



The TSG490Y Test Pattern Generator



Setup and Operations Guide

The TSG490 Operations Guide

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Utah Scientific, Inc.

4750 Wiley Post Way, Suite 150

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- EN50082-2 Generic Immunity Standard
- IEC-950 Product Safety
- C-UL 1950 Product Safety
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- EMC Directive 89/336/EED
- Low Voltage Electrical Directive 72/23/EEC

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This section provides important safety guidelines for the Operator and Service Personnel. Specific warnings and cautions are found throughout the guide where they apply, but may not appear here. Please read and follow the important safety information, specifically those instructions related to risk of fire, electric shock, or injury to persons.

Safety Symbols



Hazardous Voltage symbol



Caution symbol. The product is marked with this symbol when it is necessary to refer to the manual to prevent damage to the product.

Warnings

Please observe the following important warnings:

- Any instructions in this guide that require opening the chassis, changing a power supply, or removing a board, should be performed by qualified personnel only. To reduce the risk of electric shock, do not perform any service unless you are qualified to do so.
- Heed all warnings on the unit and in the operating instructions.
- Do not use this product in or near water. Disconnect AC power before installing any options or servicing the unit unless instructed to do so by this manual.
- This product is grounded through the power cord ground conductor. To avoid electric shock, plug the power cord into a properly wired receptacle before connecting the product inputs or outputs.
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- Do not insert anything into either of the systems two-power supply cavities with power connected.
- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as power supplies. During installation, do not use the door handles or front panels to lift the equipment as they may open abruptly and injure you.
- To avoid fire hazard when replacing fuses, use only the specified correct type, voltage and current rating as referenced in the appropriate parts list for this product. Always refer fuse replacement to qualified service personnel.
- Have qualified personnel perform safety checks after any service.

Cautions

Please observe the following important cautions:

- When installing this equipment do not install power cords to building surfaces.
- To prevent damage when replacing fuses, locate and correct the problem that caused the fuse to blow, before reconnecting power.
- Use only specified replacement parts.

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This Manual

Scope

This manual provides all the information you will need to effectively operate and maintain your UTSCI TSG490 SPG & Test Pattern Generator. It describes installation, operation, maintenance and troubleshooting.

Locating Information

Following this introduction is a Contents Table that indicates on which page in this manual a topic can be found. Additionally, there is a section entitled *How to...?*; this lists a series of operational and maintenance questions and provides answers.

Organisation

The manual is divided into two parts : *Installation & Planning* and *Operation & Maintenance*. The first part describes the product from a technical standpoint and provides important specifications and connectivity information. The second part describes how to use and look after the TSG490.

Installation and Planning

1. Introduction

This section provides a general introduction to the TSG490 briefly explaining its principal components.

The UTSCI TSG490 is a broadcast quality SPG & test pattern generator, with analogue and SD and HD digital (optional) video and analogue and digital (optional) audio outputs.

System

The system consists of a 1U rack mounting unit.

Control Panel

The control panel provides facilities for selection of patterns, audio settings, display of current settings, timing controls and user ident programming.

Remote Control

The system may be controlled digitally from a remote source. An RS232 serial interface is provided for this purpose.

2. System Integration

This section gives mechanical and electrical details about installing the TSG490.

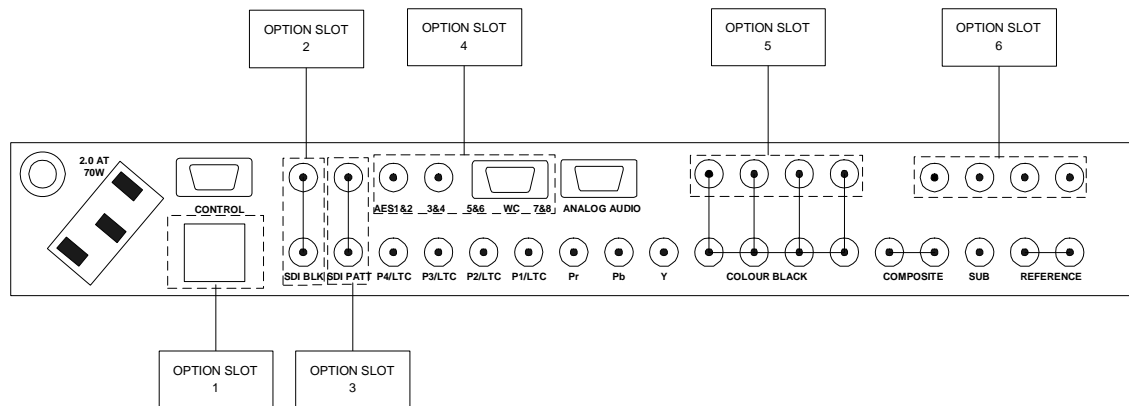
2.1 Rack Mounting

The 1U chassis is designed to be mounted in a standard horizontal format 19" rack. The unit should sit on a horizontal bracket in the rack and be affixed using four M6 bolts through the rack ears. Cooling vents are placed at the sides of the chassis, so adequate space should be available at the sides to permit air flow.

If RS232 (rather than RS422) remote control is required, a small conversion needs to be performed which should be done before the unit is mounted in a rack. See below for details.

2.2 Rear Panel Connections

The following descriptions of the rear panel assume that you are looking at the rear panel from the back of the 1U rack. Refer to the diagram that follows. The fused AC mains inlet is housed on the left-hand side of the panel; to its right are the connectors for the remote control, video and audio connectors.



