the CY460 to comply with the System I standard for frequency stability.

The master oscillator frequency can be trimmed by software control, via the calibration menu, to compensate for normal crystal ageing.

The master oscillator runs at 10MHz and enters the Xilinx where it is used to provide the reference for 'Internal Mode' operation, alternatively called 'free-run'.

External Reference Input and Sync Separator.

The genlock reference input is buffered by T101 & T102. Chrominance is passed by L101 & C109 and amplified by T103 and T104. C108 is added by U102B when operating in NTSC mode. U102C passes only bursts.

The buffered reference signal is also passed via L104, C103 and C104 to the sync separator, U101.

Additionally, U110C clamps the buffered video on C192, and this is sliced by U115A to provide VITC that can be input to the Xilinx.

Sync and Burst Presence Logic.

U101 provides data to sense loss of sync, while the slicer formed around U105C senses loss of burst.

Subcarrier Lock.

The oscillator built around crystals X11 and X12 provides either PAL or NTSC subcarrier frequencies to be compared in Burst Phase detector U103A with reference burst (genlock mode) or the master oscillator (free-run mode).

In free run mode, U102A is always closed and loop filter U107A is always connected to the phase detector. When genlocked, U102A is turned on only during alternate bursts of a PAL signal (all bursts in NTSC). The loop filter controls crystal X11 via varicap diode D171. Thus in PAL, the oscillator is locked to 135 degree bursts only. In NTSC, the loop filter controls crystal X12 via varicap diode D181.

Calibration of X11 & X12 is performed while the unit is at normal operating temperature. For a PAL reference, VC11 is adjusted for a voltage of +1V at TP15. Similarly, VC12 is used to adjust for +1V at TP15 for an NTSC reference.

PAL Ident.

If PAL ident is correct, the unused bursts demodulate as negative pulses at TP12. These are used in the Xilinx to control the PAL ident sequence.

Input Sc-H measurement and calibration.

Subcarrier (from X11/X12) is buffered in T106 before being sampled in U110A by an integrated waveform derived from dividing PAL Square Wave by 2 to give fH/4. This has an integral number of cycles in an 8-field sequence. Its polarity distinguishes field 1 from field 5. Fields 1 and 3 are reliably indicated by the odd/even fields and PAL ident. The filtered and buffered output waveform at U104B/TP13 is a 25Hz sinewave in PAL (related to the PAL 25Hz subcarrier offset), and a DC voltage in NTSC. Further sampling in U110B (using Frame pulses) produces a subcarrier polarity signal after U105B, used to determine correct field 1/5 selection. Input Sc-H calibration is performed by adjusting the sampling in U110B to produce reliable polarity indication.

Line and Field Lock.

All line and field locking occurs inside the Xilinx by controlled dropping or adding of pixels and/or lines.

Appendix G :
Characters Available For Use In Idents

Characters in Idents come from an intersection list of the first 256 characters from Unicode and the allowable characters in XML 1.1.

http://www.w3.org/TR/xml11/#charsets

Note:

Document authors are encouraged to avoid "compatibility characters", as defined in Unicode [Unicode]. The characters defined in the following ranges are also discouraged. They are either control characters or permanently undefined Unicode characters:

```
[#x1-#x8], [#xB-#xC], [#xE-#x1F], [#x7F-#x84], [#x86-#x9F],
[#xFDD0-#xFDDF],
[#x1FFFE-#x1FFFF], [#x2FFFE-#x2FFFF], [#x3FFFE-#x3FFFF],
[#x4FFFE-#x4FFFF], [#x5FFFE-#x5FFFF], [#x6FFFE-#x6FFFF],
[#x7FFFE-#x7FFFF], [#x8FFFE-#x8FFFF], [#x9FFFE-#x9FFFF],
[#xAFFFE-#xAFFFF], [#xBFFFE-#xBFFFF], [#xCFFFE-#xCFFFF],
[#xDFFFE-#xDFFFF], [#xEFFFE-#xEFFFF], [#xFFFFE-#xFFFFF],
[#x10FFFE-#x10FFFF].
```

XML 1.1 explicitly excludes the following characters:

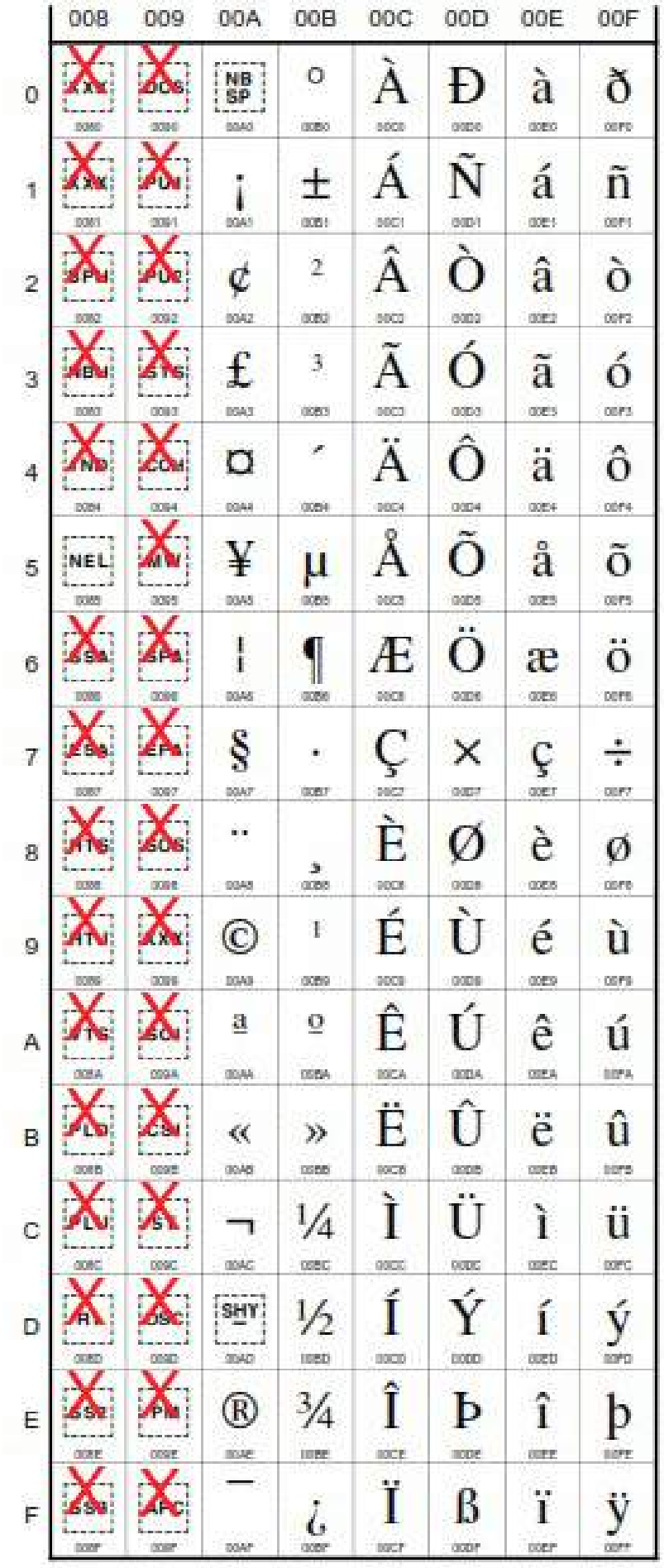
```
[0x01-0x08], [0x0b-0x0c], [0x0E-0x1F], [0x7f-0x84], [0x86-0x9f]
```

XML is used in the Dashboard interface and so the Idents also excludes these characters.

The following pages list the supported characters. Unsupported characters have a red cross through them - X.

Generally, if an unsupported character is detected, it will be replaced with the ‘space’ character 0x20.

	000	001	002	003	004	005	006	007
0	NUL 0000	DLE 0010	SP 0020	0 0030	@ 0040	P 0050	` 0060	p 0070
1	DC1 0001	DC1 0011	! 0021	1 0031	A 0041	Q 0051	a 0061	q 0071
2	STX 0002	DC2 0012	" 0022	2 0032	B 0042	R 0052	b 0062	r 0072
3	ETX 0003	DC3 0013	# 0023	3 0033	C 0043	S 0053	c 0063	s 0073
4	EOT 0004	DC4 0014	$ 0024	4 0034	D 0044	T 0054	d 0064	t 0074
5	ENQ 0005	NAK 0015	% 0025	5 0035	E 0045	U 0055	e 0065	u 0075
6	ACK 0006	SYN 0016	& 0026	6 0036	F 0046	V 0056	f 0066	v 0076
7	BEL 0007	ETB 0017	' 0027	7 0037	G 0047	W 0057	g 0067	w 0077
8	BS 0008	CAN 0018	(0028	8 0038	H 0048	X 0058	h 0068	x 0078
9	HT 0009	EM 0019	) 0029	9 0039	I 0049	Y 0059	i 0069	y 0079
A	LF 000A	SUB 001A	* 002A	: 003A	J 004A	Z 005A	j 006A	z 007A
B	VT 000B	ESC 001B	+ 002B	; 003B	K 004B	[005B	k 006B	{ 007B
C	FF 000C	FS 001C	, 002C	< 003C	L 004C	\ 005C	l 006C	| 007C
D	CR 000D	GS 001D	- 002D	= 003D	M 004D	] 005D	m 006D	} 007D
E	SO 000E	RS 001E	. 002E	> 003E	N 004E	^ 005E	n 006E	~ 007E
F	SI 000F	US 001F	/ 002F	? 003F	O 004F	_ 005F	o 006F	DEL 007F


008 009 00A 00B 00C 00D 00E 00F
0 XXX DCS NB SP º À Ð à ð
1 XXX PU1 ¡ ± Á Ñ á ñ
2 BPH PU2 ¢ ² Â Ò â ò
3 NBH STS £ ³ Ã Ó ã ó
4 IND CCH ¤ ´ Ä Ô ä ô
5 NEL MW ¥ µ Å Õ å õ
6 SSA SPA ¦ ¶ Æ Ö æ ö
7 ESA EPA § · Ç × ç ÷
8 HTS SOS ¨ ¸ È Ø è ø
9 HTJ XXX © ¹ É Ù é ù
A VTS SCI ª º Ê Ú ê ú
B PLD CSI « » Ë Û ë û
C PLU ST ¬ ¼ Ì Ü ì ü
D RI OSC SHY ½ Í Ý í ý
E SS2 PM ® ¾ Î Þ î þ
F SS3 APC ¯ ¿ Ï ß ï ÿ

C0 controls

Alias names are those for ISO/IEC 6429:1992. Commonly used alternative aliases are also shown.

0000 <control>
= NULL

0001 <control>
= START OF HEADING

0002 <control>
= START OF TEXT

0003 <control>
= END OF TEXT

0004 <control>
= END OF TRANSMISSION

0005 <control>
= ENQUIRY

0006 <control>
= ACKNOWLEDGE

0007 <control>
= BELL

0008 <control>
= BACKSPACE

0009 <control>
= CHARACTER TABULATION
= horizontal tabulation (HT), tab

000A <control>
= LINE FEED (LF)
= new line (NL), end of line (EOL)

000B <control>
= LINE TABULATION
= vertical tabulation (VT)

000C <control>
= FORM FEED (FF)

000D <control>
= CARRIAGE RETURN (CR)

000E <control>
= SHIFT OUT
• known as LOCKING-SHIFT ONE in 8-bit environments

000F <control>
= SHIFT IN
• known as LOCKING-SHIFT ZERO in 8-bit environments

0010 <control>
= DATA LINK ESCAPE

0011 <control>
= DEVICE CONTROL ONE

0012 <control>
= DEVICE CONTROL TWO

0013 <control>
= DEVICE CONTROL THREE

0014 <control>
= DEVICE CONTROL FOUR

0015 <control>
= NEGATIVE ACKNOWLEDGE

0016 <control>
= SYNCHRONOUS IDLE

0017 <control>
= END OF TRANSMISSION BLOCK

0018 <control>
= CANCEL

0019 <control>
= END OF MEDIUM

001A <control>
= SUBSTITUTE
→ FFFD replacement character

001B <control>
= ESCAPE

001C <control>
= INFORMATION SEPARATOR FOUR
= file separator (FS)

001D <control>
= INFORMATION SEPARATOR THREE
= group separator (GS)

001E <control>
= INFORMATION SEPARATOR TWO
= record separator (RS)

001F <control>
= INFORMATION SEPARATOR ONE
= unit separator (US)

ASCII punctuation and symbols

Based on ISO/IEC 646.