Option Slot 1: 10/100 base T (not Available)

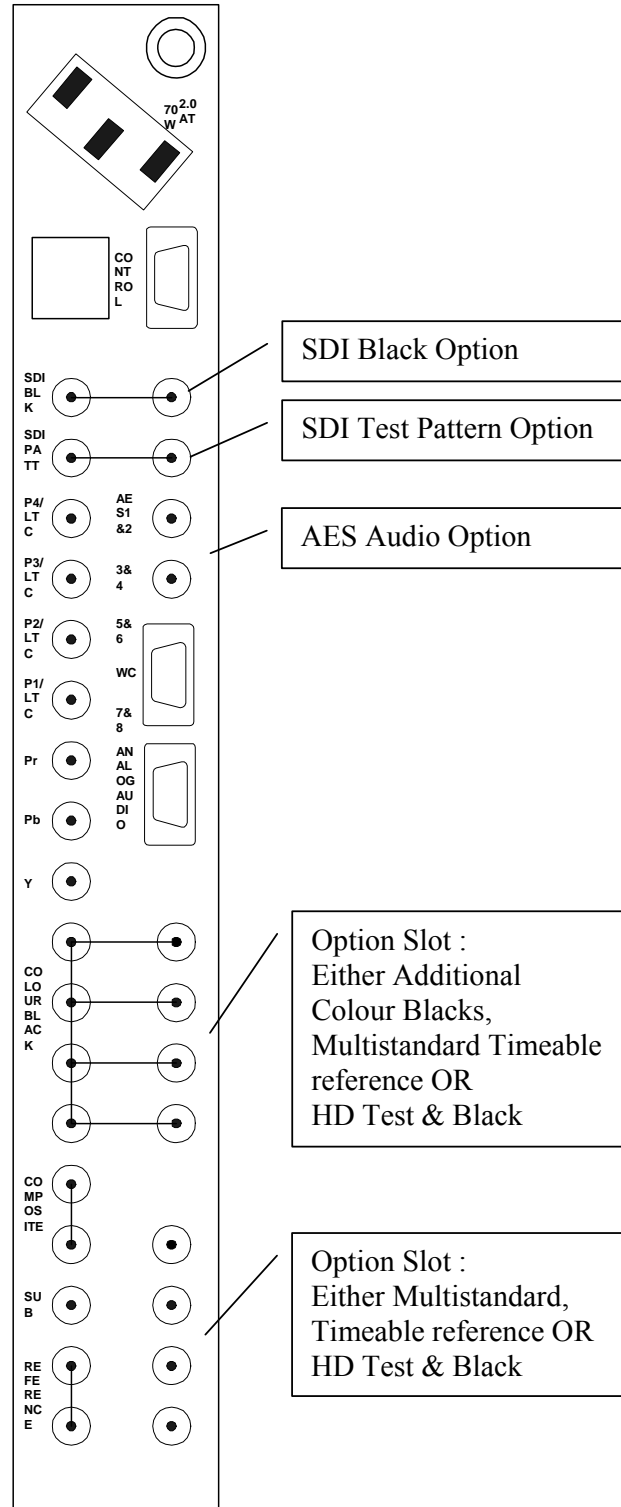
Option Slot 2: CY490/11 - SDI Black

Option Slot 3: CY490/11- SDI Test Pattern

Option Slot 4: AES Tone, Silence & WordClock

Option Slot 5 : 4x main colour black OR CY490/03 - Timeable reference/ Tri-level Sync option Or CY490/08 - HD Test Patterns & Black

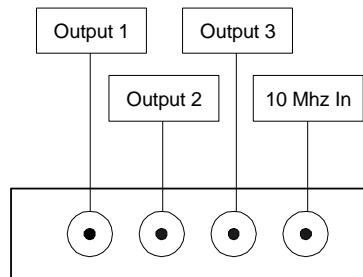
Option Slot 6: CY490/03 - Timeable Reference/ Tri-level Sync option OR CY490.08 - HD Test Patterns and Black



2.3 Options

Up to six option cards can be installed within the TSG490. It is necessary to remove the top cover to install any option card. Full installation instructions are supplied with the option.

TSG490/02 *PAL + NTSC colour black + HD Tri-level sync option. Timeable outputs configured as PAL or NTSC or Tri-level sync + 10 MHz ref input.*



Notes:

This option is normally fitted into Option Slot # 5, but can also be fitted into Option Slot #6 (when 2 of these are fitted, for example).

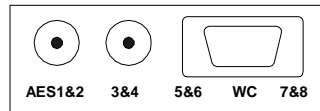
When fitted into Option Slot # 5, outputs are designated 1,2,3.

When fitted into Option Slot # 6, outputs are designated 4,5,6.

The 10MHz Reference Input is only functional when an option module is present in Option Slot #5.

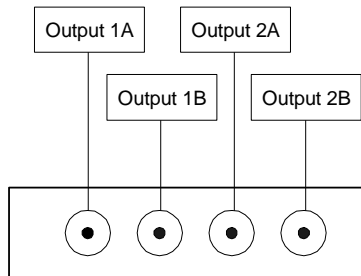
The TSG490 software recognises which slot the card is fitted in and identifies the outputs as noted above.

TSG490/04 *AES digital audio option. 2 Stereo Channels (tone &/or silence) available as: electronically balanced outputs and 75 ohm output. Word clock 48kHz AND 44.1 kHz.*



This option is fitted into Option Slot # 4.

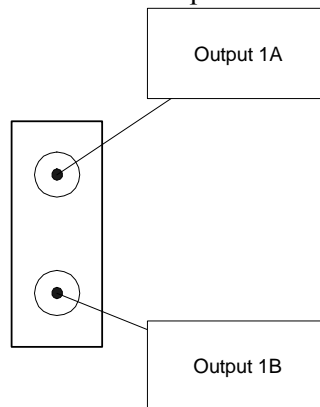
TSG490/08 *HD/SD Pattern & Black generator with embedders*



This option can be fitted into Option Slot # 5 OR Option Slot # 6. It is normally fitted into Option Slot # 6.

TSG490/11 *SD SDI Pattern or Black generator with embedders*

This option can be fitted into either or both Option Slots #2 and #3.



2.4 Remote Control Connections

The left-hand D9 connector marked CONTROL is used to connect to an RS232 serial remote control source. Additional connections provide for installation with a second SPG and changeover unit, and connection to a GPS system for time and date information (when installed).

D9 Connector Pin-outs ¹		
<i>Pin</i>	<i>Description</i>	<i>Notes</i>
1	GPI	General purpose input
2	RX-zero	RS232 RX from a PC or similar
3	TX-zero	RS232 TX to a PC or similar
4	GPS-10	GPS 10KHz / 10MHz signal
5	Ground	
6	RX-one	RS232 auxiliary RX from GPS
7	TX-one	RS232 auxiliary TX to GPS
8	GPS-1	GPS 1Hz signal
9	On Air	Used with changeover unit
	Shell	The connector shell is grounded to the chassis

2.5 Mains Power Input

The IEC mains connector requires a supply of 220V to 250V AC. The unit draws between 18 watts (min.) and 25 watts (max.), depending on the version, and the number of option modules fitted.