0020 SPACE
• sometimes considered a control code
• other space characters: 2000 – 200A
→ 00A0 no-break space
→ 200B zero width space
→ 2060 word joiner
→ 3000 ideographic space
→ FEFF zero width no-break space

0021 ! EXCLAMATION MARK
= factorial
= bang
→ 00A1 ¡ inverted exclamation mark
→ 01C3 ǃ latin letter retroflex click
→ 203C ‼ double exclamation mark
→ 203D ‽ interrobang
→ 2762 ❢ heavy exclamation mark ornament

0022 " QUOTATION MARK
• neutral (vertical), used as opening or closing quotation mark
• preferred characters in English for paired quotation marks are 201C “ & 201D ”
→ 02BA ˝ modifier letter double prime
→ 030B ̋ combining double acute accent
→ 030E ̎ combining double vertical line above
→ 2033 ″ double prime
→ 3003 〃 ditto mark

0023 # NUMBER SIGN
= pound sign, hash, crosshatch, octothorpe
→ 2114 ℔ l b bar symbol
→ 266F ♯ music sharp sign
~ 0023 FE0E text style
~ 0023 FE0F emoji style

0024 $ DOLLAR SIGN
= milréis, escudo
• used for many peso currencies in Latin America and elsewhere
• glyph may have one or two vertical bars
• other currency symbol characters: 20A0 – 20BA
→ 00A4 ¤ currency sign
→ 2081 ₱ peso sign
→ 1F4B2 💲 heavy dollar sign

0025 % PERCENT SIGN
→ 066A ٪ arabic percent sign
→ 2030 ‰ per mille sign
→ 2031 ‱ per ten thousand sign
→ 2052 ⁒ commercial minus sign

0026 & AMPERSAND
→ 204A ⁊ tironian sign et
→ 2148 ⅋ turned ampersand

0027 ' APOSTROPHE
= apostrophe-quote (1.0)
= APL quote
• neutral (vertical) glyph with mixed usage
• 2019 ' is preferred for apostrophe
• preferred characters in English for paired quotation marks are 2018 ‘ & 2019 ’
→ 02B9 ʹ modifier letter prime
→ 02BC ʼ modifier letter apostrophe
→ 02C8 ˈ modifier letter vertical line
→ 0301 ́ combining acute accent
→ 2032 ′ prime
→ A78C ꞌ latin small letter saltillo

0028 (LEFT PARENTHESIS
= opening parenthesis (1.0)

0029) RIGHT PARENTHESIS
= closing parenthesis (1.0)
• see discussion on semantics of paired bracketing characters

002A * ASTERISK
= star (on phone keypads)
→ 066D ٭ arabic five pointed star
→ 204E ⁎ low asterisk
→ 2217 ∗ asterisk operator
→ 26B9 ⚹ sextile
→ 2731 ✱ heavy asterisk

002B + PLUS SIGN
→ 2795 ➕ heavy plus sign

002C , COMMA
= decimal separator
→ 060C ، arabic comma
→ 201A ‚ single low-9 quotation mark
→ 3001 、 ideographic comma

002D - HYPHEN-MINUS
= hyphen or minus sign
• used for either hyphen or minus sign
→ 2010 ‐ hyphen
→ 2011 ‑ non-breaking hyphen
→ 2012 ‒ figure dash
→ 2013 – en dash
→ 2212 − minus sign
→ 10191 𐆑 roman uncia sign

002E . FULL STOP
= period, dot, decimal point
• may be rendered as a raised decimal point in old style numbers
→ 06D4 ۔ arabic full stop
→ 3002 。 ideographic full stop

002F / SOLIDUS
= slash, virgule
→ 01C01 ǁ latin letter dental click
→ 0338 ̸ combining long solidus overlay
→ 2044 ⁄ fraction slash
→ 2215 ∕ division slash

ASCII digits

0030 0 DIGIT ZERO
~ 0030 FE0E text style
~ 0030 FE0F emoji style

0031 1 DIGIT ONE
~ 0031 FE0E text style
~ 0031 FE0F emoji style

0032 2 DIGIT TWO
~ 0032 FE0E text style
~ 0032 FE0F emoji style

0033 3 DIGIT THREE
~ 0033 FE0E text style
~ 0033 FE0F emoji style

0034 4 DIGIT FOUR
~ 0034 FE0E text style
~ 0034 FE0F emoji style

0035 5 DIGIT FIVE
~ 0035 FE0E text style
~ 0035 FE0F emoji style

0036 6 DIGIT SIX
~ 0036 FE0E text style
~ 0036 FE0F emoji style

0037 7 DIGIT SEVEN
~ 0037 FE0E text style
~ 0037 FE0F emoji style

0038 8 DIGIT EIGHT
~ 0038 FE0E text style
~ 0038 FE0F emoji style

0039 9 DIGIT NINE
~ 0039 FE0E text style
~ 0039 FE0F emoji style

ASCII punctuation and symbols

003A : COLON
→ 0589 ։ armenian full stop
→ 05C3 ׃ hebrew punctuation sof pasuq
→ 2236 ∶ ratio
→ A789 ꞉ modifier letter colon

003B ; SEMICOLON
• this, and not 037E ; , is the preferred character for 'Greek question mark'
→ 037E ; greek question mark
→ 061B ؛ arabic semicolon
→ 204F ⁏ reversed semicolon

003C < LESS-THAN SIGN
→ 2039 ‹ single left-pointing angle quotation mark
→ 2329 〈 left-pointing angle bracket
→ 27E8 ⟨ mathematical left angle bracket
→ 3008 〈 left angle bracket

003D = EQUALS SIGN
• other related characters: 2241 ≁ –2263 ≣
→ 2260 ≠ not equal to
→ 2261 ≡ identical to
→ A78A ꞊ modifier letter short equals sign
→ 10190 𐆐 roman sextans sign

003E > GREATER-THAN SIGN
→ 203A › single right-pointing angle quotation mark
→ 232A 〉 right-pointing angle bracket
→ 27E9 ⟩ mathematical right angle bracket
→ 3009 〉 right angle bracket

003F ? QUESTION MARK
→ 00BF ¿ inverted question mark
→ 037E ; greek question mark
→ 061F ؟ arabic question mark
→ 203D ‽ interrobang
→ 2048 ⁇ question exclamation mark
→ 2049 ⁉ exclamation question mark

0040 @ COMMERCIAL AT
= at sign

Uppercase Latin alphabet

0041 A LATIN CAPITAL LETTER A
0042 B LATIN CAPITAL LETTER B
→ 212C ℬ script capital b
0043 C LATIN CAPITAL LETTER C
→ 2102 ℂ double-struck capital c
→ 212D ℭ black-letter capital c
0044 D LATIN CAPITAL LETTER D
0045 E LATIN CAPITAL LETTER E
→ 2107 Ɛ euler constant
→ 2130 ℰ script capital e
0046 F LATIN CAPITAL LETTER F
→ 2131 ℱ script capital f
→ 2132 Ⅎ turned capital f
0047 G LATIN CAPITAL LETTER G
0048 H LATIN CAPITAL LETTER H
→ 210B ℋ script capital h
→ 210C ℌ black-letter capital h
→ 210D ℍ double-struck capital h
0049 I LATIN CAPITAL LETTER I
• Turkish and Azerbaijani use 0131 ı for lowercase
→ 0130 İ latin capital letter i with dot above
→ 0406 І cyrillic capital letter byelorussian-ukrainian i
→ 04C0 Ӏ cyrillic letter palochka
→ 2110 ℐ script capital i
→ 2111 ℑ black-letter capital i
→ 2160 Ⅰ roman numeral one
004A J LATIN CAPITAL LETTER J
004B K LATIN CAPITAL LETTER K
→ 212A K kelvin sign
004C L LATIN CAPITAL LETTER L
→ 2112 ℒ script capital l
004D M LATIN CAPITAL LETTER M
→ 2133 ℳ script capital m
004E N LATIN CAPITAL LETTER N
→ 2115 ℕ double-struck capital n
004F O LATIN CAPITAL LETTER O
0050 P LATIN CAPITAL LETTER P
→ 2119 ℙ double-struck capital p
0051 Q LATIN CAPITAL LETTER Q
→ 211A ℚ double-struck capital q
0052 R LATIN CAPITAL LETTER R
→ 211B ℛ script capital r
→ 211C ℜ black-letter capital r
→ 211D ℝ double-struck capital r
0053 S LATIN CAPITAL LETTER S
0054 T LATIN CAPITAL LETTER T
0055 U LATIN CAPITAL LETTER U
0056 V LATIN CAPITAL LETTER V
→ 2164 Ⅴ roman numeral five
0057 W LATIN CAPITAL LETTER W
0058 X LATIN CAPITAL LETTER X
0059 Y LATIN CAPITAL LETTER Y
005A Z LATIN CAPITAL LETTER Z
→ 2124 ℤ double-struck capital z
→ 2128 ℨ black-letter capital z

ASCII punctuation and symbols

005B [LEFT SQUARE BRACKET
= opening square bracket (1.0)
• other bracket characters: 27E6 ⟦ –27EB ⟫ , 2983 ⦃ –2998 ⦘ , 3008 〈 –301B 〛
005C \ REVERSE SOLIDUS
= backslash
→ 20E5 ◌⃥ combining reverse solidus overlay
→ 2216 ∖ set minus
005D] RIGHT SQUARE BRACKET
= closing square bracket (1.0)
005E ^ CIRCUMFLEX ACCENT
• this is a spacing character
→ 02C4 ˄ modifier letter up arrowhead
→ 02C6 ˆ modifier letter circumflex accent
→ 0302 ◌̂ combining circumflex accent
→ 2038 ‸ caret
→ 2303 ⌃ up arrowhead
005F _ LOW LINE
= spacing underscore (1.0)
• this is a spacing character
→ 02CD ˍ modifier letter low macron
→ 0331 ◌̱ combining macron below
→ 0332 ◌̲ combining low line
→ 2017 ‗ double low line
0060 ` GRAVE ACCENT
• this is a spacing character
→ 02CB ˋ modifier letter grave accent
→ 0300 ◌̀ combining grave accent
→ 2035 ‵ reversed prime

Lowercase Latin alphabet

0061 a LATIN SMALL LETTER A
0062 b LATIN SMALL LETTER B
0063 c LATIN SMALL LETTER C
0064 d LATIN SMALL LETTER D
0065 e LATIN SMALL LETTER E
→ 212E ℮ estimated symbol
→ 212F ℯ script small e
0066 f LATIN SMALL LETTER F
0067 g LATIN SMALL LETTER G
→ 0261 ɡ latin small letter script g
→ 210A ℊ script small g
0068 h LATIN SMALL LETTER H
→ 04BB һ cyrillic small letter shha
→ 210E ℎ planck constant
0069 i LATIN SMALL LETTER I
• Turkish and Azerbaijani use 0130 İ for uppercase
→ 0131 ı latin small letter dotless i
→ 1D6A4 𝚤 mathematical italic small dotless i
006A j LATIN SMALL LETTER J
→ 0237 ȷ latin small letter dotless j
→ 1D6A5 𝚥 mathematical italic small dotless j
006B k LATIN SMALL LETTER K
006C l LATIN SMALL LETTER L
→ 2113 ℓ script small l
→ 1D4C1 𝓁 mathematical script small l

006D m LATIN SMALL LETTER M
006E n LATIN SMALL LETTER N
→ 207F ⁿ superscript latin small letter n
006F o LATIN SMALL LETTER O
→ 2134 ℴ script small o
0070 p LATIN SMALL LETTER P
0071 q LATIN SMALL LETTER Q
0072 r LATIN SMALL LETTER R
0073 s LATIN SMALL LETTER S
0074 t LATIN SMALL LETTER T
0075 u LATIN SMALL LETTER U
0076 v LATIN SMALL LETTER V
0077 w LATIN SMALL LETTER W
0078 x LATIN SMALL LETTER X
0079 y LATIN SMALL LETTER Y
007A z LATIN SMALL LETTER Z
→ 01B6 ƶ latin small letter z with stroke

ASCII punctuation and symbols

007B { LEFT CURLY BRACKET
= opening curly bracket (1.0)
= left brace
007C | VERTICAL LINE
= vertical bar
• used in pairs to indicate absolute value
→ 01C0 ǀ latin letter dental click
→ 05C0 ׀ hebrew punctuation paseq
→ 2223 ∣ divides
→ 2758 ❘ light vertical bar
007D } RIGHT CURLY BRACKET
= closing curly bracket (1.0)
= right brace
007E ~ TILDE
• this is a spacing character
→ 02DC ˜ small tilde
→ 0303 ◌̃ combining tilde
→ 2053 ⁓ swung dash
→ 223C ∼ tilde operator
→ FF5E ～ fullwidth tilde

Control character

007F <control>
= DELETE

C1 controls

Alias names are those for ISO/IEC 6429:1992.

0080 <control>
0081 <control>
0082 <control>
= BREAK PERMITTED HERE
→ 2008 zero width space
0083 <control>
= NO BREAK HERE
→ 2060 word joiner
0084 <control>
• formerly known as INDEX
0085 <control>
= NEXT LINE (NEL)
0086 <control>
= START OF SELECTED AREA
0087 <control>
= END OF SELECTED AREA
0088 <control>
= CHARACTER TABULATION SET
0089 <control>
= CHARACTER TABULATION WITH JUSTIFICATION
008A <control>
= LINE TABULATION SET
008B <control>
= PARTIAL LINE FORWARD
008C <control>
= PARTIAL LINE BACKWARD
008D <control>
= REVERSE LINE FEED
008E <control>
= SINGLE SHIFT TWO
008F <control>
= SINGLE SHIFT THREE
0090 <control>
= DEVICE CONTROL STRING
0091 <control>
= PRIVATE USE ONE
0092 <control>
= PRIVATE USE TWO
0093 <control>
= SET TRANSMIT STATE
0094 <control>
= CANCEL CHARACTER
0095 <control>
= MESSAGE WAITING
0096 <control>
= START OF GUARDED AREA
0097 <control>
= END OF GUARDED AREA
0098 <control>
= START OF STRING
0099 <control>
009A <control>
= SINGLE CHARACTER INTRODUCER
009B <control>
= CONTROL SEQUENCE INTRODUCER
009C <control>
= STRING TERMINATOR
009D <control>
= OPERATING SYSTEM COMMAND
009E <control>
= PRIVACY MESSAGE
009F <control>
= APPLICATION PROGRAM COMMAND

Latin-1 punctuation and symbols

Based on ISO/IEC 8859-1 (aka Latin-1) from here.

00A0 NO-BREAK SPACE
• commonly abbreviated as NBSP
→ 0020 space
→ 2007 figure space
→ 202F narrow no-break space
→ 2060 word joiner
→ FEFF zero width no-break space
≡ <noBreak> 0020
00A1 ¡ INVERTED EXCLAMATION MARK
• Spanish, Asturian, Galician
→ 0021 ! exclamation mark
00A2 ¢ CENT SIGN
00A3 £ POUND SIGN
= pound sterling, Irish punt, Italian lira, Turkish lira, etc.
→ 20A4 £ lira sign
→ 20BA ₺ turkish lira sign
→ 10192 𐆒 roman semuncia sign
00A4 ¤ CURRENCY SIGN
• other currency symbol characters: 20A0 ₠–20BA ₺
→ 0024 $ dollar sign
00A5 ¥ YEN SIGN
= yuan sign
• glyph may have one or two crossbars
00A6 ¦ BROKEN BAR
= broken vertical bar (1.0)
= parted rule (in typography)
00A7 § SECTION SIGN
• paragraph sign in some European usage
00A8 ¨ DIAERESIS
• this is a spacing character
→ 0308 ◌̈ combining diaeresis
≡ 0020 0308 ◌̈
00A9 © COPYRIGHT SIGN
→ 2117 ℗ sound recording copyright
→ 2488 ⒞ circled latin capital letter c
00AA ª FEMININE ORDINAL INDICATOR
• Spanish
≡ <super> 0061 a
00AB « LEFT-POINTING DOUBLE ANGLE QUOTATION MARK
= left guillemet
= chevrons (in typography)
• usually opening, sometimes closing
→ 226A ≪ much less-than
→ 300A 《 left double angle bracket
00AC ¬ NOT SIGN
= angled dash (in typography)
→ 2310 ⌐ reversed not sign
00AD SOFT HYPHEN
= discretionary hyphen
• commonly abbreviated as SHY
00AE ® REGISTERED SIGN
= registered trade mark sign (1.0)
→ 24C7 Ⓡ circled latin capital letter r

00AF ¯ MACRON
= overline, APL overbar
• this is a spacing character
→ 02C9 ˉ modifier letter macron
→ 0304 ◌̄ combining macron
→ 0305 ◌̅ combining overline
≡ 0020 SP 0304 ◌̄

00B0 ° DEGREE SIGN
• this is a spacing character
→ 02DA ˚ ring above
→ 030A ◌̊ combining ring above
→ 2070 ⁰ superscript zero
→ 2218 ∘ ring operator

00B1 ± PLUS-MINUS SIGN
→ 2213 ∓ minus-or-plus sign

00B2 ² SUPERSCRIPT TWO
= squared
• other superscript digit characters: 2070 ⁰–2079 ⁹
→ 00B9 ¹ superscript one
≡ <super> 0032 2

00B3 ³ SUPERSCRIPT THREE
= cubed
→ 00B9 ¹ superscript one
≡ <super> 0033 3

00B4 ´ ACUTE ACCENT
• this is a spacing character
→ 02B9 ʹ modifier letter prime
→ 02CA ˊ modifier letter acute accent
→ 0301 ◌́ combining acute accent
→ 2032 ′ prime
≡ 0020 SP 0301 ◌́

00B5 µ MICRO SIGN
≡ 03BC μ greek small letter mu

00B6 ¶ PILCROW SIGN
= paragraph sign
• section sign in some European usage
→ 204B ⁋ reversed pilcrow sign
→ 2761 ❡ curved stem paragraph sign ornament

00B7 · MIDDLE DOT
= midpoint (in typography)
= Georgian comma
= Greek middle dot (ano teleia)
→ 0387 · greek ano teleia
→ 16EB ᛫ runic single punctuation
→ 2022 • bullet
→ 2024 ‧ one dot leader
→ 2027 ‧ hyphenation point
→ 2219 ∙ bullet operator
→ 22C5 ⋅ dot operator
→ 2E31 ‧ word separator middle dot
→ 2E33 ˑ raised dot
→ 30FB ・ katakana middle dot

00B8 ¸ CEDILLA
• this is a spacing character
• other spacing accent characters: 02D8 ˘ –02DB ˛
→ 0327 ◌̧ combining cedilla
≡ 0020 SP 0327 ◌̧

00B9 ¹ SUPERSCRIPT ONE
→ 00B2 ² superscript two
→ 00B3 ³ superscript three
≡ <super> 0031 1

00BA º MASCULINE ORDINAL INDICATOR
• Spanish
≡ <super> 006F o

00BB » RIGHT-POINTING DOUBLE ANGLE QUOTATION MARK
= right guillemet
• usually closing, sometimes opening
→ 226B ≫ much greater-than
→ 300B 》 right double angle bracket

00BC ¼ VULGAR FRACTION ONE QUARTER
• bar may be horizontal or slanted
• other fraction characters: 2153 ⅓ –215E ⅞
≡ <fraction> 0031 1 2044 ⁄ 0034 4

00BD ½ VULGAR FRACTION ONE HALF
• bar may be horizontal or slanted
≡ <fraction> 0031 1 2044 ⁄ 0032 2

00BE ¾ VULGAR FRACTION THREE QUARTERS
• bar may be horizontal or slanted
≡ <fraction> 0033 3 2044 ⁄ 0034 4

00BF ¿ INVERTED QUESTION MARK
= turned question mark
• Spanish
→ 003F ? question mark
→ 2E2E ⸮ reversed question mark

Letters

00C0 À LATIN CAPITAL LETTER A WITH GRAVE
≡ 0041 A 0300 ◌̀

00C1 Á LATIN CAPITAL LETTER A WITH ACUTE
≡ 0041 A 0301 ◌́

00C2 Â LATIN CAPITAL LETTER A WITH CIRCUMFLEX
≡ 0041 A 0302 ◌̂

00C3 Ã LATIN CAPITAL LETTER A WITH TILDE
≡ 0041 A 0303 ◌̃

00C4 Ä LATIN CAPITAL LETTER A WITH DIAERESIS
≡ 0041 A 0308 ◌̈

00C5 Å LATIN CAPITAL LETTER A WITH RING ABOVE
→ 212B Å angstrom sign
≡ 0041 A 030A ◌̊

00C6 Æ LATIN CAPITAL LETTER AE
= latin capital ligature ae (1.0)

00C7 Ç LATIN CAPITAL LETTER C WITH CEDILLA
≡ 0043 C 0327 ◌̧

00C8 È LATIN CAPITAL LETTER E WITH GRAVE
≡ 0045 E 0300 ◌̀

00C9 É LATIN CAPITAL LETTER E WITH ACUTE
≡ 0045 E 0301 ◌́

00CA Ê LATIN CAPITAL LETTER E WITH CIRCUMFLEX
≡ 0045 E 0302 ◌̂

00CB Ë LATIN CAPITAL LETTER E WITH DIAERESIS
≡ 0045 E 0308 ◌̈

00CC Ì LATIN CAPITAL LETTER I WITH GRAVE
≡ 0049 I 0300 ◌̀

00CD Í LATIN CAPITAL LETTER I WITH ACUTE
≡ 0049 I 0301 ◌́

00CE Î LATIN CAPITAL LETTER I WITH CIRCUMFLEX
≡ 0049 I 0302 ◌̂

00CF Ï LATIN CAPITAL LETTER I WITH DIAERESIS
≡ 0049 I 0308 ◌̈

00D0 Ð LATIN CAPITAL LETTER ETH
→ 00F0 ð latin small letter eth
→ 0110 Đ latin capital letter d with stroke
→ 0189 Ɖ latin capital letter african d

00D1 Ñ LATIN CAPITAL LETTER N WITH TILDE
= 004E N 0303 ◌̃
00D2 Ò LATIN CAPITAL LETTER O WITH GRAVE
= 004F O 0300 ◌̀
00D3 Ó LATIN CAPITAL LETTER O WITH ACUTE
= 004F O 0301 ◌́
00D4 Ô LATIN CAPITAL LETTER O WITH CIRCUMFLEX
= 004F O 0302 ◌̂
00D5 Õ LATIN CAPITAL LETTER O WITH TILDE
= 004F O 0303 ◌̃
00D6 Ö LATIN CAPITAL LETTER O WITH DIAERESIS
= 004F O 0308 ◌̈

Mathematical operator

00D7 × MULTIPLICATION SIGN
= z notation Cartesian product
→ 274C ✖ cross mark

Letters

00D8 Ø LATIN CAPITAL LETTER O WITH STROKE
= o slash
→ 2205 ∅ empty set
00D9 Ù LATIN CAPITAL LETTER U WITH GRAVE
= 0055 U 0300 ◌̀
00DA Ú LATIN CAPITAL LETTER U WITH ACUTE
= 0055 U 0301 ◌́
00DB Û LATIN CAPITAL LETTER U WITH CIRCUMFLEX
= 0055 U 0302 ◌̂
00DC Ü LATIN CAPITAL LETTER U WITH DIAERESIS
= 0055 U 0308 ◌̈
00DD Ý LATIN CAPITAL LETTER Y WITH ACUTE
= 0059 Y 0301 ◌́
00DE Þ LATIN CAPITAL LETTER THORN
00DF ß LATIN SMALL LETTER SHARP S
= Eszett
• German
• uppercase is "SS"
• typographically the glyph for this character can be based on a ligature of 017F ſ with either 0073 s or with an old-style glyph for 007A z (the latter similar in appearance to 0292 ʒ). Both forms exist interchangeably today.
→ 03B2 β greek small letter beta
→ 1E9E ẞ latin capital letter sharp s
00E0 à LATIN SMALL LETTER A WITH GRAVE
= 0061 a 0300 ◌̀
00E1 á LATIN SMALL LETTER A WITH ACUTE
= 0061 a 0301 ◌́
00E2 â LATIN SMALL LETTER A WITH CIRCUMFLEX
= 0061 a 0302 ◌̂
00E3 ã LATIN SMALL LETTER A WITH TILDE
• Portuguese
= 0061 a 0303 ◌̃
00E4 ä LATIN SMALL LETTER A WITH DIAERESIS
= 0061 a 0308 ◌̈
00E5 å LATIN SMALL LETTER A WITH RING ABOVE
• Danish, Norwegian, Swedish, Walloon
= 0061 a 030A ◌̊
00E6 æ LATIN SMALL LETTER AE
= latin small ligature ae (1.0)
= ash (from Old English æsc)
• Danish, Norwegian, Icelandic, Faroese, Old English, French, IPA
→ 0153 œ latin small ligature oe
→ 04D5 ӕ cyrillic small ligature a ie
00E7 ç LATIN SMALL LETTER C WITH CEDILLA
= 0063 c 0327 ◌̧
00E8 è LATIN SMALL LETTER E WITH GRAVE
= 0065 e 0300 ◌̀
00E9 é LATIN SMALL LETTER E WITH ACUTE
= 0065 e 0301 ◌́
00EA ê LATIN SMALL LETTER E WITH CIRCUMFLEX
= 0065 e 0302 ◌̂
00EB ë LATIN SMALL LETTER E WITH DIAERESIS
= 0065 e 0308 ◌̈
00EC ì LATIN SMALL LETTER I WITH GRAVE
• Italian, Malagasy
= 0069 i 0300 ◌̀
00ED í LATIN SMALL LETTER I WITH ACUTE
= 0069 i 0301 ◌́
00EE î LATIN SMALL LETTER I WITH CIRCUMFLEX
= 0069 i 0302 ◌̂
00EF ï LATIN SMALL LETTER I WITH DIAERESIS
= 0069 i 0308 ◌̈
00F0 ð LATIN SMALL LETTER ETH
• Icelandic, Faroese, Old English, IPA
→ 00D0 Ð latin capital letter eth
→ 0384 δ greek small letter delta
→ 2202 ∂ partial differential
00F1 ñ LATIN SMALL LETTER N WITH TILDE
= 006E n 0303 ◌̃
00F2 ò LATIN SMALL LETTER O WITH GRAVE
= 006F o 0300 ◌̀
00F3 ó LATIN SMALL LETTER O WITH ACUTE
= 006F o 0301 ◌́
00F4 ô LATIN SMALL LETTER O WITH CIRCUMFLEX
= 006F o 0302 ◌̂
00F5 õ LATIN SMALL LETTER O WITH TILDE
• Portuguese, Estonian
= 006F o 0303 ◌̃
00F6 ö LATIN SMALL LETTER O WITH DIAERESIS
= 006F o 0308 ◌̈