WARNING : THIS APPARATUS MUST BE EARTHED.

¹ The RS-232 connector on the TSG-490 is a 9-pin D Connector with male pins.

3. Technical Specifications

3.1 Physical Dimensions

The system is mounted in a standard horizontal format 1U 19 inch rack.

1U Rack Electronics

Overall Dimensions 483 x 380 x 44mm
System Weight 6.3kg

Shipping

Packaging Dimensions 630 x 520 x 140mm
Boxed Weight 8kg

3.2 Connectors

All connectors are mounted on the rear panel of the 1U rack electronics.

Power Connector	Filtered 3-pin IEC mains inlet
Video Connectors	BNC
Input	Looping reference (1 off) – must be terminated.
Outputs	Analogue Colour Black (4 off min., 8 off max.) Analogue Timeable Colour Black (4 off) - OPTION Analogue Pattern : Coded (2), Y, P _b , P _r , SD SDI Colour Black (2) – OPTION SD SDI Test Pattern (2)– OPTION HD SDI Colour Black (2) – OPTION HD SDI Test Pattern (2) – OPTION Subcarrier Pulses : At 4v in NTSC At 2v in PAL 4 off from MS, MB, BG, PAL SQ, LD, FD, F1L7, LTC1-4, WCK48, WCK44. Note: the WCK48 and WCK44 pulses are not at the normal TTL levels. To obtain these pulses at TTL levels fit the TSG490/04 option.
Audio Connectors	9 way D-type socket
Outputs	Analogue Stereo Tone (balanced) AES Audio (balanced) - OPTION AES Audio/Silence & Word Clock on BNCs - OPTION
Remote Control Connector	9 way D-type plug

3.3 Electrical Requirements

This apparatus must be earthed.

Source	220 to 240 volts (UK & Europe)
Frequency	50Hz
Power Consumption	configuration dependent : 18 watts (min.), 25 watts (max.)

TSG490 Power
Consumption

31-Oct-2005

Item Current (mA) @ 240V Power (W)

TSG400-9	73	17.52
HD option	15	3.6
TB option	7	1.68
SDI option	3.5	0.84
AES option	1	0.24

Actual Measurements :

490	73	17.52	Basic unit
490+HD	88	21.12	
490+HD+TB	95	22.8	
490+HD+TB+2SDI	102	24.48	
490+HD+TB+2SDI+AES	103	24.72	Full options list

Mains Input Fuse Rating T2A (Anti-Surge).

4. Service Requirements

4.1 Service Access

Access is provided to most of the electronics (the main module, and control panel electronics, option modules, etc) via the removable top cover.

To remove the top cover, first disconnect the mains lead, then remove the screws.

When reconnecting the control panel to the rack electronics, ensure that the mains power lead is disconnected before proceeding, i.e. the control panel **MUST NOT** be connected to a “hot” system.

Should it be necessary to access the power supply or main board, or to perform measurements whilst the system is switched on, the frame top plate must be removed.

This is done by first removing the unit from the rack, then by removing all the screws in the top plate; note that it is not necessary to remove the control panel in this case.

Note : ALL top cover screws must be refitted in order that the frame continues to conform to current CE Emission Regulations.

Operation & Maintenance

1. Introduction

The TSG490 SPG & Test Pattern Generator from Utah Scientific is a high performance broadcast quality product. It offers an impressive range of test patterns simultaneously in analogue and SD and HD serial digital, an easy to use control panel, and flexible remote control facilities. This makes it ideally suited to a variety of applications.

The TSG490 system consists of a 1U rack unit with a control panel affixed to the front.

WARNING : THIS APPARATUS MUST BE EARTHED.

2. Controls and indicators

Control Types

The control panel uses a single type of control: push buttons.

Indicator types

The control panel uses green LEDs to provide operational status information. The brightness of the LEDs may be adjusted to suit the environment. This can be achieved by adjusting a potentiometer through the access hole above the “-“ button.

2.1 Pattern Select

This group of controls encompasses the groups of four buttons and indicators on the left of the panel marked *Patterns*.

Patterns

To select a pattern press the button associated with the group of patterns which includes the one you have chosen and *at the same time*, toggle either of the - or + buttons on the right of the panel until the LED adjacent to your chosen pattern is lit. Release both buttons and your chosen pattern will be available at the pattern outputs.

Red

This button toggles 1/3-red-field on/off when any colour bar pattern is selected.

Bounce

This button toggles the pattern bounce facility when certain monochrome patterns are selected.

Circle

This button toggles the Circle on/off facility.

2.2 Ident Select

This group encompasses the two buttons in the middle of the panel marked *IDENT*.

Ident (Off, Roll, Flash)

This button (used together with the - or + buttons on the right of the panel) determines which of the five display modes is selected : on and steady, roll, flash, multi-roll or multi-flash. All Idents OFF is also selectable.

Ident (Mem 1, Mem 2, Mem 3)

This button (used together with the - or + buttons on the right of the panel) determines which of the three possible Idents is to be displayed.

2.3 Locking

This control encompasses the button to the right of the Ident group and the associated group of LEDs.

Locking

Allows the user to select the SPG mode of operation (Free Run or one of three Genlock modes).

2.4 Status

This group of LEDs indicates the current status of the TSG490.

In addition, the panel buttons can be disabled to prevent accidental operation, using the “Status” button

2.5 Phase

The button marked Phase together with the - or + buttons at the right-hand end of the control panel provides the means to adjust the genlock V, H and Subcarrier phase of the TSG490 to suit the user requirements.

3. How to... ?

Front Panel Selections

Select Pattern On Pattern Output

To select a pattern on the pattern outputs, press and hold the button associated with the group of patterns which includes your choice, and simultaneously toggle either of the - or + buttons at the right most end of the control panel. Once the required pattern is selected, indicated by a green LED beside the pattern name, release the button.