Mathematical operator

00F7 ÷ DIVISION SIGN
→ 2215 ∕ division slash
→ 2223 ∣ divides
→ 2797 ➗ heavy division sign

Letters

00F8 ø LATIN SMALL LETTER O WITH STROKE
= o slash
• Danish, Norwegian, Faroese, IPA
00F9 ù LATIN SMALL LETTER U WITH GRAVE
• French, Italian
= 0075 u 0300 ◌̀
00FA ú LATIN SMALL LETTER U WITH ACUTE
= 0075 u 0301 ◌́
00FB û LATIN SMALL LETTER U WITH CIRCUMFLEX
= 0075 u 0302 ◌̂
00FC ü LATIN SMALL LETTER U WITH DIAERESIS
= 0075 u 0308 ◌̈

00FD ý LATIN SMALL LETTER Y WITH ACUTE
• Czech, Slovak, Icelandic, Faroese, Welsh, Malagasy
= 0079 y 0301 ◌́

00FE þ LATIN SMALL LETTER THORN
• Icelandic, Old English, phonetics
• Runic letter borrowed into Latin script
→ 16A6 ᚦ runic letter thurisaz thurs thorn

00FF ÿ LATIN SMALL LETTER Y WITH DIAERESIS
• French, medieval Hungarian orthography
→ 0178 Ÿ latin capital letter y with diaeresis
= 0079 y 0308 ◌̈

Appendix H : DC Power Option

Optionally, +12volt DC can be used to power the CY460 SPG. In this configuration the power inlet is a four pin XLR male connector. The input passes through a metal body bridge rectifier to provide a small voltage drop and protect against an incorrectly wired connection. After the bridge rectifier an overvoltage protection is applied using the Linear Technology 1555A board that is mounted in the frame. This provides protection for both over-voltage and under-voltage supplies.

The input of the nominally +12v DC is protected against +/- 30v DC.

The operational range of the CY460 SPG is +11v…+14.5v DC. Outside of this range the CY460 SPG DC input will shut down.

Redundant power

When used in conjunction with an AC mains power supply, if the AC mains power is present and within the correct range, the CY460 SPG will be powered from the AC mains and the DC power input will draw less than 100mA. As soon as the AC power is lost or disconnected, a seamless transition to the DC power is accomplished (if the DC power is in the correct range).

Appendix I : List of Test Patterns

The CY460 Sync Pulse and Pattern Generator patterns are stored in a pattern file in FLASH memory. Each signal format has a slightly different set of test patterns.. The pattern file is updateable via the Ethernet interface. The latest file dated 22nd July 2013 is: **PatFile_0x34000000_v00_01o**.

The following pages detail the patterns available in each format.

List of 525i test Patterns:

```
"black                          ", //0
"white100                       ", //1
"yellow100                      ", //2
"cyan100                        ", //3
"green100                       ", //4
"magenta100                     ", //5
"red100                         ", //6
"blue100                        ", //7
"rp219_000_p2white100_p3Black   ", //8
"rp219_001_p2white075_p3Black   ", //9
"rp219_002_p2nI_p3Black         ", //10
"rp219_003_p2pI_p3pQ            ", //11
"16x12hardgrille_blacksquare    ", //12
"16x12softgrille_blacksquare    ", //13
"16x12hardgrille_white050square", //14
"16x12softgrille_white050square", //15
"16x9hardgrille_blacksquare     ", //16
"16x9softgrille_blacksquare     ", //17
"16x9hardgrille_white050square  ", //18
"16x9softgrille_white050square  ", //19
"bar100_9                       ", //20
"bar100_9_red100                ", //21
"bar100_8                       ", //22
"bar100_8_red100                ", //23
"bar095_9                       ", //24
"bar095_9_red095                ", //25
"bar095_8                       ", //26
"bar095_8_red095                ", //27
"bar075_9                       ", //28
"bar075_9_red075                ", //29
"bar075_8                       ", //30
"bar075_8_red075                ", //31
"barebu_9                       ", //32
"barebu_9_red075                ", //33
"barebu_8                       ", //34
"barebu_8_red075                ", //35
"barsmpte                       ", //36
"pathalogica_type1              ", //37
"pathalogical_type2             ", //38
"multiburst_full_mono           ", //39
"multiburst_half_mono           ", //40
"multiburst_Half_Luma_Full_Chro", //41
"multiburst_half_color          ", //42
"sweep_full_mono                ", //43
"sweep_half_mono                ", //44
"sweep_Half_Luma_Full_Chroma    ", //45
"sweep_half_color               ", //46
"SincX                          ", //47
"100%_valid_ramps_1             ", //48
"Luma_ramp_full_width_1         ", //49
"Cb_ramp_full_width_1           ", //50
"Cr_ramp_full_width_1           ", //51
"All_ramps_full_width_1         ", //52
"EBU3305                        ", //53
"7_T_Pulses                     ", //54
"full_frame_picture_type1       ", //55
"full_frame_picture_type2       ", //56
```

List of 625i test Patterns:

```
        "black                          ", //0
        "white100                       ", //1
        "yellow100                      ", //2
        "cyan100                        ", //3
        "green100                       ", //4
        "magenta100                     ", //5
        "red100                         ", //6
        "blue100                        ", //7
        "rp219_000_p2white100_p3Black   ", //8
        "rp219_001_p2white075_p3Black   ", //9
        "rp219_002_p2nI_p3Black         ", //10
        "rp219_003_p2pI_p3pQ            ", //11
        "16x12hardgrille_blacksquare    ", //12
        "16x12softgrille_blacksquare    ", //13
        "16x12hardgrille_white050square", //14
        "16x12softgrille_white050square", //15
        "16x9hardgrille_blacksquare     ", //16
        "16x9softgrille_blacksquare     ", //17
        "16x9hardgrille_white050square  ", //18
        "16x9softgrille_white050square  ", //19
        "bar100_9                       ", //20
        "bar100_9_red100                ", //21
        "bar100_8                       ", //22
        "bar100_8_red100                ", //23
        "bar095_9                       ", //24
        "bar095_9_red095                ", //25
        "bar095_8                       ", //26
        "bar095_8_red095                ", //27
        "bar075_9                       ", //28
        "bar075_9_red075                ", //29
        "bar075_8                       ", //30
        "bar075_8_red075                ", //31
        "barebu_9                       ", //32
        "barebu_9_red075                ", //33
        "barebu_8                       ", //34
        "barebu_8_red075                ", //35
        "barsmpte                       ", //36
        "pathalogical_type1             ", //37
        "pathalogical_type2             ", //38
        "multiburst_full_mono           ", //39
        "multiburst_half_mono           ", //40
        "multiburst_Half_Luma_Full_Chro", //41
        "multiburst_half_color          ", //42
        "sweep_full_mono                ", //43
        "sweep_half_mono                ", //44
        "sweep_Half_Luma_Full_Chroma    ", //45
        "sweep_half_color               ", //46
        "100%_valid_ramps_1             ", //47
        "EBU3305                        ", //48
        "Pulses                         ", //49
        "full_frame_picture_type1       ", //50
        "full_frame_picture_type2       ", //51
```

List of 720p test Patterns:

```
        "black                          ", //0
        "white100                       ", //1
        "yellow100                      ", //2
        "cyan100                        ", //3
        "green100                       ", //4
        "magenta100                     ", //5
        "red100                         ", //6
        "blue100                        ", //7
        "rp219_000_p2white100_p3Black   ", //8
        "rp219_001_p2white075_p3Black   ", //9
        "rp219_002_p2nI_p3Black         ", //10
        "rp219_003_p2pI_p3pQ            ", //11
        "16x9hardgrille_blacksquare     ", //12
        "16x9softgrille_blacksquare     ", //13
        "16x9hardgrille_white050square  ", //14
        "16x9softgrille_white050square  ", //15
        "bar100_9                       ", //16
        "bar100_9_red100                ", //17
        "bar100_8                       ", //18
        "bar100_8_red100                ", //19
        "bar095_9                       ", //20
        "bar095_9_red095                ", //21
        "bar095_8                       ", //22
        "bar095_8_red095                ", //23
        "bar075_9                       ", //24
        "bar075_9_red075                ", //25
        "bar075_8                       ", //26
        "bar075_8_red075                ", //27
        "barebu_9                       ", //28
        "barebu_9_red075                ", //29
        "barebu_8                       ", //30
        "barebu_8_red075                ", //31
        "pathalogical_frame0            ", //32
        "pathalogical_frame1            ", //33
        "multiburst_full_mono           ", //34
        "multiburst_half_mono           ", //35
        "multiburst_Half_Luma_Full_Chro", //36
        "multiburst_half_color          ", //37
        "sweep_full_mono                ", //38
        "sweep_half_mono                ", //39
        "sweep_Half_Luma_Full_Chroma    ", //40
        "sweep_half_color               ", //41
        "100%_valid_ramps_1             ", //42
        "100%_valid_ramps_2             ", //43
        "7_T_Pulses                     ", //44
```

List of 1035i test Patterns:

```
"black                          ", //0
"white100                       ", //1
"yellow100                      ", //2
"cyan100                        ", //3
"green100                       ", //4
"magenta100                     ", //5
"red100                         ", //6
"blue100                        ", //7
"rp219_000_p2white100_p3Black   ", //8
"rp219_001_p2white075_p3Black   ", //9
"rp219_002_p2nI_p3Black         ", //10
"rp219_003_p2pI_p3pQ            ", //11
"16x9hardgrille_blacksquare     ", //12
"16x9softgrille_blacksquare     ", //13
"16x9hardgrille_white050square  ", //14
"16x9softgrille_white050square  ", //15
"bar100_9                       ", //16
"bar100_9_red100                ", //17
"bar100_8                       ", //18
"bar100_8_red100                ", //19
"bar095_9                       ", //20
"bar095_9_red095                ", //21
"bar095_8                       ", //22
"bar095_8_red095                ", //23
"bar075_9                       ", //24
"bar075_9_red075                ", //25
"bar075_8                       ", //26
"bar075_8_red075                ", //27
"barebu_9                       ", //28
"barebu_9_red075                ", //29
"barebu_8                       ", //30
"barebu_8_red075                ", //31
"pathalogical_frame0            ", //32
"pathalogical_frame1            ", //33
"multiburst_full_mono           ", //34
"multiburst_half_mono           ", //35
"multiburst_Half_Luma_Full_Chro", //36
"multiburst_half_color          ", //37
"sweep_full_mono                ", //38
"sweep_half_mono                ", //39
"sweep_Half_Luma_Full_Chroma    ", //40
"sweep_half_color               ", //41
"100%_valid_ramps_1             ", //42
"100%_valid_ramps_2             ", //43
"7_T_Pulses                     ", //44
```