Special Cases :

There are several patterns for which further variants exist. When the appropriate pattern LED is illuminated (as detailed above), pressing the pattern bank button (on its own) will cycle through the available variants :

- Ramp & Step : 10 Staircase &/or Ramp patterns.
- Sweep : 2 Line-rate Sweep patterns.
- APL's : Ramp, 5- & 10-step, modulated and un-modulated.
- Multitest 2 : 9 full field VITS and 1 Analogue/Digital Discriminator patterns.
- Pulse & Bar : 4 Pulse & Bar patterns.
- Grille : 4x3 and 16x9 versions available.
- Square : 50Hz, 15kHz, 250kHz (on pedestal) available.
- Full Field : All 8 100% Colour Bar colours available.
- Safe Area : 5 Safe Area patterns for anamorphic pictures.
- Bowtie : 2 Bowtie patterns.

Select Ident On Pattern Outputs And Its Display Mode

To select an Ident, press and hold the right of the two *Ident* buttons and simultaneously toggle either of the - or + buttons at the right most end of the control panel. When one of the three possible Idents (Mem 1,2 or 3) is chosen (adjacent green LED is lit), release the button.

To select the required display mode, press and hold the left of the two *Ident* buttons and simultaneously toggle either of the - or + buttons at the right most end of the control panel. When one of the five possible display modes (On and steady, Roll, Flash, multi-roll, multi-flash) is chosen (adjacent green LED(s) lit), release the button.

Note : if none of the Mode LEDs is lit, the Ident is OFF.

Select Free Run Or Genlock Mode

To select Free Run or Genlock mode, press and hold the button marked *Locking* and simultaneously toggle either of the - or + buttons at the right most end of the control panel. When the required mode (Free Run, Genlock Mem 1, Genlock Mem 2, Genlock Mem 3) is chosen (adjacent green LEDs are lit), release the button.

Select Local Or Remote Control

To select Local or Remote Control mode press and hold the button marked *Control* and simultaneously toggle either of the - or + buttons at the right most end of the control panel. When the required mode (Local, Remote all, Remote Phase, Remote Pattern) is chosen (adjacent green LED lit), release the button.

Set Genlock Subcarrier, H and V Phases

First set the TSG490 into one of the three genlock mode settings using the *Locking* button as described above. Ensure that a reference of colour black is present. The following should be completed in sequence.

Set Subcarrier Phase (1st press of Phase button)

Depress the inset button marked Phase at the right most end of the panel once using a pen or similar. The green LED marked SC will light. Now toggle either of the - or + buttons until the subcarrier phase is set as required.

Set fine H Phase (2nd press of Phase button)

Depress the inset button marked Phase at the right most end of the panel a second time using a pen or similar. The green LED marked H will light. Now toggle either of the - or + buttons until the H-phase is set as required.

Set V Phase (3rd press of Phase button)

Depress the inset button marked Phase at the right most end of the panel a third time using a pen or similar. The green LEDs marked H and SC will light. Now toggle either of the - or + buttons until the V-phase is set as required. **Note: a single depression of either of the + or - buttons will advance or retard the signal by 1 line. If you keep the button depressed, the phase will change increasingly quickly. The range is ± 4 fields - BEWARE.**

Store And Exit Phase Adjustment Mode (4th press of Phase button)

Depress the inset button marked Phase at the right most end of the panel a fourth time using a pen or similar. The green LEDs marked SC and H will extinguish and the settings will be stored to memory.

Menu System Selections

Use System Menu To Set User Preferences

Press the button marked Menu once. The Menu is displayed on the pattern output and can be viewed on a monitor. Use the - or + button to highlight the required option and press the button marked Select. This will move you to the next level or change the option depending on where you are in the menu. To leave the menu system, select and confirm Exit each time until the Main Menu is displayed, then press Menu to exit. Only when you completely exit the menu system will your changes be saved.

Set Required Video Parameters

Using the method described above, enter the menu system and move to the “Video Menu” then “Options Menu” to set Colour Bar type, F1/L7 on/off, VITS = UK/USA/INT1/INT2/EBU/Off, VITC, programmable Pulse Outputs, etc. In addition, there are further levels of options that only appear when particular option modules are installed, e.g. SDI Pattern/Black, Timeable Colour Black settings, HD Pattern settings, etc.

Program IDENTs To Memory

Enter the menu system, select “Video Menu”, then select “Ident Menu”. The menu tells you what mode the current Ident is in, and the current Ident number. Move to either of these lines to change the mode or Ident number. Select “More” to move to the Ident programming menu. The first line determines which character position you wish to edit. Move the cursor to this line then use the Select button to change the position. Move to “Program” and using the - or + buttons, select the required character. Then select “Exit” to exit character programming and return to the Ident programming menu. Continue until all required characters are programmed, up to a maximum of 30.

To insert characters and/or spaces within or around an existing ident, place the cursor at the insertion/deletion point and then select “Edit” from the Ident programming menu. The next menu offers Insert & Delete [character] options; move to “Insert” and press Select to insert character(s), or move to “Delete” and press Select to delete character(s). There is a further menu which offers the Clear and Centre options.

To completely wipe an ident, first select the ident using the method described above. From the Ident programming menu, select “Edit” then “More”. Position the cursor under “Clear”, then press the Select button.

To centre an ident, simply position the cursor under “Centre” and press select .

Set Required Audio Parameters

Using the method described above, enter the menu system and move to the Audio section to set audio levels, frequency and interrupt settings. In addition, there are further levels of options; these include Embedding of Audio information on SDI Pattern and/or SDI Black outputs, and Embedding Group selection.

Note : Channels 9 & 10 can be used to select a different set of audio parameters on the Analogue output from those on the embedded channels.

The AES audio is delivered set as 0dB = -18dBFS but any other required level can be set via the Control Menu..

Set Remote Control

Using the method described above, enter the menu system and select “Control Menu” to enable or disable Remote Control.