List of 1080i and 1080PsF test Patterns:

```
"black                          ", //0
"white100                       ", //1
"yellow100                      ", //2
"cyan100                        ", //3
"green100                       ", //4
"magenta100                     ", //5
"red100                         ", //6
"blue100                        ", //7
"rp219_000_p2white100_p3Black   ", //8
"rp219_001_p2white075_p3Black   ", //9
"rp219_002_p2nI_p3Black         ", //10
"rp219_003_p2pI_p3pQ            ", //11
"16x9hardgrille_blacksquare     ", //12
"16x9softgrille_blacksquare     ", //13
"16x9hardgrille_white050square  ", //14
"16x9softgrille_white050square  ", //15
"bar100_9                       ", //16
"bar100_9_red100                ", //17
"bar100_8                       ", //18
"bar100_8_red100                ", //19
"bar095_9                       ", //20
"bar095_9_red095                ", //21
"bar095_8                       ", //22
"bar095_8_red095                ", //23
"bar075_9                       ", //24
"bar075_9_red075                ", //25
"bar075_8                       ", //26
"bar075_8_red075                ", //27
"barebu_9                       ", //28
"barebu_9_red075                ", //29
"barebu_8                       ", //30
"barebu_8_red075                ", //31
"pathalogical_frame0            ", //32
"pathalogical_frame1            ", //33
"multiburst_full_mono           ", //34
"multiburst_half_mono           ", //35
"multiburst_Half_Luma_Full_Chro", //36
"multiburst_half_color          ", //37
"sweep_full_mono                ", //38
"sweep_half_mono                ", //39
"sweep_Half_Luma_Full_Chroma    ", //40
"sweep_half_color               ", //41
"100%_valid_ramps_1             ", //42
"100%_valid_ramps_2             ", //43
"7_T_Pulses                     ", //44
"full_frame_picture_type1       ", //45
"full_frame_picture_type2       ", //46
```

List of 1080p test Patterns:

```
        "black                          ", //0
        "white100                       ", //1
        "yellow100                      ", //2
        "cyan100                        ", //3
        "green100                       ", //4
        "magenta100                     ", //5
        "red100                         ", //6
        "blue100                        ", //7
        "rp219_000_p2white100_p3Black   ", //8
        "rp219_001_p2white075_p3Black   ", //9
        "rp219_002_p2nI_p3Black         ", //10
        "rp219_003_p2pI_p3pQ            ", //11
        "16x9hardgrille_blacksquare     ", //12
        "16x9softgrille_blacksquare     ", //13
        "16x9hardgrille_white050square  ", //14
        "16x9softgrille_white050square  ", //15
        "bar100_9                       ", //16
        "bar100_9_red100                ", //17
        "bar100_8                       ", //18
        "bar100_8_red100                ", //19
        "bar095_9                       ", //20
        "bar095_9_red095                ", //21
        "bar095_8                       ", //22
        "bar095_8_red095                ", //23
        "bar075_9                       ", //24
        "bar075_9_red075                ", //25
        "bar075_8                       ", //26
        "bar075_8_red075                ", //27
        "barebu_9                       ", //28
        "barebu_9_red075                ", //29
        "barebu_8                       ", //30
        "barebu_8_red075                ", //31
        "pathalogical_frame0            ", //32
        "pathalogical_frame1            ", //33
        "multiburst_full_mono           ", //34
        "multiburst_half_mono           ", //35
        "multiburst_Half_Luma_Full_Chro", //36
        "multiburst_half_color          ", //37
        "sweep_full_mono                ", //38
        "sweep_half_mono                ", //39
        "sweep_Half_Luma_Full_Chroma    ", //40
        "sweep_half_color               ", //41
        "100%_valid_ramps_1             ", //42
        "100%_valid_ramps_2             ", //43
        "7_T_Pulses                     ", //44
        "full_frame_picture_type1       ", //45
        "full_frame_picture_type2       ", //46
```

Appendix J : Connecting to DashBoard

This appendix contains procedures for connecting to the DashBoard remote control GUI.

General Usage

The CY460 Sync Pulse and Test Pattern Generator can be remotely controlled over an Ethernet link by a DashBoard GUI control program running on a Windows, Linux or OS X personal computer.

DashBoard can be downloaded from:
http://www.rossvideo.com/control-systems/dashboard/products/dashboard.html#download

The CY460 Sync Pulse and Test Pattern Generator is always configured as a fixed IPv4 device using the menu system accessible on the front panel.

The menu structure is -System Setup Menu > Network Menu.

The items to be configured are:

1. IP Address
2. Subnet Mask
3. Gateway

Ask your network expert to help set these up. An example setting is:

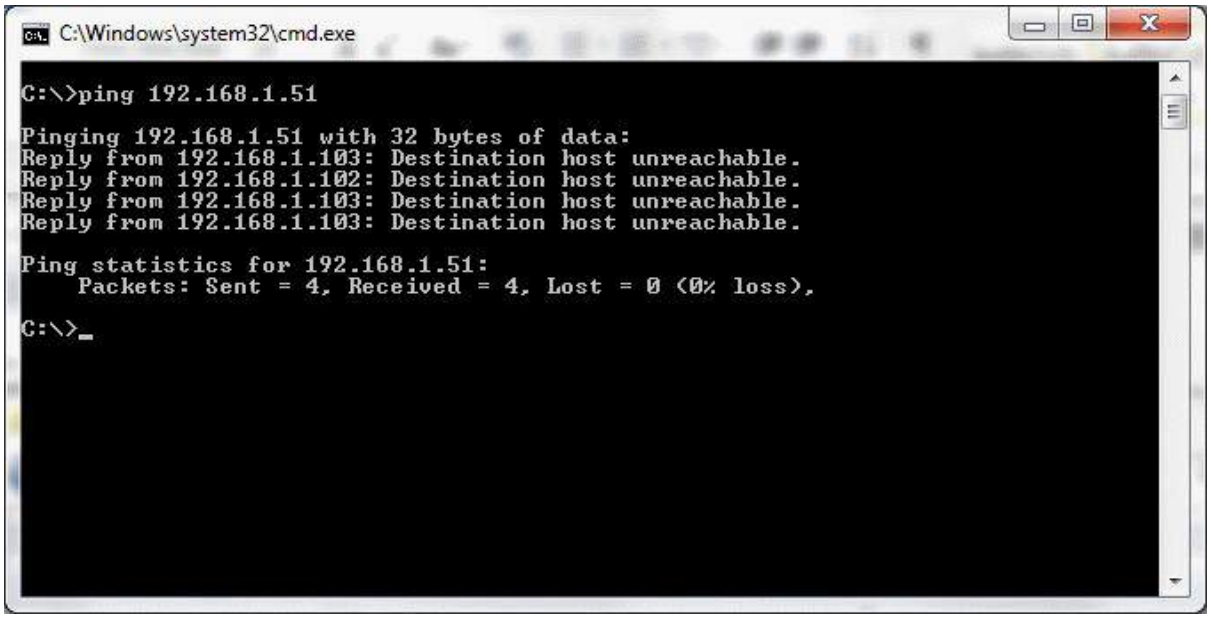
1. IP Address 192.168.001.051
2. Subnet Mask 255.255.255.000
3. Gateway 192.168.001.254

The controlling personal computer must (typically) be on the same "subnet" as the CY460.

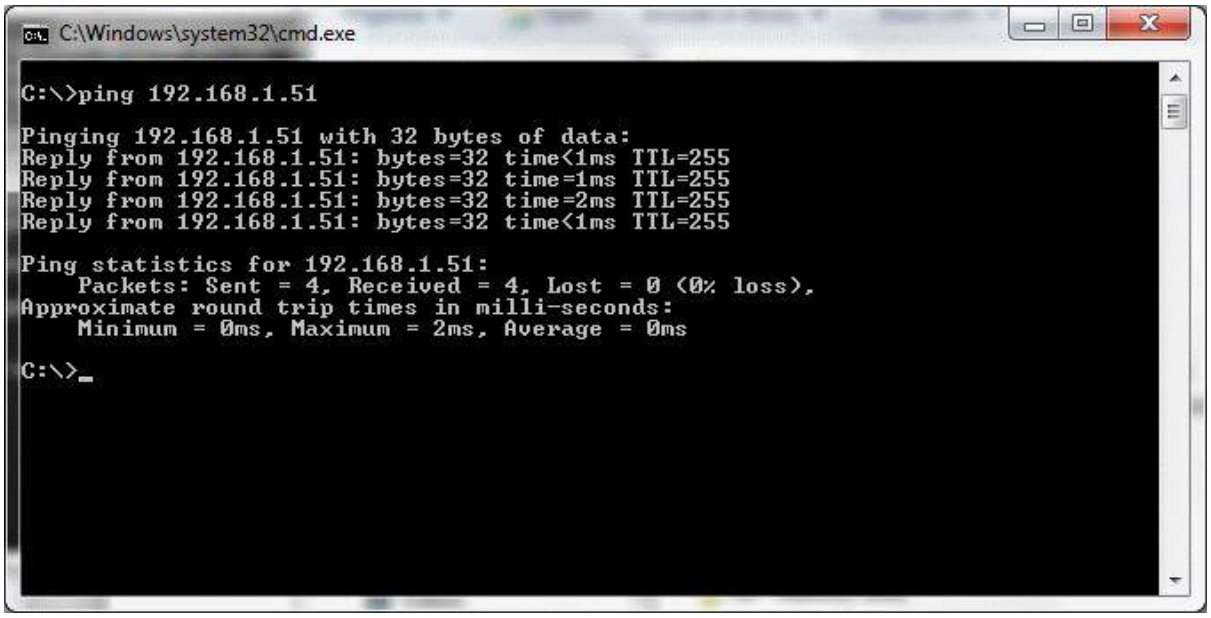
Once a connection is expected to be working the "ping" command can be issued on the personal computer. This is not a required step but is a useful diagnostic.

http://www.wikihow.com/Ping-in-Windows-XP
http://www.wikihow.com/Ping-in-Linux
http://www.wikihow.com/Ping-on-Mac-OS

If the ping fails, then the network route is not available. This indicates a basic network architecture failure. Consult a network expert.

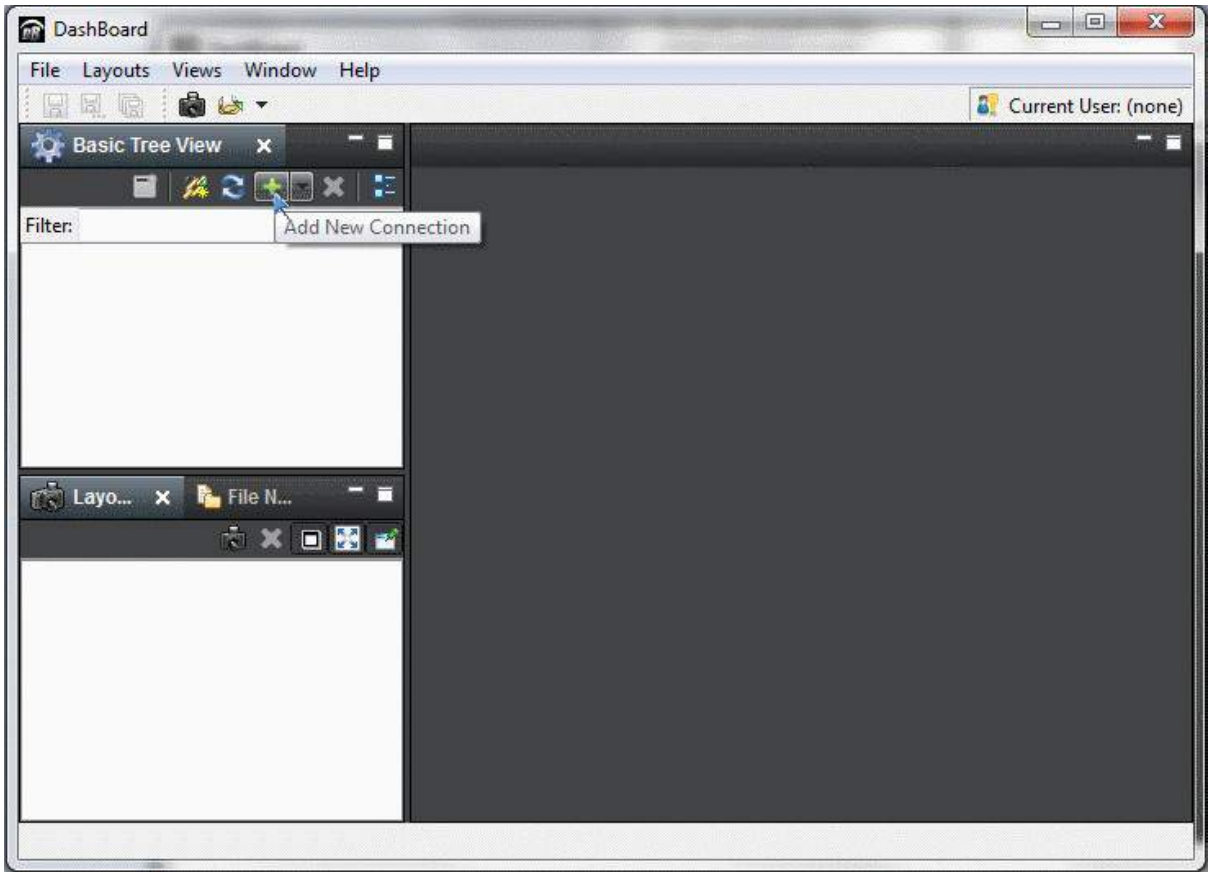


If the ping is successful, then a DashBoard connection should be possible.