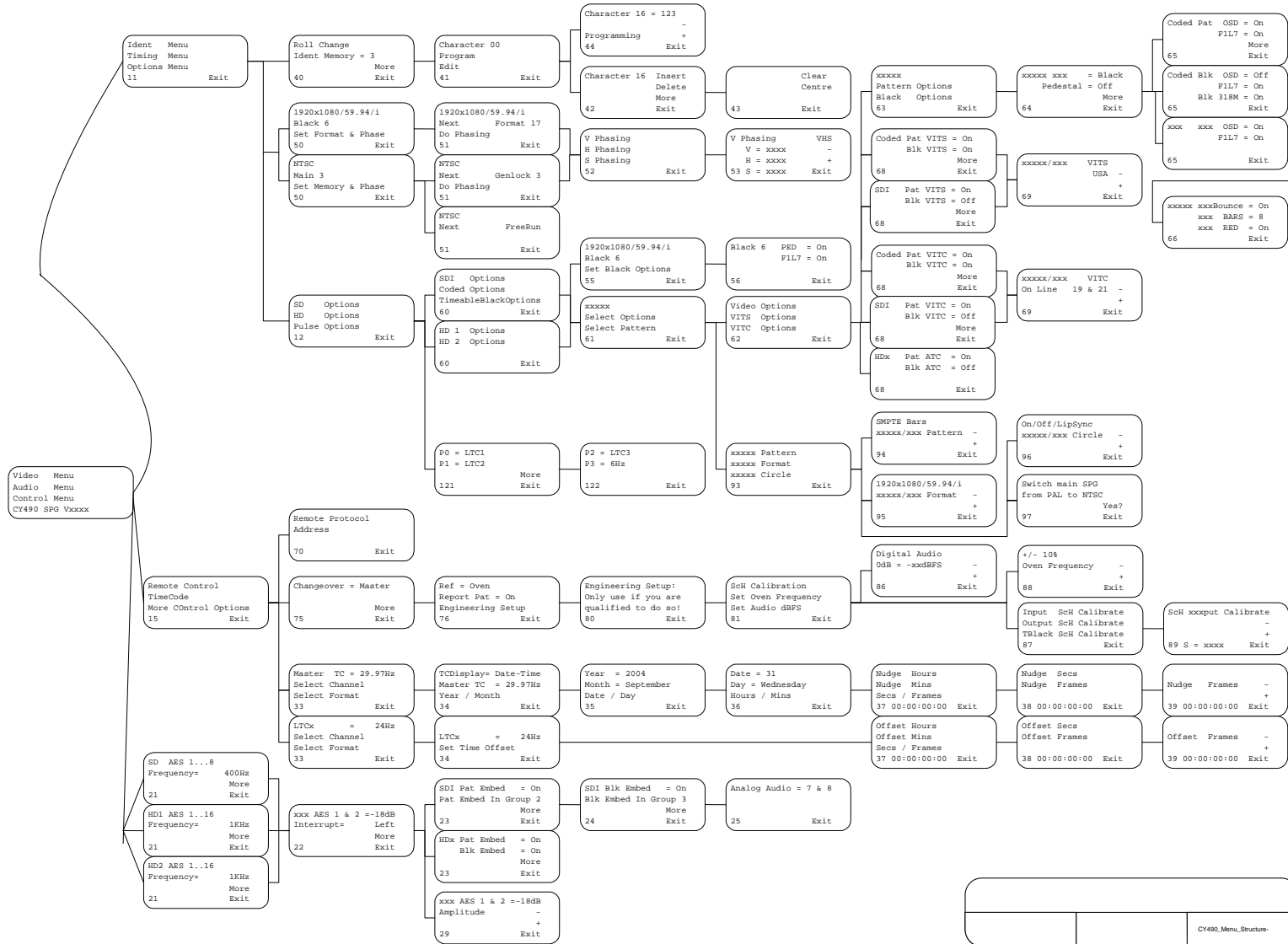
Set Timecode

This menu branch enables you to set the Timecode Generator to your personal requirements. There are four generators, which can be offset from each other (or not, as required). When the GPS option is installed, the time of day and date are automatically corrected.

Set Primary or Backup

Using the method described above, enter the menu system, select “Control Menu”, then “More Control Options”. The top line confirms the current state. To change whether the unit is the Primary (Master) or the Backup (Slave) unit in an SPG Changeover system, move to the top line and press “Select”. The front panel LED marked ON AIR illuminates when the unit is designated Primary and is off when designated Backup.

The following drawings show the primary levels of the Menu tree; more levels appear with installed options. The best way to find your way around the menu system is to use it.



4. Routine Maintenance

Only suitably qualified personnel should be permitted to remove the lid from the TSG490.

Power Supply Unit

WARNING !!

**THIS UNIT CONTAINS A SWITCHED MODE POWER SUPPLY UNIT :
WHEN THE TOP COVER IS REMOVED, LIVE PARTS ARE EXPOSED.**

The Switched Mode Power Supply Unit (SMPSU) used in the TSG490 unit is a proprietary, bought-in unit. It contains several exposed live parts, and is therefore dangerous to service. If any problems are encountered, or it fails completely, DO NOT ATTEMPT TO REPAIR. Utah Scientific is able to arrange for the manufacturers to repair any faulty units. Please contact UTSCI regarding any servicing/repair requirements.

The TSG490 requires very little maintenance. Routine adjustments are not required and the preset controls should NOT be casually adjusted.

Dust

The unit should be protected from large build-up of dust. If present, this should be removed using a brush or vacuum cleaner when the unit is switched off.

Fuses

The unit has two fuses. The first is integrated into a fuse holder on the rear panel and is connected to the mains input live (brown) connection. The other fuse is part of the Switched Mode Power Supply Unit (SMPSU) mounted inside the frame.

Fuses must always be replaced with ones of the same type and rating.

Appendix A Pinout Data

TSG490 PINOUT DATA

Analogue Audio

Connector Type : D9 socket

Pin No:	Signal
1	Right -
2	Right +
3	0V
4	Left -
5	Left +
6 - 9	0V

Digital Audio Issue 4 module (option)

Connector Type : D92 socket

Pin No:	Signal
1	AES (Audio 8 + Audio 7) -
2	AES (Audio 8 + Audio 7) +
3	0V
4	AES (Audio 6 + Audio 5) -
5	AES (Audio 6 + Audio 5) +
6	Word Clock 48kHz
7	Word Clock 48kHz
8	Word Clock 44.1kHz
9	Word Clock 44.1kHz

2 The RS-232 connector on the TSG-490 is a 9-pin D Connector with male pins.

Appendix B – Option Modules

TSG490 SPG

There are four option modules available for the TSG490, designated TSG402, TSG 403, TSG 404 and TSG 406

The TSG 402 module provides three independently timeable Colour Black channels.

The TSG 403 module provides pattern and black outputs in SD or HD serial digital formats.

The TSG 404 module provides AES audio outputs.

The TSG 406 module provides 2 SD SDI outputs.

User-selectable parameters for both option modules are available within the Menu System. For more information on how to use the Menu System, see section 3 within this manual.

TSG402 Timeable Colour Black Option Module

Issue 5 PCB

TSG490

Option #

/02 Timeable Colour Black PAL/NTSC Timeable Colour Black & Tri-level Syncs

This module has three timeable Colour Black channels, each independently adjustable in Sc, H and V phase with respect to the main SPG output. Channels 1, 2 and 3 are all single output. Any or all of these outputs can be set to produce PAL, NTSC, or one of a selection of HDTV Tri-State Sync formats, regardless of the format of the main unit.

Installation

The TSG402 module is a retro-fit module that can be installed either at the factory, or in the field. Up to two (2) of these modules can be installed in a TSG490 frame (if slots are available).

When installed, this module normally occupies the 4 BNCs above the main Colour Black outputs. With reference to the rear panel layout in “Installation and Planning” :

Timeable Col. Blk. o/p	Rear Panel Position
1	Left
2	Left-Middle
3	Right-Middle
(4)	Right This is the 10MHz reference i/p.

Adjustments, Links, Test Points, Switches

Routine adjustments are not required; these are factory set and should NOT be casually adjusted.

VR401 Video Channel 1 amplitude.
VR421 Video Channel 2 amplitude.
VR441 Video Channel 3 amplitude.

There are no user Links, Test Points or Switches on this module.

TSG402 Timeable Colour Black Option Module (cont.)

Format Selection

To change a channel's Format, enter the Menu system, select "Video Menu" then "Timing Menu", then "Next" to select a "Black" channel, then "Set Format & Phase" and then select "Next" to change to the required format. "Exit", select "Next" to adjust another "Black" channel (as required). Be sure to exit from the menu completely to save your settings. Note : if the channel format is set for NTSC or HDTV (n) when the main unit is PAL (or vice-versa), the phase settings for that channel are meaningless/superfluous.

Phase Settings

To change a channel's phase settings, enter the Menu system, select "Video Menu" then "Timing Menu", then "Next" to select a "Black" channel, then "Set Format & Phase" and then select "Do Phasing". Select the required parameter to change (V, H or SC Phasing) then select the - or + buttons to adjust the phase, then "Exit" to select another parameter to adjust. As you change the phase parameter, the SC, H and V LEDs next to the "Phase" button follow the menu selection. Be sure to exit from the menu completely to save your settings.

The numbers present on the Phase parameter adjustment lines are only a representation of the actual phase settings :

V-phase - each increment/decrement is +/- 1 video line (range = 8 fields).
default for co-timed = 2493 (PAL).

H-phase - each increment/decrement is +/- 37ns (1/2 pixel width).
default for co-timed = 1709 (PAL).

Sc-phase - each increment/decrement is +/- 0.228ns (i.e. +/- 0.36°).
default for co-timed = 0140-0160 (PAL).

Note : the settings made in the "Timing Menu" are effectively an offset that occurs between the main SPG output timing and the Timeable Colour Black outputs; if the main output timing is altered, the Timeable Colour Black outputs each move by the same amount, i.e. inter-output timings do not change.

TSG403 HD/SD Test Pattern & Colour Black Output Option module

Issue 4 PCB

TSG490
Option #

/08 HD/SD TPG HD/SD Pattern & Black generator with Embedders

Installation

The TSG403 module is a retro-fit module that can be installed either at the factory, or in the field. Up to two (2) of these modules can be installed in a TSG490 frame (if slots are available).

When installed, the available connectors are present at the rear panel. Refer to the rear panel layout in “Installation and Planning” for connector positioning.

Rear Panel BNC	Output
Left	Black 2
Left-Middle	Black 1
Right-Middle	Pattern 2
Right	Pattern 1

Note : the Pattern output may be set to produce Black, and vice versa.

Adjustments, Links, Test Points, Switches

There are no user Adjustments, Links, Test Points or Switches on this option module.

TSG404 AES Audio Option Module

Issue 4 PCB

TSG490 Option #

/04 AES Digital Audio - selectable level, freq., interruption, sample rate. Word Clock and 75Ω outputs available.
Note: analogue audio follows AES level, freq. and interrupt settings.

Installation

The TSG404 module is a retro-fit module that can be installed either at the factory, or in the field.

When installed, the available connectors are present at the rear panel. Refer to the rear panel layout in “Installation and Planning” for connector positioning.

Adjustments, Links, Test Points, Switches

There are no user Adjustments, Links, Test Points or Switches on this option module.

TSG406 SD SDI Output Option Module

Issue 2 PCB

TSG490 Option #

/11 SD SDI Digital Video - SDI Output option with Embedder

Installation

The TSG406 module is a retro-fit module that can be installed either at the factory, or in the field. Up to two (2) of these modules can be installed into a TSG490 frame.

When installed, the available connectors are present at the rear panel. Refer to the rear panel layout in “Installation and Planning” for connector positioning.

Output Selection Options

Menu Navigation

Press the button marked Menu once. The Menu is displayed on the pattern output and can be viewed on a monitor. Use the “-” or “+” button to highlight the required option and press the button marked Select. This will move you to the next level or change the option depending on where you are in the menu. To leave the menu system, select and confirm Exit each time until the Main Menu is displayed, then press Menu to exit.

SD411 Selections

To change the configuration of the signal appearing on the output of the SD411 Option, enter the Menu system, select “Video Menu” to get to the main video menu. Then, select “Options Menu”, “SD Options” and then “SDI Options”. At this point the selections available are “Select Options” and “Select Pattern”. Under Select Options, there are three menu areas in which to make selections – “Video Options”, “VITS Options” or “VITC Options”.