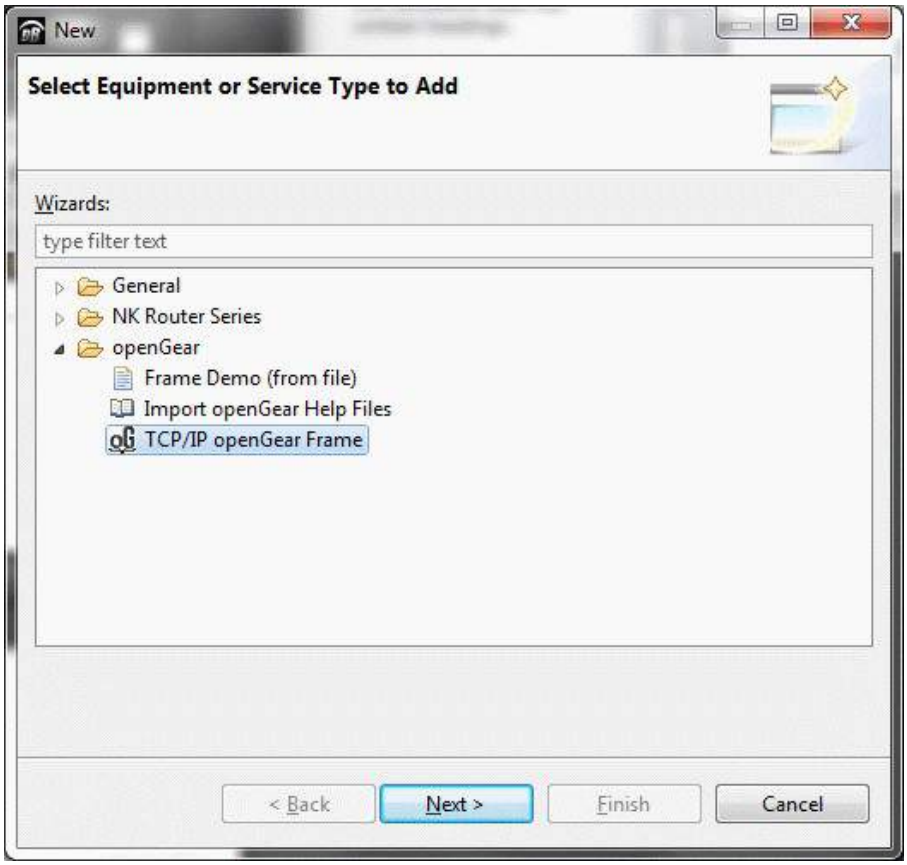


Connecting to DashBoard

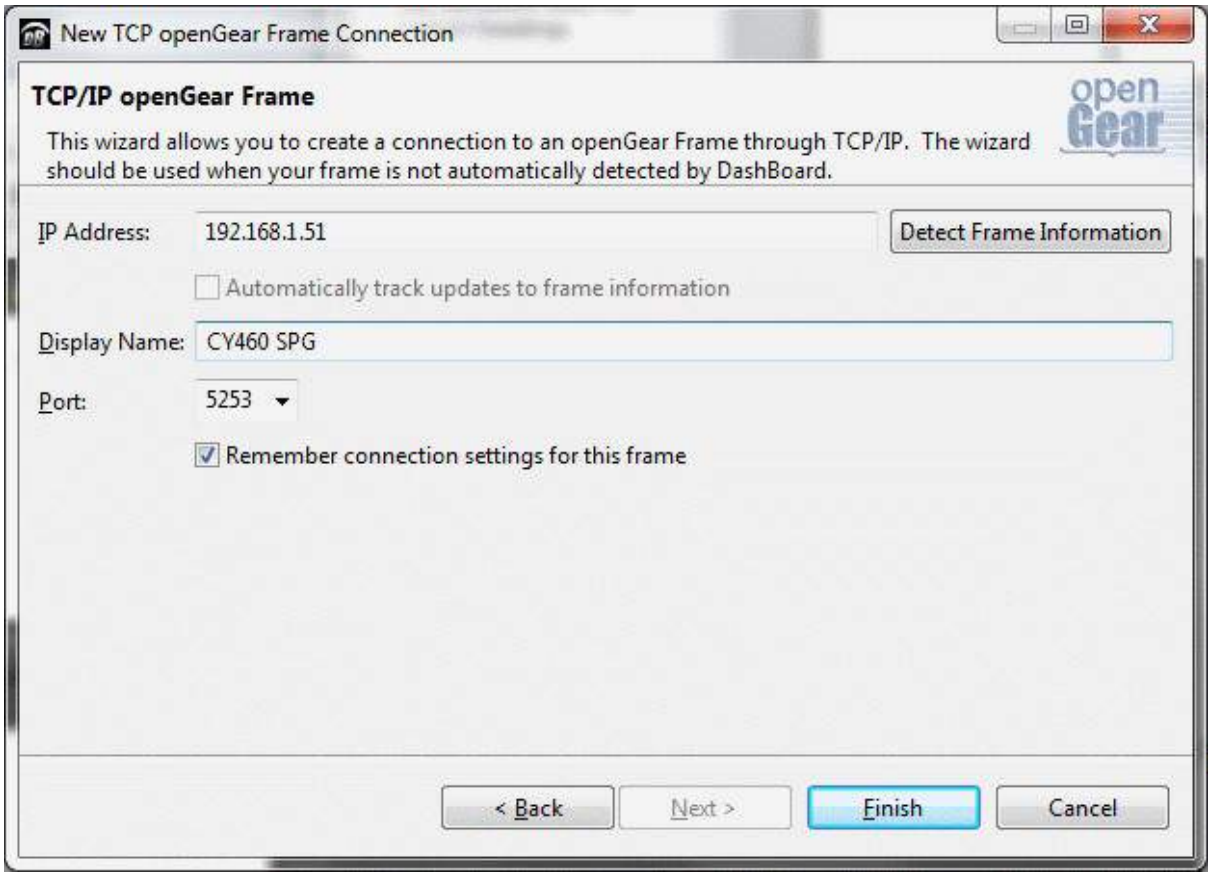
1. Start the DashBoard application and select “Add New Connection”



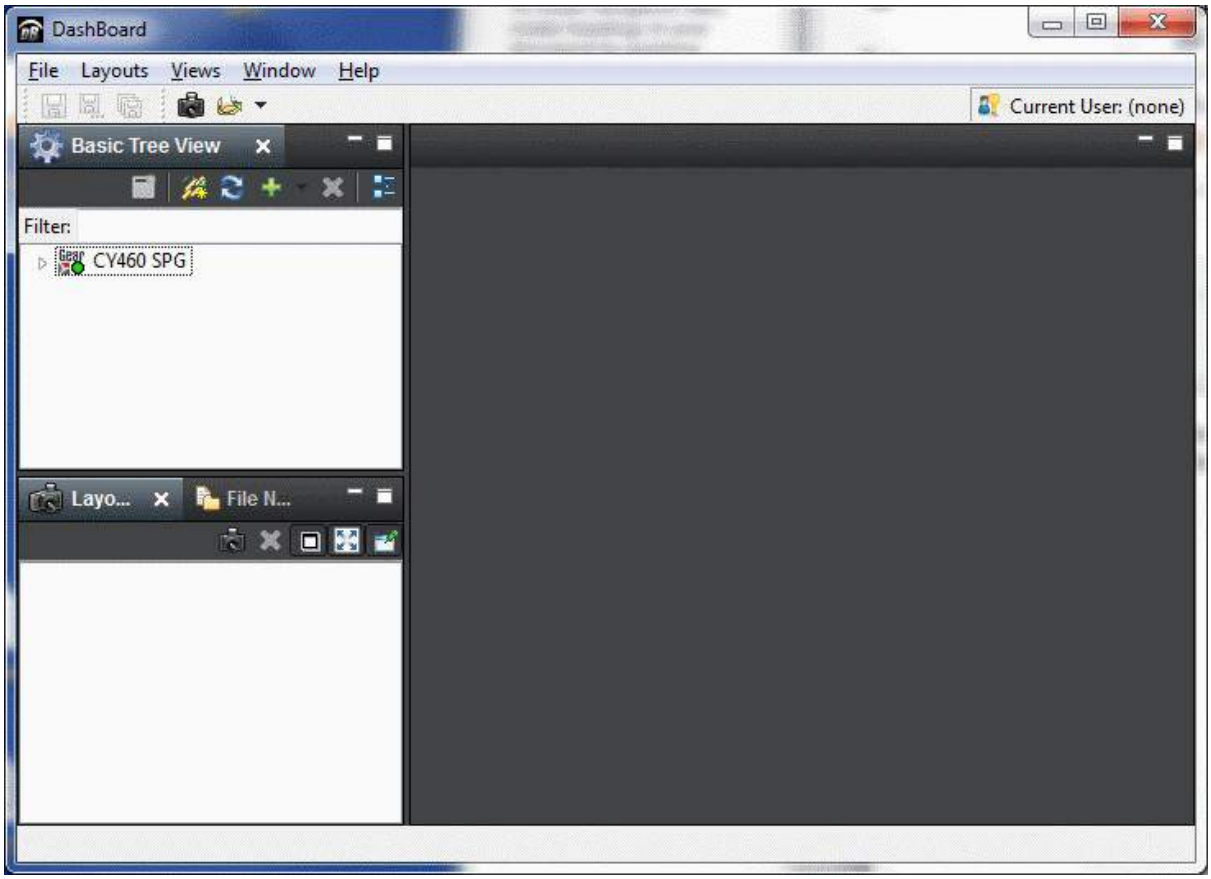
2. Select “TCP/IP openGear Frame” and click “Next”



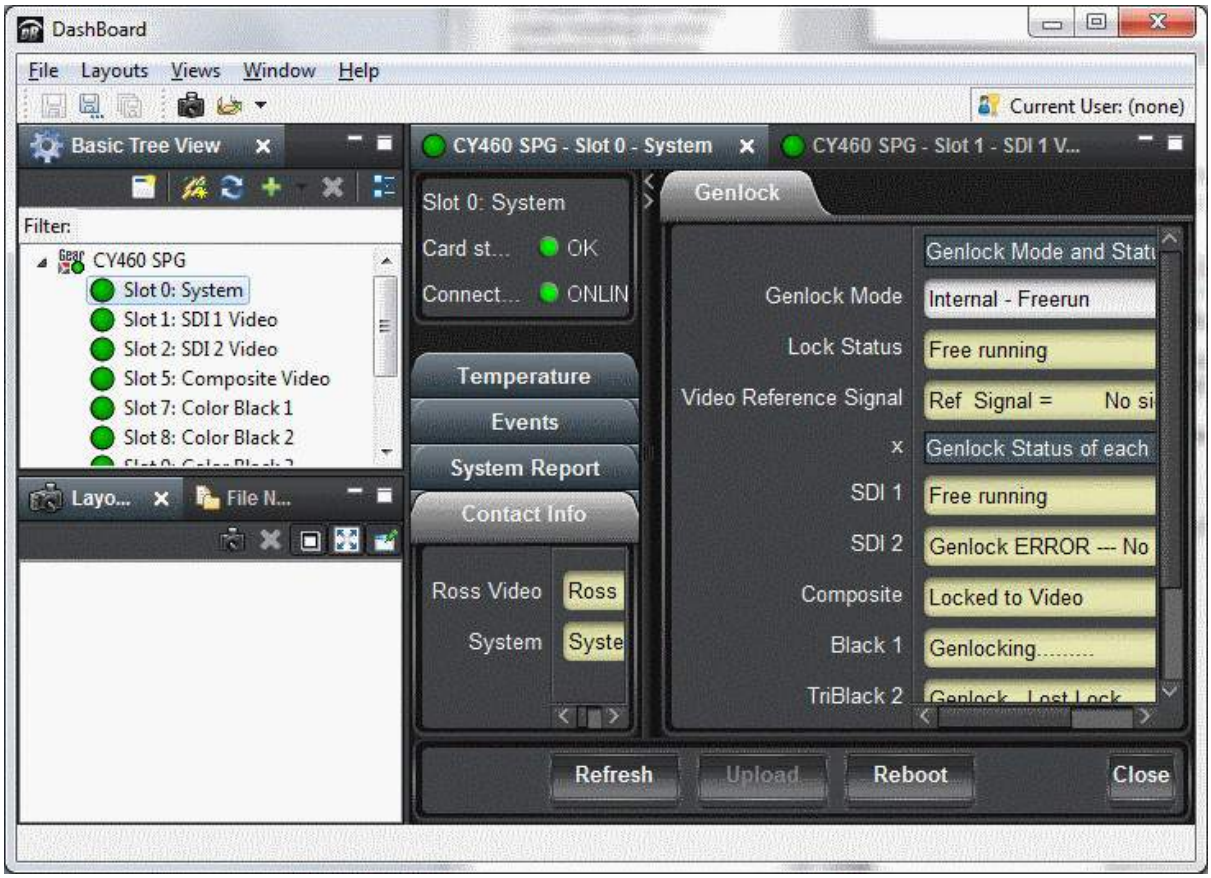
3. Type in the IP address of the CY460 SPG and give the “Frame” a name so it can be easily identified. Click “Finish”



4. After a few moments a connection to the SPG will be established. An entry will appear in the “Basic Tree View” pane.



5. Double click on the CY460 icon and the tree will expand to enable the user to navigate the available functions of the CY460.