Video Options

The configurable parameters under the menu selection “Video Options include whether the output is Black or Pattern and which of the following items are added to the output pattern –

On-screen Display added to Pattern (PAT OSD)

Field 1Line10 Timing Pulse (PAT F1L10)

Alternating Bounce pattern (SDI & PAT BOUNCE)

8 or 9 Bar Color Bars (CODED PAT then 9 BAR/8 BAR)

½ field red overlay (PAT RED).

VITS Option

The configurable parameters under “VITS Option” are –

- 1) whether the VITS signal appears on the Pattern, if selected,
- 2) whether the VITS signal appears on the Black output, if selected, and
- 3) which class of VITS is to be added –

USA

Full

IDENT

Black

INT1

INT2

EBU

UK.

VITC Options

The “VITC Options” selections are similar to the VITS Options with the exception that instead of making a class selection, the choice of line(s) on which the code is to be added must be made. The choices are

- 1) any one of lines 9 – line19 or
- 2) any pair of lines 9 & 11 through lines 17 & 19.

Appendix C

Operation of TSG490 SPG While Connected to the NTP Server

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 NTP system responds to requests from “slaves” and replies with a “time-stamp”. It is up to the slave 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!**

The TSG490 SPG acts as an NTP slave. As the SPG is powered the NTP slave begins searching for time from the NTP server. In a “good” network the search for time may take up to 5 minutes. The TSG 490 SPG NTP slave will keep searching for a time until it gets one.

The NTP operational parameters can be monitored on the first menu and on the remote control program TSG 490MiniMessage.

The TSG 490MiniMessage gives a graphic view of The NTP data and provides much information for the user.

NTP and television:

From an NTP server, the TSG 490 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.

		Offset	TSG 490 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	NTSC Drift in one day	75ms	Usually adjusted daily
3	Local Time	User defined	The user usually defines the offset from UTC at time of installation
4	Daylight Saving	1 hour	Twice per year

Table 1 - Required Time Corrections

The first three above corrections are made to the time code outputs, without disturbing any of the video signals. This correction is called a jam-sync. NTSC has a 4 field color sequence and PAL* has an 8 field color sequence, so to avoid disturbing the video, there will be a discrepancy between UTC and the time code output, after a color correction of the time code numbers occurs. The maximum discrepancies for NTSC drop frame time code will be 2 fields (33ms) after a daily jam-sync and for PAL (EBU time code) it will be 2 fields (40ms), after a leap second insertion. In NTSC countries, if you jam-sync daily, drop frame time code may also be used to drive slave clocks. The maximum time drift will be 75ms. 60Hz time code is not related to video and is not affected by jam-sync operations.

The TSG 490 may be programmed in advance, to make time and time code number changes automatically without disturbing the video.

**The TSG490 does not automatically adjust for daylight saving.
The TSG490 does not automatically adjust for leap seconds.**

* The PAL 8 field television system runs at 50 fields per second, so one field has a duration of 20ms and one PAL cycle is completed in 160ms. At this rate there are 6.25 PAL cycles per second. When a leap second is added, the extra 0.25 cycles (2 fields or 40ms) cannot be accommodated.

1. NTP reception monitoring and system status

The NTP slave is continually updating the SPG via RS232 messages. The SPG relays some of this information to the remote control protocol engine. A PC connected to the remote control port and running the UTSCI system diagnostic program can monitor the state of the NTP receiver and the parameters being used by the system to achieve lock.

The default settings of the NTP system are as follows:

SPG IP address	192.168.001.099
SPG IP mask	255.255.255.000
SPG IP Gateway	192.168.001.001
NTP Server IP address	212.013.207.101

2. Time locking

Time lock is achieved by reading the NTP time from the NTP slave and calculating an appropriate timecode. There are a few problems :

NTSC frame slip. Over 24 hours the NTSC frame count slips relative to real time by a few milliseconds. A timecode reset should be implemented once every 24 hours.

The timecode 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 timecode update should be suppressed until it has been valid for a number of seconds. Once the timecode has been set by the NTP slave, the SPG should not need to recheck the NTP time unless a crash lock has been forced by the phase locking arrangement.

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 D

How to calculate the antenna gain and cable loss for TSG490 SPG GPS antenna installation

GPS satellites orbit the earth at an altitude of 20,183 Km and output a signal at 1575.42MHz. Once the GPS signal reaches your GPS antenna the signal is so weak it is below the noise floor of the earth. It comes as no surprise that any further attenuation of this signal can render it useless.

Over the past decade GPS receivers have been getting more and more sensitive. The GPS receiver's latest offerings can pick up signals as low as -130dBm.

Because of the sensitivity of the GPS receivers, due care and attention must be paid to the antenna setup. For the best dynamic performance, an active antenna is recommended. Our recommended active antennas contain a low noise amplifier (LNA) and a filter to reduce the effects of out of band noise.

In the world of GPS; too much signal gain can be just as detrimental as too little, and RF noise, even if it is out of band, can severely disrupt the performance of your GPS application.

As a quick calculation...

The GPS receiver has a minimum input gain of 20dB and a maximum of 30dB.

The recommended antenna has a 26dB gain.
Recommended cable is RG58 and TNC connectors having a loss of 0.85dB per metre.
(RG174 has a loss of 1.2dB per meter.)

Maximum cable length is: $(26\text{dB}-20\text{dB})/0.85\text{dBpermetre} = 7.06$ metres
Minimum cable length is: $(30\text{dB} -26\text{dB})/0.85\text{dBpermetre} = 4.70$ meters

As a general rule, keep RF cable lengths as short as possible and use a good quality GPS antenna with the correct gain. UTSCI provides antenna and cable assemblies as part of the option. Using your own assembly is NOT recommended.