Appendix X : NTP Option

Introduction

The CY460 SPG always contains the hardware, software and associated circuitry necessary to allow operation of the NTP Option. An Option Key is used to enable the NTP Option (see *Section : 3.6 : System Setup Menu* of the Operational Manual for more details). No additional externally connected hardware is required as part of the installation.

Installation

The NTP Option becomes operational after the relevant Option Key has been entered on the Option Enable menu (see *Section : 3.6 : System Setup Menu* of the Operational Manual for more details). A power cycle may be required to complete the update process.

Connections

In order to utilise the NTP Option, simply use an Ethernet cable to connect the CY460 SPG to your local network device (master router or local hub).

Follow the instructions in *Section : 3.6 : System Setup Menu* of the Operational Manual to configure the Network and NTP systems with your required parameters.

Background Information

Introduction

A good source of reference time is the Network Time Protocol available on most commercial Ethernet networks. **Note: No frequency or phase can be accurately inferred from the NTP system.**

The CY460 SPG NTP system can be configured in two ways:

NTP Server	where the CY460 SPG acts as the device from which other NTP clients request time.
NTP Client	where the CY460 SPG requests time from a NTP server.

NTP Server

When configured as an NTP Server, the CY460 SPG responds to requests from "Clients" and replies with a "time-stamp". It is up to the Client to decide on the validity and accuracy of this time. An NTP system may be able to resolve time in the region of hundreds of milliseconds. **Do not expect anything better!**

NTP Client

As the SPG is powered, the NTP Client begins requesting time from the designated remote NTP server. The NTP Client will keep searching for a time until it gets one.

The NTP operational parameters can be monitored in the LCD menu, and on the Dashboard remote control program.

NTP default settings

The default settings of the NTP system are as follows:

SPG IP address	192.168.001.044
SPG IP mask	255.255.255.000
SPG IP Gateway	192.168.001.254
NTP Server IP address	139.143.005.030

Time locking.

Time lock is achieved by reading the NTP time from the NTP Server and calculating an appropriate time-code. NTP locks the SPG central timing system. There are a few problems:

The time-code needs to be checked and updated each time the NTP Server is detected. However in marginal networks the "question-response" message times may be so variable the time-code update should be suppressed until it has been valid for a number of seconds. Once the time-code has been set by the NTP Client, the SPG should not need to recheck the NTP time unless a crash lock has been forced by the phase locking arrangement.

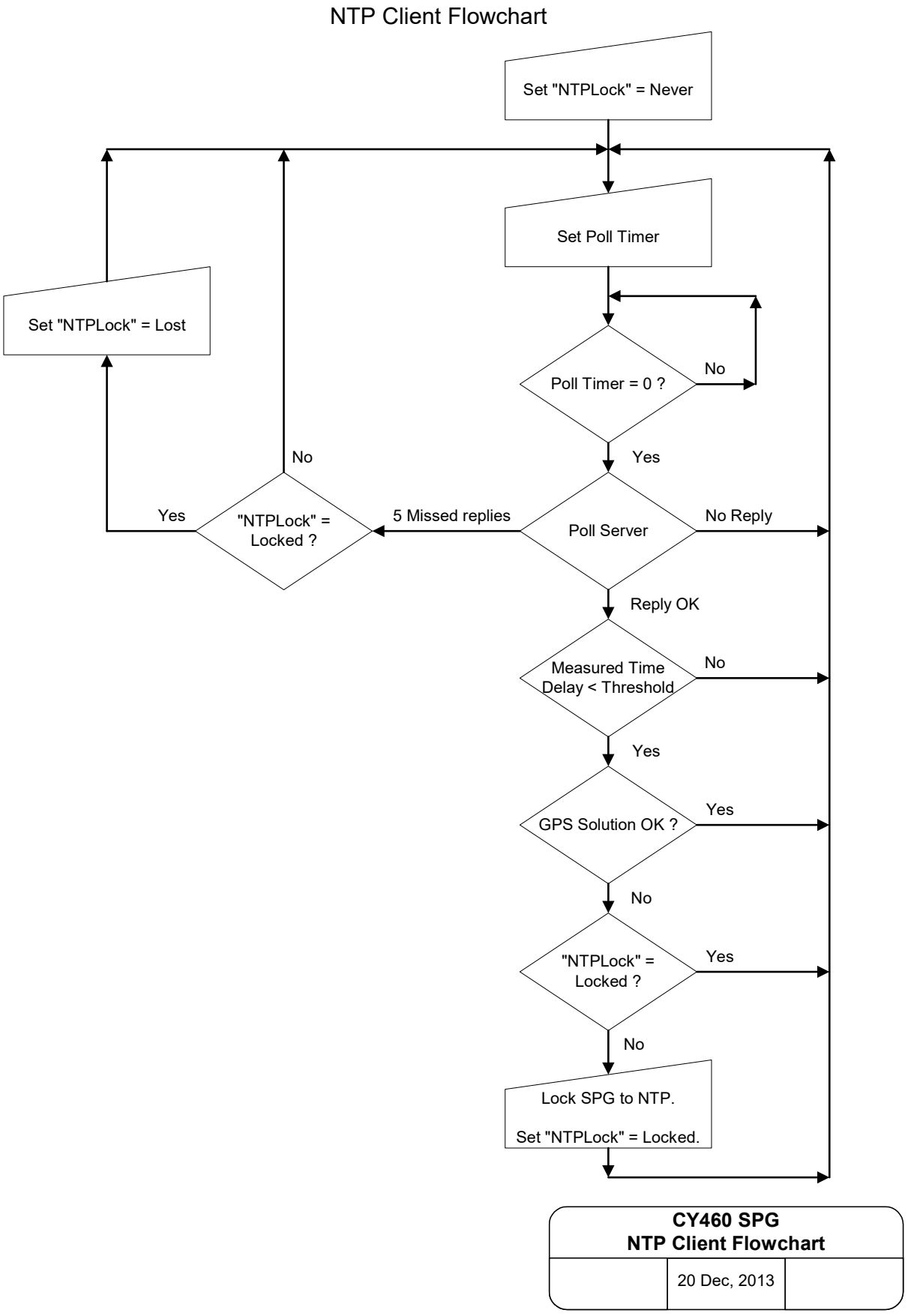


Figure X.1 : NTP Client Flowchart

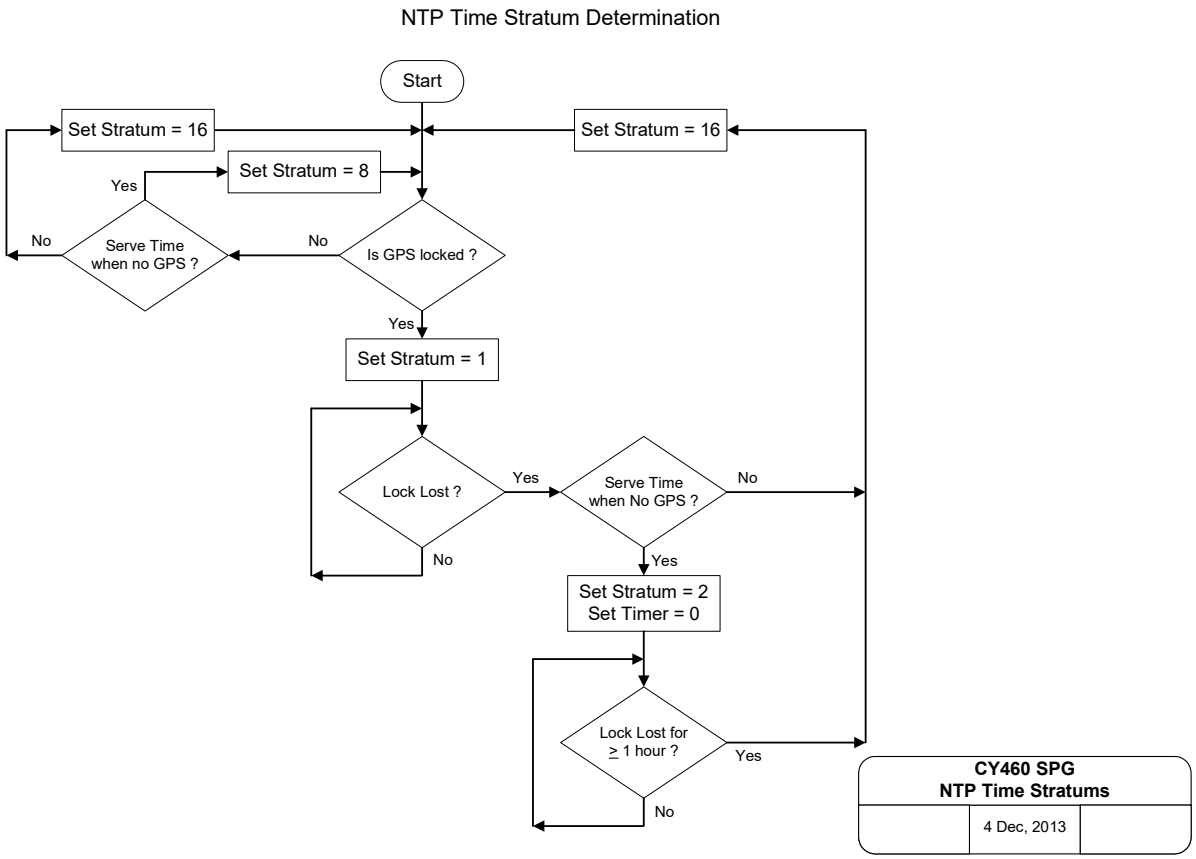


Figure X.2 : NTP Server Time Stratum Determination

NTP and television:

From an NTP Server, the CY460 Master Clock can derive UTC and also add the appropriate time offset and provide corrected local time. Table X.1 contains a list of the various corrections which need to be made by the CY460 SPG.

Table X.1 : NTP – Required Time Corrections

		Offset	CY460 update
1	Earth Speed Drift in one day	1ms	Leap second corrections are made approximately every 18 months as determined by International Earth Rotation Service (IERS) based in Paris, France. http://hpiers.obspm.fr/eop-pc/
2	Local Time	User defined	The user usually defines the offset from UTC at time of installation
3	Daylight Saving	1 hour	Twice per year

Further reading

Courtyard define a suitable remote NTP Server as part of the factory default procedure. The Factory Default NTP Server IP Address is 139.143.005.030. More information about this NTP Time Server can be found at : http://www.npl.co.uk/upload/pdf/its_user_guide.pdf.

Other NTP Servers are available, for example:

- For a list of stratum one time servers, visit the following Web site:
  http://support.ntp.org/bin/view/Servers/StratumOneTimeServers
  (http://support.ntp.org/bin/view/Servers/StratumOneTimeServers)
- For a list of stratum two time servers, visit the following Web site:
  https://support.ntp.org/bin/view/Servers/StratumTwoTimeServers
  (https://support.ntp.org/bin/view/Servers/StratumTwoTimeServers)
- For a list of NIST Internet Time Servers, visit the following Web site:
  http://tf.nist.gov/tf-cgi/servers.cgi
  (http://tf.nist.gov/tf-cgi/servers.cgi)
- For a list of NTP Pool Servers, visit one of the following Web sites:
  http://support.ntp.org/bin/view/Servers/NTPPoolServers
  (http://support.ntp.org/bin/view/Servers/NTPPoolServers)
  http://www.pool.ntp.org
  (http://www.pool.ntp.org)

Glossary

UTC (Coordinated Universal Time)

The time scale based on the atomic second but occasionally corrected, by the insertion of leap seconds, to keep it approximately synchronized with Earth's rotation. The leap second adjustments keep UTC within 0.9 seconds of UT1.

Appendix Y : GPS Installation

Introduction

The CY460 SPG always contains a GPS Receiver and associated circuitry necessary to allow operation of the GPS sub-system. An Option Key is used to enable the GPS sub-system (see *Section : 3.6 System Setup Menu* of the Operational Manual for more details). Additional externally connected hardware is supplied when the GPS Option is ordered as part of your installation.

Components

In a typical installation, the following components make up the GPS sub-system (shown assembled in the picture below).

Picture Y.1 : Assembled GPS antenna components

The GPS Receiver connector on the CY460 SPG is an SMB Jack.

The Adapter Cable is a short 130mm cable with an SMB Plug on one end, and a TNC Jack on the other.

The Coaxial Cable supplied as part of the standard option package is 8 metres long and has a TNC Plug on one end, and an FME Plug on the other.

The Antenna has an FME Jack fitted as standard.

Coaxial Cable lengths

The standard GPS Option includes an 8 metre coaxial cable and an antenna with a fixed gain of +26dB. If the cable is too short for your requirements, there are several default coaxial cable selections that will function correctly with the GPS Option on the CY460 SPG.

Standard	8m cable / +26dB Antenna
Option	35m low loss cable / +26dB Antenna
Option	100m low loss cable / Inline +20dB Amplifier / +26dB Antenna
Option	200m low loss cable / Inline +35dB Amplifier / +26dB Antenna

The option selections above are supplied with any additional inter-series adapters that may be required between components.

Contact Courtyard for other cable length requirements.

Installation

Antenna

The GPS Antenna must be mounted vertically (as depicted in the picture below) in an outdoor location, and be positioned such that it has an uninterrupted view of the sky, i.e. with as much of the hemisphere of sky above it in plain view. It must also be positioned away from any buildings or surfaces that could cause reflections to be received by the antenna. If you are mounting the antenna on a wall bracket, this assembly must be placed at the top of the wall, so as to gain a clear view of the sky above.

The GPS antenna cannot be mounted indoors; not even against a window, even one without an anti-glare coating.

Picture Y.2 : GPS Antenna

Coaxial Cable

Because the coaxial cable has different connectors at each end, be sure to install it in the correct direction.

When routing the coaxial cable, be sure to avoid tight corners, where the cable could become kinked. If the low-loss coaxial cable is being installed, this has a much larger diameter and is of a stiffer construction than the standard cable, and will therefore be very difficult to route around tight corners.

Support the cable at the CY460 SPG end to avoid the possibility of connector breakage.

Background Information

Introduction

The Global Positioning System (GPS) is a space-based radio navigation system comprising of three main components.

The first is known as the Space Segment, which consists of a constellation of 24 operational satellites. Each satellite generates a navigation message based on data periodically uploaded from the Control Segment, and adds the message to a 1.023MHz Pseudo Random Noise Coarse/Acquisition (C/A) code sequence. The satellite modulates the resulting signal on to a 1575.42 MHz L-band carrier to create a spread spectrum ranging signal which it then transmits to the user community. Each C/A code is unique which allows each satellite to be identified.

The second, the Control Segment, consists of a Master Control Station (MCS), ground antennas and monitor stations. The MCS is located at Falcon Air Force Base, Colorado and is the central control node for the GPS satellite constellation. It is responsible for all aspects of command and control, such as:

- Routine satellite bus and payload status monitoring
- Satellite maintenance and anomaly resolution
- Monitoring and management of position service performance
- Navigation data upload operations
- Prompt detection and response to service failures.

The third segment is the receivers which can be used to determine their position and the current time. These are installed within your CY460 SPG.

Each satellite provides data required to support the position determination process. The data includes information required to determine:

- satellite time of transmission
- satellite position
- satellite health
- satellite clock correction
- propagation delay effects
- time transfer to UTC
- constellation status

It does this using five sub-frames of information in the navigation message:

- Sub-frame 1 contains GPS week number, satellite accuracy and health, and satellite clock correction terms.
- Sub-frames 2 & 3 contain ephemeris parameters.
- Sub-frame 4 contains almanac and health data for satellites 25-32, special messages, satellite configuration flags and ionospheric and UTC data.
- Sub-frame 5 contains almanac and health data for satellites 1-24, almanac reference time and week number.

GPS time is established by the Control Segment and is referenced to a UTC (as maintained by the U.S. Naval Observatory) zero time point defined as 00:00:00 UTC on the night of January 6, 1980. It is maintained to be within one microsecond of UTC (modulo one second). The largest unit used in stating GPS time is one week.

Locking the CY460 SPG to GPS

One of the best sources of reference for both frequency and time is the Global Positioning System.

The GPS satellites only transmit a complete UTC-GPS time message once every 12½ minutes. So when powering up the GPS receiver, it would be wise to wait 12½ minutes before relying on the GPS time.

The CY460 SPG uses a 32 channel GPS receiver. As the CY460SPG is powered, the GPS receiver begins searching for satellites from which it can get time, frequency and phase information. In a good reception area, as many as 12 satellites may be visible. The CY460 SPG requires a minimum of 3 satellites to be located and fully decoded before it can start using the GPS data. The search for the first 3 satellites can take up to 3 minutes, but is often accomplished in 2. If less than 3 satellites are available, the CY460 SPG will not lock to GPS.

Once the minimum of 3 satellites have been located and their GPS data decoded, the CY460 SPG averages the number of counts from all of the detected satellites, and then continually adjusts the free-run oven frequency to generate a condition where the CY460 SPG is locked in frequency and phase to the GPS receiver.

In marginal reception areas, locking/unlocking of the GPS receiver will be tolerated as the short term effect on the free-running oven frequency of the CY460 SPG will be very small. When an unlocked condition is detected, the CY460 SPG software will smoothly revert to the stored free-running oven frequency.

The number of satellites can be monitored on the –System Setup | -GPS Report menu.

GPS Reception Monitoring and System Status.

The GPS receiver is continually updating the CY460 SPG via RS232 messages. The CY460 SPG relays some of this information to the remote control protocol engine. A PC connected to the remote control port and running the Courtyard (Windows) application can monitor the state of the GPS receiver and the parameters being used by the system to achieve lock.

Time Locking.

Time lock is achieved by reading the GPS time from the receiver and calculating an appropriate time-code. GPS locks the SPG central timing system. There are a few problems:

> The time-code needs to be checked and updated each time the GPS receiver is detected. However, in marginal reception, the time-code update should be suppressed until it has been valid for a number of seconds. Once the time-code has been set by the GPS receiver, the CY460 SPG should not need to recheck the GPS time unless a crash lock has been forced by the phase locking arrangement.

Frequency and Phase Locking.

Frequency locking:

Frequency lock can be established in a few seconds as the oven free-running frequency is within a few ppm of the GPS frequency at all times. The first time the CY460 SPG is powered with a GPS receiver, the CY460 SPG waits for 3 or more satellites to be “fixed”, then the CY460 SPG acquires frequency lock. This first time may take up to 5 minutes from when the GPS lock was acquired. Frequency lock is achieved when the short-term frequency error is less than 1 ppm.

Phase locking:

Phase locking can be established a few minutes after frequency locking. Phase lock is achieved when the long-term frequency error is less than 0.1 ppm.

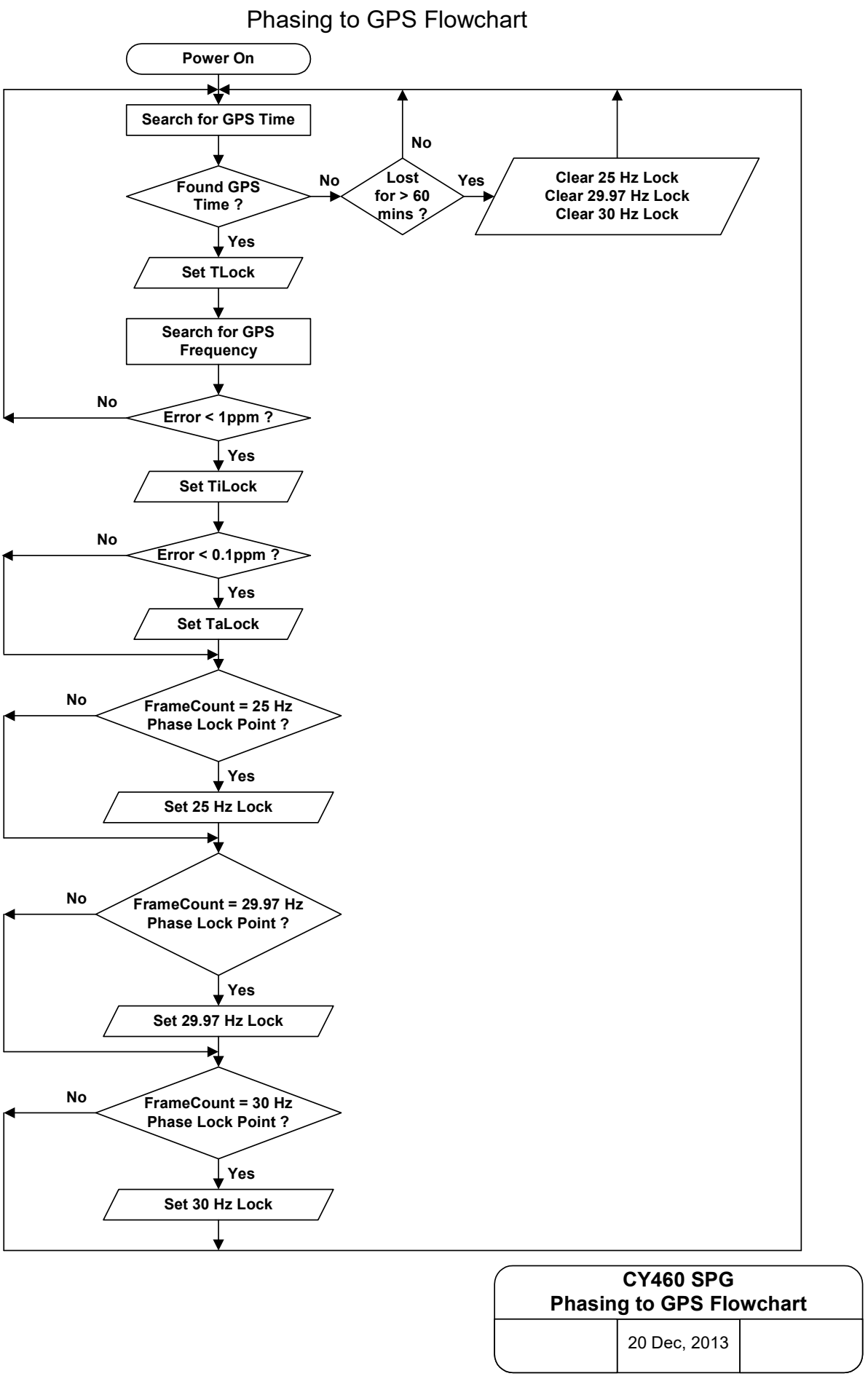


Figure Y.1 : Phasing to GPS Flowchart

GPS and Television:

From a GPS receiver, the CY460 SPG Master Clock can derive UTC and also add the appropriate time offset and provide corrected local time. Table 1 contains a list of the various corrections which need to be made by the SPG.

Table Y.1 : GPS – Required Time Corrections

		Offset	CY460 update
1	Earth Speed Drift in one day	1ms	Leap second corrections are made approximately every 18 months as determined by International Earth Rotation Service (IERS) based in Paris, France. http://hpiers.obspm.fr/eop-pc/
2	Local Time	User defined	The user usually defines the offset from UTC at time of installation
3	Daylight Saving	1 hour	Twice per year

Further reading

More information can be found at http://www.navcen.uscg.gov/gps/geninfo/

The most recent Leap Second events

After the leap second insertion at Midnight time on 31 December 2005 :
GPS-UTC = +14s (GPS will be ahead by fourteen seconds).

After the leap second insertion at Midnight time on 31 December 2008 :
GPS-UTC = +15s (GPS will be ahead by fifteen seconds).

After the leap second insertion at Midnight time on 30 June 2012 :
GPS-UTC = +16s (GPS will be ahead by sixteen seconds).

Glossary

Almanac

A set of parameters included in the GPS satellite navigation message that a receiver uses to predict the approximate location of a satellite. The almanac contains information about all of the satellites in the constellation.

Ephemeris

(from the Latin word, ephemeris, meaning diary) A description of the path of a celestial body indexed by time. The navigation message from each GPS satellite includes a predicted ephemeris for the orbit of that satellite valid for the current hour. The ephemeris is repeated every 30 seconds and is in the form of a set of 16 Keplerian-like parameters with corrections that account for the perturbations to the orbit caused by the earth's gravitational field and other forces.

Epoch

An instant of time (or a date) from which values of data are referenced. Note: an Era is the period of time between successive epochs.

UTC (Coordinated Universal Time)

The time scale based on the atomic second but occasionally corrected, by the insertion of leap seconds, to keep it approximately synchronized with Earth's rotation. The leap second adjustments keep UTC within 0.9 seconds of UT1.