Installation Kit

A kit of parts is included to provide the installer with all connectors that might be needed. This kit contains:

Mounted internal to the TSG490 SPG frame:

1. TSG409_3 – Jupiter21 assembly
 - Various screws, washers etc.
2. 50ohm SMB male to male bulkhead adaptor
 -
3. 50ohm SMB plug to SMB R/A plug cable 130mm long USING RG174 (3mm) cable

Mounted externally - Provided for use by the system installer:

1. 50ohm SMB crimp plug to RG174 (3mm) cable
2. 50ohm SMB crimp plug to RG58 (6mm) cable
3. 50ohm TNC crimp plug to RG174 (3mm) cable
4. 50ohm TNC crimp plug to RG58 (6mm) cable
5. 50ohm FME crimp plug to RG58 (6mm) cable
6. 50ohm SMB plug to TNC jack RG174 (3mm) cable 130mm long
7. 50ohm TNC plug to TNC/FME plug RG58 (6mm) cable 8000mm long
8. GPS antenna (26dB gain)
 - GPSP-F FME connector
 - Alternative parts are available on request.
 - Detailed mechanical drawings are available.



FME connector



1210FW-TNC connector

GPSP-F-

TSG490 MiniMessage

The serial control port can connect to the TSG490 SPG to give control and status information about the SPG.

Perhaps especially useful is the GPS status page on which details of the GPS lock can be viewed.

The screenshot displays the 'Courtyard CY490 MiniMessage' software interface. At the top, a status bar reads '!! SPG CY490 v3924 Online !!'. Below this, a menu bar includes 'SD Composite', 'SD Digital', 'HD Digital 1', 'HD Digital 2', 'Genlock and Timing', 'SPG Globals', 'Timecode', 'GPS', and 'Options'. The main window is divided into several sections:

- Left Panel:** A list of GPS parameters with their current values:

Xposition	4002918
Yposition	-55303
Zposition	4948819
Xvelocity	0
Yvelocity	0
Zvelocity	1
Mode1	04
DOP2	6
Mode2	02
GPSWeek	360
GPSTOW	38768677
SVsInFix	7
Chans	12
SVs	80
ClockDrift	3575074889
ClockBias	1397867806
EstimatedGPSTime	156518236
SeqStatMax	0
SeqStatLat	0
AveTrkTime	186
LastMS	91
AckID	132
NAckID	180
NoOfVisibleSVs	9
UTCHour	11
UTCMinute	41
UTCSecond	13
UTCDate	20
UTCMonth	7
UTCYear	2006
UTCOffsetInt	13
UTCOffsetFrac	999999992
PPSSstatus	07
- Center Panel:** Contains checkboxes for 'GPSTimeLock' (checked), 'GPSFrequencyLock' (unchecked), and 'GPSPhaseLock' (unchecked). Below these is a graph titled 'SPG Frequency Error - Last 5 minutes' showing a fluctuating signal.
- Right Panel:** A table with columns 'Samp', 'Data', and '20sec'.

247	0	0
248	0	0
249	-1	0
250	0	0
251	1	0
252	0	0
253	-2	0
254	0	0
255	0	0
256	0	0
257	0	0
258	0	0
259	0	0
260	0	0
- Bottom Panel:** Includes a 'GPS map' and 'GPS sats grid' section. The map shows a circular field with satellite icons labeled with IDs like 21, 26, 29, 10, 27, 28, and 13. To the right is a table of satellite data:

SV	C/N	St
8	46	BF
27	46	BF
28	44	BF
29	36	BF
26	20	AD
21	35	3F
2	35	BF
0	0	00
0	0	00
10	47	BF
0	0	00
13	39	BF

At the bottom left, there is a 'SPG0' button, and at the bottom right, the version number 'Version: 1.0.0.0' is displayed.

The MiniMessage Application

MiniMessage is the UTSCI TSG490 SPG Remote Control application that enables the operator to use a PC or Laptop to change the usual menu-selectable variables on the unit. It requires a standard RS232 D9 cable – be sure to use a cable with the correct polarity connectors. Note that the Remote port on the TSG 490 SPG is a “Male”. MiniMessage can be placed directly on the Windows® Desktop, or run via a shortcut.

Initial Start-up

On first time start-up, MiniMessage should be configured for RS232 operation (as opposed to Ethernet operation). This can be confirmed by selecting the [Options] tab and checking that the “use Com” tick-box in the top right-hand corner is ticked. MiniMessage confirms connection to a TSG 490 SPG by displaying the “TSG 490 SPG Vxxxx Online” message at the top of the application window. (Vxxxx is the software version number installed in the TSG 490 SPG).

Standard SPG Settings

The majority of tabs allow the user to change a variety of standard settings on the TSG490 SPG. Some of the tabs relate exclusively to installable option modules – if they are installed, the allowable user settings will be displayed (pane will be blank if no option is installed). Some settings are not user-selectable, and can be recognised as being “greyed-out”.

GPS operation

When a GPS option is installed, received data, tabular and graphical information is displayed on the [GPS] tab. This is purely a monitoring page – there are no user-selectable variables here. MiniMessage does not need to be running for the GPS system to operate – the GPS system is completely autonomous, and should require no user intervention after installation. Please refer to the documentation that came with the GPS option for more information.

Operating Mode

MiniMessage can be used to control the TSG490 SPG either via a PC COM port or via Ethernet (but preferably not at the same time).

The change of operating mode is determined by the “use Com” tick-box in the top-right corner of the [Options] tab :

Ticked for COM operation, Un-Ticked for Ethernet operation.

Whenever you change this tick-box, you must press the [Save Setup] button, then close MiniMessage and then re-start MiniMessage for the change to take place.

For Ethernet operation : In the table below this tick-box, either set [IP], etc. to be that as on the SPG or wait for MiniMessage to “find” the SPG. Any selections/changes made within MiniMessage are slower in Ethernet mode than in COM mode.

Operation with an NTP Client

When the TSG490 SPG is configured as an NTP Client (i.e. without the GPS option installed), the NTP system must be connected to a local network in order for valid time information to be retrieved from the specified NTP Server. Please refer to the documentation that came with the NTP option for more information.

Operation with an NTP Server

When the TSG490 SPG is configured as an NTP Server (i.e. with the GPS option installed), the GPS system must be operational in order for valid time information to be utilised by the NTP option. Only when valid GPS time is available will the NTP system function. GPS reception/operation can be monitored by looking at the GPS tab in MiniMessage while in COM mode (regardless of whether NTP is running or not). Please refer to the documentation that came with the NTP option for more information.

Compatibility

At the bottom right-hand corner of the [Options] tab is a reference to the earliest version of software that can be used with the version of MiniMessage you are using.

Standard antenna:



Alternative antenna:



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